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Effect of Organic Nutrient Management Practices on Soil Nutrient and Microbial Population and Seed Yield of Sesame (*Sesamum indicum*)

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ABSTRACT: Sesame is emerged as a valuable export crop mostly its use in foods and medicine in developing countries. But pesticide and chemical residues are becoming major problem in the promotion of sesame exports and adversely affect the sustainability of present and future generation. Therefore, organically produced sesame will get premium price in market with guarantee optimum crop yields with minimum losses of nutrients and ensure sustainable environment. A field experiment was conducted to understand the effect of organic nutrient management practices on soil nutrient and microbial population and seed yield of sesame. The investigation comprised of four foliar application of organic nutrients with three replications in plot size of 5.1 × 5 m^2. Among all main treatments, 75 % N through FYM + 25 % N through vermicompost enriched with rock phosphate + microbial consortia @ 2 kg ha^{-1} (T_4) was recorded significantly higher dehydrogenease activity (17.74 µg TPF g of $soil^{-1}$ day^{-1}), microbial count of bacteria (179.8 10^5 CFU g^{-1} soil), available NPK status (245.4, 38.4, 317.8 kg ha^{-1}) and organic carbon content (0.5%) in soil after harvest and seed yield (478.6 kg ha^{-1}) along with foliar application of Panchagavya @ 3 % (S_1) individually, but the interaction was insignificant. Whereas microbial count of fungi was higher at 25 DAS with T_1: 50 % N through FYM + 25 % N through Vermicompost + 25 % N through Neem cake and was at par with T_4. There was no significant difference among main treatments at 50, 75 DAS and at harvest and with foliar application (sub treatments) of nutrients at all stages of crop growth. Thus, it is concluded that application of organic sources *viz.*, 75 % N through FYM + 25 % N through vermicompost enriched with rock phosphate + microbial consortia @ 2 kg ha^{-1} (T_4) along with foliar application of either Panchagavya @ 3% (S_1) or NSKE @ 3 % (S_2) or Vermiwash @ 10 ml lit^{-1} (S_3) or Humic acid @ 1ml lit^{-1} (S_4) can be recommended for higher profitability in sesame.

Keywords: Dehydrogenase activity, Available N, P and K, Microbial population and Seed yield.

INTRODUCTION

Globally, total area under organic certification process (registered under National Programme for Organic Production) is 3.56 m.ha (2017-18). This includes 1.78 million ha (50%) cultivable area and another 1.78 m.ha (50%) for wild harvest collection (APEDA, 2018). Among all the states, Madhya Pradesh has covered largest area under organic certification followed by Rajasthan, Maharashtra and Uttar Pradesh. India produced around 1.70 million MT (2017-18) of certified organic products which includes all varieties of food products namely Oilseeds, Sugarcane, Cereals & Millets, Cotton, Pulses, Medicinal Plants, Tea, Fruits, Spices, Dry Fruits, Vegetables, Coffee etc. The production is not limited to the edible sector but also produces organic cotton fiber, functional food products etc. In terms of export value realization, Oilseeds (47.6%) lead among the products followed by Cereals and millets (10.4%), Plantation crop products such as Tea and Coffee (8.96%), Dry fruits (8.88%), Spices and condiments (7.76%) and others (APEDA, 2018).

Sesame is produced over an area of 8.8 million hectares with an annual production of around 2.8 million tonnes with average productivity of 382 kg ha^{-1} in the world. India is the leading country with higher (25.8%) share of production from the largest (29.8%) share of area and highest export (40%) in the world. In India, sesame is grown over an area of 16.66 lakh hectares with production of 1.74 lakh tonnes and productivity of 448 kg ha^{-1}. In Telangana, it is grown over an area of 21,000 hectares with an annual production of 15,000 tonnes and productivity of 714 kg ha^{-1}. It is mainly grown in the districts of Northern Telangana, *viz.*, Adilabad, Jagtial, Karimnagar and Nizamabad, as *kharif* crop and also as summer crop after rice, turmeric and cotton during *Kharif/Rabi* season (INDIASTAT, 2017).

