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TURFGRASS TRENDS

WEED CONTROL

Roundup Ready Creeping Bent has Application Trial

Research explores nondestructive transitional methods

By Travis W. Gannon and Fred H. Yelverton

Roundup Ready creeping bentgrass (*Agrostis stolonifera*) (RRCB) is a product of The Scotts Co. and Monsanto that is similar to Roundup Ready agricultural crops that have been commercially available for several years. However, if Roundup Ready creeping bentgrass is approved and receives federal registration, it will be the first genetically modified turfgrass. Recently, much research has been initiated to investigate various applications as well as potential areas of concern associated with RRCB.

Upon the registration and approval of RRCB, golf course superintendents would have the opportunity to incorporate RRCB into new golf course construction or renovate existing playing surfaces. Once RRCB is established, superintendents would be allowed to incorporate Roundup into their weed-control management plans.

Although weed-control programs in RRCB should not rely solely on Roundup, it certainly would be a valuable tool in managing hard-to-control perennial and annual weeds. Specifically, control options are limited with annual bluegrass (*Poa annua*) in creeping bentgrass and typically result in annual bluegrass suppression whereas Roundup has great activity on both annual and perennial biotypes of annual bluegrass. Another scenario where RRCB would be beneficial is in creeping bentgrass putting greens with bermudagrass surrounds.

Bermudagrass encroachment into these greens has been fought by superintendents with barrier and edging systems and herbicides for a number of years; however, if the greens were renovated with RRCB, the superintendent would be allowed to control bermudagrass selectively without adversely affecting the bentgrass. Possible areas of concern with the use of RRCB include outcrossing with other Agrostis species, movement of transgenic seed into nontransgenic areas, and treatment of irregular-shaped areas that are bordered by nontransgenic turfgrass species.

Research trials were initiated to determine if an existing Penncross bentgrass fairway could be renovated with RRCB utilizing nondestructive seedbed preparation in combination with sublethal Roundup applications. The intent was to prepare a seedbed conducive for RRCB establishment without disrupting play. Additionally, with sublethal rates of Roundup, it was hypothesized the growth of the existing Penncross bentgrass could be regulated, which would allow the RRCB to establish.

Sublethal Roundup rates were utilized in an attempt to maintain an acceptable play-

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ing surface during the transition. The objective was to determine if the fairway could be renovated in a nondestructive manner where the playing surface would remain acceptable, hence the course remaining open for play during renovation as opposed to the course closing for renovation. Additionally, the scope of this research allows some insight into the success of interseeding bentgrass into established bentgrass stands.

Materials and Methods

The research trial was initiated at the North Carolina State University Turfgrass Field Laboratory on Oct. 10, 2001, on an established Penncross bentgrass area that was maintained as a golf course fairway at 0.4 inch height of cut. The experimental design was a split plot with a factorial arrangement of treatments, including four replications.

The factorial levels included three seedbed preparation variables and six Roundup-application regimes. Evaluated seedbed preparation variables included: vertical mowing in two directions, vertical mowing in two directions plus core aerification with 0.5-inch hollow tines followed by topdressing, and no seedbed preparation (Figure 1).

The seedbed preparation was conducted, and the resulting debris was removed prior to applying glyphosate. Roundup-application regimes evaluated various initial Roundup applications after RRCB seeding. Initial application timings included at planting, five days after planting (DAP), 10 DAP, two treatments at 14 DAP, and 11 months after planting (MAP) (Table 1, p. 50).

The at planting, five DAP, and 10 DAP utilized 6 fluid ounces per acre (fl oz/a) of Roundup Pro, while the 14 DAP utilized 6 and 9 fl oz/a. The initial Roundup application timing of 11 MAP utilized 1 gallon per acre, and a nontreated plot was used during the initial phase of the research trial.

After the glyphosate application had time to air dry, the RRCB was seeded with shaker jars, and the trial area was topdressed lightly to increase soil-to-seed contact. After seeding, the plots were maintained to encourage the establishment of RRCB and were evaluated to determine the success of interseeding RRCB into an existing Penncross bentgrass fairway. After the initial Roundup application, all treated plots (excluding the 11 MAP or initial nontreated) received monthly Roundup applications through six months after planting to determine if the existing Penncross could be transitioned to RRCB while maintaining an acceptable playing surface.

