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Performance of castor (*Ricinus communis*)-based intercropping under rainfed condition

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ABSTRACT

A field experiment was conducted during 1990--91 and 1992--93 on sandy-loam soil to select a suitable rainy-season crop for intercropping with castor (*Ricinus communis* L.). The highest mean castor-equivalent seed yield (25.10 q/ha), net return (Rs 12,340/ha) and monetary advantage (Rs 1,394/ha) were obtained by intercropping 3 rows of early pigeonpea [*Cajanus cajan* (L.) Millsp.] between the castor crop sown at 90 cm row spacing. However, the highest land-equivalent ratio (1.602) was recorded in castor + sesame (*Sesamum indicum* L.) intercropping system.

Intercropping has proved beneficial under adverse climatic conditions. Abnormal occurrence of monsoon is one of the important limiting factors for crop production under rainfed conditions. Preliminary studies at Morena indicated that castor (*Ricinus communis* L.) is one of the very dependable crops and could be grown successfully even under late-sown conditions. Since it is a long-duration and widely-spaced crop, there are good possibilities of growing early-maturing intercrops to harness the potentiality of environment and use of natural resources for increasing production and net profit per unit area per unit time. Therefore, the present study was initiated to assess the suitable intercrops for higher production in castor-based intercropping system.

MATERIALS AND METHODS

A field experiment was conducted during the rainy season of 1990--91 and 1992--93 at Noorabad, Morena, Madhya Pradesh, on sandy-clay loam soil (Vertisols), being low available N and P_2O_5 and medium in K_2O with pH 8.6. The experiment consisted of 9 treatments, viz. sole crops of castor, sesame (*Sesamum indicum* L.), blackgram (*Phaseolus mungo* L.), clusterbean [*Cymopsis tetragonoloba* (L.) Taubert] and pigeonpea [*Cajanus cajan* (L.) Millsp.] and intercropping of castor with all these crops. Randomized block design was followed with 3 replications. Castor variety 'Aruna', sesame 'N 32' blackgram 'T 9', clusterbean 'HG 75' and pigeonpea 'ICPL 151' were used. Castor was sown at 90 cm row spacing in sole as well as in intercropping treatments. Three rows of intercrops at 30 cm distance were accommodated between 2 rows of castor. Sole crops of sesame, blackgram, cluster-bean and pigeonpea were sown at 30 cm row spacing using recommended seed rates of different crops. Plant-to-plant spacing of 45 cm in castor was maintained by thinning. The plot size was

Table 1. Seed yield (q/ha) of sole and intercrops as affected by different treatments

Treatment	1990–91		1992–93		Castor equivalent yield (q/ha)		
	Main crop	Inter-crop	Main crop	Inter crop	1990–91	1992–93	Pooled
Castor sole	30.18		15.00		30.18	15.00	22.59
Sesame sole	1.50		2.06		2.04	2.65	2.35
Blackgram sole	5.20		4.06		5.02	3.48	4.25
Clusterbean sole	11.39		9.44		9.01	5.39	7.20
Pigeonpea sole	10.85		11.82		14.01	15.26	14.63
Castor + sesame	26.85	0.76	13.33	1.78	27.87	15.62	21.75
Castor + blackgram	22.96	2.52	13.89	3.05	25.01	16.50	20.76
Castor + clusterbean	22.59	5.35	12.50	7.67	26.62	16.88	21.75
Castor + pigeonpea	24.54	4.72	13.67	5.89	30.65	19.56	24.10
CD (P = 0.05)	5.38		2.41		3.58	2.23	1.81

5 m x 3 m. The rainfall received during 1990–91 and 1992–93 was 811 and 838 mm with rainy days of 42 and 34 respectively. Fertilizer application through diammonium phosphate and urea to different crops and other agronomic practices were done as per recommendation. The experimental crops were sown on 28 July and 3 August during 1990–91 and 1992–93 respectively. Castor-equivalent yield was calculated based on the prevailing market price of the intercrops and the quantity of castor that could be purchased from the income of intercrops. Net profit was also computed on the basis of prevalent market rates of different items of produce.

RESULTS AND DISCUSSION

Large variations in the seed yield of castor were observed during different years. During 1992–93 the castor yield was low. It was due to uneven distribution and early withdrawal of monsoon. During 1990–91, the distribution of rainfall was normal and well distributed.

The highest mean castor seed yield (22.59 q/ha) was obtained in sole crop of castor. Intercropping of different crops reduced the castor-seed yield. The maximum significant reduction (22.4%) in castor yield was recorded when it was intercropped with clusterbean. Conversely, the minimum reduction in castor-seed yield was recorded when it was intercropped with sesame (11.1%), followed by pigeonpea (15.4%) and blackgram (18.5%). Gupta and

Table 2. Effect of different intercropping systems on land-equivalent ratio (LER) and net returns

Treatment	Mean LER	Mean net returns (Rs/ha)
Castor sole		10,496
Sesame sole		–4.53
Blackgram sole		690
Clusterbean sole		2,071
Pigeonpea sole		5,852
Castor + sesame	1.60	10,171
Castor + blackgram	14.1	9,831
Castor + clusterbean	1.40	10,392
Castor + pigeonpea	1.31	12,340
CD (P = 0.05)		865

Rahore (1993) also reported considerable lower yields of castor in mixed stands as compared to pure crops.

The highest mean castor-equivalent yield (25.10 q/ha) was recorded under castor + pigeonpea intercropping system, which was significantly superior to castor-equivalent yields of all sole crops. The increase of 2.51 q/ha in castor-equivalent yield was accrued from castor + pigeonpea intercropping compared with sole castor.

Intercropping of all the crops increased the land-equivalent ratio compared with sole crops. The highest land-equivalent ratio was recorded under castor + sesame system, followed by castor + blackgram, castor + clusterbean and castor + pigeonpea systems.

Similar to the castor-equivalent yield, the highest mean net returns were recorded in castor + pigeonpea intercropping system (Table 2). The increase in net returns in this system was significantly higher than the sole crops and other intercropping systems. Similar results were also reported by Patel *et al.* (1989).

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