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Influence of organic manures and biofertilizers on yield and yield attributes of Indian Basil (*Ocimum sanctum* L.) cvs - Cim-Ayu and Cim-Angana

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Abstract
The experiment was conducted at the Horticulture Research Farm, Department of Horticulture, Sam Higginbottom University of Agriculture Technology and Sciences (SHUATS), Prayagraj, during 2016-17 and 2017-18 to evaluate the "Influence of Organic manures and biofertilizers on yield and yield attributes of Indian Basil (*Ocimum sanctum* L.) cvs Cim-Ayu and Cim-Angana". The experiment was laid out in factorial R.B.D. with 12 treatments, replicated thrice. The treatment consisted of organic manures viz. FYM, Neem cake, Vermicompost and biofertlizers viz. Mycorrhiza, Azotobacter and P.S.B. The observation on yield and yield attributes namely, Fresh herbage yield per plant, Fresh herbage yield per plot, Fresh herbage yield per hectare, Dry herbage yield per plant, Dry herbage yield per plot, Dry herbage yield per hectare were recorded. The highest fresh herbage yield was obtained from T_{10} (FYM 10 t/ha+P.S.B 10 t/ha+Neem Cake @1.5 t/ha + Azotobacter @ 6.0 kg/ha). The lowest fresh and dry herbage yield was recorded in T_5 (Azotobacter @ 6.0 kg/ha+Mycorrhiza @ 6.0 kg/ha) in combination of organic manures and fertilizers, respectively.

Keywords: Indian basil, yield, organic manures, Azotobacter, Mycorrhiza and P.S.B.

Introduction
Basil or sacred Tulsi (*Ocimum sanctum*) is an excellent shrub and known as "queen of herb". The genus *Ocimum* belongs to the family Laminaceae (Labiatae) which includes about 3500 species among 210 genera and numerous varieties (Blank *et al.*, 2004) [3]. It is native to Indian subcontinent, China, South-east Asia and New Guinea (Kew garden). It was originally domesticated in India. Basil is cultivated over an area of 25,000 ha in India and it accounts for annual production of about 250-300 tonnes of oil, has been cultivated. *Ocimum* has widest distribution which covers the entire Indian sub-continent, ascending up to 1800 MSL in the Himalayas and in Andaman and Nicobar Islands. This plant can flourish in a wide range of habitats. It is an annual herb, cultivated extensively in Indonesia, Thailand, Vietnam, USA, Cambodia, Laos, the cuisine of Taiwan, France, Egypt, Hungary, Greece, morocco, Israel and many other region of the world.

Basil is an erect herbaceous, much branched, perennial, soft hairy plant, leaves are simple, petiole, opposite, sub-ovate and serrate, possessing glandular hair which secrete aromatic oil with 50-60 cm plant height and has pink and white colour flowers. Its ecological demand of temperature range between 7-27 ^{0}C, soil pH 4.3- 8.2 and annual rainfall 0.6- 4.2 m, different environmental conditions and planting density have caused different growth and yield. The useful parts of basil plant are leaf and seed. The most essential component of basil is essential oil. Essential oil ratio varies between 0.1- 4.55 based on climate conditions. Basil has three forms generally recognized as Rama Tulsi with stems and leave of green colour, Krishna Tulsi with green colour stems and stems but sometimes leaves of purple colour and Vana Tulsi which is unmodified from its wild form.

Basil has been utilized for its stomachs, expectorant, diuretic, carminative and stimulants property in folk medicine. It is also known to be used as an insecticide flea and moth repellent and against snake and insect bite. Recently the use of fresh and dry leaves of plant has been very common in food and spice industry. Traditionally, leaves and flower of basil has been used as medicinal plants for various ailments, such as headaches, cough, diarrhoea, constipation, warts, warms and kidney malfunction as well as for carminative, galactogogue, antispasmodic and anti-malarial febrifuge properties. It's essential oil are synthesized and stored in glandular hairs and are used as flavouring agents in food and beverages, as fragrances as toilet product, such as mouth washes and dental creams, as fungicide or insecticide in pharmaceutical and industrial products (Mondello *et al*., 2002) [7].

