

## 8 MAP SPECIES FROM MALAYSIA FOR ICS DATABASE

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### 8 MAP species:

*Andrographis paniculata*

*Centella asiatica*

*Eurycoma longifolia*

*Labisia pumila*

*Orthosiphon stamineus*

*Cymbopogon nardus*

*Morinda citrifolia*

*Phyllanthus niruri*



- **Volume of production in the country**

**AP** - 6.55 mt/yr (local) (2000)

**CA** - 1202.10 mt/yr

**EL** - NA

**KF** - NA

**MK** - NA

**CN** - NA

**MC** - NA

**PN** - NA

NA = Not available

- **Volume of domestic consumption**

**AP** - 9.07 mt/yr (2000)

6.55 mt/yr (local), 1.21 mt/yr (imported) (2000)

**CA** - 1,204.45 mt/yr (2000);

1202.10 mt/yr (local), 2.40 met/yr (imported)

**EL** - 74.66 mt/yr (2000)

476,339 kg/year estimated for 2004

**KF** - ~24 metric ton/year (estimated)

**MK** - NA

**CN** - NA

**MC** - 4.30 mt/yr (2000)

0.70 mt/yr(local), 3.60 mt/yr (imported) (2000)

**PN** - NA

NA = Not available

## 8 MAPS

### • Volume of export

- AP - NA
- CA - NA)
- EL - NA
- KF - NA
- MK – NA
- CN - NA
- MC - NA
- PN – NA

NA = Not available

### • Average price

AP - NA

CA - Fresh: MYR 7/kg

Powder: MYR120/kg

EL - Raw materials:~MYR8-12/kg (local)

Dry: MYR 45-90/kg

Extract (water solubles):MYR 1800/kg  
or USD 800/kg

KF - ~24 metric ton/year (estimated)

MK – NA

CN - 100% oil at ~MYR250-300.00 per kg (in  
2006) (Abu Said, per. comm.)

MC – Fresh: MYR 1.00-2.00- per kg direct  
from the growers (2001); or MYR 2000 per  
tonne (fresh fruits), ~MYR 6/kg or MYR 6000/t  
(after 2001)

PN – NA

NA = Not available

Type of plantation	Area (ha)	Major MAP planted
Small holders	801	<i>Garcinia atroviridis</i> , <i>Zingiber officinalis</i> <i>Cymbopogon citratus</i> , <i>Alpinia galangal</i>
KESEDAR	100	<i>Eurycoma longifolia</i> , <i>Cymbopogon nardus</i> <i>Orthosiphon stamineus</i> , <i>Morinda citrifolia</i>
Holden Hope	134	<i>Eurycoma longifolia</i> , <i>Melaleuca alternifolia</i> <i>Morinda citrifolia</i>
United Plantation	40	<i>Melaleuca alternifolia</i>
Nasuha Enterprise	200	<i>Cinnamomum zeylanicum</i> , <i>Murraya koenigii</i> , <i>Garcinia atroviridis</i> Allspice
Pandan Intan (Nona Roguy)	200	<i>Cymbopogon nardus</i> , <i>Cymbopogon citratus</i> Bunga tanjung
Rihini Sdn. Bhd.	20	<i>Centella asiatica</i> <i>Eurycoma longifolia</i>
Total	1495	

Source: Musa Yaacob, per. comm)



## *Eurycoma longifolia*

- Botanical name: *Eurycoma longifolia* Jack
- Family: Simaroubaceae
- Vernacular names: Tongkat Ali/Malaysian ginseng
- Traditional uses: Tonic, poultice for headaches, wounds & ulcers, febrifuge, hepatitis, aphrodisiac; MP for men



6 yo treelet of *E. longifolia*



↑↑Vegetative parts and fruits ⇒  
(Photos by Zainon)



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## *Eurycoma longifolia*

- **Common names in trade (local and foreign language)**  
Tongkat ali, penawar pahit, penawar bias, bedara merah, bedara putih, lempedu pahit, payong ali, tongkat baginda, muntah bumi, petala bumi (Malay), pasak bumi, bidara laut (Indonesian), babi kurus (Javanese), cay ba binh (Viet Nameese), hae phan chan, plaalai phuenk, phiak (Thai), tho nan (Laos)
- **HS code** - 1211.90.900
- **Use**
- **Parts used:** root, root bark, leaves
- **Volume of production in the country**
- **Volume of domestic consumption**
  - No official data.
  - 74.66 mt/yr (2000)
  - By 2004, the domestic demand estimated at 476,339 kg/year (Mohd. Azmi *et al.* 2005)
- **Volume of export**
  - No official data
- **Average price**
  - Raw materials: ~MYR8-12/kg (local)
  - Dry: MYR 45-90/kg
  - Extract (water solubles): MYR 1800/kg
  - USD 800/kg (export price, Phytes Biotek)



- **Trade points and contact addresses in the country: market, industry, association, cooperative, etc.**

☞ Phytes Biotek Sdn. Bhd.  
 ☞ Asia Botanicals Sdn Bhd  
 ☞ Orang Kampong Hildings (M) Sdn Bhd (555813 W)  
 ☞ Nutreeherb Trading Sdn Bhd (supplier of raw materials and producer of products) (formally known as Nusantara Herbs Sdn Bhd)  
 ☞ POWER ROOT (M) Sdn Bhd (489343-X)

**Nature of plant material: wild, cultivated, organic**

Mainly wild; large-scale cultivation of this species only started recently.

- **Areas of production in the country**  
 States of Kedah, Kelantan, Johor, Perak, Pahang and Selangor

- **Nature of plant products: crude, semi-processed and processed**

**Crude:** Root, powdered root, crude extract (water) of root. Capsules of powdered roots are manufactured locally and available in the Malaysian market.

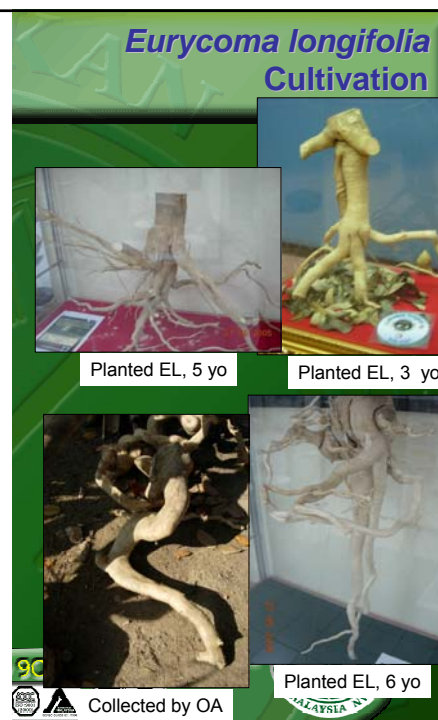
**Semi-processed:** Standardised extracts of root, exported to USA.

