Extension Bulletin



Cultivation of *Ocimum*



ICAR – DIRECTORATE OF MEDICINAL AND AROMATIC PLANTS RESEARCH
BORIAVI, ANAND – 387 310, GUJARAT

Cultivation of *Ocimum*

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Tulsi



Sweet Basil

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FOREWORD

THE aromatic plants belonging to genus *Ocimum* is popularly known by the name Basil. Basil was derived from greek word "Basilica" which means royal plant. Among the *Ocimum* genus *Ocimum basilicum* is variously known as Sweet basil, French basil or Common basil. *Ocimum sanctum* is known as Sacred basil or Holy basil which is a very sacred plant according to Hindu belief. These aromatic plants are native to Indian subcontinent and cultivated throughout Southeast Asian tropics. The essential oils from *Ocimum* genus find diverse uses in perfumery and cosmetic industries as well as indigenous systems of medicines. In India, Basil is cultivated over an area of 25,000 ha and it accounts for annual production of about 250-300 tonnes of oil.

As the demand for our aromatic industry is growing high, concerns are raising over the improved production and quality of raw materials used. Hence, I hope this extension bulletin will serve the farmers to take up Basil cultivation and increase the production by adopting the proper cultivation practices. I am happy that ICAR-DMAPR, Anand has taken appropriate step to publish this bulletin that would serve as a useful guide for the *Ocimum* growers of our nation.

Anand
November 24, 2014

(Jitendra Kumar)

A. Cultivation of Sacred Basil / Tulsi



1. Name of the plant

1.1 Scientific name: *Ocimum sanctum* Linn (2n=32) (Family: Lamiaceae / Labiatae)

1.2. Local name: Sacred basil / Holy basil (English), Tulsi (Hindi, Gujarati, Sanskrit)

2. Part to be employed in aromatic oil extraction

Whole herb at full bloom stage.

3. Characteristics of the plant

Sacred basil or Holy basil, *Ocimum sanctum* Linn is a biennial or triennial shrub. The species is worshiped by the *Hindus* and commonly

grown in courtyards and temples. The leaves of this plant on steam distillation yield a bright yellow colour volatile oil possessing a pleasant odour with an appreciable note of clove oil. The plant contains mainly phenols, aldehydes, tannins, saponin and fats. The essential oil components are eugenol (71%), eugenol methyl ether (20%), carvacrol (3%) and minor portions of nerol, caryophyllene, selinene, α-pinene, ß-pinene, camphor, cineole, linalool etc. The plant is used as a pot herb; leaves are used as condiment in salads and other foods.

O. sanctum is an erect, herbaceous, much-branched, softly hairy biennial or triennial, which grows to a height of 30-75 cm. Leaves are entire, serrate, pubescent on both sides, flowers purplish or crimson, in racemes, fruits are sub-globose or broadly ellipsoid, slightly compressed, nearly smooth, pale brown or reddish with small black markings.

4. Major production areas

O. sanctum has widest distribution which covers the entire Indian sub-continent, ascending upto 1800 m in the Himalayas and in Andaman and Nicobar Islands. This plant can occupy a wide range of habitats.

5. Characteristics of strain (s) for cultivation

Ocimums are important groups of aromatic and medicinal plants which yield many essential oils and aroma chemicals and find diverse uses in perfumery, cosmetic industries and also in indigenous systems of medicine. Owing to a high degree of polymorphism exhibited by the species and high degree of cross pollination, a large number of species, subspecies, varieties and strains have come into existence which makes botanical nomenclature extremely difficult. In view of great diversity, various species are classified into two broad groups, *viz., basilicum* and *sanctum* groups, based on geographical sources, morphological and cytological features and chemical constituents, as detailed below:

Classification of different *Ocimum* species:

