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Original Research Article

Comparative Performance of Organic and Inorganic Sources of Nitrogen on Growth and Yield of Sunflower Hybrid MSFH-17

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Sunflower Hybrid MSFH-17, Inorganic Sources of Nitrogen

A B S T R A C T

An agronomic investigation on "comparative performance of organic and inorganic sources of nitrogen on growth and yield of sunflower hybrid MSFH-17" was conducted at the research farm of Department of Agronomy, College of Agriculture, Latur under VNMKV, Parbhani (M.S.) during *kharif* 2010. The soil was clayey in texture, low in available N, medium in P and high in K with pH 7.9. The total rainfall during the experimental period was 943.3mm spread over 59 rainy days which was normal for growth and development of sunflower crop. The experiment was laid out in RBD with three replications on sunflower hybrid MSFH-17 as a test crop. Study concluded with result that supply of 50 per cent N through FYM + 50 per cent N through fertilizer was considered economically feasible combination for cultivation of sunflower hybrid MSFH-17 under rainfed condition, which also satisfies the criteria of sustainability of soil health.

Introduction

Among oilseed crops, sunflower (*Helianthus annuus* L.) has gained much popularity and the area under its cultivation is gradually increasing because of its short duration, photo-insensitivity, wider adaptability to different agro-climatic regions and soil types. In addition to higher seed multiplication ratio, its good oil quality, tolerance to drought and production of more oil per unit area and time than any other oilseed crop makes it a potential oilseed crop especially under rainfed conditions. However, sunflower in India is grown on marginal lands with low organic matter and poor fertility under rainfed conditions with inadequate application of major nutrients like nitrogen. As soils under rainfed condition are low in organic carbon status (Srinivasarao *et al.,* 2003) there is a need to enhance application of organic matter for improving productivity.

In India, the area under sunflower cultivation during *kharif* 2009-2010 was 14.80 lakh hectare with the production of 19.00 lakh tones and productivity 607 kg ha^{-1}. The important sunflower growing states in India are Karnataka, Andhra Pradesh, Maharashtra and Tamil Nadu. In Maharashtra, the area under sunflower

cultivation during 2009-2010 was 2.19 lakh hectare with the production of 1.14 lakh tones and productivity 520 kg ha^{-1} (Anonymous, 2010).

Sunflower responds to fertilizer application for high yield. Singh *et al.*, (1999) reported that the sunflower hybrids require more nutrients than the varieties. This adds to additional expenditure. On the other hand, if the hybrids are not fertilized with optimum level of nutrients; then the soil available nutrients may be greatly depleted. Increased nitrogen levels were shown to increase the growth and yield attributes with concurrent increase in seed yield of sunflower (Muthuvel *et al.,* 1983). Incorporation of organic matter (green manure) influences the soil fertility status by enhanced nitrogen fixation, reduced erosion, increased water holding capacity and weed control (Sharma *et al.,* 2010). Traditional sources of organic manure like farmyard manure are becoming scarce due to several limitations (Kamble *et al.,* 2005). Organic manures alone cannot fulfill the heavy nutrient demand of an intensive cropping system because of its low nutrient content and slow nutrient release vis-à-vis fertilizers. Application of chemical fertilizers alone has led to environmental pollution and deterioration of soil health, use of nutrients through organic sources has been found to improve the soil health, soil buffering capacity, water retention capacity, release of plant nutrients and microbial reactions. With this background present investigation was undertaken during *Kharif*2010 with the following objectives:

To study the effect of organic manures with inorganic fertilizers on growth and yield of sunflower.

To work out economics of different combinations of N fertilizers on sunflower yield.

Materials and Methods

An agronomic investigation on "comparative performance of organic and inorganic sources of nitrogen on growth and yield of sunflower hybrid MSFH-17" was conducted at the research farm of Department of Agronomy, College of Agriculture, Latur under VNMKV, Parbhani (M.S.) during *kharif* 2010. The soil was clayey in texture, low in available N, medium in P and high in K with pH 7.9. The total rainfall during the experimental period was 943.3mm spread over 59 rainy days which was normal for growth and development of sunflower crop. The experiment was laid out in RBD with three replications on sunflower hybrid MSFH-17 as a test crop. The treatment details are:

T_1-RDF (60:30:30 NPK kg ha^{-1})

T_2-50% N through Vermicompost + 25% through Fertilizer

T_3- 75% N through Vermicompost + 25% through Fertilizer

T_4- 100% N through Vermicompost

T_5-50% N through FYM + 50% through Fertilizer

T_6- 75% N through FYM + 25% through Fertilizer

T_7-100% N through FYM

Manures and fertilizers were applied as per the treatments. Full dose of P and K was applied uniformly to all the plots at the time of sowing. The gross and net plot size was 4.8 m x 4.2 m and 3.6 m x 3.6m, respectively. Sowing was done on 5th July, 2010 by dibbling the seed at spacing of 60 cm x 30 cm. The recommended cultural

practices and plant protection measures were followed periodically. The biometric and yield observations were taken as per the schedule.

Results and Discussion

The results revealed that all the growth attributes of sunflower viz.,plant height, number of functional leaves, leaf area, stem girth, dry matter, head diameter and yield attributes viz.,number of filled and unfilled seedsplant^{-1}, test weight and seed yield g plant^{-1} were significantly influenced by nutrient management practices applied especially through various organic and inorganic sources of nitrogen.

