



Burma Medical Research Council Special Report Series No. 8

BURMESE INDIGENOUS MEDICINAL PLANTS

2. Plants with Reputed Hypotensive and Hypertensive Action

DAW MYA BWIN and U SEIN QWAN
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PREFACE

This work, like the first volume of this series, was compiled to serve as a basis for future research on indigenous medicinal plants.

The plants have been grouped according to their reputed action to facilitate work by chemists, pharmacologists and clinicians who wish to screen them for their reputed action.

As was done in the first book, the botanical description and distribution of the plant are first given. Secondly, the medicinal uses of the plant as given in the literature of both local and foreign countries are enumerated. Thirdly, the results of the chemical investigations carried out on the plant by various research workers are listed. Finally, the results of the pharmacological investigations into the medicinal properties of the plant are furnished.

Specimens of the plants listed in this paper have been collected and pressed into herbarium specimens. The arrangement of the specimens and families is done according to a new system based on the phylogeny by John Hutchison (1959), primarily because of the parallel evolution of woody herbaceous dicotyledons and the monocotyledons. The species of the plant within the family are in the alphabetical order.

Drawings of all available plants are given.

Information was gathered from 3 sources: personal communications with the local traditional medical practitioners, literature on indigenous medicine and from foreign journals.

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SECTION I

PLANTS WITH REPUTED HYPOTENSIVE ACTION

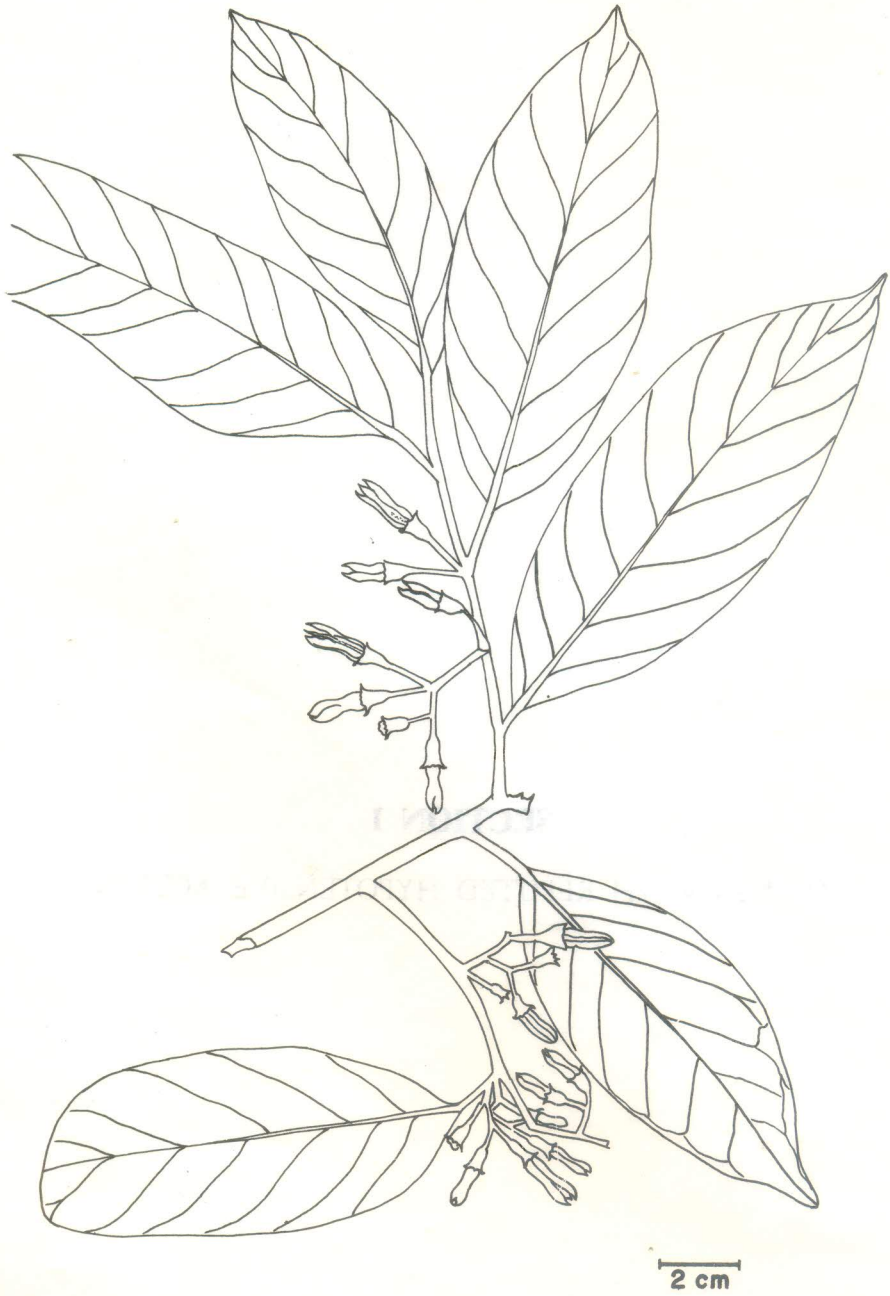


