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Javanese medicinal plants used in rural communities

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1 Introduction and Background

The impulse for two master theses (“Javanese medicinal plants used in rural communities” by Emina Koller and “Medicinal plants used in rural communities of Java” by Anna-Maria Köck) was given by a project from INTRAMED (Integrating local knowledge on traditional medicine into rural health care system in Indonesia) which was supported by the Austrian Academy of Sciences. Univ. Prof. Dr. Wolfgang Kubelka (Dept. of Pharmacognosy Univ. Vienna) took part in the project, starting fall 2006, finishing winter 2007, and went to Java in September 2006.

The project was conducted among low-income households and health care staffs in two villages in West Java; Sirnarasa is a remote village and Tanjungsari in contrast is located in a sub-urban area.

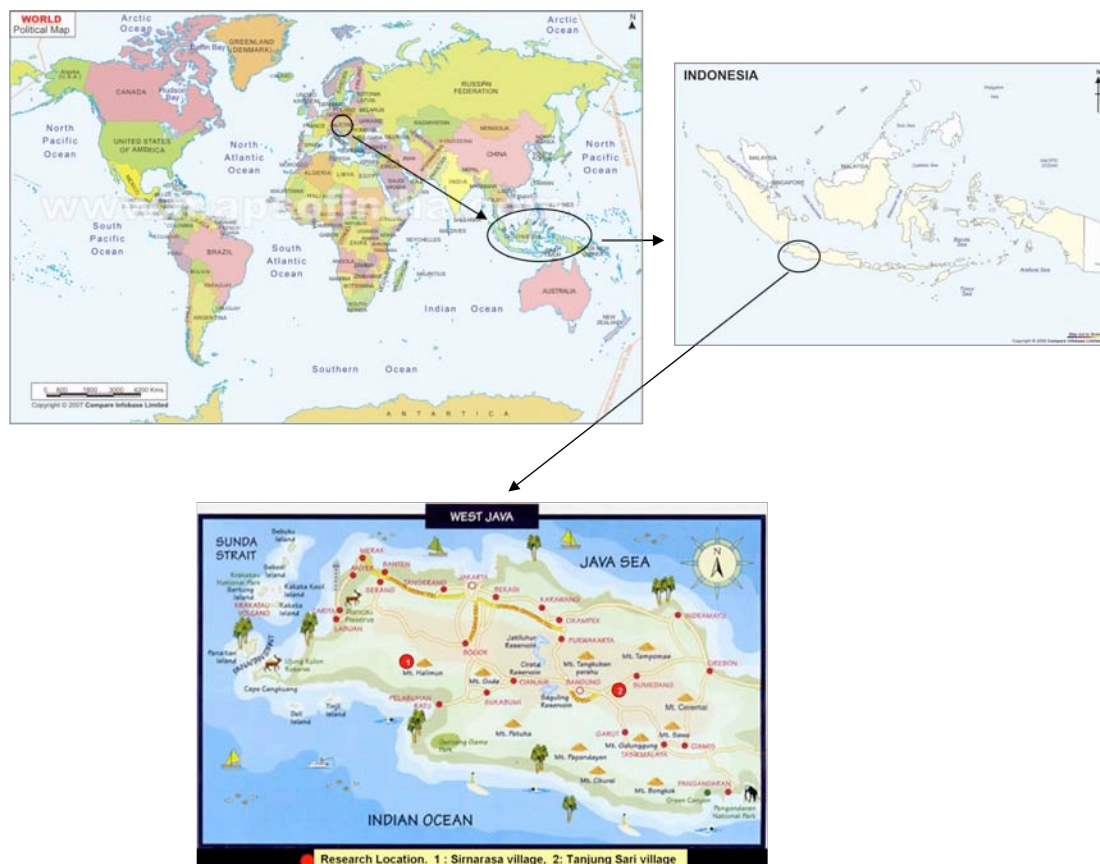


Figure: Map of World, Java and West Java

In each village respondents were involved for interviews and wider participation during group discussions. The respondents consisted of male and female inhabitants from common village, local healers as well as official health care personnel. In both villages, lack of knowledge in medicinal plant preparation was identified.

This research has demonstrated local availability and importance of medicinal plant knowledge in maintaining daily health status as well as the obstacles for its utilization in the existing rural health care system. Optimization of locally known medicinal plant use may provide an affordable

and accessible health care alternative for communities, which in long term contributes positively in poverty alleviation.

INTRAMED documented all the medicinal plant species from both villages, and their use for treatment of more than 50 illnesses, from common cold to hypertension.

Our work started with looking through the long list of collected plants, comprising appr. 160 species.

The main task of our work was to search literature for knowledge of all of the plants – botanical description, chemical constituents, pharmacological activities, use as remedies, toxic properties, etc.

In this way we intended to yield scientific background and support for the traditional use of the plants and the respective preparations.

Considering the large number of plant species it was decided to split the work into two separate parts, each of them dealing with 25 or 20 plant families and the species within these families. Information on each plant was obtained by searching in books, journals, and the internet. Special notice was given to recent research studies.

Figure: Image taken from study presentation by Verania Hödl, INTRAMED Project Coordinator

2 Monographs

In this chapter are the monographs of the different plants from Java used in the study from INTRAMED ordered alphabetically by plant family and then by the scientific name of the plant (in brackets the Javanese local name of the plant). Some plants have different local names in the two rural communities Sirnarasa and Tanjungsari.

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2.1 Alliaceae

Onion family

Alliaceae include 20 genera of usually bulbous perennial herbs, which are widely distributed in tropical and temperate regions. This group is closely related to the amaryllis family, Amaryllidaceae. It includes pungent culinary herbs such as onions, garlic, chives, shallots and leeks. The characteristic aroma emanates from sulfur compounds. Several species are grown for their ornamental flowers as well. Leaves are narrowly strap-shaped to linear. Flowers are funnel-shaped, with petals fused into a tube at the base. They are clustered in umbels and subtended by a dry, spathe-like bract and borne at the end of a leafless stalk (scape).^[1]

Alliaceae are monocots, part of the order Asparagales. The family has been widely but not universally recognised; in the past, the plants involved were often treated as belonging to the family Liliaceae, and still are by some botanists.

The APG (Angiosperm Phylogeny Group) II system of 2003 recognises the family and places it in the order Asparagales in the clade monocots. APG II allows two options of the circumscription of the family:

Alliaceae *sensu lato* ("in the wider sense"), including all the plants that were assigned to the families Agapanthaceae, Alliaceae and Amaryllidaceae in the 1998 APG.

Alliaceae *sensu stricto* ("in the strict sense"), unchanged from the 1998 APG system, excluding the plants then forming the families Agapanthaceae and Amaryllidaceae.

Note that quite a few of the plants that were once included in family Alliaceae are assigned to the family Themidaceae by both APG and APG II.

The most important genus is *Allium*, which includes several important food plants, including onions (*Allium cepa*), chives (*A. schoenoprasum*), garlic (*A. sativum* and *A. scordoprasum*), and leeks (*A. porrum*).^[2]

[1] TROPICAL FLOWERING PLANTS, A Guide to Identification and Cultivation, Llamas Albrecht Kirsten, Timber Press Inc, Portland-Oregon USA, 2003, ISBN 0-88192-585-3, pp. 51

[2] Weblink: <http://en.wikipedia.org/wiki/Alliaceae>, Wikipedia, 02.04.2008

Allium cepa L. (Bawang Ganda, Bawang Beureum)



Allium cepa L.

Occurrence and appearance

Bulb solitary or clustered, applanate-globose to cylindric-ovoid; tunic purple-red, brown-red, pale brown-red, or yellow to pale yellow, papery to thinly leathery, entire. Leaves shorter than scape, 0.5--2 cm wide, terete, fistulose. Scape developed or not, if developed then to 1 m, terete, conspicuously inflated below middle, fistulose, covered with leaf sheaths only at base. Spathe 2- or 3-valved, persistent. Umbel globose, densely many flowered or with bulblets and a few flowers. Pedicels equal, ca. 5 × as long as perianth, bracteolate. Perianth chalk white or white; segments with green or pale red midvein, oblong-ovate, 4--5 × ca. 2 mm. Filaments equal, slightly longer than perianth segments, connate at base for ca. 1/5 their length, adnate to perianth segments for 1/2 of connate part; outer ones subulate; inner ones broadened at base, 1-toothed on each side. Ovary subglobose, with concave nectaries covered by hoodlike projections at base. Style slightly exserted. Fl. and fr. May--Jul.^[1]

Parts used

Bulbs, juice of the bulbs and seeds.^[2]

Constituents

The bulb contains polyphenols, protocathechuic, caffeic and ferulic acids, quercetin and its derivatives, carbohydrates, sterols and sterol glycosides, β -amyrin and β -sitosterol. The essential oil from the bulbs yields various mono-, di-, tri- and tetra-sulphides, thiols and thiophene.^[1]

Onion contains 0.005 – 0.015 EO, methylalliin, dihydroalliin (propylalliin), and cycloalliin. The colored epidermal layer may contain 4% quercetin, 1% spiraeoside, 0.45% protocathechuic acid, phloroglucin, protocathechuic methyl

ester. Leaves contain quercetin, spiraeoside, ferulic acid ester, and caffeic acid. Cell walls contain mannan, pectin, pentosane, fructosane, myrosinase, and peroxidase. Most *Allium* species exhibit antioxidative activity in a linoleic-acid model system, and onion and garlic show it, even in minced pork. Rutin is said to be antiatherogenic, antiedemic, antiinflammatory, and hypotensive (DAD). Here are a few of the more notable chemicals found in onion:

Allicin: alcohol-dehydrogenase-inhibitor 500 μ M; amebicide 30 μ g/mL; anthelmintic; antiaggregant 0.1-1 μ M; antiatherosclerotic 0.05-0.1 mg/kg orl hmn; antibacterial MIC = 27 μ g/ml, 500 μ g/ml; antidiabetic; antifu; antiglaucomatous; antiherpetic; antiinflammatory; antileukemic 31+ μ M; antileukotriene; antilymphoma; antimutagenic; antimycobacterial MIC = 1.67 mg/ml; antineuralgic; antioxidant 1.8 μ g/ml; antiproliferant; antiprostaglandin IC₆₇ = 50 μ M; antiradicular 1.8 μ g/ml; antisarcomatous; antiseptic; antihigellitic; antistaphylococcal MIC = 27 μ g/ml; antitriglyceride 0.05-0.1 mg/kg orl hmn; antitubercular MIC = 1.67 mg/ml; antitumor; antiviral; apoptotic 31 + μ M; candidicide MIC 7 μ g/ml; cholinesterase-Inhibitor 500 μ M; cyclooxygenase-Inhibitor; fungicide; gram(+)-icide 8-12 ppm; hepatotoxic 100 mg/kg/day (= 500 cloves a day); hypocholesterolemic IC₃₇₋₇₂ = 162 μ g/ml, 0.05-0.1 mg/kg orl hmn, IC₅₀ = 9 μ M; hypoglycemic 0.1 mg/kg; hypolipidemic ID₅₀ = 10 μ M; hypotensive; immunostimulant; insecticide; insuline-sparing 100mg/kg/man; larvicide; lipolytic 4-6 mg/day; lipoxygenase-Inhibitor ED = 25 μ g/ml; mucokinetic; nematocide; NO-inhibitor IC₅₀ = 2.5-5 μ M; papain-inhibitor 500 μ M; phagocytotic; prooxidant; succinate-dehydrogenase-inhibitor 500 μ M; trichomonicide; urease-inhibitor 500 μ M; vibriocide; xanthine-oxidase-inhibitor 500 μ M; LD₅₀ = 309 mg/kg orl mus (male); LD₅₀ = 363 mg/kg orl mus (female); LD₅₀ = 60mg/kg ivn mus; 120 mg/kg scu mus.

Alliin: antiaggregant IC 100 = 60 μ g/ml; antibacterial; antidiabetic 200 mg/kg; antihepatotoxic 0.5 μ g/ml; antineuralgic; antioxidant; antiradicular; antisarcomatous 1-3 mg ims rat; antiseptic; antithrombotic; antitumor; hepatoprotective; hypocholesterolemic; hypoglycemic; lipolytic 200 mg/kg orl rat; lipolytic 7-11 mg/day.

Cepaene: antiaggregant; antiallergic; antiasthmatic; cyclooxygenase-Inhibitor; lipoxygenase-inhibitor.

Protocatechuic-Acid: antiarrhythmic, antiasthmatic; antibacterial; anticlastogenic; antihepatotoxic; antiherpetic; antiinflammatory; Antiischemic; antiophidic; antioxidant: 2/3 quercetin; 10 x alpha-tocopherol; antiperoxidant IC₅₀ = >100 μ M; antiradicular; antispasmodic EC₅₀ = 4.6-17 μ M; antitumor (colon); antitumor (mouth); antitumor (skin); antitussive; antiviral; carcinogenic; chemopreventive 100 ppm orl rat; fungicide 500 μ g/ml; glutathione-depleting; hepatotoxic; immunostimulant; nephrotoxic; phagocytotic; prostaglandinogenic; secretagogue.

Quercetin: aldose-reductase inhibitor; allelochemic IC₈₂ = 1 mM; analgesic; anesthetic; antiaflatoxic IC₅₀ = 25 μ M, IC₅₀ = 7.5 ppm; antiaggregant IC₅₀ = 55 μ M, 30 μ M; antiallergic IC₅₀ = 14 μ M; antianaphylactic; antiasthmatic IC₅₀ = 14 μ M; antiatherosclerotic; antibacterial; anticancer; anticapillary fragility; anticarcinogenic (breast) IC₅₀ = 1.5 μ M; anticariogenic ID₅₀ = 120 μ g/ml; anticataract; antiCrohn's 400 mg/man/3x/day; anticolitic; 400 mg

/man/3x/day; antidermatitic; antidiabetic; antiencephalitic; antiescherichic; antielastase IC₅₀ = 0.8 µg/ml; antiestrogenic; antifeedant (IC₅₂ = <1000 ppm diet); antifibrosarcomic; antifu; antigastric; antigonadotropic; antiGTF ID₅₀ = 10 µM; antihepatotoxic; antiherpetic; antihistaminic IC₅₀ = <10 µg/ml; antiHIV; antihydrophobic; antiinflammatory (20 mg/kg) 150 mg/kg; antileukemic IC₅₀ = >10 µg/ml, 5.5-60µM, IC₅₀ = 10 µM; antileukotrienic; antilipoperoxidant IC₆₇ = 50; antimalarial IC₅₀ = 1-6.4 µg/ml; antimelanomic; antimetastatic; antimutagenic ID₅₀ = 2-5 nM; antimyocarditic; antinitrosaminic; antioxidant IC₉₆ = 300 ppm, 4.7 x Vit. E; antiperiodontal; antipermeability; antiperoxidant; antipancreatotic; antipharyngitic; Antiplateau; antiPMS 500 mg/2x/day/wmn; antipodriac; antipolio; antiprostanoic; antiprostatic; antipsoriac; antiradicular IC₅₀ = µM; antispasmodic; antistreptococcic ID₅₀ = 120 µg/ml; antithiamin; antithrombic; antitumor; antitumor (bladder); antitumor (breast); antitumor (colon); antitumor (lung); antitumor (ovary); antitumor (skin) 20 µM; antiulcer; antiviral IC₅₀ = 10 µM; apoptotic 20-60 µM; ATPase-inhibitor; bacteristat 10mg/ml; 11B-HSD-inhibitor; bradycardiac; calmodulin_antagonist; cAMP-phosphodiesterase-inhibitor; candidicide; carcinogenic 40,000 ppm (diet) mus; catabolic; COMT-inhibitor; copper-chelator; COX-2-inhibitor <40 µM; cyclo-oxygenase-inhibitor; cytotoxic ED₅₀ = 70 µM; estrogenic (10% genistein); fungicide; hemostat; hepatomagenic 5000 ppm (diet) rat; hepatoprotective; HIV-RT-inhibitor IC₅₀ =< 1µg/ml; hypoglycemic 100mg/kg orl rats; hypotensive; inotropic; insulinogenic; juvabional; larvostat (8000 ppm diet); lipoxygenase-inhibitor IC₁₁ = 1.25 mM, IC₅₀ = 0.1-5 µM; MAOI-inhibitor; mast-cell-stabilizer; metalloproteinase-inhibitor IC₅₀ = >42 µM; MMP-9-inhibitor 20µM, mutagenic; NADH-oxidase-inhibitor; NEP-inhibitor IC₅₀ = >42 µM; neuroprotective 5-25 µM; NO-inhibitor 5-50 µM; ODC-inhibitor <10 µM; p450-inducer 5µM; p450-inhibitor 50-100 µM; phospholipase-inhibitor; protein-kinase-C-inhibitor; PTK-inhibitor 0.4-24 µM; quinone-reductase-inducer 6µM, 13 µM; teratologic; topoisomerase-I-inhibitor IC₅₀ = 42 µM, IC₅₀ = 12.8 µg/ml; topoisomerase-II-inhibitor; tyrosine-kinase-inhibitor; vasodilator; antinitrosaminic; xanthine-oxidase-inhibitor IC₅₀ = >0.4 µg/ml; LD₅₀ = 160 (orl mus) (may have been contaminated with podophyllin); LD₅₀ = >2000 orl rat PAM.^[3]

Pharmacologic properties

The main properties of onion include antimicrobial activity, cardiovascular support, hypoglycemic action, antioxidant/anticancer effects, and asthma protection.

Antimicrobial effects

In vitro

Onion has shown antibacterial, antiparasitic, and antifungal actions. *Salmonella typhimurium* mutagenicity was reduced in hamburger when onions were added. Growth of oral pathogenic bacteria, including *Streptococcus mutans*, *Streptococcus subrinus*, *Porphyromonas gingivalis*, and *Prevotella intermedia*, the main causes of dental caries and periodontitis, was prevented by onion extracts. Onion juice or oil also have inhibited growth of other gram-positive bacteria and the gram-negative bacterium *Klebsiella*

pneumoniae. Antifungal actions of onion include inhibition of yeasts, *Microsporum canis*, *Microsporum gypseum*, *Trichophyton simii*, *Trichophyton mentagrophytes*, *Chrysosporium queenslandicum*, *Aspergillus flavus*, and *Penicillium rubrum*. One source identifies the thiosulfinate principle in the onion as a main antimicrobial agent.^[4]

Cardiovascular disease

Certain onion genotypes containing higher contents of sulfur in the bulb correlated with greater antiplatelet activity. Thiosulfates dimethyl- and diphenylthiosulfinate, for example, are known to retard thrombocyte biosynthesis. The least polar fraction of onion extract was associated with the most inhibitory activity toward platelet aggregation, thus a greater inhibition of thromboxane synthesis was reported. Synthesis of thromboxanes and prostaglandins in vitro has been shown with onions, as well as with garlic and other Liliaceae family members.

Animal data

The hypolipidemic effects of sulfur-containing principles in onion, including S-methyl cysteine sulfoxide and allylpropyl disulfide, have been demonstrated in several studies in rats and rabbits. Examples include onion's protective effects against diet-induced atherosclerosis and its marked action in controlling lipids and triglycerides. Cardiovascular disease risk factors also involve blood coagulability. Several reports confirm the onion's inhibitory effects on platelet formation. Raw, but not cooked, onion demonstrated antithrombotic effects in rats. Dose-dependent inhibitory effects on platelet aggregation with raw onion also were seen in rabbits. Boiling onion may cause decomposition of the antithrombotic ingredient.

Clinical data

One report evaluates onion's hemostatic effects in humans, but certain lipid-reducing and blood pressure-lowering effects in humans have not yet been clinically proven. Onion's benefits relating to cardiovascular disease have been reviewed.^[4]

Diabetes

Animal data

Studies from 1965 to 1975 report antidiabetic activity, "hypoglycemic principles", and blood sugar level reduction in diabetic rabbits. More recent reports confirm many of these claims, finding similar outcomes. Onion decreased the hyperglycemic peak in rabbits. In addition, onion amino acid S-methyl cysteine sulfoxide contributed to antidiabetic effects in affected rats, controlling blood glucose in addition to other diabetic effects comparable to insulin.

Clinical data

Although more research is needed on the use of onion as a treatment for diabetes in humans, many articles describe its benefits in improving glucose levels.^[4]

Blood Sugar-Lowering Effects

The higher the intake of onion, the lower the level of glucose found during

oral or intravenous glucose tolerance tests. Experimental and clinical evidence suggests that allyl propyl disulfide is responsible for this effect and lowers blood sugar levels by increasing the amount of free insulin available. Allyl propyl disulfide does this by competing with insulin, which is also a disulphide, to occupy the sites in the liver where insulin is inactivated. This results in an increase in the amount of insulin available to usher glucose into cells causing a lowering of blood sugar.

In addition, onions are a very good source of chromium, the mineral component in glucose tolerance factor, a molecule that helps cells respond appropriately to insulin. Clinical studies of diabetics have shown that chromium can decrease fasting blood glucose levels, improve glucose tolerance, lower insulin levels, and decrease total cholesterol and triglyceride levels, while increasing good HDL-cholesterol levels. Marginal chromium deficiency is common in the United States, not surprising since chromium levels are depleted by the consumption of refined sugars and white flour products as well as the through lack of exercise. One cup of raw onion contains over 20% of the Daily Value for this important trace mineral.^[5]

Cancer

Onion has proven to be an antioxidant and may be beneficial in certain cancers. The organosulfur compounds contained in onion exert chemopreventive effects on chemical carcinogenesis. The constituent diallyl disulfide possesses inhibitory properties against colon and renal cancers.

Oil of onion is an effective antioxidant against nicotine-induced damage in rats.

Clinical data

People consuming diets high in allium vegetables, including onion, suffer from fewer incidences of stomach cancer. Onion's protective factors for breast cancer have been evaluated in a case-control study in France. Another report compares the antioxidant activity of onion polyphenols with those of other fruits and vegetables. The quercetin component in onion, however, was found to be absorbed by humans from dietary sources but provided no direct protective effect during low-density lipoprotein oxidation.^[4]

In a study participants consuming the most onions showed an 84% reduced risk for cancer of the oral cavity and pharynx, 88% reduced risk for esophageal cancer, 56% reduced risk for colorectal cancer, 83% reduced risk for laryngeal cancer, 25% reduced risk for breast cancer, 73% reduced risk for ovarian cancer, 71% reduced risk for prostate cancer, and 38% reduced risk for renal cell cancer, compared to those eating the least onions. Similarly, those eating the most garlic had a 39% reduced risk for cancer of the oral cavity and pharynx, 57% reduced risk for esophageal cancer, 26% reduced risk for colorectal cancer, 44% reduced risk for laryngeal cancer, 10% reduced risk for breast cancer, 22% reduced risk for ovarian cancer, 19% reduced risk for prostate cancer, and 31% reduced risk for renal cell cancer, compared to those eating the least garlic.^[5]

Miscellaneous uses

Respiratory problems

Folk medicine has used the onion for treatment of asthma, whooping cough, bronchitis, and similar ailments. The onion is used in homeopathic medicine. Onion juice administration protected guinea pigs from asthma attacks. An ethanol extract of onion reduced allergy-induced, bronchial constriction in certain patients. The thiosulfinates present in the onion are said to inhibit bronchoconstriction, but definite efficacy remains unproven in this area.^[4]

Boost bone health

A compound newly identified in onions with the long complex name of gamma-L-glutamyl-trans-S-1-propenyl-L-cysteine sulfoxide, GPCS, for short, inhibits the activity of osteoclasts (the cells that break down bone). The more GPCS given in this animal study, the more the bone resorptive (breakdown) action of osteoclasts was inhibited.

Onions may be especially beneficial for women, who are at increased risk for osteoporosis as they go through menopause. Fosamax (Alendronate), the drug typically prescribed to prevent excessive bone loss, works in a similar manner, by destroying osteoclasts, so they do not break down bone. Potential negative side effects of Fosamax include irritation of the upper gastrointestinal mucosa, acid regurgitation, esophageal ulcers and erosions. Potential negative side effects of eating onions: onion breath.

Anti-Inflammatory and Anti-Bacterial Activity

Several anti-inflammatory agents in onions render them helpful in reducing the severity of symptoms associated with inflammatory conditions such as the pain and swelling of osteo- and rheumatoid arthritis, the allergic inflammatory response of asthma, and the respiratory congestion associated with the common cold. Both onions and garlic contain compounds that inhibit lipoxygenase and cyclooxygenase (the enzymes that generate inflammatory prostaglandins and thromboxanes), thus markedly reducing inflammation. Onions' anti-inflammatory effects are due not only to their vitamin C and quercetin, but to other active components called isothiocyanates. These compounds work synergistically to spell relief from inflammation. In addition, quercetin and other flavonoids found in onions work with vitamin C to help kill harmful bacteria, making onions an especially good addition to soups and stews during cold and flu season.^[5]

Other uses

Onions have been used in the treatment of stingray wounds, warts, acne, appetite loss, urinary tract disorders, and indigestion. Onion cell extract was ineffective in treating postsurgical scarring. General reviews of therapeutic uses of onion are available.^[4]

Cadmium (Cd) is a well-known nephrotoxicant inducing kidney damage via oxidative stress. Since kidney is the critical target organ of Cd toxicity, this study was designed to evaluate the protective effects of onion (*Allium cepa* L.) and garlic (*Allium sativum* L.) aqueous extracts on Cd-induced renal oxidative stress in male Wistar rats. The control group received double distilled water alone and Cd group was challenged with $3\text{CdSO}_4 \cdot 8\text{H}_2\text{O}$ (as Cd) (1.5 mg/100 g bw/day per oral) alone. Extract-treated groups were pre-treated with varied doses (0.5 ml and 1.0 ml/100 g bw/day per oral) of onion and/or garlic extract for 1 week after which they were co-treated with Cd (1.5 mg/100 g bw/day per oral) for 3 weeks. The results showed that the levels of

renal lipid peroxidation (LPO) and glutathione-S transferase (GST) were significantly ($P < 0.001$) increased in rats that received Cd alone relative to the control group. More so, the levels of renal glutathione (GSH), superoxide dismutase (SOD), catalase (CAT) and Na^+/K^+ -ATPase were significantly ($P < 0.001$) decreased in rats that received Cd alone. Treatment of Cd-intoxicated rats with varied doses of onion and/or garlic extract significantly ($P < 0.05$) restored the alterations in these parameters relative to the group that received Cd alone. While treatment with high dose of onion extract exerted a significant dose-dependent restoration of these parameters, treatment with high dose of garlic elicited a pro-oxidant effect, relative to their respective low dose. This study suggests that onion and garlic extracts may exert their protective effects via reduction in LPO and enhanced antioxidant defense. These extracts may, therefore, be useful nutritional option in alleviating Cd-induced renal damage.^[6]

Method of administration

The bulbs are stimulant, aphrodisiac, emmenagogue, diuretic and expectorant. They are useful in fever, dropsy, catarrh and chronic bronchitis. The roasted bulbs are applied as poultice to indolent boils, bruises and body heat. A decoction of the onions is found to benefit much in the cases of strangury and heaty sensation and roasted onions mixed with sugar candy, cumin and cow's ghee form a good demulcent of great benefit in piles, stated that the onions cooked with vinegar are given in jaundice, spleen enlargement and dyspepsia. The bulbs are also used in obstruction of the intestines, prolapse of the anus and as a sedative.

The juice of the onion is used in faintness, infantile convulsions, headache, epileptic fits and hysterical fits and is also applied over skin disease and insect bites. The juice is snuffed in apistaxis and applied into eyes in dimness of vision and as antidote for tobacco poisoning. The seeds of the onion with *Punica granatum* roots, *Cajanus cajan* and *Piper rubrum* juice are taken with honey for abortion. The seeds are also used as aphrodisiac.^[2]

Therapeutic indication:

Action: antiseptic, aperitif, aphrodisiac, carminative, digestive, disinfectant, diuretic, emmenagogue, expectorant, febrifuge, preventative (snake bite), repellent (snake), sedative, stimulant, stomachic, venereal, vermifuge.^[7,8]

Traditional uses: abscesses, albuminuria, anasarca, antiseptic, arteriosclerosis, bile, bronchitis, cancer, cataracts, catarrh, colic, common cold, consumption, cough, diaphoretic, diphtheria, dropsy, dysentery, ear ailments, edema, fever, flu, hepatitis, hydroxy, hyperglycemia, inflammation, orchitis, piles, rheumatism, scorpion sting, snake bite, sore throat, stomach ache, tuberculosis, tumor, warts.^[7,8]

Special warnings

Certain sulfur compounds (e.g. propanethial-S-oxide) escape from onion in vapor form and hydrolyze to sulfuric acid when cut, causing the familiar eye irritation and lacrimation. Corneal swelling from onion exposure has been reported. Using a sharp knife minimizes the crushing of onion tissue and liberation of volatiles, and cutting an onion under running water reduces lacrimation. Ingestion of onion seems relatively safe, as the Complete

German Commission E Monographs lists no contraindications, side effects, or interactions from the plant. Onion can be taken frequently in low doses without any side effects, as seen with rat experimentation. With large intake, the stomach may be affected, and frequent contact with onion rarely causes allergic reaction. Five Onion seeds have been reported as occupational allergens. Onion toxicity is only associated with high intake.^[4]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=3&taxon_id=200027457, Chinese Plant Names, 16.06.2008

[2] MEDICINAL PLANTS AND RAW DRUGS OF INDIA, Purshotam Kaushik, Anil Kumar Dhiman; Printed by Gajendra Singh Gahlot at Shiva Offset Press, for Bishen Singh Mahendra Pal Singh, Dehra Dun, and Typesetting at Doon Phototype Printers, 14, Old Connaught Place, Dehra Dun, India, 2000, ISBN-81-211-0174-3, pp. 536-537

[3] CRC Handbook of Medical Spices, James A. Duke with Mary Jo Bogenschutz-Godwin, Judi duCellier and Peggy-Ann K. Duke, CRC Press 2003, Boca Raton, Fla., ISBN: 0-8493-1279-5, pages 43, 44, 61, 62

[4] Weblink: <http://www.drugs.com/npp/onion.html>, Drugs.com, 17.06.2008

[5] Weblink: <http://www.whfoods.com/genpage.php?tname=foodspice&dbid=45>, The World's Healthiest Foods, 17.06.2008

[6] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18521705>, PubMed, Onion and garlic extracts lessen cadmium-induced nephrotoxicity in rats, Suru SM., Department of Biochemistry, Faculty of Basic Medical Sciences, College of Medicine, University of Ibadan, Ibadan, Nigeria, 18.06.2008

[7] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 28

[8] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: <http://student.britannica.com/ebi/art-6766>, "onion." Online Photograph. Britannica Student Encyclopædia, 31.08.2008

Allium odorum L. (Kucay)

Synonyms: *Allium ramosum* L., Chinese Chives



Allium odorum L.

Occurrence and appearance

Bulbs clustered, subcylindric; tunic dull yellow to yellowish brown, reticulate to subreticulate. Leaves linear, shorter than scape, 1.5 - 8 mm wide, 3-angled, 1-keeled abaxially, fistulose, margin and angles scabrous-denticulate or smooth. Scape 25 - 60 cm, terete, obscurely angled, covered with leaf sheaths only at base. Spathe 1- or 2-valved. Umbel hemispheric to subglobose, many flowered. Pedicels subequal, 2 - 4 × as long as perianth, bracteolate and several covered with a common bract at base. Perianth white, sometimes slightly tinged with pale red; segments with pale red midvein; outer ones oblong-ovate to oblong-lanceolate, usually slightly narrower than inner, 5.5 - 9 × 1.5 - 2.9 mm; inner ones oblong-obovate, 5.5 - 9 × 1.8 - 3.1 mm. Filaments narrowly triangular, equal, 1/2 - 3/4 as long as perianth segments, connate at base and adnate to perianth segments; inner ones slightly wider than outer at base. Ovary obconical-globose, minutely tuberculate, without concave nectaries at base.^[1]

Parts used

Bulb - raw or cooked. Leaves - raw or cooked. The flavour is somewhat between that of garlic and chives.^[2]

Constituents

The leaves and bulbs contain sulphur compounds (which give them their onion flavour), saponins and bitter substances. The seed contains alkaloids and saponins.^[2]

Pharmacologic properties

The leaves and the bulbs possess antibacterial properties. They are useful for the treatment of haemoptysis, epistaxis, cough, sore throat, asthma, haematometra, dyspepsia, dysentery and oxyuriasis. The usual dose is 20 to 30g per day in the form of a decoction. They are also used in an anti-inflammatory poultice. The seeds are active on spermatorrhoea, haematuria, incontinence, lumbago, arthrodynia and metrorrhoea. The usual dose is 6 to 12g per day in the form of a decoction.^[3]

Allium odorum L. is an excellent source of calcium, phosphorus, and iron.

Externally the fresh leaves and bulbs are used as an antiseptic and vulnerary. The whole plant is used in Indo-China as a diuretic.^[4]

Therapeutic indication

Traditional uses: amebiasis, antiseptic, bactericide, cardiac, depurative, dysentery, pertussis, skin, spermatorrhea, stomachic, tonic, tuberculosis.^[5]

Special warnings

Although no individual reports regarding this species have been seen, there have been cases of poisoning caused by the consumption in large quantities and by some mammals, of certain members of this genus. Dogs seem to be particularly susceptible.^[2]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=3&taxon_id=200027524, Chinese Plant Names, 16.06.2008

[2] Weblink: <http://www.pfaf.org/database/plants.php?Allium+ramosum>, Plants For A Future, 16.06.2008

[3] Weblink: <http://traditionalmed.blogspot.com/2007/07/allium-odorum-l.html>, Traditional and Modern Medicine, 12.07.2008

[4] Weblink: <http://www.bpi.da.gov.ph/Publications/mp/pdf/k/kuchai.pdf>, Department of Agriculture, Philippines, 12.07.2008

[5] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl?ethnobot.taxon=Allium%20odorum>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 16.08.2008

Figure: <http://forums.gardenweb.com/forums/load/allium/hpgal042236434548.html>, GardenWeb, Photo by buggycrazy, 01.09.2008

Allium sativum L. (Bawang Bodas)



Allium sativum L.

Occurrence and appearance

Bulb solitary, globose to applanate-globose, usually consisting of several bulbels covered with a common tunic; tunic white to purple, membranous, entire. Leaves broadly linear to linear-lanceolate, shorter than scape, to 2.5 cm wide, apex acuminate. Scape 25--50 cm, terete, covered with leaf sheaths for ca. 1/2 its length. Spathe deciduous; beak 7--20 cm. Umbel with many bulblets and few flowers. Pedicels slender, longer than perianth; bracteoles ovate, rather large, membranous, apex acute. Perianth usually pale red; outer segments ovate-lanceolate, ca. 4 × 1.4 mm; inner ones ovate, ca. 3 × 1.4 mm. Filaments shorter than perianth segments, connate at base and adnate to perianth segments; outer ones subulate; inner ones broadened at base, 1-toothed on each side, teeth with apex filiform and longer than perianth segments. Ovary globose. Style not exserted.^[1]

Parts used

Fresh or dried bulbs, its oil and the cloves.^[2]

Constituents

The bulbs contain allylpropyl disulphide, diallyl disulphide and two more sulphur compounds, allicin, allisatin I & II, allin and amino acids. Sordinines A & B, scordinine A1, A2 and B have also been extracted from fresh garlic. Besides, sulphur, amino acids and peptides, 2-mercapto-L-cysteines and anthocyanins have been isolated from its leaves.^[2]

Through the activity of the enzyme alliinase, squeezing or culting garlic results in the formation of the volatile and highly reactive allicin and the other sulfur compounds such as ajoene and other di-, tri- and oligosulfides, which are volatile and responsible for the typical garlic smell.^[3]

Carefully dried, powdered material contains about 1 per cent of alliin [(+)-S-allyl-L-cysteine sulfoxide] as the main sulphur-containing amino acid. Other

characteristics, genuine constituents are (+)-S-methyl-L-cysteine sulfoxide, gamma-L-glutamyl peptides, S-allyl-cysteine, ubiquitous amino acids, steroids, and adenosine. In the presence of the enzyme alliinase, alliin will be converted to allicin (1 mg of alliin is considered to be equivalent to 0.45 mg of allicin).^[4]

Pharmacologic properties

Garlic is an effective drug for rheumatism and catarrhal affections. It shows antibacterial, antiinflammable, anticancer and pesticidal properties.

Raw garlic is used to decrease glucose, total cholesterol, phospholipids, triglycerides etc. in healthy persons. It is also useful in dyspepsia and cryptococcal meningitis in man. It is applied as resolvent to indolent tumours. Internally, it is given in nervous diseases, headache etc. with salt. Its regular use kills harmful intestinal bacteria. Its liniment is useful in infantile convulsions and other spasmodic affections and in gout and sciatica. The juice is applied to bruises and sprains and is also used to relieve earache and to allay pain in otorrhoea i.e., the state of discharge from the external auditory meatus. Externally, the juice of garlic is used in leprosy and after frying in mustard or coconut oil garlic is applied on maggot-infested wounds, sores and scabies. According to Chopra et al. garlic or its impure oil would appear to produce an irritant type of poisoning if it is taken in excess. Cases have been seen where its use internally has proved fatal to children. On account of the volatile nature of the essential oil of this plant, it may enter the blood through the alimentary canal as well as from the respiratory tract. Essence of garlic is stimulant-narcotic in its action on all animals. The plant produces a depressing effect upon the heart and lessens the contractibility of the myocardium.

An infusion of its bruised bulbs if given before and after every meal, has been considered good in epilepsy. The juice of garlic and milk of garlic made by boiling the bruised bulbs in milk is used as vermifuge.^[2]

Both experimental work and clinical studies provide evidence confirming the efficacy of garlic extracts in treating lipidemia and high blood pressure. It must be recognized, however, that the desired effect in regard to high blood pressure and increased blood fat levels is only slowly achieved (it usually takes at least two months), and that this treatment is not effective for severe cases. In relation to garlic as a treatment for fungal infections of the skin, experimental data and clinical studies of the constituent ajoene indicate its efficacy, but no direct clinical proof is known. No serious side effects are expected from the use of garlic. However, garlic should not be used with patients whose blood does not coagulate properly. The further uses of garlic are based on empirical experiences and experimental studies, the results of which may be taken as evidence of these effects. However, no research results are available.^[3]

A study was undertaken to elucidate the effect of diallyl disulfide from *Allium sativum*, an oil-soluble organosulfur compound found in garlic, in suppressing human non-small cell lung carcinoma H1299 cells. A potent increase in apoptotic cells has accompanied 1) a decrease in cell viability, 2) an increase of the fraction of G2/M-phase cells by up to 48.80 %, and 3) a transient increase of the phospho-p42/44 (phosphorylated p42/44 MAPK) in a time- and concentration-dependent manner. These results indicated that diallyl

disulfide could induce apoptosis in human non-small cell lung carcinoma H1299 cells via, at least partly, G2/M-phase block of the cell cycle, related to a rise in MAPK phosphorylation.^[5]

Ajoene has been described as an antithrombotic, anti-tumour, antifungal, antiparasitic and antibacterial agent. A study deals with the efficacy of ajoene to treat mice intratracheally infected with *Paracoccidioides brasiliensis*. The results indicate that ajoene therapy is effective in association with antifungal drugs (sulfamethoxazol/trimethoprim), showing a positive additive effect. Ajoene-treated mice developed Th1-type cytokine responses producing higher levels of IFN-gamma and IL-12 when compared to the infected but untreated members of the control group. Antifungal activity of ajoene involves a direct effect on fungi and a protective pro-inflammatory immune response. Reduction of fungal load is additive to chemotherapy and therefore the combined treatment is mostly effective against experimental paracoccidioidomycosis.^[6]

Garlic extract has been known to have inhibitory activity on various pathogenic bacteria, viruses and fungi. The objective of an investigation was to study the in vitro inhibitory activity of garlic extract on multidrug-resistant (MDR) strains of *Streptococcus mutans* isolated from human carious teeth. Filter sterilized aqueous extract of garlic was prepared and used. For isolation of *S. mutans*, extracted human carious teeth were cultured in Todd-Hewitt broth and Mitis-Salivarius-Bacitracin agar. *S. mutans* was characterized by colony morphology, biochemical tests and other conventional bacteriological procedures. Disk sensitivity tests and broth dilution methods were used to determine antibiotic sensitivity profile and inhibitory activity of garlic extract on *S. mutans* isolated from carious teeth. Of 105 carious teeth tested, 92 (87.6%) isolates of *S. mutans* were recovered, among which 28 (30.4%) were MDR since they were resistant to four or more antibiotics. The highest rate of resistance was observed for tetracycline (30.4%) and least resistance (0%) to teichoplanin and vancomycin while 22.8% and 23.9% of the isolates were resistant to penicillin and amoxicillin, respectively. Chlorhexidine minimum inhibitory concentration (MIC) for MDR and non-MDR *S. mutans* varied from 2 to 16 microg ml⁻¹ and from 0.25 to 1 microg ml⁻¹, respectively (P *S. mutans* were sensitive to garlic extract with the MIC ranging from 4 to 32 mg ml⁻¹). Considering in vitro data obtained in the present study, mouthwashes or toothpaste containing optimum concentration of garlic extract could be used for prevention of dental caries.^[7]

Allium sativum L. is used medicinally mainly for the treatment of hypercholesterolemia and prevention of arteriosclerosis. Clinical trials have consistently shown that "garlic breath" and body odor are the most common (and well-documented) complaints associated to garlic intake. Case reports have highlighted the possibility that garlic use may cause allergic reactions (allergic contact dermatitis, generalized urticaria, angioedema, pemphigus, anaphylaxis and photoallergy), alteration of platelet function and coagulation (with a possible risk of bleeding), and burns (when fresh garlic is applied on the skin, particularly under occlusive dressings). Consumption of garlic by nursing mothers modifies their infant's behavior during breast-feeding. Finally, garlic may enhance the pharmacological effect of anticoagulants (e. g. warfarin, fluindione) and reduce the efficacy of anti-AIDS drugs (i. e. saquinavir).^[8]

Therapeutic indication:

Action: antibiotic, antiseptic, antispasmodic, ascaricide, blood cleanser, carminative, cathartic, cholagogue, demulcent, diaphoretic, diuretic, expectorant, hypertensive, parasiticide, preventative, repellent (snake), rubefacient, stimulant, vermifuge, vulnerary.^[9,10]

Traditional uses: ache (ear, stomach, tooth), alopecia, amebiasis, antidote (scorpion), antiseptic, antispasmodic, arteriosclerosis, arthritis, ascaricide, asthma, bactericide, bite (bug), bite (snake), bladder, bronchiectasis, bronchitis, cancer, carminative, cold, colic, corn, cough, dandruff, deafness, demulcent, diaphoretic, diarrhea, diphtheria, diuretic, dysentery, dysmenorrhea, dyspepsia, emmenagogue, expectorant, fever, flatulence, gangrene, hematuria, hepatitis, hypertension, kidney ailments, leukemia, malaria, malignancy, oliguria, parturition, plague, pulmonary ailments, respiratory ailments, rheumatism, ringworm, scabies, sclerosis, senescence, toothache, tuberculosis, tumor, typhoid, ulcers, viral infections, warts, wen, worms, wounds.^[9,10]

Dose and methods of administration

The medium daily dosage is about 4 g fresh garlic, which corresponds to about 0.4-0.8 g dried garlic powder.^[3]

Prophylaxis of atherosclerosis or treatment of elevated blood lipid level for adults: The equivalent of 6-10 mg of alliin (approx. 3-5 mg of allicin) daily, typically contained in one clove of garlic or in 0.5-1.0 g of dried garlic powder.

For upper respiratory tract infections for adults: 2-4 g of dried bulb or 2-4 ml of tincture (1:5, 45% ethanol), three times daily.^[4]

Special warnings

Drug Interactions: taking large amounts of garlic can lead to postoperative bleeding. Eating garlic can cause patients being treated with warfarin to have a much longer bleeding time. In many cases the bleeding time can be doubled. As well as the unpleasant breath of which many complain, stomach ache, nausea and heartburn are often experienced when garlic is taken on an empty stomach. In one case a spontaneous spinal epidural hematoma was observed after excessive consumption of garlic, which was seen to be connected with disturbed thrombocyte function. Allergies in the form of contact dermatitis and asthma-like reactions after inhalation have been described in individual cases.^[3]

Particularities

Free-living protozoa of the genus *Acanthamoeba* can cause one of the most severe, potentially sight-threatening infections of the eye, the so-called *A. keratitis*. *A. keratitis* is difficult to treat because, under adverse conditions, the amoeba encyst and medical therapy is often less effective against cysts than against trophozoites. The aim of a study was to investigate the in vitro effect of the nonpolar subfraction of the methanol extract of garlic (*Allium sativum*) on the growth of *A. castellanii* trophozoites and cysts and also its cytotoxicity on corneal cells in vitro. Extract was evaluated for its amoebicidal activity, using an inverted light microscope. The effect of the nonpolar extract with concentrations ranging from 0.78 to 62.5 mg/mL on the proliferation of *A.*

castellanii trophozoites and cysts, was examined in vitro. For the determination of cytotoxicity of the extract on corneal cells, agar diffusion tests were performed. The present study demonstrates the in vitro effectiveness of garlic against the *A. castellanii* growth curve. Evaluations revealed that garlic inhibits trophozoite growth in dose- and time-dependent ways. In the case of the cytotoxic activities, it showed no cytotoxicity for the cornea cells in the concentration of 3.90 mg/mL. These findings indicate that nonpolar subfraction of the methanol extracts of garlic has amoebicidal, as well as cysticidal, properties on *Acanthamoeba* trophozoites and cysts. Garlic alone, and in combination with other amoebicidal agents, may be used in clinical practices after further investigations.^[11]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=3&taxon_id=200027526, Flora of China, 16.06.2008

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[3] MEDICINAL PLANTS IN TROPICAL COUNTRIES, Traditional Use-Experience-Facts; Markus S. Müller M.D., Ernst Mechler Ph.D.; Georg Thieme Verlag, Stuttgart, Germany, 2005; ISBN 3-13-138341-0, ISBN 1-58890-253-6; pp. 18-24

[4] ESCOP Monographs, The Scientific Foundation for Herbal Medicinal Products, Second Edition, by Fritz H. Kemper, ESCOP (European Scientific Cooperative On Phytotherapy, Exeter, UK, 2003, ISBN: 1-901964-07-8, page 14

[5] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18600203>, PubMed, Effect of *Allium sativum* (garlic) diallyl disulfide (DADS) on human non-small cell lung carcinoma H1299 cells, Hui C, Jun W, Ya LN, Ming X., School of Chemistry and Chemical Engineering, Nantong University, Nantong, Jiangsu 226007, P. R. China, 16.06.2008

[6] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18324489>, PubMed, Experimental paracoccidioidomycosis: alternative therapy with ajoene, compound from *Allium sativum*, associated with sulfamethoxazole/trimethoprim, Thomaz L, Apitz-Castro R, Marques AF, Travassos LR, Taborda CP., Institute of Biomedical Sciences, Department of Microbiology, University of São Paulo, SP, Brazil, 16.06.2008

[7] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18007101>, PubMed, Inhibitory activity of garlic (*Allium sativum*) extract on multidrug-resistant *Streptococcus mutans*, Fani MM, Kohanteb J, Dayaghi M., Department of Oral Medicine, School of Dentistry, Shiraz Medical School, Shiraz University of Medical Sciences, Shiraz, Iran, 16.06.2008

[8] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/17918162>, PubMed, Garlic, adverse effects and drug interactions in humans, Borrelli F, Capasso R, Izzo AA. Department of Experimental Pharmacology, University of Naples Federico II, Naples, Italy, 16.06.2008

[9] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 29

[10] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

[11] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18370873>, PubMed, In vitro evaluation of the amoebicidal activity of garlic (*Allium sativum*) extract on *Acanthamoeba castellanii* and its cytotoxic potential on corneal cells, Polat ZA, Vural A, Ozan F, Tepe B, Ozcelik S, Cetin A., Research Center, School of Medicine, Cumhuriyet University (CUTFAM), Sivas, Turkey, 16.06.2008

Figure: <http://www.agraria.org/coltivazionierbacee/aromatiche/aglio.htm>, Agraria.org, 01.09.2008

Allium tuberosum Rottler ex. Spreng (Kucay)

Garlic chives, Chinese chive



Allium tuberosum Rottler ex. Spreng

Occurrence and appearance

Bulbs clustered, cylindric; tunic dull yellow to yellowish brown, reticulate to subreticulate. Leaves linear, shorter than scape, 1.5-8 mm wide, flat, solid, margin smooth. Scape 25-60 cm, terete, usually 2-angled, covered with leaf sheaths only at base. Spathe 2- or 3-valved, persistent. Umbel hemispheric to subglobose, laxly many flowered. Pedicels subequal, 2-4 × as long as perianth, bracteolate and several covered with a common bract at base. Perianth white; segments usually with green or yellowish green midvein; outer ones oblong-ovate to oblong-lanceolate, 4-7(-8) × 1.8-3 mm; inner ones oblong-obovate, 4-7(-8) × 2.1--3.5 mm. Filaments narrowly triangular, equal, 2/3-4/5 as long as perianth segments, connate at base and adnate to perianth segments; inner ones slightly wider than outer at base. Ovary obconical-globose, minutely tuberculate, without concave nectaries at base. Fl. and fr. Jul-Sep.^[1]

Parts used

Flowers, leaves, roots, seeds

Constituents

Chives' constituents equal those of the close relatives, onion and garlic. The following volatile components have been identified: dipropyl disulfide, methyl

pentyl disulfide, pentanethiol, pentyl-hydrodisulfid and cis/trans-3,5-diethyl-1,2,4-trithiolane. Chives contain significant amounts of the vitamins A and C.^[2]

Chinese chive seeds contained high amounts of oil (15.8%), dietary fibre (18.2%) and crude protein (12.3%). Oil of seeds was composed of 10.1% saturated and 90.0% unsaturated fatty acids. Linoleic (69.1%) and palmitic (7.0%) were the most abundant unsaturated and saturated fatty acids, respectively. Chinese chive seeds contained 4.5 mg/kg of thiamin, 2.8 mg/kg of riboflavin and 55.1 mg/kg of niacin. The mineral contents of the seed of *A. tuberosum*, for iron, calcium and zinc, were 580 mg/kg, 1328 and 80.8 mg/kg, respectively. Analysis of the amino acid content of Chinese chive seed revealed that it was a rich source of the essential amino acids, isoleucine, tryptophan and lysine. The study revealed that Chinese chive seeds had high levels of nutritionally important components, such as oil, minerals and essential amino acids.^[3]

Pharmacologic properties

The whole plant is antibacterial, cardiac, depurative, digestive, stimulant, stomachic and tonic. It is an anti-emetic herb that improves kidney function. It is used internally to treat urinary incontinence, kidney and bladder weaknesses. The seed is carminative and stomachic. They are used in India in the treatment of spermatorrhoea. The leaves and the bulbs are applied to bites, cuts and wounds.^[4]

The effect of thiosulfinates from *Allium tuberosum* L. on proliferation of metastasis (DU145) and primary malignant tumor (RC-58T/h/SA#4)-derived human prostate cancer cells was investigated. Thiosulfinates decrease viable cell numbers in a dose- and time-dependent manner and induce apoptosis. The apoptosis induced by thiosulfinates is associated with the activation of initiator caspase-8, and -9, and the effector caspase-3. Thiosulfinates stimulated Bid cleavage, indicating that the apoptotic action of caspase-8-mediated Bid cleavage leads to the activation of caspase-9. Thiosulfinates decreased the expression of the anti-apoptotic protein Bcl-2, and increased the expression of the pro-apoptotic protein Bax. Thiosulfinates also increased the expression of AIF, a caspase-independent mitochondrial apoptosis factor, in RC-58T/h/SA#4 cells and induced DNA fragmentation and chromatin condensation. These results indicate that thiosulfinates from *Allium tuberosum* L. inhibit cell proliferation by inducing apoptosis in RC-58T/h/SA#4 cells which may be mediated via both caspase-dependent and caspase-independent pathways.^[5]

Therapeutic indication

Traditional uses: bite (bug, dog, snake), depurative, food, hematemesis, hemorrhage, spermatorrhea, urethra.^[6,7]

In Chinese herbal medicine, garlic chives have been used to treat fatigue, control excessive bleeding, and as an antidote for ingested poisons. The leaves and bulbs are applied to insect bites, cuts, and wounds, while the seeds are used to treat kidney, liver, and digestive system problems.^[8]

Special warnings

Although no individual reports regarding this species have been seen, there

have been cases of poisoning caused by the consumption, in very large quantities and by some mammals, of certain members of this genus. Dogs seem to be particularly susceptible.^[4]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=200027544, Flora of China, 17.06.2008

[2] Weblink: http://www.uni-graz.at/~katzer/engl/Alli_sch.html, Gernot Katzer's Spice Pages, 17.06.2008

[3] Weblink: <http://cat.inist.fr/?aModele=afficheN&cpsidt=17863408>, Centre National De La Recherche Scientifique, Chemical characterization of Chinese chive seed (*Allium tuberosum* Rottl.), GUOHUA HU, YANHUA LU, DONGZHI WIE, 16.08.2008

[4] Weblink: <http://www.pfaf.org/database/plants.php?Allium+tuberosum>, Plants For A Future, 16.08.2008

[5] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18360714>, PubMed, Induction of apoptosis by thiosulfinates in primary human prostate cancer cells, Kim SY, Park KW, Kim JY, Shon MY, Yee ST, Kim KH, Rhim JS, Yamada K, Seo KI., Department of Food and Nutrition, Sunchon National University, Suncheon, Jeonnam 540-742, Republic of Korea, 17.06.2008

[6] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 30

[7] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

[8] Weblink: http://www.piam.com/mms_garden/plants.html, MMS Gardens, Hortus Medicus, 17.06.2008

Figure: http://zh-min-nan.wikipedia.org/wiki/Image:Allium_tuberosum_HabitusInflorescences_BotGardBln0906.JPG, Wikipedia, User: BotBln, 31.08.2008

2.2 Anacardiaceae

Sumac Family

Trees or shrubs, also woody climbers or perennial herbs, resiniferous secretory ducts in bark and foliage, plants turpentine-smelling, blackening when wounded, hermaphroditic, polygamo-dioecious or dioecious. Leaves often clustered distally, alternate, exstipulate, simple, trifoliolate or imparipinnate. Inflorescences terminal or axillary thyrsoids or panicles; floral subtending bracts small, or sometimes large, membranous and fused to pedicel (Dobinea). Flowers small, actinomorphic, 3-5-merous, bisexual to unisexual; receptacle sometimes elongate and barrel-shaped (Mangifera). Perianth usually double (single in *Pistacia* or lacking in female flowers in Dobinea); sepals fused basally and lobed (bractlike in *Pistacia*), imbricate or valvate in bud, caducous or persistent. Petals free or adnate basally to extended receptacle, imbricate or valvate, deciduous to persistent. Stamens in 1 or 2 whorls, 1 (*Anacardium*, *Mangifera*), several, or all fertile; filaments slender, sometimes connate basally (*Anacardium*); anthers ovoid or oblong, introrse, dorsifixed or basifixed, longitudinally dehiscent, 2-celled with 4 pollen sacs. Disk usually distinct, intrastaminal to extrastaminal, fleshy, crenulate, stipe-shaped or 5-10-notched, round, flattened or subcupular. Ovary superior, sometimes half inferior or inferior (*Pegia* and *Semecarpus*), either (a) 1-carpellate and 1-locular, (b) syncarpous and 2-5-locular (rarely more), (c) 4-6-carpellate and apocarpous (*Buchanania*), or (d) 5-carpellate and incompletely connate (*Dracontomelon*); stigmas 1-5 (rarely more), $\pm$ distinct, each locule with one apotropous ovule, usually with one carpel developing to maturity. Fruit drupaceous or dry and indehiscent (Dobinea), sometimes borne on enlarged fleshy hypocarp formed by pedicel and receptacle (*Anacardium* and *Semecarpus*) or fused to membranous accrescent floral subtending bract (Dobinea), composed of 1-5, rarely more, cells, each containing 1 seed; epicarp thin; mesocarp usually fleshy, fibrous and resinous; endocarp crustaceous to bony.

