Int.J.Curr.Microbiol.App.Sci (2019) *8*(4): 2298-2304

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 04 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.804.268

Effect of Ridge and Furrow Seed cum Fertilizer Drill on Growth Characters and Yield of Soybean (*Glycine max*) in Shajapur District of Madhya Pradesh, India

S.S. Dhakad[1]*, G.R. Ambawatia[2], Mukesh Singh[1] and Gayatri Verma[1]

[1]RVSKVV Krishi Vigyan Kendra Shajapur (MP)-465001, India
[2]College of Agriculture (RVSKVV) Indore (MP), India

**Corresponding author*

Keywords

Soybean, Seed-cum-fertilizer drill, Growth character, Yield

Article Info

Accepted:
17 March 2019
Available Online:
10 April 2019

A B S T R A C T

A field experiments was conducted during *kharif* season 2016 to 2017 for soybean crop to assess ridge and furrow seed cum fertilizer drill. Seed-cum-fertilizer drill was found better in term of growth characters and yield of soybean in comparison with simple seed drill sowing machine. The net return is the best index of profitability of soybean crop and higher net return per ha of Rs 25144 was recorded for soybean crop under seed cum fertilizer drill where as lower net return per ha of Rs 18025 was recorded under normal seed drill sowing.

Introduction

MP has a unique distinction of having more than 87% soybean (*Glycine max*) (Dwivedi *et al.*, 2006) area of the country and is rightly designated as Soya State. Mechanization of agriculture has assumed greater importance for increasing agricultural production and productivity by efficiently and effectively utilizing scarce resources and costly farm inputs improving timeliness factor, reducing labour cost and human drudgery etc for soybean & wheat cropping system. The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed.

The machinery such as raised bed planter, conventional seed cum fertilizer drill, ridge and furrow planter, broad bed planter and zero till seed cum fertilizer drill respectively used to sow the seed on raised bed in better pulverized soil so that the minimum compaction of soil over sown seed, promote

seed emergence, higher moisture availability to the plants and better drainage facility during rainfall from furrow are available for sowing of soybean of soybean crop. Whereas, the conventional seed cum fertilizer drill is used to sow the seed on well prepared seed bed and levelled field with minimum compaction of soil on the sown seed but it requires irrigation in planting for better germination.

It facilitates manual and mechanical weeding between rows, optimum plant population, even with reduced seed rate, lower and more efficient seeding rate than broadcasting. Row seeding also promotes maximum tillering and better sunlight penetration. Though the best placement depends upon the kind of crop, the nature of soil, the type of fertilizer salt and the climatic conditions, it has been conclusively proved that placing any kind of fertilizer in a band 30-50 mm to the side and 20-30 mm deep to the seed is safe and effective for most of the crops (Martin and Leonard, 1976 and Kepner *et al.,* 1987).

Nimje *et al.,* (2003) concluded that use of improved seeding machines such as seed-cum-fertilizer drill and strip-till seed-cum-fertilizer drill reduced the cost of operation by Rs 935 and Rs 1,578/ha and increased the net income by Rs 2,589 and Rs 3,703/ha, respectively, over the local seed drills used by the farmers. They also conclude that planting density of 440,000/ha increased the seed yield by 61.6% and the net returns by Rs 6, 669/ha over farmers' practice in farmers' field in Bhopal district. Jat and Singh (2003) reported higher biological yield and highest net and gross return from land configuration treatment as compared to conventional system has been reported. Shukla (1987 and 2001), Shrivastava (2005) and Choudhary (2002) reported that the performance of strip, zero and conventional till system for wheat cropping gave better results in the light soil.Ali and Behera (2014) reported that the performance of soybean was better in raised-bed than flat-bed conventional system of planting. Beneficial effects of ridge and furrow method of sowing on soybean yield have been reported through an improved soil aeration, moisture, temperatures, better root development and nitrogen fixation (Tisdall and Hodgson, 1990; Jayapaul *et al.,* 1995; Jain and Dubey, 1998; Raut *et al.,* 2000).

