**Inheritance and Linkage of the Yd2 Gene Conditioning Resistance to the Barley Yellow Dwarf Virus Disease in Barley**

C. W. Schaller, C. O. Qualset, and J. N. Rutger

The continued importance in the United States of the barley yellow dwarf virus disease (BYDV) and its discovery in other parts of the world provide impetus for further study of the disease. More information is needed concerning the genetics, evolution, and biochemical nature of resistance, and the vector-virus-host relationships. The wide host range of the virus and the prevalence of several insect vectors render control of the disease by chemical or cultural means unfeasible. The discovery of resistance in Ethiopian barleys and the successful transfer of resistance to agronomic varieties (14) indicate that the disease may be effectively controlled by the development of resistant varieties.

Studies on the inheritance of resistance to the virus in Ethiopian varieties (3, 11) have shown that the same gene (Yd2) conditions resistance in all varieties so far tested. Suneson (15) found that 'Rojo', a commercial variety with an intermediate level of tolerance to BYDV, has a recessive gene (yd) conditioning tolerance. This paper presents evidence that three additional resistant varieties from Ethiopia have the Yd2 gene and that this gene is located on chromosome 3.

**MATERIALS AND METHODS**

The resistant varieties studied previously (11), C.I. 1227, C.I. 1237, C.I. 2376, and C.I. 3920–1 ('Abate'), have been used extensively in these investigations. In addition, C.I. 5809 and C.I. 9658, found to be resistant in a survey of the World Collection (14), were studied in resistant × resistant and resistant × susceptible crosses to determine the genetics of their reaction to the virus. C.I. 3906–1, which Damsteegt and Bruell (3) found to have the Yd2 gene, was tested in one resistant × susceptible cross. Genetic markers on each chromosome, with the exception of chromosome 6, were used to establish the linkage relationships of Yd2. The stocks used and the characters studied are listed in Table 1. The genetic symbols are those given by Robertson et al. (12) and Kasha and Walker (9). 'Streaked' and 'Uzu' were provided by D. W. Robertson, Acc. 326 by G. W. B. Walker, and the translocation stocks by R. T. Ramage. The F3 generations were grown under BYDV-free conditions to prevent differential elimination of genotypes. BYDV reaction in resistant × susceptible crosses was determined on single 16-foot rows with 25 to 30 plants per F3 line. In resistant × resistant crosses about 30 plants per F3 line were grown in single 8-foot rows. F4 progenies were tested in some instances to confirm the F3 genotype. All BYDV tests were conducted under field conditions at Davis, Calif., during the period 1957–1963. Methods used for creating disease epiphytotics have been described previously (11, 14).

Classification for the characters streaked, uzu, and spike density was made on F3 lines grown under BYDV-free conditions. Xantha and yellow stripe were classified in the BYDV nursery shortly after emergence. Seedling segregation for xantha was confirmed by germination in petri dishes. Translocation heterozygotes were...