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Winter Injury

With winter kill, soil temperature is the cause. This is a low temperature injury to the lower crown. Irrigation in the spring helps keep new roots coming. Cut a longitudinal section through the crown to see if the tissue is brown inside.

Adjustments for cold hardening off occur at from 55 to 65 degrees F. The following temperature ranges have been correlated with turfgrass growth:

60-75° F	—Optimum shoot growth;
45-60° F	—Shoot growth declines;
35-45° F	—Plants harden;
32-35° F	—Winter dormancy;
25-minus 15° F	—Low temperature kill.

Hardening off is accompanied by increases in carbohydrate reserves and a decrease in tissue hydration to 60-65 percent.

Plant hardiness zones and maps show the location of differences throughout the United States.

Differences in low temperature kill are often difficult to explain. A green may be OK, while the approach is dead. In this case, the green may be Penncross, which is hardy, and the approach, Poa annua, which is not.

The following differences in cultivar tolerance have been noted:

	OK at Soil Temperature
Penncross bentgrass	-10
Toronto bentgrass	-10
Poa trivialis	-10
Merion bluegrass	-5
Poa annua	-5
Pennlawn fine fescue	0
Common perennial ryegrass	5

In general, the bents and Poa trivialis have excellent cold tolerance.

The question still remains - at what soil temperature can winter kill be expected? There is no one answer. It depends on:

- plant hardiness level;
- degree of hydration;
- rate of freezing - more rapid, more kill;
- rate of thawing - more rapid, more kill;
- number of freeze and thaw cycles;
- length of time frozen.

Of all these, the hydration level is the most important. What can be done? Check the following:

- provide rapid surface drainage;
- provide adequate subsurface drainage;
- cultivation.

Soils thaw from underneath where warm soil is located.

An ice cover will trap water underneath.

Grass may die from increase in hydration. As crown hydration increases, hardiness declines in late winter and early spring (March). In low spots, where water stands, low temperatures kill occurs because of water standing.

Prevent low temperature kill by checking the following:

- use moderate nitrogen;
- use high potassium;
- cut higher;
- eliminate thatch;
- avoid excessive irrigation.

For bluegrasses, use more potassium to balance increased

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(Winter Injury cont'd.)

nitrogen - 2 to 1 or 3 to 2. For bentgrasses, the nutrition is not as important because these grasses have more inherent tolerance to cold.

For bluegrasses, cutting heights of from one and one half to two inches is usually good. More carbohydrates accumulate and there is more biomass. Crowns are protected because of greater insulation.

The principles are the same for warm season grasses. More winter kill is observed at low mowing heights.

More winter kill is often observed where herbicides are used - particularly the pre-emergence type.

Thatch raises the crown above the soil. Thatch also holds water and increases the hydration level.

Leave aerification holes open to prevent low temperature kill.

Never let an ice sheet stay on the alfalfa more than twenty days for it dies of suffocation. Injury from ice on turf is not due to suffocation, but to the probability of increased hydration. May remove ice and get winter kill from desiccation, or leave it on and get winter kill from crown hydration. Bentgrasses, bluegrasses and Poa annua have been kept in ice for as long as seventy five days with no injury. At ninety days, Poa annua dies. Bentgrass and bluegrass have survived up to 150 days in ice.

Traffic on frozen slush injures turf. This pushes water into the crown area and increases hydration so that low temperature kill is realized. Snow mobiles cause no injury to the turf as long as there is one inch of snow cover. Snow mobiles on frozen slush cause increased low temperature injury.

Another type of winter injury is caused by winter desiccation. During dry, open winters on sandy soils, turf injury may be significant. This type of injury is of less importance than low temperature kill.

Grasses that are more salt tolerant are also more tolerant of desiccation. For example, Seaside bentgrass. Thus, cultivar variation does exist.

Higher rates of nitrogen in the fall favor winter desiccation injury.

The presence of thatch increases the likelihood of winter desiccation.

Open aerification holes favor the development of winter desiccation injury.

Covers protect turf from adverse winter conditions. Fungicides help prevent winter diseases.

Soil warming also prevents injury from low temperatures.

Desiccation affects the crown meristematic tissue. The crown must survive if the plant is to live. Cells in the lower crown are larger. When they are killed, roots are dead. Tops may be alive. If roots are not regenerated quickly, tops will also die.

Credit: Newsletter, GCSA of New England 1/85

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Reel Versus Rotary Mowers[1]

by Roger J. Thomas[2]

1Presented at the 38th Northwest Turfgrass Conference, Sheraton Hotel, Spokane, WA, September 18-20, 1984.
2Jacobsen Division of Textron Inc., Racine, WI.

The age old controversy of reel mowers versus rotary mowers continues on and on. Areas to be maintained vary so much between cities, school districts, county highways and parks and institutions, that the most one can do is present a few guidelines for thought.

LEVEL OF MAINTENANCE

To determine the proper machines to use, a level of maintenance must be determined. Formal turf can be defined with the following concepts in mind:

A well groomed area mowed weekly or more often during the good growth period of the turf. Another view may be if the appearance of the area is important as a showplace, for example, schools, municipal buildings, parks, and athletic fields, the classification can be, formal turf. Another element to test whether there is a weed control program, or are clippings being collected. In any event, if the quality of cut *is* important, then the level of maintenance can be considered, formal turf.

Semi-formal turf generally is defined as a mowed area a distance from general viewing, weed control in itself does not seem to be the most important element, and even some skip/mow programs can be initiated. Higher cut of the grass is generally acceptable, yet suitable to walking traffic and the appearance is not quite as important as for formal turf.

Informal turf would be considered for areas of weeds and grasses that may well adapt to a skip/mow program. They are viewed by the public from some distance, and quality of cut is not the most important element. It could almost be defined as "It's green so it is satisfactory". Informal turf is mowed at cutting heights of 3, 4, or 5 inches, and generally not a walking traffic area.

ENGINE HORSEPOWER REQUIREMENTS

84" Triplex Reel Versus 72" Riding Rotary

For our determination, consider an 84" triplex reel mower versus a 72" riding rotary. On the market today, the 84" reel mowers are equipped with 12 or 14 H.P. engines. The 72" rotary machines are equipped wtih 20-23 H.P. engines. The reel type mower requires less power at slow speeds because the top speed of the reel blade is approximately 900 feet per second. Compare that with the top speed on rotary mowers that is between 18,000 and 19,000 feet per second. Generally, the rotary mower engines operate at higher speeds, even though in the last few years riding rotaries have variable traction speeds so that the engine can operate at a "fixed" speed.

ECONOMICS

The 84" triplex mower requires less horsepower; hence, less fuel. Indicative of this is the 84" triplex at operating speed uses approximately 1.03 gallons of fuel per hour. Consider also that the 84" unit is cutting a 16% wider swatch than the 72" rotary. The cost of the 84" machine runs about 15% to 25% less than a 72". Somewhat on the negative side, bedknife adjustments are necessary by people familiar with the unit. Repairs at the end of the season include grinding.

The 72" riding rotary, since it is equipped with a higher horsepower engine, uses more fuel. A 20 H.P. engine uses approximately 2.18 gallons per hour during operation. The 12" less swath results in just under 3 acres per day of less cutting. While reel grinding is not necessary on a rotary, rotary blades must be kept sharp, and require sharpening or replacement more often. Air and oil filters must be changed more often in rotary operations because of the dusty atmosphere in which it works. Engine fins, radiators, or filter screens must be cleaned often to avoid overheating, which is an enemy of the life-span of an engine.

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