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Effect on Growth and Yield of *rabi* Castor in Pulses Intercropping under Varying Planting Geometry

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Abstract: Castor is important oilseed crop raised under limited resource condition which limited per unit area productivity. Intercropping can provide substantial yield advantages compared to sole cropping. Success of cropping system depends on selection of intercrop and spatial arrangement. A biennial field experiment was carried out at Integrated Oilseed Research Farm, N. M. College of Agriculture, Navsari Agricultural University during *rabi* seasons of two consecutive years (2004 to 2006) to explore the possibility of increasing productivity from castor based intercropping system by optimizing pulse and planting pattern combination. During investigation three pulses intercrop viz., chickpea, green gram, Indian bean were evaluated under normal and paired row planting pattern. Experimental results indicated that intercropping of pulses reduced castor growth and yield and reduction was more under paired row planting. Green gram intercropping in normal as well as in paired row showed similar growth and yield performance of castor as in sole cropping. Among tried pulses, Indian bean caused severe reduction in yield attributes and yield of castor.

Key words: Castor · Intercropping and planting geometry

INTRODUCTION

Castor (*Ricinus communis* L.) is most important oilseed crop of India due to the fact that it's oil has diversified uses and has great value in foreign trade. Unfortunately, in India, castor along with other oilseed crops are raised under limited resource condition which leaving the crop thirsty and hungry by the resource poor farmers. However, as castor is a long duration, widely spaced crop with comparatively thin plant population as compared to other field crops, provide ample scope for growing intercrop in order to increase production from unit area of land. Intercropping is popular in tropical and sub-tropical countries as it creates favourable micro-climates, has low labour requirement, higher stability of yield and productivity [1]; Reddy *et al*. [2] and Tarhalkar and Rao [3] reported that pulses had a complemetary effect and cereals had a competitive effect when they were grown as intercrops with castor. The yield advantages due to intercropping is especially important because they are achieved not by means of costly inputs, but the simple expedient of growing crop together [4]. The suggested benefits of legumes as an intercrop are the increased growth of roots and shoots, better root stratification and utilization of soil nutrients and nitrogen fixation which allows the legumes to become independent of soil nitrogen and making some nitrogen available to associated to non-legume [5]. This availability to non-legume was attributed through soluble root exudes and/or decay of nodules [6]. The soil structure also improved due to legume intercrop by aggregation around roots involving the adherence of fine soil particles to living root hairs [7, 8] with improvement in water holding and buffering capacity of soil with incorporation of legume residues [9]. For achieving maximum yield potential of any crop it is necessary to provide congenial environmental conditions for the optimum growth and development of crop. The space in the field which is made available to the individual plant is an important factor affecting the growth and yield of crop. The study of the plant response to the changes with certain plant arrangement is necessary as the yield per unit area is dependent not only on the number of plants per unit area but also on the arrangement of these plants on the ground. Srinivas *et al*. [10] and Veeranna *et al*. [11] also reported increased production per unit area from castor by optimizing row ratio and planting geometry with suitable intercrop.Thus our study addresses to increase

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competitiveness of castor under South Gujarat, where recently castor is becoming popular among the farmers, through optimizing pulse and planting pattern for castor based intercropping system.

MATERIALS AND METHODS

The potentiality of system were assessed by observing growth parameters viz., plant height plant spread, dry matter accumulation and days to 50 % flowering of castor crop and yield and yield attributes of component crop. The observed data were analysed statistically using analysis of variance at 5 per cent level of significance [12].

RESULT AND DISCUSSION

The data on castor growth parameters (Table 1 and 2) indicated that normal and paired planting pattern with the intercrop remained at par with each of respective intercrop at all growth stages during both the years. This exhibited that intra crop competition within castor row was not so severe that can exhibit significant differences in treatment mean. Also, Ravichandran and Palaniappan [13] found similar differences in sorghum normal and paired system. However, per cent reduction was more in paired system irrespective of intercrop because in paired system, plants were under competition with their neighbour immediately and it become more pronounced by imposition of Indian bean which compete more stiff for resources and thus maximum reduction in paired row + Indian bean (T_{10}) than in equidistant row.