**Processed:** Beverages such as coffee drinks in cans, 3 in 1 mix.



- **Cultivation including organic farming**
- Small scale planting by small holders - single crop or interplanted with coconut, fruit trees or timber trees
- Large scale planting - generally as a single crop
- Grows on various soil types, more suitable on sandy clay with high organic matter, and preferably in areas with annual rainfall of 2000-3000 mm
- Planted from seeds, the plant produces large quantities of seeds
- Seeds germinate in 4 weeks with >90% germination by week 6.
- Germinated seedlings transferred to polybags and kept in the polybags for up to 6 months (to ensure a straight tap root) before outplanting.
- Planting hole measures 30 x 30 x 30 cm and filled with soil mixed with fertilisers such as Triple super phosphate (TSP, 100 g), ground magnesium lime (GML, 100 g) and chicken manure (50 g)
- Spacing is 1 x 2 m for monocrop → 5,000 trees/ha
- The larvae of *Atteva sciodoxa* were noted to attack the young shoots resulting in early mortality in some plants → sudden death

Source: Mohd. Noh *et al.* 2005



## *Eurycoma longifolia*

### – Pre- and post-harvest treatment

- Tap root is harvested
- Achieved by pulling out the plant using some extracting device or just by digging around the roots and pull it out manually. To date, it is still unsure the best age to harvest for the roots. Most of the wild-crafted materials are from older trees.
- The expected fresh root yield per tree in a monocrop system is 15-30 g, 300-450 g, 460-600 g and 800-1200 g for year 1, 2, 3 and 4, respectively
- The harvested roots are washed before drying.
- Drying - directly under the sun for a few days or in ovens at 40-50°C for 72 h
- The dried materials can be sold as it is or for further processing

(Source: Mohd. Nor *et al.* 2005)

### – Conservation

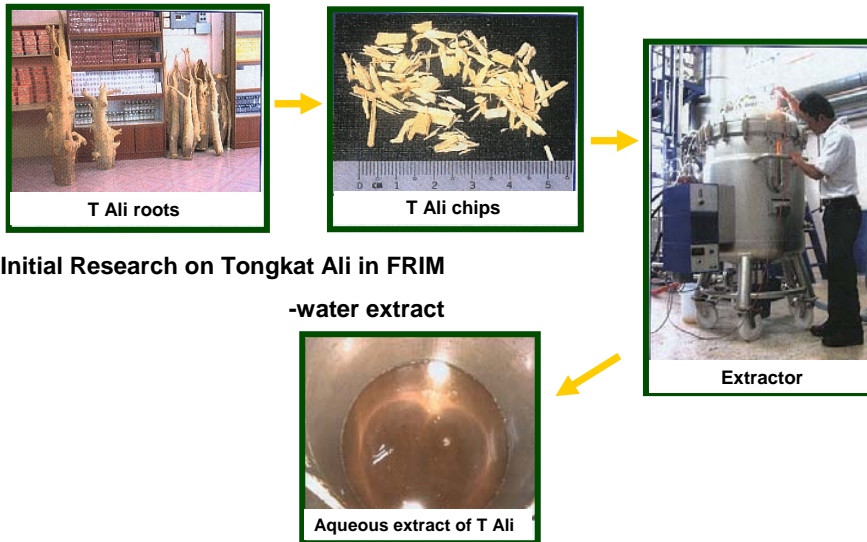
- Under the directives of the Forestry Department Peninsular Malaysia, all State Forestry Departments are to identify and demarcate a total of 12 plots of Seed Production Area (SPA) of *E. longifolia* at the Forest Ranger level as the *in situ* conservation initiative
- This initiative is to ensure sufficient and sustainable availability of quality seeds of *E. longifolia* from the natural forests.
- To date, a total of 54 plots of various sizes each containing at least two mother trees with  $\geq 5$  cm diameter.
- Under the *ex situ* conservation initiative, *E. longifolia* is included in the list of medicinal plants and herbs planted in plots totalling 37 ha in the various states. This *ex situ* conservation will be further strengthened under the Ninth Malaysia Plan (2006-2010)

(Source: Mohd. Paiz *et al.* 2006).

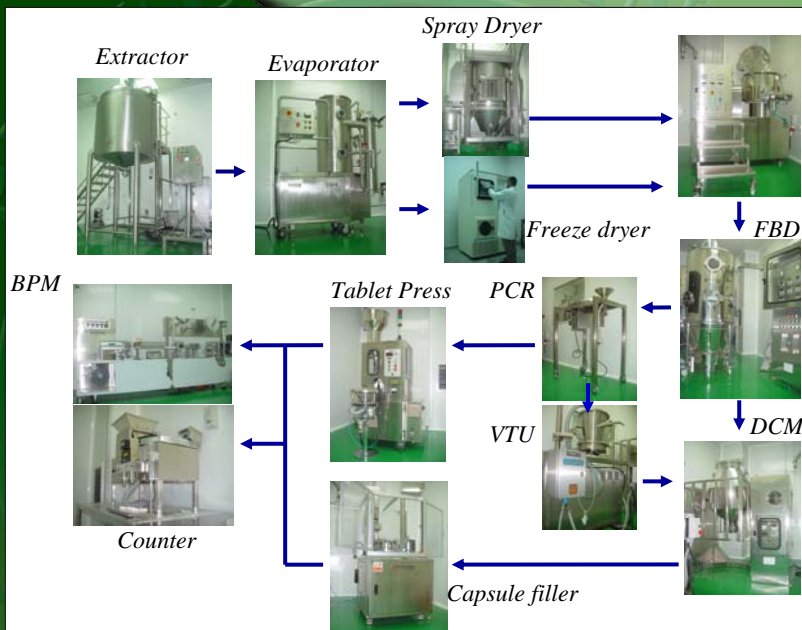
## Extraction processes of TA Primary Processing

- Herbal extracts are important sources of phytochemicals for the flavour, fragrance and pharmaceutical industry
- Primary processing of the raw materials begins with the following:  
Drying → Size reduction → Grinding → Sieving
- Traditionally medicinal plant extracts are prepared by soaking in water extraction to form infusions and concentrate
- Pilot scale facilities: solid-liquid extractor, freeze drying, spray drying, supercritical fluid extraction and distillation
- Pilot scale facilities: GMP status

## *Eurycoma longifolia* Production of extracts/ ABI



## Herbal Technology Centre FRIM Pilot scale



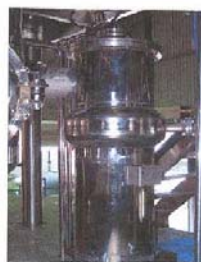
## Eurycoma longifolia Commercial processing equipment



1. Extractor



2. Filtration

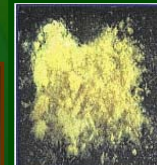


3. Concentrator



4. Lyophilizer

Source: Phytes Biotek Sdn. Bhd.



Freeze dried sample



Spray dried sample



## Eurycoma longifolia Commercial products from standardised extract

### Product Description

#### Developed and Manufactured by Nova

**EURYACTIV RTU (Ready-To-Use) GRANULES** is an innovative product developed by Nova R&D team. The whole manufacturing process, from extraction of the standardized extract to the formulation and production of the RTU (Ready-To-Use) granules, is strictly carried out in our GMP facility.

#### Standardized Extract

**EURYACTIV RTU GRANULES** contains *Eurycoma longifolia* activated standardized extract, known as **REL 504 PL**, that is extracted from our most famous Malaysian herb *Eurycoma longifolia*.

**REL 504 PL**, *Eurycoma longifolia* activated standardized extract is standardized to contain 1% Eurycomanone in which is considered as the major compound for REL 504 PL.

**Activated by NOVA-BioActive Oral Delivery Technology**

**EURYACTIV RTU GRANULES** is activated by incorporating our proprietary NOVA-BioActive Oral Delivery Technology to enhance the solubility of Eurycomanone.

**Application of EURYACTIV RTU GRANULES**

**EURYACTIV RTU GRANULES** is formulated into granular form that can be used for direct compression into tablets, filling into capsules and for processing into beverages.