Species	Habit	Cytology	Major essential oil constituents
Basilicum group (Basic No. x=12)			
O. canum Sims.	Herb	2n=24, 26	Linalool or camphor
O. basilicum L.	Herb	2n=48	Methyl chavicol, methyl cinnamate, eugenol
O. americanum L.	Herb	2n=72	Methyl chavicol, citral
O. kilimandscharicum Guerke	Shrub	2n=76	Camphor
Sanctum group (Basic No. x=8)			
O. sanctum L.	Shrub	2n=32	Eugenol
O. gratissimum L.	Shrub	2n=40	Eugenol
O. viridae Willd.	Shrub	2n=40	Thymol
O. suave Willd.	Shrub	2n=64	Eugenol
O. carnosumck	Shrub	2n=48	Eugenol
O. micranthum	Shrub	2n=48	Elimicin, eugenol, methyl isoeugenol

In India two types of *O. sanctum* are under cultivation; the green type - *Sri tulsi (Ram tulsi)* is the most common; the second type, *Krishna tulsi* bears purple leaves and is preferred in the trade for its higher potency of drug. Proper identification of the species is very important. Expert guidance and government recognized herbariums can be used for correct identification of the species.



Sri Tulsi (White type)



Krishna Tulsi (Black type)

6. Cultivation methods

6.1 Soil condition

Sacred basil thrives well on a wide range of soils. Rich loam, poor laterite, saline and alkaline to moderately acidic soils are also well suited for its cultivation. Well drained soil helps in better vegetative growth. Water logged conditions can cause root-rot and results in stunted growth.

6.2 Climate

It flourishes well under fairly high rainfall and humid conditions. Long days and high temperatures have been found favourable for plant growth and oil production. It can grow up to an altitude of 900 m. The plant is moderately tolerant to drought and frost. The plant can be grown under partially shaded conditions but with low oil contents.

6.3 Propagation



Tulsi is propagated through seeds. Seeds will get deteriorated over generations, due to its high cross-pollination. Hence, for fresh plantings, the growers have to take fresh seeds from the pedigree stock.

6.4 Planting time

The nursery can be raised in the third week of February and transplanting is generally done in the middle of April.

6.5 Nursery

Raised seed beds of 15 × 4 × 9 ft size should be thoroughly prepared and well manured by the addition of farm yard manure 10 kg per bed. About 200-300 g seeds are enough to raise the seedlings for transplanting in one hectare of land. The seeds are very small and hence it should be mixed with sand and sown to a depth of 2 cm. After sowing, the seeds in the nursery, a mixture of farm yard manure and soil should be spread in a thin layer over the seeds and irrigate



with a sprinkler hose. The seeds germinate in 8-12 days and the seedlings are ready for transplanting in about 6 weeks time at 4-5 leaf stage. A spray of 2% urea solution on the nursery plants at 15 to 20 days before transplanting helps in getting healthy seedlings for transplanting.

6.6 Land preparation

The land is brought to fine tilth and laid out into plots of convenient sizes. It is preferable to add 15 t/ha of farm yard manure and recommended fertilizers as basal dose during the preparation of land and should be mixed well in the soil.



6.7 Transplanting

Seedlings of six weeks old and having 4-5 leaves are transplanted at a spacing of 40 × 40 cm, 40 × 50 cm and 50 × 30 cm to get high herbage and oil yield at Lucknow, New Delhi and Indore respectively. The plots are irrigated immediately after transplanting. The seedlings will establish well by the time of second irrigation. At this stage gap filling and replacement of the poor plants are also done so that uniform plant stand is achieved.



6.8 Crop nutrition

As *Tulsi* is grown for its herbage, it is necessary to frequently replenish the soil. Farm yard manure / compost are to be applied at 10 t/ha before planting. Ensure that FYM / compost is well decomposed before use. Do not use compost made from city waste and human excreta. Do not apply fresh manure for plant nutrition. The optimum fertilizer dose recommended for this crop is 120 kg N, 60 kg of P_2O_5 and K_2O per hectare. Half the dose of N and the entire dose of P_2O_5 and K_2O should be given as a basal dose, whereas, the remaining N is applied in two split doses after first and second cuttings. Application of micronutrients, cobalt and manganese at 50 and 100 ppm concentrations respectively is reported to increase the oil yield significantly. Application of 120 kg N, 105 kg each of P_2O_5 and K_2O per hectare is recommended for saline and alkaline soils at Lucknow.