Several representatives of the family are economically important, delivering products such as fruits and nuts, timber, lacquers, and tannins. In China, the resinous sap of *Toxicodendron vernicifluum* and *T. succedaneum* is called Chinese lacquer. *Rhus chinensis* is the host plant of the aphid *Melanaphis chinensis* that produces the "Chinese gall," which in turn is a rich source of gallic acid. *Anacardium occidentale* and *Mangifera indica* are widely cultivated as fruit trees, and *Pistacia chinensis* yields a natural yellow dye. Several plants have ornamental value, such as *Cotinus coggygria* var. *cinerea*, which produces spectacular red leaves in the autumn.

The resinous sap of Anacardiaceae hardens and turns black when exposed to the air. Some species in the family, especially of *Toxicodendron* and *Semecarpus*, can cause severe dermatitis after contact, especially in persons who have been sensitized by long-term exposure to the plants.^[1]

Anacardiaceae are found around the globe and millions of people and animals are acquainted with them, chiefly because of the irritant effects of their chemicals rather than their botanical interest. The Anacardiaceae includes 76 genera with over 600 species. There are four tribes of poisonous Anacardiaceae (Mitchell 1990). The poisonous genera *Anacardium*, *Gluta*,

Mangifera, and Switonia are members of the tribe Anacardeae. Comocladia, Metopium, Toxicodendron, are in the tribe Rhoeae. Semecarpus, Holigarna, and Melanochyla are in the tribe Semecarpeae. Spondias is in the tribe Spondiadeae. The principle function of the secondary chemicals in the Anacardiaceae is probably to serve as a defense against vertebrate and insect herbivores. Contact with the poisonous members of the Anacardiaceae usually causes a cell-mediated dermatitis. Virtually all of the Anacard oleoresins that induce contact dermatitis are mixtures of phenolics which vary primarily in the length, branching, number and position of double bonds in the hydrocarbon side chain, and in the number and position of hydroxyl groups on the benzene ring. Furthermore, while the negative properties of the plants in this family are most emphasized, the roles that the poisonous Anacardiaceae play in medicine and commerce are often positive. Some Anacard compounds have a long history of use by humans and others are just now being discovered and developed.^[2]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=3&taxon_id=10038, Chinese Plant Names, 04.07.2008

[2] Weblink: http://www.colostate.edu/Depts/Entomology/courses/en570/papers_1998/hartley.htm, Secondary Compounds Within the Anacardiaceae, Laurel Hartley, Colorado State University, Fort Collins, Colorado, 04.07.2008

Mangifera foetida Lour. (Limus)

Synonyms: Horse mango, *Mangifera horsfieldii* Miq., Bachang



Mangifera foetida Lour.

Occurrence and appearance

Tree up to 30-35 m tall, straight bole without buttresses, bark light brown to dark greyish-brown, shallowly fissured with broad flat ridges, containing irritant whitish sap turning black on exposure; crown dense, foliage dark green, branches massive. Leaves elliptic-oblong to broadly elliptic, sometimes oblanceolate, 15-40 cm x 9-15 cm, stiffly coriaceous, dark green above, clear green below, apex sub-acute, sometimes rounded or slightly emarginate, base cuneate or attenuate, more or less bullate between the nerves; petiole 1.5-8 cm, stout, very swollen at the base. Panicles subterminal, upright, pyramidal, 10-40 cm long, sparsely branched, rather densely flowered, deep reddish-pink, inflorescence axes stout, deeply red to copper red; flowers 5-merous, scentless; sepals obovate-lanceolate, 4-5 mm long; petals narrowly lanceolate, 6-9 mm x 1.5-2.5 mm, pale reddish-pink at the base, pale yellow towards the apex, reflexed; stamens 5, 1(-2) fertile, filament ca. 8 mm long, pinkish-purple, anthers dark violet, other ones smaller, filaments connate at the base; ovary subglobose, yellow, style excentric, white, 6-7 mm long. Fruit variable in size and shape, an obliquely ovoid-oblong or almost globose drupe, 9-14(-16) cm x 7-12 cm, dirty dark olive-green or yellowish-green, smooth, dull, with brown lenticels, nose reduced to a point or slightly prominent, rarely prominent, skin ca. 5 mm thick; flesh pale orange yellow or yellow, fibrous, juicy, with strong smell and taste of turpentine at its full extent. Stone plump, ca. 6 cm x 5 cm x 3 cm, coarsely fibrous; seed monoembryonic. Different forms are recognized by

local people. Small, almost globose fruits (e.g. 'limus piit' in West Java) are consistently distinguished from large and more oblong ones which are commonly sold in Malay markets. There is also another kind, with large, oblong fruits, remarkable for being hardly fibrous, and finer textured. In West Java, it is called 'limus tipung' ('tipung' meaning flour, referring to its fine texture). A similar kind ('asem linggau') was found in East Kalimantan, with, moreover, a large proportion of fruit having abortive seeds. Sizeable variability in fruit characters is recorded in Borneo, particularly in South Kalimantan. *M. pajang* resembles *M. foetida* in bloom; it is different notably by its longer leaves with prominent nerves and by its large brown fruits. In orchards where *M. pajang* and *M. foetida* are grown together, naturally occurring cross-pollination has given rise to hybrid forms whose leaves and fruits have characteristics of the two species.^[1]

Parts used

Fruits, leaves

Constituents

The edible portion of *M. foetida* represents 65% of fruit weight. Per 100 g edible portion the flesh contains: water 72.5 g, protein 1.4 g, carbohydrates 25.4 g, calcium 21 mg, phosphorus 15 mg, thiamine 0.03 mg, beta-carotene equivalent 0.218 mg and vitamin C 56 mg. Timber: The density of the wood is 545-785 kg/m cubic at 15% moisture content.^[1]

Pharmacologic properties

Fresh bachang fruit contain an irritant juice which may inflame the lips and mouth. At maturity the irritant juice is restricted to the skin, so that the ripe fruit can be eaten fresh if it is peeled fairly thick. It is a rather savoury fruit, in spite of its turpentine smell and the taste sometimes is likened to durian, but it is not generally valued as a table fruit. Unripe fruit, washed in salted water and sliced is used in vegetable salads ('rujak') and in a sour pickle ('asinan'). In Borneo, especially in East Kalimantan, the fruit commonly replaces tamarind as an acid ingredient in the preparation of sambal. In Malaysia it is used to make chutneys as well as pickles. Medicine: The leaves are said to be antipyretic and the seeds used against trichophytosis, scabies and eczema. Other products: Orang Asli in Peninsular Malaysia reportedly used the sap to deepen tattoo scars.^[1]

Therapeutic indication:

Traditional uses: sore.^[2]

[1] Weblink: <http://www.worldagroforestry.org/sea/products/AFDbases/AF/asp/SpeciesInfo.asp?SpID=18090>, AgroForestTree Database, 15.06.2008

[2] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 514

Figure: http://commons.wikimedia.org/wiki/Image:Mangif_foetid_071228-2963_khjo.jpg, Wikimedia Commons, Photo by W.A.Djarmiko, 01.09.2008

2.3 Araceae

Aroid family, Arum family

Araceae are epiphytic and climbing herbs plus a few aquatics, which are widely distributed in tropical and temperate regions. The flowers are greatly reduced and crowded onto a cylindrical spadix, usually surrounded by a bractlike, often showy, spathe. Some temperate species are familiarly known as Jack-in-the-pulpit. Tubers of some species are eaten as starchy vegetables in the tropics after cooking. Fully ripe compound fruits of *Monstera deliciosa* are edible fresh, a sweet-tart blend the texture of bananas with a fragrance of coconut and pineapple, a ready-made pina colada. Leaves are usually simple, often lobed or variegated. Some species produce adventitious roots for climbing. Flowers are bisexual, or unisexual with male and female flowers on the same plant (monoecious) or occasionally on separate plants (dioecious). The fruit is usually a red or yellow berry or syncarp. The sap often contains oxalates, which can cause a burning inflammation of the skin or serious swelling of mucous membranes if eaten. Sodium bicarbonate (baking soda) as a paste or in water is an excellent first aid to neutralize the burn. Other poisonous compounds are often present.^[1]

The arums comprise the Family Araceae (including the numerous aroids subfamily): monocotyledonous flowering plants in which flowers are borne on a type of inflorescence called a spadix. The spadix is usually accompanied by, and sometimes partially enclosed in, a spathe or leaf-like hood. This family of 107 genera and over 3700 species is most diverse in the New World tropics, although also distributed in the Old World tropics and north temperate regions. Recent genetic research by the Angiosperm Phylogeny Group has shown that the duckweeds, previously treated in a separate family Lemnaceae, also belong in the Araceae.

Anthurium and Zantedeschia are two well-known members of this family, as are *Colocasia esculenta* (taro) and *Xanthosoma roseum* (Elephant ear or 'ape). Among the largest inflorescence in the world is that of the arum, *Amorphophallus titanum* (Titan arum). This family includes a great many ornamental plants: *Dieffenbachia*, *Aglaonema*, *Caladium*, *Nepenthes*, and *Epipremnum*, to name a few. In the genus *Cryptocoryne* are many popular aquarium plants. Both Taro and *Monstera deliciosa* provide food value (the fruit of *Monstera deliciosa* called "Mexican breadfruit"). *Philodendron* is an important plant in the ecosystems of the rainforests and is often used in home and interior decorating. *Symplocarpus foetidus* (skunk cabbage) is a common North American species. A interesting peculiarity is that this family includes the largest unbranched inflorescence, that of the titan arum, often erroneously called the "largest flower" and the smallest flowering plant and smallest fruit, found in the duckweed, *Wolffia*.

Many plants in this family are thermogenic (heat-producing). Their flowers can reach up to 45 degrees Celsius even when the surrounding air temperature is much lower. One reason for this unusually high temperature is to attract insects (usually beetles) to pollinate the plant, rewarding the beetles with heat energy. Another reason is to prevent tissue damage in cold regions. Some examples of thermogenic Araceae are: *Symplocarpus foetidus* (eastern skunk cabbage), *Amorphophallus titanum* (Titan Arum), *Amorphophallus paeoniifolius* (elephant foot yam), *Helicodiceros muscivorus*

(dead horse arum lily) and *Sauromatum venosum* (voodoo lily). Species such as Titan Arum and the dead horse arum give off a very pungent smell, often resembling a rotten animal. This is to attract flies to pollinate the plant. The heat produced by the plant helps to convey the scent further.^[2]

[1] TROPICAL FLOWERING PLANTS, A Guide to Identification and Cultivation, Llamas Albrecht Kirsten, Timber Press Inc., Portland-Oregon USA, 2003, ISBN 0-88192-585-3, pp. 76

[2] Weblink: <http://en.wikipedia.org/wiki/Araceae>, Wikipedia, 02.04.2008

***Alocasia macrorrhiza* L. Schrott (Meuhmal)**

Synonyms: *Alocasia indica* Lour, Giant taro, Elephant's Ear



Alocasia macrorrhiza L. Schrott

Occurrence and appearance

Large herb to over 4 m tall, forming large colonies from shoots at base of stem, stem short, thick, fleshy, mostly buried, with closely spaced, horizontal leaf scars. Leaves alternate, all at top of stem, near ground level, stalk to 1.5 m long, base clasping, top attached to leaf blade edge, blade about 90 cm long, 75cm wide, broadly arrow-shaped, fleshy, surface shiny, tip pointed, base deeply lobed, lobe tips pointed. Flowers pale yellow, minute, crowded on fleshy spike (spadix), surrounded by a hood-like bract (spathe), rarely blooms. Fruit fleshy, red orange, rarely fruits.^[1]

Parts used

The leaves and rhizomes are collected throughout the year. The leaves are used fresh. The rhizomes are boiled hard to reduce itching compounds, then sun-dried or heat-dried.^[2]

Constituents

The rhizomes contain phytosterols, alkaloids, glucose and fructose.^[2]

Pharmacologic properties

An antifungal protein designated alocasin was isolated from the rhizomes of the giant taro *Alocasia macrorrhiza*. The isolation protocol involved ion exchange chromatography on diethylaminoethyl (DEAE)–cellulose, ion exchange chromatography on sulfopropyl (SP)–Sephadex, and gel filtration on Superdex 75. Alocasin, which was unadsorbed on DEAE–cellulose and

SP-Sepharose, possessed the N-terminal sequence APEGEV, which exhibited some similarity to that of the miraculin-like anti-fungal protein from *Pisum sativum* legumes. It demonstrated a molecular mass of 11 kDa in sodium dodecyl sulfate–polyacrylamide gel electrophoresis and gel filtration, and displayed anti-fungal activity against *Botrytis cinerea*. Alocasin reduced the activity of HIV-1 reverse transcriptase. It exhibited weak hemagglutinating activity, only at a concentration of 1 mg/ml.^[3]

Therapeutic indication

The leaves and the rhizome are prescribed for the treatment of impetigo, furunculosis, phlegmon and snake-bite in the form of a liquid extract for administration by mouth, and their residue is used for poulticing. They are also used in treating colic and vomiting, in a daily dose of 10 to 20g of dried rhizome in the form of a decoction. Their external use as a plaster is effective against furunculosis.^[2]

Action: diuretic, laxative, parasiticide. Traditional uses: cancer, snake bite, sore, tumor.^[4,5]

Special warnings

There were severe symptoms of calcium oxalate and sapotoxin poisoning in 25 cases in Taiwan from ingesting *Alocasia macrorrhiza* leaf or tuber (raw or cooked). The primary symptom was sore throat, the secondary a numbness of the oral cavity, but other patients suffered from excess salivation, impairment of speech, difficulty in swallowing, chest tightness, and swollen lips.^[6]

[1] Weblink: http://books.google.at/books?id=d7bBIQkNI8C&pg=PA402&dq=%22Alocasia+macrorrhizos%22&sig=ACfU3U1vPdzcLGo1mst1_nC9kLPm9Rtw8g, Google Books, A Field Guide to Plants of Costa Rica, ISBN: 0195188241, page 402, 15.06.2008

[2] Weblink: <http://traditionalmed.blogspot.com/2007/07/alocasia-macrorrhiza-l-schott.html>, Traditional and Modern Medicine, 15.06.2008

[3] Weblink: http://www.sciencedirect.com/science?_ob=ArticleListURL&_method=list&_ArticleListID=778692973&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=8bc666bba3af9f88c85a9e6abdc407bc, Alocasin, an anti-fungal protein from rhizomes of the giant taro *Alocasia macrorrhiza*, Protein Expression and Purification, Volume 28, Issue 1, March 2003, Pages 9-14, H. X. Wang, T. B. Ng Science Direct, 15.07.2008

[4] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 32

[5] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

[6] Weblink: <http://books.google.at/books?id=ipQmSriMF9sC&pg=PA79&dq=%22Alocasia+macrorrhizos%22+pharmacological&sig=ACfU3U3toJJrWa9WfYJiLi3GkHS23nENw>, Medical Botany: Plants Affecting Human Health, ISBN: 0471628824, page 79, 15.06.2008

Figure: <http://commons.wikimedia.org/wiki/Image:AlocasiaMacrorrhizaLeaf.jpg>, Wikimedia Commons, Photo by Fanghong, 01.09.2008

Colocasia esculenta L. (Taleus hideung / sente)

Synonyms: *Colocasia antiquorum* Schott, *Arum esculentum* L., Taro



Colocasia esculenta L.

Occurrence and appearance

The plant is a tall coarse perennial herb with a short tuberous root-stock in wild form and a horizontal tuberous rhizome in cultivated form. The leaves are large and ovate with a broad triangular basal sinus. The petiole is 15 - 60 cm long. Spathes are yellowish and lanceolate-oblong with a convolute, cylindric and 5 -10 cm long tube, limb yellow, erect-lanceolate, narrowed into a long-acuminate point and 10 - 20 cm long. The spadix are with female flowers at base, neutral flowers in the middle and male flowers at the top.^[1]

Parts used

Tubers, rhizomes and leaves are used.^[1]

Constituents

The young leaves of Taro are rich in vitamin C and the roots are rich in a starch composed of amylase (28%) and amylopectin (72%). Taro contains thiamine (vitamin B1), riboflavin (vitamin B2), niacin, oxalic acid, calcium oxalate and a saptotoxin.

The tubers contain aminoacids and high molecular weight proteins which inhibit human salivary (and the porcine) pancreatic amylases. The corms contain the anthocyanins pelargonidin 3-glucoside, cyanidin 3-rhamnoside, and cyanidin 3-glucoside. Hydroxycinnamoyl amides have been obtained from the inflorescences and two new dihydroxysterols have been isolated from the tubers.^[2]

The leaves contain sterols and tubers contain 2 α -amylase inhibitors sterols.

Besides, HCN and oxalic acid have also been reported from the plant.^[1]

Pharmacologic properties

The tubers are cooked and are given to sick persons suffering from localized scleroderma and also to persons having tuberculosis and ulcers. The sap of the rhizomes or pulp is used as poultice to treat ulcers and also applied for crippled extremities and as anthelmintic. An ethyl alcohol (50%) extract of the rhizome is used as hypotensive. The juice of the petioles is used as styptic, stimulant and rubefacient. The juice of the leaves and tubers is used in tumours, ulcerated polyp and cancer of nose and warts. The corm juice is laxative, demulcent and anodyne and is useful in somatalgia, alopecia, areata, haemorrhoids and congestion of the portal system. Besides, various plant parts are also used in atrophy, emaciation or cachexy, wounds, consumption, dry cough, bronchitis and anthrax.^[1]

Although a few studies several decades ago suggest the use of poi in treating certain medical conditions, especially infant food allergies and failure-to-thrive in infants, studies involving poi after that period declined dramatically. The studies in the mid-1960s evaluating poi's usefulness in treating allergies and effecting weight gain in failure-to-thrive infants were helpful, but more studies need to be conducted to counter or confirm their results.

Another potential medicinal use of poi is as a probiotic because it contains the predominant lactic acid bacteria (*L. lactis*). Perhaps poi also deserves to be researched as having a possible beneficial role in those medical conditions shown to improve with the use of fermented dairy products: diarrhea, gastroenteritis, irritable bowel syndrome, and inflammatory bowel disease (Crohn's disease and ulcerative colitis), cancer, depressed immune function, and inadequate lactase digestion.

In addition, the easy digestibility and other characteristics of poi might make it a nutritional supplement for weight gain in patients with conditions such as failure-to-thrive, cancer cachexia, AIDS, pancreatitis (cystic fibrosis), and some of the induced weight loss conditions of the gastrointestinal tract, such as inflammatory bowel disease. It is suggested that poi, a nutritional supplement unique in its possible probiotic activities and low allergenic protein, should be further investigated for possible benefits to patients affected by these medical conditions.^[3]

Hawaiians tend to have lower incidence rates of colorectal cancer and it was hypothesized that this may be due to ethnic differences in diet, specifically, their consumption of poi, a starchy paste made from the taro (*Colocasia esculenta* L.) plant corm. Soluble extracts of poi were incubated at 100 mg/mL in vitro for antiproliferative activity against the rat YTT colon cancer cell line. ³H-thymidine incorporation studies were conducted to demonstrate that the poi inhibited the proliferation of these cancer cells in a dose-dependent manner. The greatest suppression of YTT colon cancer growth occurred when 25% concentration was used. When poi was incubated with the YTT cells after 2 days, the YTT cells underwent apoptotic changes as evidenced by a positive terminal deoxynucleotidyl transferase-mediated dUTP nick-end labeling (TUNEL) stain. Poi enhanced the proliferation of normal mouse splenocyte control cells, suggesting that poi is not simply toxic to all cells but even has a positive immunostimulatory role. By flow cytometry, T cells

(CD4+ and CD8+) were predominantly activated by the poi. Although numerous factors can contribute to the risk of colon cancer, perhaps poi consumption may contribute to the lower colon cancer rates among Hawaiians by two distinct mechanisms. First, by inducing apoptosis within colon cancer cells; second, by non-specifically activating lymphocytes, which in turn can lyse cancerous cells. The results suggest for the first time that poi may have novel tumor specific anti-cancer activities and future research is suggested with animal studies and human clinical trials.^[4]

Therapeutic indication:

Action: abortifacient, anodyne, antidote, astringent, carminative, cyanogenetic, laxative, stimulant, styptic, intoxicant, vermifuge.

Traditional uses: athlete's foot, boils, cancer (nose), dyspepsia, mycosis (veterinary), morphea, piles, polyps, scleroderma, sore, tubercle, warts.^[5,6]

Special warnings:

Before Taro can be eaten, all parts of the plant must be cooked, in order to break down the needle-like calcium oxalate crystals present in the leaves, stem and corm. These crystals could be extremely irritating to the throat and mouth lining, causing burning and stinging sensation.^[5]

[1] MEDICINAL PLANTS AND RAW DRUGS OF INDIA, Purshotam Kaushik, Anil Kumar Dhiman; Printed by Gajendra Singh Gahlot at Shiva Offset Press, for Bishen Singh Mahendra Pal Singh, Dehra Dun, and Typesetting at Doon Phototype Printers, 14, Old Connaught Place, Dehra Dun, India, 2000, ISBN-81-211-0174-3, pp. 544-545

[2] Weblink: http://www.ntbg.org/plants/plant_details.php?plantid=3155&rid=143, National Tropical Botanical Garden, 14.06.2008

[3] Weblink: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1482315>, PubMed Central, The Medicinal Uses of Poi, Amy C. Brown, Ph.D., R.D. and Ana Valiere, M.S., 14.06.2008

[4] Weblink: <http://www3.interscience.wiley.com/journal/112101970/abstract?CRETRY=1&SRETRY=0>, Wiley Interscience, The anti-cancer effects of poi (*Colocasia esculenta*) on colonic adenocarcinoma cells In vitro, Amy C. Brown, Jonathan E. Reitzenstein, Jessie Liu, Martin R. Jadus, 14.06.2008

[5] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 219

[6] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: <http://commons.wikimedia.org/wiki/Image:Songe-R%C3%A9union.JPG>, Wikimedia Commons, Photo by Thierry Caro, 01.09.2008

2.4 Asphodelaceae

Herbs (mostly), or shrubs, or 'arborescent' (some of the woody forms with trunks up to several metres). Plants succulent, or non-succulent. Perennial; plants with a basal concentration of leaves (commonly), or with terminal rosettes of leaves (when woody); rhizomatous, or bulbaceous. Helophytic, or mesophytic, or xerophytic. Leaves small to very large; alternate; spiral (usually), or distichous; 'herbaceous', or leathery, or fleshy, or leathery and fleshy; sessile; sheathing. Leaf sheaths with free margins. Leaves simple. Leaf blades entire; linear, or lanceolate, or ovate, or subulate (etc.); parallel-veined (but the veins often invisible externally); without cross-venules. Leaf blade margins entire, or serrate, or dentate (and often with an apical spine). Stem anatomy. Secondary thickening absent, or anomalous; when present, from a single cambial ring. Roots with velamen (in some genera), or without velamen. Reproductive type, pollination. Fertile flowers hermaphrodite. Unisexual flowers absent. Plants hermaphrodite (usually). Floral nectaries present. Nectar secretion from the gynoecium (via septal nectaries).

Flowers aggregated in 'inflorescences'; in racemes, or in spikes. The terminal inflorescence unit racemose. Inflorescences scapiflorous; terminal; simple or compound racemes or spikes. Flowers bracteate; small to large; regular to very irregular; when irregular, zygomorphic. The floral asymmetry involving the perianth, or involving the perianth and involving the androecium. Flowers 3 merous; cyclic; pentacyclic. Perigone tube present (often, as a long, commonly curved tube), or absent. Perianth with distinct calyx and corolla, or of 'tepals'; 6; 2 -whorled (3+3); isomalous; sepaloid and petaloid, or petaloid; similar in the two whorls, or different in the two whorls; green, or white, or yellow, or red, or pink, or purple, or brown, or purple and brown (not blue or violet). Androecium 6. Androecial members free of the perianth; all equal, or markedly unequal; free of one another; 2 -whorled (3+3). Androecium exclusively of fertile stamens. Stamens 6; diplostemonous; alterniperianthial. Anthers dorsifixed; dehiscent via longitudinal slits; introrse; tetrasporangiate. Pollen shed as single grains. Gynoecium 3 carpelled. The pistil 3 celled. Carpels isomalous with the perianth. Gynoecium syncarpous; eu-syncarpous; superior. Ovary plurilocular; 3 locular. Gynoecium stylate. Styles 1; apical. Stigmas 1; 3 - lobed; dry type (usually), or wet type. Placentation axile. Ovules 2–40 per locule ('2 to rather numerous'); usually arillate; hemianatropous or anatropous (nearly orthotropous in *Aloe* and *Asphodelus*). Fruit non-fleshy (nearly always), or fleshy (*Lomatophyllum*); dehiscent; a capsule. Capsules loculicidal. Seeds endospermic. Endosperm oily. Seeds winged, or wingless. Embryo well differentiated. Cotyledons 1. Embryo achlorophyllous (1/1); straight. Testa encrusted with phytomelan. Seedling. Hypocotyl internode present, or absent. Seedling collar not conspicuous. Cotyledon hyperphyll compact; non-assimilatory. Coleoptile present, or absent. Primary root ephemeral.

Holarctic, Paleotropical, Neotropical, Cape, Australian, and Antarctic; North and East Australian, South-West Australian, and Central Australian. Widespread Old World, clearly centred in southern Africa. X = (6–)7. About 800 species.^[1]

[1] Weblink: <http://florabase.calm.wa.gov.au/browse/profile/22772>, Flora of Western Australia, 04.07.2008

Aloe vera L. (Lidah buaya)

Synonyms: *Aloe barbadensis* Mill., *Aloe vulgaris* Lam.



Aloe vera L.

Occurrence and appearance

Plants short-stemmed, woody-based, stoloniferous. Stems to 50 cm; scarious leaf sheaths persistent. Leaves alternate, rosulate to distichous, 10–50 × 10–70 cm; blade glaucous-green to variegated with small white or glaucous dots, irregular bands, or blotches, often reddish near apex or margins, lanceolate to ensate, tapering from base to apex, glabrous, margins green, spiny-toothed, teeth 1–1.5 cm apart. Inflorescences terminal, usually unbranched, racemose, 10–15 dm, usually covered with scalelike bracts; racemes cylindrical, dense, 0.5 m; bracts glabrous or puberulent, with 3 prominent purple veins that are confluent at tips. Flowers: perianth yellow; tepals prominently 3-veined, connate basally for 1/2 their length, lobes broadly linear to oblong-lanceolate, apex rounded; stamens 6, included to slightly exserted, slightly unequal; filaments 2–2.5 cm; anthers 2.5–4 mm; style usually exserted; stigmas not expanded; pedicel 2.2–3.3 cm. Capsules somewhat elongate.^[1]

Parts used

Whole plant, dried juice of leaves, pulp and root.

Constituents

Aloe vera contains over 75 known active ingredients. Vitamins, antioxidants,

minerals, essential amino acids, sugars, digestive enzymes, anti-inflammatory enzymes, plant sterols, lignin, saponins, anthraquinones and more^[2]

Aloes contain C-glycosides und resins. They are anthraquinone-producing plants and the content of anthraquinones is subject to seasonal variation. The barbaloin content of Indian aloe was found to be as low as 4.24%. Purgative properties of aloes are due to presence of three pentosides: barbaloin, isobarbaloin and β -barbaloin.^[3]

Pharmacologic properties

Ancient records show that the benefits of Aloe vera have been known to mankind for centuries. Its therapeutic advantages and healing properties have survived more than 5000 years. By using the aloe vera juice a person can get the benefits of aloe vera's ability to aid in digestion, improve circulation, detoxify and heal from the inside. Aloe Vera juice can be a part of a person's daily healthy regimen because it is safe to take everyday. If Aloe is taken internally, it increases the actual amount of our bile. It affects the small intestines and stimulates the muscular coat of the large intestine thus causing purging in about fifteen hours. Aloes also help increase the menstrual flow, since it belongs to the group of emmenagogues. It is a preferable drug for many forms of constipation. Continuous use of it does not lead to enlarging the dose to take.

Aloe's benefits to our health include, helping to lower the blood sugar levels in diabetes patients. Aloe Vera is a strong laxative that may have some anti-cancer effects to humans. It is now being studied as a treatment for asthma.

Aloe vera is commonly used externally to treat various skin conditions such as cuts, burns and eczema. It is alleged that sap from Aloe vera eases pain and reduces inflammation. Scientific evidence on the effects of Aloe vera sap on wound healing is contradictory. A study showed that the healing of a moderate to severe burn was sped up by six days when covering the wound on a regular basis with aloe vera gel, compared to the healing of the wound covered in a gauze bandage. In contrast, another study suggested wounds to which Aloe vera gel was applied were significantly slower to heal.

Many cosmetic companies add sap or products derived from Aloe vera to products such as makeup, shampoos, soaps, moisturisers, sunscreens and lotions. Aloe gel is alleged to be useful for dry skin conditions, especially eczema around the eyes and sensitive facial skin and for treating fungal infections. Aloe vera has very good results in skin diseases and it is often taken as health drink. Aloe Vera is also found effective in treating wrinkles, stretch marks and pigmentations. According to ayurvedic practitioners Aloe vera has a very good role in diabetic. „Aloe vera is found to have smaller molecular structure and cutting properties. This help breaking down fat globules, therefore reducing obesity“. Medical properties of Aloe vera are still on debate, but the properties are highly accepted by the world.

Aloe vera is also known to have certain medical properties. Aloe vera drink is used as a tonic for patient suffering from arthritis, diabetes and high cholesterol. This is because of the dietary supplement properties, which help in healing like antifungal, antioxidant, antibacterial and some other properties. It is found to boost the immune system. The transparent gel that is found

inside its leaf is used as a domestic emergency treatment in burns, injuries and solar erythema, also it is applied externally on hemorrhoids and a good cicatrization. Aloe vera contains at least two active compounds that decrease the levels of sugar in the blood and its extract is also used in patients with hypoglycemia. Its juice is consumed as prevention and treatment of many gastric disorders. „The efficiency of Aloe vera in the treatment of burns is due because it has a similar structure as aspirin, that in combination with magnesium have an anesthetic effect and because of its antimicrobial composition it helps for the hygiene of the burns, avoiding a possible infection“.^[2]

Aloe-emodin is a hydroxyanthraquinone found in Aloe vera, as well as in leaves and roots of other plants. The mechanisms of its anticancer effect are largely unknown. A study investigated its molecular mechanisms. Crystal violet assay showed that aloe-emodin had a long-term anti-proliferation effect on human gastric cancer MGC-803 and SGC-7901 cells. Scratch wound-healing motility assays indicated its anti-migration effect. Aloe-emodin arrested SGC-7901 cells at G2/M phase. More importantly, aloe-emodin inhibited the expressions of protein kinase C and c-myc. In conclusion, the anticancer effect of aloe-emodin on gastric cancer cells involves suppression of c-myc expression.^[4]

Aloe vera is a natural product that is frequently used in soothing skin care products such as aftersun lotions. The anti-inflammatory potential of a highly concentrated A. vera gel in the UV erythema test in vivo was investigated. 40 volunteers with skin types II and III were included in the randomized, double-blind, placebo-controlled, phase III monocenter study. Test areas on the back were irradiated with the 1.5-fold minimal erythema dose of UVB. Subsequently, the test areas were treated occlusively on 2 subsequent days with A. vera gel (97.5%), the positive controls (0.25% prednicarbate, 1% hydrocortisone in placebo gel and 1% hydrocortisone cream) and a placebo gel. Erythema values were determined photometrically after 24 and 48 h. A. vera gel (97.5%) significantly reduced UV-induced erythema after 48 h, being superior to 1% hydrocortisone in placebo gel. In contrast, 1% hydrocortisone in cream was more efficient than A. vera gel. In this study after 48 h the A. vera gel (97.5%) displayed some anti-inflammatory effects superior to those of 1% hydrocortisone in placebo gel. The A. vera gel tested here might be useful in the topical treatment of inflammatory skin conditions such as UV-induced erythema.^[5]

Insulin resistance, which precedes type 2 diabetes mellitus (T2DM), is a widespread pathology associated with the metabolic syndrome, myocardial ischemia, and hypertension. Finding an adequate treatment for this pathology is an important goal in medicine. The purpose of the present research was to investigate the effect of an extract from Aloe vera gel containing a high concentration of polyphenols on experimentally induced insulin resistance in mice. A polyphenol-rich Aloe vera extract (350 mg/kg) with known concentrations of aloin (181.7mg/g) and aloe-emodin (3.6mg/g) was administered orally for a period of 4 weeks to insulin resistant ICR mice. Pioglitazone (50 mg/kg) and bi-distilled water were used as positive and negative controls respectively. Body weight, food intake, and plasma concentrations of insulin and glucose were measured and insulin tolerance tests were performed. The insulin resistance value was calculated using the homeo-

stasis model assessment for insulin resistance (HOMA-IR) formula. Results showed that the polyphenol-rich extract from Aloe vera was able to decrease significantly both body weight ($p < 0.008$) and blood glucose levels ($p < 0.005$) and to protect animals against unfavorable results on HOMA-IR, which was observed in the negative control group. The highest glucose levels during the insulin tolerance curve test were in the negative control group when compared to the Aloe vera extract and pioglitazone treated mice ($p < 0.05$). In conclusion, Aloe vera gel could be effective for the control of insulin resistance.^[6]

Aloe vera has been traditionally used for burn healing but clinical evidence remains unclear. A systematic review was conducted to determine the efficacy of topical Aloe vera for the treatment of burn wounds. Were searched relevant studies in MEDLINE, CINAHL, Cochrane Library, HealthSTAR, DARE, South-East Asia Database, Chinese Databases, and several Thai local Databases (1918-June 2004). Only controlled clinical trials for burn healing were included. There were no restrictions on any language of publication. Two reviewers independently extracted data on study characteristics, patient characteristics, intervention, and outcome measure. Four studies with a total of 371 patients were included in this review. Based on a meta-analysis using duration of wound healing as an outcome measure, the summary weighted mean difference in healing time of the aloe vera group was 8.79 days shorter than those in the control group ($P = 0.006$). Due to the differences of products and outcome measures, there is paucity to draw a specific conclusion regarding the effect of aloe vera for burn wound healing. However, cumulative evidence tends to support that Aloe vera might be an effective interventions used in burn wound healing for first to second degree burns. Further, well-designed trials with sufficient details of the contents of Aloe vera products should be carried out to determine the effectiveness of Aloe vera.^[7]

In a study, the prophylactic effect of the main lectin present in Aloe vera leaf pulp extract (Aloctin I) was assayed against Ehrlich ascites tumours in mice. The lectin administered prophylactically before tumour implantation regressed tumour size, however, this activity was less potent than that of the A. vera leaf pulp extract previously shown. Accordingly, serum sialic acid and tumour necrosis factor alpha (TNFalpha) levels, chosen as tumour markers, were decreased significantly by the prophylactic administration of the lectin. The increase in spleen and thymus weights in the group given only Aloctin I, could be explained by the immunomodulatory and mitogenic effects of lectins. These findings, along with lymphoid hyperplasia observed in spleen and thymus, suggest that the tumour preventive effect of Aloctin I could be due to its immunomodulatory activity.^[8]

Therapeutic indication

Action: aperient, carminative, colon cleanser, emollient, expellent, purgative, stomach soother, stool softener, topical, vulnerary.

Traditional uses: alopecia, asthma, burns, cancer (stomach), congestion, convulsion, cough, cuts, eczema, excrescence, fever, gonorrhea, headache, hemorrhoids, insect bites, intestinal worms, mouth sores, nausea, piles, pregnancy, pyorrhea, skin irritation, sores, stomach ache, sunburn, swelling, tuberculosis, vermifuge, worms, wounds, wrinkles.^[9,10]

Particularities

Researchers at the University of Miguel Hernández in Alicante, Spain have developed a gel based on *A. vera* that prolongs the conservation of fresh produce, such as fresh fruit and legumes. This gel is tasteless, colorless, and odorless. This natural product is considered a safe and environmentally friendly alternative to synthetic preservatives such as sulfur dioxide. The study showed that grapes at 1°C coated with this gel could be preserved for 35 days against 7 days for untreated grapes. According to the researchers, this gel operates through a combination of mechanics forming a protective layer against the oxygen and moisture of the air and inhibiting, through its various antibiotic and antifungal compounds, the action of microorganisms that cause food borne illnesses.^[11]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=200027555, Plants of North America, 04.04.2008

[2] Weblink: http://www.articlealley.com/article_99577_23.html, Article Alley, Herbs & Research Depart At Nutrovita.com Health Articles, 14.06.2008

[3] Weblink: http://books.google.at/books?id=-q45EZEfz0sC&pg=PA28&dq=Handbook+of+Ayurvedic+Medical+Plants+aloe&sig=ACfU3U1WSTb9ilh6Mne0HBNaUXiXvRZS_w, Handbook of Ayurvedic Medical Plants, ISBN 0849329299, L.D. Kapoor, page 28, 14.06.2008

[4] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18443957>, PubMed, Suppression of C-myc expression associates with anti-proliferation of aloe-emodin on gastric cancer cells, Guo J, Xiao B, Liu Q, Gong Z, Le Y., School of Medicine, Ningbo University, Ningbo, China, 14.06.2008

[5] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18253066>, PubMed, Investigation of the anti-inflammatory potential of Aloe vera gel (97.5%) in the ultraviolet erythema test, Reuter J, Jocher A, Stump J, Grossjohann B, Franke G, Schempp CM., Department of Dermatology, University Medical Center Freiburg, Freiburg, Germany. 14.06.2008

[6] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18186589>, PubMed, Effect of a polyphenol-rich extract from Aloe vera gel on experimentally induced insulin resistance in mice, Pérez YY, Jiménez-Ferrer E, Zamilpa A, Hernández-Valencia M, Alarcón-Aguilar FJ, Tortoriello J, Román-Ramos R., Centro de Investigación Biomédica del Sur, Instituto Mexicano del Seguro Social, Xochitepec, Morelos, México. 14.06.2008

[7] Weblink, <http://www.ncbi.nlm.nih.gov/pubmed/17499928>, PubMed, The efficacy of aloe vera used for burn wound healing: a systematic review., Maenthaisong R, Chaikunapruk N, Niruntraporn S, Kongkaew C., Pharmacy Practice Unit, Department of Pharmacy Practice, Naresuan University, Phitsanulok, Thailand, 14.06.2008

[8] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/17685385>, Tumour preventive effect of Aloe vera leaf pulp lectin (Aloctin I) on Ehrlich ascites tumours in mice., Akev N, Turkay G, Can A, Gurel A, Yildiz F, Yardibi H, Ekiz EE, Uzun H., Faculty of Pharmacy, Department of Biochemistry, Istanbul University, 34116 Beyazıt, Istanbul, Turkey, 14.06.2008

[9] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 33

[10] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

[11] Weblink: <http://www.newworldencyclopedia.org/entry/Aloe>, New World Encyclopedia, 14.06.2008

Figure: http://commons.wikimedia.org/wiki/Image:Aloe_vera_11.jpg, Wikimedia Commons, Photo by Kousvet, 01.09.2008

2.5 Bombacaceae

The family Bombacaceae includes around 30 genera with about 250 species. Many species grow to become large trees, with *Ceiba pentandra* the tallest, reaching a height to 70 m. Several of the genera are commercially important, producing timber, edible fruit or useful fibres. The family is noted for some of the softest hardwoods commercially traded, especially *Balsa*, *Ochroma lagopus*. The fruit of the Durian, *Durio zibethinus* is famous, tasting better than it smells. At one time the fibre from the Kapok tree, *Ceiba pentandra* was used in making lifebuoys. The Baobabs or "Bottle trees" (*Adansonia* spp.) are important icons in certain parts of Africa, Australia and Madagascar, noted for their immensely stout trunk development, a mechanism for enhancing water storage.

A close relationship between Bombacaceae and Malvaceae has long been recognized but until recently the families have been kept separate in most classification systems, and continue to be separated in many references, including the newest reference work in classification of flowering plants: Heywood et al. 2007. Heywood et al. say "although closely related to Malvaceae, molecular data support their separation. Only pollen and habit seem to provide a morphological basis for the separation."^[1]

Trees, usually large, often deciduous; trunks sometimes spiny, often buttressed; bark fibrous, with mucilaginous exudates; indumentum usually stellate or tufted. Leaves alternate, spiral; stipules inconspicuous, caducous; petiole pulvinate; leaf blade often palmately compound (simple and lobed in *Ochroma*), margin often entire. Inflorescences axillary, 1(or 2)-flowered, rarely many-flowered. Flowers bisexual, actinomorphic, large and showy. Epicalyx of 3 bracts, inconspicuous and caducous. Calyx shortly cylindrical, truncate, or irregularly 3-5-lobed, sometimes splitting. Petals 5, joined at base with androecium and falling as one unit, imbricate. Stamens usually very many (3-15 in *Ceiba*); filaments usually united in lower half into a filament tube around style, tube sometimes lobed, with stamens in 5 groups with completely united filaments and sessile anthers; anthers usually 1-celled, apparently 2-celled and non-septate in *Ceiba*, sometimes many anthers united into an apparent many-celled "super-anther"; pollen usually spheroidal, $\pm$ smooth, reticulate; staminodes absent. Ovary superior, syncarpous, carpels usually 5; ovules 2 to many per locule, axile, anatropous; style 5-lobed. Fruit a 5-valved capsule, or hard and indehiscent (e.g., *Adansonia*), many-seeded with seeds often embedded in endocarp hairs (kapok), less often fruit winged or juicy and few-seeded. Seeds sometimes winged.^[2]

[1] Weblink: <http://en.wikipedia.org/wiki/Bombacaceae>, Wikipedia, 02.04.2008

[2] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=10113, Flora of China 02.04.2008

Eriodendron anfractuosum D.C. (Randu)

Synonyms: *Ceiba pentandra* (L.) Gaertn., kapoktree, white silk-cottontree, *Bombax pentandrum* L.



Eriodendron anfractuosum D.C.

Occurrence and appearance

The tree grows to 60-70 m (200-230 ft) tall and has a very substantial trunk up to 3 m (10 ft) in diameter with buttresses. The trunk and many of the larger branches are densely crowded with very large, robust simple thorns. The leaves are compound of 5 to 9 leaflets, each up to 20 cm (8 in) and palm like. Adult trees produce several hundred 15 cm (6 in) seed pods. The pods contain seeds surrounded by a fluffy, yellowish fiber that is a mix of lignin and cellulose.^[1]

Parts used

Seeds, bark, leaves

Constituents

Young leaves is a source of calcium and iron.

Seeds contain oil, 24.2%; ash, 5.22%; crude fiber, 23.9 %; albuminoids,, 18.9%; carbos and others, 15.9%.

The oil is a mixture of fatty acid, 70% liquid, 30% solid palmitic acid.^[2]

Pharmacologic properties

Ceiba pentandra bark decoction has been used as a diuretic, aphrodisiac, and to treat headache, as well as type II diabetes. It is also used as an additive to some versions of the hallucinogenic drink Ayahuasca.^[1]

The seeds, leaves, bark and resin, from the kapok tree are used for dysentery, fevers, venereal diseases, asthma, menstruation bleedings and kidney diseases.^[3]

In Burma the roots are used to invigorate and the leaves are used to treat gonorrhea. In Cambodia, the root is used to reduce fever. The bark is used to promote urination, to treat gonorrhea, to reduce fever, and to treat diarrhea. In Malaysia, the bark is used to treat asthma. In Indonesia, a decoction is used as a drink to treat gravels (small kidney calculi), and a decoction of leaves is used to treat syphilis. The juice squeezed of the leaves is used to treat asthma and coughs. In the Philippines, it is used to reduce fever and to promote libido, and the gummy exudate of the plant is eaten to treat dysentery, monorrhagia, and diabetes. Some evidence has already been presented, which lends support to the argument for its antidiabetic and antiinflammatory properties. Using streptozotocin-induced diabetes mellitus in experimental rats, Ladeji et al. made a careful study of the antidiabetic properties of an aqueous bark extract given orally to rats for 24 hours. There was, they report, a statistically significant reduction in plasma glucose levels. 5-hydroxy-7,4',5'-trimethoxyisoflavone-3'-O- β -D-glucoside, and its aglycone, vavain, isolated from the bark of *Ceiba pentandra*, inhibited the enzymatic activity of cyclooxygenase-2 with IC₅₀ values of 381, 97, and 80 μ M, respectively.

Another possible pharmacologically interesting feature of *Ceiba pentandra* could be the production of sesquiterpenes and triterpenes inducing cell death or apoptosis in vitro. Hibasami et al. have recently reported the presence of 2-O-methylisohemigossylic acid lactone, a sesquiterpene lactone from the roots of *Bombax ceiba* L., which induces cell death and morphological change indicative of apoptotic chromatin condensation in human promyelotic leukemia HL-60 cells. 2-O-methylisohemigossylic acid lactone affected the survival of human promyelotic leukemia HL-60 cells cultured in vitro accompanied with chromatin condensation, fragmentation of DNA to oligonucleosomal-sized fragments, which are characteristic of apoptosis, an effect disciplined by inhibitors of caspases and proteolytic enzymes. Lupeol from *Gossampinus malabarica* (L.) Merr. induced the formation of apoptotic bodies in HL-60 cells cultured in vitro with an increase in hypodiploid nuclei up to 70.9% after 3-day treatment with 150 μ M.^[4]

The effect of the root bark extract of *Ceiba pentandra* L. in normal and streptozotocin-induced diabetic rats was studied. Blood glucose levels were determined after oral administration of graded doses of *C. pentandra* (40, 75, 150 and 300 mg/kg) in fasted normal and diabetic groups. In both groups, 40 and 75 mg/kg of the extract, significantly reduced blood glucose levels 8 h after administration, which was consistent and time-dependent. *C. pentandra* at the lower dose of 40 mg/kg produced blood-glucose-lowering effect of 40.0% and 48.9%, in normal and diabetic rats respectively when compared

with control rats. The higher doses of 150 and 300 mg/kg did not affect significantly the blood glucose levels. In multiple dose studies, the diabetic rats were treated orally by gavages, twice a day for 3 days. On day 3, *C. pentandra* (40 and 75mg/kg) significantly decreased blood and urine glucose levels as compared to initial values. The 14 h fasting blood glucose concentration was lowered by 59.8 % and 42.8% at the doses of 40 and 75 mg/kg and the corresponding urine glucose levels reductions were 95.7% and 63.6%, respectively. The results indicated that *C. pentandra* possessed hypoglycaemic effect. The plant extract was capable of ameliorating at lower doses, hyperglycaemia in streptozotocin-induced diabetic rats and could be a potential source for isolation of new orally active agent(s) for anti-diabetic therapy.^[5]

Therapeutic indication

Action: antidiarrhoea, astringent, diuretic, emetic, emollient.

Traditional uses: asthma, bladder, bowel, catarrh, colic, cough, enterosis, erysipelas, female ailments, fever, gravel, headache, hoarseness, hydropsy, leprosy, neuralgia, parturition, sprains, swelling, syphilis, tumor, urethritis.^[6,7]

[1] Weblink: <http://en.wikipedia.org/wiki/Kapok>, Wikipedia, 26.02.2008

[2] Weblink: <http://www.stuartxchange.org/Buboi.html>, Philippine Medical Plants, 04.07.2008

[3] Weblink: <http://www.tropilab.com/ceiba-pen.html>, Tropilab Inc., 26.02.2008

[4] Medicinal Plants of Asia and the Pacific by Christophe Wiart, 2006 CRC Press, ISBN 0849372453, Page 84

[5] Weblink: <http://209.85.129.104/search?q=cache:peO9NgXzdO0J:www.africanethnomedicines.net/v3n1djomenietal.pdf+%22Ceiba+pentandra%22+constituents&hl=de&ct=clnk&cd=7&gl=at>, HYPOGLYCAEMIC AND ANTIDIABETIC EFFECT OF ROOT EXTRACTS OF CEIBA PENTANDRA IN NORMAL AND DIABETIC RATS, Paul Désiré Dzeufiet Djomeni, Léonard Tédong, Emmanuel Acha Asongalem, Théophile Dimo, Selestine Dongmo Sokeng, Pierre Kamtchouing, Department of Animal Physiology, Faculty of Science, University of Yaounde I, Department of Physiological Sciences, Faculty of Medicine and Biomedical Sciences, Pharmacology and Toxicology Unit, University of Yaounde I, Department of Biological Sciences, Faculty of Sciences, University of Ngaoundere, 04.07.2008

[6] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 180

[7] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases 04.04.2008

Figure: http://upload.wikimedia.org/wikipedia/commons/d/d4/Ceiba_pentandra_0004.jpg, 04.07.2008

2.6 Brassicaceae

Brassicaceae or Cruciferae, also known as the crucifers, the mustard family or cabbage family is a family of flowering plants (Angiospermae). The name Brassicaceae is derived from the included genus *Brassica*. Cruciferae is an older name, it means "cross-bearing", because the four petals of their flowers are reminiscent of a cross. According to ICBN Art. 18.5 (Vienna Code) both Cruciferae and Brassicaceae are regarded as validly published, and are thus accepted as names for the family. It contains over 330 genera and about 3,700 species, according to the Royal Botanic Gardens, Kew. The largest genera are *Draba* (365 species), *Cardamine* (200 species), *Erysimum* (225 species), *Lepidium* (230 species) and *Alyssum* (195 species). The family contains well-known species like *Brassica oleracea* (cabbage, cauliflower), *Brassica rapa* (turnip, Chinese cabbage), *Brassica napus* (rapeseed), *Matthiola* (stock) and many other. The family is cosmopolitan, but is concentrated in the northern temperate regions and reaches maximal diversity around the Mediterranean area.

The family consists only of herbaceous plants with annual, biennial or perennial lifespans. The leaves are alternate (rarely opposite), sometimes organized in basal rosettes. They are very often pinnately incised and do not have stipules. The structure of the flowers is extremely uniform throughout the family. They have four free saccate sepals and four clawed free petals, staggered. They can be disymmetric or slightly zygomorphic, with a typical cross-like arrangement (hence the name 'Cruciferae'). They have six stamens, four of which are longer (as long as the petals, so relatively short in fact) and are arranged in a cross like the petals and the other two are shorter (tetradynamous flower). The pistil is made up of two fused carpels and the style is very short, with two lobes. Superior ovary. The flowers form ebracteate racemose inflorescences, often apically corymb-like. Pollination occurs by entomogamy, nectar is produced at the base of the stamens and stored on the sepals.

The fruit is a peculiar kind of capsule named silique (plural siliquae, American English silique/siliques). It opens by two valves, which are the modified carpels, leaving the seeds attached to a framework made up of the placenta and tissue from the junction between the valves (replum). There is often an indehiscent beak at the top of the style and one or more seeds may be borne there. Where a silique is less than three times as long as it is broad, it is usually termed a silicula. The silique may break apart at constrictions occurring between the segments of the seeds, thus forming a sort of loment (e.g. *Raphanus*), it may eject the seeds explosively (e.g. *Cardamine*) or may be evolved in a sort of samara (e.g. *Isatis*). Unsurprisingly the fruit is often the most important diagnostic character for plants in this family.

The Brassicaceae do not form mycorrhizae, although rare exceptions do exist. Most members share a suite of glucosinolate compounds that has a typical pungent odour usually associated with cole crops. The importance of this family for food crops has led to its selective breeding throughout history. Some examples of cruciferous food plants are the cabbage, broccoli, cauliflower, turnip, rapeseed, mustard, radish, horseradish, cress and watercress.^[1]

[1] Weblink: <http://en.wikipedia.org/wiki/Brassicaceae>, Wikipedia, 26.02.2008

Raphanus sativus L. (Lobak putih)

Radish



Raphanus sativus L.

Occurrence and appearance

Herbs annual or biennial, 10-130 cm tall, glabrous, scabrous, or hispid. Roots fleshy, white, pink, red, or black, linear, fusiform, oblong, or globose, 1-100 × 0.5-45 cm, sometimes slender and not fleshy. Stems simple or branched. Basal leaves with petioles 1-30 cm; leaf blade oblong, obovate, oblanceolate, or spatulate in outline, 2-60 × 1-20 cm, lyrate or pinnatisect, sometimes undivided, margin dentate, apex obtuse or acute; lateral lobes 1-12 on each side of midvein, sometimes absent, oblong or ovate, to 10 × 5 cm. Uppermost cauline leaves subsessile, often undivided, dentate. Fruiting pedicels divaricate or ascending, straight, 0.5 - 4 cm. Sepals narrowly oblong, 5.5-10 × 1-2 mm, glabrous or sparsely pubescent. Petals purple, pink, or sometimes white, often with darker veins, broadly obovate, 1.2-2.2 cm × 3-8 mm, apex obtuse or emarginate; claw to 1.4 cm. Filaments slender, 5-12 mm; anthers 1.5-2 mm, sagittate at base. Fruit fusiform or lanceolate, sometimes ovoid or cylindric; seedless valvular segment 1-3.5 mm; seed-bearing distal segment (1-)3-15(-25) × (0.5-)0.7-1.3(-1.5) cm, corky, rounded at base, conical at apex, smooth or rarely slightly constricted between seeds, not ribbed; style 1-4 cm; stigma entire. Seeds globose or ovoid, 2.5-4 mm in diam. Fl. and fr. depending on cultivation time.^[1]

Parts used

Flowers, leaves, roots, seeds and seedpot

Constituents

Leaves (dry weight): 287 Calories per 100g; Water: 0%; Protein: 28.7g; fat: 5.2g; carbohydrate: 49.6g; fibre: 9.6g; ash: 16.5g

minerals - calcium: 1913mg; phosphorus: 261mg; iron: 35.7mg; magnesium: 0mg; sodium: 956mg; potassium: 4348mg; zinc: 0mg

Vitamins - A: 21mg; thiamine (B1): 0.7mg; riboflavin (B2): 2.43mg; niacin: 34.8mg; B6: 0mg; C: 704mg^[2]

Root only: carbohydrates: 3.40 g (sugars 1.86 g, dietary fiber 1.6 g); fat: 0.10 g; protein: 0.68 g, thiamin (vit. B1): 0.012 mg; riboflavin (vit. B2): 0.039 mg; niacin (vit. B3): 0.254 mg; pantothenic acid (B5): 0.165 mg; vitamin B6: 0.071 mg; folate (vit. B9): 25 µg; vitamin C: 14.8 mg; calcium: 25 mg; iron: 0.34 mg; magnesium: 10 mg; phosphorus: 20 mg; potassium: 233 mg; zinc: 0.28 mg^[3]

Pharmacologic properties

Radishes have long been grown as a food crop, but they also have various medicinal actions. The roots stimulate the appetite and digestion, having a tonic and laxative effect upon the intestines and indirectly stimulating the flow of bile. Consuming radish generally results in improved digestion, but some people are sensitive to its acidity and robust action. The plant is used in the treatment of intestinal parasites, though the part of the plant used is not specified. The leaves, seeds and old roots are used in the treatment of asthma and other chest complaints. The juice of the fresh leaves is diuretic and laxative. The seed is carminative, diuretic, expectorant, laxative and stomachic. It is taken internally in the treatment of indigestion, abdominal bloating, wind, acid regurgitation, diarrhoea and bronchitis. The root is antiscorbutic, antispasmodic, astringent, cholagogue, digestive and diuretic. It is crushed and used as a poultice for burns, bruises and smelly feet. Radishes are also an excellent food remedy for stone, gravel and scorbutic conditions. The root is best harvested before the plant flowers. Its use is not recommended if the stomach or intestines are inflamed. The plant contains raphanin, which is antibacterial and antifungal. It inhibits the growth of *Staphylococcus aureus*, *E. coli*, streptococci, Pneumococci etc. The plant also shows anti-tumour activity.^[2]

Therapeutic indication

Action: antiphlogistic, aperient, aperitif, bactericide, carminative, diuretic, expectorant, digestive, laxative, stimulative.

