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Research Article

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Influence of SCI Practices on Yield, Nutrient Uptake and Oil Yield of Castor (*Ricinus communis* L.) *var*: YRCH-1 under Irrigated Condition of Western Zone of Tamil Nadu

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ABSTRACT

Field experiment was conducted at Tamil Nadu Agricultural University, Coimbatore under irrigated conditions to develop an improved technology package and evaluate the system of crop intensification (SCI) practices in castor. The experiment was laid out in randomized complete block design, comprised of eight treatments viz., T_1-120 x 90 cm spacing + 100% NK (60 and 30 kg of N and K_2O ha^{-1}) + Hand weeding (HW) twice (30 and 60 DAS) - Control, T_2-120 x 120 cm spacing + 100% NK + HW, T_3-150 x 150 cm spacing + 100% NK + HW, T_4 - 150 x 150 cm spacing + 125% NK + HW, T_5-120 x 120 cm spacing + 100% NK + Mechanical weeding (MW) twice (30 and 60 DAS), T_6-150 x 150 cm spacing + 100% NK + MW, T_7 - 150 x 150 cm spacing + 125% NK + MW and T_8 - 90 x 90 cm spacing + 100% NK + HW. The treatments were replicated thrice. The results revealed that the castor hybrid grown under SCI practices under square planting with wider spacing of 120 x120 cm along with 100% NK and mechanical weeding at 30 and 60 DAS produced higher castor bean yield. Higher stalk yield was observed at closer spacing of 90 x 90 cm + 100% NK + HW. Oil yield was higher under 120 x 120 cm spacing with mechanical weeding over others treatments. Higher nutrient uptake of total N, P and K was recorded under closer square geometry of 90 x 90 cm spacing with 100% NK and hand weeding.

Key words: *System of crop intensification, Square planting, Yield, Quality parameters, Oil yield, Nutrient uptake.*

INTRODUCTION

Castor (*Ricinus communis* L.) is one of the important non-edible and ancient oilseed crops of world. India occupies a premier position in the area, production and productivity and largest producer of castor in the world. In Tamil Nadu castor crop is grown over an area of 5972 hectares, with a production of 1862 tonnes and an average yield of 312 kg ha^{-1}. Castor is mostly cultivated as intercrop and as rainfed crop with groundnut and other pulses. So the maximum potential yield is not being achieved.

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Increased production is possible mainly through appropriate agro techniques such as high yielding varieties/hybrids, optimum time, maintaining optimum planting population and judicious use of nutrients. Although soil supply some amount of nutrients, it is imperative to meet the requirements by way of supplying optimum level of nutrients through the external sources in the form of organic and inorganics. These applied nutrients play an important role for higher crop production and better oil quality. The fertilizer requirement of most of the latest hybrids needs to be worked with the change in total fertilizer. Hence, the present study was undertaken with a view to improve castor production through SCI practices under irrigated conditions by increased level of nutrients.

MATERIAL AND METHODS

The field experiment was conducted at field No. 36 F, Eastern block farm, Tamil Nadu Agricultural University, Coimbatore, during the *Kharif* season of 2012-13. Four spacing levels (120 x 90 cm, 90 x 90 cm, 120 x 120 cm and 150 x150 cm), two fertilizer levels (100% RDF and 125% RDF) along with two weeding methods (HW and MW at 30 and 60 DAS) of castor were evaluated under SCI practices in a randomized complete block design with gross plot size of 108 m^2. Eight treatments were replicated in three replications. Spacing of 120 x 90 cm and 100% NK with hand weeding was fixed as control plot. The 100% NK (60:30:30 kg of NPK ha^{-1}) and 125% NK (75:30:37.5 kg of NPK ha^{-1}) for castor was applied at the time of sowing, 30 and 60 DAS. Full dose of P and 50% NK was applied as basal at the time of sowing and remaining N and K was applied in two equal splits at 30 and 60 DAS of castor. Two hand weeding and mechanical weeding was carried out at 30 and 60 DAS.

Biometric observations were recorded at different growth stages *viz*., 30, 60, 90 and 120 DAS and at harvest stages. The data recorded were statistically analysed as suggested by Gomez and Gomez (2010) and the critical differences were worked out at 5 per cent probability level and the values were furnished in details.

RESULTS AND DISCUSSION

i) Effect on bean yield and stalk yield

Significantly higher castor bean yield (2201 kg ha^{-1}) was recorded at 120 x 120 cm spacing with 100% NK and mechanical weeding than all other SCI practices. However, it was very much comparable with 120 x 90 cm spacing with 100% NK and hand weeding (2108 kg ha^{-1}) and 120 x 120 cm spacing with 100% NK and hand weeding (2085 kg ha^{-1}). 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, and effective weed control were helped the plants to exhibit their full potential and produced higher yield. Further, significant increase in yield of castor under wider row spacing was due to least competition for solar energy, water and nutrients. These results are conformity with Porwal *et al*.[2] in castor. The lowest castor bean yield (1260 kg ha^{-1}) was recorded under closer spacing of 90 x 90 cm and 100% NK along with hand weeding. This was due to more of vegetative growth and lesser yield attributes because of severe competition between plants. This is in agreement with the findings of Tomer and Tiwari[4] in greengram and blackgram.

