

## Effect of integrating inorganic fertilizer with vermicompost and Vesicular Arbuscular Mycorrhizae (VAM) on the productivity of sunflower

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**Abstract :** An experiment was conducted to study effect of organic manures integrated with chemical and biofertilizers on growth and yield parameters of sunflower for three years at Tamil Nadu Agricultural University, Coimbatore during *kharif* (June-September) season. Application of vermicompost at the rate of 2 t ha<sup>-1</sup> recorded significantly higher yield (1070, 984 and 1229 kg ha<sup>-1</sup> in 1994, 1995 and 1996 respectively) compared to farm yard manure and no manure. Application of 100 per cent recommended chemical fertilizers (NPK) resulted in significant increase in plant height, head diameter, 100 seed weight and seed yield over 50 per cent NPK and control. Among the biofertilizers, soil application of Vesicular Arbuscular Mycorrhizae (VAM) recorded higher seed yield over Phosphorus Solubilising Bacteria (PSB) and control. Combined application of organic manures and chemical fertilizers significantly influenced the sunflower seed yield. Application of vermicompost with 100 per cent recommended NPK recorded the highest seed yield of 1374, 1287 and 1458 kg ha<sup>-1</sup> in all the three years, respectively. Fifty per cent of recommended NPK along with vermicompost recorded higher seed yield than 100 per cent NPK with FYM. (*Key words:* Sunflower, Integrated Nutrient Management, Organic manure, FYM, Biofertilizer, Vermicompost, VAM, PSB).

Increasing the use of chemical fertilizer for increased crop production is causing concern on declining productivity due to the deteriorating effect of soil physical and chemical conditions. Contrary to the chemical fertilizers, organic manures and biofertilizers, besides being available indigenously at lower cost, results in creating and maintaining better physical and chemical environment for sustaining higher productivity. Due to the bulky requirement of organic manures, integrating with chemical fertilizers need to be continued for sustaining higher crop yield. Agricultural wastes and house hold garbages can provide an important ingredient for the preparation of compost. Earthworms are known to produce these wastes into valuable organic manure i.e. vermicompost (Dash, 1978).

Sunflower (*Helianthus annuus* L.), is an important oil yielding crop endowed with short growth period, photo insensitive in nature, tolerance to drought and high quality oil content with high degree of fatty acid content. With all its merits, low seed yields due to improper nutrient management is a serious defect which stands in the way of extending the area of cultivation. Studies conducted at different locations revealed that the seed yield could be increased substantially by adopting the improved nutrition management. Literatures say that the combined application of organic manures with inorganic fertilizer

significantly influenced the head diameter and seed yield of sunflower. Application of organic manures like FYM as well as vermicompost and biofertilizers like VAM and PSB improve the yield by increasing the nutrient availability to the crop.

Information about the effect of organic manures alone and integrated with inorganic and biofertilizers on sunflower growth and yields were lacking. Hence, the present study was undertaken to evaluate the organic and inorganic sources of nutrients alone and in combination with chemical fertilizers under irrigated conditions on sunflower seed yield.

### Materials and Methods

Field experiment was conducted at Tamil Nadu Agricultural University, Coimbatore for three years during *kharif* (June-September) season of 1994, 1995 and 1996 in Factorial Randomised Block Design with three replications under irrigated condition. The soil is a sandy loam with neutral reaction. The available status of nitrogen, phosphorus and potash was medium, low and high, respectively. The treatments consist of different forms of organic manures viz. farm yard manure at the rate of 5 t ha<sup>-1</sup> and Vermicompost at the rate of 2 t ha<sup>-1</sup> (Factor M), inorganic fertilizers viz. 100 per cent (40:20:20 kg NPK per ha) and 50 per cent recommended dose of



NPK (Factor F) and different biofertilizers like Vesicular Arbuscular Mycorrhizae (at the rate of 1 t ha<sup>-1</sup>), Phosphorus Solubilizing Bacteria (Factor B) and they were compared with their respective control. The organic manure vermicompost and the biofertilizer VAM were applied in band along the seed rows as soil application. PSB (2 kg) was applied as seed treatment. The inorganic fertilizers viz. nitrogen, phosphorus and potash were applied as urea, single super phosphate and muriate of potash. Entire quantity of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O and 50% N were applied as basal. The remaining 50% N was applied as top dressing on 30 days after sowing. The experiment was conducted with sunflower variety 'Co 2' during 1994 and 1995 and 'Co 3' during 1996. Both varieties are having a duration of 90 days. The crop was raised in ridges and furrows with a spacing of 30 cm between rows and 30 cm between plants. All other agronomic practices were adopted commonly for all the treatments.