6.9 Irrigation



Tulsi's irrigation requirement depends upon the season and moisture content of soil. In summer three irrigations per month are necessary whereas, during other seasons it should be done as and when required except in rainy season when no irrigation is required. About 12-15 irrigations are required during the year. Apply mulch to conserve soil moisture. However, before harvesting, irrigation should be discontinued. If possible, test the irrigation water for any contaminants and adopt appropriate measures to prevent contamination.

6.10 Intercultural operation

Weeds have to be managed before they start competing with the main crop for nutrients and light. First weeding is done one month after planting and the second 4 weeks later. After this, no further weeding is required as the plants become bushy thereby suppress the weeds. One hoeing and earthing up operation is required at two months after planting. Use mulch to maintain soil moisture and to inhibit growth of weeds. Do not use chemical herbicides to eradicate weeds and do not keep weeds till flowering as this will increase weed pressure in coming years. Do not allow the soil to dry up due to excessive weeding.

6.11 Pests

Tulsi is found to be infested with few insect pests and diseases.

Insect pests

Leaf rollers: Leaf rollers sticking to the under surface of the leaves, fold them backwards length wise and web them together.



Tulsi lace wing, *Cochlochila bullita*: The adult and nymphs feed on leaves and younger stems, sometimes gregariously and leave their excreta making it unsuitable for use. Due to feeding, the leaves initially get curled and later the whole plant gets dried up.

Management:

Spray Azadirachtin 10,000 ppm @ 5 ml/l to control this insect.

Diseases

The plant is susceptible to powdery mildew (*Oidium spp.*), seedling blight (*Rhizoctonia solani)* and root-rot (*Rhizoctonia bataticola).* Powdery mildew can be controlled by spraying wettable sulphur (4 g/litre of water) and the latter two diseases can be managed by improved phyto-sanitary measures and by drenching the nursery beds with Bavistin 1%.

6.12 Harvesting

Care should be taken while harvesting Tulsi to avoid any type of contamination. Clean all the surfaces that comes into contact with the plant during and after harvest. The crop is to be harvested at full bloom stage to obtain maximum essential oil yield and better quality oil. The first harvest is obtained at 90-95 days of planting. Thereafter, it may be harvested at every 65-75 days interval. Harvesting should be done usually on bright sunny days for high and good quality oil. It is not desirable to harvest the crop if there was a rain in the previous day. The crop should be cut at 15-20 cm above the ground level.

6.13 Processing

The harvested produce may be allowed to wilt in the field itself for 4-5 hours so as to reduce the moisture and also the bulkiness. However, oil quality and its yield do not diminish up to 6-8 hours after harvest, but further delay may cause considerable loss in yield and quality of oil. Steam distillation is found to be superior to hydro distillation and hydro cum steam distillation. Distillation unit should be clean, rust free and free of any other odour. The oil obtained is then decanted and filtered. The distilled oil is treated

with anhydrous sodium sulphate or common salt at the rate of 20 g per litre to remove the moisture. The oil should be stored in sealed amber coloured glass bottles or containers made of stainless steel, galvanised tanks, aluminium containers and stored in a cool and dry place. All processing activities should be recorded.

6.14 Expected yield

About 5 tonnes of fresh herbage per hectare can be obtained by two to three harvests in a year. The oil yield varies with type, season and place of origin. The whole herb contains 0.1-0.23% essential oil and an oil yield of 10-23 kg can be obtained per hectare.