Figure 1. တောပိုးခဲ (Taw-posa) *Alangium Lamarckii* Thu.

ALANGIUM LAMARCKII Thw. (Fig. 1)

Burmese name: တောပိစာ Taw-posa.

ALANGIUM LAMARCKII Thw. *Enum.* 133 (1859).

Alangium decapetalum Lamk. *Dict.* i. 174.

Alangium hexapetalum Lamk. & DC. 11.c.

Alangium tomentosum Lamk. & DC. 11.c.

Alangium sundanum Kurz. *For. Fl.* i. 543 (1877).

Alangium latifolium Miq. *in. Pl. Hohenack.* No. 719.

English common name : *Nil.*

DESCRIPTION

A small tree. Leaves alternate, variable narrowly oblong or ovate-lanceolate, glabrous above, pubescent on the nerves; petioles densely pubescent. Flowers few, white in axillary fascicles, densely pubescent. Fruit when young ovoid or ellipsoid, becoming nearly globular when ripe. Family *Alangiaceae*. Flowering in January.

DISTRIBUTION

Mergui district, locality Sin-din-taw.

USES

The leaf extract is used as a hypotensive agent in anesthetized dogs and conscious rabbits.¹ The bark alkaloid also in small doses reduced blood pressure temporarily.²

Leaves are also used as poultice in rheumatic pains. Root bark used as purgative, anthelmintic and in fever and skin diseases.²

CHEMICAL INVESTIGATION

Bark contains amorphous alkaloid alangine, 0.8 per cent, also alkaloids akharkantine, akoline, lamarkine; root bark contains two isomeric alkaloids alangium A (0.15 per cent) and alangium B (0.10 per cent), and a third alkaloid alanginine (0.001 per cent).²

Seeds contain 0.2 per cent alkaloids.²

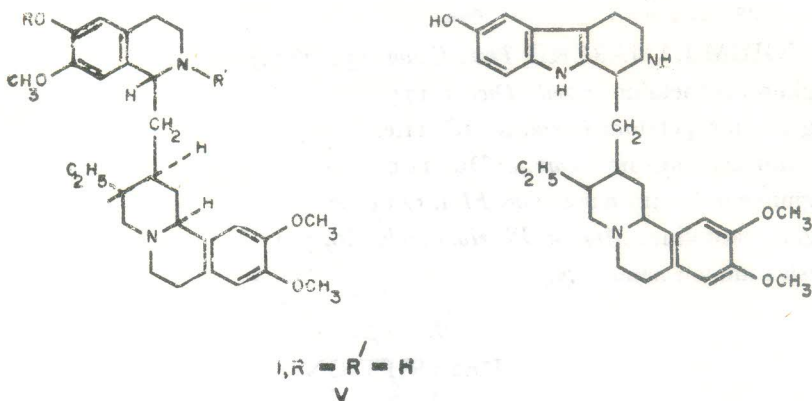
A new crystalline phenolic alkaloid, ankorine, 174—176. was isolated from the leaves of the plant. Several salts of the alkaloids have been prepared, the alkaloid has been assigned the molecular formula $C_{19}H_{29}O_4N$, with 20 CH_3 groups, one phenolic OH-group and possibly one furan ring.³

