

Productivity and economics of sunflower in response to different vermicompost from various organic sources under Cauvery delta region of Tamil Nadu

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Abstract

Field experiment was conducted at the experimental farm, Department of Agronomy, Annamalai University to study the productivity and economics of sunflower in response to different vermicompost from various organic sources under Cauvery delta region of Tamil Nadu.. The experiment with ten treatment combinations were laidout in randomized block design and replicated thrice. The ten treatment includes absolute control, recommended dose of fertilizer alone and graded dose of fertilizer nitrogen along with different organic composts and vermicompost. All the treatments exerted significant influence on growth and yield attributes and oil content of sunflower over the control. Application of 75% recommended dose nitrogen (RDN) + pressmud vermicompost @ 2.5 t ha⁻¹ significantly recorded the higher plant height (169.80 cm), leaf area index (4.80) seed yield (1825.77 kg ha⁻¹) oil content (40.47%) and oil yield (738.89 kg ha⁻¹). Recommended dose Nitrogen (50 kg N) alone recorded lower seed yield, oil content and oil yield among the treatment combinations. However it was significantly higher than control (no fertilizer and no organic manure). The next in order of ranking was 75% RDN + sewage sludge vermicompost @ 2.5 t ha⁻¹. The benefit cost ratio (2.99) was also found to be higher with 75% RDN + pressmud vermicompost @ 2.5 t ha⁻¹.

Keywords : Organic manures, Vermicompost, Sunflower, Nitrogen, Growth, Seed yield, Oil content and Oil yield and BCR.

Introduction

Indian vegetable oil economy is the fourth largest in the world, accounting for about 14.5 per cent of the world's oil seeds area and 6.65 per cent of the production and plays the second important role in the agricultural economy, next only to food grains in terms of area and production. This occupies an area of 27.86 m.ha with 27.98 mt of production registering productivity level of 1004 kg ha⁻¹. About 14 million persons are engaged in production and another one million in processing of oil seeds (Sonnad *et al.*, 2011). Sunflower is an important oilseed crop for its premier oil and manifold uses of both industrial and pharmaceutical importance. Its cultivation has gained momentum due to its special features like short

duration, photoperiod insensitivity, drought tolerance adaptability to wide range of soil and climatic situations lower seed rate high content of quality cooking oil and high seed multiplication ratio.

Nitrogen is the key to any fertilizer management programme by which yield potential can be achieved in modern sunflower cultivars. The recommendation of nitrogen use thus needs attention. Despite growth in nitrogen use, research over the past 20-30 years has showed that nitrogenous use efficiency of different N fertilizers are generally low or decreasing. Poor utilization of nitrogenous fertilizer by sunflower is thought to be largely due to different losses of nitrogen. In view of escalating cost of fertilizers and their hazardous polluting effects on environment, there is an awareness among the research workers about the alternate agricultural systems known as biological farming or organic farming. Although research work on organic wastes with inorganic fertilizer on sunflower crop was in plenty, different vermicompost made from various organic sources in sunflower is almost meager. Therefore, the present investigation was planned to develop a sustainable nutrient management concept to achieve a highly productive and remunerative sunflower crop in Tamil Nadu.

MATERIALS AND METHODS

Field experiment was conducted at the experimental farm, department of Agronomy, Annamalai University, Annamalai nagar,. The experimental soil was clay loam in texture with pH 7.9, EC 0.45 dsm^{-1} , organic carbon 0.54, and low N (210.0 Kg ha^{-1}), medium in P (27 Kg ha^{-1}) and high in K (278 Kg ha^{-1}). The experiment was laidout in a randomized block design with ten treatments and replicated thrice . The treatments were T₁- control (no fertilizer and no organic manure), T₂- 100% recommended dose of nitrogen alone (RDN), T₃- 75% RDN + FYM @ 12.5 t ha^{-1} , T₄ – 75% RDN + pressmud @ 10 t ha^{-1} , T₅ - 75% RDN + sewage sludge @ 2.5 t ha^{-1} , T₆ – 75% RDN + sugarcane trash compost @ 10 t ha^{-1} , T₇ – 75% RDN + FYM vermicompost @ 2.5 t ha^{-1} , T₈ – 75% RDN + pressmud vermicompost @ 2.5 t ha^{-1} , T₉ – 75% RDN + sewage sludge vermicompost @ 2.5 t ha^{-1} , T₁₀ – 75% RDN + sugarcane trash vermicompost @ 2.5 t ha^{-1} . The organic manures were applied as basal one week before sowing as per treatment schedule. As per treatment schedule 50 per cent of N and entire dose of P₂O₅ and K₂O were applied as basal and remaining 50 per cent N was applied on 30 DAS. N, P₂O₅ and K₂O were supplied through urea, single superphosphate and muriate of potash, respectively. Recommended cultural practices were also adopted as per need of the crop.

