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Effect of nutrient management on yield and economics of hybrid sunflower (*Helianthus annuus* L.)

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Abstract
A field experiment was conducted during *rabi* season of 2009-10 at oilseeds research station, Latur to study the effect of nutrient management on growth and yield of hybrid sunflower (LSFH-35)" The investigation was carried out in RBD design with three replication and nine no. of treatments (*i.e.*, NPK and micronutrient involving 9 treatment combinations were tested) such as T_1 = 100% NP, T_2 - 50% RDF, T_3 - 100% RDF, T_4 - 150% RDF, T_5 - RDF + Sulphur, T_6-RDF + Sulphur + Boron, T_7–RDF + Sulphur + Boron + Zinc, T_8- RDF + Sulphur + Zinc and T_9 - Control. The result of experiment revealed that among the treatments, application of 150% RDF (T_4) was recorded significantly higher yield attributes and yield over control (T_9), 50% RDF (T_2), 100% NP (T_1) and T3 - 100% RDF (T_3) whereas, it was at par with the application of RDF + Sulphur + Boron + Zinc (T_7), RDF + Sulphur + Boron (T_6), RDF + Sulphur + Zinc (T_8) and RDF + Sulphur (T_5).

Keywords: Sunflower, nutrient management, micronutrient, recommended dose of fertilizer, growth, yield attributes, yield

1. Introduction
Sunflower is one of the most important oil seed crop due to high quality nutritional value, favourable agricultural policies and it holds great promise because of its short duration, photo-insensitivity, wide adaptability and drought and salinity tolerance. It can be grown round the year and can serve as an ideal catch crop during the periods when land is otherwise left fallow (Aglave *et al.*, 2009) [1]. Among the four major oilseed crops in the world *viz.*, soybean, brassicas, sunflower and groundnut, sunflower ranks third in the total area planted and fourth in total production. The area under a sunflower in the world at present is around 23 million ha, with a production of about 33 million tonnes of seed. Although, sunflower is grown in all continents, the Europe and America account for nearly 70% of total area and 80% of total production (Damodaram and Hegde, 2007) [10]. Cultivation of sunflower in Asian countries is relatively recent. Asia accounts for 20-22% of the total sunflower area and about 18% of production in the world. The productivity of sunflower in Asia is around 1800 kg ha^{-1} much lower than that of Europe and America. In Asia, India is the largest grower of sunflower during 2006-07. Around 2.3 million ha, were planted in the country accounting for nearly 10% of the total sunflower area in the world (Anonymous, 2008). Maharashtra ranks third in area and production. In Maharashtra sunflower is grown on an area of 3.55 lakh ha with the production of 2.06 lakh tonnes having productivity of 580 kg ha^{-1}.
Effects of N fertilization on sunflower yield and quality have come under scientific scrutiny (Hocking and Steer, 1995) [14], because N is a major nutrient for plants and it increases total biomass production, yield and its components. Phosphorus is necessary to increase oil content and potash helps in grain filling and disease resistant. Sulphur is an essential secondary plant nutrient and plays a vital role in improving yield and quality of oilseed crops. Sunflower is a photo and thermo-insensitive crop. During monsoon season, loss of N is quite obvious hence its rational application at right stages of crop growth is desired for higher productivity.

2. Materials and Methods
The field experiment was conducted during *rabi* season of the year 2009-10 at Oilseeds Research Station, Latur to study the effect of nutrient management on growth and yield of hybrid sunflower (LSFH-35).

The experimental field was levelled and well drained. The soil was clayey in texture, low in nitrogen (175.61 kg ha^{-1}), low in phosphorus (14.25 kg ha^{-1}), rich in potash (343.15 kg ha^{-1}) and alkaline in reaction.

One hybrid and Nine Treatments *i.e.,* NPK and micronutrient involving nine treatment combinations were tested in randmized block design with three replications. The treatments details are : T_1 = 100% NP, T_2 - 50% RDF, T_3 - 100% RDF, T_4 - 150% RDF, T_5 - RDF + Sulphur, T_6-RDF + Sulphur + Boron, T_7–RDF + Sulphur + Boron + Zinc, T_8-RDF + Sulphur + Zinc and T_9 – Control. The net plot size was 4.2 m x 3 m. Sowing was done on 1st November, 2009. The spacing of 60 cm × 30 cm was maintained. The recommended cultural practices and plant protection measures were taken.

