Character Association and Path Analysis for Yield and its Components in Indian Mustard (*Brassica juncea* L. Czern and Coss)

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ABSTRACT

Path coefficient analysis with correlation coefficient for yield and its component were conducted using twelve genotypes of India mustard during rabi season 2010-11at Langthabal Kunja, Manipur. Information obtained by this technique helps in direct and indirect selection for genetic improvement of yield. Genotypic correlation coefficient between all the characters under study was higher than phenotypic correlation coefficient indicating strong association among the characters genetically, but the phenotypic value is lessened by the significant interaction of environment. Phenological characteristics, days to 50% flowering and days to maturity were recorded to show positive correlation both at genotypic and phenotypic level. Number of primary branches per plant showed positive correlation with number of siliquae per plant both at genotypic and phenotypic level. 1000 seed weight was positively correlated with seed yield per plant only at genotypic level. Path analysis revealed days to 50% flowering, number of primary branches per plant, number siliqua per plant, 1000 seed weight showed direct effects on seed yield per plant manifesting true relationship and selection for these traits would be rewarding for improvement of yield for Indian mustard. Characters, days to maturity, plant height, number of seeds per siliqua and oil content showed indirect effects on seed yield per plant.

Key words: Brassica, Correlation, Path analysis

1. INTRODUCTION

Brassica (rapeseed-mustard) is the second most important edible oilseed crop after soybean in the country. It contains adequate amount of the two essential fatty acids, linoleic and linolenic which are not present in many of the other edible oils. Indian mustard (*Brassica juncea* L. Czern and Coss) played important role in the oil seed economic which contributes about 80% of the total rapeseed mustard production in the country. Even though there are varieties with high yield potential, yet there is wide fluctuation in area, production and productivity which is mainly attributed due to its cultivation on marginal lands either rainfed or with limited irrigation facilities and non-availability of biotic and abiotic stress-resistant/tolerant varieties for different mustard growing regions of the country. Achievement of any crop improvement programme for developing a high yielding cultivar lies in the nature and magnitude of variation for different yield components. Thus, character association studies become a prerequisite for initiating a successful breeding programme. Yield is a complex quantitative trait which is subject to environmental fluctuations requiring indirect selection of simply highly heritable traits for its improvement. This is possible through estimates of correlations which help in determining the degree to which various yield contributing characters are associated (Wright, 1921). Path analysis further reveal the association of these characters with yield are due to direct effect on yield or is a consequence of their indirect effects via other component characters. It can discriminate between the realistic (genetic effects) and inflated (environmental effects) correlation. Some information related to these is known, but correlation coefficients vary from material to material. Keeping in view the above aspects, the present investigation was undertaken to study the correlation and path analysis for the development of high yielding cultivar of Indian mustard adapted to this region for the benefit of the farmers.

2. MATERIALS AND METHOD

The experiment was conducted at Langthabal kunja, Manipur, India during *rabi* season 2010-2011. Twelve genotypes namely, GM-1, GM-2, Pusa Bold, Sej-2, Local Yella, BIO-902, RH-0447, NDRE-7, NDRE-22, Kranti, Urvashi and JD-6 were laid out at three replications in Randomized Block Design. The crop was planted at a plot size of 4 X 1.5m with a spacing of 30 X 10 cm. Remaining package of practices were followed as given in the recommended package of practices for raising a good crop of Indian Mustard. Observations were recorded for the characters viz., days to 50% flowering, days to maturity, plant height (cm), number of primary branches per plant, number of siliquae per plant, number of seeds per siliqua, 1000 seed weight (g), oil content (%), seed yield per plant (g). Data were recorded from ten plants taken randomly from the middle rows from each plot of the three replications excepting for days to 50% flowering and days to maturity which were taken on plot basis. Correlation coefficient both at genotypic and phenotypic level was analysed as suggested by Johnson *et al.* (1955). Path coefficient as suggested by Dewey and Lu (1959).

3. RESULT AND DISCUSSION

Estimates of correlation coefficient revealed that magnitude of genotypic correlation coefficients were found to be higher than the corresponding phenotypic correlation coefficient for indicating a strong association between all the characters genetically, but the phenotypic value is lessened by the significant interaction of environment (Table 1). Similar findings were observed by Singh *et al.* (2013). A close observation of the characters under study indicates seed yield per plant was positively and significantly correlated with days to 50% flowering, days to maturity, plant height both at genotypic and phenotypic level. Therefore, selection would be effective for simultaneous improvement for these traits. This is in consonance with the results of Singh *et al.* (2011). Characters, number of siliquae per plant, number of seeds per siliqua, oil content showed positive non-significant association with seed yield per plant both at phenotypic and genotypic level which clearly indicates the independent nature between these traits.

