E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2024; SP-7(12): 610-12
Received: 15-10-2024
Accepted: 20-11-2024

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Performance evaluation and introduction of vegetable soybean (*Glycine max*) variety '*Swarna Vasundhara*' in coastal areas of West Bengal

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DOI: https://doi.org/10.33545/2618060X.2024.v7.i12Si.2285

Abstract
Vegetable soybean variety '*Swarna Vasundhara'* developed by ICAR-RCER, Research Centre, Ranchi was introduced and evaluated for its performance under different planting conditions (flatbed, raised bed and ridge & furrow) on moderately saline soils (pH 7.4 and EC 4.2 ds m^{-1}) in coastal areas of West Bengal. The experiment was conducted during the summer season of 2023 at the research farm of the School of Agriculture and Allied Sciences (SAAS), The Neotia University. Planting of this variety on ridges significantly increased (38.9%) green pod yield compared to planting on flatbed. This was mainly due to significantly higher plant height (12.4%) and number of pods $plant^{-1}$ (19.0%) associated with planting on ridges compared to planting on flatbed. Likewise gross return also increased (38.6%) to Rs.135,000 per hectare in ridge method compared to growing on flat bed. On the contrary, planting of this variety on raised bed did not show any significant improvement over planting on flatbed. Observed better performance of the crop on ridges compared to both flatbed and raised bed may be due to lower salt concentration in the crop root zone combined with better root growth associated with crop on ridges.

Keywords: Flat bed, ridge and furrow, raised bed, soybean

Introduction
Soybean (*Glycine max*) is leguminous crop rich in high-quality protein and edible oil. Along with having a high protein content, soybeans are also rich in saturated fats, fiber, antioxidants, Omega-3 fatty acids, and phytoestrogens, among other essential nutrients required by the body. Depending on the context, this plant is classified either as an oilseed (a crop primarily grown for oil) or as a pulse (an annual leguminous crop with seeds enclosed in pods). In recent times, soybeans have grown to popularity due to their derivatives such as tofu, soy milk, and textured vegetable protein. Soy products has created a new massive mark*et al*together, primarily benefiting the vegan population. Foods containing soy have also been shown to have several health benefits. For example, the health benefits of soybean for menopausal women include lowered risk of osteoporosis, protection from coronary heart disease, and fewer hot flushes. According to experts, including soybean in your daily diet can help you maintain a healthy body as well as overall well-being.

In India, the total area under soybean cultivation was 10.69 million hectares, with a total production of 12.67 million tons and a productivity of 1185 kg/hectare (SOPA, 2014) [12].

Machinery such as raised bed planters, conventional seed-cum-fertilizer drills, ridge and furrow planters, broad bed planters, and zero-till seed-cum-fertilizer drills are used for sowing soybean seeds on raised beds. This method ensures minimal soil compaction over the seeds, better seed emergence, enhanced moisture availability for the plants, and effective drainage during rainfall from the furrows. On the other hand, conventional seed-cum-fertilizer drills are used for sowing on well-prepared seedbeds and levelled fields, with minimal soil compaction over the seeds. However, this method requires irrigation during planting to ensure better germination.

Row planting facilitates both manual and mechanical weeding between rows, maintains an optimal plant population, reduces the seed rate, and is more efficient than broadcasting. Row planting also promotes maximum tillering and better sunlight penetration.

Although the ideal placement depends on the type of crop, soil nature, fertilizer type, and climatic conditions, it has been conclusively proven that placing any type of fertilizer in a band 30–50 mm to the side and 20–30 mm below the seed is safe and effective for most crops.

The beneficial effects of the ridge and furrow method of sowing on soybean yield have been highlighted, achieved through improved soil aeration, moisture, temperature, better root development, and nitrogen fixation (Tisdall and Hodgson, 1990; Jayapaul *et al*., 1995; Jain and Dubey, 1998; Raut *et al*., 2000) [13, 6, 7, 10]. Dhakad *et al*. (2017) [3] concluded that net return is the best indicator of the profitability of soybean crops. A higher net return of Rs 25,144 per hectare was recorded for soybeans sown using the ridge and furrow, whereas a lower net return of Rs 18,025 per hectare was recorded for soybeans sown using the normal raised bed. However, experiment under saline area using ridge and furrow method is scanty. Keeping the information in mind, a field experiment was conducted to observe the growth and yield performance of soybean cultivar by seed-cum-fertilizer drill sowing machine.

