Genetic Analysis for Leaf Rust Resistance in the Eight Differential Varieties of Wheat

Atef S. Soliman, E. G. Heyne, and C. O. Johnston

A KNOWLEDGE of the genetics of resistance to leaf rust of wheat, *Triticum aestivum* L., caused by the rust organism *Puccinia recondita* Rob. ex. Desm., would greatly reduce the empiricism involved in practical rust breeding programs and hasten production of resistant varieties. Breeding for leaf rust resistance is complicated by the occurrence of many physiologic races of the causal organism. A total of 183 physiologic races has been registered by Johnston (8).

Investigations reported here were undertaken to identify by monosomic analysis the chromosomes of the eight leaf rust differential varieties that carry the gene or genes for resistance to races 9 and 15 of leaf rust. Those two physiologic races are the most common races in Kansas.

REVIEW OF LITERATURE

Chester (4) reviewed early studies of inheritance of leaf rust resistance in common wheat and found that, in general, leaf rust resistance was inherited in a simple Mendelian fashion, when hybrids from pure lines of wheat were tested for reaction to pure rust races. Soliman et al. (15) found resistance governed by a single dominant factor.

Earlier work at Kansas State University showed, by conventional genetic analysis, that each of eight leaf rust differentials carry at least a major gene for resistance to a particular leaf rust race. Gonzalez (3) reviewed most of the work done in regard to inheritance of resistance to leaf rust among the eight leaf rust differential varieties.

Monosomic analysis has proved to be an excellent technique to locate genes on specific wheat chromosomes. Sears (13) pointed out the value of this technique in genetic analysis of several characters in common wheat. Heyne and Livers (7) used monosomic analysis for genetic analysis of leaf rust reaction, awnedness, winter injury and seed color in 'Pawnee' wheat. They showed that Pawnee has a major factor for physiologic resistance to race 9 of leaf rust on chromosome X (6B). Extensive investigations have been carried out using monosomic analysis to study the genetics of common wheat. Kuspira and Unrau (10) reviewed some pertinent work in this field. Unrau (17) and Person (12), however pointed out that monosomic analysis may lead to incorrect conclusions.

MATERIAL AND METHODS

The 21 monosomic lines of the spring wheat variety 'Chinese' were used as the female parents and the 8 leaf rust differential

---

1 Contribution No. 841 Department of Agronomy and No. 622 Department of Botany and Plant Pathology, Kansas State University, Manhattan, in cooperation with the Crop Research Division, ARS, USDA. Received Oct. 14, 1963. A portion of a dissertation presented by the senior author in partial fulfillment of the requirements for the Ph.D. degree at Kansas State University.

2 Former graduate student; Agronomist, Kansas State University; and Plant Pathologist, USDA; respectively.

3 Gonzalez, R. Response of F1 lines of the cross Wichita X Webster and Wichita X Carina to several races of leaf rust. Unpublished M.S. Thesis. Kansas State University, Manhattan, 1959.