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Study the Effect of ridge and furrow system on soybean cultivation in Shivpuri district of M.P.

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ABSTRACT

The field study through front line demonstration was carried during the two consecutive Kharif 2015 and Kharif 2016 to study the effect of ridge and furrow system for soybean crop at farmer's fields in Shivpuri district of Madhya Pradesh under gird agro-climatic zone. Result showed that growth character (plant population, plant height, root length, number of root nodules per plant) and yield contributing character viz., pods per plant, seed yield, straw yield and harvest index (%) found higher in ridge and furrow system over to the normal line sowing method. Net profit was recorded higher under ridge and furrow system as compared to normal flat bed sowing. Average yield for two consecutive year Kharif 2015 and 2016 was recorded as 9.01 q/ha and 11.73 q/ha under normal line sowing and ridge furrow system respectively. Average B: C ratio was recorded as 1.99 under ridge and furrow system while 1.54 under normal line sowing system.

Key Words: *Soybean, ridge and furrow, normal line sowing, growth and yield character, net profit, B:C ratio*

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INTRODUCTION

Madhya Pradesh is known as the "soybean state" of India, comprising 55% of the total national area 5.56 million hectare of soybean cultivation. Soybean has established its reorganization as both pulses and an oilseed crop. Soybean (*Glycine max*. L.) ranks first amongst oilseed crops in the world and it contributes nearly 25 per cent of worlds total oil and fat production [2]. Soybean is a major crop grown during the Kharif season in the rain fed areas of central India and it is major Kharif crop of Shivpuri district of Madhya Pradesh. In India, soybean is topmost oilseed crop currently covering 11.23m ha area with expected production of 14.22 millions tones and productivity of 1266 kg per ha [11]. It is the cheapest and richest source of high quality protein containing 38-44% protein and 18-22% oil. It supplies most of the nutritional constituents essential for human health. Hence, soybean is called as wonder crop or golden bean or miracle bean.

The average annual rainfall in Shivpuri district assured 863 mm per annum. The rainfed agriculture suffers from a number of hydro-physical and socio-economic constraints, which affect the productivity of rainy and post-rainy season crops. These include erratic and undependable rainfall, excess and deficient moisture with in a season, harsh thermal regime, soil loss, low level of input use and technology adoption and resource poor farmers [7].

The normal line sowing system or flat bed sowing system is popular in gird agro-climatic zone of Madhya Pradesh state. Soybean is more water stress crop and at the time of germination, sudden rainfall affects the crop [23]. The crop experiences moisture stress during the dry spell ranging from 15 to 21 days at any growth stage under rainfed conditions, resulting significant reduction in the yield [2]. These yield losses are expected at higher level especially in early genotype with determinate types. At present for extensively cultivation of Kharif crop like soybean which faces the problem of water logging and poor aeration thereby affecting crop productivity adversely. Among all legumes soybean is most sensitive to soil moisture. After few showers the monsoon rains in July – August are usually heavy and frequent. Under such situation water logging is a common problem which affects early growth, root proliferation and final yield performance of crop. Excess and continuous rains may create bad drainage and restricts aeration, which results in non-availability of plant nutrients and poor microbial activities. Extreme variability in the quantity, time and duration of rains expose the soybean crop to soil moisture deficit as well as excess moisture either on account of delayed monsoon, longer dry spells or early withdrawal monsoon has been identified as one of the major factors for poor performance of soybean crops [22, 8]. During too extreme rainfalls events, soybean crop gets also affected by water logging problems due to improper drainage. Water logging adversely affects the growth of crops, primarily due to reduced oxygen supply to the roots [2].

Studies on soil management for increasing crop production revealed that use of various tillage methods and modification of land configurations such as broad bed furrow, ridges and furrow for soybean in vertisols were superior over flat bed and recommended in watershed development for moisture conservation as well as for safe removal of excess rain water [18]. The small change through land configuration in normal line or flat field conditions may help in improving the productivity of Kharif crops in Vertisols in gird region. There is a need for in-situ soil and water conservation and proper drainage technology in black soils. This technology has many advantages including in-situ conservation of rainwater in furrows, better drainage of excess water and proper aeration in the ridge and root zone. More than 10000 farmers in Shivpuri district adopted the technology.

Now, the only way to increases the production of soybean left is to make concerted efforts in improvement in productivity of crops. Besides, other techniques the *In-situ* conservation of rainwater at farm level by adopting holistic approach to the management of rainwater like broad-bed and furrow, ridge and furrow, tied ridging, raised and sunken bed and compartmental bunding etc. by which crop productivity is substantially increased. Land treatments (raised sunken bed system, ridges and furrows, broad bed and furrows) increased *in situ* soil moisture conservation, minimized runoff, and soil erosion [21, 15] and increased the yield of principal crops grown in the region [16, 15]. Hari Ram *et. al.*, [9] concluded that raised bed, raised broad bed and ridge furrow sowing of soybean should be advocated over flat bed sowing mainly due to their ability to save irrigation water. The strategy for soil moisture management is therefore; to maximize use of rainfall by increasing infiltration and moisture retention, encourage surface drainage and reducing runoff and soil erosion for getting high yield. In view of the above fact the study was undertaken. This paper presents the results of ridge and furrow system on growth and yield of soybean cultivation in Shivpuri district of MP.