The data related to mean number of spikes/plant, no. of capsule/plant and seed yield (kg ha^{-1}) (Table 3) indicated that significantly maximum number of spikes, capsule/plant and seed yield were recorded under sole castor (T_1) in both the years. Reduction in yield attributes was also recorded due to pilse intercropping by Srilatha *et al*. [14]. It was expected as plant growth was

Table1: Effect of various treatments on plant height (cm) and plant spread (cm) at harvest of castor

	Plant Height (cm)			Plant Spread (cm)		
Treatments	2004-05	2005-06	Mean at harvest (2004-06)	2004-05	2005-06	Mean at harvest (2004-06)
T_1	163.69	174.05	168.87	135.37	144.31	139.84
T_2	-	-	-	-	-	-
T_3	-	-	-	-	-	-
T_4	-	-	-	-	-	-
T_5	139.46	145.43	142.44 (-15.65)	111.97	119.05	115.50 (-17.40)
T_6	150.62	158.05	154.33 (-8.61)	123.10	129.62	126.36 (-9.64)
T_7	117.24	124.80	121.02 (-28.33)	86.47	98.57	92.52 (-33.84)
T_8	135.22	141.69	138.46 (-18.01)	107.57	111.07	109.32 (-21.82)
T_9	143.28	152.69	148.05 (-12.33)	121.80	125.37	123.58 (-11.63)
T_{10}	111.55	114.82	113.18 (-32.98)	81.47	92.10	86.78 (-37.94)
S. Em. ±	7.66	8.14		4.64	7.87	
C.D. at 5 %	23.61	25.08		14.30	24.26	
C.V. %	9.67	9.76		7.33	11.64	

* Value in parenthesis indicate % increase (+) or decrease (-) over sole castor (T_1)

Table2: Effect of various treatments on days to 50 per cent flowering and dry matter accumulation (g $plant^{-1}$) at harvest of castor

	Days to 50 per cent flowering		Dry matter accumulation per plant(g $plant^{-1}$)		
Treatments	2004-05	2005-06	2004-05	2005-06	Mean at harvest (2004-06)
T_1	61.67	62.33	230.73	237.93	234.33
T_2	-	-	-	-	-
T_3	-	-	-	-	-
T_4	-	-	-	-	-
T_5	60.33	63.33	177.93	197.13	187.53 (-19.97)
T_6	60.00	64.67	203.10	217.52	210.31 (-10.25)
T_7	64.33	66.00	144.60	162.47	153.53 (-34.48)
T_8	60.33	65.00	165.60	185.96	175.78 (-24.50)
T_9	61.67	63.67	182.57	206.60	194.58 (-16.96)
T_{10}	63.67	66.67	143.70	152.07	147.88 (-36.89)
S. Em. ±	2.72	2.81	16.82	12.59	
C.D. at 5 %	NS	NS	51.82	38.80	
C.V. %	7.64	7.55	16.37	11.23	

* Value in parenthesis indicate % increase (+) or decrease (-) over sole castor (T_1)