3. Results and Discussion

3.1 Effect of nutrient management on yield attributes of sunflower

The data on mean no. of filled seeds $plant^{-1}$, mean number of unfilled seeds $plant^{-1}$, mean test weight (g), mean seed yield $plant^{-1}$ (g) as influenced by various treatments are presented in table 1.

The application of 150% RDF recorded significantly higher number of filled seeds $plant^{-1}$ (647) over the T_7–RDF + Sulphur + Boron + Zinc (646), T_6-RDF + Sulphur + Boron (592), T_8- RDF + Sulphur + Zinc (572), T_5 - RDF + Sulphur (563) and T_3 - 100% RDF (452). The application of T_6-RDF + Sulphur + Boron (592) was recorded significantly higher no. filled seeds $plant^{-1}$ over T_9-control treatment whereas it was at par with rest of all the treatments. The lowest no. of filled seeds $plant^{-1}$ was observed in T_9-control treatment (332).

The application of 150% RDF (40.30) recorded significantly lowest no. of unfilled seeds $plant^{-1}$ followed by the application of T_7–RDF + Sulphur + Boron + Zinc (43.00) and T_6-RDF + Sulphur + Boron (43.6) as compared to all other treatments. The higher no. of unfilled seeds $plant^{-1}$ was recorded in control (67.5) treatment followed by T_2-50% RDF (61.5) as compared to all other treatments.

The effect of fertilizer levels along with micronutrient on mean seed yield per plant was found to be non significant. The application of T_4-150% RDF recorded higher seed yield $plant^{-1}$ (38.8 g) followed by the application of T_7–RDF + Sulphur + Boron + Zinc (38.5 g) as compared to all other treatments. The lowest seed yield $plant^{-1}$ (g) was observed in T_9-control treatment (25.2 g).

The effect of different fertilizer levels along with micronutrients on test weight (g) was found to be significant. The application of T_4-150% RDF was recorded significantly higher test weight (50.7 g) over T_9-control (41.0 g) and T_2 - 50% RDF (44 g), whereas it was at par with rest of the treatments. The lowest test weight (g) was observed in T_9-control treatment (41.0 g).

Table 1: Mean number of filled seeds $plant^{-1}$, mean number of unfilled seeds $plant^{-1}$, mean seeds yield $plant^{-1}$ (g) and mean test weight (g) of sunflower as influenced by various treatments.

Treatment details	Number of filled seeds $plant^{-1}$	Number of unfilled seeds $plant^{-1}$	Seed yield $plant^{-1}$ (g)	Test weight (g)
T_1 = 100%NP	539	56.9	29.7	44.7
T_2 = 50% RDF	452	61.5	27.8	44.0
T_3 = 100% RDF	552	56.5	30.2	46.0
T_4 = 150% RDF	647	40.3	38.8	50.7
T_5 = RDF + S	563	55.3	32.0	46.3
T_6 = RDF + S + B	592	43.6	37.0	49.0
T_7 = T_7–RDF + Sulphur + Boron + Zinc	646	43.0	38.5	49.6
T_8 = T_8- RDF + Sulphur + Zinc	572	47.1	35.6	47.6
T_9 = Control	332	67.5	25.2	41.0
SE ±	59.6	2.74	3.94	2.04
CD (P = 0.05)	178.5	8.21	NS	6.12
General mean	544	52.4	32.8	46.5

3.2 Effect of nutrient management on yield of sunflower

The data on mean seed yield (kg ha^{-1}), stalk yield (kg ha^{-1}), dry weight of capitulum (kg ha^{-1}), harvest index (%) as influenced by various treatments are presented in Table 2.

The effect of different fertilizer levels along with micro nutrients on seed yield kg ha^{-1} was found to be significant. The application of T_4-150% RDF was recorded significantly higher seed yield 1300 kg ha^{-1} over T_9-control, T_1-100% NP, T_2-50% RDF, T_3 - 100% RDF, T_5 - RDF + Sulphur and T_8-RDF + Sulphur + Zinc, whereas, it was at par with the T_7–RDF + Sulphur + Boron + Zinc and T_6-RDF + Sulphur + Boron. The application of T_7–RDF + Sulphur + Boron + Zinc was recorded significantly higher seed yield (1135 kg ha^{-1}) over T_9-control and T_2-50% RDF, whereas, it was at par with the application of T_6-RDF + Sulphur + Boron, T_8-RDF + Sulphur + Zinc, T_5 - RDF + Sulphur, T_3 - 100% RDF and T_1-100% NP. The lowest seed yield (738 kg ha^{-1}) was observed in T_9-control treatment.

