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Genetic variability and correlation studies in castor (*Ricinus communis* L.)

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ABSTRACT

The experimental material comprised of 41 castor genotypes were evaluated for assessment of genetic variability and correlation in respect of 9 characters. The GCV and PCV were of high magnitude for the character number of capsules on primary raceme followed by plant height, seed yield per plant and number of effective branches per plant. The magnitude of PCV was higher than GCV for all the characters, suggesting the role of environmental variance. High genetic variability coupled with high heritability and high genetic advance was recorded for plant height, number of capsules on primary raceme, number of effective branches per plant and seed yield per plant indicating that direct selection for these traits could be effective. Seed yield per plant showed highly significant and positive correlation with plant height, length of primary raceme, number of capsules on primary raceme and number of effective branches per plant.

Key words : Correlation, Genetic variability, Genetic advance, Heritability, Castor

INTRODUCTION

Castor (*Ricinus communis* L.) is an important non edible oil seed crop and has great industrial value. India is one of the major contributors in production and trade of castor oil and its derivatives.

Genetic variability is pre-requisite for improving any crop plant. The information about the nature and extent of variation coupled with the knowledge of characters association are helpful for improving the seed yield through selection. Heritability and genetic advance of seed yield and its components help to assess the genetic gain that can be obtained by selection. Hence, present study was under taken to know the heritability, genetic advance and inter character association between seed yield and its component characters.

MATERIALS AND METHODS

The present investigation was carried out using 41genotypes of castor. The material was grown at Agronomy Instructional Farm, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar in Randomized Block Design (RBD) with three replications during August-2004 to March-2005. Each entry was grown in single row of 10 dibbles. The distance between two successive rows was 90 cm., while between two dibbles within a row was 60 cm. Sowing of seeds was carried out through dibbling method. Observations were recorded on five plants selected randomly and tagged from each plot. These plants were utilized for recording the observations on seed yield and its component traits. Genotypic and phenotypic coefficient of variances was estimated based on the formula given by Burton (1952) and heritability and genetic advance were calculated according to Allard (1960). Character associations were estimated by the formula of Singh and Choudhary (1976).

RESULTS AND DISCUSSION

Analysis of variance revealed highly significant differences among the genotype for all the characters indicating presence of high amount of variability among the genotypes under study. The range, mean and variability estimates such as GCV, PCV, heritability and genetic advances as per cent of mean are presented in Table 1. While, looking to the estimates of GCV and PCV was greater than GCV indicating that environmental component had been controlled considerably and hence, phenotypic selection can also effectively useful for the improvement. However, the trend of GCV and PCV was same. High GCV and PCV were recorded by the characters number of capsules on primary raceme (49.70 to 50.64) followed by plant height (48.34 to 49.60), seed yield per plant (41.40 to 43.39) and number of effective branches per plat (36.80 to 38.43). Similar results were recorded by Muthiah *et al*. (1982), Mehta and Vashi (1997) and Jaimini (2002). High heritability was recorded for number of capsules on primary raceme, days to 50% flowering, plant height and 100-seed weight while relatively lower heritability was recorded by oil content and length of primary raceme. The heritability value indicated the presence of additive gene action and further

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Table 1: Range, mean, GCV %, PCV %, H^2b (%) and GA as % of mean for different characters in castor

Sr. No.	Characters	Range	Mean	GCV (%)	PCV (%)	H^2b (%)	GA as % of mean
1.	Days to 50 % flowering (Nos.)	49.33-95.67	66.02	18.71	19.18	95.2	37.62
2.	Days to maturity (Nos.)	110.00-183.33	138.09	12.80	13.38	91.5	25.23
3.	Plant height (cm)	20.17-146.73	59.89	48.34	49.60	95.0	97.08
4.	Length of primary raceme (cm)	18.50-60.01	39.63	27.01	29.23	85.4	51.40
5.	Number of capsules on primary raceme (Nos.)	15.67-168.00	69.09	49.70	50.64	96.3	100.47
6.	Number of effective branches per plant (Nos.)	0.69-6.61	3.78	36.80	38.43	91.7	72.75
7.	Seed yield per plant (g)	31.00-260.33	140.63	41.40	43.39	91.0	81.38
8.	100-seed weight (g)	26.17-43.35	32.90	11.62	11.95	94.5	23.28
9.	Oil content (%)	42.50-54.86	48.10	4.55	5.34	72.5	7.98

