BREEDING WINTER OATS RESISTANT TO CROWN RUST, SMUT, AND COLD

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The varieties of winter common oats belonging to *Avena sativa* L., such as Winter Turf, Lee, and Culberson, that are grown in the northern part of the winter-oat belt of the South and in western Oregon and Washington, are, as a group, very susceptible to smuts and rusts. In most sections where these varieties are grown smut is usually prevalent and crown rust frequently damages the crop. As a rule, stem rust has been less prevalent and, therefore, has not been a serious limiting factor in the production of winter common oats. The objective of the investigations here reported has been to develop strains of these hardier types that are resistant to smut and crown rust. In addition to disease resistance interesting data have been obtained on the use of artificial freezing as a means of isolating cold-resistant strains. These investigations have been conducted as one phase of the general breeding program of the project on oat improvement of the Division of Cereal Crops and Diseases of the U. S. Dept. of Agriculture.

REVIEW OF LITERATURE

Stanton et al. (6) and Murphy, Stanton, and Coffman (4) have reported the development of strains of oats with a combination of resistance to crown and stem rusts, and the smuts of oats. These were effected by crossing the comparatively newly introduced Victoria and Bond varieties that are highly resistant to crown rust and smut on Richland and Iogold, leading stem-rust resistant economic varieties of the Corn Belt.

McClelland and Kapp (1, pages 14–15), in the winter of 1934–35, subjected both greenhouse and field-grown seedlings of winter oats to artificial freezing. The oats were sown in or transplanted to flats 10 by 15 inches and 4 inches deep. Because of the shallow seedbed, heat was withdrawn from all surfaces, even beneath. This procedure is not possible under field conditions. Custis (C. I. 2041) winter oats, sown on September 27 and exposed on November 27 and following dates, withstood exposures as low as 12° F for 16 hours. All plants, however, were badly damaged at 20° or lower when exposed as long as 20 hours. At the latter exposure there was complete freezing of the soil and roots. Three-tiller plants were more hardy than 2-tiller or 1-tiller plants. In a second series of experiments with younger seedlings, it was observed that seedlings 9 to 14 days old could not withstand temperatures of 22° F for 18 hours or more. Seedlings that had been fertilized showed greater resistance to freezing.

1Results of cooperative investigations conducted by the Division of Cereal Crops and Diseases, Bureau of Plant Industry, U. S. Dept. of Agriculture, and the Iowa and Idaho Agricultural Experiment Stations. Journal Paper No. J-436 of the Iowa Agricultural Experiment Station, Ames, Iowa. Project No. 73. Received for publication March 15, 1937.

2Associate Pathologist, Senior Agronomist, and Assistant Agronomist, respectively.

3Numbers in parenthesis refer to “Literature Cited”, p. 637.

4C. I. refers to accession number of the Division of Cereal Crops and Diseases, formerly the Office of Cereal Investigations, U. S. Dept. of Agriculture.