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EFFECT OF INTERMATING IN EARLY SEGREGATING GENERATIONS ON CHARACTER ASSOCIATION IN BREAD WHEAT

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Character associations are of considerable value in plant breeding and they sometimes determine the course of a breeding programme. Association of some desirable agronomic features with some unfavourable traits would limit the advance realised under selection. Intercrossing in early segregating generations is expected to break such unfavourable linkages (Moll *et al.* 1964. Miller and Rawlings, 1967. William *et al.* 1973; and Lal, 1978). The usefulness of biparental matings in breaking unfavourable linkages has been examined in two crosses of wheat by comparing the associations among a set of characters among full-sib and half-sib families and the corresponding selfs.

Two crosses of wheat, viz., Sonalika X Norteño and Pusa Lerma X Shera were used in the present study. Forty random plants from each F_2 population were grouped as 20 males and 20 females. One male was crossed with one female, thus producing 20 paired-mated (BIP) progenies in each F_2 population. All the plants used in the matings were selfed to obtain F_3 progenies Twenty seeds from each of the BIPs were grown at summer nursery, Wellington to obtain BIP-selfs.

The 20 BIP progenies from one F_2 formed one family and the corresponding 40 F_3 progenies formed the other family. The families as well as the progenies within families were randomized and grown in a Compact Family Randomized Block Design with two replications. Similarly, the BIP-self and corresponding F_4s were grown with three replications. Each plot was a row of 15 plants, spaced 15 cm apart within row and 23 cm between rows. Observations were recorded on ten competitive plants per plot in all the progenies for six characters, namely, plant height, spike length, grains/spike, grain yield of 3 spikes, test weight and yield/plant. Character associations among the six characters were estimated following Al-Jibouri *et al.* (1956).

The phenotypic and genotypic correlation coefficients among the six characters in BIP and F_3 progenies and BIP-self and F_4 progenies are presented in Tables 1 and 2. The estimates of genotypic correlation coeffients for BIP and F_3 differed from the estimates of phenotypic correlation coefficient mainly in two ways: (*i*) the estim-

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mates of genotypic correlation coefficient had usually increased in those cases where the estimates of phenotypic correlation coefficients were positive and significant, (ii) the genetic association of spike length with other characters had become negative particularly in case of the biparental progenies.

In case of Sonalika x Norteno, the genotypic associations in the BIP-self and F_3 progenies were stronger than phenotypic association among those characters where the estimates of phenotypic correlation coefficient were significant. In the cross Pusa Lerme x Shera the estimates of genotypic correlation coefficient were almost analogous to the estimates of phenotypic correlation coefficient except that the strong and weak associations observed at phenotypic level became further stronger and weaker at the genotypic level, respectively. The change in magnitude was relatively higher in BiP-selfs than in the F_3s.

Intermating in F_2 generation changed the positive genotypic association of spike length with yield in to negative association of test weight with yield in to positive in cross Sonalika x Norteno. Similar effect of intermating was observed on the association of spike length with yield/ plant in cross Pusa Lerma X Shera. Among BIP-selfs and corresponding F_3S also, it was observed that the highly negative, genotypic correlation between grains/ spike and yield/ plant was chenged to positive in cross Sonalika X Norteno. Therefore, it is suggested that biparental matings result in accumulation of favourable genes, change in direction and magnitude of character associations and maintenance of genetic variability in subsequent generations for selection to be effective. The environment suppresed the expression of the actual correlation among the characters.

REFERENCES

Al-JIBOURI, N.A., P.A. MILLER and H.F. ROBINSON 1958. Genotypic and environment variance and coveriance in an upland cotton cross of interspecific origin. Agron. J. 50: 633-637.

LAL, S.. 1978. Genetic architecture of yield characters in biparental and F_2 progenies of normal and mutagen treated populations of bread wheat (*Triticum aestivum* L.em Thell). Ph D thesis submitted at Banaras Hindu University, Varanasi.

MILLER, P. A. and J. O. RAWLINGS 1967. Selection for increased lint yield and correlated responses in upland cotton, *Gossypium hirsutum* L. Crop SCI. 7: 637-640.

MOLL R.H. M.F. Lindsey and H.F. ROBINSON. 1964. Estimates of genetic variances and level of dominance in maize. Genetics, 49:411-423.

