

Effect of nutrient management on nutrient uptake and post-harvest soil fertility of castor + blackgram intercropping

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Abstract

Field investigations were carried out at Annamalai University Experimental Farm, Department of Agronomy, Annamalai Nagar to study the nutrient management practices for augmenting the productivity of castor + blackgram intercropping system. The experiment was laid out in Randomized Block Design with three replications. There were twelve treatments consist of different levels of recommended dose of NPK viz., 100%, 125%, 150% and 75% with and without Sulphur application at two levels like 20 kg ha⁻¹ and 30 kg ha⁻¹. The results of the present study clearly concluded that application of 150 and 125 per cent recommended dose of NPK along with 30 kg S ha⁻¹ will favourably enhance the nutrient uptake by castor and post-harvest soil fertility status in castor + blackgram intercropping system.

Keywords: castor + blackgram intercropping system, nutrient uptake, soil fertility

Introduction

Castor is one of the ancient oilseed crops of the world. India ranks first in castor production in the world (DOR, 2003) [3]. Castor crop occupies 7.86 lakh hectare of area in India with an annual production of 7.7 lakh tonnes (FAO, 2001) [4]. In Tamil Nadu, the castor crop is grown in an area of 38.9 thousand hectares, with a production of 12.7 thousand tonnes with an average yield of 326 kg ha⁻¹ (Damodharan and Hegde, 2002) [2]. Castor is mainly cultivated as rainfed crop where soil is low in organic matter and poor in soil fertility. Fertilizer plays an important role in both under irrigated and rainfed condition for getting higher yields. Application of major nutrients like N, P and K certainly helps to increase the productivity level to some extent. In Tamil Nadu, soils of Madurai, Salem, Coimbatore and Cuddalore districts are found to have high percentage of sulphur deficiency (Tandon and Messick, 2002) [9]. Castor is a long duration and widely spaced crop and there is good possibility of growing intercrops to harness the potentiality of environment for increasing production and net profit. Intercropping blackgram in castor is found to be more remunerative and effective in utilizing the resources (Malarvizhi, 2005) [6]. Informations regarding manuring castor based intercropping system on uptake and post harvest nutrient status of soil is lacking and there is an imperative need to develop an appropriate nutrient management practices for castor + blackgram intercropping system. Hence, the present study was carried out at Annamalai University Experimental Farm, to find out the effect of N, P and K levels with and without S levels on nutrient uptake and post harvest soil fertility of castor + blackgram intercropping.

Materials and methods

Field experiments were conducted at Annamalai University Experimental Farm, Annamalai Nagar, Tamil Nadu to find out the suitable nutrient management for effective utilization and better post harvest nutrient status in castor + blackgram intercropping system. The soil of the experimental site was

clay loam having pH of 7.6, E.C 0.4 dSm⁻¹, low in available nitrogen (236.01 kg ha⁻¹), medium in available phosphorus (20.51 kg ha⁻¹) and high in available potassium (338.56 kg ha⁻¹). The experiment was laid out in Randomized Block Design (RBD), with three replications. The treatment consisted of four levels of primary nutrients (NPK) with and without two levels of secondary nutrient S. viz., 100 per cent recommended dose of N, P₂O₅ and K₂O (RDF 30:15:15 kg ha⁻¹) (T₁), 125 per cent RDF NPK (37.50:18.75:18.75 kg ha⁻¹) (T₂), 150 per cent RDF NPK (45: 22.50: 22.50 kg ha⁻¹) (T₃), 75 per cent RDF NPK (22.50: 11.25: 11.25 kg ha⁻¹) (T₄), 100 per cent RDF NPK + 20 kg S (T₅), 125 per cent RDF NPK + 20 kg S (T₆), 150 per cent RDF NPK + 20 kg S (T₇), 75 per cent RDF NPK + 20 kg S (T₈), 100 per cent RDF NPK + 30 kg S (T₉), 125 per cent RDF NPK + 30 kg S (T₁₀), 150 per cent RDF NPK + 30 kg S (T₁₁), 75 per cent RDF NPK + 30 kg S (T₁₂). The castor seeds were sown in rows at 60 cm apart with a plant to plant spacing of 30 cm and covered with soil. One row of blackgram as intercrop was sown in between the castor rows adopting a spacing of 10 cm between blackgram plants in each row. The nutrient uptake and post-harvest soil fertility status were studied.

Results and Discussions

The data on nutrient uptake of castor + blackgram intercropping system is presented in Table 1. Among the treatments, application of 150 per cent NPK (Fs) + 30 kg S ha⁻¹ (T₁₁) excelled other treatments by recording the maximum nutrient uptake by castor crop viz., 82.08 and 84.04 kg of nitrogen ha⁻¹, 12.28 and 13.04 kg phosphorus ha⁻¹, 74.15 and 80.04 kg potassium ha⁻¹ and sulphur uptake of 13.16 and 14.02 kg ha⁻¹ in summer and kharif, respectively. The treatment (T₁₁) was on par with 125 per cent NPK + 30 kg S ha⁻¹ (T₁₀). The uptake of all the elements including trace elements increased due to S application (Singh and Chaudhari, 1997) [7]. The increase in nutrient uptake with increasing rates of sulphur seems to be associated with increased availability of S from

applied S with concomitant increase in crop yield. These findings are in conformity with those reported by Yadav *et al.* (1996) [10], Surendra Singh *et al.* (2000) [8], and Legha and Gajendra Giri (2001) [5].

