

Winter Cover Evaluation Trial

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Introduction

During the winter of 2000 /2001 a field trial was conducted to examine the value of winter covers for protecting greens from winter injury. The study, sponsored by the Minnesota Golf Course Superintendents Association was the first year of a multi-year project to assess different aspects of winter covers including spring green-up and the risk of cold injury to turf wintered under different covers.



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One of the goals of this project was to examine the value to water impermeable covers (WICs). The interest in WICs has developed due to the incidence of crown hydration, in which the excessive moisture freezes and causes injury to the crown of the plant. The WICs would reduce the risk of crown

hydration by shielding the plant from water from rain and snow melt. The interest in this aspect of WICs comes despite past concerns about the risk of these covers limiting gas transfer, such as occurs under ice cover, resulting in anoxia (lack of oxygen) and injury/death of the plant.

The winter cover trial was conducted on two greens at Rolling Green Country Club in Hamel, MN. One of the greens was located near the maintenance shop on a higher elevation and received greater exposure than the other green located near the road was more protected at a lower elevation. Both were pushup greens established from Toronto creeping bentgrass.

The study included cover that were water permeable and water impermeable. The water permeable covers used in the study included wood fiber, 2 year old wood fiber, wood fiber with black netting, a white winter blanket, and a cover of green and clear woven plastic. The water impermeable covers included 6 mil clear plastic, 6 mil clear plastic over a wood fiber cover, a generic green tarp, closed cell foam, and closed cell foam with a backing that did not allow light to pass.

Covers were applied to the greens on November 17, 2000 following a fi" snowfall. The snow was removed from the

study site by shoveling and brushing with a shop broom. The covers were cut to 6' by 6' and held in place with nail/washer. The seams between WICs were sealed with taped. At the time of application there was only fi" of frost present in the greens.

Cover Removal and 1st Rating?

The winter covers were removed from the greens on April 6, 2001. The quality of the turf was collected on a 0-9 scale (9 being the greenest) and soil temperature were taken from each plot at a 2" depth. At both locations the uncovered plots had the lowest quality throughout the duration of the study although the quality improved steadily with no decline. The covers that yielded the best turf quality at the time of cover removal were the generic green tarp, and the closed cell foam with the backing. The highest quality turf was under the wood fiber under clear plastic which had about 1/4" growth. This is of interest as all of these covers are water barriers. The next best covers were the wood fiber which provided consistent quality at both locations. The closed cell foam without backing provided a quality turf on the protected green but the quality was lower on the exposed green. The woven plastic and white blanket yielded turf of better quality than the uncovered plots, but not up the level of other treatments. The clear plastic provided turf quality better than the uncovered plot but the lowest quality of all turf covers.

The temperature data collected following cover removal also indicated significant differences among winter covers. At the protected green, soil temperatures under the woven plastic, closed cell foam without backing, white blanket, and clear plastic covers were not different from the uncovered plot at 39° F. The wood fiber, green tarp, and plastic over wood fiber were cooler than the uncovered plots at ~ 37° F. The soil temperature below the closed cell foam with backing was only 34° F. At the protected green, the only cover to yield a significant temperature difference from the uncovered plot was the closed cell with backing. The soil temperatures under this cover (2" depth) was 33° F, 9° F cooler than the other plots.

Additional Rating Dates

The second rating was taken on April 18, 2001. Again the uncovered plots at both locations had the lowest turf quality.

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ity. The best quality turf on the exposed green near the maintenance shop were the wood fiber, closed cell foam without backing, and the wood fiber under clear plastic. The turf covered with the foam with backing and generic green tarp decreased in quality at this location from the time of the first rating. This trend held through April 27, with an increase in the quality of the closed cell foam with

Cover Type	Rating 4-6-01	Rating 4-18-01	Rating 4-27-01	Rating 5-4-01
Uncovered	2.3	3.7	4.7	5.7
Wood Fiber	6.3	7.2	6.8	6.7
Wood Fiber (2 year)	6.8	7.0	7.2	6.7
Wood Fiber (Black)	6.7	7.3	7.5	6.7
Closed Cell	7.2	6.7	6.0	6.0
Closed Cell/Backing	7.7	6.8	7.0	7.0
Woven Plastic	5.5	6.5	6.0	6.3
White Blanket	5.3	6.0	5.8	7.0
Generic Green Tarp	7.5	6.5	6.3	7.0
Clear Plastic	4.3	5.3	6.3	6.3
Wood Fiber/Clear Plastic	8.7	7.5	5.5	6.3

Quality data for the protected green. Data collected on 0-9 scale (9 being best quality) and listed the average of 3 plots.

backing. By May 4 the only the uncovered plots were identifiable and there were not differences among any of the plots that were covered throughout the winter.

At the protected green near the road there were only limited differences between the treatments with the best quality in the plots covered with the wood fiber and wood fiber under clear plastic. The clear plastic plots had the lowest quality, but were still better than uncovered plots. As with the other location, the closed cell foam with backing turf

Cover Type	Rating 4-6-01	Rating 4-18-01	Rating 4-27-01	Rating 5-4-01
Uncovered	3.3	3.0	4.0	5.0
Wood Fiber	6.3	6.0	6.5	6.7
Wood Fiber (2 year)	6.3	6.2	6.8	7.0
Wood Fiber (Black)	7.0	6.2	7.2	7.0
Closed Cell	7.1	5.7	5.8	6.5
Closed Cell/Backing	8.3	4.5	6.3	6.7
Woven Plastic	4.2	4.8	5.8	7.0
White Blanket	6.0	5.3	5.8	6.5
Generic Green Tarp	7.3	4.8	5.5	6.8
Clear Plastic	4.0	4.3	5.0	6.2
Wood Fiber/Clear Plastic	7.3	6.7	7.0	6.7

Quality data for exposed green. Data collected on 0-9 scale (9 being best quality) and listed the average of 3 plots.

improved in quality through April 27. By the final rating date of May 4, the closed cell foam with backing, the generic green tarp, and white blanket plots gave the highest quality ratings and were the only plots significantly better than the uncovered plots. The other covered plots had higher quality ratings than the uncovered but the differences were not significant.

