Inheritance Studies in Oats with Particular Reference to the Santa Fe Type of Crown Rust Resistance

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Crown rust of oats caused by the fungus *Puccinia coronata avenae* Pers. Cda. has caused severe reduction in yields in some seasons. One of the difficulties encountered in breeding crown-rust resistant varieties has been the lack of sources of resistance. Murphy and Stanton (6) and Stanton and Murphy (8) report the introduction of resistant varieties including Victoria in 1927 and Bond in 1929. In 1940, according to Stanton and Coffman (7), the first varieties carrying the Victoria type of crown-rust resistance were distributed to farmers. A few years later, new varieties of Victoria parentage, including Vicland and Tama, were widely distributed throughout the North Central oat-growing region. The extreme susceptibility to Helminthosporium blight of these and other varieties of Victoria parentage in 1946 and later years and the close association of the Victoria type of crown-rust resistance with susceptibility to the blight led to the introduction of varieties carrying the Bond type of crown-rust resistance. In recent years, the increase of races of crown rust to which Bond is susceptible has made it imperative that other sources of resistance be found.

Landhafer and Santa Fe introduced from South America in 1938 and 1945, respectively, have furnished two sources of crown-rust resistance that, so far as tested, have proved resistant to all North American races. Previous data regarding seedling reaction to 95 races of crown rust obtained by H. C. Murphy and summarized in 1950 by Finkner indicated that Landhafer had been tested for reaction to 80 and Santa Fe to 44 of those races. Both Landhafer and Santa Fe have been used extensively as sources of crown-rust resistance and have been the two new types of crown-rust resistance used in Minnesota studies.

The main purpose of the present research was to study the mode of inheritance of the Santa Fe type of crown-rust resistance to a collection of races and to individual races, in crosses with selections carrying the Canadian type of resistance to many, and perhaps all known races of stem rust, and the Bond type of crown-rust resistance. Studies were also made of the inheritance of stem-rust resistance.

The reader is referred to Hayes and Immer (2) for a comprehensive review of literature on inheritance up to 1942 and to the papers of Kehr (4), Kehr and Hayes (5), and Kehr et al. (3) for literature reviews of the more recent papers. Three papers of the present study and which are not reviewed in the earlier papers are those of Maung, Finkner, and Kehr.

Maung studied reaction of F2 plants and relatives to races 45 and 57 of crown rust in crosses used in the present research. He concluded the Canadian type of resistance to a mixture of races 7 and 8 was conditioned probably by a single-factor pair. Maung found no evidence of association between crown- and stem-rust reactions and other differentials.

MATERIALS AND METHODS

The materials consisted of F1, F2, and F3 generations of Santa Fe × a selection from the F1 of a cross of Hajira-Joanette and Santa Fe × a selection from Bond-Rainbow.