7. Comparative summary table of the characteristics of different cultivated varieties / strains

Cim-Ayu	:	Eugenol 83%, ß elemene 7.47%
Cim-Angana	:	Eugenol 40%

8. Cultivation calendar

Major activity	Month	Activity details
Nursery raising	Mid February	200 - 300 g seeds / ha are mixed with sand and sown in raised nursery beds in lines of 10 cm apart to a depth of 2 cm
Land preparation	February - March	2-3 deep ploughing and harrowing
Manure and fertilizer application	February - March	Application of FYM 10 t/ha and basal dose of fertilizers i.e. ½ N and full P_2O_5 and K_2O. (The recommended dose of fertiliser is 120 kg N, 60 kg each of P_2O_5 and K_2O/ha)
Transplantation	April	Transplant 6-8 weeks old healthy seedlings having 4-5 leaves at a spacing of 40-50 × 30-50 cm

Irrigation	April	One irrigation immediately after transplanting and thereafter 3 irrigations per month during summer months
Intercultural operations	May	First weeding at one month after transplanting
	June	Second weeding, hoeing and earthing up operations at two month after transplanting
First harvest	July - August	First harvest should be done at 90-95 days after transplantation when the plants are at full bloom stage by cutting the clumps at 15-20 cm above ground level
Irrigation and fertilizer application	July - August	First top dressing of 30 kg N and irrigation should be given immediately after I harvest.
Second harvest	September - October	Harvest the plants at 65-75 days after first harvesting by cutting the clumps at 15-20 cm from the ground level
Irrigation and fertilizer application	September - October	Second top dressing of 30 kg N and irrigation should be given immediately after II harvest.
Third harvest	November - December	Harvest the plants at 65-75 days of second harvesting by cutting the clumps at 15-20 cm from the ground level

B. Cultivation of Sweet Basil / Damro



1. Name of the plant

1.1. Scientific name: *Ocimum basilicum* Linn. (2n=48) (Family: Lamiaceae / Labiatae)

1.2. Local name: Sweet basil / French basil (English), Babaui tulsi (Hindi); Damro, Damarvo (Gujarati); Barbari, Arjaka (Sanskrit); Tirunittur (Tamil); Kamakasturi (Kannada); Bhutulasi (Telugu); Babri (Punjabi).

2. Plant part used for aromatic oil extraction

Whole herb at full blooming stage.

3. Characteristics of the plant

Ocimums are important groups of aromatic and medicinal plants which yield many essential oils and aroma chemicals and find diverse

uses in perfumery and cosmetic industries as well as in indigenous system of medicine. Among various *Ocimum* species, *O. basilicum* is commercially and extensively cultivated for essential oil production. The essential oil contains methyl chavicol, linalool, 1,8-cineole and methyl cinnamate as the major components. Its oil is employed for flavouring of food stuffs, confectionery, condiments, perfumery industry, and in toiletry products.

O. basilicum Linn. occurs in nature as a tetraploid (2n=48). It is a large, herbaceous, erect, strongly aromatic annual herb grows to a height of 30-90 cm. Leaves opposite, ovate-lanceolate, 3.75-5 cm long; petioles very slender usually slightly hairy; flowers 0.72-1.25 cm long, born in racemose inflorescences, corolla 0.72 - 1.25 cm long, white, pink or pale-purplish, bracts are petiolated, flowers are conspicuous, seeds black and ellipsoid which become mucilaginous on wetting.

4. Major production areas

The genus *Ocimum* is well represented in the warmer parts up to 1800 m altitude from sea level. The main centres of diversity in this genus are in Africa, South America (Brazil) and Asia and grow mainly in France, Italy, Bulgaria, Egypt, Hungary, South America, Comoro Islands, Thailand, India, Haiti and Guatemala. In India the cultivation of French basil is mainly concentrated in Uttar Pradesh.

5. Characteristics of strain (s) for cultivation

In view of the great diversity, the various species and varieties have been classified, in accordance with their chemical composition and geographical sources into 4 major types as hereunder.

1. European or sweet basil: The oil obtained from this type consists of mainly methyl chavicol and linalool, but no camphor. This group comprises French and American Sweet basil oils which are in demand because of high quality and the finest odour. It is distilled in France, Italy, Bulgaria, Egypt, Hungary, South Africa and occasionally in the United States.

2. Reunion basil: The main constituents of the oil obtained from this type are methyl chavicol and camphor, but no linalool. The oil

is somewhat of lower quality. It is distilled in the Reunion Island, Comoros, Malagasy Republic, Thailand and occasionally in the Seychelles.

