

NEEM

(*Azadirachta Indica*)

Local Names: Assamese: Nim, Bengali: Nim, Neemgachh, English:Neem, Indian Lilac, Margosa Tree, Paradise Tre, White Cedar, Chinaberry, Gujrathi: Limba, Limdo, Leemgo, Kohalu Limdo, Kohumba, Libado, Leemdo, Nimuri,Hindi: Nim, Nimb, Bal-nimb, Neem, Nind, Kannada: Bevinamara, bevu, Hebbevu, Kiri-bevu, Kai-bevu, Kadbevina-mara, Nimb, Olle, Val-venu, Venu, Konkani: Ni m, Malayalam: Aryaveppu, Veppu, Aryaveshnu, Rajavedhu, Vepe, Marathi: Kadu khajur, Limba, Limb, Nimbay, Bakayan, Balanti-limb, Bal-nimb, Likbacha-jhada, Kadu-limba, Nimuri, Oriya: Kakopholo, Limbo, Nimbu, Nimo, Punjabi: Bakam, Bukhain, Drekh, Nim, Neem, Mahaneem, Darkoha (fruit) Rajasthani: Neem, Neemro, Sanskrit: Arishta, Nimba, Nimbaka, Tamil: Aruhundi, Kaduppagal, Kaingi, Vembu Veppam, Nimbamu, Nim-banu, Taruka, Veepachettu, Vempa, Vepa, Veppa, Telugu: Nimbanuv, Vepa, Yeppa, Yapa, Yapachattu, Taruka, Vemu,Urdu: Neem.

Occurrence: Wildy grown in Deccan Forests and in any soil and climatic conditions below 3500 altitude. In India Uttar Pradesh, Tamilnadu, Karnataka, Madhya Pradesh, Maharashtra, Andhra Pradesh, and Gujrath are important Neem producing states. There are about 14 million Neem Trees in the country. Neem is an ever green and deciduous tree in dry areas and it has straight trunk and long spreading branches forming a broad round crown and hence grown as Avenue tree. Bark is moderately thick, Height 40-60 feet, Girth 35-74 inches, matures in 10 to 15 years. All parts of tree are bitter and medicinal, has religious significance. Fruits bearing in 4-5 years continues for about 100 years. A spacing of 8.0 X 8m is recommended to establish 150 tress per hectare. It is an ideal species for planting along road sides, canals, around farm boundary to establish an effective wind break. Average tree is 8m tall, gives about 350 kg of dry leaves. Fruit yield per tree, per year is 31 to 55kg. Fresh fruit gives on an average 60% of dry fruit of which Seed constitutes 40%, Kernel 17% of Seed.

In India it is said that, where there are large number of Neem trees, there are no diseases.

Wood: Good Timber, preferred for making idols and Agricultural implements.

Leaves: Profuse and useful in reducing intensity of sound and for refreshing the air, good fodder.

Flowers: February-March in South, March-April in North. Small, white in clusters with fragrance.

Fruits: Mature in May-June in South and June-July in North India. Green and Yellow when ripe. Yield per tree 37 to 55 kg. Driage is 50-51%

Trees: 10-12 years old Tree yield 5-8 kg Seed, 20 years and above 20-30kg every year. Yield depends on rainfall of 'Previous Year' and well drained deep soils with adequate moisture enhance tree growth and fruit yield.

Propagation: Transplantation of stumps is well known in India. These are prepared from 2-year-old seedlings and are subsequently planted in 30 Cu.Cms pits. Root-ball transplantation is another good method where one year-old seedlings are carefully uprooted along with a ball of soil around the roots and transplanted as soon as possible.

Apart from other techniques, tissue culture techniques have also been tried to propagate the plant which showed some encouraging results such as differentiation of growth centres in callus, root formation in M S medium containing IAA, and callus formation in some African progeny which may provide a basis for future research .

Neem Seeds have considerable economic significance due to a variety of commercial usages. Quality of Seed determine the commercial value. One tonne of neem seed is processed, it gives 1.5 Kg of Azadirachtin 200 kgs of neem oil and 780 kg of neem cake.