The post harvest soil fertility of castor + blackgram intercropping system is presented in Table 2. Among the treatments, application of 150 per cent NPK + 30 kg S ha⁻¹ (T₁₁) excelled other treatments by recording the highest post harvest available nutrients of 245.38 and 248.80 kg ha⁻¹ of nitrogen and 21.42 and 22.56 kg ha⁻¹ of phosphorus and 347.68

and 348.90 kg ha⁻¹ of potassium and 19.10 and 19.40 kg ha⁻¹ of sulphur during summer and kharif, respectively. This might be due to better supply, which improved availability of nutrients in the soil due to S. The least values for soil available nutrients was observed under no sulphur applied plot due to limited nutrients supply. The results are in line with the findings of Brahmachari and Mondal (2000) [6]. Increased nutrient supply might have increased the post harvest soil available nutrients.

Table 1: Effect of N, P, K and S levels on total nutrient uptake of castor in castor + blackgram intercropping system

Treatments	Total nutrient uptake of castor (kg ha ⁻¹)							
	Summer				Kharif			
	Nitrogen	Phosphorus	Potassium	Sulphur	Nitrogen	Phosphorus	Potassium	Sulphur
T ₁	67.80	8.40	54.95	8.15	68.35	8.60	58.95	8.62
T ₂	69.75	8.95	57.70	8.82	70.54	9.18	61.88	9.35
T ₃	69.90	9.02	57.85	8.95	70.80	9.25	62.04	9.43
T ₄	65.60	7.85	52.12	7.40	66.08	8.01	56.08	7.81
T ₅	73.82	10.04	63.18	10.30	75.18	10.42	67.85	10.90
T ₆	75.78	10.54	65.85	10.98	77.32	10.98	70.74	11.62
T ₇	75.95	10.62	66.04	11.06	77.75	11.05	70.80	11.75
T ₈	71.01	9.50	60.50	9.62	72.98	9.80	64.90	10.15
T ₉	79.95	11.60	71.40	12.38	81.75	12.30	76.56	13.20
T ₁₀	81.90	12.15	74.08	13.01	83.90	12.95	79.45	13.90
T ₁₁	82.08	12.28	74.15	13.16	84.04	13.04	80.04	14.02
T ₁₂	77.90	11.08	68.70	11.70	79.60	11.60	73.65	12.45
SE _D	0.90	0.22	0.23	0.30	1.01	0.25	1.36	0.32
CD (p = 0.05)	1.85	0.45	2.56	0.61	2.10	0.52	2.82	0.67

Table 2: Effect of N, P, K and S levels on the post harvest soil nutrient status of castor + blackgram intercropping system

Treatments	Post-harvest soil available nutrient status (kg ha ⁻¹)							
	Summer				Kharif			
	Nitrogen	Phosphorus	Potassium	Sulphur	Nitrogen	Phosphorus	Potassium	Sulphur
T ₁	235.18	19.20	338.40	15.72	239.09	20.15	340.57	15.80
T ₂	236.64	19.45	339.75	16.13	238.94	20.48	341.95	16.30
T ₃	236.85	19.58	339.94	16.20	239.08	20.56	342.08	16.36
T ₄	233.70	18.90	337.16	15.28	237.64	19.80	339.40	15.32
T ₅	239.60	20.04	342.35	17.10	242.68	21.24	343.55	17.30
T ₆	240.95	20.30	343.54	17.53	243.86	21.53	344.86	17.81
T ₇	241.03	20.42	343.78	17.60	244.02	21.60	344.98	17.87
T ₈	238.20	19.80	341.10	16.65	240.60	20.90	342.30	16.80
T ₉	243.80	21.02	346.18	18.85	247.04	22.18	347.45	18.83
T ₁₀	245.20	21.35	347.40	18.95	248.65	22.50	348.76	19.32
T ₁₁	245.38	21.42	347.68	19.10	248.80	22.56	348.90	19.40
T ₁₂	242.40	20.65	344.95	18.05	245.50	21.85	346.20	18.34
SED	0.64	0.09	0.54	0.15	0.70	0.11	0.60	0.20
CD (p = 0.05)	1.32	0.18	1.03	0.32	1.45	0.23	1.17	0.42

Conclusion

Based on the above results, it can be concluded that application of 150 and 125 per cent recommended dose of NPK along with 30 kg S ha⁻¹ will favourably enhance the nutrient uptake by castor and post harvest soil fertility status in castor + blackgram intercropping system.

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