Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(3): 976-978
Received: 14-03-2018
Accepted: 18-04-2018

Anbarasu M
Research Scholar, (Department of Agronomy), Agricultural College and Research Institute, Madurai. Tamil Nadu Agricultural University, Tamil Nadu, India

NS Venkataraman
Professor and Head (Department of Agronomy), Agricultural College and Research Institute, Madurai. Tamil Nadu Agricultural University, Tamil Nadu, India

T Ragavan
Professor of Agronomy, Agricultural College and Research Institute, Madurai. Tamil Nadu Agricultural University, Tamil Nadu, India

P Saravana Pandian
Professor (Department of Soil Science). Agricultural College and Research Institute, Madurai. Tamil Nadu Agricultural University, Tamil Nadu, India

Correspondence
Anbarasu M
Research Scholar, (Department of Agronomy), Agricultural College and Research Institute, Madurai. Tamil Nadu Agricultural University, Tamil Nadu, India

The effect of crop geometry on growth characters narration to yield of hybrid castor

Anbarasu M, NS Venkataraman, T Ragavan and P Saravana Pandian

Abstract
A field experiment was carried out during August 2016 to February 2017 at Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai, to study the growth parameters and yield of castor hybrid (YRCH 1). The soil of experimental field was sandy clay loam and experiment was laid out in Randomized Block Design (RBD), comprised of eight treatments were replicated thrice viz., G_1 - 150 × 120 cm (5,555 plants ha^{-1}), G_2 - 120 × 120 cm (6,944 plants ha^{-1}), G_3 - 120 × 90 cm (9,259 plants ha^{-1}), G_4 - 120 × 60 cm (13,888 plants ha^{-1}), G_5 - 90 × 90 cm (12,345 plants ha^{-1}), G_6 - 90 × 60 cm (18,518 plants ha^{-1}), G_7 - 90 × 45 cm (24,691 plants ha^{-1}) and G_8 - 75 × 75 cm (17,777 plants ha^{-1}). Growth parameters such as number of nodes, node girth and number of branches plant^{-1} were more under wider spacing of 150 × 120 cm and 120× 120 cm respectively. Plant height and node length were influenced by closer spacing of 75× 75 cm. Days to 50 per cent flowering shohwed that 150 x 120 cm spacing recorded more number of days to flowering as compared narrow crop geometry. Among the different plant geometry, significantly maximum seed and oil yield was realized with spacing of 120 × 120 cm, which provides favorable environment for better growth characters leads to higher seed and oil yield in hybrid castor as compared to closer spacing.

Keywords: castor, geometry, plant height, number of branches, seed yield and oil yield

Introduction
Castor is a non-edible oil seed crop grown during monsoon season mainly for its seed from which 45 - 50 % oil is extracted. It does well both dry and limited irrigation due to deep root system. Now its cultivation is becoming popular due to its high export potential and medicinal value. Introducing new hybrids of castor are different from the traditional ones in terms of morphology, duration, growth and productivity (Kumar, 2002 [3] and Raghavaiah and Sudhakarababu, 2000) [6]. They also respond different under varied agro climatic conditions, soil types and management factors. Plant spacing requirement of hybrid castor vary, substantially with management practices. It is well documented that yield per unit area is not only dependent on the number of plants per unit area but it also depends on arrangement of plants on the ground surface, as this enables the plant to utilize natural and manmade resources both spatially and temporally in better and efficient ways leading to better plant growth and development, eventually to higher crop yield per unit area. Considering the above facts, the present study was undertaken to evaluate the different crop geometry for hybrid castor in terms of growth and productivity over the experimental period.

Materials and Methods
A field experiment was carried out during *kharif* (August 2016 to February 2017) in Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai. The soil of the experimental field was sandy clay loam in texture, taxonomically classified as Typic Udic Haplustalf with pH- 7.4, Organic carbon - 0.48 % and EC - 0.42 dS m^{-1}.
The experiment was laid out in Randomized Block Design (RBD), comprised of eight treatments were replicated thrice viz., G_1 - 150 × 120 cm (5,555 plants ha^{-1}), G_2 - 120 × 120 cm (6,944 plants ha^{-1}), G_3 - 120 × 90 cm (9,259 plants ha^{-1}), G_4 - 120 × 60 cm (13,888 plants ha^{-1}), G_5 - 90 × 90 cm (12,345 plants ha^{-1}), G_6 - 90 × 60 cm (18,518 plants ha^{-1}), G_7 - 90 × 45 cm (24,691 plants ha^{-1}) and G_8 - 75 × 75 cm (17,777 plants ha^{-1}). The castor hybrid YRCH 1 was used as a test cultivar. The recommended dose of fertilizer was followed 90:45:45 NPK ha^{-1}, full dose of phosphorus and 50% N and K was applied as basal at the time of sowing and remaining N and K was applied in two equal splits at 30 and 60 days after sowing of castor. Five plants were randomly selected from net plot area and tagged. Biometric observations were recorded at different growth stages *viz*., 90 and 135 DAS stages respectively.

