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Performance evaluation of raised bed planting of pigeonpea in vertisols of Narsinghpur district

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Abstract

Narsinghpur district of Madhya Pradesh is a major pulse producing district of the country. The pigeon pea of Gadarwara block of the district has made a niche for itself in the pulse market in the country. Narsinghpur is centrally located in India and is one of the beneficiary districts of river Narmada. Soils of Narsinghpur district are mostly vertisols having higher clay content. Such soils are not only difficult to work with but also create conditions of deep cracks in case drought spells and waterlogging under heavy rains. There is a usual practice of flatbed sowing of pigeon pea in the district. This aggravates the situation and subsequently adversely affects the crop productivity. In view of the above issue an assessment of raised bed planting of pigeon pea variety TJT 501 was done during the year 2016-17 and 2017-18 in the Narsinghpur district under KVK programme. Results were encouraging. Average crop yield was 15.55 q/ha in case of raised bed planting higher by 5.2 q/ha over the flat bed sowing. The benefit cost ratio was 3.27 in case of raised bed planting whereas it was only 2.54 in case of flat-bed planting. Overall the ridge-furrow sowing raised bed method of sowing proved better for Pigeon pea production in the black cotton soils of the district.

Keywords: Pigeon pea, vertisol, ridge-furrow sowing

Introduction

Narsinghpur district of Madhya Pradesh is a major pulse producing district of the country. The pigeon pea of Gadarwara block of the district has made a niche for itself in the pulse market in the country. Narsinghpur is centrally located in India and is one of the beneficiary districts of river Narmada. Soils of Narsinghpur district are mostly vertisols having higher clay content. Because of the montmorillonitic nature of the clay minerals vertisols undergo considerable shrinkage on drying and swelling during wetting, which results in large and deep cracks which close only after prolonged wetting (Kanwar 1982) [2]. These soils have drainage problems. Such soils are difficult to work with in both dry and wet conditions. The average annual rainfall of the district is 1006mm. Over the years the monsoon has been irregular in the district. During the year 2013 the total rainfall in the district was 1821mm (Kaur *et al.* 2014) [4] which reduced to 915 mm during 2014 (Kaur *et al.* 2016) [5], and then increased to 1006 mm during 2015 (Kaur *et al.* 2016) [5]. There have been instances when the rains fell incessantly for a few days creating a problem of water logging in the vertisol areas. This might affect the standing pigeon pea crop. There is a usual practice of flatbed sowing of pigeon pea in the district. This aggravates the situation and subsequently adversely affects the crop productivity. In view of the above issue an assessment of raised bed planting of pigeon pea variety TJT 501 was done during the year 2016-17 and 2017-18 in the Narsinghpur district under KVK programme.

Material and Methods

The assessment was done on one acre fields of five farmers each in year 2016-17 and 2017-18. Pigeon pea variety TJT-501 was used for the study. Planting was done on raised beds through tractor drawn raised bed planter. Seed rate was kept as 10 kg/ha. The row to row distance was kept as 75 cm. Standard crop management practices were followed.

The crop yield per ha was estimated on actual yield results. Cost of cultivation and gross/net return was estimated based on prevalent market rates. Benefit: Cost ratio was calculated as ratio of average gross return and average gross cost.

Results and Discussion

During the year 2016 the annual rainfall in the district was 1187.4 mm in which monsoon and post monsoon season contributed 1120.6 mm and 53.0mm respectively (Purohit *et al.*, 2016) [5]. Results of the trials of year 2016-17 are presented in the Table 1. Sowing of pigeonpea on the raised beds resulted in better crop yield. The crop yield under flat-bed planting was 12.5 q/ha whereas it was 15.6 q/ha under the raised bed planting.

Table 1: Effect of raised bed planting on the yield of pigeon-pea var. TJT 501 (year 2016-17):

Pigeon pea	Yield Q/ha	Average Cost of cultivation (Rs/ha)	Average Gross return (Rs/ha)	Average Net Return (Rs/ha)	Benefit Cost ratio (Average gross return / Average gross cost)
Flat - bed planting	12.5	22600/-	56250/-	33650/-	2.48
Raised- bed planting	15.6	24000/-	70200/-	46200/-	2.93

During the year 2017 the annual average rainfall of the district was 777.0 mm. Monsoon and post monsoon rainfall was 720.0 mm and 20.2 mm respectively (Yadav *et al.*, 2017) [17]. Results of trials conducted during the year 2017-18 are presented in Table 2. Here also it can be clearly seen that the raised bed planting performed better than the flat-bed planting. Crop yield

Thus there was a gain in yield by 3.1 q/ha under the raised bed planting. As the crop yield was higher in case of raised bed planting, the gross returns were also higher under the raised bed planting. Under the flat-bed planting the average gross return was Rs. 56250/- per hectare whereas under the raised bed planting the gross return was Rs.70200/- per hectare. Net Returns were higher in case of raised bed planting. Under the raised bed planting it was Rs.46200/- per hectare which was higher by Rs. 12550/- per hectare over the flat-bed planting. The benefit cost ratio also was better in case of the ridge-furrow Sowing. It was 2.93 under the raised bed planting and 2.48 under the flat-bed planting.

under the flat-bed planting was 8.2q/ha and 15.5q/ha under the ridge-furrow method of Sowing. The net returns under the flat-bed planting was Rs. 30500/- per ha. And Rs. 55890/- per ha under the raised bed planting. Consequently the raised bed planting gave the B: C ratio of 3.6 whereas it was lower in the flat bed planting.

Table 2: Effect of raised bed planting on the yield of pigeonpea var. TJT 501 (year 2017-18):

Pigeon pea	Yield Q/ha	Average Cost of cultivation (Rs/ha)	Average Gross return (Rs/ha)	Average Net Return (Rs/ha)	Benefit Cost ratio (Average gross return / Average gross cost)
Flat-bed planting	8.2	19500/-	50000/-	30500/-	2.6
Raised-bed planting	15.5	20110/-	76000/-	55890/-	3.6

The average of the two years *viz.* 2017-18 and 2018-19 was worked out and is presented in Table 3. Crop yield under raised bed planting was 15.55 q/ha and substantially higher than that

obtained under the flat-bed planting. Both the net return and the benefit - cost ratio were higher in case of the raised bed planting as compared to the flat bed planting.

Table 3: Average of the two years (2016-17 and 2017-18) of the effect of raised bed planting on the yield of pigeonpea var. TJT 501

Pigeon pea	Yield Q/ha	Average Cost of cultivation (Rs/ha)	Average Gross return (Rs/ha)	Average Net Return (Rs/ha)	Benefit Cost ratio (Average gross return / Average gross cost)
Flat -bed planting	10.35	21050/-	53125/-	32075/-	2.54
Raised- bed planting	15.55	22055/-	73100/-	51045/-	3.27

Conclusion

Considering the monsoon aberrations and the constraints of vertisols during situations of moisture stress and water logging, raised bed system of planting is a better option for crop cultivation. Raised beds provide better aeration and nodulation in comparison to the crops sown on flat land. This positively affects the crop yield. In the present assessment, comparatively higher yield of pigeon-pea was obtained in the raised bed system of planting as compared to the flat-bed method. Thus it can be concluded that the raised bed planting is a better option for sowing of pigeon pea in vertisols of central India region. Meena *et al.* (2023) [1] in their study on pigeonpea growers' knowledge and constraint to raised-bed planting in eastern Uttar Pradesh, India, are also of similar view.

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