

MEDICINAL AND AROMATIC PLANTS

EUCALYPTUS (*Eucalyptus citriodora*)

Eucalyptus thrives both in the tropics and subtropics. High humidity and plenty of rainfall are conducive to its luxuriant growth. It can be grown in varied types of soils. The essential oil is used in the preparation of cosmetics, hair oil and soap and forms a raw material for menthol manufacture.

Preparation of land

Clear the land of jungle growth. Take pits of size 45 x 45 x 45 cm at a spacing 2 x 2 m at least one month prior to planting and allow to weather. Fill up the pits with soil completely so as to prevent water stagnation.

Planting

Nursery is raised and 4-5 month old seedlings are planted with the commencement of southwest monsoon. After planting, press the soil around the seedling and form mound to prevent stagnation of water.

Manuring

Manuring is not usually done. However, application of 400 g ammonium sulphate, 60 g superphosphate and 25 g muriate of potash per plant per year during August from third year onwards is found to be useful in increasing leaf yield.

Aftercultivation

During first year, cultivate the rows in both directions to prevent weed growth. Hand weeding is done around the seedlings. Fire belts are to be provided all around.

Intercropping

Eucalyptus can be grown along with coffee, lemongrass and palmarosa. In the first four years, intercropping with pineapple, yam and vegetables can be done.

Harvest and curing

Pruning of side branches may be started from second year onwards. Lopping at a height of 2 m is done during third or fourth year and there after lopping is resorted to at half-yearly intervals leaving only one branch. For extracting oil, steam distillation is resorted to. Optimum time for distillation is two hours and the average recovery of oil is 1.5-1.8% of the net weight of leaves. Wilting of the cut leaves under shade for 24 hours before distillation will increase the oil recovery percentage.

KACHOLAM (*Kaempferia galanga*) (Ad hoc recommendation)

An attractive medicinal plant used in various medicines. The aromatic essential oil of the roots is widely used in perfumery, as a condiment, and as a folk medicine. Asians employ the rhizomes and leaves as a perfume in cosmetics, hair washes and powders. They are used to protect the clothing against insects. They are chewed with betel nut.

Kacholam is a plant adapted for tropical climate. Fertile loamy soil having good drainage is ideal for the crop. Laterite soil with heavy organic manure application is also well suited.

Preparation of land

Prepare the land to a good tilth during March by ploughing or digging. On receipt of premonsoon showers in April, prepare bed of 1 m width 25 cm height and of convenient length with spacing of 40 cm between beds.

Seed materials

Whole or split rhizome with at least one healthy sprout is the planting material in kacholam. Select well developed healthy and disease free rhizomes. Rhizomes can be stored in cool dry place or pits dug under shade, plastered with mud or cowdung. Two weeks before planting of the new crop, smoking the rhizomes by spreading it on *Glycosmis pentaphylla* ('panel') leaves is practised in certain localities.

Varieties

Mostly local varieties are under cultivation and they include collections from Koothattukulam, Thodupuzha, Varandarapalli, Kalladikode, Ponnukkara, Perumbavoor and Vellanikkara. Rajani and Kasthuri are newly released high yielding varieties with an yield potential of more than 2 tonnes dry rhizomes per ha and have good aroma and flavour.

Season and method of planting

Planting is done during the month of May with the receipt of four or five pre-monsoon showers. Take small pits in the beds in rows with a spacing of 20 x 15 cm and at a depth of 4-5 cm and plant rhizomes with at least one viable healthy bud facing upwards. Adopt seed rate of 700-800 kg/ha.

Manuring

Apply FYM or compost as basal dose at the rate of 20 t/ha, either by broadcasting and ploughing or by covering the rhizome in pits after planting. Apply N, P₂O₅ and K₂O @ 50, 50 and 50 kg/ha at the time of the first and second weeding.

Mulching

After planting, mulch the beds with dry or green leaves at the rate of 15 t/ha.

After cultivation

Remove weeds as and when necessary. Apply fertilizers and earth up the crop during the first and second weeding (45 and 90 days after planting). Avoid water stagnation in the beds. Further weeding will not be necessary because of the spreading of leaves on the soil surface in the beds.