Sesamum oil consisted 85% unsaturated fatty acid is highly stable and has reducing effect on cholesterol and prevent coronary heart diseases. Sesame is called as 'queen of oils' because of extra ordinary cosmetic, skin care qualities and as well as resistance to rancidity. It is grown in all seasons of the year and being a short duration crop, fit well into various cropping sequences/systems and most preferred by farmers because of low input requirement with higher output. Sesame has emerged as a valuable export crop earning more than Rs.1000 crores from the export of 2.5 lakh tonnes of sesame seed since it is mostly used in foods and medicine in developed countries. Of late, pesticide residues are becoming major problem in the promotion of sesame exports. Use of excess chemical fertilizers had resulted in increased crop yields in the initial year which was the result of green revolution but it had adversely affected the sustainability at the present and future generations. Therefore, organically produced sesame will suit to tailor made requirements of buyers and will get premium price in both national and international markets (Gopinath *et al*., 2011).

The primary goal of organic agriculture is to optimize the inputs and productivity of interdependent communities of soil life, plants, animals and people. The management of nutrients in organic farming system presents a formidable challenge as the use of inorganic fertilizers is not permitted (Muthuswamy *et al.,* 1990). Currently agriculture is heavily dependent on mineral fertilizers and inorganic pesticides, and impacts of the continuous application are reflected in deteriorating soil health and increased resistance to pest and pathogens (Kumar *et al.,* 2010; Cai *et al.,* 2016). Biofertilizers are considered as low monetary inputs and play a vital role in agricultural ecosystem as the microorganisms fix atmospheric nitrogen, convert fixed phosphorous potassium into available forms. Therefore, organic inputs need to be optimised to ensure optimum and regulated nutrient supply which will guarantee optimum crop yields with minimum losses of nutrients and ensure sustainable environment. Hence, an experiment was conducted to optimize organic nutrient management practices in sesame under rainfed conditions.

MATERIAL AND METHODS

The experiment was carried out at College Farm, Agricultural College, Polasa, Jagtial, Professor Jayashankar Telangana State Agricultural University. The farm is geographically situated at an altitude of 243.4 m above mean sea level on 18º49′40″N latitude and 78º56′45″E longitude and it is categorized under Northern Zone of Telangana State. The weekly mean maximum temperature during crop growth period was ranged from 29.2°C to 32.3°C during 2019 with an average of 31.2°C, while the weekly mean minimum temperature ranged from 15.6°C to 24.1°C with an average of 21.1°C. The total rainfall received during crop growth period was 465.1mm and total rainy days of 37. Rainfall was not received during 45th, 46th, 47th, 48th and 49th standard weeks while maximum rainfall (104.5 mm) was received during 39th standard week. An average of 6.4 hours day^{-1} sunshine hours was received. Soil samples were collected randomly at a depth of 0-30 cm from the experimental site initially before sowing and finally after harvest. The composite samples were then analysed for their physico-chemical characteristics (pH, EC, OC), available N, P and K. The experiment was initiated with four main treatments (T_1: 50 % N through FYM + 25 % N through Vermicompost + 25 % N through Neem cake, T_2: 50 % N through FYM + 25 % N through Vermicompost enriched with rock phosphate + Microbial consortia @ 2 kg ha^{-1}, T_3: 50 % N through FYM + 25 % N through Neem cake + Humic acid granules @ 12.5 kg ha^{-1}, T_4: 75 % N through FYM + 25 % N through Vermicompost enriched with rock phosphate + Microbial consortia @ 2 kg ha^{-1}) and four sub treatments (foliar application of S_1: Panchagavya @ 3 %, S_2: NSKE @ 3 %, S_3: Vermiwash @ 10 ml lit^{-1}, S_4: Humic acid @ 1ml lit^{-1}) with three replications. FYM was applied as basal, Vermicompost and enriched Vermicompost were applied as top dressing at 25 DAS and 50 DAS. Humic acid granules, neem cake and microbial consortia were applied as basal. The recommended dose of fertilizers for the rainfed sesamum was 60 kg N, 20 kg P_2O_5 and 40 kg K_2O ha^{-1}. Out of this, 30 kg N, 20 kg P_2O_5 and 20 kg K_2O were applied as basal. 30 kg N and 20 kg K_2O were applied after 30 days. The P and K contribution from organic sources was worked out and the remaining P and K was applied through straight fertilizers. Chemical analysis of FYM, Vermicompost, neem cake and Vermicompost enriched with rock phosphate was carried as per Bradstreet, 1965. The N, P and K content was 0.51, 0.17 & 0.43 % in FYM; 1.16, 0.21&0.62 % in vermicompost; 4.31, 0.63 & 1.26 % in neem cake and 1.21, 1.50 & 0.67 % in vermicompost enriched with rock phosphate respectively. Microbial consortia @ 2 kg ha^{-1} was applied as basal in T_2 and T_4 treatments. It is a combination of N biofertilizers (azotobacter), P solubilising bacteria (PSB), K solubilising bacteria (KRB) and Zinc solubilising bacteria. Humic acid granules @ 12.5 kg ha^{-1} with 6% humic acid, 12% isolated amino acid, 4% fulvic acid 4% other nutrients was applied as basal in T_3 treatment. Three sprays of organic nutrients (sub plots) were initiated at flower initiation and continued with one week interval @ 45, 52, 59 DAS.

