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GROWTH AND YIELD OF SUNFLOWER GENOTYPES TO SULPHUR FERTILIZATION GROWN UNDER VEERANAM AYACUT REGIONS

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Abstract

Field investigations were carried out during December 2009 and June 2010 at Experimental Farm, Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar-608002, to study the growth and yield of sunflower genotypes to sulphur fertilization grown under Veeranam Ayacut regions. Sunflower genotypes *viz.*, two varieties (CO_4 and DRSF108) and three hybrids (KBSH53, sunbred and Jaya) were tried along with different sulphur levels (0, 20, 40 and 60 kg S ha^{-1}). The experiment consisted of twenty treatments and were laid out in factorial randomized block design with two replications.

Among the different genotypes, KBSH 53 was significant over other genotypes. KBSH 53 significantly recorded maximum growth attributes *viz.*, plant height, LAI, DMP and chlorophyll content, yield attributes *viz.*, head diameter, total number of seeds $head^{-1}$, seed filling per cent and seed yield and stalk yield in both the crop seasons. The lowest values of growth and yield attributes and yield were recorded in the genotype CO_4.

Among the S levels, application of 40 kg S ha^{-1} favourably influenced the growth and yield attributes and yield of sunflower. The least values for growth and yield attributes and yield, were recorded under 0 kg S ha^{-1} during both the crops.

The interaction effect between genotypes and S levels were significant. Among the treatment combinations, KBSH 53 with 40 kg S ha^{-1} recorded maximum values for growth and yield attributes, yield, nutrient uptake and quality characters in both the crops. The least values was recorded under CO_4 with no sulphur applied plots.

The results of the present investigation showed that among the treatment combinations, KBSH 53 with 40 kg S ha^{-1} had a spectacular effect on growth and yield attributes, ultimately leading to the maximum yield (2538.65 and 2683.46 kg ha^{-1}) in first and second crop respectively.

Key words : Sunflower genotypes, Sulphur furtilization grown, CO_4, KBSH53

Introduction

In India, oil seed crops constitute the second largest agricultural produce, next only to food grains and these are the important sources of our economy contributing 5% to GNP. India's contribution to the world productivity of oilseeds is very low (9.54%) owing to low productivity of different oilseed crops. Edible oil is one of the basic requirement of our daily diet. India is encountered with deficiency of edible oil because of its increased consumption. Sunflower is the fourth important oilseed crop in India which can play important role in reducing the shortage of edible oil and produce high yields of good quality oil for human consumption. The practice of intensive cropping with high yielding varieties is a great endeavour to boost production and this has caused a marked depletion of inherent nutrient resources in soil. Consequently along with N, P and K, the deficiency of sulphur is frequently reported in large areas in India. Sulphur is the fourth important nutrient in crop production. Sulphur is involved in the synthesis of chlorophyll. Oilseeds are more responsive to S than pulses and cereals. The response to S application in oilseed crops is spectacular. Response of oilseeds to S application depends

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on crops, soil S status, yield potential of the cultivar, N level used, S content of irrigation water, growth conditions, management levels, soil types, location and sources of S. plant species and even cultivars within species differ in their nutrient efficiency. Efficient species or cultivars are those which are able to growth and yield under deficit conditions as compared to inefficient ones. The different genotypes respond differently to same or diverse S supply conditions.

Materials and Method

Field experiments were conducted at Experimental Farm, Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar during December 2009 and June 2010 to study the growth and yield of sunflower genotypes to sulphur fertilization grown under Veeranam Ayacut regions. Sunflower genotypes *viz.*, two varieties (CO_4 and DRSF108) and three hybrids (KBSH53, sunbred and Jaya). The experiments were laid out in factorial Randomized block design with two replications. The treatments included in the experiments are, Sunflower genotypes *viz.*, two varieties (CO_4 and DRSF108) and three hybrids (KBSH53, sunbred and Jaya) were tried along with different sulphur levels (0, 20, 40 and 60 kg S ha^{-1}). The soil of experimental field was clay loam in texture. The soil was low in available Nitrogen, medium in available Phosphorous, high in available Potassium and low in available Sulphur.

Results and discussion

Growth attributes Table 1

Among the genotypes, KSBH 53 significantly recorded higher growth attributes *viz.*, plant height, LAI, DMP and chlorophyll content. CO_4 recorded early days to fifty percent flowering in both the crops. This might be due to difference of genetic makeup (Martre *et al.*, 2009 and Bukhsh *et al.*, 2010). The least values for growth attributes were recorded under the genotype CO_4. Due to shorter duration CO_4 flowered earlier than other genotypes (Dubey and Khan, 1993).

Sulphur levels were found to influence the growth attributes of sunflower. The growth attributes were significantly enhanced by the optimum level of sulphur @ 40 kg S ha^{-1}. This might be due to more synthesis of amino acids, increased chlorophyll content in growing region and improving the photosynthetic activity, ultimately enhancing cell division there by increased the crop growth rate. This was evidenced through the studies of Intodia and Tomar (1997). Sulphur application significantly increased the chlorophyll content. Since sulphur is constituent of succinyl CO A which is precursor of biosynthesis of chlorophyll might have resulted in higher chlorophyll content. The results are in agreement with the findings of Srirama Chandra Sekharan (2004) and Vaiyapuri *et al.*, (2004).

The interaction effect between genotypes and sulphur levels was found to be significant on growth attributes at all the stages of crop growth. The highest growth attributes *viz.*, plant height, LAI, DMP and chlorophyll content under treatment combinations of KBSH 53 with 40 kg S ha^{-1}, which produced higher plant growth due to increased utilization of carbohydrate for synthesis of protein and more availability of photosynthesis and physiological capacity to translocate them to the organ of vegetative growth. Similar results were earlier reported by Reddy and Reddy (2003). CO_4 with no sulphur application produced lesser values of growth attributes due to genetic nature and poor availability of S and other nutrients (Martre *et al.*, 2009).

