Int.J.Curr.Microbiol.App.Sci (2017) *6*(7): 2729-2732

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 7 (2017) pp. 2729-2732**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.607.382

Relay Cropping of Castor in Legume Crops

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Keywords

Castor, Greengram, Soybean and Relay cropping.

Article Info

Accepted:
29 June 2017
Available Online:
10 July 2017

A B S T R A C T

A field experiment was conducted on sandy loamy soils during *kharif* seasons of 2013-14 to 2015-16 at Regional Research Station, Anand Agricultural University, Anand to study the effect of legume-castor relay cropping system on growth and yield of castor as well as castor equivalent yield (CEY). Among the different relay cropping system evaluated, treatment Castor (sole) recorded maximum seed yield in all the years and in pooled results. This treatment also exhibited higher values of different growth and yield attributes. Significantly higher CEY is recorded by treatment Soybean + Castor (Timely) in all the years and in pooled results except in second year where it was *at par* with treatment Greengram + Castor (timely).

Introduction

Castor is an important commercial non-edible oilseed crop, which fetches sizable amount of foreign exchange in the country through export. It is a late *kharif* crop, suitable for contingent crop planning in the rainfed area. However, for intensive cropping in irrigated area, this crop offers a good scope to introduce short duration and quick growing legumes before Castor to get the benefit of vacant field in *Kharif* season. In order to reduce the soil degradation and enhance the ecosystem sustainability, various strategies such as use of cover crops and buffer strips (Adimassu *et al.*, 2014), no-till or minimum tillage practices (Shah *et al.*, 2016), organic amendments like biochar (Weyers, 2014) and mulching (prosdocimi *et al.*, 2016) are reported elsewhere. Relay cropping is one of most reliable and applicable practices including a complex suite of different resource-efficient technologies. Through relay cropping land and other resources can be exploited more efficiently. Therefore, it is necessary to evaluate suitability of castor for relay cropping in *kharif* legume crops.

Materials and Methods

Present investigation was conducted at Regional Research Station, Anand Agricultural University, Anand during 2013-14 to 2015-16 (*kharif*). The soil of experimental site is sandy loamy, neutral in reaction (7.84), low in organic carbon (0.46%) and high in phosphorus (73.13 kg ha^{-1}) and potassium (340 kg ha^{-1}). It consisting of six

treatments *viz.*,T_1: Greengram (sowing in first fortnight of July) + Castor (Sowing in last week of August), T_2: Soybean (sowing in first fortnight of July) + Castor (Sowing in last week of August), T_3: Soybean (sowing in first fortnight of July) + Castor (Sowing in last week of September), T_4: Sole Greengram (sowing in first fortnight of July), T_5: Sole soybean (sowing in first fortnight of July) and T_6: Sole castor (Sowing in last week of August) and were laid out in randomized complete block design with four replication. The castor was sown with spacing of 135 x 60 cm in Soybean sown at 45 cm apart while 120 x60 cm in Greengram sown at 30 cm apart. Castor, Greengram and Soybean were fertilized with 75, 20 and 30 N_2 kg ha^{-1} and 50, 40 and 60 P_2O_5 kg ha^{-1}, respectively. Inter-cultivations and weeding were done to keep the weed under check. Need-based plant protection measure was followed to manage sucking insects.

Results and Discussion

The experiment of relay cropping of castor in legume crops was conducted during the year 2013-14, 2014-15 and 2015-16 (Table 1). The results of the experiment revealed that CEY was significantly influenced by different relay cropping treatments. Treatment T_2: Soybean + Castor (Timely) recorded significantly the highest CEY (4617, 4815 and 4456 kg ha^{-1}) during all the year. However, it was *at par* with treatment T_1: Greengram + Castor in second year.

The pooled results presented in table 1, showed that relay cropping treatments significantly influenced CEY. Significantly the highest value of CEY (4629 kg ha^{-1}) was recorded under treatment T_2: Soybean + Castor (Timely). It was 27.74 per cent higher than CEY of treatment T_6: castor sole.

