Madras Agric. J., 83(10): 644-646 October 1996
https://doi.org/10.29321/MAJ.10.A01074

EFFECT OF SULPHUR AND MEGNESIUM ON THE SEED AND OIL YIELD OF SUNFLOWER

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ABSTRACT

Field trials were conducted during summer and *kharif*, 1993 to evaluate the influence of sulphur (s) and magnesium (Mg) application to sunflower crop on yield, seed and kernel oil content. Application of S at 45 kg S ha^{-1} increased the seed yield significantly by 6.2 and 14.9 per cent over control during summer and *kharif* respectively while Mg application failed to influence seed yield. Seed oil and kernel oil contents were increased by 2.1 to 5.3 per cent respectively by S application. The oil yield was significantly increased by S application at 45 kg ha^{-1}, the percentage increase being 9.5 per cent during summer and 11.5 per cent during *kharif*. The cost benefit ratio of higher oil yield was found to be 7.21 and 9.83 per rupee investment in summer and *kharif* respectively for S application at 45 kg ha^{-1}.

KEY WORDS: Sulphur, Magnesium, Sunflower, Seed yields, Oil yield

Sunflower (*Helianthus annuus* L.) is an important oil seed crop in India. Sulphur (s) is indispensible for the synthesis of certain amino acids and is also a constituent of glutathionine, a compound supposed to play an important part in plant respiration and in the synthesis of essential oils (Goswami, 1986). Besides, magnesium (Mg), a constituent of chlorophyll, has a positive influence of regulating enzymes, energy transfer, production of proteins and metabolism of carbohydrates. With the objective of increasing the yield of seed and oil yield of sunflower, the present investigation was therefore taken up.

MATERIALS AND METHODS

The soils of the experimental area was sandy loam in texture, neutral in reaction (pH 7.2), and the organic carbon content was 0.2%, low in available N (193 kg ha^{-1}) and medium P (14.2 kg ha^{-1}) and high in available K (295 kg ha^{-1}). The available Mg and S content were 150 and 180 ppm respectively. The trial was laid out in a factorial randomised block design during summer and *kharif*, 1993 with four levels each of S and Mg.

S levels (kg ha^{-1}) = O(S_O); 15(S_1); 30(S_2); 45(S_3)

Mg levels (kg ha^{-1}) = O(Mg_O); 15(Mg_1); 30(Mg_2); 45(Mg_3)

The treatments were replicated thrice. Half the full dose of P (20 kg ha^{-1}) and K (20 kg ha^{-1}) and S and Mg as per treatment schedule were applied uniformly to the plots before sowing sunflower seeds (var.Mordan) and incorporated. Remaining N (20 kg ha^{-1}) was applied at 30 days after sowing. N,P and K were applied in the form of urea, diammonium phosphate and muriate of potash respectively. S and Mg were applied as elemental sulphur and magnesium oxide. At maturity, the seed yield was recorded. The seed smaples were dried to 10 per cent moisture level determined in the seeds by using Hexane (B.P.75-80^{o}C) following the A.O.A.C (1962) method. Kernel oil content was determined by Nuclear Magnetic Resonance Spectrometer (NMR Model, Brooker Minispect 20 Pi).

RESULTS AND DISCUSSION

Seed yield

The highest seed yield was obtained by application of 45 kg S ha^{-1} (S_3) in summer (15.2 q ha^{-1}) and *kharif* (14.2 q ha^{-1}). The yield increase over control was 6.2 per cent in summer and 14.9 per cent in *kharif*. The increase could be due to higher requirement of s of sunflower since the initial soil S status was low (36 kg ha^{-1}). Sathyanarayana *et al.* (1977) observed response of sunflower to S application upto 20 kg ha^{-1} even in medium soils. In summer, S_3 and S_2 were on par but significantly higher than S_1: but in *khairf*, S_3

Table 1. Effect of sulphur and magnesium on seed oil yield of sunflower

Treatment	Seed yield (q ha^{-1})		Seed oil content (%)		Kernel oil content (%)		Oil yield (kg ha^{-1})	
	S	K	S	K	S	K	S	K
Sulphur (Kg ha^{-1})								
S_0 (0)	14.3	12.3	36.7	36.8	51.2	50.0	526	503
S_1 (15)	14.6	12.8	36.8	37.3	52.0	50.9	536	520
S_2 (30)	15.0	13.5	37.0	37.5	52.7	51.6	553	537
S_3 (45)	15.2	14.2	37.4	37.5	53.2	52.8	569	561
CD = (P=0.05)	.53	.60	0.23	0.14	0.35	0.34	17	23
Magnesium (Kg ha^{-1})								
Mg_0 (0)	14.7	13.0	36.9	37.3	52.6	51.5	545	521
Mg_1 (15)	14.7	13.1	36.9	37.3	52.3	51.3	549	527
Mg_2 (30)	14.8	13.1	37.0	37.4	52.3	51.4	566	536
Mg_3 (45)	14.9	13.7	37.0	37.4	52.4	51.2	554	538
CD = (P=0.05)	NS	.60	NS	NS	NS	NS	NS	NS

NS : Not Significant S = Summer ; K = *Kharif*

the treatment while S_2 was significantly higher than S_1 (12.8 q ha^{-1}) and S_0 (12.3 q ha^{-1}).