Sesame variety JCS 1020 released from Regional Agricultural Research Station, Jagtial, Telangana state during the year 2019. It is a non-branched variety with multi capsular character and suitable for dense sowing or higher population. Its yield in late *kharif* is 800 kg ha^{-1} and in summer is 1050-1100 kg ha^{-1}. Crop duration is 100 days. Its oil content is 46-49%. It is a multi capsular white seeded variety and resistant to powdery mildew disease. The gross plot size was 5.1 × 5 m^2 and a net plot size of 3.9 × 4.4 m^2. Seed rate of 2.5 kg acre^{-1} is required with a spacing of 30 cm × Solid rows and sown directly. Gap filling was taken up after 10 days of direct sowing in the field. Thinning of excess seedlings was done at 20 days after sowing. No herbicides were used as the experiment is maintained organically in the field. Weeds were removed by manual weeding carried at 25 and 45 DAS in the field. Application of *Bacillus thuringenesis* @ 2 g lit^{-1} in the field to control lepidopteran pests and majorly leaf webbers at flowering stage was followed. Drenching with *Trichoderma viridae* @ 5 g lit^{-1} in the field to control sucking pests, cercospora leaf spot and alternaria leaf spot applied at 60 DAS. As the crop was grown under rainfed conditions, irrigation was not provided till flowering stage. Two Irrigations were provided at pod filling stage as there was no rainfall after standard week 44 (November) 60 and 75 DAS. The crop was harvested on 5th December 2019.

RESULTS AND DISCUSSION

The influence of organic nutrient management practices on microbial count of bacteria of in soil at different stages of crop growth: There was no significant difference among main treatments on microbial count of bacteria (10^5 CFU g^{-1} soil) at 25 & 50 DAS. At later stages, the effect of main treatment T_2: 50 % N through FYM + 25 % N through vermicompost enriched with rock phosphate + microbial consortia @ 2 kg ha^{-1} (218.4) recorded significantly higher microbial count of bacteria and was on par with T_4: 75 % N through FYM + 25 % N through vermicompost enriched with rock phosphate + microbial consortia @ 2 kg ha^{-1} (216.0). It was also at par with T_1: 50 % N through FYM + 25 % N through vermicompost + 25 % N through Neem cake (204.8) at 75 DAS and was followed by T_3: 50 % N through FYM + 25 % N through Neem cake + Humic acid granules @ 12.5 kg ha^{-1} at 75 DAS (192.8). At harvest, it was observed that significantly highest microbial count of bacteria was found with T_4: 75 % N through FYM + 25 % N through vermicompost enriched with rock phosphate + microbial consortia @ 2 kg ha^{-1} (179.8) and was on par with T_3: 50 % N through FYM + 25 % N through Neem cake + Humic acid granules @ 12.5 kg ha^{-1} (172.8) and T_2: 50 % N through FYM + 25 % N through vermicompost enriched with rock phosphate + microbial consortia @ 2 kg ha^{-1} (165.7). Lowest microbial activity was observed with T_1: 50 % N through FYM + 25 % N through vermicompost + 25 % N through Neem cake (157.9). The increase in microbial activity in organic farming system was documented by Nardi *et al.* (2009) and Swaminathan *et al.* (2007).

