Response of castor to varying planting distance for yield and yield components

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 Received: 27.7.2018/Accepted: 17.8.2018

ABSRACT

On-farm testing was conducted at three villages under the jurisdiction of Krishi Vigyan Kendra, Dethali, Kheda, Gujarat to study the response of castor (*Ricinus communis* L) to planting distance (row distance) during kharif season. In all three distance treatments viz 180 x 150 cm, 150 x 75 cm and 150 x 100 cm were tried at three different locations with three replications. Planting distance treatments 150 x 75 cm and 150 x 100 cm had remarkable influence on plant population and plant height of castor. Planting distance 150 x 75 cm recorded considerably higher plant population at initial as well as at harvest stage and plant height at harvest over 150 x 100 cm and 180 x 150 cm planting distance. On the other hand wider spacing 180 x 150 cm significantly improved number of branches per plant (at harvest) and number of capsules per main spike. Castor sowing at planting distance 150 x 100 cm spacing recorded significantly higher seed yield (2134 kg/ha) than at 150 x 75 cm (2027 kg/ha) and 180 x 150 cm (1760 kg/ha). Thus the results indicated that castor (GCH-7) could be sown at planting distance of 150 x 75 cm under irrigated condition during kharif season.

Keywords: Castor; on-farm testing; planting distance; seed yield; farmers' practice

INTRODUCTION

Castor (*Ricinus communis* L) is the most primitive non-edible oilseed crop that belongs to family Euphorbiaceae. This is one of the most suitable oil seed crops which can be used to fulfill the ever increasing demand of industrial oil. Castor oil is considered as versatile industrial raw material because it contains about 85-90 per cent of ricinoleic acid and 12 per cent hydroxy fatty acid. The oil is different from other vegetable oils in the sense that it does not freeze up to -18ºC temperature. It is therefore considered to be the best lubricating agent particularly for both high speed engines and aeroplanes. The oil is also used in the manufacturing of dyes, detergents, plaster of Paris, soaps, costumes, polishes, greases, rubber, wetting agents etc. It is also used as bactericide and fungicide.

The demand of castor oil both inside and outside the country has grown with the advancement of industrialization all over the world. Castor cake provides excellent organic manure with 4.5 per cent N, 2.6 per cent phosphorus, 1.0 per cent potash, 22.37 per cent protein and 45-46 per cent carbohydrates. It has great value in foreign trade and annually earns foreign exchange worth about Rs 1000 corer through export of oil and its derivatives. Thus castor is also called as 'dollar crop'. India is the world leader in castor seed and oil production and contributes about 55 per cent of the world castor area and 70 per cent of the world castor production. Among the states, Gujarat with an area of about 5.91 lakh ha, total production of 12.69 lakh ton and productivity of 2149 kg/ha of castor holds the first position in the country (Anon 2018).

Now a days with increasing demand for castor oil for industrial purposes castor fetches good market price and provides higher economic returns. Yield of any crop is a function of yield per plant and number of plants per unit area. Therefore the optimum plant population for a particular region must be determined for maximum yield and efficient utilization of land. Proper spacing provides sufficient interception of sunlight and satisfactory absorption of nutrients and

water from the soil resulting in higher crop yield. Optimum plant stand can be obtained by planting the crop at proper inter- and intra-row spacing. Growing castor at wider row spacing reduces the plant population on acreage basis but the crop is capable to compensate the yield loss by increasing growth and yield of individual plant. It is also supported by the work of Patel et al (2003) who described that 150 x 75 cm spacing recorded significantly highest seed yield as compared to rest of the combinations of inter- (90, 120 and 150 cm) and intra- (45, 60 and 75 cm) row spacing.

Tank et al (2007) conducted a field experiment to study the effect of spacing (120 x 60, 120 x 75, 150 x 60 and 150 x 75 cm) on yield, quality and economics of irrigated castor. They observed that 150 x 75 cm and 150 x 60 cm spacing recorded significantly higher seed yield of castor over both the narrow spacing. Keeping these issues in mind the on-farm testing was conducted to show the response of castor to varying planting distance for yield and yield components with scientific cultivation in the fields of farmers of Kheda district, Gujarat during kharif season.

MATERIAL and METHODS

On-farm testing (OFT) was done during kharif season with total area of 1.25 ha by involving 3 farmers each year (0.4 ha area with each farmer). Each location was considered a replication. These three replicates each of 3 treatments produced a total of 12 plots for the study. The OFT continued for three years during kharif season at the different fields. Treatments used were T_1 (180 x 150 cm), T_2 (150 x 75 cm) and T_3 (150 x 100 cm) planting distance.

