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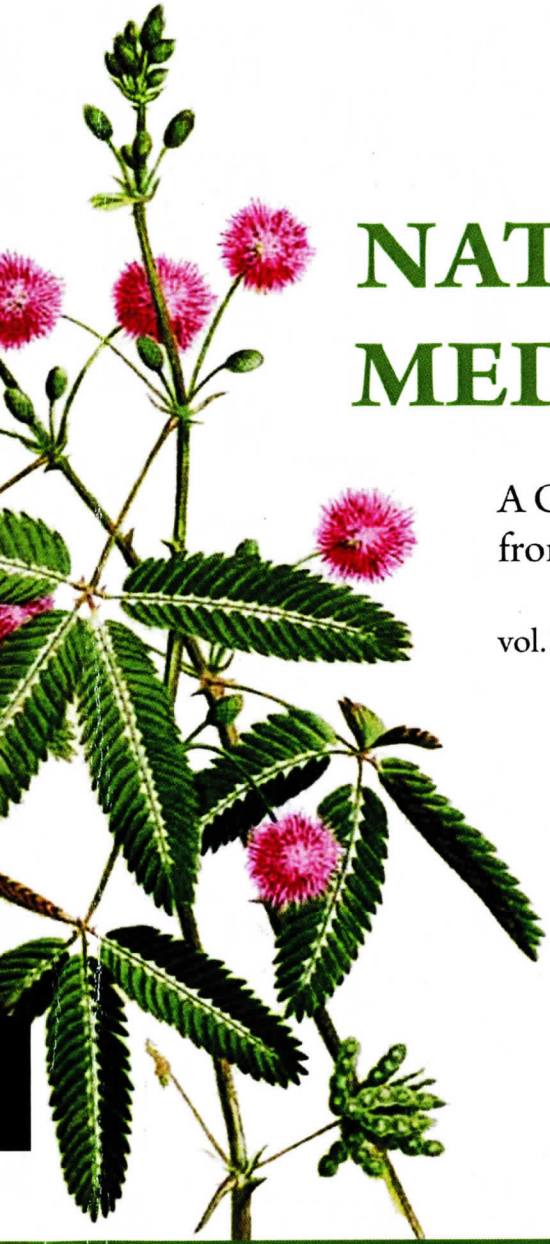

NATURE'S MEDICINE

A Collection of Medicinal Plants from Malaysia's Rainforests

vol.1(a) Weeds

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A Collection of Medicinal Plants from Malaysia's Rainforests

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Preface

Malaysia's beautiful rainforest is one of the oldest in the world. 130-million years in the making, our rainforest has a lot to offer. It feeds and protects the animals, and provides us with half of the oxygen we breathe. From its ability to absorb carbon, to its medicinal values, the forest is like a library, a classroom, a clinic and more.

Each tree has abundant benefits, and I believe we have only discovered half, if not less, of them. More and more scientific research are conducted each day to discover what plants can offer us.

Our ancestors use to practice using plants and herbs back when there were no certified medical practitioners or pharmacists. Each ethnic and race had their own remedies and concoctions, and most of them worked!

As such, we have put together this e-book, which we hope will be a start to preserving our valuable medicinal plants and their benefits. This e-book will help spread the news of our local medicinal plants and herbs across the world through current technology. Our greatest objective is to promote the use of our local plants and herbs.

This first volume showcases a total of 33 types of weeds and their respective health benefits, chemical compounds and pharmacological actions.

All of the findings presented here were conducted by a medical practitioner, cryopreservation expert, and a botanist, all of whom have been working in their respective fields for almost 40 years.

The proceeds from this e-book will go towards funding forestry conservation initiatives in Malaysia.

FOREST IS FOR US !

TUN JEANNE ABDULLAH
Chairman
Landskap Malaysia

Introduction

"One man's weed is another man's medicine"

Weeds can be defined as a plant that grows where it is not wanted. However, a better definition for these plants is that they alter the natural community structures; they interfere with the function of the local ecosystem; they have negative effects on people, agriculture and other societal interest[1]. They grow spontaneously and prolifically in disturbed environment and has caused the agricultural industry millions of Ringgits yearly in terms of efforts to control them.

Most of the weedy plants we find here were introduced either intentionally or accidently by the colonialist when the introduced foreign crops and ornamentals into the country. Many of these plants were introduced in the early 19th century when the British were actively looking into developing agriculture in their newly "acquired" land. They may appear to be weeds to the planters and farmers, but they were sometimes considered as blessed introduction to traditional medicine men and women who had found use of them in remedies they concocted for their patients.

