2006

Mower Sharpness and Creeping Bentgrass Quality of Cut

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Abstract
Regular mower maintenance is essential to achieve the best possible quality of cut. Dull mowers tear leaf tissue, severely wounding the plant and resulting in formation of frayed and necrotic leaf tips. Severe wounding may limit growth and development of grasses and increase susceptibility to stresses such as drought, pathogens, insects, and traffic. The objective of this study was to quantify mower sharpness and mowing injury over time. This information will be used to develop general mower maintenance guidelines and to determine how frequently reel-type mowers should be sharpened to achieve the best possible quality of cut.

Keywords
Horticulture

Disciplines
Agricultural Science | Agriculture | Horticulture

Mower Sharpness and Creeping Bentgrass Quality of Cut

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Introduction

Regular mower maintenance is essential to achieve the best possible quality of cut. Dull mowers tear leaf tissue, severely wounding the plant and resulting in formation of frayed and necrotic leaf tips. Severe wounding may limit growth and development of grasses and increase susceptibility to stresses such as drought, pathogens, insects, and traffic.

The objective of this study was to quantify mower sharpness and mowing injury over time. This information will be used to develop general mower maintenance guidelines and to determine how frequently reel-type mowers should be sharpened to achieve the best possible quality of cut.

Materials and Methods

Eighteen-inch walk-behind mowers (GR 800) were sharpened once by using single-blade carbide- milling, cylindrical-grind, and cylindrical-with-relief-grind processes. Three mowers were sharpened by using each sharpening process. Each mower was used to cut approximately 25,000–40,000 ft^2 of L-93 creeping bentgrass (*Agrostis stolonifera* L.) every week for 12 weeks at Cold Water Golf Links (Ames, IA). Creeping bentgrass was mowed at a height of 0.5 in.

Mowers sharpened by using the cylindrical-with-relief-grind process after every 40,000 ft^2 were used as positive controls. Mowers sharpened by using cylindrical-with-relief grinds and carbide milling were adjusted with slight reel-to-bedknife contact, whereas mowers sharpened by using cylindrical grinding were adjusted with no reel-to-bedknife contact. The gap between the reel and bedknife of these mowers was adjusted by using paper supplied by the manufacturer of the sharpening equipment.

Measurements of mowing injury and photosynthetic yield were made weekly. The length of necrotic and torn leaf tissue was measured under a microscope 24 hours after mowing. Photosynthetic yield was measured with a portable chlorophyll fluorometer 6 to 9 hours after mowing. Photosynthetic yield is an indicator of stress. Lower values indicate reduced rates of photosynthesis and greater incidence of stress. Determinations of chlorophyll concentration were made biweekly. Chlorophyll often is degraded when plants are challenged by stress. In addition, necrotic tissue that was damaged by mowing does not contain chlorophyll. Data were analyzed by using the MIXED procedure of the SAS program. Means were separated by using orthogonal contrasts.

Results and Discussion

Grasses cut with mowers sharpened by carbide milling consistently developed smaller wounds (Figure 1) and contained the greatest chlorophyll concentrations (Figure 3). Grasses clipped with mowers sharpened by using cylindrical grinding often formed the largest wounds and contained low concentrations of chlorophyll. In addition, photosynthetic yield measurements indicate that cutting grasses with mowers sharpened with the cylindrical-grind process is more injurious than clipping grasses with mowers sharpened by carbide milling (Figure 2). Grasses cut with mowers sharpened by using cylindrical-with-relief grinds compared favorably with grasses cut by mowers sharpened by using carbide milling. No differences in mowing injury were observed between these treatments until more than 250,000 ft^2 of grass had been mowed (Figure 1). Likewise, photosynthetic yield (Figure 2) and chlorophyll concentration (Figure 3) values were similar

between these treatments at times during the study.

Mowers sharpened with the cylindrical-grind process would need to be sharpened more frequently than mowers sharpened using cylindrical-with-relief-grind or carbide-milling processes to maintain acceptable quality of cut, perhaps as often as every 100,000 to 150,000 ft^2. Quality of cut was similar between mowers sharpened by cylindrical-with-relief-grind and carbide-milling processes; however, mowers sharpened by carbide milling remained sharper longer as indicated by less mowing injury in Figure 1.

