I J T A
© Serials Publications
National Academy of Agricultural Science (NAAS) Rating : 3.03

Yield, Yield Attributes, Economics and Quality of Soybean Genotypes Influnced by Different Fertilizer Levels

H. S. Garud*, S. U. Pawar* and Khazi G. S.*

ABSTRACT: *The present field experiment was conducted at research farm, Department of Agronomy, College of Agriculture, V.N.M.K.V., Parbhani (M.S.) India. The experiment was laid down in split-plot design with 12 treatment combinations comprising of four varieties i.e. JS-335 (V_1), MAUS – 162 (V_2), MAUS – 71 (V_3) and MAUS – 158 (V_4) as main plot treatments and three fertilizer levels i.e. 75% RDF as 23.5:45:23.5 Kg ha^{-1} N, P and K_2O (F_1), 100% RDF as 30:60:30 Kg ha^{-1} N P_2O_5 and K_2O. (F_2), and 125 % RDF as 37.5:75:37.5 Kg ha^{-1} N, P_2O_5 and K_2O (F_3) as subplot treatments. Variety MAUS–158 and application of 100% RDF recorded significantly higher yield and yield attributing characters* viz. *number of pods per plant, seed weight per plant, 1000 seed weight, The highest seed yield as well as gross and net monetary returns were found at highest in MAUS-158 and application of 100% RDF as compared to the rest of the varieties and fertilizer levels.*

Key words: *Economics, Fertilizer, Genotypes, Soybean, Quality, Yield.*

INTRODUCTION

Soybean being a legume crop fixes atmospheric nitrogen. It sheds about 32 to 35 per cent of crop residue at the time of harvest, which help in increasing the soil fertility and soil physical condition hence, soybean crop also called as miracle crop.Soybean has occupied third place in oilseed crops of India, which is rich source of protein (40-42%) and quality oil (20-22%). It also enriches the soil through atmospheric nitrogen fixation and leaves about 30-40 kg N (Nitrogen) per hectare for succeeding crop (Saxena and Chandel, 1992). Soybean also contains 26.9 per cent carbohydrates, 4.6 per cent minerals and 2 per cent phospholipids (Halvankar *et al.*, 1992). Owing to its multiplicity of uses as food and industrial products, it is called a '*wonder crop*'. It is the number one oilseed crop of the world. Soybean protein is rich in the valuable amino acid lysines (5%) in which most of the cereals are deficient. In addition, it contains a good amount of minerals, salts and vitamins (thiamine and riboflavin); also it is rich source of vitamin A, B and D.

Soybean varieties selected for drought tolerance have the potential of improving agricultural productivity and hence livelihoods if adopted by farmers (Chianu, 2006). Soybean grows in areas where maize and common beans are grown. It grows to a height of 60–120 cm, maturing in 3 to 6 months depending on variety, climate, and location. Soybean is drought tolerant. Depending on the variety, the crop can be grown from 0-2200 m altitude and rainfall ranging from 300 to 1200 mm. Altitude influences temperature that in turn affects the initiation of flowering and maturity. At very high altitudes, flowering may not occur and the crop remains vegetative.

Fertilizer play an important role in crop production a substantial increase in production can be obtained by using the fertilizers. However, due to high cost of fertilizers only few farmers can offered to apply chemical fertilizers as per recommended doses. Fertilizers bear a direct relationship with food grain production along with a number of supporting factors like high yielding varieties (HYVs), irrigation, access to credit, enhanced total factors of productivity, the tenurial conditions, size of the product market and prices they face both for inputs and the outputs etc.

Keeping in view these points this experiment entitled "Response of soybean genotypes to different fertilizer levels" was conducted to study the performance of soybean varieties at different fertilizer levels.

MATERIALS AND METHODS

The field investigation was conducted at P.G. student research farm, Department of Agronomy, College of

* Vasantrao Naik Marathwada Krishi Vidyapeeth Parbhani.-431 402. *Email: siddiqui.gn@gmail.com*

Agriculture, V.N.M.K.V., Parbhani (M.S.) India. The experimental field was leveled and well drained. The soil was clayey in texture, low in available nitrogen, medium in phosphorus, high in potassium and slightly alkaline in reaction. The environmental conditions prevailed during research period was favorable for normal growth and maturity of soybean crop.

The experiment was laid down in split-plot design with 12 treatment combinations comprising of four varieties i.e. JS-335 (V_1), MAUS–162 (V_2), MAUS–71 (V_3) and MAUS – 158 (V_4) as main plot treatments and three fertilizer levels i.e. 75% RDF as 23.5:45:23.5 Kg ha^{-1} N, P and K_2O (F_1), 100% RDF as 30:60:30 Kg ha^{-1} N P_2O_5 and K_2O. (F_2), and 125 % RDF as 37.5:75:37.5 Kg ha^{-1} N, P_2O_5 and K_2O (F_3) as subplot treatments. Each treatment was replicated four times. The gross and net plot size of each experimental unit was 5.4 x 4.5 m^2 and 4.5 x 3.6 m^2 respectively. Sowing was done on 7th July 2012 by dibbling method. The recommended cultural practices and plant protection measures were taken. Application of fertilizer was carried out at the time of sowing. Fertilizers were applied in the form of Urea, Diammonium Phosphate and Muriate of potash.

