Original Research Article

Influence of potassium and sulphur on Growth and Yield of zaid sunflower (*Helianthus annuus*. L)

Abstract

The experiment was conducted at CRF in department of Agronomy during summer season of 2022 on Sunflower crop. The treatments consisted of 3 levels of Potassium (30,40,50kg/ha) and Sulphur as (10,20,30 Kg/ha) and a control. The experiment was laid out in RBD with 10 treatments and replicated thrice. Application of 50 kg potassium soil application with combination of 30 kg sulphur as soil application recorded highest plant height, Maximum plant dry weight, and the yield attributes namely Test weight, seed yield and highest benefit cost ratio.

***Key words**: Potassium,Sulphur,Growth,Yield,Zaid*.

INTRODUCTION

Sunflower (Helianthus annuus L.) belongs to family Asteraceae. It is an essential oilseed crop. It is a potential remunerative crop due to its characters such as early maturity, considered very important in reducing of high serum cholesterol levels. Its oil cake contains protein in bulk amount around 40-44 percent. The seed of sunflower have an adequate amount of oil approximately 35-40 % while some varieties range up to 50 %. Potassium is one of the most essential elements for plant growth (**Ayub *et al.*, 2002**). To improve quality of product and increase grain yield, crop requires potassium as high as nitrogen. Potassium plays a major role in building resistance of crop to water stress, excess of temperature, salinity, pest and diseases (**Ahmad *et al.*, 2001**). The osmotic pressure provided by potassium that draws water into plant roots. Those plants which are deficient in K have less resistance to withstand water stress. It is because of their inability to utilize available water efficiently (**Havlin *et al.*, 2004**). Many crops require sulphur in an equal amount as phosphorus. Its use in proper amount positively affects yield and quality of the crop. Sulphur increases the percentage of oil in seeds and plays an important role in chemical composition (**Demurin *et al.*, 2001**) Sulphur deficiency in the soil increases with every next day due to the reason of severe consumption of low sulphur fertilizers, cultivation large number of crops in one season and also due to illogical use of plants for feed and fuel purpose. Erosion and leaching degraded the soil, which also donate their part in enhancing the areas have deficient in sulphur (**Rani *et al.*, 2009**).

MATERIALS AND METHODS:

The experiment was conducted during *zaid* season of 2021-22. The experiment was conducted in Randomized Block Design consisting of ten treatment combinations with three replications and was laid out with the different treatments allocated randomly in each replication. The soil of the experimental field was sandy loam in texture, slightly alkaline reaction (pH 7.1) with low level of organic carbon (0.28%), available N (225 Kg/ha), P (19.50 kg/ha) and higher level of K (92.00 kg/ha). The treatment combinations are T_1 - 30 kg/ha Potassium + 10 kg/ha Sulphur, T_2 - 30 kg/ha Potassium + 20 kg/ha Sulphur, T_3 - 30 kg/ha Potassium + 30 kg/ha Sulphur, T_4 - 40 kg/ha Potassium + 10 kg/ha Sulphur, T_5 - 40 kg/ha Potassium + 20 kg/ha Sulphur, T_6 - 40 kg/ha Potassium + 30 kg/ha Sulphur, T_7 - 50 kg/ha Potassium + 10 kg/ha Sulphur, T_8 - 50 kg/ha Potassium + 20 kg/ha Sulphur, T_9 - 50 kg/ha Potassium + 30 kg/ha Sulphur,T_{10} – N:P:K – 80:60:40 kg/ha (Control). The observations were recorded on different growth parameters at harvest viz. plant height(cm), plant dry weight, Number of seeds per capitulum, test weight, seed yield, stover yield

and harvest index.

