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Short Communication

Correlation analyses of yield and related physiological variables in twelve generations of *durum* wheat (*Triticum durum* Desf.)

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India has 2.5 million hectares of *durum* wheat (*Triticum durum* Desf.), widely cultivated in many parts of central and peninsular India. It is the second most important wheat species in the country and any further improvement in this, will be helpful to meet out the food requirement of burgeoning population of India [1]. Grain yield, is the end product of interactions of many factors known as yield contributing components. Selection based on this trait is usually not very useful but based on its component characters could be more effective. To make effective selections for higher yield, basic information on major physiological yield contributing characters is essential to ensure efficient selection. In case of *aestivum* wheat, number of findings based on pure line and segregating populations have been reported but meager information in *durum* on correlation studies particularly in the segregating populations of this species is available. Therefore, the present study was conducted to collect the information on association of three traits like, peduncle area, flag leaf area and spike area with grain yield in twelve generations of *durum* wheat.

The experimental material comprised three crosses namely, Cocorit 71 × A-9-30-1, HI 8062 × JNK-4W-128 and Raj 911 × DWL 5002, generated from six diverse parents, which had genetic variability for peduncle area, flag leaf area and spike area. Twelve populations *viz.*, two parents, F_1 and F_2, first backcross generations with both parents (BC_1 and BC_2), their selfed progenies (BC_1 F_2, BC_2 F_2) and second backcross generations (BC_{11}, BC_{12}, BC_{21} and BC_{22}). These twelve populations of each of the cross were evaluated in randomized block design with three replications. Each replicate was divided into three compact blocks. The crosses, each consisting of twelve populations was randomly allotted to the blocks. These twelve populations were then randomly allotted to twelve plots within a block. The plots of various generations contained different number of rows i.e. each parent and F_1 plots consisted of two rows, while each backcross generation in four rows and F_2 and the self backcross generation in six rows. Each row was 5m long accommodating 33 plants spaced 15 cm apart, row to row distance being 30 cm. Border rows were provided at the beginning as well as at end of experimental rows in each block. Observations on peduncle area (cm^2), flag leaf area (cm^2), spike area (cm^2) and grain yield per plant were recorded on 15 randomly selected plants in each parent and F_1, 30 plants in each backcross generation and 60 plants in each F_2 and self backcross generation in each replication in both normal and late sowing conditions. Peduncle area and spike area were calculated as per the method suggested by Yap and Harvey [2] Flag leaf area was calculated as per the method suggested by Simpson [3]. Data were analyzed statistically as per the method suggested by Panse and Sukhatme [4]. Correlation coefficient was calculated following the method of Dewey and Lu [5].

The analysis of variance revealed that the mean squares due to generations were found highly significant for all the four characters studied in three crosses of *durum* wheat indicating sufficient genetic variation among generations of all the traits in three crosses involved in the present study (Table 1). The results of correlation studies revealed that the grain yield per plant was significant and positively correlated with peduncle area and flag leaf area in the cross Cocorit 71 × A-9-30-1. However, spike area had poor correlation with grain yield, which could attribute to limited variations existing in the populations in this cross. In the cross HI 8062 × JNK-4W-128, grain yield per plant was positively correlated with peduncle area and spike area, whereas flag leaf area showed positive but weak correlation with grain yield. In the cross Raj 911 × DWL 5002, grain yield per plant was positively correlated with all the three traits studied indicated that improvement in grain yield could be possible by these traits in this material. Earlier studies [6 and 7] also substantiate this point.

Table 1. Analysis of variance for physiological traits and grain yield in three crosses of *durum* wheat

Cross	Character	Replication	Generation	Error
Cocorit 71 × A-9-30-1	Peduncle area	3.75	20.73	4.79
	Flag leaf area	14.36	41.32**	11.38
	Spike area	2.87	8.09**	2.25
HI 8062 × JNK-4W-128	Peduncle area	11.98	73.36**	5.61
	Flag leaf area	5.41	19.00*	7.84
	Spike area	3.51	6.66*	2.91
Raj 911 × DWL 5002	Peduncle area	2.05	13.79**	2.36
	Flag leaf area	0.28	20.38*	6.84
	Spike area	0.42	19.90**	3.05

* and ** significant at 5% and 1% level of probability, respectively.

Table 2. Correlations coefficients of physiological traits with grain yield in three crosses of *durum* wheat

Cross	Character	Correlation coefficient
Cocorit 71 × A-9-30-1	Peduncle area	0.5861*
	Flag leaf area	0.8205**
	Spike area	0.4013
HI 8062 × JNK-4W-128	Peduncle area	0.9759**
	Flag leaf area	0.3427
	Spike area	0.7852**
Raj 911 × DWL 5002	Peduncle area	0.7324**
	Flag leaf area	0.6591*
	Spike area	0.6572*

*and ** significant at 5% and 1% level of probability, respectively.

It is evident from the above results that direct selection for grain yield can not be practiced on the basis of correlations especially under normal sown conditions, which may be attributed to heritability and involvement of high magnitude of non additive variations within and between environments. This may limit the progress made through selection [8 and 9]. Peduncle area appeared to be more important trait in the present study because of its correlation with grain yield in all the three crosses. Flag leaf area and spike area, though showed positive correlation with grain yield in all the three crosses yet their relative magnitudes and significance changed with changes in the crosses.

Spike area and flag leaf area showed poor correlation with grain yield per plant in the cross Cocorit 71 × A-9-30-1 and HI 8062 × JNK-4W-128, respectively, however in other cases both the traits showed positive and significant correlation with grain yield per plant. Srivastava *et al.* [10] also reported similar results. Thus, the correlation studies indicated that peduncle area was the important trait for improving the grain yield in *durum*.

In conclusion, correlation studies revealed that selection for peduncle area would lead to high yield in durum wheat. However, due weightage should also be given for flag leaf area during selection of plants for further tangible advancement of grain yield in *durum* owing to positive association with grain yield.

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