

DWECK DATA

THE
WILLIAM GARDENER COLLECTION
OF
CHINESE MEDICINAL PLANTS

Written by William Gardener FLS, manuscripts computerised by: Anthony C. Dweck FLS from old papers donated by Linda Fellows and given back to the world on 22nd. April 1995.

MAP OF CHINA



EDITORIAL NOTE

This volume comprises of a long period of personal correspondence from 3rd October 1984 until 16th November 1994 from Mr. William Gardener to Dr. Linda Fellows (then of Kew Gardens).

In early 1993, Dr. Fellows passed the documents to me for inclusion in my data base. It soon became evident that there was a great deal of valuable data that should be published for the benefit of others, who might also be keen on collecting information on Chinese botanicals.

I know very little of William Gardener, except that he worked on an ancient manual typewriter and seemed an obsessive collector of plant data. I only had one conversation with his widow, and it would appear that he had spent a considerable part of his life in China and was fluent both in the spoken and written language.

I believe that he was also a Fellow of the Linnean Society and other botanical institutions.

The quality of his work was excellent, and it is a source of great personal pleasure to have salvaged a small part of his work for posterity.

Anthony C. Dweck
The Herbal Archivist

The William Gardener Collection

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Celastrus angulatus Maxim. (**C. latifolius** Hemsl.). A very vigorous climbing shrub, rising to about 3m in height, and found throughout China from the Yellow River provinces southwards in thickets and dense forest, and on rough hill slopes. It is hardy, and has been introduced into Europe and the United States for its ornamental value as a garden plant (1: 240: 2: 562).

Economic uses

Oil: The skin of the red-coated seeds contain oil up to 68%. The kernels also are rich in fats, providing an industrial oil. (9: No.3044).

Medicine: The root bark is efficacious as an antipyretic and anti-toxic, and in reducing swelling, but being slightly toxic is not suitable for internal use. (5: 441-442).

Fungicide: A fungicidal preparation can be made from the root and stem (9: No.3044).

Insecticide: This bark also provides a powerful insecticide (3: 443). Prophylactic properties, warding off insect attacks, are attributed (6: 211). Specific use in this respect has been recorded by Henry (8), who describes a powder made from flour mixed with the powdered leaves, which is applied in the Middle Yangtze region to growing cabbages, turnips, etc., to prevent the ravages of insects.

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Celastrus gemmatus Loes. A climbing shrub reaching 7m in height, with glabrous and nearly round branchlets dotted with lenticels.

The species is distributed through all provinces of mainland China south of the Yellow River, and in the island of Taiwan. Close forest and hill slope thickets are the usual places where it is to be found.

The species is hardy, and appears to have been introduced into the United States for cultivation as an ornamental plant in gardens (1: 240).

Economic importance

Pesticide: In the Chinese province of Hubei (Hupeh), spanning the Middle Yangtze but lying for the most part to the north of the river, a pesticide is made from the root and leaves (5: 445).

Oil: The seeds contain oil, used industrially. The manufacture of soap is one such use. (9: No.3047).

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Celastrus orbiculatus Thunb. (**C. articulatus** Thunb.; **C. articulatus** Thunb. var. **orbiculatus** Wang). A vigorous climbing shrub, the twining stems reaching 12m. or more in height, the branchlets glabrous, and covered with numerous lenticels.

Distribution is from north-eastern, north-western, northern and eastern China to provinces of the Middle Yangtze region and the south-west, and in Korea and Japan; and the species has also been found in the south-eastern province of Guangdong (Kwangtung) hilly areas of the more northerly parts (10: 81), and generally in hillside thickets or within forests, climbing on trees. Farmers cultivate it in districts in north-westerly provinces around the Yellow River and tributaries (6: 214), and no doubt elsewhere.

The species has been introduced into the West. In winter months from November to January, when the fruit capsules open to disclose their golden-yellow inner surface and the red-coated seeds, remaining long in this condition, the shrub is peculiarly handsome, and it is cultivated for its ornamental value in Europe and America (2: 564-65). In eastern New England it has become naturalised (1: 240).

Economic importance:

Oil: The oil content of the seeds, around 50% (9: No.3045), can be used in the manufacture of soap, and provides a lubricating oil for machinery (5: 444).

Insecticide: Among the numerous popular names for the plant is Insect Medicine. An insecticide is derived from the root, stem, and leaves (3: 444; 9: 3045). It is possible that the bark of the root contains the most potent source (5: 444).

Medicine: Medicinal uses of the root, stem, leaves and fruit are numerous. Preparations of them are said in China to stimulate the circulation, reduce swelling, and serve as an antitoxic (9: 3045). Preparations of the root and stem are said to cure rheumatoid arthritis and traumatic injuries, to ease pain in the loins and thighs, and to stop the menses. Traumatic injuries can be treated also by the leaves, which in addition are said to arrest development of boils and swollen pimples, and cure poisonous snake bites. The fruit is said to be useful in treating neurasthenia, heart palpitations, insomnia, and amnesia (7: 517). Root and fruit are further said to disperse extravasated blood (5: 444).

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Celastrus rosthornianus Loes / **Celastrus loeseneri** Rehd. & E.H. Wils. A deciduous climbing shrub rising to 7m., bearing numerous lenticels on slender branchlets.

The species is found in most of the provinces of China south of the Yellow River basin, in forests, on waste hill-slopes, or besides streams or roads, climbing up trees or hanging from cliffs.

This is a good looking species, and has been introduced into Europe and North America, where it is cultivated for its capacity, when trained up stakes, to make a handsome cluster (2: 565).

Economic importance

Medicine: The root bark is anti-toxic, curing poisonous swellings, and, so it is reported, snake bites (6: 212-3).

Insecticide: The stem bark and the leaves produce an insecticide (9: No. 3049; 6: 6: 212-13; 5: 444-45).

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ULMACEAE

Aphananthe aspera (Thunb.) Planch.

Ulmus parvifolia Jacq.

Ulmus pumila L.

14.iii.1985 6

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Aphananthe aspera (Thunb.) Planch. (Prunus aspera Thunb.; Celtis muka Sieb.: Homoioceltis aspera (Thunb.) Blume), Ulmaceae, the Muka Tree of Japan, whence it was introduced to Kew, a tall, deciduous tree up to 18m in height, providing strong, solid timber, durable in use, and producing green flowers that appear with the leaves and are so small as to be inconspicuous.

Distribution is in China, from the Tsin-ling range at the southern extremity of the province of Shaanxi (Shensi) south to the region of the Lower Yangtze, and on to the southern provinces (2), though not in tropical island of Hainan; in Korea; and in Japan in the central and southern islands (6).

The species is reasonably hardy in the south of England.

In China the tree is to be found on the slopes of hills, and in forests and woodlands thereon, at altitudes that vary with the latitudes and positioning, but can reach as high as 900m. (300m in Taiwan (5)), along the sides of rivers, and beside homesteads in country villages. It prefers a deep, warm, and firm fertile soil (2). In Japan it is to be found in lowlands and the hills(6).

The seed kernels yield a yellow oil (50.8%) with a fatty acid component made up of palmitic acid, 5.3%; hexadecouric acid, 0.1%; stearic acid, 0.3%, oleic acid, 6.1%; linolenic acid, 0.4%; and linoleic acid, 83.1% (4).

The leaves provide an insecticide which has been found useful in subduing bollworms on cotton, and as a preventive there (1,3).

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Ulmus parvifolia Jacq., Ulmaceae, (U. virgata Roxb.). A small, slow growing, smooth barked, deciduous or semi-deciduous tree to about 15m. in height, sometimes up to 25m., whose slender branches form a broad rounded head. The small glossy-green leaves stay on the tree half way through the winter, remaining green in milder climates, otherwise a late autumn change to red or purple.

The species is native to China, Korea and Japan. Its natural range in China lies south of the Tsinling mountain system, extending along the Yangtze basin from western provinces to the sea, and on southward towards south coast China and to Taiwan. It is a species of woodland and of the neighbourhood of watercress on low-lying land, and the valleys and glens in the lower slopes of mountains. It is very adaptable, and can be grown successfully outside this area, hence is cultivated further north for its ornamental value as a park and roadside tree, and could be established there for the uses customarily made of its sturdy timber and of the fibre of its bark.

As an introduced species in the West, a particularly valuable feature is its resistance to Dutch Elm Disease, a character it shares with other Chinese elms.

It is at home on acid, neutral, and calcareous soils (3).

Insecticidal -An incense is said to be made from the bark of the roots, that repels mosquitoes (2); but see U. pumila for the possibility that this also is the mucilaginous paste needed to harden the joss-stick containing the active fragrance.

In the Lower Yangtze region a local pesticide is made from the leaves, for the control of Red Spider infestations (1).

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William Gardener.
14. iii. 1985.

Ulmus pumila L., Ulmaceae, a rapidly growing shrub or small tree whose height varies with the latitude and locality, being some 8m. in the desert regions of the Chinese north-west, and in Siberia, but reaching 15m. and perhaps even more elsewhere, say from the neighbourhood of Peking southward. It produces good timber, much used.

Distribution is from China through Siberia to Korea and Japan. Within China the species is found in the north-east (Manchuria) and north-west, and southward to the Yangtze basin.

This is a hardy species, which has been introduced into the West, where it is highly resistant to Dutch Elm Disease. It is cultivated in China for the utility of its hard timber and its fibre, for sand fixation in desert regions, and as an ornament in temples and elsewhere.

The inner bark and timber are mucilaginous. In northern China a mealy substance is made by pounding the inner bark, among whose uses is the provision of a paste which can incorporate fragrant incense into the joss-sticks that are effective mosquito repellants (1). Though the active principle may well reside entirely in the fragrant incense, the paste is an essential ingredient of the repellent in arid regions of the tree's range, and one without which the repellent could not there be made.

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RUTACEAE

Acronychia pedunculata (L) Miq.	<u>19.iv.1985</u> 10
Citrus medica L.	11,12
Phellodendron amurense Rupr.	13
	14

Acronychia pedunculata (L) Miq., Rutaceae

There is disagreement as to the correct nomenclature and synonymy. Burkill (5) calls the species **Acronychia laurifolia** Blume (**Acronychia pedunculata** (L) Miq.). Chinese botanists responsible for compiling national and regional Floras call the species **Acronychia pedunculata** (L) Miq. (**Jambolifera pedunculata** L.) (8). Lecomte, in the Floré généralé de l'Indochine (Vol.1, pp 646-48) gives **Acronychia laurifolia** Bl. (**Acronychia pedunculata** (L) Miq.; **Cyminosma pedunculata** DC.; **Cyminosma aukendo** Gaertn.; **Clausenia simplicifolia** Dalz.; **Jambolifera pedunculata** Vahl.; **Gela lanceolata** Lour.; **Salas lanceolatum** Spreng.). Read in his Chinese Medicinal Plants of the Pen Ts'ao Kang Mu gives **Acronychia laurifolia** Blume (**Cyminosma resinosa** DC.; **Jambolifera pedunculata** L.), with the character for the Chinese name of the plant identical with those use din the Chinese Flora referred to above. Roi, in his Traité des plantes médicinales chinoises, published 1955, follows Read, adding that the determination is Japanese. For further confusion Wang (9) separates the species, ascribing **Acronychia pedunculata** to the monsoon rain forests of Hainan island and southern Yunnan alone. A monograph appears desirable; and it seems best here to follow the Chinese Flora, using **Acronychia pedunculata** as the main Latin name.

This species is a large evergreen shrub or small tree, of tropical Asia, very variable, bushy-topped with dense foliage on slender branches, and in tree form little more than 10m. in height. When crushed, the leaves give out a resinous scent.

Distribution is from east to west of China in the three southernmost, and tropical, provinces, and thence southward through the Indo-Chinese region of Malaya, and westward through the Andamans to India and Sri Lanka. In Taiwan it grows in forest at low altitudes in the northern and central parts of the island. Indian distribution is in evergreen forests, and on river banks and in ravines, in the sub-Himalayan tract from Dehra Dun to Sikkim, up to 1,525m., in eastern Bengal, and in the western Ghats.

The bark of the stem, and the leaves and fruit, contain essential oils (1), the leaves yielding 0.06% (7). During the course of a twenty year survey of local medicinal plants carried out by the Department of Chemistry at the University of Hong Kong, the triterpenoid bauerenol, previously obtained from another species of the genus, and thought to be rare, has been isolated from the bark of **A. pedunculata** (3 & 2). In another analysis, haemolytic tests on the stem and fruit proved positive (RfO. 4-0.84) (4).

Economic importance

Perfume: The fragrant oil from the stem and leaves provides material in China for the preparation of cosmetic perfumery (8).

Food: The fruit itself is edible, sweet to taste with a slightly acid flavour.

Fish poison: The roots have been recorded as being used as a fish-poison in southern Vietnam, formerly Cochin-China (5). Chopra (6) cites Pammel, 1911, a Manual of Poisonous Plants, for a report that **A. pedunculata** is a fish poison. It could be that the saponin (triterpenoid) content of the bark, extending to that of the roots, is the active principle, in which case the potential of **A. baueri** Schott as a fish poison and insecticide should be worth examining.

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Citrus medica L., Rutaceae, the Citron, a thorny shrub or small tree rising to about 5m., and bearing thorny branches, straggling and rather short and thick, and white flowers that are often pink on the outside. The fruit is large, very aromatic, has a very thick rind and relatively small and bitter pulp, and is produced in various shapes, oblong, obovoid, and lobed or fingered.

The last-mentioned has been accorded varietal status as var. **sarcodactylus** Swingle. It is reported to occur wild in north-west India (4), and in westerly provinces of China (5). The species has also been found apparently wild in India in Kumaon, Sikkim, and the Gar Hills of Assam (1), and has been reported wild from the Khasi Hills in Assam, and the Chittagong district (4). It has thus been considered a native of India. Cultivation is so extensive, ranging from the Mediterranean region through Iran to southern China and the West Indies, and to a limited extent in California and Florida, that the origin remains obscure, and locations apparently wild may be due ultimately to human influence.

The fingered variety is known in China as Buddha's Hand (Fushou) and Buddha's Fingers. Both species and variety are much cultivated there, in southerly parts of the country, and the variety can be grown further north, in moist artificial warmth, partly for its ornamental value (2).

Specific gravity of the oil expressed from the rind of the fruit, and known as Oleum citronis or Cedrat essence, is given as 0.840-0.860 (7). Chopra (3) records Oil of Limette as a name for this essential oil.

Molluscicide: Kuo Yuan Hua (6) includes the species in his list of molluscicides having moderate effect, achieving mortality of snails in the range of 51-89% at a concentration of 10,000 ppm.

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Phellodendron amurense Rupr., Rutaceae, the Amur Cork Tree, a handsome deciduous, aromatic, small tree, from 10-15m tall, with a straight trunk up to 60cm. in diameter, and a thick grey, corky, and deeply fissured bark, the inner bark being yellow. The leaflets on the imparipinnate leaves are 5-13 in number, and carry pellucid dots. The flowers are in panicles, and the fruit is black, giving out an aromatic odour of turpentine when bruised.

The tree is found in the Amur region of eastern Siberia and north-eastern China (Manchuria, and in Korea and Japan; and in China it occurs also in hilly areas of the most northerly province of North China, north of the Yellow River, being frequent in mixed forest (2). It is hardy in the temperate zone, and has been introduced into and is cultivated in North America and the British Isles.

The species contains berberine, palmitine, obacunone, limonene, and mucilage. Further details of the chemistry may be found in Schechter, M.S., Haller, H.L., 1940, J.Amer.Chem.Soc. 63: 1307. (3).

The seeds are said to be useful as an insecticide (1).

The species yields useful timber for small articles, a valuable dyestuff, and cork, and has properties much used in Chinese medicine. (Gardener states at this point that details were available on request, but these were not included in the text).

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GRAMINEAE I

Arthraxon hispidus (Thunb.) Merr.
Sorghum vulgare Persoon.

20.iv.1985 15
16
17

Arthraxon hispidus (Thunb.) Merr. (**Phalaris hispidus** Thunb.; **Arthraxon ciliaris** Beauv.; **Pleuroplitis langsdorfii** Trin.; **Arthraxon ciliaris** Beauv. subsp. **langsdorfii** Hack.; **A. ciliaris** Beauv. subsp. **nudus** Hack.; **Batratherum echinatum** Nees; **Andropogon echinatum** Heyne). A slender stemmed, awned, annual grass, rising to no more than 30-45 cm, the stems decumbent, or prostrate and rooting at the nodes. The species is very variable.

Distribution is throughout the moist warm regions of the Old World, though not the very moist. In India the species is found particularly in northern parts, both in the plains, and in the hills, ascending to about 2,000m. in the Himalayas (2). In the Philippine Islands the species grows in damp places about streams, in old rice-paddies, and similar semi-wild locations, on the island of Luzon, at medium altitudes up to about 1,700m. (5). Within China it grows almost everywhere (4), and it is to be found in Hong Kong and the New Territories. (1).

Economic importance

Fungicide: Fungicidal use is reported from China, in the treatment of skin diseases such as ringworm. The leaves are reported to contain acotinic acid, luteolin, luteolin-7-glucoside, and arthraxin. (3)

Medicine: Other medicinal use in China comprises treatment of chronic cough, and the cleansing of ulcers, by the roots (4), while the whole plant is said to be employed in the treatment of asthmatic cough, hepatitis, appendicitis, gonorrhoea, glandular fever, inflamed mammary gland, and boils (3).

Dye: The sap is said to provide a yellow dye (4). As vegetable have been so largely superseded, it is possible that the report stems from classical references to a renowned golden-yellow dye said to be obtained from a plant known as chin-ts'au, also 'king grass' and 'yellow grass', which was referred in the second half of the 19th century to **A. ciliaris** Beauv. (now **A. hispidus**). This was a Japanese determination, based as most such determinations were on the Japanese plant to which the characters were applied. Roi (6) claims that the Chinese plant chin-ts'au is not **A. ciliaris** Beauv.

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Sorghum vulgare Persoon (**Andropogon sorghum** Brot.), Millet or Guinea Corn, the Kao-liang (Tall Grain) of northern China. According to Doggett (3: 28) the **Sorghum vulgare**, though popular, is not legitimate, and should be replaced by **Sorghum bicolor** (L) Moench. In all the Chinese works consulted, as in several others, the name **S. vulgare** persists, and is accordingly used here for ease in reference.

A tall grass, usually annual, and often grown as single-stemmed, but of the many races developed in cultivation some generate fresh tillers from the old bases and thus persist for many years; height varies from 45 cm. to 4m. and more, according to the number of leaves produced. The inflorescence is a large panicle, lax or compact, in which the flowers open rapidly, during darkness, and shed their pollen soon after sunrise.

Except in Africa (5), **Sorghum vulgare** is now solely in cultivation, and that is almost world-wide, save in those tropics where there is little change of temperature through the year, and except that the grain sorghums, kaoliang, requiring as they do a hot summer in which they can mature in three to four months, do not give of their best in the relatively cool summers of Europe. It is regarded as the third most valuable grain in the world, ranking as a cereal after rice and wheat, is especially suitable for frier climates and soils, and is extensively cultivated in southern Africa, India, Java, China, and elsewhere.

Constituents: Triterpene esters and sterols have been found (1), and at certain stages of growth cyanogenic glucosides develop (4). Hydrocyanic acid is intermittently present in the leaves and young shoots, being produced in the tissues as a result of a glucoside, dhurrin, interacting with an enzyme. Grazing cattle can be poisoned thereby (5). Sorghum is rich in tannins; and in addition, it accumulates nitrosamines (4).

Insecticidal use: When planted near cotton (**Gossypium** L.) there is a reduction in the degree of bollworm damage customary where cotton is a monoculture (2). Whether the sorghum shields the cotton from incoming pests by its greater height, or deflects a number of them onto itself without suffering damage thereby (though it is itself a prey to aphids etc.)(2), or whether there is an alleopathic relationship derived from the plant's glucoside and tannin constituents, is not clear.

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COMPOSITAE I

	<u>28.v.1985</u>	18
Anthemis cotula		19
Pulicaria chrysantha (Diels) Ling		20
Pyrethrum coccineum (Willd.) Vorosch.		21
Saussurea lappa C.B. Clarke		22,23

Anthemis cotula L., Stinking Mayweed, Stinking Chamomile, Common Dog Fennel, Compositae. A foetid smelling, acrid, erect branching annual, 30cm. or more in height, glabrous but carrying glandular dots. Leaves are up to three time pinnately dissected. Flower heads are solitary, and many-flowered with white ray florets, in a loose terminal corymb. The flowering season is throughout summer and autumn.

The species is a weed of cornfields and waste places, now almost throughout the northern cool-temperate zone. On occasion it can penetrate further south, as in China, where it has been reported in the coastal province of Zhejiang (Chekiang) south of the Yangtze (2), the seeds having reached there, presumably, mixed with grain with which they had ripened, or in sacking that had been used to carry grain. Ridley (5) states that the achenes have been found buoyant for two days, but this property can only be useful for dispersal within the normal northerly range of this species.

The fresh plant yields 0.01%, and the fresh flowers 0.013% of an essential oil.

The strong odour and acrid taste render the plant undesirable for livestock. It contains lactones which can cause dermatitis in man (3: 84), on occasion even blistering the skin (4). However, leaves rubbed on the skin are said to give relief from bee stings (3: 345).

The plant has been used in herbal remedies, particularly where a gentle tonic or an emetic is indicated (3: 277), and as an insecticide.

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Pulicaria chrysantha (Diels) Ling, Compositae. An erect, coarse rooted semi-shrub, reaching 30-60cm. in height. The flower heads are single, terminating stem and branches, and 13-35mm. across. The ray florets are yellow, and tipped with three small teeth, the disk florets tubular, their surface glandular-dotted.

Distribution is towards the west of China, in the provinces of Sichuan (Szechwan), Yunnan, and Guagxi (Kwanghsi).

The whole plant is officinal.

Var. **oligochaeta** Ling, produced in Sichuan, is used there to drive out fleas.

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Pyrethrum coccineum (Willd.) Vorosch. (**Chrysanthemum coccineum** Willd; **C. roseum** Adams; **Pyrethrum carneum** Bieb.), Persian Insect Powder, Pyrethrum, Painted Daisy (1), Compositae. An erect perennial herb branching at the base, and reaching 20-60cm. in height, with thin pinnatifid leaves, solitary flower heads to 7.5cm across, and red, pink or white ray flowers.

Pyrethrum coccineum is native to the Caucasus region of Iran. It is cultivated in China in the neighbourhood of Peking and a few other places.

It contains the alkaloid chrysanthemin $C_{14}H_{28}N_2O_3$ (3)

As a contact poison for insects, dried Persian or Caucasian Insect Flowers have long been known in Iran, and the product in powdered form has entered into international trade. During the present century powdered or liquid pyrethrum from **Pyrethrum cinerariaefolium** Trev., native to Yugoslavia and now much cultivated in Kenya and to a lesser extent elsewhere, has largely superseded the earlier known Persian flowers. Both species owe their insecticidal properties to pyrethrin and other esters of chrysanthemic and monocarboxylic acids (4).

For an insecticide, the dried flowers are used in powdered form, or in sprays prepared with kerosene or some other solvent. The flowers of **P.coccineum** are weaker in their effect than those of **P. cinerariaefolium** (2), but in regions where the climate is too extreme for the latter, yet suitable for the former, the saving in cash through a locally grown crop no doubt compensates for the relative deficiency in strength.

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Saussurea lappa C.B.Clarke (**Aplotaxis lappa** Decne; **Aplotaxis auricula** DC.; **Aucklandia costus** Falc.; **Aucklandia lappa** Decne), Compositae. A tall perennial herb, 1-2m. in height, with a long stout root that emits a powerful odour, and often reaches 60cm. in length.

This species is apparently native to the valley of Kashmir and is found wild only there and in adjoining areas of the Himalayas. It is now grown commercially on a considerable scale, from Kashmir to Garwhal in Uttar Pradesh (United Provinces) in the forested areas similar to where it grows naturally. It has been introduced into China, in whose three southernmost provinces it is now cultivated.

Cultivation is chiefly for the sake of the fragrant root, which is used to make an incense, and yields an oil very valuable in perfumery. Trade has been considerable over a long period. Large quantities of the root have customarily been exported from Kashmir to Bombay and Calcutta, for shipment to Arabia and the Red Sea ports for use chiefly in perfumery and medicine, and in the preparation of incense. There has also been considerable movement of the product within China, from the producing centres there. Currently, France is one of the leading importers of the root.