Superior stalk yield (10041 kg ha^{-1}) at harvest was recorded with closer plant geometry of 90 x 90 cm and 100% NK along with hand weeding over other treatments (Fig. 1). The lowest stalk yield of 4634 kg ha^{-1} was recorded with 150 x 150 cm spacing along with 125% NK and mechanical weeding. This was due to, higher leaf area index and drymatter production recorded due to closer spacing levels ultimately resulted in higher stalk yield.

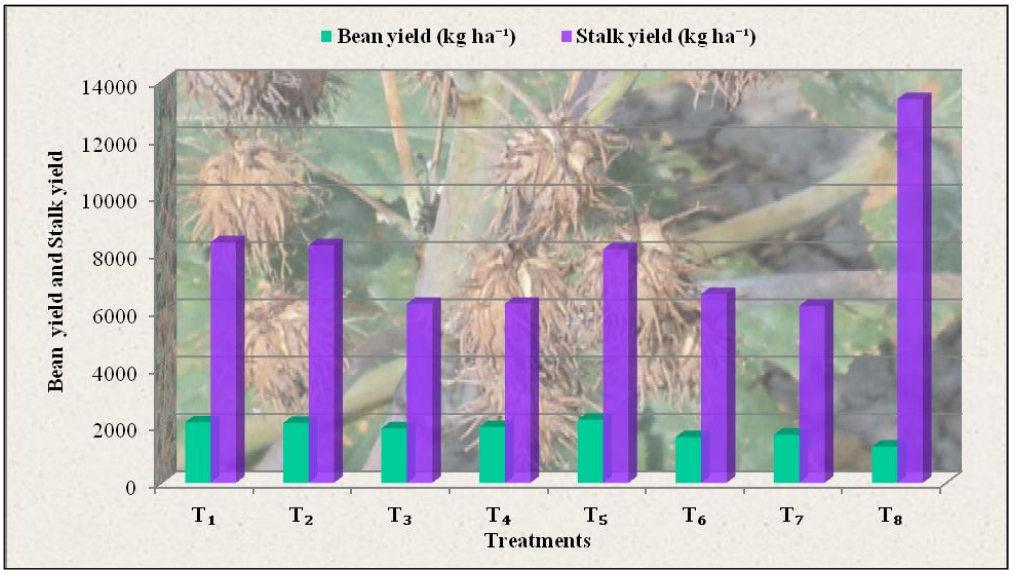

Fig 1. Castor bean and stalk yield as influenced by SCI practices

Table 1: Effect of SCI practices on castor bean yield

Treatments			Bean yield (kg ha^{-1})	Stalk yield (kg ha^{-1})
T_1	-	120 x 90 cm spacing + 100% NK + HW (Control)	2108	6296
T_2	-	120 x 120 cm spacing + 100% NK + HW	2085	6215
T_3	-	150 x 150 cm spacing + 100% NK + HW	1902	4686
T_4	-	150 x 150 cm spacing + 125% NK + HW	1947	4687
T_5	-	120 x 120 cm spacing + 100% NK + MW	2201	6111
T_6	-	150 x 150 cm spacing + 100% NK + MW	1595	4939
T_7	-	150 x 150 cm spacing + 125% NK + MW	1667	4634
T_8	-	90 x 90 cm spacing + 100% NK + HW	1260	10041
		SEd	**103**	**365**
		CD (P=0.05)	**222**	**784**

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

Treatment T_8 (90 x 90 cm spacing + 100% NK + hand weeding) registered significantly higher N,P and K uptake at120 DAS, compared to all other SCI practices and control. Higher N, P and K removal by castor was due to higher drymatter production. Increased number of plants competes for available nutrient unit area^{-1} resulting higher uptake as documented by Sathyamoorthi *et al*.[3] in greengram.

Table 2: Effect of SCI practices on Nitrogen, Phosphorous and Potassium uptake (kg ha^{-1}) at 120 DAS stages of castor

