



Full Length Research Article

Productivity and Profitability of Sunflower in Response to Integrated Use of Organic and Inorganic Sources of Nutrients

*Krishnaprabu, S.

Assistant Professor, Department of Agronomy, Annamalai University Tamil Nadu

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ABSTRACT

A field investigation was carried out at Annamalai University experimental farm, Annamalai Nagar to evaluate the integrated nutrient management practices for enhancing the productivity of sunflower during summer 2009. The results shows that application of recommended dose of fertilizer along with pressmud @ 5 t ha⁻¹ and combine with foliar application of MnSO₄ @ 0.5% on 40 and 60 DAS recorded the higher seed yield of sunflower compared with other treatments.

Key words: Sunflower, Nutrient management, Organic manures, Growth and yield components

INTRODUCTION

Sunflower is an important oilseed crop of the world and in ranks third in production next to groundnut and soyabean. The lower productivity of sunflower is mainly due to lack of high yielding varieties, its cultivation on marginal lands with inadequate nutrients, non adoption of proper crop rotation and weed management practices and also continuous use of inorganic fertilizers deteriorates soil health in and also which makes soil unproductive for next season. Hence there is an urgent need to use different combination of organics and inorganics along with biofertilizers (Agarwal, 2007). Sunflower is an annual oilseed plant of composite family. Sunflower holds great promise as an oilseed crop because of it is also a crop of choice for farmers due to its wider adaptability. High yield potential, short duration and profitability will adoptability of different agro – climatic regions and soil types. Due to that this crop play's very important role in contingency crop planning also, sunflower can play an important role in meeting out the shortage of edible oil in country. Sunflower oil is preferred among the consumers in India for its health benefits and sunflower oil the largest selling oil in the branded oil segment. The productivity of sunflower in India is low 753 kg ha⁻¹ as compared to other nations and one of the main reason for low productivity is due to its cultivation mainly under rainfed conditions with sub optimal crop stand, imbalanced nutrition and lack of soil moisture conservation techniques, thus leading to poor seed ser and high percent of chaffy seed, low oil content and yield. Sunflower is considered as exhaustive crop that adequate and balanced fertilization is must for obtaining good yield. Therefore, for wide spread adoption and exploitation of high yield potential of the hybrid, under dryland condition, response of applied fertilizers various with the available soil moisture.

Application of fertilizers having nutrients viz., nitrogen, phosphorus and potash can increase sunflower growth and yield substantially (Reddy *et al.*, 2007).

MATERIALS AND METHODS

A field experiment was conducted at experimental farm at Annamalai University, Annamalai Nagar during summer 2009. It was laid out in randomized block design with three replications and consisted of ten different treatments. Pressmud and enriched farmyard manure were incorporated in furrows as per the treatments fifteen days before sowing and entire quality of P₂O₅ and K₂O were applied as basal dose top the sunflower crop. 50% of nitrogen applied as basal dose through the organic, manures and remaining 50% nitrogen applied as top dressing through urea as per the treatments at 30 days after sowing. Phosphorus was also applied in two forms along with P solubilizers as per the treatments where as potassium was applied in the form of murate of potash for all the treatments except control. Five plants per plot were selected randomly and tagged in the net plot area for recording observations. The plant height was measured from the base of the plant at ground level to the point of attachment of the capitulum at 30, 60 and 90 days after sowing and expressed in centimeters. The seed yield from five plants were recorded and mean yield plant was computed and expressed in grams per plant. The field experiment was laid out and conducted during 2009. Sunflower hybrid (Sunbred – 275 pr RENA) was chosen for this study. The soil of the experimental field is clay loam in texture. The nutrient status of the experimental soil was low in available nitrogen, medium in available phosphorus, high in available potassum. Initial irrigation was given immediately after sowing of sunflower seeds with adequate care to avoid excess soaking of water, the life irrigation was given on third day after sowing and subsequent irrigations were given as per the crop requirement. Foliar application of MnSO₄ @ 0.5 percent were sprayed on 40 and

*Corresponding author: Krishnaprabu, S

Assistant Professor, Department of Agronomy, Annamalai University Tamil Nadu

Table 1. Influence of Organic and Inorganic Sources of Nutrients on Growth and Yield Components of Sunflower

Treatments	Plant height (cm)	LAI (cm)	DMP (Kg ha ⁻¹)	Total number of Seeds capitulum ⁻¹	Casptitulum diameter (cm)	Seed yield (kg ha ⁻¹)
T ₁	102.6	2.8	2093	476.0	10.3	872
T ₂	113.6	3.7	2418	548.3	12.8	1009
T ₃	156.2	4.9	3876	953.6	18.6	1813
T ₄	156.4	4.9	4071	964.1	19.7	1845
T ₅	141.9	4.3	3307	867.5	15.9	1559
T ₆	127.8	3.9	2738	775.2	14.3	1369
T ₇	156.1	4.8	3921	960.4	18.4	1825
T ₈	168.6	5.1	4669	1045.8	21.2	2192
T ₉	143.2	4.3	3405	880.9	16.1	1652
T ₁₀	128.9	4.0	3749	776.2	14.5	1401
S.Ed	6.27	0.19	149.57	35.46	0.71	64.24
CD (p = 0.05)	12.54	0.38	316.19	70.92	1.42	135.45

