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Evaluation of comparative performance of advanced hybrids and varieties of castor (*Ricinus communis* L.)

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Abstract
Field experiment was carried out during the Kharif-2018-19 to evaluate the performance of the hybrids and varieties of castor. Among the different hybrids and varieties number of capsules per spike was highest in DCH-519 (42.80) and was on par with DCH-177 (40.20) followed by PCH-111 (37.67), GCH-4 (36.53). Highest seed yield (509 kg/ha) and net returns (4199 Rs/ha) was recorded in DCH-519 and B:C ratio of 1.24 which was on par with DCH-177 with seed yield of 495 kg/ha and net returns, B:C ratio of 3503 Rs/ha and 1.20 respectively. Among treatments DCH-519 recorded the highest gross returns, net returns and B : C ratio to higher yield attributes which results in higher yield and lowest was in Haritha.

Keywords: Castor, FLD, varieties, rainfed

Introduction
Castor (*Ricinus communis* L.) belongs to Euphorbiaceace family which is found in both tropical and sub-tropical regions of the world (Weiss, 2000). Castor is indigenous to the southeastern Mediterranean Basin, Eastern Africa and India but is widespread throughout tropical regions. Castor seed is the source of castor oil, which has a wide variety of uses. Castor oil is one of the important raw materials for the chemical and polymer industries (Mutlu and Meier, 2010) [7] are used as biodiesel stock (Hall *et al.*, 2009; Da Silva Cesar and Batalha, 2010) [5, 3]. With its unlimited applications, castor oil has a tremendous worldwide demand and it accounts for 0.15% of vegetable oils (Scholz and da Silva, 2008) [11]. India and Brazil together accounts for more than 80% of the castor oil supply. In India, castor is cultivated in an area of 8.4 lakh ha under both irrigated and rainfed conditions. Castor has the potential for its use in bioenergy and industrial feed stock due to its high oil content and has the adaptability to grow under drought and saline conditions (Severino *et al.*, 2012) [12]. India is the first country in the world to exploit hybrid vigour of castor crop on commercial scale (Ramchandram and Rao, 2012) [8].

In India, castor grows under natural conditions and spreads through semi-wild and wild perennial forms in diverse habitats like forest, sea coast, river bund, railway track, garbage dump and waste land. India is in possession of 4373 castor accessions of which 3416 have been maintained by the Directorate of Oil Seeds Research, Hyderabad, and the remaining 957 conserved by the National Bureau of Plant Genetic Resources (NBPGR), New Delhi (Anjani and Hegde, 2007) [1]. In India, castor is found growing in wild conditions in the states of Bihar, Uttar Pradesh and Madhya Pradesh with approximately 14 ft tall and woody perennial types bearing big leaves (Anjani, 2012) [2]. In north eastern India, castor has been found in wild form and exclusively used for rearing of eri silkworm for cocoon production. It has diverse morphological variants in many parts of the world with regard to plant height, branching, stem colour, leaf size, waxy coating, length, shape and compactness of raceme, pedicle length as well as size and shape of capsule and seed (Moshkin, 1986) [6]. In the current study, an attempt has been made to record the growth and yield attributes of a few selected castor hybrids/varieties with a view to identify their suitability for both seed production and eri silkworm rearing.

In India, Telangana and Gujarat are well known for castor production and productivity. To develop high yielding castor genotypes that get fit into the present cropping system, it is important to create the genetic variability for the selection of desirable variant (Sarwar and Chaudhry, 2008) [10]. However, as major cropped area is under rainfed, the physiological efficiency of the genotypes especially water use efficiency has become pivotal. Total of Seven hybrids and varieties were evaluated at field conditions along with the popular check to find out the best lines with better physiological efficiency coupled with higher seed yield.

This identification of better lines would be helpful in the process of improving castor productivity and production.

Materials and methods:

A field study was conducted during kharif with twelve CRIDA castor genotypes, *viz.*, PCH-111, DCH-177, DCH-519, Haritha, PCS-262, DCS-107 and GCH-4 at Agricultural research Station, Rekulakunta, Anantapuram. The trial was sown during the month of June in RBD with three replications and plot size of 5.4 m X 6.0 m, the crop was raised purely under rainfed conditions following recommended package of practices and all the crop protection measures. Observations were recorded on the growth parameters (Plant height, number of nodes, effective spike length, number of capsules per spike and number of effective spikes per plant), 2) Yield and yield attributing characteristics, oil content and economics of the crop. The means of data by replicates were subjected to analysis of variance. SPSS programme was used for the analyses.

Results and discussion:

Observation on the plant height in different hybrids/varieties revealed that maximum height was recorded in DCH-519 (44.61 cm). DCH-177 (41.08 cm) and GCH-4 (40.66 cm) were on par with each other. The varieties PCH-111, PCS-262, DCS-107 and Haritha recorded plant height of 39.11, 38.32, 37.93 and 36.83 cm respectively and were on par with each other. With respect to number of nodes highest was observed in DCS-107 (17.33) and was on par with DCH-519 (16.27) followed by Haritha (15.67). PCS-262 and PCH-111 were on par with each other which recorded 14.67 and 14.33 nodes respectively.