One sometimes wonders how these knowledgeable ancient scientists could discover the medicinal values of these plants. More intriguing is the sometimes similar use in the new place as in the original place.

A look into the principles of traditional medicine had provided us with the clues to these diagnostic skills of the ancient scientists. They used the basic survival tools provided by the Almighty and incorporated into our body system i.e. the 5 senses of vision, hearing, taste, smell and touch.

The sense of vision provided us with the doctrine of signature, where the appearance of the plant is interpreted as part of the body. With our sight too we learn to observe the behaviours of the animals around us and what they take as food and medicine.

The sense of hearing and touch aid us in differentiating plant that appears to be the same but are different. The sound they produce and the texture of the leaves are sometime the differentiating point in plant identification used by traditional medicine men but not the modern taxonomists.

To a certain extent the sense of smell also helps in deriving the medicinal values of plants or plant parts. Aromatherapy is the bases of the use of smell to interpret the medicinal value of the plant.

The sense of taste is the ultimate value in the diagnostics of the medicinal value of plants. Tastes provides the knowledge of the temperaments of the plant, something essential when one wants to make medicine for specific diseases. We have 7 different tastes which are interpreted as being either hot, cold, wet or dry in temperament or translated into earth, water, wind and fire elements.

This book was written with the intention of bringing forth the medicinal values of these not so weedy plants after you have known their values. The book had been written in such a manner that we hope would benefit all who read it. The information provided is a collation of research into the traditional uses throughout the world, the rationale in the traditional uses as shown by its bioactive phytochemical contents and the proven pharmacological activities based on modern scientific evidences. It also defines some herb-drug

interactions when the activities may contraindicate their combined uses and the caution in their use during pregnancy and lactation.

When considering harvesting these plants as food or medicine the following must be strictly observed:

1. You must have thorough knowledge about the properties, the precise usage, method of preparation and the amount to be taken.

2. If using for treatment of a disease, you must make sure your diagnosis is correct and the plant is the most suitable for use in the treatment of the disease.

3. You must correctly identify the plant before harvesting it for use.

4. Harvest the plant in the morning and do not take them at midday.

5. Ensure that the plant is the healthiest in the group.

6. Ensure that the place from where you harvest is not exposed to pesticides and pollution of heavy metals from fumes of industrial areas or vehicles.

7. Do not take more than needed, if very few then always leave the most matured ones behind so that new one can grow from seeds produced by the matured tree.

8. Respect the plant, and say a little prayer for their sacrifice to enhance our health and ward off diseases.

The information written in this book is compiled from various books as listed in the list of references. Some of these simple remedies have not been tested for their safety and efficacy. Many of the remedies are traditionally used by various communities in the world. Exercise extreme care when attempting to use them, and if uncertain seek help from those with more knowledge. The intention of providing the information here is to illustrate the importance of weeds and their usefulness. The author cannot be held responsible for any untoward effects from indiscriminate use of the information written in this book.

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SUBANG NENEK
Acmella oleraceae (L.) R.K.Jansen
(ASTERACEAE)

Summary and Pharmaceutical Comment

Acmella oleracea is a member of the Asteraceae family. It is a common weedy plant found in waste areas especially where the soil is moist.

The name toothache plant in English, aptly described its universal use as a remedy for toothache and gum infection. The proven anaesthetic effects with an onset of around 5 minutes and its antibacterial properties further provide complete relieve of the problem. Generally the flower head is used either fresh or dried, However, the whole plant can be used too for this purpose. It is a strong antibacterial with activity against *Escherichia, Klebsiella, Proteus, Pseudomonas, Salmonella* and *Staphylococcus.* It is also effective against *Candida albicans*. As an insecticide, it has been proven effective against *Aedes*, *Anopheles* and *Culex* mosquitoes and corn earworms (Helicoverpa zea) [5].

At least 23 scientific studies have been carried out on the plant to prove its traditional uses and its active chemical contents. The N-alkylamides seems to be responsible for most of the actions of the plant. The properties that have been proven to be true of the plant based on scientific research include analgesic, antimicrobial, antimalarial, anti-inflammatory, anaesthetic, aphrodisiac, diuretic and vasorelaxant activities.