Tolerance to Freezing Injury

While it is obvious that the ability of a cover to prevent desiccation and crown hydration are important, along with the quality of turf when the covers are removed; the hardiness of plants following cover removal is of equal consideration. To examine the tolerance of turf from the different covers to freezing injury, turf samples collected on April 6 after the covers were removed. The turf samples were subjected to temperatures of 39° F, 21° F, or 10° F for 1 hour. The sample were then transferred to the greenhouse and rated for turf quality.

There were no differences in turf quality of samples that were maintained at 39° F, but this was expected as this is similar to temperatures the turf would have been experiencing prior to sample collection. When the samples were cooled to 21° F all covers yielded similar quality turf to the uncovered turf with the exception of the turf from the wood fiber covers which had greater levels of turf injury. The most noticeable effect of freezing temperature was observable when

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the turf samples were cooled to 10° F. At this temperature there was a complete loss of turf that were wintered under the wood fiber and wood fiber under plastic covers. Only the turf that was wintered under the closed cell with backing cover had appreciable survival. It is likely that the turf under this cover still maintained much of its winter hardiness due to a delay in growth associated with the cooler soil temperatures under this cover.

Conclusions

This first year of the winter cover trial revealed some of the benefits of winter covers beyond protection from winter injury. Although we did not have conditions that promoted desiccation or crown hydration, this trial demonstrated the role of covers in spring green-up and maintenance of winter hardiness. One of the areas in interest in this trial was the value of water barrier covers. On a turf quality basis, they performed well as a whole. Of these the closed cell foam with the light barrier backing gave the best overall quality. The other cover of note was the wood

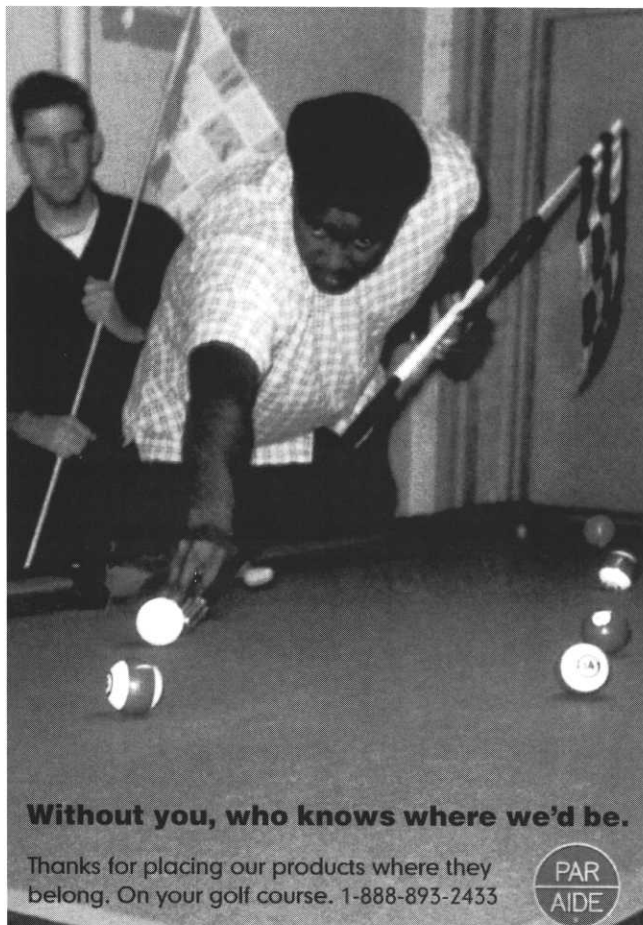
Cover Type	39° F	21° F	10° F
Uncovered	7.0	3.8	0.0
Wood Fiber	6.7	1.8	0.3
Wood Fiber (2 year)	7.7	3.8	0.3
Wood Fiber (Black)	6.7	0.5	0.0
Closed Cell	7.0	2.8	0.3
Closed Cell/Backing	7.7	4.3	1.8
Woven Plastic	6.3	3.3	0.5
White Blanket	7.0	2.5	0.0
Generic Green Tarp	7.3	4.3	0.3
Clear Plastic	7.0	4.5	0.5
Wood Fiber/Clear Plastic	7.3	3.3	0.0

Quality rating (0-9; 9 = best quality, 0 = all dead) of samples of creeping bentgrass wintered under different winter covers when subjected to freezing temperature.

fiber which excelled in the exposed green and performed well otherwise. The data from this trial suggest that there is little concern for a decrease in effectiveness between new and 2 year old wood fiber covers. Even if you are on a budget and would like to use a cover, the generic green tarp was comparable to the other covers included in the study and yielded significantly better quality than the uncovered turf.

The freezing tolerance of turf coming out from winter covers is another important consideration when considering a winter cover. This spring proved to be quite mild once the snow had finally melted so we did not see freezing injury associated with winter hardiness. However, next year could be entirely different. The winter hardiness (or lack of) is also related to the decline in turf quality following cover removal. The reduction in turf quality was observed in this study but only to a limited extent. Had we suffered severe freezing temperatures following cover removal we would have seen a greater reduction in turf quality.

It is important to remember that the results presented here are on the basis of one year's research and was subjected to the weather of a single winter. Products that worked well under these conditions may not perform the same during a winter with little snow and extreme temperatures.



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