Traditional uses: amygdalitis, asthma, bilious, catarrh, depurative, gall, insomnia, neuralgia, burn, pertussis, scurvy, stomachic, tympanitis, urogenital, wen.^[4,5]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=3&taxon_id=200009662, Chinese Plant Names, 26.02.2008

[2] Weblink: <http://www.pfaf.org/database/plants.php?Raphanus+sativus>, Plants for a Future, 26.02.2008

[3] Weblink: <http://en.wikipedia.org/wiki/Radish>, Wikipedia, 13.03.2008

[4] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 701

[5] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: [http://commons.wikimedia.org/wiki/Image:Radijs_planten_\(Raphanus_sativus_sub_sp._sativus\).jpg](http://commons.wikimedia.org/wiki/Image:Radijs_planten_(Raphanus_sativus_sub_sp._sativus).jpg), Wikimedia Commons, Photo by Rasbak, 01.09.2008

2.7 Campanulaceae

The family Campanulaceae (also bellflower family), of the order Asterales, contains about 70 genera and 2000 species. They are mostly herbs, shrubs, and more rarely small trees, which usually have milky non-toxic sap. The family includes the familiar garden plants *Campanula* (or bellflower), *Lobelia*, and the balloonflower (*Platycodon*.)

This family is almost cosmopolitan but concentrated in the Northern Hemisphere. However in the Southern Hemisphere, South Africa is remarkably rich in members of this family. These species are absent in the Sahara, Antarctica and northern Greenland.

Most current classifications include the segregate family Lobeliaceae in Campanulaceae.^[1]

Annual or perennial herbs, sometimes lactiferous. Roots and rhizomes often thickened and tuberous. Leaves simple, usually alternate, sometimes opposite, exstipulate. Stems erect, decumbent, trailing or climbing. Flowers usually hermaphrodite, actinomorphic, regular, sometimes cleistogamous. Calyx-tube adnate to the ovary. Sepals with linear to triangular or lanceolate segments. Corolla united, campanulate, infundibuliform or tubular, 5-lobed, sometimes the segments split to the base. Stamens 5 with flattened filaments. Ovary inferior, (2-)3-5 locular, with numerous ovules; styles thick with 3, sometimes 2 stigmas. Fruit a capsule, dehiscing by valves or pores.^[2]

Perhaps the most interesting character is one the Campanulaceae shares with the closely related Asteraceae (sunflower family). Inside the flower, the five stamens are arranged closely together around the central female style and are often fused together, thus forming a little cylinder. When they are mature, the stamens release their pollen into the center of the tube they form, where the pollen collects. The style will then grow longer, slowly pushing the mass of pollen out of the tube, where it then falls on the backs of bees that visit the flower for nectar. Once all the pollen is pushed out and the female style is mature, the tip will split open to reveal sticky surfaces where it can receive pollen from other flowers. In other words, the flower will not pollinate itself, because the pollen is released and pushed out of the way before it is ready to be pollinated. However, there are species that take out insurance on pollination by allowing the sticky tips to eventually coil back into the remnants of pollen in the flower, just in case the bees weren't as busy as they're fabled to be.

Many species are grown in gardens for their large colorful flowers, which are usually red, blue, or purple, but sometimes yellow. The blue color is attractive to bees, though other insects may visit the flowers, and some red-flowered species may be visited by birds or butterflies.

Pretty flowers are not the only potential benefit from this group. Many species produce chemical compounds in wide variety. Some of these compounds are highly toxic, but others have been used to treat asthma and other breathing disorders. Perhaps the best known compound is lobeline, a mild narcotic which provides the slight rush and calming effect of nicotine, but which does not appear to be addictive. As such, it can be used as an aid to quit smoking, though its sale is now regulated in some countries.

The only report of fossil pollen from the Campanulaceae comes from the

Pliocene of New Zealand (Mildenhall, 1980), which is rather surprising when one considers the many species and global distribution of the family. In fact, some close relatives of the Campanulaceae have fossils in the Oligocene and earlier. Based on the fossil record of these relatives, the group's ancestors must have evolved before the end of the Cretaceous.^[3]

[1] Weblink: <http://en.wikipedia.org/wiki/Campanulaceae>, Wikipedia, 04.07.2008

[2] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=10152, Flora of Pakistan, 12.08.2008

[3] Weblink: <http://www.ucmp.berkeley.edu/anthophyta/asterids/campanulaceae.html>, University of California Museum of Paleontology, 12.08.2008

Laurentia longiflora L. (Ki Korejat, Ki Caang)

Synonyms: Star-of-Bethlehem, Hippobroma longiflora (L.) G. Don., Horse Poison



Laurentia longiflora L.

Occurrence and appearance

Herb with rosette of narrow sessile oblanceolate coarsely pinnatilobed leaves mostly 10-15 cm long, up to 3-4 cm wide near apex; flowers white, on 2 cm pubescent pedicel; calyx to 3 cm long; corolla usually 8-11 cm long, plus the 2-2.5 cm long lobes; anthers apically bearded; capsule campanulate, pubescent, 2-celled, nearly 2 cm long, over 1 cm thick; seeds many, ovate, reticulate, light brown, minute.^[1]

Pharmacologic properties

It is notable for its concentrations of two pyridine alkaloids: lobeline and nicotine. The effects of nicotine and lobeline are quite similar, with psychoactive effects at small dosages and with unpleasant effects including vomiting, muscle paralysis, and trembling at higher dosages. For this reason, *H. longiflora* (and its various synonyms) is often referenced for both its toxicity and its ethnobotanical uses.^[2]

Therapeutic indication

Action: calmative, diaphoretic, expectorant, narcotic, rubefacient.

Traditional uses: asthma, syphilis.^[3,4]

Special Warnings

All parts of this plant are poisonous. The toxin is diphenyl lobelidiol, a nicotine-like alkaloid.^[5]

When pulling this weed, it is important to wear gloves: the sap is an irritant

which can be absorbed through the skin, and a small amount of sap in the eyes can cause blindness.^[2]

[1] Weblink: http://www.hear.org/Pier/species/hippobroma_longiflora.htm, Hawaiian Eco-systems at Risk project, 13.06.2008

[2] Weblink: http://en.wikipedia.org/wiki/Hippobroma_longiflora, Wikipedia, 13.06.2008

[3] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 460

[4] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

[5] Weblink: <http://books.google.at/books?id=-J-YxltyrHEC&pg=PA177&dq=%22Laurentia+longiflora%22+pharmacological&lr=&sig=ACfU3U2v0b8P8Z641lcEO4C0UFwbAN3V7g>, Google Books, Handbook of Poisonous and Injurious Plants, by Lewis S. Neslon, page 177, ISBN:0387312684, 13.06.2008

Figure: http://www.ruhr-uni-bochum.de/boga/html/Isotoma_longiflora_Foto.html, Ruhr-Universität Bochum, Photo by Armin Jagel, 01.09.2008

2.8 Caricaceae

Trees small, palmlike, or shrubs, rarely vines, often prickly, monoecious, dioecious, andromonoecious, gynomonoecious, or polygamomonoecious. Stem stout, unbranched, rarely branched, with a terminal cluster of leaves, with flowing, latexlike exudate. Leaves alternate, long petiolate, usually estipulate, large; stipules when present, spiny; leaf blade palmate or palmatifid, rarely entire or pinnatifid. Inflorescences axillary; male flowers aggregated in cymose panicles; female flowers usually solitary or aggregated in corymbose cymes, large. Calyx 5-lobed; lobes small, connate basally. Corolla 5-lobed; tube long in male flowers, short in female flowers. Stamens 5 or 10, 1- or 2-whorled, inserted in throat of corolla tube; filaments free, connate basally; anthers introrse, tetrasporangiate, dehiscing via longitudinal slits. Gynoecium in male flowers vestigial, or absent; in female flowers syncarpous, synovarious to synstylovarious; ovary superior, 1- or 5-loculed, placentation when 1-loculed parietal (placentas $\pm$ deeply intruded) or laminar-dispersed, when 5-loculed axile; ovules numerous, anatropous, bitegmic; styles 1 or 5, free to partly joined, apical; stigmas 5, papillate, dry. Fruit large, fleshy, indehiscent berry. Seeds numerous, surrounded by mucilage; endosperm oily; embryo well differentiated; cotyledons 2, broad, flat. $n = 9$.

Six genera and 34 species: Central and South America, one genus of two species (*Cylicomorpha* Urban) in tropical Africa, one genus (*Carica*) widely introduced and cultivated in tropical areas of the world, including China.^[1]

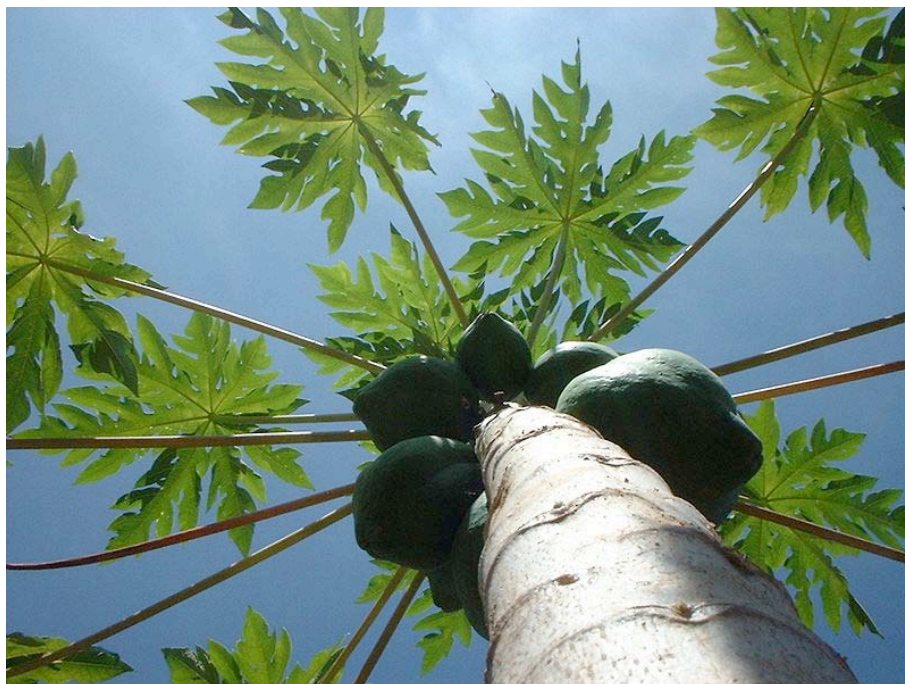
Mustard-oils present (often). Not cyanogenic. Alkaloids present (carpaine), or absent. Iridoids not detected. Proanthocyanidins absent. Flavonols absent. Ellagic acid absent (*Carica*). Saponins/sapogenins present, or absent.^[2]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=3&taxon_id=10161, Chinese Plant Names, 04.07.2008

[2] Weblink: <http://delta-intkey.com/angio/www/caricace.htm>, „The Families of Flowering Plants“ L. Watson and M. J. Dallwitz, 04.07.2008

Carica papaya L. (Gedang)

Synonym: *Papaya vulgaris* DC.



Carica papaya L.

Occurrence and appearance

It is an erect soft-wooded, fast growing and short lived tree with 6.0 - 7.5 m height. The leaves are palmatipartite and 30 - 50 cm across with long petiole of about 90 cm length forming a round tuft at the top of the stem. The plant may be dioecious or monoecious and occasionally may be bisexual. Flowers white; the male flowers on axillary panicles and the female flowers solitary or in racemes. The fruits are cylindrical or spherical, flesh yellow to pink and edible and are borne near the top of trunk, packed at the base of leaves, succulent and indehiscent. The seeds are many, grey or black and brittle.

Flowering and fruiting is throughout the greater parts of the year.^[1]

Parts used

Reports of traditional uses describe the use of every part of the plant, but in particular the sap, the fresh or dried seeds, the fruits, the fresh leaves, the roots, and the bark.^[2]

Constituents

The fruits contain protein, sugars, vitamins A, B (thiamin, riboflavin), C (ascorbic acid), D and folic acid, and also carotenoids, carbohydrates (fructose, glucose, mannitol, xylitol) and essential oils.^[2]

The latex of unripe fruits contain papain, a proteolytic enzyme, chymopapain, pectin and malic acid.^[1]

The leaves contain vitamin E and numerous enzymes (esterases, proteases)

and saponins. The leaves also contain the alkaloids carpain and pseudocarpin.^[2]

Carpasemine has also been isolated from the seeds.^[1]

The seeds have 25% fatty oils including oleic acid, palmitic acid and carpasemine.

The roots, trunk, leaves and seeds, but not the sap, contain mustard oil glycosides and the enzyme myrosinase.

The milky latex sap of papaya contains also numerous enzymes (esterases, proteases), the most significant of which in terms of quantity is papain, a proteolytic enzyme, and chymopapain.^[2]

Pharmacologic properties

The fruits are considered as digestive, stomachic, carminative, diuretic, alterative and laxative. The milky juice of unripe fruits is used as cosmetic to remove frackles and other blemishes from skin and also used as anthelmintic, particularly effective in expulsion of lumbrici. The ripe fruits are stomachic, carminative and diuretic. The ripe fruits find their application in haemoptysis, bleeding piles and psoriasis in ayurvedic and unani system of medicine. The milky juice clears the ulcers and fissures of tongue and is also applied in ringworm infections. The fruits are used in hepatitis (inflammation of the liver).^[1]

The enzyme myrosinase from the roots, trunk, leaves and seeds, but not the sap, converts the mustard oil glycoside benzyl glucosinolate into the aglycon benzyl isothiocyanate, which has an antimicrobial effect.^[2]

Experimental studies with animals and earlier clinical observations have confirmed the efficacy of treating nematode worms with the latex sap of the papaya. A preparation made from the enzymes of the latex sap is registered in Germany. The known mechanism, long-term clinical experience, and the fact that several papaya enzyme preparations are registered in the USA all support the treatment of dyspepsia and other disturbances of the digestive system. Both ethnopharmacological reports and the results of experimental studies support the other uses.^[2]

The traditional use of papaya to treat many diseases, especially skin conditions and its prohibition for consumption during pregnancy has led to investigations whether papaya extracts both from green and ripe fruits improve wound healing and also produce foetal toxicity. Aqueous extracts of green papaya epicarp (GPE) and ripe papaya epicarp (RPE) were applied on induced wounds on mice. GPE treatment induced complete healing in shorter periods (13 days) than that required while using RPE (17 days), sterile water (18 days) and Solcoseryl ointment (21 days). Extracts were administered orally (1mg/g body weight/day) to pregnant mice from day 10 and onwards after conception. 3 (n=7) mice and 1 (n=6) mice given RPE and misoprostol, an abortive drug, respectively experienced embryonic resorption while this effect was observed in none of the mice given GPE (n=5) and water (n=5). The average body weight of live pups delivered by mice given GPE (1.12 $\pm$ 0.04g) was significantly lower than those delivered by mice given water (1.38 $\pm$ 0.02g). In SDS-PAGE, proteins were distributed in three bands (Mr range approximately 8-29kDa). Band intensity at Mr approximately 28-29kDa

was higher in GPE than in RPE. In contrast, band intensity at low Mr (approximately 8kDa) was found to be higher in RPE than in GPE. Notably, the band corresponding to Mr approximately 23-25kDa was absent in RPE. These differences in composition may have contributed to the different wound healing and abortive effects of green and ripe papaya.^[3]

The tropical fruit *Carica papaya* and its seeds have proven antihelminthic and anti-amoebic activities. To determine the effectiveness of air-dried *C. papaya* seeds on human intestinal parasitosis, 60 asymptomatic Nigerian children with stool microscopic evidence of intestinal parasites received immediate doses (20 mL) of either an elixir composed with air-dried *C. papaya* seeds and honey (CPH) or honey alone (placebo) in two randomized treatment groups. Repeat stool microscopic examinations were conducted 7 days postintervention for intestinal parasites. Significantly more subjects given CPH elixir than those given honey had their stools cleared of parasites [23 of 30 (76.7%) vs. five of 30 (16.7%); $z = 4.40$, $P = .0000109$]. There were no harmful effects. The stool clearance rate for the various types of parasites encountered was between 71.4% and 100% following CPH elixir treatment compared with 0-15.4% with honey. Thus, air-dried *C. papaya* seeds are efficacious in treating human intestinal parasites and without significant side effects. Their consumption offers a cheap, natural, harmless, readily available monotherapy and preventive strategy against intestinal parasitosis, especially in tropical communities. Further and large-scale intervention studies to compare *C. papaya* with standard antiparasitic preparation are desirous.^[4]

The oral LD(50) of the juice of *C. papaya* was determined, and the antioxidant potentials determined by DPPH and FRAP tests. In vivo examination was performed after oral administration of dried papaya juice to rats for 2 weeks at doses of 100, 200 and 400 mg/kg. Blood TBARS and FRAP assays were used to determine the potential of the juice to act against oxidative stress. The acute toxicity test (LD(50)) demonstrated that papaya juice is not lethal up to a dose of 1500 mg/kg after oral administration and thus is considered nontoxic. In treated groups, no sign of toxicity was observed. In vitro evaluation of the antioxidant effects of papaya showed that the highest antioxidant activity (80%) was observed with a concentration of 17.6 mg/mL. Blood lipid peroxidation levels decreased significantly after administration of all doses of papaya juice (100, 200, 400 mg/kg/day) to 35.5%, 39.5% and 40.86% of the control, respectively, compared with a value of 28.8% for vitamin E. The blood total antioxidant power was increased significantly by all doses of papaya juice (100, 200, 400 mg/kg/day) to 11.11%, 23.58% and 23.14% of the control, respectively. The value for vitamin E was 18.44%. This preliminary study indicates the safety and antioxidative stress potential of the juice of *C. papaya*, which was found to be comparable to the standard antioxidant compound alpha-tocopherol.^[5]

Ethanol and aqueous extracts of *Carica papaya* has been evaluated for its anti hepatotoxic activity. The ethanol and aqueous extracts of *Carica papaya* showed remarkable hepatoprotective activity against CCl(4) induced hepatotoxicity. The activity was evaluated by using biochemical parameters such as serum aspartate amino transferase (AST), alanine amino transferase (ALT), alkaline phosphatase, total bilirubin and gamma glutamate transpeptidase (GGTP). The histopathological changes of liver sample were

compared with respect to control.^[6]

Therapeutic indication

Action: amebicide, antibiotic, antiphlogistic, bactericide, cardiac, decoagulant, digestive, diuretic, emmenagogue, fumitory, laxative, pediculicide, venereal, vermifuge.

Traditional uses: abortifacient, ache (head, tooth), arthritis, asthma, boil, cardiac, cholagogue, colic, constipation, corn, diarrhea, dysuria, elephantiasis, enteritis, fever, fumitory, gravel, hypertension, liver, psoriasis, rheumatism, ringworm, stomachic, tumor (uterus), ulcer, venereal, wart, wound.^[7,8]

Dose and method of administration

To treat worm infestations internally, Fortin et al. recommend 2-4 teaspoons (8-16 g) latex sap as a single dose for adults and for necrotic wounds, freshly crushed seeds should be laid upon the wounds. For indigestion problems, Valnet recommends 0.1-0.3 g thickened sap daily. All these recommendations are simply those of the individual authors and are not generally accepted.

One Vermizym tablet, which can be purchased in Germany, contains 205 mg papain. On the first day five tablets should be taken five times, followed in the evening by a laxative. If the worm infestation is strong, this treatment should be repeated for a second and third day. On the day of treatment, no foods containing protein should be eaten.^[2]

Special warnings

Carpaine can cause paralysis, numbing of the nerve centres and cardiac depression. Inhalation of papain can result in allergies.

Caraica papaya should not be used when allergies are known to result from the use of either the entire plant or certain plant parts. Allergic reactions, along with asthmatic attacks, have been observed following inhalation of papain powder. Just 1% of the cases of intradisc injections of chymopapain resulted in anaphylactic reactions. The sap must not be allowed to enter the eyes because, with its proteolytic properties, it may cause epitheliolytic damage.^[2]

[1] MEDICINAL PLANTS AND RAW DRUGS OF INDIA, Purshotam Kaushik, Anil Kumar Dhiman; Printed by Gajendra Singh Gahlot at Shiva Offset Press, for Bishen Singh Mahendra Pal Singh, Dehra Dun, and Typesetting at Doon Phototype Printers, 14, Old Connaught Place, Dehra Dun, India, 2000, ISBN-81-211-0174-3, pp. 292-293

[2] MEDICINAL PLANTS IN TROPICAL COUNTRIES, Traditional Use-Experience-Facts; Markus S. Müller M.D., Ernst Mechler Ph.D.; Georg Thieme Verlag, Stuttgart, Germany, 2005; ISBN 3-13-138341-0, ISBN 1-58890-253-6; pp. 48-54

[3] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18468758>, PubMed, Effect of green and ripe Carica papaya epicarp extracts on wound healing and during pregnancy, Anuar NS, Zahari SS, Taib IA, Rahman MT., Department of Biomedical Science, Faculty of Science, International Islamic University Malaysia, 13.06.2008

[4] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/17472487>, PubMed, Effectiveness of dried Carica papaya seeds against human intestinal parasitosis: a pilot study, Okeniyi JA, Ogunlesi TA, Oyelami OA, Adeyemi LA., Department of Paediatrics and Child Health, College of Health Sciences, Obafemi Awolowo University, Ile-Ife, Ilesa, Nigeria, 13.06.2008

[5] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/16691628>, PubMed, Antioxidant potentials of Iranian *Carica papaya* juice in vitro and in vivo are comparable to alpha-tocopherol, Mehdipour S, Yasa N, Dehghan G, Khorasani R, Mohammadirad A, Rahimi R, Abdollahi M., Laboratory of Toxicology, Faculty of Pharmacy, and Pharmaceutical Sciences Research Center, Tehran University of Medical Sciences, Tehran, Iran, 13.06.2008

[6] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/12499657>, PubMed, Effect of dried fruits of *Carica papaya* Linn on hepatotoxicity, Raj Kapoor B, Jayakar B, Kavimani S, Muruges N., Department of Pharmacology, Vinayaka Mission's College of Pharmacy, Salem, Tamil Nadu, India, 13.06.2008

[7] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 168

[8] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: http://commons.wikimedia.org/wiki/Image:Indian_papaya.jpg, Wikimedia Commons, Photo by Jagbot, 01.09.2008

2.9 Crassulaceae

Herbs, subshrubs, or shrubs. Stems mostly fleshy. Leaves alternate, opposite, or verticillate, usually simple; stipules absent; leaf blade entire or slightly incised, rarely lobed or imparipinnate. Inflorescences terminal or axillary, cymose, corymbiform, spiculate, racemose, paniculate, or sometimes reduced to a solitary flower. Flowers usually bisexual, sometimes unisexual in *Rhodiola* (when plants dioecious or rarely gynodioecious), actinomorphic, (3 or)4-6(-30)-merous. Sepals almost free or basally connate, persistent. Petals free or connate. Stamens as many as petals in 1 series or 2 × as many in 2 series. Nectar scales at or near base of carpels. Follicles sometimes fewer than sepals, free or basally connate, erect or spreading, membranous or leathery, 1- to many seeded. Seeds small; endosperm scanty or not developed.

About 35 genera and over 1500 species: Africa, America, Asia, Europe; 13 genera (two endemic, one introduced) and 233 species (129 endemic, one introduced) in China.

Some species of Crassulaceae are cultivated as ornamentals and/or used medicinally.^[1]

Plants in this family are cyanogenic, or not cyanogenic. Alkaloids present (often), or absent. Iridoids not detected. Proanthocyanidins present, or absent; when present, cyanidin, or delphinidin, or cyanidin and delphinidin. Flavonols present, or absent; when present, kaempferol, or kaempferol and quercetin, or kaempferol, quercetin, and myricetin. Ellagic acid absent (5 species, 3 genera). Saponins/sapogenins present, or absent. Aluminium accumulation not found.^[2]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=10225, Flora of China, 04.07.2008

[2] Weblink: <http://delta-intkey.com/angio/www/crassula.htm>, The Families of Flowering Plants by L. Watson and M. J. Dallwitz, 04.07.2008

Kalanchoe crenata Andrews (Buntiris)

Synonyms: *Kalanchoe integra* var. *verea* Cufod., *Kalanchoe schumacheri* Koord.



Kalanchoe crenata Andrews

Occurrence and appearance

A perennial succulent herb 0.3-2 m high. Stem erect or ascending, fleshy, terete, up to 2 cm in diameter at the base, usually simple, sometimes branched, glabrous or glabrescent towards the base, more or less pubescent-glandular above (hairs of the indumentum short, usually not longer than 0.5 mm, hyaline or pale tawny, spreading, thin, capitate-glandular) or also glabrous. Leaves decussate, horizontal to deflexed, petiolate, not very crowded below; lamina 4 3-25(30) x 1.5-12(20) cm, ovate or oblong-ovate to spatulate, usually with the breadth subequalling or less than half the length, the median passing gradually (in shape & size) into the bract-like upper ones, rounded at the top, irregularly doubly crenate to sometimes sublobed at the margin, sometimes edged with red, cuneate at the base and decurrent along the petiole, all glabrous or sometimes the upper ones sparsely pubescent-glandular, fleshy (but less thick than the majority of other species), flattish, concave, pale green changing to dark green or brownish on drying and then rather thin to membranous; petiole up to 4 cm long, flattened and grooved above, broadened and $\pm$ embracing the stem at the base but not or slightly connate with the opposite one. Flowers in many-flowered cymes, grouped in corymbs forming terminal, usually large (up to 40 cm or more long) panicles, sometimes only the terminal corymb present; branches of the panicle at $\pm 45^\circ$ with the axis, $\pm$ pubescent-glandular or glabrous, the lower ones up to 35 cm long, floriferous only in the terminal 1/4-1/3; pedicels 2-7(10) mm long, glabrous or $\pm$ glandular-pubescent; bracts

linear, very attenuate and acute to nearly filiform. Calyx 2.4-10 mm long; tube 0.1-1(1.5) mm long; sepals 1-1.5 mm broad at the base, lanceolate to linear-lanceolate, $\pm$ attenuate, very acute, rather scattered between them, green, sometimes lineolate with red, pubescent-glandular to glabrous, thin on drying. Corolla 11.5-22 mm long; corolla-tube papery and somewhat rigid in fruit, white below, coloured $\pm$ like the lobes upwards, glandular-pubescent or glabrous; corolla-lobes 4.5-7.5 x (2.5)3.5-5 mm, oblong-lanceolate to elliptic, acute or subacute and with a somewhat long apiculum (up to 1 mm long) at apex, sulphur-yellow to bright or deep yellow, or bright salmon to red, deep red, orange or brick. Anthers 0.5-0.7(1) mm long, all included or the upper ones $\pm$ exserted. Follicles 6-8.5 mm, fusiform, attenuate; styles 0.75-2(2.5) mm long. Scales 2.5-3.5 mm long, linear. Seeds c. 0.75 mm long, oblong, ribbed.^[1]

Parts used

Leaves

Pharmacologic properties

Kalanchoe crenata is a vegetable widely used in Cameroon and largely efficient in the treatment of diabetes mellitus. The effect of the water-ethanol extract of this plant (WEKC) on blood glucose levels was investigated in fasting normal and diet-induced diabetic rats (MACAPOS 1) after a short- and medium-term treatment. Diabetes was induced by submitting Wistar rats to a hypercaloric sucrose diet over 4 months. Six hours after a single oral administration of WEKC, 135 and 200 mg kg⁻¹ body weight extracts significantly ($P < 0.01$) reduced the blood glucose levels both in normal and diabetic rats without real dose-dependant effect. During the medium-term treatment, 200 mg kg⁻¹ WEKC administered daily for 4 weeks significantly reduced blood glucose levels within week 1 ($P < 0.05$), with a maximum effect at week 4 (-52%, $P < 0.01$), while maintaining glycaemia within the normal range. All the WEKC-treated diabetic rats exhibited significant ($P < 0.01$) increase in insulin sensitivity index (K_{ITT}) compared with the initial time and to the untreated diabetic animals. Animals treated for 4 weeks exhibited a slight resistance in body-weight gain and decrease in food and water intake. The WEKC activities on all parameters assessed were comparable with the glibenclamide effects. Qualitative phytochemical screening revealed that *K. crenata* contains terpenoids, tannins, polysaccharids, saponins, flavonoids and alkaloids. The data suggest that *K. crenata* might contain important chemical components that could induce significant improvement in glucose clearance and/or uptake and resistance to body-weight gain and insulin sensitivity, and could be a potent alternative or complementary therapeutic substance in the control of type 2 diabetes and other insulinresistant conditions.^[2]

The methylene chloride/methanol extract of *K. crenata* was extracted by using hexane, methylene chloride, ethyl acetate, and n-butanol. The antiinflammatory profile of these extracts was investigated on the basis of paw edema induced by carrageenan. The n-butanol fraction (most potent) was further assessed through acute inflammatory models induced by histamine, serotonin, and formalin. The chronic antiinflammatory and the ulcerogenic activities of the n-butanol fraction were also examined. The oral administration of n-butanol fraction (600 mg/kg) caused a maximum inhibition of about 45% in paw edema induced by carrageenan. The n-butanol fraction

also exhibited acute antiinflammatory activity on paw edema induced by histamine (47.51%), serotonin (54.71%), and formalin (40.00%) . In the chronic inflammation model, this extract showed maximum inhibition of 61.26% on the ninth day of treatment. The ulcerogenic assessment showed that ulcer indices after oral treatment with n-butanol fraction were zero and 0.4 ± 0.2 , for the 300 and 600 mg/kg doses, respectively. On the basis of these findings, it may be inferred that *K. crenata* is an antiinflammatory and antiarthritic agent that blocks histamine and serotonin pathways. The results are in agreement with the traditional use of the plant in inflammatory conditions.^[3]

Kalanchoe crenata Andr. (Crassulaceae) is a fleshy herbaceous plant used in the African traditional medicine as remedies against otitis, headache, inflammations, convulsions and general debility. The analgesic effects of methylene chloride/methanol (1:1) ($\text{CH}_2\text{Cl}_2/\text{CH}_3\text{OH}$) extract and its hexane, methylene chloride (CH_2Cl_2), ethyl acetate, n-butanol fractions and aqueous residue have been evaluated using acetic acid, formalin and pressure test. The anticonvulsant effects of the $\text{CH}_2\text{Cl}_2/\text{CH}_3\text{OH}$ extract were also investigated on seizures induced by pentylenetetrazol (PTZ 70 mg/kg), strychnine sulphate (STN 2.5 mg/kg) and thiosemicarbazide (TSC 50 mg/kg). $\text{CH}_2\text{Cl}_2/\text{CH}_3\text{OH}$ extract and its fractions, administered orally at the doses of 150 and 300 mg/kg, exhibited protective effect of at least 30% on the pain induced by acetic acid. The CH_2Cl_2 fraction at 300 mg/kg showed a maximal effect of 78.49%. The $\text{CH}_2\text{Cl}_2/\text{CH}_3\text{OH}$ extract and its CH_2Cl_2 fraction at the doses of 150 and 300 mg/kg significantly reduced the first phase of pain induced by formalin while the second phase was completely inhibited. The CH_2Cl_2 fraction produced more than 45% reduction in the sensitivity to pain induced by pressure. The $\text{CH}_2\text{Cl}_2/\text{CH}_3\text{OH}$ extract of *Kalanchoe crenata* significantly increased the latency period in seizures induced by PTZ and significantly reduced the duration of seizures induced by the three convulsant agents. The extract protected 20% of animals against death in seizures induced by TSC and STN. These results suggest a peripheral and central analgesic activities as well as an anticonvulsant effect of the leaves of *Kalanchoe crenata*.^[4]

Organic extracts from the leaves of *Kalanchoe crenata* have been shown to possess inhibitory effects against abdominal pain that can be induced by visceral spasm. The present work examined the spasmolytic effects of extracts from the leaves of *K. crenata* on the rat and guinea pig isolated ileum. Methanol/methylene chloride extract obtained from dry leaves of *K. crenata* was suspended in distilled water and successively extracted in hexane, methylene chloride, ethyl acetate and n-butanol. The spasmolytic effects of the resulting extracts were tested on the spontaneous contractions and contractions induced by KCl, carbachol and histamine. The effects of two possible antagonists, propranolol (3 μM) and prazosin (1 μM), on the relaxant effects of the n-butanol extract were investigated. The extracts reduced in concentration-dependant manner rat ileum spontaneous contraction and contraction induced by KCl, the n-butanol extract been the most active. The relaxant effect of the n-butanol extract was significantly antagonised by prazosin (40%). This extract at the concentration of 300 $\mu\text{g}/\text{ml}$ significantly inhibited response to carbachol by 66.8%. At the same concentration, the extract totally inhibited histamine induced contraction. Both inhibitions were non-competitive. When essayed on the phasic contraction induced by KCl, the extract at the concentration of 300 $\mu\text{g}/\text{ml}$ induced an inhibition of 75.56 %.

These data suggest that *K. crenata* extracts possess spasmolytic effects on the intestinal smooth muscle, which may account for their analgesic activities. The n-butanol extract may interfere with the calcium metabolism in the smooth muscle cells.^[5]

The aqueous and ethanol extracts of the dry leaves of *Kalanchoe crenata* (300 and 600 mg/kg) were evaluated for their analgesic properties on the pain induced by acetic acid, formalin and heat in mice and by pressure on rats. The ethanol extract of *K. crenata* at a dose of 600 mg/kg produced an inhibition of 61.13% on pain induced by acetic acid and 50.13% for that induced by formalin. An inhibition of 67.18% was observed on pain induced by heat 45 min after the administration of the extract. The aqueous extract administered at a dose of 600 mg/kg produced a maximum effect of 25% on pain induced by pressure. These activities were similar to those produced by a paracetamol-codeine association, while indomethacin exhibited a protective effect only against the writhing test. Our results suggest that the leaves of *K. crenata* could be a source of analgesic compounds.^[6]

Therapeutic indication

Action: insecticide, purgative.

Traditional uses: abscesses, tonic.^[7,8]

[1] Weblink: <http://www.aluka.org/action/showMetadata?doi=10.5555/AL.AP.FLORA.FZ5136&pgs=>, Aluka, 12.06.2008

[2] Weblink: <http://www.springerlink.com/content/t3v3425397x47789/>, Springer Link, Anti-hyperglycaemic potential of the water–ethanol extract of *Kalanchoe crenata* (Crassulaceae), René Kamgang, Rostand Youmbi Mboumi, Angèle Foyet Fondjo, Michel Archange Fokam Tagne, Gabriel Patrice Roland Mengue N'dillé and Jeanne Ngogang Yonkeu, 13.06.2008

[3] Weblink: <http://www.ijp-online.com/article.asp?issn=0253-7613;year=2006;volume=38;issue=2;spage=115;epage=119;aulast=Dimo>, Indian Journal of Pharmacology, Antiinflammatory activity of leaf extracts of *Kalanchoe crenata* Andr., Theophile Dimo, Agathe L Fotio, TB Nguelefack, EA Asongalem, P Kamtchouing, 13.06.2008

[4] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/16423479>, PubMed, Analgesic and anti-convulsant effects of extracts from the leaves of *Kalanchoe crenata* (Andrews) Haworth (Crassulaceae), Nguelefack TB, Nana P, Atsamo AD, Dimo T, Watcho P, Dongmo AB, Tapondjou LA, Njamen D, Wansi SL, Kamanyi A., Department of Animal Biology, University of Dschang, P.O. Box 67, Dschang, Cameroon, 13.06.2008

[5] Weblink: http://74.125.39.104/search?q=cache:LSkuCeKN_D4J:www.unisa.it/download/1966_145_931063878_3_Nguelefack.pdf+Kalanchoe+crenata+constituents&hl=de&ct=clnk&cd=13&gl=at, Pharmacologyonline, SPASMOLYTIC EFFECTS OF EXTRACTS FROM *KALANCHOE CRENATA* ANDREWS (CRASSULACEAE) LEAVES, Télesphore Benoît NGUELEFACK, Bruno SONTIA, Alain Bertrand DONGMO, Théophile DIMO, Albert KAMANYI, Wolfgang VIERLING, 13.06.2008

[6] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/15173998>, PubMed, Analgesic properties of the aqueous and ethanol extracts of the leaves of *Kalanchoe crenata* (Crassulaceae), Nguelefack TB, Fotio AL, Watcho P, Wansi SL, Dimo T, Kamanyi A., Department of Animal Biology, Faculty of Science, University of Dschang, BP 67 Dschang, Cameroon, 13.06.2008

[7] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 448

[8] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: http://www.metafro.be/prelude/prelude_pic/Kalanchoe_crenata1.jpg, Metafro-Infosys, 04.09.2008

2.10 Cucurbitaceae

Annual or perennial herbs or undershrubs, prostrate or climbing, mostly with simple or branched tendrils. Leaves exstipulate, petiolate, alternate, lamina entire or palmately, pedately or pinnately divided, rarely compound. Inflorescence paniculate, racemose, umbellate or subumbellate or flowers solitary. Flowers unisexual (plants then monoecious or dioecious), very rarely bisexual, actinomorphic, yellow or white. Sepals mostly 5, united into a rotate, campanulate, saucer-shaped or tubular calyx, adnate to and often produced beyond the ovary in female flowers, with 5, imbricate or open lobes. Petals mostly 5, free or united into a rotate or campanulate corolla, with 5, imbricate or induplicate-valvate, entire or rarely fimbriate lobes. Stamens basically 5, of which 4 mostly connate in pairs, thus giving false impression of only 3 stamens or sometimes 2 or 1 due to cohesions, anthers connate or free, all monothealous when all stamens free, 1 monothealous and other 2 dithealous when stamens 3, thecae straight, curved, flexuous or conduplicate, connective often produced; staminodes often present in female flowers. Carpels (2-) 3 (-5), syncarpous; ovary inferior to semi-inferior, mostly unilocular, rarely more loculed, ovules numerous, anatropous with parietal, fleshy placentas, mostly meeting in the middle; style simple, rarely (2-) 3, free, stigmas (2-) 3, bilobed, thick. Fruit an elongated or globose berry or pepo, rarely capsule, indehiscent or variously dehiscent, smooth or covered with tubercles or prickles. Seeds mostly flattened, occasionally winged, exalbuminous, embryo straight.

A family of about 120 genera and 825 species, mostly distributed in tropical countries, poorly represented in temperate regions. Represented in Pakistan by 17 genera and 32 specific and infraspecific taxa.^[1]

The plants in this family are cyanogenic (rarely), or not cyanogenic. Alkaloids present (commonly), or absent. Iridoids not detected. Proanthocyanidins absent. Flavonols present, or absent; kaempferol and quercetin, or quercetin. Ellagic acid absent (4 species, 4 genera). Saponins/sapogenins present. Aluminium accumulation not found. C₃ and CAM. C₃ physiology recorded directly in *Citrullus*, *Cucumis*, *Cucurbita*. CAM recorded directly in *Seyrigia*, *Xerosicyos*.^[2]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=10233, Flora of Pakistan, 04.07.2008

[2] Weblink: <http://delta-intkey.com/angio/www/cucurbit.htm>, The Families of Flowering Plants by L. Watson and M. J. Dallwitz, 04.07.2008

Coccinia grandis MJ Roemer (Gambas Ipapasan)

Synonyms: *Coccinia cordifolia* L., *Coccinia indica* Wight & Arn., Ivy Gourd



Coccinia grandis MJ Roemer

Occurrence and appearance

Perennial, climbing and widely spreading, sometimes prostrate, bright green.^[1] Growing up to 3m.^[2] Stem much branched, cylindrical, glabrous or white scaly. Petiole slender, striate, 2-5 cm long. Leaves 5-10 cm long, equally broad, cordate, usually entire to 5-angular with few glistening glands on both sides of the midrib towards the base. Probract small. Flowers large, white, c. 4 cm long, pedicellate, solitary, male and female on different plants. Fruit cylindrical or fusiform, 2.5-5 x 1.2-2.5 cm, bright scarlet when ripe, slightly beaked, many seeded. Seeds asymmetrically pyriform in outline, c. 6 x 4 mm, compressed.^[1]

Parts used

Roots, stem, leaves, fruits

Pharmacologic properties

The juice of the roots and leaves is considered to be a useful treatment for diabetes. The juice of the stem is dripped into the eyes to treat cataracts. The leaves are used as a poultice in treating skin eruptions. The plant is laxative. It is used internally in the treatment of gonorrhoea. Aqueous and ethanolic extracts of the plant have shown hypoglycaemic principles.^[2]

Ethanol extract of *Coccinia grandis* MJ Roemer showed significant triglyceride (TG) and cholesterol-lowering effects in dyslipidemic hamster model. Ethanolic extract was fractionated into chloroform, n-butanol and water-soluble fractions and were evaluated. Activity was proved to be concentrated in chloroform-soluble fraction. Chloroform-soluble fraction

containing active component was subjected to repeated column chromatography, furnished a polyprenol characterized as C(60)-polyprenol (1) isolated for the first time from this plant. It significantly decreased serum TG by 42%, total cholesterol (TC) 25% and glycerol (Gly) 12%, accompanied HDL-C/TC ratio 26% in high-fat diet (HFD)-fed dyslipidemic hamsters at the dose of 50mg/kg body weight. Results are comparable to standard drug fenofibrate at the dose of 108mg/kg. Based on these investigations, it was concluded that the compound polyprenol (1) isolated from leaves of *C. grandis* possess marked antidyslipidemic activity.^[3]

Therapeutic indication

Traditional uses: convulsion, diabetes, scrofula.^[4,5]

The roots are cooling and aphrodisiac and are useful in vomiting, burning sensation and uterine discharges. The leaves are bitter, sweet, astringent and cooling, and are useful in vitiated conditions of kapha and pitta. The fruits are cooling, sweet, astringent, depurative, antipyretic, galactagogue and expectorant, and are useful in burning sensation, leprosy, skin diseases, intermittent fever, agalactia, asthma, cough, bronchitis, consumption and jaundice.

The fruits and leaves of the bitter variety are bitter, acrid, thermogenic, emetic, purgative, vulnerary, anti-inflammatory, anthelmintic, digestive, liver tonic, alexeteric, depurative, febrifuge, sudorific and expectorant, and are useful in vitiated conditions of kapha and pitta, wounds, ulcers, inflammation, heminthiasis, dyspepsia, hepatopathy, jaundice, skin diseases, leprosy, fever, asthma, cough, diabetes, stomatitis and anaemia.^[6]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=200022610, Pub-Med, Flora of Pakistan, 12.06.2008

[2] Weblink: <http://www.pfaf.org/database/plants.php?Coccinia+grandis>, Plants for a Future, 12.06.2008

[3] Weblink: <http://lib.bioinfo.pl/pmid:17689941>, BioInfoBank, Antidyslipidemic activity of poly-prenol from *Coccinia grandis* in high-fat diet-fed hamster model, Geetu Singh, Prasoon Gupta, Preeti Rawat, Anju Puri, Gitika Bhatia, Rakesh Maurya, 12.06.2008

[4] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 216

[5] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, 04.04.2008

[6] Weblink: <http://books.google.at/books?id=vfnP2FC-qrsC&pg=PA133&dq=Coccinia+grandis&lr=&sig=ACfU3U2WBptFlgXkzNX97xin2HQfUurMtw#PPA133,M1>, Indian medicinal plants: A Compendium of 500, C Ramankutty, R, Vasudevan Nair, India, Arya Vaidya Sala, Kottakkal, V P K, Nambiar, P K Warriar, 1994, ISBN:8125002464, page 133, 12.06.2008

Figure: http://commons.wikimedia.org/wiki/Image:Coccinia_grandis_fruit.jpg, Wikimedia Commons, Photo by Tau'olunga, 04.09.2008

Lagenaria leucantha Rusby (Kukuk)

Synonyms: *Lagenaria siceraria* (Mol.), *Lagenaria vulgaris* Ser., bird-house gourd, bottle gourd



Lagenaria leucantha Rusby

Occurrence and appearance

It is a soft pubescent and climbing or trailing annual or perennial herb. The stems are 5-angled. The leaves are cordateorbicular, entire or 3-7-lobed, acute, soft pubescent and dentate. Male flowers show pedicels up to 50 cm long and white corolla and female flowers are short peduncled up to 15 cm long. The fruits are usually bottle or dumbbell shaped and glabrescent on maturity.

Flowering and fruiting is throughout the year but mostly during winter.^[1]

Parts used

The fruit, leaves, seeds, roots, flowers and tender shoots are used.^[1]

Constituents

The saponin and fatty acids are contained in the plant. The fruits are rich in calcium, iron, potassium, vitamin B complex and C and iodine.^[1]

Pharmacologic properties

The pulp of the fruit is emetic and purgative and is applied in the burning of the feet. The juice of the fruit is used in pimples.^[1] It is also given in cases of stomach acidity, indigestion and ulcers.^[2] The decoction of the leaves mixed with sugar is given in jaundice. The seeds are used in dropsy and a paste of the seeds in water is considered good brain tonic and nerve

stimulant. The seed-oil is used in rheumatism.

According to Agarwal, the roots are used in dropsy and headache. A paste of the roots in water is applied externally in headache. The flowers are used as antidote to food poisoning. Its tender shoots are considered diuretic and antibilious and are eaten as vegetable in constipation.^[1]

The stem bark and the rind of the fruit are diuretic. The fruit is antilithic, diuretic, emetic and refrigerant. The seed is vermifuge. A poultice of the boiled seeds has been used in the treatment of boils. Taken with *Achyranthes* spp. the seed is used to treat aching teeth, gums and boils. Extracts of the plant have shown antibiotic activity.^[3]

Therapeutic indication

Action: purgative. Traditional uses: baldness, colic, fever, pimple, typhoid.^[4,5]

Dose and method of administration

In many parts of China 3 grams per day of this species (the report does not say what part of the plant) has been used as a single treatment for diabetes mellitus.^[3]

Special warnings

The fruits and leaves of *L. siceraria*, in doses of 1 to 5 g per kg per day given to young ruminants, caused death after a period 1 day to 2 weeks. The seeds were less toxic.

The clinical, haematological and pathological changes indicated that *L. siceraria* reduced the ability of the liver to synthesize protein, although there was no evidence of interference with the excretion of bilirubin. Kidney dysfunction and haemoconcentration also occurred.^[6]

Particularities

Hypolipidemic and antihyperlipidemic effects of *Lagenaria siceraria* (Mol.) fruit extracts.

Bottle gourd [*Lagenaria siceraria* (Mol.) Stand.] fruit is ascribed with many therapeutic effects. The present study was undertaken to explore the antihyperlipidemic effect of four different extracts viz. petroleum ether, chloroform, alcoholic and aqueous extracts from bottle gourd in Triton-induced hyperlipidemic rats and their hypolipidemic effects in normocholesteremic rats. The study is comprised preliminary phytochemical screening of the extracts. Oral administration of the extracts, at doses of 200 and 400 mg/kg body weight in rats, dose-dependently inhibited the total cholesterol, triglycerides, low-density lipoproteins level, and significantly increased the high density lipoproteins level. However, petroleum ether extract did not show the significant effects. Both the chloroform and alcoholic extract exhibited more significant effects in lowering total cholesterol, triglycerides and low density lipoproteins along with increase in HDL as compared to the others. Preliminary phytochemical screening revealed the presence of flavonoids, sterols, cucurbitacin saponins, polyphenolics, proteins, and carbohydrates. The results obtained suggest marked antihyperlipidemic and hypolipidemic activity of the extracts.^[7]

[1] MEDICINAL PLANTS AND RAW DRUGS OF INDIA, Purshotam Kaushik, Anil Kumar

Dhiman; Printed by Gajendra Singh Gahlot at Shiva Offset Press, for Bishen Singh Mahendra Pal Singh, Dehra Dun, and Typesetting at Doon Phototype Printers, 14, Old Connaught Place, Dehra Dun, India, 2000, ISBN-81-211-0174-3, pp 279-280

[2] Weblink: <http://books.google.at>, Plants and People of Nepal, Narayan P. Manandhar, Sanjay Manandhar. ISBN 0881925276, page 114, 03.03.2008

[3] Weblink: <http://www.pfaf.org/database/plants.php?Lagenaria+siceraria>, Plants for a future, 03.03.2008

[4] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 454

[5] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, 04.04.2008

[6] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/6643755>, Pubmed, Toxicity of five Sudanese plants to young ruminants. Barri ME, Onsa TO, Elawad AA, Elsayed NY, Wasfi IA, Abdul-Bari EM, Adam SE. 03.03.2008

[7] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/17205712>, Pubmed, Institute of Pharmaceutical Education and Research, Borgaon (Meghe), Wardha 442 001, India, Ghule BV, Ghante MH, Saoji, AN, Yeole PG, 03.03.2008

Figure: http://hu.wikipedia.org/wiki/K%C3%A9p:Lagenaria_flower_fruit.jpg, Wikipedia, Photo by Grzegorz Polak, 04.09.2008

Momordica charantia L. (Paria / pare)

Wild Balsam Apple, Balsam Pear, Bitter Gourd, Bitter Melon



Momordica charantia L.

Occurrence and appearance

Annual, monoecious, climber or trailer with unbranched tendrils. Stem glabrous or hairy. Leaves suborbicular to orbicular, 5-10(-12) cm long and broad, mucronate-dentate, deeply 5-7-lobed, lobes ovate-oblong or ovate-elliptic, glabrous or pubescent, acute, base constricted. Petiole 1.5-3.5 (-6) cm long, villous. Flowers yellow, c. 3 cm across, solitary, male peduncles c. 7.0 cm long, bearing the bracts about the middle or below the middle. Calyx pubescent. Corolla slightly zygomorphic, with obovate, obtuse lobes. Ovary fusiform, muricate. Fruit oblong-fusiform or oval, 7-25 cm long, dehiscent. Seeds oblong, 1-1.5 cm long, 6-9 mm broad, embedded in red pulp, sculptured.^[1]

Parts used

Whole plant, fruits, seeds.

Constituents

Bitter melon contains an array of biologically active plant chemicals including triterpenes, proteins, and steroids. One chemical has clinically demonstrated the ability to inhibit the enzyme guanylate cyclase that is thought to be linked to the cause of psoriasis and also necessary for the growth of leukemia and cancer cells. In addition, a protein found in bitter melon, momordin, has clinically demonstrated anticancerous activity against Hodgkin's lymphoma in animals. Other proteins in the plant, alpha- and beta-momorcharin, and cucurbitacin B, have been tested for possible anticancerous effects. A chemical analog of these bitter melon proteins has been developed,

patented, and named "MAP-30"; its developers reported that it was able to inhibit prostate tumor growth. Two of these proteins-alpha- and beta-momorcharin-have also been reported to inhibit HIV virus in test tube studies. In one study, HIV-infected cells treated with alpha- and beta-momorcharin showed a nearly complete loss of viral antigen while healthy cells were largely unaffected. The inventor of MAP-30 filed another patent which stated it was "useful for treating tumors and HIV infections . . . " Another clinical study showed that MAP-30's antiviral activity was also relative to the herpes virus in vitro.

In numerous studies, at least three different groups of constituents found in all parts of bitter melon have clinically demonstrated hypoglycemic (blood sugar lowering) properties or other actions of potential benefit against diabetes mellitus. These chemicals that lower blood sugar include a mixture of steroidal saponins known as charantins, insulin-like peptides, and alkaloids. The hypoglycemic effect is more pronounced in the fruit of bitter melon where these chemicals are found in greater abundance.

Alkaloids, charantin, charine, cryptoxanthin, cucurbitins, cucurbitacins, cucurbitanes, cycloartenols, diosgenin, elaeostearic acids, erythrodiol, galacturonic acids, gentisic acid, goyaglycosides, goyasaponins, guanylate cyclase inhibitors, gypsogenin, hydroxytryptamines, karounidiols, lanosterol, lauric acid, linoleic acid, linolenic acid, momorcharasides, momorcharins, momordenol, momordicilin, momordicins, momordicinin, momordicosides, momordin, multiflorenol, myristic acid, nerolidol, oleanolic acid, oleic acid, oxalic acid, pentadecans, peptides, petroselinic acid, polypeptides, proteins, ribosome-inactivating proteins, rosmarinic acid, rubixanthin, spinasterol, steroidal glycosides, stigmasta-diols, stigmasterol, taraxerol, trehalose, trypsin inhibitors, uracil, vacine, v-insulin, verbascoside, vicine, zeatin, zeatin riboside, zeaxanthin, and zeinoxanthin are all found in bitter melon.^[2]

Pharmacologic properties

To date, close to 100 in vivo studies have demonstrated the blood sugar-lowering effect of this bitter fruit. The fruit has also shown the ability to enhance cells' uptake of glucose, to promote insulin release, and to potentiate the effect of insulin. In other in vivo studies, bitter melon fruit and/or seed has been shown to reduce total cholesterol. In one study, elevated cholesterol and triglyceride levels in diabetic rats were returned to normal after 10 weeks of treatment.

Several in vivo studies have demonstrated the antitumorous activity of the entire plant of bitter melon. In one study, a water extract blocked the growth of rat prostate carcinoma; another study reported that a hot water extract of the entire plant inhibited the development of mammary tumors in mice. Numerous in vitro studies have also demonstrated the anticancerous and antileukemic activity of bitter melon against numerous cell lines, including liver cancer, human leukemia, melanoma, and solid sarcomas.