Plant protection

During heavy rains, leaf rot disease occurs in certain localities. For controlling this disease, drench the beds with 1% Bordeaux mixture. Thiram 0.2% can also be sprayed.

Harvesting and curing

The crop can be harvested seven months after planting. Drying of the leaves is the indication of crop maturity for harvest. Harvest the crop carefully without cutting the rhizomes, remove dried leaves and roots, wash the rhizome in water and dry. With sharp knife, chop the rhizomes into circular pieces of uniform size except the end portion, which has to be cut separately. Spread the cut rhizomes uniformly on clean floor and allow drying for four days. On fourth day, heap the rhizomes and keep it overnight. On the next day it is again spread and dried. Clean the dried produce, bag and store in cool dry place or market it. Prolonged storage can cause insect and fungus attack:

LEMON GRASS (*Cymbopogon Jlexuosus*)

Lemongrass prefers warm climate with a well-distributed rainfall and well-drained soil. Usually it is grown on poor, gravelly soils. Lemongrass is a perennial grass mainly cultivated on hill slopes as a rain fed crop. The crop provides maximum yield from the second to fourth year of planting and economic yield up to the sixth year. Thereafter, the yield declines considerably. The leaves yield an aromatic oil, containing

70-90% citral. This oil is used in soaps, cosmetics and disinfectants and is a raw material for manufacturing ion ones and vitamin A.

Seeds and sowing

The crop is propagated mostly through seeds. It can also be propagated vegetatively through planting of slips.

OD-19 is the improved variety of lemongrass recommended for cultivation.

Seeds can be sown directly in the field or seedlings are raised in a nursery and then transplanted. Transplanted crop is found superior to direct-sown crop in respect of grass yield, oil content and citral content in oil. Seeds are sown in well prepared nursery beds during April-May with the onset of pre-monsoon rains and covered with thin layer of soil. The seed rate is 3 to 4 kg/ha. Seeds collected in the season should be sown latest by August of the same year. The seedlings will be ready for transplanting in 2 to 2.5 months.

Preparation of land

The land is prepared by digging. Raised beds of 75-80 cm width and of convenient length are formed with a spacing of 30-35 cm between beds. On sloppy terrain, the beds are formed along the contours. At the early southwest monsoon (June-July), two or three seedlings or slips per hill are transplanted on the beds at a spacing of 15-20 cm in 4-5 rows. Before planting, the top leafy portion of the seedling is cut off leaving the plant stalk about 15-20 cm length.

Manuring

Application of compost made of spent lemongrass (refuse obtained after distillation) and wood-ash at the rate of 2500 kg/ha and 1875 kg/ha respectively is found beneficial. Application of nitrogenous fertilizers @ 100 Kg/ha in four splits (each after 1st to 4th harvest) has been found to increase oil yield considerably.

After cultivation

Regular weeding depending on weed growth and earthing up at least once in a year along with manuring is recommended. Serious pests or diseases do not generally infest the crop.

Harvesting

Harvesting is done by cutting the grass 10 cm above ground level. During the first year of planting, three cuttings are obtained and subsequently five to six cuttings per year are taken subject to weather conditions. The harvesting season begins in May and continues till the end of January. The first harvest is taken about 90 days after planting and subsequent harvests at intervals of 40-50 days. The optimum interval between harvests to obtain maximum quantity of oil is 40-45 days for local types of lemon grass. For OD-19, the optimum interval was found to be 60-65 days when grown in hill-tops and 45-55 days in valleys and lower areas.

Seed collection

The crop for seed production is left without cutting to get maximum seeds. The crop flowers during November-December and the seeds are collected during January-February. The whole panicle is cut and dried for one or two days and then threshed and sieved to collect the seeds.

Distillation

Lemongrass is distilled in copper stills of about 100 kg capacity by steam distillation, or water and steam distillation process. Time required for one distillation is about two hours including the time required for charging and discharging, provided the firewood is well dried and of good quality. For one distillation, about 40 kg of firewood is required. A light yellow, lemon-scented volatile oil is obtained. Providing a perforated disc just above the water level in the copper still will be helpful to produce oil of better quality. This method is known as water and steam method. When crop area is large enough, steam method is found to be more economical. Coal is used as fuel.