The observations were recorded on plant population (number of plants counted just before harvesting then converted into plant population per hectare). Five tagged plants were taken to measure plant height (height measured at harvest from the ground level to the base of main spike), number of branches per plant (at 90 days after sowing and at harvest) and number of capsules/main spike. For calculating the seed yield the produce of each net plot was sundried, threshed and cleaned separately.

In order to evaluate most effective and remunerative treatment the relative economics of each treatment was computed. For each treatment gross realization in terms of rupees per hectare was worked out taking into consideration the prevailing market price of grain during the season. Likewise the cost of cultivation was worked out by considering the expenses incurred for cultural operations from preparatory tillage to harvesting. The cost of cultivation was then deducted from the gross realization to work out net realization under each treatment.

RESULTS and DISCUSSION

Yield attributes

The data pertaining to yield attributes are given in Table 1.

Plant population: Planting distance significantly influenced plant population at harvest as it altered the crop geometry. Significantly higher initial and final plant population was recorded under 150 x 75 cm as compared to 150 x 100 cm and 180 x 150 cm. The results are supported by the work of Thadoda et al (1996).

Plant height: The maximum plant height was recorded in 150 x 75 cm planting distance ie 150 cm at crop harvest. However plant height decreased with increasing planting distance (124 and 99.40 cm under T_3 and T_1 respectively). Similar finding were also reported by Patel and Patel (2004) and Rana et al (2006).

Number of braches/plant: The number of branches per plant increased when planting distance was increased from 150 x 75 cm to 180 x 150 cm. At harvest in 180 x 150 cm (T_1) planting distance recorded higher number of branches per plant (9.4) over 150 x 100 cm (T_3) (8.9) and 150 x 75 cm (T_2) (7.2). Similar pattern of positive growth response to wider spacing was also observed by Narkhede et al (1984), Thadoda et al (1996), Singh (2003) and Porwal et al (2006).

Number of capsules/main spike: Widening crop planting distance from 150 x 75 cm to 180 x 150 cm showed positive increase in number of capsules per main spike. Castor at 180 x 150 cm (T_1) registered the maximum number of capsules per main spike (89) which was higher over 150 x 100 cm (81) and 150 x 75 cm (78). Similar results were also reported by Porwal et al (2006) and Rana et al (2006).

Seed yield: Castor sowing at 150 x 100 cm (T_3) planting distance recorded highest seed yield (2134 kg/

Table 1. Technological practices followed under farmers' practice and demonstrations

Parameter	T 1	T 2	T 3
	180 x 150 cm	150 x 75 cm	150 x 100 cm
Plant population	3678	8805	6645
Plant height (cm)	99.40	150	124
Number of branches	9.4	7.2	8.9
Number of capsules/main spike	89	78	81
Seed yield (kg/ha)	1760	2027	2134

Table 2. Net return and BCR under farmers' practice and demonstrations

Parameter	T 1	T 2	T 3
	180 x 150 cm	150 x 75 cm	150 x 100 cm
Net return (Rs)	42667	56307	57387
BCR	2.76	3.17	3.34

ha) as compared to 150 cm x 75 cm (T_2) (2027 kg/ha) and 180 x 150 cm (T_1) (1760 kg/ha). The treatment T_3 recorded 5.20 and 21.25 per cent higher grain yield than that recorded at planting distance 150 x 75 cm (T_2) and 180 x 150 cm (T_1). The results are in conformity with those of Rana et al (2006), Manukonda and Shaik (2007) and Sardana et al (2008).

Economics

The data on net realization in rupees per hectare and benefit-cost ratio (BCR) as influenced by various treatment are presented in Table 2. In respect of planting distance the higher net realization of Rs 57387/ha with cost-benefit ratio of 1:3.34 was recorded under T_3 (150 x 100 cm) as compared to T_2 (150 x 75 cm) and T_1 (180 x 150 cm). It accrued Rs 14720/ha and Rs 1080 more in net realization under T_3 (150 x 100 cm) over T_2 (150 x 75 cm) and T_1 (180 x 150 cm). Similar observations were made by Leela Rani (2008) and Sardana et al (2008).

CONCLUSION

The spacing distance of 150 x 75 cm resulted in higher plant populationm plat height as compared to the other two plant distance spacing tried. Based on the three years results on the trial conducted during kharif season on castor crop it was found that a spacing distance of 150 x 100 cm was the most suitable for higher growth parameters and yield in castor.

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