International Journal of Biology Research
ISSN: 2455-6548, Impact Factor: RJIF 5.22
www.biotechjournals.com
Volume 1; Issue 1; March 2016; Page No. 47-49

Genetic association yield with different agronomic traits in castor (*Ricinus communis* L.)

*** Dapke JS, Naik, MR, Singh, AP, Baraskar VV, Narwade AV, Indivar Prasad**

Department of Genetics and Plant Breeding, Navsari Agricultural University, Navsari. Gujarat, India.

Abstract
Sixty one genotypes were evaluated in randomized block design with three replications to study the correlation and path co-efficient analysis for ten quantitative characters in castor (*Ricinus communis* L.) under irrigated conditions during *rabi* seasons of 2014. Correlation studies revealed that seed yield was positive and significantly genotypic as well as phenotypic associated with leaf plant height up to primary spike, total length of primary spike, length of capsule bearing region of primary spike, number of effective branches per plant, number of capsules on primary spike and oil content. Path coefficient analysis showed that number of capsules on primary spike, number of effective branches per plant and oil content were the most important characters manifesting large direct effects on seed yield per plant. It is, therefore, suggested that simultaneous selection for total length of primary spike, length of capsule bearing region of primary spike, number of effective branches per plant, number of capsules on primary spike would result in improvement of seed yield by phenotypic selection in castor.

Keywords: Genotypic correlation, phenotypic correlation, Path analysis, direct effects

1. Introduction
Castor is important non-edible oilseed crop cultivated mainly for source of oil which has tremendous industrial use. Gujarat is the leading castor growing state in India and contributes more than 70 % of the castor production from about 47 % of the area in the country. Castor seed yield being a complex character is dependent on a number of characters. Correlation studies provide the association of quantitative characters, especially of seed yield and its attributes. Path co-efficient analysis measures the direct influence of one variable upon another and permits the separation of correlation coefficients into direct and indirect effects. The knowledge on association among different traits with yield and interrelationship is essential to improve the selection efficiency. Keeping this objective in view, the present study was conducted to observe association between yields its contributing traits and path analysis for observe direct indirect effect of important yield contributing traits on seed yield.

2. Materials and methods
Sixty one castor genotypes comprising of 44 hybrids (Including two checks) and 17 parents of hybrids were evaluated in randomized block design with three replications at college farm Navsari Agricultural University Navsari, Gujarat during *rabi* 2014 under irrigated conditions. Each genotype was planted in 10 rows each accommodating 10 plants in a row-to-row and plant-to-plant spacing being 120 cm and 60 cm, respectively. All the recommended package of practices was adopted besides providing necessary plant protection measures to raise a healthy crop. Observations were recorded on eleven quantitative characters *viz*., days to 50 % flowering of primary spike, days to maturity of primary spike, plant height upto primary spike (cm), number of nodes upto primary spike, total length of primary spike (cm), length of capsule bearing region of primary spike (cm), number of effective branches per plant, number of capsules on primary spike, seed yield per plant (g), 100-seed weight (g) and oil content (%).phenotypic and genotypic correlations (Falconer, 1964) [3] and path coefficient analysis (Dewey and Lu, 1959).

3. Result and Discussion
In general, the values of genotypic correlation coefficient were on higher side than those of phenotypic correlation coefficient, indicating the role of environment is influencing the characters. Generally, the nature of inter trait correlations may enhance or retard the selection progress. A positive relationship indicates that the selection for improvement in one of the yield components would result in concomitant increase in one or more components. The perusal of correlation estimates (Table 1.) revealed that seed yield per plant had positive significant genotypic and phenotypic correlations with plant height upto primary spike, total length of primary spike, length of capsule bearing region of primary spike, number of effective branches per plant, number of capsules on primary spike and oil content indicating their importance as yield component traits. Positive association between seed yield with total length of primary raceme, total number of racemes per plant were reported by Moshkin (1986) [9] and Sarwar and Chaudhry (2008) [11]; Lima *et al*. (1998) [6] found that castor seed yield was positively correlated with plant height and number of capsules per plant. The characters like days to 50 % flowering and days to maturity of primary spike exhibited negative non-significant correlations with seed yield and only number of nodes upto primary spike showed significant negative correlation with seed yield per plant.
Considering the interrelationship among the yield components, number of effective branches per plant had significant positive genotypic as well as phenotypic correlations with days to 50 % flowering of primary spike, days to maturity of primary spike, plant height up to primary spike, total length of primary spike, length of capsule bearing region of primary spike, number of capsules on primary spike, whereas 100-seed weight and oil content showed significant positive genotypic correlation with of effective branches per plant. While, total