There was no significant difference among sub treatments on microbial count of bacteria at all growth stages. The interaction effect between main treatments and sub treatments on microbial count of bacteria (10^5 CFU g^{-1}soil) at 25 DAS, 50 DAS, 75 DAS and at harvest in plant and seed was found non significant.

The influence of organic nutrient management practices on microbial count (10^5 CFU g^{-1} soil) of fungi of sesame: There was no significant difference among main treatments on microbial count of fungi (10^5 CFU g^{-1} soil) at 50 DAS, 75 DAS & at harvest. Lower number was observed with T_2: 50 % N through FYM + 25 % N through vermicompost enriched with rock phosphate + microbial consortia @ 2 kg ha^{-1} (15.8). At 25 DAS, T_1: 50 % N through FYM + 25 % N through vermicompost + 25 % N through Neem cake (19.7) recorded highest microbial count of fungi and on par with T_4: 75 % N through FYM + 25 % N through vermicompost enriched with rock phosphate + microbial consortia @ 2 kg ha^{-1} (18.9), T_3: 50 % N through FYM + 25 % N through Neem cake + Humic acid granules @ 12.5 kg ha^{-1} (18.7) and was followed by T_2: 50 % N through FYM + 25 % N through vermicompost enriched with rock phosphate + microbial consortia @ 2 kg ha^{-1} (17.7). The microbial consortia may have increased fungal (beneficial) colonies by increasing the nutrient availability and rhizosphere development (Jarvan *et al.,* 2014). It is observed that there was no significant difference among sub treatments on microbial count of fungi at all growth stages. The interaction effect between main treatments and sub treatments on microbial count of fungi (10^5 CFU g^{-1} soil) at 25 DAS, 50 DAS, 75 DAS and at harvest in plant and seed was found no significant.

Effect of organic nutrient management practices on dehydrogenase activity (µg TPF g of $soil^{-1}day^{-1}$) in soil: Dehydrogenase activity (DHA) is one of the important and most sensitive bioindicator relating to soil fertility. It serves as an indicator of the microbiological redox systems and could be considered as a good and adequate measure of microbial oxidative activities in soil (Jarvan *et al.,* 2014). Influence of organic nutrient management practices on dehydrogenase activity (µg TPF g of $soil^{-1}$ day^{-1}) in soil during the experiment was presented in Table 1. The dehydrogenase activity was significantly influenced by main and sub treatments at all stages of crop growth. Dehydrogenase activity was reached its peak at 50 DAS and slowly decreased at 75 DAS and at harvest.

Dehydrogenease activity was significantly higher with T_4: 75 % N through FYM + 25 % N through vermicompost enriched with rock phosphate + microbial consortia @ 2 kg ha^{-1} at 25 DAS (14.4), 50 DAS (24.41), 75 DAS (20.21) and at harvest (17.74) compared with other treatments. It was followed by T_2: 50 % N through FYM + 25 % N through vermicompost enriched with rock phosphate + microbial consortia @ 2 kg ha^{-1}, T_1: 50 % N through FYM + 25 % N through vermicompost + 25 % N through Neem cake and T_3: 50 % N through FYM + 25 % N through Neem cake + Humic acid granules @ 12.5 kg ha^{-1} respectively, at all stages of crop growth. It was supported by Jarvan *et al.* (2014) who stated that organically managed crop rotation increased dehydrogenase activity in soil. Dehydrogenase reflects the total range of oxidative activity of soil microflora (Liang *et al.* 2014). Foliar application of organic nutrients also significantly increased Dehydrogenase activity in soil. Foliar application of Panchagavya @ 3 % showed higher dehydrogenase activity (14.03, 23.85, 19.44 and 17.32) at 25, 50, 75 DAS and at harvest. It was followed by and S_4: Humic acid @ 1ml lit^{-1}, S_3: Vermiwash @ 10ml lit^{-1} and S_2: NSKE @ 3 %. It was supported by Ramakrishna *et al.* (2017).