**EURYACTIV RTU GRANULES** 20% Pack

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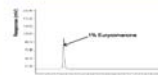
**EURYACTIV RTU GRANULES** 20% Pack

Nova

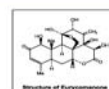
### Specification For EURYACTIV RTU GRANULES

#### SPECIFICATION FOR EURYACTIV RTU GRANULES

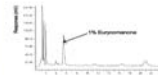
EURYACTIV RTU GRANULES:	
Content per gm of granules	500 mg / gm granules
REL 504 PL standardized extract	5.0 mg / gm granules
Guaranteed to contain 1% Eurycomanone	
Eurycomanone	As shown below
HPLC Fingerprint	> 800 µg / ml
Solubility of Eurycomanone	Between Mesh # 30 - 40
Particle size of granules	



HPLC Chromatogram of Eurycomanone



Structure of Eurycomanone



HPLC Fingerprint of EURYACTIV

#### Quality Guarantee

Every batch of our product will be provided with HPLC Assay of Eurycomanone and HPLC Fingerprint.

Nova

Source: Nova Laboratory Sdn Bhd






## Eurycoma longifolia

### Production of herbal drugs/Scientific information

- **Production of herbal drugs**
  - Traditionally, the wild-crafted TA root is dried and cut into small pieces, then packed for sale
  - Or, it is ground to saw dust size and packed into fix weight bags for sale
  - The ground TA saw dust is also put into capsule (manually) or made into tablets for sale
  - Sometimes, root is sold as it is
  - Today, some of these steps are done by specialised machines to ensure uniformity in the products
- **Scientific information:**
  - Ethno-botanical information
    - Roots and root bark are used in the remedieis
    - It is anti-malarial, anti-histaminic, anti-pyretic, tonic and aphrodisiac
    - Also useful for fever, medication after birth, boils, wounds, ulcer, syphilis and bleeding gums
  - **Pharmacological studies**
    - Eurycomanone, a quassinoid, is identified as the most potent and toxic inhibitor of the chloroquine-resistant Gombak A isolate of *Plasmodium falciparum* (Chan et al. 2005)
    - As a bioactive component, it has shown strong anti-malarial and anticancer activities
    - Currently selected for further investigation of its derivatives and also to improve its anti-malarial and anticancer activities.

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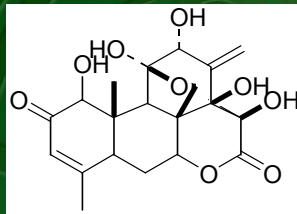
## Eurycoma longifolia

### Scientific information

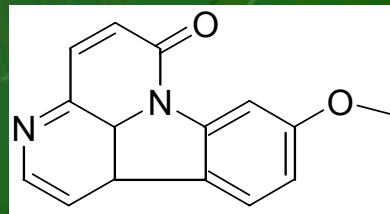
- Anti-malarial and anti-cancer activities are the two major areas investigated in this plant (Kardono *et al.* 1991; Ang *et al.* 1995; Chan *et al.* 2004; Pin *et al.* 2004; Chan *et al.* 2005; Tee & Azimahtol 2005; Nurhanan *et al.* 2005)
- Chan and co-workers (2005) have investigated the antimalarial of semisynthetic derivatives of eurycomanone. The synthesized acylated eurycomanones have shown that acylation only at the C-15 hydroxy group (15-O-acyl- and 1,15-di-O-acyleurycomanones) may be worthy of further antimalarial investigation.
- In another related study on the bioavailability of eurycomanone Low and co-workers (2005) found that eurycomanone is poorly bioavailable when given orally. The poor oral bioavailability was not attributed to instability problems since eurycomanone has been shown to be stable under different pH conditions. This poor oral bioavailability may be due to poor membrane permeability in view of its low P value and/or high first-pass metabolism
- Research by several researchers has some scientific evidence to support the folk use of *E. longifolia* as an aphrodisiac (Ang et al. 2004; Azimahtol Hawariah 2002). Azimahtol Hawariah (2002) provided some evidence to the claimed energy boosting property of *E. longifolia* at the cellular level where it increases the level of cGMP, a secondary messenger that produces smooth muscle relaxation in the corpus cavernosum, thus allowing inflow of blood and eventually penile erection
- **Quality control including chromatographic finger-print profiling**
- Eurycomanone, 9-methoxyacanthin-6-one, 14-15- $\beta$ -dihydroxyklaineaneone, 13-21-dihydroeurycomanone have been used as reference markers for standardisation

## *Eurycoma longifolia*

- For quality assessment, eurycomanone and 9-methoxycanthine-6-one are used as chemical markers



Eurycomanone



9-methoxycanthine-6-one

as well as the presence of eurypeptides

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## *Eurycoma longifolia*

- DNA finger-printing
- Safety data
- Contraindications
- Interactions with other drugs
- Dosage
- Clinical trials
- Registration status
- People and projects and contact addresses

Data unavailable

- Project: Malaysia-MIT Biotechnology Partnership Programme.  
Prof. Dr. Zhari Ismail, School of Pharmaceutical Sciences, University Science Malaysia (USM)  
Prof. Dr. Chan Kit Lam, School of Pharmaceutical Sciences, USM  
Dr. Mohd. Ilham Adenan, Forest Research Institute Malaysia (FRIM)  
Dr. H.H. Ang, School of Pharmaceutical Sciences, USM  
Dr. Azimahtol Hawariah L.P., National University Malaysia (UKM)
- **Monographs**  
Zhari, I., Norhayati, I. & Jaafar, L. 1999. Malaysian Herbal Monograph Vol. 1. P. 29-32.  
Malaysian Monograph Committee, Kuala Lumpur. 93pp.
- **Patents**
  - (Wo 02/17946) Bioactive Fraction Of *Eurycoma Longifolia*
  - (Wo 02/085394) The Process Of Preparing The Topical Anti-Inflammatory/Analgesic Preparation