The treatment T_5 recorded significantly higher values of growth and yield attributes, followed by T_1 and T_6 over other treatments. The grain and stalk yield recorded by treatment T_5, T_1 and T_6 were 1611 & 1942, 1595 & 1802 and 1541 & 1691 kg ha^{-1}, respectively (Table 1). Availability of inorganic nitrogen during the early stages of crop growth contributed positively resulting in taller plants with more number of leaves, higher leaf area index which was reflected in higher dry matter production and greater translocation of photosynthates to the developing head resulted in larger flower heads. Thus, the increased head diameter might have accommodated more number of florets resulting in more number of seeds in these treatments (T_5, T_1 and T_6).

These findings corroborate the results of Chinnamuthu *et al.,* (2004) and Aruna and Mohammad (2005). On the other hand, yield attributes and the yields of seed and stalk of sunflower were significantly increased when the entire dose of N was supplied through fertilizer (T_1). Increased nitrogen assimilation due to adequacy of instant N ions might have increased the dry-matter production and better partitioning to yield in this treatment.

Table.1 Yield attributes of sunflower Hy. MSFH-17 as influenced by various treatments

Treatments	Seed yield (kg ha^{-1})	Stalk yield (kg ha^{-1})	Dry wt. of capitulum (kg ha^{-1})	Biological yield (kg ha^{-1})	Harvest index (%)	Oil content (%)	Oil yield (kg ha^{-1})
T_1-RDF (60:30:30 NPK kg ha^{-1})	1595	1802	1086	4483	36	41.77	666.39
T_2 -50% N through Vermicompost + 25% through Fertilizer	1232	1624	853	3709	33	39.57	487.53
T_3- 75% N through Vermicompost + 25% through Fertilizer	1131	1476	767	3374	33	38.17	431.73
T_4- 100% N through Vermicompost	1015	1408	651	3074	33	36.56	371.04
T_5-50% N through FYM + 50% through Fertilizer	1611	1942	1099	4652	35	42.27	680.85
T_6- 75% N through FYM + 25% through Fertilizer	1541	1691	1027	4258	36	41.43	638.30
T_7-100% N through FYM	1349	1645	913	3908	35	41.15	555.25
SE $\pm$	79	91	60	126	--	2.622	37.077
C.D.at 5 %	242	282	184	387	--	N.S.	114.24
General Mean	1353	1655	914	3923	34	40.13	547.30

Table.2 Economics of various treatments

Treatments	Cost of Cultivation (Rs. ha$^{-1)}$	GMR (Rs. ha$^{-1)}$	NMR (Rs. ha$^{-1)}$	B : C
T_1	14086	37978	23892	2.69
T_2	16725	29581	12856	1.76
T_3	18046	27125	9079	1.50
T_4	19364	24389	5025	1.25
T_5	17325	38483	21158	2.22
T_6	18945	36620	17675	1.93
T_7	20564	32236	11672	1.56
SE ±	-	1753	1753	-
C.D.at 5 %	-	5401	5401	-
General Mean	17865	32345	14480	1.84

* Price of Sunflower = Rs. 2391 / qtl.

Table.3 Simple correlation of seed yield with growth and yield attributing characters of sunflower Hy.MSFH-17

Particulars	Plant height (cm)	No. of functional leaves plant $^{-1}$	Stem girth (cm)	Head diameter (cm)	Dry matter (g plant $^{-1}$)	No. of filled seeds plant $^{-1}$	No. of unfilled seeds plant $^{-1}$	Seed yield (kg ha^{-1})
Plant height(cm)	1.000	0.993**	0.980**	0.965**	0.982**	0.939**	-0.979	0.985**
Number of functional leaves plant $^{-1}$		1.000	0.987**	0.976**	0.990**	0.916**	-0.973	0.978**
Stem girth (cm)			1.000	0.977**	0.958**	0.901**	-0.961	0.958**
Head diameter (cm)				1.000	0.961**	0.847**	-0.933	0.917**
Dry matter (g)					1.000	0.898**	-0.948	0.964**
No. of filled seeds plant $^{-1}$						1.000	-0.933	0.967**
No. of unfilled seeds plant $^{-1}$							1.000	-0.986

*Significance at 5 per cent
**Significance at 1 per cent

This nitrogen-management practice (T_1) was, however, on a par with T_5 andT_6. In fact, the yield attributes and yield of sunflower declined in proportion to the dose of nitrogen substitution through organic sources viz., Vermicompost and FYM, owing to slow release nature of N, which probably was not sufficient to meet the N requirement of the crop. Similar results were reported by Shylaja *et al.*, (2003) and Sumathi and Rao (2007). Similar trend was also noticed with respect to dry weight of

capitulum (kg ha^{-1}), biological and oil yield (kg ha^{-1}) under T_5, T_1 and T_6 treatments (Table 1). Likewise, treatment T_5 which being on par with T_1 also recorded significantly higher values of GMR, NMR (Rs. ha^{-1}) and B: C ratio (Table 2).

This might be due to less cost incurred on nutrient application under these treatments, as compared to other means and the significant differences in seed yield observed therein. Moreover, the positive and highly significant correlation of seed yield with dry matter accumulation (r = 0.982**), head diameter (r = 0.965**), number of filled seeds $plant^{-1}$ (r = 0.939**) indicated accumulation of metabolites in adequate amount during vegetative growth phase and their efficient translocation to sink during reproductive growth phase for improving yield attributes, which ultimately contributed to improved seed yield (Table 3).

Hence, the supply of 50 per cent N through FYM + 50 per cent N through fertilizer was considered economically feasible combination for cultivation of sunflower hybrid MSFH-17 under rainfed condition, which also satisfies the criteria of sustainability of soil health.

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