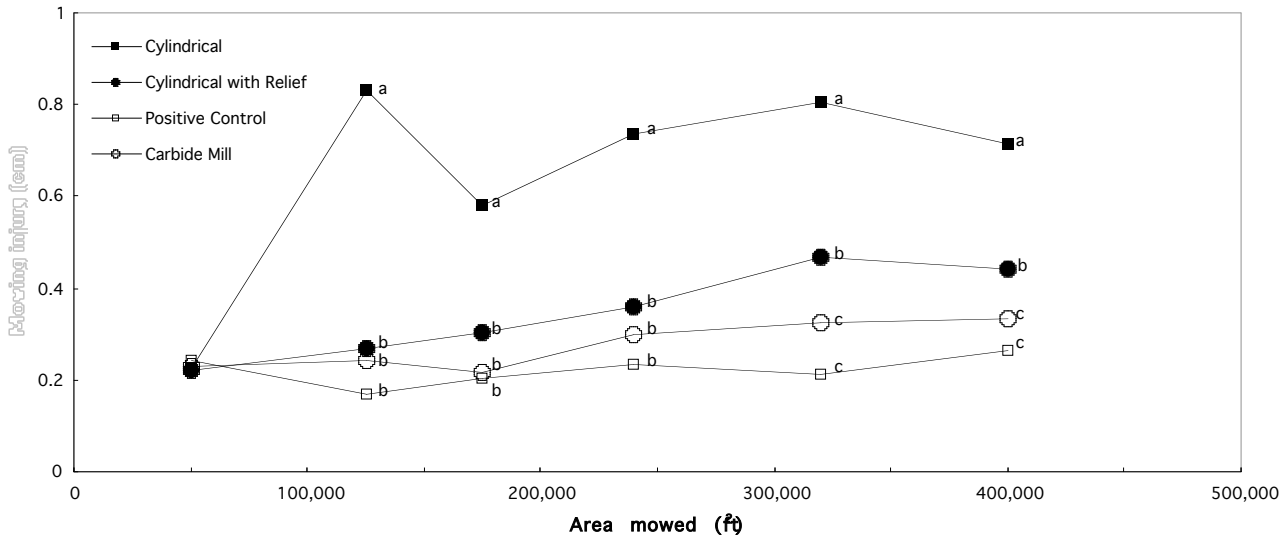

Figure 1. Length of necrotic and torn leaf tissue over time of L-93 creeping bentgrass clipped with mowers sharpened by using cylindrical-grind, cylindrical-with-relief-grind, and carbide-milling processes. Each data point is the mean of 120 observations. Means labeled with the same letter at each sampling time are not different at $P \leq 0.05$. Means were separated by using orthogonal contrasts.