WILLIAM, R., Jr. Meredith and R R. Bridge, 1973 The relationship between F_2 and selected F_3 progenies in cotton. Crop SCI. 13: 115-119

Table 1. Phenotypic (above diagonal) and genotypic correlation coefficients of SIP and F_3 progenies in bread wheat for crosses Sonalika Nerteno (the first row for each combination) and Pusa Lerma X Shera (the second row for each combination)

Character	Plant height	Spike length	Grains/ spike	Grain yield/3 spikes	Test weight	Yield/ plant
Plant height	—	0.046 (−0.063)	0.191 (0.121)	0.650** (0.566**)	0.651** (0.458**)	0.594** (0.303**)
	—	−0.053 (0.098)	0.128 (−0.009)	0.672** (0.463**)	0.560** (0.697**)	0.740** (0.634**)
Spike length	−0.107 (−0.321)	—	0.516* (0.446**)	0.142 (0.302)	−0.086 (0.037)	0.113 (0.410**)
	−0.186 (−0.023)	—	0.446* (0.487**)	0.159 (0.156)	−0.104 (−0.026)	0.196 (0.263)
Grains/spike	0.010 (0.162)	−0.047 (0.146)	—	0.486* (0.410**)	0.126 (−0.009)	0.257 (0.361*)
	0.117 (−0.259)	−0.352 (0.279)	—	0.454* (0.439*)	0.105 (0.041)	0.437* (0.342*)
Grain yield/3	0.674 (0.649)	−0.315 (−0.39)	0.301 (0.730)	—	0.697** (0.652**)	0.534* (0.695**)
spikes	0.816 (0.430)	−0.359 (−0.014)	0.047 (0.612)	—	0.657** (0.742**)	0.723** (0.635**)
Test weight	0.790 (0.874)	−0.513 (−0.395)	−0.288 (−0.661)	0.992 (0.582)	—	0.618* (0.365*)
	0.675 (0.799)	−0.222 (−0.207)	0.324 (−0.046)	0.892 (0.866)	—	0.519* (0.601**)
Yield/plant	0.681 (0.286)	−0.880 (0.104)	0.630 (0.713)	0.860 (0.878)	0.910 (−0.825)	—
	0.892 (0.863)	−0.625 (0.044)	−0.474 (0.401)	0.718 (0.821)	0.693 (0.725)	—

*, ** Significant at $P = 0.05$, and 0.01, respectively.

The figures in parentheses denote the correlation coefficients of F_3 progenies.

Table 2. Phenotypic (above diagonal) and genotypic correlation coefficients of BIP-self and F_3 progenies in bread wheat for crosses Sonalika X Norteno (the first row each combination) and Pusa Lerma X Shera (the second row for each combination)

Character	Plant height	Spike length	Grains/spike	Grain yield/3 spikes	Test weight	Yield/plant
Plant height	—	0.017 (—0.045)	0.135 (—0.205)	0.399 (0.363*)	0.356 (—0.005)	0.287 (0.263)
	—	0.117 (0.155)	0.278 (0.073)	0.592** (0.465**)	0.410 (0.623**)	0.399 (0.289)
Spike length	—0.202 (—0.109)	—	0.320 (0.437**)	0.045 (0.318*)	0.006 (—0.005)	0.092 (0.263)
	0.246 (0.151)	—	0.535* (0.603**)	0.349 (0.390*)	—0.028 (0.018)	0.155 (0.58**)
Grains/spike	—0.775 (—0.580)	—0.113 (0.145)	—	0.872** (0.492*)	0.111 (—0.206)	0.621** (0.381)
	0.368 (0.085)	0.977 (0.642)	—	0.666** (0.0497**)	0.087 (0.036)	0.380 (0.387*)
Grain yield/3 spikes	0.793 (0.485)	—0.333 (0.316)	0.130 (0.001)	—	0.683** (0.609**)	0.713** (0.645*)
	0.579 (0.523)	0.425 (0.252)	0.732 (0.626)	—	0.601** (0.593**)	0.516* (0.525*)
Test weight	0.728 (0.832)	0.283 (0.013)	—0.399 (—0.351)	0.906 (0.932)	—	0.493* (0.323*)
	0.460 (0.765)	—0.178 (—0.173)	0.121 (0.026)	0.767 (0.791)	—	0.259 (0.319*)
Yield/plant	0.632 (0.191)	0.405 (—0.183)	0.654 (—0.987)	0.721 (0.408)	0.773 (0.702)	—
	0.689 (0.326)	0.912 (0.413)	0.116 (0.470)	0.318 (0.741)	0.101 (0.537)	—

*, ** Significant at P = 0.05, and 0.01, respectively.

The figures in parentheses denote the correlation coefficients of F_3 progenies.