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EFFECT OF FERTILIZERS WITH AND WITHOUT FYM ON GROWTH, YIELD ATTRIBUTES AND YIELD OF SOYBEAN [*GLYCINE MAX* (L) MERRILL] VARIETIES IN MEDIUM BLACK (VERTISOL) OF VINDHYAN PLATEAU OF MADHYA PRADESH, INDIA

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Abstract

A field experiment was conducted during rainy (*kharif*) season of 2010 at R. A. K. College of Agriculture Farm, Sehore (M.P), India; to study the effect of 8 fertilizer levels (75% RDF, 75% RDF + FYM 5 t/ha, 100% RDF, 100% RDF + FYM 5 t/ha, 125% RDF, 125% RDF + FYM 5 t/ha**,** FYM 5 t/ha**,** Absolute control**)** on growth, yield attributes and yield of two soybean varieties JS 95-60 and JS 97-52 were evaluated in factorial randomized block design with 3 replications. Fertilizer level 125% RDF + FYM 5 t/ha produced significantly highest values of growth parameters and it was at par with 100% RDF + FYM 5 t/ha. The variety JS 97-52 was significantly higher in growth parameter *i.e.* plant height, branches per plant and dry weight per plant than variety JS 95-60. Yield attributing characters *i.e.* pods per plant, seed index, grain yield per plant attained significantly higher values under the application of 125% RDF + FYM 5 t/ha followed with 100% RDF + FYM 5 t/ha. Variety JS 95-60 was significantly higher than JS 97-52 for yield attributing characters *i.e.* seeds per pod, seed index and grain yield per plant while pods per plant were significantly higher in variety JS 97-52 than variety JS 95-60. The grain yield was significantly higher with application of 125% RDF + FYM 5 t/ha (1820 kg/ha), which was at par with 100% RDF + FYM 5 t/ha (1801 kg/ha). The variety JS 95-60 recorded significantly higher grain yield (2203 kg /ha) as compared to variety JS 97-52 (886 kg/ha).

Key words : Soybean, FYM, food industry, plant nutrition.

Introduction

Soybean (*Glycine max* L) is an important oil seed crop that is widely grown as a valuable source of protein and oil for human nutrition in the world. The oil of soybean contains 85% unsaturated fatty acid and is cholesterol free. Soybean seeds contain 43.2% protein, 19.5% fat, 20.9% carbohydrate and a good amount of other nutrients like calcium, phosphorus, iron and vitamins (Gopalan *et al*., 1971). It has highest content of lysine, which is limiting factor in cereals. It is used in manufacturing of antibiotics in pharmaceutical industries and for producing soymilk and soya protein in food industry. In spite of its high yield potential soybean productivity is much lower than developed countries mainly due to sub-optimal application of fertilizers. In plant nutrition, organic matter of a soil is the key property that decides the availability status of essential nutrients. The appropriate combination of mineral fertilizers with organic manure can be feasible and visible to sustain agriculture as commercial and profitable ensuring high yield of crop without deterioration in quantity and quality of the produce and soil health. FYM (Farm yard Manure) is by far, the most popular and available for use as an organic source of plant nutrient with the farmers. An assessment showed each tonne Farm yard Manure (FYM) to be equivalent to 3.0 kg nutrients in mono cropping and 5.0 kg in double cropping in terms of yield response (Tondon, 1983). Keeping in view the above facts, the present study was undertaken to see the effect of applied inorganic fertilizer with FYM and without FYM on growth, yield attributes and yield in soybean varieties.

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Materials and Methods

The field experiment was conducted during the rainy (*kharif*) season 2010 at research farm of the R. A. K. College of Agriculture, Sehore, Madhya Pradesh (23^0 12' N, 77^0 05' E and at 498.77m above mean sea level).

