

# INTERACTION EFFECT OF METHOD AND DEPTH OF SOWING ON GROWTH AND YIELD CHARACTERS OF SOYBEAN (*GLYCINE MAX*)

Ashish Kumar Chandrakar\*, Chandresh Kumar Chandrakar, Chetan Kumar Dewangan and Deepshikha Manu

Department of Agronomy, Jawahar Lal Nehru Krishi Vishwavidyalaya, Jabalpur, 482004  
(Madhya Praesh), India

\*Email of corresponding author - chandrakar22@gmail.com

**Abstract:** The field experiment was conducted during *khariif* season of 2008-09 at Research Farm of Jawahar Lal Nehru Krishi Vishwavidyalaya, Jabalpur, College of Agriculture, Indore for evaluating the interaction effect of method and depth of sowing on growth and yield characters of soybean [*Glycine max* (L.) Merrill.]. Ridge method of sowing and 5 cm depth of sowing (M<sub>1</sub>D<sub>2</sub>) showed promising effect on growth parameters and yield attributes with 30 cm x 10 cm planting geometry of soybean over rest of the treatments. Thus it can be concluded that soybean crop raised with ridge method at 30 cm x 10 cm plant spacing with 5 cm depth could be beneficial.

**Keyword:** Sowing depth, Sowing method, Soybean, Spacing

## INTRODUCTION

Soybean [*Glycine max* (L.) Merrill.] is established as one of the major *Khariif* season field crop in Madhya Pradesh particularly in Malwa plateau. It is considered as an economical crop because of comparatively good economic returns/unit area obtained by the farmers from its cultivation. Soybean has a good adaptability in a wide range of soil and climate. Soybean can be recognized as the efficient producer of the two major quality characters *i.e.* oil (20%) and protein (40%), which are not only the major components in the diet of vegetarians but also a boon to the developing countries as well. In Madhya Pradesh, it occupies an area of about 39.5 lac ha with a production of about 25.7 lac tones. The productivity of soybean in Madhya Pradesh is 1130 kg ha<sup>-1</sup> whereas its global productivity is 2206 kg ha<sup>-1</sup>. Among the several factors responsible for such low productivity, inadequate crop stand due to faulty methods of sowing or use of very high seed rates in irregular spatial arrangement and depth of sowing appears to be the possible reasons. Generally flatter land *Vertisols* of Malwa region as at present extensively the flat-land cultivation system is more popular in cultivation of *Khariif* crop like soybean, which faces the problem of water logging and poor aeration thereby affecting crop productivity adversely. The small changes through land configuration in flat field conditions may help in improving the productivity of *Vertisols* of Malwa region. Plant spacing also plays a significant role in determining plant growth and development. Optimum plant population would improve light interception and that would then have a cascade effect, increasing crop growth rate and potentially improving seed production. With this background in view the present investigation entitled "Interaction effect of method and depth of sowing on growth and yield characters of Soybean (*Glycine max*)" was done with the objectives to find out the precise depth of

sowing for soybean and suitable method of sowing with suitable plant spacing to improve the growth and yield of soybean.

## MATERIAL AND METHOD

Experiment was conducted under Jawahar Lal Nehru Krishi Vishwavidyalaya Research Farm, College of Agriculture, Indore, M.P. during *Khariif* 2008-09. The topography of field was uniform with gentle slope. The soil of the experimental field has been grouped under medium black (*Vertisols*) belonging to fine montmorillonite hypothermic family of typical chromosterts predominantly clay in texture. There were six main treatment combinations (2 method of sowing): M<sub>1</sub>. Ridge method of sowing, M<sub>2</sub>. Flat method of sowing with (3 plant spacing): P<sub>1</sub>. 45 cm x 05 cm, P<sub>2</sub>. 30 cm x 05 cm, P<sub>3</sub>. 30 cm x 10 cm and 02 sub plot treatments (2 depth of sowing): D<sub>1</sub> – 2.5 cm depth, D<sub>2</sub> – 5 cm depth of soybean laid out in split plot design (SPD) with three replications. Sowing of the crop variety JS-335 was done on 3<sup>rd</sup> July 2008, seed rate was kept slightly higher to attain adequate plant population. The plant population of crop was maintained in all of the plots. Thinning was done 15 days after emergence of the crops in order to maintain the requisite plant population. Irrigation is not used because of sufficient rainfall in *Khariif* season and the crop was harvested on 13<sup>th</sup> October. For analyzing the growth patterns of the crop, five plants of uniform size were selected randomly and tagged from each treatment for recording various observations on growth and development at different stages.

## RESULT AND DISCUSSION

### *Growth attributes*

Data presented in Table.1 shows that more height of plant was recorded at 5 cm depth of sowing compared to 2.5 cm in ridge method of sowing. Among all combinations M<sub>1</sub>D<sub>2</sub> (42.34cm) was

produced significantly taller plant height than other combinations. Similar findings were also reported by Khan and Agarwal (1985).

