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FACTORS INFLUENCING VARIATION IN SUSCEPTIBILITY OF PRAIRIE PLANTS TO AN EARLY SUMMER FROST IN EAST-CENTRAL MINNESOTA

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Temperature fluctuations are considered the most critical factor in determining plant survival because temperature directly affects physiological activity needed for growth, reproduction and survival. If temperatures fall below a certain critical level, which is species-specific, plant tissues can experience visible physical damage such as blanching of green portions of leaves resulting from a breakdown in chlorophyll pigments, or experiencing white or dark brown regions on plant tissues due to increased tannin and resin levels. Understanding the effects and severity of frost damage has economic importance because agricultural crops experience damage from unseasonably late frosts, decreasing overall crop yield. Studying the damage caused by frost also has evolutionary significance in better understanding mechanisms of plant succession. The problem researchers face is that little information is known concerning the effects of frost in the field because of the unpredictability of frost events. Thus, prior research has been restricted to laboratory effects on plant growth and physiology.

In this study I examined the damage caused by an early summer frost on plant species at Cedar Creek Natural History Area, in east-central Minnesota. The degree of frost damage on prairie plants was recorded using a scale of frost damage based on visual criteria. Possible causes of variation in frost susceptibility were examined. The degree of frost damage was independent of plant type (grass or forb), life cycle (annual, perennial, or biennial), successional status (early or late), and species origin (native or introduced). No significant correlations were noted between plant height and either mean or average frost damage. The mean biomass allocated above and below ground, and to leaves, stems and roots were not correlated to the mean or maximum frost damage. However, plants that allocated a greater proportion of biomass to leaves were more severely damaged than plants that allocated less biomass to leaves.