The effect of different fertilizer levels along with micronutrients on stalk yield kg ha^{-1} was found to be significant. The application 150% RDF was recorded significantly higher stalk yield 4125 kg ha^{-1} over T_9-control, T_2-50% RDF, T_1-100% NP and T_3 - 100% RDF, whereas, it was at par with the application of T_7–RDF + Sulphur + Boron + Zinc, T_6-RDF + Sulphur + Boron, T_8- RDF + Sulphur + Zinc and T_5 - RDF + Sulphur. The application of T_7–RDF + Sulphur + Boron + Zinc was significantly superior over control, whereas it was at par with rest of all the treatments.

The application of T_4-150% RDF was recorded was significantly higher dry weight of capitulum 2744 kg ha^{-1} over T_9-control T_2-50% RDF, T_1-100% NP and T_3 - 100% RDF, whereas, it was at par with the application of T_7–RDF + Sulphur + Boron + Zinc, T_6-RDF + Sulphur + Boron, T_8-RDF + Sulphur + Zinc and T_5 - RDF + Sulphur. The application of T_6-RDF + Sulphur + Boron was significantly superior over T_9-control, T_1-100% NP, T_2-50% RDF, T_7–RDF + Sulphur + Boron + Zinc, T_5 - RDF + Sulphur and T_3 - 100% RDF. The application of T_5 - RDF + Sulphur was significantly superior over T_9-control and T_2-50% RDF,

whereas, it was at par with T_3 - 100% RDF and T_1-100% NP. In respect of dry weight of capitulum the lowest dry weight of capitulum was observed in control treatment. The highest harvest index was recorded by application of T_4-150% RDF as 21.42% as compared to other treatment. The lowest harvest index was recorded in T_9- control treatment (15.89).

Table 2: Seed yield (kg ha^{-1}), stalk yield (kg ha^{-1}), dry weight of capitulum (kg ha^{-1}) and harvest index (%) of sunflower as influenced by various treatments.

Treatments	Seed yield (kg ha^{-1})	Stalk yield (kg ha^{-1})	Dry weight of capitulum (kg ha^{-1})	Harvest index (%)
T1 = 100%NP	981	3666	1640	18.48
T2 = 50% RDF	940	3638	1493	19.86
T3 = 100% RDF	1042	3701	1847	18.78
T4 = 150% RDF	1300	4125	2744	21.42
T5 = RDF + S	1101	3970	1956	18.07
T6 = RDF + S + B	1117	4016	2140	18.23
T7 = T7–RDF + Sulphur + Boron + Zinc	1135	4029	2209	18.19
T8 = T8- RDF + Sulphur + Zinc	1071	4000	2057	18.17
T9 = Control	738	3438	1214	15.89
SE ±	62.49	131.2	116.0	-
CD (P = 0.05)	187.07	392.8	346.8	-
General mean	1054	3842	1866	18.56

3.3 Effect of nutrient management on economics of sunflower cultivation

The effect of different fertilizer levels along with micronutrients on gross monetary returns was found to be significant. The application of T_4-150% RDF was recorded significantly higher GMR (32725 Rs ha^{-1}) over T_9-control, T_2-50% RDF, T_1-100% NP, T_3 - 100% RDF and T_5-RDF + Sulphur, whereas it was at par with the application of T_7–RDF + Sulphur + Boron + Zinc, T_6-RDF + Sulphur + Boron and T_8- RDF + Sulphur + Zinc. The lowest GMR was observed in T_9-control treatment **(**19674 Rs ha^{-1}).

The effect of different fertilizer levels along with micronutrient on net monetary returns (Rs ha^{-1}) was found to be significant. The application of T_4-150% RDF was recorded significantly higher NMR (19120 Rs ha^{-1}) over all of the treatments. The next best treatment was application of T_3 - 100% RDF was recorded significantly higher NMR (13725 Rs ha^{-1}) over control, whereas it was at par with rest of the treatments. The lowest NMR (8174 Rs ha^{-1}) was observed in T_9-control treatment.