Bitter melon, like several of its isolated plant chemicals, also has been documented with in vitro antiviral activity against numerous viruses, including Epstein-Barr, herpes, and HIV viruses. In an in vivo study, a leaf extract increased resistance to viral infections and had an immunostimulant effect in humans and animals, increasing interferon production and natural killer cell activity.

In addition to these properties, leaf extracts of bitter melon have demonstrated broad-spectrum antimicrobial activity. Various extracts of the leaves have demonstrated in vitro antibacterial activities against *E. coli*, *Staphylococcus*, *Pseudomonas*, *Salmonella*, *Streptobacillus*, and *Streptococcus*; an extract of the entire plant was shown to have antiprotozoal activity against *Entamoeba histolytica*. The fruit and fruit juice have demonstrated the same type of antibacterial properties and, in another study, a fruit extract demonstrated activity against the stomach ulcer-causing bacteria *Helicobacter pylori*.

Many in vivo clinical studies have demonstrated the relatively low toxicity of all parts of the bitter melon plant when ingested orally. However, toxicity and even death in laboratory animals has been reported when extracts are injected intravenously. Other studies have shown extracts of the fruit and leaf (ingested orally) to be safe during pregnancy. The seeds, however, have demonstrated the ability to induce abortions in rats and mice, and the root has been documented as a uterine stimulant in animals. The fruit and leaf of bitter melon have demonstrated an in vivo antifertility effect in female animals; and in male animals, to affect the production of sperm negatively.^[2]

In a study the immunoadjuvant activity of the crude *Momordica charantia* lectin (crMCL) extracted from seed using beta-galactosidase (beta-gal) as the model antigen was investigated. BALB/c mice were injected intramuscularly with beta-gal alone or beta-gal + crMCL for up to four immunizations at two-week intervals. After administration of 2 doses, the IgG-specific titer to beta-gal was significantly higher in mice in the beta-gal + crMCL group than in that from the animals from the beta-gal alone group, while it was about the same in both groups after 1 dose. The data suggest that crMCL may help raise antibodies under the prime and boost administration regimen and could be a potent vaccine adjuvant.^[3]

Glycoconjugates in the kidney play an important role in the maintenance of glomerular filtration barrier. Thickening of the glomerular basement membrane (GBM) is well characterized in diabetic nephropathy. Changes in GBM mainly include reduction and undersulfation of heparan sulfate, and laminin with accumulation of type IV collagen leading to kidney dysfunction and there is a need to identify therapies that arrest disease progression to end-stage renal failure. In the present investigation, effect of bitter melon on streptozotocin-induced diabetic rats with particular emphasis on kidney heparan sulfate (HS) was studied. Earlier, study showed partial reversal of all the diabetes-induced effects by bitter melon. Increase in the components of glycoconjugates during diabetes was significantly decreased by bitter melon feeding. Diabetes associated elevation in the activities of enzymes involved in the synthesis and degradation of glycosaminoglycans (GAGs) were significantly lowered by bitter melon supplementation. GAGs composition revealed decrease in amino sugar, and uronic acid contents during diabetes and bitter melon feeding was effective in countering this reduction. Decrease in sulfate content in the GAGs during diabetes was ameliorated by bitter melon feeding. HS decreased by 43% in diabetic rats while bitter melon feeding to diabetic rats showed 28% reduction. These results clearly indicate beneficial role of bitter melon in controlling glycoconjugate and heparan sulfate related kidney complications during diabetes thus prolonging late complications of diabetes.^[4]

Therapeutic indication

In the Amazon, local people and indigenous tribes grow bitter melon in their gardens for food and medicine. They add the fruit and/or leaves to beans and soup for a bitter or sour flavor; parboiling it first with a dash of salt may remove some of the bitter taste. Medicinally, the plant has a long history of use by the indigenous peoples of the Amazon. A leaf tea is used for diabetes, to expel intestinal gas, to promote menstruation, and as an antiviral for measles, hepatitis, and feverish conditions. It is used topically for sores, wounds, and infections and internally and externally for worms and parasites.

In Brazilian herbal medicine, bitter melon is used for tumors, wounds, rheumatism, malaria, vaginal discharge, inflammation, menstrual problems, diabetes, colic, fevers, worms. It is also used to induce abortions and as an aphrodisiac. It is prepared into a topical remedy for the skin to treat vaginitis, hemorrhoids, scabies, itchy rashes, eczema, leprosy and other skin problems. In Mexico, the entire plant is used for diabetes and dysentery; the root is a reputed aphrodisiac. In Peruvian herbal medicine, the leaf or aerial parts of the plant are used to treat measles, malaria, and all types of inflammation. In Nicaragua, the leaf is commonly used for stomach pain, diabetes, fevers, colds, coughs, headaches, malaria, skin complaints, menstrual disorders, aches and pains, hypertension, infections, and as an aid in childbirth.^[2]

Action: abortifacient, aperitif, aphrodisiac, canicide, digestive, emmenagogue, fatal poison, laxative, refrigerant, vermifuge.

Traditional uses: abdomen, asthma, burns, cancer, colic, common cold, depurative, dermatosis, diabetes, diarrhea, dysentery, dyspepsia, eczema, fever, gonorrhea, head ache, hyperglycemia, hypertension, insecticide, jaundice, leprosy, malaria, malignancy, melancholy, parturition, renitis, rheumatism, roundworms, snake bite, sore, sprue, stomach ache, swelling, tumor, urethritis, yaws.^[5, 6]

Special warnings

Bitter melon traditionally has been used as an abortive and has been documented with weak uterine stimulant activity; therefore, it is contraindicated during pregnancy.

This plant has been documented to reduce fertility in both males and females and should therefore not be used by those undergoing fertility treatment or seeking pregnancy.

The active chemicals in bitter melon can be transferred through breast milk; therefore, it is contraindicated in women who are breast feeding.

All parts of bitter melon (especially the fruit and seed) have demonstrated in numerous in vivo studies that they lower blood sugar levels. As such, it is contraindicated in persons with hypoglycemia. Diabetics should check with their physicians before using this plant and use with caution while monitoring their blood sugar levels regularly as the dosage of insulin medications may need adjusting.

Although all parts of the plant have demonstrated active antibacterial activity, none have shown activity against fungi or yeast. Long-term use of this plant may result in the die-off of friendly bacteria with resulting opportunistic

overgrowth of yeast (*Candida*). Cycling off the use of the plant (every 21-30 days for one week) may be warranted, and adding probiotics to the diet may be beneficial if this plant is used for longer than 30 days.

Drug Interactions: Bitter melon may potentiate insulin and anti-diabetic drugs and cholesterol-lowering drugs.^[2]

Particularities

Extracts of *Momordica charantia* suppress postprandial hyperglycemia in rats.

Momordica charantia (bitter melon) is commonly known as vegetable insulin, but the mechanisms underlying its hypoglycemic effect remain unclear. To address this issue, the effects of bitter melon extracts on postprandial glycemic responses have been investigated in rats. An aqueous extract (AE), methanol fraction (MF) and methanol insoluble fraction (MIF) were prepared from bitter melon. An oral sucrose tolerance test revealed that administration of AE, MF or MIF each significantly suppressed plasma glucose levels at 30 min as compared with the control. In addition, the plasma insulin level at 30 min was also significantly lower after MF administration than in the control in the oral sucrose tolerance test. By contrast, these effects of bitter melon extracts were not observed in the oral glucose tolerance test. In terms of mechanism, bitter melon extracts dose-dependently inhibited the sucrase activity of intestinal mucosa with IC(50) values of 8.3, 3.7 and 12.0 mg/mL for AE, MF and MIF, respectively. The fraction with a molecular weight of less than 1,300 (LT 1,300) obtained from MF inhibited the sucrase activity most strongly in an uncompetitive manner with an IC(50) value of 2.6 mg/mL. Taken together, these results demonstrated that bitter melon suppressed postprandial hyperglycemia by inhibition of alpha-glucosidase activity and that the most beneficial component is present in the LT 1,300 fraction obtained from MF.^[7]

Bitter gourd (*Momordica charantia*) improves insulin sensitivity by increasing skeletal muscle insulin-stimulated IRS-1 tyrosine phosphorylation in high-fat-fed rats.

The aim of this present study was to investigate the effect of bitter gourd extract on insulin sensitivity and proximal insulin signalling pathways in high-fat-fed rats. High-fat feeding of male Wistar rats for 10 weeks decreased the glucose tolerance and insulin sensitivity compared to chow-fed control rats. Bitter gourd extract supplementation for 2 weeks (9th and 10th) of high-fat feeding improved the glucose tolerance and insulin sensitivity. In addition bitter gourd extract reduced the fasting insulin (43 (se 4.4) v. 23 (se 5.2) microU/ml, $P < 0.05$), TAG (134 (se 12) v. 96 (se 5.5) mg/dl, $P < 0.05$), cholesterol (97 (se 6.3) v. 72 (se 5.2) mg/dl, $P < 0.05$) and epididymal fat (4.8 (se 0.29) v. 3.6 (se 0.24) g, $P < 0.05$), which were increased by high-fat diet (HFD). High-fat feeding and bitter gourd supplementation did not have any effect on skeletal muscle insulin receptor, insulin receptor substrate-1 (IRS-1) and insulin-stimulated insulin receptor tyrosine phosphorylation compared to chow-fed control rats. However high-fat feeding for 10 weeks reduced the insulin-stimulated IRS-1 tyrosine phosphorylation compared to control rats. Bitter gourd supplementation together with HFD for 2 weeks improved the insulin-stimulated IRS-1 tyrosine phosphorylation compared to rats fed with

HFD alone. The results show that bitter melon extract improves insulin sensitivity, glucose tolerance and insulin signalling in HFD-induced insulin resistance. Identification of potential mechanism(s) by which bitter melon improves insulin sensitivity and insulin signalling in high-fat-fed rats may open new therapeutic targets for the treatment of obesity/dyslipidemia-induced insulin resistance.^[8]

Bitter melon (*Momordica charantia* L.) inhibits adipocyte hypertrophy and down regulates lipogenic gene expression in adipose tissue of diet-induced obese rats.

Bitter melon (*Momordica charantia*; BM) has been shown to ameliorate diet-induced obesity and insulin resistance. To examine the effect of BM supplementation on cell size and lipid metabolism in adipose tissues, three groups of rats were respectively fed a high-fat diet supplemented without (HF group) or with 5 % lyophilised BM powder (HFB group), or with 0.01 % thiazolidinedione (TZD) (HFT group). A group of rats fed a low-fat diet was also included as a normal control. Hyperinsulinaemia and glucose intolerance were observed in the HF group but not in HFT and HFB groups. Although the number of large adipocytes (>180 microm) of both the HFB and HFT groups was significantly lower than that of the HF group, the adipose tissue mass, TAG content and glycerol-3-phosphate dehydrogenase activity of the HFB group were significantly lower than those of the HFT group, implying that BM might reduce lipogenesis in adipose tissue. Experiment 2 was then conducted to examine the expression of lipogenic genes in adipose tissues of rats fed low-fat, HF or HFB diets. The HFB group showed significantly lower mRNA levels of fatty acid synthase, acetyl-CoA carboxylase-1, lipoprotein lipase and adipocyte fatty acid-binding protein than the HF group ($P < 0.05$). These results indicate BM can reduce insulin resistance as effective as the anti-diabetic drug TZD. Furthermore, BM can suppress the visceral fat accumulation and inhibit adipocyte hypertrophy, which may be associated with markedly down regulated expressions of lipogenic genes in the adipose.^[9]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=200022698, Flora of Pakistan, 07.05.2008

[2] Weblink: <http://www.rain-tree.com/bitmelon.htm>, Raintree Nutrition, Tropical Plant Database, 07.05.2008

[3] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18525182>, PubMed, Immunoadjuvant activity of crude lectin extracted from *Momordica charantia* seed, Huang L, Ikejiri A, Shimizu Y, Adachi T, Goto Y, Toyama J, Tanaka H, Akashi R, Uchida K, Miyata H, Haga T., Department of Veterinary Microbiology, University of Miyazaki, Miyazaki, Japan, 07.05.2008

[4] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18024034>, PubMed, Modulatory effect of bitter melon (*Momordica charantia* LINN.) on alterations in kidney heparan sulfate in streptozotocin-induced diabetic rats, Kumar GS, Shetty AK, Salimath PV., Department of Biotechnology, Daegu University, Republic of Korea, 07.05.2008

[5] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 539

[6] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

[7] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18202535>, PubMed, Uebanso T, Arai H, Taketani Y, Fukaya M, Yamamoto H, Mizuno A, Uryu K, Hada T, Takeda E., Department of Clinical Nutrition, University of Tokushima Graduate School, Tokushima, Japan, 07.05.2008

[8] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/17942003>, PubMed, Sridhar MG, Vinayagamoorathi R, Arul Suyambunathan V, Bobby Z, Selvaraj N., Department of Biochemistry, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Pondicherry-605 006, India, 07.05.2008

[9] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/17651527>, PubMed, Huang HL, Hong YW, Wong YH, Chen YN, Chyuan JH, Huang CJ, Chao PM., Department of Health and Nutrition, Chia Nan University of Pharmacy and Science, Tainan, Taiwan, 07.05.2008

Figure: http://www.metafro.be/prelude/prelude_pic/Momordica_charantia5.jpg, Metofra-Infosys, Photo by G.D. Carr, 04.09.2008

Sechium edule (Jacq.) Sw. (Labu siem)

Chayote



Sechium edule (Jacq.) Sw.

Occurrence and appearance

S. edule is a perennial, monoecious climber, with thickened roots and slender, branching stems up to 10 m long. Its leaves are on sulcate petioles of 8 to 15 cm in length, they are ovate-cordate to suborbicular, measure 8 to 18 x 9 to 22 cm, are slightly lobate (with three to five angular lobes) and have minutely denticulate margins and three to five divided tendrils. The flowers are unisexual, normally pentamerous, coaxillary and with ten nectaries in the form of a pore at the base of the calyx. The staminate flowers grow in axillary racemose inflorescences that are 10 to 30 cm long, and the groups of flowers are distributed at intervals along the rachis. The calyx is peltiform and 5 mm wide, the sepals triangular and 3 to 6 mm long, the petals triangular, greenish to greenish-white and measure 4 to 8 x 2 to 3 mm. There are five stamens, and the filaments are fused almost along their total length, forming a thickened column which separates at the apex into three or five short branches. The pistillate flowers are normally on the same axilla as the staminate flowers; they are usually solitary but are occasionally in pairs; the ovary is globose, ovoid or piriform, glabrous, inerm and unilocular; the perianth is as in the staminate flowers but has slightly different dimensions; the styles are fused in a slender column and the nectaries are generally less evident than in the staminate flowers. The fruit is solitary or rarely occurs in pairs; it is viviparous, fleshy and sometimes longitudinally sulcate or crestate; it is of very different shapes and sizes, indumentum, number and type of spines; it is white and yellowish, or pale green to dark green with a pale green to whitish flesh that is bitter in the wild plants and not bitter in the cultivated ones. The seed is ovoid and compressed with a soft and smooth testa.^[1]

Parts used

Fruits, seeds, young stems, roots, leaves.

Constituents

The edible parts of *S. edule* have a lower fibre, protein and vitamin content than other plants. However, the calorie and carbohydrate content is high, chiefly in the case of the young stems, root and seed, while the micronutrients and macronutrients supplied by the fruit are adequate. The fruit and particularly the seeds are rich in amino acids such as aspartic acid, glutamic acid, alanine, arginine, cysteine, phenylalanine, glycine, histidine, isoleucine, leucine, methionine (only in fruit), proline, serine, tyrosine, threonine and valine.^[1]

Pharmacologic properties

Infusions of the leaves are used to dissolve kidney stones and to assist in the treatment of arteriosclerosis and hypertension; infusions of the fruit are used to alleviate urine retention. The cardiovascular properties of the infusions of leaves have been tested in modern studies, while their great effectiveness in curing kidney diseases has been known since colonial times on the Yucatán peninsula, where these ailments are very common.^[1]

The antioxidant activities (AA) of *Sechium edule* extracts were tested by three established in vitro methods, namely reducing power, β -carotene linoleate model and 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical-scavenging. Leaf ethanolic extracts and leaf and seed water extracts showed strong inhibitory activity by β -carotene bleaching (AA values of 90%). Furthermore, these extracts exerted hydrogen-donating ability in the presence of DDPH stable radical (IC₅₀ 2 μ g/ml). These extracts also showed strong reducing power by the potassium ferricyanide reduction method. Leaf and seed extracts may be exploited as biopreservatives in food applications as well as for health supplements or functional food, to alleviate oxidative stress.^[2]

The antimicrobial properties of *Sechium edule* (Jacq.) Swartz alcoholic extracts obtained according to the Farmacopea Argentina (6th edn) were tested against bacteria of clinical relevance as nosocomial pathogens. To evaluate antibacterial activity, the disc diffusion assay was carried out with several gram-positive bacteria (*Enterococcus faecalis*, *Staphylococcus aureus*, coagulase-negative staphylococci, *Streptococcus pyogenes*, *Streptococcus agalactiae*, *Staphylococcus aureus* ATCC 29213, *Enterococcus faecalis* ATCC 29212). This assay was suitable for the screening of a large number of extracts at one time. All ethanolic extracts showed activity against gram-positive bacteria. Minimal inhibitory concentration (MIC) values were determined with a microdilution assay. The highest activity was obtained with the 80% aqueous-ethanolic leaf extract (MIC values of 4.16-8.32 μ g/ml against staphylococci and enterococci) and with the 96% ethanolic seed extract (MIC values of 8.32-16.64 μ g/ml and >8.32 μ g/ml against staphylococci and enterococci, respectively). The results indicate that both fluid extract and tincture have very good antimicrobial efficacy against all strains of multiresistant staphylococci and enterococci. In this study the minimal bactericidal concentration (MBC) values were identical to the MIC values or twofold higher than the corresponding MIC. This may indicate a bactericidal effect. Stored extracts have similar anti-staphylococcal and anti-enterococcal

activity to recently obtained extracts. The results obtained might be considered sufficient to warrant further studies aimed at isolation and identification of the active principle.^[3]

The pulp and the peel were examined for hypotensive activity. Water-soluble extracts were prepared from these components of the fruit and injected into anaesthetised rats. Various cardiovascular parameters were measured including heart rate, mean arterial pressure (MAP) and several ECG intervals. All extracts tested produced a fall in blood pressure with little change in ECG intervals. Extract B produced the least change in heart rate with a fall in MAP of approximately 23 mmHg. Changes in heart rate with all extracts appeared to be minimal as an ED₂₅ value could only be determined for extract A, and ED₁₀ values could not be evaluated for extracts C and D. The mechanisms by which these extracts produce their hypotensive effects could not be determined in these preliminary experiments. However, it appears not to involve direct effects on cardiac tissue. This conclusion is based on the finding that it took a minimum of 10 to 15 seconds for the hypotensive action to manifest post bolus. Future experiments will be aimed at delineating the mechanism(s) involved in decreasing MAP.^[4]

Therapeutic indication

Traditional uses: arteriosclerosis, bronchitis, catarrh, diuretic, freckle, hypertension, leucoderma, pertussis.^[5]

Special warnings

A case of severe hypokalemia in pregnancy is presented. Chayote, a subtropical vegetable with potent diuretic action, is implicated, as the potassium level returned to normal, without recurrence of hypokalemia, once the ingestion was stopped.^[6]

[1] Weblink: <http://www.hort.purdue.edu/newcrop/1492/chayote.html>, Department of Horticulture & Landscape Architecture, Purdue University, 07.05.2008

[2] Weblink: http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6T6R-4GNCJ35-4&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=f7004a7611a0d1727eedf5ac19f6ee92, ScienceDirect, Antioxidant activities of *Sechium edule* (Jacq.) Swartz extracts, A.A.L. Ordoñez, J.D. Gomez, M.A. Vattuone and M.I. Islab, aCátedra de Farmacotecnia II, Instituto de Farmacia "Dr. Adolfo Rovelli", Facultad de Bioquímica, Química y Farmacia, Universidad Nacional de Tucumán, Argentina, 07.05.2008

[3] Weblink: <http://www.informaworld.com/smpp/35861765-14411777/content~content=a713789553~db=bisc>, informaworld, Antimicrobial Activity of Nine Extracts of *Sechium edule* (Jacq.) Swartz, A. A. L. Ordontildeez; J. D. Gomez; N. M. Cudmani; M. A. Vattuone; M. I. Isla, Microbial Ecology in Health and Disease, Volume 15, Issue 1 January 2003 , pages 33–39, 07.05.2008

[4] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/10786447>, PubMed, The antihypertensive effects of the Jamaican Cho-Cho (*Sechium edule*), Gordon EA, Guppy LJ, Nelson M., Department of Basic Medical Sciences, Faculty of Medical Sciences, University of the West Indies, Mona, Kingston, Jamaica., 07.05.2008

[5] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

[6] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/3777045>, PubMed, Chayote (*Sechium edule*) causing hypokalemia in pregnancy., Jensen LP, Lai AR., 07.05.2008

Figure: http://commons.wikimedia.org/wiki/Image:Sechium_edule_flower_and_fruit_2.JPG, Wikimedia Commons, Photo by B. navez, 04.09.2008

2.11 Equisetaceae

Reed-like herbs along margins or river or swamps, with creeping underground stems, aerial stems erect, sometimes with branching at the nodes, sometimes with a whorl of smaller branches, longitudinally grooved, articulate, with a sheath at each node, the internodes green and rough to the touch, hollow, leaves reduced to a single whole of minute, +/- deciduous teeth on the rim of the sheath at each node.^[1]

Sporangia borne on peltate sporophylls aggregated in cones 0.3--10 cm. Spores green (except white in hybrids), all 1 kind. Gametophytes green, terrestrial, unisexual; male gametophytes smaller than female.

Genus 1, species 15 (11 species in the flora): nearly worldwide.^[2]

[1] Weblink: <http://www.anbg.gov.au/fern/aquatic/equisetaceae.html>, Australian National Botanic Gardens, 03.03.2008

[2] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=10315, Flora of North America, 04.07.2008

Equisetum arvense L. (Tikal balung)

Horsetail



Equisetum arvense L.

Occurrence and appearance

Aerial stems dimorphic; vegetative stems green, branched, 2-60(-100) cm; hollow center 1/3-2/3 stem diam. Sheaths squarish in face view, 2-5(-10) × 2-5(-9) mm; teeth dark, 4-14, narrow, 1-3.5 mm, often cohering in pairs. Branches in regular whorls, ascending, solid; ridges 3-4; valleys channeled; 1st internode of each branch longer than subtending stem sheath; sheath teeth attenuate. Fertile stems brown, lacking stomates, unbranched, shorter than vegetative stems, with larger sheaths, fleshy, ephemeral.^[1]

Parts used

Whole plant

Constituents

Acids: ascorbic, ferulic, silicilic, malic, caffeic, gallic, pectic, tannic (plant)

campesterol, equisetin, equisetinonin (plant)

Alkaloids: nicotine, palustrine (plant)

Amino acids: niacin (plant)

Fiber (plant)

Minerals: magnesium, silicon, silica selenium, calcium, iron, manganese, phosphorus, potassium, aluminum, zinc, chrome, cobalt (plant)^[2]

Pharmacologic properties

Internal use

Metabolism: The horsetail constitutes one of the most diuretic species in all the plants. That is to say that it possesses a great capacity to eliminate water from the body, in such a point to increase urination up to 30% more than what is habitual. This fact makes that its scientific name *Equisetum arvense* generally appears in the composition of most of products that habitually are sold to reduce weight. This property is due to the action of several components, among which it is necessary to highlight equisetonin and potassium, but there are another ones that also take part such as calcium, magnesium, ascorbic acid and caffeic acid.

Altogether this is the reason why this plant has traditionally been used in illnesses related with the problems of retention of liquids. In this Sense you can consider the horsetail like one of the best purifiers that you can use for the treatment of the following illnesses or metabolic problems:

- In the obesity or dropsy
- In the excess of uric acid
- In rheumatic illnesses, as the arthritis or gout
- In illnesses of the urinary apparatus, especially when little urine production takes place, what is known medically as oliguria, with the probability of developing of gallstones or kidney stones (calculous), illnesses of the urinary bladder (cystitis), prostate problems (prostatitis), etc.

Decoction during 30 minutes of 100 gr. of the dry plant for a liter of water. Take a couple of cups a day. 2 spoonfuls of fresh juice diluted in water every day or 3 gr. of extract fluid every day. It is sold in pharmacies and herbalists.

Hemorrhages: Horsetail is a good remedy to stop hemorrhages since the pectic and gallic they constitute good homeostatic that stop the lost of blood. Therefore its use will be suitable in situations where blood leakage is more abundant than the usual: excess of blood in menstruation uterine hemorrhage, blood from the nose, bloody sputa, blood in the urine, etc. (Take three cups a day of the previous preparation or 6 gr. of extract fluid)

A remedy for bones: Because of it content in silica, this plant is recommended when it is necessary for the body to repair bony tissues that are in not well condition, as a result of some traumatism or because of the own corporal decalcification. Silica helps to fix calcium, so that the body can store more quantity of this mineral and it is able to form stronger bones or tendons . It will be very interesting to use this plant when some fracture or distention has taken place in some bone or ligament. Equally, it will be advisable in those cases when an abnormal calcium intake or a bad fixation of it takes places, just as it happens in osteoporosis.

Hair care: For its content in silica is also appropriate to maintain the hair health helping in the prevention of baldness or in the appearance of dandruff. (Infusion of a spoonful of dry plant for cup of water. Take a cup a day)

Fingernails care: Equally this element strengthens the fragile or brittle fingernails and prevents them to break up so easily. (Infusion of a spoonful of

dry plant for cup of a water. Take a cup a day)^[2]

External use

Skin: Used externally it possesses astringent properties, useful in the treatment of illnesses of the skin, as eczemas, or in wounds difficult to cure. (Clean affected area with the infusion of a spoonful of dry leaves for a cup of water) In the case of buccal ulcers, carry out mouthwashes with the previous preparation. This same property can be used to treat inflamed or aching eyes, sties, or to combat the irritation or the itching that ocular affections generate, as in conjunctivitis. (Apply with a gauze the liquid of the infusion)

Female genital apparatus: These healing properties in external use can be an advantage to alleviate the inflammations or infections of the vulva and of the vagina (vulvitis, vulvovaginitis, vaginitis). Carry out a vulva or vagina washing with the decoction of 60 gr. of dry plant for a liter of water.

Hemorrhoids: The same previous preparation can be used to treat hemorrhoids externally, especially those that bleed. (Washings with the decoction of 60 gr. of dry plant for liter of a water)

Blood from the nose: Apart from using it internally, just as it has seen before, it is convenient to reinforce the capillars of the nose externally to impede their break. To make it possible we will introduce it in the bleeding nasal hole a piece of wet cotton with some juice of the tender plant.^[2]

Composition and antimicrobial activity of *Equisetum arvense* L. essential oil.

The volatile constituents of the sterile stems of *Equisetum arvense* L. (Equisetaceae) were investigated for the first time using GC, GC/MS and ¹³C-NMR. Twenty-five compounds were identified. Hexahydrofarnesyl acetone (18.34%), cis-geranyl acetone (13.74%), thymol (12.09%) and trans-phytol (10.06%) were the major constituents. A disk diffusion method was used for the evaluation of the antimicrobial activity of this oil against a panel of microorganisms (bacteria: *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Salmonella enteritidis*; fungi: *Aspergillus niger* and *Candida albicans*). The 1:10 dilution of the essential oil of *Equisetum arvense* L. was shown to possess a broad spectrum of a very strong antimicrobial activity against all tested strains.^[3]

Sedative and anticonvulsant effects of hydroalcoholic extract of *Equisetum arvense*.

The hydroalcoholic extract of *Equisetum arvense* (HAE) tested at the doses of 200 and 400 mg/kg showed a significant activity on the open-field, enhanced the number of falls in the rota-rod reducing the time of permanence in the bar and increased the sleeping time (46% and 74%) in the barbiturate-induced sleeping time. In the pentylenetetrazole-seizure, it increased the first convulsion latency, diminished the severity of convulsions, reduced the percentage of animals which developed convulsion (50% and 25%) and protected animals from death. On the contrary, in the elevated plus maze, the doses 50, 100 and 150 mg/kg did not affect the evaluated parameters. Thus, HAE presented anticonvulsant and sedative effects. Phytochemical analysis detected the presence of tannins, sterols and flavonoids.^[4]

Therapeutic indication

Action: antirheumatic, antiseptic, astringent, carminative, diuretic, hemostat, laxative. Traditional uses: aging, albuminuria, anodyne, bladder, calculus, cancer, children's ailments, consumption, diabetes, diarrhea, dropsy, dyspepsia, gout, gravel, hematuria, hemoptysis, kidney ailments, leg cramps, liver ailments, orthopedic ailments, skin problems, sore, tuberculosis, tumor, urinary ailments, urinary tract ailments, wounds, albuminuria.^[6,7]

Dose and method of administration

Adults (18 years and older):

Most reported doses for horsetail are based on historical use or expert opinion. There is a lack of reliable studies available in humans that show horsetail to be effective or safe at any specific dose. Different doses of horsetail have been used, starting at 300-milligram capsules taken three times per day, up to 6 grams per day. A maximum of 6 cups of tea, containing 1.5 grams of dried stem in one cup of hot water, is a dose that has been used. A common dose for a tincture (1:1 in 25% alcohol) is 1 to 4 milliliters three times daily. To treat osteoporosis, a supplement containing 270 milligrams of Osteosil® calcium (a combination of horsetail and calcium) has been taken twice daily for one year. A wash prepared by mixing 10 teaspoons of horsetail in cold water and soaking for 10 to 12 hours has been applied on the skin.

Children (younger than 18 years):

There is not enough scientific information to recommend the use of horsetail in children. Poisonings have been reported in children using horsetail stems as whistles.^[5]

Special warnings

Allergies

People with allergies to *Equisetum arvense*, related substances, or to nicotine should avoid horsetail. Rash has been reported in a patient taking horsetail who was known to be sensitive to nicotine.

Side Effects and Warnings

There are few scientific studies or reports of side effects with horsetail. It is more often used in Germany and Canada, where it is traditionally considered to be safe when taken in appropriate doses. *Equisetum palustre* (marsh horsetail) contains a poisonous ingredient and should be avoided. There are reports that some batches of *Equisetum arvense* (horsetail) have been contaminated with *Equisetum palustre*.

Large doses of horsetail may cause symptoms of nicotine overdose, including fever, cold hands and feet, abnormal heart rate, difficulty walking, muscle weakness, and weight loss. People who smoke or who use nicotine patches or nicotine gum should avoid horsetail. Reports from animal studies and one report of a nicotine-allergic person describe a rash occurring after the use of white horsetail. Other reports from use in animals describe nausea, increased frequency of bowel movements, increased urination, loss of the body's potassium stores, and muscle weakness. People with kidney

disorders should avoid horsetail.

Studies in mice suggest that horsetail may change the activity of the kidneys, causing abnormal control of the amount of water and potassium release. Low potassium, which in theory may occur with horsetail, can have negative effects on the heart. Individuals who have heart rhythm disorders or who take digoxin should be cautious. Studies suggest that horsetail does not change blood pressure.

Horsetail contains an ingredient that destroys thiamine (vitamin B1), which could lead to deficiency with long-term use. This may cause permanent damage to the brain and nervous system, including confusion, difficulty walking, difficulties with vision and eye movement, and memory loss. People who have thiamine (vitamin B1) deficiency or poor nutrition should avoid horsetail, as it may affect levels of thiamine even more. Alcoholic or malnourished individuals are often thiamine deficient and this may be worsened by horsetail.

Avoid use in children due to anecdotal reports of poisonings while using horsetail stems as whistles.

Avoid use in patients taking antidiabetic agents, as a different horsetail species (*Equisetum myriochaetum*) has reportedly caused low blood sugar levels in type 2 diabetic patients. However, the effects of *Equisetum arvense* are unclear.

Avoid use in patients with gout or in those taking antigout agents, as horsetail has been shown to increase the formation of uric acid crystals in the urine.

Pregnancy and Breastfeeding

Horsetail is not recommended during pregnancy or breastfeeding, since little information is available about its safety. Its potential to cause thiamine (vitamin B1) depletion, low potassium, and nicotine-like effects are of particular concern. Many tinctures contain high levels of alcohol and should be avoided during pregnancy.

Interactions with Drugs

Some diuretic drugs ("water pills") can cause the body to lose water and potassium, for example loop diuretics like furosemide (Lasix®). The use of horsetail with certain diuretics may cause dehydration or further potassium deficiency. Some steroids and laxative drugs can also lower potassium levels and should not be combined with horsetail. Individuals with heart rhythm disorders who are treated with digoxin (Lanoxin®) or digitoxin may be especially sensitive to low potassium levels, and potassium levels should be monitored in such individuals.

Nicotine, a stimulant, may be found in horsetail. Because horsetail can stimulate the brain and nervous system, caution should be used when combining horsetail with stimulant drugs and nicotine.

Horsetail may interact with antigout agents, as horsetail has been shown to increase the formation of uric acid crystals in the urine.

Other horsetail species have caused low blood sugar and therefore horsetail may increase the effects of diabetes medications. However, clinical effects on diabetes therapies are unclear.

Horsetail may have additive effects when taken with agents that treat osteoporosis, as horsetail may increase bone density. However, horsetail's anti-osteoporosis effects are not well established.

Many tinctures contain high levels of alcohol and may cause nausea or vomiting when taken with metronidazole (Flagyl®) or disulfiram (Antabuse®).

Interactions with Herbs and Dietary Supplements

Increased urine production, dehydration, or electrolyte imbalances may theoretically occur when horsetail is used with herbs that may increase urination. Dehydration or low potassium levels also may theoretically occur if horsetail is used with laxatives. Horsetail may also interact with herbs or supplements taken for gout or osteoporosis, although supportive evidence is currently lacking.

In theory, low potassium levels caused by horsetail may be dangerous in people using herbs that have cardiac glycoside activity on the heart such as foxglove and oleander. Other potassium-depleting herbs, such as licorice, should also be avoided when taking horsetail.

Horsetail may interact with stimulants and herbs and supplements with similar properties such as ephedra and licorice.

Other horsetail species have caused low blood sugar and therefore horsetail may increase effects of diabetes medications. However, clinical effects on diabetes therapies are unclear.

Horsetail may break down thiamin and may cause thiamine deficiency. Horsetail may also have additive effects in patients taking antioxidants.^[5]

Toxicity

Having a series of substances potentially toxic is the reason why many professionals consider this grass too dangerous for its use as medicinal plant. Among the noxious substances we have the following ones:

- Silicates that can produce digestive problems, especially when used for long.
- Alkaloids: Although they don't appear in strong concentrations, a prolonged use, can take place by accumulating them in the organism which may facilitate premature childbirth, nervous disorders, headaches, loss of appetite, swallowing problems, etc.
- Enzymes: Its content in Thiaminases can produce a decrease of vitamin B1 (Thiamine) that is necessary for the conversion of carbohydrates in glucose. Shortage of this vitamin produces nervousness, depression, lack of appetite, muscular weakness, gastrointestinal problems, weakness or acceleration of the pulse, arrhythmia, coordination lack, etc.

In human beings these intoxications have not been registered if ingesting *Equisetum arvense*, but there has been some cases of toxicity when consuming the species *Equisetum telmateia* that presents higher proportions of toxicity. Cases of intoxication can be easy because *Equisetum arvense* can be confused with *Equisetum palustre* whose content in alkaloids, especially palustrine, is much higher.

In animals all horsetail species are very toxic and they produce an

intoxication called equisetosis that, in the case of the horses, it is very frequent and which can produce the animal's death. Sheep, oxen and cows are also affected by this plant. The most characteristic symptoms are breathing disorders and digestive problems or fever. Milk in females becomes bitter and less abundant . Because of the oxytotic properties of the alkaloids, females can lose their breeding, something that can also happen in human females.

These intoxications force to a treatment that restores the thiamine deficiency, although in the case of the animals, they are no longer recoverable in many occasions.^[2]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233500616, Flora of North America, 06.05.2008

[2] Weblink: <http://www.botanical-online.com/medicinalsequisetoangles.htm>, Botanical Online, 06.05.2008

[3] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/16397851>, PubMed, Radulović N, Stojanović G, Palić R., University of Nis, Faculty of Sciences and Mathematics, Department of Chemistry, Visegradska 33, 18000 Nis, Serbia and Montenegro, 06.05.2008

[4] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/15972249>, PubMed, Dos Santos JG Jr, Blanco MM, Do Monte FH, Russi M, Lanziotti VM, Leal LK, Cunha GM., Department of Psychobiology, Neurophysiology Laboratory, Federal University of São Paulo, Rua Botucatu, 862, 5 andar, 04023-900, São Paulo, Brazil., 06.05.2008

[5] Weblink: <http://www.nlm.nih.gov/medlineplus/druginfo/natural/patient-horsetail.html>, MedlinePlus Herbs and Supplements, 06.05.2008

[6] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 307

[7] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: <http://flora.nhm-wien.ac.at/Seiten-Arten/Equisetum-arvense.htm>, Naturhistorisches Museum, Botanik im Bild, Photo by Ernst Horak, 05.09.2008

Equisetum debile Roxb. (Tikal balung)

Horsetail



Equisetum debile Roxb.

Occurrence and appearance

Stems 30-100 cm or more tall, arising from a dark brown, segmented rhizome with nodes c. 1 cm apart, aerial segments 1-10 cm long, 2-5 mm diameter, inserted in a cup 3-10 mm deep at the end of the next lower segment, pale to mid green, longitudinally striate, very finely scabrid along the ridges, the striae ending in scariose or dark triangular teeth to 1 mm long; stems near the water generally unbranched, those away from the water often with 1-6 radial branches arising from the base of the apical cup of each segment, the branches sometimes only a few segments long and all fertile. Cones terminal on the main branch or on side branches, c. 10-15 mm long, 5-7 mm across, back when mature, yellow or pale orange internally, sporangiophores radially arranged in up to 12 rows; spores minute, bright green.^[1]

Pharmacologic properties

To observe the effects on the triglyceride and cholesterol of normal rats and rabbits of hyperlipidemia by *Equisetum debile* Roxb. rats were given various doses of *Equisetum debile* Roxb. extracts (alcohol) intragastrically for 15 days. Then the triglyceride and total cholesterol of blood were measured. Every rabbit was given fodder (100 g/day) for 60 days. The fodder contained some cholesterol and oil added with various dose of *Equisetum debile* Roxb. extracts. Then the triglyceride and total cholesterol and the b-apoprotein of blood were measured. Their body weight was measured. Results: *Equisetum*

debile Roxb. Alcoholic extracts could decrease the triglyceride and total cholesterol of rat ($P < 0.05$) and triglyceride of the rabbits ($P < 0.05$). But the concentration of b-apoprotein was not influenced. The body weights of rats and rabbits did not change greatly. Conclusions: Equisetum debile Roxb. extracts have regulated blood lipid of normal rat and triglyceride of rabbits significantly, but the body weight does not change greatly.^[2]

Therapeutic indication

Traditional uses: arthritis, eyesight, gonorrhea, joint, pain, refrigerant.^[3,4]

[1] Weblink: <http://www.anbg.gov.au/fern/aquatic/equisetaceae.html>, Australian National Botanic Gardens, 03.03.2008

[2] Weblink: <http://www.shvoong.com/exact-sciences/1605963-modifying-effect-hyperlipidemia-extraction-equisetum/>, The Modifying Effect on Hyperlipidemia by the Extraction of Equisetum Debile Roxb, Journal of Qiqihar Medical, TsingHua, 06.05.2008

[3] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 307

[4] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: [http://www.botanypictures.com/plantimages/equisetum%20debile%202%20\(hippochaete%20debilis\)%20menglun%20xtbg%20med.jpg](http://www.botanypictures.com/plantimages/equisetum%20debile%202%20(hippochaete%20debilis)%20menglun%20xtbg%20med.jpg), Botanypictures, Photo by Antonie van den Bos, 06.09.2008

2.12 Malvaceae

Hibiscus family, Mallow family

About 100 genera and ca. 1000 species: tropical and temperate regions of N and S Hemisphere. Herbs, shrubs, or less often trees; indumentum usually with peltate scales or stellate hairs. Leaves alternate, stipulate, petiolate; leaf blade usually palmately veined, entire or various lobed. Flowers solitary, less often in small cymes or clusters, axillary or subterminal, often aggregated into terminal racemes or panicles, usually conspicuous, actinomorphic, usually bisexual (unisexual in *Kydia*). Epicalyx often present, forming an involucre around calyx, 3- to many lobed. Sepals 5, valvate, free or connate. Petals 5, free, contorted, or imbricate, basally adnate to base of filament tube. Stamens usually very many, filaments connate into tube; anthers 1-celled. Pollen spiny. Ovary superior, with 2-25 carpels, often separating from one another and from axis; ovules 1 to many per locule; style as many or 2 × as many as pistils, apex branched or capitate. Fruit a loculicidal capsule or a schizocarp, separating into individual mericarps, rarely berrylike when mature (*Malvaviscus*); carpels sometimes with an endoglossum a crosswise projection from back wall of carpel to make it almost completely septate. Seeds often reniform, glabrous or hairy, sometimes conspicuously so.

Members of the Malvaceae are important as fiber crops (particularly cotton, *Gossypium*). Young leaves of many species can be used as vegetables, and species of *Abelmoschus* and *Hibiscus* are grown as minor food crops. Many species have attractive flowers and an ever-increasing selection is grown as ornamentals. Several have been cultivated for a very long time, particularly species of *Hibiscus*, and some of these are not known in the wild.^[1]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=3&taxon_id=10534, Chinese Plant Names, 04.07.2008

Sida rhombifolia L. (Sadagori)



Sida rhombifolia L.

Occurrence and appearance

Subshrubs erect or prostrate, many branched, to ca. 1 m tall. Branchlets stellate. Stipules spinelike, 3-5 mm; petiole 2-5(-8) mm, stellate puberulent; leaf blade rhombic to oblong-lanceolate or obovate, rarely linear-lanceolate, 1-4.5 × 0.6-2 cm, abaxially gray-white stellate pilose, adaxially sparsely stellate pilose to subglabrous, base broadly cuneate, margin dentate, apex obtuse to acute. Flowers solitary, axillary. Pedicel 1-2.5 cm, densely stellate tomentose, articulate above middle. Calyx cup-shaped, 4-5 mm, abaxially stellate pubescent, lobes triangular, apices acute. Corolla ca. 1 cm in diam.; petals yellow, obovate, ca. 8 mm, base attenuate, apex rounded. Filament tube 4-5 mm, glabrous. Style branches 8-10. Fruit semiglobose to broadly turbinate, 6-7 mm in diam.; mericarps 7-10, 2.5-3 mm excluding awn, shallowly grooved to near base, eventually dehiscent, side walls usually thin, not veined, stellate puberulent, apex usually (1 or)2-awned, awns to 1.5 mm. Seeds reniform, ca. 2 mm, blackish.^[1]

Flowering is during rainy season and fruiting in winter season.^[2]

Parts used

Whole plant, leaves, stem and roots are used.^[2]

Constituents

The plant has been reported to contain ephedrine, cellulose, lignin, quinazolines, β -phenethylamines, tryptamine derivate, sterculic, malvalic and linoleic acids.^[2]

Pharmacologic properties

The whole plant is used in pulmonary tuberculosis and rheumatism. The leaves are pounded and are applied on swellings. The stem is mucilaginous and both externally and internally is used as demulcent and emollient. The roots are considered valuable in the treatment of rheumatism and their paste in milk with honey is given to relieve pain of leucorrhoea. Leaves are used as a substitute for tea.^[2]

Sida rhombifolia (L.) ssp. *retusa* (L.) is widely used in Ayurvedic medicine for the treatment of fever as well as a diuretic. The comparative antioxidant potentials of ethanol extract of roots, stems, leaves, and whole plant were studied. Estimation of total polyphenolic content and high-performance thin-layer chromatography profile were determined. Further inhibition of oxygen-derived free radicals, viz., assays for free radical scavenging, reducing power, superoxide anion scavenging, nitric oxide scavenging, and anti-lipid peroxidation, were performed. All the antioxidant activities were compared with standard antioxidants such as butylated hydroxyanisole and alpha-tocopherol acetate. Extracts were found to be good scavengers of the 1,1-diphenyl-2-picrylhydrazyl radical in the order root > leaves > whole plant > stem with 50% inhibitory concentrations of 546.1, 852.8, 983.8, and 1,222.5 microg/mL, respectively. All extracts of this plant showed effective free radical scavenging activity, reducing power, and superoxide scavenging activity. Only root extract inhibited lipid peroxidation in rat liver and brain homogenate. All these antioxidant properties were concentration dependent. In addition, total polyphenolic contents of all the extracts were determined as gallic acid equivalents. The highest antioxidant activity was observed in root extract. The results obtained from the current study indicate that *S. rhombifolia* ssp. *retusa* is a potential source of natural antioxidants.^[3]

Therapeutic indication

Action: alopecia, aphrodisiac, diuretic. Traditional uses: abdomen, abortive, bilious, boils, burns, chicken pox, constipation, cramps, delirium, dermatosis, diarrhea, dysmenorrhea, dyspepsia, enterosis, fever, fractures, headache, herpes, impetigo, impotence, itch, ophthalmia, rheumatism, shortwindedness, sore, sty, swelling, thrush, toothache, tuberculosis, tumor, urethritis, waspstings, wounds.^[4,5]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=3&taxon_id=200013764, Chinese Plant Names, 06.05.2008

[2] MEDICINAL PLANTS AND RAW DRUGS OF INDIA, Purshotam Kaushik, Anil Kumar Dhiman; Printed by Gajendra Singh Gahlot at Shiva Offset Press, for Bishen Singh Mahendra Pal Singh, Dehra Dun, and Typesetting at Doon Phototype Printers, 14, Old Connaught Place, Dehra Dun, India, 2000, ISBN-81-211-0174-3, pp 119-120

[3] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18158841>, PubMed, Evaluation of in vitro antioxidant activity of *Sida rhombifolia* (L.) ssp. *retusa* (L.), Dhalwal K, Deshpande YS, Purohit AP., Poona College of Pharmacy, Bharati Vidyapeeth University, India., 06.05.2008

[4] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 773

[5] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: http://www.metafro.be/prelude/prelude_pic/Sida_rhombifolia1.jpg, Metafro-Infosys, 06.09.2008

2.13 Moraceae

Mulberry Family

Trees, shrubs, herbs, or vines, deciduous or evergreen, frequently with milky sap. Leaves alternate (rarely opposite or whorled), simple; stipules present, persistent or caducous; petiole adaxially grooved. Leaf blade: margins entire, toothed, or lobed; venation pinnate or with 3-5 basal palmate veins; cystoliths often present in epidermal cells. Inflorescences racemes, cymes, or capitula. Flowers unisexual, staminate and pistillate on same or different plants, small, occasionally on flattened torus, more often enclosed within fleshy, flask-shaped receptacle (syconium); sepals 2-6, distinct or partly connate (vestigial in *Brosimum*). Staminate flowers: stamens equal in number to sepals or calyx lobes and opposite them, straight or inflexed; anthers 1-2-locular. Pistillate flowers: sepals or calyx lobes 4, $\pm$ connate; pistils 1, 1-2-carpellate; ovary 1, superior or inferior, 1(-2)-locular; ovules 1 per locule; styles or style branches 1-2; stigmas 1-2, entire. Fruits multiple (syncarps); individual achenes or drupelets partly or completely enclosed by enlarged common receptacle or by individual calyces.

Genera ca. 40: widespread in tropical and subtropical regions, less common in temperate areas.

Members of the large and diverse mulberry family are mainly woody and tropical; they are most abundant in Asia. The largest genera are *Ficus*, with approximately 750 species, and *Dorstenia*, with about 170 species. The family includes important timber trees, e.g., *Chlorophora excelsa* (Welwitsch) Benth, iroko, from tropical Africa; *Brosimum guianense* (Aubl.) Huber, letterwood, snakewood; and *Ficus* spp. Genera with species bearing edible fruits include the mulberries, *Morus* spp.; breadfruit and jackfruit, e.g., *Artocarpus altilis* (Parkinson) Fosberg and *A. heterophyllus* Lamarck; and figs, *Ficus* spp. Several species of *Ficus* are commonly cultivated in subtropical regions of the United States. These include *F. carica* Linnaeus; *F. elastica* Roxburgh ex Hornemann, India rubber plant; *F. benghalensis* Linnaeus, banyan; *F. benjamina* Linnaeus, weeping fig; *F. pumila* Linnaeus, creeping fig; and *F. microcarpa* Linnaeus f., Indian-laurel.

Rubber plants and weeping figs are commonly sold as houseplants. Economically, the most important species are those associated with the silk trade. *Morus alba* Linnaeus, *M. indica* Linnaeus, *M. laevigata* Wallis, and *M. serrata* Roxburgh, cultivated in many temperate and tropical countries, provide the natural food source for the silkworm, *Bombyx mori* Linnaeus.

Cudrania tricuspidata (Carrière) Bureau ex Lavallée, used as a food source for silkworms when *Morus* spp. are in short supply, is cultivated in North America as a hedge plant. The fruit is edible. Native to Korea and China.^[1]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=10583, Flora of North America, 04.07.2008

Ficus edelfeltii King. (Ki Kunci)



Ficus edelfeltii King.

Occurrence and appearance

Tree up to 25 m tall, without or with buttresses up to 1 m high. Branchlets drying brown; scars of the petioles +/- prominent. Leafy twigs 2-4 mm thick, solid, +/- angular, rather densely to sparsely minutely white puberulous to glabrous. Leaves spirally arranged to subdistichous; lamina oblong to elliptic, 8-20 (-33) by 3.5 -9 (-14) cm, often slightly asymmetric, coriaceous, apex (shortly and bluntly) acuminate, base often slightly inequilateral, cuneate to rounded (to subattenuate or to subcordate), margin entire, flat or slightly revolute; upper surface glabrous, dull when dry, lower surface (very) (sparsely) appressed-puberulous to strigillose on the midrib or (sub) glabrous, smooth; cystoliths only beneath; midrib almost flat above, lateral veins (8-)10-14 pairs, sometimes furcate far from the margin, the basal pair slightly or not distinct, tertiary venation reticulate to subscalariform, the smaller veins slightly or not distinct, tertiary venation reticulate to subscalariform, the smaller veins slightly prominent to almost flat beneath; waxy glands in the axils of the basal lateral veins; petiole 1-2.5 (-5) cm long, appressed-puberulous or glabrous, the epidermis flaking off; stipules 1-2(-3) cm long, densely brownish to whitish appressed-puberulous to subtomentose, sometimes with some lateral bracts, red at maturity, apex convex, ostiole 1.5-5 mm diam., prominent, often surrounded by apical bracts; internal hairs present (sparse and short) or absent. Tepals red, glabrous. Stamens 1 or 2. habitat: forest and montane scrub, at altitudes up to 1650 m. Uses: the bark is used to make rope for clothes.^[1]

[1] FLORA MALESIANA, Series I – Seed plants, Volume 17/Part 2-2005, Moraceae (Ficus); C. C. Berg & E. J. H. Corner, 2005; Publication Department: Leiden, Netherlands: National Herbarium Nederland; ISBN – 90-71236-61-7; pp. 147-148

Figure 1: http://image01.ng.brit.org/images/collections/gdweiblen_00gw2363_01_f.jpg, Digital Flora of New Guinea, 06.09.2008

2.14 Musaceae

Banana family

Herbs perennial or monocarpic, growing from sympodial rhizomes or a massive, sympodial corm. Pseudostems composed of closely packed leaf sheaths. Leaves spirally arranged, petiolate; leaf blade entire, pinnately veined. Inflorescence terminal or rarely axillary, cymose. Bracts spirally arranged, often brilliantly colored, spathe-like, large. Flowers bisexual or unisexual by abortion, zygomorphic. Perianth in 2 whorls; 3 outer tepals and 2 inner ones united into a compound tepal; third inner tepal free. Stamens 5, free; anthers 2-loculed. Pistil 1; ovary inferior, 3-loculed; ovules numerous per locule, anatropous; placentation axile. Style simple or capitate. Fruit a berry, fleshy or leathery and dry, indehiscent. Seeds hard, not arillate; embryo straight, surrounded by a $\pm$ well-developed endosperm and a mealy perisperm.

Three genera and ca. 40 species: tropical and subtropical regions of Africa and Asia.^[1]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=10588, Flora of China, 04.07.2008

Musa paradisiaca L. “Banana” (Cau)

Synonym: *Musa sapientum* L.



Musa paradisiaca L.