Synonym(s)

Anacyclus pyrethraria (L.) Spreng.
Bidens fervida Lam.
Bidens fixa Hook.f.
Bidens fusca Lam.
Bidens oleracea (L.) Cav. ex Steud.
Cotula pyrethraria L.
Pyrethrum spilanthus Medik.
Spilanthes fusca hort.par. ex Lam.
Spilanthes oleracea var. *fusca* (Lam.) DC.
Spilanthes oleracea var. *oleracea*

Vernacular Names

Malaysian (Malay): Subang nenek, Pokok getang kerbau, Kerabu, Galang, Gutang

Indonesia: Jotang

Filipino: Hagong (Tagalog); Agonoy (Spanish); Palunay (Pam)

Thai: Phaak krat, Phak phet

Vietnamese: Cuc ao, Ngo ao

Indian: Akalkar (Sanskrit); Ukra, Pokarmul, Pakarmul (Hindi); Roshunta (Bengali) Ukra (Tamil); Matatimogga, Maratitige (Telagu)

Chinese: Jin chou kou

English: Toothache plant, Paracress, Paraguay cress

Description

Herbaceous weed,common in waste ground. Usually erect up to 45 cm tall. Leaves ovate to deltate 5-10 cm x 4-8 cm, base truncate to shortly attenuate, leaf margin dentate, apex acuminate to acute. Petiole 2-6 cm, narrowly winged. Inflorescence is discoid. Flowers are yellow, cone-shaped, nearly 12 mm long. Fruits in the form of cypselae, black with short pappus[1,2].

Parts used

Whole plants: Anthelmintic, antiscorbutic, antiseptic, antitumour, convulsant, insecticide, sialogogue, stimulant [3]

Root: Purgative

Leaf: Anti-inflammatory, anaesthetic, sialagogue, analgesic

Flower: Anti-inflammatory, analgesic, antibacterial, anaesthetic

Food Use

In culinary terms the flower heads are known as buzz button, Szechuan button and electric button. Eating portions or whole of the flower head is supposed to offset the intense heat of chillies and peppers. It is indeed a taste experience when one bites in on the flower head, from an initial grassy taste one would then experience an extremely strong tingling sensation followed by numbness with excessive salivation and finally a cooling sensation in the throat [4].

The leaves are eaten raw or cooked in various manners in South America, Indian Ocean Islands, India, Southeast Asia, China and Japan. In the raw state it is added to salads, soup and meats as a pungent flavouring [5]. The leaves and shoots are sometime used as *ulam* in Indonesia served with sambal [3].

Herbal use

Whole plant: The whole plant is a remedy for dysentery and rheumatism and to enhance the immune system. It acts as a prophylaxis and cure for malaria and elephantiasis[5]. In Latin America, apart from being used in the treatment of toothache and stammering, it is also used in the treatment of gingivitis, glossitis, sore throat, headache, paralysis, liver infection, cystitis and prostatitis[6].The Peruvians use the plant decoction as an antiseptic[6]. In the east, the decoction is used as a vulnerary, a cure for dysentery and rheumatism and to enhance the immune system[4]. The decoction has diuretic properties and has been recommended to help dissolve bladder stones[4]. The spilanthol-rich extract and essential oil has been used commercially in the manufacture of dentifrices, mouth washes, chewing gums and breath fresheners[4].

Leaf: The leaf is traditionally considered a tonic and has been used in the treatment of rheumatism, gout and induction of salivation[4].

Root: The decoction of the roots are used as a purgative[4].

Flower: The flower head is commonly and widely used in the treatment of toothache, gum and throat infection, and stammering. It can be used either fresh or dried and powdered form for this purpose [5]. In Indonesia the flowers are chewed to promote salivation and to treat sore mouth of sprue[4].

Chemical constituents

Acmella oleracea contains a variety of active phytochemicals which are responsible for the varied actions as observed in

many researches done on the plant. Notably are the N-alkylamides class. The N-Alkylamide compounds isolated from *A. oleracea* are the following:

(2E,6Z,8E)- N-isobutyl-2,6, 8-decatrienamide (Spilanthol, 0.20%w/w)[7,8];(2E,4E,8Z,10Z)-N-isobutyl-dodeca-2,4,8,10-tetraenamide(0.71%);(2E,7Z)-N-isobutyl-2,7-tridecadiene-10,12-diynamide(0.12%);(2Z)-N-phenethyl-2-nonene-6,8-diynamide(0.11%); (2E,4Z)-N-isobutyl-2,4-undecadiene-8,10-diynamide(0.25%); (2E,7Z)-N-isobutyl-2,7-decadienamide (0.04%);(2E,6Z,8E)-N-(2-methylbutyl)-2,6,8-decatrienamide (0.07%);(z)-Non-2-en-6,8-diynoic acid isobutylamide (0.01%), (2E)-N-isobutylundeca-2-ene-8,10-diynamide(0.01%),and Spilanthic acid 2-methylbutylamide (0.04%). (7Z,9E)-2-oxo-undeca-7,9-dienyl 3-methylbut-2-enoate (aka. Acmellonate) at less than 100ppm (1mg/kg or less)[9].

