SEPARATING A GENERALIZED INTERACTION INTO COMPONENTS

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 Breeders are frequently confronted by the need for determining both relative yield and differential responses or interactions of selected strains or varieties of plants. A determination of differential response is desirable (a) for use in determining the significance of differences in yield, (b) for classifying the strains in separate response groups, and (c) as a starting point from which studies may be undertaken to determine the causes for these differences in behavior. The procedures presented here for breaking down interactions are of much assistance in analysis of complex relationships. However, the number of components which are isolated is beyond the number of sets of degrees of freedom available for a determination of their significance. Therefore, it is usually desirable to group similar components before rendering final judgments for those cases in which such minute analysis is desirable in preliminary studies.

Analysis of variance (1) is now an indispensable tool for use in determining significance of differences in yield and seasonal response among varieties and strains of plants. Its use is justified in most cases where one may logically assume that a homogeneous error is common to the observations of all classes. The data are very easily analyzed when observations of similar classes occur with equal frequency. This method of statistical analysis is of particular value when the number of degrees of freedom is great enough to permit isolation of differential responses, such as interactions between variety and season, in addition to "residual error".

When observations of different classes do not occur with equal frequency the data are more difficult to analyze. However, Yates (2, 3) and Snedecor and Cox (4) have presented procedures for dealing with these cases of unequal frequency.

INTERACTION

Such yield interactions as those between variety and rate of planting apparently were observed early in agronomic investigational work. Mooers (5) pointed out definite corn yield interactions between variety and soil fertility. A statistical consideration of this phenomenon was presented by Fisher and Mackenzie (6) in studies of differential response of potato varieties to manurial treatments. Engledow and Yule (7) stressed the necessity for forming some estimate of the extent to which weather conditions may influence relative yields.

It was pointed out by Maskell (8) that variance introduced by variety differences is of importance in establishing general superiority

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3 Figures in parenthesis refer to "Literature Cited", p. 424.