Occurrence and appearance

Tree-like herb, up to 9 m in height. Leaf sheaths tubular, forming a thick trunk. Leaf blade c. 1.5 m, oblong, usually ragged in appearance, splitting between the transverse parallel veins. Spike c. 1 m, drooping. Peduncle thick. Bracts opening in succession, 15-20 cm, ovate, concave, dark red, somewhat fleshy. Outer tepals 22-24 mm, 5-toothed, fleshy, tinged pink. Inner tepals 19-20 mm, ovate, acute, concave. Stamens 5.^[1] Fruits are oblong, usually 3-gonous and yellow with soft and sweet pulp. Flowering and fruiting is almost throughout the year.^[2] In the wild form 5-7 cm with seed; seedless and longer in the cultivated varieties.^[1]

Parts used

Roots, fruits, leaves, stem, flowers and sap are used.^[2]

Constituents

The fruits contain protein, the major ones are a globulin and an albumin besides, glutelin, prolamines and proteoses are also found. The essential amino acids are arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine. Besides, the banana contain calcium, iron, potassium, magnesium, sodium, phosphorus, sulphur, manganese, copper, chlorine, silica, iodine, aluminium, zinc, cobalt and arsenic and good source of vitamin A, B and C. The peels are good source of pectin and stem of the plant yields protein, carbohydrates, fibers, mineral matter, calcium, phosphorus and nicotinic acid.^[2]

Pharmacologic properties

The roots are anthelmintic and stem and roots both are tonic and antiscorbutic and are useful in blood and venereal diseases. The fruits can be eaten to cure uremia, nephritis, gout, diabetes, hypertension and cardiac diseases. Young leaves are used as a cool dressing for blisters and burns. The flowers are astringent and their juice mixed with curd is given in dysentery and menorrhagia. Sap obtained from the stem is used in nervous affections and is drunk in dysentery and diarrhoea and also used as a valuable drink and mouth wash to allay thirst in cholera. The fruits are used in seminal weakness and in small-pox as a prophylactic.^[2]

The antioxidant activity of flavonoids from banana (*Musa paradisiaca* L.) was studied in rats fed normal as well as high fat diets. Concentrations of peroxidation products namely malondialdehyde, hydroperoxides and conjugated dienes were significantly decreased whereas the activities of catalase and superoxide dismutase were enhanced significantly. Concentrations of glutathione were also elevated in the treated animals.^[3]

The present study reveals the effect of *Musa paradisiaca* L. stem juice on blood glucose level (BGL) of normal & diabetic rats. The dose of 500 mg/kg bodyweight produces a significant rise of 28.3% in blood glucose level after 6h of oral administration in normal rats. Whereas, in sub diabetic rats the same dose produces a rise of 16.4% in blood glucose levels within 1h during glucose tolerance test (GTT) and a rise of 16% after 4 h in fasting blood glucose levels of severe diabetic cases. These results were unexpected and important to report as other species of *Musa* like *Musa sapientum* L. has been reported for its hypoglycemic effect.^[4]

Methanolic extract of *Musa sapientum* var. *paradisiaca* (MSE, 100 mg/kg) was studied for its antiulcer and mucosal defensive factors in normal and non-insulin dependent diabetes mellitus (NIDDM) rats. NIDDM was induced by administering streptozotocin (STZ, 70 mg/kg, ip) to 5 days old rat pups. The animals showing blood glucose level >140mg/dL after 12 weeks of STZ administration were considered as NIDDM positive. Effects of MSE were compared with known ulcer protective drug, sucralfate (SFT, 500 mg/kg) and anti-diabetic drug glibenclamide (GLC, 0.6 mg/kg) when administered orally, once daily for 6 days against gastric ulcers (GU) induced by cold-restraint stress (CRS) and ethanol and subsequent changes in gastric mucosal glycoproteins, cell proliferation, free radicals (lipid peroxidation and nitric oxide) and anti-oxidants enzymes (super oxide dismutase and catalase) and glutathione (GSH) levels. MSE showed better ulcer protective effect in NIDDM rats compared with SFT and GLC in CRS-induced GU. NIDDM caused a significant decrease in gastric mucosal glycoprotein level without having any effect on cell proliferation. However, all the test drugs reversed the decrease in glycoprotein level in NIDDM rats, but cell proliferation was enhanced in case of MSE alone. Both CRS or NIDDM as such enhanced gastric mucosal LPO, NO and SOD, but decreased CAT levels while CRS plus NIDDM rats caused further increase in LPO and NO level without causing any further changes in SOD and CAT level. MSE pretreatment showed reversal in the levels of all the above parameters better than GLC. Ethanol caused a decrease in glutathione level which was further reduced in NIDDM-ethanol rats. MSE reversed the above changes significantly in both

normal as well as in NIDDM rats, while GLC reversed it only in NIDDM rats. However, SFT was ineffective in reversing the changes induced by CRS or ethanol or when given in NIDDM-CRS or NIDDM-ethanol rats. The results indicated that the ulcer protective effect of MSE could be due to its predominant effect on mucosal glycoprotein, cell proliferation, free radicals and antioxidant systems.^[5]

Studies with plantain banana (*Musa sapientum* var. *paradisiaca*) have indicated its ulcer protective and healing activities through its predominant effect on various mucosal defensive factors. Oxidative stress and *Helicobacter pylori* colonization are considered to be important factors in the pathogenesis of gastric ulcers. In the present study methanolic extract of plantain banana pulp (BE) was evaluated for its (i) antiulcer and antioxidant activities in 2 hr cold restraint stress and (ii) anti-*H.pylori* activity in vitro. The extract (BE, 50 mg/kg, twice daily for 5 days) showed significant antiulcer effect and antioxidant activity in gastric mucosal homogenates, where it reversed the increase in ulcer index, lipid peroxidation and super oxide dismutase values induced by stress. However it did not produce any change in catalase values, which was significantly decreased by stress. Further, in the in vitro study. BE (0.32-1,000 microg/ml) did not show any anti-*H.pylori* activity. The results suggest absence of anti-*H. pylori* activity of methanolic extract of banana in vitro and its antioxidant activity may be involved in its ulcerprotective activity.^[6]

Therapeutic indication

Action: antacid, anodyne, antidote (centipede), antidote (spider), aphrodisiac, astringent, bactericide, bacteriostatic, carminative, cicatrizant, emollient, fungicide, hemostat, intoxicant, laxative, refrigerant, vermifuge.

Traditional uses: abscess, alopecia (female), anasarca, burns, cancer, cataplasm, diabetes, diarrhea, dog bites, dysentery, dyspepsia, eruptions, fractures, gangrene, headache, hematuria, hemiplegia, hemoptysis, hemorrhage, hypertension, lizard bites, mange, marasmus, migraine, nausea, otalgia, psoriasis, ringworm, scorpion sting, septicemia, shingles, smallpox, snake bite, sore, strain, syphilis, tuberculosis, tumor, uremia, urticaria, warts, wound.^[7, 8]

Special Warnings

There are two forms of banana allergy. One is oral allergy syndrome which causes itching and swelling in the mouth or throat within one hour after ingestion and is related to birch tree and other pollen allergies. The other is related to latex allergies and causes urticaria and potentially serious upper gastrointestinal symptoms.^[9]

The objective of this cohort study was to assess the relationship between banana given as early solid food with the symptoms of intestinal obstruction (SIO) among neonates, in a rural community in West Lombok District, West Nusa Tenggara Province, Indonesia. Mothers having newborn infants were interviewed and 3,420 neonates were followed for 28 days. Compared with infants who were not given solid food, the relative risk (RR) for infants given food other than banana as early solid food was 1.87, 95% CI 0.48-8.24, $p=0.4$, while for infants given banana only as early solid food the RR was 9.15, 95% CI 1.96-42.58, $p=0.0005$. After adjustment for birthweight,

colostrum, and breastfeeding, the odds ratio for infants given banana and the appearance of SIO was 2.99, 95% CI 2.65-5.14; $p=0.0012$. These data indicate that banana given as early solid food is an important risk factor for the appearance of SIO in neonates.^[10]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=222000252, Flora of Pakistan, 03.05.2008

[2] MEDICINAL PLANTS AND RAW DRUGS OF INDIA, Purshotam Kaushik, Anil Kumar Dhiman; Printed by Gajendra Singh Gahlot at Shiva Offset Press, for Bishen Singh Mahendra Pal Singh, Dehra Dun, and Typesetting at Doon Phototype Printers, 14, Old Connaught Place, Dehra Dun, India, 2000, ISBN-81-211-0174-3, pp 526-527

[3] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18329185>, PubMed, Antioxidant activity of banana flavonoids, Vijayakumar S, Presannakumar G, Vijayalakshmi NR., Department of Zoology, NSS College Manjeri, Malappuram Kerala Pin, 676122, India., 03.05.2008

[4] Weblink: http://209.85.129.104/search?q=cache:86rgdOoh96QJ:medind.nic.in/iaf/t07/i2/iaft07i2p48.pdf+%22Musa+paradisiaca%22&hl=de&ct=clnk&cd=7&gl=at&lr=lang_en, Indian Journal of Clinical Biochemistry, 2007 / 22 (2), ASSESSMENT OF GLYCEMIC POTENTIAL OF MUSA PARADISIACA STEM JUICE, Santosh Kumar Singh, Achyut Narayan Kesari, Prashant Kumar Rai and Geeta Watal, Alternative Therapeutics Unit, Drug Development Division, Medicinal Research Lab, Department of Chemistry, University of Allahabad, Allahabad, India, 03.05.2008

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[7] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 547

[8] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

[9] Weblink: http://en.wikipedia.org/wiki/Banana#Allergic_reactions, Wikipedia, 05.05.2008

[10] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/15115137>, PubMed, Vomiting, abdominal distention and early feeding of banana (Musa paradisiaca) in neonates. Wiryo H, Hakimi M, Wahab AS, Soeparto P., Department of Pediatrics, Mataram General Hospital, Faculty of Medicine, Udayana University, Denpasar, Bali, Indonesia., 05.05.2008

Figure: http://commons.wikimedia.org/wiki/Image:Bananas_on_tree.JPG, Wikimedia Commons, Photo by dekoelie, 06.09.2008

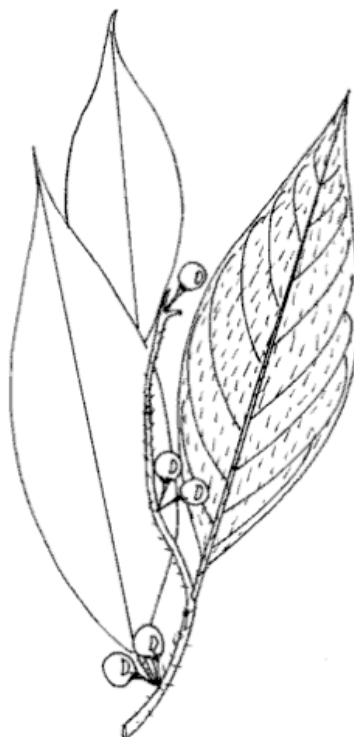
2.15 Myrsinaceae

Trees, shrubs, climbers [or rarely herbs]. Leaves simple, alternate, rarely opposite or whorled, without stipules, often glandular. Inflorescences terminal, axillary, or at apices of lateral branches, racemose (often paniculate), corymbose, cymose, umbellate, or fascicled on scaly spur branches in leaf axils. Flowers bisexual or polygamous, rarely unisexual and plants polygamodioecious or dioecious, 4- or 5(or 6)-merous, actinomorphic. Sepals basally connate or free, persistent, usually glandular. Petals basally connate or rarely free, usually glandular. Stamens as many as and opposite to petals, usually adnate to base or throat of corolla tube, sometimes free, rarely united into a tube; anthers 2-celled, dorsifixed, dehiscing longitudinally or by apical slits or pores, rarely transversely septate; filaments present or absent. Ovary superior, rarely inferior to half-inferior, 1-celled; placentation free-central, sometimes basal; ovules 1 to several in 11 to many rows, usually embedded in placenta, anatropous or semicampylotropous. Style 1; stigma simple or lobed. Fruit drupes with fleshy exocarp or capsules. Seeds 1 to many; endosperm fleshy or horny; embryo $x = 10-13$, 23.

About 42 genera and more than 2,200 species: primarily in tropical and subtropical or warm temperate regions of both hemispheres.^[1]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=10598, Flora of China, 12.07.2008

Ardisia fuliginosa Bl. (Ki Ajag)



Ardisia fuliginosa Bl.

Occurrence and appearance

Ardisia fuliginosa is a treelet up to 3m in height. The leaves are simple, exstipulate and elliptic. The blade is velvety below and measures 16 cm x 6.5 cm – 15 cm x 6 cm and shows 15 pairs of secondary nerves. The inflorescences are axillary panicles. The flowers are small, 5-merous and pinkish. The fruits are globose, glossy, orange berries that are 8mm x 5 mm. The fruit pedicel is 8 mm long.^[1]

Therapeutic indication

Indonesians apply the sap squeezed from the stem to itchy parts of the skin. There is no evidence available on the pharmacological value of the plant.^[1]

Traditional uses: itch.^[2,3]

[1] Medicinal Plants of Asia And the Pacific, by Christophe Wiat, CRC Press 2006, ISBN 0849372453, page 56-57

[2] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 65

[3] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: Medicinal Plants of Asia And the Pacific, by Christophe Wiat, CRC Press 2006, ISBN 0849372453, page 57

2.16 Oxalidaceae

Herbs, annual or perennial, sometimes shrubs or trees. Stipules absent or small. Leaves alternate or whorled, basal or cauline, pinnate or palmate; leaflets often folded together at night, margin always entire. Inflorescences umbellate, cymose, or racemose, or flowers solitary. Flowers bisexual, regular, 5-merous, usually heteromorphic, heterostylous. Sepals 5, distinct or basally connate, imbricate, rarely valvate. Petals 5, sometimes basally slightly connate, convolute. Stamens 10, in 2 whorls of 5; outer whorl usually with shorter filaments, opposite petals; filaments connate near base; anthers 2-celled, with longitudinal slits. Ovary superior; carpels 5 and fused; placentation axile, each locule with (1 or) 2 to several ovules; styles 5, distinct; stigmas capitate or shortly 2-cleft. Fruit a loculicidal capsule or a berry. Seeds often with basal aril involved in explosive ejection of seed from capsule; endosperm fleshy.

Six to eight genera and ca. 780 species: mostly in tropics and subtropics of both hemispheres but extending into temperate regions.^[1]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=3&taxon_id=10644, Chinese Plant Names, 04.05.2008

Averrhoa carambola L. (Belimbing)



Averrhoa carambola L.

Occurrence and appearance

The carambola tree is slow-growing, short-trunked with a much-branched, bushy, broad, rounded crown and reaches 20 to 30 ft (6-9 m) in height. Its deciduous leaves, spirally arranged, are alternate, imparipinnate, 6 to 10 in (15-20 cm) long, with 5 to 11 nearly opposite leaflets, ovate or ovate-oblong, 1 1/2 to 3 1/2 in (3.8-9 cm) long; soft, medium-green, and smooth on the upper surface, finely hairy and whitish on the underside. The leaflets are sensitive to light and more or less inclined to fold together at night or when the tree is shaken or abruptly shocked. Small clusters of red-stalked, lilac, purple-streaked, downy flowers, about 1/4 in (6 mm) wide, are borne on the twigs in the axils of the leaves. The showy, oblong, longitudinally 5- to 6-angled fruits, 2 1/2 to 6 in (6.35-15 cm) long and up to 3 1/2 (9 cm) wide, have thin, waxy, orange-yellow skin and juicy, crisp, yellow flesh when fully ripe. Slices cut in cross-section have the form of a star. The fruit has a more or less pronounced oxalic acid odor and the flavor ranges from very sour to mildly sweetish. The so-called "sweet" types rarely contain more than 4% sugar. There may be up to 12 flat, thin, brown seeds 1/4 to 1/2 in (6-12.5 mm) long or none at all.^[1]

Parts used

Fruits, leaves, inner bark, seeds

Constituents

Fresh mature green fruits of 'Golden Star' were found to have a total acid content of 12.51 mg/g consisting of 5 mg oxalic, 4.37 tartaric, 1.32 citric, 1.21

malic, 0.39 a-ketoglutaric, 0.22 succinic, and a trace of fumaric. Mature yellow fruits had a total acid content of 13 mg/g, made up of 9.58 mg oxalic, 0.91 tartaric, 2.20 a-ketoglutaric, 0.31 fumaric.

Food Value Per 100 g of Edible Portion*:

Calories	35.7
Moisture	89.0-91.0 g
Protein	0.38 g
Fat	0.08 g
Carbohydrates	9.38 g
Fiber	0.80-0.90 g
Ash	0.26-0.40 g
Calcium	4.4-6.0 mg
Phosphorus	15.5-21.0 mg
Iron	0.32-1.65 mg
Carotene	0.003-0.552 mg
Thiamine	0.03-0.038 mg
Riboflavin	0.019-0.03 mg
Niacin	0.294-0.38 mg
Ascorbic Acid*	26.0-53.1 mg

* According to analyses made in Cuba and Honduras.

Amino Acids: (shown in Cuban analyses)

Tryptophan	3.0 mg
Methionine	2 mg
Lysine	26 mg

Other amino acids reported by the Florida Citrus Experiment Station at Lake Alfred and expressed in micromoles per g in mature green fruits (higher) and mature yellow fruits (lower), respectively, are:

Asparagine	0.82-0.64
Threonine	0.92-0.79
Serine	3.88-2.00
Glutamic Acid	2.41-1.80
Proline	0.23-0.09
Glycine	0.20-0.10
Alanine	5.40-1.26
Valine	0.17-0.11
Isoleucine	0.03-trace
Leucine	trace
Phenylalanine	trace
Gamma Amino Butyric Acid	0.77-0.55
Ornithine	0.11-0.13
Histidine	trace

**Analyses in India showed 10.40 mg ascorbic acid in the juice of a "sweet" variety; 15.4 mg in juice of a sour variety. Ascorbic acid content of both waxed and unwaxed fruits stored at 50° F (10° C) has been reported as 20 mg/100 ml of juice. Waxed fruits stored for 17 days at 60° F (15.56° C) had 11 mg/100 ml of juice. Unwaxed fruits had lost ascorbic acid.^[1]

Pharmacologic properties

Laxative, refrigerant, antiscorbutic, and antidysenteric.^[2]

In a study the inhibitory effects of star fruit (*Averrhoa carambola*) juice was examined towards seven major liver cytochrome P450 (CYP) isoforms and NADPH-cytochrome P450 reductase (CPR). The inhibitory effects of star fruit juice (0.5 to 5%, v/v) against the activities of seven CYP isoforms including CYP1A2, CYP2A6, CYP2C8, CYP2C9, CYP2D6, CYP2E1, CYP3A4 and CPR were examined in human liver microsomes. To identify time-dependent inhibition, star fruit juice (2.5%, v/v) was preincubated with microsomes and a NADPH-generating system for 0-15 min, and then the extent of inhibition towards seven CYP isoforms were examined. Star fruit juice (5.0%, v/v) was found to inhibit all the activities of CYP isoforms tested by more than 70%. Based on the half inhibition values (%), the inhibitory effects towards different CYP isoforms were in the following order: CYP2A6 (0.9) > CYP1A2 (1.4) > CYP2D6 (1.6) > CYP2E1 (2.0) > CYP2C8 (2.2) > CYP2C9 (3.0) > CYP3A4 (3.2). Time-dependent inhibition was not observed towards any of the tested CYP isoforms. In addition, star fruit juice was found not to inhibit the activity of CPR. The conclusion was, that Star fruit juice inhibited the seven CYP isoforms tested, with the strongest inhibitory effect against CYP2A6 and the least towards CYP3A4.^[3]

In another study, antioxidant activities of the fruits of *A. heterophyllum*, *A. squamosa*, *T. bellirica*, *S. samarangense*, *A. carambola* and *O. europa* were investigated. For this, at first matured fruits of them were sliced into small pieces and dried in the sun and finally crushed in a grinder to make powder. Ethanolic extracts of fruit powder were prepared using 99.99% ethanol. The antioxidative activities of these extracts were determined according to their abilities of scavenging 1, 1-diphenyl-2-picrylhydrazyl (DPPH) free radical. It was demonstrated that all the ethanolic extracts of *A. heterophyllum*, *A. squamosa*, *T. bellirica*, *S. samarangense*, *A. carambola* and *O. europa* showed antioxidant activities. The IC₅₀ of the ethanolic extracts of *A. heterophyllum*, *A. squamosa*, *T. bellirica*, *S. samarangense*, *A. carambola* and *O. europa* were 410, 250, 34, 200, 30 and 76 microg/mL, respectively. Among them, *A. carambola* showed the highest antioxidant activities followed by *T. bellirica*, *O. europa*, *S. samarangense*, *A. squamosa* and *A. heterophyllum* indicating that fruits of *A. carambola*, *T. bellirica* and *O. europa* are very beneficial to human health.^[4]

Therapeutic indication

In India, the ripe fruit is administered to halt hemorrhages and to relieve bleeding hemorrhoids; and the dried fruit or the juice may be taken to counteract fevers. A conserve of the fruit is said to allay biliousness and diarrhea and to relieve a "hangover" from excessive indulgence in alcohol. A salve made of the fruit is employed to relieve eye afflictions. In Brazil, the carambola is recommended as a diuretic in kidney and bladder complaints, and is believed to have a beneficial effect in the treatment of eczema. In Chinese Materia Medica it is stated, "Its action is to quench thirst, to increase the salivary secretion, and hence to allay fever."

A decoction of combined fruit and leaves is drunk to overcome vomiting. Leaves are bound on the temples to soothe headache. Crushed leaves and

shoots are poulticed on the eruptions of chicken-pox, also on ringworm.

The flowers are given as a vermifuge. In southeast Asia, the flowers are rubbed on the dermatitis caused by lacquer derived from *Rhus verniciflua* Stokes.

Burkill says that a preparation of the inner bark, with sandalwood and *Alyxia* sp., is applied on prickly heat. The roots, with sugar, are considered an antidote for poison. Hydrocyanic acid has been detected in the leaves, stems and roots.

A decoction of the crushed seeds acts as a galactagogue and emmenagogue and is mildly intoxicating. The powdered seeds serve as a sedative in cases of asthma and colic.^[1]

Other traditional uses: acne, angina, aphtha, biliousness, chicken pox, cough, dermatosis, diabetes, diarrhea, fever, gingivitis, hangover, headache, hypertension, inflammation, nausea, piles, rheumatism, ringworm, scurvy, sialagogue, thirst.^[5, 6]

Special Warnings

Like grapefruit, star fruit is considered to be a potent inhibitor of seven cytochrome P450 isoforms. These enzymes are significant in the first pass elimination of many medicines, and thus the consumption of star fruit or its juice in combination with certain medications can significantly increase their effective dosage within the body. Research into grapefruit juice has identified a number of common medications affected, including statins which are commonly used to treat cardiovascular illness, benzodiazepines (a tranquilizer family including diazepam) as well as other medicines. These interactions can be fatal if an unfortunate confluence of genetic, pharmacological, and lifestyle factors results in, for instance, heart failure, as could occur from the co-ingestion of star fruit or star fruit juice with atorvastatin (Lipitor).^[7]

Star fruit ingestion may induce severe neurological complications in chronic renal failure patients. A case on maintenance dialysis therapy who developed a consciousness disturbance without convulsion after eating star fruit. The symptoms became aggravated after haemodialysis. The brain computed tomography scan showed no abnormal findings, but the electroencephalogram found active focal sharp waves in the left central regions and diffusion-weighted magnetic resonance imaging also showed hyperintense lesions in the left central regions that were compatible with non-convulsive status epilepticus. His condition improved dramatically after anticonvulsant therapy and regular haemodialysis. The patient was discharged 20 days later without neurological sequelae.^[8]

Clinical symptoms and outcomes of uraemic patients ingesting star fruit are quite variable and may progress to death. The purpose of the present report was to discuss the neurotoxic effects of star fruit intoxication in uraemic patients and to present the efficacy of different therapeutic approaches. Methods: a total of 32 uraemic patients had ingested star fruit. Before the intoxication episodes, 20 patients were on regular haemodialysis, eight were on peritoneal dialysis and four were not yet undergoing dialysis. Two patients were analysed retrospectively from their charts, 17 were directly monitored by the clinic and 13 were referred by physicians from many areas throughout

the country, allowing to follow their outcome from a distance. Intoxicated patients were given different therapeutic approaches (haemodialysis, peritoneal dialysis and supportive treatment), and their outcomes were analysed. Results: The most common symptoms were persistent and intractable hiccups in 30 patients (93.75%), vomiting in 22 (68.7%), variable degrees of disturbed consciousness (mental confusion, psychomotor agitation) in 21 (65.6%), decreased muscle power, limb numbness, paresis, insomnia and paresthesias in 13 (40.6%) and seizures in seven (21.8%). Patients who were promptly treated with haemodialysis, including those with severe intoxication, recovered without sequelae. Patients with severe intoxication who were not treated or treated with peritoneal dialysis did not survive. Conclusions: Haemodialysis, especially on a daily basis, is the ideal treatment for star fruit intoxication. In severe cases, continuous methods of replacement therapy may provide a superior initial procedure, since rebound effects are a common event. Peritoneal dialysis is of no use as a treatment, especially when consciousness disorders ensue.^[9]

Star fruit, belonging to the Oxalidaceae family, species *Averrhoa carambola*, is a popular fruit among Orientals. There have been reports of hiccup, confusion, and occasional fatal outcomes in uraemic patients after ingestion of star fruit. An excitatory neurotoxin from star fruit has been implicated although the exact nature of this toxic substance has not been identified. A group of seven patients is described from the dialysis centres at Queen Mary and Tung Wah Hospitals who developed symptoms including hiccup, confusion, vomiting, impaired consciousness, muscle twitching and hyperkalaemia shortly after ingestion of star fruit. Symptoms of most patients resolved after intensified dialysis or spontaneously, and no mortality was observed. The close temporal relationship of ingestion of star fruit and onset of symptoms strongly suggests the existence of a causal relationship between the two. It is recommended that uraemic patients should totally abstain from star fruit due to these rare but potentially fatal complications. The clinical manifestations of other reported series and current evidence for the possible candidate(s) of the neurotoxin are discussed.^[10]

Particularities

It has been reported that star fruit can lead to a fatal outcome in uremic patients. The intoxication syndrome consists of hiccups, mental confusion, dizziness, and vomiting. On the other hand, folk medicine uses teas and infusions of carambola leaves to treat headache, vomiting, cough, insomnia, and diabetes. This motivated to determine if *Averrhoa carambola* can act on the contractility and automaticity of the guinea pig heart. We measured the atrial isometric force in stimulated left atria and determined the chronotropic changes in spontaneously beating right atria. The carambola leaf extracts (1.5 mg/ml) abolished the contractile force in a concentration-dependent manner. Among the crude, methanolic, ethanolic, aqueous, and acetic extracts, the aqueous one was the most potent ($EC_{50} = 520 \pm 94$ microg/ml; flavonoids and tannins are the main constituents; Na^+ and K^+ contents in 1.0 mg/ml of aqueous extract were 0.12 ± 0.016 and 1.19 ± 0.15 mM, respectively). The aqueous extract abolished the positive Bowditch staircase phenomenon and reduced the inotropic response to $CaCl_2$ (0.17 – 8.22 mM), events that are dependent on the cellular Ca^{2+} inward current. The adrenergic, muscarinic or opioid membrane receptors do not seem to

participate in the mechanism of action of the cardioactive substance(s). In spontaneously beating atria, the aqueous extract promoted a negative chronotropic effect that was antagonized by 0.1 microM isoproterenol bitartrate. With this agonist, the EC₅₀ of the aqueous extract increased from 133 +/- 58 to 650 +/- 100 microg/ml. These data regarding the effect of *A. carambola* on guinea pig atrial contractility and automaticity indicate an L-type Ca²⁺ channel blockade.^[11]

[1] Weblink: <http://www.hort.purdue.edu/newcrop/morton/carambola.html>, Purdue University, Morton, J. 1987. *Carambola*. p. 125–128. In: *Fruits of warm climates*. Julia F. Morton, Miami, FL., 04.05.2008

[2] Weblink: http://books.google.at/books?id=pqms9BE7a_oC&pg=PA58&lpg=PA58&dq=%22Averrhoa+carambola%22+pharmacological&source=web&ots=tWdZLFUXvw&sig=O-RKfWb1PLp7CPLBIGbAf6sb-4&hl=de, CRC Handbook of Ayurvedic Medical Plants, L.D.Kapoor, ISBN: 0849305594, pp. 58, 04.05.2008

[3] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18261370>, PubMed, Inhibition of human liver cytochrome p450 by star fruit juice, Zhang JW, Liu Y, Cheng J, Li W, Ma H, Liu HT, Sun J, Wang LM, He YQ, Wang Y, Wang ZT, Yang L., Laboratory of Pharmaceutical Resource Discovery, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Zhongshan Road, Dalian, China, 04.05.2008

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[5] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 105

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[10] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/12823678>, PubMed, Star fruit intoxication in uraemic patients: case series and review of the literature., Tse KC, Yip PS, Lam MF, Choy BY, Li FK, Lui SL, Lo WK, Chan TM, Lai KN., Division of Nephrology, Department of Medicine, University of Hong Kong, Queen Mary Hospital, Hong Kong., 04.05.2008

[11] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/16007283>, PubMed, Negative inotropic and chronotropic effects on the guinea pig atrium of extracts obtained from *Averrhoa carambola* L. leaves., Vasconcelos CM, Araújo MS, Silva BA, Conde-Garcia EA., Laboratório de Biofísica do Coração, Departamento de Fisiologia, Centro de Ciências Biológicas e da Saúde, Universidade Federal de Sergipe, Aracaju, SE, Brasil., 04.05.2008

Figure: http://commons.wikimedia.org/wiki/Image:Averrhoa_carambola_ARS_k5735-7.jpg, Wikimedia Commons, Photo by David Monniaux, 06.09.2008

2.17 Polygalaceae

Milkwort family

Perennial or annual herbs or shrubs or trees, rarely small herbs (the latter sometimes saprophytic). Leaves simple, alternate, opposite, or whorled, petiolate or sessile, papery or leathery, with pinnate veins, margin entire, leaves rarely reduced and scalelike; stipules absent, sometimes spiniform or scalelike appendages present. Flowers bisexual, zygomorphic, white, yellow, or purple-red, pedicellate or sessile, in axillary or terminal racemes, panicles, or spikes, with bracts and usually also with bracteoles. Calyx persistent or caducous; sepals 5, free or connate at base, outer 3 small, inner 2 (alae) large, petal-like, or all 5 nearly equal. Petals 3 or 5, basally often connate, lower (median) one ("keel") usually inflexed, carinate, sometimes with fimbriate or lamellate or papilionaceous apical appendages. Stamens 8, 7, 5, or 4; filaments free, or variously united and forming a sheath open on upper side and troughlike; anthers basifixed, usually dehiscent by a single apical pore. Disk usually absent, if present annular or glandular. Ovary superior, 1- or 2-loculed; ovule 1 per locule, anatropous, pendulous, rarely ovules numerous and placentas parietal; style 1, erect or curved; stigmas 1 or 2, capitate. Fruit a 2-loculed capsule, dehiscent by valves, or a 1-loculed samara or a berrylike drupe, dehiscent or not. Seeds 2, or 1 with 1 sterile locule, yellow-brown, dark castaneous, or black, ovoid, globose, or ellipsoidal, glabrous or piliferous, strophiolate or not, with or without endosperm, sometimes with an appendage at end opposite to strophiole.

Thirteen to 17 genera and about 1000 species: widespread worldwide, especially in tropical and subtropical regions of both hemispheres.^[1]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=10716, Flora of China, 12.07.2008

Polygala glomerata Lour (Ki Tajam)

Synonym: *Polygala chinensis* L.



Polygala glomerata Lour.

Occurrence and appearance

A herb, up to 18 cm high. Leaves sessile, oblong, mucronate at apex, obtuse at base, 1.1–1.3 cm long, 0.25–0.5 cm wide; petioles 0.5 cm long. Racemes axillary, up to 1.2 cm long; peduncles up to 3 mm long; flowers bluish purple, sessile, 2 mm long; calyx-lobes acuminate. Capsules flat-reniform, 1 mm long, 1.5 mm wide.^[1]

Parts used

Roots

Constituents

The plant is known to elaborate a series of oligosaccharide polyesters and a series of polygalasaponins including polygalasaponin XLII – XLVI.^[2]

Four new benzophenone C-glucosides, glomeratides, along with a known compound arrilamin, have been isolated from the whole plant of *Polygala glomerata* Lour.^[3]

Pharmacologic properties

No special pharmacological property found, see therapeutical indication for ethnopharmacological properties.

Therapeutic indication

In Vietnam, Cambodia, and Laos, the roots are used to cure inflamed throat,

reduce fever, and remove blood from urine. In Indonesia, a tea of the leaves is drunk to treat asthma and cough.^[2]

Other traditional uses: anodyne, asthma, bronchitis, diarrhea, fatigue, inflammation, sore throat, tonic.^[4,5]

[1] Weblink: <http://www.discoverlife.org/20/q?search=Polygala+glomerata>, Flora of Taiwan Vol. 6, pp. 573, 02.05.2008

[2] Weblink: <http://books.google.at/books?id=U8oRy3gy-p8C&pg=PA80&lpg=PA80&dq=%22Polygala+glomerata%22+pharmacological&source=web&ots=nc7hxP3Htw&sig=2illx9DToze2GllSMklDjX4h9PU&hl=de#PPA81,M1>, Ethnopharmacology of Medical Plants: Asia and Pacific, Christophe Wiart, 2006, ISBN 1588297489, pp. 81, 02.05.2008

[3] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18348056>, PubMed, Benzophenone C-glucosides from *Polygala glomerata* Lour, Li CJ, Zhang DM, Yu SS., Key Laboratory of Bioactive Substances and Resources Utilization of Chinese Herbal Medicine, Ministry of Education, Institute of Materia Medica, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China, 02.05.2008

[4] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 649

[5] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: <http://www.cuhkacs.org/~mathew/Bo-Blog/index.php?mode=1&page=7>, Blog of Mathew, Photo by Mathew, 07.09.2008

Polygala paniculata L. (Ki kumat)

Orosne



Polygala paniculata L.

Occurrence and appearance

Herbs annual, erect, 10-50 cm tall. Stems terete, mostly much branched, glandular pubescent. Leaves alternate, subsessile, lowest 4 or 5 often in pseudowhorls; leaf blade lanceolate to linear-lanceolate, 5-20 × 1-4 mm, 1-veined, lateral veins absent, base attenuate, margin entire, apex acute. Racemes terminal or opposite to leaves, 2-15 cm. Pedicel 0.5-1 mm; basal bracteoles caducous, lanceolate, apex acute. Sepals 5; outer sepals 3, ± elliptic, apex obtuse; inner sepals 2, purple, petaloid, elliptic-oblong, ca. 2 mm, 3-veined. Petals 3, white or violet; lateral petals narrowly ovate-lanceolate, attenuate to apex; keel apex with multifid appendages. Stamens 8, forming an open staminal sheath glabrous inside and split at top into 8 very short free filaments. Ovary obovoid to nearly globose; style straight, 1.5-2 × as long as ovary, apex expanded into an oblique broad cup, upper portion of which ends in tuft of hair; stigma at base of cup. Capsule oblong, ca. 2 mm, not winged, apex notched, glabrous. Seeds black, oblong, densely white pubescent; strophiole small, with 2 membranous appendages.^[1]

Parts used

Roots

Pharmacologic properties

From the petrol ether and chloroform extracts of *Polygala paniculata* L., possessing both molluscicidal and antifungal properties, four coumarins were isolated by flash chromatography and centrifugal thin-layer chromatography.

They were identified as aurapten, phebalosin, murrangatin and 7-methoxy-8-(1,4-dihydroxy-3-methyl-2-butenyl) coumarin, a new natural product. Among these compounds phebalosin showed biological activity, but proved to be very unstable in aqueous solution.^[2]

Polygala paniculata L. is a herb widespread all around in Brazil, occurring in altitudes between 10 and 2300 m. This species is popularly used for the treatment of bruises due to the presence of methyl salicylate, which acts as a blood activator in the place where it is applied. This study had as the main aim evaluate the antinociceptive potential of *Polygala paniculata* aerial parts, by the hot plate model. The ethanolic extract made from aerial parts of this plant was assayed in Swiss male mice (20-25g) in groups of 5 animals, being the extract applied in a doses of 200mg/kg. In the hot plate model, the animals were placed over a hot plate metal warmed in (550,5 °C) being considered the time that each animal took to react for the thermal stimulus. The effects were evaluated after the extract application in 30, 60, 90 e 120 min. As a positive control fentanyl was used (0.3 mg/kg). The results were expressed as a percentage of antinociceptive activity. *Polygala paniculata* presented best effects at 60 and 90 minutes, applying the permanence time of animals in a hot plate in 107.94% and 134.79%. Fentanyl presented higher percentages of activities at 30 min (181.67%) and 60 min (167.37%). It is interesting to note that 90 min after the onset of treatment, the analgesic percentage shown with fentanyl (53.65%) was lower than that presented for the *Polygala paniculata* ethanolic extract, that has shown its maximum effect. These results indicate *Polygala paniculata* as a plant possessing compounds with very interesting central analgesic activity, justifying by this way, its popular use for the treatment of bruises and other algesic processes.^[3]

The ethanolic extracts of *Polygala paniculata* L., which is a herbaceous plant widely distributed all over Brazil, were tested for their analgesic effects using hot plate, tail flick and formalin test models, and for their antiedematogenic effects using croton oil induced ear oedema. The ethanolic extracts obtained from wild and micropropagated plants produced analgesic effects against thermal and chemical induced pain. The highest results were observed at the dose of 400 mg/kg. The inhibition of ear oedema in mice was also observed after treatment with ethanolic extract of *Polygala paniculata* L. . The effects produced by micropropagated plants were lower than wild plants, whereas both had produced significant effects. These results suggest that the ethanolic extracts from wild and micropropagated *Polygala paniculata* L. possess analgesic and antiedematogenic effects.^[4]

Therapeutic indication

The roots as a diuretic, emetic and expectorant and against blenorreas. An infusion or decoction of a handful in a liter of water. It is drunk substituting the water until the symptoms disappear.

In treat of snake bites, the roots are eaten and placed above the affected area.^[5]

Other traditional uses: cataplasm, gonorrhea, headache, hypertension, vertigo.^[6,7]

Particularities

Plants of the genus *Polygala* have been shown to possess protective effects against neuronal death and cognitive impairments in neurodegenerative disorders related to excitotoxicity. Moreover, previous reports have shown the neuroprotective effects of the plant *Polygala paniculata* against methylmercury (MeHg)-induced neurotoxicity. The potential protective effects of three compounds (7-prenyloxy-6-methoxycoumarin, quercetin, and 1,5-dihydroxy-2,3-dimethoxy-xanthone) from *Polygala* species were examined against MeHg- and mercuric chloride (HgCl_2)-induced disruption of mitochondrial function under in vitro conditions using mitochondrial-enriched fractions from mouse brain. MeHg and HgCl_2 (10-100 μM) significantly decreased mitochondrial viability; this phenomenon was positively correlated to mercurial-induced glutathione oxidation. Among the isolated compounds, only quercetin (100-300 μM) prevented mercurial-induced disruption of mitochondrial viability. Moreover, quercetin, which did not display any chelating effect on MeHg or HgCl_2 , prevented mercurial-induced glutathione oxidation. The results suggest that the protective effects of quercetin against mercurial-induced mitochondrial dysfunction is related to the removal of oxidant species generated in the presence of either MeHg or HgCl_2 . Reinforcing this hypothesis, MeHg and HgCl_2 increased the production of hydrogen peroxide in the brain mitochondria, as well as the levels of malondialdehyde. These oxidative phenomena were prevented by co-incubation with quercetin or catalase. These results are the first to show the involvement of hydrogen peroxide as a crucial molecule related to the toxic effects of both organic and inorganic mercurials in brain mitochondria. In addition, the study is the first to show the protective effect of quercetin against mercurial-induced toxicity, pointing to its capability to counteract mercurial-dependent hydrogen peroxide generation as a potential molecular mechanism of protection. Taken together, these data render quercetin a promising molecule for pharmacological studies with respects to mercurials' poisoning.^[8]

The possible gastroprotective effects of the hydroalcoholic extract of *Polygala paniculata* in rats have been evaluated. We have investigated the effects of this hydroalcoholic extract on acute lesions induced by ethanol (70%, p.o.) and indomethacin (20 mg kg^{-1} , s.c.). Its influence on mucus secretion was investigated, measured as the amount of Alcian blue dye estimated by colorimetry, and antisecretory effects were assessed in the pylorus ligation model. The treatment of rats with a crude hydroalcoholic extract of *P. paniculata* (HEPP; 30, 100, 300 mg kg^{-1} , p.o., or 3, 10 and 30 mg kg^{-1} , i.p.) decreased the ulcer index, and maintained the gastric mucus production in acute gastric lesions caused by ethanol 70%. In addition, the extract partially protected the mucosa against indomethacin-induced lesions. The extract did not change the volume and acidity of gastric secretion in the pylorus-ligated rat. An additional antioxidant activity of the extract and its isolated flavonoid compound rutin, in the DPPH free radical scavenging assay, was observed. In conclusion, HEPP exhibited marked gastroprotection; these effects may have involved prostaglandins and be related to cytoprotective factors, such as antioxidant activity and maintenance of mucus production.^[9]

The possible protective effects of *Polygala paniculata* extract were examined against methylmercury (MeHg)-induced neurotoxicity in adult mice. MeHg was diluted in drinking water (40 mg L^{-1} , freely available) and the hydro-

alcoholic Polygala extract was diluted in a 150 mM NaCl solution and administered by gavage (100 mg kg⁻¹) b.w., twice a day). After a two-week treatment, MeHg exposure significantly inhibited glutathione peroxidase and increased glutathione reductase activity, while the levels of thiobarbituric acid reactive substances were increased in the cerebral cortex and cerebellum. These alterations were prevented by administration of Polygala extract, except for glutathione reductase activity, which remained elevated in the cerebral cortex. Behavioural interference in the MeHg-exposed animals was evident through a marked deficit in the motor performance in the rotarod task, which was completely recovered to control levels by Polygala extract co-administration. This study has shown, for the first time, the in-vivo protective effects of Polygala extract against MeHg-induced neurotoxicity. In addition, the findings encourage studies concerning the beneficial effects of *P. paniculata* on neurological conditions related to excitotoxicity and oxidative stress.^[10]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=242339343, Flora of China, 03.05.2008

[2] Weblink: <http://www.thieme-connect.com/ejournals/abstract/plantamedica/doi/10.1055/s-2007-969460;jsessionid=264A857B4D8C366B76008437B96D4103.jvm5>, Thieme connect, „Coumarins from Polygala paniculata“, M. Hamburger, M. Gupta, K. Hostettmann, 03.05.2008

[3] Weblink: http://bvs.sld.cu/revistas/pla/vol10_esp_05/pla03405.htm, Plantas colombianas con actividad antimalárica, „Antinociceptive activity of Polygala paniculata L.“, Pereira F.L., de Oliveira S.B., Reis G., Dias P., Matheus M.E., Salgueiro C.L., de Sousa F., 03.05.2008

[4] Weblink: http://www.scielo.br/scielo.php?script=sci_abstract&pid=S0102-695X2005000400009&lng=en&nrm=iso, SciELO Brasil, Revista Brasileira de Farmacognosia, „Analgesic and antiedematogenic activities of wild and micropropagated Polygala paniculata L (Polygalaceae)“, Rev. bras. farmacogn., Oct./Dec. 2005, vol.15, no.4, p.310-315. ISSN 0102-695X, 03.05.2008

[5] Weblink: http://74.125.39.104/search?q=cache:fuO1Ulf_8_IJ:www.geplam.com.br/artigos_files/art10.pdf+%22Polygala+paniculata%22+%22parts+used%22&hl=de&ct=clnk&cd=6&gl=at, Journal of Ethnopharmacology 111 (2007) p. 392, 03.05.2008

[6] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 649

[7] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

[8] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/17944542>, PubMed, Mercurial-induced hydrogen peroxide generation in mouse brain mitochondria: protective effects of quercetin, Franco JL, Braga HC, Stringari J, Missau FC, Posser T, Mendes BG, Leal RB, Santos AR, Dafre AL, Pizzolatti MG, Farina M., Departamento de Bioquímica, Centro de Ciências Biológicas, Universidade Federal de Santa Catarina, 03.05.2008

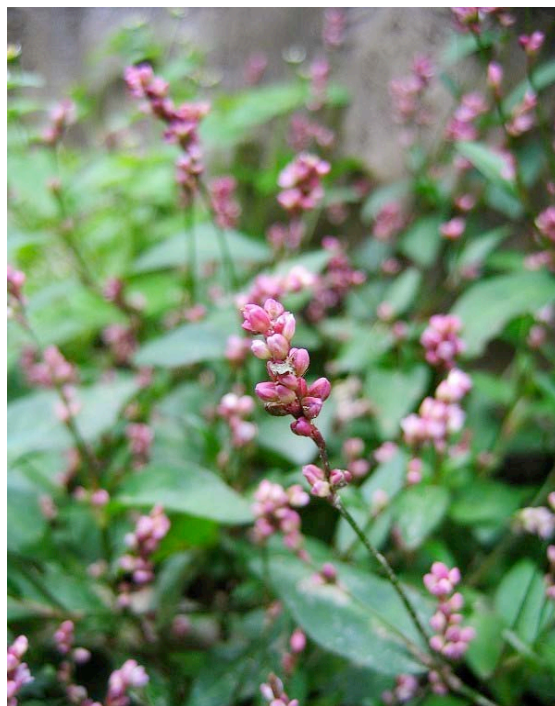
[9] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/17910817>, PubMed, Gastroprotective activity of the hydroalcoholic extract obtained from Polygala paniculata L. in rats., Lapa Fda R, Freitas CS, Baggio CH, Missau FC, Pizzolatti MG, Santos AR, Marques MC., Departamento de Farmacologia, Centro de Ciências Biológicas, Universidade Federal do Paraná, Curitiba, 88015-420, PR, Brazil, 03.05.2008

[10] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/16259784>, PubMed, Protective effects of Polygala paniculata extract against methylmercury-induced neurotoxicity in mice, Farina M, Franco JL, Ribas CM, Meotti FC, Missau FC, Pizzolatti MG, Dafre AL, Santos AR., Departamento de Bioquímica, Centro de Ciências Biológicas, Universidade Federal de Santa Catarina, 88040-900, Florianópolis, SC, Brazil, 03.05.2008

Figure: <http://www.kingsnake.com/westindian/polygalapaniculata1.JPG>, Kingsnake, 07.09.2008

Polygonum posumbu Buch. – Ham. (Baran)

Synonyms: *Persicaria posumbu* Buch.-Ham. Ex D.Don, *Polygonum cespitosum* Bl.



Polygonum posumbu Buch. - Ham.

Occurrence and appearance

Herbs annual. Stems decumbent, 30-70 tall, slender, branched at base, glabrous, angulate. Petiole 5-7 mm, appressed hispid; leaf blade ovate-lanceolate or ovate, 3-6(-8) × 1-2(-3) cm, papery, both surfaces sparsely appressed hispid or glabrescent, midvein prominent abaxially, base broadly cuneate, margin ciliate, apex caudate-acuminate; ocrea tubular, 4-6 mm, thinly membranous, appressed hispid, apex truncate, cilia 7-8 mm, stout. Inflorescence terminal or axillary, spicate, lax, 5-10 cm, interrupted below; bracts greenish, funnel-shaped, glabrous, margin ciliate, each 3- or 4-flowered. Pedicel short. Perianth pinkish, 5-parted; tepals elliptic, 2-2.5 mm. Stamens 8, exserted. Styles 3, connate at base; stigmas capitate. Achenes included in persistent perianth, blackish brown, shiny, ovoid, trigonous, 2-2.5 mm. Fl. Jun-Sep, fr. Jul-Oct.^[1]

Therapeutic indication

A paste of the leaves is applied to muscular swellings^[2]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=242339686, Flora of China, 02.05.2008

[2] Weblink: <http://books.google.at/books?id=kIAFeYz4YdYC&pg=RA2-PA355&lpg=RA2PA355&dq=Persicaria+posumbu&source=web&ots=QILE5PKsUy&sig=vxAdvzsh1QMEhKaqfmVoxKCdj9Y&hl=de>, Plants and People of Nepal, Narayan Prasad, Manandhar, Sanjay Manandhar, ISBN: 0881925276, pp. 335, 02.05.2008

Figure: <http://89sky.net/vbb/showthread.php?t=2226>, 89sky Forum, Photo by athome, 07.09.2008

2.18 Punicaceae

Small trees or shrubs, sometimes spiny. Leaves opposite, simple, exstipulate. Flowers showy, solitary, axillary or terminal, bisexual, 5-7-merous. Calyx campanulate, adnate below, thick and coriaceous, lobed at the top, valvate, persistent. Petals free, imbricate. Stamens numerous, persistent. Ovary inferior, multilocular, loculi in two layers; placentation axile in the lower and parietal in the upper loculi. Style simple. Fruit baccaceous, crowned with the lobes of the calyx, rind leathery. Seeds numerous, pulpy and juicy.

A monogeneric family with two species; one endemic to Socotra and the other distributed throughout the tropical regions of the world.

Punica has been included under Lythraceae, but it is separated on account of its inferior, multilocular ovary, with superposed loculi and ebracteate flowers. Punicaceae is also related to Sonneratiaceae, a family of Indomalaysian mangrove trees.^[1]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=10746, Flora of Pakistan, 07.04.2008

Punica granatum L. (Delima putih)

Pomegranate



Punica granatum L.

Occurrence and appearance

Tree or shrub, 1.5-5 m tall. Branches terete, opposite, branchlets usually ending in spines. Leaves glabrous, lustrous 19-35(-50) x 8-12(-15) mm, oblong-lanceolate to obovate or elliptic, subpetiolate, entire, apex sub-acute to obtuse. Flowers scarlet red or white, conspicuous, 3 cm or more in length. Calyx 20-35 mm long, indented slightly above the middle, reddish, somewhat succulent; lobes 5-7, c. 8 mm long, triangular. Petals and stamens inserted at the throat of the calyx. Petals 16-20 x 10-12 mm, broadly obovate, wrinkled, alternating with the sepal lobes. Filaments c. 7 mm long, multiseriate, persistent. Ovary subglobose; style thick, c. 1 cm long, reddish; stigma simple; slightly bilobed. Fruit globose, 2-8 cm in diameter, sometimes persistent, pale red to scarlet, or brownish, partitioned by thin leathery yellow septa; the rind thick and coriaceous. Seeds red or pink, c. 10 mm long, angular, testa thick, fleshy, juicy.^[1]

Parts used

Fruit, seeds, bark of roots and wood.

Constituents

Flowers: A new polyphenol compound named pomegranatate (1), together with, ellagic acid, 3,3',4'-tri-O-methylellagic acid, ethyl brevifolincarboxylate, urolic and maslinic acids, and daucosterol were isolated from the ethanolic extract of the flowers of *Punica granatum*. The structure of compound 1 was determined by spectroscopic analysis. Maslinic acid exhibited antioxidant

activity, evaluated by measurement of LDL susceptibility to oxidation.^[2]

Fruits: contains about 1.5% protein, 1.6% fat, 16.8% carbohydrate, 0.6% ash. Constituents per 100g of fruit: Protein: 5g; Fat: 2.2g; Carbohydrate: 90.5g; Fibre: 12g; Ash: 2.6g; Minerals - Calcium: 40mg; Phosphorus: 180mg; Iron: 3mg; Magnesium: 0mg; Sodium: 4.35mg; Potassium: 1250mg; Zinc: 0mg; Vitamins - A: 90mg; Thiamine (B1): 0.27mg; Riboflavin (B2): 0.25mg; Niacin: 3.2mg; B6: 0mg; C: 43mg.^[3]

Pharmacologic properties

Pomegranate aril juice provides about 16% of an adult's daily vitamin C requirement per 100 ml serving, and is a good source of vitamin B5 (pantothenic acid), potassium and antioxidant polyphenols.

The most abundant polyphenols in pomegranate juice are the hydrolyzable tannins called punicalagins which have free-radical scavenging properties. Punicalagins are absorbed into the human body and may have dietary value as antioxidants.

Many food and dietary supplement makers have found advantages of using pomegranate phenolic extracts instead of the juice as ingredients in their products. Many pomegranate extracts are essentially ellagic acid which absorbs into the body after parent molecule polyphenolic punicalagins are hydrolyzed.

In preliminary laboratory research and human pilot studies, juice of the pomegranate has been found effective in reducing heart disease risk factors, including LDL oxidation, macrophage oxidative status, and foam cell formation, all of which are steps in atherosclerosis and cardiovascular disease. Tannins such as punicalagins have been identified as the primary components responsible for the reduction of oxidative stress which led to these risk factors. Pomegranate has been shown to reduce systolic blood pressure by inhibiting serum angiotensin-converting enzyme (ACE).

Containing polyphenols which inhibit estrogen synthesis, pomegranate seed oil was effective against proliferation of breast cancer cells in vitro.

The juice may also have antiviral and antibacterial effects against dental plaque.^[4]

All parts of the plant contain unusual alkaloids, known as 'pelletierines', which paralyse tapeworms so that they are easily expelled from the body by using a laxative. The dried rind of the fruit is used in the treatment of amoebic dysentery and diarrhoea. It is a specific remedy for tapeworm infestation. The stem bark is emmenagogue. Both the stem and the root barks are used to expel tapeworms. Use this with caution, the root bark can cause serious poisoning. The bark is harvested in the autumn and dried for later use. The dried pericarp is decocted with other herbs and used in the treatment of colic, dysentery and leucorrhoea.^[3]

β-Sitosterol, Friedelin, D-Mannitol, Ursolic and Betulic acids were detected in the different parts of *Punica granatum* L. Biological testing of the various extracts of the leaves, seeds, root and stem bark revealed their hypotensive, antispasmodic and anthelmintic effects. D-Mannitol was found to possess some anthelmintic properties and possible constipating value. Hormonal experiments on the oil showed that it has an oestrogenic activity but is devoid of any androgenic effect.^[5]

Therapeutic indication

Action: astringent, cardiotonic, refrigerant, stimulant, stomachic, taenifuge, urogenital, vermifuge. Traditional uses: amygdalitis, asthma, bilious, cancer, colic, cough, dermatosis, diarrhea, dysentery, dysmenorrhea, dyspepsia, fever, hemorrhagia, inflammation, leucorrhea, malaria, metrorrhagia, night sweet, ophthalmia, piles, stomach ache, tapeworm, thirst, throat, tumor.^[6,7]

Particularities

Absorption, metabolism, and antioxidant effects of pomegranate (*Punica granatum* L.) polyphenols after ingestion of a standardized extract in healthy human volunteers.

The intake of polyphenols has been demonstrated to have health-promoting and disease-preventive effects. The pomegranate (*Punica granatum* L.), which is rich in several polyphenols, has been used for centuries in ancient cultures for its medicinal purposes. The potential health benefits of pomegranate polyphenols have been demonstrated in numerous in vitro studies and in vivo experiments. This study investigated the absorption and antioxidant effects of a standardized extract from pomegranate in healthy human volunteers after the acute consumption of 800 mg of extract. Results indicate that ellagic acid (EA) from the extract is bioavailable, with an observed C(max) of 33 ng/mL at t(max) of 1 h. The plasma metabolites urolithin A, urolithin B, hydroxyl-urolithin A, urolithin A-glucuronide, and dimethyl ellagic acid-glucuronide were identified by HPLC-MS. The antioxidant capacity measured with the oxygen radical absorbance capacity (ORAC) assay was increased with a maximum effect of 32% after 0.5 h, whereas the generation of reactive oxygen species (ROS) was not affected. The inflammation marker interleukin-6 (IL-6) was not significantly affected after 4 h after the consumption of the extract. Overall, this study demonstrated the absorbability of EA from a pomegranate extract high in ellagitannin content and its ex vivo antioxidant effects.^[8]

Phase II study of pomegranate juice for men with rising prostate-specific antigen following surgery or radiation for prostate cancer.

Phytochemicals in plants may have cancer preventive benefits through antioxidation and via gene-nutrient interactions. We sought to determine the effects of pomegranate juice (a major source of antioxidants) consumption on prostate-specific antigen (PSA) progression in men with a rising PSA following primary therapy. Experimental design: A phase II, Simon two-stage clinical trial for men with rising PSA after surgery or radiotherapy was conducted. Eligible patients had a detectable PSA > 0.2 and < 5 ng/mL and Gleason score < or = 7. Patients were treated with 8 ounces of pomegranate juice daily (Wonderful variety, 570 mg total polyphenol gallic acid equivalents) until disease progression. Clinical end points included safety and effect on serum PSA, serum-induced proliferation and apoptosis of LNCaP cells, serum lipid peroxidation, and serum nitric oxide levels. The study was fully accrued after efficacy criteria were met. There were no serious adverse events reported and the treatment was well tolerated. Mean PSA doubling time significantly increased with treatment from a mean of 15 months at baseline to 54 months posttreatment (P < 0.001). In vitro assays comparing pretreatment and posttreatment patient serum on the growth of

LNCaP showed a 12% decrease in cell proliferation and a 17% increase in apoptosis ($P = 0.0048$ and 0.0004 , respectively), a 23% increase in serum nitric oxide ($P = 0.0085$), and significant ($P < 0.02$) reductions in oxidative state and sensitivity to oxidation of serum lipids after versus before pomegranate juice consumption. We report the first clinical trial of pomegranate juice in patients with prostate cancer. The statistically significant prolongation of PSA doubling time, coupled with corresponding laboratory effects on prostate cancer in vitro cell proliferation and apoptosis as well as oxidative stress, warrant further testing in a placebo-controlled study.^[9]

Effects of oral administration of ellagic acid-rich pomegranate extract on ultraviolet-induced pigmentation in the human skin.