length of primary spike was positively and significantly correlated with length of capsule bearing region of primary spike, number of capsules on primary spike and 100-seed weight. The character like number of capsules on primary spike showed positive and significant genotypic correlation with length of capsule bearing region of primary spike, and 100-seed weight, while significant negative genotypic and phenotypic correlation with number of nodes upto primary spike. Oil content showed significant negative genotypic correlation with days to maturity of primary spike, plant height upto primary spike, number of nodes upto primary spike. The remaining component characters showed either positive or negative non-significant relationship with each other's. These results are in accordance with the results of Yadav *et al*., (2004) [12], Lakshmamma *et al*., (2005) [5] and Manivel and Manivannan (2006) [7].

As the correlation coefficients are insufficient to explain true relationship for an effective manipulation of the characters, path coefficients were worked out. The path analysis furnishes a method for partitioning the correlation coefficients into direct and indirect effects and measures the relative importance of the causal factors involved (Dewey and Lu, 1959) [2]. In our study of path analysis (Table 2), number of capsules on primary spike (0.609) had shown the highest positive direct contribution to seed yield followed by number of effective branches per plant (0.429) and oil content (0.157) Mehta and Vashil (1998) [8] found that the greatest direct effect on seed yield per plant number of capsules in main raceme, Deepika and Tummala (1981) [1] reported high direct effect through number of effective branches per plant. In the present study, significant and high positive correlations of number of effective branches per plant, number of nodes and oil content with seed yield were due to their substantially large positive direct effects on seed yield.

The characters *viz.*, plant height upto primary spike (0.027), number of node upto primary spike, (0.039), days to maturity of primary spike (0.08), total length of primary spike (0.054) and 100-seed weight (0.06) had positive low direct effects on seed yield. Whereas, length of capsule bearing region of primary spike, (-0.043) and days to 50 % flowering of primary spike (-0.117) depicted negative low and high direct effects on seed yield respectively. Similar results were reported by Khorgade *et al.* (1994) [4], Lakshmamma *et al.* (2005) [5] and Manivel and Manivannan (2006) [7]. The total length of primary spike, length of capsule bearing region of primary spike and plant height upto primary spike had shown significant positive correlation with seed yield, the direct effect of this trait to seed yield was low. The high correlation observed by this trait with seed yield was mainly due to its indirect contribution through different yield contributing traits.

Table 1: Genotypic (lower) and phenotypic (upper) correlation coefficients between seed yield per plant other quantitative traits in castor.

Character	DFF	DM	PH	NNP	NEB	TLP	LCP	NCP	SY	TW	OC
DFF		0.620**	0.114NS	0.008NS	0.212**	0.112NS	0.079NS	0.108NS	0.123NS	-0.006NS	-0.013NS
DM	0.747**		0.404**	0.011NS	0.266**	0.096NS	0.052NS	0.033NS	0.099NS	-0.016NS	-0.180*
PH	0.144*	0.440**		0.125NS	0.286**	0.090NS	0.090NS	0.060NS	0.203**	0.062NS	-0.073NS
NNP	-0.054NS	0.032NS	0.185*		-0.109NS	-0.086NS	-0.097NS	-0.157*	-0.104NS	-0.083NS	-0.039NS
NEB	0.309**	0.328**	0.339**	-0.126NS		0.567**	0.561**	0.522**	0.647**	-0.117NS	-0.045NS
TLP	0.142NS	0.097NS	0.110NS	-0.114NS	0.685**		0.950**	0.830**	0.822**	0.106NS	0.053NS
LCP	0.111NS	0.057NS	0.092NS	-0.099NS	0.685**	1.010**		0.831**	0.816**	0.078NS	0.019NS
NCP	0.119NS	0.032NS	0.057NS	-0.235**	0.629**	0.895**	0.901**		0.848**	0.110NS	0.097NS
SY	0.134NS	0.113NS	0.214**	-0.182*	0.775**	0.871**	0.862**	0.901**		0.066NS	0.080NS
TW	0.025NS	-0.012NS	0.047NS	-0.166*	-0.221**	0.148*	0.098NS	0.156*	0.092NS		0.059NS
OC	-0.126NS	-0.353**	-0.154*	-0.163*	-0.166*	0.142NS	0.073NS	0.135NS	0.163*	0.239**	

Table 2: Direct (bold) and indirect effects of different traits on seed yield in castor.