The data presented in Table.2 showed that plant spacing with method of sowing  $M_1P_3$  (65.16cm) is produced significant taller plants than  $M_2P_1$  (55.82cm) and  $M_2P_3$  (56.24cm) but at par with  $M_1P_1$  (62.11cm),  $M_1P_2$  (62.22cm) and  $M_2P_2$  (64.49cm).

The data presented in Table 1 indicate that mean number of branches per plant was significantly affected with interactive effect of method of sowing and depth of sowing ( $M \times D$ ). Among all interactive effect of method of sowing and depth of sowing  $M_1D_2$  (1.33) produce more number of branches than  $M_2D_2$  (0.95) but at par with  $M_1D_1$  (1.19) and  $M_2D_1$  (1.26) at 40 DAS and  $M_2D_1$  (2.97) produced more number of branches than  $M_1D_1$  (2.14) and  $M_2D_2$  (2.09) but at par with  $M_1D_2$  (2.60) at 60 DAS and  $M_1D_2$  (2.12) produced more number of branches than  $M_1D_1$  (1.41) and  $M_2D_2$  (1.10) but at par with  $M_2D_1$  (2.01) at 80 DAS. Meharsingh *et al.* (1986) and Ralli and Dhingra (2003) also reported similar findings

In case of number of leaves combination of method of sowing and depth of sowing,  $M_1D_2$  (2.17) is superior than  $M_1D_1$  (1.87) but at par with  $M_2D_1$  (2.07) and  $M_2D_2$  (1.98) at 20 DAS and  $M_2D_1$  (7.88) is superior than  $M_2D_2$  (6.89) but at par with  $M_1D_1$  (7.41) and  $M_1D_2$  (7.87) at 40 DAS.

The number of nodules per plant at different growth stages of the crop is presented in Table 3. It is revealed that the number of nodules per plant was superior in  $M_1D_2$  than  $M_1D_1$  and  $M_2D_2$  but at par with  $M_2D_1$  at 40 DAS. This trend was maintained

also in all growth stages. Ralli and Dhingra (2003) and Thakur *et al.* (2004) also reported similar findings.

The dry matter production per plant at different growth stages shows that  $M_1D_2$  produced more dry matter than  $M_1D_1$  and  $M_2D_2$  but at par with  $M_2D_1$  at 20 DAS. This trend was maintained also in 80 DAS but in case of 40 DAS  $M_1D_2$  produce more dry matter than  $M_2D_2$  and at par with  $M_1D_1$  and  $M_2D_1$ . In 60 DAS all combination are at par. Kumar and Badiyala (2001), Dangore *et al.* (2001) and Vrishali *et al.* (2006) also reported similar findings.

#### Effect of yield attributes

The data presented in Table 4. and Fig 1. indicate that mean number of pods per plant was significantly affected with interactive effect of method of sowing and depth of sowing. Among all interactive effect of method of sowing and depth of sowing the combination of  $M_1D_2$  (38.11) produced more number of pods per plant than  $M_1D_1$  (34.43),  $M_2D_1$  (32.50) and  $M_2D_2$  (28.91). Parmar and Gandhi (1981) and Raut *et al.* (2000) also reported similar findings.

The analysis of data in Table 4. and Fig 2. shows that seed index was significantly affected by interaction of method of sowing and depth of sowing ( $M \times D$ ). The data presented in Table 3 shows that among all interactive effect of method of sowing and depth of sowing the combination of  $M_1D_2$  (11.62g) resulted significantly more seed index than  $M_1D_1$  (10.61g) and  $M_2D_2$  (10.41g) but at par  $M_2D_1$  (11.12g). Verma *et al.* (2004) and Vrishali *et al.* (2006) also reported similar results.

**Table .1:** Interaction effect of method of sowing and depth of sowing on plant height, number of branches and number of leaves.

Method of Sowing (M)	Depth of sowing (D)											
	Plant Height (cm.)		Number of Branches						Number of leaves			
	D <sub>1</sub> - 2.5cm	D <sub>2</sub> - 5cm	D <sub>1</sub> - 2.5cm			D <sub>2</sub> - 5cm			D <sub>1</sub> - 2.5cm		D <sub>2</sub> - 5cm	
	40 DAS		40 DAS	60 DAS	80 DAS	40 DAS	60 DAS	80 DAS	20 DAS	40 DAS	20 DAS	40 DAS
Ridge method - M <sub>1</sub>	37.72	42.34	1.19	2.14	1.41	1.33	2.60	2.12	1.87	7.41	2.17	7.87
Flat method - M <sub>2</sub>	35.21	33.53	1.26	2.97	2.01	0.95	2.09	1.10	2.07	7.88	1.98	6.89
	(M×D) <sub>1</sub>	(M×D) <sub>2</sub>	(M×D) <sub>1</sub>			(M×D) <sub>2</sub>			(M×D) <sub>1</sub>		(M×D) <sub>2</sub>	
SEm±	0.73	0.71	0.06	0.14	0.08	0.06	0.21	0.09	0.08	0.29	0.08	0.25
CD at 5%	2.27	2.22	0.20	0.43	0.26	0.21	0.66	0.29	0.27	0.92	0.26	0.79

