Research Paper

ADVANCE RESEARCH JOURNAL OF
C R P
IMPROVEMENT
Volume 4 | Issue 1 | June, 2013 | 70-73

Soil fertility and quality parameter as inluenced by INM in soybean grown during summer season under different land configuration

■ P.B. SHINDE[1], D.R. PRAJAPATI[1], SHAUKAT ALI[2] AND S.D. MUNDE[2]

AUTHORS' INFO

Associated Co-author :
[1]Department of Agronomy, N. M. College of Agriculture Navsari Agricultural University, NAVSARI (GUJARAT) INDIA

Associated Co-author :
[2]Department of Agronomy, C.P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, SARDARKRUSHINAGAR (GUJARAT) INDIA

Author for correspondence :
SHAUKAT ALI
Department of Agronomy, C.P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University SARDARKRUSHINAGAR (GUJARAT) INDIA
Email : shaukatagri@gmail.com

ABSTRACT : A field experiment was conducted during summer season of 2011 at the soil and water management research unit farm, Navsari Agricultural University, Navsari to study the soil fertility and quality parameter as inluenced by inm in soybean (*Glycine max*.L) grown during summer season under different land configuration. The soil of the experimental plot was clayey in texture, low in nitrogen, medium in available phosphorus, fairly rich in available potassium and slightly alkaline in reaction. Total eight treatment combinations comprising of two land configuration treatments (L_1: Raised bed, L_2: Flat bed) and two treatments of integrated nutrient management (N_1: RDF 30:60:00 NPK kg/ha, N_2: 75% RDF+ (PSB + *Rhizobium*) and two treatments of biocompost (B_0: No biocompost $B_{1:}$ Biocompost @ 10 t/ha) were evaluated in factorial Randomized Block Design with four replications. The soybean cv. Gujarat soybean-2 was used as test crop. A remarkable increase in nitrogen uptake in stover and phosphorus content in stover were recorded in raised bed sowing. Organic carbon also significantly increased due to raised bed sowing. The treatment 75 % RDF + biofertilizer (*Rhizobium* and PSB) recorded significantly higher N content and uptake by seed and stover. Though it was found to be non significant in N, P and K content and uptake by seed and stover. The treatment 75 % RDF + biofertilizer (*Rhizobium* and PSB) recorded significantly higher organic carbon content (0.62). Oil yield, organic carbon and soil available nutrients were significantly higher in biocompost application. Oil and protein, N, P and K content and N, P, K uptake in seed and stover remained unaffected by biocompost application. Remarkably higher N uptake in stover was significantly increased with biocompost application.

Key Words : N uptake, Land configuration, Biocompost

How to cite this paper : Shinde, P.B., Prajapati, D.R., Ali, Shaukat and Munde, S.D. (2013). Soil fertility and quality parameter as inluenced by INM in soybean grown during summer season under different land configuration, *Adv. Res. J. Crop Improv.,* **4** (1) : 70-73.

Paper History : Received : 04.04.2013; **Revised :** 22.04.2013; **Accepted :** 21.05.2013

Soybean [*Glycine max* (L.) Merrill] belongs to the family Fabaceae. The wild ancestor of the soybean is *Glycine soja* (previously called *G. ussuriensis*), a legume native to central China. It is considered as the 'miracle crop or wonder legume'. The potential of soybean crop to augment protein and oil production has been well recognized in the recent years. The productivity of this crop is nearly 2-3 times higher than traditional pulses. Due to several merits, its cultivation has gained momentum in several states of the country. However, its productivity remained still lower in spite of higher potential of the crop. The factors responsible for the low yield are poor management and injudicious use of nutrients.

Land configuration can play an important role for easy and uniform germination as well as growth and development of plants. It is particularly useful in areas having poor quality of irrigation water because it helps to avoid direct contact of young plants with saline irrigation water. The superiority of raised bed system could be ascribed to proper drainage of excess water coupled with adequate aeration at the time of irrigation or heavy rainfall.