Results and Discussion

Growth Attributes

Integrated application of organic and inorganic fertilizers increased the growth attributes of sunflower. Application of 75% RDN + pressmud vermicompost @ 2.5 t ha^{-1} (T₈) recorded significantly higher plant height (169.80 cm) and LAI (4.80). Favourable effect of pressmud vermicompost on plant

height and LAI could be attributed to sustained availability of major and micronutrients with different growth hormones like gibberellins resulting in increased plant height and LAI. This results coincides with the work of Manivannan *et al.* (2009). The least plant height was recorded under T₁ (no fertilizer and no organic manure). Lesser response of sunflower to other organic manures could be attributed to slow mineralization of organically bound nutrients and low population of beneficial microbes as compared to pressmud vermicompost (Khatik and Dikshit, 2001).

Yield attributes and yield

The yield potential of sunflower is determined by yield attributes and the values of yield attributes are in accordance with that of growth parameters. Among the INM treatments, substantial increase in yield attributes viz., head diameter size and number of filled seeds head⁻¹ were realized in inorganic fertilizer along with pressmud vermicompost applied plots. 75% RDN + pressmud vermicompost @ 2.5 t ha⁻¹ (T₈) registered higher head diameter size (18.26 cm) and number of filled seeds head⁻¹(591.50). This might be due to higher amount of nutrients supplied through pressmud vermicompost along with inorganic fertilizer, which have increased the availability of nutrients in soil, thus more uptake of nutrients and increased photosynthetic efficiency as evident from increased LAI resulted in higher head diameter size and number of filled seeds head⁻¹. This results is in accordance with the reports of Bank and Kalaiyaran and Vaiyapuri (2008). The control plot (no fertilizers and no organic manure) recorded the least head diameter size and number of filled seeds head⁻¹.

Integration of 75% RDN + pressmud vermicompost @ 2.5 t ha⁻¹ (T₈) significantly recorded a higher seed yield of 1825.77 kg ha⁻¹ which was 268.84 per cent higher than T₁ (no fertilizer and no organic manure) and 108.61 per cent over 100% RDN (T₂). This might be due to the fact that pressmud vermicompost offer a balanced nutritional release pattern to plants, providing nutrients such as available N, soluble K, exchangeable Ca, Mg, and P that can be taken readily by plants (Edwards, 2004). The least seed yield was registered under T₁, (No fertilizer and no organic manure).

Oil content and Oil yield

Application of 75% RDN + pressmud vermicompost + @ 2.5 t ha⁻¹ (T₈) registered higher oil content (40.47%) and oil yield (738.89 kg ha⁻¹). This might be due to better availability of macro, micro nutrients especially sulphur and trace elements in pressmud vermicompost (Rathika *et al.*, 2008). The least oil content and oil yield was recorded under control (T₁).

Economics

Application of 75% RDN + pressmud vermicompost + @ 2.5 t ha⁻¹ (T₈) registered higher benefit cost ratio (BCR: 2.99) over other treatments. Among the INM treatments, T₈ (75% RDN + pressmud vermicompost @ 2.5 t ha⁻¹) significantly influenced the growth and yield attributes of sunflower. The growth attributes are directly reflected on increased yield of sunflower. In addition aforesaid treatments

offered favorable neutro physiological conditions and enhanced the soil fertility. These might be the reason for increased profitability in the sunflower crop (Byrareddy *et al.*, 2008).

Conclusion

From the results of the field trials, it can be concluded that 75% RDN with pressmud vermicompost @ 2.5 t ha⁻¹ significantly recorded maximum seed yield, oil content and oil yield and benefit cost ratio (BCR) of sunflower crop. In places of non availability of pressmud or high availability of sewage sludge, sewage sludge vermicompost can be replaced instead of pressmud based vermicompost to realize similar higher yields in sunflower.

Table 1. - Effect of different sources of vermicompost on growth, yield parameters, seed yield , oil content and oil yield and BCR of sunflower.

Treatment	Plant height (cm)	LAI	Head diameter (cm)	Number of filled seeds head ⁻¹	Seed yield (kg ha ⁻¹)	Oil content (%)	Oil yield (kg ha ⁻¹)	BCR
T ₁	46.04	1.30	4.95	138.96	495.00	39.09	193.50	1.41
T ₂	81.39	2.30	8.75	408.37	875.17	39.31	344.03	1.97
T ₃	139.05	3.93	14.95	444.21	1495.14	39.55	591.33	2.52
T ₄	151.39	4.28	16.28	493.90	1627.84	39.91	649.67	2.79
T ₅	145.31	4.11	15.62	468.41	1562.47	39.73	620.77	2.72
T ₆	135.75	3.84	14.60	433.05	1459.72	39.49	576.44	2.50
T ₇	159.61	4.51	17.16	537.76	1716.28	40.11	688.40	2.81
T ₈	169.80	4.80	18.26	591.50	1825.77	40.47	738.89	2.99
T ₉	164.56	4.65	17.70	564.30	1769.51	40.29	712.94	2.90
T ₁₀	156.74	4.43	16.85	522.67	1685.38	40.07	675.33	2.76
SED	1.65	0.06	0.24	12.92	24.11	0.08	11.24	-
CD (P=0.05)	3.41	0.13	0.48	25.84	48.21	0.16	22.48	-

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