Table 1
Yield and yield attributes of soybean genotypes as influenced by different Treatments

Treatments	*Number of pod plant-1*	*Seed weight plant-1*	*1000 seed weight*	*Seed yield (kg ha^{-1})*
Varieties (V)				
V_1 JS-335	35.44	9.40	142.77	1836
V_2 MAUS – 162	38.56	10.44	140.24	2117
V_3 MAUS-71	40.74	11.96	145.07	2415
V_4 MAUS-158	46.48	13.70	148.36	2519
S.E. ±	0.50	0.38	2.34	57.55
C.D. at 5 %	1.50	1.14	NS	172.27
Fertilizer levels (F)				
F_1 - 75 % RDF	37.26	10.16	142.63	2064
F_2 - 100 % RDF	40.60	11.62	144.12	2264
F_3 - 125 % RDF	43.06	12.35	145.57	2370
S.E. ±	0.82	0.55	3.69	67.28
C.D. at 5 %	2.48	1.66	NS	201.41
Interaction (V x F)				
S.E. ±	1.65	1.11	7.38	134.57
C.D. at 5 %	NS	NS	NS	NS
General mean	40.31	11.38	144.11	2226

Table 2
Gross and Net monetary returns (Rs ha^{-1}) and benefit: cost ratio:

Treatment	*Gross Monetary Returns Rs ha^{-1}*	*Net Monetary Returns Rs ha^{-1}*	*B:C Ratio*
Varieties (V)			
V_1 JS-335	47080	30155	1.78
V_2 MAUS – 162	54193	37268	2.19
V_3 MAUS-71	63501	47549	2.64
V_4 MAUS-158	63919	47549	2.80
S.E. ±	1298.9	1102.3	–
C.D. at 5 %	388.8.1	3299.8	–
Fertilizer levels (F)			
F_1 - 75 % RDF	52035	35949	2.23
F_2 - 100 % RDF	58772	41032	2.42
F_3 - 125 % RDF	60713	42926	2.41
S.E. ±	1181.1	906.71	–
C.D. at 5 %	3535.5	2714.2	–
Interaction (V x F)			
S.E. ±	2362.2	1813.4	–
C.D. at 5 %	7071.0	5428.4	–
General mean	57173.1	3996.9	2.35

RESULT AND DISCUSSION

Effect of Varieties

Significant variation was recorded due to different varieties concerning various yield attributes, variety MAUS–158 has recorded the highest number of pods $plant^{-1}$, maximum seed weight $plant^{-1}$ and 1000 seed weight (g) and was significantly superior over all other varieties except variety MAUS–71. The differences in seed weight were mainly due to genetic characters of the varieties under study. Anetor and Akinrinde (2006) and Sharief *et al*., (2010) found significant differences in yield attributing characters due to different varieties. The seed yield of soybean differed significantly due to different varieties used in the experiment. The variety MAUS–158 has recorded the highest seed yield (2519 kg ha^{-1}) which was significantly superior over variety MAUS–162 and JS-335 but remained at par with the variety MAUS–71. Mathu, *et al*., (2009), Sharief *et al*., (2010) and Rattiyaporn Jaidee, *et al*., (2012) reported the similar results regarding the grain yields.

From the data it was revealed that the highest gross and net monetary returns were gained by variety MAUS–158 followed by MAUS–71. On the other hand, the least amount of gross and net monetary returns were achieved with genotype JS–335. The highest B: C ratio was recorded by variety MAUS–158. The analogous results were put in to hands by Sarawgi and Rajput (2005) in respects of economic studies.

Effect of Fertilizer Levels

Significant differences in various yield attributes due to different fertilizer levels were observed. Fertilizer application of 125% RDF noted highest number of pods per plant, maximum seed weight per plant and

was found significantly superior over fertilizer level 75% RDF and on par with fertilizer level 100% RDF. The differences in fertilizer levels in respect of 1000 seed weight did not reached to the level of significance due to different fertilizers levels. The results are in line with those reported by Patil and Pawar (1996) and Zhao and Wang (1998). Application of 125% RDF produced maximum seed yield which was significantly higher than rest of the fertilizer levels under study and on par with application of 100% RDF. Application of 100% RDF was superior over 75% of RDF in respect to grain yield. Bansode (2008) and Ramesh *et al*., (2008) reported similar kind of results.