Spilanthol; hendeca-2E,7Z,9E-trienoic acid; hendeca 2E -en-8,10-diynoic acid; polygodial; eudesmanolide II; limonene; β–caryophyllene; Z-β–ocimene; γ-cadinen; thymol; germacrene D; myrcene; vanillic acid; trans-ferulic acid; trans-isoferulic acid; 3-acetylaleuritolic acid; scopoletin; β-sitostenone; stigmasterol; stigmasteryl-3-O-β-D-glucopyranosides; stigmasteryl-and β-sitosteryl-3-O-β-D-glucopyranosides; acmellonate[10].

The pungent flavour of the plant is attributed to the presence of spilanthol, an unsaturated alkamide which can reach a concentration of 1% in the flowers. Other alkamides implicated for the pungentness include isobutylamides of hendeca-2E,7Z,9E-trienoic acid and hendeca-2E-en-8,10-diynoic acid and C9 poly-unsaturated alkamides[11]. Apart

from the alkamides, non-volatile sesqueterpenoids like polygodial and eudesmanolide II were found to contribute to the pungent taste [12].

The essential oil of the flowers yield limonene, β-caryophyllene, Z-β-ocimene, γ-cadinen, thymol, germacrene D and myrcene [13].

Aqueous extract of the *A. oleracea* yielded a polysaccharide, rhamnofalacturonan, which contained uronic acid, galactose, arabinose, rhamnose, and glucose in a molar ratio of 15:2:1:1:0.5 and a molecular weight of 226,000 g/mol. Methylation analysis and NMR spectroscopy indicated that it is composed of a long chain of →4)-6-OMe-α-D-GalpA-(1→, interspersed with some α-L-Rhap residues, partly substituted by side-chains of type II arabinogalactans[14].

Pharmacological Actions

In vitro and animal studies

WHOLE PLANT

Gastroprotective activity

A rhamnogalacturonan (RGal) isolated from *A. oleracea* administered by oral route showed gastroprotective activity against acute lesions induced by ethanol. In this study, the gastric ulcer healing effect of RGal and its mechanisms of action were investigated. Intraperitoneal treatment of animals with RGal protected the gastric mucosa against acute lesions induced by ethanol, with participation of gastric mucus. Furthermore, in the chronic ulcer model, oral administration of RGal accelerates the gastric ulcer healing, accompanied

by increasing of cellular proliferation and gastric mucus content, reducing inflammatory parameters and oxidative stress. In addition, the repeated 7 days-treatment of animals with RGal did not show alterations of clinical and behavioral symptoms, body and organs weights or plasmatic biochemical parameters. Collectively, these results showed that RGal has an interesting antiulcerogenic activity and could constitute an attractive molecule of interest for the development of new antiulcer agents[5, 15].

Acaricidal activity

The acaricidal activity of the aerial parts of *A. oleracea* was tested against the larvae and engorged female cattle tick *(Rhipicephalus microplus)*. Results showed that the hexane extract with spilanthol as the main constituent (14.8% of the extract) was effective against the larvae (LC_{50} of 0.8 mg/ml) and the engorged female (LC_{50} of 79.7 mg/ml). The effectiveness was high (>95%) at concentration of 3.1 mg/ml for the larvae and 150.0 mg/ml for the engorged female. It was observed that the extract was able to reduce oviposition and hatchability of the eggs at LC_{50} of 79.7 mg/ml [16].

Antimalarial Activity

In Africa and India *A. oleracea* has been used in the treatment of malaria. Two studies done had shown its potential as an antimalarial drug. Four N-alkaylamides obtained from the methanol extract using centrifugal partition chromatography (CPC) solvent system (heptanes-ethyl acetate-methanol-water [3:2:3:2, v/v/v/v]) showed high antiplasmodial activity [17]. Spilanthol and undeca-2E-ene-8, 10-diynoic acid isobutylamide, were shown to have IC_{50}s of 16.5 µg/mL and 41.4 µg/mL on *Plasmodium falciparum* strain PFB and IC_{50}s

of 5.8 µg/mL and 16.3 µg/mL for the chloroquine resistant *P. falciparum* K1 strain, respectively. At a relatively low concentrations, spilanthol and water extract of *S. acmella* were able to reduce the parasitemia by 59% and 53% in mice infected with *P. yoelii yoelii* 17XNL at 5 mg/kg and 50 mg/kg respectively[18].

