Linkage Relationships of the Martin, Hussar, Turkey, and Rio Genes
For Bunt Resistance in Wheat

C. W. Schaller and F. N. Briggs

The identification and cataloging of germ plasm resistant to pathogenic organisms are basic to the successful development of resistant varieties. This may be done either on a varietal or gene basis and by the use of either pure or mixed cultures of the pathogene. However, for greatest utility such an index should be reduced to its simplest component, that of gene-race interaction. With this information available, the development of resistant varieties resolves itself to the proper combination of the available germ plasm to provide for maximum race coverage. Information on the linkage relationships of the genes involved is necessary to determine whether the desired combinations can be obtained.

Briggs and associates (1, 2, 6, 11, 16) have identified seven genes conditioning resistance to race T-1 of Tilletia caries (DC.) Tul. Two of the genes in combination provide protection against at least 25 of the 31 races presently isolated (10). Although four of these genes are located in one linkage group (9, 16), sufficient crossing-over occurs to permit their combination into one variety if desired. In this paper additional information on the linkage relationships of these genes is presented. The genetics of resistance of two varieties, California 3028 and California 3029, which contribute information to some of the linkage values under consideration is also reported.

MATERIALS AND METHODS

Stanford (16) reported linkage between the R gene for bunt resistance in Rio and the T gene in Turkey 3055. However, his data did not permit a reliable estimate of the recombination value between them. Subsequently, test crosses were made to obtain this information. The F1 hybrid of Rio (Rt) X Turkey 3055 (rT) was crossed with the susceptible varieties, White Federation, Poso, and Big Club. The F2 progenies of these crosses were tested for their reaction to bunt.

The resistant varieties, Calif. 3028 and Calif. 3029, were crossed with the susceptible variety Baart and with the resistant varieties Martin, Turkey 3055, Rio, and Selection 1403, which are testers for the M, T, R, and H genes, respectively. A small F2 population of each cross was inoculated with chlamydospores of race T-1 of T. caries. This collection has been used in all previous studies at this station. The progenies of all crosses, except with the tester varieties Martin, Turkey 3055, Rio, and Selection 1403, were grown in duplicate rod rows. Only single progeny rows of the test crosses were grown. Eighty seeds were planted in each row. Resistant and susceptible parental checks were included at regular intervals. The plants were pulled when nearly mature and classified as diseased or healthy.

Calif. 3028 and Calif. 3029 are selections of Turkey wheat obtained from W. J. Sando, Agronomist, United States Department of Agriculture. They have been highly resistant to race T-1 over an 11-year period with only one infected plant found in each variety.

The genetics of the resistance in Rio and Turkey 3055 have been reported previously by Stanford (16) and Briggs (6), respectively.

RESULTS

Crosses Between (Turkey 3055 X Rio) F1 and White Federation, Poso, and Big Club

These crosses were designed to measure the frequency of parental and recombination gametes produced by the F1 hybrid of the cross Turkey 3055 (Tr) X Rio. Crossing-over occurred, four types of zygotes were produced in crosses with susceptible varieties having one allele at each locus, i.e. Tttr, tTrt, TRtr, and TtTt. The frequency of these types would provide an estimate of the recombination value between the T and R genes.