A Technique of Freezing Plant Crowns to Determine the Cold Resistance of Winter Oats

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Winter hardness of oats (Avena sativa L. and A. byzantina C. Koch.) is a complex characteristic conditioned by many genes, and winter survival reflects the ability of a plant to withstand stresses caused by factors such as low temperature, disease, drought, dessication, heaving, prolonged snow cover, or interactions thereof. Because of the undependable nature of winter-killing and the high experimental error in field testing, the breeder generally must depend on the average performance of lines and varieties over a range of environments to determine winter hardness. This is usually accomplished by testing over several locations and years. Since selections with low hardiness are not likely to possess sufficient winter hardness for use in northern areas of winter oat production, an accurate and efficient test for the determination of cold resistance would be a useful tool for the elimination of material.

Although several investigators have reported good correlations between survival of small grain varieties in controlled freezing tests and survival in the field (1, 2, 3, 4, 5, 7, 9), tests of this type have not been of common use in breeding programs. The techniques involved utilized pots or flats of plants from a relatively wide range for survival. Amirshahi and Patterson (1) and Porter (3) reported that several factors may influence survival of oats in freezing tests, such as soil moisture differences and interactions thereof. Porter (3) reported high variation between and within lines and varieties.

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