With the exception of Thatcher, most of the hard red spring wheat varieties now being grown were derived from Hope or its sib selection, H-44. These Hope derivatives were resistant to leaf rust, *Puccinia recondita f. sp. tritici* (Erikss. and Henne) Carl., previous to 1944, but have been susceptible since then, due probably to the increase in prevalence of races 126 and 128, of the disease organism. The damage from leaf rust infection was estimated to be 20% in North Dakota in 1947 (10).

New sources of leaf rust resistance are available now, but no available resistant variety is adapted for growing in the hard red spring wheat area. Some are highly resistant not only to a collection of races in the field, but also to a large number of individual races in the seedling stage in the greenhouse. It has been necessary, therefore, to combine these new sources of resistance with the desirable characters of standard varieties.

The primary purpose of this study was to determine the mode of inheritance of leaf rust reaction to a collection of races in the field and to certain individual races in the seedling stage in the greenhouse.

A summary of the mode of inheritance of various characters in wheat was given by Ausemus et al. (3). The genetics of wheat with particular attention to leaf rust and stem rust was given by Hayes and Immer (4).

**MATERIAL AND METHODS**

Lee (C.I. 12488) is a selection from a cross of Hope with Timstein. It is early maturing, of medium height, and awned. It is moderately resistant to leaf rust and to certain races of stem rust in the mature plant stage but is susceptible to loose smut. This variety also is resistant in the seedling stage to all available races of leaf rust to which it has been tested except race 12 and a biotype called Canadian race 11. Lee has a pale green coleoptile and nonhairy auricles.

Mida (C.I. 12008) is a selection from a cross of Ceres–Double Cross × Ceres–Hope–Florence. It is an awned, early-maturing variety of medium height. It is moderately susceptible to leaf rust in the mature plant stage in the field and is resistant to race 12 and Canadian race 11 of leaf rust in the seedling stage. It has a brown coleoptile, hairy auricles, and tillers more slender than in Lee.

The mode of inheritance of the mature plant reaction to leaf rust of the hybrids and parents was studied in the summer of 1948 by using two experimental designs:

1. Five randomized complete blocks, each block having one plot or row of each: *F_1* (Lee), *F_1* generation, *F_2* generation, *F_3* generation, and 5 plots of the *F_4* generation, making a total of 25 plots per block. Each plot or row contained 16 plants and was randomized within each block.

2. Two randomized complete blocks with each block containing 300 plots or rows. Two hundred sixty-one *F_1* lines, and three other varieties, i.e., Hope, Timstein, and a line from which the parents were derived, were grown in one plot or row containing 25 plants.

In both experiments, the plots or rows were spaced 1 foot apart.

Susceptible varieties were seeded in the borders outside of the block and through the alleys. These were inoculated hypodermically and also sprayed with a mixture of 14 races of leaf rust: 1, 5, 9, 11, 12, 15, 21, 28, 31, 52, 93, 126, and 128; and 31 races of stem rust: 1, 5, 9, 11, 12, 15, 21, 28, 31, 43, 46, 49, 52, 56, 59A, 59B, 59C, 75, 80, 90, 93, 95, 133, 157, 167, 171, 172, 174, 186, 190, 193, 197, 198, and 200.

All races used in these studies were obtained from the Division of Plant Pathology and Agricultural Botany of Minnesota.

Notes on the mature plant reaction to leaf rust, the time of maximum development of rust on the plants, and those of stem rust infection were taken on the 1 week before harvest.

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