MATERIAL AND METHODS

The field experiment was conducted at the farmer's fields in Shivpuri district of Madhya Pradesh during Kharif 2015 and 2016 to determine the impact of ridge and furrow system over normal line sowing. The field study was performed with ridge and furrow system through tractor operated seed-cum-fertilizer drill machine. This ridge and furrow system involves sowing of crop at a row spacing of 30 cm while in normal line sowing is done at a row 22 cm in soil. The soybean crop (variety JS 95-60) was sown for the experiment. Before demonstration or experiment, trainings were conducted to the farmers about use of ridge and furrow system by KVK Scientists.

The plant growth and yield contributing data such as are plant height, root length, number of root nodules per plant, seed yield and straw yield were recorded of soybean crop for sown by ridge and furrow system and normal line sowing.

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. It indicates the efficiency of plant material to convert the photosynthate in to the economic yield and it is worked out as:

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

Where, the biological yield = Seed yield + Stover yield

Economic Analysis

Cost of cultivation

The cost of cultivation (Rs/ha) of each treatment was worked out by considering the price of inputs, charges for cultivation, labour and other charges.

Gross monetary returns

The gross monetary returns (Rs/ha) occurred due to different treatments in the present study were worked out by considering market prices of economic product, by product and crop residues during the experimental year.

Net monetary returns

The net monetary returns (Rs/ha) of each treatment were worked out by deducting the mean cost of cultivation of each treatment from the gross monetary returns gained from the respective treatments.

Benefit: Cost ratio

The benefit: cost ratio of each treatment was calculated by dividing the gross monetary returns by the mean cost of cultivation

RESULT AND DISCUSSION

The data collected from the field experiment were analyzed and results obtained from the investigation as well as relevant discussion has been summarized under following heads:

Growth and yield attributing characteristics of soybean

Growth and yield attributing characteristics of soybean are presented in Table 1. Table reveals that the plant growth and yield parameters were found better in ridge and furrow system as compared to normal line sowing. Its due to proper drainage of excess rainfall through furrows. Similar results were reported by Ralli and Dhingra [19] and Basediya *et al*, [2] and they found that the higher nodule and count under ridge and furrow system. The average crop yield is found better as 17.73 q/ha in ridge and furrow system while as 9.01 q/ha in normal line sowing. The yield in recommended practice (ridge and furrow system) increased 30.18 % over farmer practice i.e. normal line sowing system. Similar trends reported by Verma [23]; Bhargav *et. al.,* [4]; Jadav *et. al.,* [10]; Dhakad *et. al.*, [5, 6] and Basediya *et.al.,* [2] for productivity of soybean in Vertisols. They reported that ridge and furrow system has higher growth, yield and yield attributes parameters over traditional sowing system for soybean. Jat and Singh [13] reported higher biological yield from land configuration treatment as compared to conventional system. Ram *et al.* [20] also concluded that ridge and furrow sowing of soybean should be advocated over flatbed sowing mainly due to their ability to save irrigation water.

Table 1: Average growth and field attributes of soybean (average of 2 years)

Parameters	Ridge and furrow system	Normal line sowing
Plant population (No./m^2)	44.7	40.7
Plant height (cm) at harvest	68.4	57.6
Root length (cm) at 60 DAS	24.5	19.7
Number of root nodules per plant at 60 DAS	30.3	25.9
Seed yield (kg/ha)	1173	901
Straw yield (kg/ha)	1109	878
Harvest index (%)	51.42	51.01

Economics analysis

Economic analysis of soybean cultivation is presented in Table 2. It reveals that average higher net return of Rs 20555 per ha and average B: C ratio of 1.99 was recorded in ridge and furrow system whereas, the lowest average net return of Rs 11035 per ha and average B: C ratio of 1.54 was recorded under normal line sowing for year 2015 and 2016. Similar results reported by Jain and Dubey [12]; Jat and Singh [13]; Verma [23]; Bhargav *et al*, [4]; Dhakad *et al.,* [5, 6] and Basediya *et al.*,[2]. They concluded that the higher yield and gross as well as net monetary returns were recorded under ridge and furrow system as compared conventional sowing system.

