Indian Journal of Science and Technology Vol. 4 No. 10 (Oct 2011) ISSN: 0974- 6846

Influence of different K fertilizer sources on sunflower (*Helianthus annus*)

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Abstract

The objective of this study is to investigate the influence of different K sources (KCl and K_2SO_4) on sunflower yield. For this purpose, a randomized block experimental design with K_2SO_4 and KCl sources was established in the greenhouse. The treatments were consisted of 0 (standard), 50, 100, 150 and 200 kg/ha fertilizers each with four replicates. After development, plants were harvested. The heights and weights of each plant was obtained and dried in the oven. The potassium content of each plant was measured, using flame photometer apparatus. The obtained results indicated that by increasing potassium concentration in soil, its accumulation in plant tissues was also increased. So that the best yield was in 200Kg/ha level of K_2SO_4 treatment and the lowest yield was in the 50Kg/ha of the KCl treatment. Also, the sulphur content increased with increasing of K_2SO_4 fertilizer. This study may help the integrated nutrient management for oil seed crops especially the sunflower.

Keywords: Crop yield, Fertilizer, K_2SO_4, KCl, Plant nutrient, Sunflower, Soil fertility

Introduction

Sunflower (*Helianthus annus*), belonging to the family Compositae, is a major source of edible oil, with an annual production of 25.1 million tons. The varieties that are grown in India have high oil content (46-51%) while the hull content varies from 24.0% to 32.0% (Earle *et al*., 1968). Sunflower oil contains large amount of A, D, E, K vitamins and considerable proteins (20-40%) (Connor & Hall, 1997). By increasing the soil fertility, the seed yield and its oil content are increased (Egli, 1998). Factors such as potential yield, seed weight (per 1000 seeds), plant density, seed protein and oil content, water deficit tolerance, response to environmental stresses, and resistance to pests and diseases have featured extensively (Makesam *et al.,* 2001; Fasoula & Boerma, 2007).

Crop yield is frequently constrained by availability of major nutrients, including nitrogen and phosphorus. While approaches for the diagnosis and management of crop nutrition often target individual nutrients, there is an increasing interest in integrated nutrient management (Heady *et al.,* 1955). Sunflower responds best to fertilizer when soil nutrient levels are low, appropriate plant populations are used and weeds are controlled. Optimum production of high-yielding, high-quality sunflower requires fertilization based on an evaluation of the current soil fertility level (Aulakh & Pasricha, 1996). The objective of this study was to assess the influence of KCl and K_2SO_4 nutrient levels on sunflower yield. Consequently, an experiment was conducted to recognize the efficiency of using KCl and K_2SO_4 nutrient sources with different levels of K in soil.

Materials and method

A randomized block experimental design with two K sources (K_2SO_4 and KCl) and four replicates was established in the greenhouse under uncontrolled environmental conditions. The treatments were consisted of 0 (standard), 50, 100, 150 and 200 kg/ha fertilizer. First, the sunflower seeds were put in washing detergent 20% for 15 minutes for disinfectant and after that, seeds washed with water for acquiring the necessary wet for budding. The soils were carefully packed in the pots to obtain a uniform bulk density of 1.35 gr/cm3.The soil fertilization process was performed until the target concentrations were achieved. In order to obtain a reliable set of data, four replicates for each treatment was established. Content of N and P that used were in arrangement 100 and 150 kg/ha and the amount of K in different level of K_2SO_4 and KCL fertilizers was assessed in this study. After 48 hours, the seeds were seeded in the pots. Three seeds were first seeded and after 20 days with comparing the plant growth, separated the weak shoots and thinned to 1. Having a standard treatment, the soil water content was always held at field capacity to prevent any water stress during the whole growth period (March to September). When plants were fully developed, after measuring plant height, sunflowers were harvested. Also, weight of each sample (whole plant) in different fertilizer levels was measured. The plants were then washed with distilled water and dried in an oven for 48 hours (at 85 °C). The potassium content of each plant was measured, using flame photometer (Gupta, 2000). Finally, the effect of two fertilizers (K_2SO_4 and KCl) was assessed on sunflower yield.

Results

To distinguish the influence of different soil fertilizer levels on sunflower yield, different amounts of potassium were measured. The results of these chemical analyses are given in Table 1 and 2. The lowest potassium concentrations belong to the treatment with 50 Kg/ha KCl.

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Table1. The average of plant weight and height in K_2SO_4 and KCl treatments

Treatment (Kg/ha)	Average of height (cm)		Average weight (gm)	
	K_2SO_4	KCl	K_2SO_4	KCl
0	126	126	395	395
50	131	128	400	398
100	135	130	420	407
150	138	133	435	420
200	142	137	490	447

Table 2. Potassium concentration in the experimental plants (A=K_2SO_4, B=KCl)

Treatment	K (ppm)
standard	10
A1	14
A2	30
A3	41
A4	50
B1	11
B2	28
B3	39
B4	45

Also, the highest potassium concentrations belong to the treatment with 200 Kg/ha K_2SO_4. The relationship between soil potassium and in sunflower was analysed. By increasing the potassium concentration in the soil, its concentration in plant tissues also increased. The maximum yield was obtained for the treatment with 200 Kg/ha K_2SO_4 and the yield was minimum with 50Kg/ha KCl.

Conclusion

The application of K_2SO_4 as soil nutrient has better influence on yield than the KCl treatment.

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