Table3: Effect of various treatments on yield attribute and yield of castor

Treatments	No. of spikes per plant			No. of capsules per main spikes			Seed yield (Kg ha $^{-1}$)		
	2004-05	2005-06	Mean at harvest (2004-06)	2004-05	2005-06	Mean at harvest (2004-06)	2004-05	2005-06	Mean at harvest (2004-06)
T_1	6.53	6.60	6.57	68.03	71.50	69.76	2008.54	2136.75	2072.65
T_2	-	-	-	-	-	-	-	-	-
T_3	-	-	-	-	-	-	-	-	-
T_4	-	-	-	-	-	-	-	-	-
T_5	5.73	5.67	5.7 (-13.24)	54.27	61.80	58.03 (-16.81)	1595.44	1752.13	1673.79 (-19.24)
T_6	6.13	6.33	6.23 (-5.18)	61.13	69.60	65.36 (-6.31)	1712.25	1880.34	1796.29 (-13.33)
T_7	4.23	4.40	4.32 (-34.25)	46.80	50.27	48.53 (-30.43)	1250.00	1388.89	1319.44 (-36.34)
T_8	5.16	5.27	5.22 (-20.56)	53.67	60.53	57.10 (-18.51)	1424.50	1652.42	1538.46 (-25.77)
T_9	5.87	6.07	5.97 (-9.13)	59.80	64.60	62.20 (-10.84)	1655.98	1873.22	1764.60 (-14.86)
T_{10}	4.02	4.20	4.11 (-37.44)	41.93	46.03	43.98 (-36.95)	1171.65	1289.17	1230.41 (-40.64)
S. Em. ±	0.23	0.27		4.08	4.26	132.16	110.42	86.11	
C.D. at 5 %	0.70	0.83		12.56	13.12		407.17	340.18	251.33
C.V. %	7.31	8.50		12.82	12.17		14.81	11.18	16.66

* Value in parenthesis indicate % increase (+) or decrease (-) over sole castor (T_1)

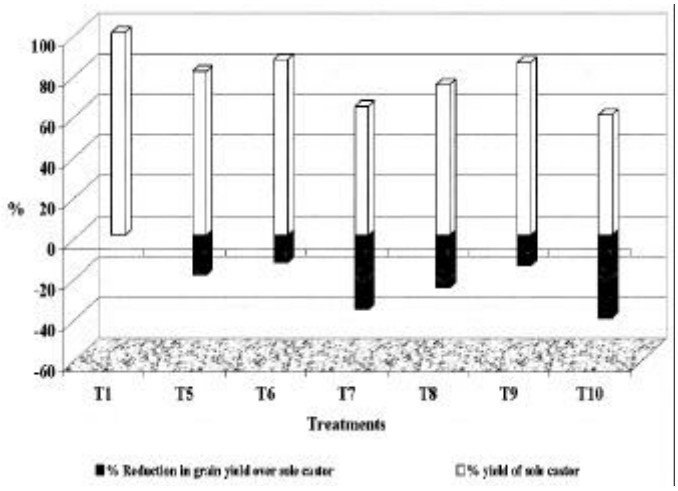

Fig. 1: Effect of various treatment on grain yield of castor

also reduced due to imposition of intercrop. However green gram intercropping in normal (T_6) and paired row (T_9) gave statistically at par values for number of spikes and capsule/plant with sole castor. As discussed earlier, of tried pulses green gram, seems to be less harmful for castor might be due to its short life span and also their growth peaks are never coincide with each other which reduced demand pressure and environmental resources are efficiently utilized by both the crops. The results also indicated that normal and paired row system remained at par with each other with their respective intercrop for these characters. Similar, non-significant difference due to planting pattern was also observed, by Pawar and Khade [15] in sorghum when intercropped with gram. However, reduction was more in paired system as compared to normal row, might be due to reduced canopy development as indicated by data on plant growth (Table 1 and 2). Chickpea intercropping also gave promising results during second year and under normal row planting (T_5) gave at par value of number of spikes, capsule/plant to sole castor. It was attributed to nitrogen fixation ability which can be utilized by companion crop of long duration like castor while such effect was not observed with Indian bean intercropping because of its long duration nature, as compared to chickpea and green gram and competes more intentionally.Planting pattern did not influence seed yield of castor, similar to growth and yield attributes. Similar results were also reported by Kumar [16] in castor, per cent reduction in seed yield over castor indicated that imposition of green gram (Fig. 1) was least harmful and recorded only 13.33 % in normal and 14.86 % in paired planting while Indian bean recorded 40.6 % reduction in paired row over sole castor. About 50 % reduction in castor seed yield was also observed by Saran and Giri [17] in castor + grain legumes system. Significantly maximum castor equivalent yield were obtained from all intercropping treatments and maximum was recorded with green gram in normal row (T_6) (83.9 % higher over sole

castor). Thus, total productivity per unit area can be increased due to green gram intercropping in castor under South Gujarat condition.

