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ASSOCIATION IN SEGREGATING POPULATION OF BARLEY

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ABSTRACT

Grain yield was found to have significant and positive phenotypic correlations with all the characters except days to maturity and 250-grain weight where the correlations were non-significant but positive. Yield was found negatively correlated at genotypic level with plant height, leaf area, ear length and grains/ear. The path analysis at phenotypic level indicated that plant height, tillers/plant, grains/ear and 250-grain weight, were the important yield contributing characters. Days to maturity, grains/ear and leaf area only contribute positively and directly to the grain yield at genotypic level.

The yield is a polygenically controlled character and its final expression is the sum total of effects of its various components. For improving the yielding ability of any variety the knowledge of direct and indirect effects of various yield attributed is essential. The path coefficient analysis originally proposed by Wright (1921) is helpful in partitioning the complete association into direct and indirect effects, and identifying the most important yield contributing characters. Since, the selection operates on the segregating generations to exploit artificially created variability, an attempt has, therefore, been made to study the path coefficients in F_2 generation.

MATERIALS AND METHODS

The material comprised of 45 F_2's and their 10 parents, was grown in a randomized block design with 3 replications in rabi 1985-86. Each treatment was assigned 4 rows of 3 m length. The rows and plants within a row were spaced 25 cm and 15 cm apart, respectively. The data were recorded on ten randomly selected plants/plot representing each entry for plant height, tillers/plant, leaf area, days to maturity, ear length, grains/ ear, 250-grain weight

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and grain yield/plant. The analysis was done following Li (1948) and Dewey and Lu (1959).

RESULTS AND DISCUSSION

The results of path coefficient analysis along with correlation coefficients of yield with other attributes are presented in Table 1. At phenotypic level yield showed highly significant and positive correlation with all the traits except for days to maturity and 250-grain weight where the values were 0.134 and 0.141, respectively. At genotypic level the association of yield was positive only with tillers/plant(0.562) days to maturity (0.274) and 250-grain weight (0.153). The rest of the characters were negatively associated.

These results indicate that there is great difference in the nature and magnitude of correlation coefficients at phenotypic and genotypic levels between yield and its most of the component characters. This change in nature and magnitude of correlations for some of the characters depends on the extent to which they are effected by the environment. This lends support to the studies of Adams (1967) where he stated that correlations are developmental rather than genetic per se and postulated to be caused by genetically independent components that are free to vary with the environment, Pandey and Torrie (1973) have also expressed the similar views.

The path analysis revealed negative direct contribution of plant height (-3429) to grain yield, whereas its indirect contribution through most of the characters except ear length (-0.302) and grains/ear(-0.107) was positive. The tillers/ plant also showed high negative direct effect on yield. The indirect effects through other characters except leaf area (-0.715) were positive. Days to maturity exhibited high positive direct (0.959) as well as indirect effects via 250-grain weight (0.628) and leaf area (0.327). Indirect effects through rest of the characters were negative. The direct effect of ear length was also negative (-0.641) but its indirect effects through most of the characters were positive and substantial. The number of grains per ear was found to have positive (0.353) direct was well as indirect effects. Its contribution was negative only through plant height (-1.038) and ear length (-0.341). The direct contribution of 250-grain weight to grain yield was negative and of high magnitude (-0.935), but indirect effects through most of the remaining characters except number of days to maturity and leaf area were positive. The leaf area had the maximum direct effect (0.967) on yield but was neutralized to some extent due to negative indirect effects via plant height (-3.627) and other negatively contributing characters like ear length and grains/ear.

