Research Article

Yield Performance of Castor Hybrid (YRCH 1) to Different Crop Geometry levels Under SCI Practices

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Abstract

Castor (*Ricinus communis* L.) is a most preferable and non-edible, dryland oilseed crop in Tamil Nadu. In order to determine the yield performance of castor hybrid under different spacing levels on yield attributes and yield a study was conducted at TNAU, Coimbatore, and an altitude of 426.7 m above MSL. The aim of this study was to evaluate the yield of the castor hybrid YRCH 1 to different crop geometry under system crop intensification practices during *kharif* season of 2012-13. The experimental plot was located at eastern block of TNAU, soil has the pH of 7.86 and EC 0.57 dSm^{-1}. There were eight treatments imposed in randomized block design (RBD) with three replications with the plot size of 18 x 6 m. The treatments consisted of four row spacing (120x90 cm, 120x120cm, 150x150 cm and 90x90cm), hand weeding and mechanical weeding. Nitrogen and potash was applied in two split doses at 30 and 60 DAS. The full dose of phosphorus applied as basal for all treatments. The crop was cultivated during 2012-2013 *kharif* season. The parameters such as plant height, number of branches, height of primary raceme, number of racemes per plant, raceme length, number of capsules per raceme and grain yield were assessed. The spacing of 120x120cm, between rows and plant had the highest yield of castor beans during *kharif* season. The average yield of the cultivar YRCH 1 indicates its potential for cultivation in dryland system with lesser amount of irrigation under monsoon season.

Keywords: Castor YRCH 1, primary receme, crop geometry, system of crop intensification

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Introduction

Castor (*Ricinus communis* L.) is an indeterminate and non-edible oil seed crop grown in low rainfall regions of semi-arid regions of India. India ranks first in castor bean production in the world followed by China and Brazil. Currently castor oil is used an animal feed for energy production [1]. Earlier cultivating of castor is situated only in high altitudes, however, with the advantage of biodiesel production, cultivation of castor crop has become important by providing effective land utilization pattern in dryland cropping system with generating profit and creating employment opportunities for farm families.

Practicing proper method of agronomic practices with wider crop geometry results more light interception in crop canopy, maximum use of nutrients and water that the plants absorbs are the key deciding factors which are closely related to castor bean yield. Production of castor bean is essential due to its multipurpose usage potential. However, study on cultivating castor is meager and it is restricted in an area of dryland under rainfed farming system. Moreover, the currently available cultivars have not been widely tested for the entire agro climatic condition of Tamil Nadu. It is felt necessary to develop an improved technology package, in the name of system of crop intensification (SCI) to improve the castor yield.

Crop geometry defines the arrangement of crops in different spacing levels that has a greater impact on physiological and yield attributes of castor crop. In determining plant population per hectare area, adoption wider or closer spacing, climatic condition, soil characteristics, cultivar selected, management practices are must be taken into consideration [2]. Now, the recommendations on spacing of castor plants are generalized. Different crop geometry had been studied but the availability of scientific information is less for the support of technical recommendations to the farmers by adopting optimum crop geometry levels between rows and plants with ultimate aim of increasing yield. There is therefore a need for experiments that evaluate the spacing of castor crops under irrigated/rainfed condition with lesser number of irrigations. The objective of this study is to determine the agronomic response of the cultivar YRCH 1 to wider spacings levels to increase the grain yield of castor beans.

Materials and Methods

A field experiment on system of crop intensification in castor (*Ricinus communis* L.) was conducted during the *Kharif* season of 2012-13, at Tamil Nadu Agricultural University, Coimbatore. During the cropping period the crop received 228.4 mm of rainfall in 14 rainy days. The mean maximum and minimum temperature recorded were 31.15°C and 21.49°C, respectively. The mean maximum and minimum relative humidity were 86.05 per cent and 50.09 per cent. The soil was sandy clay loam in texture (*Typic Haplustalf*), the pH of 7.86 and EC 0.57 dSm^{-1}. There were eight treatments imposed in randomized block design (RBD) with three replications with the plot size of 18 x 6 m. The treatments consisted of four row spacings (120x90 cm, 120x120cm, 150x150 cm and 90x90cm), hand weeding and mechanical weeding. The different combinations included here were, Control (T_1)-120x90cm + 100% NK+HW; (T_2)-120x120cm + 100% NK+HW; (T_3)-150x150cm + 100% NK+HW; (T_4)-150x150cm + 125% NK+HW; (T_5)-120x120cm + 100% NK+MW; (T_6)-150x150cm + 100% NK+MW; (T_7)-150x150 cm spacing + 125% NK+MW; (T_8)-90x90cm + 100% NK+HW. Two seeds per hole were used at the time of sowing, for thinning, leaving one healthy plant per hole. Weed control measures are accomplished by hand and mechanical weeding. Five plants are randomly selected and tagged from each plot and the following biometric observations were noted; plant height, number of branches, length of primary spike, number of spikes per plant, number of capsules per spike, bean yield was assessed. The plants were grown upto harvest and castor spikes are harvested when 50 per cent of the capsules dried.

Results and Discussion

Effect on yield attributes and yield

The result of the experiment showed that the SCI practices exhibited significant effect (P=0.05) on number of spikes $plant^{-1}$, number of spikes m^{-2}, number capsules on spike, number of capsules $plant^{-1}$, number of capsules m^{-2} and length of spike. Discernible variations in bean yield and stalk yield (kg ha^{-1}) have been observed due to adoption of different crop geometry levels in castor cultivation.