Results and Discussion

The plant growth is manifested in many ways. Though growth characters *viz*., plant height and dry matter production are largely genetically controlled, these could be altered agronomically by manipulating environment and management factors. The plant height is a direct index to measure the growth and vigour of plants.

Crop geometry of 75 × 75 cm produced the tallest plants at 152.15 cm and 175.33 cm respectively during 90 and 135 DAS as compared with wider spacing (150× 120 cm). But the highest number of nodes (19.43 and 25.50 at 90 and 135 DAS) registered at150 x 120 cm and lowest number of nodes (15.87 and 16.76 at 90 and 135 DAS) noticed at 75 × 75 cm. Length of node was higher in closer spacing with less girth. While the wider spacing produced shorter node length and more girth. Further number of branches plant^{-1} (7.77 and 16.67) was registered in 120 x 120 cm during 90 and 135 DAS. This was followed by 120 x 90 cm during 90 and 135 DAS respectively (Table 1). The influence of crop geometry had significant effect on days to 50 per cent flowering, G_1-150 x 120 cm spacing required more number of days (52.30) to produce 50 per cent flower in the main stem, whereas, G_8-75 x 75 cm spacing took the less number of days (48.00) to 50 per cent flowering.

Table 1: Effect of crop geometry on growth characters of Plant height (cm), Number of nodes, Node length (cm), Node girth (cm) and Number of branches of hybrid castor during 90 and 135 DAS

Treatments		90 DAS					135 DAS				
		Plant height (cm)	Number of nodes	Node length (cm)	Node girth (cm)	Number of branches	Plant height (cm)	Number of nodes	Node length (cm)	Node girth (cm)	Number of branches
G_1	150 × 120 cm	99.47	19.43	7.63	6.73	6.97	138.25	25.50	13.13	7.47	13.66
G_2	120 × 120 cm	107.40	18.27	8.30	6.61	7.77	147.13	23.17	14.77	7.33	16.67
G_3	120 × 90 cm	115.67	18.01	8.97	6.49	6.03	144.85	22.50	14.00	7.27	15.03
G_4	120 × 60 cm	124.46	17.39	9.67	6.47	5.63	150.03	20.83	15.87	6.83	11.77
G_5	90 × 90 cm	138.43	17.11	10.93	6.39	5.00	155.13	20.67	15.97	6.47	10.33
G_6	90 × 60 cm	143.74	17.00	11.33	6.27	4.67	164.88	20.50	16.00	6.41	8.97
G_7	90 × 45 cm	148.24	16.33	11.97	6.21	4.33	170.40	19.83	16.63	6.33	8.00
G_8	75 × 75 cm	152.15	15.87	12.47	5.81	4.03	175.33	16.76	17.53	6.30	6.70
SEd		5.57	0.81	0.37	0.22	0.30	7.33	1.51	0.91	0.34	0.54
CD (P = 0.05)		11.95	1.75	0.80	0.49	0.65	15.74	3.25	1.95	0.74	1.16

In this study, crop geometry effect on growth characters of castor at wider spacing (150×120 cm and 120× 120 cm) had lower plant height, high number of branches, number of nodes and node girth. This might be due to more availability of resources as compared to narrow row spacing of 75 × 75 cm.

Significant effect was seen for plant height, stem girth and yield due to the influence of the spacings the variables. Narrow spacing had the highest plant height and node length due to inter and intra row competition of factor available resources. Days to fifty per cent flowering showed that more days required for wider spacing which slow the process of dry matter accumulation without interference of competition. A similar result was obtained by Severino *et al*. (2006) [7] found increase in plant height was seen as the population density increased. Significant differences were also seen for stem diameter. As plant spacing decreased, the stem diameter also gets decreased.