Among the several factors, nutrient management is one of the most crucial factors responsible for high productivity of soybean. The basic concept of integrated nutrient management is the maintenance or adjustment of soil fertility and to supply plant nutrient at an optimum level for sustaining the desired crop productivity through optimization of the benefits from all possible sources of plant nutrient in an integrated manner. The role of biocompost is well recognized, which supplies macro and micro nutrients that are necessary for plant growth. It also develops a sustainable agriculture system by maintaining soil

fertility and providing stability to the production without polluting the soil, water and air (Subba Rao, 1994).

Besides mineral nutrition, biofertilizers also play an important role in the soybean production as these are eco-friendly, low-cost, non-bulky agricultural inputs. *Rhizobium japonicum* has an enormous potential to fix atmospheric nitrogen, while phosphate solubilizing bacteria has capacity to solubilize and mobilize phosphorus that is present in non available form in the soil (Menaria and singh, 2004).

In view of paucity of information in respect of the effect of land configuration biofertilizers and biocompost, there is need to work out the level of fertilizer with bioinoculant, biocompost and configuration technique for soybean crop. Therefore, this experiment was planned during summer season of 2011.

RESEARCH PROCEDURE

A field experiment was conducted during summer season of 2011 at the Soil and Water Management Research Unit Farm, Navsari Agricultural University, Navsari to study the soil fertility and quality parameter as inluenced by inm in soybean grown during summer season under different land configuration. The soil of the experimental plot was clayey in texture, low in nitrogen, medium in available phosphorus, fairly rich in available potassium and slightly alkaline in reaction. Total eight treatment combinations comprised of two land configuration treatments *viz.*, raised bed and flat bed and two treatments of integrated nutrient management *viz.*, RDF 30:60:00 NPK kg/ha and 75% RDF+ (PSB + *Rhizobium*) and two treatments of biocompost *viz.*, no biocompost and biocompost @ 10 t/ha were evaluated in factorial Randomized Block Design with four replications. The soybean cv. Gujarat Soybean-2 was used as test crop. The weather conditions prevailed during the entire crop growth period was congenial for the normal growth and development of soybean. No severe incidence of diseases and pest were observed during the entire crop growth period. Representative samples from seed and stover were taken separately for the estimation of N, P and K content from each treatment from all the four replications. The samples were sun dried for a week and oven dried at 65^0C temperature for 24 hours and grounded to powder by mechanical grinder. Seed and stover samples were digested in diacid mixture. The extract prepared after digestion was used for estimation of N, P and K content as per following methods.

Nutrients content	Method	Reference
Nitrogen	Modified Kjeldahl's method	Jackson (1967)
Phosphorus	Olsen's method	Jackson (1967)
Potassium	Flame photometric method	Jackson (1967)

The uptake values of nitrogen (N), phosphorus (P) and potassium (K) for seed /stover were out by following formula:

$$\text{Nutrient uptake (kg/ha)} = \frac{\text{Nutrient content in seed / stover (\%) x Seed / stover yield (kg/ha)}}{100}$$

Protein content was obtained by multiplying N content with 6.25 (Bhuiya and Chowdhary, 1974). Oil content of seed was determined by using nuclear magnetic ressonance (NMR) instrument as per the method suggested by Tiwari *et al.* (1974). For oil content study, a sample of 25 g was drawn from net plot of each treatment in all replications.

RESEARCH ANALYSIS AND REASONING

The results of the present study as well as relevant discussions have been presented under following sub heads:

Effect of land configuration :

Effect on nutrient content and uptake :

Significantly higher N uptake by stover, P content in stover and P uptake by both seed and stover were recorded under raised bed over flat bed sowing. Higher N uptake in stover (35.28 %) and P content in stover (0.092 %) and P uptake in seed and stover (7.62% and 2.03%) by soybean (Table 1).

This might be attributed to better root growth due to better aeration and good soil air movement might have also increased microbial activity with optimum moisture and nutrient availability for its growth.

Effect on seed quality :

Oil content, oil yield and protein content in soybean seed did not differ significantly due to land configuration (Table 2).