The product has been marketed under the names Putchuk or Patchak (the Bengali name), Costus root and Costus root oil, and now in India as Kuth. Medicinally, the drug is known as **radix saussureae lappae**.

The roots contain resinoids, 6% essential oil, 1.5%; an alkaloid, given the name saussurine, 0.05%; inulin, c. 18%; a fixed oil; and other minor constituents including potassium nitrate, tannins, and sugars (1). The root when whole is brown in colour outside and white within, unevenly cylindrical in shape, and 7-15cm. long by 1-5cm wide, but is usually supplied in commerce in pieces about 4cm. long by 1cm. wide.

The leaves contain 0.025% of the alkaloid saussurine, but no essential oil.

This oil has been analysed and found to be composed, in approximate amounts of: camphene 0.04%; phellandrene 0.04%; terpene alcohol 0.2%; α -costene 6%; β -costene 6%, aplotaxene 20%; costol 7%; dihydrocostus lactone 15%; costus lactone 10%; costic acid 14%. (1). Allergenic properties in the oil are due to the presence of sesquiterpene α -methylone lactones. A way of removing these lactones has recently been found (3).

Perfumery: The fragrant oil is very valuable in perfumery. It is almost as expensive as oil of orris, whose odour it slightly resembles, and it blends well with other oriental perfumes, in a lasting manner (cf. 2).

Medicine: Carminative, stimulant, antiseptic, prophylactic, astringent, and sedative properties are ascribed to the root. The alkaloid saussarine is a bronchodilator, relaxing the bronchioles much as adrenaline does, though it is slower to develop and persists longer. In India the root, containing both the alkaloid and the essential oil, has been found remarkably effective in controlling attacks of bronchial asthma. It is especially useful in conditions where ephedrine, adrenaline, and atropine would be disadvantageous, but while it may prevent attacks from recurring for a considerable period, it does not give a permanent cure. (1).

Pesticidal: The root, containing both the alkaloid and the essential oil, is a reliable insect repellent. In China it is the basis of an incense, made into sticks which are burned in temples and in the home in worship, and serve also through their smoke to keep mosquitoes, gnats, and other flying insects at a distance. In India the dried root yields excellent fumigatory pastilles, which burn fairly well and serve the same insectifugal purposes as the Chinese joss-sticks. (1).

Inula sp.: Augustine Henry, in Hooker's Icones Pantarum (Plantarum ? - ACD) t. 1975, reports the cultivation of **Inula racemosa** Hook.f. in the mountains north of the Middle Yangtze (province of Hubei [Hupeh]) as a substitute for patchuk. He mentions that the local name for **I. racemosa** is kuang mu-hsiang, meaning in this connection Foreign Woody Fragrance. This is also the book-name for **Saussurea lappa** (4). Known medicinal uses of the two plants are far from identical, so it is very possible that **I. racemosa** was a substitute for patchuk in the provision of incense. The potentialities of **I. racemosa** as an insect repellent might be worth examining.

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GRAMINEAE II

	<u>19.vi.1985</u>	24
Cymbopogon citratus DC. Stapf.		25,26
Cymbopogon nardus (L) Rendle		27,28
Cymbopogon torilis (Presl.) A.Camus.		29

Cymbopogon citratus (DC) Stapf. (**Andropogon citratus** DC). Gramineae, Lemon Grass, Malay 'Sereh', a tall, tufted, perennial, panicked grass, whose leaves reach 100cm. in length, and 1-1.4cm in width, and whose panicles are 30-80cm. long, with somewhat nodding branches and branchlets.

This is now a grass very largely of cultivation throughout tropical Asia, in India, Sri Lanka, China, the Malay Peninsular, Java, the Philippines Islands, and elsewhere in the Malaysian and Indonesian region, and in Florida, the West Indies, Brazil, Mauritius, Réunion, Madagascar, and East and West Africa. It seems to have come to western notice first in the Malayan region, early in the 17th century, and must be presumed to have originated there rather than in India, for it is recorded as having been introduced into India later in that century.

It has been grown principally for its qualities in perfumery and in medicine, qualities that derive from the fragrant oil that the grass yields, located most plentifully in the heads of the branches of the rhizome, with the base of the leaf-tuft that springs from them.

The principal constituent of the oil is the aldehyde citral. The amount varies with the country of cultivation. Data cited in the Wealth of India (2) gives 76% as the figure for Sri Lankan oil, with grass grown in the Seychelles producing oil that exceeds this figure, to an upper limit of 86%, and oil produced in Taiwan dropping below it, in the range 54-76%. In addition to citral, the oil contains citronellal, geraniol, and myrcene. (2).

Very different Malayan values are recorded by Burkill (1), citing the Bulletin of the Imperial Institute 3 (1905) 229 for content of a sample of oil from Perak, as: citronellal 55.3%; geraniol 32.7%. He records roughly similar percentages of citronellal and geraniol for a Perak sample of five years later. So great a variant from the figures in other production seems worth further examination, with possibly a fresh analysis of currently obtained Malayan samples.

The oil is known commercially as West Indian Lemongrass Oil, though production in the West Indies is not what it was. Geographically, it is a suitable area for production. The grass has now been introduced into neighbouring Florida, where use of fertilisers is reported to provide a high tonnage of the grass per acre, and consequent high yield of citral.

Insecticide: The amount of citronellal in the oil produced in Sri Lanka and most other parts of the world may be too small to allow **C. citratus** to serve as more than an adulterant of the mosquito repellent Citronella Oil. Yet, in the past, in China, where requirements of oil from **C. citratus** were met largely from Singapore, the opinion was that it was rather superior to Citronella Oil, from **C. nardus** Rendle, which is by far the better known repellent; and the form currently cultivated in China is regarded there as a mosquito repellent when applied to the skin as an oil.

Fungicide: The oil is considered a useful application in ringworm (4)

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Cymbopogon nardus (L.) Rendle (**Andropogon nardus** L.), Citronella Grass, known frequently in pre-war Chinese commerce as Indian Grass, Gramineae, a tall, rufous, aromatic, tufted grass with flat, narrow, leathery leaves. It is known only in cultivation, and occurs in two principal forms. One is Maha Pengiri or Old Citronella Grass, known also as Winter's grass and sometimes treated as a separate species, **C. winterianus** Jowitt, a grass whose roots are close to the surface, and which lasts in cultivation only some 10-15 years before needing to be replaced. The other, Lenabatu Pangiri or Lena Batu, originated in southern Sri Lanka as recently as the late 19th century, and being a quick-growing, long-lasting, hardy grass, suited to poor soils, soon displaced the others in cultivation in Sri Lanka. (6). Old Citronella Grass had been introduced into Malaya perhaps before Lena Batu originated, and is the form cultivated in Java, now a major producer, and Malaya.

C.nardus first came to European notice through the Dutch in Sri Lanka, then Ceylon, in the late 17th. century. It is not cultivated in India, though as a cultivated plant it may have derived from **C. confertiflorus** Stapf. (**Andropogon confertiflorus** Steud.) of the Nilgiris in southern India, and Sri Lanka (6). Chopra (2) states that it is cultivated in Burma. It is cultivated on no great scale in southern China (4). The Wealth of India adds South Sumatra, Fiji and Tanganyika to the list of countries where the grass is planted for commerce. Taiwan is another.

Though not now cultivated in India, Watt (8) states that it is common in the plains and lower hills of the Punjab and elsewhere in north-western India, and "abundant in Travancore".

The grass is cultivated for the sake of the essential oil that is expressed by steam distillation of the leaves. Citronella oil is thin and colourless, and very aromatic, with a distinctive odour, and it tastes acrid and somewhat citron-like. The grass is grown from seed, and provides two or three crops a year (8). The same source says that it contains about 0.4% oil, and yields over 3 oz. from 1 cwt. (about 85g from 50Kg.) The young foliage yields the greatest amount of oil (1).

Lena Batu, the form cultivated in Sri Lanka, and Winter's Grass, cultivated in Java and Malaya and elsewhere, differ markedly in the quantities of their constituents. According to The Wealth of India (3), the former yields in total alcohols 57.8 - 62.1%; geraniol 26.3 - 37.9%; and citronellal 24.2 - 33.6%.

-27 (cont.)-

Winter's Grass from Java yields in total alcohols 79.0 - 84.8%; geraniol 24.1 - 32.5%; and citronellal 40.5 - 60.7%.

Lawrence (5) gives slightly different values, recording that the former contains 55-65% total acetylisable alcohols (calculated as geraniol), and 7-15% total aldehydes (calculated as citronellal), and the latter not less than 85% total acetylisable alcohols and not less than 35% aldehydes.

A Chinese source (7) states that the oil is often adulterated with alcohol or with mineral oils.

Citronella oil is well known in the east in the form of a preparation that is applied to the skin to keep mosquitoes away. It is effective as long as the odour lasts, but the application may be repeated frequently. care should be taken not to let the liquid touch the eyes.

Other uses of the oil are in perfumery, including soap, and in medicine, and of the grass for paper-making, soil stabilisation, and thatch.

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Cymbopogon tortilis (Presl.) A. Camus (**Anthistiria tortilis** Presl.; **Andropogon tortilis** (Presl) var. **hamatulus** Hack.; **A. tortilis** (Presl.) Merr.). Gramineae, an erect stout, leafy and fairly tall grass, 50-100cm. in height, bearing flat, narrow leaves 30-50cm. long by 6-12mm. wide. The panicles can be either loosely or closely packed, 15-30cm. long, and often drooping. The grass seeds in summer and autumn.

Distribution is from Japan southwards through Taiwan and south-east China to the Philippine Islands (2). The species tolerates, and is frequent on, a poor acid soil (1). In the Philippines it is found in many parts of Luzon, on open grassland at low and medium altitudes (3).

The culm and leaves contain a small quantity of an extractable aromatic oil (1).

Economic importance

Insecticide: Quisumbing (3) comments on the grass under the name **Andropogon tortilis** (Presl) Merr. He states that it has not been studied chemically, hence cannot be asserted to be a source of citronella oil; but that an ointment prepared from it is, however, used in the Philippines locally as a protection against mosquito bites. The preparation would clearly have advantages in cheapness and availability over citronella oil from **C. nardus** (L) Rendle that might have to come from a distance.

Soap: The oil can be used as a perfume in soap (3).

Fodder: The grass can provide fodder and pasture for livestock.

Paper: The stem and leaves yield paper-stuff (1).

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ACANTHACEAE

	<u>21.vi.1985</u>	30
Adhatoda vasica Nees		31
Gendarussa vulgaris Nees		32
Rostellularia procumbens (L) Nees		33

Adhatoda vasica Nees (**Justicia adhatoda** L.), Acanthaceae, an attractively flowered, gregarious, evergreen and vigorous shrub rising to 3m., with large ovate-lanceolate leaves 8-15cm. long and white flowers, spotted or lined in purple, borne on a compound and usually axillary spike. The wood is white, moderately hard, can reach 2-5cm. in diameter (6), and is particularly pliant in the smaller branches. The plant is known in India as the Malabar Nut.

The quinazoline alkaloids vasicine (peganine), (toxic to cold-blooded creatures, including fish), vasicoline, vasicolinone, adhatodine, and anisotine have been isolated from the plant (1), with vasicine 0.25% in the leaves, the empirical formula being $C_{11}M_{12}N_2O$ (suggest $C_{11}H_{12}N_2O$ - ACD), molecular weight 188, the base occurring as needle-shaped crystals (2: 264). The leaves also contain a very small amount of an essential oil and a crystalline acid (3). An analysis published in India in 1956 showed the seeds as containing 25.8% of a deep yellow oil composed of glycerides of arachidic 3.1%, behenic 11.2%, lignoceric 10.7%, cerotic 5%, oleic 49.9%, and linoleic acids 12.3% and β -sitosterol (2: 691).

The species is widely distributed through the Indo-Malayan region, from India, at altitudes in the north to 1,525m. to Sri Lanka, Upper and Lower Burma, southern China, Laos, and the Malay Peninsular and Indonesian Archipelago. Common in waste places it can appear in great quantities, persisting and spreading as a result of its freedom from being browsed. It is unpalatable even to goats.

It is grown experimentally in southern Florida. It is a popular cultivated plant, and some of its appearances in the wild are, in reality, escapes from cultivation. Outside the tropics and subtropics it is a stove plant, and cultivated as such from China, in such centres as Shanghai, to the west. It was introduced into England from Sri Lanka, then Ceylon, possibly as early as the late 17th. century, and was found to be rather shy of flowering, according to t.861 in the Botanical Magazine, a circumstance that is not noticeable in China.

Insecticide: An infusion of the leaves is reported to be an excellent agent for the destruction of white ants, flies, and mosquitoes (5). The active principle is presumably the alkaloid vasicine. A more general insecticide does not appear to have been developed as yet.

In other uses the species provides dyestuff, fascines for wells, fuel, green manure, hedges, medicine, and ornament.

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Gendarussa vulgaris Nees (**Justicia gendarussa** L.f.; **Dianthera subserrata** Blanco; **Adhatoda subserrata** Nees), Acanthaceae, known in China as the Small Bone-graft, Bone-graft Herb, and Hidden Hedge Fuel (Hsian po-ku, Po-ku-ts'ai, and Huai-li-ch'iao). Evergreen shrub to about 1m., erect; leaves lanceolate, 5-10cm. long by 5-15mm. wide, papery; inflorescence a short spike, terminal, often forming a panicle; corolla white or rose with purple spots.

The species is found wild throughout the Indo-Malayan region, though often as an escape from cultivation. It is commonly cultivated in India, and Hooker (5) considers it doubtful if it is native there, or genuinely wild. Merrill (6) suggests that it is native to the Philippines, where it is found "chiefly along streams at low and medium altitudes in both secondary and primary forests, sometimes in thickets in and about towns" in most islands and provinces, but is rarely cultivated. It is found throughout Hainan Island, by roadsides, and is sometimes cultivated (3), and extends westward, in similar locations and on grassland, throughout the tropical mainland of China. It has been reported wild in Tenasserim in Lower Burma (5). Gamble (4) calls it a shrub of the moister regions of India, Burma, Sri Lanka. Its home would appear to be in the Philippines, perhaps extending westward through southern China to parts of Burma. It is, however, ancient in India. Burkill, stating that it is common in villages in all parts of the Malay Peninsula, says that the Malays call the plant 'ganda rusa', a name of Sanskrit origin (gandha = fragrance)(2).

The root contains the alkaloid justiciine (7). Unconfirmed.

Insecticidal properties are attributed to the leaves (2).

Other uses are in horticulture, hedging, medicine, and as fuel.

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Rostellularia procumbens (L.) Nees (**Justicia procumbens** L.; **Justicia japonica** Thunb.), Acanthaceae, a small hairy, stoloniferous herb 20-50cm. tall, with elliptic leaves, and flowers, variously appearing as purple and delicate pale pink, that are borne in racemes either terminal or at the axils of the upper leaves.

There is a widespread distribution in the tropics and sub-tropics of southern and eastern Asia. The species is found in India, in much of central and southern China and in Taiwan (2), and in south-east Asia to northern and central Malaya, and on to Australia (1).

The plant has been known in China since classical times. Waste places, damp shady roadsides and lawns, cornfields, marshes, and canal edges are typical habitats.

Kao Yuan Hua (3) includes the species in his list of molluscicides having moderate effect (51%-89% mortality at a concentration of 10,000ppm.).

There are medicinal properties in the species, which is further, a famine food and cattle feed.

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LEGUMINOSAE I

	<u>17.ix.1985</u>	34
Caesalpinia nuga (L) Ait.		35,36
Caesalpinia pulcherrima (L) Swartz		37
Caesalpinia sepiaria Boxb.		38,39
Cajanus cajan (L) Millap.		40

Caesalpinia nuga (L) Ait. (**Guilandina nuga** L.; **Caesalpinia laevigata** Perr.; **Caesalpinia paniculata** Roxb.; **Caesalpinia sumatrana** Wall.; **Caesalpinia scandens** Koenig.; **Mezoneurum sinense** Hemsl.), Leguminosae. A large climbing shrub, rising to 10m or more, producing very pliant branches armed with short, stout, hooked prickles. The rachis of the bipinnate leaves is armed with recurved spines on the underside. The flowers are yellow, borne in many-flowered terminal panicles. PODs are 2.5-3cm. broad, beaked, hard, and unarmed. They are one-seeded.

Distribution is throughout the Asian tropics from India southward and eastward, in northern Australia, and in Polynesia, largely in tidal swamps, seashore thickets, along tidal rivers, and in other coastal situations. The seeds float readily, allowing the species to be freely distributed by sea. (7). However, distribution is not confined to the sea-coast and tidal river banks. Thus the species occurs in central China by mountain streamsides and in ravines at low altitudes (5), in ravines in Hong Kong and in the New Territories there (3), and in Hainan Island in thickets on the drier mountain slopes (4). It is reported to be cultivated on the mainland of south-east China.

Economic uses:

Fish poison: In Burma, the stems and fruit are pulped to yield a fish-poison (8). Chopra mentions the same use for India (2).

Lac: The Indian lac-insect is said to feed on the plant (1).

Medicine: The roots are said to be diuretic, and have been reported as useful in cases of gravel and stone in the bladder. For eye diseases, the bitter-tasting roasted fruits and the juice of the stem have been used externally and internally. The finely powdered red leaves have been administered to women immediately after delivery, as a tonic to the uterus. (8). Burkill in his Dictionary considers that these uses suggest that **Caesalpinia nuga** may be employed there as a substitute for **Caesalpinia jayabo**, and that some of the uses ascribed to it in Java may be transferred ones. Such are the reported utility of the thin, hard, woody roots in treating gravel and stone in the bladder.

Chinese use is chiefly as a diuretic. (4: 6).

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Caesalpinia pulcherrima (L) Schwartz (**Poinciana pulcherrima** L.), Leguminosae. A shrub or small tree, though more usually seen as a large shrub, capable of forming a very decorative hedge. Hence the name Flower Fence for it, in America, one of many popular names.

The plant is lightly armed, carrying on its branches only a few scattered prickles. It blooms throughout, or nearly throughout the year, producing large orange or bright red flowers borne on long stalks nearly twice the length of the flowers. The pods are flat, and according to Hocker (5) straighter and thinner than those of any other species in the genus.

The origin is uncertain, but most probably tropical American, though Brandis (1) records that it has been found apparently wild in the Tapel-Choung valley in the Shan States in Burma, at altitudes of 1,700-5,000ft. (500-1,500m). It is widely cultivated in the tropics of America and Asia for the striking beauty of its flowers. Its presence in China and Malaya is known to be the result of introduction. Frequent cultivation in gardens has led to its running wild in parts of India (4), and in Hainan Island, South China.

The flowers contain gallic acid, resins, benzoic acid, tannins, and a red colouring matter (2).

Pammel lists the species as poisonous (7). The seeds are said to have been used to poison criminals, and the leaves to be used as a fish poison in Guatemala and Panama (6), a circumstance which supports the theory that the species originated in America.

The heartwood is orange-yellow, the sapwood white (4), and ink has been made in India from the charred wood (8).

There has been much medicinal use in India. Emmenagogic, purgative, and tonic properties are attributed to the leaves and bark, and the bark is also regarded as an abortifacient, while pectoral and febrifugal properties are attributed to the flowers (2).

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Caesalpinia sepiaria Roxb. (**C.decapetala** (Roth) Alston), Leguminosae, the Mysore Thorn. In China, Many Fruits (literally, Cloud Fruits, Yun-shih), a scrambling and scandent shrub 2-3m. tall, with yellowish-white corky bark having corky excrescences that bear strong thorns, hoked and more or less plentiful. The flowers are bright yellow in colour, borne in many-flowered pyramidal racemes, and opening between February and June. While not the most spectacular in the genus, they are still beautiful. The pods are unarmed, and dry, and contain 4-8 seeds.

Distribution

An Indo-Malayan species, the plant is indigenous and naturalised throughout India and Burma (1), Sri Lanka in the low country, eastern China, and elsewhere in VChina south of the Yangtze Valley, and south-east Asia generally down to the Malay Peninsular.

Habitat

It is found chiefly on lower maountain slopes and in mountain glens, and in thickets, by river-sides, and in open or open bushy places. Where it has been cultivated, as for example, in West China, the species occurs at roadsides and near villages.

The barks and pods contain tannin.

The species can form impenetrable hedge. Watt (8) records that Hyder Ali (ruler of Mysore in the 1770s) had a barrier formed by **C. sepiaris** constructed round his fortified places. Brandis calls it an excellent hedge plant. In China where the species makes an ornamental appeal, as much for the fragrance of the flowers as for the great pleasure they give the eye, it is used to make a green hedge. It is clearly stockproof.

The oil expressed from the seeds is used in China in the preparation of soap (4). The chemistry of this possibly fragrant oil would be worth examining.

The shrub has been recorded as a host to the lac insect in western India (Baroda).The bark is much used for tanning in southern India (the Konkan).

Medicine: The root is purgative. Other medicinal uses cover application of the young leaves to burns (India); and use of all parts of the plant in China except the leaves for stimulating the circulation, detoxifying, and dispersing cold (7). The juice from the pounded leaves is used to treat fever and feverish pains (3).

Insecticide: Pesticidal properties, in getting rid of noxious insects, are attributed in China to the plant (5: 7). It is probable that the use is domestic, for parasites, rather than agricultural, for the seeds are stated to be purgative and anthelmintic.

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Cajanus cajan (L) Millsp. (**Cytisus cajan** L.; **Cytisus pseudo-cajan** Jacq.; **Cajanus indicus** Spreng.; **Cajanus bicolor** Wall.; **Cajanus flavus & bicolor** DC.), Leguminosae. A widely cultivated pulse bearing numerous popular names, Red Gram, Pigeon Pea, Cogo Pea (Congo ? - ACD), and Dal or Cadjan Pea among them. In China it is now the Wood Bean.

The species is thought to have originated in tropical Africa, and to have spread thence into Asia. Whether it can be regarded as wild there, even in India, seems to be a matter of some doubt, as shown by the entry "? wild" in the Flora of British India. However, Lecomte, after mentioning cultivation in the Indo-Chinese region of the lac insect to feed on, says the species is "indigene aussi". Cultivated worldwide in warm regions as a food crop, *Cajanus* is particularly suitable to predominantly vegetarian countries such as India. Work to develop sufficiently cold-resistant to grow in the Central Asian Republics has been carried out in the USSR.

Various forms and races have been developed, in various parts of the world, including the West Indies, some grown as an annual. The principal, and perhaps typical, form is a shrub or shrubby perennial 1-4m. tall. The form grown as an annual has been distinguished botanically as var. **fulvus** DC, useful as a crop that matures early. Var. **bicolor** DC., a tall deep-rooting perennial, is late maturing. It is also short-lived, but is easy to renew from seed. It is the form grown especially in northern India, while the annual has been grown in more southerly parts (6: 1). China grows the shrub.

Chemical composition of the pulse is given by Watt (6) as: Nitrogenous matter (albuminoids) 19.83-20.38%; starch or carbonaceous matter 61.90-64.32%; oil or fat 1.10-1.12%. There is a valuable vitamin B content in the seeds, and they contain urease, in addition to the amidon 60% content (5).

Given warmth, short daylight, and only moderate rainfall, the plant can be grown on most soils. It is relatively drought-resistant, and more suited to the drier climates.

Food: Chief of the many uses of the cultivated plant is as food.

Medicine: The root is used in Chinese traditional medicine, as a sedative, expectorant, and antidote to poisons (5); and in lacerations, for staunching blood and alleviating pain (2: 3).

Insecticide: The same Chinese sources attribute insecticidal properties.

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Additional notes by ACD

Willis, J.C.: A Manual and Dictionary of the Flowering PLants and Ferns. Third edition. Cambridge University Press. 1908. p.282., says that **Cajanus indicus** Spreng. is the dhal, Pigeon Pea, or Congo Pea, very extensively cultivated in India and other warm countries for its seeds or pods, used like ordinary peas.

COMPOSITAE II

	<u>20.ix.1985</u>	41
Aster scaber Thunb.		42
Aster tataricus L.f.		43,44
Senecio scandens Buch.-Ham. ex D.Don		45

Aster scaber Thunb. (**Doellingeria scabra** (Thunb.) Nees; **Biotia discolor** Max.), Compositae. An upright perennial herb 100-150cm.tall, with large alternate cordate leaves abruptly narrowing from the base upward. The flower-heads are 18-20mm. across, with white florets, borne in corymbose panicles.