The essential oils from *Ocimum* genus find diverse uses in perfumery and cosmetic industries as well as indigenous systems of medicines. The essential oils of basil extracted via steam distillation from the leaves. Extracted essential oil has also been shown to certain biologically active constituent that are insecticidal, nematicidal and fungicidal. The oil is essential microbial activity. These properties can be frequently attributed to predominate. The plant contains mainly phenols, aldehydes, tannins, saponin and fats. Essential oil constitutes Eugenol (71%), Eugenol methyl ether (20%), Methyl Chavicol (3%), Camphor and Mehylcinnamates and minor portions of Nerol, Caryophyllene, Selinene, α-pinene, ß-pinene, Camphor, Cineole and Linalool etc. Apart from biologically active compound, such as volatile oils terpenese, flavonoids or glycoside are also valuable source of micro and macro elements.

The plant of basil was studied by many researchers to determine yield component, essential oil ratio and composition of essential oil under different ecological conditions, but only a few researches were focused on organic manure and bio fertilizers. Hence, with this background the main aim of present study was focused on evaluation of anti-microbial activity of *Ocimum sanctum* leaf extract in normal top water and local river water.

Organic Manure plays major role in plant growth as a source of all necessary macro and micro nutrient in available for during mineralization and improving physical and chemical properties of soil (Chaterjee *et al.*, 2005) [4]. Plant and animal wastes are used as source of plant nutrients that release nutrients after their decomposition. The art of collecting and using wastes from animal, human and vegetable sources for improving the crop production and productivity is as old as agriculture. Naturally, occurring or synthetic chemicals containing plant nutrients are called fertilizers. Manures with low nutrient, content per unit quantity have longer residual effect besides improving soil physical properties compared to fertilizer with high nutrient content (Gaur, 1991) [6].

Farmyard manures refers to the decomposed mixture of dung and urine of farm animals along with litter and left over material from roughages or other green fed to the farm animals. It contains 0.5 percent N, 0.2 percent P_2O_5 and 0.5 percent K_2O. Usually, dung and urine of animals along with their litter and waste feed are collected and placed in bench daily and when riled in, it is covered with soil. Farm yard manure seems to act directly in increasing the crop yield either by acceleration of respiratory process with increasing cell permeability and hormonal growth action or by combination of these processes. It supplies nitrogen, phosphorus, potassium and micronutrients like Fe, S, Mo and Zn etc. in available forms to the plants through biological decomposition and improves soil physico-chemical properties such as aggregation, aeration, permeability, water holding capacity, slow release of nutrients and increase in cation exchange capacity and stimulation of soil as flora and fauna (Gaur, 1991) [6].

Neem cake which is obtained from the seed kernels after extraction of the oil is needed for agricultural uses and soap production. Neem cake applications in soil have shown a stimulating effect on the blue-green algal growth, mainly by depressing predator’s activity in the soil. Algae biomass was higher in treated soil than untreated situations (Aziz, 1981) [2]. Neem cake is the residue obtained after the extraction of oil from neem seed. It contains more nitrogen (2-5%), phosphorus (0.5-1.0%), potassium (1 -2%) calcium (0.5 -3%), magnesium (0.3 –1%) sulphur (0.2% to 3.0%), zinc (15 ppm to 60 ppm), copper (4 ppm to 20 ppm), manganese (20 ppm to 60 ppm) than farm yard manure or sewage sludge (Radwanksi and Wickens, 1981) [10].

Bio-fertilizers help in better utilization of added inorganic fertilizers thus reduce its level of application as well as reduce the deleterious effect of harsh chemical residues that the inorganic fertilizers leave in the soil (Umar, 2007) [12].