60 days after sowing with the help of knapsack sprayer. The treatments schedule of experiment field as follows: T₁ – Control, T₂ – Recommended dose of fertilizer (60:90:60 kg of NPK ha⁻¹), T₃ – RDF + EFYM @ 750 kg ha⁻¹, T₄ – RDF + Pressmud @ 5 t ha⁻¹, T₅ – RDF + Neem cake @ 750 kg ha⁻¹, T₆ – RDF + Azospirillum seed treatments @ 600 g ha⁻¹, T₇ – RDF + EFYM @ 750 kg ha⁻¹ + foliar application of MnSO₄ @ 0.5% on 40 and 60 DAS, T₈ – RDF + Pressmud @ 5t ha⁻¹ + foliar application of MnSO₄ @ 0.5% on 40 and 60 DAS, T₉ – RDF + Neem cake @ 750 kg ha⁻¹ + foliar application of MnSO₄ @ 0.5% on 40 and 60 DAS, T₁₀ – RDF + Azospirillum seed treatment @ 600 g ha⁻¹ + foliar application of MnSO₄ @ 0.5% on 40 and 60 DAS.

RESULTS AND DISCUSSION

Growth Components: From the perusal of the experiment results, it is evident that the integrated nutrient management practices significantly influenced the growth components viz., plant height, LAI and DMP. Among the different treatments tested, application of RDF + Pressmud @ 5 t ha⁻¹ + foliar application of MnSO₄ @ 0.5 % on 40 and 60DAS exhibited an accelerated effect on the growth attributes. This might be due to better performance of INM treatments contributed to availability of nutrients from vermicompost along with inorganic fertilizer and micro nutrients and it is reflected on increased growth attributes (Blaise and prasad, 2005). Favorable effect of pressmud on plant height could be attributed to sustained availability of major and micro nutrients with different growth hormones like gibberellins, NAA and cytokinin resulting increased plant higher the least plant height was recorded under control. This was also confirmed by Ramprakash *et al* 2001. The application of recommended dose of fertilizer along with pressmud and foliar application of MnSO₄ @ 0.5 percent on 40 and 60 DAS. Registered higher LAI. Higher LAI could be attributed to increase of metabolic activity in plant which could have promoted meristematic activities causing apical growth (yadav *et al.*, 2009). Among the various treatments tested application of RDF + Pressmud @ 5t ha⁻¹ + foliar application of MnSO₄ @ 0.5 percent on 40 and 60 DAS registered maximum DMP. This could be attributed to increased leaf area due to sustained and enhanced availability of nutrients from combined source of organic and inorganic fertilizer till the maturity that would have enhanced better biomass production. This was supported by the findings of Tejeswara Rao *et al.*, 2013. The increase in growth attributes might be due to higher availability of both native and applied nutrients in this treatment along with better source and sink relationship in the crop which has contributed to

better dry matter accumulation 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 (Khatik and Dikshith, 2001). Foliar application of MnSO₄ might have provided optimum availability of both manganese and sulphur for sunflower at critical stages of crop. Which in turn might have resulted in vigorous root and shoot initiation reflecting upon enhanced crop growth and establishment in terms of plant height, LAI and DMP, similar inferences were documented by baradhan (2008).

Yield components: Among the various treatments evaluated yield components viz., capitulum diameter, total no. of seeds capitulum⁻¹ and seed yield were significantly influenced by application of RDF + pressmud @ 5t ha⁻¹ + foliar application of MnSO₄ @ 0.5 per cent on 40 and 60 DAS. This might be due to higher amount of nutrients supplied through pressmud along with inorganic fertilizer and micronutrients, which have influenced the availability of nutrients in rhizosphere of the soil, thus more uptake of nutrients by sunflower in the higher yield attributed. Similar findings were reported by Reddy *et al.*, 2008. Also, it could be attributed to application of pressmud, which constrains essential plant nutrients, released slowly steadily to entire crop period, leading to better growth and development. The results corroborate with the findings of Patel, Pathak 2002 and premi *et al.*, 2005. The yield attributed was recorded at least under control. Being the key components in photosynthesis (Rattan *et al.*, 2004) manganese might have improved the psychological activity of plant resulting in enhanced synthesis photosynthesis, studies have revealed the manganese not only improved the nutrients uptake, it also augmented the conversion, translocation of starch to sink region. The findings of present study are in line with the earlier reports of Radha Krishnan 2009 and Kannan *et al.*, 2005.

Conclusion

The results shows that application of RDF + pressmud @ 5 t ha⁻¹ + foliar application of MnSO₄ @ 0.5 per cent on 40 and 60 DAS may be an eco friendly, economically viable and practice that can be advocated to the farmers of Tamilnadu.

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