Neem is one of the plant species that possesses the combination of most of the pest control properties like antifeedant, repellent, chemosterilant, attractant, juvenile and anti-juvenile and anti-juvenile hormone, moulting and anti-moulting hormone, ovicide, nematicide, rodenticide, anti-viral, fungicide and bactericide. These multifaceted biological effects and pest enable neem products to control more than 200 different species of insects.

The ever increasing dosage of synthetic insecticides to combat resistance problem coupled with high cost and depleting natural reserves make synthetic insecticides an unprofitable input in Agriculture. Thus a cheap source, which is easily available, renewable and effective to cut down the input cost, is needed.

Neem is a renewable source of various useful products-seeds and leaves being of particular interest. A fully-grown tree yields about 50 kg fruits and about 350 kg leaves annually (Parmar and Ketkar, 1993). From about 14 millions neem trees that grow in India, 0.7 million metric tones of fruits and about 5 million metric tones of leaves, besides, 83,000 tonnes of Neem oil and 3,30,000 tonnes of Neem cake are expected to be produced annually.

Neem Fruit Production in A.P
(Estimated- Qty in M.Tons)

District	Production
Mahabubnagar	4,000-4,500
Medak	4,000
Nalgonda	3,000
Warangal	2,000
Khammam	2,000
Ananthapur	400-500
Chittoor	500
Vizianagram	200-300
Srikakulam	400-500
Total	16,500 - 17,300

Neem Composition :

A. Neem Fruit (fresh):

1. Greenish Brown Kernels - 30%
2. Other Shell, Pulp etc., - 70%

B. Neem Seed:

- | | | |
|--------|---|-------|
| Shell | - | 55.3% |
| Kernel | - | 44.7% |

C. Neem Kernel Oil Content: - 46-48%

D. Other Ingredients:

1. Azadirachtin - 0.3%
2. Nimbidin - 1.2 - 1.6%
3. Nimbin - 0.1%
4. Nimbinin - 0.01%
5. Vepinin - 0.15%

On an average, Kernels contain between 2 and 3 mg., of Azadirachtin Per gram of Kernel. Indian Neem tree is the gold mine for treating ailments of the wound.

Mineral Constituents of Neem Kernels: Neem Kernels collected from different Agro - eco zones, when analysed for minerals were found to contain: Calcium 0.2 - 0.4%, magnesium 0.29 - 0.46% and phosphorus content 0.24 - 0.38% and Oil is around 40%.

Many of the seed collectors are not fully aware of the quality standards and essential steps for collecting Neem Seed. In view of this their collection do not result in getting remunerative prices.

Methods for Obtaining Quality Neem Seed:

A. Collection:

Naturally Ripened fruits drop on the ground are to be collected within 1-2 days for further processing.

1. Fruits with yellowish colour should be harvested.
2. Fruits should be harvested by shaking tree branches as well as by plucking fruits and if possible spread a cloth, tarpaulin under the tree.
3. Fresh fruits should be collected in the morning.
4. Fruit should be transported in baskets and or gunny bags.
5. These fruits should not be mixed up with semi dried fruits collected through Sweepings. Moisture in Commercial Neem Fruits to be 6-9% and after drying 5%.

B. Depulping:

1. Collected fruits should be kept immediately in warm water to avoid fungal growth. These fruits may be kept in water from 12-24 hours to further soften the pulp.
2. Such Water soaked fruits should be macerated with the help of gunny bags.
3. Mechanised scrubbers, macerators and washers can also be used for larger quantities.
4. Depulping can also be done manually by rubbing and washing the detached pulp.
5. A simple alternative is to dump the fruits in ash or soil for a couple of days followed by trampling, rubbing and winnowing.

C. Drying:

1. Seed should be spread in thin layers for drying.
2. Jute gunny bags or perforated sheets should be used for drying seed.
3. Small tray driers using hot flue gases from a furnace have also been fabricated.
4. Sun drying in open space / or Partially covered space is preferable. However, in cloudy, rainy weather use of Fans, and hot air blowers are suggested.
5. In dried seed moisture level of 9 - 15% is reasonable (as against 40 - 50% moisture at the time of collection of fruits).
6. Germination rate of fresh seed is 90% which would drop to 40% in 30 days and less than 5% in 60 days.