In the present study, Mg application did not influence the seed yield significantly in both the seasons. This might be due to high Mg status of experimental site. Similar results were obtained by Rudra Shetty (1962). The interaction effects were not significant. Summer season recorded comparatively higher sunflower seed yield. This might be due to optimum temperature for better bee activities for higher seed setting. Chaudhary and Anand (1989) observed better bee activities in summer.

Oil content and oil yield

The oil content of sunflower seed at 45 kg S ha^{-1} was on par with 30 kg S ha^{-1} and significantly higher than the other levels of S application. The percentage increase of oil content over control was 4.05 and 5.06 in summer and *kharif* respectively. S might have influenced rapid conversion of N to crude protein and finally to oil. The acetic thiolinase, a sulphur based enzyme in the presence of s converts acetyl CoA to Melonyl CoA rapidly resulting in higher oil content in sunflower (Bonner and Verner 1965) and due to full utilisation of carbohydrate for the synthesis of oil with S nutrition (Ajab Singh Yadav and Harishankar 1980). The interaction effects were not significant.

The kernel oil content also reflected the same trend as that of seed oil content with added levels of S considerably influencing the oil content. The oil content in kernel in S_3 was 53.2 per cent in summer was significantly higher than S_2, S_1 and S_0 in both seasons. The different levels of Mg did not influence the oil content of kernel.

Increased oil yield is obtained either by increasing seed yields or oil content in the seeds or by both. In the present study, both seed yield and oil content were increased significantly by S application compared to control. Oil yield recorded in S_3 in summer and in *kharif* was significantly higher than S_2 during *kharif* but on par during summer. The increase in oil yield over control was 8.3 per cent during summer and 11.5 per cent during *kharif*. The interaction effects were not significant. The results corroborated with the earlier finding of Praburaj (1988). The cost benefit ratio was found to be 7.21 and 9.83 rupees per rupee invested for summer and *kharif* seasons respectively.

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(Received : July 1995 Revised : December 199

Madras Agric. J., 83(10): 646-647 October 1996

SEEDING METHODS, WEED MANAGEMENT AND MOISTURE REGIMES ON NUTRIENT UPTAKE BY GROUNDNUT

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ABSTRACT

Field experiments were conducted in summer season of 1990 and 1991 at the Agricultural College and Research Institute, Madurai to study the uptake pattern and yield of groundnut. Application of 4.00 cm water through line source sprinkler significantly increased the nitrogen, phosphorus and potash uptake by groundnut. Among the seeding methods, ridges and furrows method of seeding recorded higher uptake of nutrients. Pre emergence application of fluchloralin followed by hand weeding on 30 days after sowing (DAS) significantly increased the uptake of nutrients. Improvement in the uptake of nutrients resulted in increased yield of groundnut.

KEY WORDS : Groundnut, Yield, Nutrient uptake, Seeding Methods

Groundnut (*Arachis hypogaea* L.) is an important oil seed crop. The slow growth and poor coverage of foliage in groundnut at early stage favours more weed population (Kulandaivelu and Morachan, 1981). Weed growth in the early stages affects the nutrient uptake of the crop resulting in poor yield. Hand weeding (HW) is time consuming and uneconomical. Chemical weed control is therefore, gaining importance and also economical. However, information on different seeding methods, moisture regimes and weed management on the uptake of nutrients is lacking. Therefore, the uptake pattern of groundnut was studied under different seeding, moiture regimes and weed management.

MATERIALS AND METHODS

Field experiments were conducted during summer 1990 and 1991 at the Agricultural College and Research Institute, Madurai. The soil was sandy loam in texture having a pH of 7.9 and low in available N and medium in P and K. The experiments were run in split plot design with four replications. The treatment details are as follows. The moisture regimes *viz.*, 4.78 cm (I_1), 4.00 cm (I_2) and 3.18 cm (I_3) under line source sprinkler and 4.00 cm (I_4) by surface flow method were allotted to main plots. In the subplots, seeding furrows (L_2) and check basin (L_3) methods were studied. Pre emergence (Pre em.) application of fluchloralin @ 1 kg/ha followed by (fb) HW 30 DAS (W_1) was compared with HW 30 DAS (W_2) in sub-sub plots. The plant samples were collected at harvest after recording the yield data and processed. The contents of N,P and K were analysed by standard methods. The uptake values were computed by multiplying the nutrient content with that of dry matter production.

RESULTS AND DISCUSSION

The nutrient uptake by the crop and grain yield are presented in Table 1. In both the years, the uptake of N and P was significantly increased resulting in higher yield under ridges and furrows method of seeding. However, the uptake of K was not significant. Pre em. application of fluchloralin fb. HW 30 DAS increased the nutrients uptake over HW. The increase was 38 and 72 per cent for N and 11 and 25 per cent for P in the first and second year, respectively. The K uptake was increased to the tune of 88 and 95 per cent during 1990 and 1991, respectively. High root volume, root density, root thickness and plant dry matter associated with weed free situation due to fluchloralin might have contributed for higher uptake of nutrients.