The cholinergic principle in aqueous extracts from the leaves was identified as choline chloride.⁴

A quaternary base was isolated from the water soluble fraction of the alcoholic extract of the leaves.⁵

Emetine, cephaeline and psychotrene were isolated from the root bark of the plant. Alangine B and cephaeline were found to be identical substance.⁶

Cephaeline (I) and an alkaloid with empirical formula $C_{29}H_{37}N_3O_3$ was also isolated from the root bark.



The latter is shown by chemical and physical means to have the structure V combining tetrahydro- β -carboline and hexahydrobenzo (a) quinolizine moieties, identical with tubulosine. In addition, the presence of protoemetinol (not previously found in nature), a possible biogenetic intermediate is shown by mass spectral measurements.⁷

New crystalline alkaloid AL 64 (I), $C_{20}H_{37}N_3O_3$, m.p. 272° , (α) $D-64^\circ$ (CH_3Cl_3). I formed a mono- and a diacetate, m.p. 184° and 150° respectively.⁸

N-Me cephaeline and deoxytubulosine is present in both the bark of root and stems and also in fruits.

Tubulosine is a pure crystalline form, needles colourless, m.p. $256-57^\circ$. Molecular weight by mass spectrum 475. Molecular formula, $C_{29}H_{37}N_3O_3$.⁹

Recent isolations of alkaloids tubulosine, emetine, cephaeline and psychotrine from the bark of the plant were reviewed.¹⁰

New alkaloid merkine (I), m.p. 281° (MeOH), (α) $D^{22} = -68^\circ$ (c 3, pyridine), $C_{28}H_{35}N_3O_3$. (I) formed a mono- and dipicrate (m.p. 192 decomposition, from H_2O), chloroplatinate, a mono-Ac. derivate. II (m.p. $225-8^\circ$ decomposition, from aqueous alc.) and a methiodide, m.p. 270° decomposition. II formed a monopicrate (m.p. $224-5^\circ$ decomposition) and a methiodide m.p. 265° decomposition.¹¹

The plant also contains newer alkaloids desmethylpsy-chotrine and alangine.¹²

Betulinic acid, betulinaldehyde, betulin and lupeol, showing biogenetic sequence along with hydroxylactone A of betulinic acid and β -sitosterol have been isolated from the seed kernels of the plant. The so-called "Sterol" previously reported from other laboratories from the same source is presumably identical with betulinic acid. The hydroxylactone β of the triterpene acid isolated in the neutral part during chromatographic separation is probably an artefact. It has however, been shown to have equatorial hydroxyl function. The preparation of hitherto unreported 3-desoxybetulinic acid III, m.p. $270-271^\circ$, (α) $D+20^\circ$ is also reported.¹³

Two sterols have been isolated from the leaves, β -sitosterol $C_{29}H_{50}O$, stigmasterol $C_{29}H_{48}O$ and friedelin.

Wolff-Kishner reduction gave a hydrocarbon $C_{30}H_{52}$, m.p. $248-250^\circ$, (α) $D+20^\circ$. $NaBH_4$ reduction yielded an alcohol $C_{30}H_{50}O$, m.p. $278-280^\circ$; (α) $D+20^\circ$; acetate $C_{32}H_{54}O_2$, m.p. $288-290^\circ$; (α) $D+35^\circ$. Reduction with Na and n-anyl alcohol furnished an alcohol, m.p. $300-304^\circ$. (α) $D+20^\circ$; acetate $C_{32}H_{54}O_2$, m.p. $316-318^\circ$; (α) $D-10^\circ$.

