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Standardize the ideal dose of different organic sources in growth and yield of Tulsi (*Ocimum sanctum*) cv. Krishna

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Abstract
The maximum vegetative growth viz., plant height, plant spread, Number of branches, fresh herbage yield, dry herbage yield with the application of FYM (10 t/ha) and pressmud (10t/h). Among the various organic sources applied FYM (10 t/ha) performed better in increasing fresh and dry herbs yield and quality. From over all experimental results, it is concluded that higher observation can be obtained from higher dry herbs yield of Tulsi with the application of FYM (10 t/ha).The present finding gained significance particularly in the present context i.e. increasing awareness of farmers for use of various organic manures doses for increasing yield of important medicinal plants (Tulsi and others). There is further need to workout the efficacy of various organic manures (organic farming) and use of boi-fertilizers for improving quality of processed products of Tulsi in order to maintain the quality value (Eugenol & Linalool) in international market.

Keywords: effect of organic manure on growth and yield

Introduction
Tulsi is known as 'The Queen of Herbs", it is most sacred herb of India. It is cultivated in Southern France, USA, Egypt, Hungary and Belgium. Tulsi commonly called as Holy Basil in English and Tulasi in Sanskrit. Green leaves of tulsi are called Sri Tulsi and the reddish leaves are called Krishna Tulsi. Leaves of tulsi contain very essential oil. The oil from this plant constitutes eugenol, Linalool, camphor, geraniol, methyl chavicol, methyl cinnamate and caryophyllene, etc. The leaves contain beta-carotene, sterols, fatty acids, proteins, carbohydrates, volatile oil, fixed oil, mineral matters and vitamin A, B and C. It contains phenolics such as carvacrol and eugenol; non-phenolics such as methyl Eugenol, methyl chavicol and caryophyllene, etc.

Major: volatile oil (0.4-0.8%) is containing chiefly eugenol (~21%) and β-caryophyllene (37%). Eugenol content reaches maximum in spring and minimum in autumn. Others: - A number of sesquiterpene and monoterpenes viz. Bornyl acetate, a-elemene, methyleugenol, neral, β-pinene, camphene etc. Ursolic acid, campestrol, cholesterol, stigrasterol, a-sitostorol and methyl esters of common fatty acids. Tulsi (*Ocimum sanctum*) is an important medicinal plant which belongs to family Lamiaceae and native to India. The plant is useful in the treatment of stomach pains, fever, cough, worms and gout. The leaf juice is used as a nasal douche, a nostrum for ear ache and croup for which it is given with honey. The seeds are refreshing and have sedative properties. Sweet basil is used as food flavourant in perfumery and cosmetics industries. The chemical constitutions of essential oils obtained from various species have shown that there exist a number of types available which can be interesting to perfumes. The utilization in industry found in following chemical constituent of the tulsi (*Ocimum species*) are in case of oil in *Ocimum basilicum* 0.5-2.0 per cent essential oil, *Ocimum canum* 2.0-4.0 per cent, *Ocimum americanum* 3.6-6.5 per cent, *Ocimum kilimandscharicum* 1.5-3.5 per cent, *Ocimum sanctum* 0.5-1.0per cent. The whole plant is medicinal. Essential oil derived from vegetative parts of the *O. sanctum* is costly. There is very good scope for its cultivation. Indigenous basil is distributed in India, Sri Lanka, Bangladesh, Thailand, China, Myanmar and Malaysia. In India, *Ocimum sanctum* is grown in temple, household precinct and is found throughout in plains to 1800-2000 m in

Himalayas. The different sources of organic manures, *viz*., animals, plant, wastage and bio-dynamic manures which contains variable amount of nutrients among the various sources of organic manure, well rotten FYM, decomposed pressmud, vermicompost, bio-fertilizers, other plant based waste materials and micro nutrients are mainly used as organic manures. The application of organic sources is also helpful to improve the soil properties and microbial population. The use of vermicompost in horticultural, medicinal crops found to be most effective organic which influence the physico-chemical properties of soil viz. soil structure, porosity and good aeration.

Materials and Methods

The present investigation entitled "Standardize the ideal dose of different organic sources in growth and yield of Tulsi *(Ocimum sanctum*) cv. Krishna'' was carried out at Farm of C.B.G. Ag. P.G. College, BKT, Lucknow (U.P.) during the year 2017-18. The details of experimental materials used and methods adopted are being enumerated below. The experiment was laid out in randomized block design (RBD). All treatments were randomly allocated among the plots and replicated three times.

Total Treatments: 11 T_1 Control, T_2 FYM 5 ton/ha, T_3 FYM 10 ton/ha, T_4 Vermicompost 2.5 ton/ha, T_5 Vermicompost 5 ton/ha, T_6 Pressmud 5 ton/ha, T_7Pressmud 10 ton/ha, T_8 Biofertilizers (PSB) 10 kg/ha, T_9 FYM 5 ton/ha + PSB 10 kg/ha, T_{10}Vermicompost 2.5 t/ha + PSB 10 kg/ha and T_{11}Pressmud 5 t/ha + PSB 10 kg/ha.

Statistical Analysis

The data obtained during the experimentation was subjected to statistical analysis as per procedure described by Gomez and Gomez (1984). The significance of the treatments was tested through F test at 5% and 1% level of significance. Whereas, the mean analysis was done after testing the significance of the variance ratio of error mean squares.

