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Variability studies in castor germplasm accessions (*Ricinus communis* L.)

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A total of 45 castor germplasm were studied for the variability for nine biometrical traits and four physiological traits. The study was conducted during *Kharif* season of 2011-12 at Agricultural College and Research Institute, Madurai. The data were subjected to analysis of variance and it was found that the germplasm differed significantly for all the characters studied. The estimates of genotypic and phenotypic variances were worked out for all the characters. While considering the biometrical traits high GCV estimates were observed for number of capsules in primary spike, single plant yield, plant height, primary spike length. In the present investigation both biometrical and physiological characters showed high heritability indicating low environmental effect and high capacity of the characters for the transmission to subsequent generation.

Key words : Castor, Variability, GCV, PCV, Germplasm accessions

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INTRODUCTION

Castor is considered native to Ethiopian region of tropical East Africa and India. Castor seed contains 40-60 per cent oil which is a non drying oil. It has great industrial utility as it is used for the manufacture of soaps, refined and perfumed hair oil, printing inks, varnishes, synthetic resins, carbon paper, lubricant, ointments, other cosmetics, processed leather etc. In any crop improvement programme, germplasm serves as a valuable source of base population, which offers much scope for further improvement. The primary aim of the breeder is to improve the available genotypes by evolving superior varieties. Evolving superior genotypes would be effective, only when the existing variability in the chosen material is wide. The observed variability for any character is the result of interaction of genotype with environment. Hence, it becomes necessary to partition the overall phenotypic variability into heritable and non heritable components of variability to have an effective selection for superior genotypes.

RESEARCH METHODOLOGY

Forty five castor genotypes of diverse origin maintained in the germplasm bank at Directorate of Oilseeds Research, Hyderabad formed the basic materials for the present study. A completely randomized design with two replications was adopted. Data were recorded on days to 50 per cent flowering, plant height upto primary spike, number of nodes upto primary spike, number of spikes per plant, length of primary spike, number of capsules in primary spike, hundred seed weight, oil content, single plant yield, chlorophyll stability index, relative water content, membrane injury index and proline content. The mean values of five plants in each replication were used for the analysis of variance as suggested by Panse and Sukhatme, 1961. Phenotypic and genotypic variances were estimated according to the formulae given by Lush (1940).

RESEARCH FINDINGS AND ANALYSIS

Maximum phenotypic and genotypic variances were observed for plant height upto primary spike and single plant yield while minimum variances were shown by number of capsules in primary spike (Table 1). Number of capsules in primary spike, plant height upto primary spike, and single plant yield exhibited high PCV and GCV estimates, while oil content had lower PCV and GCV. Little difference between PCV and GCV for all the traits indicated that the least role played by environment on these characters. Sundervelpandian (2003) obtained high genotypic co efficient of variation for

Table 1: Variability parameters for different characters

Sr. No.	Characters	Range		Grand mean	Variance		Co-efficients of variation(%)		
		From	To		Genotypic (GV)	Phenotypic (PV)	Genotypic (GCV)	Phenotypic (PCV)	PCV-GCV
1.	Days to 50 per ent flowering	43.15	90.74	63.75	100.79	103.65	15.74	15.96	0.22
2.	Plant height	58.56	179.57	96.43	710.28	789.19	27.63	29.13	1.50
3.	Number of nodes up to primary spike	11.46	23.24	17.22	11.58	11.85	19.75	19.99	0.24
4.	Number of spikes per plant	3.14	6.44	4.84	33.32	33.83	15.97	16.26	0.29
5.	Length of primary spike	14.44	37.24	22.58	50.30	50.68	25.56	25.76	0.20
6.	Number of capsules in primary spike	11.46	41.84	21.53	0.59	0.62	32.94	33.06	0.12
7.	Hurdred seed weight	12.00	22.94	17.75	8.17	8.40	16.11	16.33	0.22
8.	Oil content	43.36	51.34	46.78	3.80	5.38	4.17	4.96	0.79
9.	Chlorophyll stability index	73.41	94.60	82.32	27.73	31.68	6.39	6.83	0.44
10.	Relative water content	70.86	95.02	80.18	40.79	44.19	7.96	8.29	0.33
11.	Membrane injury index	25.49	39.12	32.46	18.58	19.32	13.28	13.54	0.26
12.	Proline content	8.89	34.09	21.37	25.09	25.35	23.43	23.55	0.12
13.	Single plant yield	26.27	86.00	52.65	218.85	231.08	28.09	28.86	0.77

Table 2: Heritability, genetic advance and genetic advance as percent of mean for different characters in castor

Sr. No.	Character	Heritability	Genetic advance	GA as % of mean
1.	Days to 50 per cent flowering	97.24	20.39	31.98
2.	Plant height	90.00	52.07	54.00
3.	Number of nodes up to primary spike	97.66	6.92	40.21
4..	Number of spikes per plant	96.44	1.56	32.32
5.	Length of primary spike	98.50	11.80	52.27
6.	Number of capsules in primary spike	99.26	14.55	67.61
7.	Hundred seed weight	97.29	5.80	32.73
8.	Oil content	70.72	3.37	7.22
9.	Chlorophyll stability index	87.52	10.14	12.32
10.	Relative water content	92.30	12.63	15.76
11	Membrane injury index	96.19	8.70	26.83
12.	Proline content	98.99	10.26	48.04
13.	Single plant yield	94.70	26.65	56.32

the traits *viz.*, plant height upto primary spike, single plant yield and length of primary spike. Sarwar and Bootar Choudary(2008) estimated high GCV for number of capsules in primary spike. Omkarappa *et al.*(2010) also observed high GCV for number of capsules in primary spike and primary spike length. Rajesh *et al.*(2010) reported high GCV for plant height and single plant yield. Patel *et al.*(2010) recorded high GCV for the characters number of capsules on primary spike, plant height, seed yield per plant. As yield and its attributes are highly influenced by the environment, it is difficult to conclude whether the observed variability is heritable or not. Therefore, it becomes essential to partition the observed variability into heritable and non heritable components. Genotypic co-efficient of variation along with heritability estimates would be better effective for selection. Heritability is a good index of the transmission of characters from parents to offspring (Falconer, 1967). In the present investigation all the characters showed high heritability indicating low environmental effect and high capacity of the characters for the transmission to subsequent generation (Table 2).

Conclusion:

Maximum phenotypic and genotypic variances were observed for plant height upto primary spike and single plant yield while minimum variances were shown by number of capsules in primary spike. High heritability coupled with high genetic advance were observed for the characters *viz.*, days to 50 per cent flowering, plant height, number of nodes upto primary spike, number of spikes per plant, primary spike length, number of capsules in primary spike, hundred seed weight, single plant yield, chlorophyll stability index, relative water content, membrane injury index and proline content. Hence, there is a potential possibility of improvement of the above characters.

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