The experimental site is characterized by sub-tropical zone with extreme temperature during summer (45.60^{0}C) and very low temperature (as low as 5^{0}C). The average rainfall varies from 1000 to 1200 mm most of which is received during June-September. The soil was medium black clay loam having pH (7.3), electrical conductivity (EC) (0.12 dS/m), organic carbon (0.58), medium available N (245.25 kg/ha), medium available P (17.80 kg/ha), and high available K (425.24 kg/ha). The field trail consisting of 8 levels of fertilizer (75% RDF, 75% RDF +FYM 5 t/ha, 100% RDF, 100% RDF + FYM 5 t/ ha, 125% RDF**,** 125% RDF + FYM 5 t/ha**,** FYM 5 t/ha**,** Absolute control) and 2 levels of soybean variety (JS 95-60 and JS 97-52) was a factorial experiment laid out in randomized block design with 3 replications. Fertilizer doses were calculated on the basis of recommended dose of nutrients 20 N+60 P_2O_5+20 K_2O+20 S, kg/ha through urea, single super phosphate and muriate of potash, respectively. The quantity of fertilizer was calculated for respective treatment separately and was drilled as per treatment at the time of sowing. Decomposed farm yard manure (FYM) @ 5 tonnes/ha were applied before sowing and well incorporated in the soil. The sowing was carried out on 5th July 2010 maintaining row spacing of 45 cm with recommended seed rate of JS 95-60 and JS 97-52 was 75 kg/ha and 65 kg/ha, respectively was applied. Other agronomic management practices were followed as per the standard recommendation. The crop harvested at maturity and observation on growth, yield and yield contributing parameters were recorded as per standard procedure. Grain yield and straw yield altogether were considered as biological yield. Harvest index denotes the ratio of grain yield to biological yield multiplied by 100. The statistical analysis of the data was done as per procedure of analysis of variance using F-test.

Results and Discussion

Growth attributing characters

The growth characters were significantly influenced by fertilizer levels and varieties (table 1). In soybean, growth characters like plant height and branches per plant are very important parameters, which directly influence the grain yield. The application of 125% RDF + FYM 5 t/ha of fertilizer level improved significantly the growth characters viz plant height, number of branches per plant and dry weight per plant and it was at par with 100% RDF + FYM 5 t/ha. The increase in plant growth was attributed to the increase availability of nutrients with application of inorganic fertilizer, continuous supply of macro and micro nutrient from FYM, which helped in acceleration of various metabolic processes *viz*. photosynthesis, energy transfer reaction and symbiotic biological N – fixation process. These results are in close agreement with the findings of Shiv Kumar and Ahalawat (2008) and Mohod *et al*. (2010). The plant height and branches per plant, which are one of the characters responsible for the canopy structure of the plant have significantly influenced by varieties. The variety JS 97-52 was significantly superior in growth characters than variety JS 95-60 due to their genetically make up.

Yield attributing parameters

Fertilizer levels were significantly influenced the yield attributing parameters of soybean (table 2). Application of 125% RDF + FYM 5 t/ha produced significantly higher number of pod per plant, seeds per pod, seed index and grain yield per plant and it was at par with 100% RDF+FYM 5 t/ha. Enhancement in yield attributes due to ideal condition for soil microflora due to application of FYM and increased availability of nutrients with 125% RDF, which is turn might have increased the yield of soybean. The results are in close agreement with the findings of Tomar and Khajanji (2009). The variety JS 95-60 was significantly higher in seeds per pod, seed index and grain yield per plant than variety JS 97-52. Whereas, pods per plant were significantly higher in variety JS 97-52 as compared to variety JS 95-60. The variation in above parameters may be due to varietals inheritance.