Vermicompost is organic manure which is produced as the vermicast by earth worm feeding on biological waste material and plant residues. This compost is an odorless, clean and organic material containing adequate quantities of N, P, K and different micronutrients essential for plant growth. Vermicompost is eco-friendly, non-toxic and consumes low energy input for composting and is a recycled biological product. Humic acids isolated from vermicompost enhance the root elongation and formation of lateral roots in maize. Vermicompost enhance the nutrient uptake by the plants by increasing the permeability of root cell membrane, stimulating root growth and increasing proliferation of root hairs (Pramanik *et al*., 2007) [9]. The nutrients content in vermicompost vary depending on the waste materials that are being used for compost preparation. If it is the waste materials are heterogeneous one, there will be wide range of nutrients available in the compost. The common available nutrients in vermicompost are as follows: Organic carbon 9.5-17.98%, Nitrogen 0.5-1.50%, Phosphorous 0.1-0.30%, Potassium 0.15-0.56%, Sodium 0.06-0.30%, Calcium and Magnesium 22.67-47.60 meq/100g, Copper 2-9.50 mg kg^{-1}, Iron 2-9.30 mg kg^{-1}, Zinc 5.70-1.50 mg kg^{-1}, Sulphur 128-548 mg kg^{-1}. It improves physico-chemical properties of the soil and enhances the microbial growth and yield (Vasanthi and Kumaraswamy, 1999) [11].

Azotobacter belongs to family *Azotobacteriaceae*, which are aerobic, free living and heterotrophic in nature. *Azotobacte*r is present in neutral or alkaline soils. *A. chroococcum* is the most commonly occurring species in aerable soils. *A. vinelandii*, *A. beijerinckii, A. insignis* and *A. macrocytogenes* are other reported species. The bacterium produces anti-fungal antibiotics which inhibits the growth of several pathogenic fungi in the root region thereby preventing seedling mortality to a certain extent. The population of *Azotobacter* is generally low in the rhizosphere of plants and in uncultivated soils.

Many heterotrophic bacteria and fungi efficiently solubilize insoluble phosphate in the soil as well as the inert phosphorus sources, its bacterial species to solubilise insoluble inorganic phosphate compounds, such as tri-calcium phosphate, dicalcium-phosphate, hydroxyl-apatite and rock-phosphate. Among the bacterial genera with this capacity are *Pseudomonas, Bacillus, Rhizobium, Burkholderia, Achromobacter*, *Agrobacterium, Microccocus*, *Aereobacter*, *Flavobacterium* and *Erwinia*. These are present in considerable population in soil and in plant rhizospheres. These include both aerobic and anaerobic strains, with a prevalence of aerobic strains in submerged soils. A considerably higher concentration of phosphate solubilizing bacteria is commonly found in the rhizosphere in comparison with non-rhizosphere of soil. The soil bacteria belonging to the genera *Pseudomonas* and *Bacillus* and *Fungi* are more common.

The term Mycorrhiza denotes “fungus roots”. It refers to a symbiotic association between host plants and certain group of fungi at the root system, in which the fungal partner is benefited by obtaining its carbon requirements from the photosynthesis of the host and the host in turn is benefited by obtaining the much needed nutrients especially phosphorus, calcium, copper, zinc etc. which are accessible to it, with the help of the fine absorbing hyphae of the fungus. These fungi are associated with majority of agricultural crops, except with those crops/plants belonging to families of *Chenopodiaceae, Amaranthaceae, Caryophyllaceae, Polygonaceae, Brassicaceae, Commelinaceae, Juncaceae* and *Cyperaceae.*

Materials and Method

The experiment entitled "Influence of Organic manures on Quantitative and Qualitative Traits of Indian Basil (*Ocimum Sanctum* L.) Cvs. Cim-Ayu and Cim-Angana. Cultivation of Indian basil was taken in organic resources separately during the year 2016-17 under agro-climatic condition of Prayagraj at Research Farm of Horticulture department, SHUATS, Prayagraj, U.P., India.