For the phenological characteristics, days to 50% flowering recorded a strong positive association with days to maturity and plant height both at genotypic and phenotypic level while days to maturity showed positive association with plant height with both the levels. In most of the character studied for association, number of primary branches per plant recorded negatively correlated except with number of siliquae per plant which has positive significant correlation. At genotypic level number of seeds per siliqua was positively and significantly correlated with number of primary branches per plant. But oil content was recorded to be negatively correlated with this trait.

The character, 1000 seed yield was positively and significantly correlated with seed yield per plant only at genotypic level only on the other hand, at the phenotypic level it was recorded as negatively correlated with the latter. Positive correlation for 1000 seed weight with seed yield per plant was also reported by Singh (2004) and Yadava *et al.* (2011). 1000 seed weight was also found to be significant and shown strong positive correlation with days to 50% flowering, days to maturity and plant height both at genotypic and phenotypic level.

If more variables are considered, the indirect correlation association becomes more complex, less obvious and somewhat perplexing. This may be attributable due to many of the characters are correlated due to mutual association, positive or negative with other characters. Hence, path coefficient analysis becomes an efficient estimate which splits the correlation coefficient into the measures of direct and indirect effects. Residual effect of path analysis was low (0.402) indicating that number of characters chosen for the study was very much appropriate for yield determination in Indian mustard.

Estimated of path analysis revealed characters *viz.,* days to 50% flowering, number of primary branches per plant, number of siliquae per plant and 1000 seed weight showed direct positive effect with seed yield per plant (Table 2). On the contrary, days to maturity, plant height, number of seeds per siliqua and oil content had negative direct effect. The maximum direct effect was shown by days to 50% flowering which is followed by 1000 seed weight along with its positive correlation implies that the association is real and selection for these traits would be effective in improvement of seed yield of Indian mustard. Maximum indirect effect was shown by plant height. Similar results were given by Singh *et al*. (2013).

Table No. 1: Phenotypic and genotypic correlation coefficient for nine characters in India mustard

Characters (s)		Days to maturity	Plant height (cm)	Number of primary branches per plant	Number of siliquae per plant	Number of seeds per siliqua	1000 seed weight (g)	Oil content (%)	Seed yield per plant (g)
Days to 50% flowering	G	0.909**	0.785**	-0.431	-0.206	-0.200	0.837**	0.154	0.802**
	P	0.888**	0.759**	-0.411	-0.203	-0.108	0.790**	0.155	0.757**
Days to maturity	G		0.837**	-0.560*	-0.469	-0.281	0.918**	-0.072	0.629*
	P		0.794**	-0.527*	-0.449	-0.150	0.850**	-0.001	0.588*
Plant height (cm)	G			-0.574*	-0.306	-0.347	0.703**	-0.261	0.569*
	P			-0.555*	-0.305	-0.181	0.689**	-0.177	0.566*
Number of primary branches per plant	G				0.547*	0.605*	-0.359	0.398	-0.061
	P				0.537*	0.360	-0.347	0.226	-0.051
Number of siliquae per plant	G					0.068	-0.371	0.402	0.256
	P					0.040	-0.365	0.281	0.257
Number of seeds per siliqua	G						-0.252	-0.751**	0.099
	P						-0.123	0.009	0.041
1000 seed weight (g)	G							0.199	0.652**
	P							0.186	0.634
oil content (%)	G								0.357
	P								0.227

Table 2: Direct and indirect effects of different yield components at genotypic level on seed yield of Indian mustard

Character (s)	Days to 50% Flowering	Days to maturity	Plant height (cm)	Number of primary branches per plant	Number of siliquae per plant	Number of seeds per siliqua	1000 seed weight (g)	oil content (g)	seed yield per plant (g)
Days to 50% flowering	**1.080**	-0.467	-0.082	-0.075	-0.090	0.014	0.465	-0.043	0.802**
Days to maturity	0.982	**-0.513**	-0.088	-0.097	-0.204	0.02	0.509	0.020	0.629**
Plant height (cm)	0.848	-0.43	**-0.105**	-0.100	-0.133	0.025	0.390	0.073	0.569*
Numbe of primary branches per plant	-0.466	0.287	0.060	**0.174**	0.238	-0.043	0.199	-0.112	-0.061
Number of siliquae per plant	-0.223	0.241	0.032	0.095	**0.435**	-0.005	0.206	-0.113	0.256
Number of seeds per siliqua	-0.216	0.144	0.036	0.105	0.03	**-0.071**	0.140	0.211	0.099
1000 seed weight (g)	0.904	-0.471	-0.074	-0.062	-0.161	0.018	**0.555**	-0.056	0.652*
oil content (%)	0.167	0.037	0.027	0.069	0.175	0.053	0.110	**-0.281**	0.357

significant at 5% and ** significant at 1%, Residual effect= 0.402

4. CONCLUSION

From the results above, it can be concluded that there is strong inherent association between the characters studied, so selection would be effective as it would be less influence by the environment. Due importance could be given to days to 50% flowering and 1000 seed weight in development of high yielding cultivar and future breeding programme of Indian mustard.

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