

Livelihood security of small and marginal farmers through *Ocimum* cultivation

In view of achieving the target of doubling farmers income by March 2022, there is a need to identify crops and varieties that may suit resource poor farmers. Introduction, adaption and acceptance of new crops, varieties and latest technical knowhow for crop production can potentially strengthen farmers' cropping systems by increasing yields, improving drought resilience and also by capturing new market opportunities. In this context, ocimum cultivation may be adopted by small and marginal farmers of India. It is a miracle plant which is valued for its medicinal properties. It has been harvested for use in Ayurveda treatments for 5,000 years and is known as the 'Queen of Herbs'. Essential oil of ocimum is widely used in perfumery, cosmetics, pharmaceuticals and confectionary industries. Farmers may adopt ocimum cultivation in rainfed areas in *Kharif* season as it requires lower input and gives better returns, thus it has the potential of enhancing farmers income.

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. Basil is an excellent shrub and known as the 'queen of herbs'. It belongs to the family of 'Lamiacea'. 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. The annual export of dry leaves herb, its products, essential oil, and its derivatives/chemical constituents of *Ocimum* are worth 5,000 tonnes.

Tulsi leaves contain a bright yellow volatile oil which is useful against insects and bacterial. The principle

constituents of this oil are eugenol, eugenol methyl ether and carvacrol. The oil is reported to possess anti-bacterial and antiviral properties. Drugs obtained from tulsi are used to cure fever, decreases inflammation and increases stamina. It is 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 herb improves resistance to stress and has



Field view of *Ocimum* crop at maturity stage



Field view of one month old *Ocimum* crop

a normalizing influence on blood pressure and blood sugar imbalances. The plant is also richly endowed with bioavailable antioxidants, vitamins A and C and calcium. It has marked insecticidal activity against mosquitoes. The oil is used as antiperspirant and as fly and mosquito repellent. CSIR-CIMAP is actively involved in both genetic enhancement of the *Ocimum* species as well as developing various cultivation practices for increasing yield of herb and oil yield. Commercial farming of genus *Ocimum* can be grouped in cultivation of these two species.

Indian basil (*Ocimum basilicum*)

Indian basil (*Ocimum basilicum*) is a short-duration crop and is cultivated in India for its essential oil used extensively in flavour, fragrance, food, oral health, etc. The crop thrives well on moderate fertile and well-drained sandy loam soil. It can be grown in subtropical and tropical climate conditions. Temperate climate is not suitable for this crop. CSIR-CIMAP has developed high-yielding varieties with chemical variability, namely, CIM-Saumya, CIM-Snigdha and CIM-Surabhi. The crop is propagated by seeds/seedlings during months of June and July, and it can yield about 80 kg oil giving a net profit of ₹ 35,000–40,000 per ha in about 3 months.

Varieties

CIM-Saumya: The variety is a short-duration crop of 3 months and has the potential to produce about 80–100 kg/ha oil rich in methyl chavicol (62%) and linalool (25%).

CIM-Snigdha: This variety developed by CSIR-CIMAP is distinct in leaf morphology and has unique aroma. The variety matures in 80–90 days yielding essential oil rich in methyl cinnamate content (78.7%).

CIM-Surabhi: The essential oil of sweet basil with linalool, linalool acetate in desired combinations is used in various cosmetic and perfumery products. This high oil-yielding variety (100–120 kg/ha) is developed with a unique chemical composition having 70–75% linalool

with 99% purity. The linalool obtained from this variety is superior to that obtained from lavender and will be a cheaper source of linalool for the industry.

Holy Tulsi (*Ocimum sanctum*)

Tulsi is well known for its traditional medicinal values due to its antioxidant and anti-ageing properties. The decoction of leaves is effective for relief from seasonal cold and cough and stomach disorders. The crop is cultivated by a large number of farmers which can give a net profit of about ₹ 70–80,000 per ha.

CIM-Ayu: The variety CIM-Ayu developed by CSIR-CIMAP has the potential to produce 16 q dry leaf yield or 110 kg/ha oil rich in eugenol (83%) even in rainy season. The variety is being cultivated as annual crop in around 4000 ha in Mathura, Uttar Pradesh, Gujarat, Karnataka and Maharashtra states of India for its leaf oil and dry leaves for use in herbal tea.

CIM-Angna: The plant morphology is distinct by having greyish purple stem with green leaves, which turn purplish in winter season. The variety is producing dry leaf herb yield (14 q/ha) or 90 kg/ha essential oil yield containing eugenol (40%) and germacrene-D (16%).

Improved agronomic practices for basil cultivation

Soil

Ocimum cultivation is avoided in highly saline, alkaline or water logged conditions as these are not good for its yield. It gives best result when grown under well drained soil with good organic matter. Well drained soil ranging from pH 5.5–7 suits best for its growth.

Seed and sowing

About 500 g seeds are enough to raise the seedlings for transplanting in one hectare of land. Seed beds of 4.5 × 1.0 × 0.2 m size are prepared. Before sowing, to protect crop from soil borne disease and pests, seeds are treated



Ocimum basilicum crop at full bloom stage

with Mancozeb @ 5 gm/kg of seeds. 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 25-30 days time. A spray of 2% urea solution on the nursery plants at 15 to 20 days before transplanting helps in getting healthy seedlings for transplanting.

Transplanting

Seedlings of six weeks old and having 4-5 leaves are transplanted in July at a spacing of 45 × 30 cm to get high herbage and oil yield. Water seedling beds 24 hours before transplanting so that seedlings can be easily uprooted and remain turgid at transplanting time. 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.

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 10-15 t/ha before planting. Ensure that FYM / compost is well decomposed before use. The optimum fertilizer dose recommended for this crop is 80 kg N, 40 kg of P_2O_5 and 40 kg K_2O per hectare. One third 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 1-1.5 kg farm yard manure/m² in nursery is recommended for obtaining healthy seedling.

Irrigation

In summer, apply 3 irrigation per month and in rainy season, no irrigation is required. About 12-15 irrigations should be given in one year. First irrigation should be given after transplanting and then second irrigation is given during seedling establishment. Apply mulch to conserve soil moisture. However, before harvesting, irrigation should be discontinued.

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. 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

Harvesting

Harvesting is usually done in bright sunny days for good oil yield and quality. 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. 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.

Post-harvest processing

Post-harvest processing is usually the most critical stage in determining the end quality of the aromatic plant material. After harvesting, drying of leaves is done. Then steam distillation is done to obtain Basil oil. 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. For transportation, it is packed in airtight bags. Leaves should be stored in dry places. From herb, several products like Panch Tulsi oil, Tulsi Ginger, Tulsi Powder, Tulsi Tea and Tulsi Capsules are made after processing. Extraction of oil through steam distillation is better than hydro-distillation as it takes less time and improves the oil recovery.

Expected returns

An average yield of 20 tonnes of green herbage and 100-120 kg/ha from whole herb will be obtained. Tulsi farming involves an average cost of cultivation ₹ 45,000/ha and gross returns of ₹ 1,00,000/ha after selling the herb, thus leading to a net return of ₹ 55,000/ha.

For further interaction, please write to:

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