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Response of Soybean (*Glycine max* L.) Genotype to Row Spacings and Fertility Levels under Rainfed Conditions

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ABSTRACT

A field experiment was conducted on soybean during *kharif* season of 1993 and 1994 to study the performance of newly developed soybean (*Glycine max* L.) genotypes in relation to different row spacings and fertility levels. Genotype JS-87-59 gave significantly higher seed yield than JS-87-60. Wide row spacing (45 cm) and high level of fertilizers (30 : 80 : 20 kg NPK/ha) proved superior than close row spacing (30 cm) and low fertilizer dose (20 : 60 : 15 kg NPK/ha).

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INTRODUCTION

Soybean (*Glycine max* L.) is most energy rich commercial crop during *kharif* season in Satpura Plateau zone of M. P. It has wide adoptibility and mainly grown as rainfed crop. Optimum plant population and proper fertilizer application play an important role in increasing yield of soybean particularly under rainfed condition. Fertilizers being a costly inputs, it has become necessary to improve the productivity per unit area by efficient use of fertilizers. Selection of high yielding improve genotypes and adoption of proper row spacing may help to achieve this target (Kacha *et al.*, 1990). In lacking of informations, the present investigation was undertaken to identify the suitable genotype under varying row spacings and fertility levels.

MATERIALS AND METHODS

A field experiment was conducted on soybean in clay loam soil at Zonal Agricultural Research Farm, Chhindwara (M.P.) during *kharif* season 1993 and 1994. The soil was low in available nitrogen (245 kg N/ha), medium in phosphorus (12 kg P/ha) and high in potash (580 kg k/ha) with 7.3 pH. The total rainfall was 863 and 1183 mm in the two consecutive years during crop season. Treatments consisted with 2 genotypes (JS-87-60 and JS-87-59) and 2 row spacings (30 and 45 cm.) as main plot treatments and 2 fertility levels (30 : 80 : 20 and 20 : 60 : 15 kg N, P_2O_5 and K_2O/ha) as subplot treatments were tested in split plot design with 3 replications. Sowing was done on June 26, 1993 and June 28, 1994 in 5.0 m x 4.5 m plots with 100 kg seeds/ha. Before sowing seeds were treated with thiram and with

rhizobium culture respectively. All fertilizers were given as basal as per treatments. Interculture operations like hoeing two times and single hand weeding were done uniformally in all plots. The crop was harvested at maturity genotype wise. Date on growth, yield attributing characters and yield were collected and exposed to statistical analysis.

RESULTS AND DISCUSSION

In general, the yield of soybean was 41.2% higher during 1993 than yield of during 1994 under all treatments. During second year crop suffered due to continuous rains at vegetative and flowering stages which resulted in the poor yield.

Genotypes

Genotype JS-87-59 recorded significantly taller plants, higher number of branches and pods/plant, longer pods, more number of seeds/pod and bolder seeds as compared to genotype JS-87-60 which attributed to produce significantly higher seed yield (24.3 q/ha) and straw yield (38.2 q/ha).

Row spacings

Wide row spacing (45 cm) resulted in significantly more seed yield than the close spacing of 30 cm in both the years but straw yield did not vary due to row spacings (Table 1). Growth and yield contributing parameters were superior with wide spacing than close spacing mainly due to better utilization of available nutrients, light and soil moisture. These results also confirmed the findings of Deshmukh *et al.* (1977) and Kacha *et al.*, (1990).

TABLE 1

Effect of row spacings and fertility levels on yields of soybean genotypes.

Treatment	*Seed yield (q/ha)*			*Straw yield (q/ha)*		
	1993	*1994*	*Mean*	*1993*	*1994*	*Mean*
Genotypes						
JS-87-60	26.6	18.5	22.6	40.1	28.6	34.4
JS-87-59	28.2	20.3	24.3	45.9	30.5	38.2
CD (P = 0.05)	0.3	—	0.7	0.7	1.0	—
Row spacings						
30 cm	27.0	18.5	22.8	42.1	30.8	36.5
45 cm	27.8	20.3	24.1	43.9	28.3	36.1
CD (P = 0.05)	0.3	0.5	—	0.7	1.0	—
Fertility levels						
NPK (kg/ha)						
30 : 80 : 20	27.9	20.4	24.2	43.8	31.3	37.6
20 : 60 : 15	26.9	18.3	22.6	42.2	27.8	35.0
CD (P = 0.05)	0.6	0.4	—	1.0	0.9	—

TABLE 2

Growth and yield attributes of soybean as affected by genotypes spacings and fertilizers.

Treatment	Plant height (cm)		Branches/ plant		Pods/ plant		Pod length (cm)		Seeds/ pod		1000 seed weight (g)	
	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994
Genotypes												
JS-87-60	76.7	69.1	2.53	3.43	37.6	23.5	3.62	3.23	2.65	2.42	68.4	53.5
JS-87-59	83.9	77.6	2.74	2.07	44.1	31.0	3.81	3.58	2.73	2.93	73.3	59.6
CD (P=0.05)	1.6	1.6	0.09	0.12	1.8	1.7	0.03	0.08	0.09	0.06	1.1	1.1
Row spacings												
30. cm	79.2	72.0	2.46	2.58	39.3	25.4	3.67	3.32	2.60	2.54	69.7	54.4
45 cm	81.4	74.7	2.81	2.92	42.4	29.1	3.76	3.58	2.78	2.78	72.0	58.7
CD (P=0.05)	1.6	1.6	0.09	0.12	1.8	1.7	0.03	0.08	0.09	0.06	1.1	1.1
Fertility levels												
NPK (kg/ha)												
30 : 80 : 20	82.6	76.8	2.89	2.97	44.0	30.8	3.82	3.53	2.78	2.81	72.1	58.2
20 : 60 : 15	78.0	69.8	2.38	2.53	37.7	23.7	3.60	3.28	2.59	2.54	69.6	54.9
CD (P=0.05)	2.2	1.3	0.12	0.16	1.1	0.7	0.09	0.09	0.10	0.09	1.4	0.7

Fertility levels

Application of higher fertilizer dose (30 : 80 : 20 kg NPK/ha), significantly produced the more grain (24.2 q/ha) and straw (37.6 q/ha) yields than lower fertilizer dose (20 : 60 : 15 NPK kg/ha). The beneficial effect of higher fertilizer dose on yields were reflected through plant height, branches and pods/plant, seeds/pod, pod length and test weight (Table 1). Application of adequate fertilizers improve these growth and yield parameters because of efficient photosynthesis, metabolic activity and cell division and ultimate gave more yields. Similar results were reported by Kacha *et al.*, 1990, Patel *et al.*, 1992 and Singh *et al.*, 1994.

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