Yield attributes Table 2

The sunflower genotypes had a significant effect on yield attributes *viz.*, head diameter, total number of seeds $head^{-1}$, number of filled seeds $head^{-1}$, seed filling per cent and 100 seed weight in both the crops.

Among the genotypes, KBSH 53 recorded maximum head diameter, total number of seeds $head^{-1}$, number of filled seeds $head^{-1}$, seed filling per cent and 100 seed weight followed by Sunbred and Jaya while the minimum values of yield attributes were noticed in CO_4 in both the crops. These results are in line with findings of Yousaf *et al.* (1989).

Sulphur levels significantly influenced the yield components in both the crops. Application of 40 kg S ha^{-1} significantly increased the head diameter, number of seeds $head^{-1}$, number of filled seeds $head^{-1}$, seed filling per cent and 100 seed weight over other levels. The possible reason for this kind of result may be due to the nutritional imbalance caused by the highest level of 60 kg S ha^{-1}. Sulfur is known to play a vital role in the formation of amino acids, It had favourable effect on yield components due to proper partitioning of photosynthetic from source to sink. These findings were earlier reported by Sarkar and Mallick (2009) and Syed Shuja Hussain *et al.,* (2011). The least values for yield attributes were recorded under the treatment 0 kg S ha^{-1} could be due to poor availability of S and other nutrients. These findings were earlier reported by Poonkodi and Poomurugesan (2005).

The interaction effect between genotypes and sulphur levels were found to be significant. Among the different genotypes, KBSH 53 with 40 kg S ha^{-1} registered higher

Table 1: Growth attributes of sunflower genotypes as influenced by sulphur fertilization

Treatments	Plant height (cm) (At harvest)		LAI (At flowering)		DMP (Kg ha^{-1}) (At harvest)		Chlorophyll content (At 60 DAS)	
	I	II	I	II	I	II	I	II
Genotypes								
V_1	125.28	129.13	4.19	4.25	4433.33	4589.25	1.72	1.80
V_2	131.77	135.39	4.27	4.34	4616.98	4784.77	1.80	1.88
V_3	153.79	156.46	4.53	4.61	5152.33	5374.84	2.06	2.15
V_4	146.11	149.61	4.44	4.52	4964.92	5179.26	1.92	2.06
V_5	138.99	142.56	4.36	4.43	4856.77	4972.15	1.90	1.97
S.Ed	1.3	1.4	0.018	0.019	41.19	44.74	0.012	0.013
CD (P=0.05)	2.8	3.0	0.039	0.040	89.80	92.36	0.026	0.027
S levels								
S_1	116.11	116.82	4.13	4.19	3918.43	4074.36	1.23	1.35
S_2	139.50	141.31	4.36	4.42	4805.16	4982.49	1.83	1.90
S_3	152.12	157.46	4.49	4.57	5293.14	5468.42	2.27	2.35
S_4	149.13	154.93	4.46	4.54	5201.90	5394.94	2.25	2.33
SEd	1.2	1.26	0.019	0.018	41.07	43.33	0.011	0.012
CD (P=0.05)	2.6	2.8	0.040	0.039	88.72	88.79	0.024	0.025

Table 2: yield attributes and yield of sunflower genotypes as influenced by sulphur fertilization

Treatments	Head diameter (cm)		Total no. of seeds $head^{-1}$		Seed $filling^{-1}$ per cent		Seed yield (Kg/ha)		Stalk yield (Kg/ha)	
	I	II	I	II	I	II	I	II	I	II
Genotypes										
V_1	15.66	16.72	670.34	700.54	72.25	75.19	1518.13	1573.82	3742.44	3790.84
V_2	16.21	17.57	579.82	736.67	75..57	76.63	1668.58	1230.78	3898.34	3983.79
V_3	17.46	19.28	818.03	854.29	79.79	80.17	2144.63	2293.10	4229.06	4445.76
V_4	17.01	18.74	778.06	816.76	77.79	78.53	1966.72	2090.32	4203.59	4276.50
V_5	16.54	18.26	743.06	729.28	76.56	77.54	1802.84	1921.34	4050.37	4105.42
S.Ed	0.09	0.099	7.60	7.93	0.13	0.17	34.24	30.96	37.27	35.7
CD (P=0.05)	0.19	0.201	15.61	14.61	0.29	0.35	68.51	71.10	74.56	73.2
S levels										
S_1	12.58	13.65	522.82	556.96	65.87	67.17	1177.48	1275.09	3361.80	3393.62
S_2	16.49	17.82	729.22	761.55	76.81	77.98	1809.0	1907.43	4062.25	4152.00
S_3	18.64	20.42	866.27	902.29	82.41	82.85	2177.69	2277.88	4422.27	4482.97
S_4	18.50	20.24	853.16	889.72	82.17	82.54	2116.57	2230.06	4252.73	4412.78
S.Ed	0.08	0.199	7.11	7.09	0.14	0.16	33.70	30.38	36.57	36.8
CD (P=0.05)	0.18	0.403	14.62	14.85	0.31	0.34	67.43	63.59	73.18	75.7

values for yield components. This might be due to availability of S and other nutrients. These findings were earlier reported by Raja *et al.* (2007). The least values of yield attributes were recorded under CO_4 with 0 kg S application could be due to inadequate availability of s and other nutrients, The results are in agreement with the findings of Govindarasu *et al.* (1998).

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