RESULTS AND DISCUSSION

A. Growth Attributes:

At 75 DAS, treatment T_9-50Kg/ha Potassium + 30Kg/ha Sulphur recorded significantly higher plant height (125.4 cm) compared to all other treatments. Whereas, treatment T_8-50Kg/ha Potassium + 20Kg/ha Sulphur (125.0 cm) was found to be statistically at par with T_9-50Kg/ha Potassium + 30Kg/ha Sulphur, At 75 DAS, maximum Dry weight (15.0 g/plant) was observed in the treatment T_9-50Kg/ha Potassium + 30Kg/ha Sulphur over the other treatments. However, treatments T_8- 50Kg/ha Potassium + 20Kg/ha Sulphur (14.8 g/plant) was found to be statistically at par with T_9-50Kg/ha Potassium + 30Kg/ha Sulphur as compared to other treatments (**Pavani *et al.*, 2013)**

Yield Attributes

Significantly Maximum Number of Seeds/capitulum (332.4) was recorded with the treatment T_9- 50Kg/ha Potassium + 30Kg/ha Sulphur over all the treatments. However, number of seeds (331.5) were obtained in T_8- 50Kg/ha Potassium + 20Kg/ha Sulphur were found to be statistically at par with T_9- 50Kg/ha Potassium + 30Kg/ha Sulphur. Significantly Maximum Test weight (33.7 g) was recorded with the treatment of application of T_9- 50Kg/ha Potassium + 30Kg/ha Sulphur over all the treatments. However, the treatment T_8- 50Kg/ha Potassium + 20Kg/ha Sulphur (33.2) which were found to be statistically at par with T_9- 50Kg/ha Potassium + 30Kg/ha Sulphur. Significantly Maximum Seed yield (1463.44 kg/ha) was recorded with the treatment T_9- 50Kg/ha Potassium + 30Kg/ha Sulphur. over all the treatments. However, the T_6- 40Kg/ha Potassium + 30Kg/ha Sulphur (1417.10 kg/ha) and T_8- 50Kg/ha Potassium + 20Kg/ha Sulphur (1426.03 kg/ha) which was found to be statistically at par with T_9- 50Kg/ha Potassium + 30Kg/ha Sulphur. Significantly Maximum Stover yield (3211.6 kg/ha) was recorded with the treatment T_9- 50Kg/ha Potassium + 30Kg/ha Sulphur over all the treatments. However, the T_6- 40Kg/ha Potassium + 30Kg/ha Sulphur (3194.8 kg/ha) and T_8- 50Kg/ha Potassium + 20Kg/ha Sulphur (3202.9 kg/ha) which was found to be statistically at par with T_9- 50Kg/ha Potassium + 30Kg/ha Sulphur. Significantly Maximum Harvest index (31.3 %) was recorded with the treatment T_9- 50Kg/ha Potassium + 30Kg/ha Sulphur over all the treatments. However, the treatments T_5- 40Kg/ha Potassium + 20Kg/ha Sulphur (30.5 %) T_6- 40Kg/ha Potassium + 30Kg/ha Sulphur (30.7 %) and T_8- 50Kg/ha Potassium + 20Kg/ha Sulphur (30.8%) which was found to be statistically at par with T_9- 50Kg/ha Potassium + 30Kg/ha Sulphur (**Singh *et al.*, 2000**)

CONCLUSION

On the basis of one season experimentation, it is concluded that with the application of Potassium 50 kg/ha and Sulphur 30 kg/ha (Treatment 9) recorded highest seed yield and benefit cost ratio.

The conclusions drawn are based on one season data only which requires further confirmation for recommendation.

Reference.

Ahmad M, Nadeem MA, Ayub R & Javaid F (2001). Response of sunflower to different potassium levels and harvesting times. Pak J Life Soc Sci 1(1): 45-47.

Ahmad, F. (2018). Influence of Sulphur and Potassium Levels on Yield and Yield Attribute of Sesame (*Sesamum indicum* L.). International Journal of Research Studies in Agricultural Sciences (IJRSAS), 4(5), pp.8-10.

Ayub M, Tanveer A, Amin MZ, Sharar MS & Pervaiz A (2002). Effect of different sources and levels of potassium on yield and oil content of spring sunflower. Pak J Biol Sci 2(3): 801-803

Ayub. (2009). Experiment conducted on effect of different sources and levels of potash on yield and oil content of spring sunflower. *Pakistan J. of Biological sci.* **2** (3) 801-803.

Badrul, H., and Intikhab, A. (2013). Effect of nitrogen, sulphur and farmyard manure on growth dynamics and yield of sunflower (*Helianthus annuus L.*) under temperate conditions. *Scientific Research and Essays*, **8**(43), 2144-2147.

