



Research Article

Yield and economics of soybean influenced by integrated nutrient management practices

S.D. BACHHAV, S.H. PATEL AND P.K. SURYAWANSHI

ABSTRACT : Yield and economics of soybean [*Glycine max* (L.) Merrill] influenced by integrated nutrient management practices was assessed in a field experiment carried out on loamy sand soil at Agriculture Research Station Farm Derol, Anand Agricultural University, Anand, during Kharif 2010. Field experiment comprised of sixteen treatment combinations comprising four different organic manures *i.e.* No (No organic), CC (Castor cake @ 0.5 t ha⁻¹), VC (vermicompost @ 1 t ha⁻¹), and FYM (FYM @ 5 t ha⁻¹) and four different levels inorganic fertilizer *i.e.* F₀ (No RDF), F₁ (50% RDF), F₂ (75% RDF), F₃ (100% RDF) were tried in Randomized Block Design with Factorial concept and replicated four times. The FYM applied @ 5 t ha⁻¹ recorded maximum seed yield (1,908 kg ha⁻¹), haulm yield (3,588 kg ha⁻¹), gross realization, net realization with BCR than remaining treatments. Application of inorganic fertilizer @ 100 % RDF (*i.e.* 60 kg N: 30 P₂O₅: 0kg K₂O) recorded significantly higher seed yield (1,868 kg ha⁻¹), haulm yield (3,537 kg ha⁻¹), gross realization, gross realization and BCR. Significantly the higher seed yield, highest net realization of Rs. 30,815 ha⁻¹ with BCR 3.21 was recorded under the combination of FYM + 100 per cent RDF (*i.e.* FYM @ 5 t ha⁻¹ + 100 % RDF).

KEY WORDS : Economics, Inorganic, Organic, Yield, Integrated nutrient management, Soybean

How to cite this Article : Bachhav, S.D., Patel, S.H. and Suryawanshi, P.K. (2012). Yield and economics of soybean influenced by integrated nutrient management practices, *Internat. J. Forestry & Crop Improv.*, 3 (2) : 140-143.

Article Chronical : Received : 07.09.2012; Revised : 20.10.2012; Accepted : 15.11.2012

INTRODUCTION

Soybean [*Glycine max* (L.) Merrill] is known as soja bean, soya bean, chinese pea and manchurian bean which belongs to family Fabaceae, sub family Faboideae and has Eastern Asian origin. This legume is making straight way in Indian agriculture to meet protein and oil requirement. It is outstanding in its nutritive value with enhanced protein and oil content and is

also rich in vitamins, minerals, salts and other essential amino acids.

Madhya Pradesh, Maharashtra, Rajasthan, Andhra Pradesh, Karnataka and Chhatisgarh are the leading soybean growing states with an area of 53.0, 30.3, 7.1, 2.3.1.3 lakh ha, respectively. Soybean production has not only gained the vital importance in the Indian agriculture, but also plays an important role in oil economy of India as it contributes more than 10 per cent of total foreign revenue (Anonymous, 2005).

Different organic manures like castor cake, vermicompost, and FYM which resulted in greater assimilation of photosynthates and their accumulation in yield components. Careful management of nutrient resources *i.e.* organic manures and inorganic fertilizers is a application of pre-requisite for sustainable crop production in soybean. For higher production and better soil health the combined organic manures and inorganic fertilizers is required. In order to check, whether it is profitable to reduce dose of chemical fertilizers with combination

MEMBERS OF RESEARCH FORUM

Address of the Correspondence :

S.D. BACHHAV, Department of Agronomy, B.A. College of Agriculture, Anand Agricultural University, ANAND (GUJARAT) INDIA
Email : sachinb971@gmail.com

Address of the Coopted Authors :

P.K. SURYAWANSHI, Department of Agronomy, B.A. College of Agriculture, Anand Agricultural University, ANAND (GUJARAT) INDIA
Email : paoksarya0923@gmail.com

S.H. PATEL, Pulse Research Station, Anand Agricultural University, VADODARA (GUJARAT) INDIA

of organic manures to increase production of soybean, 100 per cent RDF, 75 per cent RDF and 50 per cent RDF were taken for investigation. Therefore, presents study was planned to find out the response of soybean to varying sources of organic fertilizer coupled with inorganic fertilizer, alone and their combinations, in respect of growth, yields and economics of soybean.