Distribution is from the eastern mountain range in the north-eastern provinces, alongside the Ussuri River and Korea, across to Inner Mongolia and south through western provinces of northern and Central China as far as the south-west, and down the coastal provinces stopping just short of the tropics. the species occurs also in eastern Siberia, Korea and Japan, and is clearly hardy.

It is cultivated in China for its medicinal properties, when it does best in positions of good sunlight, and throws up a regular succession of shoots. In the wild it is found among other plants at forest edges on hill slopes, in shrubby thickets and thickets by streamlets in mountain valleys, in damp grass among trees, beside roads, and in the north-east in the riverine plains.

The stems contain flavone and saponin, and the root coumarin and saponin. Flowers and stem contain 0.14-0.37% of a volatile oil (1).

Medicine: The whole plant is officinal, with antipyretic, detoxifying, carminative, and analgesic properties attributed to it. It can be cut at any time of the year, and used fresh, or pounded to a pulp, or after being dried in the sun. In the north-east, conditions treated by it are reported to be sore throat, particularly when painful and swollen, and rheumatoid arthritis (1). There and elsewhere throughout China it is regarded as useful in the case of poisonous snakebites, when applied all round the injury (3), and traumatic injuries. In the rest of China the plant is held also to relieve boils, headache generally, by application to the temples (3), sore throat, inflammation of the eyes, and the confusion of vision that can result from dizziness (3: 4).

Headache, dizziness, and inflammation of the eyes are conditions that have been treated by the plant since it first came into the Chinese materia medica, in the K'ai-pao pen-ts'ao of the Sung dynasty in the 10th. century A.D.

Food: That the plant could be an ingredient in meat broth is mentioned in the same work. (5).

Parasiticide: In the northeast, a drug is derived from the plant for the suppression of parasitic insects in the body (1). The active principle is presumably the saponin found in the root and stem.

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Aster tataricus L.f., Compositae. An erect, hairy, perennial herb, developing many rootlets from the thizome. The strong, branching stem can reach a height of 150cm., but it is likely to be shorter in the extreme northern conditions. The leaves, very large at the base, narrow from the lower to middle and upper parts of the stem. The numerous flower-heads are borne terminally, or at axils at the upper end of the stem-branches. The ray-florets are bluish-purple, and the plant derives its Chinese name, meaning Purple Luxuriance, from the colour and profusion of the flowers.

Native to the northern temperate zone, in North-east China (Manchuria) and northern China, Inner Mongolia and Mongolia, eastern Siberia, Korea, and Japan, **Aster tataricus** is cultivated in parts of China for its medicinal properties. For this reason it can be found in the Lower Yangtze Valley, a considerable distance from its natural area of distribution.

The species is essentially one of damp places, whether in the mountains or on the plains. In Manchuria it is a common swamp plant of the larch forests of the eastern mountains, and grows also in the sedge-grass tussocks of the wet meadows that lie in the plains watered by the Amur, Sungari, Nonni, and Ussuri rivers (6). It is sensitive to drought, and while being resistant to cold and to flooding, it prefers an environment that it predominantly moist, and provides some warmth. Hill and riverside rough grass are its usual locations. In cultivation it does best in moist, fertile, rich soil of a sandy nature. (1).

The root contains saponins and coumarin. The principal saponin is astersaponin, giving on hydrolysis asterprosapogenin, and on further hydrolysis hederagenin* with glucose (1-4); and apart from these, it contains shionone, C₃₀H₃₀O; epidihydroshionola (5,6); friedelin; epifriedelinol (4); quercetin; and auraptene C₁₀H₂₂O₃ (4, 7, 8).

(1-4)

C.A. 24; 1387, 1930; 50: 2120a, 1956; 50: 8142b, 1956; .:268,: ;975.

(5-6)

Shang-shih-ku ho-fu ting Materia medica 84(4): 318, 1964.

Shang-shih-ku ho-fu ting Materia medica 85(10): 888, 1965

(The text contains Chinese characters.)

Apparently a work issued periodically under a local place-name in North China, not likely to be available in the United Kingdom. Nor is the next reference. I have romanised the titles for convenience.

(7-8)

Chung-ch'ung: Materia medica 49: 1169, 1929; 52: 499, 1932

Lit., Central, or Chinese, Thoroughfare, a pre-war Chinese language publication that I do not know under this name, and whose title I have romanised for conveniences.

The flowers contain much carotene. The plant without the sap contains lead and zinc. (C.A. 65: 5876g, 1966; C.A. 80: 130840u, 1974). (1)

At a concentration of 10,000ppm the plant has moderate molluscicidal effect, the mortality caused to snails being in the range 51-89% (5).

Medicinal use in China concentrates on the expectorant and antitussic properties of the root, and its beneficial effect on the lungs. In the Lower Yangtze part of China, where it is cultivated with plants having related properties are used to treat influenza where there is much coughing of phlegm, obstinate inveterate coughs, and pulmonary haemorrhage (2; 3). In Inner Mongolia, where the species grow wild, the root is used especially for asthmatic cough, pulmonary cough, and conditions where coughing produces blood in the sputum. (4).

In Mongol medicine the fruit is used, under a Tsitsihar name having the sound a-chun, Antipyretic, anti-inflammatory, disinfectant, and pus-extruding properties are attributed to it, and it is reported to be used to treat headaches, boils and ulcers, light attacks of measles, and plague (4).

* Hederagenin: a tentative translation of an obscure part of the text.

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Senecio scandens Buch.-Ham. ex D.Don (**S. wightianus** DC.; **S.chinensis** DC.; **Cineraria repanda** Lour.; **C. chinensis** Spreng.; **Senecio solanifolius** S.F. Jeffr.; **S. confusus** Elm.; **S. intermedium** Wight), Compositae. A climbing herb reaching 2-5m. in height from a woody base, with zig-zag branches, distinctive leaves that are deeply divided near the base, and taper gradually to an acuminate apex, and numerous yellow flower heads that separate at the end of the branches into a corymbose compound umbel.

The species is very various.

It occurs in the Indian Himalayas from Kumaon to Sikkim at elevations of 1,800-3,000m., and on to the Mishmi, Khasia, and Manipur hills, as well as in the Nilgiris in southern India, and in Sri Lanka (2); in central and southern China and down to the western side of the country (5); and in North Vietnam and the Philippines (4).

Watsides, waste places, and open hillsides are usual locations.

The plant is acrid and bitter-tasting. When crushed, and mixed with **Macleaya cordata** (Willd.) R.Br. and **Zanthoxylum** species, it eliminates fly maggots in waste water and latrines (1).

In Chinese medicine, the plant is regarded as antifungal (3).

There are other medicinal uses, particularly in the Philippines and China.

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COMPOSITAE III

	<u>21.x.1985</u>	46
Carpesium abrotanoides L.		47,48
Carpesium divaricatum Sieb. et Zucc.		49
Carpesium triste Maxim.		50

Carpesium abrotanoides L. (**C. thunbergianum** Sieb. et Zucc.; **C. wulfianum** Schreb.; **C. abrotanoides** L., var. **thunbergianum** (Sieb. et Zucc.) Makino), Compositae. Erect perennial herb 30-100cm. high, branching much in the upper sections; leaves are alternate, short-stalked in the lower part, sessile in the upper, elliptic to oblong, 20-28cm. long and 8.5-15cm. wide, but gradually reduced in size towards the top of the stems. The basal leaves, broadly ovate, wilt after the flowers have bloomed. Flower-heads are in short leafy racemes, or appear singly along the whole length of the branches at or above the leafy axils. Flowers are yellow, blooming in autumn. The achenes are about 3.5mm. in length, beaked, and sticky.

Distribution is almost throughout the temperate zone in Eurasia, proceeding from north-east Italy, north-west Yugoslavia, and southwest Hungary in Europe (7), to Kashmir, where it is abundant, by way of northern Iran, and from Kashmir along the Himalaya at altitudes of 1,500-3,000m. to Sikkim, and on to south-western, south-eastern, and central China, and Taiwan, to Korea and the four main islands of Japan. Grassy situations along its range, whether in the open beside tracks, are the main habitat, though in Canton it has been identified on the city walls and among brick rubbish (5).

Oil: The fruit yields a volatile oil, 0.25-0.65%, containing carabrone, carpesia-lactone, n-caproic acid, and stigmasterol (6).

Anthelmintic: Known in China at least as far back as the 1st. millenium BC, the accent there has always been on the plant's vermicial properties expelling most kinds of intestinal worms. It is the seeds, slightly poisonous, and known as hao-shih (Crane Louse) or pei-hao-shih, that provide the anthelmintic. They are used in decoction, or as a compound mixed with the same quantities of **Areca catechu** and **Quisqualis indica** seeds, again in decoction (3).

Pesticides: Soaked in water, the plant provides a pesticide, killing pumpkin beetles and other insects that attack crops (4).

Medicine: The whole plant is officinal, with antipyretic, detoxifying and diuretic properties. It treats heat exhaustion and stomach ulcers (6), tonsillitis, bronchitis, and boils and ulcers (1). The root is said to be used in cases of abdominal haemorrhage.

Food: The young leaves, which have a foxy smell when fresh, can be eaten when cooked as a spinach (2), a use confined as a rule to times of scarcity.

Dye: Watt (Dictionary of the Economic Products of India, Part 2, p.176.) reports a large use of the plant in Kashmir as a dye for silk, a use which was not known in the late 19th century in the plains of India, nor was the dyestuff itself and the method of extracting it known. This appears to have remained a local use. I have not seen reference to it except in Kashmir.

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Carpesium divaricatum Sieb. et Zucc. (**C. divaricatum** Sieb. et Zucc. var. **pygmaea** Miq.; **C. erythrolepis** Lévl.), Compositae. An erect perennial herb, 25-150cm. tall, branching in the middle and upper parts of the stems, with alternate leaves, the lower ones ovate or ovate-oblong, 7-28cm. long by 3-5cm. broad, and glandular-dotted beneath, the upper leaves gradually decreasing in size upwards, and sessile or nearly so. The flower heads are terminal and solitary on the branches, sometimes axillary, rather small, 6-8 (10)mm across, yellow and drooping. The fruit is an achene, a peculiar feature of which is a narrow extension of the apex (whence the Chinese name for the plant, Chin-wa-erh, Dold Ear-pick) bearing glandular dots.

Distribution is confined to eastern Asia, in north-east, northern, eastern, central, and south-east mainland China, Taiwan, Korea, the main islands of Japan, and the Ryukyu islands.

Hillsides, roadsides, valleys, and grassy places generally, form the customary habitat.

The species is reported to act as a vermicide, the root or the whole plant being used in decoction (1).

The plant is bitter tasting and acrid (2), is regarded as anti-inflammatory, detoxifying, antipyretic, and analgesic, the last mentioned property applying particularly to abdominal pains, and contusions (3), and has many applications in Chinese medicine. Inflammations, which it is employed to treat, are pharyngitis, inflammation of the mammary glands, acute intestinal inflammation, and glandular fever. It is said to be used in cases of urethritis, feverish influenza, diarrhoea and dysentery, and toothache (2), to treat boils and buboes, and generally to reduce swellings and pain (4). The claim in the last references that it is useful in poisonous snake bites perhaps needs substantiation, in view of the large number of plants in China and India for which a similar claim is made, but is found on close investigation and testing to be unwarranted.

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Carpesium triste Maxim., Compositae. An erect perennial herb with stems 40-100cm. tall, branching. The leaves decrease gradually in size from the base of the stems upward, the lower ones being ovate-oblong, 13-20cm. long by 3-5cm. wide, the median leaves ovate-lanceolate, and the upper linear-lanceolate, acuminate at both ends, and short-stalked. The flower heads are single along branches and stalks reflexed, and 8-12mm. across. The flowers are yellow. Achenes are 4mm. long, having at the apex a short mouth and glandular dots.

Distribution is in the Chinese north-east, where var. **manshuricum** Kitamura is also reported, and Taiwan (2), Korea, parts of the Soviet far east, and Japan in the four main islands (3).

In north-east China the species occurs both in the eastern mountain range of the Ch'ang-pai-shan, in and on the edges of mixed coniferous and broad-leaved forest, and in the well-watered plains of Jilin province near the rivers (1).

The uses of the plant are reported to be the same as those of **C. divaricatum** Sieb. et Zucc. (1), which includes a vermifugal use.

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BARRINGTONIACEAE

	<u>28.x.1985</u>	51
Barringtonia asiatica (L) Kurz		52,53
Barringtonia macrostachya (Jack) Kurz		54
Barringtonia racemosa (L) Blume ex DC.		55,56,57

Barringtonia asiatica (L.) Kurz (**Mammea asiatica** L.; **Barringtonia speciosa** Forst.), Barringtoniaceae. A medium-sized evergreen tree of the beach vegetation back of the mangrove swamp, 8-15m. in height, with large obovate or obovate-oblong leaves 20-40cm. long, large white flowers, and fruits 8-14cm. long and 8-12cm. across, with a fibrous pericarp, containing a single large seed.

Distribution is from the Bengal coast through the Andamans, Sri Lanka, the Malay Peninsular, and the Philippines to Taiwan and to the Ryu-kyus, and southward to Australia & Polynesia, occurring on sandy shores to which the fruits can be carried over long distances by sea.

The seeds have been found to contain about 2.9% of fixed oil consisting of olein, palmitin, and stearin; gallic acid 0.54%; and a glucoside, barringtonin 3.271% ($C_{18}H_{25}O_7CH_3$) (5), and 1% of a substance designated as barringtonogenetic (2). Howes (4) states that in Queensland use the species is considered an alkaloid-containing plant of intermediate activity. Further investigation into the possibility of an alkaloidal content would appear desirable.

Wood: The wood is pale and soft, and is suitable for floats, but is not durable (3). It is reportedly used in parts of Java, the Nicobars, and the Philippines in native huts, and in the last-mentioned locality there has been a suggestion that the wood, if impregnated, would make good ties and paving-blocks, and serve as a pretty cabinet-wood (1).

Fish poison: Use of the bark and fruits to capture fish is widespread. Watt (7) states that the bark, as used in India, is simply narcotic, stupefying fish without poisoning them. Tattersfield, Martin, and Howes, in their 1940 paper on fish-poison plants (6), cite the Philippine Agriculturist 21, p.29: 1902, for a description of the method used in the Philippine islands, namely, to mix earth with powdered bark, throw the mixture into pond water at early dawn, and collect the stunned fish as they rise to the surface by six or seven o'clock in the morning.

Quisumbing (5) states that the fruits are used in the Philippine Islands, and in the Indo-Chinese region, as a fish-poison. The fruits are used also in the Malay Peninsular, being pulped and thrown into the rivers in many places there, for the purpose of intoxicating fish (1).

Insecticide: The general impression, among those who have studied its activities, is that this and other species of *Barringtonia* used as fish-poisons do not compare with tuba root, **Derris elliptica** Benth., as a contact insecticide. Nevertheless, the wide distribution and easy availability of fish-poison species of **Barringtonia** could make further testing of insecticidal possibilities in **B. asiatica** worth while, in spite of specific past disappointments. There have been two of these.

Burkhill (1) records that an extract of the bark sprayed on caterpillars of **Parasa herbifera** Walk. in an experiment in Malaya was found to be only a little toxic, "much less so than the root of **Derris**". In the joint paper in the Kew Bulletin of 1940, already referred to (6), it is recorded that a sample of the bark sent to Rothamsted from Arnhem Land in the Australian Northern Territory showed only a slight insecticidal potency when an alcoholic extract was tested at a concentration of 1% in terms of the bark. The length of time in transit of the specimen used is not recorded. In today's conditions, specimens sent could be fairly fresh on arrival.

Medicine: The fresh leaves have been used medicinally as an application to parts affected by rheumatism, and the heated leaves as an application for stomach ache, while the seeds can be employed as a vermifuge (5).

Food: After a thorough cooking, to destroy the saponins, the fruit, pods and all, is said to be edible, and is eaten in the Indo-Chinese region (1).

Illuminant: Oil extracted from the seeds has been used in the Moluccas as an illuminant (7).

Ornamental: The trees give shade, and is handsome enough to be planted along boulevards and avenues that neighbour the sea (5).

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Barringtonia macrostachya (Jack) Kurz (**Careya macrostachya** Jack; **Barringtonia fuscicarpa** Hu), Barringtoniaceae. A shrub or small tree, more commonly the latter, with elliptic-oblong leaves whose blades are six times the length of the leaf stalk, and purple flowers carried in drooping spikes.

B. macrostachya is one of those species in the genus with a preference for the banks of inland rivers, away from the tidal waters of the coast. It is found from southern Burma (Tenasserim) eastward through south-western and southern Yunnan in China (3) to Borneo, and south to the Malay Peninsular where it is said to be not uncommon in dry woods (1).

Gamble (2) includes the species in **B. pendula** (Griff.) Kurz (**Careya pendula** Griff; **B. yunnanensis** Hu), a species of southern Tenasserim which is separated from **B. macrostachya** in the Index Florae Yunnanensis, with a similar distribution in that province.

The species has medicinal use in Malaya, where the pulped root can be applied to the skin for ringworm, and applied also around sore eyes (1).

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Barringtonia racemosa (L.) Blume ex DC. (**Eugenia racemosa** L.), Barringtoniaceae. A large smooth, evergreen shrub, or smallish to medium-sized tree, rising to 10, in places 15, metres, with numerous spreading, drooping branches, and leaves whorled at the tips of the branchlets. The flowers are four-petalled, and variously cream-coloured and pink, borne on drooping, many-flowered, terminal racemes. The fruit is a drupe, "size of a large pullet's egg" (4), which contains rather spongy brown flesh.

The species occurs throughout southern Asia, whence its range extends to the Solomon Isles, Samoa and Fiji in the Pacific. It is to be found also in East Africa for a short distance up to the Zambesi, in South Africa, and in Madagascar (9).

It is a denizen sometimes, and particularly in Hainan island and the mainland of south-east China (5; 7), of the mixed herbaceous and shrubby formation, the so-called **pes-caprae** formation, that grows immediately at the back of sandy beaches, but it is more usually found growing in damp and often muddy places close to the sea. It grows in such locations in Taiwan, the Philippines, Malaya, the Sandarbans of the Ganges delta, the west coast in India, Sri Lanka, and elsewhere in its range.

Dispersal: The thick fruit-wall, a combination of flesh and fibre, renders the fruit very buoyant, and able to float for months. It is this property which has led to the species to be so widely dispersed over island and mainland coasts. It also allows the fruit to drift up tidal rivers and backwaters, but some of this inland distribution is the result of cultivation by man, for the ornamental value of the plant (9).

A plant was introduced into England, in or before 1836, for ornamental cultivation in a warm greenhouse (4). It has been introduced into the United States, where it has been found suitable for seaside planting in Florida, according to Bailey's Hortus Third.

Timber: The wood is soft, white and porous, and at least in the Sanderbands is considered fit only for firewood (6).

Insecticide from the bark: The seeds are rich in starch, and the fibrous bark contains 18% tannin. Alcoholic and cold and warm water extracts of the bark have been found toxic to citrus aphids (probably Toxoptera aurantii Boy.) affording complete destruction at concentrations representing 2-2.5% of the bark, with the bulk of the toxic principle being found in the resin fraction. This experiment was conducted in East Africa, using East African plants of the species; but bark sent from East Africa to Rothamsted, and used in alcoholic extracts equivalent to 2% of the bark, were not found toxic to Aphis rumicijii. Some loss of activity in transit must be allowed for. (10).

Tanning: Leather that is tanned with this bark is likely to develop a reddish-colour.

Fish-poison: The bark is used as a fish-poison in the Philippines (8). As **B. acutangula** Gaertn., **B. asiatica** (L.) Kurz, and **B. speciosa** Forst. are fish intoxicants, the last-mentioned in particular stupefying fish without killing them (10), it seems likely that **B. racemosa** is more stupefying than lethal. Burkhill (1) attributes the fish-poison property to the presence of saponins, especially in the seeds, though, as he says, the bark of either trunk or root is sometimes employed.

Seeds as vermifuge: Chopra (2) states that in Madagascar the seeds are used as a household vermifuge.

Food: The leaves when young and tender are said to be eaten in eastern Malaysia (1). Starch in which the seeds are rich is said to be extracted in Malaya, by primitive tribes there, for food (10).

Medicine (skin): The powdered fruit is used as snuff; and there would appear to be fungicidal properties in it, for it is applied externally in skin diseases (11). The leaves also treat itch, being applied as a poultice (1).

Other medicinal uses are numerous. In India the root has been regarded as having obstruent and cooling properties, resembling quinine in its medicinal virtues (11). Burkhill (1) considers that the deobstruent action may be due to saponin. Antipyretic properties are attributed to the root in China also (9).

A decoction of the bark is used externally in the Philippines as an anti-rheumatic (8).

In India the fruit has been found efficacious in coughs, asthma, and diarrhoea (11). Quisumbing (8) says that this use extends to the Indo-Chinese region. In China the fruit is used to treat coughs (5). Watt reports an Indian Use of the seeds for colic and ophthalmia - doubtless, as Burkhill points out, internally in the first case, and as a poultice in the second.

Oil: The report, mentioned by Quisumbing, that the oil from the seeds suffices for an illuminant is said by Burkhill to be incorrect.

Wayside planting: Quisumbing (8) reports a Philippine use of the tree as a roadside ornament; and indeed the long drooping inflorescences or large flowers are attractive.

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RUBIACEAE

Randia spinosa (Thunb.) Poiret	<u>23.i.1986</u> 58 59, 60
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RUTACEAE II

Boeninghausenia albifolia (Hook.) Meissn.	<u>23.i.1986</u> 61
Boeninghausenia sessilicarpa Lév.	62
Evodia rutaecarpa (Juss.) Benth.	63,64
Orixa japonica Thunb.	65
Poncirus trifoliata (L) Rafin.	66,67,68
Zanthoxylum armatum DC	69,70,71,72,73
Zanthoxylum avicennae (Lam.) DC	74
Zanthoxylum bungeanum Maxim	75
Zanthoxylum hamiltonianum Wall.	76
Zanthoxylum schinifolium (Engl.) Sieb. et Zucc.	77
Zanthoxylum simulans Hance	78,79

Randia spinosa (Thunb.) Poiret (**Gardenia spinosa** Thunb.; **Randia dumetorum** Lamk.; **Randia malabarica** Wall.; **R. spinosa** Blume), Rubiaceae. In China the Wild Pomegranate, Shan-shih-liu, a deciduous much-branched shrub, usually 1-4m., or tree up to 8m., glabrous or slightly hairy, armed with straight, stout, axillary spines ascendant or horizontal, 2-3.5cm.; leaves oval-shaped, in clusters at the ends of short branchlets; flowers somewhat large, white, single or in a cluster of two or three at the branchlet ends; fruit a round thick-skinned berry. Growth is from slow to moderate [7 rings per inch of radius, according to specimens examined by Gamble (3)], and the wood moderately heavy.

The species is variable. Gamble (3) records several forms wild in India. Of these he regards the common kind in North India "a small tree with rather soft leaves and large smooth fruit found in shady undergrowth in the deciduous forest of sal and other trees" as "probably the true **Randia dumetorum**". He records three other kinds with distinct features in leaf, size of fruit, and to some extent length and disposal of thorns, but admits the difficulty of finding good botanical characters to separate them. Of these kinds the most common open dry lands in the Deccan and Carnatic is a shrub, used for fencing, having the smallest leaves of all the kinds, hard thorny stems, and smooth fruit, a shrub which he attributes to **R. floribunda** DC as a probability.

Distribution extends from tropical east Africa, and India, Sri Lanka, and Burma, to south-east China, including Hong Kong, Taiwan, Vietnam, Laos, Campuchea, and Indonesia (Java and Sumatra). Introduction with subsequent naturalisation is possible in parts of this area, for the plant is desirable horticulturally and for other reasons.

Habitat: The species does not appear to take kindly to the moister regions of its general range. According to Burkill (1) it has not been proved to occur in the Malay Peninsular. Merrill (6) says that it was admitted to the Flora of Manilla on the basis of a single introduced plant, but has apparently not persisted. It is significant that it is a species especially of the sal forests in India, that is, of sand and gravel soils, neither deep nor moist. In Hainan and south-east China generally it is common at low altitudes in waste land or wilderness, but here the rainfall, heavy during the summer monsoon and the typhoon season, is inconsiderable for a good part of the year. Rocky glens are another habitat.

Economic importance

Hedges: In North Vietnam (Tonking) (5) and in various parts of south-east China (2), the species is planted to form hedges, which should certainly suffice to exclude cattle and smaller livestock. In India, as has been mentioned, there has been a similar use in fencing.