**Table .2:** Interaction effect of method of sowing and planting geometry on plant height at 60 DAS.

Method of Sowing (M)	Planting geometry (P)		
	P <sub>1</sub> (45 × 05)cm	P <sub>2</sub> (30 ×05 )cm	P <sub>3</sub> (30 ×10)cm
Ridge method - M <sub>1</sub>	62.11	62.22	65.16
Flat method - M <sub>2</sub>	55.82	64.49	56.24
SEm±	1.60		
CD at 5%	5.06		

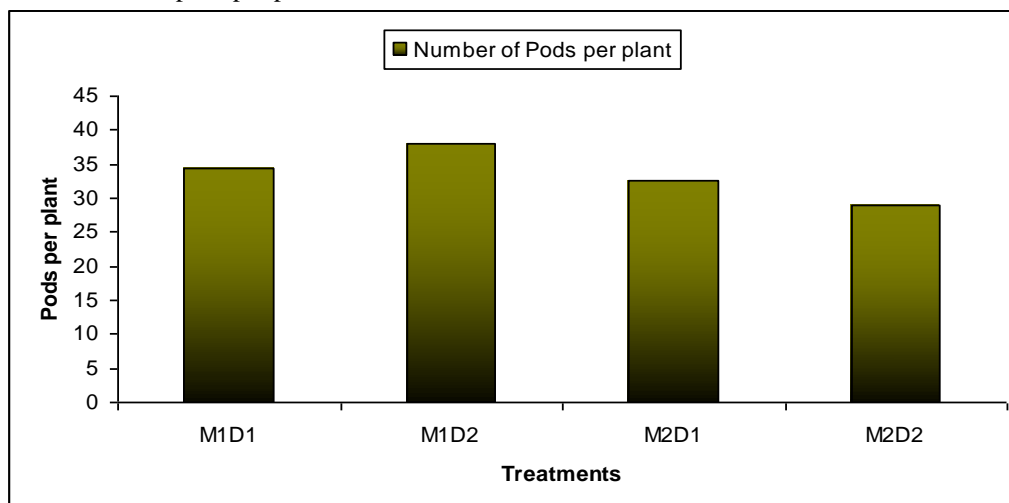
**Table .3:** Interaction effect of method of sowing and depth of sowing on number of nodules per plant and dry matter production per plant (g plant<sup>-1</sup>)

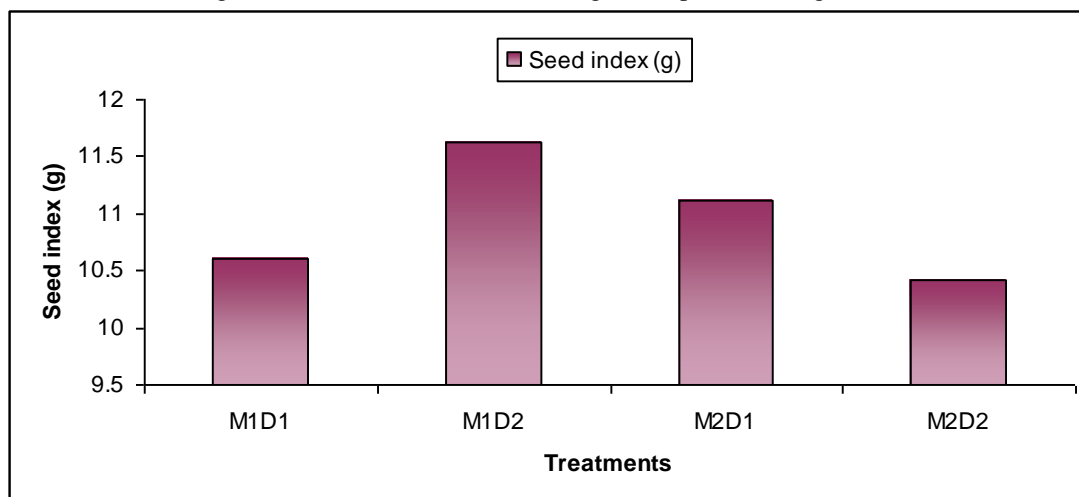
Method of Sowing (M)	Depth of sowing (D)													
	Number of nodules per plant						Dry matter production per plant (g plant <sup>-1</sup> )							
	D <sub>1</sub> - 2.5cm			D <sub>2</sub> - 5cm			D <sub>1</sub> - 2.5cm				D <sub>2</sub> - 5cm			
	40 DAS	60 DAS	80 DAS	40 DAS	60 DAS	80 DAS	20 DAS	40 DAS	60 DAS	80 DAS	20 DAS	40 DAS	60 DAS	80 DAS
Ridge method - M <sub>1</sub>	10.00	36.44	38.22	12.56	50.89	54.89	0.58	4.20	18.66	18.37	0.73	4.93	19.97	21.61
Flat method - M <sub>2</sub>	12.49	44.67	50.56	10.33	36.33	39.89	0.64	4.16	18.32	20.09	0.51	3.71	15.59	18.59
	(MXD)1			(MXD)2			(MXD)1				(MXD)2			
SEm±	0.56	2.40	1.72	0.49	2.62	1.74	0.03	0.19	0.89	0.66	0.03	0.25	1.85	0.80
CD at 5%	1.73	7.41	5.31	1.52	8.18	5.42	0.09	0.60	2.74	2.05	0.11	0.81	5.84	2.51

