Covering up

By Michael Goatley, Jr.

Sports turf managers in both the north and south have found numerous ways to use turf covers to extend their turf's growing season, protect their fields from environmental extremes (particularly cold and moisture), and by doing these things, covers help maximize field use potential. Covers are used for low-temperature protection of both warm- and cool-season fields, and to maximize turf recovery and establishment from late-season seed and sod installations in preparation for spring sporting events.

Unfortunately, no single type of cover meets every need of a sports turf manager. Differences in cover composition, thickness, and color play major roles in how a cover will perform. One must also consider practical factors such as cost, lifespan, ease in handling and applying, and storage characteristics.

The following is a summary report from 15 years of field research and my personal observations on the use of various covers on sports turf:

'Riviera' bermudagrass color response in late November in Blacksburg, VA as influenced by the application of covers to prevent frost damage.

Cover sources and temperature modification

With the support of numerous Mississippi State University faculty and staff, I conducted a 3-year research trial measuring how various cover sources modified the surface temperatures of a bermudagrass golf green. Though the applications in the research were for the winter protection of a sand-based golf green, the relative effects on temperature from cover application apply equally to both warm- and cool-season sports fields.

Of course, the amount of light transmission is an important consideration in how long a cover can stay in place when turf growth is desired. The data that are typically of most interest, though, are the effects of the covers on maximum and minimum soil surface temperatures.

Almost all covers were successful in elevating soil surface temperatures as compared to the uncovered control but remember that these increases in temperature are accompanied by concerns as well. For instance, the experimental OB (looks and performs much like a clear plastic) consistently provided the highest daily maximum mean temperatures in the 3 years of the trial, but these high temperatures also increased the likelihood of breaking bermudagrass dormancy in either late winter or early spring. This enhancement of dormancy break could be a desirable feature for the use and playability of spring sports, but it also might cause serious problems in the long-term performance of the bermudagrass turf if the early season growth can not be properly protected by covering when spring freeze or frost events occur.

This is an important consideration in the use of any cover for accelerating spring growth — can the early-season investment in plant growth and development (all of which requires the utilization of carbohydrates within the plant) be adequately protected from the highly variable temperatures of the spring period?

What about covering effects on minimum daily temperatures? All commercially available covers tended to increase the average daily minimum temperatures over the uncovered control, and color and thickness generally did not result in large differences between cover sources. The addition of a 2-mm thick reflective film (often used as the external backing of insulation sheeting used in home construction) to the underside of the SL 500 geotextile as an experimental treatment resulted in the highest daily minimum temperatures in each of the 3 years, providing at least a 6 degree F increase in average temperature over the uncovered control.

Is this source the answer to our 'covering prayers'? Maybe, maybe not! It might be if you are interested in maximum cold temperature protection, but the reflective backing will also

likely reduce soil warming in the spring, perhaps working against you if you are interested in early season turf growth or establishment. The addition of the reflective backing converted a permeable geotextile into an impermeable cover. Further research is needed to determine how this cover would perform in long-term applications either as is or when vented to allow for improved moisture and gas exchange.

This research was published in Applied Turfgrass Science (Goatley, J. M., Jr., Sneed, J. P., Maddox, V. L., Stewart, B. R., Wells, D. W. and Philley, H. W. 2007. Turf covers for winter protection of bermudagrass golf greens. Online. Applied Turfgrass Science doi:10.1094/ATS-2007-0423-01-RS.). The full article also details cover effects on daily temperature ranges and averages that might be important in your quest to select the best cover for your situation.

Ongoing research at Virginia Tech on both warm-season and cool-season athletic field turfs is being conducted to further the understanding of how various colored covers can modify sports turf morphology and physiology. Research with single layers of black and white woven polypropylene on 'Riviera' bermudagrass have shown that the application of black covers in mid-late fall to prevent frost/freeze damage to the turf maintains acceptable green turf color until low air temperatures are approximately 23° F or lower. Black, white, and a silver cover all helped sustain turf color into late fall, but when using instrumentation to measure photochemical efficiency (PE, in effect, a measurement of chlorophyll activity) the black cover maintains higher turf PE levels until extreme cold finally damaged the leaves.

We hypothesize that darker colored covers block ultraviolet radiation, thus reducing chlorophyll degradation that otherwise would be occurring due to frost events and the high light intensities of the fall season. Conversely, long-term application of black (or any light impermeable) covers do not work as well in accelerating spring transition to a dense bermudagrass canopy because of the lack of light.

Research by Erik Ervin, Turfgrass Physiologist at Virginia Tech, and Josh McPherson, sports field manager at George Mason University (and former graduate student), similarly reported that different colored covers resulted in different turfgrass responses when applied in either the fall or spring to Kentucky bluegrass. The research stemmed from the desire to accelerate the growth rate and aesthetic quality of a Kentucky bluegrass field in the fall and spring months when temperatures were suboptimal for grass growth. McPherson applied three impermeable vinyl rain tarps (colors of red, blue, and orange) along with a standard cover for short duration covering events (approximately 14 days) in order to accelerate Kentucky bluegrass growth either before or during heavy use periods on the field. In the fall, if daily high air temperatures hit 75-85 F, turf quality declined under the colored rain tarps due to excessive heating and only one tarp improved turf quality. As daytime highs cooled into the 50-60 F range, red, orange, and [green] covers improved turf quality, but the blue cover resulted in even lower quality ratings than the uncovered control, apparently due to poor photosynthetic light quality penetrating the cover. In the spring, all covers improved turf quality after only two weeks of application in mid-March, and the vinyl rain tarps even provided higher growth rates and better turf quality than the green cover. Desirable turf growth and color responses from short term covering in the spring were more closely linked to temperature alone, whereas both temperature and light were important in turf performance in the fall. Based on the results of this study, VT Athletics purchased an orange-colored nonwoven geotextile cover for the football practice field specifically for enhancing spring regrowth prior to the practice season. As evidenced in McPherson's research, the enhancement of turf quality from short-term spring covering is exceptional.

The good and the bad

As desirable as accelerated spring greening is from cover use on either cool- or warm-season grasses, be aware that all of this growth requires 'accountability' from Mother Nature. Due to your manipulation of the growing conditions by covering, the plant has expend-

ed quite a bit of its stored food reserves towards all the new growth. If Mother Nature provides ideal growing conditions for the spring, you might see very little decline in turf quality later that year and might even have a healthier turfgrass plant. However, very often our observation has been that late spring/early summer turf quality in covered areas is noticeably less than that of nearby uncovered turfs and you might even need to use your covers to protect the turf from unseasonable cold that could damage the turf.

Future research

As this article has indicated, many questions remain regarding cover color, composition, and timing of application to gain desirable turf responses. There are many things that we don't fully understand regarding what is happening with the plant itself regarding biochemical, physiological, and morphological responses due to covering. Research is planned to see if the addition of a plant growth regulator such as trinexapac ethyl (Primo Maxx) to a covering program can desirably regulate the surge in spring growth and improve other turf characteristics as well. While there is almost always a situation where a cover can enhance the turf, there really isn't a cover that applies to every situation. ■

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Spring greening response of Kentucky bluegrass after just two weeks of covering.