Utensils: The wood is compact, hard, close, and even-grained. It is used in India for making agricultural implements (3), and in China for making household furniture, and such miscellaneous objects as printing blocks, which require particularly hard wood, and walking sticks.

Fuel: It also provides fuel (3).

Dyes: In India the fruit has been used as a colour intensifier (7). Watt also mentioned a yellow dye as being obtained in China. I have not found other references to this, but at least two other species in the genus (**R. aculeata** L. of the West Indies, and **R. exaltata** Griff. of lower latitudes in south-east Asia than China) are said to yield dye-stuffs (1).

Fish-poison: The fruit would appear to contain a saponin. When unripe, and pounded to a pulp, it makes a fish poison in China (2) and India (3). Burkhill adds the Philippines, but Merrill's statement referred to earlier is difficult to reconcile with this.

Soap: The skin of the fruit can serve as a cleanser (3). According to Burkhill, the berries serve as soap in the Himalayas.

Medicine: Analgesic properties are attributed to the lant in China. It is used there to alleviate rheumatic pains, and treat severe bruises from falls, blows, etc. (4).

In India, the bark has provided an internal and an external alleviation "when bones ache during fever" (presumably a reference especially to one of the unpleasant accompaniments of an attack of dengue, 'break-back fever'); the fruit pulp has been regarded as a very valuable emetic, requiring larger doses than ipecacuanha, but superior in every other respect; and use as an abortifacient has been reported (7). The bark is astringent, and according to Burkhill has been used in India to treat diarrhoea and dysentery.

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Boeninghausenia albiflora (Hook.) Meissn. (**Ruta albiflora** Hook.; **R. japonica** Sieb.), Rutaceae. In the wild, an erect and slender perennial herb usually no more than 60 cm. in height, though occasionally more, branching, particularly in the upper parts, while the lower can be somewhat woody. Leaves are imparipinnate, and the leaflets are finely gland-dotted, but the herb is remarkable, and ornamental, chiefly for the profusion of small white flowers borne at the end of branchlets.

Distribution is from temperate zones of the Himalaya, and the Khasia Hills in Assam (4), to central China, and on to the Philippines in mossy forests at altitudes of 2,000-2,400 m. (6), Taiwan and Japan. Chinese altitudes for the plant are lower, ranging from 110-1550 m. in the province of Hubei. It is partial in China to limestone cliffs and hills, as well as growing in damp shady green forest and in thickets by mountain streams (5).

Japanese botanists accord separate specific status to the Japanese form, under the name **Boeninghausenia japonica** Nakai (**B. albiflora** var. **japonica** (Nakai) S.Suzuki (7).

The species is hardy enough to be grown for its ornamental value in southern states of the USA, and in sheltered positions in southern England (1).

Oil: The leaves yield a fragrant oil (3).

Medicine: The plant is employed in Chinese medicine as a disperser of coagulated blood at contusions (3), and as an anthelmintic, its popularity causing it to be cultivated in several physic gardens in the Lower Yangtze region in central China (2).

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Boeninghausenia sessilicarpa Levl., in Fedde Repert. xii, 282 (1913) (**B.albiflora** Meissn. var. **brevipes** Franch.; **B. brevipes** Levl.), Rutaceae.

Leveille describes the plant as differing from the herbaceous **B.albiflora** (Hook.) Meissn. in its smaller leaves and sessile or subsessile capsules. Bean (1) mentions star-shaped, not campanulate flowers.

The species appears to be confined in the wild to the south-west Sichuan and the central and northern parts of the province of Yunnan. There it can be found at altitudes of 1,950-2,800 m. It does not occur in the wettest parts of the province, that is, in the monsoon rain forests of the south, and the parts west of the Salween-Mekong Divide, where the south-west monsoon delivers its greatest precipitation (3; 2). Cultivation in the West should be no less successful than for **B.albiflora**.

The whole plant is said to be slightly poisonous. In Yunnan it is regarded as a febrifuge, and is used in medicine in cases of influenza, and also for the treatment of infected blisters (3).

It has a reputation in Yunnan as a mosquito repellent (3). The active principle does not appear to have been ascertained.

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Evodia rutaecarpa (Juss.) Benth. - (Gardener refers to **Euodia**, this is probably incorrect) - (**Boymia rutaecarpa** Juss.), Rutaceae. A deciduous shrub or small tree 2-5 m. in height, and clothed in dense though not aromatic foliage, the leaves imparipinnate and carrying 5-9 elliptic or ovate leaflets 6-15 cm. long and 3-6 cm. broad. The flowers are borne in cymose panicles, and the fruit, red or crimson in colour and acrid in flavour, carries glandular dots on the outer surface and contains one seed.

The species occurs naturally in China from as far north as the southern side of the Tsin-Ling range, which forms the watershed between the Yellow River and the Yangtze basins, and the barrier between sub-tropical or warm-temperate flora and the flora of cooler temperate zones. Westward the natural range extends but disjunctively, for in Yunnan the species appears to go on no further than the eastern side of the Mekong - Red River divide (9).

H.L.Li is of the opinion that the Taiwan species **Evodia hirsutifolia** Hayata, occurring in forests at altitudes of 1,300 m. but relatively uncommon in the island, is clearly identical with **E. rutaecarpa** (11).

Bretschneider quotes von Siebold as saying that the species is an introduction from China into Japan, where the fruit "is much esteemed as a medicine" (3). It is also much cultivated in China, and has long been so.

Chemistry

The plant is alkaloidal. The leaves contain the alkaloids evodine, avodiamine, and rutaecarpine (13). Evodine and evodiamine are said to be present also in the volatile oil contained in the fruits (5). Roi (14) says that evodiamine, $C_{19}H_{17}O_3$, is present in the plant in the form of pale yellow, odourless, acrid flakes, fusible at $278^{\circ}C$ (assumed not $^{\circ}F$ - ACD), insoluble in water, benzene, or chlorine, very soluble in acetone, and barely soluble in ether or diluted alcohol; that rutaecarpine, $C_{18}H_{13}ON_3$, crystallizes in the form of yellowish silky needles, fusible at $260^{\circ}C - 262^{\circ}C$, soluble in ether and alcohol but not in water; that the plant contains also the alkaloid wuchuyine; and that the evodine of Fuyita, Kaku, and Kotani has been identified with limonine* by Schechter and Haller. (See J.Amer.Chem.Soc. 1910, 62:1307; also J.Chem.Soc. 1927, 1708; J.Am.Pharm.Assoc. 1933, 22:716; J.Pharm.Soc.Japan. 1935, 55:67, 248, 474'; as cited by Roi).

[*Editorial note: most likely limonene]

Interest in the alkaloids appears to have revived recently. Chemical Abstracts 84:180446 refers to the presence of a quinoline alkaloid (Trease and Evans, Pharmacognosy, 11th. edition).

As in the scientific names, the Chinese term for some of these alkaloids incorporate the name of the plant, wu-chu-yu.

The terpene ocimene is present in the essential oil contained in the seeds (13; 14).

The leaves yield a fragrant oil, and provide a yellow dye (6).

Medicine: The species has been officinal in China since the 1st millennium BC at latest, being described in the Herbal Classic (Shen-nung pen-t'sao-ching) of that early period, and included there in the second class of drugs, those rectifying the consequences and lessening the violence of disease, yet requiring discretion in their use. Considerable importance was then, and has been ever since, attached to the plant's anthelmintic properties. The Herbal Classic says that the root with its white bark expels the "three worms", while the 5th. century AD commentary, the Ming-i pieh-lu, reaffirms the root's efficacy as a general anthelmintic, and gives a prescription for dealing specifically with tapeworms (12). Various authorities of the present time attribute anthelmintic properties to the fruits (6; 8; 7), while one says that commonly it is the young fruit that is used in medicine (5).

Other main uses in Chinese medicine at the present time are as a stimulant, stomachic, carminative, and purgative (9; 14; 1; 7). Burkill states that the fruits are imported into Malaya for considerable use there by the Chinese, the Malayan climate being unsuitable for cultivation of the plant (4).

Molluscicide: The species has been found to possess moderately effective molluscicidal properties. It gives a kill rate of 51-89% at a concentration of 10,000ppm. (10).

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Orixa japonica Thunb., (**Celastrus dilatatus** Thunb.; **Othera orixa** (Thunb.) Lam.; **Celastrus orixae** (Thunb.) Sieb. & Zucc.; **C. japonicus** (thunb.) K.Koch; **Evodia ramiflora** A.Gray), Rutaceae. It is known in Japan as Kokusagi, and in China as Japanese ch'ang-shan (jih-pen ch'ang-shan) to distinguish it from the ch'ang-shan which is **Dichroa febrifuga** Lour. There is an alternative popular name in China meaning Stinking Ch'ang-shan.

There is but one species in the genus, a deciduous, erect, foetid, small shrub rising to about 3m. in height, with greyish branches, alternate leaves two together on one side, and an axillary inflorescence which is borne on branches of the previous year, and produces greenish flowers of four spreading, glandular-dotted petals.

Orixa is native to the region that lies between the western part of central China, southern Korea, and the more southerly islands of Japan. It is found in woods and thickets in hilly country throughout that area, at altitudes of 800-1,600 m. in central china (2), and corresponding heights in low mountains in Japan (3). It is a cultivated species in China, where it can be found in private gardens, and beside roads. It is reasonably hardy, and has been introduced into the West.

The root contains several alkaloids (1), orixine being one of them, and also the substances orixidin, isoorixin, and kokusagin, while the leaves contain essential oil, 0.01% camphene, and linalool (4).

A decoction of the leaves, applied externally, kills lice and ticks on livestock.

There is further use of the plant in Chinese medicine.

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Poncirus trifoliata (L.) Raffin. (**Citrus trifoliata** L.; **Aegle sepiaria** DC.), Rutaceae. It is denoted in China by a single character (chih), a circumstance which usually indicated great antiquity of knowledge and application of the plant concerned. An armed and spreading deciduous shrub or small tree, glabrous, 2-5 m. tall, and nearly as wide; branchlets dense and angular, carrying an array of strong, straight, and sharply pointed thorns, 1.5-7.0 cm. long; leaves alternate, of three leaflets, gland-dotted, the central leaflet appreciably larger than the lateral ones; flowers sweetly scented, five-petalled, white, solitary or produced in pairs in the axils of the thorns before the leaves, the petals 1.8-3.0 cm. long fruit round, orange-like in colour, 3-5 cm. across, fragrant, bitter to taste, shining on the branchlets after the leaves have fallen, the skin very thick.

Leafage is sparse, rendering the long thorns particularly prominent, and particularly effective.

The fruit contains aeglin and glucose (1), and the skin an essential oil whose constituents are limonene, camphene, and according to Roi (10) linalol and linaloolactate. The seeds provide oil by expression, and the leaves and flowers as well as the fruit yield fragrant oil (7). Root, seeds, and unripe fruits contain coumarins, and the peel flavone glycosides (4).

Ancient Chinese authors distinguish between the chih (**Poncirus trifoliata**), and a fruit called both ku-chu and ch'ou-chu which is mentioned in a 12th-century manual of orange cultivation (the chu-lu) as being much cultivated as a hedge plant. Bretschneider (2) thought that this might be **Triphasia trifoliata** DC. However, Japanese authors in his time applied all three names to **Poncirus trifoliata** (L.) Raffin., as do the authors of Chinese botanical works today.

P.trifoliata is a native to northern parts of China, down to and including the northern part of the Yangtze basin, at altitudes of up to 1,000 m., the distribution extending disjunctively to the south-eastern province of Guangdong (Kwangtung). It is possible that this more southerly appearance represents in reality escapes from cultivation. The plant is widely cultivated in northern China, at the approaches to villages and in gardens, and the frequent natural appearance at roadsides may be a consequence of dispersal by man.

Cultivation spread to Japan at an unknown but probably early date, and has spread through south-east Asia, certainly as far as the Malay Peninsular. Following introduction to Europe and the United States in the 19th century, considerable interest was taken in the plant's cultivation and development there.

It does better on clay than on calcareous soil.

Economic importance

Molluscicide: The plant is a molluscicide, placed after testing in China in class 3, species providing a mortality rate of 50% or under, at concentrations of 10,000 ppm. It would appear that the whole dried plant was used in the tests, hence the active principle has not been determined. (7).

Stock: The species is resistant to cold and to disease (5); and is used as a rootstock for grafting citrus species to improve their hardiness in these respects, and as a stock for hbridizing. The citrange, **P.trifoliata x Citrus sinensis**, is perhaps the best known of such crosses.

Hedge: The species is well known as a hedging plant that affords excellent protection for farm-houses, compounds, etc. It has long been planted for this purpose in China, from the Yangtze basin southwards. Burkhill (3) states that it is similarly cultivated in Japan, and that it was brought southward from there into south-east Asia to serve as a hedging plant; and hedges of it have been formed in Europe and the USA. The dense growth and impressive armature should amply suffice for protection against intrusion by man or beast, but the presence of coumarins in the lant, some of which may be distasteful to animals, could afford an additional defence against livestock.

Ornamental: Apart from its utility as a hedge, the plant well merits the place it occupies as an ornamental species in gardens (public and private) - such as the Pei-hai and others around Peking.

Food: Given an adequate amount of sugar, a conserve can be made from the fruit (12).

Medicine: The fruit is laxative. It acts as stomachic and diuretic, and can be used to treat diarrhoea and rheumatism (10). Traditionally there is a distinction between the unripe fruit and the dried, in medicinal use, the former being most used to treat constipation, pulmonary congestion with much phlegm, and tightness of the chest; and the latter to treat lumbago, indigestion, and pulmonary congestion without the complication of much phlegm (1).

Nowadays the dried fruit is used in medicine as a substitute for pummelo and orange species, restorative, stomachic, carminative, diuretic, and tumour-inhibiting properties being attributed to them, with in addition, the capacity to treat prolapse of the rectum (7).

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Zanthoxylum armatum DC. (**Z. alatum** Roxb.; **Z. planispinum** Sieb. et Zucc.; **Z. hostile** Wall.; **Z. bungei** Hance; **Z. alatum** Roxb. var. **subtrifoliatum** Franch.; **Z. alatum** Roxb. var. **planispinum** Rehd. et Wils.), Rutaceae. Shrub, or now and then a small tree up to 4 m. in height, with an erect stem having a corky bark and bearing on the branchlets and petioles stout thorns up to 2 cm. long on a broad flattened base. The leaves are imparipinnate, the rachis very clearly winged, and the leaflets are sparsely dotted with glands. The flowers are yellow, borne in lax axillary panicles 3-4 cm. long, opening in China in May but somewhat earlier in the Himalaya. The fruits are red and numerous, and the seeds they contain are black and shining.

There is a wide distribution, from Kashmir to Bhutan at altitudes up to 2,500 m./ in the Khasia hills in Assam and in hill country in Orissa, then throughout most of China, including Taiwan and Hong Kong, to Luzon in the Philippines at altitudes of 1,300-1,500 m. (12), and Korea and Japan. Valleys and tickets in the mountains, wasteland, and the under-storey of mixed forest, are customary locations of the species. It is a plant as much of the temperate as of the subtropical zone though occurring widely in the subtropics in India, China, and to a lesser extent in the Philippines, and is consequently found at medium to high altitudes in the southernmost parts of its range.

It has been in cultivation in England since the 1870s, but it cannot always take a very hard winter. (2).

The species is likely to be found even in recent authorities under one or other of its synonyms (cf. Bean (2) and Icon. Cormo. Sin. (11), **Z. planispinum**; Roi (14), **Z. alatum**). Flora Hupehensis (9) regards **Z. armatum** and **Z. planispinum** as distinct species, attributing to **Z. armatum** half the height of **Z. planispinum**, two metres to the latter's four, more savage thorns, trifoliate leaves where the latter's are given as imparipinnate with 3-9 leaflets. Fruiting season is recorded as shorter in the case of the former, being confined to August, while the latter is said to fruit from June to August, and its seeds yield oil, of which there is no mention in this Flora's description of **Z. armatum**, nor is there mention in it of any culinary or medicinal uses such as are attributed to **Z. planispinum**.

This is not the only species in the genus on whose currently valid name there is a lack of agreement. **Z. hamiltonianum** Wall. ex Hook.f. is another. A monograph on the Asian species of the genus would seem desirable. In view of the variety and importance of the chemical constituents and the uses of the several species, it is to be hoped that a monograph would include references to them, not excluding the Chinese uses of the numerous species that occur in that country.

Essential oil: *Z. armatum* provides essential oil, and in various countries where it occurs attention has been paid to the contents and their analysis.

Constituents: Watt's Dictionary (16) records the distillation by Dr. Stenhouse of the aromatic oil yielded by the carpels, and its results. He found the oil to be, when pure, a hydrocarbon, isomeric with oil of turpentine, colourless, refracting light strongly, and having an agreeable aromatic odour similar to that of Eucalyptus oil. He named it zanthoxylene, composition $C_{10}H_8$. Zanthoxylol, a stearopten appearing in its pure state as large crystals of a fine silky lustre, readily soluble in alcohol or ether but not in water, and a very slight odour of stearine, with a slight aromatic taste. It distilled unchanged, and had been found floating on the water distilled from the carpels and separable from the crude essential oil. Composition of zanthoxylol is $C_{40}H_{60}O_4$. Two later chemists, Pedler and Warden (1888), who distilled the essential oil, detected in it the presence of a pale yellow, viscid, non-drying principle, but were unable to obtain the crystallisable stearopten zanthoxylol that Stenhouse had isolated.

Quisumbing (12) in the Philippines records a report that over 85% of the essential oil from the carpels consists of the hydrocarbon 1- α -phellandrene.

The wealth of India (8) describes the oil as having a colour pale to live yellow, with a lasting spicy fragrance resembling that of cubeb (**Piper cubeba**), and faintly that of wild rose; and records a yield of 2.3% from the dried fruits, collected in Kashmir and Jammu, containing linalool, 64.1%; linalyl acetate; citral; geraniol methyl cinnamate; limonene; and sabinene; and total acid value of 2.2.

Leaves from Garwhal, further east in the Himalaya, yield 0.04% essential oil, acid value 6.3, containing methyl-n-nonyl ketone, ca. 44%; linalool, 19.5%; linalyl acetate, 10.7%; uncharacterised sesquiterpenes, ca. 13%; and tricosane.

According to Chopra (7:640) the yield of oil from Indian specimens is little more than half that from specimens used elsewhere. His figures are 2.10% from Indian specimens, which agrees roughly with the figure of 2.3% recorded in The Wealth of India, and 3.7% from foreign specimens - presumably collected from China and Japan.

Read (13) gives the essential oil content of the fruit as 3.0%, and contents as zanthoxylol, cuminal, phellandrene, sabinene, and saponin. Roi (14) gives the constituents of the fruit as cuminal and cinnamic aldehydes, dimethyl ether of phloracetophenone, zanthoxylol, phellandrene, an essential oil containing sabinene, and saponins.

Alkaloids: The alkaloids dictamnine and skimmianine have been identified from the roots in China (6). The same alkaloids have been isolated from the roots in India. The Wealth of India lists dictamnine as isolated from the stem bark in West Bengal, and berberine (source unstated) as isolated from the bark; and records Japanese sources (Chem. Abstr. 55 (1961): 14495 as having isolated magnofluorine (0.02% as picrate) and zanthoplanine, skimmianine, dictamnine, and y-fagarine from the root (8). Chopra (7:590) states that the bark contains a bitter crystalline principle identical with berberine, and contains a volatile oil and resins.

Economic importance

The economic importance of the species is considerable, and by no means confined to its essential oils.

Food: In China the dried fruits are marketed, and appear as small red carpels containing the black, shining, pungent, and somewhat acrid-tasting seeds, which are about 3.125 mm across. The skin or fruit wall provides a seasoning for food (6), a use supplied by several other wild peppers in the genus. The fruits have also been used, since classical times, for pickling (4).

Hedging: The thorns are sufficiently powerful for the species to be planted as a hedge in Assam (8).

Purification: Gamble (10) mentions an Indian use of the fruit for purifying water.

Domestic uses: He says further that the wood, which is close-grained and yellow, can make walking sticks, while the twigs serve as tooth brushes. The Wealth of India says that they are chewed in order to clean the teeth.

Soap: The Wealth of India suggests that the essential oil, possessing as it does deodorant and antiseptic properties, may find use in soap making. This is not one of the several wild peppers whose oil is used in China in soap manufacture.

Fish-poison: Brandis (3) states that the bark is used for intoxicating fish. The fruit also is reported to be used in India for the same purpose (7:590).

Insecticide: Insecticidal properties have been reported in both the oil and the bark. The latter showed, when powdered, 100% mortality when used against one-day-old nymphs of **Locusta migratoria** L. The oil, in a dilution of 1 in 40,000, was reported to have shown a good immediate effect against one-day-old nymphs of this locust, but to produce only 40% mortality after 24 hours.

[Editorial note: Gardener makes an addendum to **Zanthoxylum amartum** DC., Rutaceae. p.89]

T'u-nung-yao chih (Manual of Insecticidal Plant) 1959. Peking: Science press. No. 82, as **Z.**

planispinum Sieb. et Zucc.:

The species distributed from south-east to south-west China, throughout, more especially south to south-east, but not in Hainan Island; north-west to the Tsinling range; very widespread in all south-eastern and central provinces.

Habitat: At altitudes of 30-2,000 m. in thick undergrowth, wasteland, and scattered woodland, also wld by roadsides etc.

1 catty (1.33 lb.) of leaves and seeds dried and ground to a powder, with 10 catties of potter's clay added, is effective, when puffed out as a dust, in removing (lit. preventing, but the sense is, destroying) up to 80% or more of the caterpillars of pyralid moths that feed on rice plants; and the same dust has a suppressive effect on the epidemic disease of rice.

(Sichuan, Ta-hsien (Sui-ting), Lat. 31°18', Long. 107°38').

Gardener makes a note for Dr. Fellows:

It will be apparent that the foregoing extract differs from particulars recorded in my note of 23.i.1986 on this species, in respect of the parts of the plants used as an insecticide, namely powdered seeds and leaves instead of bark and essential oil in the leaves. Further, this extract excludes Hainan Island from the distribution. Also, see generally the fourth paragraph in my note on **Z. armatum**.

I think it would be advisable to check with Index Kewensis the synonymy of **Z. armatum**; and if you agree I would appreciate knowing any result.

Snake-bite remedy: **Z. armatum** is one of the many species looked on in China and India as snake-bite remedies (1), and that Chopra, in a no doubt almost equally long list, gives as one of the species which have been tested and found to have no curative or other beneficial effect. (7:608).

Medicine: Medicinal use has been recorded since at least the 1st. millenium BC. The name by which the plant was then, and for many centuries thereafter, known in China, was ch'in-chiao, a reference to its being first known and found in the state of Ts'in (Ch'in), whose territory lay generally north of the considerable mountain range which stands divide between the basins of the Yellow river and the Yantze, here in northern China. In succeeding centuries cultivation and naturalisation has spread throughout China, as recorded in various herbals quoted in the 16th-century Pen-ts'ao-kang-mu, chapter 33.

Early descriptions of the plant refer to resemblance of its leaves to bamboo leaves. Botanists in the People's Republic of China, who describe the species under the names **Z. planispinum** Sieb. et Zucc. (11) or **Z. armatum** (6) now use it for the book-name Bamboo-leaf Pepper (chuh-yeh-chiao), and have ceased employing the name ch'in chiao. Nevertheless, it seems certain that chu-yeh-chiao is the species long known as ch'in-chiao, and that analyses of the constituents of ch'in-chiao made at times when this plant was referred to **Z. alatum** hold good for the species in China now variously named **Z. armatum** and **Z. planispinum**, after 19th-century botanists referred it to **Z. alatum**.

Knowledge and use of the species, apparently native to eastern Himalayan-central China floral zone, has spread considerably into other parts of Asia. Watt (16) states that the Arab countries in the western half of the continent, where the fruits have long been used in Mohammedan medicine, obtained their supplies originally from northern India. Burkhil (5) records that the fruits are imported into the Malay Peninsular, where the Chinese use the fruit walls, after the seeds have been removed, as a sudorific. The leaves and fruit are said to be regarded in Vietnam as an emmenagogue (12).

Bark, fruit and seeds are much used in Indian medicine as carminatives, stomachics, and anthelmintics (8). In Chinese medicine, wherein the plant is even more important than it is as a culinary article, there are these and other uses. Stimulant, astringent, and analgesic properties are attributed to the plant (15). The fruit when powdered and mixed with vinegar is used against dental maladies (14). In this connection, application of bark and thorns for toothache has been reported in northern India (16).