Seeds were sown in first week of July during both years 2016-17 and 2017-18 in sandy clay soil in seed pans. After one month from sowing, when the seedling reached 8-10 cm height with 6-8 leaves and 4 branches, they were transplanted in different spacing on using sandy loam soil. The physical analysis of the used soil revealed that it was sandy clay loam soil which contained 21, 25.75 and 53.25% clay, silt and sand, respectively. The chemical analysis cleared that, it contained the available N, P and K values at 113, 16.10 and 215 Kg/ha respectively. The electric conductivity (EC) was 7.85 (dsm^{-1}) with pH of 7.6.

The experiment was laid out in factorial randomized block design (F.RBD) with 12 treatment and three replications. The total number of plots for Indian basil was 36. The size of a unit plot was 1.80 m×1.20 m.

Treatments details

S. No	Treatments	Treatment combinations
1.	T_0	(Control)
2.	T_1	FYM @ 20 t/ha
3.	T_2	P.S.B @ 20 t/ha
4.	T_3	Vermicompost @ 6.0 t/ha
5.	T_4	Neem Cake @ 3.0 t/ha
6.	T_5	Azotobacter @ 6.0 kg/ha+Mycorrhiza @ 6.0 kg/ha
7.	T_6	FYM 10 t/ha+Vermicompost @ 3.0 t/ha
8.	T_7	Vermicompost @ 3.0 th+P.S.B @ 10 t/ha
9.	T_8	FYM 10 t/ha+Neem Cake @1.5 t/ha
10.	T_9	P.S.B @ 10 t/ha+Neem Cake @1.5 t/ha
11.	T_{10}	FYM 10 t/ha+P.S.B 10 t/ha+Neem Cake @1.5 t/ha+Azotobacter @ 6.0 kg/ha
12.	T_{11}	FYM 10 t/ha+P.S.B 10 t/ha+Neem Cake @1.5 t/ha+Mycorrhiza @ 6.0 kg/ha

The observations on Fresh herbage yield per plant, Fresh herbage yield per plot, Fresh herbage yield per hectare, Dry herbage yield per plant, Dry herbage yield per plot and Dry herbage yield per hectare were recorded.

Statistical analysis

The data were subjected to proper statistical analysis of variance according to Panse, V.G., and Sukhatme, 1989 [8] and means separation were done according to New L.S.D. at 5% level of probability.

Results and Discussion

Fresh herbage yield per plant

The data presented in table 1 and 2 clearly showed that the organic manures and biofertilizer played significant role in directly affecting fresh herbage yield. The maximum fresh herbage yield per plant during first year was recorded significantly in organic manure and biofertilizer application @ (FYM 10 t/ha+P.S.B 10 t/ha+Neem Cake @1.5 t/ha+Mycorrhiza @ 6.0 kg/ha) that is T_{10}, which was recorded in Cim-Ayu (9.02 kg/plant) and Cim-Angana (8.71 kg/plant), followed by treatment T_{11} in the variety of Cim-Ayu (8.35 kg/plant) and Cim-Angana (8.11 kg/plant) with the application of FYM 10 t/ha+P.S.B 10 t/h+Neem Cake @1.5 t/ha+Mycorrhiza @ 6.0 kg/ha. The minimum fresh herbage yield per plant during first year was found in treatment T_5 variety of Cim-Ayu (5.97 kg/plant) and Cim-Angana (5.74 kg/plant). The maximum fresh herbage yield per plant during first year was recorded significantly with T_{10} (FYM 10 t/ha+P.S.B 10 t/ha+Neem Cake @1.5 t/ha + Azotobacter @ 6.0 kg/ha) 9.50 kg/ha in V1 and 8.97 kg/ha in V_2.