## Eurycoma longifolia

- Ang, H.H., Chan, K.L., Lee, S.P., Sam, T.W. & Mak, J.W. 1991. Effect of chronic administration of *Eurycoma longifolia* against local chloroquine-resistant *Plasmodium falciparum* isolates. Pp. 110-114. In: *Proceedings of the Conference on Medicinal Products from Tropical Rain Forests*. Forest Research Institute Malaysia, Kepong, Selangor, 13-15 May 1991. [Abstract: Six Local chloroquine-resistant *Plasmodium falciparum* isolates were cultured and used for anti-malarial evaluations with chloroquine and a semi-purified fraction of *Eurycoma longifolia* Jack. Results indicated that butanol extracts of *E. longifolia* produced 31-45% and 22-39% inhibitions at 5.00 and 2.50 ug/ml respectively one day post-treatment, 86-92% and 79-83% inhibitions respectively two days Post-treatment but complete inhibition three days post-treatment. Complete inhibition was also observed at 0.62 and 0.31 ug/ml respectively four and six days post- treatment.
- Burkill, I.H. & Haniff, M. 1930. *Gard. Bull. Straits Settl* 6. P. 182.
- Burkill, I.H. 1966. *A Dictionary of the Economic products of the Malay Peninsula*. Vol. I & II. Ministry of Agriculture, Malaysia. 2444pp.
- Chan, K.L., O'Neil, M.J., Phillipson, J.D. & Wadhurst, D.C. 1986. Plants as sources of anti-malarial drugs. Part 3. *Eurycoma longifolia* Jack. *Planta Medica* 52(2): 105-107.
- Chan, K.L., Lee, S.P., Sam, T.H. & Han, B.H. 1989. *Phytochemistry* 28: 2857-2859.
- Chan, K.L., Lee, S.P., Sam, T.H. & Han, B.H. 1991. *Phytochemistry* 30: 3138-3141.
- Darise, M., Kohda, H., Mizutani, K & Tanaka, O. 1982. *Phytochemistry* 21: 2091-2093.
- Gimlette, J.D. & Burkill, I.H. 1930. *Gard. Bull. Straits Settl* 6: 329.
- Gimlette, J.D. & Thomson, H.W. 1939. *A Dictionary of Malayan Medicine*. P. 242. Oxford University press, London.
- Indu Bala, J. & Ng, L.T. 2000. *Herbs, the Green Pharmacy of Malaysia*. Vimpress, Kuala Lumpur.
- Mohd. Ilham Adenan. 1998. Opportunities on the planting of medicinal and herbal plants in Malaysia. *Planter* 74: 339-342.
- Oei-Koch, A. & Kraus, L. 1980. *Sci. Pharm.* 48: 110-117. Sam, T.W. & Chan, K.L. 1991. Some physio-active components of *Eurycoma longifolia* (Simaroubaceae). Pp. 211-221. In: *Proceedings of the Conference on Medicinal Products from Tropical Rain Forests*, 13-15 May 1991, Forest Research Institute Malaysia, Kepong, Selangor. [Abstract: The non-potor petroleum ether extract of the roots of *Eurycoma longifolia* Jack containing primarily sitosterol, stigmasterol, and campesterol was found to be both antipyretic and hypothermic when inoculated into febrile and normal mice. The polar fractions contain several quassinoids: eurycomanol, its 2-B glucoside and a new 13,18- dihydro derivative, eurycomanolactone, eurycomenone, and a new 14,15dihydroxyklaineanone. These compounds were identified principally from their spectroscopy properties and some of them have anti-malarial activities. In all, about a dozen compounds have been isolated from *E. longifolia*. Unfortunately none as yet could be tied to the alleged increase in male libido arising from regular consumption of the root extracts]
- Samy, J., Sugumaran, M. & Lee, K.L.W. 2005. *Herbs of Malaysia*. Edited by K.M. Wong. Times Editions. Federal Publications Sdn. Bhd.
- Uji, T. 1999. *Eurycoma*. Pp.272-275. In: *Plant Resources of Southeast Asia No. 12(1). Medicinal and poisonous plants 1*. L.S. de Padua, N. Bunyapraphastara & R.H.M.J. Lemmens (Eds). Backhuys Publishers, Leiden. 711pp.
- Zhari, I., Norhayati, I. & Jaafar, L. 1999. *Malaysian Herbal Monograph Vol. 1*. Malaysian Monograph Committee, Kuala Lumpur. 93pp.

## Labisia pumila

- **Botanical name:** *Labisia pumila* (Blume) Fern.-Vill  
Three varieties: *L. pumila* var. *pumila*
- *L. pumila* var. *alata*
- *L. pumila* var. *lanceolata*
- **Synonyms:** *Labisia pothoina* Lindl.
- **Family:** *Myrsinaceae*
- **Vernacular names:** Kacip fatimah (Malay)
- **Traditional uses:** Root decoction prior to giving birth to induce and ease delivery; Leaf and root decoction as a post-partum tonic; Root decoction to treat gonorrhoea; Also to treat flatulence and dysentery  
Essential MP for women
- **Common names in trade (local and foreign language)**
- Kacip Fatimah, selusoh Fatimah, rumpur Siti Fatimah, kacit Fatimah, pokok pinggang, rumput palis, tadah matahari, mata pelanduk rimba (Malay), Sangkoh (Iban)
- **HS code (Harmonized Commodity Description and Coding System)**  
1211.90.900
- **Use**  
*Post-partum* medication, tonic, incorporated into beverages

## *Cymbopogon nardus*

- Botanical name with authority and synonyms  
*Cymbopogon nardus* (L.) Rendle Catalogue of the African Plants collected by Dr. Friedrich Welwitsch in 1853-61 2(1) 1899  
Basionym: *Poaceae*  
*Andropogon nardus* L.  
Species Plantarum 2 1753
- Family Gramineae (= Poaceae)



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## *Cymbopogon nardus*

- **Plant part used:** Leaves & stem
- **Common names in trade (local and foreign language)**  
Citronella, Sri Lanka or Lenabatu citronella (English), Serai wangi (Malay), sereh wangi, seriwang (Indonesian)
- **HS code (Harmonized Commodity Description and Coding System)**  
3301.19000 (essential oils)
- **Use**  
Leaves and stem – distilled for essential oil known as 'citronella oil'  
The oil is used as an ingredient in insect repellent sprays, scented candles, scented soap, body and hair shampoos, etc.
- **Volume of production in the country**  
No data available
- **Volume of domestic consumption**  
No data available
- **Volume of export**  
No data available
- **Average price**  
100% oil at ~MYR250-300.00 per kg (in 2006) (Abu Said, per. comm.)



## *Cymbopogon nardus*

- **Trade points and contact addresses in the country: market, industry, association, cooperative, etc.**  
Southern Kelantan Development Authority (KESEDAR) (A state agency involved in planting)  
Malaysian Agricultural Research and Development Institute (MARDI) (Planting and Essential oil extraction)  
Biossentials Sdn. Bhd. (Supply pure essential oils)
- **Nature of plant products: crude, semi-processed and processed**  
Semi-processed: essential oil  
Processed: Insect repellent (spray, roll-on, cream and candles) Toiletries: hair shampoo, body shampoo, liquid hand soap & soap bar  
Aromatherapy: massage oil blend
- **Any special regulations pertaining to trade and web links to enforcing agencies**  
In Malaysia,  
Control of Drugs and Cosmetics Regulations 1984  
Pesticides Act 1974 (as of August 2000)  
Specification based on ISO and MS standards: for essential oils  
Malaysian Herbal Monographs  
Guidelines for standardisation of herbal medicinal products (National Committee for Research and Development in Herbal Medicine)  
GMP facilities for manufacturing of herbal products

## *Cymbopogon nardus*

In Europe,

Ceylon type citronella oil is placed in category 3 (The Council of Europe) (i.e. items with a safety concern associated with the active ingredient; with Ceylon type citronella oil there are limits on methyl eugenol content)

In the United States of America,

Food and Drug Administration has placed citronella oil on its list of chemicals that are generally recognized as safe (GRAS), also approved by the Flavor and Extract Manufacturers' Association (FEMA)

In Canada,

under the Food and Drugs Act (Part B, Division 10), considered safe as most flavouring substances, including essential oils such as (responsibility of the manufacturer as indicated in Part A, Section 4a)

## Cymbopogon nardus Cultivation

- subtropical and tropical regions
- annual rainfall of 2000-2500 mm
- sun loving, areas of 600-1500 m ASL
- various soil types though less suitable in clayey and sandy soils
- optimal soil pH is ~ 6.0
- 8 month-old plant separate into clumps of 1 to 3 tillers
- leaves are cut leaving a rooted stem of 25-30 cm in length
- clumps are planted in rows, clump spacing is 0.5 m, row spacing is 1.0 m density of ~20,000 clumps /ha
- Weed management - early growing stages preferably during the ground preparation
- - closer planting distance (e.g. 0.5 x 1.0 m)
- fertiliser applications - 400 kg/ha of NPK (15:15:15) applied in three stages could be implemented 100 kg/ha one month after planting, 150 kg/ha each three and five months after planting
- as a monocrop or intercrop with oil palm
- very few problems of pests and diseases.
- expected yield of fresh weight of leaves ~ 25-30 t/ha
- 2 harvest for year 1 and 3 harvests for the subsequent years until year 4 or 5.
- replanting is necessary after year 5 to retain optimum yield