Scabies is treated by the plant in China, using a lotion applied to the skin (14); and Watson (15) states that an infusion in vinegar is used to expel bugs or worms that have been infecting the ear.

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Zanthoxylum avicennae (Lam.) DC. (**Fagara avicennae** Lam.; **Zanthoxylum pterota** Blanco; **Z. iwaginense** Elm.), Rutaceae. An evergreen shrub 2-3 m. in height, or small tree rising to 12 m. as found in China (2). In the Philippines the branches are unarmed (4), but in China there are triangular prickles on the bark (2). The leaves are compound, alternate, imparipinnate, with 7-13 leaflets 2-6 cm. long, the terminal one being rather longer, averaging 8 cm. There are numerous flowers, white or greenish in colour, borne in clusters of five in an umbelliferous panicle. The fruits are crimson, and carry glandular dots.

Distribution is from south-western and southern China, including Hong Kong, to North Vietnam and the Philippine Islands at low altitudes 510 - 550 m. in southern Yunnan - in dense or scattered forests, or on level ground, or alongside roads.

Oil: The seeds contain about 25.24 to 30% in weight of a drying oil, and the seed wall and the leaves yield an aromatic oil (1; 2).

Wood: The wood is pale yellow in colour, and suitable for making small agricultural implements and domestic articles.

Medicine: The plant is officinal. The root, fruit, and leaves have analgesic properties and promote diuresis, and are used to treat acute hepatitis, rheumatism, traumatic injuries, and stomach-ache (3). The root and fruit are also a blood-stimulant, and the anti-bilious property that allows treatment of hepatitis has been attributed to these two parts of the plant alone, which in addition are reported to treat inflammation of the kidneys and dropsy (1).

Tonic: The bark is very bitter. Quisumbing mentions its reported use in the Indo-Chinese region as an astringent tonic, and he says that a decoction of the stem is used in the Philippines as a stomach tonic (4).

Paints and soap: The drying oil extracted from the seeds is used in the manufacture of oil paints and soap (1).

Ascariasis: This oil also provides anthelmintic, specifically treating roundworms (ascaridae) (1).

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Zanthoxylum bungeanum Maxim., Rutaceae. A tall, deciduous, fragrant shrub or small tree, from 1-7 m. in height, bearing on its branches sharp thorns that face upward from a broad, flat base, and are 5-16 mm. long. Leaves are alternate, imparipinnate, and often thorned on the rachis. The fruits are round, and from red to crimson in colour.

Barring the north-east (Manchuria) and the north-west, the species is distributed almost everywhere through China. It prefers situations of ample sunlight and warm, moist, fertile soil; and it is much cultivated beside villages and in fields.

The seeds yield by expression an oil (4; 3) said to be used industrially (1). The whole fruit is reported to yield an aromatic oil (1; 2).

The leaves provide a pesticide (1; 2; 3; 4). It seems likely that the active principle, which has apparently not been determined yet, develops only as the leaves mature, for these are described as edible when young (3).

Other uses of the plant are in Chinese medicine, and as a substitute for pepper.

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Zanthoxylum hamiltonianum Wall., Rutaceae. A large climbing or scrambling shrub, having short recurved thorns, often nearing 2 cm. in height, on the stem and the stout branches, and numerous prickles on the stalks of the leaves. Leaflets are long, 10-17.5 cm. opposite, glossy on both surfaces, with prominent secondary nerves. Flowers are small, green, and borne in short axillary panicles.

Distribution in the wild is confined to Sikkim, Assam, Upper Burma (1), south-eastern Tibet, where altitudes are low enough for subtropical vegetation to flourish, and perhaps western to south-western Yunnan (4:150).

The roots serve as a fish poison, and as an insecticide capable of destroying mosquito larvae, bot Anopheles and Culex. A boiled fresh solution of the root has been observed to kill 100 anopheline larvae in seven minutes, and it acts equally lethally on culicines. It has no destructive effect on the pupae. Further, it must be used fresh. The potency of the diluted juice is lost after three days, and the juice becomes inert on the fifth day (Chopra (2), citing Manson, J.Malar.Inst.India, 1939, 2, 85).

The Wealth of India (3) shows this species under **Zanthoxylum nitidum** (Roxb.) DC. (**Fagara nitida** Roxb.), a synonymy not always accepted. Chinese botanists in particular do not admit it, and distinguish between the species in distribution (4:147), uses, and characters. Should the synonymy in The Wealth of India be correct, it would follow that **Z. nitidum** possesses insecticidal and fish-poison properties, but there is no record of the species, much valued in China as a medicinal plant, being used there in those two capacities.

The fruits of **Z. hamiltonianum** are considered in India to have astringent, stimulative, and demulcent properties (5).

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Zanthoxylum schinifolium (Engl.) Sieb. et Zucc. (**Fagara schinifolium** Engl.), Rutaceae. A deciduous shrub, sometimes small tree, from 1-3 m. in height, with a substantially armed, dark grey, glabrous bark. The leaves are alternate and imparipinnate, carrying 11-21 elliptic or lanceolate-elliptic leaflets of no great length to 4.5 cm. Flowers are many, and small, blueish-green, and carried each on its own stalk in clusters of five. Male flowers, stamens and anthers have one glossy rather deep gland-dot. The ripe follicles turn to crimson, and the seeds are blue-black and shining.

Early records of the plant go back to the 11th century A.D., when it was regarded as a not particularly aromatic wild pepper of central China, in the area that is now the province of Hubei (Hupeh), and its bark was collected throughout the year for medicinal use. It is now known to be distributed through all provinces of northern and southern China, though not in the tropical south or south-west, and to occur also in Korea and Japan (5). It is basically a woodland plant of lowish altitudes up to 800 m. in central China (4), but in addition to occurring beside mountain forest and in thickets it can be found on open hillsides and beside stony cliffs (2).

The fruit yields a fragrant oil, and oil can be expressed from the seeds (4). The alkaloid skimmianine has been isolated in the root (3).

An agricultural insecticide can be compounded from a decoction of the sap of stem and leaves (2).

The fruit provides a fragrant condiment in the eastern part of central China (3). Early writers were more than a little dismissive of its value as a seasoning, saying merely that the savages added it when cooking chicken and duck (1).

In China the carpels, mixed with powdered ginger and taken with wine, have been used for centuries against coughs and asthma (6; 7). Root, leaves, and fruit are now regarded as possessing cold-relieving, antitoxic, and stomachic properties (5).

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[Editors note: Gardener makes an addendum on p.90. as follows:

T'u-nung-yao chih (Manual of Insecticidal Plant) 1959. Peking: Science press. No. 83.

1 catty (1.33 lb.) of **Z. schinifolium** cut into small pieces, with 20 catties of water added, boiled for one hour, strained to remove all sediment, and sprinkled, gives around 70% effectiveness against aphids and the caterpillars of pyralid moths damaging rice.

(Sichuan, Ta-hsien (Sui-ting), Lat. 31°18', Long. 107°38').

Zanthoxylum simulans Hance (**Z. setosum** Hemsl.), Rutaceae, a lowish shrub not usually exceeding two metres in height, whose bark carries thorns and white lenticels. The leaves, alternate, compound, imparipinnate, are borne on a prickly rachis. Leaflets, 5-9 pairs, are stalkless, and in the medium range for size in the genus, being 2.5-6 cm. long by 1.8-3.5 cm. wide, with finely crenate margins, and transparent glands on both surfaces. The panicles of flowers are terminal or axillary, and the fruit, red to crimson in colour, bears large translucent glands on the surface.

The species is native to China, and occurs from north of the Yellow River, in the province of Hobei, south through central China to southern coastal provinces, stopping short of the tropics. It can be found on hillsides at low altitudes (100-400 m.) in northern central China (4), and at forest edges, or in thickets, and beside roads (3 ;4). It is regarded as hardy in the United Kingdom, where it was introduced more than a century ago.

Var. **prodocarpum** (Hemsl.) Huang, differing from the type in greater height, reaching 3 m., in its long sharp thorns with a markedly flattened base, the larger number of leaflets (7-15), and the absence of stiff hairs on them. It grows at slightly higher altitudes than the type, and by watersides and in the general kind of situation where the type can be found. It is more plentiful than the type in the province of Hubei, and does not reach north of the Yangtse valley. To judge from the description under **Z. simulans** in Hortus Third, it is this form that has been introduced into cultivation in the United States.

The species was originally determined on the basis of a plant that had been known in China and used medicinally there since at least the first century BC, when it was obtained in the Ordos mountains in what is now the province of Shaanxi (Shensi), part of the heartland of ancient China. The characters then used for the plant (and used for it when it was referred to **Z. simulans**) are romanised as man-chiao, but it carried other names as well, some derogatory, such as pig, sow, and dog, allusions to the offensive odour spread by the acrid leaves of the plant (see 2); and it is as man-chiao that 20th century authors such as Read (Medicinal Plants of the Pen-Ts'ao Kang Mu) and Roi (Traite des plantes medicinales Chinoises) list the species. The name man-chiao has been dropped by contemporary Chinese botanists, who use the name "Wild Flower Pepper" (yeh-hua-chiao [Gardener writes the character here]); but there can be no doubt that this name refers to the same species (**Z. simulans**) as did man-chiao, and that the references to man-chiao in the Pen-Ts'ao Kang Mu hold good for the present day **Z. simulans**.

Fragrant oils and fatty oils are obtained from the plant (5).

The leaves contain coumarin (3).

The acrid red fruit of var. **podocarpum** is reported to have anthelmintic properties (1). The fruit of the type could have the same properties.

Fruit, leaves, and root of **Z. simulans** have warming and stomachic properties, and are used to curtail vomiting and promote diuresis (5). The roots, stem and bark of var. **podocarpum** can be chewed before swallowing, or used in decoction, to relieve sore throat, traumatic injuries, and the ache in bones that can be produced by rheumatism (1).

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[Editorial note: Gardener makes an addendum on this plant:]

Zanthoxylum simulans Hance, Rutaceae.

T'u-nung-yao chih (Manual of Insecticidal Plant) 1959. Peking: Science press. No. 84. An insecticidal and avicidal plant.

Up to 80% of caterpillars generally are kept off by a solution obtained by cutting 1 catty (1.33 lb.) of the plant into very small pieces, boiling briskly in 2 catties of water, removing the sediment, and adding 7 catties water to each catty of the secretion. (Sichuan Province, Feng-chieh, Lat. 31°10', Long. 109°35').

0.4 catties of the plant with 4 catties of water added, reduced in boiling to 2 catties, and to each catty of this solution 7 catties of water added, secures usually a kill rate of 91.6% on aphids. (Jiangsu Province, Feng-hsien, Lat. 29°50', Long. 121°19').

10 measures (say, 10 gills) of the leaves in 250 gills of water, reduced in boiling to 20 cups, effects a kill rate of up to 100% on Cabbage White Butterflies and caterpillars (**Pieris rapae**).

Immerse each catty of meal in 3 catties of water, reduce in boiling to 1 catty, and sprinkle an inch of each catty of this mixture into 10 catties of water, to kill cabbage aphids (**Brevicoryne brassicae** (L.) and **Lipaphis erysimi** (Kaltenbach)); aphids on mulberry (not specified, but could well be **Toxoptera aurantii** (Boyer de Fonscolombe), the black citrus aphid, a species originating in the Far East and now world wide in the tropics and subtropics, and recorded on species of numerous families including Moraceae; and caterpillars of the Pyralid moths.

To the leaves cut into small pieces add 3 times the amount of water, soak for 8-12 hours, and the solution mixed with alcohol and spread on the surface of manure will kill 85% of maggots after 72 hours.

The fruit ground to pieces, with moistened rice added, and white spirit sprinkled immediately on the mixture, tempts sparrows to take the food, and acts as an immediate poison.

Footnotes:

1. The species is used in medicine. The fragrant oil extracted from the fruit is a flavouring. The seeds yield oil by expression, usually around 14%. A drying oil which is used as a binder or blender in paints and varnishes, an illuminant, and for soap-making, and provides a lubricating oil.
2. Of the species of the genus produced round the country, **Z. bungeanum** Maxim. yields the greatest quantity of fragrant oil.

DAPHNIPHYLLACEAE

Daphniphyllum macropodum Miq. 6.v.1986 80
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Daphniphyllum macropodum Miq., (**Webera marchandii** Lév.; **Daphniphyllum marchandii** (Lév.) Croiz. et Metc.; **D. membranaceum** Hayata), Daphniphyllaceae. A small evergreen tree, the leaves alternate, but at the end of the branches set close together, oblong, 15-20 cm. long, glossy on the upper surface, with red stalks. Flowers are small, pale green, dioecious, and borne in short racemes. Drupes are black, usually elliptic, with a fleshy outer skin.

Daphniphyllum has been separated from the Euphorbiaceae. It is the sole genus in the family to which it has been assigned.

Daphniphyllum macropodum occurs in most provinces of mainland China, from the Yangtze basin southward, and in Taiwan, Korea, and Japan. In the wild, it appears to be confined to these regions, as a hillside tree of medium altitudes, 1,000 m. or more, rising locally to 2,000 m. In China it is also cultivated as a garden tree.

Daphnimacrin $C_{27}H_{41}O_1N$, and asperuloside, $C_{18}H_{22}O_{11}$ which is reported to crystallise in spirits of wine, have been isolated in the plant (4).

The seeds yield oil by expression (1). No commercial use appears to have been found for it.

1 catty (1.33 lb.) of the leaves, boiled briskly in 5 catties of water, and filtered, provide an aphicide for sprinkling (4).

The leaves are used in Chinese medicine to treat boils and swollen septic sores (3), drawing out the poison (2).

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Eleusine indica (L.) Gaertn. (**Cynosurus indicus** L.), Wiregrass, Goose Grass, Gramineae. An erect, tufted grass of little more than 90 cm. in height, usually classified as an annual, but having a deep and strong root system that causes the grass, after it has been cut on maturity, to regenerate, and flower and bear fruit, repeatedly. The inflorescence is composed of digitate one-sided racemes, with unawned spikelets dense at the top of the spikes, and it produces seeds prolifically.

Distribution: Whatever its origin, perhaps India, the grass has now reached all the warmer parts of the world, thriving better in the rather drier climates than in the markedly wet. Dispersal can be by rain-wash, by cattle and horses that have fed on the ripe plant and voided the seeds, and by ants that have carried off the seed to eat the aril (6). Ridley, who declares himself very doubtful as to how it has travelled so widely, says that it is not a sea-shore plant and does not appear to be carried by birds, and that he has "no knowledge of any spot where **E. indica** occurs unassociated by man, nor of any where it was impossible for it to have been brought by man".

Habitat: It is an invasive grass, growing almost anywhere in open situations, other than land that is periodically flooded, such as rice plantations, though even here it will cover the small bunds that enclose or separate the paddy fields.

HCN: Burkhill (1) states that hydrocyanic acid has been obtained from the plant, but that poisoning has not been recorded.

Forage: In climates that are not wet enough for the grass to grow rank, northern India, for instance, Australia, and parts of China and the USA, the species is considered a valuable, nutritious, and plentiful forage grass (2 ;4).

Food: In Malaysia the entire plant, roots and all, is sometimes eaten by man, but only when quite young, and usually uncooked. In India and parts of Africa the seeds, in times of great scarcity, provide food, though rarely (1).

Anthelmintic: Burkhill also quotes a report (Bartlett, 1927, Papers Michigan Acad. Sci. 6:9) that in central Sumatra the leaf juice is used as a medicine for worms.

Soil-stabiliser: In Hainan Island off the southern Chinese coast the deep root-system renders the plant an excellent soil-conservation species. It is from this root-system, and the strength of its resistance to attempts at extraction, that the Chinese name for the plant, meaning Ox-muscle Grass (Niu-chin-ts'ao) is derived (3).

Weed-danger: As a weed in cultivated land, the species presents specific hazards. It is a host plant for certain virus diseases of maize and rice, and while not perhaps growing actually among the rice, it certainly surrounds the paddy fields closely enough for it to become a menace. It is subject to infection by the insect-transmitted Rice "Tungro" Virus (5:30). It is a host of the Green Rice Leafhopper (**Nephotettix nigropictum**) (5:313). Further, it is a collateral host to the Rice-borer Beetle or Hispa (**Dicladispa armigera** and related genera) (5:401-2). However, when growing as a weed among maize, the larvae of armyworms, **Spodoptera exempta**, sometimes prefer feeding on it to feeding on the crop itself (5:497).

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Note:

Eleusine coracana (L.) Gaertn. is regarded by Burkill (loc. cit.) as a cultigen derived from **E. indica**, and Bews, 1929, The World's Grasses, says that it probably derived from **E. indica**. If so, an important active principle would appear to have been lost in the development, for Blackman, R.L. & Eastop, V.F., 1984, Aphids on the World's Crops (London: John Wiley) recorded **E. coracana** as the host to at least six species of aphid (pp. 161-2)

Salix Babylonica L. (**S. japonica** Thunb.; **S. elegantissima** C. Koch; **S. pendula** Moench.), Salicaceae. The Weeping Willow, large and spreading, and one of the most decorative trees of the temperate and warm-temperate zones. It is tallish, 10-15 m. in height, and its long pendent branches spread out from a relatively short trunk, with branchlets and long linear-lanceolate leaves providing a green shade and a green ornament.

Originating probably in the central and southern parts of China, where it can still be found wild in western parts, its beauty has caused it to be cultivated throughout that country and in much of the world besides. It thrives best beside water, and if its roots can tap a steady supply it can grow to a great size, but it can also grow in dry places (2). Thus it is a favourite for cultivation in oasis cities and settlements in the Chinese deserts, for ornaments and bank protection (6), while in India it is grown chiefly in the drier parts of the north, namely Baluchistan, the Punjab (where it is known as the majnün) and parts of the Himalaya, and, to a lesser extent, in the plains further east (1).

The constituents of the leaf include (2) the crystalline glucoside salicin, $C_{13}H_{18}O_7$, 0.2%; salicortin, $C_{20}H_{24}O_{10}$; salidroside, $C_{14}H_{20}O_7$; triandrin, $C_{15}H_{20}O_7$, and vimalin, $C_{16}H_{22}O_7$; (1 & 2). The bark has been found to contain 0.2-0.4% of salicin (2).

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The bark also contains tanning material, 7.5% (11)

Vitamin C is also contained in the leaf.

S. babylonica provides a great variety of uses, for some of which it has been developed, both in China and to a lesser extent in India, as a plantation tree. It grows fast and can be easily reproduced by cuttings, and aside from plantation cultivation is commonly planted for protection and stabilisation of the banks of rivers, canals, reservoirs, irrigation channels, and in wet places for re-clothing slips, being especially useful where periodic inundation is to be expected. (7: 12).

The use most recently discovered is that of the leaf as an agent, reportedly, in the control of plant pathogens. A Chinese-language manual of insecticides (15), published in Peking in 1959, carries the results of experiments conducted in various parts of the country, using the leaf, whose most important constituent is regarded by the manual as salicin.

[Editorial note: Gardener adds an addendum, page 87 in the original manuscript].

Addendum

5 parts of leaf juice to 1 part of water generally destroys 93% of cabbage aphids (**Brevicoryne brassicae** (L.) and **Lipaphis erysimi** (Kalt.)). The juice 30-fold in water destroys 96.1% of the spores of fruit-bodies of black mildew of sweet potato (**Meliola ipomeae** Earle).

In Anhui province it was found that five parts of the leaf juice diluted in one part of water killed 96.1% of the summer-born fruit-bodies of the fungus Wheat Stem Rust (**Puccinia graminis** Pers.), and five parts of the leaf in a decoction killed 87.57% of the fruit-bodies of Leaf rust of Wheat (**Puccinia recondita** Rob ex Desm. f. sp. **tritici**). In seed stations of the Central Agricultural Department and the Hubei Agricultural Department it was found that 10 parts of the leaf juice in water killed 75% of a fungal disease on cotton (**Xanthomonas malvacearum** (E.F.Smith) Dowson, Fusarium Wilt of Cotton (**Fusarium oxysporum** f. sp. **vasinfectum** (Atk.) Snyder & Hanson, and a red mildew on wheat.

The same manual states that the leaves are effective against aphids, certain caterpillars, and mosquito larvae. It would seem unlikely that vimalin is an active principle in control of caterpillars, seeing that leaves of **S. viminalis** L. are fed to silk-worms (10:738).

Against aphids, and the caterpillars of Heliothid moths that feed on the leaves of cereals, soya beans, etc., 1 catty (1.33 lb.) of the leaves of **S. babylonica** pulped, and soaked in 3 catties of water for a day, or infused for half an hour, should be used. The leaves sliced fine, and scattered in privies, are said usually to kill mosquito larvae in 24-48 hours, while 100 parts of the leaf (presumably the leaf juice) in spirits of wine are said to kill 32.3% of mosquito larvae.

The bark-fibre can provide pulp for paper making (10:724).

Strips of the bark, after having been carbonised, can serve as carbon pencils for drawing designs, or maps, or plans (5). They can also make baskets (8), as can branches and branchlets, both in India and China.

The wood is white, soft, porous, and even-grained (7). Furniture and utensils can be made from it (9). In North China it provides pit props and building material (4).

The catkins stuff chair cushions and halters (3).

Other medicinal use in that country is of the leaves, flowers, and fruit to treat foul ulcers (10:724); of the root to treat leucorrhoea, retained placenta, and oedema (11); and the roots and branches to ease rheumatic pains, and pain in jaws swollen from toothache (10:724). Generally speaking, both leaves and bark are used as febrifuge (4), and it is recommended that bark and leaves should be picked in the summer or autumn and dried straight away in the sun (2). Other uses of the leaves are for the treatment of chronic bronchitis, infection of the urinary passage, stone in the bladder, and hypertension, and to relieve the pain of arthritic swellings, swollen infected sores, itching skin sores (2). The flowers are used in cases of jaundice (11), a treatment only from south-west China.

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ADDENDUM

27.v.1986

Salix babylonica L.

87

5 parts of leaf juice to 1 part of water generally destroys 93% of cabbage aphids (**Brevicoryne brassicae** (L.) and **Lipaphis erysimi** (Kalt.)). The juice 30-fold in water destroys 96.1% of the spores of fruit-bodies of black mildew of sweet potato (**Meliola ipomeae** Earle).

ADDENDA

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Zanthoxylum armatum DC	89
Zanthoxylum schinifolium (Engl.) Sieb. et Zucc.	90
Zanthoxylum simulans Hance	91

Gardener makes an addendum to **Zanthoxylum amartum** DC., Rutaceae.

T'u-nung-yao chih (Manual of Insecticidal Plant) 1959. Peking: Science press. No. 82, as **Z. planispinum** Sieb. et Zucc.:

The species distributed from south-east to south-west China, throughout, more especially south to south-east, but not in Hainan Island; north-west to the Tsinling range; very widespread in all south-eastern and central provinces.

Habitat: At altitudes of 30-2,000 m. in thick undergrowth, wasteland, and scattered woodland, also wld by roadsides etc.

1 catty (1.33 lb.) of leaves and seeds dried and ground to a powder, with 10 catties of potter's clay added, is effective, when puffed out as a dust, in removing (lit. preventing, but the sense is, destroying) up to 80% or more of the caterpillars of pyralid moths that feed on rice plants; and the same dust has a suppressive effect on the epidemic disease of rice.

(Sichuan, Ta-hsien (Sui-ting), Lat. 31°18', Long. 107°38').

Gardener makes a note for Dr. Fellows:

It will be apparent that the foregoing extract differs from particulars recorded in my note of 23.i.1986 on this species, in respect of the parts of the plants used as an insecticide, namely powdered seeds and leaves instead of bark and essential oil in the leaves. Further, this extract excludes Hainan Island from the distribution. Also, see generally the fourth paragraph in my note on **Z. armatum**.

I think it would be advisable to check with Index Kewensis the synonymy of **Z. armatum**; and if you agree I would appreciate knowing any result.

Gardener makes an addendum as follows:

T'u-nung-yao chih (Manual of Insecticidal Plant) 1959. Peking: Science press. No. 83.

1 catty (1.33 lb.) of **Z. schinifolium** cut into small pieces, with 20 catties of water added, boiled for one hour, strained to remove all sediment, and sprinkled, gives around 70% effectiveness against aphids and the caterpillars of pyralid moths damaging rice.

(Sichuan, Ta-hsien (Sui-ting), Lat. 31°18', Long. 107°38').

Gardener makes an addendum on this plant:

Zanthoxylum simulansHance, Rutaceae.