EXPERIMENTAL METHODS

The experiment was conducted at Agriculture Research station Farm Derol, Anand Agricultural University, Anand, during *Kharif* 2010 to study the yield and economics of soybean [*Glycine max* (L.) Merrill] influenced by integrated nutrient management practices. The soil of experimental field was loamy sand in texture having pH 7.1 and organic carbon of soil was 0.45 per cent. The fertility status of experimental field was found to be low in available P_2O_5 (26 kg ha⁻¹) and high in available K_2O (350 kg ha⁻¹) (Table A).

Table A : Physical and chemical properties of the soil of the experimental site	
Properties	Values
Mechanical composition	
Coarse sand (%)	0.90
Fine sand (%)	81.30
Silt (%)	12.45
Clay (%)	5.35
Textural class of soil	Loamy sand
Chemical composition	
EC (dsm ⁻¹)	0.12
Soil pH	7.1
Organic carbon (%)	0.45
Available P_2O_5 (kg ha ⁻¹)	26
Available K_2O (kg ha ⁻¹)	350

The experiment was laid out in Factorial Randomized Block Design with four replications. The treatments were follows : four different organic manures *i.e.* No (No organic), CC (castor cake @ 0.5 t ha⁻¹), VC (vermicompost @ 1 t ha⁻¹), and FYM (FYM @ 5 t ha⁻¹) and four different levels inorganic fertilizer *i.e.* F₀ (No RDF), F₁ (50% RDF), F₂ (75% RDF), F₃ (100% RDF).

Note :

- 100 per cent RDF is 60:30 N P, kg ha⁻¹.
- Seed was inoculated with liquid biofertilizer of *Rhizobium* and PSB @ 5ml kg⁻¹ at sowing.

The shallow furrows about 7-8 cm were opened through bullock drawn seed drill at a distance of 45 cm between two rows thereafter, the crop was fertilized with organic manure *i.e.* castor cake @ 0.5 t ha⁻¹, vermicompost @ 1 t ha⁻¹ and FYM @ 5 t ha⁻¹ as per treatment. After this the inorganic fertilizer as per treatments was applied in the form of DAP and urea in furrows

as a basal application *i.e.* before sowing in open furrow. To control the aphid's infestation Dimethoate (0.03%) was sprayed. Two interculturing and two hand weeding were carried out during the entire crop growth period.

EXPERIMENTAL RESULTS AND ANALYSIS

Experimental results should be distributed in following head :

Effect of organic manure:

Perusal of data in Table 1 indicated that the treatment FYM @ 5 t ha⁻¹ gave the significantly higher seed yield (1,908 kg ha⁻¹) and haulm yield (3,588 kg ha⁻¹) as compared to treatment castor cake and no application of organic manure. The second best treatment vermicompost was found significantly better as compared to castor cake and no application of organic manure. The later two were also differed significantly as castor cake @ 0.5 t ha⁻¹ gave higher seed yield as compared to no application further in short FYM, vermicompost and castor cake yielded, 26 per cent, 24 per cent and 13 per cent higher seed yield as compared to no application of organic manure. Its might be due to the maximum quantity of FYM decomposition, which might have supplied available plant nutrients direct to plants and created favourable soil environment, ultimately increased the nutrients and water-holding capacity of soil for longer time, which resulted in better growth, yield attributes and ultimately grain and haulm yields of soybean. These results are in close agreement with those reported by Pattanashetti *et al.* (2002). Same treatment gave maximum gross realization (Rs.40,622 ha⁻¹), net realization (Rs. 28,818 kg ha⁻¹) with BCR (3.20) than remaining treatments while, the lowest grain, haulm yield, gross realization, net realization with BCR was to recorded under treatment (N0) - No organic.