Compound "A", m.p. $152-154^\circ$, is probably a mixture of stigmasterol and β -sitosterol and compound "C" is impure sample of friedelin.¹⁴

PHARMACOLOGICAL INVESTIGATION

The alkaloid extract contained five alkaloids having Rf values of 0.22, 0.28, 0.44, 0.5 and 0.62. The extract exerted a non-specific antispasmodic action in rats and rabbits ileum, a biphasic action on isolated rabbits ileum and rat uterus, a hypotensive action in anesthetized dogs and conscious rabbits, a weak adrenolytic activity and an anticholinesterase activity in vitro. The hypotensive action was not due to any central, ganglionic or parasym-pathomimetic action nor the weak adrenolytic action could explain the same.¹

Pharmacological studies conducted with the quaternary base showed its cholinergic nature. Studies conducted with the quaternary base, with acetylcholine and choline as standards, showed that the quaternary base possessed the physico-chemical and pharmacological characteristics of choline.⁵

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MORINGA OLEIFERA Lam. (Fig. 2)

Burmese name : သန့်သလွန် ; Dan-da-lun.

MORINGA OLEIFERA Lam. *Encycl.* I. 398 (1784).

Moringa pterygosperma Gaertn. *Fruct.* II. 314 (1791).

Moringa polygona DC. *Prodr.* ii. 478 (1825).

Moringa zeylanica Pers.

Hyperanthera decandra Willd.

Guilandina Moringa Linn. *Sp. Pl.* 381 (1753).

English common name : Drumstick.

DESCRIPTION

A middle sized tree, bark corky ; root pungent ; young parts tomentose. Leaves usually 3-pinnate, leaflets of the lateral elliptic, the terminal obovate and slightly larger than the lateral ones. Flowers white, many flowered, densely arranged. Fruit long, pods, 9-ribbed. Seeds 3-angle, the angles winged. Family *Moringaceae*. Flowering from December to May and fruiting from April to June.

DISTRIBUTION

Often cultivated in gardens for its edible fruits throughout Burma.

USES

The Burmese believe that macerated juice of mature green leaves taken twice a day, once in the morning before food and once before retiring at night produces a fall in blood pressure¹.

The plant is used as stimulant in paralytic affections and intermittent fever, also in epilepsy, chronic rheumatism, as carminative, stomachic, abortifacient, cardiac and circulatory tonic.³

Root bark used as fomentation to relieve spasm.³

Bark used in diseases of liver and spleen, articular pains, tetanus and paralysis.³

Flowers as stimulant and aphrodisiac.³

Oil from seeds used as external application in rheumatism.³

Gum from the plant used for dental caries³.

CHEMICAL INVESTIGATION

Alkaloid and gum present in the plant^{3,4}. Alkaloid moringine and moringinine is isolated from the root bark of the plant^{5,6}.

Pterygospermin present in the roots is an oily substance with a reddish brown colour and highly piercing smell.⁷

Flowers contain amorphous base.⁸



Figure 2. ဒန့်ဒလှန် (Dan-da-lun) *Moringa oleifera* Lam.

PHARMACOLOGICAL INVESTIGATION

Aqueous and ethyl alcoholic leaf extracts of the plant markedly decreased blood pressure in anaesthetized dogs. Pressor response to carotid arterial occlusion was not depressed. Decreased blood pressure was accompanied by stimulation of respiration. The extracts had no adrenolytic activity. Atropinization had no effect on the fall of blood pressure. The contractile effects of acetylcholine and histamine were inhibited on guinea pig ileum. A similar inhibitory action appeared on isolated rabbit heart and frog rectus abdominus muscle. Significant neuromuscular blocking action occurred on the rat phrenic nerve diaphragm preparation. Extracts produced sedation and reduction in the movements in mice and dogs. The isolated rat uterus was not significantly affected. The bronchial musculature of the guinea pig was unaffected. The toxicity of the extract was very low. The aqueous extract was a more potent hypotensive agent than the alcoholic extract².