The present results are in close conformity with Govindan *et al*. (2003) [4] observed a significant variation among castor hybrids/varieties with respect to plant height at different days of sowing. Further, Sanappa *et al*. (2016) [9] who reported that among the castor hybrids/varieties, DCH-519 hybrid showed significantly superior plant height, number of branches/plant, number of leaves /plant, leaf area, leaf area index, leaf area duration, leaf yield and seed yield followed by DCS-9 variety, GCH-4 hybrid, DCH 177 hybrid and 48-1 variety.

Similarly the effective spike length was recorded highest in DCH-519 (26.99 cm) and was on par with DCH-177 which recorded spike length of 25.83 cm. GCH-4, DCS-107, PCS-262 and PCH-111 were on par with each other which recorded spike length of 24.57, 23.55, 22.89 and 22.15 respectively. Whereas, Haritha recorded spike length of 21.33 cm and was least among the hybrids.

Number of capsules per spike was highest in DCH-519 (42.80) and was on par with DCH-177 (40.20) followed by PCH-111 (37.67), GCH-4 (36.53). DCS-107, Haritha and PCS-262 recorded 31.67, 29.73 and 29.67 capsules per spike and were on par with each other. Further, number of effective spikes per plant was also highest in the DCH-519 (2.60) followed by GCH-4 (2.20) which were on par statistically and followed by DCH-177 (2.07). PCH-111 (1.93), PCS-262 (1.87), Haritha (1.80) and DCS-107 (1.73) were on par with each other with respect to number of effective spikes per plant.

Highest seed yield (509 kg/ha) and net returns (4199 Rs/ha) was recorded in DCH-519. Further DCH-519 also recorded the B:C ratio of 1.24. DCH-519 was on par with DCH-177 with seed yield of 495 kg/ha and net returns, B:C ratio of 3503 Rs/ha and 1.20 respectively. DCS-107, PCH-111 and GCH-4 recorded seed yield of 380, 441 and 460 kg/ha and were on par with each other. The lowest yield of 272 kg/ha was recorded in Haritha with B:C ratio of 0.66.

The variation that existed in the yield components studied in the castor accessions showed that castor seed yield could be improved upon through selection programmes if genetic information on how these characters are inherited is known. Similar variations were reported on yield, 100- seed weight; seed yield per plant (Uguru, 2000) [14]. Shifa (2011) [13] recorded that plant height, number of leaves/plant and leaf area were significantly greater among the castor genotypes with the plant height being maximum in Acc. 208624 (176.33 cm) and no variation was observed in the number of leaves/plant which varied from 32.77 (local) to 46.22 (Acc. 208624). Further, leaf and seed yields of castor genotypes were higher in Acc. 208624 (13531 and 1971.36 kg/ha), but reduced leaf yield in Bako (7567.4 kg/ha) and declined seed yield in local (732.84 kg/ha).

Seed yield is a complex character and it is polygenic in inheritance. Therefore, selection for seed yield *per se* may be difficult due to the low heritability of the character.

However, certain characters, which may be strongly related with seed yield, may be more heritable than the seed yield. If such components are selected for, better success may be achieved in seed yield improvement.

Table 1: Growth, yield attributes, yields and economics of castor hybrids and varieties (*Kharif*, 2018-19)

Treatments	Plant height (cm)	No of nodes	Effective spike length (cm)	No of capsules per spike	No of effective spikes per plant	100 seed wt(g)	Oil content (%)	Seed Yield (kg/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	BC ratio
T_1-PCH-111	39.11	14.33	23.55	37.67	1.93	27.23	46.88	441	20965	965	1.07
T_2-DCH-177	41.08	11.73	25.83	40.20	2.07	25.37	46.79	495	23503	3503	1.20
T_3-DCH-519	44.61	16.27	26.99	42.80	2.60	21.90	44.25	509	24199	4199	1.24
T_4-Haritha	36.83	15.67	21.33	29.73	1.80	22.90	46.61	272	12921	-6700	0.66
T_5-PCS-262	38.32	14.67	22.15	29.67	1.87	27.33	45.30	347	16489	-3136	0.84
T_6-DCS-107	37.93	17.33	22.89	31.67	1.73	27.93	45.71	380	18069	-1681	0.92
T_7-GCH-4	40.66	15.87	24.57	36.53	2.20	23.50	45.48	460	21853	1903	1.12
SE(m)±	1.02	0.38	0.81	1.36	0.17	0.73	0.21	32			
C.D@5%	3.17	1.19	2.53	4.25	0.52	2.28	0.64	100			
C.V(%)	4.42	4.39	5.88	6.66	14.14	5.04	0.78	13			

Seed cost of Hybrids 5kg: Rs.1250/- per ha, varieties 10kg: Rs.600/- per ha.

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