

Productivity Improvement of Groundnut-castor Intercropping System through Row Proportion and Castor Sowing Time

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Abstract: An experiment was conducted at the Main Oilseeds Research Station, Junagadh Agricultural University, Junagadh (Gujarat), to study the effects of row proportion and sowing time of castor in groundnut-castor intercropping system. Nine treatment combinations were tested in randomized block design with three replications. Sowing of castor 30 DAS of groundnut in 2:1 or 4:2 row ratio produced maximum castor seed and castor seed equivalent yield. Groundnut pod and haulm yields were highest when castor was sown 60 DAS of groundnut in 3:1 row proportion. Number of spikes/plant, capsules/spike and internodes were higher when castor was sown 30 DAS of groundnut in 3:1 row ratio. Plant height was maximum under sowing of castor 30 DAS of groundnut with 4:2 row ratio.

Key words: Castor, groundnut, row proportion, sowing time, intercropping.

Of late, there is a growing interest in intercropping as a potentially beneficial system of crop production as it, provides insurance against the failure of crops, increases productivity per unit area and time, offers greater stability to yield, utilizes the available growth resources efficiently (Aiyer, 1949). Castor is usually raised either as a sole crop or mixed/inter crop with kharif cereals, millets, grain legumes, oilseeds and some times even with horticultural crops. The crop is unique in its adaptation to poor fertility and aberrant weather. This owes to its hardy growth with deep tap-root system. It is a long duration crop with slow growth habit in the initial stages and is grown in wider rows. Similarly, groundnut is a short statured, short duration crop, attaining quick growth in early stages and has a very little vertical spread. The features of both these crops offer a potential scope for intercropping to exploit the land and

resources more efficiently. However, for growing castor as an intercrop in groundnut, particularly under semi-arid, erratic and uneven rainfall conditions of Saurashtra region of Gujarat, it is necessary to evaluate the compatibility vs. the competitive effects of different row ratios and sowing time of this crop.

Materials and Methods

The experiment was carried out at the Main Oilseeds Research Station, Junagadh Agricultural University, Junagadh (Gujarat) during kharif-rabi seasons of 1997-98, 1998-99, 1999-2000 and 2000-01. The experimental soil was medium black in texture having low available N (87.5 kg ha^{-1}), medium available P_2O_5 (28.0 kg ha^{-1}) and high available K_2O (386.5 kg ha^{-1}) with pH 7.8. The nine treatment combinations were tested. These comprised of different row ratios of groundnut-castor and sowing time of castor viz., T_1 - 2:1

Table 1. Influence of row ratios and sowing time of castor on growth and yield attributes of castor (Mean of four years)

Row ratio	Treatment Sowing time of castor (DAS of groundnut)	Plant height (cm)	Spike length (cm)	No. of spike per plant	No. of capsules per plant	No. of internodes per plant	Test weight (g)
2:1	30	83.9	40.8	7.8	59.4	19.4	28.5
2:1	45	72.7	39.8	7.2	55.2	18.9	28.8
2:1	60	59.8	37.3	4.5	35.2	15.1	29.7
3:1	30	78.7	40.5	8.4	74.2	19.6	29.4
3:1	45	72.4	39.0	5.9	54.7	18.5	29.9
3:1	60	50.7	38.9	5.2	45.2	15.7	29.8
4:1	30	85.5	43.1	8.3	59.7	19.5	28.5
4:1	45	81.0	38.5	5.5	54.2	19.5	2.95
4:1	60	57.4	39.3	5.1	48.0	15.7	29.5
CD (P=0.01)		12.9	NS	2.0	11.6	1.4	NS

+ castor sown 30 DAS of groundnut, T₂- 2:1 + castor sown 45 DAS of groundnut, T₃- 2:1 + castor sown 60 DAS of groundnut, T₄- 3:1 + castor sown 30 DAS of groundnut, T₅- 3:1 + castor sown 45 DAS of groundnut, T₆- 3:1 + castor sown 60 DAS of groundnut, T₇- 4:2 paired row + castor sown 30 DAS of groundnut, T₈- 4:2 paired row + castor sown 45 DAS of groundnut and T₉- 4:2 paired row + castor sown 60 DAS of groundnut. The treatments were laid out in randomized block design with three replications. Groundnut cv. GG-2 was sown in the previously opened furrows as per treatment as soon as sufficient rainfall was received for germination and establishment of the crop. Castor hybrid was sown by dibbling as per row ratio and sowing time. Both groundnut and castor were sown in rows 45 cm apart. Base (12.5-25.0-00 NPK kg ha⁻¹) and inter crop (75.0-50.0-00 NPK kg ha⁻¹) were fertilized as per recommendation. Pod, haulm and castor seed yields were recorded from each plot and converted in castor seed equivalent

yield. Growth and yield attributing parameters were recorded from five plants randomly selected from each plot.

Results and Discussion

Mean maximum plant height (85.5 cm) was recorded when castor was sown 30 DAS of groundnut in 4:2 row ratio followed by in time sowing of castor at 2:1 row ratio. Castor sown 30 DAS of groundnut at 3:1 row ratio produced maximum number of spikes/plant (8.4), number of capsules/spike (74.3) and internodes (19.6) and it was comparable within time sowing of castor in 2:1 or 4:2 groundnut-castor row proportion (Table 1). This suggests that the sowing of castor 30 DAS of groundnut at 3:1 or 4:2 row proportion in groundnut-castor intercropping system may have less interspecific competition for radiation, moisture, nutrients and space because of favorable rainfall and environmental conditions as compared to late sown and narrow spaced crop. Similar results were also reported by Srinatha *et al.* (2002).

