Tester Races for Dwarf Bunt Resistance Factors in Winter Wheat Varieties

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DWARF bunt (Tilletia caries (DC.) Tul.) of winter wheat currently constitutes the major wheat smut problem in certain regions of the United States. This is particularly true of the Pacific Northwest where its relentless spread presents an increasingly complex problem of smut control in winter wheat. Since dwarf bunt is primarily a problem of soil contamination, the most practical and effective means of control is to grow resistant varieties (1). Thus, the development of dwarf-bunt-resistant varieties is an important phase of wheat breeding in any area where this disease occurs. Consequently, there is real need for practical and reliable means for determining resistance and susceptibility to dwarf bunt in wheat varieties and hybrid selections.

With common bunt, varietal resistance is determined by inoculating the seed with spores and planting it under conditions favorable for infection. However, under experimental conditions the chlamydospores of dwarf bunt do not germinate readily and therefore seed inoculation does not produce infection (4, 10). For this reason it is necessary to plant the seed in soil believed to be naturally infested with dwarf bunt inoculum, hoping that conditions will favor infection and thereby indicate varietal resistance or susceptibility (6). This procedure has many disadvantages, the principal one being that it is uncertain of results. For example, in the last 15 years less than half of the dwarf bunt tests in the Pacific Northwest have been successful. Consequently, this has been the limiting factor in progress toward the development of dwarf-bunt-resistant varieties.

Although dwarf bunt chlamydospores can be induced to germinate by special treatment (4, 7) these techniques have not solved the practical problem of determining varietal reaction to dwarf bunt. In an attempt to solve this problem studies were undertaken to determine whether one of the common bunt races (8) or a synthetically produced race (5) could be used as a tester race for dwarf bunt reaction. The results of these studies are presented in this paper.

Materials and Methods

The varieties of wheat used in these studies and differential varieties for physiologic races of fungi (8), several standard commercial varieties and hybrid selections of number of varieties ranged from 25 to 35, 01 number of new selections available for testing. The seed of all varieties was treated with formaldehyde to 320 parts of water) to remove unknown source. The treated seed was then water to remove the formaldehyde.

For inoculation purposes, chlamydospores of hybrid selection (designated as Hybrid 119) from dwarf bunt and T-8 were used. The hybrid method previously described (5) and the selected F1 from Oro, a dwarf-bunt-susceptible varietant to T-8. Soil-borne inoculum was relied upon demonstrating the dwarf bunt reaction.

All tests were conducted in commercial wheat soil was known to be infested with dwarf bunt prepared at Pullman, Wash., and distributed for series at Logan, Utah; Bozeman, Mont.; and Troy, Mont. One set of seed were prepared for each nursery were grown at Bozeman, Mont. One set was T-16, one was inoculated with Hybrid 119, uninoculated. Each set of seed was prepared seed was planted in the fall, when moisture favorable for seed germination, and data were following summer. Degree of infection was recorded smutted heads and the percentages were actual head count or by estimate. Where exact actual counts were made in occasional row accuracy of the estimates.

The most recent classification (8) of bunt varieties include dwarf bunt, although it is recognized a Basic to the success of the study reported here of the dwarf-bunt-reaction of the standard development of common bunt varieties as well. For this purpose variety plots seed were grown in dwarf-bunt-infested soil 1937-47 at Bozeman, Mont.; Logan, Utah; and Troy, Idaho.

Experimental Results

DWARF BUNT PATHOGENICITY

The tests for dwarf bunt pathogenicity successful in 5 years at Bozeman, Mont.; Logan, Utah, and 1 year at Troy, Idaho. The results are presented in Table 1 as combined average percent infection. The most recent classification (8) of bunt varieties include dwarf bunt, although it is recognized a Basic to the success of the study reported here of the dwarf-bunt-reaction of the standard development of common bunt varieties as well. For this purpose variety plots seed were grown in dwarf-bunt-infested soil 1937-47 at Bozeman, Mont.; Logan, Utah; and Troy, Idaho.

Figures in parenthesis refer to "Literature Cited", p.