FREEZING INJURY OF FORAGE PLANTS

Dale Smith

The duration of productive forage stands depends on the interaction of many environmental factors. Of these, freezing temperatures are of major importance. Thus, the maintenance of stands over winter is involved in the culture of all winter annual, biennial, and perennial forages. Freezing injury may be the result of one particular condition occurring at one period during the winter or it may be the result of several conditions occurring at one period or during successive periods of the winter.

Species and varieties of forages differ markedly in their frost resistance and examples are numerous (3, 12, 13, 27, 33, 72, 74, 76, 90, 95, 96). Even so, the hardiest forages can be injured or killed in northern latitudes. None is winter-proof. They are in danger of freezing injury wherever freezing temperatures occur. For example, McCloud and Creel (58) in Florida and Adams and Twersky (1) in Georgia have shown that bermudagrass (Cynodon dactylon (L.) Pers.) and pangolagrass (Digitaria decumbens Stent.) sometimes are injured by short periods of freezing temperature that can occur in these southern latitudes.

DEVELOPMENT OF COLD RESISTANCE

Overwintering forage species develop resistance to freezing with the onset of the shortening days and lowering temperatures of autumn within their inherent capacity to do so (25, 90, 102). Tysdal (102) found that frost-hardening of alfalfa (Medicago sativa L.) under artificial conditions was favored by: (1) short daylengths of around 7 to 8 hours, (2) generally lowering temperatures, (3) an alternation of temperatures between 20°C. (or warm) during the day and 0 to 5°C. (or cold) during night, and (4) adequate light intensity for a high rate of photosynthesis. These are

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2. Professor of Agronomy.