Table 2. Castor seed and groundnut pod yields as influenced by different row ratio and sowing time of castor

Treatment		Season				
Ratio	Sowing time of castor (DAS of groundnut)	1997-98	1998-99	1999-00	2000-01	Pooled
Castor seed yield (kg ha ⁻¹)						
2:1	30	2103	3145	2558	2885	2701
2:1	45	1575	1935	1880	2358	1937
2:1	60	782	819	554	1501	957
3:1	30	1771	2850	2283	2299	2301
3:1	45	1447	1882	1525	1820	1559
3:1	60	514	1053	1087	1420	1045
4:1	30	1892	3738	2488	3057	2795
4:1	45	1507	2294	1583	1954	1852
4:1	60	704	1587	835	1153	1072
CD (P = 0.01)		157.6	255.4	151.4	315.2	395.1
Groundnut pod yield (kg ha ⁻¹)						
2:1	30	223	450	455	758	479
2:1	45	348	474	548	879	552
2:1	60	432	488	521	915	514
3:1	30	240	521	512	941	503
3:1	45	415	533	555	981	559
3:1	60	509	548	724	1039	730
4:1	30	221	545	548	714	507
4:1	45	390	559	495	798	551
4:1	60	451	558	523	943	524
CD (P = 0.01)		86.0	55.4	101.3	123.9	84.9

Castor sown in time (i.e. 30 DAS of groundnut) with 2:1 groundnut-castor row ratio recorded maximum castor seed yield of 2103 and 2558 kg ha⁻¹ during 1997-98 and 1999-2000, respectively (Table 2). In time sowing of castor under 4:2 row ratio resulted in higher castor seed yield of 3738, 3057 and 2795 kg ha⁻¹ during 1998-99, 2000-2001 and in pooled results, accordingly. Delay in sowing of castor (i.e. 60 DAS of groundnut) under 2:1 row proportion resulted in lowest mean castor

seed yield (957 kg ha⁻¹) which was 192.0% less as compared to castor crop sown in time under 4:2 row ratio. This was due to significant improvement in growth and yield attributes under in time sowing of castor at 4:2 row ratio (Table 1). Simultaneous sowing of groundnut-castor in 2:1 row ratio is known to produce higher castor seed yield (Anonymous, 2003). Agasimani *et al.* (1994) reported that groundnut-castor sown in 3:1 row ratio produce higher castor yield than 6:1 and

Table 3. Effect of row ratio and sowing time of castor on groundnut haulm and castor seed equivalent yield

Treatment		Season				
Ratio	Sowing time of castor (DAS of groundnut)	1997-98	1998-99	1999-00	2000-01	Pooled
Haulm yield (kg ha ⁻¹)						
2:1	30	440	705	782	900	705
2:1	45	478	715	823	1005	755
2:1	60	586	741	956	1044	857
3:1	30	447	945	895	1008	824
3:1	15	525	957	1049	1054	901
3:1	60	725	956	977	1195	954
4:1	30	477	833	811	802	731
4:1	45	593	842	882	883	800
4:1	60	555	842	820	1040	842
CD (P=0.01)		144.2	59.9	145.1	147.5	110.7
Castor equivalent yield (kg ha ⁻¹)						
2:1	30	2526	3979	3522	4181	3552
2:1	45	2194	2789	2857	3879	2932
2:1	60	1558	1700	1788	3184	2050
3:1	30	2222	3972	3381	3913	3372
3:1	15	2177	3026	2890	3476	2887
3:1	60	1523	2226	2370	3418	2335
4:1	30	2320	4725	3454	4123	3558
4:1	45	2212	3303	2523	3338	2859
4:1	60	1515	2509	1827	2786	2184
CD (P=0.01)		203.8	309.8	333.0	471.5	492.2

9:2 row ratios. The results confirm the findings of Venkateswarlu and Subba Reddy (1989).

Intercropping of groundnut-castor in 3:1 row proportion and castor sown 60 DAS of groundnut offered significantly higher pod yield (Table 2). Similar trend was also observed for haulm yield (Table 3). Groundnut-castor intercropped at 3:1 row proportion and late sowing of castor gave

groundnut pod yield advantage of 52.4% on pooled data basis over simultaneous sowing of both the crops at 2:1 row ratios. Agasimani *et al.* (1994) reported that groundnut-castor sown in 6:1 row proportion produced higher pod yield over 3:1 and 9:2 row ratio. The yield in 6:1 row proportion was comparable with sole groundnut.

Sowing of castor in time (i.e. 30 DAS of groundnut) with 2:1 row ratio resulted

in significantly high and maximum castor seed equivalent yield of 2526, 3522 and 4181 kg ha⁻¹ during 1997-98, 1999-2000 and 2000-2001, respectively, while during 1998-99 and in pooled results, castor sown 30 DAS of groundnut in 4:2 row proportion resulted in highest castor seed equivalent yield of 4725 and 3558 kg ha⁻¹, respectively and remained comparable with each other during 1999-2000, 2000-2001 and in pooled results (Table 2). Castor sown 30 DAS of groundnut with 4:2 or 2:1 groundnut-castor row ratio resulted in increased yield of 73.6% over castor sown 60 DAS of groundnut with 2:1 row ratio. Simultaneous sowing of groundnut-castor have been recorded to produce highest pod equivalent yield (Anonymous, 2003). Agasimani *et al.* (1994) also recorded maximum total productivity of the system and LER in groundnut-castor sown with

3:1 row ratio than 6:1 and 9:2 row proportion.

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