At higher population densities, there is greater intraspecific competition for factors limiting growth and development, such as water, nutrients and light. It can be seen from the data for plant height, that the plants suffered from etiolation and displayed a less stem diameter, a typical characteristic of etiolated plants, Lopes *et al*. (2008) [4].

Table 2: Effect of crop geometry on Days to 50 % flowering, Seed yield (kg ha^{-1}) and Oil yield (kg ha^{-1}) of hybrid castor

Treatments		Days to 50 % flowering	Seed yield (kg ha^{-1})	Oil yield (kg ha^{-1})
G_1	150 × 120 cm	52.30	1825	838
G_2	120 × 120 cm	52.00	2153	988
G_3	120 × 90 cm	51.00	2010	914
G_4	120 × 60 cm	50.30	1637	736
G_5	90 × 90 cm	49.00	1540	688
G_6	90 × 60 cm	50.00	1327	589
G_7	90 × 45 cm	48.30	1044	461
G_8	75 × 75 cm	48.00	1002	442
SEd		1.18	58	18
CD (P = 0.05)		2.47	124	40

Closer planted of castor might have experienced competition for sunlight, water, nutrients, and space and in turn produced lower number of branches plant^{-1} per unit area^{-1}. Though more number of branches plant^{-1} was noticed under widely planted castor, due to lack of population, leads to increase number of branches unit area^{-1}. Hence, optimum spacing at 120 x 120 cm provides less competition between rows and plants which in turn increased the number of branches unit area^{-1} and finally reflected on increased seed (2153 kg ha^{-1}) an oil yield (988 kg ha^{-1}) (Table 2). These results are in conformity with Porwal *et al*. (2005) [5] and Bhunia *et al*. (2012) [1] in castor. Higher seed and oil yield was obtained under wider spacing whereas reduced yield in the narrow spacings may be associates with competition between plants as evidenced by the less number of branches plant^{-1} and increase the length of node. Therefore, properly selecting plant arrangements can improve the amount of solar radiation captured, water and nutrient use and the management factor that the plants require, are closely related to crop yield (Argenta *et al*, 2001) [2].

Conclusions

The study concurrently differentiated that there was remarkable influence of crop geometry on the growth characters and the production of hybrid castor. The optimum spacing of 120 × 120 cm which provides a way that all plants get equal opportunity to harness available growth resources so that the hybrid castor YRCH 1, can express their potential with respect to health and vigour which leads to enhanced seed and oil yield.

Acknowledgement

The authors would like to their water shed management AAO and labours of AC & RI, Madurai for their help and support during this study.

References

1. Bhunia SR, Chauhan RPS, Yadav BS. Effect of plant geometry and irrigation levels on productivity, yield components, water use and water use efficiency of castor (*Ricinus communis*) in canal command areas of north-western Rajasthan. J Rural Agric. Res. 2012; 12(2):37-39.
2. Argenta G, Silva PRF, Bortolini CG, Forsthofer EL, Manjabosco EA, Neto VB. Resposta de Híbridos Simples de Milho à Redução do Espaça- mento Entre Linhas. Pesquisa Agropecuária Brasileira, 2001; 36(1):71-78.
3. Kumar S. Effect of planting pattern and fertilizer management on castor (Ricinus communis) based intercropping system. Indian J Agron. 2002; 47(3):362-360.
4. Lopes FMM, Beltrão NEM, Lopes neto JP, Jp Pedroza. Crescimento inicial de genótipos de mamoneira com sementes submetidas ao envelhecimento acelerado. Revista Brasileira de Oleaginosas e Fibrosas. 2008; 12:69-79.
5. Porwal MK, Agarwal SK, Khokar A. Effect of planting methods and intercrops on productivity and economics of castor (*Ricinus communis*) based intercropping systems. Indian J Agron. 2005; 51(4):274-277.
6. Raghavaiah CV, Sudhakara Babu SN. Effect of seedling date, female: male row proportion and nitrogen on certified seed production of GCH 4 (VP1× 48 1) castor hybrid. J Oilseeds res. 2000; 7(1):100-106.
7. Severino LS, Moraes CRA, Gondim TMS, Cardoso GD, Beltrão NEM, Crescimento. e produtividade da mamoneira influenciada por plantio em diferentes espaçamentos entre linhas. Revista Ciência Agronomica. 2006; 37(1):50-54.