Drought and high-temperature resistance are important agronomic problems in many areas. Heyne and Laude (4) stated that high-temperatures are closely associated with deficient moisture in Kansas, and corn adapted to Kansas probably has factors for resistance both to high-temperatures and deficiency of soil moisture. This close relationship between drought and high-temperature resistance has caused confusion in the literature. It is difficult to determine whether drought, high-temperature, or a combination of both were being investigated.

Heyne and Brunson (3) exposed corn plants to 127 to 130°F at 30% relative humidity for 5 hours. They found that field drought resistance was closely correlated with their laboratory heat test and that heat tolerance was definitely inherited. Julander (5) immersed plants in glass tubes in a constant temperature bath at 118°F for up to 16 hours. This study indicated that heat resistance was a measure of drought resistance. Carroll (1) exposed grass species to soil and air temperatures of 113, 122, and 140°F independently. The relative humidity was about 15% during the high air temperature tests. He found that high soil temperature was more destructive than similar high air temperature. Changes in relative ranking of the grass genera or species were observed between the high air and soil temperature tests. Carroll also observed differences in relative ranking between drought (caused by withholding water) and heat tests.

Kinbacher (6) reported that relative humidity greatly influenced the degree of injury sustained by winter oat plants exposed to high temperatures. When humidity was increased from 50 to 75% and from 75 to 100%, the degree of injury was doubled. This paper indicated that careful consideration of relative humidity is an important feature in high-temperature research. He postulated that varieties with a narrow range in heat resistance may vary in relative ranking when relative humidity is changed and temperature is held constant.

This investigation was initiated to determine the effect of relative humidity on the relative high-temperature resistance of varieties which are known to have a limited range in cold resistance and to determine the relative humidity at high temperatures that gave the closest correlation with cold resistance.

MATERIALS AND METHODS

Eight varieties of winter oats, Nysel (C. I. 5364), Ballard (C. I. 6980), Wintok (C. I. 3424), Norline (C. I. 6903), Dubois (C. I. 6572), Pentagon (C. I. 2499), LeConte (C. I. 5107), and Winter Turf (C. I. 3296) were used in this investigation. The heat tests were conducted during the winter and early spring of 1962. Seeds increased at Aberdeen, Idaho, during the summer of 1961 were used throughout this study. Planting procedure, greenhouse growing conditions, and heat chamber employed were described in a previous paper (6).

The heat test consisted of an 8-hour exposure at 112°F at 50, 75, or 100% relative humidity. Since only one specific treatment could be conducted on a given day, the different relative humidity treatments were conducted on 3 consecutive days on different groups of plants sown on the same day. Ten high-temperature tests were conducted. Each test consisted of 6 pots per variety per humidity treatment and each pot contained 12 plants. Plants used were approximately four weeks old.

Survival notes were recorded one week after the high-temperature exposure. Each plant was examined to determine the degree of