Source: Abdul Rahman *et al.* 2005

## Cymbopogon nardus Pre- & Post -harvest

- harvested at 7 to 8 months (Abdul Rahman *et al.* 2005), some put the first harvest (for oil) after 70-80 days (Samy *et al.* 2005)
- cut about 5 cm above the leaf sheath (pseudostem) or 20-30 cm above ground
- allow to regenerate for subsequent harvest at intervals of 45 to 55 days or 3-4 months
- oil can be extracted by steam distillation of finely chopped fresh, dried or partly-dried (moisture content at 30-50%)
- Dry under the sun for 3-4 h or 1-2 days in the shade

Source: Samy *et al.* 2005; Abdul Rahman *et al.* 2005

*Cymbopogon nardus*  
Production of extracts/ABI

- Hydro-distillation
- Steam and steam-cum water distillation
- Supercritical Fluid extraction (SFE)
- Microwave-assisted distillation
- Solvent extraction
- Turbo extractor distiller

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*Cymbopogon nardus*  
Production of extracts/ABI



Steam-distiller at  
Perlis Essential Oils



Turbo extractor  
distiller at CEPP



Sources: CEPP, FRIM

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MS ISO





*Cymbopogon nardus*  
Production of extracts/ABI

By hydro-distillation



Source: FRIM



*Cymbopogon nardus*  
Production of extracts/ABI/Products

- Expected oil yield - 0.6% (fresh weight) or 300-360 kg oil /ha for year 1 and 450-540 kg oil/ha for subsequent years (Musa *et al.* 2005)
- Citronella oil - for production of insect repellent and toiletry products such as hair and body shampoos



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## *Cymbopogon nardus* Scientific information

- Scientific information:
  - Ethno-botanical information
- Oil from *C. nardus* is used for stomach discomfort and as digestion aid as well as an emmenagogue. An infusion or decoction of the leaves with those of banana (Golden Banana), *Genderussa* and *Piper betle* is used as an after-childbirth wash (Source: Burkill 1966; Samy *et al.* 2005)
  - Pharmacological studies
- Studies conducted include those on antibacterial, antifungal, acne control, insect repellency
- Essential oils of citronella, *Cymbopogon nardus* Rendle exhibited inhibitory activity of polyphenol oxidase (tyrosinase) responsible for the hyperpigmentation in humans and could be used as naturally occurring inhibitors for this enzyme (Ranasinghe *et al.* 2004)
- Zaridah and co-workers (Zaridah *et al.* 2003) investigated the larvicidal properties of essential oils of *C. nardus* from two locations and their LC50 values towards the late third instar larvae of *Aedes aegypti*

## *Morinda citrifolia* Scientific information

### Chemical information including known chemo-types

- Citronella oil is classified in trade into two types:  
Ceylon (Sri Lankan) citronella oil (from *Cymbopogon nardus* Rendle), and  
Java Type citronella oil (from *Cymbopogon winterianus* Jowitt)

#### The Ceylon type

- pale-yellow - yellowish-brown liquid
- contains 7-15% aldehyde and 55-65% total alcohol
- characteristic citronellal-like smell, a well rounded lemon citrus scent
- main constituents geraniol (18-20%), citronellol (6.4-8.4%), citronellal (5-15%), geranyl acetate (2%), limonene (9-11%), and methyl isoeugenol (7.2-11.3%)

#### The Java type

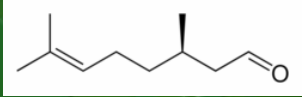
- clear, light-yellow to brownish liquid
- contains 30-45% aldehyde and 32-35% total alcohol
- fresh and sweet odour
- richer in geraniol and citronellal (max 85%)
- main constituents are citronellal (32-45%), geraniol (21-24%), citronellol (11-15%), geranyl acetate (3-8%), limonene (1.3-3.9%), elemol and sesquiterpene alcohols (2-5%)

Source: Anon. 2004

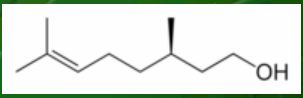
Three principle chemical constituents of citronella:  
citronellal, citronellol and geraniol

- **Citronellal** or **rhodinal** or **3,7-dimethyloct-6-en-1-al (C<sub>10</sub>H<sub>18</sub>O)**
  - a monoterpenoid, gives citronella oil its distinctive lemon scent
- **Citronellol**, or dihydrogeraniol
  - a natural acyclic monoterpenoid
  - (+)-Citronellol - common isomer
  - (-)-Citronellol - found in the oils of rose and geranium
  - Both enantiomers occur in nature, and is used in perfumes
- **Geraniol**, also called **rhodinol**
  - a monoterpenoid and an alcohol, occurs in small quantities in citronella oil, and many other essential oils
  - appears as a clear to pale-yellow oil, insoluble in water, but soluble in most common organic solvents
  - has a rose-like odour, for which it is commonly used in perfumes
  - used in flavours such as peach, raspberry, grapefruit, red apple, plum, lime, orange, lemon, watermelon, pineapple and blueberry

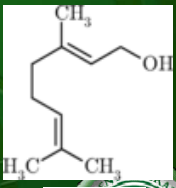
*Cymbopogon nardus*  
Scientific information




citronellal




citronellol




geraniol






- **Nor Azah and co-workers (2002) found some variations in the citronellal and geraniol proportion in the Malaysian grown *C. nardus* from two locations :**
  - location 1, geraniol (major, 44-46%); citronellal (21-27%)
  - location 2, geraniol (24-36%); citronellal (28-33%)
- **Safety data**
  - Citronella oil may irritate sensitive skin and cause dermatitis in certain individuals

*Cymbopogon nardus*  
Scientific information





## Cymbopogon nardus Scientific information

- Contraindications
- Interactions with other drugs
- Dosage
- Clinical trials
- People and projects and contact addresses

No information

☞ Dr. Nor Azah Mohd. Ali (Extraction and characterisation of essential oils; formulation and product development)  
Medicinal Plants Programme, Forest Research Institute Malaysia (FRIM),  
52109 Kepong, Selangor Darul Ehsan, Malaysia  
E: norazah@frim.gov.my

☞ Prof. Dr. Ibrahim Jantan

Department of Pharmacy, Universiti Kebangsaan Malaysia (National University of Malaysia), Jalan Raja Muda Abdul Aziz, 50300 Kuala Lumpur  
E: ibj@medic.ukm.my

☞ Abdul Rahman Azmil Idris and Ahmad Wahab  
Malaysian Agricultural Research and Development Institute (MARDI),  
P.O. Box 12301, 50774 Kuala Lumpur, Malaysia

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## Cymbopogon nardus

### – Monographs

- Malaysian Herbal Monograph Volume II (to be published)
- Patents
- Important publications
- Burkill, I.H. 1966. *A Dictionary of the Economic products of the Malay Peninsula*. Vol. I & II. Ministry of Agriculture, Malaysia. 2444pp.
- Indu Bala, J. & Ng, L.T. 1999. *The Green Pharmacy of Malaysia*. Malaysian Agricultural Research and Development Institute (MARDI), Kuala Lumpur.
- Musa Y., Muhamad Ghawas M. & Mansor P. (Eds.) *Cultivation of Medicinal and Aromatic Plants*, Malaysian Agriculture Research and Development institute (MARDI), Ministry of Agriculture and Agro-based Industry, Malaysia. 149 pp [in Malay].
- Nor Azah, M.A., Abu Said A., Abdull Rashih A., Mohd. Faridz Z. & Khozirah S. 1998. Chemical evaluation of the essential oils of *Cymbopogon nardus* from Peninsular Malaysia. In: Malaysian Science & Technology Congress 98. Symposium B: Agriculture, Biology, Marine, Medical & Social Sciences. Primula Parkroyal Hotel, Kuala Terengganu, 7-9 November 1198.
- Samy, J., Sugumaran, S. & Lee, K.L.W. 2005. *Herbs of Malaysia*. Edited by K.M. Wong. Times Edition. Federal Publications Sdn. Bhd. (General & Reference Publishing), Shah Alam. 244 pp.
- Wijesekera, R.O.B. 1973. The chemical composition and analysis of citronella oil. *J. National Sci. Council of Sri Lanka* 1: 67-81.