Fresh herbage yield per plot

The data presented in table 1 and 2 clearly showed that the fresh herbage yield was significantly influenced by different organic manures. The maximum fresh herbage yield per plot during first year was observed in treatment T_{10} in the variety of Cim-Ayu (46.27kg/plot) and Cim- Angana (44.33 kg/plot) with the application of P.S.B @10t/ha+Neem Cack @1.5t/h followed by treatment T_{10} in the variety of Cim-Ayu (43.51 kg/plot) and Cim-Angana (41.85 kg/plot) with the application of FYM 10 t/ha+P.S.B 10 t/h+Neem Cake @1.5 t/ha+Mycorrhiza @ 6.0 kg/ha and the lowest fresh herbage yield per plot during first year was obtained in treatment T_5 Cim-Ayu (30.49 kg/plot) and Cim-Angana (30.18 kg/plot) with application of Azotobacter @ 6.0 kg/ha+Mycorrhiza@ 6.0 kg/ha. The maximum fresh herbage yield per plant during first year was recorded significantly with T_{10} (FYM 10 t/ha+P.S.B 10 t/ha+Neem Cake @1.5 t/ha+Azotobacter @ 6.0 kg/ha) 46.74 kg/ha in V1 and 45.36 kg/ha in V_2.

Fresh herbage yield per hectare

The data presented in table 1 and 2 clearly showed that At 210 DAS, the maximum fresh herbage yield per hectare during first year was appeared from treatment T_{10} in the variety of Cim-Ayu (180.51 q/ha) and Cim-Angana (153.85 q/ha) with application of FYM@10t/ha+P.S.B@10t/ha+Neem Cack@1.5t/h+Azotobacter @6.0 kg/ha followed by treatment T_{11} in the variety of Cim–Ayu (178.64 q/ha) and Cim-Angana (151.867 q/ha) with application of FYM @10t/ha+P.S.B @10t/ha+Neem Cack @1.5t/h+Mycorrhiza @6.0 kg/ha and lowest fresh herbage yield per hectare during first year (108.65 q/ha and 101.63 q/ha) was obtained in T_5 Azotobacter @6.0 kg/ha+Mycorrhiza@6.0 kg/ha. The maximum fresh herbage yield per plant during first year was recorded significantly with T_{10} (FYM 10 t/ha+P.S.B 10 t/ha+Neem Cake @1.5 t/ha + Azotobacter @ 6.0 kg/ha) 183.34 q/ha in V1 and 153.61 q/ha in $V_{2.}$

Dry herbage yield per plant

The data presented in table 1 and 2 clearly showed that the organic manures and biofertilizer played significant role in directly affecting dry herbage yield per plant at harvesting time. The maximum dry herbage yield per plant during first year was recorded statistically significantly in organic manure and bio-fertilizer with the application of FYM 10 t/ha+ P.S.B 10 t/ha.+Neem Cake @1.5 t/ha+Mycorrhiza @ 6.0 kg/ha) that is treatment T_{10}, which was recorded in the variety of Cim-Ayu (3.22 kg/plant) and Cim-Angana (2.90 kg/plant), followed by treatment T_{11} in the variety of Cim-Ayu (3.20 kg/plant) and Cim- Angana (2.86 kg/plant) with the application of FYM 10 t/ha+P.S.B 10 t/h+Neem Cake @1.5 t/ha+Mycorrhiza @ 6.0 kg/ha. The minimum dry herbage yield per plant during first year was found in treatment T_5 variety of Cim-Ayu (1.97 kg/plant) and Cim-Angana (1.98 kg/plant). The maximum fresh herbage yield per plant during first year was recorded significantly with T_{10} (FYM 10 t/ha+P.S.B 10 t/ha+Neem Cake @1.5 t/ha+Azotobacter @ 6.0 kg/ha) 3.24 kg/ha in V_1 and 2.96 kg/ha in $V_{2.}$

