



Strip-seeding: A new approach for converting cool-season turf

A new method of converting perennial ryegrass to seeded bermudagrass may make the process more efficient and less expensive for golf courses.

The rising cost of water and fungicide applications needed to maintain cool-season turfgrass in the transition zone has increased interest in converting these areas to freeze-tolerant warm-season grasses. Bermudagrass (*Cynodon* species) is used extensively in the transition zone, but until recently no turf-type cultivars had acceptable freezing tolerance. Oklahoma State University released Yukon seeded bermudagrass in 2002, and Riviera seeded bermudagrass soon afterward. Zenith seeded zoysiagrass (*Zoysia japonica* Steud.) also has been used effectively on golf courses in the transition zone of the United States and can be established more cheaply than Meyer zoysiagrass (*Z. japonica* Steud.), which requires vegetative establishment.

Converting an existing stand of perennial ryegrass (*Lolium perenne* L.) to a seeded warm-season grass would commonly be done by treating the perennial ryegrass sward with a nonselective herbicide before seeding. This may require the area to be closed during establishment, however, resulting in a significant loss of revenue at golf courses. In addition, costs associated with purchase of herbicide and seed may be prohibitive for some operations.

Strip-sodding with zoysiagrass

To avoid the expense associated with sodding, Meyer zoysiagrass is routinely strip-sodded into cool-season fairways. During this process, zoysiagrass strips measuring 6 to 12 inches (15.2 to 30.5 centimeters) wide are laid into voids of the same width that have been cut in the existing

cool-season turf and spaced anywhere from 1 to 2 feet (30.5 to 61 centimeters) apart; closer spacing results in faster zoysiagrass coverage (1). The strip-sodding process can be accomplished in a matter of days, and the golf course is then open for play. Hence, establishment costs are minimized, and there is little interruption in golf course revenue flow.

After strip-sodding is completed, the area is managed to favor zoysiagrass cultural requirements. Complete zoysiagrass coverage can usually be expected over a period of two or three years. Past successes with strip-sodding zoysiagrass on golf courses, and the release of freezing-tolerant seeded warm-season turfgrass cultivars, led us to consider the use of strip-seeding to convert a stand of perennial ryegrass to warm-season turf.

Research objectives

Our objective was to evaluate how effectively a perennial ryegrass turf could be converted to Riviera bermudagrass in small plots, and then develop a strip-seeder that could accomplish the conversion on a larger scale.

Methods

Plots measuring 6 feet × 6 feet (1.8 meters × 1.8 meters) were set up in an existing perennial ryegrass stand to evaluate strip-seeding. Four treatments were imposed on the perennial ryegrass sward: broadcast bermudagrass seed; glyphosate broadcast + broadcast bermudagrass seed; and planting bermudagrass in rows to mimic those created by a



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One of four rotating tiller blades mounted on a modified seeder and used to create the 2-inch-wide strip-seeded rows in perennial ryegrass plots and evaluate conversion to seeded Riviera bermudagrass. Photos by J. Fry

strip-seeder, with and without a glyphosate overspray on each row. For the glyphosate broadcast treatment, the herbicide was applied with a backpack sprayer one week before planting.

Before seeding, all plots except those to be established by strip-seeding were core-aerified and verticut. On July 2, 2002, bermudagrass seed was mixed with Milorganite and spread by using a shaker bottle to provide pure live seed (PLS) at 1.5 pounds/1,000 square feet (7.3 grams/square

meter) and nitrogen at 1 pound/1,000 square feet (4.9 grams/square meter).

To plant rows to mimic rows made by a strip-seeder, we modified a slit-seeder. Existing vertically operating knives were removed and replaced with four knives attached to a horizontal crankshaft. Knives had teeth extending obliquely from their perimeter. The unit was operated by using the power takeoff on a tractor and, when set on the soil surface, the knives created four tilled rows 2 inches (5.1 centimeters) wide, 1 inch (2.5 centimeters) deep, and 15 inches (38.1 centimeters) apart, for the entire length of each plot. This resulted in disturbance of approximately 4 square feet (0.4 square meters) in each plot (11% of the entire plot area). Riviera bermudagrass seed was mixed with Milorganite to apply 2.4 pounds PLS/1,000 square feet (11.7 grams/square meter). A shaker bottle was modified to include a tube in its lid to deliver the seed-Milorganite mixture in a narrow row. A hand-held press wheel the same width as the seeded rows was used to firm the surface after seeding.

Immediately after seeding, a band of glyphosate 2.8 inches (7.1 centimeters) wide was sprayed over the rows in one of the strip-seeding treatments to eliminate perennial ryegrass up to 0.5 inch (1.3 centimeters) on either side of the row using the same sprayer and application rate described previously.