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CITRULLUS VULGARIS Schrad.

Burmese name : ဖရဲ Phay-ye.

CITRULLUS VULGARIS Schrad. ex Eckl. & Zeyh. Enum. 279 (1836).

Cucurbita Citrullus Linn. Sp. Pl. 1010 (1753).

Citrullus fistulosus Stocks in Hook. Kew Journ. Bot. III. t. 3.

Cucumia Citrullus DC. Prodr. III. 301. (1828).

Cucurbita Citrullus Linn ; Roxb. Fl. Ind. III. 319 (1832).

English common name : Water melon.

DESCRIPTION

An extensively climbing annual with thick angular branching stems ; young shoots villous, woolly at their tips. Tendril bifid, stout, pubescent. Leaves divided or moderately lobed, some what hairy, alternate. Flowers rather large, yellow within, greenish outside. Fruit large, subglobose or ellipsoid, dark green. Family *Cucurbitaceae*. Fruiting from June to July.

DISTRIBUTION

Cultivated for its edible fruits, in dry areas.

USES

A saponin *bitrin* and *cucurbitocitrin* isolated from the seed was formerly used for hypertension.¹ Fruit is cooling and used as diuretic.²

The seed has a cooling effect, used as a tonic and also for diuretic. Seed oil used as a substitute for almond oil.²

Seed contains diuretic principles.¹

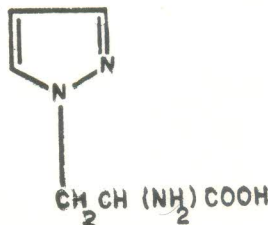
Cucurbitocitrin a glucosidal saponin isolated from the seed has been used as an antihypertensive drug, oral dose used from 60 to 120 mg.¹

CHEMICAL INVESTIGATION

Cucurbitocitrin, a glucosidal saponin was isolated from the seed.

Cucurbitol. $C_{24}H_{32}O_2(OH_2)$ obtained from resin of seeds. Probably a phytosterol glucoside. Needles, m.p. about 260° . with decomposition. Soluble in chloroform, ether, pyridine ; insoluble in cold alcohol.¹

Seeds contain β -pyrazol-1-yl-L-alanine (α)D- 73° . (in H_2O).³



Juice contains citrulline to the extent of 0.17 per cent.³

Citrullin also present.²

Fruit contains carotene, lycopin.²

Mannitol also present.²

Varying percentages (20—40) of oil is obtained from the seeds.²

Vitamin C and provitamin A content present is very little.²

Fruit rich in pectin.²

Enzyme urease is present in great abundance in the seeds.²

Citrulline, $C_6H_{13}N_3O_3$; an amino acid, first isolated from the juice. δ -Ureidonorvaline; α -amino- δ -ureidovaleric acid; N δ -carbamyloornithine.

Prisms from methanol + water, m. p. 22° . $(\alpha)_D^{20} + 3.7^\circ$ (c=2). Soluble in water, insoluble in methanol, ethanol.

Hydrochloride, $C_6H_{13}N_3O_3 \cdot HCl$, crystals, decomp. 185° $(\alpha)_D^{22} + 17.9^\circ$ (c=2).¹

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HIBISCUS ROSA-SINENSIS Linn. (Fig. 3)

Burmese name : ကခါင်ရမ်း: Khaung-yan.

HIBISCUS ROSA-SINENSIS Linn. *Sp. Pl.* 694 (1753).

English common name : Shoe Flower.

DESCRIPTION

An evergreen shrub. Leaves ovate or ovate-lanceolate, margin serrate toward the top, entire near the base; stipules lanceolate-subulate. Flowers large, red. Family *Malvaceae*. Flowers from February to October.