Grain yield, straw yield and harvest index (%)

Fertilizer levels were significantly influenced the grain yield of soybean (table 2). Application of 125% RDF+FYM 5 t/ha was significantly higher in grain yield and it was at par with 100% RDF + FYM 5 t/ha. It may be due to higher values of various growth and yield parameters. The increment in supply of essential elements through organic and in-organic sources, their availability, mobilization and influx into the plant tissues increased and thus improved growth and yield components and finally the seed yield of soybean. The results corroborated the findings of Singh Guriqbal (2009). The variety JS 95-60 produced highest grain yield (2203kg/ha) than variety JS 97-52 (886kg/ha). It may be due to higher seeds per pod and better seed index. These favourable phenomenon in this variety resulted higher seed yield. Similar results were also observed by Thakur and Vyas (2005). Maximum straw yield was obtained in 125% RDF + FYM 5 t/ha (3127 kg/ha). It may be due to better growth attributes. Tiwari *et al*. (1997) observed that the maximum straw yield of 5.94 tonnes was obtained with the application of 100 per cent NPK + 5 t/ha FYM. The variety JS 97-52 produced significantly higher straw yield (3576 kg/ha) compared to the variety JS 95-60. The

Table 1 : Effect of fertilizer levels and varieties on the plant height, branches per plant and dry weight per plant.

Treatments	Plant height (cm)	Branches per plant (no.)	Dry weight per plant (g)
Fertilizer levels (F)			
75% RDF	73.61	3.33	18.67
75 % RDF + FYM 5 t/ha	75.11	3.61	21.22
100% RDF	75.94	3.67	21.08
100 % RDF + FYM 5 t/ha	77.78	3.95	23.69
125% RDF	78.17	3.95	21.22
125 % RDF + FYM 5 t/ha	79.45	4.45	24.11
FYM 5 t/ha	72.22	3.11	14.61
Control	70.00	2.55	13.58
SEm±	1.01	0.21	0.84
CD (P=0.05)	2.91	0.61	2.44
Varieties (V)			
JS 95-60	56.42	2.74	16.81
JS 97-52	94.15	4.51	22.74
SEm±	0.50	0.11	0.42
CD (P=0.05)	1.46	0.30	1.22

Table 2 : Effect of fertilizer levels and varieties on pods per plant, seeds per pods seed index, grain yield per plant, grain yield (kg/ ha), straw yield (kg/ ha) and harvest index (%).

Treatments	Pods per plant	Seeds per pod (no.)	Seed index (g)	Grain yield per plant	Grain yield (kg/ha)	Straw yield (kg/ha)	Harvest index (%)
Fertilizer levels (F)							
75% RDF	28.11	2.39	8.92	4.58	1599	2955	34.45
75 % RDF + FYM 5 t/ha	30.10	2.41	9.17	5.17	1657	2980	35.21
100% RDF	30.33	2.42	9.08	5.28	1710	3044	35.21
100 % RDF + FYM 5 t/ha	32.56	2.44	9.67	6.42	1801	3081	36.53
125% RDF	31.28	2.43	9.33	5.37	1716	3069	35.57
125 % RDF + FYM 5 t/ha	33.89	2.45	9.92	6.48	1820	3127	36.60
FYM 5 t/ha	19.61	2.38	8.67	3.75	1054	2929	26.82
Control	18.17	2.37	8.50	3.42	997	2875	26.14
SEm±	0.48	0.03	0.15	0.18	33.67	63.30	0.41
CD (P=0.05)	1.38	NS	0.44	0.52	96.97	NS	1.17
Varieties (V)							
JS 95-60	22.51	2.72	12.58	6.51	2203	2439	46.84
JS 97-52	33.50	2.10	5.73	3.61	886	3576	19.79
SEm±	0.24	0.01	0.08	0.09	16.84	31.65	0.20
CD (P=0.05)	0.69	0.04	0.22	0.26	48.49	91.58	0.59

highest straw yield may be due to the plant height and higher number of branches and dry weight per plant. This favourable morphological phenomenon in this variety resulted highest straw yield. Application of fertilizer levels showed significant effect on harvest index (table 2). The maximum harvest index was recorded with the application of 125% RDF + FYM 5 t/ha because fertilizer nutrient influenced the seed yield through source – sink relationship, resulting in higher production of photosynthates and their increased translocation to reproductive parts and increase the yield thus resulting harvest index. The variety JS 95-60 significantly higher in harvest index than variety JS 97-52. It is due to better yield attributing parameter of variety JS 95-60 as compared to variety JS 97-52.

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