D. Storage:

1. Cold Storage of seed prolongs its shelf life.

2. Dried Seed should be stored in airy containers, jute bags or perforated bags at room temperature under moisture free conditions: can be stored up to one year but never store in plastic bags.

After collection and drying of seed Immediate transport arrangements should be made for its processing.

E. Processing / Extraction:

Decortication is invariably done. Hand or power operated small, mobile decorticators can be used. Decorticator gives dried fruits 70% shell, 25% kernel and for depulped seed 45% shell 50% kernel, windage loss 4 - 5 %. Maximum oil yields after 2 - 5 months of collection. Use of decorticators fabricated by Khadi and Village Industries Commission proved to be very successful.

	Crushing	Whole Fruit	Developed Seed	Kernel
Oil	- In ghani	-	-	25-35%
Yield	- In expeller	4-6%	12-16%	30-40%

Uses: All parts of Neem Tree are useful

1. **Bark:** Contains about 10 - 12% tannins, a chemical required by leather industry. Use of Bark includes as tonic, antipyretic, thrust, nausea, vomiting, skin diseases and ulcer.
2. **Timber:** One cubic metre of wood weighs about 925kg., Used for constructing door panels, carts and toys, ship building, charcoal making. Wood is termite resistant and hence used for making cup-boards, trunks, to provide protection to stored material. The germicidal properties of Neem coupled with release of high amount of oxygen by the tree can also improve the neighborhood.
3. **Leaf:** Leaves are sharpened. The colour varies from light to dark green measures 6-8cms in length. Used as Antiseptic, Ear ache, Glandular tumor, Postural eruptions (specially in the eruption of small pox, Jaundice, prurigo, [eruption of skin causing itching]) boils and liver secretion. Given as cattle / goats feed to increases milk. Juice of fresh leaf is given in Jaundice, Prurigo and boils. Externally these are applied to glandular tumors and pustular eruptions. It is common ingredient of drug formulations prescribed in helminthiasis and leucoderma.
4. **Neem Oil:** Estimated potential of oil is about 3.50 lakh tones @10% Neem of oil from 3.50 million tones Seed / Kernel. Used to cure diseases related to glands, leprosy, ulcers, rheumatism (external application), Hair tonic, Sore throat, Soap production, medicines, pesticides and coating urea to reduce

nitrogen loss in fertilized soil. Used in medicated soaps, both pastes and washing soap etc. Colour is dark, bitter and has disagreeable odour.

Nimbidin: A compound present in the Seed oil 'nimbidin' was found effective against many skin diseases, pyorrhea, bleeding gums and sore throat. It is also diuretic (drug increases flow of urine), lotions, paste and tooth pastes, prepared according to usual prescriptions have proved effective in the treatment of pyorrhea (disease of gums, tooth, sockets which causes bleeding of gums and formation of pus).

5. **Branches:** Twig / Sticks have antiseptic and refreshing qualities when used as a chewing sticks.
6. **Flower:** Stimulant tonic, atonic dyspepsia (Indigestion).
7. **Gum:** Stimulant and tonic.
8. **Cake:** Manurial - Nitrogen 5.22%, P - 1.08%, K - 1.48%. It contains more sulphur than any other cake. Good manure and pest repellent. 20% of cake with urea for paddy, sugar cane etc., useful for nitrogen economy. As feed up to 3% in a feed mix for cattle, debitterized processed meal an agreeable poultry feed. Neem coated urea is as effective as sulphur coated urea, lac coated urea. Cake after removal of the active compounds has about 28% Protein and can be used as cattle feed.
9. **Neem as Pesticide:** Sensing the value of neem by its invaluable and incomparable chemical molecules useful in pest control and health a number of countries took intensive research on neem and found it really, suitable for the present scenario of the pest infestation. Countries like USA, UK and Europe have now developed an array of about 40 products out of neem tree for use in Agriculture in field and storage and medicine.

For Centuries, parts of neem have been used as allelo chemicals in plant protection, soap, dentifrice and medicines. Scientists at the National Institute of Immunology, New Delhi discovered that neem oil has principles that can be used as Spermicide and Abortifacients. This has subsequently resulted in patents in India.

