

## Effect of Integrated Nutrient Management and Mulching on Growth and Yield of Soybean [*Glycine max* (L.) Merrill] in Clay Loam Soil

R.C. JAIN

Rafi Ahmed Kidwai college of Agriculture (RVSKVV) Sehore 466001 (M.P) India.

<http://dx.doi.org/10.12944/CWE.10.2.40>

(Received: June 29, 2015; Accepted: August 06, 2015)

### ABSTRACT

The present experiment was laid out in a randomized block design consisted of 6 treatments. Taking the JS 95-60 as test variety in clay loam soil. Analysis of soil and plant samples was done as per standard methods. The present experiment was laid out in the field No.52 at Research Farm of R. A. K. College of Agriculture, Sehore (M.P.) during *Kharif* season, 2013 & 2014. The experimental site having fairly uniform topography with normal fertility status. The effect of integrated nutrient management and mulching on plant height was noticed non significant. However, branches per plant, Root length/ plant (cm), Dry weight/ plant (g), Pods/plant(no), Seed index(g), and Grain yield(kg/ha) were found to increase significantly due to the application of 50% RDF + ZnSO<sub>4</sub> @ 25 kg/ha + V.C. 1.5t/ha + B.F.+ A.M. + Mulching(T<sub>6</sub>) followed by treatment T<sub>4</sub> and T<sub>5</sub> (Table 3) over other treatments. The such increase in soybean growth and yield was attributed to the increase in availability of nutrients with application of inorganic fertilizer.

**Key words:** Integrated nutrient management, mulching, growth, yield, clay loam soil

### INTRODUCTION

Soybean being a high protein and energy crop and its productivity is often limited by the low availability of essential nutrients or imbalanced nutrition. Farming is one of the important constraints to soybean productivity in India. Hence a balanced nutrients application is must to harness the potential productivity of the crop. Integrated nutrient management (INM) involves the use of manures, bio-fertilizers and chemical fertilizers to achieve sustained crop production and maintain better soil health. INM is best approach for better utilization of resources and to produce crop with less expenditure.

Considering these points in view, the present study was initiated to know the "effect of integrated nutrient management and mulching on growth and yield of soybean [*Glycine max* (L.) Merrill] in clay loam soil"

### MATERIALS AND METHODS

The present experiment was laid out in a randomized block design consisted of 6 treatments. Taking the JS 95-60 as test variety in clay loam soil. Analysis of soil and plant samples was done as per standard methods. The present experiment was laid out in the field No.52 at Research Farm of

R. A. K. College of Agriculture, Sehore (M.P.) during *Kharif* season, 2013 & 2014 The experimental site having fairly uniform topography with normal fertility status.

#### Climate and weather condition

Sehore is situated in the eastern part of the Vindhyan plateau in subtropical zone at the 27°12' North latitude and 77°05' East longitude at an altitude of 498.77m above mean sea level in Madhya Pradesh. The average annual rainfall varies from 1000-1200mm, concentrated mostly from June to September. The mean annual maximum and minimum temperature are 31.16°C and 18.5,

respectively. The summer months are hot and May is the hottest month having maximum temperature up to 45.60, winter months experienced mild cold with an average temperature from 16.56 to 8.74. December is the coldest month as temperature reaches up to 1.0.

The weekly meteorological data viz. rainfall, temperature, relative humidity and no. of rainy days during crop season were recorded at meteorological observatory, R.A.K. College of Agriculture, Sehore. The meteorological data are presented in Table 3.1 and depicted in Figure 1.

**Table1: Metrological data during crop season-2013-14(mean value)**

Month	Standard week No.	Dates	Temperature (°C)		Relative humidity (%)	Rainfall (mm)	Number of rainy days
			Max.	Min.			
June	23	4-10	35.6	24.7	76.1	44.6	3
	24	11-17	30.9	23.6	70.5	76.8	6
	25	18-24	29.6	23.6	69.4	36.5	4
	26	25-01	28.1	23.1	67.7	312.2	4
	Average		31.05	30.29	70.6	470.1	17
July	27	02-08	27.6	22.7	67.1	82	3
	28	09-15	28.3	23.6	67.8	120.5	4
	29	16-22	26.6	23.3	66.1	85	3
	30	23-29	27.3	23.1	67.0	176.6	7
	Average		27.5	23.1	67.0	464.1	17
August	31	30-05	26.9	23.0	66.5	120	4
	32	06-12	26.6	22.7	66.1	37	2
	33	13-19	28.2	23.1	67.8	33.5	3
	34	20-26	25.3	22.5	64.8	287.5	6
	35	27-02	28.5	21.9	68.1	4.0	1
	Average		27.1	22.64	66.66	482	16
September	36	03-09	30.4	21.3	70.0	2	1
	37	10-06	36.7	23.2	73.3	0	0
	38	17-23	31.9	22.7	71.4	111.5	2
	39	24-30	29.2	21.5	68.8	0	0
	Average		32.05	22.1	70.8	113.5	3
October	40	01-07	27.9	20.9	67.6	9	3
	41	08-14	28.5	21.3	69.6	8	2
	42	15-21	31.9	18.7	72.3	0	0
	43	22-28	30.2	17.0	69.4	0	0
	Average		29.6	19.4	69.72	17	5
				G.T.	1546.7	58	

