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EFFECT OF DIFFERENT NITROGEN, PHOSPHORUS AND POTASSIUM LEVELS ON SESAME (*SESAMUM INDICUM*) IN BASTAR PLATEAU OF CHHATTISGARH

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ABSTRACT

The experiment was conducted under field conditions at SG College of Agriculture and Research Station, Jagdalpur during *Kharif* season 2012 and 2013. The experiment was laid out in Randomized Block design with factorial arrangement in three replications had three nitrogen levels (15, 30 and 45 kg ha^{-1}), two phosphorus levels (30 and 60 kg ha^{-1})and three potassium levels(10, 20 and 30 kg ha^{-1}). On the basis of two years experiment, nitrogen level 45 kg ha^{-1} recorded highest number of seeds pod^{-1}(48.63 and 49.58) during 2012 and 2013. Phosphorus and potassium level shows no significant effect during both the years of experimentation. Seed yield and test weight was recorded significantly higher in nitrogen level 45 kg ha^{-1} (7.13 q ha^{-1}, 7.81 q ha^{-1} and 3.57 g, 3.59 g) than the other levels. Application of 60 kg P_2O_5 ha^{-1} recorded significantly highest seed yield (6.17 and 6.83 q ha^{-1}) and test weight (3.20 g and 3.25g) during 2012 and. K30 kg ha^{-1} recorded significantly highest seed yield (6.111 and 6.71 q ha-1) during both the year during experimentation.

INTRODUCTION

Sesame *(Sesamum indicum L.)* is an oilseed crop generally cultivated on small holdings by poor-resource farmers in the tropics. Sesame is one of the oldest crops known to humans. There are archeological remnants of sesame dating to 5,500 BC in the Harappa Valley in the Indian subcontinent (Bedigian and Harlan, 1986). Sesame is one of the most ancient oilseed crops in India. The crop is cultivated almost throughout India for its high quality oil and has tremendous potential export of sesame in the world.Except for a brief period of satisfaction during 1986-90 wherein the country had witnessed near self-sufficiency in vegetable oils, in spite of continuous increase in domestic oilseeds production, only of 50% the requirement of vegetable oil is met and nearly half is made through imports at a huge cost of 9.7 billion US dollars as incurred during 2011-12 (Hegde *et al.,* 2012).The importance of sesame lies in its high content of oil, protein, calcium, iron and methionine (Gupta *et al,* 1998). Phosphorus is very important plant nutrient which helps the growth and development of plant and it increases crop yield. It involves in many biolochemical functions in the plant physiology systems. It is essential parts of skeleton of plasma membrane, nucleic acid, many coenzymes, organic molecules and phosphorylated compounds in plant system Pandey and Sinha(1986). But the productivity of sesame in general is much lower than its potential yield. Lower productivity is due to use of lower rate of fertilizer, poor management and cultivation of sesame in marginal and sub-marginal lands where deficiency of macronutrients such as nitrogen, phosphorus, potassium. This indicates the scope and need to increase the productivity of sesame. Farmers in the Bastar plateau of Chhattisgarh have no definite fertilizer recommendations for the production of sesame as a sole crop as most crops are grown in a mixture with sorghum or millet. This, view was upheld by many farmers especially in the Bastar plateau of Chhattisgarh. This coupled with the low fertility status of the soil and low levels of management are responsible for low yield of sesame.

MATERIALS AND METHODS

A field experiment was conducted during *kharif* season of 2012 and 2013 at SG College of Agriculture and Research Station, Kumhrawand, Jagdalpur under AICRP for dryland agriculture at village *Tandpal*. The soil was coarse textured with pH 6.2, available N 250 kg ha^{-1}, available P_2O_5 18.9 kg ha^{-1} and K_2O 270 kg ha^{-1}. The experiment was laid out in a randomized block design with factorial arrangement and was three replications. All possible 18 treatment combinations consisting of nitrogen was three levels (15, 30 and 45 kg ha^{-1}) as a main factor, two levels of phosphors(30 and 60 kg ha^{-1}) as a sub plot-I and three levels of potassium (10, 20 and 30 kg ha^{-1})as a sub plot-II. Sesame variety GT-2 was sown in row at 30 cm a part on 17th and 12th July 2012 and 2013, respectively. Half dose of nitrogen and full dose of phosphorus and potassium was applied at the time of sowing in the form of urea, single super phosphate and murate of potash as per treatments and remaining half of dose of nitrogen was given at branching stage in the farm of urea. The five plants were randomly selected from each net plot. Each selected plant was labeled and same were harvested separately for post harvest study. The mean of five observation plants were used for calculating sampling values of growth parameters, yield attributes and yield.

RESULTS AND DISCUSSION

The effects of N, P and K fertilizers on yield and yield components of sesame are shown in Table 1and 2. Application of N fertilizer significantly influenced all parameters. Application of 45 kg N, 60 kg P_2O_5 and 30 K_2O ha^{-1} was recorded significantly higher seed yield than the different levels of nitrogen during the experimentation.

Application of 45 kg N ha^{-1} recorded significantly highest yield and yield attributing components, maximum plant height, more number of branches, higher number of leaves, maximum number of pods and seed, heavier test weight, seed yield and straw yield, during both the years followed by 30 kg N ha^{-1}. Nitrogen is one of the most limiting factors in Bastar plateau and plays an important role in vegetative growth. The present findings are also observed by Subramanian *et al.* (1979). The highest seed yield recorded at 45 kg N ha^{-1} is conformity with Roy *et al.* (1995) who recorded that economically optimum yield from 66 to 69 kg N ha^{-1}.