3. Methyl cinnamate basil: The oil obtained from this type consists of methyl chavicol, linalool and methyl cinnamate is also present in substantial amounts. It is distilled in tropical countries like India, Haiti, Guatemala and a few African countries.

4. Eugenol basil: Eugenol is the principle constituent of the oil. It is distilled in U.S.S.R. and North African countries like Egypt and Moracco.

Nine species are recorded in Eugenol basil from India of which three are exotic. The more important of these species are:

a) *Ocimum basilicum* Linn (2n=48) (English / French / Sweet Basil)

It has the following subspecies and varieties.

1. *O.basilicum* Linn. Subsp. minima Danert (Syn. *O.minima* Linn)
2. *O.basilicum* Var. majus Benth
3. *O.basilicum* Var. difforme Benth (Curly - leaved basil)
4. *O.basilicum* Var. purpurascens Benth (Violet - red basil)
5. *O.basilicum* Var. glabratum Benth (Common white basil)
6. *O.basilicum* Var. *pilosum* Benth (Syn. *O.pilosum* Roxb)
7. *O.basilicum* Var. crispa
8. *O.basilicum* Var. thyrisiflora
9. *O.basilicum* Var. darkopal

b) *O.americanum* Linn. (Syn. *O.canum* Sims.) (Hoary Basil)

c) *O.gratissimum* Linn. (Shrubby basil)

d) *O.kilimandscharicum* Guerke (Camphor basil)

e) *O.sanctum* Linn. (Sacred or Holy Basil)

f) *O.viride* willd (Fever plant of Sierra Leone)

Of the above listed species, *O. basilicum* Linn. is the only commercially cultivated species in India.

Varieties like RRL-011, Vikarsudha, Kusumohak and Cim-Saumya have been released from different institutes.

6. Cultivation methods

6.1 Propagation:

The plant is propagated through seeds, but direct sowing of seeds in the field is not advisable. Seedlings are first raised in the nursery and then transplanted to the field. This plant is highly cross pollinated and gets deteriorated over generations in quality oil yield. Hence for planting grower has to collect fresh seeds from the pedigree stock which are in good condition and free from pests. About 125 g seeds are required for raising seedlings in one hectare.

6.2 Soil condition

Basil can be cultivated on a wide range of soils, from moderately fertile, well drained loamy to sandy loam soils with a pH ranging from 4.3-9.1. While, clayey, water logged soils are unsuitable. It is tolerant to higher concentration of copper and zinc, but is susceptible to cobalt and nickel.

6.3 Climate

Crop comes up well in warm and humid climate up to an altitude of 1800 m. Long day, high temperature and high humidity have been found favourable for plant growth and high oil production. The plant is also susceptible to frost. The crop growth is poor in areas which receive heavy and continuous rainfall. In such areas the crop could be raised prior to the onset of monsoon and care should be taken that the rain water does not stagnate in the field. Water logging causes root rot and result in stunted growth.

6.4 Planting time

The crop can be grown from the middle of February to the end of September and also during *Kharif* in plains of North or South India. In the hilly areas of north India, the crop can be grown during *kharif*.

6.5 Nursery rising of seeds



Raised seed beds of 10 - 15 cm height should be thoroughly prepared by the addition of well rotten farmyard manure and leaf mould each at the rate of 1 kg/ sq m and mixed well into the soil. Beds of 1 m × 4 m, with irrigation channels are laid out and seeds (10-15 g per bed) are mixed with fine sand or wood ash and sown in lines of 6 cm apart or broadcast over the beds. The seeds are then covered with a thin layer of fine soil or farm yard manure. The nursery beds are watered immediately after sowing and regularly thereafter. In the plains of North India the seeds may be sown in the nursery in the months of April-May or August-September and in the hilly regions seeds are sown in April. The seeds start germinating 3 days after sowing and the germination will be complete in about 8-12 days. The seed bed should be kept weed free. The seedlings will be ready for transplanting in about 6 weeks after attaining a height of 10-15 cm. A spray of 2% urea solution to the nursery plants at 15-20 days before transplanting helps in getting healthy and vigourous seedlings.