Source: Meteorological observatory, R.A.K. College of Agriculture, Sehore (M.P.)

**It is evident from the data that rainfall pattern during the *Kharif* season of 2013 was not normal**

Table 3.1 indicates that during the crop season total rainfall concentrated in 58 rainy days from June to October. The rainfall of 470.1 mm was received in the month of June in 17 rainy days with an average humidity of 70.6 per cent was recorded. The rainfall of 464.1 mm was recorded in 17 rainy days in the month of July with an average relative humidity of 67 per cent. During August 482.0 mm rainfall was received in 16 rainy days with an average relative humidity of 66.66 per cent. While in September 113.5 mm rainfall was recorded in 3 rainy days with an average relative humidity of 70.8 per cent. During October 17 mm rainfall was received in 5 rainy days with an average relative humidity of 69.72 percent

The soil of the experimental field was clay loam in texture, fairly deep having a slight slope from west to east, which in turn provides good drainage.

To access the initial soil fertility status, soil samples to a depth of 0-30 cm were taken from randomly selected spots covering the entire experimental area with the help of soil augur before sowing. The samples thus collected were analysed for various chemical tests in the soil-testing laboratory of department of soil science and

agricultural chemistry, college of agriculture, Sehore. The analysed values are presented in table 2: -

**Physico- Chemical properties of experimental field**

In order to find out the inherent fertility status of the experimental field, representative soil samples were collected from the experimental field. Soil samples were taken randomly with the help of auger up to a depth of 0-30 cm after the land preparation but prior to sowing of soybean. The samples were air dried, sieved through 2 mm sieve and used for chemical analysis. The initial soil samples were analysed as per standard procedures and contain the following status of available nutrients the available N was low (215.60 kg/ha), P was medium (16.5kg/ha), K was high (423.24kg/ha), and available S was Normal (10.2ppm). Therefore the recommended dose of fertilizer (RDF) were maintained on the basis of initial status of available nutrients in the experimental soil to carry out the present investigation. Accordingly as per RDF 20:60:20:20kg/ha each of nutrients nitrogen phosphorus, potassium and sulphur were applied.

**RESULTS AND DISCUSSION**

The effect of integrated nutrient management and mulching on plant height was noticed non significant. However, branches per plant, Root length/ plant (cm), Dry weight/ plant

**Table 2 : Organic Carbon -0.43 (low), Available nitrogen (Kg/ha-(low)**

S. No.	Particulars	Content	Level	Method adopted
1.	Organic carbon (%)	0.43	Medium	Walkely and Black Method(1934)
2.	Available Nitrogen(N kg/ha)	215.60	Low	Modified alkaline Permanganate method (Subbiah and Asija 1956)
3.	Available Phosphorus( $P_2O_5$ kg <sup>-1</sup> )	16.50	Medium	Olsen's extractant colorimetric method (Olsen's <i>et al.</i> , 1954)
4.	Available Potassium( $K_2O$ kg <sup>-1</sup> )	423.24	High	Neutral normal Ammonium acetate (Toth and Prince, 1949)
5.	Available Sulphur(ppm)	10.2	Normal	Turbidimetric Methods (Chesnin and Yien, 1951)
6.	Soil pH	7.6	Normal	By pH meter using 1:2.5 soil: water extract as described by (Jackson, 1973)
7.	Electrical conductivity(dSm <sup>1</sup> )	0.32	Normal	By conductivity meter as described by (Jackson, 1973 )

Table 3:

