

Physiological Responses of Creeping Bentgrass to Mowing

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Development of practical mowing programs that balance agronomic requirements with sports play demands is important to produce dense, uniform, and visually appealing turf. The overall objective of our current research projects is to evaluate the performance of creeping bentgrass (*Agrostis stolonifera* L.) after common mowing practices. Practices of interest include mowing frequency (i.e., single- or double-cutting) and mower sharpness.

Grasses maintained on sports fields often are double-cut or mowed twice in different directions, to create a more uniform playing surface. This practice is especially prevalent on golf course greens. However, the effects of multiple cuttings on the growth, development, and physiological status of creeping bentgrass have not been identified. Primary areas of research to quantify severity of mowing stress include carbohydrate metabolism and activities of antioxidant enzymes.

Mowing removes leaf tissue that grasses use to acquire solar energy, effectively lowering the rate of photosynthesis and limiting the ability of the plant to synthesize carbohydrates. Re-growth and initiation of new leaf tissue after mowing is necessary to develop the photosynthetic leaf area required for production of carbohydrates. Grasses often increase leaf and shoot density below the height-of-cut to reestablish leaf surface area. Plants rely on carbohydrate reserves to provide energy and raw materials required to redevelop leaf and shoot tissue.

Mowing is a destructive process that wounds grass plants and increases the susceptibility of grass plants to other stresses. Formation of reactive oxygen species is a typical response of plants to wounding. Accumulation of reactive oxygen species may lead to damage of carbohydrates, lipids, proteins, and nucleic acids. Damage to these macromolecules may result in reductions in rates of photosynthesis and respiration. Because of the highly toxic nature of reactive oxygen species, plants have developed enzymatic systems to scavenge reactive oxygen species and protect cells from oxidative damage.

Regular mower maintenance is essential to achieve the best possible quality of cut. Dulled mower blades tear and fray leaf blades, resulting in brown and ragged leaf tips that reduce the visual quality of the turf. Moreover, grasses mown with dull mowers are subjected to more stress than grasses mown with sharp mowers.

Several methods of sharpening reel-type mowers exist, including single-blade grinding, spin-grinding, carbide-milling, back-lapping, and facing of the front face of the bedknife. The decision on which method, or combination of methods, to use often depends on economic, labor, and time factors, as well as desired cutting quality and personal preference. There is no set standard regarding how often reel-type mowers should be sharpened. That depends on several factors, such as the area of turf to be mowed, the regularity of cutting, the species of grass being cut, the method used to sharpen the mower, and the adjustment of the reel to the bedknife.

An objective of a current research project at Cold Water Golf Links is to develop general guidelines to determine how frequently reel-type mowers should be sharpened. Mowers were sharpened by using different sharpening techniques and are used to mow a known area of turf each week. Measurements of leaf blade tissue damage, carbohydrate concentration, photosynthetic yield, and cutting surface geometry are used to quantify mower sharpness over time.

Significance

Determining the re-growth potential and quantifying the stress caused by mowing practices will allow us to make general recommendations to turfgrass managers regarding the design and implementation of mowing programs. In addition, data garnered from the field study will provide timelines for proper mower maintenance to ensure the highest quality of cut.