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RESEARCH ARTICLE

INFLUENCE OF ORGANIC COMPOST AND INORGANIC FERTILIZER ON NUTRIENT UPTAKE AND SOIL HEALTH IN SUNFLOWER (*HELIANTHUS ANNUUS L.*)

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ABSTRACT

Field experiments were carried out at the Annamalai University, Experimental Farm, Department of Agronomy, Annamalai Nagar, Tamil Nadu to study the Influence of organic compost and inorganic fertilizer on nutrient uptake and soil health in sunflower (*helianthus annuus L.*) for two season during Feb – May (2010) and July – Sep (2010). The experiment was laid out in a randomized block design with ten treatments each replicated thrice. The treatments were T1- control (no fertilizer and no organic manure), T2- recommended dose of nitrogen, T3- 75% RDN + FYM @ 12.5 t ha⁻¹, T4 - 75%RDN + pressmud @ 10 t ha⁻¹, T5 - 75% RDN + sewage sludge @ 2.5t ha⁻¹, T6 – 75% RDN + sugarcane trash compost @ 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 results revealed that crop raised with pressmud vermicompost in two season had significant influence on the N, P₂O₅ and K₂O uptake. Plots receives with pressmud vermicompost @ 2.5 t ha⁻¹ along with 75 % RDN increase the soil organic carbon of post harvest soil after experimentation. Also the same treatment recorded significantly higher soil available N, P₂O₅ and K₂O after the harvest of the crop. The least values were recorded in absolute control (no organic and chemical fertilizers). From the results of the field trials, it can be concluded that application of pressmud vermicompost @ 2.5 t ha⁻¹ along with 75 % RDN to sunflower was significantly registered higher soil available N, P and K and organic carbon after harvest of sunflower in tail end area of cauvery deltaic zone of Tamil Nadu.

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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. The 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. 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. 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.

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In view of escalating cost of fertilizers and their hazardous polluting effects on environment, there is an awareness among the research biological farming or organic farming. Through India has a industrial by products like pressmud, urban waste like sewage sludge, etc, the potentially of the organic resources has not yet been fully tapped. 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 meagre. Therefore, the present investigation was planned to develop a sustainable nutrient management concept to maintain and sustain the soil health in sunflower crop under tail end area of Cauvery deltaic zone of Tamil Nadu.

MATERIALS AND METHODS

Field experiments were conducted at the Experimental farm, department of Agronomy, Annamalai University, Annamalai nagar, to study the Influence of organic compost and inorganic fertilizer on nutrient uptake and soil health in sunflower (*helianthus annuus L.*) in two season during Feb – May (2010) and July – Sep (2010). The experimental farm is geographically located at 11°24'N latitude, 79° 44'E longitude and +5.79 m above mean sea level. 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 Kg ha⁻¹), medium in P (27 Kg ha⁻¹) and high in K (278 Kg ha⁻¹).

Table 1. Influence of organic compost and inorganic fertilizer on NPK uptake, post harvest available soil nutrient status and Organic carbon content of soil in sunflower

Treatments	Nitrogen Uptake (kg ha ⁻¹)		Phosphorus Uptake (kg ha ⁻¹)		Potassium uptake (kg ha ⁻¹)		Available Nitrogen (kg ha ⁻¹)		Available Phosphorus (kg ha ⁻¹)		Available Potassium (kg ha ⁻¹)		Organic carbon content of soil	
	First season	Second season	First season	Second season	First season	Second season	First season	Second season	First season	Second season	First season	Second season	First season	Second season
T ₁	22.63	23.11	4.58	4.67	20.93	21.37	179.82	183.22	17.38	18.42	244.93	249.63	0.43	0.42
T ₂	38.50	39.37	7.79	7.96	35.61	36.41	188.48	196.45	20.26	21.48	253.75	261.02	0.48	0.47
T ₃	62.07	62.40	12.56	12.62	57.41	57.71	197.91	204.71	23.48	24.89	262.56	269.73	0.57	0.59
T ₄	65.74	66.50	13.30	13.45	60.80	61.50	204.87	211.53	28.82	30.55	269.27	276.12	0.61	0.63
T ₅	63.86	64.49	12.92	13.05	59.06	59.64	201.33	208.28	23.84	25.27	265.72	272.97	0.59	0.61
T ₆	61.01	61.38	12.34	12.42	56.42	56.77	196.12	203.05	22.16	23.49	260.93	267.85	0.56	0.58
T ₇	68.45	69.58	13.85	14.08	63.30	64.35	210.59	216.98	26.75	28.36	274.58	281.43	0.64	0.66
T ₈	71.92	73.36	14.55	14.84	66.51	67.85	218.52	223.45	29.43	31.20	281.47	287.95	0.68	0.71
T ₉	70.15	71.49	14.19	14.46	64.88	66.12	214.64	220.12	27.64	29.30	278.18	284.78	0.67	0.69
T ₁₀	67.30	68.33	13.62	13.82	62.24	63.20	208.49	215.17	25.17	26.68	272.69	279.84	0.64	0.65
SEd	0.67	0.84	0.16	0.17	0.76	0.822	1.62	1.44	0.54	0.43	1.51	1.42	0.01	0.01
CD (p=0.05)	1.34	1.68	0.32	0.34	1.52	1.65	3.24	2.98	1.08	0.96	2.92	2.74	0.02	0.02