The tree's most important use is as a biopesticide. Neem has more than 60 valuable compounds, among which the widely used is Azadirachtin-A which has been identified as the key compound which acts as an insect antifeedant, repellent and an inhibitor of ecdysis and growth. About 300 insect species can be managed with the Aza-A. It is therefore observed that Azadirachtin can be a suitable alternative to the chemical pesticides. Studies conducted in the past 20 years revealed that Neem has diverse biological effects on insects. It acts as a repellent in feeding and oviposition, deterrent arrests growth of developing stages, causes, sterility and also has mild direct

toxicity. No other plant / synthetic substance is known to have such a diverse activity against insects. Experiments revealed that more than 250 insect species have already been reported susceptible to neem extracts. In India alone, Neem has been evaluated against 105 insects species of the various biological effects of Neem on insects.

Neem has also been found to possess nematicidal and fungicidal properties. About a dozen nematodes have already been reported to be susceptible to Neem. Soil treatment with Neem Cake, has given effective control of *meloidogyne incognita* in tomato. Cardamom growers regularly use Neem cake for management of nematodes.

Any effort in conserving the Soil moisture in Neem plantations on waste lands will improve the seed yield which will be a sustainable source of income for the rural people.

A German Patent describes a dental composition containing meal or extracts of wood, bark or leaves useful for preventing and curing Gingivitis and Periodontis.

Neem blended urea has proven useful for sugarcane crop. From economic point of view 30kg + 140kg Neem cake gives high yield with higher net returns. In case of cotton, Neem cake application (20%) has been beneficial in increasing cotton yield.

Neem cake serves as a significant source of cattle, sheep and poultry feed. Neem Seed meal rich in protein was palatable to buffalo at a 25% concentration. Neem Seed cake feeding during lactation at 10-20% concentration without any side effect on the milk constituents. Deoiled Neem cake could be incorporated up to 25 - 50% in a Maize diet for sheep without toxic effects.

Major Neem based products for improving nitrogen efficiency are: "Neem Manure" from M/s. Swastic Chemicals Works, Mumbai, "Wellgro" from M/s. ITC (I) Ltd., Rajhamundry. Neem extract coated urea and "Nimin" (urea coated with Neem triterpenes) from M/s. Godrej Soaps Ltd., Mumbai, "Jeevan" soil conditioner from M/s. MCDA Agro Pvt. Ltd., Mumbai, "Humigold" from M/s. Fertiplant Engineering Co., Humigold division, Mumbai, Neem Cake mixed NPK from M/s. Jaisingpur Mills Kolhapur, Maharashtra. Cardamom Plantations in Kerala alone consumes about 3000 tones of cake.

Neem Oil Properties:

- | | | |
|-----------------------------|---|-------------------|
| 1. Colour | - | Greenish Brown |
| 2. Odour | - | Garlic repulsive |
| 3. Refractive index at 40°C | - | 1.14617 - 1.46270 |
| 4. Specific Gravity at 30°C | - | 0.9087 - 0.9189 |

5. Titer °C	-	35 - 36
6. Iodine Value	-	68.0 - 75.8
7. Saponification Value	-	193-204
8. 1 NS. No.	-	128
9. Unsaponifiable Matter	-	0.8-2.4%

<u>Fatty Acids</u>	<u>Percentage</u>
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1. Myristic Acid	0.2 - 2.6
2. Arachidic Acid	0.8 - 3.4
3. Linoleic Acid	2.3 - 15.8
4. Palmitic Acid	13.6 - 16.2
5. Stearic Acid	14.4 - 24.1
6. Oleic Acid	49.1 - 61.9

Components weight in fruit (percentage):

Pulp and Skin	-	48%
Seed	-	35%
Kernel	-	17%

Kernels constituting about 45% of the seed contain 40% to 45% oil.