A double-blind, placebo-controlled trial was made to clinically evaluate the protective and ameliorative effects of ellagic acid-rich pomegranate extract on pigmentation in the skin after ultraviolet ray (UV) irradiation, using female subjects in their 20s to 40s. Thirteen healthy volunteers per group were randomly assigned to three groups; namely, high dose (200 mg/d ellagic acid), low dose (100 mg/d ellagic acid) and control (0 mg/d ellagic acid). Each group received the respective test foods for 4 wk. Each subject received a 1.5 MED (minimum erythema dose) of UV irradiation on an inside region of the right upper arm, based on the MED value measured on the previous day. Luminance (L), melanin and erythema values were measured before the start of the test food intake, and after 1, 2, 3 and 4 wk following the start of the test food intake. Further, questionnaires were conducted regarding the condition of the skin before the start of the test food intake and at the termination of the test food intake. As a result, decreasing rates of L values from the baseline in the low- and high-dose groups were inhibited by 1.35% and 1.73% respectively, as compared to the control group. Further, a stratified analysis using subjects with a slight sunburn revealed an inhibited decrease of L values compared with the control group at 1, 2 ($p < 0.01$, respectively) and 4 wk ($p < 0.05$) after the start of the test food intake in the low-dose group, and at 2 and 3 wk ($p < 0.05$) in the high-dose group. Furthermore, the results of questionnaires showed ameliorating tendencies due to the test food, in some items such as "brightness of the face" and "stains and freckles." Based on the above mentioned results, it is suggested that ellagic acid-rich pomegranate extract, ingested orally, has an inhibitory effect on a slight pigmentation in the human skin caused by UV irradiation.^[10]

Prostate cancer prevention through pomegranate fruit.

Prostate cancer (CaP) is the second leading cause of cancer-related deaths among U.S. males with a similar trend in many Western countries. CaP is an ideal candidate disease for chemoprevention because it is typically diagnosed in men over 50 years of age, and thus even a modest delay in disease progression achieved through pharmacological or nutritional intervention could significantly impact the quality of life of these patients. In this regard we and others have proposed the use of dietary antioxidants as candidate CaP chemopreventive agents. The fruit pomegranate derived from the tree *Punica granatum* has been shown to possess strong antioxidant and anti-inflammatory properties. In a recent study, we showed that pomegranate fruit extract (PFE), through modulations in the cyclin kinase inhibitor-cyclin-

dependent kinase machinery, resulted in inhibition of cell growth followed by apoptosis of highly aggressive human prostate carcinoma PC3 cells. These events were associated with alterations in the levels of Bax and Bcl-2 shifting the Bax:Bcl-2 ratio in favor of apoptosis. Further, we showed that oral administration of a human acceptable dose of PFE to athymic nude mice implanted with CWR22Rnu1 cells resulted in significant inhibition of tumor growth with concomitant reduction in secretion of prostate-specific antigen (PSA) in the serum. The outcome of this study could have a direct practical implication and translational relevance to CaP patients, because it suggests that pomegranate consumption may retard CaP progression, which may prolong the survival and quality of life of the patients.^[11]

Punica granatum (pomegranate) juice provides an HIV-1 entry inhibitor and candidate topical microbicide.

For approximately 24 years the AIDS pandemic has claimed approximately 30 million lives, causing approximately 14,000 new HIV-1 infections daily worldwide in 2003. About 80% of infections occur by heterosexual transmission. In the absence of vaccines, topical microbicides, expected to block virus transmission, offer hope for controlling the pandemic. Antiretroviral chemotherapeutics have decreased AIDS mortality in industrialized countries, but only minimally in developing countries. To prevent an analogous dichotomy, microbicides should be acceptable, accessible, affordable, and accelerative in transition from development to marketing. Already marketed pharmaceutical excipients (inactive materials of drug dosage forms) or foods, with established safety records and adequate anti-HIV-1 activity, may provide this option. Therefore, fruit juices were screened for inhibitory activity against HIV-1 IIIB using CD4 and CXCR4 as cell receptors. The best juice was tested for inhibition of: (1) infection by HIV-1 BaL, utilizing CCR5 as the cellular coreceptor, and (2) binding of gp120 IIIB and gp120 BaL, respectively, to CXCR4 and CCR5. To remove most colored juice components, the adsorption of the effective ingredient(s) to dispersible excipients and other foods was investigated. A selected complex was assayed for inhibition of infection by primary HIV-1 isolates. The results indicate that HIV-1 entry inhibitors from pomegranate juice adsorb onto corn starch. The resulting complex blocks virus binding to CD4 and CXCR4/CCR5 and inhibits infection by primary virus clades A to G and group O. Therefore, these results suggest the possibility of producing an anti-HIV-1 microbicide from inexpensive, widely available sources, whose safety has been established throughout centuries, provided that its quality is adequately standardized and monitored.^[12]

Effects of pomegranate juice consumption on myocardial perfusion in patients with coronary heart disease.

Pomegranate juice contains antioxidants such as soluble polyphenols, tannins, and anthocyanins and may have antiatherosclerotic properties. However, no study has investigated the effects of pomegranate juice on patients who have ischemic coronary heart disease (CHD). It was investigated whether daily consumption of pomegranate juice for 3 months would affect myocardial perfusion in 45 patients who had CHD and myocardial ischemia in a randomized, placebo-controlled, double-blind study. Patients were randomly assigned into 1 of 2 groups: a pomegranate juice group (240

ml/day) or a placebo group that drank a beverage of similar caloric content, amount, flavor, and color. Participants underwent electrocardiographic-gated myocardial perfusion single-photon emission computed tomographic technetium-99m tetrofosmin scintigraphy at rest and during stress at baseline and 3 months. Visual scoring of images using standardized segmentation and nomenclature (17 segments, scale 0 - 4) was performed by a blinded independent nuclear cardiologist. To assess the amount of inducible ischemia, the summed difference score (SDS) was calculated by subtracting the summed score at rest from the summed stress score. The experimental and control groups showed similar levels of stress-induced ischemia (SDS) at baseline ($p > 0.05$). After 3 months, the extent of stress-induced ischemia decreased in the pomegranate group (SDS -0.8 ± 2.7) but increased in the control group (SDS 1.2 ± 3.1 , $p < 0.05$). This benefit was observed without changes in cardiac medications, blood sugar, hemoglobin A1c, weight, or blood pressure in either group. In conclusion, daily consumption of pomegranate juice may improve stress-induced myocardial ischemia in patients who have CHD.^[13]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=200014674, Flora of Pakistan, 07.04.2008

[2] Weblink: <http://cat.inist.fr/?aModele=afficheN&cpsidt=18317171>, Centre National de la Recherche Scientifique, 07.04.2008

[3] Weblink: <http://www.pfaf.org/database/plants.php?Punica+granatum>, Plants for a Future, 08.04.2008

[4] Weblink: <http://en.wikipedia.org/wiki/Pomegranate>, Wikipedia, 08.04.2008

[5] Weblink: <http://www.springerlink.com/content/u63224n775042231/>, Springer Link, A. Sharaf, M. B. E. Fayez and S. A. R. Negm, Research Units of Pharmacology and Natural Products, National Research Centre, Cairo, U.A.R. 08.04.2008

[6] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 687

[7] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

[8] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/17090147>, PubMed, Mertens-Talcott SU, Jilma-Stohlawetz P, Rios J, Hingorani L, Derendorf H., Pharmaceutics Department, University of Florida, Gainesville, Florida 32610, USA, 08.04.2008

[9] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/16818701>, PubMed, Pantuck AJ, Leppert JT, Zomorodian N, Aronson W, Hong J, Barnard RJ, Seeram N, Liker H, Wang H, Elashoff R, Heber D, Aviram M, Ignarro L, Beldegrun A., Department of Urology, David Geffen School of Medicine, University of California at Los Angeles, Los Angeles, California 90095-1738, USA, 08.04.2008

[10] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/17190110>, PubMed, Kasai K, Yoshimura M, Koga T, Arii M, Kawasaki S., Research and Development Division, Kikkoman Corporation, 399 Noda, Noda, Chiba 278-0037, Japan, 08.04.2008

[11] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/16479165>, PubMed, Malik A, Mukhtar H., Department of Dermatology, University of Wisconsin, Madison 53706, USA, 08.04.2008

[12] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/16387698>, Neurath AR, Strick N, Li YY, Debnath AK, New York Blood Center, New York, NY 10021, USA, 08.04.2008

[13] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/16169367>, Sumner MD, Elliott-Eller M, Weidner G, Daubenmier JJ, Chew MH, Marlin R, Raisin CJ, Ornish D., The Preventive Medicine Research Institute, Sausalito, California, USA, 08.04.2008

Figure: http://commons.wikimedia.org/wiki/Image:Pommegranate_tree01.JPG, Wikimedia Commons, Photo by Amnon s, 07.09.2008

2.19 Rhizophoraceae

Evergreen, glabrous trees or shrubs with or without conical respiratory roots (pneumatophores) or stilt roots. Branchlets swollen at the nodes. Leaves simple, opposite, rarely alternate, entire, leathery, mostly mucronate; stipules interpetiolar, conspicuous, caducous, leaving annular scar, rarely absent. Inflorescence axillary, mostly lax or congested biparous cymes or racemes of spikes or fascicled, rarely flowers solitary axillary. Flowers generally bisexual, rarely unisexual (plants then monoecious), actinomorphic, hypogynous to epigynous; bracteoles cupuliform or absent. Sepals 3-16, united into a tube, basally $\pm$ adnate to the ovary, lobes valvate, persistent. Petals as many as and alternating with sepals, free, often clawed, fleshy and conduplicate, mostly bifid and fringed, rarely persistent. Stamens 8 -numerous, free or epipetalous, anthers dorsifixed, introrse, 4-loculed rarely multilocellate, dehiscing lengthwise or by a ventral valve; staminodes in female flowers present. Ovary of (1-) 2-12, united carpels, inferior rarely perigynous or superior, (1-) 2-12-loculed, placentation axile, ovules anatropous, pendulous, usually 2 in each locule; style with simple or lobed stigma. Fruit 1-seeded, unilocular, mostly an indehiscent berry or drupe rarely septicidally dehiscent, 2-4-chambered capsule. Seeds with or without aril, endospermic or not, often viviparous; embryo straight or curved with macropodous radicle.

A family of 16 genera and c. 120 species, distributed in tropical areas, mainly of the Old World and forming part of the mangrove vegetation of muddy coasts.^[1]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=10767, Flora of Pakistan, 12.07.2008

Rhizophora apiculata Bl. (Bako)

Synonyms: *Rhizophora candelaria* DC., *Rhizophora conjugata* Arn.



Rhizophora apiculata Bl.

Occurrence and appearance

Trees or shrubs, 3-6(-10) m tall. Bark gray, usually with vertical fissures. Stipules 4-8 cm. Petiole 1.5-3 cm, usually tinged reddish; leaf blade elliptic-oblong to sublanceolate, 7-16 × 3-6 cm, abaxial midvein reddish, base broadly cuneate, apex acute to apiculate. Inflorescences 2-flowered cymes; peduncle 0.7-10 mm. Flowers sessile. Calyx lobes ovate, concave, 1-1.4 cm, apex acute. Petals lanceolate, flat, 6-8 mm, membranaceous, glabrous, white. Stamens mostly 12, 4 adnate to base of petals, 8 adnate to sepals, 6-7.5 mm; anthers nearly sessile, apex apiculate. Ovary largely enclosed by disk, free part 1.5-2.5 mm; style ca. 1 mm. Fruit ca. 2.5 × 1.5 cm, apical half narrower. Hypocotyl cylindric-clavate, ca. 3.8 × 1.2 cm, ± blunt before falling. Fl. and fr. all year.^[1]

Parts used

Leaves, bark

Pharmacologic properties

Pyroligneous acid of *R. apiculata* species is a rich source of antioxidants. Pyroligneous acid or wood vinegar contains many beneficial ingredients such as organic acetic acid, methanol, ketones, aldehydes and polyphenols. The dichloromethane extracts of pyroligneous acid, CPAE evidently showed higher total phenolics content, more effective antioxidative activity, reducing power, and DPPH radical scavenging activity when compared to different standards such as BHA, BHT, alpha-tocopherol, and ascorbic acid. In

addition, the raw pyroligneous acid, CPA was also a potent antioxidant since it has high phenolic content and showed comparable efficacy with BHA, BHT, alpha-tocopherol and ascorbic acid in the antioxidant assays. Also, it showed that polyphenolic compounds are the major antioxidants in pyroligneous acid of *R. apiculata*. In the present work, however, the components responsible for the antioxidant activities are unclear. Therefore, further work is in progress for the isolation and identification of the antioxidant components in pyroligneous acid of *R. apiculata*.^[2]

A polysaccharide extracted from the leaf of *Rhizophora apiculata* (RAP) was assessed in cell culture systems, for its activity against human and simian immunodeficiency viruses. RAP inhibited HIV-1 or HIV-2 or SIV strains in various cell cultures and assay systems. It blocked the expression of HIV-1 antigen in MT-4 cells and abolished the production of HIV-1 p24 antigen in peripheral blood mononuclear cells (PBMC); the 50% effective concentration (EC₅₀) of RAP in HIV-1 infected MT-4 cells and in PBMC was 10.7 and 25.9 microg/ml, respectively. RAP (100 microg/ml) completely blocked the binding of HIV-1 virions to MT-4 cells. RAP also reduced the production of viral mRNA when added before virus adsorption. RAP inhibited syncytium formation in cocultures of MOLT-4 cells and MOLT-4/HIV-1(IIIB) cells. RAP did not prolong activated partial thromboplastin time (APTT) up to 500 microg/ml. These properties may be advantageous should RAP be considered for further development.^[3]

The leaves of *R. apiculata*, a plant belonging to the family Rhizophoraceae were collected from the mangrove forest of Sunderbans, West Bengal, India from February to June 2000. Alcoholic extracts of the leaves of this plant was prepared and hypoglycaemic/anti-hyperglycaemic activity was studied in fed male Wistar rats, glucose loaded rats and streptozotocin-induced diabetic rats. The results indicate that this plant extract has potential hypoglycaemic action.^[4]

Therapeutic indication

Stilt mangrove bark has reportedly been used to treat angina, boils, and fungal infections. The leaves and bark have been used as an antiseptic and to treat diarrhea, dysentery, fever, malaria, and leprosy, although it is not clear how effective the treatments have been in each of these cases.^[5]

The plant contains polysaccharides with anti-HIV activity in vitro.^[6]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=3&taxon_id=200014689, Flora of China, 09.04.2008

[2] Weblink: http://www.aseanbiodiversity.info/scripts/count_article.asp%3FArticle_code%3D51007558+%22Rhizophora+apiculata%22+constituents&hl=de&ct=clnk&cd=44&gl=at, Antioxidant and radical scavenging activities of the pyroligneous acid from a mangrove plant, *Rhizophora apiculata*, A.Y. Loo, K. Jain, I. Darah, 09.04.2008

[3] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/10669261>, PubMed, Premanathan M, Arakaki R, Izumi H, Kathiresan K, Nakano M, Yamamoto N, Nakashima H., Department of Microbiology and Immunology, Kagoshima University Dental School, Japan, 09.04.2008

[4] Weblink: <http://www.cababstractsplus.org/google/abstract.asp?AcNo=20043048482>, Cab Abstracts, Sur, T. K., Tapan Seal, Srikantha Pandit, Dipankar Bhattacharyya, Department of Pharmacology, Dr. B.C. Roy Post Graduate Institute of Basic Medical Sciences, 09.04.2008

[5] Weblink: <http://www.agroforestry.net/tti/Rhizophora-IWP.pdf>, Agroforestry.net, Norman C. Duke, 09.04.008

[6] Medicinal Plants of Asia and the Pacific, by Christophe Wiart, CRC Press, ISBN 0-8493-7245-3, pp. 153

Figure: <http://www.starfish.ch/photos/plants-Pflanzen/Rhizophora-apiculata1.jpg>, Starfish,
Photo by Teresa Zubi, 08.09.2008

2.20 Ruscaceae

Erect shrubby perennials, rhizomatous. Bisexual or unisexual, usually dioecious. Branches modified into cladodes, arising in the axils of scale leaves. Cladodes coriaceous, evergreen. Flowers axillary in racemes or fascicles on the cladodes. Perianth in 2 whorls; segments free or basally united. Male-flower: stamens 3 or 6, united into a tube; anthers sessile. Female flower: ovary 1-3-locular; superior. Fruit a berry, 1-2(-4)-seeded.

A family of 3 genera distributed chiefly in the Mediterranean region, W. Europe and Caucasus. Represented in Pakistan by one genus.

The family is included under Liliaceae by most authors but can be separated from it on account of its cladodes and united stamens. Hutchison (Fam. Flow. Pl. 2:111.1934) suggests that it can be regarded as a highly advanced tribe of Liliaceae or as a separate family.^[1]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=10779, Flora of Pakistan, 12.07.2008

Pleomele angustifolia Roxb. (Suji)

Synonym: *Dracaena angustifolia* Roxb.



Pleomele angustifolia Roxb.

Occurrence and appearance

Plants shrubby, rhizomatous, 1-3 m tall. Stems simple or few branched; internodes often longer than wide; bark grayish, smooth. Leaves spaced along distal part of stems, subsessile or indistinctly petiolate; petiole to 1 cm, base not completely covering internode; leaf blade nearly sword-shaped to linear-oblongate, 20-45 × 1.5-5.5 cm. Inflorescence terminal, branched, 30-50 cm; rachis glabrous. Flowers in clusters of 2 or 3; pedicel 7-8 mm, articulate distally or near apex. Perianth greenish white, 1.9--2.3 cm; tube 7-8 mm; lobes 1.1-1.6 cm. Filaments filiform; anthers 2-3 mm. Style 5-8 × as long as ovary. Berry orange, globose, 0.8-1.2 cm in diam., 1- or 2-seeded. Fl. Mar-May, fr. Jun-Aug. 2n = 40.^[1]

Therapeutic indication

Traditional uses: beriberi, gonorrhea, stomach.^[2,3]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=200027618, Flora of China, 05.04.2008

[2] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 640

[3] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: <http://biodiversity.sci.kagoshima-u.ac.jp/suzuki/halimun/plant/live/dscn1449s.jpg>, Faculty of Science Kagoshima University, Photo by Eiji Suzuki, 08.09.2008

2.21 Rutaceae

Citrus family

Shrubs, trees, or sometimes herbs, sometimes scrambling or scandent, sometimes armed, with aromatic volatile oils contained in glands visible at surface of at least leaves, young branchlets, inflorescences, flower parts, fruit, or cotyledons in seed. Stipules absent [or stipular excrescences rarely present]. Leaves alternate, opposite [or whorled], simple (petiole neither apically swollen nor articulate with leaf blade), 1-foliolate (in individual specimens at least some 1-foliolate leaves with petiole apically swollen and/or articulate with leaf blade), or variously compound. Flowers bisexual or unisexual, usually 3-5-merous, actinomorphic or rarely zygomorphic, hypogynous [or rarely perigynous]. Perianth in 2 series, with clearly differentiated calyx and corolla or sometimes in 2 irregular series or 1 series, with $\pm$ undifferentiated tepals. Sepals distinct or connate to their full length. Petals distinct [or rarely coherent or connate for part of their length]. Stamens usually as many as or 2 $\times$ as many as petals or sometimes more numerous; filaments distinct or sometimes coherent or connate for at least part of their length; anthers introrse or sometimes latrorse, longitudinally dehiscent. Disk [rarely lacking] within androecium, nectariferous, flattened, annular, cup-shaped, pulvinate, or sometimes columnar, bell-shaped, conic, or hourglass-shaped. Gynoecium of 1-5 distinct 1-loculed carpels or 2 to many partially to completely connate carpels; placentation axile [very rarely becoming parietal]; ovules 1 to many per locule. Fruit of 2-5 follicles [drupes or samaras] or a single follicle, capsule, or berry [or samara]. Seeds with relatively large embryo; endosperm present and fleshy or lacking.

About 155 genera and ca. 1600 species: nearly cosmopolitan but mainly tropical and subtropical; 22 genera (one endemic, one introduced) and 126 species and hybrid species (49 endemic, at least two introduced) in China.

Oil glands of Rutaceae, when viewed from the surface of plant parts they occupy, are usually pellucid. They also appear to be $\pm$ isodiametric and to have $\pm$ definite patterns of distribution. In blades of leaves, for example, where they are most commonly observed, they are usually $\pm$ evenly scattered throughout, or sometimes they are restricted to the margins. Rarely they are alleged to occur only along the secondary veins of the blades.^[1]

The most economically important genus in the family is *Citrus*, which includes the orange (*C. sinensis*), lemon (*C. $\times$ limon*), grapefruit (*C. paradisi*), and lime (various, mostly *C. aurantifolia*, the key lime). *Boronia* is a large Australian genus, some members of which are plants with highly fragrant flowers and are used in commercial oil production. Other large genera include *Zanthoxylum* and *Agathosma*.^[2]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=10781, Flora of China, 12.07.2008

[2] Weblink: <http://en.wikipedia.org/wiki/Rutaceae>, Wikipedia, 12.07.2008

Citrus aurantifolia Swingle (Jeruk Nipis)

Synonyms: *Citrus medica* L., *Citrus acida* Roxb., Mexican Lime



Citrus aurantifolia Swingle

Occurrence and appearance

It is a shrub or small tree with greenish-grey bark. The leaves are coriaceous; leaflets are elliptic-oblong or ovate-lanceolate and actuse or obtuse. The flowers often are unisexual, 2.5 cm long, white and 5-10 in a raceme. The fruits are globular, ovoid or oblong, often mamillate at the apex; rind is thin and tightly attached, yellow when ripe; pulp yellow-green and usually acidic with pleasant smell.

Flowering is during March-April and fruiting in May-June.^[1]

Parts used

Fruits and aerial parts of the plant are used.^[1]

Constituents

The flowers and buds have amino acids, L-aspartic acid, L-leucine, L-threonine and L-tryptophan. The fruits contain ascorbic acid, fructose, glucose, sucrose, pectins, γ -aminobutyric and 9, 16-dihydroxy-10-oxohexadecanoic acids, jasmonic acid and its methylester, eriodictyol, 7-rutinosides of hesperetin and naringenin. The seeds contain 6, 7-dinethoxycoumarin and tangeretin. In leaves, bergapten, citropten, crisoeriol-7-rhamnoglucoside, eriocitrin, isopimpinellin, limettin, deoxyribonucleic acid and starch are found. The leaf-oil contains citronellal, citronellol, geranial, geranyl acetate, isopulegol, limonene, linalool, myrcene, nerol and its acetate, ocimene and methylhentenone. The bark is reported to contain 1,3- β – glucon synthase and xanthyletin.^[1]

Pharmacologic properties

The fruits are considered antiscorbutic, antiseptic, appetizing, astringent, digestive and stomachic and are used in liver troubles and in vomiting. The juice of the fruits is used as a refrigerant drink in burning sensation and in allaying thirst. Ethyl alcohol (50%) extract of the aerial parts is central nervous system depressant and diuretic. Besides, the plant has also been reported to be used against syphilis and in fractures.^[1]

Therapeutic indication

Action: antidot (manihot), antiseptic, bactericide, carminative, emetic, laxative, pediculicide, purgative, refrigerant, stomachic, venereal, vermifuge. Traditional uses: bilious, catarrh, collyrium, common cold, cough, cystitis, depurative, dermatosis, diarrhea, dropsy, dysentery, dysmenorrhea, empacho, epistaxis, erysipelas, fever, flu, gonorrhea, headache, hepatitis, insomnia, jaundice, nausea, neuralgia, newborn, ophthalmia, pneumonia, rheumatism, scorpion sting, scurvy, sore, stomach ache, stomatitis, thrush, toothache, trachoma, tumor, wounds, yaws, yellow fever.^[2,3]

Lime juice dispels the irritation and swelling of mosquito bites.

In Malaya, the juice is taken as a tonic and to relieve stomach ailments. Mixed with oil, it is given as a vermifuge. The pickled fruit, with other substances, is poulticed on the head to allay neuralgia. In India, the pickled fruit is eaten to relieve indigestion. The juice of the Mexican lime is regarded as an antiseptic, tonic, an antiscorbutic, an astringent, and as a diuretic in liver ailments, a digestive stimulant, a remedy for intestinal hemorrhage and hemorrhoids, heart palpitations, headache, convulsive cough, rheumatism, arthritis, falling hair, bad breath, and as a disinfectant for all kinds of ulcers when applied in a poultice.

The leaves are poulticed on skin diseases and on the abdomen of a new mother after childbirth. The leaves or an infusion of the crushed leaves may be applied to relieve headache. The leaf decoction is used as eye drops and to bathe a feverish patient; also as a mouth wash and gargle in cases of sore throat and thrush.

The root bark serves as a febrifuge, as does the seed kernel, ground and mixed with lime juice.

In addition, there are many purely superstitious uses of the lime in Malaya.^[4]

Particularities

Effects of Hesperidin on cyclic strain-induced endothelin-1 release in human umbilical vein endothelial cells.

1. Hesperidin, a member of the flavanone group of flavonoids, can be isolated in large amounts from the rinds of some citrus species and has been reported to have antihypotensive and vasodilator properties. However, the mechanism of action of hesperidin in the prevention and treatment of vascular diseases remains unclear.

2. The vascular endothelium can produce potent contracting factors, such as endothelin (ET)-1, and endothelium-derived relaxing factors, such as nitric oxide (NO). The aims of the present study were to test the hypothesis that

hesperidin may alter strain-induced ET-1 secretion and NO production and to identify the putative underlying signalling pathways in human umbilical vein endothelial cells (HUVEC).

3. Hesperidin (10 and 100 mmol/L) inhibited strain-induced ET-1 secretion. Hesperidin also inhibited strain-induced increases in the formation of reactive oxygen species and extracellular signal-regulated kinase (ERK) phosphorylation.

4. Hesperidin treatment of HUVEC enhanced NO production, endothelial NO synthase (eNOS) activity and the phosphorylation of eNOS and Akt. Furthermore, hesperidin modulated strain-induced ET-1 release and suppressed ERK phosphorylation in part via the NO/protein kinase G pathway.

5. In summary, it was demonstrated that hesperidin inhibits strain-induced ET-1 secretion and enhances NO production in HUVEC.^[5]

Activity against drug resistant-tuberculosis strains of plants used in Mexican traditional medicine to treat tuberculosis and other respiratory diseases.

Tuberculosis (TB) kills about 3 million people per year worldwide. Furthermore, TB is an infectious disease associated with HIV patients, and there is a rise in multidrug-resistant TB (MDR-TB) cases around the world. There is a need for new anti-TB agents. The study evaluated the antimycobacterial activity of nine plants used in Mexican traditional medicine to treat tuberculosis and other respiratory diseases. *Nasturtium officinale* showed the best activity (MIC = 100 microg/mL) against the sensitive *Mycobacterium tuberculosis*. The following plants were active also but at 200 microg/mL: *Citrus sinensis*, *Citrus aurantifolia*, *Foeniculum vulgare*, *Larrea tridentata*, *Musa acuminata* and *Olea europaea*. Contrary to the above data, activity against drug-resistant variants of *M. tuberculosis* was more evident, e.g. *N. officinale* was the most potent (MIC $\leq$ 100 microg/mL) against the four mono-resistant variants tested; *F. vulgare* and *O. europaea* were active against all the resistant variants (MICs $\leq$ 100 microg/mL). The most susceptible variant was the isoniazid resistant, being inhibited by *C. aurantifolia*, *C. sinensis* and *O. europaea* (MIC = 25 microg/mL). These data point to the importance of biological testing of extracts against drug-resistant *M. tuberculosis* isolates, and the bioguided assay of these extracts for the identification of lead compounds against MDR-TB isolates.^[6]

Antibacterial properties of tropical plants from Puerto Rico.

In an effort to document the antibacterial properties of plants commonly used by the people of Puerto Rico, the effects of 172 plant species were studied, utilizing the disc diffusion method, against *Escherichia coli* and *Staphylococcus aureus*. The methanolic extracts of 14 species showed antibacterial activities during this preliminary screen. These positive plant extracts were tested successively over 15 additional species. The results showed that extracts from *Citrus aurantifolia* (Rutaceae), *Citrus aurantium* (Rutaceae), *Punica granatum* (Punicaceae), *Phyllanthus acidus* (Euphorbiaceae) and *Tamarindus indica* (Caesalpiniaceae) possess strong in vitro antibacterial activity against the bacteria tested.^[7]

Immunomodulatory effect of concentrated lime juice extract on activated human mononuclear cells.

In this study, the in vitro immunomodulatory effect of concentrated juice of *Citrus aurantifolia* cv. swingle (Lime) was investigated. Clarified fresh lime juice was concentrated by freeze-drying. After dialysis against phosphate buffered saline and sterilization by a Millipore filter, it was used for further experiments. Immunogenic property of the CLJ extract was documented by production of specific polyclonal antibodies in rabbits. The immunomodulatory effect of the extract was tested in mitogen activated cultured mononuclear cells. The culture results indicated that proliferation of phytohemagglutinin (PHA) activated mononuclear cells were significantly inhibited by 250 and 500 microg/ml of CLJ extract, whereas only 500 microg/ml of the extract could inhibit proliferation of staphylococcal protein A (SPA) activated mononuclear cells ($P < 0.05$). The abrogation of this inhibitory effect of the CLJ extract was noted by adding anti-CLJ antibody to the lymphocyte culture. Considering these data, it can be concluded that the CLJ extract possesses immunomodulatory principles, which may mainly be due to the protein components of the extract.^[8]

[1] MEDICINAL PLANTS AND RAW DRUGS OF INDIA, Purshotam Kaushik, Anil Kumar Dhiman; Printed by Gajendra Singh Gahlot at Shiva Offset Press, for Bishen Singh Mahendra Pal Singh, Dehra Dun, and Typesetting at Doon Phototype Printers, 14, Old Connaught Place, Dehra Dun, India, 2000, ISBN-81-211-0174-3, pp 148-149

[2] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 208

[3] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 11.04.2008

[4] Weblink: http://www.hort.purdue.edu/newcrop/morton/mexican_lime.html, NewCrop, Purdue University, 05.05.2008

[5] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18430059>, PubMed, Chiou CS, Lin JW, Kao PF, Liu JC, Cheng TH, Chan P., Department of Medicine, Taipei Medical University Hospital, Taipei, Taiwan. 11.04.2008

[6] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/17726732>, PubMed, Camacho-Corona Mdel R, Ramírez-Cabrera MA, Santiago OG, Garza-González E, Palacios Ide P, Luna-Herrera J., Laboratorio de Química de Productos Naturales, Facultad de Ciencias Químicas, Universidad Autónoma de Nuevo León, Mexico. 12.04.2008

[7] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/16492531>, PubMed, Meléndez PA, Capriles VA., Department of Biology, Inter American University of Puerto Rico, San Germán Campus, San Germán, Puerto Rico, 12.04.2008

[8] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/11483382>, PubMed, Gharagozloo M, Ghaderi A., Immunology Department, Medical School, Shiraz University of Medical Sciences, 12.04.2008

Figure: http://commons.wikimedia.org/wiki/Image:Citrus_%C3%97aurantifolia927505341.jpg, Wikimedia Commons, Photo by Matt, 08.09.2008

Citrus mitis Blanco (Limaú)

Synonyms: Citrofortunella microcarpa Bunge, Citrus madurensis Lour, Calamondine, China Orange, Citrofortunella, Panama Orange



Citrus mitis Blanco

Occurrence and appearance

Small shrubby tree, c. 2 m tall, not spiny. Leaves 6.5 x 3.2 cm, obovate to broadly-ovate, obtuse, margin crenulate; petiole very narrowly margined. Flowers bisexual, solitary. Fruit 30 x 27 mm, oblate; rind thin, orange-red, smooth and loosely attached; core hollow. Pulp deep orange, acid.

Calamondin orange is usually cultivated in pots as a dwarf ornamental. It blooms throughout the year. Its bitter acid fruit may be used instead of lime.^[1]

Parts used

Fruit

Constituents

The volatile constituents of fresh calamondin (*Citrus madurensis* Lour.) cultivated in the Philippines were investigated by GC and GC/MS. As a result, 58 and 98 compounds were identified from the peel and juice volatile concentrates, respectively. The characteristic flavor components of calamondin were examined by GC-olfactometry. Limonene, cis-linalool oxide, linalool, α -terpineol, (E,E)-2,4-decadienal, and methyl N-methyl anthranilate had high flavor dilution factors. Additionally, the enantiomeric ratio of limonene, linalool, terpinen-4-ol and α -terpineol in calamondin were measured by chiral GC.^[2]

Therapeutic indication

The juice expressed from the fruit is applied externally to calm insect bites, to

heal buboes, to promote the growth of hair, to cool, to treat cough, to perfume, and to soothe inflammation.^[3]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=242313274, Flora of Pakistan, 09.04.2008

[2] Weblink: http://findarticles.com/p/articles/mi_qa4091/is_/ai_n9474293, Bnet, Volatile Constituents of Calamondin Peel and Juice (*Citrus madurensis* Lour.) Cultivated in the Philippines, Journal of Essential Oil Research: JEOR, Jan/Feb 2005 by Takeuchi, Hiroaki, Ubukata, Yoshihito, Hanafusa, Masayoshi, Hayashi, Shuichi, Hashimoto, Seiji, 09.04.2008

[3] Medical Plants of Asia and the Pacific, Christophe Wiart, CRC Press 2006, ISBN: 0-8493-7245-3, pp 218

Figure: <http://davesgarden.com/guides/pf/showimage/33574/>, Daves Garden, Photo by Thaumaturgist, 08.09.2008

2.22 Staphyleaceae

Trees or shrubs, deciduous or evergreen. Leaves opposite, odd-pinnately compound, or trifoliate, rarely simple, stipulate or exstipulate; leaflets with petiolules, less commonly sessile, pinnately veined. Flowers bisexual to rarely unisexual, pinkish to white, pendent or erect, actinomorphic and hypogynous, arranged in panicles or racemes. Sepals 5, often petaloid, caducous or persistent, imbricate. Petals 5, free or connate at base, imbricate, rarely valvate, as equal as sepals. Stamens 5; filaments free or inserted on corolla tube, alternating with corolla lobes; anthers dehiscent by longitudinal slits. Disk annular to barely discernible. Gynoecium superior; carpels 2 or 3(or 4), free or weakly united, lobed ovary with as many locules as carpels; style free or slightly united; ovules 1 to several and arranged in 2 rows. Fruits inflated capsules or follicles or berrylike drupes. Seeds globose to ovoid; arillode present or absent.

Three genera and 40-50 species: mainly in tropical or subtropical regions, especially in the N Hemisphere.^[1]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=10848, Flora of China, 06.04.2008

Turpinia montana Kurz. (Karas Tulang)

Synonym: *Zanthoxylum montanum* Blume



Turpinia montana Kurz.

Occurrence and appearance

Small trees; branches greenish white. Leaves odd-pinnate; rachis ca. 15 cm, slim; leaflets 5; terminal petiolule up to 15 mm, slender, green, lateral ones 2-3 mm; leaflet blades oblong to oblong-oval, (4-)4.5-6 × 1.5-4 cm, papery, glabrous, adaxially green, abaxially greenish, lateral veins many, conspicuous abaxially and faint adaxially, base broadly cuneate, margin sparsely crenate or serrate, apex cuspidate with cusp 5-7 mm. Inflorescence terminal, main axis up to 17 cm. Flowers small, ca. 3 mm in diam., densely arranged on panicle. Sepals broadly ovate, ca. 1.3 mm, glabrous. Petals ovate to rounded, ca. 2 mm, tomentose or glabrescent. Filaments glabrous. Ovary 2- or 3-locular; ovule 1 per locule. Berry dark purple, globose, 4-7 mm in diam., exocarp thin, ca. 0.2 mm.^[1]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=200012880, Flora of China, 06.04.2008

Figure: <http://i134.photobucket.com/albums/q86/treelearner/Tree/Turpinia%20montana/tree.jpg>, HKWildlife.Net Forum, Photo by treelearner, 08.09.2008

2.23 Sterculiaceae

Trees or shrubs, rarely herbs or liane; young growth usually stellately hairy; bark mucilaginous and rich in fibers. Leaves alternate; stipules usually present caducous; leaf blade simple, rarely palmately compound, entire, serrate, or parted. Inflorescence axillary or rarely terminal, paniculate, corymbose, racemose, or cymose, rarely solitary. Flowers unisexual, bisexual or polygamous. Sepals (3-)5, $\pm$ connate, rarely free, valvate. Petals 5 or lacking, free or adnate to base of androecium, convolutedly imbricate. Androgynophore usually present; filaments usually connate into a single tube; staminodes 5, tongue-like or filiform, opposite to sepals, sometimes lacking; anthers 2-celled, longitudinally dehiscent. Pistil consisting of 2-5 (or 10-12) $\pm$ connate carpels, or a single carpel; ovary superior, 2-5 (or 10-12)-loculed; ovules 2 or more per locule; style 1 or as many as carpels. Fruit usually a capsule or follicle, dehiscent or indehiscent, very rarely a berry or nut. Seeds with abundant endosperm or endosperm lacking; embryo straight or curved.

About 68 genera and ca. 1100 species: tropics and subtropics of both hemispheres, a few in temperate regions.^[1]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=10850, Flora of China, 05.04.2008

Sterculia rubiginosa Vent. (Hantap)



Sterculia rubiginosa Vent.

Occurrence and appearance

Sub-canopy tree up to 26 m tall and 41 cm dbh. Stipules ca. 20 mm long, very narrow. Leaves alternate, simple, penni- to tripli-veined, hairy lower surface. Flowers ca. 11 mm diameter, white-yellow-pink-red, placed in panicles. Fruits ca. 60 mm long, red, dehiscent capsule with black seeds.^[1]

Parts used

The timber is used.^[1]

Therapeutic indication

Action: laxative.^[2]

[1] Weblink: http://www.nationaalherbarium.nl/sungaiwain/Malvaceae/Sterculia_rubiginosa.htm, National Herbarium Netherlands, 05.04.2008

[2] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: http://toptropicals.com/pics/garden/m1/Podarki5/Sterculia_rubiginosa_1MKh.jpg, Top Tropicals, Photo by Marina Khaytarova, 08.09.2008

2.24 Tiliaceae

Trees, shrubs, or herbs. Leaves simple, alternate or rarely opposite, basally veined, entire or serrate, sometimes lobed; stipule, when present, caducous or persistent. Inflorescences cymose or cymose-paniculate. Flowers bisexual or unisexual (plants dioecious), actinomorphic. Bracts caducous or sometimes large and persistent. Sepals (4 or) 5, free or sometimes basally connate, valvate. Petals as many as sepals, sometimes absent, free, usually glandular on adaxial surface. Androgynophore present or absent. Stamens numerous, rarely 5, free or connate into fascicles at base; anthers 2-loculed, dehiscence longitudinal or apical; petaloid staminodes alternating with petals or absent. Ovary superior, 2-6-loculed, sometimes more; ovules 1 to many per locule; placentation axile; style simple, sometimes free; stigma acute or peltate, usually lobed. Fruit usually a drupe, capsule, or schizocarp, sometimes a berry or samara, 2-10-loculed. Seeds without aril; endosperm copious; embryo erect; cotyledons flat.

About 52 genera and ca. 500 species: primarily in tropical and subtropical areas.^[1]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=10898, Flora of China, 05.04.2008

Triumfetta rhomboidea Jacq. (Pungpurutan)

Synonyms: *Triumfetta bartramia* L., Diamond Burbark



Triumfetta rhomboidea Jacq.

Occurrence and appearance

It is an annual or perennial, erect and simple or branched hirsute herb with about 10-90 cm height. The leaves are cordate, rhomboid or ovate, irregularly serrate and usually 3-lobed. The flowers are yellow, small and about 1.9 cm across and are borne in dense cymes. The sepals are lanceolate-narrowly oblong, mucronate and stellate-hairy outside. The petals are oblong and shorter than sepals. The fruit are ovoid or globose capsules with smooth hooked spines. The seeds are 0.3 cm x 0.2 cm.

Flowering and fruiting is during October-December.^[1]

Parts used

The leaves, bark, root, flowers and fruits are used.^[1]

Constituents

The plants been reported to contain 4-hydroxyisoxazole and triumfoidin.^[1]

Pharmacologic properties

The leaves, flowers and fruits are mucilaginous, demulcent and astringent and these are given to promote parturition when it is delayed. Nadkarni, reported that the flowers are rubbed with sugar and water and are given in gonorrhoea to stop burning sensation caused by urine. The bark and fresh leaves are used in diarrhoea and dysentery. The leaves and flowers are used in leprosy. The root is considered diuretic and a hot infusion of these is given to facilitate the child birth. Besides, the roots are pounded and are given for intestinal ulcer.^[1]

The essential oil of the aerial parts of *Triumfetta rhomboidea* was analysed by GC and GC-MS and assayed for its antibacterial and antifungal activities. The main constituents identified were trans--caryophyllene (22.4%), kessane

(14%) and caryophyllene oxide (13%). The antimicrobial tests showed a mild activity against *Escherichia coli* and *Enterococcus hirae*.^[2]

Therapeutic indication

Action: venereal. Traditional uses: carbuncle, convulsion, sore, spiderlick, tongue, tumor, whitlow.^[3,4]

[1] MEDICINAL PLANTS AND RAW DRUGS OF INDIA, Purshotam Kaushik, Anil Kumar Dhiman; Printed by Gajendra Singh Gahlot at Shiva Offset Press, for Bishen Singh Mahendra Pal Singh, Dehra Dun, and Typesetting at Doon Phototype Printers, 14, Old Connaught Place, Dehra Dun, India, 2000, ISBN-81-211-0174-3, pp 137-138

[2] Weblink: <http://www3.interscience.wiley.com/cgi-bin/abstract/110503032/ABSTRACT?CRETRY=1&SRETRY=0>, Wiley InterScience, Composition and antimicrobial activities of the essential oil of *Triumfetta rhomboidea* Jacq., J. P. Mevy, J. M. Bessiere, J. Rabier, M. Dherbomez, M. Ruzzier, J. Millogo, J. Viano, 02.04.2008

[3] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 854

[4] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 01.04.2008

Figure: <http://www.hear.org/Pier/imagepages/singles/trrhop10.htm>, Hear.org, Photo by Cook Islands Biodiversity Database, G.McCormack, 08.09.2008

2.25 Zingiberaceae

Ginger family

Herbs perennial, terrestrial, rarely epiphytic, aromatic, with fleshy, tuberous or non-tuberous rhizomes, often with tuber-bearing roots. Stems usually short, replaced by pseudostems formed by leaf sheaths. Leaves distichous, simple, those toward base of plant usually bladeless and reduced to sheaths; leaf sheath open; ligule usually present; petiole present or not, located between leaf blade and sheath, cushionlike in *Zingiber*; leaf blade suborbicular or lanceolate to narrowly strap-shaped, rolled longitudinally in bud, glabrous or hairy, midvein prominent, lateral veins usually numerous, pinnate, parallel, margin entire. Inflorescence terminal on pseudostems or on separate, short, sheath-covered shoots arising from rhizomes, cylindric or fusiform, sometimes globose, lax to dense, few to many flowered, sometimes with bracteolate cincinni in bract axils and then a thyrs, sometimes a raceme or spike; bracts and bracteoles present, often conspicuous, colored. Flowers bisexual, epigynous, zygomorphic. Calyx usually tubular, thin, split on 1 side, sometimes spathe-like, apex 3-toothed or -lobed. Corolla proximally tubular, distally 3-lobed; lobes varying in size and shape. Stamens or staminodes 6, in 2 whorls. Lateral 2 staminodes of outer whorl petaloid, or forming small teeth at base of labellum, or adnate to labellum, or absent. Median staminode of outer whorl always reduced. Labellum formed from lateral 2 staminodes of inner whorl. Fertile stamen median, of inner whorl; filament long or short; anther locules 2, introrse, dehiscent by slits or occasionally pores; connective often extended basally into spurs and/or apically into a crest. Ovary inferior, 3-loculed initially, 1- or 3-loculed when mature; ovules $\pm$ numerous per locule; placentation parietal, basal, or axile. Developed style 1, very thin, placed in a furrow in filament and between anther locules; stigma appearing above anther, funnelform, papillose, $\pm$ wet, margin often ciliate. Stylodes 2, reduced to nectaries at apex of ovary. Fruit a capsule, fleshy or dry, dehiscent or indehiscent, sometimes berrylike. Seeds few to many, arillate; aril often lobed or lacerate.

Zingiberaceae includes about 50 genera and 1300 species^[1]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=10960, Flora of China, 12.07.2008

Alpinia galanga Willd. (Laja)

Chewing John, Little John Chew, Langkwass, Galanga Root



Alpinia galanga Willd.

Occurrence and appearance

The plant grows from rhizomes in clumps of stiff stalks up to two meters in height with abundant long leaves which bears red fruit. *Alpinia galanga* is the galangal used most often in cookery. The robust rhizome has a sharp, sweet taste and smells like a blend of black pepper and pine needles. The red fruit is used in traditional Chinese medicine and has a flavor similar to cardamom.

The rhizome is a common ingredient in Thai soups and curries, where it is used fresh in chunks or thin slices, mashed and mixed into curry paste, or dried and powdered. Indonesian rendang is usually spiced with galanga. Greater galanga is used in Russia as a flavoring for beverages, including a liqueur called nastoika.^[1]

Parts used

Rhizome and fruit.

Constituents

The rhizome contains up to 1.5% essential oil (1,8 cineol, α -pinene, eugenol, camphor, methyl cinnamate and sesquiterpenes). In dried galanga, the essential oil has quantitatively different composition than in fresh one. Whereas α -pinene, 1,8-cineol, α -bergamotene, trans- β -farnesene and β -bisabolene seem to contribute to the taste of fresh galanga equally, the dried rhizome shows lesser variety in aroma components (cineol and farnesene, mostly).

The resin causing the pungent taste (formerly called galangol or alpinol) consists of several diarylheptanoids and phenylalkanones (the latter are also

found in ginger and grains of paradise). Furthermore, the rhizome is high in starch.^[2]

Pharmacologic properties

They have no well-defined medicinal use, although they have been advocated for many of the disorders that are treated with ginger. In Germany, herbalists use lesser galanga for dyspepsia biliary symptoms, bowel spasm and angina.^[3]

The tubers and seeds are said to possess carminative properties. The drug has a slight irritant action on the mucous membrane of the stomach and this may be used in producing a reflex increase in the bronchial secretion. As the oil is excreted through the lungs, it acts as an expectorant.

Intravenous injections of small doses of a tincture or an infusion of *A. galanga*, produce a sharp fall in blood pressure in experimental animals. The blood pressure, however comes to normal in short time. The fall in blood pressure is accompanied by a rise in the volume of the intra- abdominal organs like the spleen and the intestines showing that dilation of the splanchnic blood vessels is one of the causes of the fall of blood pressure. The contractions of both the auricle and the ventricle are lessened showing that the drug has a depressant action on the heart. Dilatation of the peripheral blood vessels is observed when they are perfused with physiological saline solutions containing various concentrations of the drug. The drug is depressant to the cardiovascular system.

Respirations in experimental animals are stimulated in small doses but depressed with larger ones, the respiratory centre being paralysed. The important action of the drug is, however, on the bronchiles and this effect is much more pronounced when the dose is increased. Asthma-like conditions produced artificially in animals by administering pilocarpine are immediately relieved by small doses of the tincture of *A. galanga*.

The drug has no marked action on other systems of the body. The secretion of urine is slightly diminished, but this effect appears to be vascular, for the rate of secretion comes to normal as soon as the blood pressure comes to normal. The isolated uterus is relaxed and its contractions become regular. The action of the gastro-intestinal tract is similar to that produced by other essential oils.^[4]

Therapeutic indication

Action: cardiodepressant, carminative, digestive, expectorans, stimulant. Traditional uses: bronchitis, cancer, catarrh, parturition, rheumatism, ringworm, splenomegaly, stomachic.^[5,6]

Dose and method of administration

Powder 5 to 10 grains, tincture 1 in 10, dose $\frac{1}{2}$ to 1 drachm. Paste made with any bland oil to apply locally in skin diseases.^[4]

Particularities

Osteoclastogenesis is commonly associated with various age-related diseases, including cancer. A member of the tumor necrosis factor superfamily, receptor activator of nuclear factor- κ B (NF- κ B) ligand (RANKL),

has been shown to play a critical role in osteoclast formation and bone resorption. Thus, agents that suppress RANKL signaling have a potential to suppress bone loss. In this report, we investigated the effect of 1 - acetoxychavicol acetate (ACA), a component of *Alpinia galanga*, on RANKL signaling and consequent osteoclastogenesis in RAW 264.7 cells, a murine monocytic cell line. Treatment of these cells with RANKL activated NF- κ B, and coexposure of the cells to ACA completely suppressed RANKL-induced NF- κ B activation in a time- and concentration-dependent manner. The suppression of NF- κ B by ACA was mediated through suppression of RANKL-induced activation of I κ B α kinase, I κ B α phosphorylation, and I κ B α degradation. Furthermore, incubation of monocytic cells with RANKL induced osteoclastogenesis, and ACA suppressed it. Inhibition of osteoclastogenesis was maximal when cells were simultaneously exposed to ACA and RANKL and minimum when ACA was added 2 days after RANKL. ACA also inhibited the osteoclastogenesis induced by human breast cancer MCF-7 cells, multiple myeloma MM1 cells, and head and neck squamous cell carcinoma LICR-LON-HN5 cells. These results indicate that ACA is an effective blocker of RANKL-induced NF- κ B activation and of osteoclastogenesis induced by RANKL and tumor cells, suggesting its potential as a therapeutic agent for osteoporosis and cancer-associated bone loss.^[7]

Chloroform extracts of selected Thai medicinal plants commonly employed to treat infections were investigated for their antibacterial activity against important foodborne pathogenic bacteria. These included *Bacillus cereus*, *Staphylococcus aureus*, methicillin-resistant *S. aureus* (MRSA), *Escherichia coli* O157:H7, *Salmonella Typhi* and *Shigella* sp. Among 33 extracts tested, only chloroformic extracts of five plant species exhibited antibacterial properties. *Alpinia galanga*, *Boesenbergia rotunda*, *Zingiber zerumbet* and *Piper betel* were active against *S. aureus*. *Barleria lupulina* was active against *B. cereus*. Only the extract from *P. betel* leaves possessed activity against gram-negative bacteria. As extracts from the three plant species belonging to family Zingiberaceae displayed strong activity against *S. aureus*, they were further tested against 17 clinical isolates. Minimum inhibitory concentration (MIC) values of *B. rotunda*, *A. galanga* and *Z. zerumbet* extracts against most clinical *S. aureus* isolates were 0.01, 0.19 and 0.79 mg/mL and the minimum bactericidal concentration (MBC) values were 0.19, 1.57 and >12.5 mg/mL, respectively. Significant growth inhibition of MRSA was observed in the cultures incubated in the presence of the *B. rotunda* extract, *A. galanga* and *Z. zerumbet*. *B. rotunda* exhibited the greatest activity among the three plant species against *S. aureus* at MIC, 2MIC and MBC within 2 h.^[8]

[1] Weblink: http://en.wikipedia.org/wiki/Alpinia_galanga, Wikipedia, 20.03.2008

[2] Weblink: http://www.uni-graz.at/~katzer/engl/Alpi_gal.html, Gernot Katzer's Spice Page, 20.03.2008

[3] Weblink: <http://web.archive.org/web/20070225093004/unitproj.library.ucla.edu/biomed/spice/index.cfm?displayID=29>, History & Special Collections Louise M. Darling Biomedical Library, 20.03.2008

[4] Herbs Cultivation and Medicinal Uses, H. Panda, ISBN 8186623469, pages 135-136

[5] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 34

[6] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and

Ethnobotanical Databases, 04.04.2008

[7] Weblink: <http://cat.inist.fr/?aModele=afficheN&cpsidt=17710842>, INIST-CNRS, 1'-acetoxychavicol acetate inhibits RANKL-Induced osteoclastic differentiation of RAW 264.7 monocytic cells by suppressing nuclear factor- κ B activation, ICHIKAWA Haruyo ; MURAKAMI Akira; AGGARWAL Bharat B., Molecular cancer research, ISSN 1541-7786, 21.03.2008

[8] Weblink: <http://www.blackwell-synergy.com/doi/abs/10.1111/j.1745-4565.2006.00052.x>, ANTIBACTERIAL ACTIVITY OF EXTRACTS FROM FAMILY ZINGIBERACEAE AGAINST FOODBORNE PATHOGENS, S.P. VORAVUTHIKUNCHAI, S., O. and S. SUBHADHIRASAKUL, 21.03.2008

Figure: <http://www.flickr.com/photos/haile/416405285/>, flickr, Photo by Hai Le, 08.09.2008

Amomum cardamomum L. (Kapol)

Synonyms: *Amomum compactum* Sol. ex Maton, *Amomum kepulaga* Sprague & Burkill, Javanese cardamom



Amomum cardamomum L.