T'u-nung-yao chih (Manual of Insecticidal Plant) 1959. Peking: Science press. No. 84. An insecticidal and avicidal plant.

Up to 80% of caterpillars generally are kept off by a solution obtained by cutting 1 catty (1.33 lb.) of the plant into very small pieces, boiling briskly in 2 catties of water, removing the sediment, and adding 7 catties water to each catty of the secretion. (Sichuan Province, Feng-chieh, Lat. 31°10', Long. 109°35').

0.4 catties of the plant with 4 catties of water added, reduced in boiling to 2 catties, and to each catty of this solution 7 catties of water added, secures usually a kill rate of 91.6% on aphids. (Jiangsu Province, Feng-hsien, Lat. 29°50', Long. 121°19').

10 measures (say, 10 gills) of the leaves in 250 gills of water, reduced in boiling to 20 cups, effects a kill rate of up to 100% on Cabbage White Butterflies and caterpillars (**Pieris rapae**).

Immerse each catty of meal in 3 catties of water, reduce in boiling to 1 catty, and sprinkle an inch of each catty of this mixture into 10 catties of water, to kill cabbage aphids (**Brevicoryne brassicae** (L.) and **Lipaphis erysimi** (Kaltenbach); aphids on mulberry (not specified, but could well be **Toxoptera aurantii** (Boyer de Fonscolombe), the black citrus aphid, a species originating in the Far East and now world wide in the tropics and subtropics, and recorded on species of numerous families including Moraceae; and caterpillars of the Pyralid moths.

To the leaves cut into small pieces add 3 times the amount of water, soak for 8-12 hours, and the solution mixed with alcohol and spread on the surface of manure will kill 85% of maggots after 72 hours.

The fruit ground to pievcces, with moistened rice added, and white spirit sprinkled immediately on the mixture, tempts sparrows to take the food, and acts as an immediate poison.

Footnotes:

1. The species is used in medicine. The fragrant oil extracted from the fruit is a flavouring. The seeds yield oil by expression, usually around 14%. A dryin goil which is used as a binder or blender in paints and varnishes, an illuminat, and for soap-making, and provides a lubricating oil.

2. Of the species of the genus produced round the country, **Z. bungeanum** Maxim. yields the greatest quantity of fragrant oil.

LABIATAE

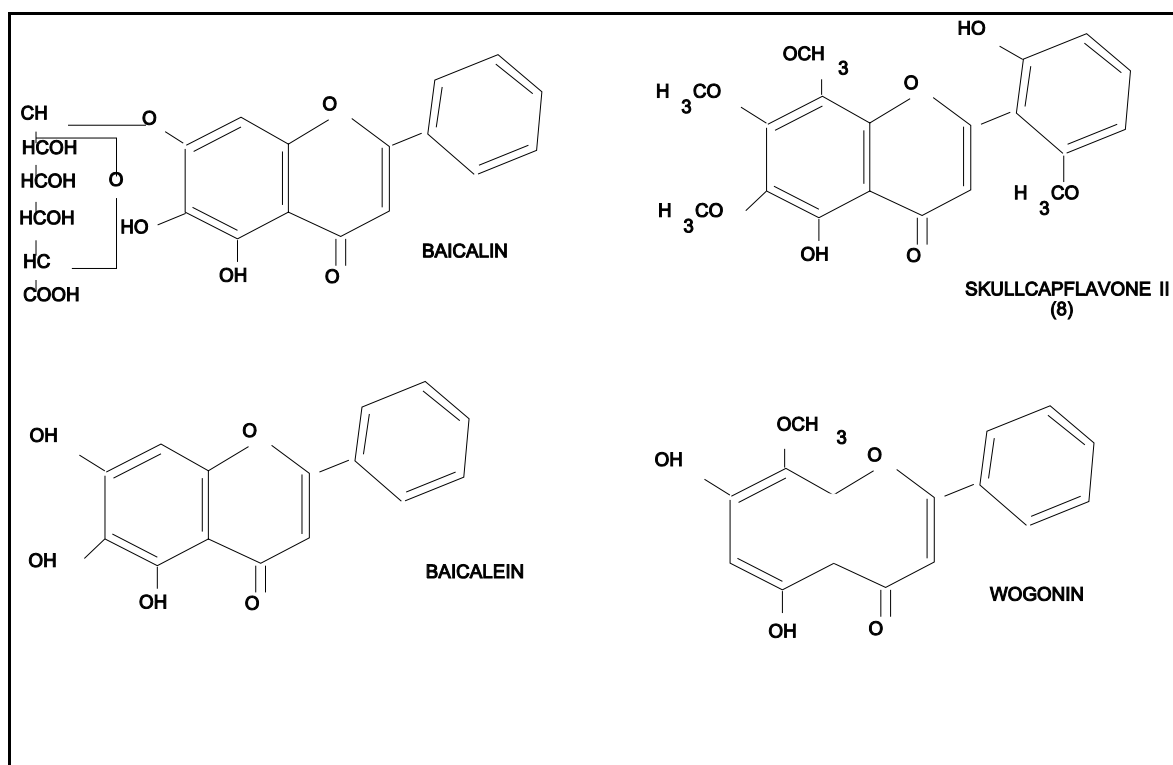
Scutellaria baicalensis Georgi

22.v.1986 92
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Scutellaria baicalensis Georgi (**S. macrantha** Fisch.; **S. viscidula** Bunge), Skullcap, Wogon (Japanese), Labiatae. A perennial herb with a long yellow root 2 cm. across, and a rather lengthy stem ascending from a prostrate base to a height of 30-120 cm. The under side of the leaves is thickly pitted with gland-dots. The flowers are usually of a blueish-purple colour, and are borne in a terminal raceme.

There is a wide distribution in eastern Asia. The species occurs throughout most of China, including Inner Mongolia and the north-east (Manchuria), and in Mongolia, Siberia, Korea, and Japan (3). It is sun-loving, and to be found on grassy hill-slopes, rich meadowland such as is characteristic of parts of Inner Mongolia, and wasteland.

The plant contains an essential oil and numerous flavone-derivatives. The 5,6,7-trihydroxyflavone baicalein occurs in baicalin, $C_{21}H_{18}O_{11}$, in the roots, combined with glucuronic acid (6). Read (5) states that the root contains scutellarin, $C_{21}H_{18}O_{12}$. According to Steele (6) this flavone occurs also in the leaves, and that by hydrolysing it the 5,6,7,4-tetrahydroxyflavone scutellarein is obtained along with glucuronic acid. Wogonin, $C_{16}H_{12}O_5$, occurs in the roots, as do the 5,2'-dihydroxy-6,7,8,6'-tetramethoxyflavone skullcapflavone II, oroxylin A, and 2'-methylated skullcapflavone II (8). Isoflavones in the root are reported to produce, when passed through weak alkali, 1 molecule of formic acid together with flavones associated with the soya bean (**Glycine max** (L.) Merr.) and **Iris tectorum** Maxim. (9).



Investigation conducted in China during recent decades report extensive prevention and eradication of pests and pathogens on crops (9).; specifically:

5 parts of the root to 1 of water are reported to kill 88% of cabbage aphids (**Brevicoryne brassicae** (L.) and **Lipaphis erysima** (Kalt.)), but to be ineffective against fruit flies (**Drosophila**). Used against caterpillars of the moth **Leucania separata** Walker, a pest on most cereals, sweet potato and other vegetable crops, lucerne, **Astragalus sinicus** L., and ginger, and found throughout China except in Tibet and north-western parts, as well as in India, south-east Asia, and Australia, 30% are poisoned. A preventive of caterpillars of the moth **Malacosoma neustria testacea** Motschulsky, found in Inner Mongolia, northern and north-eastern China, Korea, Japan, and the Soviet Union, an important pest on apples, pears, plums, apricots, peaches and others; the American bollworm, **Heliothis armigera** (Hübner), a world-wide species harming especially cotton, but also numerous other commercial crops including maize, wheat, tobacco, sunflowers, chillies, lucerne, sesame, pumpkins (**Cucurbita moschata** (Duch.) Poitet), eggplant, and tomatoes.; also weevils; is provided by a preparation involving 1 catty (1.33 lb.) of the root being boiled in 5 catties of water until the quantity is reduced to 3 catties, and after filtering more water being added, followed by 3 direct decoctions, obtaining 9 catties in each decoction, adulterated with **Aristolochia debilis** Sieb. et Zucc., and using 1 catty of this mixture in 10 catties of water.

In respect of fungal infections, 15-fold of the root in water usually destroys 96.17% of black mildew of sweet potato **Meliola ipomeae** Earle) and 99.4 % of late blight of potato (**Phytophthora** (Botrytis) **infestans** (Mont.) de Bary; 90% and upward of summer shoots of wheat stem rust (**Puccinia graminis** Pers. f. sp. **tritici**) and 50-60% of the fruit bodies of wheat leaf rust (**Puccinia recondita** Rob ex Desm. f. sp. **tritici**) are killed by a liquid preparation of 15 parts of the root to one of water, and this preparation is a 60% preventive of wheat stem rust and 20% and under of leaf rust of wheat; and finally 30 parts of the root to one of water is an effective preventive of late blight of potato and of blossom blight of cotton (**Choanephora cucurbitarum** (Berk. et Rav.).

In recent experiments in China the plant has been found to possess moderate molluscicidal effects, in the range of 50-89% mortality, on the Oncomeliad snail that is vector of schistosomiasis in China (4).

The plant's root, when fresh and juicy, has been a valued drug in China since at least the 1st. millenium BC, especially as an analgaesic, anodyne, astringent, tonic, preventive of miscarriage, and quietener of the pregnant womb (7; 1), and it has been prescribed in cases of cancer of the breast (7).

In recent research in Korea (8), cytotoxic activities in vitro have been observed in the ether extract from the root of **Scutellaria baicalensis**, and in skullcapflavone II, 5,2'-dihydroxy-6,7,8,6,'-tetramethoxyflavone, which was isolated from the ether extract; and the ether extract was found to possess seven times the strength of activity disclosed by the pure substance. The other flavones of *Scutellariae radix* showed no significant cytotoxic activity.

S. baicalensis has now come to be regarded as an effective hypotensive agent with low toxicity, the more active principle thought of to be an unnamed yellow crystalline substance rather than the flavone baicalin (2).

Gardener puts a note for Dr. Fellows:

(When the active principle referred to in the last paragraph has been ascertained, I may be able to find a reference to other species of **Scutellaria** that contain that principle).

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LABIATAE II

Glechoma longituba (Nakai) Kupr.

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Glechoma longituba (Nakai) Kupr. (**Glechoma hederacea** L.; **Nepeta glechoma** Benth.; **Glechoma brevituba** Kupr.; **Calamintha hederacea** Scop.; **Chamaeclama hederacea** Moench.), Labiatae. Ground Ivy, a perennial ascending herb, rising from a wholly creeping root-stock which roots at nodes wherever it adheres to the ground. The leaves increase in size as they proceed up the stem. The inflorescence is arranged in a few-flowered whorls up the length of the stem, and the flowers are pale blue to purple in colour. The fruits, nutlets, are blue, and small.

The species occurs throughout the Eurasian temperate zone, from England, where it has been common, through Europe to Russia and Siberia (except in the extreme north), and on to China, Korea, and Japan.

Apart from Inner Mongolia, the deserts and other parts of the north-west, Tibet, and the extreme south and south-east of the country, the species is thought to occur throughout China.

The habitat, varying slightly according to local conditions, is otherwise much the same throughout the range of the species, namely scattered woodlands and forest edges, under hedges, in short grass, by waterways, and by edges of fields and tracks.

The plant has been long known in China, and used in medicine there, and the Chinese names are numerous. One is derived from the supposed cooling properties, another from the likeness of its round leaves to the centuries-old copper sash. The principal book-name means Blood-Stimulating Drug, but one or other of the alternative names are often used instead.

The herb was formerly referred in China to **Glechoma hederacea** L., and still occasionally is, although this is fairly generally regarded as erroneous. In one current Flora (6) **G. longituba** (Nakai) Kupr. and **G. brevituba** Kupr. are distinguished on the basis of length of corolla and calyx, and some difference in distribution within the country, where **G. brevituba** is said not to occur in the south and south-west. Usually, however, the plant is referred nowadays to **G. longituba** (Nakai) Kupr.

The leaf content of fragrant oil is 3%, and its constituents include aldehydes and ketones (3). Chemical constituents have been extensively listed in the Chinese-language Medical Botany of the Long White Mountain, a range in north-east China extending part of the way along the Ussuri River and the North Korean frontier, though the work does not confine itself to the mountains, but covers the vegetation of the plains westward to the Sungari and Nonni Rivers (2).

The chief constituent of the volatile oil yielded by the plant is given as l-pinocamphone, $C_{10}H_{16}O$, and other constituents being l-menthone, $C_{10}H_{18}O$; l-pulegone, $C_{10}H_{16}O$; α -pinene, $C_{10}H_{16}$; β -pinene; limonene, $C_{10}H_{16}$; p-cymene, $C_{10}H_{14}$; isomenthone; isopinocampone; linalool, $C_{10}H_{18}O$; menthol, $C_{10}H_{20}O$; and α -terpineol, $C_{10}H_{18}O$. Other isomers are said to be produced, depending on the place of origin of the plant and other circumstances.

The plant contains the sesquiterpenes glechomafuran and glechomanolide. The gamma-lactone oxyclechomanolide is formed from the free oxygen in each of the two sesquiterpenes (2).

Components of the herbs sap include several amino acids, viz.: proline, valine, tyrosine, aspartic acid, glutamic acid, threonine, serine, glycine, alanine, cystine, methionine, leucine, isoleucine, and phenylalanine (2).

Further chemical constituents of the plant are ursolic acid, β -sitosterol, palmitic acid, isobutyric acid, caffeic acid, cinnamic acid, ferulic acid, p-hydroxycoumaric acid, a tannin, choline, a bitter principle, and stachyose (2).

The oil from the leaves can be used in perfumery, as a modifier in a number of bases and compounds where a heavy note is required. It is similar in these respects to the Ivy Leaf Absolute obtained from the root-climbing **Hedera helix** L. (1).

The seeds or nutlets are viscid, exuding their mucilage, and becoming adhesive, when wetted. They are consequently dispersed by ants, seeking food, and the species has been found, ant-dispersed, on pollarded willows in England (5).

Anti-microbial properties are reported, the plant being regarded as bacteriostatic against **Staphylococcus aureus**, **Salmonella typhi**, dysentery bacilli (**Shigella** spp.), and **Pseudomonas** (2).

The plant is reported (6) to have insecticidal properties, and is used for sprinkling or spraying. The fresh plant may be cut into small pieces and pounded to a pulp. After the pulp has been soaked in warm water, and filtered, 4-5 measures of water may be added to each measure of the original secretion. Alternatively, the sun-dried plant may be ground to a fine powder, and mixed evenly with water in the proportion of 1½ measures of water to each measure of the powder. The target to which these mixtures should be applied is not specified, but could well be aphids.

The stem and leaves are applied externally in cases of ringworm, this use being made perhaps principally, or exclusively, in south-west China, where the species is found at 50-2,000 m. in scattered forest and forest edges and other of its customary habitats (4).

Further pharmacological action may be summarised as: (2):

1. Regulating the bladder, by promoting secretion of gall from the liver cells, increasing bile in the bile duct, relaxing muscles within the bile duct, and allowing the bile to be discharged.
2. For uterine use, wherein the whole herb in tinctures, decoctions, or sap, or the soaked fat of a large quantity of seeds (water-chlorinated or pure soaked mucilage), used in large doses at a time of high viscosity and reinforced with the isolated intestines of rabbits, contracts the smooth muscle of the womb and intestines. Choline is used.
3. Against calculi.
4. Glechoma contains ionised methionine (content, c. 0.28%), metabolised in ethanolamine to choline and on to phospholipins, functionally very much the same during alternation of the seasons.

The species is regarded as antipyretic, detoxifying, diuretic, easing contusions, anti-swelling (2), decoagulant (3), and stimulating to the heart (6).

The stem and leaves, or the whole herb, have long been prescribed in Chinese medicine for internal use in fevers, including malaria, and for a variety of pains, including those from arthritic swellings, swollen suppurative infections, and poisonous snake-bites. It is regarded as a relief for coughs and colds, and mild influenza; further it is regarded as a relief for irregular and painful menses, menorrhagia, leukorrhoea (leucorrhoea), pain and swelling of the womb, and post-partum anaemic dizziness; also for children's bronchitis, for sores in the mouth, and rickets; for pulmonary consumption, jaundice, hepatitis, and diabetes mellitus; for various disorders involving the blood, such as nose-bleed, coughing blood, voiding blood, and passing blood in the urine; and for the relief of stone in the bladder and urinary stones (calculi); while it is applied externally for traumatic injuries and fractures, bleeding from external injuries, painful swollen boils, and erysipelas. It is also used to treat inflammation of the bladder, inflammation of the kidneys with oedema, and duodenal ulcer. (2 & 4).

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LABIATAE III

Schizonopeta tenuifolia (Benth.) Briq.

10.ii.1987 100
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Schizonopeta tenuifolia (Benth). Briq. (Nepta tenuifolia Benth.; Elsholtsa tenuifolia Benth.; Nepeta vaniotiana Levl.), Labiatae. A low stylish annual herb, coarsely textured, slightly hairy, 0.3-1m. in height disclosing a lively perfume. The leaves are trilobed, or on occasion more, 1-3.5cm. long and 1.5-2.5cm, broad, the lobes themselves being 1.5-4mm. broad. The inflorescence is a spike carrying a succession of many-flowered whorls, or verticillasters, bearing purple corollas.

Distribution is in all provinces of north-eastern China, and westward as far as Kokonor, and then down the western side of the country. It is much cultivated, and cultivation extends to the province of yunnan in the south-west and of Zhejiang on the coast, below the Yangtze estuary. In the wild it is to be found besides forests and roads, and in wasteland and dry watercourses, at altitudes of 540-2,700m. (3). Roadside appearances could well be escapes from cultivation.

The species is happiest in a damp, warm, rich environment, where it can take up much water and is good for draining the soil, and development is then very rapid. Cultivation on a rich fertile soil of a sandy nature leads to excellent results (1).

The whole plant contains a fragrant volatile oil. The principle constituents are menthol, $C_{10}H_{20}O$, and Limonene $C_{10}H_{16}$, (1). Elsewhere (6) menthone and d-limonene are given as constituents.

The plant is used medicinally, and as a food and a pesticide.

As a pesticide, the species acts against aphids, mosquito larvae, and certain diseases of plants (6).

To prevent aphids, the stem and leaves can be cut into small pieces, steeped in water for half an hour in the proportion of 1 catty (1½ lbs.) of the plant to 5 catties of water, and then, after the sediment has been strained off, the mixture should be sprinkled on the parts to be protected.

Tests have shown that 20-fold of the plant in water usually kills 45.5% of mosquito larvae, and 100-fold in alcohol usually kills 74%.

For dealing with diseases of plants, a solution of about 70-80% of urediospores of stem rust of wheat and leaf rust of wheat (Puccinia graminis pers. f.sp. tritici, and P. recondita Rob. ex Desm., f.sp. tritici). 30-fold in water suppresses late blight of potato (Phytophthora infestans (Mont.) de Bary).

Tests in central China on bacterial blight of cotton of angular leaf spot (Xanthomonas malvacearum (F.E. Smith) Dawson), proved negative.

-101 (cont.)-

Recent screening of plants in China for potential molluscicide has been that S. tenuifolia obtains a kill-rate of up to 50% on Onchmeliad snails, the vector in China of the liver-fluke Schistosoma (4).

Use of the leaves as avegetable in the area that is now the province of Sichuan goes back at least to the 1st century B.C. (5). Nowadays, it appears that it is the young sprouts, salted,

that are chiefly used (6).

Medicinal use is at least as old as the culinary (5), and the plants is still employed in a variety of conditions. Among skin complaints, it is said to be useful in nettle-rash (urticaria), scrofulous swellings and painful swellings generally, and weeping pustules of infected scores. Feverish influenza, and the cold spell that precedes fever (malaria for example), and measles in early stages to bring out the rash, wherein the spike alone, that carries the flowers, is said to possess greater power (7). Still another concerns the blood-nose-bleed, hsematemesis, blood in the stool, menorrhagia, and dizziness resulting from post-partum loss of blood, and regulating the blood generally. (1; 2; 6).

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LABIATAE IV

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Salvia bowleyana Dunn, Labiatae, a tallish, hairy, perennial herb, rising to one metre in height. The leaves are imparipinnately compound, arranged in five to seven pairs of leaflets, the terminal leaflet being rather rounder than the others. The inflorescence is of eight or more whorls, and the flowers are pale to blueish purple in colour.

The species is apparently confined to China, where it is found south of the Yangtze in the central and south-eastern provinces, at altitudes of 30-960m., on hillsides, in woodland, and beside water (2).

It is very close to S. miltiorrhiza Bunge. Its name in Chinese means Southern Miltiorrhiza. It is used in medicine in the same way, discriminating very slightly. (1).

The chemical constituents are not recorded. From the identity of medicinal uses, it would seem likely that the plant will be found to contain the active principle of S. miltiorrhiza, tanshinon or tanshonone. If, as seems possible, or even likely, this is the active principle responsible for the molluscicidal property of S. miltiorrhiza, then the possibility of S. bowleyana being also a molluscicide should be worth considering.

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Salvia digitaloides Diels, Labiatae, a large-leaved, upright, perennial herb, rising to a height of 20-60cm. from a coarse, straight, and blackish-brown root. The stem is unbranched. The leaves are broad at the base, and oval-elliptic in shape, and can reach 21cm. in length and 9.5cm. in breadth. The flowers are white or pale yellow, arranged in six-flowered whorls up the stem. The whole plant is densely hairy. The species is close to S. miltiorrhiza Bge. (3).

The species is found in mountainous country in northern and central Yunnan, on grassy slopes or in coniferous woodland, at altitudes of 2.500-3.400m. Seeds were sent to England by George Forrest (1). A variety occurs in south-western Sichuan.

The root is used in medicine, for the same purpose as that of S. miltiorrhiza Bunge, namely to stimulate the circulation, treat women's diseases, clear extravasated blood, and regulate the senses, also to allay the pains of swellings and clear out pus. recently it has been found eminently successful for use in cardiovascular and coronary heart disorders. (2).

From the identity of medicinal uses, it would seem likely that the plant will be found to contain the active principle of S. miltiorrhiza, tanshinon or trashonone. If, as also seems possible, or even likely, this is the active principle responsible for the molluscicidal property of S. miltiorrhiza, then the possibility of S. digitaloides having molluscicidal properties should be worth considering, particularly since, according to a recent personal communication from Yunnan, the incidence of schistosomiasis is still a problem in the central parts of the province, though it has decreased of late.

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Salvia miltiorrhiza Bunge (S.pogonocalyx Hance), Labiatae, in China the tan-shen, Red Ginseng, a perennial herb with a longish, cylindrical, finger-thick root having a sweetish taste. The root is red on the outside and purple within. The stem can be from 40-80cm. tall, and is erect, square, hairy, and much branching. The leaves are opposite, imparipinnately compound with 1-2 (-3) pairs of basically oval leaflets. The inflorescence is in whorls arranged up in terminal raceme, and bears large violet flowers.

According to Roi (8) there are two forms of the root, one light and richly coloured, typical of the species as found in north-east China, the other dull and containing less colour.

The species is widely distributed in northern China from eastern Gansu to the province of Shandong, extending north to the southernmost province of north-east China, Liaoning, and south to the Huai river area and the Middle Yangtze province of Hubei. It grows also in Japan.

Three kinds of tanshinon with slightly different chemical constituents and different melting points are reported to be contained in the root (7). Specifically, constituents are recorded as containing dihydrotanshinone I, hydroxytanshinone II-A, kryptotanshinone, methyl tanshinone, and tanshinone II-A and II-B (4).

The plant is a molluscicide reported to obtain up to 50% mortality (6).

Anti-microbial properties are reported in the species. Extracts are said to be effective against drug-resistant Staphylococcus, the name of the species not being given. Dihydrotanshinone I, hydroxytanshinone II-A, kryptotanshinone, methyl tanshinone, and tanshinone II-B are reported to be bacteriostatic against Staphylococcus aureus. (4).

