Thus, the information gathered on different propagation parameters of mulberry accessions would be useful for selecting the appropriate accessions for further use.

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Research Notes

Studies on relationship between yield and its components in Indian mustard

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Understanding the relationship between yield and its components is of paramount importance for making best use of these relationships in selection. Correlation coefficient and path analysis are the important parameters for achieving this purpose. The correlation coefficient would reveal direct effect due to common association inherent in trait interrelationship. Therefore, information derived from the correlation coefficients may be augmented by partitioning correlations into direct and indirect effects by path analysis. The aim of the present study was to work out interrelationship among 13 traits and their direct and indirect effects on seed yield in Indian mustard.

Forty genotypes were grown in *rabi* 2002-2003 at Agricultural Research Station, GAU, Ladol. The experiment was planned in randomized block design with three replications, keeping the row to row and plant to plant distance 45 cm and 15 cm, respectively. Ten competitive plant selected randomly in each plot per replication were used to record observations for thirteen characters. Analysis of genotypic and phenotypic correlation was carried out as per formula suggested by Burton (1952). The path coefficient analysis was carried out according to the method given by Dewey and Lu (1959).

The data presented in Table 1, revealed that genotypic correlation was greater in magnitude than phenotypic ones with exception of that between length of main branch. It suggested that there is strong association between these characters genetically. Seed yield per plant was positively and significantly correlated with number of secondary branches (0.733), plant height (0.641), number of primary branches (0.530), days to flowering (0.520), days to maturity (0.469), number of siliquae per plant (0.402), test weight (0.247) and length of siliqua (0.241). Mahala *et al.* (2003) also reported similar findings for plant height, seeds per siliqua and length of main branch. These results are in conformity with the report of Khubie and Pant (1999) for number of primary branches, number of secondary branches, number of siliquae per plant, length of siliqua and test weight.

Number of primary branches, number of secondary branches, plant height and days to fifty per cent flowering, exhibited significant and positive association with seed yield and these components in turn exhibited positive correlation with each other. The results indicated that selection for one of these traits may automatically help to combine many useful other variables as indicated above. Khan and Gupta (1998) reported similar result for plant height, days to fifty per cent flowering and report of Khuble and Pant (1999) for number of secondary branches per plant. Oil content showed non-significant and negative correlation with all the characters except days to flowering, number of secondary branches, length of main branch and length of siliqua. Harvest index also showed negative association with all the characters under study except length of main branch and oil content.

The direct and indirect effects of characters on seed yield are presented in Table 2. The number of primary branches per plant showed the highest direct effect, followed by plant height, seeds per siliqua, test weight, length of siliqua and length of main branch.

Number of primary branches did exert indirect effect mainly through plant height, seeds per siliqua and number of secondary branches. Plant height had indirect effects mainly through number of primary branches and seeds per siliqua. Indirect effect through oil content was negligible. In case of number of primary branches per plant, plant height and test weight, the correlation with seed yield was high and positive along with high direct effect. Hence direct selection may be

Table 1. Genotypic (r_g) and Phenotypic (r_p) correlation co-efficient of different traits in Indian mustard.

Characters		Days to flowering	Days to maturity	Plant height	Length of main branch	No.of primary branches/ plant	No.of secondary branches/ plant	no.of siliquae / plant	Length of siliqua	Seeds / siliqua	Test weight	Oil content	Harvest index
Seed yield per plant	r_g	0.520**	0.469**	0.641**	0.066	0.530*	0.733**	0.402**	0.241**	-0.008	0.247**	-0.053	-0.434**
	r_p	0.475**	0.404**	0.584**	0.069	0.463*	0.593**	0.359**	0.135	-0.020	0.237*	-0.045	-0.237*
Days to flowering	r_g		0.756**	0.800**	-0.396**	0.853**	0.621**	0.390**	0.086	0.297**	0.010	-0.226*	-0.857**
	r_p		0.703**	0.753**	-0.350**	0.736**	0.491**	0.351**	0.081	0.256**	0.010	-0.207*	-0.670**
Days to maturity	r_g			0.797**	-0.049	0.611**	0.371**	0.115	0.446**	0.226*	0.228*	-0.095	-0.836**
	r_p			0.692**	-0.038	0.499**	0.269**	0.109	0.293**	0.181	0.203*	-0.084	-0.582**
Plant height	r_g				-0.192*	0.602**	0.510**	0.120	0.128	0.147	0.122	-0.176	-0.825**
	r_p				-0.122	0.520**	0.422**	0.119	0.084	0.135	0.115	-0.149	0.630**
Length of main branch	r_g					-0.667**	-0.468**	-0.522**	0.535**	-0.323**	0.633**	-0.110	0.361**
	r_p					-0.557**	-0.343**	-0.375**	0.377**	-0.205*	0.554**	-0.086	0.251**
No.of primary branches/plant	r_g						0.925**	0.689**	-0.071	0.406**	-0.295	-0.110	-0.826**
	r_p						0.768**	0.578**	-0.061	0.340**	0.250**	-0.084	-0.527**
No.of secondary branches/plant	r_g							0.777**	-0.190	0.421**	-0.424**	-0.031	-0.884**
	r_p							0.613**	-0.143	0.286**	-0.327**	-0.025	-0.430**
No.of siliquae / plant	r_g								-0.052	0.424**	-0.516**	-0.090	-0.301**
	r_p								-0.035	0.314**	-0.445**	-0.067	-0.160
Length of siliqua	r_g									-0.201*	0.541**	0.024	-0.043
	r_p									-0.040	0.430**	0.009	-0.068
Seeds / siliqua	r_g										-0.568**	-0.120	-0.055
	r_p										-0.493	-0.090	-0.037
Test weight	r_g											-0.008	-0.069
	r_p											-0.002	-0.045
Oil content	r_g												0.111
													0.095

* and ** significant at 5% and 1% levels, respectively.

