

Character association in maize under normal and excess soil moisture (ESM) conditions in different environments

AJAZA. LONE and M.Z.K. WARSI

Department of Genetics and Plant Breeding, College of Agriculture, G. B. Pant University of Agriculture and Technology, Pantnagar-263 145 (U. S. Nagar, Uttaranchal)

ABSTRACT: A set of forty-five genotypes including five parents, their F_1 , F_2 , and backcross generation of maize differing in their reaction to ESM conditions were used for estimating inter-character correlations between different morphological traits, planted at Pantnagar and Gorakhpur. Estimates of genotypic correlation coefficient were generally higher than phenotypic correlations coefficients in the both environments. The results revealed that the anthesis silking interval (ASI) showed negative correlation with the nodes bearing adventitious roots in most of the cases under both conditions.

Key words: ASI, correlation, excess soil moisture, yield, maize

The ultimate aim of a breeding programme is to evolve superior genotypes by exploiting the available genetic variability from the broad array of breeding material. To end up with superior genotypes, the knowledge of interrelationship of yield and yield related traits in a particular situation is a prerequisite. The extent of relationship between the important traits in given conditions can be studied by correlation coefficients and will aid in developing suitable selection criterion in order to choose suitable breeding procedure for developing cultivars suitable for wide range of environments. The excess soil moisture (ESM) is becoming threat to maize crop as floods affect 15 per cent of the total maize growing area and water logging problem in south-East Asia alone. In India about 25-30 per cent loss of maize production occurs every year because of ESM stress (DMR, 2001).

MATERIALS AND METHODS

The experimental materials consisted of forty-five genotypes of maize, which included five parents (three tolerant and two susceptible), their F_1 , F_2 and backcrosses, grown during *kharif* 2005 at G.B. Pant University of Agriculture and Technology, Pantnagar and Maize Farm, Belipar, Gorakhpur, in randomized block design with three replications. At both the locations, the experiments were laid down in two sets (one under normal and the other under ESM conditions). Experiments were sown in two row plots of 5 metre

length with row to row spacing of 75 cm and plant to plant distance of 25 cm. In ESM trial, waterlogging treatment was given at knee high growth stage i.e. 30 DAS, for 6 days, by keeping continuous submergence with an average depth of ponding of about 5 cm. After 6 days of ponding, water was drained out of the plots. Observations were recorded on days to 50 per cent tasseling, days to 50 per cent silking, anthesis silking interval, plant height, ear height, cob length and cob diameter for evaluation of genotypes for intercharacter relationship.

The correlations between all possible pairs of characters under study, at genotypic, phenotypic and environmental levels were worked out from the analysis of variance and covariance as suggested by Searle (1961).

RESULTS AND DISCUSSION

The present investigation, character correlation coefficients estimated in normal and ESM trials at Pantnagar and Gorakhpur are presented in the Tables 1, 2, 3 and 4, respectively.

In Pantnagar normal trial days to 50 per cent tasseling were positively and significantly correlated with days to 50 per cent silking ($r_p = 0.835$), 100-kernel weight ($r_p = 0.177$) and cob length ($r_p = 0.191$) at phenotypic level. Days to 50 per cent silking were significant and positively correlated with ASI ($r_p = 0.449$)

and significantly correlated with ear height ($r_g = 0.602$), yield ($r_g = 0.369$), cob length ($r_g = 0.348$) and cob diameter ($r_g = 0.407$).

Under ESM conditions at Pantnagar days to 50 per cent tasseling were positively and significantly correlated with days to 50 per cent silking ($r_p = 0.846$) and $r_g = 0.865$) and ASI ($r_p = 0.654$ and $r_g = 0.446$). Days to 50 per cent silking were positively and significantly correlated with ASI ($r_g = 0.835$ and $r_p = 0.796$). In case of ESM trial, an important negative correlation of ASI and yield ($r_p = -0.143$ and $r_g = -0.235$) was observed, as

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roots ($r_p = -0.321$ and $r_g = -0.382$) which is contradicting to the findings of Rathore *et al.* (1996) and Zaidi and Singh (2001). Plant height was positively correlated to yield ($r_p = 0.110$ and $r_g = 0.172$) at Gorakhpur and also at Pantnagar ($r_p = 0.153$ and $r_g = 0.152$), which are confirmation to the findings of Lizaso and Ritchie (1997) and Mathur *et al.* (1997). In ESM trials, nodes bearing adventitious roots should be more in order to support the plant growth under ESM conditions, which is evident from the correlation of this trait with ASI and yield at both the locations.

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Generally, correlation coefficients at genotypic levels were similar in direction but of higher magnitude than phenotypic correlation coefficient for most of the intercharacter associations. This suggested the preponderance of environmental factors, which might have suppressed the expression of character association at phenotypic level.

In any breeding programme directed to improve the yield under ESM conditions it is necessary to conduct experiments under both the conditions as selection for yield under stress is much less efficient than under non-stress conditions (Blum, 1988). Further due importance is to be given to the growth parameters like ASI, nodes bearing adventitious roots and there interrelationships to the yield.

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