Dry herbage yield per plot

The data presented in table 1 and 2 clearly showed that dry herbage yield of Tulsi was significantly influenced by different organic manures and biofertilizer. Where the maximum fresh herbage yield per plot during first year was appeared in treatment T_{10} variety of Cim-Ayu (15.25 kg/plot) and Cim-Angana (14.29 kg/plot) with the application of FYM @10t/ha+P.S.B @10t/ha + Neem Cack @1.5t/h+Azotobacter @ 6.0 kg/ha followed by treatment T_{11} in the variety of Cim-Ayu (13.55 kg/plot) and Cim-Angana (14.29 kg/plot) with the application of FYM 10 t/ha+P.S.B 10 t/h+Neem Cake @1.5 t/ha+Mycorrhiza @ 6.0 kg/ha. The minimum dry herbage yield per plot during first year was obtained in treatment T_5 (7.57 kg/plot and 5.25 kg/plot) with the application of Azotobacter @6.0 kg/ha+Mycorrhiza @6.0 kg/ha. The maximum fresh herbage yield per plant during first year was recorded significantly with T_{10} (FYM 10 t/ha+P.S.B 10 t/ha+Neem Cake @1.5 t/ha+Azotobacter @ 6.0 kg/ha) 15.66 kg/ha in V_1 and 14.63 kg/ha in $V_{2.}$

Dry herbage yield per hectare

The data presented in table 1 and 2 clearly showed that the dry herbage yield per hectare of Tulsi was significantly influenced by different organic manures and biofertilizer. The maximum fresh herbage yield per hectare during first year was recorded in treatment T_{10} in the variety of Cim-Ayu (54.61 q/ha) and Cim-Angana (53.49 q/ha) with the application of FYM @10t/ha +P.S.B @10t/ha+Neem Cack @1.5t/h+Azotobacter @6.0 kg/ha followed by treatment T_{11} in the variety of Cim-Ayu (52.91 q/ha) and Cim-Angana (48.19 q/ha) with the application of FYM 10 t/ha+P.S.B 10 t/h+Neem Cake @1.5 t/ha+Mycorrhiza @ 6.0 kg/ha. The lowest dry herbage yield during first year was obtained in treatment T_5 (65.92 q/ha and 63.82 q/ha) with the application of Azotobacter @6.0 kg/ha+Mycorrhiza @6.0 kg/ha. The maximum fresh herbage yield per plant during first year was recorded significantly with T_{10} (FYM 10 t/ha+P.S.B 10 t/ha+Neem Cake @1.5 t/ha + Azotobacter @ 6.0 kg/ha) 55.92 q/ha in V_1 and 53.11 q/ha in $V_{2.}$

Discussion

Organic fertilizers (FYM, Vermicompost and Neem cake) and Biofertilizers (Azotobacter, mycorrhiza and PSB), had articulated impact on yield and yield parameters of Indian basil. The expansion in vegetative growth parameters may be because of the generation of more chlorophyll content with inoculation of nitrogen fixers. The other logical explanation behind increased vegetative growth might be the creation of plant growth regulators by microorganism in rhizosphere, which are absorbed by the roots. Vemicompost is considered as a rich source of available plant nutrients, growth regulators, enzymes, antifungal and antibacterial compound (Arancon *et al*., 2004) [1]. Azotobacter is free living nitrogen fixing bacteria and apart from having ability to fix atmospheric nitrogen it is also known to synthesize biologically active PGRs such as IAA, GA etc. Due to application effect of organic fertilizer physical, chemical, and biological properties of soil; that is seems to enhanced by increasing soil organic matter, cation exchange capacity, water holding capacity and availability of mineral nutrients and, this in turn, increases plant growth parameters. The positive effect of the various treatments on the fresh and dry herbage yield could be explained through its stimulatory effect on producing more vegetative growth and ultimately higher fresh herbage yield of Tulsi. Moreover, the increase in fresh and dry herbage yield could be explained by increasing metabolic activities of the plant under the effect of the interaction between the biofertilizers and organic fertilizers that gave significant values for fresh weight in the two seasons.