Interaction between main treatments and foliar application of organic nutrients (sub treatment) was insignificant on dehydrogenase activity of soil at different stages of crop growth in sesamum.

The influence of organic nutrient management practices on Available N, P_2O_5, K_2O status (kg ha^{-1}) and Organic carbon content (%) in soil: Influence of organic nutrient management practices on available N, P_2O_5, K_2O status and Organic carbon content in soil after harvest of sesame was presented in Table 2. The available N, P_2O_5, K_2O status and Organic carbon content in soil after harvest of sesame was found to be significantly influenced by main treatments. The treatment T_4: 75 % N through FYM + 25 % N through vermicompost enriched with rock phosphate + microbial consortia @ 2 kg ha^{-1} has significantly highest available N, P_2O_5, K_2O status and Organic carbon content in soil (245.4, 38.4, 317.8 kg ha^{-1} and 0.5%). Lower available N, P_2O_5, K_2O status and Organic carbon content in soil after harvest of sesame was observed with T_3: 50 % N through FYM + 25 % N through Neem cake + Humic acid granules @ 12.5 kg ha^{-1} (217.5, 31.1, 276.3 kg ha^{-1} and 0.4%). Available N, P_2O_5, K_2O and organic carbon in soil was improved under integrated application of chemical, organic and biological sources of nutrients compared to its initial soil fertility. It could be attributed to addition of root biomass, fallen leaves of sesame and black gram and organic matter through FYM or Vermicompost (Vishal Kumar *et al.,* 2019). Mokariya *et al.* (2021) states that most of growth and yield attributes contributed in seed yield of sesame evidently resulted in higher yield in treatments which get nitrogen and phosphorus through chemical fertilizers.

There was no significant difference among foliar application of organic nutrients in available N status in soil after harvest of sesame but found significant with available P_2O_5 and K_2O status and Organic carbon content in soil. Higher available P_2O_5 and K_2O status and Organic carbon content in soil after harvest of sesame of 35.7, 311.7 kg ha^{-1} and 0.5% was observed with foliar application of Humic acid @ 1ml lit^{-1} and was at par with Panchagavya @ 3% and (36.0, 301.9 kg ha^{-1} and 0.5%). Lower available P_2O_5 and K_2O status and Organic carbon content in soil after harvest of sesame was observed with foliar application of NSKE @ 3 % (32.6, 270.5 kg ha^{-1} and 0.4%).

The interaction effect between main treatments and sub treatments on available N, P_2O_5, K_2O status and Organic carbon content in soil after harvest of sesame was found non significant.

The influence of organic nutrient management practices on seed yield (kg ha^{-1}) of sesame: Main organic nutrient management practices and their interaction with foliar application of organic nutrients (sub treatments) showed significant effect on seed yield of sesame. But, only foliar application of organic nutrient (sub treatments) showed non significant effect on seed yield of sesame.

The effect of main treatments on seed yield of sesame was found significant. Application of 75 % N through FYM + 25 % N through Vermicompost enriched with rock phosphate + Microbial consortia @ 2 kg ha^{-1} (T_4) produced significantly higher seed yield (478.6 kg ha^{-1}) and was superior over other treatments. It may be due to balanced and timely supply of nutrients from diversified sources of nutrients (FYM, vermicompost, microbial consortia) that resulted in prolonged availability of nutrients to crop (Dharati *et al.,* 2017). The positive influence of INM on nutrient content of crop due to improved nutritional environment both in the rhizosphere and the plant system (Nirav Parmar *et al.,* 2020).

Table 1: Microbial activity in the soil as influenced by organic nutrient management practices in sesamum.