CONCLUSION

Experimental results demonstrated that intercropping of pulses reduced castor growth and yield attributes.and reduction was more under paired row planting. Green gram intercropping in normal as well as in paired row showed similar growth and yield performance of castor as in sole cropping thus under south Gujarat condition it is most profitable to intercrop Green Gram with castor. Among tried pulses, Indian bean caused severe reduction in yield attributes and yield of castor.

REFERENCES

1. Osiru, D.S.O., 1983. Intercropping: A review of possible advantages. S.K. Roy (ed.), In Frontiers of Research in Agriculture, Indian Statistical Institute, Cultutta, pp: 304-320.
2. Reddy, P.G., S.C. Rao and P.R. Reddy, 1965. Mixed cropping in castor. Indian Oilseeds J., 9(4): 310-316.
3. Tarhalkar, P.P. and N.G.P. Rao, 1975. Changing concepts and practices of cropping systems. Indian Farming, 25(3): 3-7.
4. Willey, R.W., 1979. Intercropping, its importance and research needs. Part-I. Competition and yield advantages. Field Crop Abst., 32 (1): 1-10.
5. De, R., 1979. Role of legumes in intercropping systems. In proceedings FAO / IAEA advisory group meeting on nuclear techniques in development of fertilizer and water management practices for different cropping systems. Ankara, Turkey, pp: 8-10 Oct.
6. Whitehead, D.C., 1970. Role of nitrogen in grassland productivity: A review of information from temperate regions. Commonwealth Bureau of Pastures and Field Crops, Husley. Berkshire Bull No, 48.
7. Karlen, D.L., G.E. Varvel, D.G. Bullock and R.M. Cruse, 1994. Crop rotations for the 21st century. Adv. Agron., 53: 1-45.
8. Latif, M.A., G.R. Mehuys, A.F. Mackenzie, L. Ali and M.A. Faris, 1992. Effects of legumes on soil physical quality in a maize crop. Pl. Soil, 140: 15-23.
9. Buresh, R.J. and S.K. De Dutta, 1991. Nitrogen dynamics and management in rice-legume cropping system. Adv. Agron., 45: 1-59.
10. Srinivas, M., M. Shaik and A. Sairam, 2005. Yield components and yield of castor (*Ricinus communis* L.) as influenced by different planting geometries and row proportions of intercropped groundnut or pearlmillet. Crop Res., 30(3): 349-354.
11. Veeranna, G., M. Yakadri and M. Shaik, 2004. Effect of intercropping vegetables in castor under rainfed conditions. J. Oilseeds Res., 21(2): 364-365.
12. Panse, V.G. and P.V. Sukhatme, 1967. Statistical methods for agricultural workers, ICAR Pub.; New Delhi, pp: 152-165.
13. Ravichandran, P.K. and S.P. Palaniappan, 1979. Effect of intercropping on dry matter production and nutrient uptake in sorghum (CSH-5) under rainfed condition. Madras agric. J., 66(4): 222-229.
14. Srilatha, A.N., S.C. Masthan and M. Shaik, 2002. Production potential of castor intercropping with legumes under rainfed conditions. J. Oilseeds Res., 19(1): 127-128.
15. Pawar, H.K. and B.S. Khade, 1988. Effects of planting patterns, intercropping of gram and addition of mulch on growth and yield attributes of sorghum under *rabi* rainfed conditions. J. Maharashtra agric. Univ., 13(3): 361-362.
16. Kumar, S., 2002. Effect of planting pattern and fertilizer management on castor (*Ricinus communis*) based intercropping system. Indian J. Agron., 47(3): 355-360.
17. Saran, G. and G. Giri, 1983. Intercropping of dryland castor planted in different dates and planting systems with grain legumes. Indian J. Agron., 28(4): 362-368.