DISTRIBUTION

Commonly grown in gardens for its large, ornamental flowers throughout Burma.

USES

Air dried powdered leaf extract lowers blood pressure.¹

Root of the plant used in cough.²

Infusion of petals is given as a demulcent and refrigerant drink in fevers.²

CHEMICAL INVESTIGATION

Air dried powdered leaves contains glycosidic material.¹

PHARMACOLOGICAL INVESTIGATION

The glycosidic material isolated from air dried powdered leaves, given intravenously in doses of 40–80 mg./kg., produced a rapid initial reduction of blood pressure in intact cholralose (100 mg./kg i.v.)—anesthetized dogs, which after a slight initial recovery persisted for 1–2 hrs. This hypotensive action was not significantly altered by atropine sulphate (2 mg./kg. i.v.). In spaniel dogs, the glycosidic material (40 mg./kg. i.v.) caused hypotension which was similar pattern as seen in the intact dogs. The glycosidic material showed a spasmogenic action on the rat, rabbit and guinea pig intestinal muscle, rat lung, dog and rabbit tracheal muscle and rabbit uterus, all of which were blocked by atropine. On the frog rectus muscle, δ -tubocurarine (4×10^{-8}) showed a partial antagonism to the contract induced by the glycosidic at a concentration of 0.2–1 mg./ml. On the smooth muscles of the intestine, the glycoside at concentrations of 0.1–0.3 mg./ml. after initial contraction caused relaxation and blocked the spasmogenic action of 5-hydroxytryptamine (1×10^{-7}), acetylcholine chloride (1×10^{-7}), histamine (1×10^{-7}), and BaCl_2 (1×10^{-4}). The glycosidic material of the plant seems to be a mixture of more than one substance acting on the cholinergic receptors, as well as directly on the smooth muscles.

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Figure 3. ခေါင်ရမ်း (Khauṅ-yan) *Hibiscus rosa-sinensis* Linn.