NEEM PRODUCTS AND THEIR METHODS OF USAGE IN AGRICULTURE

Neem Kernal Extract: 50 gm of neem kernel is required for use in 1 litre of water. The neem kernel is pounded gently. It should be pounded in such a way that no oil comes out. The outer coat is removed before pounding. This is used as a manure. If pounded with seed coat one and half times (75 g) seeds are required. The seeds that are used for preparation of neem kernel extract should be atleast 3 months old and should not be used after 8 to 10 months. Before 3 months or after 8 months the azadirachtin quantity is quite low in the seeds and hence it cannot be efficiently used for pest control. The pounded neem kernel powder is gathered in a muslin pouch and this is soaked overnight in the water. The pouch is squeezed and the extract is filtered. To the filtrate an emulsifier like tween 80, sandovit, soap oil, nirma or soap cake powder is added. One ml of emulsifier is added to one litre of water. The emulsifier helps the extract to stick well to the leafsurface.

Neem Leaf Extract: For 5 litres of water, 1 kilogram of green neem leaf is required. Since the quantity of leaves required for preparation of this extract is quite high (nearly 80 kilograms are required for 1 hectare) this can be used for nursery and kitchen gardens. The leaves are soaked overnight in water. The next day the leaves are ground and the extract is filtered. The extract is beneficial against leaf eating caterpillars, grubs, locusts and grasshoppers. To the extract, emulsifier is added as mentioned for kernel extract.

Neem Cake Extract: 100 gms of neem cake is required for 1 litre of water. The neem cake is put in a muslin pouch and soaked in water. It is soaked overnight

before use in the morning. It is then filtered and emulsifier is added at the rate of 1 ml for 1 litre of water. It is now ready for spraying.

Neem Oil Spray: 30 ml neem oil is added to 1 litre of water and stirred well. Only then will be oil and water mix well. To this emulsifier is added (1 ml/1 litre): It should be used immediately. Otherwise oil droplets start floating. A knapsack sprayer is better for neem oil spraying in preference to a hand sprayer.

Spraying:

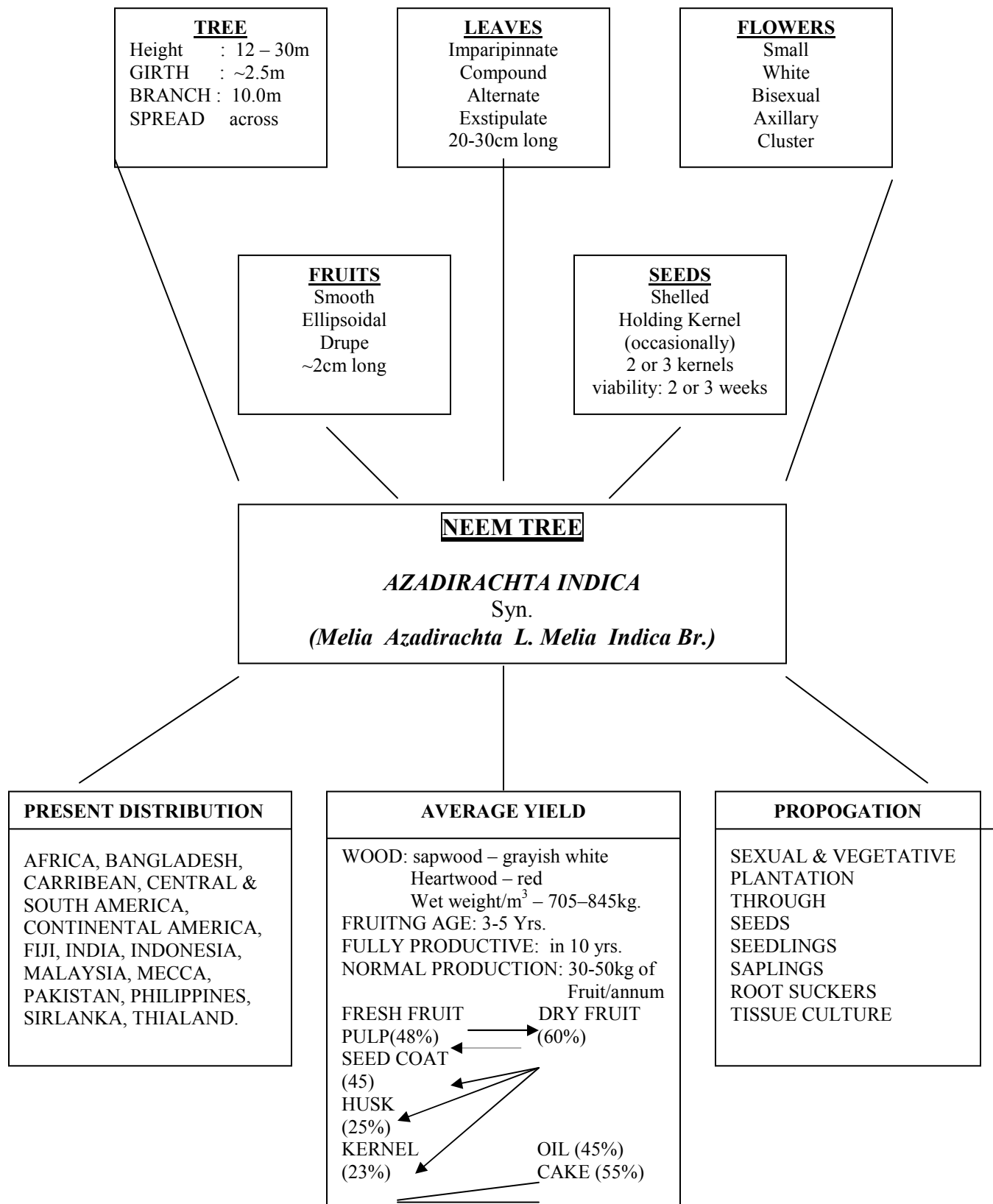
- Spraying should be undertaken in the morning or late in the evening. During hot conditions the frequency of spraying should be more. In winter spraying once in 10 days and in rainy season everyday spraying is recommended.
- Insects lay eggs on the underside of the leaves. Hence it is important to spray under the leaf also.
- While using a power sprayer reduce the quantity of water used to half.
- It is better to use low concentration of extracts frequently.
- As a general guideline it can be said that each acre of land to be protected can be sprayed with 60 liters of ready to use solution (not the concentrate). Of course the volume may have to be varied depending on the exact condition such as the intensity of the pest attack.

