Heritability Estimates of Winter Hardiness in Winter Barley
Determined by the Standard Unit Method of Regression Analysis

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Lack of winter hardiness in winter barley is the major deterrent toward more extensive growth of this crop. This character, although extremely important in most winter barley breeding programs, has not been studied genetically in much detail. Winter hardiness in winter barley, like winter hardiness in most other crops, is conditioned by a complex group of interrelated factors involving both the physiological condition of the plant and the plant environment. The complex nature of winter hardiness has made genetic studies of this character very difficult.

This deficiency of genetic information prompted G. A. Wiebe, Agronomist, U. S. Department of Agriculture, to initiate a study from which it might be possible to obtain information as to the nature of the inheritance of the winter hardiness of winter barley. He assembled a group of 18 varieties which represented the most winter-hardy varieties in the important winter barley growing areas of the world. Initial reports of the results obtained from studies of these varieties and all possible single cross hybrids among them were presented by Pulham and Rohde and Pulham. This paper gives a summary of additional results obtained from these studies.

Rohde and Pulham gave a review of regarding winter hardiness studies in barley, therefore, this paper will include only the results that have been reported in these studies. The data presented in the initial reports indicated the varieties in this group all differed in the genes each possessed for winter hardiness. It was further observed that the expression of dominance for winter tenderness or low winter survival varied depending on the severity of the test. Under conditions conducive to severe killing or low winter survival, winter tenderness was usually dominant, while under conditions conducive to low killing or high winter survival, high winter hardiness appeared to be dominant. It was also observed that the predominant gene effects were additive, however, as pointed out above, non-additive effects were also observed.

The purpose of this paper is to present heritability estimates obtained from these studies. Mean survival varied widely among the tests, the standard unit method of the progeny-parent regression procedure described by Frey and Horner permits the calculation of percentages which have an approximate ceiling of 100% irrespective of the environmental scaling effects which may have occurred because of the different conditions under which the tests were conducted.