Treatments	Microbial count of bacteria (10^5 CFU g^{-1} soil)				Microbial count of fungi (10^5 CFU g^{-1} soil)			
	25 DAS	**50 DAS**	**75 DAS**	**At Harvest**	**25 DAS**	**50 DAS**	**75 DAS**	**At Harvest**
T_1	141.9	255.4	204.8	157.9	19.7	34.2	30.8	23.9
T_2	144.8	242.8	218.4	165.7	17.7	31.3	29.3	23.7
T_3	145.0	242.0	192.8	172.8	18.7	33.5	29.3	24.1
T_4	129.9	248.5	216.0	179.8	18.9	33.4	30.4	24.5
SEm±	5.5	8.2	8.5	7.3	0.5	1.1	1.3	0.9
CD (0.05)	NS	NS	24.4	21.0	1.5	NS	NS	NS
S_1	139.8	251.0	210.3	162.8	18.4	31.9	30.2	24.3
S_2	134.4	246.6	200.4	165.8	18.4	34.3	28.3	23.3
S_3	141.6	241.8	211.2	165.1	18.4	33.5	30.7	24.1
S_4	145.8	249.4	210.1	182.5	19.7	32.7	30.6	24.5
SEm±	5.5	8.3	8.5	7.3	0.5	1.1	1.3	0.9
CD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS
CV	**14.5**	**14.1**	**11.6**	**14.9**	**9.4**	**12.0**	**14.8**	**13.4**

*Values are statistically non-significant at 5% probability level

This was closely followed by application of T_2: 50 % N through FYM + 25 % N through Vermicompost enriched with rock phosphate + Microbial consortia @ 2 kg ha^{-1} in recording higher sesame seed yield (433 kg ha^{-1}) and was at par with T_1: 50 % N through FYM + 25 % N through Vermicompost + 25 % N through Neem cake (424) and T_3: 50 % N through FYM + 25 % N through Neem cake + Humic acid granules @ 12.5 kg ha^{-1} (405). Vermicompost enriched with rock phosphate was found to be effective compared to only vermicompost application due to increased availability of P, K and S to oilseed crops that increased seed yield and quality of sesame (Parthasarathi and Ashwin Chandra, 2012). Mokariya *et al.* (2021) revealed that proper fertilization with increased net photosynthesis and greater mobilization of photosynthates towards reproductive structures, which might increased the yield attributes and finally the seed and stalk yield of sesame.

Among sub treatments, foliar application of different organic sources *i.e.,* Panchagavya, Neem Seed Kernel

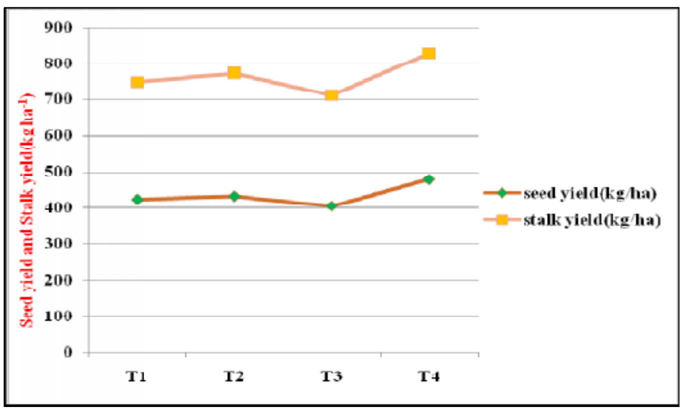
Extract, vermiwash and humic acid as foliar application effectively increased seed yield of sesame though found non-significant among them. In addition to small fraction of nutrients, the above organic sources has enzymatic and hormonal action that resulted in increase in seed yield besides improving the quality of sesame and lower incidence of pest and diseases. Application of panchagavya @ 3 % produced higher sesame yield (450 kg ha^{-1}) and was closely followed by humic acid, Vermiwash and Neem Seed Kernel Extract respectively.

Interaction between main treatments and sub treatments was significant on seed yield of Sesame and was presented along with stalk yield of Sesame.

Table 2: Enzymatic activity and physico chemical properties of the soil as influenced by organic nutrient management practices in sesame.