Effect of integrated nutrient management :

Effect on nutrient content and uptake and seed quality :

Application of 100 per cent RDF and 75 % RDF + biofertilizers equally effective in nutrient response as these two levels did not significantly influence on the oil content, nutrient content and uptake except N and protein content in stover. The results are supported by (Rana *et al*., 1998, Singh *et al.*, 2009).

Effect of biocompost :

Effect on nutrient content and uptake :

The production of photosynthates and their translocation to sink depends largely on the adequate supply of mineral nutrients from the soil. The variations in nitrogen, phosphorus and potassium content and uptake due to biocompost application was numerically higher which might be attributed to their inherent capacity to supply these nutrients during the crop growth period and in turn influenced the nutrients uptake by the crop.

Table 1 : N, P. K content and uptake in seed and straw of summer soybean as influenced by land configuration, INM and biocompost

Treatments	N content (%)		N uptake (kg/ha)		K content (%)		K uptake (kg/ha)		P content (%)		P uptake(kg/ha)	
	Seed	Stover	Seed	Stover	Seed	Stover	Seed	Stover	Seed	Stover	Seed	Stover
Land configurations (L)												
L_1 = Raised bed	6.28	1.60	73.26	35.28	1.320	0.376	15.51	8.24	0.639	0.092	7.62	2.03
L_2 = Flat bed	6.47	1.57	71.25	31.75	1.328	0.381	14.63	7.69	0.625	0.079	6.90	1.60
S.E.±	0.068	0.019	1.369	0.929	0.015	0.004	0.350	0.197	0.007	0.001	0.219	0.056
C.D. (P=0.05)	NS	NS	NS	2.731	NS	NS	NS	NS	NS	0.0029	0.645	0.165
Integrated nutrient management (INM)												
N_1 = RDF(30:60:00 NPK kg ha^{-1})	6.41	1.53	72.39	32.18	1.346	0.385	15.25	7.99	0.630	0.084	7.25	1.76
N_2 = 75% RDF + Biofertilizers	6.33	1.63	72.12	34.85	1.303	0.373	14.89	7.94	0.635	0.087	7.27	1.86
S.E.±	0.068	0.019	1.369	0.929	0.015	0.004	0.350	0.197	0.007	0.001	0.219	0.056
C.D. (P=0.05)	NS	0.056	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Biocompost (B)												
B_0 = No Biocompost	6.44	1.58	70.73	32.09	1.319	0.377	14.50	7.71	0.641	0.085	7.06	1.73
B_1 = Biocompost	6.31	1.59	73.78	34.95	1.330	0.380	15.63	8.22	0.624	0.086	7.46	1.90
S.E.±	0.068	0.019	1.369	0.929	0.015	0.004	0.350	0.197	0.007	0.001	0.219	0.056
C.D. (P=0.05)	NS	NS	NS	2.731	NS	NS	1.030	NS	NS	NS	NS	NS
Interaction												
L x B	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
L x N	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
N x B	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
L x N x B	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	4.29	4.86	7.58	11.08	4.59	4.48	9.30	9.87	4.26	4.75	12.09	12.40

NS=Non-significant

Table 2 : Available nutrients, O.C., protein content, oil content and oil yield in soil of summer soybean as influenced by land configuration, integrated nutrient management and biocompost