The results are in close conformity with the finding Elnasikh *et al.* (2011) [5] and Elnasikh *et al.* (2011) [5] who reported highest values of plant height, number of branches, fresh and dry herbage yield for the treatment of biofertilizer in comparison to the other treatments plants.

It is clear that, the combination of organic manure and biofertilizers treatment together had a significant effect on fresh and dry herbage yield of plant. Dewidar (2007) and Abo (2008) found that the combination between organic and biofertilizers increased fresh and dry herbage yield of Tulsi.

Conclusion

Bio-fertilizers are known to be ecofriendly as well as environmentally safe. They are available at low cost which is of immense help to the farmers. Also, organic and biofertilzers have positive alternative to chemical one. They are very safe for humans and animals, and reduce pollution of environment. Use of biofertilizer enhances growth and yield promoting parameters. As in this study pronounced yield in comparison to control was obtained by the application of biofertilizers and organic manures. Overall, utilization of biofertilizers in combination with organic manures to increase in yield could be a strategy to achieve sustainable production in Tulsi in near future.

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Table 1: Influence of Organic fertilizers and their interaction effect on yield and yield attributes of Indian Basil (*Ocimum sanctum* L.) cvs Cim-Ayu and Cim-Angana during 2016-17.

Treatments	Fresh herbage yield/ Plant (kg/ha)			Fresh herbage yield/ Plot (kg/ha)			Fresh herbage yield/ha (q/ha)			Dry herbage yield/ plant (kg/ha)			Dry herbage yield/plot (kg/ha)			Dry herbage yield/ha (q/ha)		
	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_1	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean
T_0	6.56	6.00	6.28	34.49	30.33	32.41	127.71	107.87	117.79	2.20	2.06	2.13	9.33	7.46	8.40	40.67	39.45	40.06
T_1	7.20	7.12	7.16	37.33	36.67	37.00	131.83	116.42	124.13	2.37	2.25	2.31	10.47	9.13	9.80	44.76	42.05	43.41
T_2	8.18	8.11	8.15	42.41	41.65	42.03	184.76	145.64	165.20	3.19	2.81	3.00	13.27	12.39	12.83	47.64	44.31	45.98
T_3	6.56	6.28	6.42	32.93	33.26	33.10	128.38	109.45	118.92	2.14	2.13	2.14	10.41	9.23	9.82	41.89	40.86	41.38
T_4	7.89	7.57	7.73	40.27	38.67	39.47	150.62	121.64	136.13	2.56	2.37	2.47	11.39	10.23	10.81	43.01	45.35	44.18
T_5	5.97	5.74	5.86	30.49	30.18	30.34	108.65	101.63	105.14	1.97	1.98	1.98	7.57	5.25	6.41	39.89	38.56	39.23
T_6	7.09	6.99	7.04	36.63	35.33	35.98	126.67	111.12	118.90	2.35	2.04	2.20	11.28	8.29	9.79	43.45	40.82	42.14
T_7	8.08	7.71	7.90	41.27	38.61	39.94	144.49	127.90	136.20	2.56	2.46	2.51	12.10	10.48	11.29	44.34	43.67	44.01
T_8	7.31	7.20	7.26	37.33	36.42	36.88	141.81	117.46	129.64	2.43	2.26	2.35	11.84	9.91	10.88	46.65	43.86	45.26
T_9	8.08	7.85	7.97	41.27	39.67	40.47	167.19	139.25	153.22	2.92	2.68	2.80	11.51	11.38	11.45	46.78	43.92	45.35
T_{10}	9.02	8.71	8.87	46.27	44.33	45.30	178.51	153.85	166.18	3.22	2.88	3.05	15.25	14.29	14.77	54.61	53.49	54.05
T_{11}	8.35	8.11	8.23	43.52	41.85	42.69	180.64	151.67	166.16	3.17	2.80	2.99	13.55	12.14	12.85	52.91	48.19	50.55
Average	7.52	7.28	7.40	38.68	37.25	37.97	147.61	125.33	136.47	2.59	2.39	2.49	11.50	10.02	10.76	45.55	43.71	44.63
	V	t	V x t	V	t	V x t	V	T	V x t	V	t	V x t	V	t	V x t	V	t	V x t
C.D. (0.05)	0.066	0.161	0.228	0.333	0.815	1.153	1.083	2.652	3.751	0.031	0.077	0.108	0.128	0.313	0.443	0.402	0.986	1.394
SEm±	5.33			5.26			4.76			7.54			7.13			5.41		