Irrigation was applied frequently after seeding, and then every two to three days once seedlings had emerged and had begun to mature. A reel mower was used to cut the study area three days per week at 0.5 inch (1.3 centimeters). Nitrogen from urea was applied every two to three weeks to provide a total of 3 pounds/1,000 square feet (14.6 grams/square meter) between the seeding date and mid-August. In 2003, nitrogen was applied at 1 to 1.5 pounds nitrogen/1,000 square feet (4.9 to 7.3 grams/square meter) every three weeks between early June and mid-August.

Data were collected on bermudagrass coverage and turfgrass quality. The vertical-point quadrant method (3) was used to determine bermudagrass coverage within each treatment plot after growth had ceased in October.

To determine the impact of establishment treatments on turfgrass quality the first two months after seeding, visual ratings were taken weekly in July and August 2002, and monthly averages were determined. Quality was rated on a 0 to 9 scale, where 7 = acceptable fairway quality.

Bermudagrass coverage

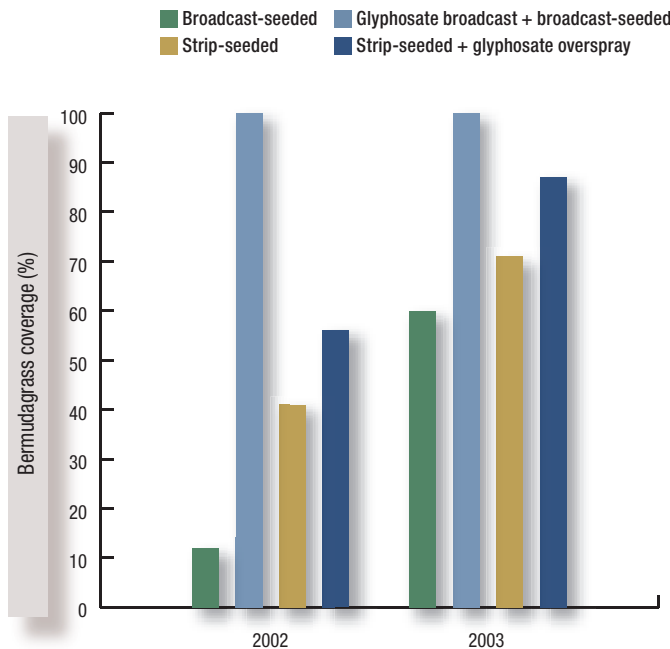


Figure 1. Riviera bermudagrass coverage in an existing perennial ryegrass turf at the end of 2002 and 2003 after seeding in June 2002 using various establishment methods.

Results

Perennial ryegrass plots that were broadcast-seeded with Riviera had 12% bermudagrass cov-



erage at the end of the first year and 60% coverage at the end of the second (Figure 1). Complete bermudagrass coverage the first season was attained by using a broadcast glyphosate application followed by broadcasting bermudagrass seed. Visual observations indicated that complete coverage had occurred within four to five weeks after seeding.

Although strip-seeding disturbed only 11% of the plot area at planting, it resulted in 41% bermudagrass coverage by October 2002 and 71% coverage by October 2003 (Figure 1). Applying glyphosate over the rows removed an additional 11% of the perennial ryegrass and resulted in approximately 15% greater coverage in 2002 and 2003, compared to coverage in strip-seeded rows without a glyphosate overspray (Figure 1). Once bermudagrass coverage exceeds 80%, the superintendent can remove the remaining perennial ryegrass with a broadcast application of glyphosate over the dormant bermudagrass.

Bermudagrass establishment using the strip-seeding method was successful, in part, because it created space, or a gap, which allows the seedling to emerge and develop without the competition of surrounding perennial ryegrass plants. Converting sod-forming cool-season grasses, such as Kentucky bluegrass or creeping bentgrass using the strip-seeding method has not been evaluated. The ability of these grasses to spread laterally would likely create more competition for seeded bermudagrass and affect establishment rate.

Seeding rates

At the seeding rates evaluated here, a seed savings of 79% would have been realized by using the strip-seeder vs. the broadcast method. At the time the study was done, Riviera bermudagrass seed cost \$27.90/pound PLS. At these seeding rates, using the strip-seeder instead of a broadcast method would result in a savings of nearly \$1,600/acre (\$3,394/hectare). Savings also would have been realized in glyphosate and labor involved in aerification and verticutting before seeding.