Table 1 Effect of SCI practices on number on yield attributes and yield of castor crop at harvest stage

Treatments		No. of spikes $plant^{-1}$	No. of capsules $spike^{-1}$	No. of capsules $plant^{-1}$	Length of spike (cm)	Bean yield (kg ha^{-1})
T_1	120 x 90 cm + 100% NK + HW	30.67	21.40	764.0	25.85	2108
T_2	120 x 120 cm + 100% NK + HW	32.33	30.51	989.9	24.59	2085
T_3	150 x 150 cm + 100% NK + HW	35.33	31.78	1133.8	26.37	1902
T_4	150 x 150 cm + 125% NK + HW	35.00	32.88	1150.6	27.16	1947
T_5	120 x 120 cm + 100% NK + MW	32.67	34.67	1130.2	25.31	2201
T_6	150 x 150 cm + 100% NK + MW	35.00	27.86	965.9	25.36	1595
T_7	150 x 150 cm + 125% NK + MW	34.67	29.05	1008.5	26.86	1667
T_8	90 x 90 cm + 100% NK + HW	29.00	12.51	362.0	27.45	1260
SEd		1.22	2.09	84.8	1.44	103
CD (P=0.05)		2.61	4.48	181.9	NS	222

NK - Nitrogen and Potassium, HW - Hand weeding, MW - Mechanical weeding

Thus, to interpret the results, an association between the physiological parameters and the row spacing of the growth of the castor plant which is highly responsible for the formation of number of branches and number of receme

per plant during the *kharif* season was observed. It is stated that this effect is might be because of reduced competition between plants in the wider row spacing, compounded by availability of more nutrients and water.

Number of spikes plant^{-1} was higher under wider crop geometry of 150 x 150 cm with either 100% or 125% and hand weeding or mechanical weeding than other SCI practices. This may be due to more radiation interception above the canopy and higher availability of nutrients and water below canopy to the individual plant under wider crop canopy during the growth cycle of the crop. The variability of micro climate condition of a crop alters the number of spikes unit area^{-1} and variability in the yield. This is in agreement with the earlier findings of Kittock and Williams (1970) [3] in castor. The lower number of plant population arrangement resulted in plants with a more number of spikes [4]. The number of capsules spike^{-1} and capsules plant^{-1} were maximum under wider spaced castor (150 x 150 cm) with other combinations. Efficient utilization of both above and below ground resources due to wide area available to the individual plant might be the reason.

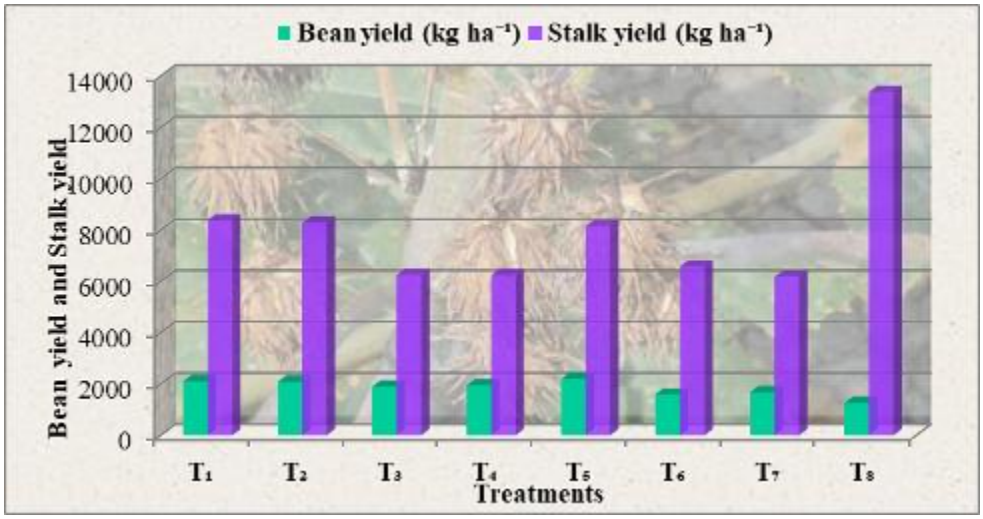

Figure 1 Effect of SCI practices on bean yield and stalk yield of castor

The spacing of 150 x 150 cm with 100% NK and hand weeding exhibited increased spike length. The enhanced length of spike at wider crop geometry was due to better crop growth, more space available for plants, lesser competition for moisture and nutrients between plants. This is in conformity with the findings of Subramani *et al*. (2002) [5]. The planting geometries which contributed for higher bean yield of castor under wider plant geometry over closer plant geometry was due to better availability of resources induced for better yield attributing characters. Castor bean yield was higher under 120 cm row spacing with 100% NK and wider either hand weeding or mechanical weeding. Patel *et al*. (2010) [6] reported similar findings in castor.

Conclusion

The highest yield of castor beans during the *kharif* season 2012 was produced at a wider spacing of 120 cm between rows and plants yielding a population of 6944 plants ha^{-1}. Castor hybrid YRCH 1 grown under 120 x 120 cm spacing with 100% NK and mechanical weeding twice at 30 and 60 DAS produced better yield being economically productive than other treatments. The average yield of the cultivar highlights its potential yield of castor hybrid YRCH 1 under the dryland and rainfed system of Tamil Nadu.

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