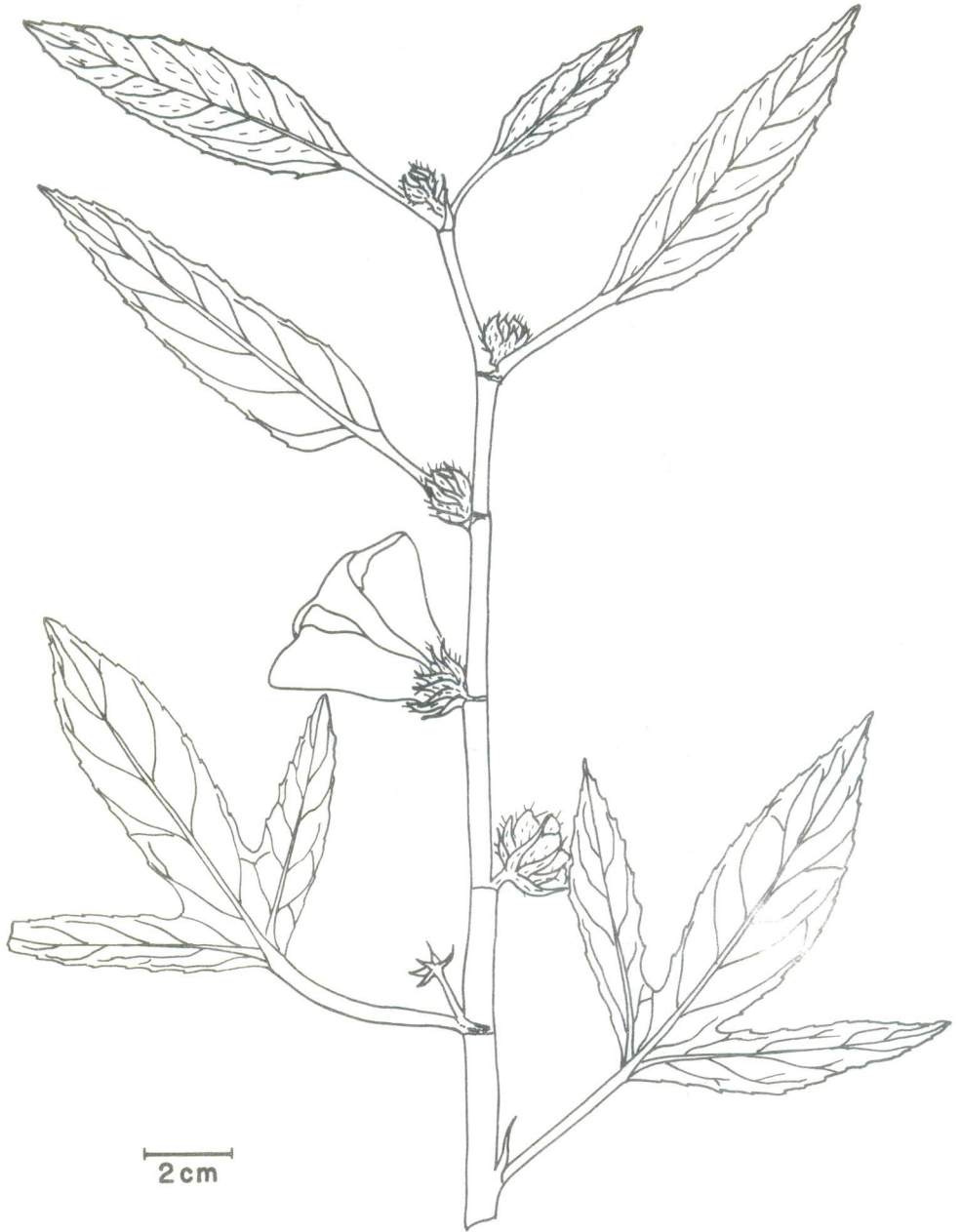


Figure 4. ချဉ်ပေါင်နီ (Chin-baung-ni) *Hibiscus Sabdariffa* Linn.

HIBISCUS SABDARIFFA Linn. (Fig. 4)

Burmese name : ချင်ပေါင်နီ Chinbaungni.

HIBISCUS SABDARIFFA Linn. *Sp Pl.* 659 (1753).

Hibiscus sanguineus Griff. *Not. iv.* 520.

English common name : Roselle ; Red sorrel ; Indian Sorrel.

DESCRIPTION

An erect, glabrous shrub or small tree. Stem and branches reddish purple. Leaves simple, lower ones undivided, upper palmately three to five lobed, lobes lanceolate or oblong, the middle lobe the longest, serrate, glandular on the midrib beneath, often blotched with purple ; petioles reddish purple ; stipules linear, acute. Flowers yellow with a dark, crimson eye. Fruit capsule, ovoid, beaked, hairy. Family *Malvaceae*. Flowers and fruits from December to March.

DISTRIBUTION

Often planted in house compounds, for edible purposes throughout Burma.

USES

Infusion of drug used to reduce blood pressure.¹

Leaves, seeds and ripe calyces used as diuretic and antiscorbutic.

In bilious condition, succulent calyx boiled in water is used as a drink.¹

CHEMICAL INVESTIGATION

Organic acids present in flowers, gossypetin, anthocyanin and a glucoside hibiscin is also present.

Dried fruits contain Calcium oxalate, gossepetin, anthocyanin (having antiseptic power) and vitamin C.¹

Dry petals contain flavonol glucoside hibiscitrin.¹

Infusion of drug contains citric, tartaric and malic acids.¹

PHARMACOLOGICAL INVESTIGATION

Infusion of drug reduced blood pressure and stimulated intestinal peristalsis ; the drug also possesses diuretic and choleric effect.¹

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