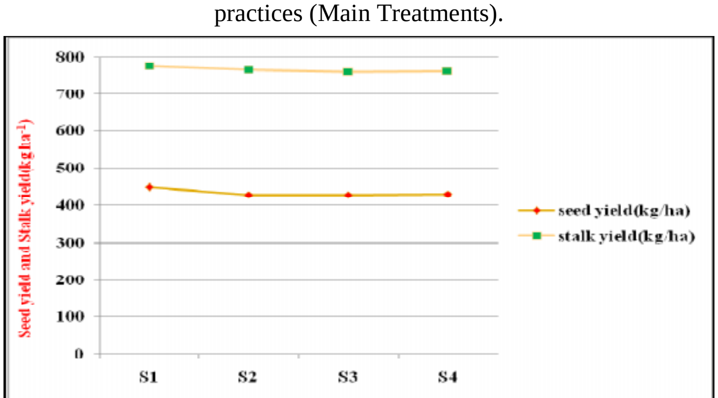
Treatments	Dehydrogenase activity (μg TPF g of $soil^{-1} day^{-1}$)				Physico chemical properties of soil			
	25 DAS	50 DAS	75 DAS	At Harvest	N (Kg ha^{-1})	P_2O_5 (Kg ha^{-1})	K_2O (Kg ha^{-1})	OC (%)
T_1	13.55	23.73	19.29	17.45	231.4	32.3	273.8	0.4
T_2	13.26	23.18	18.78	16.53	236.4	35.8	303.8	0.5
T_3	12.81	22.69	18.35	15.95	217.5	31.1	276.3	0.4
T_4	14.40	24.41	20.21	17.74	245.4	38.4	317.8	0.5
SEm±	0.05	0.04	0.03	0.05	3.2	0.7	13.1	0.01
CD (0.05)	0.14	0.11	0.09	0.15	9.2	2.1	13.0	0.04
S_1	14.03	23.85	19.44	17.32	238.0	36.0	301.9	0.5
S_2	12.92	23.12	18.86	16.52	223.7	32.6	270.5	0.4
S_3	13.30	23.37	19.09	16.79	230.6	33.2	287.6	0.4
S_4	13.77	23.67	19.24	17.04	238.5	35.7	311.7	0.5
SEm±	0.05	0.04	0.03	0.05	3.2	0.7	13.1	0.01
CD (0.05)	0.14	0.11	0.09	0.15	NS	2.1	13.0	0.04
CV	-	-	-	-	4.7	7.3	5.3	7.5
Initial value	-	-	-	-	210.7	25.9	285.2	0.41

*Values are statistically non-significant at 5% probability level



T_1: 50 % N through FYM + 25 % N through Vermicompost + 25 % N through Neem cake; T_2: 50 % N through FYM + 25 % N through Vermicompost enriched with rock phosphate + Microbial consortia @ 2 kg ha^{-1}; T_3: 50 % N through FYM + 25 % N through Neem cake + Humic acid granules @ 12.5 kg ha^{-1}; T_4: 75 % N through FYM + 25 % N through Vermicompost enriched with rock phosphate + Microbial consortia @ 2 kg ha^{-1}.

Fig. 1a. Seed yield and stalk yield (kg ha^{-1}) of sesame as influenced by different organic nutrient management practices (Main Treatments).



S_1: Panchagavya @ 3 %; S_2: NSKE@ 3 %; S_3: Vermiwash @ 10ml lit^{-1}; S_4: Humic acid @ 1ml lit^{-1}

Fig. 1b. Seed yield and stalk yield (kg ha^{-1}) of sesame as influenced by different organic nutrient management practices (Sub Treatments).

CONCLUSION

Dehydrogenease activity was significantly higher with application of 75 % N through FYM + 25 % N through vermicompost enriched with rock phosphate + microbial consortia @ 2 kg ha^{-1} at 25, 50, 75 DAS and at harvest compared with other treatments. Highest microbial count of bacteria was found with application of 75 % N through FYM + 25 % N through vermicompost enriched with rock phosphate + microbial consortia @ 2 kg ha^{-1} at harvest whereas at 25 DAS, fungal count was higher with 50 % N through FYM + 25 % N through Vermicompost + 25 % N through Neem cake and was at par with T_3 and T_4. Foliar application of organic nutrients (Sub treatments) did not show significant effect on dehydrogenase and microbial population.

FUTURE SCOPE

Application of organic sources helps to maintain sustainability and higher profitability in sesame by saving the cost of production.

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Conflict of Interest. None.

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