Effect of inorganic fertilizers:

Treatment F₃ (100 % RDF) gave significantly higher seed yield (1,868 kg ha⁻¹) and haulm yield (35,37 kg ha⁻¹) being statistically at par with treatment F₂ (75 % RDF). The second best treatment F₂ (75 % RDF) was found significantly better as compared to F₁ (50 % RDF) and F₀ (No RDF). The later two were also differed significantly. F₁ (50 % RDF) gave higher seed yield as compared F₀ (No RDF), further in short 100 per cent RDF, 75 per cent RDF and 50 per cent RDF yielded 19 per cent, 17 per cent and 10 grain yield under higher level of recommended dose of fertilizer, resulted in higher rate of dry matter accumulation in terms of plant height and might be the leaf area per plant by increased translocation towards yield attributing characters and water from the deeper soil layers for higher photosynthetic activity and translocation of photosynthates to the sink which might led significant increase in higher grain yield and haulm yield under higher level of

Table 1 : Effect of nutrient management practices on yield and economics of soybean

Treatments	Grain yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)	Gross realization (Rs. ha ⁻¹)	Total cost of cultivation (Rs. ha ⁻¹)	Net realization (Rs. ha ⁻¹)	BCR
Organic manure						
(N0) - No organic	1516	3030	32361	9054	23162	3.35
(CC)- Castor cake @ 0.5 t ha ⁻¹	1716	3261	34887	11954	22934	2.72
(VC)Vermicompost @ 1 t ha ⁻¹	1883	3538	40088	12304	27784	3.03
(FYM)-FYM @ 5 t ha ⁻¹	1908	3588	40622	11804	28818	3.20
S. E. ±	36.86	74.22	-	-	-	-
C.D. (P=0.05)	105.007	211.41	-	-	-	-
Inorganic manure						
(F ₀) - No RDF	1573	3139	33580	10250	23185	3.10
(F ₁) - 50% RDF	1735	3255	36930	11181	25749	3.09
(F ₂) - 75% RDF	1846	3486	37656	11622	26034	3.03
(F ₃) - 100% RDF	1868	3537	39793	12062	27731	3.08
S.E. ±	36.86	74.22	-	-	-	-
C.D. (P=0.05)	105.007	211.41	-	-	-	-
Interaction effect (O x I)	Sig.	NS				
C.V. %	8.40	8.85				

(Sig.: Significant) (NS: Non-significant)

Table 2 : Seed yield influenced by interaction of organic manure and inorganic fertilizer

Organic manures	Inorganic fertilizer			
	(F ₀) No RDF	(F ₁) 50% RDF	(F ₂) 75% RDF	(F ₃) 100% RDF
(N0) No organic	1500	1514	1515	1535
(CC) Castor cake @ 0.5 t ha ⁻¹	1531	1545	1871	1916
(VC) Vermicompost @ 1 t ha ⁻¹	1629	1939	1983	1981
(FYM) FYM @ 5 t ha ⁻¹	1632	1941	2017	2042
S. E. ±			36.866	
C.D. (P=0.05)			105.007	

Table 3 : Seed yield (kg ha⁻¹), haulm yield (kg ha⁻¹), gross realization (Rs. ha⁻¹), total cost of cultivation (Rs. ha⁻¹), net realization (Rs. ha⁻¹) and BCR as influenced by different treatments

Treatments	Seed yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)	Gross realization (Rs. ha ⁻¹)	Total cost of cultivation (Rs. ha ⁻¹)	Net return (Rs. ha ⁻¹)	BCR
T ₁ : NO + FO	1500	2756	31903	8493	23410	3.76
T ₂ : NO + 50 % RDF	1514	2848	32234	9653	23240	3.34
T ₃ : NO + 75 % RDF	1514	3260	32440	10126	23006	3.20
T ₄ : NO + 100 %RDF	1535	3256	32865	10599	22991	3.10
T ₅ : CC + NO RDF	1531	3021	32666	11766	21704	2.78
T ₆ : CC + 50 % RDF	1545	3064	32973	12712	21129	2.59
T ₇ : CC + 75 % RDF	1545	3419	33150	13185	20866	2.51
T ₈ : CC + 100 % RDF	1916	3540	40761	13658	28036	2.98
T ₉ : VC + NO RDF	1629	3335	34818	12142	23505	2.87
T ₁₀ : VC + 50 %RDF	1939	3513	41215	13088	29022	3.15
T ₁₁ : VC + 75 % RDF	1983	3619	42164	13561	29529	3.11
T ₁₂ : VC + 100% RDF	1981	3683	42155	14033	29080	3.00
T ₁₃ : FYM + NO RDF	1632	3442	34932	11605	24120	3.01
T ₁₄ : FYM + 50% RDF	1941	3596	41297	12551	29604	3.29
T ₁₅ : FYM + 75 %RDF	2017	3645	42868	13024	30734	3.29
T ₁₆ : FYM + 100 RDF	2042	3670	43390	13497	30815	3.21