Domestic Markets:

Andhra Pradesh	Tamilnadu	Karnataka
1) Mahabubnagar 2) Jedcherla	Salem Dindigal	Bangalore Tumkur
3) Shadnagar 4) Nalgonda 5) Bhongir 6) Vikarabad 7) Pargi 8) Tandur 9) Warangal 10) Jangaon 11) Hyderabad 12) Jogipet 13) Zaheerabad 14) Ongole 15) Khammam	Madurai Thene Thirunamalai	

Exports: Neem oil is exported to Malaysia, Sri Lanka, Nepal and U.S.A. and Neem cake to Malaysia, Taiwan, Japan and U.A.E.

At Collection point Market Prices for Neem Fruit hangs between Rs .0-50 to Rs.1-50 and for Seed Rs.2/- to Rs.2-50 per Kg. Most of the material is going to Karnataka, Tamilnadu and Kerala for oil extraction and use in making Bio-Pesticides.



(Ref: Supplement to Cultivation and Utilization of Medicinal Plants – Regional Research Laboratory, CSIR, Jammu - Dr. S.S.Honda and Dr. M.K. Kaul)

Manufactures of Neem based Pesticides:

1. ITC Agro-Industries,

7) EID parry(India)Ltd.,

- 31, Sarojini Devi Road,
Secunderabad - 500 003,
Andhra Pradesh
2. Tata Oil Mills Ltd.,
Bombay House,
24, Homi Wadi Street,
Mumbai - 400 001.
3. SPIC,
Biotechnology & Seeds Division,
97, Mount Road,
Chennai.
4. Godrej Soaps,
Neem Pesticides division,
Firojshanagar,
Eastern Express Heighway,
Vikhroli, Mumbai.
5. Green Bio-Botanicals
#108, Cordon Apartments,
Chintalbasti, Khairatabad,
Hyderabad.
6. MCDA, Agro Pvt. Ltd.,
#9, Kitab Mahal,
Dr. D.N.Road,
Mumbai - 400 001.
- Bio-Products Division,
Dare House,
234, NSC Bose Road, .
Chennai-600 001.
Tel:5341101/5340251
Fax: 044-5342381-5340858
- 8) Fortune Biotech
6-6-125, Annam Gardens,
Kavadiguda,
Secunderabad- 500 380.
Phones: 7534867
7531888
7533689
Fax : 7536089

