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**Topic-** Cultivation of Ocimum crop  
**Sub-Topic-** Introduction, Botanical Description, Uses, Major production areas, Methods of Cultivation, Soil, Irrigation, Manuring & Fertilization, Climate, Species, Improved varieties, Season of Planting, Nursery, Intercultural Operations, Method of Planting, Propagation, Plant Protection Measures, Processing, Harvesting, Yield.

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#### **Cultivation of Ocimum:**

**Local name:** Sacred basil / Holy basil (English), Tulsi (Hindi, Gujarati, Sanskrit)  
**Botanical name:** *Ocimum sanctum* (Linn).  
**Family name:** Lamiaceae

#### **Introduction:**

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. Many species of *Ocimum* contain various economically important essential oils used in perfumery and cosmetics industries. The major constituents in *Ocimum* oils include linalool, geraniol, citral, camphor, eugenol, methyl chavicol, safrol, thymol, methylcinnamate etc. *Ocimum* species are used as herbs and find diverse uses in the indigenous systems of medicine in countries like India, Africa, Arabia, Australia, Malaya, pacific islands and Sri Lanka. The oil of certain species of *Ocimum* has the antifungal, bactericidal and insecticidal properties too. As the demand for our aromatic industry is growing high, concerns are raising over the improved production and quality of raw materials used.

#### **Botanical Description:**

Sacred basil or Holy basil, *Ocimum sanctum* Linn is a biennial or triennial shrub. The species is worshiped by the Hindus and commonly Cultivation of *Ocimum* DMAPR, Boriavi 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,  $\alpha$ -pinene,  $\beta$ -pinene, camphor, cineole, linalool etc. The plant is used as a pot herb; leaves are used as condiment in salads and other foods. *Ocimum 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.

### **Medicinal Use:**

Tulsi is an aromatic medicinal plant is often taken in combination with other herbs. The fragrant leaves and flowers, in the form of tincture, tea or decoction are considered to be stomachic and expectorant, used in treating coughs, bronchitis, skin diseases, and diarrhea. These preparations are considered to be prophylactic against epidemics including cholera, influenza and malaria. The tulsi seeds, taken mixed in water, juice or cow's milk, are antioxidant, nourishing, mucilaginous and demulcent.

They are used in treating low energy, ulcers, vomiting and diarrhea or as an overall tonic. The powder of the dried root, taken in milk, ghee or as a decoction, is recommended to treat malarial fever as an analgesic application to the bites and sting of insects and also to increase sexual stamina and prevent premature ejaculation. The herb improves resistance to stress and has a normalizing influence on blood pressure and blood sugar imbalances. Tulsi is likely to prove prophylactic against the negative effects of environmental toxins, including cancer. The plant is also richly endowed with bioavailable antioxidants, vitamins A and C and calcium. It has marked insecticidal activity against mosquitoes.

### **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.

### **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 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.

### **Cultivation methods:**

#### **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.

#### **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.

#### **Species:**

- 1 *Ocimum basilicum*- Sweet basil
- 2 *Ocimum sanctum*- Tulsi and Holy Basil
- 3 *Ocimum minimum*- This is a dwarf variety of tulsi.
- 4 *Ocimum gratissimum*- Ram tulsi and Shrubby Basil.
- 5 *Ocimum americanum*- Kali tulsi, Mummy and Hairy Basil.

**Improved Varieties:**

- **R.R.L.O.C.-11**
- **R.R.L.O.C.-12**
- **R.R.L.O.C.-14**

**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.

**Planting time:**

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

**Preparation of Nursery:**

Raised seed beds of  $15 \times 4 \times 9$  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.

**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.

**Transplanting:**

Seedlings of six weeks old and having 4-5 leaves are transplanted at a spacing of  $40 \times 40$  cm,  $40 \times 50$  cm and  $50 \times 30$  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.

**Manure and Fertilizers:**

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<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O per hectare. Half the dose of N and the entire dose of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O 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<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O per hectare is recommended for saline and alkaline soils at Lucknow.

**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.

**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.

**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.

**Control:** 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%.

**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.

**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.

**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.

<b>Reference Books</b>		
<b>1.</b>	Aushadhiya Paudhe	S.K. Jain. NBT New Delhi
<b>2.</b>	Medicinal plants of India & Pakistan	Dr.Kirti Garg.
<b>3.</b>	Plantation crops	K. V. Peter
<b>4.</b>	Major Spices of India, Crop Management – Post Harvest Technology	Pruthi.J.S.