Anaesthetic activity

The aqueous extract of *A. oleracea* was tested for its anaesthetic activity using the intracutaneous wheal in guinea pigs and plexus anaesthesia in frogs with 2% xylocaine as the standard drug. It was found that at 10% concentration the extract produced 70.36% anaesthesia and 20% concentration produced 87.02% anaesthesia. The onset of anaesthesia was found to be 5.33±0.57 min in the plexus anaesthesia model. The standard drugs was found to be superior in its actions as compared to the extract[19].

Anti-inflammatory activity

The anti-inflammatory activity of *A. oleracea* was done using 85% ethanol extraction followed by liquid partition against hexane, chloroform, ethyl acetate and butanol. The ethyl acetate extract exhibit strong free radiacal scavenging capacity while the chloroform extract significantly inhibit nitric oxide (NO) production. From the chloroform extract the compound spilanthol was isolated. This compound inhibited proinflammatory mediator production at the transcriptional and transational levels. This is evidenced by its ability to reduce levels of LPS-induced inducible nitric oxide synthase (iNOS) and cyclo-oxygenase-2 (COX-2) mRNA and protein expression. It also reduced the LPS-stimulated IL-1 beta, IL-6, and TNF alpha productions, and restrained the LPS-

induced phosphorylation of cytoplasmic inhibitor-kappaB and the nuclear NF-kappaB DNA binding activity. In conclusion, spilanthol actually attenuates the LPS-induced inflammatory responses in murine RAW264.7 macrophages partly by inactivating NF-kappaB, which negatively regulates the production of proinflammatory mediators[20].

Vasorelaxatant activity

Extracts of *A. oleracea*, notably ethyl-acetate and chloroform, showed maximal vasorelaxation of phenylephrine-induced contraction of rat thoracic aorta in a dose-dependent manner. This vasorelaxation effect was completely loss with the removal of the endothelium and partially reduced in the presence of N(G)-nitro-l-arginine methyl ester and indomethacin. This shows that the expression of vasorelaxation is via endothelium-induced NO and prostacyclin in a dose-dependent manner [21].

FLOWERS

Antinociceptive activity

The ethanol extract of the flowers of *A. oleracea* has the ability to reduce pain both in the neurogenic and inflammatory phases of the process. This was seen in the formalin-, capsaicin- and cinnamaldehyde-induced orofacial nociception. At a dose of 100 mg/kg (ip.) it reversed capsaicin-induced heat hyperalgesia, increased hot-plate paw withdrawal latency and reduced mechanical allodynia caused by sciatic nerve ligation. It did not alter the locomotion of the rats in the open-field test. These effects is believed to be due to the presence of N-alkylamides including spilanthol, suggesting it to be

related to its anaesthetic activity[22].

Cytotoxic activity

The hydroethanol extract of the flowers of *A. oleracea* was found to affect the integrity of the cytoskeleton of neoplastic cells (Hep-2). There was evidence of depolymerisation of the filaments of the cytoskeleton causing loss of morphology and consequently compromising cell adhesion. This happened as concentrations of 500 µg/mL and 1,000 µg/mL. The IC_{50} of the extract was 513 µg/mL[23].

Aphrodisiac activity

Traditionally the flowers of *A. oleracea* have been used in the treatment of sexual deficiency in old age. A study was done to look into its aphrodisiac activity. The ethanol extract of the flower was found to improve the mounting frequency, intromission frequency and ejaculatory frequency at a dose of 150 mg/kg. This effect persisted even after 7 and 14 days discontinuation of therapy. There was also significant increase in FSH (3.10±0.25mIU/ml), LH (6.87±0.18mIU/ml) and testosterone (3.72±0.12ng/ml) levels. It was also observed that in vitro release of NO was 21.7±2.9µM, which was significantly higher compared to the control group ($p<0.01$). The presence of N-alkylamides might be responsible for the improved sexual potential. The extract has great potential in being developed into a drug for the treatment of sexual dysfunction in the elderly[24].