Table 2: Influence of Organic fertilizers and their interaction effect on yield and yield attributes of Indian Basil (*Ocimum sanctum* L.) cvs Cim-Ayu and Cim-Angana during 2017-18.

Treatments	Fresh herbage yield/ Plant (kg/ha)			Fresh herbage yield/Plot (kg/ha)			Fresh herbage yield/ha (q/ha)			Dry herbage yield/plant (kg/ha)			Dry herbage yield/plot (kg/ha)			Dry herbage yield/ha (q/ha)		
	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_1	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean
T_0	6.76	6.18	6.47	33.99	31.24	32.62	124.89	109.72	117.31	2.21	2.11	2.16	9.58	7.62	8.60	42.10	40.04	41.07
T_1	7.42	7.33	7.38	37.77	37.08	37.43	134.71	119.91	127.31	2.38	2.31	2.35	10.71	9.37	10.04	45.62	43.56	44.59
T_2	8.45	8.35	8.40	42.38	42.23	42.31	181.65	149.92	165.79	3.21	2.89	3.05	13.89	12.67	13.28	47.98	44.89	46.44
T_3	6.76	6.46	6.61	33.97	32.69	33.33	121.56	113.67	117.62	2.15	2.19	2.17	10.71	7.42	9.07	43.56	41.50	42.53
T_4	8.12	7.80	7.96	40.86	39.43	40.15	145.77	126.45	136.11	2.58	2.43	2.51	12.46	10.71	11.59	46.65	44.59	45.62
T_5	6.15	5.91	6.03	30.93	29.87	30.40	111.93	105.54	108.74	1.98	2.03	2.01	7.65	5.36	6.51	42.01	40.67	41.34
T_6	7.30	7.20	7.25	36.71	36.39	36.55	133.81	108.63	121.22	2.37	2.09	2.23	11.54	8.45	10.00	45.36	42.66	44.01
T_7	8.32	7.94	8.13	41.89	40.17	41.03	145.73	130.79	138.26	2.58	2.52	2.55	11.88	11.64	11.76	46.22	45.19	45.71
T_8	7.53	7.42	7.48	37.89	37.51	37.70	138.38	120.62	129.50	2.45	2.32	2.39	12.25	10.21	11.23	46.09	43.36	44.73
T_9	8.32	8.08	8.20	41.89	40.86	41.38	165.78	142.78	154.28	2.93	2.75	2.84	13.74	10.51	12.13	47.68	44.89	46.29
T_{10}	9.30	8.97	9.14	46.74	45.36	46.05	183.34	153.61	168.48	3.24	2.96	3.10	15.66	14.63	15.15	55.92	53.11	54.52
T_{11}	8.60	8.35	8.48	43.26	42.23	42.75	180.46	149.13	164.80	3.19	2.87	3.03	15.55	13.91	14.73	49.01	45.92	47.47
Av	7.75	7.50	7.63	39.02	37.92	38.47	147.33	127.56	137.45	2.61	2.46	2.53	12.14	10.21	11.17	46.52	44.20	45.36
	V	t	V x t	V	t	V x t	V	t	V x t	V	t	V x t	V	t	V x t	V	t	V x t
C.D. (0.05)	0.082	0.200	0.282	0.343	0.839	1.187	1.093	2.677	3.785	0.030	0.072	0.102	0.137	0.337	0.476	0.523	1.282	1.813
SEm±	6.41			5.34			4.77			7.01			7.38			6.92		

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