CHARACTER ANALYSIS OF WINTER WHEAT VARIETIES

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NEVER before was the task of the wheat breeder more exacting and difficult than it is at the present time. Today he must not only develop varieties possessing the ability to give maximum yields, but in addition he must synthesize into the same variety all or nearly all of the major characters that will render it more desirable to the locality and purposes for which it is intended. A complete knowledge, therefore, of all major varietal characters is important and necessary in a wheat-breeding program. Obviously, such a knowledge is fundamental and basic to an intelligent selection of suitable parental stock. In this paper reference will be made to soft and semi-hard wheat varieties only; however, so far as the underlying principles are concerned, they apply equally to the hard wheats.

In illustrating the procedure followed in this study an analysis is made of 11 characters of 30 varieties of soft and semi-hard winter wheats grown at Lafayette, Indiana, during the five years of 1933 to 1937, inclusive.

MATERIALS AND METHODS

The experiments here reported were conducted on 30 varieties of wheat included in the eastern winterhardiness wheat nurseries planted in cooperation with the U. S. Dept. of Agriculture Bureau of Plant Industry and interested state experiment stations. Each variety was grown under uniform soil conditions, in rod-row plats replicated four times. Numerical data on 10 major characters are reported, namely, winterhardiness, yield, gluten strength, meal color, meal particle size, test weight, kernel size, leaf rust, loose smut, and plant height. Strength of straw was also studied. The data for relative winterhardiness reported as percentage survival were obtained from both field determinations and artificial freezing tests. In the former, estimates were made on each of four replications, while in the latter comparable data were secured on eight separate tests in which seedlings grown in the field in flats and naturally hardened were subjected to a controlled temperature of \(-10^\circ\) F for 24 hours in a cold chamber.

Gluten strength was determined by means of the wheat meal fermentation time test as developed by Cutler and Worzella (2, 3, 4). The carotenoid pigmentation, expressed as carotene in parts per million on finely ground whole wheat meal, was determined spectrophotometrically by the method outlined by Ferrari and Bailey (6) and Ferrari (5). The particle size index was obtained by a modified procedure of the method described by Cutler and Brinson (1). By this procedure, particle size index represents the percentage of material passing through the finer or 270-mesh sieve. Accordingly, a low index indicates large particles of flour usually associated with hard wheats and a high index indicates a fine, smooth flour characteristic of soft wheats.

1Contribution from Department of Agronomy, Purdue University Agricultural Experiment Station, Lafayette, Ind. Received for publication February 18, 1938.
2Assistant in Agronomy and Assistant Chief in Agronomy, respectively.
3Figures in parenthesis refer to "Literature Cited", p. 433.