Medicinal use of the root in China goes back at least to the 1st millennium B.C. It is considered to be a tonic, employed specifically to stimulate the circulation and regulate the menses (3), curtail uterine bleeding, and relieve abdominal pain, and relieve also depression and insomnia (1). Current Chinese-language regional Floras state that it has recently been used with eminent success in the treatment of cardiovascular and coronary heart disorders (3;5). Beneficial effect on the heart as a property of plant is a belief of long standing in China. Li Shih-chen in his 16th century Pen-ts'ao kang-mu, in describing the traditional functions of five shen or ginseng-named plants, states that the root of tan-shen (S. miltiorrhiza) operates upon the heart (2).

In pharmacological activity, the constituent tanshinone is said to be anti-inflammatory in rats with infective arthritis, and tanshinone II-A to ameliorate the disturbances of myocardial metabolism induced by deficiency of oxygen (4).

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2. xii. 1986.

Salvia officinalis L., Lamiatae, Garden Sage, a small shrub or shrubby herb, rarely a herb, the lower part woody, the stems of the upper part square, and clothed with felted hairs.

Native to southern Europe, and growing wild there, the plant is widely cultivated for its culinary and medicinal values. It will grow in any temperate or warm temperate region, including mountain areas in low latitudes. Thus it is cultivated successfully in Kashmir (3), and in hill country in northern Yunnan (4), as well as in other parts of China, but in the deep tropics seem too near the equator for it. Burkill (2) mentions that when introduced into the hills near Penang it did not persist for long. Clayey and loamy soils are said to produce the best quality of sage, and hot dry climates to be unsuitable (3).

The species is very variable in cultivation, particularly in shape and colouration of the leaves.

Sage Oil, also known as Dalmatian Sage Oil, a pale yellow, mobile liquid, is produced by steam distillation from the leaves in southern Europe, the Levant, the USSR, and Kashmir. Young plants which are not yet in flower are thought to be the most aromatic and to provide the most oil. The best quality is regarded as that produced from wild plants in Yugoslavia, while oil produced from cultivated plants in Kashmir is claimed to be the second best (3). The odour and the flavour are warm and aromatic, the odour being also fragrant, and the taste somewhat astringent, and a little bitter.

properties and constituents of the oil vary according to source. The wealth of India (3) records a European sample of the oil as containing α -pinene, 3.3%; β -pinene, 5.6%; linalyl acetate, 14.8%; thujone, 51.0%; camphor, 8.2%; borneol, 6.6%; and borneol acetate, 1.7%; with large numbers of mono- and sesquiterpenes present, along with small amounts of triterpenoids and steroids, with ursolic and oleanolic acids, thujene, 3-carene and viridifloral among the constituents.

Another analysis, based on samples predominantly from southern Europe and the USSR, states (6) that the plant contains 1-2.8% of volatile oil (citing C.A. 87, 141106x, 1977), whose constituents include the bitter principles picrosalvin and carnosol (citing C.A. 71, 113102u, 1969); salvin, salvin monomethyl ether, and carnosic acid (citing C.A. 86, 117603r, 1977); flavonoids including genkwanin, 6-methoxyluteolin, 6-methoxyluteolin-7-methyl ether, hispidulin, and salvigenin; phenolic acids (rosmarinic, labiatic, caffeic, and a trace of chlorogenic); a tanning, salviatannin, of the condensed catechin type which on storage undergoes degradation to phlobaphenes; and others. The main components are reported to be α - and β -thujones, normally c. 50%.

The higher the thujone content, the better the quality attributed to the oil; and The Wealth of India (3) records the values of a sample of oil obtained by hydrodistillation of the dried herb from Kashmir (yield (1.1%) as :d₂₀/20. 0.9268 n²⁰, 1.4633 [a], +0.2%, acid value, 1.1; and ester value after acetylation, 30.0. The constituents reported as present were: α -pinene, 1.8%; cineole; linalyl acetate, 10.1%; thujone, 44.45%; borneol, bornyl acetate; farnesol; and camphor. The linalyl acetate content of the oil was regarded as too low for commercial exploitation of the oil for the ester.

Arctander (1) suggests that the use of infusions of the herb in effective mouth washes and gargles in household medicine

indicates fairly good bactericidal value in the oil.

Antimicrobial properties have been reported as especially active against Staphylococcus aureus, and to be due to phenolic acids (e.g. salvin and salvin monomethyl ether) isolated from sage (6, citing C.A. 82 (1975), 167491r, and C.A. 86 (1977), 117603r).

In The wealth of India (3) it is stated that the oils is used in insecticidal preparations. The volatile oil in this and other labiates is known to be obnoxious to insects and to reduce their presence in gardens, of the parts of gardens, where these herbs are planted (7: 370).

Large doses of the oil have been considered toxic to human beings, increasing the flow of blood to the abdominal organs, and possibly being harmful to the central nervous system (5). Lesser quantities would appear to have no adverse effects, in spite of the thujone content, given the considerable use as a flavouring material in vermouth and other bitters or aperitifs, and as a spice in sauces, sausages, pickles, etc. (1).

Knowledge and use of the species go back many centuries. Theophrastus (9) records two sages, one a spineless wild undershrub whose name he gives as Joakos (sphakos), the other resembling it, but cultivated, called (elelispakos). Pliny the Elder (8) says that this latter plant is called Salvia by the Romans, a mint-like, hoary and aromatic and also cultivated more than sphakos of Theophrastus, and used as a diuretic, for promoting menstruation, as a local anaesthetic (numbing the surface of the skin where it is applied), a styptic, and when taken in drink with wormwood, a treatment for dysentery. Monastery gardens in the time of the Carolingian empire of the early Middle Ages were cultivating the plant. Walafrid Strabo, in his Hortulus (10), describes it as having a sweet scent and being of proved value in many human ailments, and he goes back to the Greek root for the name he gives it, Lelifagus. By the time the Medical School of Salerno was established and famous, in the full flowering of the Middle Ages, this sage's name had reverted to Salvia, and a well-known distich became current, Cur moriatur homo, cui salvia crescit in horto - why should a man die, in whose garden Salvia is grown?.

There can be little doubt that, from the time of Theophrastus and Pliny on, the sage cultivated under these different names is Salvia officinalis.

The oil is anti-inflammatory, and astringent (5). leung (6) states that in pharmacological action it is reported to have neurotropic effects against acetylcholine spasms in animals, and, citing Hartwell, J.L., 1969, Lloydia 32: 247, that it has been reported to have been used in cancers. It is also used as a convulsant, though it is less active in that capacity than wormwood oil (1). Mixed with rosemary, sage is said to maintain a dark sheen in the hair, strengthening it, and stimulating growth, activities attributable to the volatile oil in the plant (7:339).

In official medicine sage does not have the reputation it enjoyed in former days. In domestic or folk medicine it is still valued, however, especially in the form of an infusion, sometimes known as mint tea. The properties ascribed to it are tonic, digestive, antiseptic, astringent, and anti-spasmodic. It is used to treat nervous conditions such as trembling, depression and vertigo, and in addition gastritis, dysmenorrhoea diarrhoea, and sore throats (6).

Indian use is much on these lines, and include the long-used gargle for sore throats that is derived from an infusion of the leaves. The hot infusion is said to be diuretic. Extracts from the leaves are reported to be antipyretic; and the dried leaves rubbed on the teeth are said to provide a good dentifrice. (3).

Use of the leaves, liquefied, to treat laryngitis, is mentioned in China (4).

In perfumery, the oil blends well with many other perfumes (1). It can form a component of the fragrance in soaps, detergents, and colognes and after-shave lotions (6).

In culinary use, the plant is well known as a standard spice, though in Roman times it is doubtful if it enjoyed the culinary popularity of other fragrant Mediterranean labiate herbs.

Sage and onion stuffing is no doubt also when used as a customary flavouring ingredient in sausages. It is among the most versatile of flavourings, and processed foods such as condiments and relishes, meat and meat products, and vegetables and soups, may all contain sage or sage oil, as can cermouth and bitters (6).

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Salvia plebeia R. Brown, Labiatae, an annual herb, stout, hairy and erect, 15-90cm tall, the leaves stalked, ovate-elliptic or lanceolate, and 2-7.5 cm long. The inflorescence consists of 6- flowered verticillasters arranged in numerous, slender, paniced, glandular racemes. The corolla tube is noticeably short, and the colour of the flowers can vary from pink to lilac and nearly white.

The species is widespread as a weed in southern and eastern asia. in India it occurs throughout the plains, and up to 1,900m, in the hills (10). in china it occurs throughout the country, except in the north-west and Tibet (6), and in this part of Asia it extends to Korea. In the Philippines it occurs in Luzon, in and about towns at low altitudes (8). Confinement to these localities suggests that the species has been introduced at some early date, and has escaped into the wild. It is not known to be in medicinal use now in the Philippines. In the Indo-Chinese region it is found in Vietnam and Cambodia (7). It is said to occur in Malaya, but is not mentioned in Burkill's Dictionary of the Economic Products of the Malay Peninsula.

The whole herb contains flavones, Homoplantagenin, Hispidulin, Nepetin, Nepetin, Nepetrin, and Eupafolin and its 7-monoglucoside among them. It also contains protocatechuic acid, 4-hydroxypropionic acid, volatile oil and saponin. Sterols are few, but there are several terpenes. (5).

The seeds contain 15% of a fatty oil (4).

Anthelmintic properties are reproted in the herb, both in India (3) and Korea (9).

The plant is reported to be bacteriostatic against Staphylococcus aureus, Aspergillus fumigatus, Phyllody disease, and Pseudomonas (5).

The oil from the seeds can contribute to the manufacture of soap in China (4). In India, the mucilaginous properties of this oil cause it to be used to anoint women's hair, hold it in place, and keep it glossy (10).

Pharmacological action of the plant, in experiments with rats is reported as antitussive, antiasthmatic, and anti-inflammatory, when used in decoction, and as a cure for bronchitis (5).

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Medicinal use of the seeds, and of the other above-ground parts of the plant, are distinct. In the Indo-Chinese region of plant provides a tisane against stomach-ache (7), and the whole plants and the flowers are reportedly prescribed to treat cholic, cholera, and dysentery (9). In India the leaves are said to relieve toothache; further, the herb is employed there as a diuretic and astringent (5). The mucilaginous seeds have long been used in native medicine in that country to treat gonorrhoea and menorrhagia (10), to which conditions Chopra (2) adds diarrhoea and haemorrhoids. In China (1) the plant is used as a febrifuge, detoxifier, diuretic, blood cooler, haemostatic, and for the reduction of swellings. It relieves painful swellings, bleeding piles and inflammation of the mammary gland. A decoction taken hot is used to treat tonsillitis, haemorrhage in pulmonary consumption, and sluggish blood developing slight erythema.

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Salvia yunnanensis C.H. Wright (1896) (S. bodinieri Vaniot (1904); S. esquirolii Lévl. (1910)), Labiatae. The species goes under various book-names and local names in china, many of them having Lake TienMiltiorrhiza (2), Lake Tien being the major lake in the eastern Yunnan, near Kunming, and among other names in Yunnan Small Miltiorrhiza and Purple Miltiorrhiza.

The species appears to be confirmed to south-western Provinces of China, where it occurs in south-western Sichuan, Guizhou in the western part, and from the north of Yunnan, through such central districts as Dali, to the south-east of the province. The type was obtained from Mengtsh, not so far from the Vietnam border.

A national Flora (2) states succinctly that the root is used for that of S. miltiorrhiza Bunge. In Yunnan, recorded uses of the foot in medicine lie in stimulating the circulation, regulating the menses, clearing fresh extravasated blood, stopping pain, and clamming the spirits by lowering the effects of stress, (1), all of them properties attributed also to S. miltiorrhiza.

Chemical constituents of S. yunnanensis do not appear to have been recorded, but the loseness of the two species so clearly indicated in the Chinese literature suggests that the active principle of S. miltiorrhiza, tanshinon, may well be present in S. Yunnanensis. Should it be, the possibility that S. yunnanensis is also a molluscicide could be worth considering.

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14.iii.1987

LABIATAE V

Mentha sachalinensis (Briq.) Kudo
Mentha spicata L.

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Mentha sachalinensis (Briq) Kudo, Labiatae, a hairy, branching, upright perennial herb 50-100 cm tall. The rootstock, which bears small, fine rootlets from numerous nodes, is four-angled and fragrant. The moderately long, opposite leavy carry conspicuous glandular dots on the under-surface. The inflorescent is borne and axillary whorls. The calyx bears yellow glandular dots, and the corolla is pale purple or light crimson in colour.

The plant is found beside marshy river-banks and water-courses and is distributed through north-east China, the Soviet Far East and Korea, to Japan.

At flowering time, the leaves contain 3.3% of volatile oil, whose chief constituents are menthol, $C_{10}H_{20}O$, ca. 70% and Menthone $C_{10}H_{18}O$ ca. 10%. Other constituents are Borneol, $C_{10}H_{16}O$, ca. 1%, limonene, ca. 1% and other terpene-rich constituents.

The entire plant is medicinal, and can be collected spring, summer and autumn, taking the whole plant and removing muddy soil.

As the most important constituents of M. arvensis L., var. Piperascens Malinv. are also Menthol and Menthone, the pharmacological activity of M. sachalinensis can be summarized as follows;

- 1) Control of the nervous system: Injection of the oil into the lymph nodes of a frog's belly, or a rabbit's quiet pulse, depresses the central nerves.
- 2) Influence on the cardiovascular system: The oil has a numbing effect on the separated heart of a frog. Experiments have proved that the oil expands the blood vessels of a frog's rear section, and of rabbits, and also depresses the movements of the separate intestinal tract of rabbits.**
- 3) Menthone can strengthen the breathing of rabbits and dogs, and lower the blood pressure. It has also a depressive effect on a frog's separated heart, and causes movement in the separated intestinal tract and womb of rabbits to be retarded.
- 4) menthol $C_{10}H_{19}OH$ stimulates skin affected by cold or pain. After application to the particular place on the skin the blood vessels of the mucous membrane contract, and those of the epithelial tissue expand. Combination of l-limonene with α -pinene is, in use, quite stimulating, leading to increase of the leucocytes and reduction of lymph cells.
- 5) Menthol $C_{10}H_{19}OH$ has a minor use as a local anaesthetic.
- 6) menthol expels cat and dog tapeworm (Dipylidium caninum), and exhibits some toxicity towards pork tapeworm.

In medicine, the species is antipyretic and diaphoretic. It treats feverish influenza, painful swollen throat, toothache, nausea with vomiting, discomfort in the liver, melancholic pains and skin irritations, and it clears a stuffed-up nose.

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** There is a moderate curare-like action on a frog's heart.

Mentha spicata L., also recorded as M. spicata L. emend. Huds. (M. viridis L.; M. spicata var. viridis L., M. piperella Opiz; M. leavigata Willd.; M. cordifolia Opiz; M. crispata Schrad.), Labiatae, popularly know a Spearmint. This is a coarse, woolly barrow-leaved, stoloniferous perennial herb, erect or ascending, 0.4-1.3m. in height, bearing lilac flowers arranged in verticillasters along slender spikes, and at the tip of the flowering spikes.

Garden mint grown for culinary purposes are always forms of this species, whose origin is variously ascribed. Chevalier (3) regards it as essentially a species of temperate regions, which has penetrated neither into Asia nor into the tropics, though it is sometimes encountered in gardens in forms separate from X M. Piperita L. which resemble it. Bentham and Hooker, in the British Flora (2), regard it as not improbably a mere variety of M. silvestris L., of garden or accidental origin, rendered perpetual by its ready propagation of suckering. Elsewhere it has been regarded as native to the north of England (1), and again as a hybrid between M. rotundifolia (L.) Hudson and M. longifolia (L.) Hudson (4). The greeks knew at least two species of mint, and if the one called by Theophrastus (minthe), in II, iv, of his Inquirey into Plants has been correctly identifies as M. viridis (i.e. M. spicata) (see the Loeb Classical Library edition of the work), it follows that M. spicata is probably one of the many labiates that have originated in the Mediterranean region. Theophrastus in VII, vii, 1 calls the plant one of the pot-herbs brought in from the wild, using the name..... (heduosmon) which Pliny in Liber XIX 159 of his Natural Histroy explains by saying that the name minthe, the origin of the latin mentha, was changed by the Greeks to heduosmon because of the herb's sweet savour.

In its various forms it is cultivated almost world-wide, only the deep tropics seeming unsuitable for it. It is usually thought to be found wild, or apparently wild, only in countries where it has long been cultivated. Chinese regional and Central Asia (8&6).

The world's main producing areas are the mid-western and far-western states of the U.S.A., where the plant was introduced from Europe, with lesser quantities in southern Europe and India, and apparently increasing now in China (1).

The leaves are aromatic, and have a slightly pungent flavour, which unlike the taste of peppermint is not followed by a sense of cooling. The plant is much cultivated in India, and the Wealth of India (4) records an analysis of the green leaves as showing contents of moisture, 83.00%; protein, 4.8%; fat (ether extract), 0.6%; carbohydrate, 8%; fibre, 2.0%; and mineral matter, 1.6%; calcium, 200mg.; phosphorus, 80mg.; iron, 15.6mg; carotene (as vitamin A), 2,700 i.u.; nicotinic acid, 0.4mg.; 2 ribilayin 80 and thiamine, 50 µg/100g.; also, traces of copper (1.8 µg./g.).

The plant, in its flowering stage, yields on distillation either of the partially dried flowering tops (1) or the fresh flowering part (4), 0.25%-0.50% of a volatile oil. The specific gravity varies according to the place of production in the range of 0.910-0.930 (1). The liquid, known as Spearmint Oil (formerly Oleum mentheo viridis) varies from the colourless to the greenish-yellow, the taste and odour of spearmint improving on ageing.

The characteristic main constituent of this oil is Carvone, $C_{10}H_{14}O$, a ketone that is widely distributed in essential oils. As with all other constituents, as well as the chromosome numbers, of spearmint oil, the proportion of carvone that is present varies greatly from place to place where samples of the oil are taken for analysis. The Wealth of India (4) gives a Kanpur figure of 55.8%, and a Poona figure of nil.

Leung (9) records that in addition to carvone the oil yields lesser amounts of dihydrocarvone, phellandrene, and limonene; and other compounds reported present include 6-hydroxy-carvone, menthone, menthol, pulegone, piperitone, piperitone oxide, cis-carveol, myrcene, - & - pinenes, cineole, linalool, -terpineol, terpinen-4-ol, terpinolene, dihydrocarvol acetate, 3-octanol, Menthofuran and cis-hexonyl isovalerate have been found, as well as flavonoids (e.g. diosmin and diosmenin).

The fresh leaves are reported to contain as much vitamin C as oranges, and more provitamine A than carrots (5).

In cultivation in India, the plant has been susceptible to attack by rust Puccinia menthae Pers., which becomes active in the spring, and can be controlled by immersing cuttings in hot water at 110°Fahr. for ten minutes before planting; Rhizoctonia solani Luhn can also attack the plant, causing leaf rot (4). The root-knot nematode Meloidogyne hapla Chitwell can be a pest, as can other nematodes (7).

Insecticidal use of the species is reported from China, where one measure of the plant pounded to a pulp in half a measure of water, the solution then being strained, and six measures of water added, has found to reduce the incidence of aphids by up to 50% (10).

In perfumery, the oil has a good, powerful, and surprisingly stable effect on soap perfumes, although its chief constituent is the very delicate and unstable ketone Carvone (1).

The principal uses of M. spicata, however, are in domestic medicine, and in the flavouring of food, and follow much the same pattern wherever the herb is cultivated. It serves as a stomachic, carminative, and expectorant, particularly in children's complaints, and treats sore throats, colds, headaches, and toothache. It can be used as a local anaesthetic, for pains from injuries. Leung (9) cites Hartwell, J.L., Lloydia 32:247 (1969) for reported use in cancers.

In culinary use, some of the properties of the herb are apparent. Mint sauce aids the digestion when eating lamb. A soothing effect on the throat is one of the reasons why M. spicata goes into mint juleps and various mouth washes. The lasting, as well as the special, nature of the aroma, renders the oil peculiarly suitable for chewing gums, toothpastes, confectionary, etc. Further, the oil or leaves and extracts of the plant, enter into a wide variety of processed meat and meat products, sauces, baked goods, frozen goods such as ice creams, and beverages (9). In China the range seems slightly widened by the addition of crystallized fruits (6). M. Spicata furnishes the mint tea of North Africa, where the Arabs and Berbers of Algeria and Morocco cultivate the plant on a considerable scale.

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SCHIZAEACEAE

	<u>29.ix.1988</u>	119
Ligodium circinnatum (N.L.Burm.) Sw.		120
Ligodium flexuosum (L) Sw.		121,122
Ligodium japonicum (Thunb.) Sw.		123,124,125
Ligodium scandens (L) Sw.		126,127

Lygodium circinnatum (N.L.Burm.) Swartz, Schizeaceae, a scrambling and climbing fern of the tropics in Asia, whose sterile leaflets are distinctly lobed almost to the base, the almost equal lobes measuring some 25 by 3 cm.

The fern grows in open places and in forests, climbing over shrubs and up trees.

Distribution is from India and the extreme south east of China to the Malay Peninsula, Indonesia, and the Philippine Islands.

The fern is found almost throughout India, at altitudes up to 600m. (2). In South-east China Hong Kong would appear to be about the fern's northern-most limit (3). In the Malay Peninsula the fern is very common. Burkill (1) says that the Malays may use it as a substitute for L. scandens (1.) Sw, Hence it might have the anti-dysenteric and fungal and pesticidal properties of the latter fern, and of L. japonicum (Thunb.) Sw. for which Icon. Cormo. Sin no. 257 says L. scandens is sometimes substituted. It should be worth examining accordingly.

In Indonesia the roots and leaves are recorded as an application to wounds, and Wuisumbing (4) states that the stems, after being chewed, are applied to the bites of poisonous reptiles and noxious insects in order to neutralize the poison.

The stems are tough, and can be used for plaiting.

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Lygodium flexuosum (L.) Sw. in Schad. Journ. 1800 (2): 108. 1801 (ophioglossum flexuosum L. Sp. Pl. 2:1063. 1758; L. pinnatifidum Sw.), a scrambling and climbing fern of the tropics, growing both in open conditions among other vegetation, as noted in the Malay Peninsula (2) and the Philippines (7), and in scattered forest in Hainan Island (5), where it can attain a height of 7m.

From a short-creeping rhizome the fronds rise rather closely, together, ascending often through or upon other vegetation. Edie (4) calls it generally rather similar to L. japonicum Sw., seeming to interbreed with it. A notable difference is that the sterile and fertile leaflets of L. flexuosum are of approximately the same shape (6).

Distribution is widespread through the tropics and subtropics of the Old World. The species is found in India both north and south, at altitudes up to 1,500m. in the Himalayas, and in Sri Lanka, China, Vietnam, Thailand, the Malay Peninsula, and northern Australia. In China it is found as far west as Tibet, thence eastward through the tropical and subtropical southern part of the country to Hainan Island.

Chemical constituents include kaempferol, kaempferol 3- β -p-glucoside, β -sitosterol, stigmasterol, dryocrassyl (a), and a new compound characterised as O-p-coumaryldryocrasol (b),(1).

a) Dryocrassyl

b) O-p-coumaryldryocrasol

The plant is reported to exhibit antifertility activity, (1) presumably allelopathic.

The stout stems of the fronds, when old, are used for tying rice sheaves in several regions where the plant grows.

In Malaya the roots and leaves are used in external applications to treat skin complaints, including ringworm (2). In India such use extends specifically to rheumatism, sprains, scabies, eczema, and cuts that have caused wounds, and the roots are reported to be of particular value in treating carbuncles (3). Quisumbing (7) quotes Crevost and Petelot for an Indo-Chinese use of an infusion of the plant to treat discharge of mucus (blennorrhagia).

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Lygodium japonicum (Thunb.) Sw. in Schrad. Journ. 1500 (2): 106, 18 (Ophioglossum japonicum Thunb. in Fl. Jap. 328. 1784; Hydroglossum japonicum (Thunb.) Willd.), Schizaeaceae. A tall slender climbing and twining fern, attaining a height of 4m. when climbing among trees, or over other objects. The fronds rise close together from a creeping hairy rhizome, with the rachis tough and clabrous. The speices derives its Chinese name, meaning "golden sea-sand", from the colour and the fine powdery appearance of the sporangium similar in this respect to the spores of Lycopodium. the sori cotnaining the spores are ovate, and appear late in the summer immediately below the pinnule apexes.

The fronds are similar to those of L. flexuosum, but with smaller pinnae and pinnules, and Beddome regarded the fern as probably only a form of L. flexuosum (1).