Treatments	Available nutrient kg/ha			Organic carbon (%)	Protein content (%)		Oil content (%)	Oil yield (kg/ha)
	N	$P_2 0_5$	$K_2 0$		Seed	Stover		
Land configurations (L)								
L_1 = Raised bed	250	40	333	0.62	39.23	9.98	19.16	228.71
L_2 = Flat bed	255	40	328	0.59	40.44	9.79	18.90	208.96
S.E.±	2.44	0.44	3.44	0.01	0.427	0.120	0.233	7.382
C.D. (P=0.05)	NS	NS	NS	0.02	NS	NS	NS	NS
Integrated nutrient management (INM)								
N_1 = RDF(30:60:00 NPK kg ha^{-1})	246	40	328	0.59	40.09	9.57	19.32	223.28
N_2 = 75% RDF + Biofertilizers	248	40	333	0.62	39.58	10.20	18.74	214.39
S.E.±	2.44	0.44	3.44	0.01	0.427	0.120	0.233	7.382
C.D. (P=0.05)	NS	NS	NS	0.02	NS	0.353	NS	NS
Biocompost (B)								
B_0 = No Biocompost	244	39	325	0.60	40.24	9.86	18.69	205.51
B_1 = Biocompost	251	41	336	0.62	39.42	9.91	19.37	232.16
S.E.±	2.44	0.44	3.44	0.01	0.430	0.120	0.233	7.382
C.D. (P=0.05)	7.18	1.28	10.11	0.02	NS	NS	NS	21.710
Interaction								
L x B	NS	NS	NS	NS	NS	NS	NS	NS
L x N	NS	NS	NS	NS	NS	NS	NS	NS
N x B	NS	NS	NS	NS	NS	NS	NS	NS
L x N x B	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	3.94	4.35	4.16	4.74	4.29	4.86	4.90	13.49

NS=Non-significant

Effect on seed quality :

Protein content in seed and stover was not affected significantly by biocompost treatments. Oil content was not affected significantly due to biocompost application. This might be because of the fact that the oil biosynthesis was complex process whereas, the treatment biocompost produced significantly higher oil yield over no biocompost. The increase in oil yield was mainly due to cumulative effect of seed yield of oil content in seed.

Nutrient status of soil after harvest of soybean crop :

Soil available N.P_2O_5 and K_2O :

The soil available N, P_2O_5 and K_2O were not significant due to land configuration and INM treatments. However, incorporation of biocompost @ 10 t/ha significantly increased the soil available nutrients. The soil available nitrogen and potassium content higher in biocompost treatment which is mainly due to slow release of nutrients through manures and maintaining the availability of the nutrient in soil. The soil available phosphorus content was significantly higher in biocompost. This may be due to biocompost contain sufficient amount of sulphur, further in soil incorporation it produce weak sulphuric acid, which increase the availability of applied as well as native available phosphorus.

Organic carbon :

The organic carbon content of soil was significantly influenced by land configuration, INM and biocompost treatments. This was possible due to land configuration and INM treatments. Provide better aeration and microbial activity which resulted in better root growth, further residues remain in soil decomposed and improve the soil organic carbon whereas addition of organic matter through partially decompose biocompost remain long term in soil and resulted in enhanced organic carbon in soil.

LITERATURE CITED

Bhuiya, Z.H. and Chowadhry, S.O. (1974). Effect of N,P,K and S on the protein and oil content of groundnut grown in Bharahmaputra flood plain soil. *Indian.J.Agric.Sci.*, **44**(11):751-754.

Jackson, M.L. (1967). *Soil chemical analysis.* Published by prentice Hall of India Pvt. Ltd., NEW DELHI, INDIA.

Menaria, B.L. and Singh, P. (2004). Effect of chemical and biofertilizers on yield attributing characters and yield of soybean [*Glycine max* (L.) Merril]. *Leg. Res.*, **27** (3): 231-232.

Rana, N.S., Singh, G. V. and Ahlawat, I. P. S. (1998). Effect of nitrogen *Rhizobum* inoculation and phosphorus on root nodulation, dry matter yield nutrient uptake in pigeonpea (*Cajanus cajan*). *Indian J. Agron*., **43** (1):102-105.

Singh, S.R., Singh, U. and Singh, J.K. (2009). Effect of bioinoculants and FYM on growth, yield and quality of soybean (*Glycine max*) under rain fed conditions of Kashmir valley. *Ann. Agric. New series*, **30** (3&4): 87-90.

Subba Rao, I.V. (1994). Integrated nutrient management for sustainable productivity of oilseed in India. In: MVR Prasad *et.al* Ed. Sustainability in oilseeds. Indian Soc.Oilseed Res., 264-270.

Tiwari, P. N., Gambher, P. N. and Rajan, T. S. (1974). Rapid and non-destructive determination of oil in oilseeds. *J. Oil Chem .Sci*., **51**:10-49.

****