Antiobesity activity

The 70% ethanol extract of the flower buds of *A. oleracea* which was fractionated on silica gel was used to look into

the pancreatic lipase inhibitory activity. It was found that in the concentration range of between 0.75-2.0 mg/ml, the lipase inhibitory activity was 40%. There may be some use of this extract in the development of weight reduction and obesity control drug[25].

Diuretic activity

The cold-water extract of the flowers of *A. oleracea* was studied for its diuretic activity as claimed by Sri Lankan traditional medicine practitioners. It was found that the highest dose of the extract i.e. 1500 mg/kg markedly increase the urine output in hydrated rats. The diuresis was prompt (within 1 hour) and lasted throughout the studied period (up to 5 hours) with peak effects between 1 and 2 hours. It caused marked increase in urinary Na^+ and K^+ levels with a reduction in osmolarity of urine, indicating it mainly acts as a loop diuretic. There is a possibility that it may also inhibit ADH release and/or action[26].

Clinical studies
No documentations.

Side-effects and Toxicity
No documentations.

Contraindications, Warnings

A study of the toxicity of hexane extract,it was found that at high doses (100-150 mg/kg), It produced full tonic-clonic convulsion accompanied with typical electrographic seizure in EEG in Wistar rats[27].

Drug interactions

The use of the plant together with anti-hypertensive drugs may cause postural hypotension due to the fact that it has vasorelaxant and diuretic properties.

Pregnancy and lactation
No documentation.

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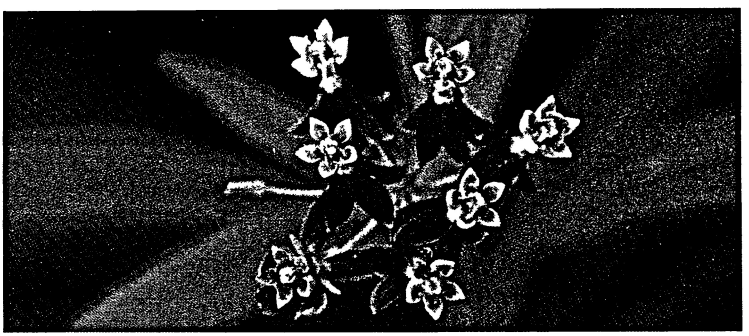
BUNGA EMAS
Asclepias curassavica Linn.
(APOCYANACEAE)

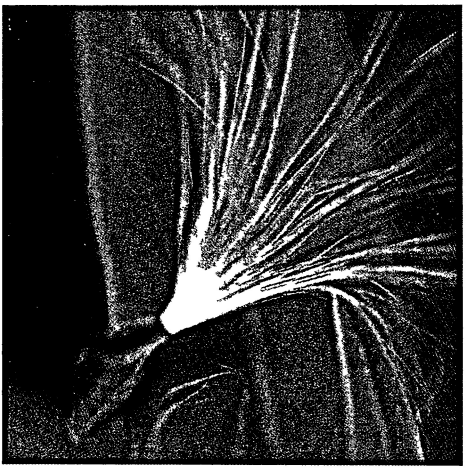


Summary and Pharmaceutical Comment

Asclepias curassavica is a member of the Apocynaceae family. It is a perennial herbaceous plant that is native to tropical America. It has been introduced here as an ornamental because of the attractive flowers. The plant is highly toxic and has compounds that are cardioactive and neuroactive. It is not a good ornamental plant to plant when one has toddlers in the house. One of the poisonous compounds found throughout the plant is a group of cardioactive cardenolides. These group of compounds act in similar manner to digitalis and ouabain and can cause cardiac arrhythmias when taken in large doses.

Synonym(s)[1]

Asclepias cubensis Wender.
Asclepias margaritacea Hoffmanns. ex Schult.



Vernacular Names[5]

Malaysian: Bunga mas, Bunga tanjong, Melukut paya

Filipino: Anibung, Asuncion, Buak damo, Kapul-kapul

Thai: Fai duean haa, Mai cheen, Thian daeng

Vietnamese: B[oo]ng tai, Ngo thin g[oo] th[ij]

Indian: Ariyaman, Ban-kapas, Chikkakaagethonde, Hole chadaranga, Hulugilugida, Jilledu

mandara, Kaakathundi, Katakatundi, Kakana sika, Kakatudi, Kakatundi, Kakkathondi, Karki, Kaura-dodi, Kirai kaage thonde, Krishnachura, Kukatund, Kurki, Lalma