The LER of different treatments are given in table 1. Results revealed that treatment T_2: Soybean + Castor (Timely) recorded maximum values of LER (1.50) followed by treatment T_1: Greengram + Castor (Timely) and T_3: Soybean + Castor (Late). These treatment recorded LER of 1.34 and 1.18 respectively. Such increase in LER was also reported by Akram *et al.*, (2004), Dua *et al.*, (2007) and Zhang *et al.*, (2007) for different relay cropping system.

Table.1 Castor Equivalent Yield influenced by different relay cropping treatments

Treatment		Castor Equivalent Yield (kg ha^{-1})				LER
		2013-14	2014-15	2015-16	Pooled	
T1	**Greengram + Castor (Timely)**	3882	4294	3179	3785	1.35
T2	**Soybean + Castor (Timely)**	4617	4815	4456	4629	1.50
T3	**Soybean + Castor (Late)**	3887	3931	2589	3469	1.08
T4	**Greengram**	1914	2469	2290	2224	1.00
T5	**Soybean**	2445	3070	1879	2464	1.00
T6	**Castor**	3838	3891	3143	3624	1.00
S. Em. ±		233	274	156	142.2	
C. D. (P=0.05)		701	827	470	402	
C. V. %		13.57	14.65	10.68	13.45	

	S. Em. ±	C. D. (P=0.05)
Y	92.4	NS
Y × T	226.4	NS

Table.2 Year wise seed yield of castor as influenced by relay cropping treatments

Treatment		Castor Seed yield (kg ha^{-1})			
		2013-14	2014-15	2015-16	Mean
T1	**Greengram + Castor (Timely)**	2154	2508	1650	2104
T2	**Soybean + Castor (Timely)**	2799	2910	3083	2931
T3	**Soybean + Castor (Late)**	1963	2074	1274	1771
T6	**Castor**	3838	3891	3143	3624

Table.3 Effect of relay cropping treatments on growth and Yield attributes of castor (mean of 3 years)

Treatment		Plant height (cm)	No. of effective branches plant^{-1}	Days to 50% flowering	Length of primary spike (cm)	Days to first picking	Test weight (g)	Oil content (%)
T1	**Greengram + Castor (Timely)**	163	8.92	49.75	65.88	122	29.48	45.24
T2	**Soybean + Castor (Timely)**	164	9.87	50.58	68.88	123	29.93	46.17
T3	**Soybean + Castor (Late)**	147	8.45	49.00	63.85	121	28.38	43.52
T6	**Castor**	170	10.17	52.58	69.54	125	30.87	46.73

The results of seed yield of castor are presented in table 2 indicated that, treatment T_6: Castor sole recorded maximum mean values of seed yield (3624 kg ha^{-1}).

However, such loss of Castor yield in system was compensated later with the additional yield advantage from Soybean and Greengram. This is in confirmation with results of Nazir (1992).

The results presented in table 3, showed that T_6: Castor sole recorded maximum values of growth and yield attributing characters *i.e.* plant height (170 cm), No. of effective branches per plant (10.17), days to 50% flowering (52.58), length of primary spike (69.54 cm), days to first picking (125), test weight (30.87) and oil content in seed (46.73 per cent) followed by treatment T_2: Soybean + Castor (Timely), T_1: Greengram + Castor (Timely) and T_3: Soybean + Castor.

From the three years of results of experiment, it can be concluded that soybean-castor relay cropping system can be adopted for getting higher CEY. In which soybean and castor is sown in first fortnight of July and last fortnight of August, respectively. One row will be skipped for castor sowing after two rows of soybean.

Acknowledgements

Authors are thankful to the Anand Agricultural University, Anand for providing facilities and fund during the course of investigation.

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How to cite this article:

Bhanvadia, A.S., K.J. Vekariya and Patel, R.A. 2017. Relay Cropping of Castor in Legume Crops. *Int.J.Curr.Microbiol.App.Sci.* 6(7): 2729-2732.
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