Materials and Methods

The study was conducted at the research farm of School of Agriculture and Allied Sciences (SAAS), The Neotia University pre-*kharif* season 2023. The soil pH is 7.4 and electrical conductivity (EC) of experimental area 4.2 ds m^{-1}. The area of the experiment was 400 square meter. The cultivar *Swarna Vasundhara* was introduced from ICAR-RCER, Research Centre, Ranchi. The data was collected on different agro-morphic characters *viz.* plant height, no. of branches $plant^{-1}$, no. of pods $plant^{-1}$, green pod weight (t / ha), dry pod weight (t / ha) and grain yield $plot^{-1}$ (t ha). Regular agronomic cultivation package and practices including plant protection measures were followed towards crop maintenance. Duncan's Multiple Range Test (DMRT) was performed for all the mean data of each treatment (flat bed, raised bed and ridge furrow) for different characters to test the significant differences at 5% level. Data were analysed using the statistical software XL-Stat, MS Excel 2008.

Results and Discussion

Growth and yield attributing characteristics of soybean variety '*Swarna Vasundhara'* are presented in Table 1. Significant difference in all growth parameters among the raised bed, flat bed, and ridge-furrow methods was revealed by DMRT. Table 1 presented that the plant growth and yield parameters were found better in ridge and furrow as compared to raised bed planting system. Its due to proper drainage of excess rainfall through furrows and moisture conservation during dry spell. Similar results were reported by Ralli and Dhingra (2003) [11] and he found that the higher nodule count under ridge sowing when compared with flat sowing for soybean crop. Significant increase using ridge and furrow method observed in all the growth parameter like plant height (65.00 cm), no. of branches $plant^{-1}$ (5.67), No. of pods $plant^{-1}$ (20.83), green pod weight (4.50 t/ha), dry pod weight (0.94), and seed yield $plot^{-1}$ (3.74 t /ha) than raise bed planting system. The seed yield $plant^{-1}$ significantly higher (3.74 t / hec) on ridge and furrow as compared to planting on raised bed. In this regard, Dhakad and Khedkar (2014) [2] observed the opposite result, where soybeans sown in the raised bed showed better gain yield and economic parameters compared to the ridge and furrow method in non-saline land. This could primarily be due to the absence of the salinity effect on the planting system, whereas, in our experiment, salinity plays a crucial role in any growth stage and the production of soybean crops. It was observed in our experiment that salt deposition is higher in the raised bed planting method which affect the root system of plants compared to the ridge and furrow method. Similar result was reported by Verma (2008) [14] for productivity of soybean. He reported that ridge and furrow sowing produced significantly higher growth parameters, yield and yield attributes and root parameters as well. He found higher seed and straw yield under modified land configurations as compared to the traditional planting system. Jadav *et al*., (2012) [8] found higher growth parameters, yield and yield attributes parameters in ridge and furrow system over flat sowing system in soybean. The results were in conformity with the findings of Bhargav *et al*., (2013) [1], Jat and Singh (2003) [5]; Verma (2008) [14], and Dhakad *et al*., (2014, 2015 & 2020) [2, 4]. Jat and Singh (2003) [5] reported higher biological yield from land configuration treatment as compared to conventional system in soybean. Ram *et al*., (2011) [9] also concluded that ridge and furrow sowing of soybean should be advocated over raised bed sowing mainly due to their ability to save irrigation water. The data also revealed that the gross return was higher in the ridge and furrow method compared to the flat bed and raised bed planting techniques. The overall results of the experiment indicate that the ridge and furrow planting method is more effective for achieving higher productivity of soybean crops.