Occurrence and appearance

Plants 1 - 1.5 m tall. Leaves sessile; ligule orbicular, 2-cleft, 5 - 7 mm, initially pubescent, later ciliate at margin; leaf blade lanceolate, 25 - 50 × 4 - 9 cm, glabrous except ciliate at margin, apex caudate, with tip 2.5 - 3 cm. Spikes cylindric, ca. 5 × 2.5 cm, elongate after anthesis; peduncle to 8 cm; bracts yellow, ovate-oblong, 2 - 2.5 cm × 7 - 10 mm, longitudinally striate, persistent, margin ciliate; bracteoles tubular. Calyx 1 - 1.2 cm, pubescent, apex 3-toothed. Corolla white or yellowish; tube 1 - 1.2 cm; lobes oblong, ca. 8 mm. Lateral staminodes absent. Labellum yellowish with orange midvein and purple margin, elliptic, 1.5 - 1.8 × 1 - 1.5 cm, slightly concave, pubescent. Filament hairy at base; anther elliptic, ca. 2 mm; connective appendage 3-lobed, ca. 4 mm. Ovary pilose. Capsule yellowish, oblate, 1 - 1.5 cm in diam., slightly 9-grooved when dry, pilose. Seeds irregularly polyhedral, ca. 4 mm in diam.^[1]

Parts used

Capsule, seed

Constituents

In the seeds of round cardamom from Jawa (*A. kepulaga*), the content of essential oil is lower (2 to 4%) than in *Elettaria cardamomum* (Cardamom), and the oil contains mainly 1,8 cineol (up to 70%) plus β -pinene (16%); furthermore, α -pinene, α -terpineol and humulene were found.^[2]

Pharmacologic properties

The plants are used in folk remedies for indurations of the liver and uterus and for cancer. Reported to be antitoxic, antiemetic, carminative and stomachic, round cardamom is a folk remedy for ague, cachexia, cancer, catarrh, cold, cough, cramps, dyspepsia, gout, heartburn, hepatitis, neusea, ophthalmia, rheumatism and vomiting. Rarely used alone in China, more frequently used in combinations, e.g. mixed with fresh egg yolks, it is used

during parturition. Used, along with other cosmetic fragrances, in Malayan recipe for madness.^[3]

Therapeutic indication

Traditional uses: carminative, cold, nausea, stimulant, stomachic, urogenital.^[4]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=3&taxon_id=200028314, Chinese Plant Names, 22.03.2008

[2] Weblink: http://www.uni-graz.at/~katzer/engl/Elet_car.html, Gernot Katzer's Spice Pages, 22.03.2008

[3] Weblink: <http://books.google.at> CRC Handbook of Alternative Cash Crops, James A. Duke, Judith L. DuCellier, ISBN 0849336201, page 28

[4] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: <http://www.senhealth.com/vsite/vcontent/page/xmlcontent/0,11740,4822-129205-130513-19252-68365-xmlcontent-item,00.html>, Sen – traditional Chinese medicine, 10.09.2008

Amomum coccineum Bl. (Tepus)

Synonyms: *Etlingera punicea* (Roxb.) R.M.Sm., *Elettaria coccinea* Blume



Amomum coccineum Bl.

Occurrence and appearance

Robust perennial herb, up to 7 m tall, with slender rhizome. Leaves subsessile, lanceolate, up to 108 cm x 18 cm. Infructescence globular, 12 cm in diameter, near to the ground; fruit sessile, berry-like, obovoid or obconical, polygonal, 2—5 cm x 2—3 cm, 9—14-ribbed, densely sericeous. In primary and secondary forests, often along water, at 800—1600 m altitude.^[1]

Therapeutic indication

Traditional use: vermifuge^[2,3]

The aril around the seeds is edible, sweet. Pounded leaves are rubbed over the whole body against fever.^[1]

[1] Weblink: [javascript:fncNewWin\('e-prosea_detail.php?frt=&id=1649','detail',0,600,50,1,0,0,0\), E-Prosea, 10.09.2008](javascript:fncNewWin('e-prosea_detail.php?frt=&id=1649','detail',0,600,50,1,0,0,0), E-Prosea, 10.09.2008)

[2] Weblink: <http://www.floridaplants.com/Med/vermifuge.htm>, Florida Plants, 22.03.2008

[3] CRC Ethnobotany Desk Reference – Timothy Johnson – CRC Press LLC 1999, ISBN 0-8493-1187-X, page 41

Figure: <http://biodiversity.sci.kagoshima-u.ac.jp/suzuki/halimun/plant/live/dscn0657s.jpg>, Plants on Gn. Halium, West Java, Photo by Eiji Suzuki, 10.09.2008

Amomum dealbatum Roxb. (Hangasa)

Long-fruited amomum



Amomum dealbatum Roxb.

Occurrence and appearance

Plants 1 - 3.5 m tall. Ligule orbicular, 2-cleft, 0.4 - 1.6 cm, rusty villous; petiole 0.5 - 3 cm; leaf blade adaxially bright green, abaxially whitish, oblong-lanceolate, 50 - 70 × 5.5 - 14 cm, adaxially glabrous, abaxially brownish pubescent, base cuneate, apex acuminate. Spikes subglobose, 3 - 5 cm in diam.; peduncle 2 - 8 cm; bracts reddish, ovate, ca. 2.5 cm. Calyx 3-lobed at apex; lobes 2-lobed. Corolla tube white, ca. 2.5 cm; lobes white, lanceolate, equaling tube. Lateral staminodes subulate, ca. 2 mm. Labellum white with yellow line along center and radiate, red veins, elliptic, ca. 2.5 cm, apex emarginate. Filament ca. 5 mm; anther ca. 2 mm; connective appendage elliptic, ca. 3 mm. Capsule purple-green, ellipsoid, 2.5 - 3 × 1 - 1.2 cm, with 9 crenulate-winged ribs, indehiscent; Fl. May - Jun, fr. Jun - Sep.^[1]

Parts used

Rhizome

Therapeutic indication

Traditional use: parturition^[2,3]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=3&taxon_id=200028316, Chinese Plant Names, 22.03.2008

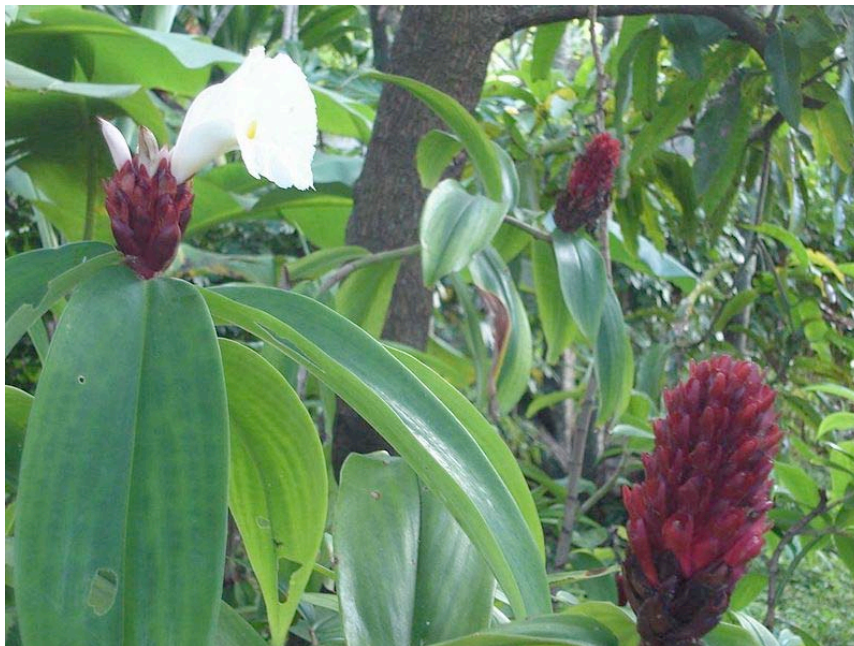
[2] CRC Ethnobotany Desk Reference, CRC Press 1999, by Timothy Johnson, ISBN: 084931187X, page 41

[3] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: http://www.ganeshvilla.com/gingers/ammomum_dealbatum.htm, Ganesh Mani Pradhan & Son, 10.09.2008

Costus speciosus Smith (Pacing)

Grape ginger



Costus speciosus Smith

Occurrence and appearance

It is an erect and perennial herb with a tuberous, horizontal and rhizomatous rootstocks and about 120 - 150 cm high. Leaves are subsessile and are arranged spirally, about 15 - 30 cm x 6 -10 cm, oblong or oblanceolate, acute or acuminate and often cupsidate and glabrous above and silky beneath. Sheath is up to 4.0 cm long with an obliquely truncate hairy mouth and ciliate. Flowers are white and are borne in 5 -12 cm long and dense terminal spikes. Staminodes are absent and filament is hairy on the back and 3 - 4 cm long. Style is 4 - 5 cm long and stigma with a semi-lunar and ciliate mouth. Capsules are trigonous and red when ripe.

Flowering is during August-September and fruiting in November-December.^[1]

Parts used

The rhizomes are used, the tuber and the seeds

Constituents

The rhizomes yield an essential oil, diosgenin, tigogenin, saponins, genins and β -sitosterol. Besides, seeds contain diosgenin and saponin.^[1]

Two new quinones-dihydrophytylplastoquinone and its 6-methyl derivative-along with α -tocopherolquinone and 5 α -stigmast-9(11)en-3 β -ol isolated from seeds and their structures elucidated; methyl hexadecanoate, methyl octadecanoate and tetracosanyl octadecanoate isolated from seeds; a tocopherol isolated from seeds and identified as G2-tocopherol; five new compounds-tetradecyl 13-methylpentadecanoate, tetradecyl 11-methyltridecanoate, 14-oxotricosanoic acid, 14-oxoheptacosanoic acid and

15-oxooctacosanoic acid- isolated from rhizomes and characterised; seed oil (6.0%) consisted of palmitic (55.97) oleic (23.75%), linoleic stearic myristic and lauric acids. Defatted seeds contained diosgenin, glucose, galactose and rhamnose; 31-norcycloartanone, cycloartanol, cycloartenol and cyclolaudenol isolated from roots; methyl 3-(4-hydroxyphenyl)-2E propenoate isolated from rhizomes.^[2]

Pharmacologic properties

The rhizomes are considered bitter, astringent, purgative, stimulant, depurative, anthelmintic and tonic. A paste of its rhizomes is taken when urine contains blood. Besides, various plant parts are used in fever, dropsy, anasarca, gravel, cholera and bronchial asthma. Dhar et al. (1973), reported that an ethyl alcohol (50%) extract of the plant possesses antiviral activity also.

The rhizomes are used as an adulterant to *Gloriosa superba* and as a substitute for *Dioscorea deltoidea* and also for *Saussurea lappa*.^[1]

The antihepatotoxic activity of aqueous and methanolic extracts of rhizomes of *C. speciosus* have been investigated using CCl₄ and acetaminophen induced liver damage in albino rats. Two extracts were tested in five models with three different treatment schedules. Five liver specific biochemical parameters viz. serum glutamic oxalacetate transaminase (SGOT), serum glutamic pyruvate transaminase (SGPT), serum alkaline phosphatase (SALP), serum sorbitol dehydrogenase (SSDH) and serum glutamic dehydrogenase (SGLDH) and histopathological examination of the liver were undertaken to monitor the status of the liver. Silymarin, a natural antihepatotoxic agent has been used as a standard compound to compare the activity of the extract.

The experimental animals were treated with aqueous and methanolic extract of *C. speciosus* before and after administration of carbon-tetrachloride and acetaminophen in three different treatment protocols. Both the extracts of *C. speciosus* at a dose of 300 mg and 500 mg/kg. p.o. exhibited significant inhibition of SGOT, SGPT, SALP, SSDH and SGLDH elevated due to liver necrosis produced by CCl₄ (1.5ml/kg, s.c.) and acetaminophen (3.0 g/kg, p.o.). Comparison of the percentage reduction of individual enzymes and overall percentage reduction of all biochemical parameters suggested that the potency of both extracts are well comparable (78.2-96.0 %) to equal dose of silymarin. The liver biopsy of experimental rats showed significant restoration of normal histomorphological pattern of liver cells.

These observations support the ethnopharmacological claims of folklore uses of rhizomes of *C. speciosus* in the treatment of liver diseases and the presence of antihepatotoxic bioactive phytoconstituent(s) in both extracts.^[3]

Therapeutic indication

Traditional uses: alopecia, carcinoma (mouth), cough, depurative, dysentery, fever, leprosy, ophthalmia, purgative, smallpox, syphilis, tonic, vermifuge.^[4]

Particularities

C. speciosus alkaloids have been shown to possess anticholinesterase activity in both in vitro and in vivo methods, explaining the earlier observed

potentiation of acetylcholine responses on frog rectus muscle and dog blood pressure. The alkaloids, like physostigmine, were approximately equally effective against true and pseudo cholinesterases.

However, the alkaloids were very much weaker than physostigmine. Isolation and selective screening of the individual alkaloids is warranted in order to pinpoint the specific alkaloid or alkaloids responsible for this activity. The use of the plant in eye diseases and as a depurative may be due to the anticholinesterase activity of the plant alkaloids.^[5]

[1] MEDICINAL PLANTS AND RAW DRUGS OF INDIA, Purshotam Kaushik, Anil Kumar Dhiman; Printed by Gajendra Singh Gahlot at Shiva Offset Press, for Bishen Singh Mahendra Pal Singh, Dehra Dun, and Typesetting at Doon Phototype Printers, 14, Old Connaught Place, Dehra Dun, India, 2000, ISBN-81-211-0174-3, pp 520-521

[2] Weblink: <http://dracharya.tripod.com/journal/id1.html>, Ethno-medical Plants Used by Gond Tribe of Bhanadehi, M K Rai¹, A K Pandey, Deepak Acharya, 23.03.2008

[3] Weblink: <http://www.biologie.uni-erlangen.de/pharmbiol/Abstract/Effects.html>, PREVENTION OF CARBON-TETRACHLORIDE AND ACETAMINOPHEN INDUCED HEPATIC DAMAGE BY AN EXTRACT FROM COSTUS SPECIOSUS, J.C. Gogoi, D.K. Sharma, 23.03.2008

[4] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

[5] Weblink: http://www.ijp-online.com/temp/IndianJPharmacol43178_100009.pdf, Indian Journal of Pharmacology, Anticholinesterase activity of Costus speciosus alkaloids, Bhattacharya SK, Parikh AK, Debnath PK, Pandey VB, Neogy NC, 23.03.2008

Figure: http://commons.wikimedia.org/wiki/Image:Costus_speciosus.jpg, Wikimedia Commons, Photo by Tau'olunga, 10.09.2008

Curcuma aeruginosa Roxb. (Koneng Hideung)

Pink and Blue Ginger



Curcuma aeruginosa Roxb.

Occurrence and appearance

Leafy plants to 1.8m tall; leaves striped with purple. Pink flowers on a short inflorescence, in spring, before the leaves emerge. Rhizomes with blue flesh.^[1]

Constituents

The essential oil of rhizome of *Curcuma aeruginosa* Roxb. was analyzed by GC-MS. There are 33 components, the major compounds as furanodienon (20,13%), gemacron (16,67%), curdion (8,58%) and furannodien (8,39%). Those essential oil, petroleum ether and ethyl acetate extracts showed the antibacterial and antifungal activities. From petroleum ether and ethyl acetate extracts, Zederon, Stigmasterol, beta-Sistosterol, Rutaecarpine and Evodiamine have been isolated. Their structures were elucidated by means of IR, Ms and NMR spectroscopic methods.^[2]

Pharmacologic properties

The rhizome is used medicinally to treat asthma and cough, and is also applied externally, pounded in coconut oil for scurf. Previous studies of *C. aeruginosa* have resulted in the isolation of aerugidiol, difurocumenone and guaiane sesquiterpene lactones. The chemical compositions of the essential oil of *C. aeruginosa* of Malaysia have been reported to comprise mainly curzerenone.^[3]

Therapeutic indication

Action: purgative. Traditional uses: asthma, cough, dermatosis, insanity, parturition, scabies, scurf.^[4,5]

[1] Weblink: <http://www.fortunecity.com/business/koch/3/sections-n/gingers/gingers.html>, Gingers, 24.03.2008

[2] Weblink: http://english.vista.gov.vn/english/Proceedings/200711282802962523/folder_listing?b_start:int=90, Studies on rhizome of *Curcuma aeruginosa* Roxb. growing in Tam Dao, Vinh Phu, 24.03.2008

[3] Weblink: <http://cat.inist.fr/?aModele=afficheN&cpsidt=2413008>, INIST-CNRS, Abstract from Sesquiterpenes from *Curcuma aeruginosa*, 24.03.2008

[4] CRC Ethnobotany Desk Reference, CRC Press 1999, by Timothy Johnson, ISBN: 084931187X, page 247

[5] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: http://calphotos.berkeley.edu/cgi/img_query?query_src=photos_flora_com&enlarge=0000+0000+1203+0874, University of California, Photo by Joseph Dougherty, 10.09.2008

Curcuma longa L. (Kunyit)

Synonyms: Turmeric, *Curcuma domestica* Valetton, *Curcuma rotunda* L.



Curcuma longa L.

Occurrence and appearance

The plant is a perennial herb about 90 - 120 cm tall with short stem and tufted leaves. Primary tubers are at the base of aerial stem and are ellipsoidal and bearing many rhizomes. The rhizomes have distinct smell and taste. Roots are fleshy with ellipsoidal tubers. The leaves are 25 - 40 cm x 10 - 15 cm linear, acuminate, ascending and pubescent beneath. The Inflorescence is produced on short leafless peduncle, consists of cone-shaped collection of numerous ovate bracts and about 10 - 18 cm long and 5 cm broad. The flowers are pale-yellow and are borne in pairs in the axils. The seeds are black and shining with large, lacerate and white aril.

Flowering and fruiting is during winter.^[1]

Parts used

The dried root (rhizome) and in some traditional uses also the leaves.^[2]

Constituents

Curcuma longa contains up to about 5% essential oil, which, amongst others, consists of monoterpenes and sesquiterpenes. The curcuminoids (curcumin, desmethoxycurcumin and bisdesmethoxycurcumin), diaryl heptane derivatives, are found in the roots in a concentration between 0.8% and 2%. They give the root powder its characteristic yellow color and are also the active constituents that have been most investigated.^[2] The rhizomes contain also zingiberine and p-tolymethyl carbinol (in oil).^[1]

Pharmacologic properties

The rhizomes are aromatic, stimulant, carminative, alterative, blood purifier, antiperiodic and tonic. Externally, these are applied to sprains and on wounds. Fresh juice of the rhizomes is considered anthelmintic and is used as antiparasitic in many skin affections. Its decoction is used in purulent conjunctivitis. The leaves are used as ingredients for stomachic preparations. That essential oil obtained from the leaves possesses antimicrobial activity against some bacteria.

Smearing of turmeric paste on the face and limbs during bath, clears the skin, blemishes and beautify the face and also checks the growth of hairs on skin. In pemphigus and shingles, the part is first smeared with a thick coating of mustard oil and dusted with turmeric powder. This cured the disease within 2 to 4 days. In scorpionsting, the smoke produced by sprinkling powdered turmeric over burnt charcoal gives relief when the affected part is exposed to the smoke for few minutes. The fumes of burning roots is employed also in hysteric fits.^[1]

Both phytochemical and clinical studies support the use of *Curcuma longa* for dyspeptic stomach complaints and as an adjuvant anti-inflammatory, although it should be recognized that, in all the clinical studies, the criteria by which patients were included and the examination criteria are scarcely reproducible, and therefore subjective judgements cannot be ruled out. The use for dyspepsia is also included in the Indian Pharmaceutical Codex and the European Pharmacopoeia, but not the use for rheumatic complaints.^[2]

Curcumin is the active ingredient in the traditional herbal remedy and dietary spice turmeric (*Curcuma longa*). Curcumin has a surprisingly wide range of beneficial properties, including anti-inflammatory, antioxidant, chemopreventive and chemotherapeutic activity. The pleiotropic activities of curcumin derive from its complex chemistry as well as its ability to influence multiple signaling pathways, including survival pathways such as those regulated by NF-kappa B, Akt, and growth factors; cytoprotective pathways dependent on Nrf2; and metastatic and angiogenic pathways. Curcumin is a free radical scavenger and hydrogen donor, and exhibits both pro- and antioxidant activity. It also binds metals, particularly iron and copper, and can function as an iron chelator. Curcumin is remarkably non-toxic and exhibits limited bioavailability. Curcumin exhibits great promise as a therapeutic agent, and is currently in human clinical trials for a variety of conditions, including multiple myeloma, pancreatic cancer, myelodysplastic syndromes, colon cancer, psoriasis and Alzheimer's disease.^[3]

The use of turmeric, derived from the root of the plant *Curcuma longa*, for the treatment of various diseases has been described in Ayurveda and in Traditional Chinese Medicine for thousands of years. The active component of turmeric responsible for this activity, curcumin, was identified almost two centuries ago. Extensive research over the last decade has indicated that this polyphenol can both prevent and treat prostatic diseases.^[4]

Therapeutic indication

Action: balsamic, diuretic, lactagogue, stomachic, tonic, urogenital, vulnerary. Traditional uses: abscesses, amenorrhea, athlete's foot, colic, common cold, conjunctivitis, depurative, dermatosis, diarrhea, dysentary, fumitory,

gonorrhea, gravel, hemostat, hepatosis, impetigo, jaundice, parturition, pyuria, rashes of infants, scabies, skin sores, sore, smallpox, swelling, wounds.^[5,6]

Dose and method of administration

The rhizome can be eaten raw, in which case the recommended daily dose is 3 - 9 g. The recommended average daily dose of the dried and pulverized drug is 1.5 - 3.0 g. The rhizome should be dried in the air, and when stored should be protected from the sun.^[2]

Special warnings

With respect to the prevention and treatment of stomach ulcers, the results of experimental studies do not present a uniform picture. Because of the possibility of acute life-threatening complications of ulcers in the stomach and intestines, given the present state of knowledge this particular use should be absolutely avoided.^[2]

Particularities

The immune system has evolved to protect the host from microbial infection; nevertheless, a breakdown in the immune system often results in infection, cancer, and autoimmune diseases. Multiple sclerosis, rheumatoid arthritis, type 1 diabetes, inflammatory bowel disease, myocarditis, thyroiditis, uveitis, systemic lupus erythematosus, and myasthenia gravis are organ-specific autoimmune diseases that afflict more than 5% of the population worldwide. Although the etiology is not known and a cure is still wanting, the use of herbal and dietary supplements is on the rise in patients with autoimmune diseases, mainly because they are effective, inexpensive, and relatively safe. Curcumin is a polyphenolic compound isolated from the rhizome of the plant *Curcuma longa* that has traditionally been used for pain and wound-healing. Recent studies have shown that curcumin ameliorates multiple sclerosis, rheumatoid arthritis, psoriasis, and inflammatory bowel disease in human or animal models. Curcumin inhibits these autoimmune diseases by regulating inflammatory cytokines such as IL-1 β , IL-6, IL-12, TNF- α and IFN- γ and associated JAK-STAT, AP-1, and NF- κ B signaling pathways in immune cells. Although the beneficial effects of nutraceuticals are traditionally achieved through dietary consumption at low levels for long periods of time, the use of purified active compounds such as curcumin at higher doses for therapeutic purposes needs extreme caution. A precise understanding of effective dose, safe regimen, and mechanism of action is required for the use of curcumin in the treatment of human autoimmune diseases.^[7]

Chemoprevention, which is referred to as the use of nontoxic natural or synthetic chemicals to intervene in multistage carcinogenesis, has emerged as a promising and pragmatic medical approach to reduce the risk of cancer. Numerous components of edible plants, collectively termed "phytochemicals" have been reported to possess substantial chemopreventive properties. Curcumin, a yellow coloring ingredient derived from *Curcuma longa* L. (Zingiberaceae), is one of the most extensively investigated and well-defined chemopreventive phytochemical. Curcumin has been shown to protect against skin, oral, intestinal, and colon carcinogenesis and also to suppress angiogenesis and metastasis in a variety of animal tumor models. It also

inhibits the proliferation of cancer cells by arresting them in the various phases of the cell cycle and by inducing apoptosis. Moreover, curcumin has a capability to inhibit carcinogen bioactivation via suppression of specific cytochrome P450 isozymes, as well as to induce the activity or expression of phase II carcinogen detoxifying enzymes. Well-designed intervention studies are necessary to assess the chemopreventive efficacy of curcumin in normal individuals as well as high-risk groups. Sufficient data from pharmacodynamic as well as mechanistic studies are necessary to advocate clinical evaluation of curcumin for its chemopreventive potential.^[8]

[1] MEDICINAL PLANTS AND RAW DRUGS OF INDIA, Purshotam Kaushik, Anil Kumar Dhiman; Printed by Gajendra Singh Gahlot at Shiva Offset Press, for Bishen Singh Mahendra Pal Singh, Dehra Dun, and Typesetting at Doon Phototype Printers, 14, Old Connaught Place, Dehra Dun, India, 2000, ISBN-81-211-0174-3, pp 521-523

[2] MEDICINAL PLANTS IN TROPICAL COUNTRIES, Traditional Use-Experience-Facts; Markus S. Müller M.D., Ernst Mechler Ph.D.; Georg Thieme Verlag, Stuttgart, Germany, 2005; ISBN 3-13-138341-0, ISBN 1-58890-253-6; pp. 64-69

[3] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18324353>, PubMed, Curcumin: From ancient medicine to current clinical trials, Hatcher H, Planalp R, Cho J, Torti FM, Torti SV, Department of Cancer Biology, Wake Forest University School of Medicine, Winston-Salem, NC, 27157, USA, 14.04.2008

[4] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/18297817>, PubMed, Curcumin in the treatment of prostatic diseases, Chen ZQ, Mo ZN., Institute of Urology & Nephrology, First Affiliated Hospital of Guangxi Medical University, Nanning, Guangxi 530021, China, 14.04.2008

[5] CRC Ethnobotany Desk Reference, CRC Press 1999, by Timothy Johnson, ISBN: 084931187X, page 247

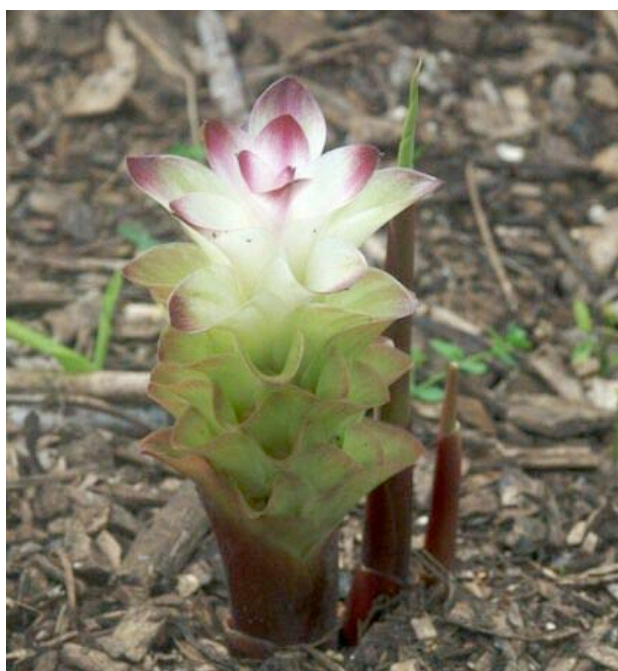
[6] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

[7] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/17569223>, PubMed, Curcumin and autoimmune disease, Bright JJ., Neuroscience Research Laboratory, Methodist Research Institute, 05.04.2008

[8] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/17569209>, PubMed, Cancer chemopreventive effects of curcumin, Surh YJ, Chun KS, National Research Laboratory of Molecular Carcinogenesis and Chemoprevention, College of Pharmacy, Seoul National University, South Korea, 05.04.2008

Figure: <http://www.gingersrus.com/cart/index.php?productID=3086>, Gingers R Us, 10.09.2008

Curcuma purpurascens Bl. (Koneng tinggang)



Curcuma purpurascens Bl.

Occurrence and appearance

A herb with branched rhizome, outside and inside orange-yellow with whitish tips; leaf blades elliptical, 55-70 cm x 19-23 cm, green but purple along the midrib above; inflorescence terminal on a leafy shoot, bracts pale green, coma bracts white at base and pale green towards the top or almost entirely white, outside pale brown spotted at the top; corolla about 5 cm long, white; labellum about 17 mm x 17 mm, pale creamy yellow with a dark yellow median band, other staminodes pale creamy yellow, anther with long spurs. *Curcuma purpurascens* grows spontaneously in teak forest.^[1]

Parts used

Rhizome.^[1]

Pharmacologic properties

Rhizoms are used against tussis and when mixed with *Alyxia stellata*, applied as a poultice after childbirth. The main tubers contain extractable starch.^[1]

Therapeutic indication

Traditional uses: boils, cough, fever, itch, scabies, wounds.^[2,3]

[1] Weblink: <http://www.proseanet.org/prosea/e-prosea.php>, E-Prosea, 25.03.2008

[2] CRC Ethnobotany Desk Reference, CRC Press 1999, by Timothy Johnson, ISBN: 084931187X, page 248

[3] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: http://toptropicals.com/pics/garden/m1/Podarki4/CURUCMA_PURPURASCENS2747JM.jpg, Top Tropicals, Photo by John Mood, 10.09.2008

Curcuma xanthorrhiza Roxb. (Koneng Gede)

Synonyms: *Curcuma zedoaria* Roscoe, *Curcuma javanica* Rieck, Javanese turmeric.

German: Javanischer Gelbwurz



Curcuma xanthorrhiza Roxb.

Occurrence and appearance

Thick stems shoot directly from large, round, yellow rhizomes that can grow larger than a clenched fist. Smaller rhizomes form around the main root. Large 10 cm wide leaves stand upright, taking the plant to 1.5 metres high. A red strip runs up the centre of the leaf. Maroon/red flowers form on thick 15 cm spikes. The plant dies down over winter and shoots again in spring. Early spring, is a good time to divide the plant for propagation, however, they may be dug at any time for use. It will grow in sun or shade, and requires well-drained, rich soil and sufficient water during dry periods for good growth. Rhizomes are aromatic and pungent with a ginger-sour-lemon flavour.^[1]

Parts used

Rhizome

Constituents

The rhizomes contain curcuminoids, curcumin, demethoxy curcumin, bis-demethoxycurcumin, 5'-methoxycurcumin and dihydrocurcumin which are found to be natural anti-oxidants. A new curcuminoid, cyclocurcumin, was isolated from the nematocidally active fraction of turmeric. The fresh rhizomes also contain two natural phenolics, which possess antioxidant and anti-inflammatory activities and also two new pigments. Several sesquiterpenes, germacrone, turmerone, ar-(+)-, α -, β -turmerones; β -bisabolene; α -curcumene; zingiberene; β -sesquiphellandene, bisacurone; curcumenone; dehydrocurdione; procucumadiol; bis-acumol; curcumenol;

isoprocurcumenol, epiprocurcumenol; procurcumenol; zedoaronediol; curlone; and turmeronol A and turmeronol B, have been recorded from the rhizomes. The rhizomes also contain four polysaccharides-ukonans - having activity on the reticuloendothelial system, along with stigmasterol, β -sitosterol, cholesterol and 2-hydroxymethyl anthraquinone.^[2]

Pharmacologic properties

Interesting is that the rhizome is used medicinally; it has liver protection properties. The active ingredients (antioxidant and antiedemic) are the curcuminoids (e. g. curcumin), encourage bile and prevent the formation of gallstones. It also has essential oils, cinnamaldehyde and starch / carbohydrate. The rhizomes have antiviral and antiinflammation properties (Hepatitis B and C). Used against acne (inhibits bacterial growth); normalize digestion. It increases breast milk production. Decreases cholesterol levels in blood and liver.^[3]

Curcumin, demethoxycurcumin and bisdemethoxycurcumin have antioxidant activity. They may also possess anticarcinogenic, antiinflammatory, antiviral and hypocholesterolemic activities. The curcuminoids have been found to have a number of antioxidant activities, including scavenging of such reactive oxygen species as superoxide anions and hydrogen peroxide, inhibition of lipid peroxidation and inhibition of the oxidation of low-density lipoprotein (LDL). The reduced derivative of curcumin, tetrahydrocurcumin, has been found to have even stronger antioxidant activity. Tetrahydrocurcumin may be formed from curcumin following ingestion; but this is unclear. The possible anticarcinogenic activity of curcumin and the other curcuminoids may be accounted for by a few mechanisms. These include inhibition of angiogenesis, upregulation of apoptosis, interference with certain signal transduction pathways that are critical for cell growth and proliferation, inhibition of colonic mucosa cyclooxygenase (COX) and lipoxygenase (LOX) activities and inhibition of farnesyl protein transferase. In addition to its possible activity in preventing malignant transformation and inhibiting tumor growth, curcumin may have antimetastatic potential, as well. In this regard, curcumin has been found to inhibit matrix metalloproteinase-9 in a human hepatocellular carcinoma cell line. The possible anticarcinogenic activity of the curcuminoids may be attributed, at least in part, to their ability to inhibit activation of the transcription factors NF-KappaB and AP-1. Curcuminoids have also been found to target the fibroblast growth factor-2 (FGF-2) angiogenic signaling pathway and inhibit expression of gelatinase B in the angiogenic process. In the final analysis, the curcuminoids' antioxidant activity may underlie many of the above mechanisms. Reactive oxygen species (ROS) can activate AP-1 and NF-KappaB. Further, FGF-2 induces AP-1 activation via ROS produced through NADPH oxidase. The curcuminoids, acting as antioxidants, may interfere with the ability of FGF-2 to stimulate AP-1, and they may generally inhibit the activation of NF-KappaB and AP-1. The possible antiinflammatory activity of the curcuminoids may also be accounted for by several mechanisms, including inhibition of COX and LOX, reduction of the release of ROS by stimulated neutrophils, inhibition of AP-1 and NF-KappaB, and inhibition of the activation of the pro-inflammatory cytokines TNF (tumor necrosis factor) -alpha and IL (interleukin)-1 beta. Curcumin has modest anti HIV-1 activity. It has been found to inhibit HIV-1 and HIV-2 proteases, HIV-1 LTR (long terminal repeat)-

directed gene expression, Tat-mediated transactivation of HIV-1-LTR and HIV-1 integrase. All of these actions have been demonstrated in vitro. There is no evidence that curcumin or the other curcuminoids significantly inhibit the replication of HIV-1 in vivo. The mechanism of the possible hypocholesterolemic effect of the curcuminoids is unclear. The pharmacokinetics of the curcuminoids remains only partly understood. Of the curcuminoids, curcumin has been most studied, mainly in animals. Curcumin is poorly absorbed following ingestion in mice and rats. In these animals, 38 to 75% of an ingested dose is excreted directly in the feces. Absorption appears to be better with food. In mice, the major metabolites of curcumin are curcumin glucuronoside, dihydrocurcumin glucuronoside, tetrahydrocurcumin glucuronoside and tetrahydrocurcumin. These metabolites are formed in the liver. Animal studies and the pharmacokinetics of curcumin are continuing. Human pharmacokinetic studies are needed.^[2]

Therapeutic indication

Action: choleric, emmenagogue. Traditional uses: amenorrhea, constipation, dyspepsia, gallstones, hepatitis, parturition, rheumatism.^[7,8]

Dose and method of administration

Fresh root: 3-9 g, graded

Dried root: 1-5 g^[4]

Dose to make a tea; infuse 1/2 teaspoon of powdered rhizome in 1 cup of boiling water, steep 10-15 mins, drink 1-3 cups a day.^[1]

Special warnings

Do not use during pregnancy, this may cause uterus contraction or if there is a bile duct obstruction - it can increase bile secretion and may create inflammation. Do also not use with gallbladder disease, as it will increase the flow of bile, creating a possible flare-up. Do not use on those on blood-thinning medications - it has blood-thinning effect. Long-term large quantity usage may produce stomach ulcer.^[4] Germacron, a part of essential oil, acts allergenic.^[5]

Particularities

In vitro activity of xanthorrhizol against *Streptococcus mutans* biofilms.

Aims: The effect of xanthorrhizol (XTZ) purified from the rhizome of *Curcuma xanthorrhiza* Roxb. on the *Streptococcus mutans* biofilms in vitro.

Methods and results: The biofilms of *S. mutans* at different phases of growth were exposed to XTZ at different concentrations (5, 10 and 50 micromol l(-1)) and for different time exposures (1, 10, 30 and 60 min). The results demonstrated that the activity of XTZ in removing *S. mutans* biofilm was dependent on the concentration, exposure time and the phase growth of biofilm. A concentration of 5 micromol l(-1) of XTZ completely inhibited biofilm formation by *S. mutans* at adherent phases of growth, whereas 50 micromol l(-1) of XTZ removed 76% of biofilm at plateau accumulated phase when exposed to *S. mutans* biofilm for 60 min.

Conclusions: Xanthorrhizol isolated from an edible plant (*C. xanthorrhiza* Roxb.) shows promise as an antibacterial agent for inhibiting and removing

S. mutans biofilms in vitro.

Significance and impact of the study: XTZ could be used as a potential antibacterial agent against biofilm formation by *S. mutans*.^[6]

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[6] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/16599995>, Pubmed, Department of Biotechnology and Bioproducts Research Center, Yonsei University, Seoul, South Korea, Rukayadi Y, Hwang JK, 03.03.2008

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[8] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: <http://www.thaimisc.com/freewebboard/php/vreply.php?user=maipradab&topic=5035>, Maipradab Online, Photo by Hans Erken, 10.09.2008

Boesenbergia rotunda L. (Kunci)

Chinese Ginger, Fingerroot

German: Fingerwurz



Boesenbergia rotunda L.

Occurrence and appearance

Plants to 50 cm. Rhizomes bright yellow, ovoid-globose, strongly aromatic; roots robust. Leaves 3 or 4; leaf sheath red; ligule 2-cleft, ca. 5 mm; petiole 7--16 cm, channeled; leaf blade green on both surfaces, ovate-oblong or elliptic-lanceolate, 25--50 × 7--12 cm, glabrous except for sparsely hairy midvein abaxially, base rounded to cuneate, apex apiculate. Inflorescences terminal on pseudostems, appearing from within apical leaf sheaths, subsessile, 3--7 cm; bracts lanceolate, 4--5 cm. Flowers aromatic. Calyx 1.5--2 cm, apex 2-cleft. Corolla pink; corolla tube 4.5--5.5 cm; lobes oblong, 1.5--2 cm. Lateral staminodes light pink, obovate, ca. 1.5 cm. Labellum white or pink with purple stripe, fiddle-shaped, 2.5--3.5 cm, concave, margin slightly crisped, apex entire. Filament short; connective appendage reflexed, 2-cleft, 1--3 mm. Fl. Jul--Aug.^[1]

Parts used

Rhizome

Constituents

Fingerroot contains 1-3% of an essential oil. Several aroma components have been identified, 1-8 cineol, camphor, d-borneol and methyl cinnamate being the most important. Trace components are d-pinene, zingiberene, zingiberone, curcumin, zedoarin and others. In other context, the rose-

flavoured monoterpenoid alcohols geraniol and nerol are named.

Among the non-volatile constituents, flavones and flavonoids (pinostrobin, alpinetin, pinocembrin), chalcones (cardamonin) and dihydrochalcones (boesenbergin A) have been identified. Cardamonin is under investigation because of its antitumor properties.^[2]

Pharmacologic properties

Boesenbergia rotunda exhibits antimutagenic, antitumour, antibacterial, antifungal, analgesic, antipyretic, antispasmodic, antiinflammatory and insecticidal activities.^[3]

The cyclohexenyl chalcone derivatives of *B. rotunda* are reported to be anti-inflammatory, strongly antimutagenic and Dengue virus protease inhibiting.^[4]

Particularities

Helicobacter pylori, a gram-negative bacterium, is recognized as the primary etiological agent for the development of gastritis, dyspepsia, peptic ulcer as well as gastric and colon cancer. In developing countries the incidence of *H. pylori* infection ranges from 50-100%. Two plants, namely *Boesenbergia rotunda* (L.) Mansf. and *Myristica fragrans* Houtt., have been used to treat dyspepsia and peptic ulcer in Thai Traditional Medicine. Their crude extracts were previously reported to possess anti- *H. pylori* activity. This investigation proposed to test previously isolated bioactive compounds from *B. rotunda* and *M. fragrans* if they possessed anti- *H. pylori* activity. Primary cultures of *H. pylori* from local hospital patients in Thailand were used in the investigation. In vitro anti- *H. pylori* testing had been performed with pinostrobin and red oil from roots of *B. rotunda*, and dihydroguaiaretic acid from arils of *M. fragrans*. Clarithromycin (MIC 120 µg/mL) was used as a positive control. All three compounds showed positive clear zone in agar diffusion test at $p < 0.05$ in all 10 clinical cultures. Pinostrobin, red oil and dihydroguaiaretic acid autoclaved in blood agar medium had MIC of 125, 150, 100 µg/mL and MBC of 150, 175, 125 µg/mL, respectively. All three compounds have their activities against *H. pylori* in the same range of that of drug currently used in the treatment of peptic ulcer. Thus, all three compounds from *B. rotunda* and *M. fragrans* show good potential for further drug development. This investigation demonstrates that food and spice plants used in Thai Traditional Medicine for treatment of dyspepsia and peptic ulcer contain compounds which inhibit the growth of *H. pylori* in vitro.

The result suggests that ingredients of some Thai food in regular diet may contribute to the low incidence of gastric cancer in the Thai population by affecting the growth of *H. pylori*.^[5]

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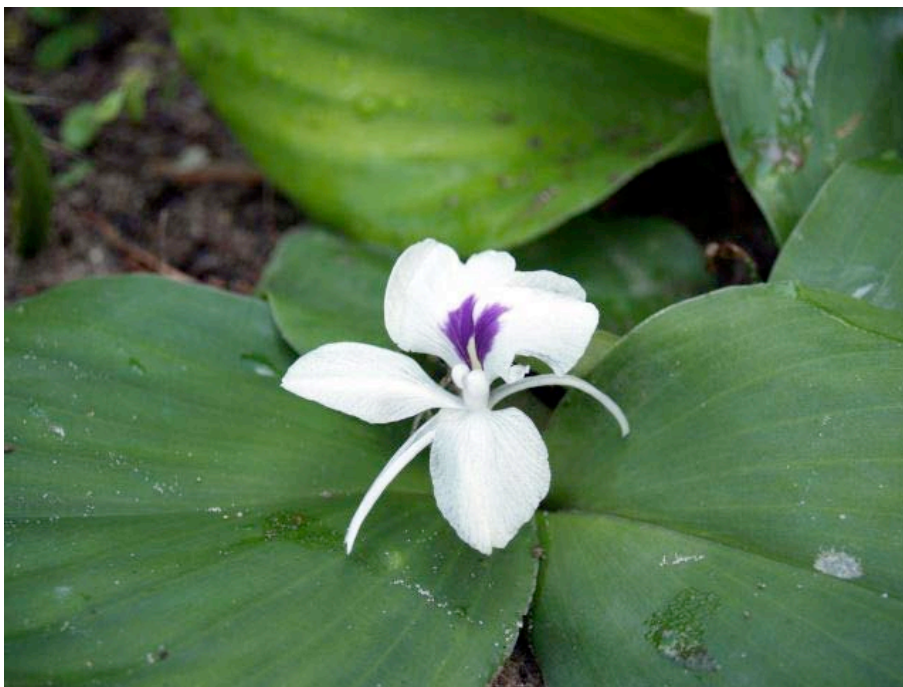
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Kaempferia galanga L. (Cikur)

Aromatic ginger, sand ginger, resurrection lily, lesser galangale

German: Gewürzlilie



Kaempferia galanga L.

Occurrence and appearance

Rhizomes pale green or greenish white inside, tuberous, fragrant. Leaves usually 2, spreading flat on ground, subsessile; leaf sheath 2-3 cm; leaf blade green, orbicular, 7-20 × 3-17 cm, glabrous on both surfaces or villous abaxially, margin usually white, apex mucronate or acute. Inflorescences terminal on pseudostems, enclosed by imbricate leaf sheaths, sessile, few to many flowered; bracts lanceolate, ca. 2.5 cm. Calyx equaling bracts. Corolla tube 2-2.5 cm; lobes white, linear, ca. 1.2 cm. Lateral staminodes obovate-cuneate, ca. 1.2 cm. Labellum ca. 2.5 × 2 cm, apex slightly 2-lobed or deeply 2-cleft; lobes white with purple markings at base. Anther sessile; connective appendage strongly reflexed, rectangular, 2-lobed. Fl. Aug-Sep.^[1]

Parts used

Rhizome

Constituents

Lesser galanga rhizome contains about 2.5-4% essential oil, whose main components are ethyl-cinnamate (25%), ethyl-p-methoxycinnamate (30%) and p-methoxycinnamic acid; furthermore, 3-carene-5-one was found. Other literature reports 4-butylmenthol, β -phellandrene, α -terpineol, dihydro- β -sesquiphellandrene, pentadecane and 1,8-cineol.^[2]

Volatile oil of dried rhizome of *Kaempferia galanga* obtained by water distillation was determined for its chemical components using gas chromatography and mass spectrometry (GC-MS). The major chemical

constituents were identified as ethyl-p-methoxycinnamate (31.77%), methylcinnamate (23.23%), carvone (11.13%), eucalyptol (9.59%) and pentadecane (6.41%), respectively. Antimicrobial activity of the volatile oil was tested against various microbes using agar disc diffusion method with the inhibition zones from 8.0 - 31.0 mm. Brine shrimp toxicity of volatile oil exhibited an EC₅₀ value of 26.84 µg/ml; whereas the volatile oil was inactive for antioxidant activity (IC₅₀ >100 µg/ml).^[3]

Pharmacologic properties

The rhizome extract has been potently active against bacterial infections. Indigenous medical practitioners use these rhizomes for treatment of scariasis, bacterial infections, tumor and it is also applied externally for abdominal pain in women and used topically for treatment of rheumatism. In Thailand, the dried rhizome has been used as cardiostimulant and CNS stimulant, whereas an acetone extract has an effect on monoamine oxidase inhibition.

The 95% ethanol extract of this plant possessed antibacterial activity against *Staphylococcus aureus* and hot water extract against *Escherichia coli*. The rhizome of *K. galanga* has been used for treatment of fungal derived-skin diseases as well as eczema.

Among all compounds of *Kaempferia galanga* oil, the highest content is ethyl-p-methoxycinnamate. This component has been reported to show many biological activities, such as anticancer and antimonamine oxidase activities.

Regarding antioxidant activity (DPPH assay), the volatile oil of *K. galanga* was inactive at concentration 100 µg/ml. Regarding antimicrobial activity, the volatile oil of *K. galanga* exhibited marked activity against Gram-positive and Gram-negative bacteria; and also against a fungus, *C. albicans*, by using agar disc diffusion method. The result revealed that the oil of this plant possessed marked antimicrobial activity against Gram-positive bacteria with the inhibition zones from 12.0-16.0 mm., and 8.0-12.0 mm. against Gram-negative bacteria; whereas it potently inhibited *C. albicans* with an inhibition zone of 31.0 mm., which was stronger than that of standard antifungal Clotrimazole (diameter = 25.0 mm.). It is suggested that the essential oil of this plant may be useful for treatment of the diseases caused by these bacteria and fungi, such as skin diseases and diarrhea.

For brine shrimp lethality assay, the volatile oil of *K. galanga* give appreciable activity against brine shrimp lethality test with LD₅₀ of 26.84 µg/ml. The result indicated that essential oil of *K. galanga* might possess some physiological activities since this oil was toxic to brine shrimp. In conclusion, the main components, especially ethyl-p-methoxycinnamate, could be used as a biomarker for standardization of this plant and the results of bioactivities suggest that the essential oil of *K. galanga* could be used for treatment of some microbial infections, which also agrees with the traditional use of this plant in treatment of those fungal- and bacterial-derived skin diseases. Moreover, *K. galanga* should also be subjected to more elaborated bioassay for specific pharmacological activities.^[3]

One patented application of *Kaempferia galanga* pertains to its action against ultraviolet rays and function as a 'booster' that augments the activity of

conventional sunscreens.^[4]

A natural extract obtained from the roots of *Kaempferia galanga* (patent pending) uses a proprietary extraction process to prepare a specific composition. The resultant extract composition has antimicrobial action and tyrosinase inhibitory functions, suggesting its multifaceted benefits in acne fighting formulations. The extract prepared as above was found to be active against *Propionibacterium acnes*, its activity being several-fold greater than that of native *Kaempferia galanga* extract.

To test the comparative antibacterial activity of the extracts against *Propionibacterium acnes*, the organism was first cultured in an anaerobic environment, and grown on prepared plates containing reinforced clostridial agar (RCA) with graded amounts of either native *Kaempferia galanga* extract or the novel composition. The plates were incubated anaerobically at 37° C for 48 hours and zones of inhibition were measured and compared to untreated control plates. The novel composition was far more effective than the native *Kaempferia galanga* extract in inhibiting *Propionibacterium acnes*, producing significant zones of inhibition at concentrations even as low as 0.5%.

Use of this extract would therefore potentially benefit in the management of acne.^[5]

In the study “Antinociceptive and anti-inflammatory activities of the aqueous extract of *Kaempferia galanga* leaves in animal models” the antinociceptive and antiinflammatory activities of aqueous extract of *Kaempferia galanga* leaves using various animal models were determined. The extract, in the doses of 30, 100, and 300 mg/kg, was prepared by soaking (1:10; w/v) the air-dried powdered leaves (40 g) in distilled water (dH₂O) for 72 h and administered subcutaneously in mice/rats 30 min prior to the tests. The extract exhibited significant ($P < 0.05$) antinociceptive activity when assessed using the abdominal constriction, hot-plate and formalin tests, with activity observed in all tests occurring in a dose-dependent manner. Furthermore, the antinociceptive activity of *K. galanga* extract was significantly ($P < 0.05$) reversed when prechallenged with 10 mg/kg naloxone. The extract also produced a significantly ($P < 0.05$) dose-dependent antiinflammatory activity when assessed using the carrageenan-induced paw-edema test. In conclusion, this study demonstrated that *K. galanga* leaves possessed antinociceptive and antiinflammatory activities and thus supports the Malay’s traditional uses of the plant for treatments of mouth ulcer, headache, sore throat, etc.^[6]

Therapeutic indication

Action: carminative, cicatrizant, entheogen, expectorant, stimulant.
Traditional uses: abdomen, cosmetic, cancer, cough, dandruff, dyspepsia, eye infection, fever, headache, malaria, mastitis, ophthalmia, otosis, rheumatism, sore throat, stomachic, swelling, tooth ache, veterinary chills.^[7,8]

Dose and methods of administration

The 1997 Commission E on Phytotherapy and Herbal Substances of the German Federal Institute for Drugs recommends *Galanga* rhizome for Dyspepsia, loss of appetite. Daily dosage: Tincture: 2-4 g; Rhizome: 2-4 g.

Mode of Administration: Comminuted drug, powder, as well as other galenical preparations for oral application. Actions: antispasmodic; antiphlogistic (inhibition of prostaglandin synthesis); antibacterial.

King's 1898 Dispensatory: 'Galangal is a stimulating aromatic, and has been successfully employed to aid the digestive process, preventing fermentation and removing flatus. It will be found especially useful in some forms of dyspepsia, preventing vomiting or sickness of the stomach, and facilitating digestion. It may be used in all cases in which a stimulating aromatic is indicated. It has some reputation as a remedy for perineal relaxation with hemorrhoids, and for a lax and pendulous abdomen. Its best form of administration is in tincture, the dose of which is from ½ to 1 fluid drachm. The powder may be given in doses of 15 to 20 grains; from 30 to 60 grains may be given in infusion.

British Pharmaceutical Codex, 1911: Galanga is aromatic and carminative. It is used in the form of infusion or decoction (1 in 20) for flatulence and dyspepsia.^[9]

Particularities

Four fractions of *Kaempferia galanga* (hexane fraction, dichloromethane fraction 1, dichloromethane fraction 2 and methanolic fraction) were tested for larvicidal activity toward fourth instar *Culex quinquefasciatus*. The hexane fraction was found to exhibit the highest larvicidal effect with the LC₅₀ of 42.33 ppm. Testing for adulticidal activity, the hexane fraction did not show any promising adulticidal effect. However, it caused a knockdown effect which might be useful as a repellent. It was then tested for repellent activity in human volunteers both in laboratory and field studies. In a laboratory study, the hexane fraction possessed repellency against *Aedes aegypti* (ED₅₀ value of 30.73 microg/cm²), and provided biting protection for 3 hours. In a field study, it could protect against certain mosquitos, ie, *Armigeres subalbatus*, *Anopheles barbirostris*, *An. aconitus*, *Mansonia uniformis*, *Cx. quinquefasciatus*, *Cx. gelidus*, *Cx. tritaeniorhynchus* and *Ae. aegypti*. The hexane fraction did not cause dermal irritation when applied on human skin.^[10]

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Figure: <http://www.pacificbulbsociety.org/pbswiki/index.php/Kaempferia>, Pacific Bulb Society, Photo by Alani Davis, 10.09.2008

Kaempferia rotunda L. (Kunir putih)

Asian crocus



Kaempferia rotunda L.

Occurrence and appearance

Rhizomes with tuberous roots. Leaves 2 - 4, erect; ligule broadly triangular, 3-4 mm; petiole 1-2 cm, channeled; leaf blade adaxially usually variegated dark and pale green on both sides of midvein, abaxially tinged purple, lanceolate-oblong, 17-27 × 7.5-9.5 cm, base cuneate. Inflorescences on separate shoots arising from rhizomes, appearing before pseudostems, sessile or shortly pedunculate, 4-6-flowered; bracts purple-brown; bracteoles ca. 2.3 cm, apex 2-toothed. Calyx 4.5-7 cm, split on 1 side, apex 3-toothed. Corolla tube equaling calyx; lobes spreading, white, linear, ca. 5 cm. Lateral staminodes erect, white, lanceolate, ca. 5 × 1.7 cm, apex acute. Labellum lilac, suborbicular, apically 2-cleft to base; lobes downcurved, ca. 3.5 × 2 cm, apex acute. Anther connective appendage erect, 2-cleft, fishtail-like. Ovary 4-6 mm, hairy. Fl. Apr.^[1]

Parts used

Rhizome

Constituents

The chemical composition of the rhizome oil of *Kaempferia rotunda* isolated by hydrodistillation was analyzed by capillary GC and GC/MS. The main constituents found in the oil were pentadecane (25.4%), bornyl acetate (24.9%), benzyl benzoate (15.3%) and camphor (12.1%)^[2]

The chloroform extract of the rhizomes of *Kaempferia rotunda* yielded many interesting secondary plant metabolites. Among them are highly oxygenated cyclohexane derivatives, crotepoxide, monoacetylcrotepoxide,

desoxipipoxide, 4-benzoyloxymethyl-3,8-dioxatricyclo[5.1.0.0(2,4)]octane-5,6-diol 6-benzoate and chalcone, 2'-hydroxy-4,4',6'-trimethoxychalcone besides a mixture of plant sterols, stigmast-5-en-3-ol and stigmast-5,22-dien-3-ol.^[3]

Methanol extracts of *Kaempferia rotunda* L. rhizomes yielded seven compounds including six polyoxygenated cyclohexane derivatives identified as (-)-6-acetylzeylenol, four acylated derivatives of 1-benzoyloxymethyl-1,6-epoxycyclohexan-2,3,4,5-tetrol, a Diels–Alder adduct of 3-benzoyl-1-benzoyloxymethylcyclohexa-4,6-dien-2,3-diol, and a triacylated derivative of salicin. The cyclohexane diepoxide, crotepoxide, was also obtained. Spectroscopic methods were used for structure determination. The methanol extract of the rhizomes of *K. rotunda* and (-)-2-acetyl-4-benzoyl-1-benzoyloxymethyl-1,6-epoxycyclohexan-2,3,4,5-tetrol (2-acetylrotepoxide B), had antifeedant activity against larvae of *Spodoptera littoralis*. (-)-Zeylenol also showed antifeedant activity, whereas (-)-6-acetylzeylenol was inactive.^[4]

Pharmacologic properties

Fresh bruised tubers, even the whole plant, are in popular use in many parts of India in the form of powder or ointment as an application to wounds and bruises to reduce swellings; used in mumps and cancerous swellings also. Decoction is applied with much benefit to wounds with coagulated blood and with any purulent matter, and also taken internally with the object of purifying blood and removing pus from the body.^[5]

Therapeutic indication

Traditional uses: cosmetic, stomach ache, tumor.^[6,7]

[1] Weblink: http://www.efloras.org/florataxon.aspx?flora_id=3&taxon_id=200028420, Chinese Plant Names, 25.03.2008

[2] Weblink: http://grande.nal.usda.gov/ibids/index.php?mode2=detail&origin=ibids_references&therow=796502, International Bibliographic Information on Dietary Supplements, The rhizome oil of *Kaempferia rotunda* Val., Sirat,-H.M.; Jamil,-S.; Siew,-L.W., 24.03.2008

[3] Weblink: <http://www.chemie.fu-berlin.de/~steven/ACGC/ACGC-CRC-Vol-11-19.html>, Chemie Uni Berlin, Asian Coordinating Group for Chemistry, Chemical Research Communications, Volume 11 to 19, Constituents of *Kaempferia rotunda*, Hasnah M. Sirat, Shajarahtunnur Jamil and Lee Wai Siew, 24.03.2008

[4] Weblink: <http://dx.doi.org/10.1016/j.phytochem.2007.03.015>, ScienceDirect, Polyoxygenated cyclohexane derivatives and other constituents from *Kaempferia rotunda* L., Philip C., Nigel C. Veitcha and Monique S.J. Simmondsa, 25.03.2008

[5] Weblink: <http://books.google.at>, Dr. K. M. Nadkarni's Indian Materia Medica, A K Nadkarni, ISBN 8171541429, page 16, 24.03.2008

[6] CRC Ethnobotany Desk Reference, CRC Press 1999, by Timothy Johnson, ISBN: 084931187X, page 448

[7] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

Figure: http://shaman-australis.com.au/shop/product_info.php?cPath=30&products_id=977, Shaman Australis Botanicals, 10.09.2008

Zingiber cassumunar Roxb. (Panglay)

Synonyms: Plai, Thai Ginger, *Zingiber montanum* J.Koenig



Zingiber cassumunar Roxb.