Table 2. Path co-efficient analysis showing direct (bold) and indirect effect of different traits on seed yield in Indian mustard.

Character	Days to flowering	Days to maturity	Plant height	Length of main branch	No.of primary branches/	No.of secondary branches/ plant	No.of siliquae / plant plant	Length of siliqua	Seeds / siliqua	Test weight	Oil content	Harvest index	Genotype correlation with seed yield
Days to flowering	**-1.248**	-1.680	1.307	-0.137	1.386	0.165	-0.371	0.082	0.367	0.110	0.000	-0.360	0.520**
Days to maturity	-0.945	**-1.220**	1.304	-0.017	1.754	0.099	-0.109	0.422	0.299	0.241	0.000	-0.352	0.469**
Plant height	-0.999	-1.772	**1.634**	-0.067	1.720	0.135	-0.114	0.121	0.207	0.129	0.000	-0.347	0.641**
Length of main branch	0.494	0.109	-0.315	**0.346**	-1.907	-0.124	0.397	0.505	-0.348	0.668	0.000	0.152	0.060
No.of primary branches / plant	-1.043	-1.363	0.984	-0.231	**1.856**	0.245	-0.656	-0.067	0.458	-0.311	0.000	-0.348	0.530**
No. of secondary branches/plant	-0.776	-0.826	0.843	-0.162	0.642	**0.265**	-0.739	-0.180	0.473	-0.447	0.000	-0.351	0.733**
No.of siliquae / plant	-0.487	-0.255	0.197	-0.181	1.969	0.206	**-0.951**	-0.049	0.601	-0.544	0.000	-0.127	0.402**
Length of siliqua	-0.108	-0.992	0.210	0.185	-0.204	-0.050	0.050	**0.944**	-0.320	0.571	0.000	-0.018	0.241**
Seeds / siliqua	-0.434	-0.627	0.320	-0.114	1.238	0.119	-0.541	-0.286	**1.058**	-0.706	0.000	-0.059	-0.008
Test weight	-0.014	-0.508	0.200	0.219	-0.843	-0.112	0.491	0.512	-0.709	**1.054**	0.000	-0.029	0.247**
Oil content	0.283	0.212	0.289	0.041	-0.317	0.008	0.087	0.023	-0.147	-0.005	**-0.001**	0.047	-0.053
Harvest index	1.070	1.857	1.349	0.125	-1.361	-0.221	0.287	-0.040	-0.150	-0.074	0.000	**0.420**	-0.434

Residual effect : 0.203, * and ** significant at 5% and 1% levels, respectively.

practiced for these characters to improve the yield. The characters *viz.*, seeds per siliqua and harvest index showed negative correlation with seed yield with positive direct effect. Under these situations, a restricted simultaneous selection model is to be followed to nullify the undesirable effects in order to make use of the direct effect (Singh and Kakkar, 1977). On the contrary, the correlation of days to 50 per cent flowering and number of siliquae per plant with seed yield was positive and high but the direct effect was negative. In this case, indirect effect seemed to be the cause of correlation so the indirect causal factors should be considered simultaneously for selection

From the result of path analysis, it appears that number of primary branches per plant, plant height, test weight and length of siliqua were some of the component which had relatively higher and positive direct effects on seed yield. Indirect effects of other characters through these characters were also high.

The overall results suggested that number of primary branches per plant, plant height and length of siliqua should be considered most reliable and effective selection criteria for improvement of seed yield in Indian mustard.

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Research Notes

Inter trait association and path coefficient analysis in irrigated finger millet (*Eleusine coracana (L) Gaertn)*

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Finger millet (*Eleusine coracana* (L) *Gaertn)* plays a vital role in providing quality nutrition to human of South Asia and Africa. Many kinds of traditional and processed foods are produced from finger millet. It is one of the important small millets, which is very well adapted to marginal lands, hilly regions and shallow soils. In any breeding programme, selection based on the knowledge and direction of association between different yield attributes and yield is very useful. The present investigation was undertaken to determine the associations between yield and yield components in hybrids and parents of finger millet.

The experimental material for the present study comprised of eight parents which were selected on the basis of desirable agronomic, morphological characters including five female parents (CO 9, CO 10, CO 11, CO 12, CO 13) and three pollen parents (TNAU 946, GPU 28 and DPI 2011), and these were crossed in line x tester fashion during *kharif* 2002. The resulting 15 hybrids along with eight parents were evaluated in a RBD with three replications by adopting a spacing of 22 x 10 cm at the field of Department of Millets, TNAU, Coimbatore during *rabi* 2002-2003. Observations were recorded on five