## *Morinda citrifolia*

- **Botanical name with authority and synonyms**  
*Morinda citrifolia* L.
- **Synonyms:**  
*Morinda bracteata* Roxb./ *Morinda littoralis* Blanco
- **Family** Rubiaceae
- **Common names in trade (local and foreign language)**  
Mengkudu (Malay), Indian Mulberry (Eng.), Noni (Hawaiian)
- **HS code (Harmonized Commodity Description and Coding System)**
- **Use**  
Fruit is used to make juice or puree/ Young shoots are eaten as a salad



## *Morinda citrifolia*

- **Volume of production in the country**  
0.7 mt/yr (2000)  
~1.73 tonnes per ha/yr (Department of Agriculture, 2002)
- **Volume of domestic consumption**  
No official figures available  
4.30 mt/yr (2000)  
0.70 mt/yr(local), 3.60 mt/yr (imported) (2000)  
Newspaper reported a company producing 1.5 million cans of health drinks required 1.5 tonnes per month (in 2001)
- **Volume of export**  
No official figures available
- **Average price**  
Fresh: MYR 1.00-2.00- per kg direct from the growers (2001); or MYR 2000 per tonne (fresh fruits), ~MYR 6/kg or MYR 6000/t (after 2001)
- **Trade points and contact addresses in the country: market, industry, association, cooperative, etc.**  
Golden Hope Research Sdn. Bhd.  
Organic Gain Sdn Bhd  
White Heron Pharmaceutical Sdn. Bhd.
- **Nature of plant material: wild, cultivated, organic**  
Wild and cultivated



## *Morinda citrifolia*

- **Areas of production in the country**
  - ~74 ha in 2002 (Department of Agriculture)
  - **Nature of plant products: crude, semi-processed and processed**
  - Processed – juice for health drinks
    - **Cultivation including organic farming**
  - Cultivated from seeds and stem cuttings
  - Unconfirmed reports from growers suggested poor performance of plants under plantation conditions, reasons unclear
  - Land preparation - must be cleared of any rubbish or tree stumps to reduce the risks of root infection
  - Ploughed 25-30 cm deep with a dish plough and two weeks later with a drill-like plough to break up the soil
  - Planting hole is approximately 0.3 x 0.3 x 0.3 m in size (Muhamad Ghawas 2005) and lime is added two weeks after the addition of Triple Super Phosphate fertiliser (TSP).
  - Planting materials - seedlings or stem cuttings
  - Planting distance - 3x 5 m (Muhamad Ghawas 2005)      667 trees/ha
  - Row distance of 5 m is for access of trucks and other machinery
  - Fruit production - begins 8 months after planting, harvesting every 20-25 days
  - First harvest yields about 1-2 t/ha and increases to ~18 t/ha in the subsequent years for up to 10 years
- (Source: Muhamad Ghawas 2005).

## *Morinda citrifolia*

- **Pre- and post-harvest treatment**
- Fruits form about 9 months after planting. This first crop is best discarded as the yield is poor (fruits are small and few). The plant should be pruned at this stage and possibly the following year. This pruning in the first and second year will give rise to bushier plants with more vertical and lateral branches and greater fruit yield. The expected annual yield from each plant is at least 25 kg.
- Fruits are picked before they begin to ripen, i.e. before they turn whitish-yellow. This allows ripening en route to the final destination. For local processing, the fruits are picked ripe or ~80% whitish yellow just before they fall naturally from the tree.
- A recent study by Rohani and Rosalizan (2006) established the harvest index for *M. citrifolia* based on the physico-chemical changes of the fruit during growth and maturation. Fruit maturation is determined by the changes in colour and four colour indices are established to indicate the stage of harvesting depending on the usage and maximum health benefits.
- After the fruits are picked, they are washed carefully to avoid injury to the skin before they are stored for further ripening.

## *Morinda citrifolia*

### – Conservation

- No special conservation programme
- Planted in *ex situ* conservation sites such as FRIM Ethnobotanic Garden, Rimba Ilmu, University Malaya, Research station of MARDI.
- This plant grows very easily along roadsides and on vacant land, and can easily be found growing in people's gardens or backyard in the rural or urban areas.

### – Production of extracts: “ABI” (Active botanical ingredient)

- Juice and puree are extracted from the fruits and processed into health drinks. The production is advised to follow **Hazard Analysis Critical Control Point (HACCP)** for nutraceuticals and juices.

### – Production of phyto-pharmaceuticals

- Mengkudu capsules, tablets, concentrate and juice

### – Production of herbal drugs

### • Scientific information:

### – Ethno-botanical information

- Fruit eaten as vegetable
- Ripe fruit eaten by women to regulate menstrual flow and to purify blood
- Fruit believed to treat diabetes
- Fruit pulp used to make shampoo as hair wash and to treat head lice
- Dried leaves used as a hot compress by the Malays for coughs, nausea and abdominal colic by placing on the chest and stomach
- Decoction of leaves to treat fever, dysentery and diarrhoea
- Root bark to treat hypertension, osteodynia and lumbago

## *Morinda citrifolia*

### – Pharmacological studies

- Potent **antioxidant** activity noted from neolignan and americanin A (Su *et al.* 2005) in DPPH and ONOO(-) bioassays
- Other activities investigated include **anti-tumour**, **cancer prevention**, **hypoglycaemic** activities (Hirazuni & Furusawa *et al.* 2003; Wang & Su 2001)
- Hrazuni and Furusawa (1999) investigated the **immunomodulatory** property of the polysaccharide-rich substance called **noni-ppt** from the fruit juice using the Lewis lung (LLC) peritoneal carcinomatosis model, they found improved survival time and curative effects occurred when noni-ppt was combined with sub-optimal doses of the standard chemotherapeutic agents, adriamycin (Adria), cisplatin (CDDP), 5-fluorouracil (5-FU), and vincristine (VCR), suggesting important clinical applications of noni-ppt as a **supplemental agent in cancer treatment**
- **Morindin** followed by acetylcholine or vice versa, increased heart beat frequency in isolated cockroach heart. It stimulated cardiac neurons by causing acetylcholine release and did not appear to affect cholinesterase at neuromuscular junction. When taken orally Proxeronine and Proxeronase combine in the intestine to produce xeronine. The alkaloid xeronine is physiologically very active and important for the proper function of all the cells in the body. It actually works at the molecular level to repair damaged cells. Anticancer activity of the fruit on intraperitoneally implanted lewis lung carcinoma in syngenic mice was observed. It acts indirectly by enhancing host immune system involving macrophages and/or lymphocytes. The compound **damacanthal** found in the fruit was found to be an inhibitor of Ras function.
- The fruit showed analgesic and behavioural effects. It is also effective against at least seven different kinds of harmful bacteria. It is a **natural antiseptic**. It is effective against fungus and parasites.