Dixit *et al.,* (2004) concluded that no-till seed cum fertilizer drill has resulted in 17.09% increase in yield, 83.22% saving in energy and 80.34% saving in cost of production over conventional seed drill. Rawat *et al.,* (2007) concluded that the zero till ferti seed drill was found energy efficient and cost efficient compared to conventional sowing of wheat on the basis of energy ratio, specific energy and benefit cost ratio.Ram & Singh. (2011) conducted an experiment on four sowing methods namely raised bed planting, raised broad bed planting, ridge-furrow. sowing and flat sowing for soybean crop. The highest seed yield was recorded in raised bed sowing, which was 6.70 and 5.29% higher than ridgefurrow and flat sowing methods, respectively.

The study has revealed that it is possible to save machine labour and irrigation water under zero tillage than under conventional method an due to resource saving, net return has been significantly higher in zero tillage technology (Tripathi *et al.,,* 2013). Muhammad et.al (2013) concluded from the results that tillage implements followed by rotavator showed better performance in terms of number of tillers and harvest index of wheat than sole use of tine cultivator twice and sowing by drill produced better results in terms of emergence, number of tillers, spike length and harvest index as compared to broadcasting. Patro *et al.,* (2014) was conducted experiment on four sowing

methods (conventional sowing, seed-cum-fertilizer drill sowing, paired row sowing and criss-cross sowing) on groundnut production and concluded that paired row sowing gave significantly highest pod yield and net returns (1781 kg ha^{-1} and Rs 19730 ha^{-1} respectively). Paired row sowing also improved various yield associated attributes viz., number of pegs (35.1) and pod $plant^{-1}$ (27.6), shelling percentage (66.6) and 100-kernel weight (33.6 g), and profitability (Rs 19,730) in groundnut. Dhakad and Khedkar (2014) concluded that field demonstration was conducted during kharif season 2012 to 2013 to study effect of seed-cum-fertilizer drill sowing machine for soybean crop that soybean sown by seed-cum-fertilizer drill was found better in term of growth characters and economics parameters with comparison to simple seed drill sowing machine. With a view to generate information, a field experiment was conducted at at farmer's fields to observe effect of seed-cum-fertilizer drill sowing machine on the growth characters and yield of soybean.

Materials and Methods

The field experiments were conducted at the farmer's fields during *kharif* seasons 2016 and 2017 for soybean crop in the selected village under operational area of Krishi Vigyan Kendra Shajapur to assess the effect of ridge and furrow attach seed cum fertilizer drill machine on yield and economics of soybean crop. To make the ridge and furrow system an extra punji is attached on the back tines of tractor operated seed-cum-fertilizer drill machine. The width of panji depends upon the row to row distances. Sowing seeds by front line tines and covering them by soil took place by punji attached in back line tines. Thus lines of soybean automatically come over ridge favoured by formation of alternate furrows. These furrows are useful to drain out excessive rainwater during heavy storms and for storing rainwater in furrows for enriching soil moisture through percolation in case of deficit rainfall. The soil moisture thus stored sustains the crop during dry spells. The plant growth character and yield contributing data such as plant height, number of branches per plant, number of root nodules per plant, number of pods per plant, seed index (weight of 100 seeds), seed yield, stover yield, harvest index (%),net monetary returns, benefit: cost ratio (B: C ratio) were recorded for soybean crop. Nimje *et al.,* (2002) and Dhakad *et al.,* (2014) reported that effect of seed-cum-fertilizer drill sowing machine for soybean crop. The machine parameters (Time required in sowing, diesel consumption, ffield capacity of implement, require labour and cost of operation during sowing) were measured from seed-cum-fertilizer drill and seeddrill sowing machine. The observations plant height, number of branches per plant, number of root nodules per plant, number of pods per plant, seed index, seed yield, straw yield, harvest index and economics of treatments were calculated for continuously two years for soybean crop.