The cut grass is chopped into smaller pieces before feeding to the distillation unit. It can be stored up to 3 days under shade without any adverse effect on yield or quality of oil.

Storage of oil

Lemongrass oil can be stored up to 3 years without affecting the quality of oil, if kept in aluminum containers sealed air-tight using wax. The containers are to be kept in darkness.

Yield

The grass yield during the first year will be about 10 t/ha, which gives about 28 kg of oil. From the second year onwards, the grass yield will be about 25 t/ha giving about 75 kg of oil. The average recovery of oil is 0.30-0.35% with 70% citral for local types of lemongrass while OD-19 variety gives 0.40-0.45% oil recovery and 85-90% citral content.

PALMAROSA (*Cymbopogon martinii* var. *mafia*)

Palmarosa (rosha grass) is adapted to marginal areas and poor soils; can be grown under dense canopies of trees and used for soil conservation.

The flowering tops and foliage contain sweet smelling oil emitting a rose like odour and is widely used in soaps, cosmetics and perfumery industries. The oil is also used as a raw material for producing geraniol, which is extensively used in the perfumery industry.

Propagation

The crop can be propagated by seeds and slips. Seedlings establish quicker and are better than slips from clones. So seedlings are preferred as planting materials under Kerala conditions. Prepare the seedbed in well-pulverized soil after 15th April. Four to five kg of seeds are sown in one hectare of land and covered with a thin layer of soil.

Give frequent watering till the onset of southwest monsoon. Seeds collected in January-February must be sown latest by August.

Planting

Prepare the main field for planting form beds and plant the seedling, two on a hill, at a spacing of 30 x 20 cm. Apply organic manures like compost made of spent grass and wood ash @ 6 t/ha and 2.5 t/ha respectively at the time of formation of beds.

Harvesting

By about 3.5 to 4 months, the plants attain a height of 150-200 cm and they start producing inflorescence. The grass is cut one week after flowering. Generally two cuttings are made during the first year of planting. From second year onwards 3 to 5 cuttings are possible.

Distillation

As in the case of lemongrass, extraction of palmarosa oil is done by the steam and water method. It takes two hours to complete one distillation. The average recovery of oil from Amaravathy variety is 0.40 to 0.45%. Allowing the cut grass to wilt in shade for 24 hours during monsoon seasons and 48 hours during the post-monsoon will increase the oil recovery.

Plant protection

Pink globular root aphids (*CTetrcweura*) occur -on the roots and cause' withering of the crop in patches due to de-sapping. Dig out and bum the affected patches and irrigate with water charged with fish oil soap or emulsion spray oil to control the aphids.

VETIVER (*Vetiveria zizanioides*)

Vetiver is a perennial grass, commonly known as 'khus' plant and mainly cultivated on hill slopes as a rainfed crop. The essential oil is extracted from the roots and known as 'khuskhus oil'.

It prefers a warm climate and grows in areas up to 600 m elevation. Even though vetiver grows almost in all soils, a rich and fairly well drained sandy loam is the best. An annual rainfall of about 100 to 200 cm, temperature ranging from 25 to 40°C and moderate humidity are ideal for its growth.

Its root contains fragrant oil, which is a perfume by itself. The dry aromatic roots are made into curtains, mats, fans, etc. to emit scented cool aroma when moistened. The oil is used as a valuable fixative for blending perfumes and cosmetics.

Varieties

Two types of vetiver namely, South Indian and North Indian (khus) are generally under cultivation. South Indian types produce higher root and oil yield, but North Indian types have superior oil quality. Among the South Indian types, the Nilambur type (ODV-3) on an average produces 5 t/ha of root, yielding 20-30 kg oil/ha.

Planting

The crop is propagated through slips. June

July is the optimum period for planting. Two to three ploughing are given so that the soil is well loosened and ridges or beds of convenient length are made. Slips are planted in two rows on 1 m wide beds.

