J Krishi Vigyan 2022, 10 (2) : 78-81 DOI : 10.5958/2349-4433.2022.00014.9

Effect of Broad Bed Furrow System on Growth, Yield and Economics of Rainfed Soybean

S S Dhakad, G R Ambawatia and K C Mahajan

RVSKVV Krishi Vigyan Kendra, Shajapur - 465001 (Madhya Pradesh)

ABSTRACT

Field experiments were conducted in Shajapur district of Madhya Pradesh to assess the effect of broad bed furrow (BBF) seed drill on growth, yield and economics of soybean crop. The observations like plant population, plant height, number of branches per plant, root length, root width, number of root nodules per plant, number of pods per plant, pod length, number of seed per pod, seed yield weight per plant and seed index were recorded from 5 randomly selected plants from each treatment from each replication. Besides these, seed yield, straw yield, harvest index and economics of treatments were also calculated. The broad bed furrow sowing was significantly better in term of growth, seed index, yield and harvest index when compare with normal flat bed sowing of soybean crop. Economic analysis of pooled data revealed that the significant higher net profit (Rs. 31,177/ha) was recorded with broad bed furrow (BBF) sowing compared to normal flat sowing (Rs. 24,317/ha) for soybean crop.

Key Words: Broad bed furrow (BBF), Seeddrill, Soybean

INTRODUCTION

Madhya Pradesh has a unique distinction of having more than 87% soybean (*Glycine max*) area of the country and is rightly designated as Soya State. It is leading state in area, production and productivity at all India level known as soya state with contribution of 48. 30 and 50.53per cent in area and production, respectively followed by Maharashtra which contributes 34.35 and 34.86 per cent in total area and production of India, respectively (Anonymous, 2018). Soybean also has unique chemical composition. It has highest protein content around 40 % among cereals and other legume species and contains 20 % oil content, second highest content among all food legume. In Madhya Pradesh, during 2017-18, 6.64 Mha area with production of 6.95 Mt and productivity of 1046 kg/ha was under oilseed crops out of which an area of 5.01 Mha in soybean with a production of 5.32 Mt in soybean with a productivity of 1062 (Shaktawat and Chundawat ,2021)).

Soybean cultivated mostly in rainfed areas, abiotic factors like erratic rainfall and uneven distribution of rainfall and other adverse weather conditions affects its growth and production. Soybean is also sensitive to waterlogged condition. Since water is primary limiting factor and hence, required management in soybean production (Billaore, 2017). Land configuration can play important role in enhancement of soybean productivity by effective management of water and other resources. Use of broad bed furrow (BBF) can have several benefits depending on its use. Raised beds are primarily a field drainage tool aimed at decreasing water logging and increasing crop yield. Broad bed furrow helps to conserve moisture, increases infiltration and reduce runoff and soil erosion. It provides effective drainage system during excess rain, while retains moisture during dry spells thus reduces the effect of extreme situations with increase in yield and fetching additional income (Chattopadhayay *et al,* 2016). Jain (2019)

reported that planting of soybean in altered land configuration (broad bed furrow) resulted increase in productivity by 21.19 % over conventional flat bed planting. The broad bed furrow (BBF) farming has many advantages with regard to water saving, mechanical weeding, fertilizer placement, available moisture conservation, less lodging and better crop stand (Astatke *et al,* 2002)

Considering the above facts, attempt was made to study the effect of broad bed furrow (BBF) on the growth, yield and economics of rainfed soybean in Shajapur district of Madhya Pradesh.

MATERIALS AND METHODS

The field experiments were conducted at the farmer's fields in the operational village of Krishi Vigyan Kendra in Shajapur district of Madhya Pradesh with five replications to assess the effect of broad bed furrow (BBF) planting on growth, yield and economics of soybean crop. Soybean variety JS 95-60 was used for sowing. The soybean crop was sown on 28th June 2016 and harvested on 29th September 2016 during first year and sow on 1st July, 2017 and harvested on 2nd October, 2017 during second year. Analysis of weather data revealed that the rainfall during season (June–October) was 1090.1 mm in 2016 and 723 mm in 2017. The tractor-operated broad bed furrow seed drill was used for sowing attachable to 40-45 PTO HP range tractors. The observations like plant population, plant height, number of branches per plant, root length, root width, number of root nodules per plant, number of pods per plant, pod length, number of seed per pod, seed yield weight per plant and seed index were recorded from 5 randomly selected plants from each treatment from each replication. Besides these, seed yield, straw yield, harvest index and economics of treatments were also calculated. The data collected on various characters of soybean crop were processed and subjected to statistical analysis by t test as suggested by William Sealy Gosset (Fisher Box Joan, 1987). First, all the growth and yield attributes of soybean crop was analyzed and then the results were pooled over for both the years and analyzed. Statistical analysis was carried out by analyze the difference between two treatments using the 't' test of significance. The calculated 't' value was compared with the theoretical value from a 't' table at 5% probability level.