Measurement of different parameters for soybean

Plant height

Plant height at 60 days after sowing, and at harvest stage was recorded. In plot five plants were selected randomly and tagged for periodic observation. The height (cm) was recorded at 60 DAS and at harvest stage of the crop in all the plots. It was measured from the ground surface to the main stem apex.

Number of branches per plant

Number of branches was recorded at 60 DAS and at harvest stage of the crop in all the plots. It was measured on five plants which were selected randomly and tagged.

Number of root nodules per plant

Nodulation studies of soybean were done from 5 random plants in each plot. Five plants dug up randomly in each plot and the nodules were washed out and counted. This study was done at 60 days after sowing.

Number of pods per plant

The total number of pods of five plants was counted and average figures were worked out.

Seed Index (weight of 100 seeds)

The seed samples from the produce of each plot were taken and samples comprising of 100 seeds were drawn irrespective by shape and size from the produce and weight of these seeds was recorded.

Seed yield

The plants were harvested net plot-wise and then threshed after the sun drying.

Stover yield

The produce after harvesting were left in the field then tied the bundles of each net plot for sun drying. The stover and stick yield of each net plot was obtained in kg/plot by subtracting the seed yield of respective plot from the weight of these bundles.

Harvest index

Harvest index is the ratio of economic yield (kg/ha) to biological yield (kg/ha) and multiplied by 100 to obtain its value in percentage. The harvest index is calculated by the following formula.

$$\text{Harvest index (\%)} = \frac{\text{Economic yield (kg/ha)}}{\text{Biological yield (kg/ha)}} \times 100$$

Where, the biological yield = Seed yield + Stover yield

Net monetary returns

Net monetary returns were obtained by subtracting cost of cultivation from gross monetary returns. Net monetary returns are considered to be a good indicator of suitability of a particular cropping system as this represents the accrued net income to the farmer. Net monetary returns (Rs/ha) = Gross monetary return (Rs/ha) – Cost of cultivation (Rs/ha)

Benefit: cost ratio (B: C ratio)

It is the ratio of gross return to cost of cultivation and is expressed as returns per rupee invested. Benefit cost ratio = Gross monetary return (Rs/ha)/Cost of cultivation (Rs/ha). The data collected on various characters of soybean crop was processed and subjected to statistical analysis by t test as suggested by William Sealy Gosset (Fisher Box, Joan 1987). The experiment comprising two treatments with five replications and in this case the number of plots was 02 x 05 = 10 and degree of freedom was 8 {(5-1) + (5-1)}. Statistical analysis was carried out by analyze the difference between two treatments using the 't' test of significance and the formula for T test is given below

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Where,
$\bar{x}_1$= Mean of first set of values
$\bar{x}_2$= Mean of second set of values
S_1 = Standard deviation of first set of values
S_2 = Standard deviation of second set of values
n_1 = Total number of values in first set
n_2 = Total number of values in second set.

Finally, the calculated 't' value is compared with the theoretical value from a 't' table at 5% probability level. Based on the comparison of calculated 't' value with the theoretical 't' value from the table, we conclude: If the calculated "t" value is greater than the theoretical 't' value, then the difference between the two treatments is significant. If the calculated 't' value is less than the theoretical 't' value, then the difference between the two treatments is not significant.

Results and Discussion

The pooled data related to yield and economics parameters are presented in Table 1. The grain yield, straw yield and net monetary returns were higher in ridge and furrow attaches seed cum fertilizer drill sowing compare to normal seeddrill sowing. The highest productivity of 1309 kg ha^{-1} observed in the seed cum fertilizer drill sowing whereas lowest under normal seeddrill sowing (1091 kg ha^{-1}) for soybean crop. The net return is the best index of profitability of soybean crop and higher net return per ha Rs 25144 was recorded for soybean crop under ridge and furrow attach seed cum fertilizer drill where as lower net return per ha of Rs 18025 was recorded for soybean crop under normal seeddrill sowing.