The higher benefit: cost ratio (2.40) was observed by the application of T_4-150% RDF followed by T_3 - 100% RDF, T_2- 50% RDF and T_1- 100% NP as compared to all other treatments. The lowest B:C ratio (1.71) was observed by the application of T_9– control treatment.

Table 3: Economics of Sunflower cultivation as influenced by various treatments.

Treatments	Gross monetary returns (Rs ha^{-1})	Net monetary returns (Rs ha^{-1})	Benefit: cost Ratio
T_1 = 100%NP	25248	12648	2.00
T_2 = 50% RDF	24318	12218	2.00
T_3 = 100% RDF	26625	13725	2.06
T_4 = 150% RDF	32725	19120	2.40
T_5 = RDF + S	27532	14532	2.11
T_6 = RDF + S + B	28790	15290	2.13
T_7 = RDF + S + B + Zn	28999	14999	2.07
T8 = RDF + S + Zn	28222	14422	2.05
T9 = Control	19674	8174	1.71
SE ±	1570	1576	-
CD (P = 0.05)	4694	4712	-
General mean	26904	13903	2.06

Conclusion

On the basis of present investigation, it may be concluded that application of T_4-150% RDF was found best to Sunflower crop. The application of T_4-150% RDF to sunflower was recorded significantly higher yield attributes, yield, GMR, NMR over T_9-control, T_2-50% RDF, T_1-100% NP, T_3 - 100% RDF and T_5-RDF + S, whereas it was at par with the application of T_7–RDF + Sulphur + Boron + Zinc, T_6-RDF + Sulphur + Boron and T_8- RDF + Sulphur + Zinc.

References

1. Aglave BN, Kalegore NK, Chavan MH, Jagtap PK. Performance of rabi sunflower under varied cropping sequence and nitrogen levels under rainfed condition. J Oilseeds Res. 2009;(special Issue):252-253.
2. Ahmad R, Saeed M, Mahmood J. Yield potential and oil quality of two sunflower hybrids as affected by K application and growing season. Int J Agric Biol. 2002;3(1):51-58.
3. Anonymous. Ministry of Indian Agriculture; c2003. p. 442-447.
4. Anonymous. Annual report of oilseed crops. Directorate of Oilseeds, Hyderabad; c2008.
5. Aydin S. *Aycicegi bittisnin* Fozkligeli and Anadolu. 1996;6:120-126.

6. Balamurugan P, Angamuthu K. Influence of mother crop nutrients on BSH-1 sunflower hybrid seed yield. Madras Agric J. 1999;86(10-12):679-680.
7. Bhagat GJ, Hamid A, Bonde SP, Giri MD, Sajid M. Effect of irrigation and sulphur levels on growth and yield attributes of rabi sunflower (*Helianthus annuus*). Res Crop. 2003;4(1):56-59.
8. Bhoite SV, Nimbalkar VS. Effect of plant densities and fertilizer levels on yield of kharif sunflower. J. 1995.
9. Choudhary CS, Paturde JJ. Effect of nitrogen and phosphorus on seed and oil yield of sunflower. Indian J Agric Res. 1981;15(3):141-144.
10. Damodaram T, Hegde DM. Oilseeds situation: A statistical compendium, Directorate of Oilseeds Research, Hyderabad. 2007:434.
11. Dauley HS, Singh KC. Fertilizer use in rainfed sunflower. Indian J Agric Sci. 1980;50(10):525-528.
12. Devi Dayal, Agrawal SK. Response of sunflower (*Helianthus annuus* L.) to organic manures and fertilizers. Indian J Agron. 1998;43(3):469-473.
13. Duve DN. Effect of graded levels of fertility and fly ash on growth, yield and quality of kharif sunflower (*Helianthus annuus* L.). MSc (Agri.) dissertation, M.A.U., Parbhani, M.S; c1996.
14. Hocking PJ, Steer BT. Effects of timing and supply of nitrogen on nitrogen remobilization from vegetative organs and redistribution to developing seeds of sunflower. Plant and Soil. 1995 Mar;170:359-370.