Result and Discussion

Plant height of Tulsi influenced significantly by the application of different organic manures. However, the maximum plant height (88.89cm) was recorded with the application of T_7 (Pressmud 10 ton/ha) followed by T_3 (FYM 10ton/ha). The minimum plant height (55.90 cm) was observed under T_1 (Control) treatment Spread of plant ranged from 46.23-81.23 cm.^{2} and maximum plant spread (81.23 cm^2) was recorded with the application of T_3 (FYM 10 t/ha) followed by T_7 (Pressmud 10 t/ha) (76.58). The minimum plant spread (46.23) was observed under T_1 (Control) treatment. However, the maximum no. of branches/ plant (19.53) was recorded with the application of T_3 (FYM 10 ton/ha) which was superior over rest of the treatments followed with the application of T_7 (Pressmud 10t/ha) of 16.93. The minimum no. of branches per plant (9.82) were recorded in T_1 (Control) treatment. The maximum day taken for 50% flowering in T_3 (89.00) followed by T_7 (Pressmud 10 t/ha) 87.33.The minimum reading observed in control (81.67) T_1. However, the maximum fresh herbage yield (110.63 q/ha) was obtained with the application of T_3 (FYM 10 ton/ha) followed by 107.95 T_7 (Pressmud 10 t/ha). The minimum fresh herbage yield (71.64 q/ha) was noted in T_1 (Control). However, the maximum dry herbage yield (33.18 q/ha) was obtained with the application of T_3 (FYM 10 t/ha) followed by (32.38) T_7 (Pressmud 10 t/ha). While the minimum herbage yield (17.91 q/ha) was observed in T_1 (control).

Plant height as influenced by the use of different organics treatments clearly indicated that Pressmud (10 t/ha) has been found significantly superior (87.77 cm) to the rest lowest was and in control (56.90cm). Although these organic sources increase plant height significantly higher plant height measured with the use of Pressmud might be due to containing higher organic matter as well as NPK. Similar result was observed by Hosni *et al*. (1998) in Tulsi. plant spread (cm^2) indicated that significant variation observed due to application of various organics treatments. The maximum plant spread (80.77 cm^2) was measured due to the application of FYM (10 ton/ha) than other organics treatments. Moreover, all the FYM doses except control which may be enhance the spread because of their role influence plant spread of Tulsi. Similar results were observed by Hosni *et al*. (1998) in Tulsi. Number of branches per plant indicated that significant variation observed due to application of various organics treatments. The maximum number of branches per plant (19.53) was found due to application of FYM (10 ton/ha) as providing the organic nutrients which enhances strength, stem, growth and development of plant. Compared to other organics treatments and all the FYM doses were significantly superior over to control, which might be due to the role of FYM increasing number of branches per plant. Similar results were observed by Hosni *et al*. (1998) in Tulsi. Flowering 50% flowering was noted. In control treatment after 81.67 days of planting while late flowering was noted with the application of 10 ton FYM /ha which may be due to application of different organics treatments containing NPK. Similar results were also observed by Singh and Singh (2006) in Kalmegh. Application of various organics doses, higher fresh herbage yield (110.63q/ha) has been achieved by the application of FYM 10ton/ha compared to other organics treatments combination and control (71.64q/ha). The beneficial responses of FYM on the herbage yield have also been reported by other workers. The maximum dry herbage yield (33.18q/ha) was obtained due to application of FYM 10ton/ha. Similar result was observed by (Gill *et al.* 1992, Prakash *et al.* 2005, Sandeep-Sanhgal; Thakur, P-S 2009).

Table 1: Effect of different organic sources in plant height (cm), plant spread (cm^2), No. of branches/plant and days taken to 50% flowering at harvesting time

Treatments	Plant height (cm)	Plant spread (cm^2)	No. of branches/plant	Days taken to 50% flowering
T_1 Control	55.90	46.23	9.82	81.67
T_2 FYM 5 t/ha	63.62	69.78	15.44	87.00
T_3 FYM 10 t/ha	84.49	81.23	19.53	89.00
T_4Vermicompost 2.5 t/ha	63.55	70.44	14.00	82.67
T_5Vermicompost 5 t/ha	67.89	66.44	16.04	84.33
T_6Pressmud 5 t/ha	71.97	62.48	13.66	87.00
T_7Pressmud 10 t/ha	88.89	76.58	16.93	87.33
T_8Biofertilizers (PSB) 10 kg/ha	57.78	48.22	11.11	82.00

T_9 FYM 5 ton/ha + PSB 10 kg/ha	76.23	74.89	14.66	85.33
T_{10} Vermicompost 2.5 t/ha + PSB 10 kg/ha	74.77	71.66	13.11	83.67
T_{11} Pressmud 5 t/ha + PSB 10 kg/ha	79.89	73.33	14.84	86.00

Table 2: Effect of different organic sources in fresh herbage yield and dry herbage yield (q/ha)

Treatments	Fresh herbage yield (q/ha)	Dry herbage yield (q/ha)
T_1 Control	71.64	17.91
T_2 FYM 5 t/ha	96.47	26.06
T_3 FYM 10 t/ha	110.63	33.18
T_4Vermicompost 2.5 t/ha	86.00	21.88
T_5Vermicompost 5 t/ha	88.77	22.19
T_6Pressmud 5 t/ha	96.18	24.04
T_7Pressmud 10 t/ha	107.95	32.38
T_8Biofertilizers (PSB) 10 kg/ha	73.26	18.31
T_9 FYM 5 ton/ha + PSB 10 kg/ha	96.58	24.14
T_{10} Vermicompost 2.5 t/ha + PSB 10 kg/ha	85.53	20.79
T_{11} Pressmud 5 t/ha + PSB 10 kg/ha	96.83	24.20

Conclusion

This experiment concluded that is further need to work out the efficacy of various organic manures (organic farming) and use of boi-fertilizers for improving quality of processed products of Tulsi in order to maintain the quality value (Eugenol& Linalool) in international market.

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