



# Effect of Fertilizer Application on Growth, Hebage and Oil Yield in Hybrid Aromatic Tulsi

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**Abstract:** A field experiment was conducted for an inter-specific hybrid (*Ocimum kilimandscharicum* and *Ocimum basilicum*) variety CIM-Shishir of *Ocimum* at College of Forestry, Dr Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli during 2021-2022 to analyse the response fertilizer application on growth, fresh biomass, oil content and oil yield. Experiment was laid out in randomized block design (RBD) with six treatments (with four replications): T<sub>1</sub>(control- no fertilizer), T<sub>2</sub> (FYM 10 T ha<sup>-1</sup>), T<sub>3</sub> (FYM 10 T ha<sup>-1</sup>) +100% NPK, T<sub>4</sub> (FYM 10 T ha<sup>-1</sup>) + 75% NPK, T<sub>5</sub> (FYM 10 T ha<sup>-1</sup>) +50% NPK, T<sub>6</sub> (RDF @ 160:80:80 NPK. Plant height (110.80 cm), number of primary branches (8.05), fresh biomass yield (537.75 quintal ha<sup>-1</sup>), oil content in fresh herb (0.70 %) and oil yield (221.25 kg ha<sup>-1</sup>) was highest in response to FYM (10T ha<sup>-1</sup>) + 100% NPK application and lowest was in control (no fertilizer application). From these results it was concluded that dose of fertilizer FYM (10T ha<sup>-1</sup>) + 100% NPK (160:80:80 kg ha<sup>-1</sup>) increase the growth, fresh biomass yield, oil content and oil yield in hybrid aromatic tulsi.

**Keywords:** Tulsi, Growth, Fresh biomass, Oil content, Oil yield

Tulsi is an aromatic shrub in the basil family Lamiaceae that is thought to have originated in north central India and now grows native throughout the eastern world tropics. In Ayurveda, tulsi is known as “The Incomparable One,” “Mother Medicine of Nature” and “The Queen of Herbs,” and is revered as an “elixir of life” due to its medicinal and spiritual values. In India, tulsi has been adopted into spiritual rituals and lifestyle practices that provide a vast array of health benefits including anxiety, cough, asthma, diarrhea, fever, dysentery, arthritis, eye diseases, otalgia, indigestion, hiccups, vomiting, gastric, cardiac and genitourinary disorders, back pain, skin diseases, ringworm, insect, snake and scorpion bites and malaria (Cohen 2014). Many species of genus *Ocimum* have been advocated for commercial cultivation under agroforestry land use systems and are found economically viable (Thakur et al 2012, Suvera et al 2015, Kumar et al 2016). Therefore, it is necessary to develop package of practices of cultivation for newly developed varieties (Suvera et al 2016, Rahman et al 2014).

The nutrient management practices involve judicious combination of inorganic fertilizers and organic manures to maintain soil fertility and to improve the production potential of any crop (Thakur et al 2009; Verma et al 2010; Khalid et al 2015;). This approach is reasonably cheap, technically sound and practically feasible and is capable of maintaining the sustainability in production. Keeping this view, the experiment was carried out to study the “effect of fertilizer application on growth, biomass oil content and oil yield in hybrid aromatic tulsi crop” was carried out.

