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Short Communication

Towards decreasing erucic acid content in Indian mustard [*Brassica juncea* (Linn) Czern & Coss] through the combination with genes for high oleic acid

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Indian mustard [*Brassica juncea* (Linn) Czern & Coss] is the second most important oilseed crop next to groundnut. It is one of the rich sources of calories and edible oil. The mustard oil from high yielding varieties is generally considered inferior due to the presence of the long chain fatty acids like erucic acid (22:1) and eicosenoic acid (20:1). However, low erucic acid content varieties of *Brassica napus* were developed in Canada. Similarly, '0' erucic acid strains of *Brassica juncea* were also developed by Indian Plant Breeders, which are expected to be agronomically suitable for cultivation under Indian conditions.

The experimental material comprised 50 F_1 hybrids derived in 2005-06 by crossing ten high yielding varieties/strains of Indian mustard viz., PM 67, GM 1, GM 2, SKM 125, 139,149,301,425,450 and RSK 28, and five male parents were zero/low erucic acid and high oleic acid donors viz., NUDH YJ 3, NUDH YJ 4, Dhara, IC 385682 and BPR-6-166-43-6. Fifty F_1 hybrids and their 15 parents were grown in a Randomized Complete Block Design with three replications during *rabi* season of 2006-07 at Main Castor and Mustard Research Station, SDAU, Sardarkrushinagar. The spacing followed by 45 cm between rows and 15 cm between plants within row. The five competitive plants were selected at random and selfed for each genotype. Selfed seeds were used for fatty acids analysis. The fatty acids of oil were determined in percentage by Gas Chromatography available at Main Castor and Mustard Research Station, SDAU, Sardarkrushinagar. The mean values were utilized for statistical analysis. The correlation coefficients were estimated according to Johnson *et al.* (1), whereas, path coefficients were worked out as per the procedure suggested by Wright (2) and described by Dewey and Lu (3).

In general, a close agreement existed between genotypic and phenotypic correlation coefficients. Although, genotypic correlations were generally higher than their corresponding phenotypic correlation for most of the fatty acids. This indicate that though there was a high degree of association between two variables at genotypic level, its phenotypic expression was deflated by the influenced of environment. In few cases, the phenotypic correlations were slightly higher than their genotypic counterparts, indicating greater role of non-genic causes.

Table 1. Genotypic (upper right) and phenotypic (lower left) correlation coefficient between fatty acids in Indian mustard

Fatty acid	Palmitic	Stearic	Oleic	Linoleic	Linolenic	Erucic
Palmitic	-	0.188*	0.483**	0.248**	0.033	-0.445**
Stearic	0.183*	-	0.141*	-0.081	0.463**	-0.075
Oleic	0.476**	0.139*	-	0.174*	-0.120	-0.735**
Linoleic	0.244**	-0.075	0.170*	-	0.074	-0.391**
Linolenic	0.030	0.449**	-0.117	0.072	-	0.029
Erucic	-0.441**	-0.074	-0.730**	-0.386**	0.029	-

* Significant at 5 % level, ** Significant at 1 % level

Table 2. Direct (diagonal) and indirect effects of fatty acids on erucic acid in Indian mustard

Fatty acid	Palmitic	Stearic	Oleic	Linoleic	Linolenic	Erucic
Palmitic	**0.048**	0.009	0.023	0.012	0.002	-0.022
Stearic	0.032	**0.170**	0.024	-0.014	0.079	-0.013
Oleic	0.010	0.003	**0.021**	0.004	-0.003	-0.016
Linoleic	0.028	-0.009	0.020	**0.112**	0.008	-0.044
Linolenic	0.001	0.018	-0.005	0.003	**0.038**	0.001
Erucic	0.057	0.010	0.094	0.050	-0.004	**-0.128**

The results revealed that palmitic acid was positively and significantly correlated with stearic, oleic and linoleic acid at genotypic and phenotypic levels, whereas, it had negative and significant correlation with erucic acid (Table 1). Stearic acid had shown positive and significant correlation with oleic and linolenic acid at both the levels. The present findings are in agreement with the earlier reports in toria (4). Oleic acid showed significant positive association with linoleic, while, it was negatively and significantly correlated with erucic acid at both the levels. These results were in accordance with Chauhan *et al.* (5) and Chauhan *et al.* (6). The negative correlation of erucic acid with oleic acid is of paramount significance to develop varieties with low erucic and high content of oleic acids. The variable relationship between fatty acids could be the consequence of recombination of gene(s) controlling the inheritance of fatty acid profiles Linoleic acid exhibited significant negative correlation with erucic acid at phenotypic and genotypic levels.

Path analysis at genotypic level is presented in Table 2, which revealed that the impact of stearic and linoleic were remarkably positive, while, palmitic, linolenic and oleic acid had also substantial positive effects, further these all fatty acids are negatively correlated with erucic acid except linolenic acid.

Thus, from the study, it can be concluded that for decreasing erucic acid content and increasing oleic acid in Indian mustard selection based on stearic acid, oleic acid and linoleic acid should be undertaken which would lead to further improvement in Indian mustard.

References

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