Manuring

Usually 5 t/ha of FYM or compost is applied at the time of bed preparation. Application of 22.5 kg each of P_2O_5 and K_2O per ha is found to be beneficial for increasing root and oil yield.

Harvesting and distillation

The optimum period of harvest of roots to get the maximum oil yield is 18 months. Harvesting is done with the digging forks. The roots are washed gently to remove the earth and are chopped into bits of 4-5 cm length. The oil is extracted by hydro-distillation.

Vetiver as a soil binder

Vetiver has a deep, dense and strong fibrous root system. The perennial and sterile characteristics of the crop with its hardness and un-palatability to livestock make it an excellent soil-conserving crop. It may be planted as a contour hedge on sloppy lands or can be used to protect the banks of major irrigation canals.

CHETHIKODUVELI [CITRAKA] (*Pulmbago rosea*) (Ad hoc recommendation)

This is an attractive erect rambling shrub with long tuberous roots and bright red flowers in long terminal spikes. The root tubers are the medicinally important parts. This is an esteemed remedy for leucoderma and other skin diseases. The synonyms of fire like 'agnih' 'analah' etc. are attributed to this drug to indicate the caustic action of roots causing blisters on the skin. The drug is used only after adequate curing and purification. Roots contain plumbagin, which is responsible for the therapeutic action of the drug.

Planting materials

Propagated by single, double or three node semi-hard wood stem cuttings. Cuttings are planted in nursery beds of convenient length and 1 m width for rooting.

Land preparation

Prepare the land to a good tilth by ploughing two or three times. Make ridges of about 30 cm height and 50 cm apart for planting rooted cuttings. Two to three month old rooted cuttings can be planted on the ridges at a spacing of 15 cm in June-July.

Manuring

Cattle manure or compost @ 10 t/ha may be applied as basal dose at the time of land preparation. The fertilizer dose for chethikoduveli is N: P_2O_5 : K_2O 50:50:50 kg/ha. Entire P_2O_5 has to be applied as basal

dose and N and K_2O in two split doses, 2 months and 4 months after planting.

Aftercultivation

Weeding has to be done two or three times depending on weed growth. Earthing up may be done two times along with topdressing of fertilizers.

Harvesting

The crop can be harvested in about 18 months after planting. After digging out, the root tubers are cleaned by washing in water and marketed.

NEELA AMARI [NEELI] (*Indigo/era tinctoria*)

Nili is a reputed drug for the promotion of hair growth. Due to antitoxic property it is also a good remedy for poisons. This plant, which is the original source of natural indigo, is an erect shrub with imparipinnate leaves. Leaves are important in medicine and form a major ingredient of preparations like 'Nilibhringadi'.

Land preparation

Prepare the soil to fine tilth by ploughing two or three times.

Seeds and sowing

Seeds are very small and the seed rate is 3 kg/ha. Seeds require pretreatment for good germination, as the seed coat is hard. Seeds are mixed with sand and ground gently to break the seed coat. An alternate method for enhancing germination is dipping the seeds in boiling water for a second. After pre-treatment seeds are broadcasted. Broadcast the seeds preferably mixed with sand 2-3 times its volume to ensure uniform coverage. Seeds germinate within a week.

Seasons

The best time for sowing is September-October.

Manuring

Apply cattle manure at the rate of 10 t/ha as basal dressing and incorporate into soil along with last ploughing.

Aftercultivation

Weeding has to be done twice, three weeks and six weeks after sowing.

Harvesting

Plants start flowering 2-3 months after sowing. Harvesting is done by cutting the plants at this time, at a height of about 10 cm from ground level. Irrigate plants after harvest. Subsequent harvests can be made at 1.5-2 months interval. Four to five cuttings can be taken in a year depending on the growth.

Seeds collection

A few plants per plot are left without cutting to set seeds. Ripe pods are to be harvested in the early morning to prevent loss of seeds by shattering during harvest.

Pests

The psyllid *Arytaina puctipennis* infest top shoot causing curling up and drooping of leaves and shoots, and wilting of plants.