## MATERIAL AND METHODS

A field experiment was conducted for an inter-specific hybrid (*Ocimum kilimandscharicum* and *Ocimum basilicum*) variety CIM-Shishir of *Ocimum* at College of Forestry, Dr Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli during 2021-2022. It is Konkan region of Maharashtra situated at an elevation of 243.84 m above sea mean sea level and located at 12° 58' North latitude, 77° 55' East longitude. The climate of the Dapoli is warm humid with an annual rainfall 3000 to 3500 mm. The climate is typically tropical with hot and humid summers having heavy rainfall during monsoon and warm winters. The experiment area is comprised of red sandy loam soil with uniform fertility with available nitrogen, phosphorus and potassium of 288.51, 7.8 and 202.94 kg/ha, respectively. Soil has pH, EC and organic carbon values 5.16, 0.17 dsm<sup>-1</sup> and 1.51%, respectively. The experiment was laid out in randomized block design (RBD) with four replications with six treatments viz., T<sub>1</sub>(control- no fertilizer), T<sub>2</sub> (FYM 10 T ha<sup>-1</sup>), T<sub>3</sub> (FYM 10 T ha<sup>-1</sup>) +100%NPK, T<sub>4</sub> (FYM 10 T ha<sup>-1</sup>) + 75% NPK, T<sub>5</sub>(FYM 10 T ha<sup>-1</sup>) +50% NPK, T<sub>6</sub> (RDF @ 160:80:80 NPK). Field was prepared following standard practices and divided into plots of 3 m x 4.2 m size. As per treatment dose, FYM was applied to each plot and incorporated well in the soil 10 days prior to plating and chemical fertilizers were applied as per package of practice at the time of seedling planting. After each harvest (90 days interval), remaining fertilizer dose was applied. Seedlings were raised through cutting in nursery. One-month-old seedling were transplanted in plots of 3 x 4.2 m size at 60 x 60 cm spacing in November, 2021 and light

irrigation was given immediately after planting. Weeding was done at periodic intervals to keep the field weed free. Subsequent irrigations were given as per the crop requirement based on soil moisture content. First harvest was taken (at 50% full bloom stage) at 90 days after planting and subsequent cuttings were again taken at 90 days intervals. Five plants from each plot were used to record the average height of the plant, number of primary branches, after each harvest fresh weight of fresh biomass was recorded and then the plants were used for the oil extraction with help of Clevenger apparatus and oil content is recorded.

## RESULTS AND DISCUSSION

**Growth performance:** Significant differences were observed in the plant height up to the harvest period of the hybrid aromatic tulsi (Table 1) in response to different integrated nutrient management practices.

Maximum plant height (110.00 cm) and number of primary branch/plant (8.00) was observed in response to T<sub>3</sub> (FYM 10 T ha<sup>-1</sup>) +100% NPK application and lowest (75.50 cm) was in control T<sub>1</sub>. On the basis of results the effect of treatments on plant height was in the order T<sub>3</sub>>T<sub>6</sub>>T<sub>4</sub>>T<sub>5</sub>>T<sub>2</sub>>T<sub>1</sub>.

The results are in close conformity with the finding of Naggar et al (2015) and Rajit et al (2019). This might be due to sufficient supply to nitrogen to crop. It might be due to higher nitrogen content in farm yard manure and NPK fertilizers been used in T<sub>4</sub> and T<sub>5</sub>. T<sub>4</sub> and T<sub>6</sub> treatment are statistically similar.

**Fresh biomass yield:** It is evident from the (Table 1) that the application of FYM 10 T ha<sup>-1</sup> +100% NPK resulted in significantly highest fresh herbage yield of 537.75 q ha<sup>-1</sup> (Three ratoon crop). The lowest fresh biomass yield (205.50 q ha<sup>-1</sup>) was obtained in T<sub>1</sub> (control- no fertilizer). Combined application of organic manure along with inorganic fertilizer

regulate the supply of nutrients which in turn increase the crop yield (Merestala 1996; Thakur et al 2009). Similar findings were also reported by Mohamad et al (2014) in *Ocimum basilicum* and Verma et al (2010) in *O. sanctum*.

**Essential oil content and oil yield:** Application of different levels of FYM and inorganic fertilizer showed a significant effect on essential oil content (Fig. 1) and yield of hybrid aromatic tulsi (Table 1). Application of FYM 10 T ha<sup>-1</sup> +100% NPK gave maximum essential oil content (0.70%) whereas the lowest (0.31 %) was from control- no fertilizer. Soil nutrient get enhanced with application of organic manure resulting in positive effect on the growth, herbage and oil yield (Khalid et al 2015, Thakur et al 2009).