These results revealed that plant height and tillers per plant had nothing to do directly in augmenting grain yield. However, indirectly they contributed through each other. The high negative direct effect of plant height succeeded in neutralizing the positive indirect effects and ultimately gave high negative correlation with grain yield as has also been reported by Tewari (1975). The indirect contribution of tillers/plant and leaf area to yield was by increasing the total assimilation area of the plant resulting in the increase of 250-grain weight due to accumulation of more photosynthates. The later trait in showed positive correlation with grain yield. The negative direct and indirect effects of tillers/plant were trespassed by the positive indirect effects through most of the characters resulting in a high and positive correlation with grain yield. Days to maturity contributed to yield directly as well as indirectly through 250-grain weight and leaf area. These results are in agreement with the previous findings of Tewari (1975). The positive indirect effect of ear length was counter balanced giving an overall negative association with yield. The negative correlation of grains/ear with grain yield/plant indicates that an increase in number of grains will decrease the grain yield. But the path analysis reveled that it is an important adjunct because of its high direct as well as indirect effects through days to maturity (so that all seeds are properly filled), leaf area and 250-grain weight. However, the latter character did not directly contribute to grain yield but its indirect contribution through most of the characters was much appreciable. Malhotra and Jain (1972); Solanki and Bakshi (1973) and Tewari (1975) have also reported the number of grains and 1000-seed weight to be the important factors contributing to yield. Leaf area had the highest direct contribution to grain yield although it showed a negative association with the latter which was due to very high negative indirect effect through plant height. The characters like plant height, ear length and grain number showed negative indirect effect for each other and for the remaining characters except 250-grain weight whose contribution towards yield was only due to the positive indirect effects of these three characters. The indirect effects of the remaining four characters were mostly positive. It is concluded from the present study that selection in segregating populations based on tillers/plant is likely to be misleading. The days to maturity, grains/ear and leaf area together with tillers/plant are the parameters for selection for grain yield.

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Table 1 : Showing direct and indirect path effects at phenotypic and genotypic levels.

		Effect Via							
		Plant height	Tillers/ plant	Days to maturity	Ear length	grains/ ear	250-grain wt.	Leaf area	Correlations with yield
Plant height	P	0.242	0.077	0.009	-0.022	0.149	-0.041	-0.017	0.397**
	G	-3.429	1.689	0.179	-0.302	-0.107	0.369	1.023	-0.577
Tiller/plant	P	0.037	0.497	0.008	-0.008	0.098	-0.008	-0.008	0.616**
	G	2.814	-2.058	0.197	0.249	0.007	0.061	-0.715	0.562
Days to maturity	P	0.035	0.066	0.064	-0.008	0.128	-0.147	-0.004	0.134
	G	-0.642	-0.424	0.959	-0.273	-0.301	0.628	0.327	0.274
Ear length	P	0.145	0.115	0.015	-0.037	0.182	-0.043	-0.015	0.362**
	G	-1.615	0.800	0.408	-0.641	-0.188	0.472	0.524	-0.239
Grains/ear	P	0.133	0.180	0.030	-0.024	0.272	-0.090	-0.013	0.458**
	G	-1.038	0.041	0.816	-0.341	0.353	0.574	0.265	-0.036
250-grain wt	P	-0.034	-0.013	-0.032	0.005	-0.083	0.296	0.002	0.141
	G	-1.354	0.146	-0.644	0.324	0.247	-0.935	-0.308	0.153
Leaf area	P	0.152	0.150	0.010	-0.020	0.132	-0.017	-0.028	0.377**
	G	-3.627	1.521	0.324	-0.348	-0.097	0.298	0.967	-0.961

Residual effects P = 0.662
G = 0.906
**Significant at 1 percent level
Underlined figures denote direct effects.

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RESEARCH NOTES

MOISTURE RETENTIVITY OF MUDUKULAM SERIES - A TYPIC RHODUSTALF IN A LATERITIC SOIL TRACT

A detailed knowledge on the moisture retentivity in soils is of atmost importance to accomplish economy of irrigation water and achieve soil based water management strategy. In a typical lateritic soil of Sivagangai in Tamil Nadu, the Mudukulam soil series occupies a predominant portion (25 per cent) of the land area. It is a tract of aridity in most years and the uncertainty and ill distribution of rainfall are common events. The main occupation in the area is agriculture. The knowledge on water retention behaviour of soils in this zone is not adequate enough and hence the investigation.

Four pedons were dug up in different places apart in the Sivagangai taluk, examined, described and sampled horizon wise for laboratory analysis (Soil Survey Staff, 1951). The morphological description of pedon reveals that the Mudukulam series is reddish brown to red, very deep, medium textured in surface and fine textured in sub-surface, moderately drained, neutral and in-situ formed soil from weathered gneiss overlaid with plinthite stone layer having a well developed argillic horizon. These characteristics qualify this series to be placed in Typic Rhodustalf (Soil Survey Staff, 1975).

The particle size distribution of the fine earth samples was estimated by International Pipette Method (Piper, 1966). The moisture holding power of the soil was estimated by employing pressure plate and pressure membrane apparatus as per the method by Richards (1964).

The moisture retentivity at different tensions of pressure are furnished in Table 1. The data revealed that the moisture retained at field capacity in a Aphorizon expressed an increasing trend