FIGURE 1

Turf quality was best in plots that were vertically mowed in two directions. This photo was taken 16 weeks after planting.

Monthly Roundup application rates beginning at one month after planting across treated plots were 6, 16, 16, 32, 32, 64 fl oz/a, respectively through six months after planting. Additionally, at eight months after planting, all treated plots received 64 fl oz/a Roundup Pro. At 11 months after planting all plots (including previously nontreated) received 128 fl oz/a Roundup Pro. The 11-month treatment of Roundup Pro (128 fl oz/a) was included to ensure the tolerance of RRCB to higher application rates of Roundup Pro as well as to determine how much RRCB was present in the plots that were previously nontreated, or plots that had received seedbed preparation and were seeded but had not previously been treated with Roundup.

Additionally, this will offer some insight into the effectiveness of interseeding other bentgrass cultivars into existing Penncross bentgrass with seedbed preparation procedures.

The research trial was monitored, and data were collected for one year. Specifically, turfgrass quality (1 - 9 scale with seven being average or that of the nontreated) and percent bentgrass cover (0 to 100 percent scale) were estimated visually, and data were analyzed accordingly.

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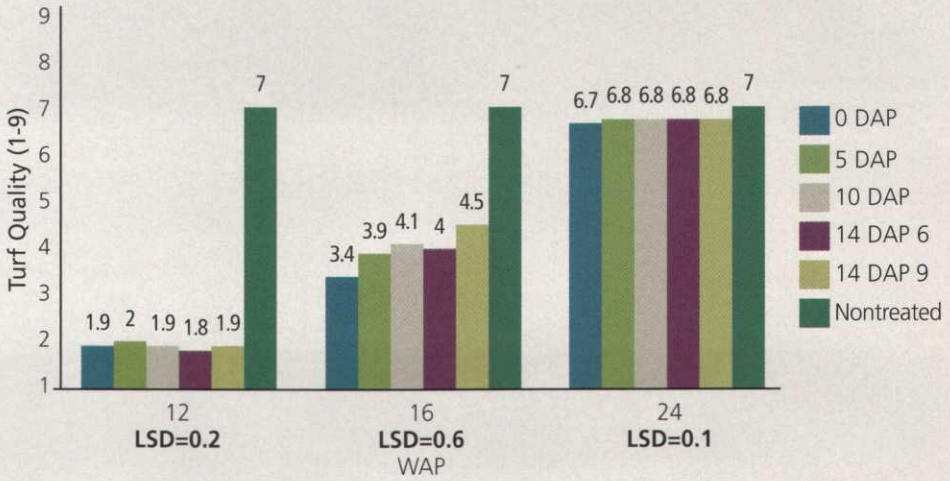
TABLE 1

Effect of Roundup Application Regimen on Turf Quality



DAP: days after planting, WAP: weeks after planting, LSD: least significant difference (P=0.05).

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Results

Data were analyzed and sorted according to Fisher's Protected LSD (P=0.05) and are presented averaged over seedbed preparation or Roundup application regime. Averaged across seedbed preparation at 12 and 16 weeks after planting (WAP), all treatments were providing unacceptable turfgrass quality and RRCB cover (Table 2, p. 52).

At 12 WAP, all treated plots exhibited severe phytotoxicity and nonuniform playing surface with turf quality ranging from 1.8 to 2. At 16 WAP, turf quality had increased, compared to 12 WAP, but remained unacceptable, ranging from 3.4 to 4.5 while RRCB cover ranged from 25 to 45 percent.

It was not until 24 WAP that RRCB cover and turf quality reached an acceptable playing surface. At 24 WAP, averaged across seedbed preparation, RRCB cover exceeded 90 percent in all plots, and no significant differences were present. Additionally, turf quality ranged from 6.7 to 6.8 in Roundup-treated plots. RRCB was not as uniform as the nontreated areas, giving the RRCB a clumpy appearance.