**Table .4:** Interaction effect of method of sowing and depth of sowing on number of pods per plant and seed index.

Method of sowing (M)	Depth of sowing (D)			
	Number of pods per plant		Seed index (g)	
	D <sub>1</sub> - 2.5cm	D <sub>2</sub> - 5cm	D <sub>1</sub> - 2.5cm	D <sub>2</sub> - 5cm
Ridge method - M <sub>1</sub>	34.43	38.11	10.61	11.62
Flat method - M <sub>2</sub>	32.50	28.91	11.12	10.41
	(M×D)1		(M×D)2	
SEm±	0.71	1.16	0.24	0.28
CD at 5%	2.19	3.66	0.76	0.89

**Fig. 1.** Mean number of pods per plant under different treatments



**Fig.2.** Mean seed index (g) under different method of sowing and depth of sowing

## CONCLUSION

It is concluded that under ridge method of sowing, higher depth (5cm) was showed promising effect on growth parameters and yield attributing characters of soybean JS-335 over flat method with 2.5cm depth and among different plant spacing 30cm× 10cm was found most suitable for obtaining optimum plant population (33333plants $ha^{-1}$ ) and higher yield characters.

## REFERENCES

- Dangore, S.T.; C.S. Chaudhari; P.R. Panchabhai and R.M. Deshpande.** (2001). *J. Soils and Crops*.11(2):219-222.
- Khan, G.M. and S.K. Agarwal.** (1985). Influence of sowing methods, moisture stress and nitrogen levels on growth, yield components and seed yield of mustard. *Indian J. Agric. Sci.*,55: 5, 324-327.
- Kumar, J. and D. Badiyala** (2001). Studies on the effect of seed rate, row spacing and sowing time on dry matter accumulation and nutrient uptake in soybean, *Glycine max* (L) Merrill., *J. Oilseed Res.* 21(2):290-292.
- Meharsing; S.B. Phogat; P. Rao and R.C. Sing** (1986). Effect of method of sowing on growth and yield of soybean. *Haryana Agric. Res. J.* 4: 352-355.
- Parmar, M.T. and A.P.Gandhi** (1981). A cooperative research project on resource development conservation and utilization in rainfed areas. *Annual Report, GAU Rajkot*, 179-197.
- Ralli, S. and K.K. Dhingra** (2003). Response of soybean to different planting methods. *Annals of Biology.*,19(2):151-155. Publi. by Hisar, India.
- Raut, V.M; S.P. Taware; G.B. Halvankar and P. Varghese.** (2000). Comparison of different sowing methods in soybean. *Maharashtra J. Agric. Univ.*,25(2): 218-219.
- Thakur, H.S.; S.K. Sharma and D.P. Singh.** (2004). Effect of Land Configurations on Performance of Pigeonpea and Turmeric Grown under Sole and Intercropped Conditions in Black Soils of Western Part of MP. International Conference on disordered Systems Organized by IDSAS, India, Allahabad & Goa University, Goa from Sept. 24-26, 2004.
- Verma, V.S.; Vineet Kumar and Rajendra Prasad.** (2004). Performance of Sweta and T 397 cultivars of linseed under land configuration with and without FYM application in salt affected soils under rainfed situation. *Farm Scien. J.*,13(2):166-167.PB:Kanpur,India;C.S. Azad Univ. of Agric & Tech.
- Vrishali D, Salunke C and Akmanchi A.** (2006). Yield of soybean influenced by varying depth of vertisols and dates of planting. *Indian Journal of Dryland Agricultural Research and Development.* 21(1):46-49.