6.6 Planting:

Land preparation



The land is well prepared with 2 to 3 ploughings until a fine tilth of soil is obtained. Farmyard manure / compost 10-15 t/ha is to be applied before the 2nd and 3rd ploughing.

Transplanting

The seedlings of six weeks old which are having a height

of 10-15 cm are transplanted in the main field. Transplanting should be done preferably in the evening hours to avoid transplantation shock. Spacing of 40-60 cm is ideal for basil cultivation. Cloudy weather and fine drizzle are considered ideal for transplanting.

6.7 Crop nutrition

Farm yard manure/ compost are to be applied at 10 t/ha before planting. Ensure that FYM / compost is well decomposed before use. Do not use compost made from city waste and human excreta. Do not apply fresh manure for plant nutrition. A medium fertilizer dose of 40:40:40 kg/ha of N, P_2O_5 and K_2O is recommended for economic yield, though good response can be received up to 120:100:100 kg/ha. This crop is tolerant to higher concentration of copper and zinc but susceptible to cobalt and nickel.

6.8 Irrigation

When this crop is raised as a summer crop, irrigation is required once in a week. But, with the onset of monsoon, irrigation is not required till September. The crop needs irrigation once or twice a month thereafter. In total, 12-15 irrigations are required during a year. Apply mulch to conserve soil moisture. However, before harvesting, irrigation should be discontinued.

6.9 Intercultural operation:

Normally the seedlings get well established in the field one month after transplanting. First weeding is done at this stage and second, 4 weeks after the first. No further weeding is required thereafter as the plants become bushy and thereby suppress the weeds. In large plantation the expenditure on weeding can be minimised by the use of cultivator drawn by tractor. Hoeing is done two months after planting. The crop may also be earthed up at this stage. Use mulch to maintain moisture in the soil and to inhibit growth of weeds. Do not use chemical herbicides to eradicate weeds. Do not allow weeds to produce seeds as this will increase weed growth in the following year. Do not allow the soil to dry up due to excessive weeding.

6.10 Pests

Insect pests

Leaf rollers: The larvae cause serious damage to the plants by sticking to the under surface of the leaves, folding them from midrib length wise and webbing. Finally the infected leaves fall off.

Bug (*Monanthia globulifera*): Causes leaf curling

Management: The spray of Azadirachtin 10,000 ppm @ 5 ml/l reduces this insect menace.

Diseases

Leaf spot (*Corynespora cassicola*): Disease appears as small water soaked spots which later turn brown in colour.

Scab (*Elsinoe arxii*): Disease causes puckering and dipping of the leaves and distortion of the tender twigs.

Blight (*Alternaria sp.*): It is an important disease which starts with a chlorotic appearance on the leaves which turns purple and finally black. Later on leaves are shed. *Colletotrichum capsici* also causes leaf blight. The disease appears as small chlorotic spots on the leaves which enlarge rapidly. Older leaves appear to be more susceptible to infection.

Management: Disease can be effectively managed by foliar spraying of Bordeaux mixture 1% at 15 days interval.

Wilt (***Fusarium oxysporum***)*:* It can occur at all stages of growth. The disease is more pronounced in rainy season. Initially the leaves wilt but soon spreads to the whole plant.

Management: To control this disease the seedlings should be dipped in a solution of tafason or agallol at the time of planting

6.11 Harvesting:

Care should be taken while harvesting the basil to avoid any type of contamination at this stage. Clean all surfaces that come in to

contact with the plants during and after harvest. Time of harvest plays an important role in qualitative and quantitative oil production. Harvesting is usually done in bright sunny days for good oil yield and quality. It is not desirable to harvest the crop if there is a rain during the previous day. The crop is harvested at 90-95 days after planting in a stage when the plant is in full bloom and the lower leaves start turning yellowish. Harvesting is done with the help of sickles. Corresponding to the part harvested, two grades of oil can be obtained i.e. herb oil and flower oil. The flower oil has a superior note. For getting the high quality oil only the flowering tops are harvested.