The plant height, number of branches per plant, number of root nodules per plant, number of pods per plant, seed yield, straw yield and net monetary returns were statistically higher in seed cum fertilizer drill sowing compare to normal seeddrill sowing for soybean crop. The analysis showed that there was no significant difference on seed index, grain straw ratio and harvest index due to treatments was observed.

Table.1 Growth characters and economics of soybean for seed cum fertilizer drill and normal seed drill

Economic parameters	Two year pool data for Soybean			
	Ridge and furrow seed cum fertilizer drill	Normal Seed drill	% increase over seed drill	CD at 5%
Plant height at harvesting (cm)	62.6	54.2	15.50	S
Number of Branches per plant at 60 DAS	5.57	5.22	6.70	S
Number of root nodules per plant at 60 DAS	29.4	22.6	30.09	S
Number of pods per plant at harvesting	42.8	31.9	34.17	S
Seed Index (g)	12.62	12.43	1.53	NS
Grain yield (kg/ha)	1309	1091	19.98	S
Straw yield (kg/ha)	1606	1362	17.91	S
Grain straw ratio	0.824	0.799	3.13	NS
Harvest index (%)	44.9	45.1	-0.44	NS
Net monetary returns (Rs/ha)	25144	18025	39.50	S
Benefit: cost ratio	2.43	2.11	15.17	S

Nimje *et al.,* (2002) Dhakad and Khedkar (2014) and Dhakad *et al.,* (2017) also reported an increase in net income of soybean due to seed-cum-fertilizer drill.

In conclusion, effect of seed-cum-fertilizer drill sowing soybean crop was found better in comparison with normal seed drill sowing. Seed-cum-fertilizer drill sowing recorded net return significantly higher over the normal seed drill sowing for soybean crop. The results of experiment indicate that for achieving higher productivity of soybean crop, the soybean crop should be sown by seed-cum-fertilizer drill sowing machine.

References

Ali, M. and Behera, U.K. (2014). Tillage and weed management for improving productivity and nutrient uptake of soybean. Indian Journal of Weed Science 46: 184-186.

Choudhary, V. P. and Singh, B. (2002). Effect of zero, strip and conventional till system on performance of wheat. J. of Agricultural Engineering vol. 39(2):27-31

Devnani RS (1989).Design manual for sowing equipment, RNAM, Regional office Philippines. pp 4-9

Dixit J, Gupta RSR, Behe VP and Singh S (2004). No-till seed cum fertilizer drill in wheat crop production after paddy harvesting, 35(1):19-26

Dhakad, S.S. and Khedkar, N.S. (2014). Influence of seed-cum-fertilizer drill machine on the growth characters and yield of soybean (*Glycine max* L.) at farmer's fields. *Internat. J. Forestry & Crop Improv.,* 5 (2): 68-72

Dhakad S.S., G.R. Ambawatia and N.S. Khedkar (2017). Effect of seed cum fertilizer drill on Growth Characters and Yield of Soybean (Glycine Max) in Shajapur District of Madhya Pradesh. *International Journal of Agricultural Engineering,* 10(1): 16-21

Dwivedi S P, Ramana R S, Vadivelu K V, Navalgund A and Pande A B. (2006). Spatial distribution of rainy season fallows in Madhya Pradesh: Potential for increasing productivity and minimizing land degradation. SAT eJournal, An Open Access Journal published by ICRISAT 2(1)

Fisher Box Joan. Guinness, Gosset, Fisher, (1987). Small Samples. Statistical Science 2 (1): 45–52

Jat, L.N. and Singh, S.M. (2003). Varietal suitability, productivity and profitability of wheat (*Triticum* species) intercrops and relay cropping under furrow-irrigated raised bed system. *Indian Journal of Agriculture Sciences* 73(4):187-190

Jain, M.P. and Dubey, A.K. (1998). Productivity and economic viability of soybean with respect to planting systems and cultivars in Vertisol. *Crop Research* 16:102-22.