improvement in these traits could be effective through direct selection. The results are in accordance with the findings of Patel and Jaimini (1988), Mehta and Vashi (1997) and Jaimini (2002). High genetic advance was recorded for number of capsules on primary raceme, plant height indicating that these characters are governed by additive genes and simple phenotypic selection will be rewarding for improvement of these characters. The results are in close conformity with the finding of Patel and Jaimini (1988). Moderate genetic advance was also observed in seed yield per plant, number of effective branches per plant, length of primary raceme and days to 50% flowering. Low heritability combined with low genetic advance was observed for oil content indicates that the scope for improvement these traits through selection is very much limited and may be attributed to the non-additive gene action.

Estimates of genotypic and phenotypic correlation coefficient are presented in Table 2. Positive and significant correlations were observed between character combinations *viz.*, days to 50% flowering with days to maturity, plant height, length of primary raceme, number of capsules on primary raceme and 100-seed weight; days to maturity with plant height, length of primary raceme, number of capsules on primary raceme and 100-seed weight; plant height with length of primary raceme, number of capsules on primary raceme, number of effective branches per plant, 100-seed weight, oil content and seed yield per plant; length of primary raceme with number of capsules on primary raceme, 100-seed weight

Table 2 : Genotypic and phenotypic correlation coefficients (r) between seed yield per plant other quantitative traits in castor

Characters		Days to maturity	Plant height	Length of primary raceme	Number of capsules on primary raceme	Number of effective branches per plant	100-seed weight	Oil content	Seed yield per plant
Days to 50 %	G	8.75**	0.630**	0.611**	0.660**	0.033	0.488**	0.188*	-0.026
flowering	P	0.838**	0.589**	0.546**	0.632**	0.043	0.463**	0.153	-0.027
Days to maturity	G		0.568**	0.496**	0.614**	0.061	0.671**	0.082	0.045
	P		0.527**	0.447**	0.574**	0.065	0.611**	0.073	0.048
Plant height	G			0648**	0.745**	0.295**	0.461**	0.226*	0.553**
	P			0.588**	0.721**	0.272**	0.448**	0.197*	0.514*
Length of primary	G				0.760**	0.123	0.319**	0.019	0.378**
raceme	P				0.694**	0.133	0.304**	0.040	0.343**
Number of capsules	G					0.145	0.326**	0.151	0.473**
on primary raceme	P					0.138	-0.112	0.125	0.445**
Number of effective	G						-0.112	0.319**	0.418**
branches per plant	P							0.291**	0.379**
100 seed weight	G							-0.080	0.135
	P							-0.055	0.129
Oil content	G								0.058
	P								0.056

G= Genotypic correlation coefficient, P= Phenotypic correlation coefficient, * and ** indicate of significance of values at P = 0.05 and 0.01, respectively,

and seed yield per plant; number of capsules on primary raceme with 100-seed weight and seed yield per plant whereas number of effective branches per plant with oil content and seed yield per plant. The results are in concerance with Mehta and Vashi (1998) and Sevugaperumal *et al*. (1999) for length of primary raceme and number of capsules on primary raceme, Muthaih *et al*. (1982) and Jaimini (2002) for plant height and number of effective branches per plant, at both genotypic and phenotypic levels. These results revealed that positive and significant, genotypic and phenotypic association with above characters can be utilized in selection for improvement of seed yield per plant.

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