Normally 3-4 floral harvests are obtained in this crop. The first harvest is taken when the plants are in full bloom and the subsequent harvests at 65-75 days interval. The whole plant is harvested after leaving about 15 cm from the ground level for regeneration of the crop. The harvested produce will be allowed to wilt in the field for 4-5 hours so as to reduce the moisture and also the bulkiness.

6.12 Processing

Post harvest processing is usually the most critical stage in determining the end quality of the aromatic plant material. Oil of Sweet basil is obtained by hydro-distillation or steam distillation of young inflorescence or the whole herb. Extraction of oil through steam distillation is better than hydro-distillation as it takes less time and improves the oil recovery. Hydro-distillation which can be carried out by direct heating and is cheaper and handy for small plantations, while steam distillation is preferred for larger plantations. Distillation unit should be clean, rust free and free of any other odour. The oil obtained is then decanted and filtered. The distilled oil is treated with anhydrous sodium sulphate or common salt at the rate of 20 g per litre to remove the moisture. The oil should be stored in sealed amber coloured glass bottles, containers made of stainless steel, galvanised tanks, aluminium containers in a cool and dry place. All processing activities should be documented in a diary.

6.13 Expected yield

An average yield of 3-4 tons of flowers and 13-14 tons of herbage can be obtained per hectare. The inflorescence contains 0.4% while the whole herb contains 0.10 to 0.25% which gives to an oil yield will be about 30-35 kg /ha from flower (flower oil) and 18-22 kg/ha from whole herb.

7. Comparative summary table of the characteristics of different cultivated varieties / strains

RRL-011	:	Oil is sweet smelling, gives an herbage yield of 50 t/ha and oil recovery of 320 kg/ha. The green herb contains 0.45% oil with linalool (40%) and methyl chavicol (35%) as main constituents.
Vikarsudha	:	Is a hybrid variety which grows to 75-90 cm tall and matures at about 75-90 days after transplantation. The spacing recommended for this variety is 45 × 30 cm. The variety is day neutral (Photo insensitive) and can be cultivated throughout the year expect in areas experiencing severe winter where its growth is retarded. It yields 3.73 t herb, 0.7 % oil content and 261 kg oil yield / ha with 78% methyl chavicol
Kusumohak	:	The oil yield is 134 kg/ha. The oil is rich in linalool (46%) and moderate methyl chavicol (38%) contents.
Cim-Saumya	:	This is a short duration variety which comes to maturity within 60-80 days. It contains 62% methyl chavicol and 24% linalool.

8. Cultivation calendar

Major activity	Month	Activity details
Nursery raising	April-May / Aug-Sep	125 g seeds / ha are mixed with sand and sown in raised nursery beds of 1×4 m in lines of 6 cm apart and covered with soil / FYM
Land preparation	May	2-3 deep ploughing and harrowing. Incorporate 10-15 t FYM/compost before 2nd / 3rd ploughing
Manure and fertilizer application	May	A medium fertilizer dose of 40:40:40 kg/ha of N, P_2O_5 and K_2O is recommended for economic yield though good response is received up to 120:100:100 kg/ha.
Transplantation	June	Transplanting of 6-8 weeks old healthy seedlings preferably in the evening at a spacing of 40-60 cm
Irrigation	June	During summer irrigation is required once a week. With the onset of monsoon, the rains meet the water requirements of the crop fully till September. The crop needs irrigation once or twice a month thereafter. About 12-15 irrigation are enough during a cropping season.
Intercultural operations	July	Weeding
	August	Weeding, hoeing and earthing-up

First harvest	September	Harvest at 90-95 days after planting when plants are at full bloom stage and the lower leaves start turning yellowish. Harvesting is done by cutting the crop at 15-20 cm above ground level with help of sickles.
Subsequent harvest	November onwards	Subsequent harvesting can be done after every 65-75 days. 3-4 floral harvest can be obtained. The whole plant is harvested finally leaving about 15 cm from the ground level for regeneration of the crop.

– Note : –



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