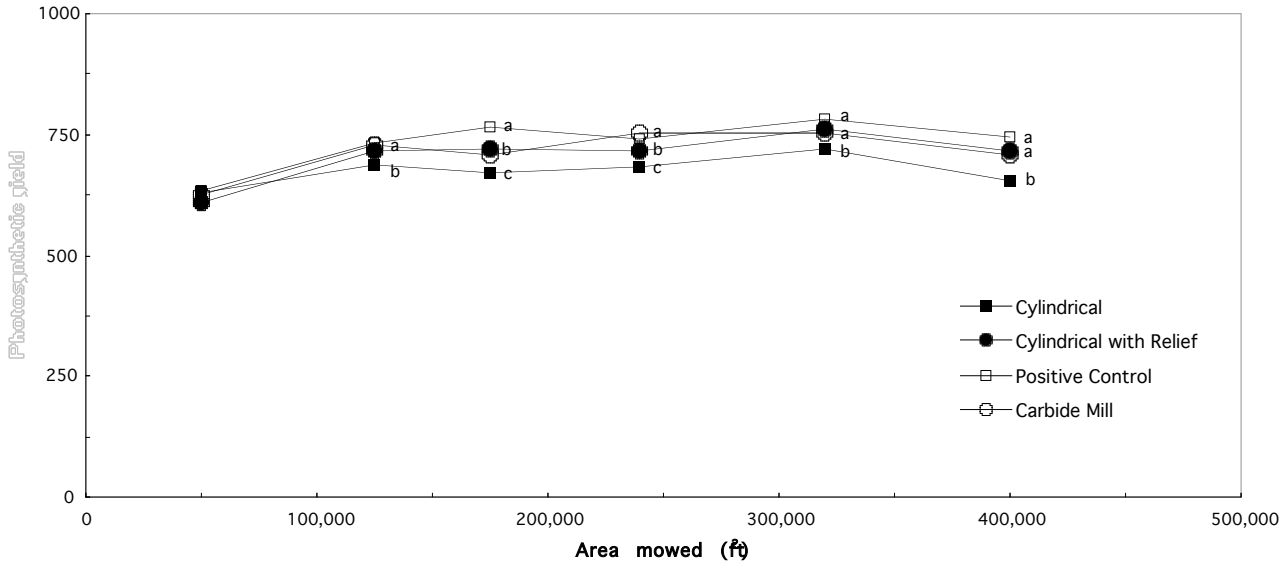

Figure 2. Photosynthetic yield over time of L-93 creeping bentgrass clipped with mowers sharpened by using cylindrical-grind, cylindrical-with-relief-grind, and carbide-milling processes. Each data point is the mean of 120 observations. Means labeled with the same letter at each sampling time are not different at P≤0.05. Means were separated by using orthogonal contrasts.

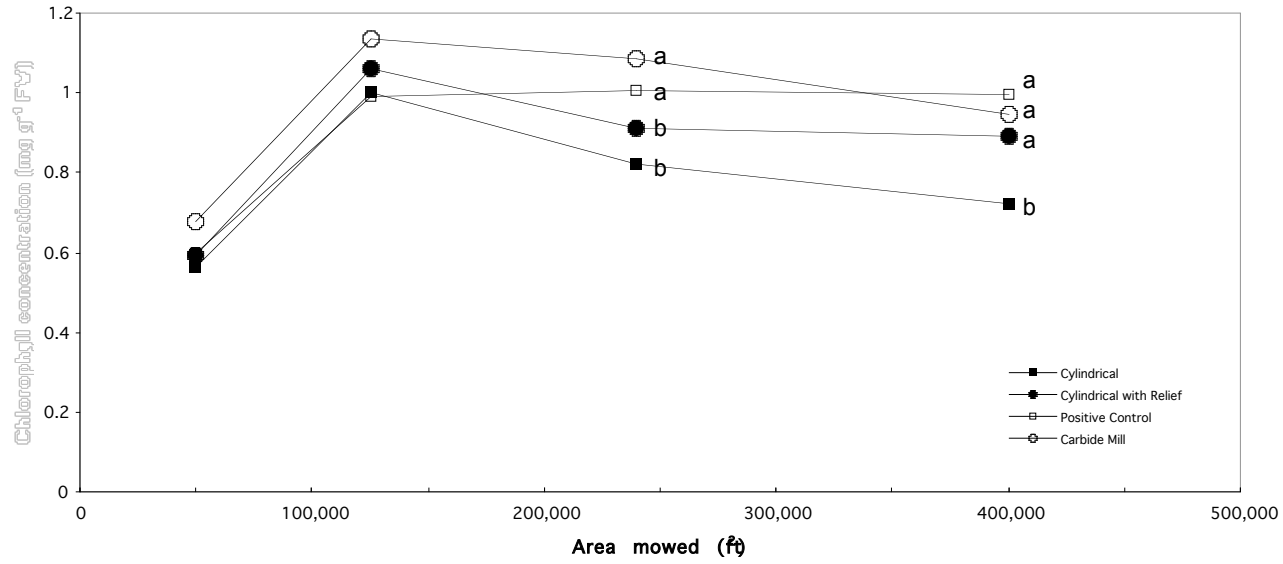

Figure 3. Chlorophyll concentration over time of L-93 creeping bentgrass clipped with mowers sharpened by using cylindrical-grind, cylindrical-with-relief-grind, and carbide-milling processes. Each data point is the mean of 6 observations. Means labeled with the same letter at each sampling time are not different at P≤0.05. Means were separated by using orthogonal contrasts.