In a golf course setting, strip-seeded turf could be played on shortly after seeding. Restricting golf cars from these areas would be necessary because traffic can greatly reduce establishment success of seeded warm-season grasses (4). Local rules would have to be implemented for occasions when a ball comes to rest on a seeded row.

By comparison, strip-seeding Zenith zoysiagrass at 1.7 pounds/1,000 square feet (8.3 grams/square meter) into glyphosate-treated strips 3 inches (7.6 centimeters) wide, spaced 1 foot (30.5 centimeters) apart, resulted in 73% coverage by the end of the third season of establishment

in Kansas (4). Bermudagrass is more aggressive than zoysiagrass, and we observed that greater than 80% coverage was achieved in two seasons by using rows 2 inches (5.1 centimeters) wide and 15 inches (38.1 centimeters) apart. Successful establishment of zoysiagrass using strip-seeding in small plots suggests that this species also may be a candidate for conversion of perennial ryegrass turfs using the strip-seeder.

Turf quality

Differences in turf quality were observed among all treatments in July 2002. The poorest quality was observed in plots where glyphosate was used over entire plots (quality = 1.1) or over rows created by the strip-seeder (quality = 3.5). By August 2002, bermudagrass had completely covered glyphosate-treated perennial ryegrass plots, and acceptable quality was observed. Similarly, strip-seeded plots over which glyphosate had been applied also exhibited acceptable quality by August. Using the strip-seeder without glyphosate also resulted in unacceptable quality in July 2002 (quality = 5.9), but recovery occurred by August (quality = 7.1). In general, treatments that resulted in the greatest reduction in perennial ryegrass quality provided the best bermudagrass establish-

Riviera bermudagrass coverage resulting from strip-seeding into perennial ryegrass and then applying a 2.8-inch-wide band of glyphosate over each row. Dormant, straw-brown bermudagrass is shown at the end of 2002 (top) and in the same plot at the end of 2003 (bottom).





The strip-seeder was used to convert a perennial ryegrass turf to seeded Riviera bermudagrass.

ment by the end of the season.

Although initial quality was better in strip-seeded turf than in glyphosate-broadcast-treated turf, one would expect a less uniform appearance to persist for a longer period of time in strip-seeded turf. In autumn and early spring, strip-seeded turf has a nonuniform striped appearance when bermudagrass is dormant and the surrounding perennial ryegrass remains green. Some may consider this striping objectionable.

Strip-seeder development and evaluation

In 2003, a strip-seeder was assembled in the department of biological and agricultural engineering at Kansas State University. The strip-seeder is capable of creating six rows, approximately 2 inches (5.1 centimeters) wide, using tilling devices similar to those employed in the initial evaluation. A seed-fertilizer mixture is retained in seed hoppers and is then deposited on the surface of the tilled row. A press wheel firms the row and then a glyphosate spray solution, originating from a tank mounted on the unit, is applied over the surface. In June 2006, the River Oaks Golf Course in Grandview, Mo., was strip-seeded with Riviera bermudagrass using the seeder described here. The course remained open for play after seeding, and by October 2006, most fairways exhibited greater than 60% bermudagrass coverage.

Summary

Two primary advantages of strip-seeding bermudagrass are: little interruption in use of the turf, which would allow revenue flow of a golf course to continue during the conversion process; and as

much as 80% less seed (by weight) is required, compared with broadcasting bermudagrass seed. Savings are also realized on other practices associated with seedbed preparation before a broadcast application of seed. A U.S. patent is pending on the strip-seeding method and equipment (2).

Superintendents or contractors who are interested in this establishment technique can contact: Topeka Sod Farm, 6506 Cherokee Lane, Ozawkie, KS 66070, Attn: Mike Mallory; phone: (785) 979-4078; e-mail: lpcc@gobluestreak.com.



Dormant Riviera bermudagrass (straw brown) as it appeared in December 2006. The bermudagrass was strip-seeded in June 2006 into cool-season turf at River Oaks GC, Grandview, Mo.

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The research says

→ The increased cost of maintaining cool-season grasses in the transition zone has increased interest in using freeze-tolerant bermudagrasses.

→ This research tested a new method and a new machine for seeding bermudagrass in strips — similar to the practice of sodding in strips — to replace perennial ryegrass on fairways while the golf course remains open.

→ The combination of strip-seeding Riviera bermudagrass and spraying glyphosate over the rows resulted in greater than 80% coverage at the end of the second season.

→ Using the strip-seeder resulted in a 79% savings in the cost of bermudagrass seed; other savings in seedbed preparation were also realized.

→ Until the bermudagrass is completely grown in, strip-seeded turf has a striped appearance (caused by dormant bermudagrass and green perennial ryegrass) in autumn and early spring.