Patterns of yield related-trait interrelationships in F1 and F2 in barley

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ABSTRACT

We studied interrelationships between 'grain yield' and yield-related traits in the F1 and F2 populations derived from a 5 X 5 half-diallel cross in barley by using correlation, factor, and stepwise multiple regression analyses. In F1, 'grain yield' had the highest correlation coefficient with 'spike yield', 'number of seeds per spike', 'spike length (cm)' while it had the strongest and statistically significant correlations with only 'number of spikes' in F2. To reveal patterned variability among the traits studied, we performed factor analysis by excluding the response trait, 'grain yield'. Factor analysis reduced the 7 casual traits to 3 groups, small number of unrelated grouped variables called factors or patterns, both in F1 and F2. Together these 3 factors accounted for 87.3% and 83.0% of the variance of 7 variables, respectively. First factor was similar both in F1 and F2 which were composed of 'spike length', 'number of grains' and 'spike yield'. 'Number of grains' is one of the main yield components and others are its redundant traits. Therefore, it was named as "grains" factor. Other two yield components, 'number of spikes' and '1000-grain weight' affected by different factors, which should be called in these names. However, '1000-grain weight' was also depended on the factor 'number of spikes'. To ascertain how yield components explain variance of the response character, stepwise multiple regression analysis was run and it was indicated that 'number of spikes', 'number of grains' and '1000-grain weight' were the most potent predictors of the response trait both in F1 and F2 as demonstrated by multiple determination coefficients (R2), 96.3 and 76.3%, respectively. Due to the segregations in heading time in F2, inclusion of 'days to heading' in the model increased the R2 (82.1%) via either number of grains or 1000-grain weight, or both. In

conclusion, the patterns of interrelationships in different generations can be better-understood by the combination of the proper statistical tools.

Keywords: Correlation, factor analysis, patterned variability, prediction, regression, yield components

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