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FACULTY OF AGRICULTURAL SCIENCES AND ALLIED INDUSTRIES

Ocimum -Importance, chemical composition origin, distribution, area, production, climate and soil requirements, types and varieties, propagation techniques, planting and after care, training and pruning, nutritional requirements, plant protection, harvesting and distillation of oil

Importance and chemical composition

The 'Sacred basil' or 'Holy basil', *Ocimum sanctum* Linn. belonging to the family Lamiaceae, is commonly cultivated in gardens. The species is worshipped by the Hindus of India and traditionally grown in courtyards and temples. The leaves of this species, on steam-distillation, yield a bright yellow, volatile oil possessing a pleasant odour characteristic of the plant, with an appreciable note of camphor and cloves.

The plant contains mainly phenols, aldehydes, tannin, saponin and fats. The essential oil components are eugenol (about 71%, eugenol methyl ether (20%), nerol caryophyllene, selinene, α-pinene, β-pinene,camphorcineole, linalool and carvacrol (3%). A terpeneurobsolic acid possessing anticancer properties has also been isolated. The seeds of this plant give a greenish-yellow fixed oil and also contain antistaphlocoagulase which can be extracted with water and alcohol.
The plant is also used as a pot herb. Its leaves are used as a condiment in salads, and other dishes. The leaves, seed and root are medicinally useful. The leaves also contain ascorbic acid (83 mg 100 g) and carotene (2.5 mg/100 g). The juice of the leaves possesses disphoretic, antiperiodic, stimulating, expectorant and antipyretic properties. It is used in catarrh and bronchitis, applied to the skin in ringworm and other cutaneous diseases and as drops to relieve earache. An infusion of the leaves is used as a

stomachic in gastric disorders of children. If taken internally, it strengthens the liver and heart and is a good appetizer. It cures amenorrhoea and promotes the secretion of milk in lactating women. The leaves, if chewed, give relief from toothache. The leaf-juice is applied to reduce inflammations. A decoction of the root is given as a disphoretic in malarial fevers. The powdered root, if taken twice daily for seven days cures spermatorrhoea.

The seeds are mucilaginous and demulcent and are given in disorders of the genito-urinary system. The seeds rubbed in water are given for irritation coughs, gonorrhea, labour pains and dysentery. The seeds rubbed with cow's milk are given for vomiting and diarrhea. The juice of the fresh leaves, flower-tops and the slender roots are considered to be good antidotes for snakebite and scorpion sting. Tribals (Santals) use the plant in cholera, cough, postnatal complaints, hemorrhagic septicemia and dog bite. The volatile oil is reported to possess antibacterial and insecticidal properties. It inhibits the in vitro growth of Mycobacterium tuberculosis and *Micrococcus pyrognes var. aureus.* It has marked insecticidal activity against mosquitoes.

Soil

It thrives well on a variety of soils. Rich loam to poor laterite, saline and alkaline to moderately acidic soils are all well suited for its cultivation. Well-drained soils aid in better vegetative growth. Water-logged conditions can cause root-rot and result in stunted growth.

Climate

The plant can be grown under partially shaded conditions but it yields less oil. It flourishes well under fairly high rainfall and humid conditions. Long days and high temperatures have been found favourable for the plant growth and oil production. Tropical and subtropical climate (at altitudes up to 900 m) are suited for its cultivation. The plant is moderately tolerant to drought and frost.

The nursery can be raised in the third week of February and transplanting

is generally started in the middle of April. This can be undertaken in the month of March, if the seedlings are raised in beds.

Land preparation

The land is brought to a fine tilth and laid out into plots of convenient sizes for irrigation. It is preferable to add 15t/ha of FYM during the preparation of the land.

Propagation

The plant is propagated by seeds. The seeds are likely to deteriorate in future generations on account of the highly cross-pollinated nature of the crop. Hence, for fresh plantings, the growers have to take fresh seeds from the pedigree stock.

Nursery raising

Raised seed-beds of 15’ x 4’x 9” size should be thoroughly prepared and well manured by the addition of FYM. About 200-300 g seeds are enough to raise seedlings for planting one hectare of land. The seeds should be sown 2 cm deep in the nursery-beds. After sowing the seeds in the nursery, a mixture of FYM and soil is thinly spread over the seeds and irrigated with a sprinkler-hose. The seeds germinate in 8-12 days and the seedlings are ready for transplanting in about 6 weeks time, at the 4-5 leaf stage. A spray of 2% urea solution on the nursery plants 15 to 20 days before transplanting helps in raising very healthy plants for transplanting.

Transplanting

It is recommended to plant the seedlings at a distance of 40 x 40 cm, 40 x 50 cm and 50 x 30 cm to get high herbage and oil-yield per hectare at Lucknow, New Delhi and Indore, respectively. The plots are irrigated immediately after transplanting. The seedlings will establish well by the time of the second irrigation. At this stage gap filling and replacement of the poor plants is done so that a uniform stand is achieved.

Fertilizer application

The application of 120 kg/ha, 105 kg/ha of P2O5 and K2O is recommended for saline and alkaline soils at Lucknow. The optimum fertilizer dose recommended for this crop is 120 kg N and 60 kg P2O5/ha. Half the dose of N and the entire dose of P2O5 are given as a basal dose. Whereas, the remaining N is applied in two split doses, after the first and second cuttings. The application of the micronutrients Co and Mn at 50 and 100 ppm concentrations, respectively, is reported to increase the oil-yield significantly.

Irrigation

Irrigation depends upon the moisture content of the soil. In summer, 3 irrigations per month are necessary whereas, during the remaining period, it should be done as and when required, except in the rainy season when no irrigation is necessary. Altogether, about 12-15 irrigations years are sufficient.

Weeding

The first weeding is done one month after planting, and the second 4 weeks after the first. After this, no further weeding is required as the plants become bushy, thereby naturally suppressing the weeds.

Interculture

One hoeing, two months after planting, is sufficient. The crop may also be earthed-up at this stage.

Diseases and pests

Diseases

The plant is susceptible to powdery mildew caused by *Oidium spp.*, seedling blight caused by *Rhizoctonia solani* and roor-rot caused by *Rhizoctonia bataticola*. Powdery mildew can be controlled by spraying

wettable sulphur (4 g/l of water), and the latter two diseases are managed by improved phyto-sanitary measures and by drenching the nursery-beds with a solution of mercurial fungicide.

Pests

Among the insects, the larvae of leaf-rollers sticking to the under surface of the leaves fold them backwards lengthwise, thus webbing them. Malathion (0.2%) may be sprayed to control this insect.

Harvesting, yield and processing

The crop is harvested when it is in full bloom. The first harvest is obtained 90-95 days after planting. Afterwards, it may be harvested at every 65-75 days, intervals. Harvesting should be done on bright, sunny days in order to obtain good quality oil-yield. It is not desirable to harvest the crop if it has rained the previous day.

The crop should be cut 15-20 cm above ground-level. The harvested produce may be allowed to wilt in the field itself for 4-5 hours, to reduce the moisture content and the bulkiness.

About 5 t/ha of fresh herbage can be obtained twice or thrice a year.

Distillation of oil

The harvested produce is usually distilled in its fresh form. However, the oil quality and yield do not diminish up to 6-8 hours after harvest, by any further delay may cause considerable loss in yield and quality of oil. Steam-distillation is found to be superior to water distillation. The whole herb contains 0.1 to 0.23% essential oil. The yield of oil varies with the type, season and place of origin. The oil-yield will be approximately 10-23 kg/ha.