Character	DFF	DM	PH	NNP	NEB	TLP	LCP	NCP	TW	OC	Genotypic correlation of seed yield/plant
DFF	-0.117	0.060	0.004	-0.002	0.132	0.008	-0.005	0.073	0.002	-0.020	0.134NS
DM	-0.088	0.080	0.012	0.001	0.141	0.005	-0.002	0.020	-0.001	-0.055	0.113NS
PH	-0.017	0.035	0.027	0.007	0.145	0.006	-0.004	0.035	0.003	-0.024	0.214**
NNP	0.006	0.003	0.005	0.039	-0.054	-0.006	0.004	-0.143	-0.010	-0.025	-0.182*
NEB	-0.036	0.026	0.009	-0.005	0.429	0.037	-0.029	0.383	-0.013	-0.026	0.775**
TLP	-0.017	0.008	0.003	-0.004	0.294	0.054	-0.043	0.545	0.009	0.022	0.871**
LCP	-0.013	0.005	0.003	-0.004	0.294	0.055	-0.043	0.549	0.006	0.011	0.862**
NCP	-0.014	0.003	0.002	-0.009	0.270	0.049	-0.038	0.609	0.009	0.021	0.901**
TW	-0.003	-0.001	0.001	-0.006	-0.095	0.008	-0.004	0.095	0.060	0.037	0.092NS
OC	0.015	-0.028	-0.004	-0.006	-0.071	0.008	-0.003	0.082	0.014	0.157	0.163*

DFF	=	Day to 50% flowering of primary spike	LCP	=	Length of capsule bearing region of primary spike (cm)
DM	=	Days to maturity of primary spike	NCP	=	Number of capsules on primary spike
PH	=	Plant height upto primary spike (cm)	SY	=	Seed yield per plant (g)
NNP	=	Number of nodes upto primary spike	TW	=	100-seed weight (g)
NEB	=	Number of effective branches per plant	OC	=	Oil content (%)
TLP	=	Total Length of primary spike (cm)			

4. Conclusion

Based on the above findings, it may be suggested that plant height upto primary spike, total length of primary spike, length of capsule bearing region of primary spike, number of effective branches per plant, number of capsules on primary spike had significant positive correlation and positive direct effects on seed yield irrespective of seasons. Hence, these components may be given due importance in selection programme to improve the seed yield in castor.

5. References

1 Deepika B, Tummala PR. Correlations and path analysis in castor (*Ricinus communis*). *Genome* 1981; 23:525-531.
2 Dewey DR, Lu KH. A correlation and path coefficient analysis of component of crested wheat grass seed production. Agronomy Journal. 1959; 51:515-518.
3 Falconer DS. Introduction to Quantitative Genetics Oliver and Boyd, Edinburgh, 1964, 312-318.
4 Khorgade PW, Dhapke SK, Narkhede MN. Path analysis in castor (*Ricinus communis* L.) Agr. Sci. Digest 1994; 14:60-62.
5 Lakshmamma P, Lakshmi P, Chandra MY, Lavanya C. Genetic variability and character association in castor (*Ricinus communis* L.). Natl. J Pl. Improv. 2005; 7(2):122-126.
6 Lima EF, Santos J, Dos W. Genotypic, phenotypic and environmental correlations among agronomic characteristics of castorbean (*Ricinus communis* L.). Revista de leaginosas e Fibrosas 1998; 2:147-150.
7 Manivel P, Manivannan N. Path analysis under different environments in castor, *Ricinus communis* L. J Oilseeds Res. 2006; 23(1):89-92.
8 Mehta DR, Vashi PS. Correlation and path analysis of seed yield and its components in castor. Indian J Agr. Res. 1998; 32:160-164.
9 Moshkin VA. *Castor*. Amerind Publishing Co. Pvt. Ltd. New Dehli, 1986, 1-315.
10 Patel PS, Jaimini SN. Variability in castor (*Ricinus communis* L.). Indian J Agric. Sci. 1988; 58(5):394-396.
11 Sarwar GM. Chaudhary Evaluation of castor (*Ricinus communis* L.) induced mutants for possible selection in the improvement of seed yield. Span. J Agric. Res. 2008; 6:629-634.
12 Yadav YP, Yadav IS, Ravi P, Singh R, Yadava JS. Genotypic association and path coefficient analysis in castor, (*Ricinus communis* L.) J Oilseeds Res. 2004; 21(2):346-348.