As regards to the economics, it was observed that the significantly the highest gross (Rs. 60713 ha^{-1}) and net monetary return (42926 ha^{-1}) were recorded with application of 125% RDF but it was at par with the application of 100% RDF. Among the fertilizer levels the highest B: C ratio was recorded with the application of 100% of RDF (2.42). The similar results were quoted by Ananda *et al*., (2006). The interaction effect of varieties and fertilizer levels did not reached to the level of significance.

Table 3
Mean oil content (%) as influenced by different treatments.

Treatment	*Oil Content (%)*	*Protein Content (%)*
Varieties (V)		
V_1 JS-335	20.56	40.04
V_2 MAUS – 162	20.75	39.72
V_3 MAUS-71	20.57	39.96
V_4 MAUS-158	20.54	40.28
S.E. ±	1.30	0.540
C.D. at 5 %	NS	NS
Fertilizer levels (F)		
F_1 - 75 % RDF	20.47	39.85
F_2 - 100 % RDF	20.83	39.97
F_3 - 125 % RDF	20.51	40.17
S.E. ±	0.89	1.514
C.D. at 5 %	NS	NS
Interaction (V x F)		
S.E. ±	1.79	3.029
C.D. at 5 %	NS	NS
General mean	20.61	40.002

The data furnished in Table 3 indicated that there were non significant difference in oil and protein content of soybean due to different fertilizer levels. Application of 125% RDF and 100% RDF recorded numerically higher values of oil and protein content.

REFERENCES

Ananda M. G., Ananda M. R., Reddy V. C. and Ajaykumar M. Y., (2006), Influence of different organic sources on yield and yield components and benefit: cost ratio of paddy (*Oryza sativa* L.) and groundnut (*Arachis hypogea* L.) in paddy – groundnut cropping system, *Crop Res*., **31**(3): 329-333.

Anetor M. O. and E. A. Akinrinde, (2006), Response of soybean (*Glycine max* (L.) Merrill) to lime and phosphorous fertilizer treatments on an acidic alfisol of Nigeria, *Pakistan J. Nutrition*, **5**(3): 286-293.

Bansode, (2008), Effect of organic, inorganic sources of nutrient and rain water conservation techniques on periodicity, profitability and moisture use in soybean + pigeonpea (4:2) intercropping system, M.Sc. (Agri.) *Thesis submitted to, M.K.V., Parbhani.*

Chianu J., (2006), Soybean (*Glycine max*) promotion for improved nutrition and soil fertility in small holder farms. East Africa, *Tropical Soil Bio. and Fertility Inst. of the Internat*, *Centre for Tropical Agriculture* (CIAT).

Halvankar G. B., V. M. Raut, S. P. Taware, and B. P. Patil, (1992), Production component study in soybean, *J. Maharashtra agric. Univ*., **17**(3): 326-398.

Mathu R. W., T. Nandokha T. C. Riungu, Matere S. and N. K. Bendera, (2009), The potential of soybean to increase agricultural productivity in dry areas of central Kenya, *Kenya Agric.. Res. Inst. (KARI)-Muguga South report*, *Nairobi*, 156-160.

Patil P. A. and P. V. Pawar, (1996), Response of nitrogen and phosphorus application to soybean on vertisol, *P. K. V. Res. J*., **23**(2): 129-132.

Ramesh P., N. R. Pawar, A. B. Singh,. and S. Ramana, (2008), Production potential, nutrient uptake, soil fertility and economic of soybean (*Glycine max*)-based cropping systems under organic, chemical and integrated nutrient management practices, *Indian J. Agron*, **54**(3): 278-283.

Rattiyaporn Jaidee, Anan Polthanee and Patcharee Saenjan (2012), Growth and yield of soybean cultivars as affected by ground water levels and phosphorus rates grown under greenhouse and field conditions, *Australian J. Crop Sci*., **6**(1): 81-92.

Sarawgi S. K. and R. S. Rajput, (2005), Response of soybean (*Glycine max L.* Merril) varieties to phosphorus levels in vertisols of Chhattisgarh plain, *Annals of Agric. Res*., **26**(1): 27-29.

Saxena S. C. and A. S. Chandel, (1992), Effect of Zinc fertilization on different varieties of soybean (Glycine max), *Indian J. Agric. Sci*., **62**(10): 695-697.

Sharief A. E. M., S. E. El-Kalla, A. M. Salama,. and E. I. Mostafa, (2010), Influence of organic and inorganic fertilization on the productivity of some soybean cultivars, *crop & environ*., **1**(1): 6-12.

Zhao L. X. and H. E. Wang, (1998), The effect of nitrogen, phosphorus and potassium fertilizers on growth and yield of spring soybean on newly reclaimed red soils, *Zhejiang Nongye Kexue*, **2**: 70-71.