recommended dose of fertilizer which might have due to more vegetative growth resulting utilization of nutrient, water, solar radiation and increase in metabolic activity and root development have produced maximum dry matter production. Similar results were also reported by Pattanashetti *et al.* (2002)

The same treatment also gave highest gross realization Rs. 39,793 ha⁻¹ net realization of Rs. 27,731 ha⁻¹ with BCR 3.08; and ranked first which was followed by treatment (F₂) - 75 per cent RDF. The treatment (F₁) - 50 per cent RDF also recorded maximum value of net return and was found more economic.

The lowest grain, haulm yield, gross realization, net realization with BCR was to be found under (F₀) - No RDF (Control) treatment.

Interaction effect:

Interaction data given in Table 2 indicated that treatment combination (FYM @ 5 t ha⁻¹ + 100% RDF) recorded significantly higher seed yield (2,042 kg ha⁻¹) of soybean as compared to the rest of the treatment combinations, however, it was found at par with the treatment combinations FYM @ 5 t ha⁻¹ + 75 % RDF, FYM @ 5 t ha⁻¹ + 50 % RDF, Vermicompost @ 1t ha⁻¹ + 75 % RDF, Vermicompost @ 1t ha⁻¹ + 100 % RDF, FYM @ 5 t ha⁻¹ + 50 % RDF and Vermicompost @ 1t ha⁻¹ + 50 % RDF. The lowest seed yield (1500 kg ha⁻¹) was recorded under the treatment combination (No organic + No RDF). It might be due to remarkable improvement in the yield attributing characters *viz.*, number of pods per plant, number of seeds per pod, pod length and seed index by the combination of organic and inorganic fertilizer. The results are in conformity with the

findings of Patel *et al.* (1996).

Maximum haulm yield 3,670 kg ha⁻¹ gross realization Rs. 43,390 ha⁻¹, net realization of Rs. 30815 ha⁻¹ with BCR of 3.21 was obtained from the treatment combination FYM @ 5 t ha⁻¹ + 100 per cent RDF in inorganic fertilizer. The second best treatment was FYM @ 5 t ha⁻¹ + 75 per cent RDF in inorganic fertilizer with the value of 30,734 Rs ha⁻¹ with BCR 3.29 represented in Table 3.

The higher monetary net return under treatment combination FYM 100 per cent RDF was mainly on account of more seed and haulm yields and favourable response of soybean to the organic results are in conformity with the findings of Manral *et al.* (2001).

REFERENCES

- Anonymous (2005). *Monthly review* of the Indian Economy (CMIE). Andheri (East), Mumbai, **15** (6): 17-34.
- Manral, H. S., Saxena, S. C. and Chandel, A. S. (2001). Effect of inorganic and organic sources of nutrients on soybean (*Glycine max*). *Indian J. Agron.*, **46**(1): 135-140.
- Patel, S.R., Naik, M.L and Chandravanshi, B.R. (1992). Effect of nitrogen and phosphorus levels on growth, yield and protein content of soybean. *J. Oilseed Res.*, **9** (2): 202-208.
- Pattanashetti, V.A., Agasimani, C.A. and Babalad, H.B. (2002). Effect of organic and fertilizer levels on growth, yield and yield attributes of soybean intercropped with maize in northern transitional tract of Karnataka. *J. Oilseed Res.*, **19**(1):113- 114.