Distributin is from Japan, where the fern is common in thickets and hedges in Lowlands and low mountains in the main islands, in the Ryukyu Islands and Taiwan, then southward through eastern the central China to Vietnam and the Philippine Islands, with the fern reappearing again in tropical northern Australia in Cape York and the York Peninsula of Queensland and in the Port Darwin area of Northern Australia and the islands of that coast (2). Westward the distribution extends to India, where the fern has been reported as abundant in the north, up to slightly over 900m., from kashmir eastward to the Lushai Hills, and albeit rarely, in the Western Ghats (1). mention of it in malaya has not been found. Full distribution perhaps relains to be observed.

Habiate is in forested mountain areas at low to medium altitudes, perferably not in deep shade, and in China it can be found by the sides of roads and watercourses.

the species has pesticidal and medicinal properties, and is cultivated as a ornamental. it has been found to have no effect as a molluscicide (7).

Chemical constituents include the lipid diacylglyceryltrimethylhomoserine (11), tannins, phenolic compounds, neochlorogenic acid, in isomer of chlorogenic acid, flavonols, polymeric flavonoids, caffeic acid (8), kaempierol and fatty oil in the sori (4).

The antheridiogens that the plant contains are structural related to gibberellins (15).

For pesticidal use, the above-ground part of the plant should be chopped fine, one to two parts of water should be added to it (in hot weather two to three times this amount can be added), and the whole soaked for five to six hours, after which time the liquid should be strained through a filter, thus obtaining the sap of the plant plus water, and making it available as a sprinkler. Experiments in Sichuan have found that this controls cotton aphids (Aphids gossypii Glover) and Red Spider. The sap soaked in twenty times the amount of water has been found to be an instant killer of 3.3% of mosquito larvae but only 2.2% if 100 times the quantity of spirits of wine is used. (12).

In considering the pesticidal uses mentioned in the preceding paragraph, it may be significant that the ratio of tannins, low polymers, and tannin depolymerization appears to be affected by the length of time chopped prothallus is kept cultured in a liquid medium. Thus in the second week an increase of low polymers and some tannins depolymerization was noted, while in third week the rapid growth of prothallin during regeneration diminished the ratio of phenolic compounds to a value below that observed in uncut prothallin (13).

In medicine, chiefly Chinese, the plant is regarded as diuretic (particularly the sporangia (4)), antifebrile, disinfectant haemostatic (6), refrigerant, sedative, lithagogic (5), anti-inflammatory and expectorant (10). Sometimes the frond or sori are powdered and mixed with hemp oil for use as a haemostatic (6). The Leafy part is used, with or without the sori, but sometimes the drug is regarded as consisting of the spores alone, Spora Lygodii (14).

Conditions treated particularly by reason of the high tannin content are acute infections of the urinary system, including gonorrhoea and urethritis from acute gonorrhoea (5). Other conditions treated are calculi, and pain when urination from bladder stones and urinary gravel (5), acute chronic hepatitis, parotitis (mumps), ulcerous conditions, traumatic injuries, and the issue of blood from internal piles (6), mastitis, epidemic encephalitis B, enteritis, dysentery, (3), and haematuria and haemorrhagia (10).

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Lygodium scandens (L.) Sw. in Schrad. Journ. 1800 (2), 106. 1801 (.....loglossum scandens L. Sp. Pl. 1:063; L. Microphyllum R. Br. in Prodr. Fl. Nov. Holl. 162. 1810), Schizaeaceae.

Some floras and other works of reference reverse the synonymy given above, and call the fern L. microphyllum R.Br. (L. scandens (L.) Sw.). It would seem however that L.scandens has priority, by virtue of the date of authorship of the name, and this name will be used here.

Like other in the genus, this is a leaf-climbing fern and it has particularly graceful pinnate fronds, anything up to 7m. in length, which twine around other vegetation until they almost over it, and form dense thickets difficult to penetrate. A distinguishing feature of the species is the light green colour of the small pinnules.

Distribution is widespread in the tropics of the Old World , and extends south-eastwards into Polynesia. in India the fern is found from Bengal and Bihar southward and southwestward to Bombay and the southern part of the country, at altitudes up to the 900m level in the hills. it is also cultivated in gardens as a covering to pillars and to bowers. (4). In China it is found in the south, including Hainan Islans, and south-west, extending north to the subtropics in the provinces of Hunan and Fujian and the islans of Taiwan. (6). In the Pilippines it is reported from Luzon, and also the Batanes Islands (7). it has been observed frequently throughout the Malay Peninsula, and in Indonesia generally (2). It has been found in the Port Darwin area of Northern Australia, in several parts of Queensland, and in New South Wales beside the Tweed River (1): and from these Australian parts its range extends easward into the Pacific Islands to Polynesia (7). Introduced for its decorative value presumably accounts for some of this distribution, fostered perhaps by some of its reputed medicinal properties.

In the tropics of Hainan Island, south-east Asia, it is regarded as a indicator of acid soils, of a pH value usually of 4.5-5.0 (5).

The plant has been remarked upon as a sun fern in Malaya having physical characteristics that give greater capacity for photosynthese than shade ferns (3).

Burkill (2) states that in java the young leaves are eaten.

The tough stems of the fronds have several uses. Baskets can be plaited from them; and when old they can be twisted to make rough cord or ropes, suitable for such purposes as binding rice sheaves. These ropes can be found on sale in the markets in Malaya.(2).

The plant is astringent, and a decoction of it, which according to Burkill (2) may be sweetened, is given in cases of dysentery, and also for spitting of blood. Most authorities mention the use of poultices of the plant applied externally to treat skin diseases and complaints, but Chinese authorities merely state that the fern can be used in medicine as the equivalent of L. japonicum (Thunb.) Sw. (whose properties are held to include the pesticidal, in respect of mosquito larvae, cotton aphids, and red spider). Quisumbing in the Philippines (7), where the distribution is rather limited, as shown above, repeats without addition the uses and treatments reported by Burkill (2), namely dysentery, spitting of blood, measles and lotions and poultices for skin diseases, measles and swellings, and as a cooling agent in high fever.

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LABIATAE VI

Agastache rugosa (Fische & C.A.Mey.) O.Kuntze 129, 130

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Agastache rugosa (Fische & C.A.Mey.) O.Kuntze (**Lophanthus rugosus** Fische. & Mey.; **L. formosanus** Hayata; **L. chinensis** Walp.; **Stachys betonica** Benth.; **Lysimachia sikokianabsensu** Stuart; **Agastache rujosa** Kye.), Labiatae, in China Huo Hsiang, meaning Sudden Fragrance. An erect perennial herb, 0.5 - 1.0 m tall and over, the tall stems branching out at the top and bearing ovate leaves 4.5 - 11.0 cm long and 3.0 - 6.5 cm wide, nearly glabrous above and whitish beneath. The characteristic fragrance is emitted by the whole plant.

The species occurs throughout China, and is frequently seen in cultivation there (4), and occurs also in the USSR, Korea, Japan, northern Vietnam, and Laos.

The plant is intolerant of drought, and susceptible to frost. It prefers a warm, damp, rich environment, hence it is best cultivated in open, cleared, sandy rich soil or clay soil where the drainage is good (1).

The plant yields about 35% of volatile oil, though this amount, and that of particular constituents, can vary according to the place of production and the time of collection (1). Trease and Evans (Pharmacognosy, 11th edtn., 1978, pp. 675-76) mention that in Labiate species which are much cultivated, and accordingly produce several cultivated varieties, distinct and stable chemical races are found, whose common components differ in amount between the varieties, and they list estragol (vide infra) in their table of components affording an example (**Ocimum menthaefolium**).

The most important constituent of the oil is reported to be methylchavicol.

The oil further contains small quantities of α -pinene; limonene, $C_{10}H_{16}$; 3-octonone, $C_8H_{16}O$; 3-octanol, $C_8H_{18}O$; 1-octon-3-ol, $C_8H_{16}O$; *p*-cymene; dis- β -hexanol, $C_6H_{12}O$; and caryophyllen; and also trifling quantities of α -ylangene, β -elemine; β -humulene, $C_{15}H_{24}$; β -farnesene, $C_{15}H_{24}$; cadinene, $C_{15}H_{24}$; and calamene, $C_{15}H_{24}$.

Another Chinese regional materia medica, this time from a southern coastal region (3), gives the most important constituents of the oil as estragol, anisaldehyde, *p*-methoxycinnamic aldehyde, together with a small quantity of limonene, sesquiterpenes, etc.

C.A. 77:85547 (1972) records a sesquiterpene hydrocarbon as comprising 0.48% of the essential oil.

The oil is used in preparations requiring fragrance (4).

The whole herb has medicinal properties, for which it is culled in autumn, cut into small pieces, and dried in the sun. It is bitter, and slightly warming, and is said to resolve (summer) dampness and dirt, regulate the vital functions of the stomach, and stop vomiting and retching (3).

Pharmacological activity:

1. The volatile oil can promote the liquid secretions of the stomach, and strengthen the digestive capacity, and it is a defence against intestinal convulsions (1).
2. Agastache *in vitro* is a rather strong fungicide countering ringworm on the skin (1), and the plant appears to have beneficial effects on common contagious skin conditions (3).

The drug, consisting of the dried aerial parts, whose esteem in Chinese medicine goes back many centuries, is used as a stomachic and antiemetic to treat nausea, vomiting, biliousness (1), bad breath and diarrhoea (2), and acute gastroenteritis (3). It is also used to treat cases of sunstroke and heat exhaustion (3), summer colds and catarrh, feverish headache and swelling of the pleura, and pain from hiatus hernia (1).

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LABIATAE VII

Ajuga bracteosa Wall.	<u>24.ii.1990</u> 131
Ajuga campylantha Diels	132,133
Ajuga decumbens Thunb.	134
Ajuga forrestii Diels	135,136,137,138,139
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Ajuga bracteosa Wall. ex Benth./Labiatae, a low perennial aromatic herb covered with soft hairs, the diffusely branched stem rising erect or ascending from a creeping rootstock to not more than 10cm. The flowers are small, and white or pale blue, crowded in axillary whorls that form leafy spikes.

The species is close to A. forrestii Diels

A. bracteosa is widely distributed in Asia. It is reported to occur in Afghanistan, in the Himalayas from Kashmir eastward to Nepal at elevations of 2,000m., in the Punjab and upper-Ganges plains and in the sub-Himalayan tract, in Burma, in parts of Luzon and Mindanao in the Philippines at altitudes of from 600 to 1,700m., in south-west China at altitudes, in central and south-eastern Yunnan, of 1,500 to 1,900m., and is said to occur in Japan (4), though Ohwi's Flora of Japan (in English, edtd. F.G. Meyer and E.H. Walker, Smithsonian Institute, Washington D.C. 1965) does not list it under the genus Ajuga.

Open ground, even cultivated parts, ravines, and scattered grassland thickets, are its favourite localities.

According to the Wealth of India (1) the petroleum extract of the plant contains ceryl alcohol, α - and β - sitosterol, a crystalline compound ($C_{40}H_{82}O$, m.p. 94), and cerotic and palmitic acids, and a glucosidic constituent is also reported to be present).

The herb is reported to be used in India as a parasiticide, killing lice (1).

Medicinal use is known to the Filipinos, (4), and appears to be most common in India, where the herb has been used since ancient times, as shown by mention in Ayurvedic literature(1).

Astringent, febrifugal, stimulant, aperient, tonic, diuretic, and depurative properties are attributed in Indian medicine, where the plant is used to treat gout and rheumatism, palsy and amenorrhoea. The juice of the leaves is used as a blood purifier, and in fevers, where its bitter astringency has caused it to be substituted sometimes for quinine (5; also Kirtikar, K.R. & Basu, B.D., 1918, Medicinal Plants of India, cited by Quisumbing (4). The leaves have a peculiar, resinous odour (5). Powdered, they can treat burns and boils. As regards the diuretic and stimulant properties ascribed to the plant, references quoted in the Wealth of India (1) state that an aqueous extract of the leaves showed diuretic activity on rats almost equal to that of urea, and an alkaloidal fraction isolated from the leaves showed stimulant action on the isolated perfused frog heart, rabbit auricle, and rat ventricle (Gokhale & Karandikar, Indian J. Pharmac. 1960, 22:278; Patel et al. Indian J. Physiol. Pharmacol., 1962, 6:224).

In China, the root of the plant is used to cool the blood (3), and to treat the eyes in certain conditions where excessive light is a problem (2).

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Ajuga campylantha Diels, (1912) Labiatea.

An upright herb, though the stem is sometime wholly creeping, 6-16 cm. long. The rootstock is fat, the branchlets are crowded and not pubescent, the leaves chartaceous, long-elliptical-ovate in shape, 4-6.5 cm. long and 1.5-2.6 cm. wide. The petioles are distinctly less in length, 0.6-1.5 cm. or even rather short. The flowers are arranged in a terminal verticil atster not reaching 3cm. in length, with the corolls ehite, slightly differing in pubescence externally and internally. The nitlets are three-cornered obovate in shape.

The species occurs in north-west Yunnan, Long. 100°o8', Playfair, (2)), through western central Yunnan including the Tali district, at 2.800-3,500 m., in mountain thickets, azalea grassland thickets, and under coniferous forests.

The type was originally distinguished from Li-chiang, (Flora yunnanica Tomus I, (1).

In the Li-chiang district the whole plat is used to treat dysentery, though whether to combat the Shigella and Amoeba species that are the causative agent of the dysenteries, or merely as an astringent easing the symptom is not made clear. Chemical examination of the species might be worth considering. The dose is in decoction.

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18.ii.1990.

Ajuga decumbens, Thunb. (1784). Ohwi, 1965, (1), gives the synonymy for Japan as (A. decumbens, Thunb., var glabrescens, Fr. et Sav.;

A. devestita, Lev. et Ven't.), Labiatae.

The plant is generally known in China by names meaning Bone-set herb and Summer-withering herb. It is a low-growing pubescent species with creeping basal branches and short rhizomes. The stems are 5-10 (-15)cm. long, decumbent or ascending. The leaves are opposite, obovate or long-oval, 3-5 (-14) cm. long, the young leaves frequently purplish-red on the under surface.

The flowers are white or a light purple in colour, arranged in axillary verticillaster on the main stems ending in a spike, the nuts are ovate, black, and small, about 2mm long.

The species occurs within China in all provinces south of the Yangtze and in Korea and Japan, on creeksides and grassy places and in hedges, at lowish altitudes, 360-1,400m. according to latitude, Ohwi, op. cit. (1), states that it is common in the woods and hedges of hills and low mountains of much of Japan - the islands of Honshu, Shikoku, and Kyushu.

Constituents

According to the Materia Medica of the province of Fujian (2) the whole plant contains flavone glycosides; saponin; alkaloids (unspecific); compounds containing several acids; glycogen; and not many salts; while the root contains the rare hexasaccharide ajugose. This sugar was originally isolated from the root of A. nipponensis Makino by Courtois et al. 1960 (3).

It consists of 4 units of galactose and one each of glucose and fructose (Farrer, 1958, (4)), and is reported by Jeremias, 1982, (5) to occur in only three species of the Labiatae and three in the Leguminosae and Scrophulariaceae.

To the foregoing compounds Cheung and Li 1985, (6) add phenolic compounds, and compounds having side effects on the body.

Ajugalactone

Further, Kore da et al. 1970, (7) Have isolated the α,β - unsaturated lactone Ajugalactone, which has the property of inhibiting the molting of insects. The inhibitory property might allow the compounds to be a useful tool in the control of insect pests.

Fungicide

Perry 1980 (8) cites Dragendorff, F., 1989, Die heilpflanzen der verschiedenen Volker und Zeiten, Stuttgart, p. 570, as authority for stating that the plant is a remedy for fungoid diseases.

Use of the plant in Chinese medicine may be assumed to go back to classical times. Li Shih-chen's great 16th century Materia Medica the Pen-ts'ao kang-mu described figured (description in chapter 15) a labiate herb called hsia-ku-ts'ao, Summer-withering herb. Bretschneider 1894 (9) referred this plant to Brunella vulgaris L. (= Prunella vulgaris L.) and other botanists have followed him, for instance Read 1936 (10) and Roi 1955 (11).

However, Augustine Henry 1887 (12), while recording the use of this name for P. vulgaris in the Ichang area of the Middle Yangtze, states that A. decumbens is also called Summer-withering herb in the same region. Bretchneider (op. cit. 9) quotes a Japanese source, so moku XI, as using 'Summer-withering herb' for A. dgenevensis L., now synonymous with A. nipponensis Makino. Currently, 'summer-withering herb' is the Chinese book-name for Prunella austriaca Nakai, a herb of north-east China which in the 16th century was no part of the Chinese Empire.

Today, Summer-withering herb is a name still used for A. decumbens in Anwehi province in the decumbens Thunb.

Lower Yangtze region, as will be shown in pharmaceutical reports mentioned later, and 1 white-haired summer-withering herb' is an alternative name for A. decumbens given in a Chinese-language Materia Medica published in Peking in 1970 and again referred to later in the pharmaceutical reports. Most importantly of all, the figure drawn for the herb in the Pen-ts'ao kang-mu resembles A. decumbens, but is unlike both A. nipponensis and each of the Perillas mentioned above. Having regard to all these pints, I conclude that Li shih-chen, whose home district was the Middle Yangtze, was describing Ajuga decumbens in chapter 5 of his great work.

He records that the plant is described in the earliest Materia Medica of China, the Shen-nung pen-ts'ao-ching of the 1st millennium BC or earlier in its material, as a drug of class 3, the class which can cure diseases but being very poisonous ought not to be used continuously. As there were millennia to go before the chemistry of the plant was known, the classification was remarkably percipient.

The herb was at that time used principally in scrofulous swellings and purulent head sores, and to disperse goitrous swellings, to relieve feet swollen through rheumatism, and as a catharti. The first two conditions, specified as painful ulcers (Flora of Jiangsu province 1982 (13) and Flora Yunnanica 1977 (14)), and all kinds of swollen sores (Illustrated register 1970 (5)), are still treated by plant in China. Perry op. cit. (8) records Japanese use of a hot decoction of stem and leaves for relieving rheumatic and neuralgic affections.

There is also a much wider range of conditions treated currently in China. The Barefoot Doctor's Manual, 1978 (16) recommends using the crushed and pounded plant to rub on places affected not only by boils etc., but also by traumatic injuries and injuries and infection from burns, and to stop bleeding and promote tissue regeneration. Breast pains, nose bleed, flatulence, scalds, dog bites and poisonous snake bites are given in Flora Yunnanica op. cit. (14) as conditions treated by the plant, though in view of R.N. Chopra's 1982 analysis of plants reputed to counter snake bites, and all found useless (17), reliance should perhaps not be placed on A. decumbens to treat this injury. It is a virtue commonly ascribed to plants in China.

The Chinese-language Flora of Jiangsu province (op. cit., (13)) adds gonorrhoea to the conditions treated, and Cheung & Li 1985, op. cit. (6) add gastroenteritis, hepatitis, mastitis, and appendicitis. Further conditions treated, specially mentioned in the Materia Medica of Fujian province, op. cit. (2), are laryngitis and tonsillitis, diphtheria and dysentery, high blood pressure, jaundice, congenital disease in children, and acute conjunctivitis. The principal Chinese name for the plant,, indicates external application of a decoction in fractures (16, & 2).

Case-histories of treatments for mastitis and lung infections, pharmacological activity, are recorded in the Fujian Materia Medica (op.cit. (2)), as follows:

Treatments: 1) - in the treatment of 12 cases of mastitis by the P'u-t'ien hsien (Lat. 25°25', Long. 119° 17', Playfair 1965 (18)) Forest Bridge Production Brigade, using A. decumbens, the pus was altered and then dispersed in

A. decumbens

-3-

3 cases, dispersed in 2 cases, with a satisfactory result in a further 7 cases, leaving the whole number satisfactorily cured.

2) In the treatment of 35 cases of abscess of the lung by the Lung Department of the People Medical college of Anwei Province, 28 showed excellent recovery, in 6 cases there was no change, and in 1 there was a deterioration. The shortest period of treatment was 14 days, the longest took 45, the generality needed a month more or less..

3) In the Wen-hsi Health Department of Wen-ling district in Zhejiang province (for Wen-ling see note)), using injections of plain fluid secretions of A. decumbens in the treatment of 30 cases of bronchitis, there was excellent recovery in 24 hours and no effect in 6; in 70 cases of infection of the upper respiratory tract, 60 made an excellent recovery and there was no effect in 15; in 40 cases of abscess in the lungs 35 showed excellent recovery, and 5 no effect; in 96 cases of painful swellings 86 showed excellent recovery, and 10 no effect.

Treatment was by injection into the flesh under the skin of plain fluid secretion of A. decumbens, one dose 5ml. containing in it 5 grs of the plain form of the drug, each 5ml. dose twice daily, decreasing the amount for children.

(N.B.: Wen-ling is a Sung dynasty name for the Ch'ung-an magistracy in what is now the province of Fujian, Lat 27°26', Long. 118°08' (Playfair op. cit.18). Here it is perhaps the former Treaty Port of Wenchow on the Zhejiang coast, Lat. 28°11'. Long. 120°08,(Playfair op. cit. 18), under a new name that alters the final term Chow since that signified an Imperial division).

Properties attributed to the plant, as enumerated in the various Materia Medica already or still to be referred to, are: bitter, cold; anti-pyretoc, fever reducing by purging, antiseptic, anti-swelling, styptic, anti-inflammatory, expectorant, antitussive, promoting tissue-regeneration.

Prescriptions (Materia Medica op. cit. 2):

- 1) Laryngitis and tonsillitis: 60 grs of the plant (presumably, the aerial parts only) pounded, the juices squeezed out, and mixed with vinegar, to be taken every two to three hours as a mouth rinse; the liquid can also be swallowed.
- 2) Jaundice: 15-30 grs of the plant (again presumably the aerial parts, though possibly on this occasion the root), in decoction with the fresh root of Raphanus sativus L. Cruciferae (radish).
- 3) For mastitis, in case history no. 1 above, the fresh herb cleansed, with a little table salt or cooked rice added, should be pounded and applied topically once a day. Perry (op. cit. 8) mentions Japanese use as a tumour inhibitor, in hot fomentations of the fresh leaves well pounded with boiled rice, to be applied externally on carcinomas.

Pharmacological activity (Materia Medica op. cit. 2):

- 1) Acids, spirits extracted, flavone glucosides, and all kinds of alkaloids from A. decumbens certainly stop coughs in all white mice. Use as expectorant.
- 2) Animal experiments prove that the flavone glycosides of this species have the property of expanding the smooth muscles of the bronchial tubes of large rats, hence the species is also useful in controlling asthmatic breathing.

Bacteriostatic

- 3) The species, soaked, is a preparation against tetrachloride of carbon causing liver damage in white rats.
- 4) Reduces anaesthesia in dogs and cats. It has a strong contracting effect on separated rabbits' hearts. Promotes diuresis in large rats.
- 5) Compounds in this species make it strongly bacteriostatic against Staphylococcus aureus, Streptococcus pneumoniae, Protus and Pseudomonas.
- 6) Influence on the appearance of the blood: After using A. decumbens for treatment, the white cells count rises, indicating an increase in the power of resistance of the organism, the acidic cells clearly dropping (decreasing). Taking into account the past standard of activity of the organism, this represents a good change.

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Ajuga forrestii Diels (A. mairei (Lévl.), Labiatae, a low perennial herb from 6-20 (30)cm. in height, its stem covered with a white pubescence. The leaves, lanceolate to oblong-lanceolate, are hairy on both surfaces, and the inflorescence is a densely-arranged terminal spike 6cm long.

The species is regarded as being related to A. bracteosa Wall. ex Benth. (2).

Distribution extends from south-eastern Tibet through the western Chinese province of Sichuan to north-eastern and Central parts of Yunnan, extending as far south as the tropical parts of that province, at altitudes from 1,700 - 3,200 m. sometimes 4,000m.

The plant can be found on level open roadsides, stream banks etc. and damp places, sometimes colonizing large areas. (1).

The type was obtained from the Shuang-chiang area of tropical southern Yunnan, surrounding the part now known in Chinese anglicised maps etc. as Xishuanghanna (1).

The whole plant is used in medicine. In central and tropical Yunnan, from Dali southward, a hot decoction is recommended in the treatment of infestation by round-worms (ascariasis), and in the treatment of dysentery. Indeed the reputation in this latter respect is such that the name given to the plant in China means 'dysentery-stopping artemisia' - the term for artemisia used here being sometimes loosely applied to species in other genera. External application is employed in mastitis. (1).

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