CHENGAZHINIRKIZHANGU (*Kaempferia rotunda*)

Indian crocus, also known as *bhucampaka* in Sanskrit, *abhuyicampa* in Hindi and *chengazhinirkizhangu* in Malayalam is a medicinal herb with aromatic rhizome. The rhizomes are used for the treatment of tumours, swellings and wounds. It helps to remove blood clots and other purulent matters in body. It is used in many *ayurvedic* formulations including 'Chyavanaprasam' for improving complexion and curing burning sensation, gastric complaints, mental disorders and insomnia.

Climate and soil

The plant is distributed in the tropics and subtropics of Asia and Africa. It grows wild in wet, humid or shaded forest ecosystems of south India. It is also cultivated as an intercrop with other commercial crops. Moist loamy soil is ideal for the crop. Laterite soil with heavy organic manure application is also well suited.

Propagation

It is propagated through rhizomes and tissue culture methods.

Varieties

At present, only local types are available for cultivation.

Season

The optimum time of planting is with the receipt of four or five pre-monsoon showers in May-June.

Land preparation

Plough the field to good tilth. Incorporate organic manure at 10-15 t/ha. Prepare raised seedbeds of 1 m breadth and of convenient length.

Seed rate

Use rhizome bits of size 10-15 g for planting. About 2500-3000 kg rhizomes are required for planting one hectare. Smoking the rhizomes for 2-3 weeks is good for the development of healthy sprouts. At times, rhizomes are stored in *Glycosmis pentaphylla* leaves in underground pits covered with coconut fronds.

Planting

Pits are made at 20 cm spacing on the seedbed. Whole or split rhizomes with at least one healthy sprout is planted 5 cm deep with the sprout facing upwards and covering the pit with FYM.

Mulching

Mulch the beds thickly with green leaves or straw @ 15 t/ha immediately after planting and again after two months along with weeding and topdressing. Mulching is absolutely essential for good growth.

Fertilizer application

Fertilizer application can be skipped in fertile soils. In poor and marginal soils a moderate dose of 50:50:50 N:P₂O₅:K₂O kg/ha U1ay be applied; P₂O₅ as basal and N & K₅O in two or three split doses.

Aftercultivation

Remove weeds, apply manure and fertilizers and earth up two and four months after planting, followed by mulching.

Plant protection

During rainy months, rhizome rot is noticed which can be controlled by drenching 1% Bordeaux mixture.

Harvesting and yield

The crop matures in 7-8 months, Drying up of the leaves is the indication of maturity. Dig out the rhizomes carefully, remove leaves and clean. The rhizomes with attached tubers are usually marketed afresh. Prolonged storage may cause insect and fungus attack. The average yield is 12-15 t/ha and dry rhizome yield 27-30%.

KASTHURIMANJAL (*Curcuma aromatica*)

Curcuma aromatica known as *vanharidra* in Sanskrit *jangali-haldi* in Hindi and *kasthurimanjal* in Malayalam is a rhizomatous herbaceous medicinal plant. The rhizome is an odoriferous ingredient of the cosmetics used for the cure of chronic skin diseases caused by impure blood. It is used as appetizer and tonic to women after childbirth. It is also useful against high fever and worm infestation.

Climate and soil

It is distributed in Southeast Asia. The plant grows wild in the eastern Himalayas and in moist deciduous forests of Kerala and Kamataka. It is grown as a subsistence crop in backyard, kitchen garden and interspaces of other crops in areas with good rainfall. Well-drained rich loamy soils are ideal for the crop.

Propagation

It is propagated vegetatively by rhizomes and by tissue culture methods.

Varieties

At present, only local types are available for cultivation.

Land preparation

Clear the areas, remove all the pebbles and stones and plough the field to good tilth. Incorporate FYM or organic manure @ 10-15 t/ha. Prepare raised seedbeds of 1.2 m breadth and of convenient length. .

Seed rate

A healthy disease free mother rhizome with at least one germinated sprout is' the planting material. It is required at the rate of 1500 kg/ha.