Oil production is the most important parameter in aromatic hybrid tulsi farming. Different levels of FYM and inorganic fertilizer showed a significant increase in oil production which can be attributed to the increased NPK doses either through organic or inorganic form (Table 1). In the present study, oil yield per hectare increased with the increase of FYM doses, and application FYM 10 T ha<sup>-1</sup> +

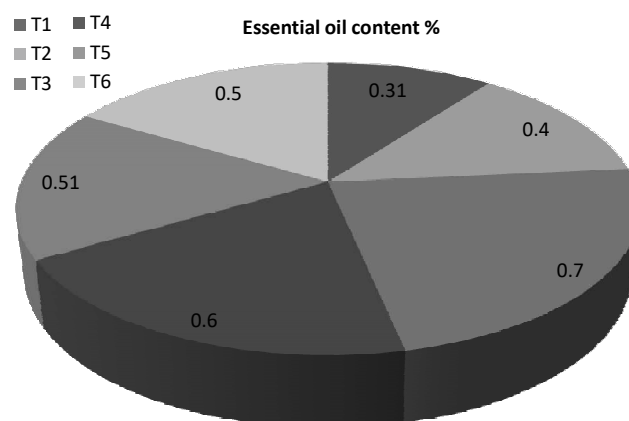


Fig. 1. Essential oil content in aromatic tulsi crop

Table 1. Effect of fertilizer application on growth and yield parameter in hybrid aromatic tulsi crop

Treatment	Plant height (cm)	No. of primary branches	Fresh biomass (q ha <sup>-1</sup> )	Essential oil content %	Oil yield (kg ha <sup>-1</sup> )
T <sub>1</sub> (control- no fertilizer)	75.50	3.25	205.50	0.31	151.0
T <sub>2</sub> (FYM 10 T ha <sup>-1</sup> )	83.50	4.75	299.75	0.40	167.0
T <sub>3</sub> (FYM 10 T ha <sup>-1</sup> ) +100%NPK	110.80	8.05	537.75	0.70	221.0
T <sub>4</sub> (FYM 10 T ha <sup>-1</sup> ) + 75% NPK	97.00	6.02	465.50	0.60	191.2
T <sub>5</sub> (FYM 10 T ha <sup>-1</sup> ) +50% NPK	84.00	5.02	424.25	0.51	177.5
T <sub>6</sub> (RDF @ 160:80:80 Kg NPK	97.75	4.77	421.50	0.50	173.2
SE	1.01	0.157	4.26	0.005	2.20
CD (p=0.05)	3.04	0.474	12.85	0.016	6.63
CV %	2.21	5.93	2.17	2.15	2.44

100% NPK gave maximum oil yield in the tulsi crop (221 kg ha<sup>-1</sup>) and the lowest oil yield (151.0 kg ha<sup>-1</sup>) was obtained in T<sub>1</sub> (control- no fertilizer). Integrated nutrient management improve the chemical, physical and biological soil proprieties that reflect positively on plant growth and oil yield (Patra et al 2000, Thakur et al 2014). These results are similar to the observation of Dadkhah (2012). The outcome of the present investigation revealed that the maximum fresh herbage yield, essential oil content, oil yield was obtained with combined application of FYM 10 T ha<sup>-1</sup> +100% NPK.

### CONCLUSION

The study indicated that application of FYM 10 T ha<sup>-1</sup> + 100% 160: 80:80 kg ha<sup>-1</sup> NPK recommended organic and inorganic fertilizer as basal and the remaining fifty per cent as top dressing after each harvest (90 days interval) proved best for aromatic tulsi crop to achieve better growth, higher fresh herbage and oil yield.

### ACKNOWLEDGEMENT

Thanks to Dr. Sunita Dhawan, Scientist CSIR-Central institute of Medicinal and Aromatic plants, Lucknow for providing sample planting material of hybrid aromatic tulsi variety *CIM-Shishir*.

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