Treatments			N	P	K
T_1	-	120 x 90 cm spacing + 100% NK + HW (Control)	49.65	8.43	50.17
T_2	-	120 x 120 cm spacing + 100% NK + HW	51.30	8.51	54.16
T_3	-	150 x 150 cm spacing + 100% NK + HW	43.84	7.98	43.90
T_4	-	150 x 150 cm spacing + 125% NK + HW	44.00	7.35	42.18
T_5	-	120 x 120 cm spacing + 100% NK + MW	52.64	8.96	57.19
T_6	-	150 x 150 cm spacing + 100% NK + MW	44.54	8.12	49.45
T_7	-	150 x 150 cm spacing + 125% NK + MW	45.86	7.94	47.68
T_8	-	90 x 90 cm spacing + 100% NK + HW	59.21	10.12	61.25
		SEd	**1.428**	**0.56**	**0.51**
		CD (P=0.05)	**3.06**	**1.20**	**1.08**

ii) Effect on quality parameters

Data on castor bean oil content (%) were statistically analysed and perusal of data showed that varied SCI practices did not exert any significant influence on oil content of castor beans. However, the maximum oil content (46.07%) was recorded under T_2 (120 x 120 cm spacing + 100% NK + hand weeding) and the minimum (44.01%) was noted at 150 x 150 cm spacing with 100% NK and hand weeding (T_3). The oil content is largely governed by genetic nature and also the parameters under study *viz.*, crop geometry, nitrogen levels, weeding etc., may have the least influence on the quality character like oil content might be the reason for unchanged results.

Table 3: Effect of SCI practices on oil content and oil yield (kg ha^{-1}) of castor

Treatments			Oil content (%)	Oil yield (kg ha^{-1})
T_1	-	120 x 90 cm spacing + 100% NK + HW (Control)	44.70	942.4
T_2	-	120 x 120 cm spacing + 100% NK + HW	46.07	960.7
T_3	-	150 x 150 cm spacing + 100% NK + HW	44.01	836.4
T_4	-	150 x 150 cm spacing + 125% NK + HW	45.26	865.6
T_5	-	120 x 120 cm spacing + 100% NK + MW	45.16	991.9
T_6	-	150 x 150 cm spacing + 100% NK + MW	45.80	779.8
T_7	-	150 x 150 cm spacing + 125% NK + MW	45.92	770.5
T_8	-	90 x 90 cm spacing + 100% NK + HW	44.19	602.0
		SEd	**1.48**	**39.6**
		CD (P=0.05)	**NS**	**84.9**

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

SCI practices had significant influence on quantum of oil yield among the different spacing levels (Fig.2). Higher oil production was recorded with 120 cm row spacing with 100% NK and either hand weeding or mechanical weeding. This is expected, because the oil yield is a computed value from oil content by multiplying with bean yield.

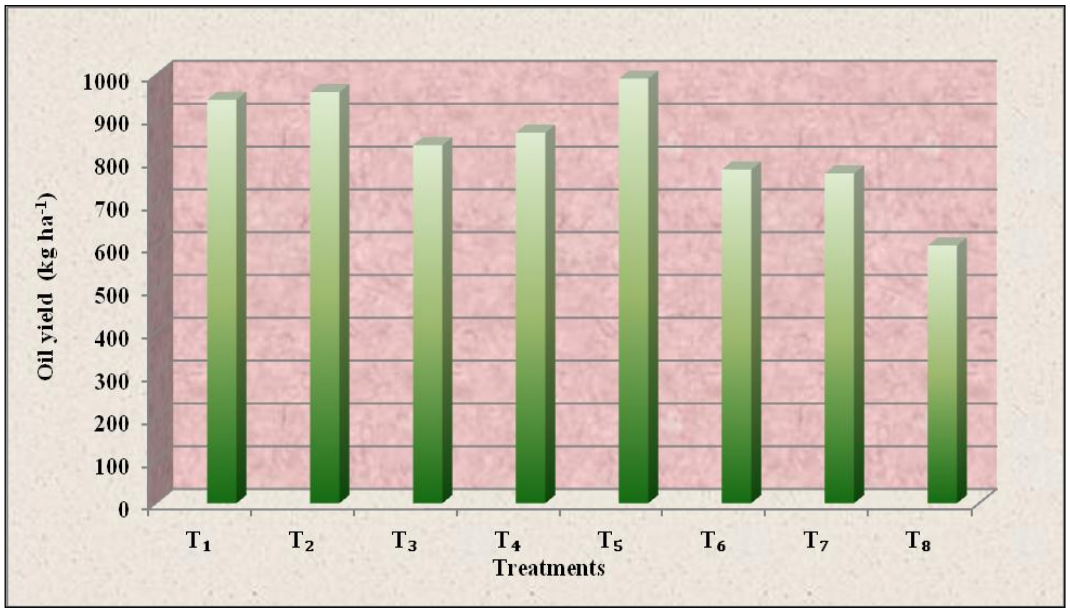

Fig. 2: Effect of SCI practices on oil yield of castor

CONCLUSION

Higher castor bean yield and oil yield was recorded under 120 x 120 cm spacing with 100% NK and mechanical weeding twice at 30 and 60 DAS than other treatments. Adoption of SCI practices did not have any significant influence on oil content of castor. However, the highest oil content was observed under wider spacing of 120 x 120 cm with 100% NK and hand weeding at 30 and 60 DAS. Nutrient uptake of NPK was recorded maximum under closer spacing of 90 x 90 cm with 100% NK and hand weeding treatment.

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