S. no	Treatments	Growth Parameters at maturity of soybean (mean of two years)						
		Plant height(cm)	Branches/ plant	Root length/ plant (cm)	Dry weight/ plant (g)	Pods/ plant(no)	Seed index(g)	Grain yield (kg/ha)
T <sub>1</sub>	Absolute control	44.50	2.56	21.25	5.80	16.88	9.76	658.00
T <sub>2</sub>	Farmer's practice(50kgDAP/ha)	47.24	3.07	23.50	6.28	18.75	10.08	796.00
T <sub>3</sub>	RDF+ ZnSO <sub>4</sub> @25 kg/ha+ A.M. (1.0g/kg seed)	54.90	3.62	26.03	8.58	22.48	10.72	1067.00
T <sub>4</sub>	RDF+ ZnSO <sub>4</sub> @25 kg/ha.+B.F.+ A.M	56.23	4.35	30.00	10.43	24.13	11.06	1120.00
T <sub>5</sub>	50%RDF+ ZnSO <sub>4</sub> @25 kg/ha.+FYM	55.50	4.10	29.65	10.13	23.75	10.95	1091.00
T <sub>6</sub>	2.5 t/ha +BF+ A.M. + Mulching	58.50	4.70	31.95	11.80	24.41	11.18	1364.00
	50% RDF + ZnSO <sub>4</sub> @25 kg/ha+ V.C. 1.5t/ha + BF+ A.M. + Mulching.	3.35	0.20	0.77	0.22	0.62	0.15	90.60
	SEm±	NS	0.62	2.31	0.66	1.87	0.44	273.00
	CD at 5%							

(g), Pods/plant(no), Seed index(g), and Grain yield(kg/ha) were found to increase significantly due to the application of 50% RDF + ZnSO<sub>4</sub>@25 kg/ha+ V.C. 1.5t/ha + B.F.+ A.M. + Mulching(T<sub>6</sub>) followed by treatment T<sub>4</sub> and T<sub>5</sub> ( Table 3) over other treatments. The such increase in soybean growth and yield was attributed to the increase in availability of nutrients with application of inorganic fertilizer, Therefore, continuous supply of macro and micro nutrients from vermicompost, in the soil was maintained which might helped in acceleration of various metabolic processes viz., photosynthesis, energy transfer reaction and symbiotic biological N-fixation process. And mineralization occurred and hence such response. However, these results are also in close agreement with the findings of Singh and Kumar(2012), and Konthoujam *et al.*(2013)

#### ACKNOWLEDGEMENT

Author is also gracefully Acknowledge the direct or indirect help received from H.S., Department of Soil Science & Agricultural Chemistry , RAK College Of Agriculture Sehore, MP, India and Mr. Ashish Thakur my dear student who was here at the then span.

#### CONCLUSION

The application of 50% RDF + ZnSO<sub>4</sub>@25 kg/ha+ V.C. 1.5t/ha + B.F.+ A.M. + Mulching(T<sub>6</sub>) followed by treatment T<sub>4</sub> and T<sub>5</sub> was found to the beneficial for enhancing the soybean production in clay loam soil of M.P. , India.

#### REFERENCES

1. Chesnin, L. and Yien, C. Turbidimetric determination of available sulphates. *Soil Sci. Soc. of America Proceedings* **15**, 149-151 (1951).
2. Jackson, M. L. , Soil Chemical Analysis, *Prentice Hall of India Pvt. Ltd.*, New Delhi (1973).
3. Konthoujam, N. D; Tensubam, B. S; Athokpam, H.S; Naorem, B.S. and Diana Shamurailatpam1, Influence of inorganic, biological and organic manures on nodulation and yield of soybean (*Glycine max* L. Merrill ) and soil properties. *Australian J. Crop Sci.*

- 7(9): 1407-1415 (2013).
4. Olsen, S.R., Cole, C.V. Watanabe F.S. and Dean ,L.A. Estimating of available phosphorus in soil by extraction with sodium bicarbonate *USDA Circular.*, **939** (1954).
  5. Singh M., and Narendra Kumar, Effect of FYM, vermicompost, vermiwash and NPK on growth, microbial biomass and yield of soybean. *Soybean Res.* **10**:60-66 (2012).
  6. Subbiah, B.V. and G.L. Asija, A rapid method for the estimation of available nitrogen in soil. *Current Sci.* (**25**): 259-260 (1956).
  7. Toth, S.J. and Priece, A.L. Estimation of CEC and exchangeable calcium , potassium and sodium contents of soil by flame photometer techniques .*Soil Sci.* **67**:439-445 (1949).
  8. Walkley, A. and Black C.A. Estimation of soil organic carbon by the chromic acid titration method. *Soil Sci.* **37** (1): 29-38 (1934).