Table 1: Performance of *Swarna Vasundhara* variety of soybean in same-saline soil in West Bengal.

	Plant height (cm)	No. of branches/plant	No. of pods/plant	Green pod weight (t/ha) *	Gross return ('000 Rs./ha)**	Dry pod weight (t/ha) *	Grain yield (t/ha) *
Flat Bed (Control)	57.83^{a}	5.67^{a}	17.50^{a}	3.24^{a}	97.1	0.55^{a}	2.59^{a}
Raised Bed	54.23^{a}	7.67^{b}	17.83^{a}	3.12^{a}	93.6	0.70^{b}	2.91^{b}
Ridge & Furrow	65.00^{b}	5.67^{a}	20.83^{b}	4.50^{b}	135.0	0.94^{c}	3.74^{c}
SE	1.43	0.67	0.48	0.08	-	0.02	0.10
CD	4.65	1.09	1.57	0.26	-	0.05	0.31

*Three pickings (combined total yield)

** Considering market price Rs.30/kg green pod

Conclusion

The overall results of this experiment indicate that the ridge and furrow planting system provides better productivity of the soybean variety Vasundhara compared to the raised bed, and it could be introduced in semi-saline land in West Bengal.

References

1. Bhargav KS, Jain VK, Umat R. Ridge and furrow system of planting seeds: A water management approach for increased soybean production in Madhya Pradesh. J Interacademicia. 2013;17(2):245-253.

2. Dhakad SS, Khedkar NS. Influence of seed-cum-fertilizer drill machine on the growth characters and yield of soybean (*Glycine max* L.) at farmer's fields. Int J Forestry & Crop Improv. 2014;5(2):68-72.
3. Dhakad SS, Ambawatia GR, Khedkar NS. Effect of seed cum fertilizer drill on growth characters and yield of soybean (*Glycine max*) in Shajapur district of Madhya Pradesh. Int J Agric Eng. 2017;10(1):16-21.
4. Dhakad SS, Agrawal V, Kirar KS, Chauhan SS, Verma S. Performance of soybean (*Glycine max*) under raised bed planting in Malwa region of Madhya Pradesh, India. Int J Curr Microbiol Appl Sci. 2020;9(3):3181-3186. DOI: 10.20546/ijcmas.2020.903.364.
5. Jat LN, Singh SM. Varietal suitability, productivity and profitability of wheat (Triticum species) intercrops and relay cropping under furrow-irrigated raised bed system. Indian J Agric Sci. 2003;73(4):187-190.
6. Jayapaul P, Uthayakumar B, Devasagayam MM, Pandit BJ, Palchamy A, Balakrishnan A. Effect of land configuration methods, irrigation regimes and soil moisture conservation amendments on soybean (*Glycine max* L. Merrill) yield and quality characters. Crop Res. 1995;11:253-257.
7. Jain MP, Dubey AK. Productivity and economic viability of soybean with respect to planting systems and cultivars in Vertisol. Crop Res. 1998;16:102-122.
8. Jadhav JA, Patil DB, Ingole PG. Effect of mechanization with different land configuration on yield and in situ moisture conservation of soybean. Int J Agric Sci. 2012;8(1):48-51.
9. Ram H, Singh G. Soybean (*Glycine max*) growth, productivity and water use under different sowing methods and seeding rates in Punjab. Indian J Agron. 2011;56(4):377-380.
10. Raut VM, Taware SP, Varghese P. Comparison of different sowing methods in soybean. J Maharashtra Agric Univ. 2000;25:218-219.
11. Ralli S, Dhingra KK. Response of soybean to different planting methods. Ann Biol. 2003;19(2):151-155.
12. SOPA. Soybean crop report 2014. Available from: http://www.sopa.org/crop%20report%202014.pdf
13. Tisdall JM, Hodgson AS. Ridge tillage in Australia: A review. Soil Tillage Res. 1990;18:127-144.
14. Verma M. Effect of land configurations and seed rates on the growth and productivity of rainfed growth parameters of mustard (*Brassica juncea* L.). J Oilseeds Res. 2008;22(1):188-189.