## *Morinda citrifolia*

### – Quality control including chromatographic finger-print profiling

- No data available
  - Chemical information including known chemo-types
- Morinda contains **antidepressant compounds** in the form of two sugars, **inulin** and **nystose**, as well as **succinic acid**, a compound created from simple sugars. Morinda also contains **xeronine**, which brings about a feeling of well-being by opening brain receptor sites to receive more endorphin hormone
- Ripe fruit contains anthrawuinone, morindone, rubiadin, and asperulosid
- Some recently isolated compounds include the **iridoid glucosides**, 6 alpha-hydroxyadoxoside and 6beta 7β-epoxy-8-epi-splendoside Others are americanin A, narcissoside, asperuloside, asperulosidic acid, borreriagenin, citrifolinin B epimer a, citrifolinin B epimer b, cytidine, deacetylasperuloside, dehydromethoxygaertneroside, epi-dihydrocornin, d-glucose, d-mannitol, methyl alpha-d-fructofuranoside, methyl beta-d-fructofuranoside, nicotifloroside, and β-sitosterol 3-O-beta-d-glucopyranoside  
(Source: Su *et al.* 2005)
- Liu and co-workers (2001) identified two novel glycosides from the fruit juice, namely 6-O-(beta-D-glucopyranosyl)-1-O-octanoyl-beta-D-glucopyranose and asperulosidic acid
- Hirazumi and Furusawa (1999) discovered from the fruit juice a polysaccharide-rich substance (noni-ppt) with that exhibited antitumour activity in the Lewis lung (LLC) peritoneal carcinomatosis model.

## *Morinda citrifolia*

### – DNA finger-printing

No published data available

### – Safety data

- Ingestion of noni juice by patient with chronic renal disorder could lead to hyperkalemia (Mueller *et al.* 2000). It was also reported that noni juice caused hepatotoxicity (Millonig *et al.* 2005)
  - Contraindications
- No information
  - Interactions with other drugs
- No information
  - Dosage
- No information
  - Clinical trials
- No clinical trials conducted in Malaysia.
  - Registration status
- For health drinks (concentrate and juice), follow the registration guidelines under the Food Act 1983 and Food Regulations 1985.
- For herbal products (capsules and tablets), follow the guidelines under the Control of Drugs and Cosmetics Regulations 1984

## *Morinda citrifolia*

### – People and projects and contact addresses

- Sporadic research on anti-oxidant, anti-inflammatory, anti-diabetic and anti-malarial properties of *M. citrifolia* had been conducted by researchers in research institutes and universities in Malaysia.
- Researchers who had worked on this species:
- Noor Rain, A., Dr. (anti-malarial)
- Institute for Medical Research (IMR)
- Vimala Subramaniam, Ms. (anti-oxidant)
- Forest Research Institute Malaysia (FRIM)
- Azizah Abdul Hamid, Dr. (anti-oxidant)
- Department of Food Science, Faculty of Food Science and Biotechnology, Universiti Putra Malaysia (UPM) Latifah Saiful Yazan, Ms. (anti-cancer)
- Faculty of Medicine and Health Sciences, UPM
- Hamdan Noor, Dr.
- Department of Biology, Faculty of Science, UPM
- Umi Kalsom, Y., Dr. (anti-diabetic)
- Department of Biology, Faculty of Science, UPM
- Maskat, M.Y., Dr. (Processing)
- Food Science programme, School of Chemical Sciences and Food Technology, Faculty of Science and Technology, Universiti Kebangsaan Malaysia

## *Morinda citrifolia*

### – Monographs

- Malaysian Herbal Monograph Volume 2 (in press)
  - Patents
  - Important publications
- Burkill, I.H. 1966. *A Dictionary of the Economic products of the Malay Peninsula*. Vol. II. Ministry of Agriculture, Malaysia. P. 1518.
- Muhamad, Z. & Mustafa, A. M. 1994. *Traditional Malay Medicinal Plants*. Penerbit Fajar Bakti Sdn. Bhd., Kuala Lumpur.
- Levand, O. & Larson, H.O. 1979. Some chemical constituents of *Morinda citrifolia*. *Planta Medica* 36: 186-187.
- Indu Bala, J. & Ng, L.T. 2000. *Herbs, the Green Pharmacy of Malaysia*. Vimpress, Kuala Lumpur.
- Samy, J., Sugumaran, M. & Lee, K.L.W. 2005. *Herbs of Malaysia*. Edited by K.M. Wong. Times Editions. Federal Publications Sdn. Bhd., Kuala Lumpur.
- Wang, M-Y, West, B., Jensen, J., Nowicki, D., Su, C., Palu, K. & Anderson, G. 2002. A literature review and recent advances in Noni juice research. *Acta Pharmacologica Sinica* 23: 1127-1141



## *Phyllanthus niruri*

- Botanical name with authority and synonyms  
*Phyllanthus niruri* L.
- Synonym: *Phyllanthus amarus* Schumach & Thonn.
- Family: Euphorbiaceae
- Part used: Whole plant, leaves
- Common names in trade (local and foreign language)
- Bhumyamalaki, Bahupatri (Sanskrit); Jaramla, Jangli amla, Bhuinavalah, Bhonyabali (Hindi); Bhui amla, Sadahazur-mani (Bengali); Bhuivali (Marathi); Bhonya anmali (Gujarat); Nela usirika (Telugu); Keela nelli (Tamil); Nela nelli, Kiranelli gida (Kannada); Kizha nelli (Malayalam); Bhui aola, Badianla (Oriya) Chanca piedra (Spanish); Stone-breaker (Eng.); Dukong anak (the child pick-a-back, from the position of the fruit on the back of the branches), Dukong-dukong anak, Amin buah, Rami buah, Turi hutan (Malay); ye-xia-zhu (Chinese [beads below the leaves])

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## *Phyllanthus niruri*

- **Volume of production in the country**
- No official data. But a company that is producing the herbal drug is planting its own.
- **Volume of domestic consumption**
- **Volume of export**
- **Average price**
- Trade points and contact addresses in the country: market, industry, association, cooperative, etc.
- Nova Laboratories Sdn Bhd
- Office
- 48A, Main Road, 43950 Sg. Pelek, Sepang, Selangor, Malaysia
- Tel : (603) 3141 3181, 3141 1115, 3141 2876 Fax : (603) 3141 1661
- Factory
- Lot 11195 Tuanku Jaafar Ind. Est, Seremban, Malaysia
- Tel : (606) 6777 015

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## *Phyllanthus niruri*

- Nature of plant material: wild, cultivated, organic  
Cultivated
- Areas of production in the country  
<200 ha (unverified)
- Nature of plant products: crude, semi-processed and processed  
Semi-processed: extract  
Processed: products

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MS ISO 9001:2000



## *Phyllanthus niruri*

### – Cultivation including organic farming

- Grows in various soil types but mainly in soil with higher sand component such as bris soil, ex-tin mining land and alluvial
- Needs enough water to grow well best suited to areas with monthly rainfall of 180 mm
- Optimum soil pH range is 5.0-6.0.
- Raised beds should be 25-30 cm high and the distance between beds should 120 cm. In areas with higher water table, the beds should be constructed higher to avoid flooding.
- *Phyllanthus niruri* is planted from seeds.
- Raised beds are lined with black plastic sheets to discourage the weeds.
- Seeds are very small, ~ 3000 to 4000 per gram of seeds. With the suggested bed size, it needs 30-40 g seeds per ha to give a density of ~83,000/ha
- Seeds germinate in 5 days and the seedlings are ready for planting 7 days later
- Height of seedlings at this time is about 10-15 cm
- Organic fertilizer such as chicken manure can be applied before planting. Depending on the soil type, the drip irrigation system is recommended
- The plants are ready for harvesting after 8-10 weeks.