### Results and Discussion

The results of the experiment (Table. 1) revealed that among the organic manures, application of vermicompost at the rate of 2 t ha<sup>-1</sup> as band placement in seed rows recorded significantly higher seed yield in all the three years (1070, 984 and 1229 kg ha<sup>-1</sup> for 1994, 1995 and 1996, respectively) compared to FYM application and no manure. Growth and yield parameters like plant height, head diameter and 100 seed weight were also higher in the vermicompost applied plot. The organic manure, vermicompost had higher contents of organic carbon (17.38%), total N(1.48%), Phosphorus (0.26%) Potassium (0.75%) and Calcium and Magnesium (48.20 me/100g) than the other organic wastes (Andani Gowda *et al.*, 1995). The higher content of nutrients as well as in readily available form resulted in better growth and yield of sunflower.

Though the application of one hundred percent NPK recommended chemical fertilizers recorded higher seed yield (1105, 1026 and 1318 kg ha<sup>-1</sup> in 1994, 1995 and 1996) still it could be improved significantly by the addition of organic manures. This is evident from the results (Table.2) of the interaction between organic manures and inorganic fertilizers. Application of the organic manure vermicompost at the rate of two tonnes per hectare with hundred per cent recommended chemical fertilizer recorded the highest seed yield of 1374, 1287 and 1458 kg

ha<sup>-1</sup> during 1994, 1995 and 1996, respectively. Soils receiving plant nutrients through chemical fertilizers are showing declining productivity even though sufficient amounts of nutrients are being provided (Nambiar, 1989). This decline in productivity could be attributed to the appearance of deficiency of secondary and micro-nutrients as well as to the deteriorating soil physical conditions caused due to long term use of chemical fertilizers especially the nitrogenous ones (Ravindra *et al.* 1985; Lal and Mathur, 1989). Contrary to chemical fertilizers, organic manures, besides being available indigenously at lower cost, results in enhanced crop yield per unit of applied nutrients by creating and maintaining better physical and chemical environment for sustaining higher productivity. Vermicompost is more efficient in increasing the seed yield of sunflower compared to the farm yard manure. An equal yield of sunflower can be produced by saving 50 per cent NPK recommended when it is applied with vermicompost as that of 100 per cent NPK with 5 t FYM.

The biofertilizer Vesicular Arbuscular Mycorrhizae (VAM) recorded higher growth and sunflower seed yield (Table. 1) when compared to phosphorus solubilising bacteria and control. Beneficial effect of VAM on plant growth has largely been attributed to higher P uptake and consequently better P nutrition of mycorrhizae inoculated plants. Pot culture trials have proved that sunflower responds to inoculation with VAM fungi. Thomson, (1987); Jones and Sreenivasa, (1993) reported that sunflower inoculated with VAM at 38kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> resulted in efficient utilization of P which in turn increased dry matter production and their accumulation in different parts, which ultimately lead to higher seed yield.

In conclusion the seed yield of sunflower could be improved by the application of the organic manure vermicompost. Among the biofertilizers, Vesicular Arbuscular Mycorrhizae performed better than the Phosphorus Solubilising Bacteria. Reduction in the recommended chemical fertilizers (NPK) without the addition of organic manure resulted in significant reduction in growth and yield of sunflower. Combined application organic manures and chemical fertilizers significantly influenced the sunflower seed yield. Application of vermicompost with 100% recommended chemical fertilizers sustained the higher productivity over years.

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## Performance of sesame hybrids in multilocation trial

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**Abstract :** Eight sesame (*Sesamum indicum* L.) hybrids and three check varieties were studied at five locations of sesame growing areas of Tamilnadu. Five characters namely plant height, number of branches per plant, number of capsules per plant, seed yield (kg ha<sup>-1</sup>) and oil content (per cent) were observed. All the hybrids recorded significant standard heterosis for seed yield confirming the superiority of hybrid at all locations. Among the hybrids SI 861 X BS 6-1-1, SI 2257 X SO 573 and IS 200 X IS 305 are recommended for commercial cultivation. (**Keywords:** Sesame hybrids, multilocation trial).

Sesame (*Sesamum indicum* L.) is an ancient oilseed crop grown in India. The productivity of sesame is very low. The crop has been grown mostly under rainfed with marginally fertile lands. Many breeders in India are working on sesame to increase the productivity. Varietal improvement of sesame during the past had been oriented towards developing pure line varieties through conventional breeding. In recent years developing hybrid varieties through heterosis breeding is being attempted. The genotype x environment interaction plays an important role in the performance of genotypes. Hence, a multilocation evaluation

of eight high yielding hybrids along with local cultivars was done to assess the superiority of hybrids.

### Materials and Methods

The experiment was conducted at Faculty of Agriculture, Annamalai University, Annamalainagar during June-July, 1997. Eight high yielding hybrids (SI 861 x SI 2257, SI 861 x BS 6-1-1, SI 861 x IS 207, SI 2257 x S 0573, SI 2257 x IS 305, S 0573 x IS 207, S 0573 x IS 534 and IS 200 x IS 305) were chosen