Brar, M. S., P. Sharma, A. Singh, N. S. Dhillon and S. S. Sandhu, 2010.Effect of potassium nutrition on the yield, quality and nutrient uptake by sunflower. J. of the Indian Soc. of Soil Sci. **58** (3):344-346.

Demurin, Y, Skoric D, Veresbaranji I & Jocic S (2001). Inheritance of increased oleic acid content in sunflower seed oil. Afri J Biotech 23(2): 87-92.

Ebrahimian, A. and A. Soleymani, 2013. Growth length and dry matter yield in different stages of safflower as affected by nitrogen, phosphorus and potassium fertilizers, *International Journal of Agronomy and Plant Production* **4** (5): 963-969.

Havlin JL, Beaton JD, Tisdale SL & Nelson WL (2004). Soil fertility and fertilizers: An introduction to nutrient management. 6: 196-216.

Intodia, S. K. and Tomar, O. P., 1997. Effect of Sulphur application on growth and yield of sunflower (*Helianthus annus* L.) *Indian J. Agri. Sci.*, **67**(1) 46-47.

Pavani, S., Rekha, K. B., Babu, S. N., and Moguloju, M. (2013). Effect of nitrogen and Sulphur on growth, yield and quality of sunflower (*Helianthus annuus* L.). *Crop Research*, **45**(1to3), 152-154.

Singh, A. Singh, S. P., Katiyar, R. S. and Singh, P. P., 2000. Response of nitrogen and sulphur on economic yield of sunflower (*Helianthus annus* L.) under sodic soil condition, *Indian J. Agril. Sci.* **70**(8): 536-537.

Table.1 Influence of Potassium and Sulphur on growth attributes of Sunflower.

Treatments	Plant height(cm) At 60 DAS	Dry Weight(g/plant) At 60 DAS
30 kg/ha Potassium + 10 kg/ha Sulphur	116.0	10.6
30 kg/ha Potassium + 20 kg/ha Sulphur	116.3	10.8
30 kg/ha Potassium + 30 kg/ha Sulphur	117.3	11.4
40 kg/ha Potassium + 10 kg/ha Sulphur	116.6	11.1
40 kg/ha Potassium + 20 kg/ha Sulphur	118.4	12.1
40 kg/ha Potassium + 30 kg/ha Sulphur	118.8	12.2
50 kg/ha Potassium + 10 kg/ha Sulphur	117.8	11.8
50 kg/ha Potassium + 20 kg/ha Sulphur	199.0	12.5
50 kg/ha Potassium + 30 kg/ha Sulphur	119.4	12.8
Control: N:P: K – 80:60:40 kg/ha	115.2	10.3
F-Test	S	S
SEm±	0.17	0.09
CD (P=0.05)	0.52	0.28

Table.2 Influence of Potassium and Sulphur on yield attributes and yield of Sunflower.

Treatments	Seeds/Capitulum	Test weight(g)	Seed yield (kg/ha)	Stover yield (kg/ha)	Harvest index (%)
30Kg/ha Potassium + 10Kg/ha Sulphur	320.0	28.8	1155.10	3035.4	27.6
30Kg/ha Potassium + 20Kg/ha Sulphur	321.3	29.3	1235.81	3092.2	28.6
30Kg/ha Potassium + 30Kg/ha Sulphur	325.7	30.2	1290.80	3159.0	29.0
40Kg/ha Potassium + 10Kg/ha Sulphur	324.4	29.5	1247.81	3132.5	28.5
40Kg/ha Potassium + 20Kg/ha Sulphur	329.2	31.7	1399.42	3186.9	30.5
40Kg/ha Potassium + 30Kg/ha Sulphur	330.5	32.4	1417.10	3194.8	30.7
50Kg/ha Potassium + 10Kg/ha Sulphur	327.8	30.4	1349.70	3171.7	29.8
50Kg/ha Potassium + 20Kg/ha Sulphur	331.5	33.2	1426.03	3202.9	30.8
50Kg/ha Potassium + 30Kg/ha Sulphur	332.4	33.7	1463.44	3211.6	31.3
Control	318.8	28.3	1071.70	2996.3	26.3
F test	**S**	**S**	**S**	**S**	**S**
S. Em (±)	0.51	0.24	17.92	7.57	0.29
CD (P = 0.05)	1.54	0.73	53.25	22.50	0.88