Occurrence and appearance

The rhizome part of the herb has a yellow to green color with fleshy thick texture containing multiple sessile tubers. Leaf stems 1-1.5 m tall. Leaves distichous, oblong-lanceolate, 20-30 cm long and 2 to 8 cm wide, pubescent below; ligule very short, bilobed, pubescent; sheath glabrous or hairy. Inflorescences scapose; peduncle 8-30 cm long, with pubescent sheaths. Spike ovoidellipsoid; bracts greenish red, narrowly obovate or rhomboid, 2.5-3.5 cm long; bracteole shorter than bract, ovate, 3-dentate. Calyx truncate, glabrous. Corolla tube ca. 2.5 cm long, pale yellow, dorsal lobe cymbiform, lateral lobe linearlanceolate. Labellum pale yellow, suborbicular, apex emarginate, lateral lobe ovate-oblong, appendage slightly longer than anther; stamen pale yellow. Ovary inferior, 3-celled. Fruit, small, globose capsule ca. 0.5-1 cm.^[1]

Parts used

Rhizome

Constituents

Essential oil of Plai is steam distilled from the rhizome and has a pale amber color. The scent is a cool, green peppery one with a touch of a bite. Active chemicals: sabinene (27-34%), g-terpinene (6-8%), a-terpinene (4-5%), terpinen-4-ol (30-35%), and (E)-1-(3,4-dimethoxyphenyl)butadiene (DMPBD) (12-19%).^[2]

A major part of the oil consists of monoterpenes with sabinene and terpinen-4-ol as main constituents. Sesquiterpenes accounted for a small part of the oil with sesquiphellandrene being the principal constituent. In addition to

these terpenes the oil contains a number of phenylbutanoids. The essential oil obtained by hydrodistillation contained about 25 % of these phenylbutanoids whereas the oil obtained by extraction with light petroleum had about 46 %, with trans-1-(3,4-dimethoxyphenyl)but-1-ene, trans-1-(3,4-dimethoxyphenyl)butadiene and trans-4-(3,4-dimethoxyphenyl)but-3-ene-1-yl acetate as the main constituents.^[3]

Pharmacologic properties

Actions: Analgesic, antineuralgic, antiinflammatory, antiseptic, antispasmodic, antitoxic, anti-viral, carminative, digestive, diuretic, febrifuge, laxative, rubefacient, stimulant, stomachic, tonic, vermifuge.

Applications: Aches and pains, inflammations, joint problems, muscle spasms, sprains and strains, torn muscles and ligaments asthma, catarrh, chronic colds, colic, constipation, diarrhea, fevers, flatulence, heartburn, immune problems, influenza, nausea, respiratory problems.^[2]

A study was carried out to elucidate the antiinflammatory effect of the methanol extract obtained from the rhizomes of *Zingiber cassumunar* Roxb. and its active principles. The methanol extract was partitioned between ether and water, and then the ether-soluble fraction was extracted with n-hexane. The n-hexane-soluble fraction was chromatographed and part of the fraction was rechromatographed by silica gel column. Three compounds were isolated from the n-hexane-soluble fraction and the chemical structures of these compounds were identified as (E)-1-(3,4-dimethoxyphenyl)but-1-ene, (E)-1-(3,4-dimethoxyphenyl)butadiene and zerumbone. The anti-inflammatory activity of these fractions was investigated on carrageenin-induced edema in rats, as well as on acetic acid-induced vascular permeability and writhing symptoms in mice. The methanol extract (p.o.) showed both anti-inflammatory activity and analgesic activity. These activities shifted successively to ether-soluble and n-hexane-soluble fractions and to (E)-1-(3,4-dimethoxyphenyl)but-1-ene. These results suggest that the anti-inflammatory action and analgesic action of *Zingiber cassumunar* is the result of the (E)-1-(3,4-dimethoxyphenyl)but-1-ene that it contains.^[4]

It is reported that the ethanol extract from the rhizome of *Zingiber cassumunar* Roxb., inhibited hyaluronan (HA) production in oral fibroblasts, suggesting its antiinflammatory activity. Pathologically, matrix metalloproteinases (MMPs), particularly MMP-2 and MMP-9, play a central role in inflammation and wound healing similar to HA. Objective: The purpose of the study was to determine the effects of *Zingiber cassumunar* extract on MMP-2 and MMP-9 activity in oral fibroblasts and epithelial cells. Methods: Cultured oral fibroblasts and epithelial cells were stimulated with either 1 µg/ml of 12-O-tetradecanoyl phorbol-13-acetate (TPA), 5 ng/ml of proinflammatory cytokine IL-1β, or various concentrations of retinoic acid (RA) in the absence or presence of various concentrations of the ethanol extract. Culture medium was collected and analyzed for gelatinase activity by gelatin-zymography. Results: MMP-9 activity was markedly induced in oral epithelial cells in response to stimulation with TPA and IL-1β. The induction was inhibited by the *Zingiber cassumunar* extract in a dose-dependent manner. In oral fibroblasts, MMP-2 activity was induced by RA, which was inhibited by the *Zingiber cassumunar* extract. In addition, incubation with the extract alone could partially inhibit MMP-2 and MMP-9 activity. Conclusion: These results

suggest the ability of the *Z. cassumunar* extract to inhibit gelatinase activity from stimulated oral cells, corresponding with its antiinflammatory activity.^[5]

The essential oil of *Zingiber cassumunar* (Plai oil) exhibits antimicrobial activity against a wide range of Gram-positive and Gram-negative bacteria, dermatophytes and yeasts. Dermatophytes were found to be the most susceptible microorganisms followed by yeasts, whereas bacteria were the least susceptible. The mean diameter of the inhibition zone determined by the disc diffusion screening method increased with increasing Plai oil concentration between 6.25 and 50 vol%. The minimum bactericidal concentration (MBC) determined by the broth macrodilution method ranged from 0.62 - 2.5 vol% for Plai oil and from 52 to 79 mg/mL for the 5 wt% Plai oil gel, whereas the minimum fungicidal concentration (MFC) ranged from 0.31 - 1.25 vol% for Plai oil and from 13.8 - 39.5 mg/mL for the 5% Plai oil gel.^[6]

The rhizomes of *Zingiber cassumunar* exhibited strong fungitoxic action against *Rhizoctonia solani*, the damping-off pathogen. On chemical and spectral investigations, the antifungal compound was found to be zerumbone, a sesquiterpene. Its minimum effective dose against *R. solani* was 1000 ppm, much lower than some commercial fungicides. Zerumbone had fungistatic activity, a narrow fungitoxic spectrum and was not phytotoxic. Moreover, when used as a seed treatment, zerumbone could control damping-off disease of *Phaseolus aureus* caused by *Rhizoctonia solani* by 85.7%.^[7]

In a previous study, a novel phenylbutenoid dimer (+/-)-trans-3-(3,4-dimethoxyphenyl)-4-[(E)-3,4-dimethoxystyryl]cyclohex-1-ene (PSC), isolated from *Zingiber cassumunar* ROXB. (*Zingiberaceae*), inhibited proliferation of various human cancer cells with the IC(50) values ranging 10 to 30 microM. Prompted by these anti-proliferative effects, we performed additional studies in A549 human lung cancer cells in order to investigate the mechanism of action. PSC arrested cell cycle progression at the G0/G1 phase in a concentration- and time-dependent manner. PSC dose-dependently induced cyclin-dependent kinase (CDK) inhibitor p21 expression, whereas the expression of cyclin D1, cyclin A, CDK4, CDK2, and proliferating cell nuclear antigen (PCNA) were decreased by treatment with PSC. These results suggest that one of the anti-proliferative mechanisms of PSC is to suppress cell cycle progression by increasing p21 expression and down-regulating cyclins and CDKs. This study characterizes additional biological activity of this novel phenylbutenoid dimer and expands its therapeutic potential for cancer as a chemotherapeutic agent derived from natural products.^[8]

Therapeutic indication

Action: anodyne, vermifuge. Traditional uses: ague, anasarca, anemia, anthrax, ascites, asthma, bronchitis, carminative, colic, constipation, cramps, dropsy, fever, flatulence, gonorrhea, head ache, jaundice, malaria, numbness, parturition, phthisis, spice, stomach ache.^[9,10]

Particularities

This study aimed to investigate the antiinflammatory activity of (E)-1-(3,4-dimethoxyphenyl) butadiene (DMPBD), isolated from previous term *Zingiber cassumunar* next term Roxb., using in vivo and in vitro models. The results show that DMPBD dose-dependently inhibited the rat ear edema induced by ethyl phenylpropiolate (EPP), arachidonic acid (AA) and 12-O-

tetradecanoylphorbol 13-acetate (TPA) and it was more potent than any other standard drugs being used. In EPP-induced edema IC₅₀ of DMPBD and oxyphenbutazone were 21 and 136 nmol per ear, respectively. The IC₅₀ of DMPBD and phenidone were 60 and 2520 nmol per ear, respectively, in AA-induced edema whereas DMPBD was 11 times more potent than diclofenac in TPA-induced edema (IC₅₀=660 and 7200 pmol per ear, respectively). DMPBD and diclofenac inhibited the rat paw edema induced by carrageenan but not by platelet activating factor (PAF). In in vitro study DMPBD, aspirin and phenidone inhibited collagen-induced platelet aggregation with IC₅₀ of 0.35, 0.43 and 0.03 mM, respectively. Whereas IC₅₀ of these agents in ADP, AA and PAF inductions were 4.85, 3.98 and 1.30 mM; 0.94, 0.13 and 0.04 mM; and 1.14, 6.96 and 2.40 mM, respectively. These results indicate that DMPBD possesses a potent antiinflammatory activity through the inhibition of CO and LO pathways and seems to have more prominent effects on the LO pathway.^[11]

[1] Weblink: <http://www.whitelotusaromatics.com/newsletters/plai.html>, White Lotus Aromatics Newsletter 11.11.2005, 27.03.2008

[2] Weblink: <http://www.thailabonline.com/aromaplai.htm>, Thailabonline iHealthSite, 27.03.2008

[3] Weblink: <http://www3.interscience.wiley.com/cgi-bin/abstract/112645732/ABSTRACT>, Wiley InterScience, Analysis of the essential oil of Zingiber cassumunar Roxb. from Indonesia, Taroeno, J. J. Brophy, J. H. Zwaving, 27.03.2008

[4] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/1804548>, PubMed, Anti-inflammatory effect of Zingiber cassumunar Roxb. and its active principles, Ozaki Y, Kawahara N, Harada M., 27.03.2008

[5] Weblink: http://iadr.confex.com/iadr/2005Balt/techprogram/abstract_62837.htm, Int. Association for Dental Research, Zingiber cassumunar Extract Inhibits Gelatinase Activity in Cultured Oral Cells, S. KRISANAPRAKORNKIT, P. CHOTJUMLONG, S. ONGCHAI, and P. KONGTAWELERT, 27.03.2008

[6] Weblink: <http://cat.inist.fr/?aModele=afficheN&cpsidt=18481249>, Centre National De La Recherche Scientifique, In Vitro antimicrobial activity of Zingiber cassumunar (Plai) oil and a 5% plai oil gel, PITHAYANUKUL P., TUBPRASERT J., WUTHI-UDOMLERT M., 28.03.2008

[7] Weblink: <http://www.springerlink.com/content/w4rw7h45175655mx/>, Springer Link, Zerumbone: a potential fungitoxic agent isolated from Zingiber cassumunar Roxb., N. Kishore and R. S. Dwivedi, 28.03.2008

[8] Weblink: <http://www.ncbi.nlm.nih.gov/pubmed/17666821>, PubMed, Growth inhibition and induction of G1 phase cell cycle arrest in human lung cancer cells by a phenylbutenoid dimer isolated from Zingiber cassumunar, Lee JW, Min HY, Han AR, Chung HJ, Park EJ, Park HJ, Hong JY, Seo EK, Lee SK, 28.03.2008

[9] CRC Ethnobotany Desk Reference, CRC Press 1999, by Timothy Johnson, ISBN: 084931187X, page 898

[10] Weblink: <http://www.ars-grin.gov/cgi-bin/duke/ethnobot.pl>, Dr. Duke's Phytochemical and Ethnobotanical Databases, 04.04.2008

[11] Weblink: http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6T8D-48WJVS_H1&_user=10&_coverDate=08%2F31%2F2003&_alid=714258812&_rdoc=6&_fmt=summary&_orig=search&_cdi=5084&_sort=d&_docanchor=&view=c&_ct=11&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=26dc038918677c6e3c9187241a1bec04 ScienceDirect, Anti-inflammatory activity of (E)-1-(3,4-dimethoxyphenyl) butadiene from Zingiber cassumunar next term Roxb., Rattima Jeenapongsa, Krongtong Yoovathawornb, Kittima M. Sriwatanakulb, Ubonwan Pongprayoona and Kampon Sriwatanakul, 28.03.2008

Figure: <http://aoki2.si.gunma-u.ac.jp/BotanicalGarden/HTMLs/Zingiber-cassumunar.html>, Private Homepage, Photo by Shigenobu Aoki, 10.09.2008

Zingiber odoriferum Bl. (Lampuyang)



Zingiber odoriferum Bl.

Occurrence and appearance

Robust perennial herb, up to 3 m tall with strongly branched rhizome. Leaves oblong-lanceolate to linear, 15-47 cm x 3-7 cm, strongly scented when bruised. Fruiting spikes narrow cylindric, 9-20 cm long, on robust 1 m long penduncle; fruit berry-like, ovoid to globose, about 2 cm diameter, white. Seeds oblong-globular, angular, 5 mm long. In primary and secondary forests on moist soils, up to 1500 m altitude.^[1]

[1] Weblink: <http://www.proseanet.org/prosea/e-prosea.php>, E-Prosea, 25.03.2008

Figure: „The Ecology of Java and Bali“ by Tony Whitten, Roehayat Emon Soeriaatmadja, Suraya A. Affif, Surya Affif, Oxford University Press, 1997, ISBN 9625930728, page 160 (Figure 4.7.)

Zingiber officinale Rosc. (Jahe)

German: Ingwer



Zingiber officinale Rosc.

Occurrence and appearance

It is a herbaceous perennial^[1] and erect herb with horizontal jointed tuberous rhizomes. The stems are leafy, erect and about 15-150 cm long. The leaves are 10-30 cm long, lanceolate and glabrous beneath.^[2] The rather inconspicuous^[1] flowers are bisexual and are borne solitary in heads. The bracts are suborbicular, cuspidate, 2.5 cm x 2.0 cm and greenish.^[2] Each flower has three yellowish-orange petals with an additional purplish, liplike structure.^[1] The fruit is a capsule. The seeds are many, endospermic and arillate.^[2]

Parts used

The fresh (or dried) rhizomes, which are greyish-brown with a wrinkled surface and pale yellow inside, are grown commercially.^[1]

Constituents

The rhizome contains about 2-3 % essential oils, including the mono- and sesquiterpenes zingiber (which give rise to the smell of the rhizomes), zingiberol and β -eudesmol. Other constituents include lipophilic pungent constituents such as (6)-gingerol (out of which, by drying, shogaol and zingerone are obtained, and also starch (50%), mucilage, fats, sugar, raw fiber (3-8%), minerals (approx. 5%), vitamins (niacin, vitamin A), proteins and amino acids (approx. 9%), diterpens, gingesulfonic acid and cinnamic acid.^[3]

In the related species, *Z. zerumbet*, many sesquiterpenes have been obtained. These include humulenol 1 and 2, humulene epoxide 1 and 2 and zerumbone. Monoterpenes, flavonoids and lignans are also present.^[4]

Pharmacologic properties

Antioxidant Effect: The antioxidant properties of ginger have been shown in various investigations. In one study, the oxidative stress induced by malathion (a pesticide) into rats was overcome by introducing ginger into the rats' diets. The antioxidant activity of *Zingiber officinale* was shown to be as effective as vitamin C in lowering lipid peroxidation in rats by influencing the enzymatic blood level of superoxide dismutase, catalase, and glutathione peroxidase. The lipid peroxidation lowering associated with ginger consumption was also demonstrated in apolipoprotein E-deficient mice (i.e., mice that are prone to develop atherosclerosis). Mice that consumed ginger (250 mcg of extract/day) in their drinking water showed a significant reduction in their basal concentration of LDL-associated lipid peroxides. A number of animal studies have shown that ginger lowers cholesterol levels. Experimental animal data suggest a strong positive effect of ginger on plasma lipid composition that may be important for the prevention of atherosclerotic events.

Antitumor Effect: Ginger is listed among the herbs possessing the highest antitumor activities. The observed evidence from in vitro experiments warrant further investigations into the potential anti-tumor activity of ginger. This antitumor activity was shown to be related to its vanilloids, [6]-gingerol and [6]-paradol. Both compounds were shown to block the epidermal growth factor responsible for cell transformation, thus inhibiting cellular proliferation. Ginger may also produce its antitumor effect by inducing "programmed cell death," also known as apoptosis, in cancer cells. In one study, the cytotoxic effect of [6]-gingerol and [6]-paradol was associated with the induction of apoptosis in human promyelocytic leukemia cells (HL-60). A third mechanism of ginger's antitumor protection is its modification to the carcinogen-metabolizing enzymes in the liver. Both glutathione S-transferase and aryl hydrocarbon hydroxylase activity in the liver were elevated following administration of ginger oil to mice for 14 consecutive days. The application of [6]-gingerol to the shaven backs of mice prior to applying cancer-promoting agents significantly inhibited skin cancer formation.

Antiinflammatory Effect: The anti-inflammatory effect of [6]-gingerol was studied in a mouse model challenged with TPA (a phorbol ester). The phenolic compound was capable of suppressing the inflammatory effect of TPA. Male Sprague-Dawley rats with severe arthritis were treated with ginger oil (33 mg/kg PO) for 26 days. The treatment resulted in a significant reduction in joint swelling. The oleoresin constituents in *Zingiber officinale*, as well as the phenolic substances paradol and shogaol, were shown to possess an inhibitory action on cyclooxygenase-2 (COX-2) enzymatic activity, a mechanism important in controlling the inflammatory process. Another mechanism of ginger as an anti-inflammatory herb was proposed to relate to inhibitory effects on leukotriene and prostaglandin biosynthesis, both of which are important in the inflammatory process. In a randomized, placebo-controlled, double-blind, crossover study, a ginger extract was compared to ibuprofen in patients with osteoarthritis of the hip and knee. Whereas ibuprofen showed a significant reduction in pain, ginger extract was not significantly different from a placebo when the study was terminated. It appears that the issue of using ginger for osteoarthritis or as an anti-inflammatory is not supported in human clinical trials.

Nausea and Emesis: Some studies (randomized, double-blind, placebo-

controlled) have shown that the use of ginger to prevent postoperative nausea and vomiting in women who have undergone gynecological diagnostic laparoscopy was not effective. However, another randomized, placebo-controlled, double-blind study involving 60 women who had undergone gynecological surgeries found that the effect of ginger on nausea was similar to that of metoclopramide. Both ginger and metoclopramide significantly lowered the incidence of nausea after surgery compared to the placebo group. In another study, similar results were confirmed with a larger group of patients (120 women) undergoing the same surgical procedure. The antiemetic effect of ginger was investigated in rats receiving cisplatin. Ginger extracts or ginger juice given to rats reversed the effect of the cisplatin-induced delay in gastric emptying. However, no effect from ginger (1 g) was observed in 16 healthy volunteers on gastric emptying. Evidence from these studies suggest that the usefulness of ginger to alleviate nausea and vomiting is still debatable.

Perhaps ginger is most popular for its antinausea and antiemetic effects in pregnancy. Up to 85% of pregnant women experience nausea in early pregnancy, and some 50% of those with nausea experience vomiting as well. In an extensive review of studies using ginger as an agent to fight morning sickness, the authors concluded that "ginger...may be beneficial." In two major trial databases on the use of antiemetic agents during pregnancy, ginger was found to provide some relief from nausea and vomiting; however, no strong support for its use for this condition was recommended. A randomized, placebo-controlled, double-blind study was carried out on 70 women in the first 17-week period of gestation. The women were given either a placebo or an oral ginger formula (1 g/day) for four days. Pregnant women recorded the incidents of nausea and vomiting during the treatment and those that had occurred one day prior to the start of treatment. Those who received ginger reported a significantly higher reduction in the number of episodes of nausea and vomiting than those who took a placebo formulation. Similar results were observed in another randomized, placebo-controlled, double-blind, crossover study. A significantly greater reduction in the symptoms of hyperemesis gravidarum (pernicious vomiting during pregnancy) was observed with ginger treatment (1 g/day of powdered ginger root) than was seen in the control group.

The use of ginger in pregnancy was discussed in an article in *HerbalGram*. The authors advocated the use of ginger to prevent nausea and vomiting in pregnancy, stating that a literature search they conducted showed no adverse effects from its use. The German Commission E Monographs, however, do not recommend the use of ginger for morning sickness. The authors of the article state, "The Commission E caution about not using ginger should be interpreted as a general caution, which it has expressed with most of its herbs, against pregnant women taking anything during pregnancy that has not been extensively researched. The Commission E itself stated 'no adverse effects' in its ginger monograph."

The use of ginger root for preventing seasickness and motion sickness was investigated in several studies. In one attempt to prevent seasickness, ginger root was compared to six other medications in a randomized, double-blind study of 1,741 tourist volunteers (observations were obtained from 85.5% of the participants). Ginger root was found to be as effective as five out of the

six medications, and superior to scopolamine transdermal therapeutic system in preventing seasickness. This anti-motion effect of ginger was not shown to be related to its CNS effects, but were possibly due to anticholinergic and antihistaminic actions. In a separate study, the anti-motion sickness effect of ginger compared to scopolamine or a placebo was tested on 28 subjects. Ginger showed no activity against motion sickness in doses as high as 1,000 mg given orally. In contrast, scopolamine (0.6 mg PO) provided significant protection against motion sickness when compared to the control group. Thus, the use of ginger for the prevention of seasickness remains controversial.^[5]

Ginger is traditionally used for functional dyspepsia and the activity is due mostly to 6-gingerol and 8-gingerol, as well as alpha-zingiberene. The latter has anti-ulcer effects. Recent studies have shown the inhibition of prostaglandin biosynthesis and also an anti-5-hydroxytryptamine effect.^[1]

The rhizomes are stimulant and carminative and are used as flavouring agent and in dyspepsia, flatulent, colic and vomiting. An infusion of the dry ginger with two teaspoonful of castor oil is recommended in painful affections of the bowels and stomach, stated that the ginger is chewed to stimulate the flow of saliva, to warm and tone the stomach, to relieve toothache and hoarseness of voice, to restore loss of voice, to relax the congested uvula and tonsils and the paralysed muscles of the tongue and faces. A paste of the ginger is considered as a local stimulant and rubefacient in headache, toothache and short sight due to deficient contractile power of the iris. The powder of ginger is rubbed on the extremities of the limbs, to check cold perspiration and to improve blood circulation in the collapse stage of cholera.^[2]

The mutagenic potential of ginger is the subject of controversy. Tea extracts show mutagenic effects on B2911 cells and on *Salmonella typhimurium* TA 100, but not TA 98. A mutagenic effect of isolated gingerol has also been demonstrated. In other investigations, however, ginger was reported to be antimutagenic. The significance of these experimental data for the use of ginger with human beings is still a matter of considerable debate.^[3]

Receptor interactions: Gingerols were identified as agonists of the capsaicin-activated vanilloid receptor. [6]-gingerol and [8]-gingerol evoked capsaicin-like intracellular Ca^{2+} transients and ion currents in cultured dorsal root ganglion neurones, which were blocked by capsazepine (a vanilloid receptor antagonist). Capsaicin-sensitive neurons in isolated guinea pig ileum in vitro could be modified by [6]-gingerol inhibited or enhanced contraction, which was affected by vanilloid receptor antagonist (capsazepine, ruthenium red), tetrodotoxin or atropine. Like capsaicin, [6]-gingerol stimulated choline release from prelabeled slices of the ileum.

Effect of contractility: Dried ginger, crude methanolic and processed (steamed and dried) aqueous ginger extracts and the pungent constituents [6]- and [8]-gingerol and [6]- and [8]-shogaol were investigated in various contractility models (isolated rat fundus, guinea pig small intestine, mouse mesenteric veins, guinea pig trachea and guinea pig left and right atria stripes, isolated rat and mouse blood vessels, isolated atrial cells and fragmented sarcoplasmic reticulum from rabbit peripheral and dog cardiac muscles, extravesicular Ca^{2+} concentration). Contractility was modulated depending on the dose, the frequency of administration and the stimulant

used, but not always in the same direction among preparations and constituents. Intravenous [6]-shogaol suppressed gastric contraction in rats in situ more than [6]-gingerol. Interactions with hyoscine, morphine (reversible by naloxone), diphenhydramine, promethazine, substance P, noradrenaline, phenylephrine, eicosanoid derivatives and non-competitive antagonisms to acetylcholine and histamine were observed. The [6]-shogaol-induced positive inotropic and chronotropic actions on isolated atria in rats disappeared on repeated injections or pretreatment (100mg/kg, s.c.) of [6]-shogaol. The inhibitory effect of galanolactone on the contractile response to 5-hydroxytryptamine (5-HT) may be related to antagonism of 5-HT₃ receptors.^[7]

Therapeutic indication

Action: abortive, anodyne, antidote (scorpion), antihistamine, antioxidant, antiseptic, aperitif, aphrodisiac, astringent, carminative, digestive, expectorant, panacea, pediculicide, rubefacient, sialogogue, sternutatory, stimulant, stomachic, sudorific, tonic, vermifuge.

Traditional uses: ague, amenorrhe, asthma, back ache, bronchitis, cancer (breast), cataplasm, chills, cholera, cold extremities, colic, congestion, cough, diarrhea, dog bites, dysentery, dyspepsia, fatigue, fever, fistula, flatulence, flugingivosis, gout, head colds, headache, hepatitis, indigestion, infection, intestinal gas, laryngitis, malaria, morning sickness, nausea, paralysis, parturition, phthisis, poor circulation, puerperium, rabies, rheumatism, rhinosis, snake bite, sore, stomach ache, suppressed menstruation, swelling, syphilis, tetanus, tumor (hand), ulcer, urogenital, wen.^[8,9]

Dose and method of administration

For the symptoms of motion sickness adults and children over 6 years old, 0.5g ground ginger should be taken two to four times daily. For stomach upsets, the medium dose is 2 - 4g daily.^[3,6]

Special warnings

No serious side effects were observed when ginger was used at the recommended dosages. There are occasional reports of allergic dermatitis and heartburn and headache in individual patients after taking ginger. Because of its positive inotropic, hypoglycemic and thrombocyte aggregation inhibiting effect, ginger taken in excessive doses can interfere with the actions of anticoagulants, or who have other coagulation disturbances, and patients with gallstones should not take ginger.^[3]

Although it is not widely recognized by the general public, treatment with herbs can interfere with the action of many drugs, resulting in potentially risky consequences. Ginger can enhance the anticoagulant effect of warfarin, leading to an increased risk of bleeding. Platelet aggregation in 20 healthy male volunteers was enhanced by the consumption of 100 g of butter per day for one week. Concomitant administration of dry ginger (5 g) significantly inhibited platelet aggregation. In a rat model, however, this interaction between ginger and warfarin was absent. Ginger use is also contraindicated if the patient suffers from gallstones, due to ginger's cholagogue effect (i.e., it promotes the flow of bile into the intestine).

Although ginger is commonly used for morning sickness during pregnancy, no major safety study on its use has been reported. Scattered studies in

animals, however, point to ginger's potential harmful effects if used during pregnancy and caution against its use. Ginger tea was given to pregnant Sprague-Dawley rats for 20 days from the day of gestation. The rate of spontaneous loss of fetuses was double in the ginger group than in a control group. However, the surviving fetuses were heavier and more developed in the ginger group than those in the control group.

The potential loss of fetuses after ginger use was also reported in another communication using experimental animal models. This harmful effect on the fetus is perhaps linked to blood-thinning properties of ginger, which may facilitate and enhance blood flow. However, other reported experiments failed to show any harmful effect on the developing fetus in Wistar SPF rats receiving ginger extracts. The phenolic compound [6]-gingerol was shown to be an active mutagen (the aliphatic chain containing a hydroxy group is the active mutagenic moiety). Because of the uncertainty concerning the safety of ginger use, pharmacists should advise women not to include ginger in a self-treatment program before first consulting with their obstetrician/gynecologists. Until further information on its safety is known, the use of ginger during pregnancy is not recommended. It should be used only after consultation with a healthcare provider.^[5]

Particularities

Pharmacologic studies in humanes:

The study by Micklefield et al. (1999) demonstrated an increase in gastroduodenal motility after oral ginger in the fasting state and after a standard test meal. However, the study by Phillips et al. (1993a) did not observe an impact on gastric emptying in the oral paracetamol absorption model after 1g of powdered ginger. In a cross-over-design, double-blind, randomized placebo-controlled study, Lien et al. (2003) investigated 13 volunteers with a history of motion sickness who underwent circularvection. Pretreatment with ginger (1000 and 2000mg) significantly reduced nausea, tachygastric activity and plasma vasopressin. Ginger also prolonged latency before nausea onset and shortened recovery time aftervection cessation. Intravenous vasopressin infusion at 0.1 and 0.2 U/min induced nausea and increased bradygastric activity; ginger pretreatment (2000mg) affected neither.

Acute hyperglycemia evoked gastric slow wave dysrhythmias via endogenous prostaglandin generation: In a randomized double-blind study 22 healthy humans underwent fasting electrogastricography during hyperglycemic clamping to 250 to 290mg/dl after 1g of ginger, placebo or the prostaglandin E₁ analog misoprostol (400µg). Acute hyperglycemia-induced gastric slow wave dysrhythmias were prevented by ginger root; however, dysrhythmias elicited by misoprostol did not show a similar effect, indicating that ginger likely acts to blunt production of prostaglandins rather than inhibit their action. Repeated oral stimulation with the irritant capsaicin produced sensitization or desensitization, depending on the temporal relationship and, to a lesser extent, the intensity of the stimuli. Zingerone, an irritant present in ginger, shows only desensitization across repeated samples as well as following a hiatus in stimulation. Analysis of the qualities found that the sensations produced by zingerone were predominantly burning and warmth, making it qualitatively similar to capsaicin. However, the time course of

zingerone irritation differed from that of capsaicin. Only three of the seven exploratory experimental studies on motion sickness had a positive outcome. In the remaining four studies most of them investigated powder of the plant material ginger was ineffective compared to comparators. The stimuli might have been too strong and the intrinsic antiemetic potency of ginger weaker than that of conventional antiemetics. Further studies using a set of variable stimuli progressively increasing in strength for producing motion sickness are necessary to find this out. Clinical studies of better methodology investigating the effect of 2g dried powdered ginger on platelet aggregation or 15g raw or 40g cooked ginger have not yielded such hemostatic effects. It is tempting to speculate whether higher doses of raw or dried powdered ginger may inhibit platelet aggregation, but further investigations are required. Although gastric emptying was not affected by ginger in a human pharmacological study, electrogastrography showed at least some effect of ginger on gastric motility. Again, there is not enough data to draw definitive conclusions.^[7]

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Figure: <http://www.britannica.com/EBchecked/topic-art/657395/8081/Common-true-or-Canton-ginger>, Britannica Online Encyclopedia, Photo by Helen Cruickshank, 10.09.2008

Zingiber zerumbet (L.) Rosc. ex Smith (Tepus)

Synonyms: Amomum zerumbet L., Pinecone Ginger, Shampoo Ginger, Awapuhi, Bitter Ginger



Zingiber zerumbet (L.) Rosc. ex Smith

Occurrence and appearance

Rhizomes yellowish inside, tuberous. Pseudostems 0.6 - 2 m. Leaves sessile or shortly petiolate; ligule entire, 1.5 - 2 cm; leaf blade lanceolate or oblong-lanceolate, 15 - 40 × 3 - 8 cm, glabrescent or abaxially somewhat pilose, base narrowed, apex acuminate. Inflorescences arising from rhizomes, conical or ovoid-oblong, 6 - 15 × 3.5 - 5 cm, apex obtuse; peduncle 10--30 cm, scalelike sheaths 5 - 7; bracts closely imbricate, green when young, red when old, slightly hairy, slimy adaxially, margin membranous; bracteoles ca. 1.5 cm. Calyx 1.2 - 2 cm, membranous, split on 1 side, apex 3-toothed. Corolla tube 2 - 3 cm, slender; lobes pale yellow, lanceolate, central one 1.5--2.5 cm. Labellum pale yellow, ca. 1.5 × 2.5 cm; central lobe suborbicular or subobovate, 1.5 - 2 × ca. 1.5 cm, apex emarginate; lateral lobes obovate, ca. 1 cm, free nearly to base. Stamen ca. 1 cm; connective appendage beaklike, ca. 8 mm. Ovary ca. 4 mm, glabrous. Capsule ellipsoid, 0.8 - 1.2 cm. Seeds black. Fl. Jul - Sep, fr. Oct. 2n = 22*.^[1]

Parts used

Rhizome, leaves, bracts

Constituents

Sixty-nine constituents were identified in essential oil from the rhizomes, leaves and flowers of *Zingiber zerumbet* Smith from Reunion Island. The oils were obtained by steam distillation. The oils obtained from rhizomes were rich in zerumbone (37%), alpha-humulene (14.4%) and camphene (13.8%). The oils from leaves and flowers differed appreciably from that from rhizomes by the presence of large amounts of (E)-nerolidol (21.4% and 34.9%), beta-caryophyllene (6.9% and 10.2%), and linalool (7.7% and 17.1%),

respectively. The leaf oils differed from the others by their high levels of α - and S-pinenes (10.3% and 31.4%, respectively).^[2]

Pharmacologic properties

Zerumbone and 3",4"-O-diacetylfazelin were isolated from organic extracts of rhizomes of *Zingiber aromaticum* (Zingiberaceae) and zerumbone and 4"-O-acetylfazelin were obtained from organic extracts of entire plants of *Z. zerumbet*. Zerumbone exhibited HIV-inhibitory and cytotoxic activities, while the afzelins were inactive in both assays.^[3]

Zingiber zerumbet has beneficial effects of inhibiting the release of inflammatory mediators and influencing the gene expressions of cytokine network. Examples of human use of extracts of *Zingiber zerumbet* to treat allergic disorders were also described. The potentials of the aqueous crude extract (ACE) of *Zingiber zerumbet* (L.) Smith (ZZ) in anti-hypersensitivity and antiinflammation were demonstrated in mice. Leukotriene C4 (LTC4) release was measured from lung tissue of mice treated with ZZ-ACE. Results showed that ZZ-ACE effectively suppressed LTC4 release from the lung tissue. An active compound was identified as 5,7- Dihydroxy-2- (4-hydroxy-phenyl) - 3-methoxy-chromen-4-one for the effect of suppressing LTC4. Ovalbumin was used to induce asthmatic allergy reactions in mice. Mice treated with ZZ-ACE had higher ratios of splenocyte IFN- γ /IL-4 gene expressions levels ($p < 0.05$) as compared with those of the control groups. Zerumbone was identified as an active ingredient to increase the IFN- γ /IL-4 gene expression ratio. Anti-allergic effects were also observed when human volunteers were administrated with ZZ-ACE in liquid or in capsule form. These results indicate that extracts of ZZ, using ethanol, water, or a mixture of ethanol and water as solvent, contains components that have potentials in preventing or treating allergic inflammation.^[4]

In a study the objective was to evaluate the antipyretic and analgesic activities of aqueous and ethanol extracts of *Zingiber zerumbet* rhizomes. The anti-pyretic activity of *Zingiber zerumbet* (25, 50 and 100 mg kg⁻¹) was studied in Brewer's yeast-induced pyrexia in rats. The analgesic activity of *Zingiber zerumbet* (10, 25, 50 and 100 mg kg⁻¹) was studied using acetic acid-induced writhing in mice. Both aqueous and ethanol extracts of *Zingiber zerumbet* showed significant anti-pyretic activities in Brewer's yeast-induced pyrexia in rats throughout the observation period of 8 h. The ethanol extract of the rhizomes of *Zingiber zerumbet* however significantly decreased the writhing movements in mice in acetic acid-induced writhing test. In conclusion, rhizomes *Zingiber zerumbet* have both analgesic and anti-pyretic activities.^[5]

Zerumbone significantly showed an antiproliferative activity upon HepG2 cells with an IC₅₀ of 3.45 ± 0.026 μ g/ml. Zerumbone was also found to inhibit the proliferation of non-malignant Chang Liver and MDBK cell lines. However the IC₅₀ obtained was higher compared to the IC₅₀ for HepG2 cells (> 10 μ g/ml). The extent of DNA fragmentation was evaluated by the Tdt-mediated dUTP nick end labelling assay which showed that, zerumbone significantly increased apoptosis in HepG2 cells in a time-course manner. In detail, the apoptotic process triggered by zerumbone involved the up-regulation of pro-apoptotic Bax protein and the suppression of anti-apoptotic Bcl-2 protein expression. The changes that occurred in the levels of this antagonistic

proteins Bax/Bcl-2, was independent of p53 since zerumbone did not affect the levels of p53 although this protein exists in a functional form. Western blotting analysis for Bax protein was further confirmed qualitatively with an immunoassay that showed the distribution of Bax protein in zerumbone-treated cells. Therefore, zerumbone was found to induce the apoptotic process in HepG2 cells through the up and down regulation of Bax/Bcl-2 protein independently of functional p53 activity.^[6]

Therapeutic indication

Action: antiseptic, apertif, bactericide, vermifuge.

Traditional uses: asthma, biliousness, bronchitis, burns, chest, cough, dermatitis, diarrhea, dysentery, dysuria, gallstones, gonorrhea, head ache, lassitude, leprosy, mouth infection, peptic ulcers, phthisis, ringworm, skin, spice, stomach ache, toothache, wounds.^[7,8]

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3 Conclusions and Summary

Our work started with looking through the huge number of all the plants collected from the project. The plants were ordered by families and divided into two master theses. Most of the monographs of each plant has the same structure of description, like, occurrence and appearance, parts used, constituents, pharmacologic properties, therapeutic indications, e.g., depending on the available informations from the different sources we used. We also thought over how to deal with all collected information, and to which further opportunities this could possible lead.

At this point we had to go back to the very beginning, the motives behind the work.

The foundation stone of our literature work is to support people in both of the villages with scientific studies and verified literature in order to leverage their traditional knowledge. We were looking for recent data for all the plants, well known or not, with special eye on toxicity risks for the people using their herbal medicine. We brought together all the information in a kind of reference book, which now allows us to take an outlook for possible supportive ideas.

There are short monographs, and longer ones. There are very popular plants included as well as quite unknown ones. We searched in books, scientific papers and the internet, and only included the information which seemed to be serious and verified.

Some of the plants from the project have been used traditionally for a long time, and were much later verified by scientific research and are now well experienced.

Some of the plants have toxic properties, and others may be used more effectively. Again other plants are used and prepared in traditional medicine only and have just been started to be part of research studies, which often seem to verify the old knowledge.

Taking out examples comparing the use of traditional plants in the villages with findings from literature, shows how different further work with all the collected information could be.

Taking a look at *Emilia sonchifolia* L., which is a plant where not much is known about pharmacological properties and activity, though many traditional uses are reported. The Pyrrolizidine alkaloids, senkirkine and doronine were isolated from the aerial parts. This plant is eaten raw or cooked and is sold in local markets in Java. People in Sirnarasa village use the cooked plant, called “*Jonge*” for abdominal discomfort and gastritis.

Another, very popular example is *Sauropus androgynus* Merr., which is used in Tanjungsari village with the local name “*Katuk*” for increasing breast milk production and treating hot stomach symptom. This plant became popular in an unconfirmed weight control method in Taiwan 1995 where several cases of poisoning were reported. The symptoms of poisoning, such as cardio pulmonary problems, can appear no matter whether the stem or leaf is eaten, or the juice is frozen or filtered, or any supplement is added, and the way it is processed. Though the *Sauropus* extract is suspected to have a function as

lactagogum, it is highly risky to be consumed by the natives!

The beautiful Asteraceae *Ageratum conyzoides* L., is widely used in traditional medicine systems where ever it grows. Very similar applications are recorded from many different countries, even different continents! *Ageratum*, also known under the name “winter weed” shows pharmacologic activity, as proven by several research investigations in different countries! There are already some small pharmaceutical companies in Brazil, using *Ageratum* as a raw material for phytochemicals.

Work also shows us, the well known plants, such as *Centella asiatica* L. Urban, *Plantago major* L., *Cymbopogon winterianus* Jowitt, *Morinda citrifolia* L., *Orthosiphon aristatus* (Blume) Mig and *Persea Americana* Mill, are used in both villages, though more of them are prepared in the sub urban communities of Tanjungsari for the same diseases as found in scientific literature. Another example for this could be the leaves of *Psidium guajava* L., which are used in very similar preparations against diarrhea in Sirnarasa and Tanjungsari. The place of origin is uncertain, and Guava was adopted as a crop in Asia, so was knowledge of the plant experienced by native people themselves, or was the information brought from outside?

This is just one of many questions, that may never be completely answered by scientific research, but an important and interesting fact to be considered in an international project, is to exchange, integrate, save, support and compare knowledge about medicinal plants!

Common illnesses experienced by village, in groups

In both villages:

Sickness of the stomach:

Abdominal discomfort, distension

Stomach ache

Gastritis

Upset stomach, vomiting

Enhancing appetite

Common cold and flu:

Runny, stuffy nose

Itchy, sore throat

Coughing

Chill

Inflammation:

Rheumatism, joint pain

Fever

Skin injury:

Skin itching, small wounds

Common pain:

Body pain, muscle pain, sprained muscles, luxation, lower back pain

Headache

Post-natal care:

Reconditioning vaginal function and the womb

Increasing breast milk

Only in Sirnarasa:

Diabetes

Eye Infections

Ulcers

Toothache

Treating kidney stone symptoms

Only in Tanjungsari:

High blood pressure

Low blood pressure

Diarrhea

Worms

Difficult urination

Medicinal plant species commonly known in Sirnarasa:

Ageratum conyzoides L.

Alstonia scholaris L. R. Br.

Ardisia fuliginosa Bl.

Centella asiatica (L.) Urban

Emilia sonchifolia (L) DC.

Ficus edelfeltii King

Gardenia jasminoides Ellis

Gigantochloa veriticillata (Willd.) Munro

Kalanchoe crenata (Andr.)

Lagenaria leucantha Rusby

Physalis angulata L.

Zingiber officinale Rosc.

Medicinal plant species commonly known in Tanjungsari:

Allium cepa L.

Andrographis paniculata Ness.

Bancudus latifolia Rumph.

Cymbopogon flexuosus (Nees ex Steudel) J.F. Watson

Gynura procumbens (Lour.) Merr.

Manihot esculenta Crantz.

Persea americana Mill.

Sauropus androgynus (L.) Merr

Strobilanthes crispus L.

Zingiber cassumunar Roxb.

Medicinal plant species commonly known in both villages:

Blumea balsamifera (L.) DC.

Citrus aurantifolia Swingle

Coleus blumei Benth.

Curcuma aeruginosa Roxb.

Curcuma longa L.

Curcuma xanthorrhiza Roxb.

Cymbopogon winterianus Jowitt.

Kaempferia galanga L.

Orthosiphon aristatus (Blume) Mig.

Plantago major Linn.

Psidium guajava Linn.

Comparison of common illnesses with most commonly known plants

Common Illnesses	Plants used Tanjungsari	Plants used Sirnarasa	Plant Indications Literature	Application Conclusion	Alternative Plant
1.) Stomach & Intestine					
* Diarrhea	Psidium guajava L.	Psidium guajava L.	diarrhea, antibacterial; diabetes, digestive complains	useful	Persea americana Mill
* Abdominal discomfort (distension, vomiting, upset)	Zingiber cassumunar Roxb.	Zingiber officinale Rosc. Blumea balsamifera (L.) DC. Curcuma xanthorrhiza Roxb. Emilia sonchifolia L.	analgesic, antiinflammatory, antiseptic, antitoxic, antispasmodic, carminative, digestive, diuretic, stomachic, vermifuge,... digestion discomfort, antibacterial, antifungal,... many traditional applications (depurative, headache..) diuretic, dissolution kidney stones, hypertension.. traditionally used for digestive complains used only traditionally; Pyrrolizidine alkaloids!	useful	Citrus aurantifolia L.
				useful	
				could be usefull	
				usefull	
				not safe	
* Stomach ache	Psidium guajava L.	Psidium guajava L.	Leaves diarrhea, antibacterial	useful	Andrographis paniculata Ness
	Sauropus androgynus Merr.		can induce primarily cardio-pulmonary problems	not safe	Kaempferia galanga L.
* Gastrites	Curcuma xanthorrhiza Roxb.	Curcuma xanthorrhiza Roxb.	antiviral, antiinflamm, normalices digestion, increases brest milk production; CAVE pregnancy!	useful	Persea americana Mill Citrus aurantifolia L. Kaempferia galanga L.
	Curcuma aeruginosa Roxb.	Blumea balsamifera (L.) DC. Emilia sonchifolia L. Zingiber officinale Rosc.	Action: purgative	not useful	
	Curcuma longa L.		acute life threatening complications of ulcers!	not safe	
			(see above)	could be useful	
			(see above)	not safe	
* Enhancing appetite	Curcuma aeruginosa Roxb.		(see above)	useful	Kaempferia galanga L. Allium cepa L.
				not usefull	

Common Illnesses	Plants used Tanjungsari	Plants used Sirnarasa	Plant Indications Literature	Application Conclusion	Alternative Plant
2.) Common cold & flu	Cymbopogon winterianus Jowitt		sedative, disinfectant, anti-inflammatory, antibacterial		
* Runny, stuffy nose	Cymbopogon winterianus Jowitt		antispasmodic, analgesic, digestive tonic, ...	useful	
* Coughing	Kaempferia galanga L. Citrus aurantifolia L.	Citrus aurantifolia L. Zingiber officinale Rosc. Gigantichloa verticillata Munro Ficus edelfeltii King	antibacterial, carminative, antispasmodic	could be useful	Persea americana Mill
			antiphlogistic, expectorant, stimulant, entheogen	useful	
			antiseptic, bactericide, carminative, emetic, laxative		
			pediculicide, purgative, refrigerant, stomachic, venereal, vermifuge, antidot (Manihot!) (see above)	could be useful	
* Chill	Allium cepa L.	Citrus aurantifolia L. Gardenia jasminoides Ellis Kaempferia galanga L. Lagenaria leucantha Rusby Zingiber officinale Rosc.	no application found	not usefull	Plantago major L.
			no application found	not useful	
			enhancing appetite, antimicrobial, lower blood sugar	useful	
			antiasthmatic, antiallergic	could be useful	
			(see above)	useful	
			choleretic, to lower body temp., lower blood press.		
* Fever	Allium cepa L. Manihot esculenta Cranz	Gardenia jasminoides Ellis Gigantichloa verticillata Munro	haemostatic, anti inflammatory effect; purgative action! (see above)	could be useful	Cymbopogon winterianus Jowitt
			emetic, purgative, partly toxic	not useful	
			(see above)	could be useful	
			(see above)		
* Fever	Allium cepa L. Manihot esculenta Cranz	Gardenia jasminoides Ellis Gigantichloa verticillata Munro	Manihot amyllum as dietary food	could be useful	Alstonia scholaris L.
			juice (Manipuera) is deadly poison! (see above)	not safe	Andrographis paniculata Ness
			no application found	useful	
				not useful	Gardenia jasminoides Ellis

Common Illnesses	Plants used Tanjungsari	Plants used Sirnarasa	Plant Indications Literature	Application Conclusion	Alternative Plant
		Kalanchoe crenata Andrews Lagenaria leucantha Rusby	insecticide, purgative, anti diabetic, analgesic (see above)	not useful not useful	Physalis angulata L.
3.) Inflammation, common pain					
* Rheumatism, joint pain	Andrographis paniculata Ness		hyptoprotective, cholinergic, stomachic, antihelmetic antithrombogenic, antidiarrheal, immunstimulant, anti-inflammatory properties, sedative, lowers fever traditionally used to treat dysentery, fever, renosia	useful	Zingiber cassumunar Roxb.
	Gynura procumbens Merr		antibacterial, antiseptic, antitussiv, expectorant, astringent, antiinflammatoric, diuretic, cardiac,...	could be useful	
	Plantago major L.		antibacterial, anticoagulant, antiviral, hypotensive, immunstimulant, antiseptic, antispasmodic,...	useful	
	-	Physalis angulata L.		could be useful	Morinda citrifolia L.
				-	-
* Body, muscle, lower back pain, luxation, spaidem	Cymbopogon winterianus Jowitt		(see above)	useful	
	Plantago major Linn		(see above)	not useful	Ageratum conyzoides L.
		Curcuma aeruginosa Roxb.	Action: purgative	not useful	Alstonia scholaris Linn
		Curcuma longa L.	(see above)	not useful	Plantago major Linn
		Curcuma xanthorrhiza Roxb.	(see above)	not useful	Gardenia jasminoides Ellis
		Kaempferia galanga L.	(see above)	could be useful	
		Physalis angulata L.	(see above)	could be useful	
* Headache		Kaempferia galanga L.	(see above)	useful	
4.) Post natal care					
* After delivery care	Blumea balsamifera (L.) DC.	Blumea balsamifera (L.) DC.	(see above)	could be useful	Morinda citrifolia L.
	Coleus blumei Benth		poisoning	not safe	Plantago major Linn

Common Illnesses	Plants used Tanjungsari	Plants used Sirnarasa	Plant Indications Literature	Application Conclusion	Alternative Plant
* Recording vaginal function		Centella asiatica Urban	dermatologic, vasoprotective, poisoning in high levels	useful	
* Increasing breast milk	Sauropus androgynus Merr.		(see above)	not safe	Curcuma xanthorrhiza Roxb.
5.) Skin injury					
* Skin itching small wounds	Zingiber cassumunar Roxb.	Ageratum conyzoides L. Coleus blumei Benth Plantago major L.	(see above) antiinflammatory, antispasmodic, insecticide effects (see above) (see above)	useful useful not safe useful	Persea americana Mill
6.) Urological					
* Kidney stone		Orthosiphon aristatus Mig	bacterial infections urinary tract; antiinflammatory	could be useful	Blumea balsamifera (L.) DC.
* Difficult urination	Orthosiphon aristatus Mig Strobilanthes crispus L.		(see above) traditionally used as antidiabetic, diuretic, laxative...	useful could be useful	
7.) Others only in one village					
* Diabetes		Psidium guajava L.	(see above)	useful	Allium cepa L.
* Eye Infections		Ficus edelfeltii King Gigantichloa verticillata Munro Kalanchoe crenata Andrews	no application found no application found (see above)	not useful not useful could be useful	Ageratum conyzoides L. Blumea balsamifera (L.) DC. Physalis angulata L.
* Ulcers		Ficus edelfeltii King Ardisia fuliginosa	no application found no application found	not useful not useful	Centella asiatica Urban Alstonia scholaris L.
* Toothache		Alstonia scholaris L.	antipyretic, laxative, antiinflammatory,...	could be useful	Persea americana Mill

Common Illnesses	Plants used Tanjungsari	Plants used Sirnarasa	Plant Indications Literature	Application Conclusion	Alternative Plant
* High blood pressure	Persea americana Mill		antibiotic, effective hypertension, antitussive, arthrites prevents/protects different cardiovascular diseases (see above)	useful	Physalis angulata L. Blumea balsamifera (L.) DC.
	Morinda citrifolia L.			useful	
	Gynura procumbens Merr			not useful	
* Low blood pressure	missing				Alstonia scholaris L.
* Worms	Coleus blumei Benth		(see above)	not safe	Andrographis paniculata Ness
					Alstonia scholaris L.
* maintaining stamina	Curcuma aeruginosa Roxb.		(see above)	not useful	Morinda citrifolia L.

4 Curriculum vitae

Emina Koller, geb. Islamovic

Familienstand: Verheiratet

Kind: Danis Koller, geb. 23.09.2004

Vater: Faik Islamovic, Selbständig

Mutter: Izeta Islamovic, Angestellte im sozialen Bereich

Geschwister: Schwester, Mersiha Todorovac, geb. Islamovic

Geboren am: 27.08.1980 in Brcko, Bosnien und Herzegowina
1992 als Kriegsflüchtling nach Österreich gekommen
2001 Verleihung der österr. Staatsbürgerschaft

Ausbildung

1986 – 1992 Grundschule in Brcko, Bosnien und Herzegowina

1992 – 1994 Öffentl. Hauptschule mit naturkundlich – technischem Schwerpunkt, 1160 Wien, Koppstrasse 110, Abschluss mit ausgezeichnetem Erfolg

1994 – 1998 Oberstufenrealgymnasium, 1030 Wien, Kundmannngasse 30, Abschluss Matura

1998 – 2009 Studium der Pharmazie und Chemie, Universität Wien