(Source: Musa *et al.* 2005)

## *Phyllanthus niruri*

### – Pre- and post-harvest treatment

- After 8-10 weeks, the plants are ready for harvesting. The plants can be harvested by cutting the plant ~5 cm above the ground. The harvested materials can be collected in bamboo or rattan or plastic baskets.
- Post harvest handling is very important in retaining the quality of the raw materials. The harvested materials must be dried as soon as possible. For small scale production, the materials can be dried under shade or in a well ventilated shed for 3-4 days. On a commercial scale, the materials are dried in ovens ( $\leq 40^{\circ}\text{C}$ ) or a drying room. The dried materials should have ~10% moisture content (Musa et al. 2005) and stored in airtight containers.

### – Conservation

- Planted in herbal and private gardens. There is no special conservation programme for this species.
  - Production of extracts: “ABI” (Active botanical ingredient)
  - Production of [phyto-pharmaceuticals](#)
  - Production of herbal drugs

## *Phyllanthus niruri*

### • Scientific information:

#### – Ethno-botanical information

- *Phyllanthus niruri* is a native to the Americas (van Holthoon 1999). The Spanish name of the plant, *chanca piedra*, means “stone breaker”. It was named for its effective use by generations of Amazonian indigenous peoples to eliminate gallstones and kidney stones (Virtual Health 1998). In addition to kidney stones, the plant is also used in the Amazon for numerous other conditions including colic, diabetes, malaria, dysentery, fever, flu, tumors, jaundice, vaginitis, gonorrhea, and dyspepsia.
- The Malays use *P. niruri* internally for diarrhea, kidney trouble, gonorrhoea syphilis, and miscarriage. The young leaves are used to treat coughs especially in children (Ridley in Burkill 1966, Burkill & Haniff 1930) The juice or extract of its thinner roots and young leaves are taken internally to stimulate the kidneys (Burkill 1966). Heyne (in Burkill 1966) recorded its uses in the Dutch Indies (Indonesia) for stomach-ache, gonorrhoea and children’s cough. In India,

– **Pharmacological studies**

- *Phyllanthus* blocks DNA polymerase, the enzyme needed for the hepatitis B virus to reproduce. In one study by Thyagarajan and co-workers (1988), 59% of those infected with chronic viral hepatitis B lost one of the major blood markers of HBV infection (e.g., hepatitis B surface antigen) after using 900 mg of phyllanthus per day for 30 days. In a later study, Ott and co-workers (1997) demonstrated that exposure to *P. amarus* inhibited C/EBP alpha- and beta-mediated up-regulation of HBV enhancer I activity in a dose-dependent manner. While clinical trials on the effectiveness of phyllanthus for HBV have been mixed, the species *P. urinaria* and *P. niruri* seem to work better than *P. amarus*.<sup>4</sup> Clinical trials with hepatitis B patients have used 900–2,700 mg of phyllanthus per day.
- Liemer and co-workers (2003) show that the standardized extracts of *P. amarus* inhibit the induction of iNOS, COX-2, and TNF-alpha.

- **Quality control including chromatographic finger-print profiling**
- **Chemical information including known chemo-types**

- Phyllanthus primarily contains lignans (e.g., phyllanthine and hypophyllanthine), alkaloids, and flavonoids (e.g., quercetin).
- phyllanthin, hypophyllanthin, gallic acid, and ellagic acid
- Many of the "active" constituents are attributed to biologically active lignans, glycosides, flavonoids, alkaloids, ellagitannins, and phenylpropanoids found in the leaf, stem, and root of the plant. Common lipids, sterols, and flavonols also occur in the plant.
- securinega-type alkaloids, isobubbialine and epibubbialine, were isolated from the leaves of *Phyllanthus amarus*, as well as the three known alkaloids, phyllanthine, securinine and norsecurinine (Houghton *et al.* 1996)



## *Phyllanthus niruri*

- **DNA finger-printing**
- **Safety data**
- **Contraindications**

- It may be contraindicated for some individuals with heart conditions and/or heart medications
- At high dosages, it has been considered in herbal medicine to be abortive as well as a menstrual promoter. Animal studies do indicate it has uterine relaxant effects & should therefore be considered contraindicated during pregnancy
- It is contraindicated for people with hypoglycemia & diabetics should consult their doctor before taking this plant as insulin medications.
- Chronic and acute use of this plant may be contraindicated in various other medical conditions where diuretics are not advised. Chronic long-term use of any diuretic can cause electrolyte and mineral imbalances. Human studies with chanca piedra (for up to three months of chronic use) has not reported any side effects. Any person intend to use this plant chronically for longer than three months should be concern for side effects and should consult a doctor

## *Phyllanthus niruri*

- **Interactions with other drugs**
- **Dosage**
- **Clinical trials**

- None reported
- Clinical studies have been conducted in Brazil, Germany and China in the 1990s on the use of the herb (and related species) in treating kidney stones and Hepatitis B infection (HBV)
- Clinical studies conducted in Brazil by the Paulista School of Medicine in São Paulo, in 1990, with humans and rats with kidney stones Nicole Maxwell reported in the same year (1990) that Dr. Wolfram Wiemann (of Nuremburg, Germany) treated over 100 kidney stone patients with chanca piedra obtained in Peru and found it to be 94% successful in eliminating stones within a week or two
- A Chinese research group in China reported on the positive anti-HBV results using a straight water extract and/or herb powder with human HBV patients in 1994 and 1995
- However, more studies are needed to settle the confusing and at time contracting results from the various studies. It is also pointed by Taylor (2005) that studies should adopt a standardized format so that the results are comparable and the importance of using the same species for the studies

(Source: Taylor 2005)

## Phyllanthus niruri

### – Patents

- **1. AN ENRICHED FRACTION PREPARED FROM PHYLLANTHUS AMARUS FOR THE TREATMENT OF HEPATITIS AND THE PREPARATION THEREOF**
- **Publication number:** WO0056347
- **Publication date:** 2000-09-28
- **Inventor:** PREMILA MANAKKAL SIVARAMAN (IN); JANARDHAN PALA BUSHANAM (IN); KUMARAN ALAGANANDAM (IN)
- **Applicant:** SOUTHERN PETROCHEMICAL IND COR (IN); PREMILA MANAKKAL SIVARAMAN (IN); JANARDHAN PALA BUSHANAM (IN); KUMARAN ALAGANANDAM (IN)
- **Classification:**
  - **international:** (IPC1-7): A61K35/78
  - **European:** [A61K35/78](#)
- **Application number:** WO2000IN00029 20000323
- **Priority number(s):** IN1999MA00339 19990324
- **2. Method for the production of phyllanthus extracts**
- **United States Patent:** 7,074,436
- **Inventors:** Kreuter; Matthias-Heinrich (Walenstadt, DE), Wagner; Hildebert K. M. (Breitbrunn a. Chiemsee, DE), Tittel; Gerolf (Grafelfing, DE)
- **July 11, 2006**
- **Important publications**
- Burkill, I.H. 1966. A dictionary of the economic products of the Malay peninsula. Revised reprint. Volume II. Ministry of Agriculture and Cooperatives, Kuala Lumpur, Malaysia. Pp.1748-1748.
- van Holthoon, F.L. 1999. Phyllanthus. In: de Padua, L.S., Bunyaphatsara, N. and Lemmens, R.H.M.J. (Editors). *Plant Resources of South –East Asia No. 12(1). Medicinal and poisonous plants 1*. Backhuys Publishers, Leiden, the Netherlands, pp.381-392.
- Taylor L. 2005. *The Healing Power of Rainforest Herbs*. <http://www.rain-tree.com/chanca.htm> (Accessed on 26/12/2006)

## Remarks

- Lack of updated data in particular on cultivation, trade figures (export/ import) of specific MAP
- Limited access to certain journals to get updated information on scientific investigation (QC with fingerprint profile, DNA finger-printing, Safety data, Contraindications ), clinical trials etc.

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MS ISO 9001:2000



# Thank you

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