Neem Fruit / Seed Buyers:

1. AGRO EXTRACTS Ltd 080-8397276, 8391969(O) 8395928
PLOT No. 16, PHASE - II
PEENYA INDUSTRIAL AREA Telex - 845-5038 AEL IN
BANGALORE - 360 058 Fax(91)080-8392134
2. SHRI. AMMAN TRADERS (INDIA) Ltd 42345,42190(O)
SINGAMPUNNARI
PASUMPON THEVAR Dist
TAMILNADU - 624 502
3. SOM PHYTOPHARAM (INDIA Ltd) 292523, 295890(O),
KEMSON APARTMENTS 3745262(Fax)
7-1-80/202, AMEERPET
HYDERABAD - 500 016

- | | | |
|-----|--|--|
| 4. | SUNNY NEEM EXTRACTS Pvt. Ltd
PLOT No. 3
DWARAKAPURI COLONY
PUNJAGUTTA
HYDERABAD - 500 082 | 3393270, 3320718 (O)
3320718 (Fax) |
| 5. | SIRNIVASA TRADERS
15-2-652/1, FIRST FLOOR
KISHANGUNJ
HYDERABAD - 500 012 | 4600418, 4601106 (O)
4047224 |
| 6. | SHIRDI TRADERS
P.B.No. 54
KHAMMAM - 507 003 | 08610, 3329 (O) |
| 7. | MINAR FATS and FEEDS Pvt Ltd
10/4, NACHARAM INDUSTRIAL AREA
HYDERABAD - 500 076 | 671227, 671228 (O) |
| 8. | GAYATHRI OIL MILL
41/545, KOTHAPETA
KURNOOL - 518 003 | 08518-36702 (O)
08518-26086 (P.P) |
| 9. | NAWA BHARATI OIL INDUSTRIES
RAGUDI "NAVA BHARAT HOUSE"
SIRICILLA - 505 301 | (08723)32151, 32164, 32580(O) |
| 10. | M/s. AMRIT BIOTECH Pvt Ltd
101, BAJRANG Apts PLOT No. 3
WARDHA ROAD, SOMALWADA
NAGAPUR - 440 025 | 0712-271659 (O)
271751 (Fax)
E-mail: ggsarwate@satyam.net.in |
| 11. | M.NATESANA PILLAI & SONS
COMMISSION MUNDY,
10/169,1 ST Road,
LEIGH BAZAR,
SALEM
Tamilnadu-636 009. | 350068, 52068 |
| 12. | ARUMUGA PANDARAM SON
COMMISSION MUNDY,
68/165, 4 TH road,
LEIGH BAZAR,
SALEM-636 009.
TAMILNADU. | Mundy : 350606
" : 350471
® : 333822
Fax : 334432
Cell- 98427- 44782 |

Buyers:

1. Neem Oil Processing Plants / Solvent Extraction Units
2. Khadi and Village Industries Commission, Mumbai
3. Khadi and Village Industries Board, Andhra Pradesh
4. Bio-Pesticides manufacturers
5. Herbal Medicine, manufacturers
6. Organic Fertilizer Producers
7. Soap Industry
8. Tea / Coffee Plantations
9. Farmers Growing Orchards

References:

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3. Minor Forest Products of India - T. Krishna Murthy
4. National Oil Seeds and Vegetable Oils Development Board - Gurgaon.
5. Promotion of Nationalised products through Social Forestry - of National Workshop holding BAIF, Development Research Foundation, Pune.
6. Tribal Coop-Marketing Development Federation of India Ltd., New Delhi.
7. Solvent Extractors Association of India (SEA), Mumbai.
8. Opportunities in Neem and its Derivatives, ITCOT (Industrial and Technical Consultancy Organisation of Tamilnadu Ltd) Chennai - 6.
9. Cultivation and Utilization of Medicinal Plants - Dr. S.S. Honda and Dr. M.K. Kovel, Regional Research Laboratory, CSIR, Jammu.
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