The experiment comprising of ten treatments viz., T₁- control (no fertilizer and no organic manure), T₂- recommended dose of nitrogen, T₃ - 75% RDN + FYM @ 12.5t ha⁻¹, T₄ - 75%RDN + pressmud @ 10 t ha⁻¹, T₅ - 75% RDN + sewage sludge @ 2.5t ha⁻¹, T₆ - 75% RDN + sugarcane trash compost @ 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. Organic manures and different source of vermicompost were applied as basal one week before sowing as per treatment schedule. The experiment was laid out in a randomized block design with three replications. The sunflower cultivar CO 4 was chosen for the study. The recommended seed rate of 15 kg ha⁻¹ was used for the experiment. The seeds were sown by dibbling with a spacing of 45 X 30 cm. Vermicompost was prepared using heap method. After 3 months, matured vermicompost was applied to experimental plots as per the treatment schedule. A fertilizer schedule of 50 kg N, 60 kg P₂O₅ and 40 kg K₂O ha⁻¹ was applied. Nitrogen was applied as per the treatment schedule. 50 per cent of recommended N was applied as basal and remaining 50 per cent was applied on 30 DAS. Entire dose of P₂O₅ and K₂O were applied as basal. N, P₂O₅ and K₂O were supplied through urea, single superphosphate and muriate of potash, respectively. All other improved recommended package of practices were followed to sunflower as per the Crop Production Guide. The post harvest composite soil samples were collected after the harvest of sunflower and analysed for post harvest available nutrients.

Analytical methods employed for soil/manure were as under: Plants were also analyzed for N, P and K uptake after harvest. The data on various studies recorded during the investigation were subjected to statistical scrutiny as suggested by Gomez and Gomez (1984).

Particulars	Author(s)	Method
Organic carbon	Walkley and Black (1934)	Chromic acid wet digestion method
Available N	Subbiah and Asija (1956)	Alkaline permanganate method
Available P	Olsen <i>et al.</i> (1954)	Colorimeter method
Available K	Stanford and English (1949)	Flame photometric method

RESULTS AND DISCUSSION

Effect INM treatment on crop nutrient uptake: Sunflower crop with different sources of vermicompost registered higher nutrient uptake and was significantly superior to recommended dose of nitrogen alone and absolute control. The date on the effect of different sources of vermicompost show that in both the season, pressmud vermicompost @ 2.5 t ha⁻¹ along with 75% RDN (T₈) excelled other treatments by recording the highest nutrient uptake of 71.92 and 73.36 kg of N, 14.55 and 14.84 kg of P₂O₅ and 66.51 and 67.85 kg of K₂O during first and second season, respectively. This could be due to steady and sustained availability of nutrients in pressmud vermicompost along with inorganic nutrients in the forms that are readily available to plants, which match the uptake pattern of different physiological growth phases of crop (Kavitha *et al.*, 2008). The least uptake of N, P and K were registered under T₁ (control).

Effect of INM treatments on available soil nutrients : The post harvest soil available NPK were markedly influenced by different sources of vermicompost on sunflower. Application of pressmud vermicompost @ 2.5 t ha⁻¹ + 75% RDN (T₈) registered significantly the higher post harvest soil available nitrogen of 218.52 and 223.45 kg ha⁻¹, phosphorus of 29.43 and 31.20 kg ha⁻¹ and potassium of 281.47 and 287.95 kg ha⁻¹.

This might be due to the continuous and slow release of nutrients from vermicompost involving higher availability of N, P and K (Namita Joshi and Sonal Sharma, 2010). The least post harvest soil available NPK were registered under T₁ (control).

Effect of INM treatments on available Organic carbon: In both the season appreciably higher availability of organic carbon were recorded from plots received pressmud vermicomposts @ 2.5 t ha⁻¹ along with 75% RDN (T₈) than other treatments. This might be due to the build up of humus and higher microbial population by vermicompost and crop residue. This concurs with the views of Patro *et al.* (2005). The least available organic carbon was registered under T₁ (control).

Conclusion

Based on the experiment result, it may be concluded that basal application of pressmud vermicompost @ 2.5 t ha⁻¹ along with 75% RDN could be recommended to maintain and sustain the soil health in sunflower cultivation.

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