RESULTS AND DISCUSSION

The results on validation of broad bed furrow (BBF) seed cum fertilizer drill brought out that the plant population of soybean was higher when the crop was planted using the machine as compared to planting on normal seed drill. The plant population was 19.90 per cent higher on sowing soybean using broad bed furrow (BBF) seed cum fertilizer drill machine as compared to planting with normal seed drill. This indicated that use of broad bed furrow (BBF) sowing promotes better germination and emergence of the crop as compared to planting by normal seed drill. Plant growth parameters were found significantly better in broad bed furrow (BBF) planting as compared to normal seed drill and pooled data of growth characters of soybean (Table 1). The increase in plant growth might be due to proper drainage of excess rainfall through furrows in broad bed furrow (BBF) planting of soybean. Broad bed furrow (BBF) sowing was significantly superior to flat sowing in increasing plant population and plant height were reported Verma (2008), Singh *et al* (2011**)** and Gupta *et al* (2017).

Root is a major part of the soybean crop which provides anchoring and active participation in nutrient, moisture uptake and play effective role in fixation of atmospheric nitrogen. For root studies, observation on root length, root width and number of root nodules per plant were recorded (Table 1). Root characters of soybean crop was significantly higher in broad bed furrow (BBF) planting as compared to normal sowing in which number of root nodules per plant was 22.56 per cent more in broad bed furrow (BBF) planting and these root nodules are responsible for the fixation of atmospheric nitrogen in the soil. Verma *et al* (2017), Jain (2019), Singh *et al* (2019) and Dhakad *et al* (2020) reported that

Table 1. Growth, yield and economics of soybean for broad bed furrow (BBF) system

Parameter	BBF sowing	Normal sowing	Increase in %	CD at 5%
Plant population (No.m^{-2})	49.4	41.2	19.90	S
Plant height (cm)*	69.8	62.6	11.50	S
No. of branches per plant*	5.42	5.12	5.86	S
Root length (cm) **	23.81	19.22	23.88	S
Root width (cm)**	1.34	1.13	18.58	S
Number of root nodules per plant**	35.6	29.05	22.56	S
Number of pods per plant	46.8	36.45	28.40	S
Pod length (cm)	4.58	4.35	5.29	S
No. of seeds per pod	2.46	2.31	6.49	S
Seed Index (g)	11.472	11.361	0.98	NS
Seed yield (kg ha^{-1})	1485	1344	10.49	S
Straw yield (kg ha^{-1})	1820	1513	20.29	S
Harvest index (%)	44.72	44.18	1.22	NS
Net monetary returns (Rs.ha^{-1})	31177	24317	28.21	S
Benefit: cost ratio	2.46	2.09	17.70	S

*= at harvest; **= 60 DAS

broad bed and furrow sowing produced significantly higher growth parameters, yield and yield attributes and root parameters as well. The economics of treatments showed that the gross as well as net monetary returns were also recorded under broad bed and furrow sowing.

The yield attributes and economics parameters of soybean crop were presented in Table 1. The number of pods per plant, pod length, number of seeds per pod, seed yield, straw yield and net monetary returns were statistically higher in the broad bed furrow (BBF) system compared to normal sowing. The analysis showed that there was no significant difference on seed index due to treatments was observed. The highest productivity of 1485 kg/ha observed in broad bed furrow (BBF) system whereas lowest under normal sowing (1344 kg/ha) in pooled data.The net return is the best index of profitability of soybean crop production and higher net return (Rs 31,177/ha) and B: C ratio (2.46) was recorded under broad bed furrow (BBF) system whereas lowest net return of (Rs 24,117/ ha) and B: C ratio (2.09) was recorded under normal flat sowing. Singh *et al* (2011**)** , Asewar *et al* (2017),Motwani and Ashish **(**2018**),** Pathak et al (2018), Verma *et al* (2018**)** ,Jatav et al (2019) and Shete *et al* (2020) also reported an increase in crop yield due to broad bed furrow (BBF) sowing in rainfed Soybean. The results are also in consonance of the study conducted by Dhakad *et al* (2020).

