

# **PLANT RESPONSE TO TEMPERATURE STRESS AND ITS EFFECT ON WEED COMPETITION**

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Temperature is the driving force of all cellular reactions. Optimum temperature range promotes plant health through active growth. Temperatures above the optimum can slow growth and lead to deteriorating affects. In addition, temperature can influence the competitive outcome between desirable turfgrasses and weeds. Before exploring the effect temperature has on turfgrasses, a brief review of high temperature stress is needed.

## **HIGH TEMPERATURE STRESS**

Turfgrass growth and development is usually confined between 40 to 105 F (Beard, 1973). Optimum turfgrass growth however is often a much narrower range such as 60 to 75 F for cool season turfgrasses and 80 to 95 F for warm season turfgrasses. Optimum temperatures are needed for turfgrass growth and development. Temperatures exceeding the optimum range, especially in cool season turfgrasses can have detrimental affects. Temperature stress begins to occur when respiration exceeds photosynthesis. As temperatures continue to exceed the given optimum growth slows, root maturation and root death occurs. Physiologically if temperatures become detrimental to growth, a decline in protein levels occur. At the point where temperatures cause turfgrass death, cellular proteins denature.

High canopy temperatures can result from various biotic and abiotic factors. Droughty situations can result in elevated plant temperatures. As moisture becomes limiting to the plant, transpiration rates are reduced from stomates closing to conserve moisture. The lack of transpiration (cooling process) causes a buildup of temperature within the plant. Pathogens can also cause an elevation in temperature. As infections take place, a byproduct of this attack is an elevation in temperature.

Management practices influence turfgrass temperatures. Mowing height is a major contributing factor to temperature buildup in a turf. The lower the mowing height the higher the heat load which results in increasing plant temperature.

## **HIGH TEMPERATURE EFFECTS ON WEED COMPETITION**

In lawn situations where crabgrass is considered a major problem, temperature in combination with improper cultural practices can enhance weed pressure. For example, low mowing heights may reduce the density of Kentucky bluegrass turf. By reducing competition, successful germination of crabgrass is more likely. As crabgrass germinates, high temperatures favor its develop while at the same time reduces the competitive ability of Kentucky bluegrass.

Crabgrass is considered a C4 plant which has the ability to capture carbon dioxide in a more efficient manner than C3 plants such as Kentucky bluegrass. As temperatures rise C3 plants suffer from the wasteful use of carbon dioxide called photorespiration. Crabgrass being a C4 plant rarely carry-on photorespiration. If Kentucky bluegrass is undergoing photorespiration it will be capturing half-the energy compared to crabgrass. Thus, Kentucky bluegrass is 50 percent the competitive ability of crabgrass.

So in lawncare maintenance, practices that favor temperature buildup favor C4 weed growth and development. Management practices that favor a "cooler" temperature should discourage unwanted C4 weeds.

## **REFERENCES**

Beard, J.B. 1973. Turfgrass: Science and Culture. Prentice-Hall, Inc. 658 pp.