The significant response of the number of leaves to N application might be due to increase in photosynthetic activity that's why more number of branches was recorded in higher dose of nitrogen. This was increased pod production and number of seeds per pods thus increased final economic yield. These findings are also observed by Sharma and Kawal (1993), Tyagi *et al.* (2014) Ishwar *et al.* (1994).

Table 1: Effect of N, P and K on plant height, No. of branches, No. of leaves, No. of pods and No. of seeds

Treatments	Plant heightcm		No. of Branches Plant^{-1}		No. of leaves plant^{-1}		No. of pods plant^{-1}		No. of seeds pod^{-1}	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
N levels										
15	105.74	106.91	1.86	1.94	31.48	33.09	19.41	20.47	46.35	46.46
30	108.23	108.76	2.41	2.50	35.16	37.51	25.57	26.01	47.81	48.15
45	110.14	110.97	3.56	3.63	38.23	41.55	36.68	37.99	48.63	49.58
SEm ±	0.42	0.36	0.08	0.10	0.45	0.69	0.46	0.43	0.38	0.52
CD 5%	1.23	1.04	0.23	0.29	1.30	2.01	1.34	1.26	1.11	1.51
P levels										
30	107.38	108.20	2.30	2.40	34.07	36.32	25.86	26.70	47.40	47.57
60	108.69	109.09	2.93	2.98	35.84	38.45	28.58	29.62	47.79	48.56
SEm ±	0.35	0.29	0.06	0.08	0.36	0.57	0.38	0.35	0.31	0.43
CD 5%	1.06	0.85	0.19	0.24	1.06	1.64	1.09	1.09	NS	NS
K levels										
10	107.68	107.67	2.45	2.53	34.06	36.50	26.46	27.30	46.94	47.47
20	108.02	109.03	2.52	2.65	35.12	37.52	27.33	28.03	47.61	47.87
30	108.40	109.23	2.87	2.90	35.69	38.13	27.86	29.14	48.35	48.85
SEm ±	0.42	0.36	0.08	0.10	0.45	0.69	0.46	0.43	0.38	0.52
CD 5%	NS	1.04	0.23	0.29	1.30	NS	NS	1.26	NS	NS

Table 2: Effect of N, P and K on seed yield, straw yield, harvest index and 1000 seed weight

Treatments	Yield qha^{-1}		Straw yield qha^{-1}		HI	1000 seed wt		
	2012	2013	2012	2013	2012	2013	2012	2013
N levels								
15	4.78	5.10	6.53	12.56	2.35	3.48	2.68	2.17
30	5.83	6.58	11.49	13.77	2.97	3.09	2.99	3.11
45	7.13	7.81	16.53	15.33	3.31	2.96	3.57	3.59
SEm ±	0.08	0.08	0.32	0.10	0.05	0.03	0.10	0.11
CD 5%	0.24	0.24	0.93	0.29	0.15	0.09	0.30	0.31
P levels								
30	5.65	6.16	10.25	13.50	2.74	3.24	2.96	3.03
60	6.17	6.83	12.78	14.27	3.02	3.11	3.20	3.25
SEm ±	0.06	0.07	0.26	0.08	0.04	0.02	0.08	0.09
CD 5%	0.20	0.20	0.76	0.23	0.12	0.08	NS	NS
K levels								
10	5.71	6.26	10.74	13.56	2.81	3.21	3.01	3.05
20	5.92	6.51	11.44	13.96	2.86	3.18	3.08	3.10
30	6.11	6.71	12.38	14.14	2.96	3.14	3.15	3.26
SEm ±	0.08	0.08	0.32	0.10	0.05	0.03	0.10	0.11
CD 5%	0.23	0.24	NS	0.29	NS	NS	NS	NS

Application of phosphorus shows significant effect on growth and yield parameters. This might be due to well root development which is very important for the moisture as well as nutrient uptake from the soil and also it is noted as it is a constitute of cell nucleus and function in cell division as an energy supplier. Plant height, number of branches, number of leaves, number of pods, seed yield and straw yield were recorded significantly highest in application of 60 kg P ha^{-1} , whereas, number of seeds per pod and 1000 seed weight shows not significant during both the years. These findings are also conformity with Mianet *al* (2011),Kumaret *al* (2014)and Sahrawat and Islam (1990). The significant effect of phosphorus on number of leaves, number of pods and seed yield was also reported by Olowe and Busari (2000).

Application of potassium fertilizer had recorded significant effect on yield and yield attributing characters. Application of 30 kg N ha^{-1} was recorded significantly higher in seed yield and number of branches during both the years, however, plant height, number of pods and straw yield were recorded significantly higher during 2014, but in case of leaves during 2013 it was observed statistically higher than the rest of the potassium levels. Harvest index, 1000 seed weight and number of pods per plant were recorded unaffected due to potassium levels. These findings are also observed by Singaravel and Govindasamy (1998), Thanki *et al.* (2004) and Nayek *et al.* (2014)

An interaction was not recorded significant during both the years due to different fertilizer levels.

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