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Response of sunflower (*Helianthus annuus* L.) to nitrogen and sulphur

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Abstract

A field experiment was conducted to study the effect of nitrogen and sulphur on seed yield and quality of sunflower (*Helianthus annuus* L.). *Among the various treatments tried, maximum seed yield (22.51q/ha) was obtained with the combined application of 100Kg. nitrogen and 45Kg. Sulphur ha^{-1}, closely followed by the combination of S @ 100 Kg., N and 65 Kg S ha^{-1} (21.10 q/ha), and 100Kg N and 25 kg S ha^{-1} (20.28q/ha). The increase in yield might be attributed to elongation in shoot height, diameter of head, seed per head, Test weight, Oil content, Seed yield and Oil content were significantly increased by N and S application over control, the combination treatments were also beneficial effecting better seed quality, maximum oil content.*

Key words- Nitrogen, sulphur, sunflower yield, test weight

Introduction

Sunflower is an important oil seed crop and its cultivation has been widely attempted in the country. Though the crop has several advantages, some of the short duration photoperiod adaptability high yield, high oil percentage, high quality edible oil, easier and cheaper cultivation allow it to be suitable in to various cropping system. It is known for its excellent oil quality as it contains high degree of polyunsaturated fatty acid. This problem demands greater attention due to its adverse effect on seed yield and quality of produce. Insufficient supply of nutrients seems to be one of the major causes for seeds and oil yield thereby low productivity. In sunflower, there is ample scope for increasing the production through fertilizer, use especially nitrogen and sulphur, their beneficial role effect has observed on oil seed crops has reported by many workes (Dubey *et al.* 1994, Reddy and Reddy, 2003). Nitrogen plays a key role for chlorophyll II content and protein synthesis (Singh *et al.* 1997). Sulphur act as increase in oil percentage amino acid content seed crops response to sulphur remarkably depending on the soil type (Nageshwar *et al.* (1995). The interaction between N and S are closely linked to protein metabolism and their combined effect on oil seed crops could be synergetic (Jaggi *et al.* 1993) effect.

Materials and Methods

A field experiment was conducted during *zaid* season of 2004-2005 at agriculture farm, S.M.M. Town P.G. College, Ballia (U.P.). The initial properties of experimental soil was sandy loam texture, pH 8.2, available phosphorus 45Kg/ha, available potassium 315kg/ha, available sulphur 7.5 ppm, organic carbon 0.28 per cent respectively. Treatment comprised of combination of three levels of nitrogen (50, 100 and 120Kg/ha with three levels of sulphur 25, 45 and 65kg./ha along with control N_0S_0 were applied in a randomized block design with four replication. Net plot size 3×2 m^2 of each plot. Sunflower variety Jawalanukhi was sown on 18 march 2004 with 45×30cm spacing. Nitrogen was applied through urea and sulphur was applied through elemental sulphur as treatment combination wise. Sunflower requisite quality of sulphur was thoroughly mixed in the form of elemental sulphur 15 days before sowing with the help of kudali. The nitrogen half and other recommended doses of fertilizer were applied at the time of sowing and remaining half nitrogen were applied at 20 DAS. Standard management operations were also provided time to time. Observations were recorded on growth; yield attributes and oil content were estimated. Irrigation weeding and care was taken as per need of experiment.

Results and Discussion

Effect of N and S on growth and seed yield

The various yield contributory characters viz. plant growth and seed yield has been presented in table 1. In general all treatments showed significant increased in seed yield, shoot height, number of leaf per plant, diameter of head, number of seed per plant, test weight due to application of different does of N and S combination than the control. The maximum seed yield (22.52q/ha) was recorded with application of 100 kg N and 45kg S/ha, which was found significantly superior over N_{100} kg + 65Kgs /ha (22.10q/ha) and N_{100} Kg +S_{25} Kg/ha (20.28q/ha) due to found suitable combination between N and S to the biosynthesis of protein and further production of dry matter (Reddy and Reddy, 2003, Dubey *et al.* 1993).

Table1. Growth, yield and oil content of sunflower influenced by different doses of N and S

Treatments	Plant height (cm)	No.of leaves/Plant	Diameter of head (cm)	No. of seed/head fertile	Test weight (g)	Yield(q/ha) Over control	% increase yield	Oil contents
N_{50}+S_{25}	160.3	41.52	14.89	454	51.12	14.68	22.23	38.8
N_{50}+S_{45}	170.1	42.62	15.24	487	52.48	14.89	24.83	39.1
N_{50}+S_{65}	165.4	39.21	15.12	486	5044	15.24	27.00	40.1
N_{100}+S_{25}	191.2	44.74	20.4	514	52.23	20.28	69.00	41.7
N_{100}+S_{45}	207.9	52.89	22.23	615	56.78	22.51	87.58	42.42
N_{100}+S_{65}	195.6	46.23	19.47	566	53.64	22.10	84.58	42.34
N_{120}+S_{25}	182.5	45.14	18.47	515	51.43	18.80	84.16	41.6
N_{120}+S_{45}	190.2	45.32	20.89	550	53.22	19.00	56.60	40.1
N_{120}+S_{65}	190.9	46.28	18.23	490	52.17	18.85	58.33	40.4
N_0+S_0	150.0	35.72	14.03	440	51.28	12.00	57.08	38.6

CD=5%	2.12	0.23	0.12	10.25	0.24	2.13	-	0.46

Application of s@45Kg/ha stimulated the uptake and utilization of most of the crop plants, particularly oil seed crops at vegetative stages (Dubey *et al.* 1993) number of lef, shoot height and number of grain also found maximum at the level of treatment due to the interaction between N×S in increasing cell division which has favourable effects of S in chlorophyll synthesis. This leads to yield attributes ultimately seed yield in case of mustard. Application of N_{100} Kg/ha with tree levels of sulphur (25,45 and 65 Kg/ha has resulted in 69.00, 87.58 and 84.16% seed yield respectively over control (N_oS_o). The need S fertilization could be particularly related to the amount of N application since both nutrients are required for protein formation and are inter dependent in their path way of reduction correctly (Friedrich ,1997 and Burman *et al*. (2003).

Effect of N and S on oil content

Oil content in seed was found maximum by application of different doses of N and S as recorded for seed yield. The increase in oil content was recorded 38.60 to 42.42% for various treatments of N and S. But maximum oil content of 42.15% was observed in the treatment combination of N_{100} + S_{45} Kg/ha at par with all among the treatments. Sulphur act in conversion of carbohydrates to oil, and it also played an important role in the fatty acid synthesis by converting acetyl. Co-A to malonys Co-A. It is a precursor compound for the synthesis of long chain fatty acid in accelerating in oil formation which ultimately led to greater oil yield (Dubey *et al.* (1994) and Arora *et al.* (1994) Padma et al. (2001) and Shukla *et al*. (1993) over the control. The excess dose of N and S used there was no increased in oil percentage (Kameshwara Rao *et al.* (1991). So, that treatments N_{100} + S_{45} Kg/ha significantly was superior than other treatment.

Conclusion

Sunflower is very important crop to the references of oil seed which most of Indian population need qualitative oil regarding the cholesterol. Through the treatments N_{100} + S_{45} Kg/ha significantly was superior to other treatment. Since, the N_{100} + S_{45} Kg/ha is recommended for enhancing the crop productivity and quality of sunflower, it may be a superior dose in enhancing the crop production in seed oil crops such as sunflower.

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