Table 2: Eeconomics analysis of ridge furrow system and normal line sowing

Treatments	Average yield (q/ha)	Average % change in yield	Average cost of cultivation (Rs./ha)	Average gross return (Rs./ha)	Average net return (Rs./ha)	Average B:C ratio
Farmers practice (normal line sowing)	9.01	30.18	20500	31535	11035	1.54
Recommended practice (ridge & furrow system)	11.73		20500	41055	20555	1.99

CONCLUSION

Average yield in ridge and furrow system was recorded as 11.73 q/ha over conventional line sowing system as 9.01 q/ha. Average B: C ratio was recorded as 1.99 under ridge and furrow system while 1.54 under normal line sowing system. The results of experiment indicated that ridge and furrow system recommended for achieving higher productivity of soybean crop in Shivpuri district of Madhya Pradesh in excess and dry spell both extreme situations. On the basis of study, it is concluded that the better results of average of two consecutive years were found in ridge and furrow system on the growth and yield characters of soybean as compared to conventional method of sowing i.e. normal line sowing.

REFERENCES

1. Anonymous (2013). Second estimate of soybean crop survey: Kharif (2013). Press Release. The Soybean Processors Association of India.
2. Basediya, A.L., Sunita Mishra, Rajesh Gupta, P. Kumar and Basediya, S.S. 2018. Performance of Ridge and Furrow System on the Growth and Yield Attribution of Soybean in Barwani District of M.P. India. *Int.J.Curr.Microbiol.App.Sci.* 7(08): 499-505.
3. Bhatnagar, P.S. and Joshi, O.P. (1999). Soybean in cropping systems in India, *Integrated crop management series*, FAO, Rome. **3**: 1-39.
4. Bhargav K S, V K Jain and Umat R (2013). Ridge and furrow system of planting seeds: A water management approach for increased soybean production in Madhya Pradesh. *Journal of Interacademicia* **17**(2): 245-253
5. Dhakad, S S, Vijay Agrawal and Sanjeev Verma (2014). Effect of ridge and furrow system on the growth character and productivity of rainfed soybean in Vidisha district of M.P. *Res. Environ. Life Sci.* 7(3): 211-212
6. Dhakad, S S, A K Badaya, S S Chauhan, and G S Gathiye (2015). Effect of ridge and furrow system on the growth character and yield in rainfed soybean in Madhya Pradesh. *Indian Journal of ecology* 42(1): 230-232
7. Gupta R K (2002). National resources conservation technologies for black clay soil region of Peninsular India. *Journal of Indian Society of Soil Science* **50**(4):438-447.
8. Gupta Rajesh, Kulmi G.S, Basediya, A.L. and Mohan Jadav (2018). Influence of furrow irrigated raosed bed seed drill on growth characteristics and yield of soybean in Mandsaur district of Madhya Pradesh, India. *Plant Archives* 18(1):320-324.
9. Hari Ram, Guriqbal Singh, Navneet Aggarwal and Jagmeet Kaur (2012). 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.

10. Jadhav, J A, Patil, D B, Ingole P G (2012). Effect of mechanization with different land configuration on yield and *in situ* moisture conservation of soybean. *Internat. J. agric. Sci.*, **8**(1): 48-51
11. Jadon, C.K., Dashora, L. N., Mundra, S. L. and Upadhyay, B.(2016). Effect of Weed Management and Fertility Levels on Productivity and Economics of Soybean [Glycine max (L.) Merr.] in South-Eastern Rajasthan. *Soybean Research,* 14(2): 84-88 (2016)
12. 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.
13. 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. *Ind. J. Agriculture Sci.,* **73**(4):187-190.
14. Kumari C R and Rao D S K (2005). Effect of land treatments and dates of sowing on growth parameters of mustard (*Brassica juncea* L.). *J. Oilseeds Research* **22**(1): 188-189.
15. Nagavallemma K P, Wani S P Reddy, M S and Pathak, P (2005). Effect of landform and soil depth on productivity of soybean based cropping systems and erosion losses in Vertic Inceptisols. *Ind. J. Soil Conservation,* **33**(2): 132–136.
16. Mandal D K, Mandal C and Venugopalan M V (2005). Suitability of cotton cultivation in shrink–swell soils in central India. *Agricultural Systems* **84**: 55–75.
17. Rajput R P , Kauraw D L, Bhatnagar R K, Bhavsar M, Velayutham M and Lal R (2009). Sustainable management of vertisols in central India. *J. Crop Improvement* **23**: 119–135.
18. Raut, V.M. and Taware, S.P. (1997). Comparison of different sowing methods in soybean. J. Maharashtra Agric. Univ., 25 (2): 218-219.
19. Ralli S and Dhingra K K (2003). Response of soybean to different planting methods. *Annals of Biology* **19**(2): 151-155.
20. Ram Hari, Singh Guriqbal, Aggarwal Navneet and Kaur Jagmeet (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
21. Singh P, Alagarswamy G, Pathak P, Wani S P, Hoogenboom G and Virmani S M (1999). Soybean-chickpea rotation on Vertic Inceptisol: 1.Effect of soil depth and landform on light interception, water balance and crop yields. *Field Crops Research* **63**:211-224. II. Long-term simulation of water balance and crop yields. *Field Crops Research.* **63**(3): 225-236.
22. Tiwari, S.P. (2014). Raising the yield ceiling in soybean. An Indian overview. *Soybean Research*, 12(2):1-43.
23. Verma Mukesh (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.).