Planting

Take small pits at 60 x 40 cm spacing on the seedbed find plant seed rhizomes with the germinating sprout facing upwards. Cover the rhizome with FYM and mulch the bed with leaves or straw. .

Fertilizer application

Apply fertilizers @ 100:50:50 N:P₂O₅:K₂O kg/ha; entire P₂O₅ as basal and N and K₂O in two equal splits at planting and two months after planting.

Aftercultivation

Carry out gap filling if necessary within one month. Remove weeds two months after planting followed by topdressing, earthing up and mulching.

Plant protection

No serious pests and diseases are encountered in the crop.

Harvesting and yield

The crop matures in 7 months. Drying up of leaves is the indication of maturity. Dig out the rhizomes without causing damage. Remove the dry leaves and roots. The cleaned rhizomes are either marketed or dried and stored. The average yield of fresh rhizome is 28 t/ha which on drying gives 27% recovery.

Processing

The rhizome is thinly sliced and steam distilled for 3-4 hours for extracting the essential oil and the yield is 90 litres per ha. Oil recovery is 0.33% on fresh weight basis and 1.05% on dry weight basis.

CHITTARA THA (*Alpinia calcarata*)

Alpinia calcarata (galangal) is also known as *rasna* in Sanskrit, *kulainjan* in Hindi and *chittaratha* in Malayalam. It is a perennial herb with non-tuberous pungent rootstock. It grows to a height of 1.5 m and produces around 24 suckers per clump per year. The economic part is rhizome, which is a major constituent of many formulations of indigenous system of medicine for relieving throat inflammation, stimulating digestion, purifying blood, improving voice and maintaining youthful vigour.

Climate and soil

Alpinia comes up well in tropical climate. It grows on a wide range of climate and soil. Well-drained hilly areas and places up to 1400 m altitude are good for its cultivation. Fertile red loams to forest soils are suitable.

Propagation

It is propagated vegetatively by rhizomes and by tissue culture methods.

Varieties

At present, only local types are available for cultivation.

Season

Rainfed crop is planted with the onset of monsoon in May-June. Irrigated crop can be planted at any time.

Land preparation

Plough the field to good tilth. Remove all pebbles and stones. Incorporate FYM or organic manure at 10-15 t/ha. Prepare raised beds of convenient length and breadth to facilitate drainage.

Seed rate

Fresh healthy disease-free rhizome bits with at least one shoot is the planting material, which is required @ 1000-1500 kg/ha.

Planting

Take small pits on the seedbed and plant 5 cm long rhizome bits. Cover rhizome with FYM and mulch the seedbed with leaves or straw. The optimum spacing is 30 x 20 cm under good fertility and 40 x 30 cm under poor fertility conditions.

Fertilizers application

Apply fertilizers @ 100:50:50 N:P₂O₅:K₂O kg/ha per year in two or three split doses. Application of biofertilizer *Azospirillum* @ 10 kg/ha and *in situ* green manuring with cowpea are beneficial for the crop.

Aftercultivation

Carry out gap filling, if required, within one month; remove weeds two months after planting followed by topdressing, earthing up and mulching. Thereafter no weeding is required as the crop smothers the weeds.

Plant protection

Usually pests and diseases are not serious enough to take up any control measures. Occasionally shoot borers and leaf eating caterpillars are observed which can be controlled by spraying 0.1 % monocrotophos. Blight disease can be controlled by spraying 1 % Bordeaux mixture.

Harvesting and yield

Though the crop can be harvested after 18 months, the optimum stage of harvest for obtaining maximum rhizome and oil yield is

36-42 months after planting. Cut and remove the shoot portion and carefully dig out the rhizomes and roots. Harvesting is very arduous due to strong and extensive root ramification. Separate the roots, clean the rhizomes and cut into 5 cm long pieces, which are dried in the sun for 3-5 days to 10% moisture for marketing. The average yield of rhizomes is about 23 t/ha, which on drying gives 25% recovery.

Processing

The fresh rhizomes on steam distillation for 3-5 hours give 0.22% essential oil. The oil recovery on dry weight basis is 0.93%. Root is also a significant contributor of essential oil. .