Jayapaul, P., Uthayakumar, B., Devasagayam, M.M., Pandit, B.J., Palchamy, A. and Balakrishanan, A. (1995). Effect of land configuration methods, irrigation regimes and soil moisture conservation amendments on soybean (*Glycine max* L. Merrill) yield and quality characters. *Crop Research* 11: 253-57.

Kepner RA; Bainer R; Barger EL. (1987). Principles of Farm Machinery. 1st Indian edn. CRS Publishers and Distributors, Delhi.

Martin JH; Leonard WHO.(1976). Principles of Field Crop Production. 3rd edn. The Macmillan Co., London, 1118

Muhammad Amin, Muhammad Jamal Khan, Muhammad Tariq Janand, Javaid Akhtar Tariq (2013). Response of wheat growth characteristics to various tillage practices and sowing methods under semi arid environment. *Sarhad J. Agric.*

*29(*4):529-535

Nimje P.M., Agrawal Vijay, Soni R.D. (2003). Effect of planting density and improved seeding machinery on yield and economics of soybean (*Glycine max*). *Indian Journal of Agronomy*.48 (4):301-304

Patro Hrusikesh, Md. Alim Abdul, Dash Debiprasad (2014). Growth and productivity of groundnut (*Arachis hypogaea*) under different tillage and sowing methods in India. *Applied Biological Research*. 16 (2):209-213

Rawat S. N., Verma M. R.,Goyal S. K. and Dave A. K. (2011). Cost economic evaluation of zero till ferti seed drill vs conventional method of sowing. *Prog Agric*.7(1/2):161-162.

Raut, V. M., Taware, S.P. and Varghese, P. (2000). Comparison of different sowing methods in soybean. *Journal of Maharashtra Agricultural University* 25: 218-219.

Ram H., Singh G. (2011), Soybean (*Glycine max*) growth, productivity and water use under different sowing methods and seeding rates in Punjab, Indian journal of Agronomy, 56 (4): 377-380.

Shrivastava A.K., C.S. Deshmukh and N. Jain (2005). Design development and performance of T.D. rotavator cum seed drill under vertisol. Paper presented and published in the International Conference of Agricultural Engineering, AAAE, AIT, Bangkok pp 5-9,

Shukla, L. N., Dhalwal I. S. and Chauhan A. M. (2001). Multiplication field performance of strip till drill on wheat crop J. of Agricultural Engineering vol. 38/3, 35-39, July-Sep. 2001.

Shukla, J.N., Chouhan A.M. Dhaliwal I.S., Verma S.R. (1987). Field evaluation of Rotary blade Till attachment for Direct sowing operation, Journal of Agricultural Engineering 29(1) pp. 21-27

Tripathi R.S., Raju R. and Thimmappa K(2013). Impact of Zero Tillage on Economics of Wheat Production in Haryana. *Agricultural Economics Research Review*. 26(1): 101- 108

Tripathi S C And Chauhan D S (2000). Evaluation of fertilizer and seed rate in wheat *(Triticum aestivum)* under different tillage conditions after transplanted rice *(Oryza sativa). Indiall Journal of Agricultural Sciences* 70 (9): 574-6

Tisdall, J. M. and Hodgson, A.S. (1990). Ridge tillage in Australia: A review. *Soil & Tillage Research* 18: 127-44

How to cite this article:

Dhakad, S.S., G.R. Ambawatia, Mukesh Singh and Gayatri Verma. 2019. Effect of Ridge and Furrow Seed cum Fertilizer Drill on Growth Characters and Yield of Soybean (*Glycine max*) in Shajapur District of Madhya Pradesh, India. *Int.J.Curr.Microbiol.App.Sci.* 8(04): 2298-2304.
doi: https://doi.org/10.20546/ijcmas.2019.804.268