CONCLUSION

Soybean is sensitive to water stress and sudden rainfall at the time of germination affects the crop growth. The broad bed furrow (BBF) system of soybean may be useful in rainfed areas. Effect of broad bed furrow (BBF) sowing system on the growth parameters of soybean was found better compared to normal flat sowing. The results of experiment indicate that for achieving maximum

productivity from soybean in vertisols, the crop should be sown by broad bed furrow (BBF) seed drill.

REFERENCES

Anonymous (2018). *Agricultural Statistics at a glance*. Directorate of Economics and Statistics. Department of Agriculture, Cooperation and Farmer Welfare, Ministry of Agriculture and Farmer Welfare

Astatke A, Jabbar M, Mohamed M A, Erkossa T (2002). Technical and economical performance of animal drawn implements for minimum tillage-experience on vertisols in ethopia. *Expl Agric* **38**(2): 185-196

Asewar B V, Gore A K, Pendke M S, Waskar D P, Gaikwad G K, Ravindra Chary G, Naraland S H, Samindre M S. (2017). Broad Bed and Furrow Technique- A Climate Smart Technology for Rainfed Soybean of Marathwada Region. *J Agric Res Technol* 42(3):5-9

Billore S.D.2017.Enhancing the Water Stress Tolerance in soybean through anti-transparent and mulches. *Soybean Res***15**(1):25-34.

Chattopadhayay S., Motwani S., Bais H. and Dubey S. (2016). Technology to mitigate climate change adversities in soybean. *Soybean Res* **14**(1):58-67.

Dhakad S S, Ramana Rao K V, Bhargava V K, Verma G, Ambawatia G R, Agrawal V, Verma S and Tomar R K S (2020). Effect of different sowing methods on the growth characters and yield of soybean in vertisol -A Review. *Int J Curr Microbiol App Sci* **9** (05):1607-18

Gupta,R, Gupta B S, Kulmi G S, Somvanshi S P S and Basediya A L. (2017). Influence of broad bed furrow seed drill on growth characters and yield of soybean (Glycine *max* L.) in Mandsaur district of Madhya Pradesh**.** *Prog Res Int J* **12** (S-IV): 2675-2678.

Fisher Box Joan (1987). Guinness, Gosset, Fisher, and Small Samples. *Stat Sci* **2** (1):45–52.

Jain M (2019). Yield potential of soybean on altered land configuration. *Soy Res* **17**(1&2):77-82

Jatav Hansraj, Sharma R P, Tomar D S and Suryawanshi D K (2019) Impact of soybean production technology dissemination through front line demonstrations in Malwa Region of M P. *J Krishi Vigyan* **7** (2) : 149-152

Motwani and Ashish **(**2018**).** Performance of soybean planted on broad bed furrow system under real farm conditions. *Soy Res* **16** (1&2): 113-117

Pathak Jagannath (2021) Yield Performance of Soybean (Glycine max L.) in Madhya Pradesh, *J Krishi Vigyan* 2018, 6(2) : 253-256

Shaktawat R P S and Chundawat G S (2021) Technological and extension yield gaps in oilseeds crops in Mandsaur District of Madhya Pradesh. *J Krishi Vigyan* **9** (2) : 234-237

Singh D V, Vyas A K, Gupta G K, Ramteke R and Khan I R (2011). Tractor-drawn broad bed furrow seed drill machine to overcome moisture stress for soybean (*Glycine max*) in vertisols. *Ind J Agric Sci* **81**(10): 941-944.

Shete P G, Dubey D V , Yadav Y B and Ghadge R G (2020) Yield performance of soybean (*Glycine max*. L) under BBF sowing with improved variety MACS-1188 under Western Maharashtra Condition. *J Krishi Vigyan* **9** (1) : 341-344

Singh S R K, Mishra A, Agrawal S, Raut A A, Prem Chand and Dixit A K (2019). Impact of Better management practices on performance of Soybean in MP. *Soy Res* **17** (1&2):54-61

Verma M (2008). *Effect of land configurastions and seed rates on the growth and productivity of rainfed soybean grown in Vertisols. M.Sc. (Ag.) Thesis*, JNKVV, Jabalpur (M.P.).

Verma P D, Parmanand and Tamrakar S K (2017). Effect of broad bed furrow method for rainfed soybean cultivation at Balodabazar district of Chhattisgarh. *Int J Agril Eng* **10** (2):297-301

Verma P D, Parmanand, Jain V and Rajput A S (2018). Evaluation of sowing methods of soybean in Bhatapara District of Chhattisgarh. *J Krishi Vigyan* **6**(2) : 109-112

Received on 6/6/2021 *Accepted on 17/02/2022*