Additionally, averaged across Roundup application regimes at 24 WAP, although significant, turf quality ranged slightly from 6.7 to 6.9. Turf quality was greatest in the plots where vertical mowing was completed in two directions (6.9) followed by no seedbed preparation (6.8) followed by vertical mowing in two directions in combination with core aerification (6.7). Again, these differences were statistically significant, but each provided an acceptable playing surface at 24 WAP. Similarly, all seedbed preparation techniques provided greater than 90 percent bentgrass cover at 24 WAP although vertical mowing in two directions (96 percent) or vertical mowing in two directions in combination with core aerification (95 percent) provided slightly higher RRCB cover compared to that of the nontreated (91 percent).

These data indicate interseeding RRCB into an existing Penncross creeping bentgrass fairway does not provide a timely transition regardless of seedbed preparation technique or Roundup application regime. In this trial, 24 weeks were required to obtain an acceptable playing surface, which is not a timely option for renovation. Once an acceptable playing surface was achieved at 24 WAP, subtle, if any, differences were present with respect to seedbed preparation techniques or Roundup application regimes. Also, vertical mowing in two directions, vertical mowing in two directions in combination with core aerifica-

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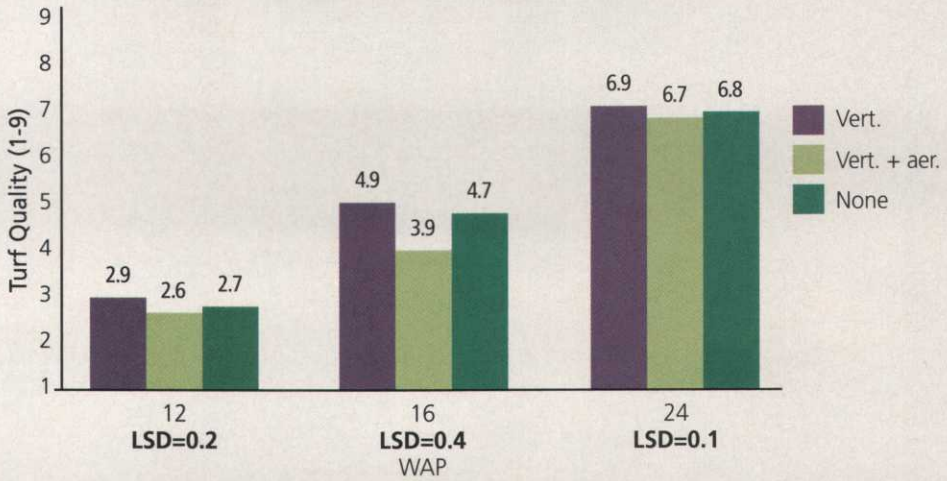
QUICK TIP

With a growing selection of generic pesticides out there, it can be confusing to decide which pest control product is best for you. Because your credibility may be on the line, the best solution to this dilemma is to ask plenty of questions, use your common sense and look for third-party research that compares the products with the industry standards. Beware of "in-house" research alone; third-party data is usually unbiased and can provide a good measure of a product's performance. Don't be afraid to try new technologies, however, as many of these new products are better and can do more than the older, standard products. And be sure to check out the new PRECISE® controlled-release pesticide technology in the future.

TABLE 2

Effect of Seedbed Preparation Techniques on Turf Quality



DAP: days after planting, WAP: weeks after planting, LSD: least significant difference (P=0.05).

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tion, and no seedbed preparation resulted in an acceptable playing surface at 24 WAP, indicating the seedbed preparation might not be required.

At one year after treatment, which was one month after the 128 fl oz/a Roundup application, the previously treated plots exhibited no phytotoxicity. But the nontreated areas, which received seedbed preparation and were seeded but received no Roundup until 11 MAP, were completely desiccated (100 percent phytotoxicity), regardless of seedbed preparation technique. These data indicate Roundup applications during establishment are critical as no RRCB were present in previously nontreated plots, although initial Roundup application timing may range from at seeding to two weeks after seeding. The broader implication of this treatment indicates that interseeding new and improved cultivars into existing bentgrass can be an unsuccessful practice. Also, in the previously treated plots, it demonstrates RRCB was tolerant of postemergent Roundup applications totaling 352 fl oz/a in nine applications in 12 months.

In additional research trials, RRCB was seeded into a conventionally prepared seedbed to compare the establishment and maintenance of RRCB compared to several nontransgenic creeping bentgrass cultivars, including Crenshaw, Penncross, Penneagle, Providence, Backspin, A4 and L93. Data from these trials indicate RRCB responds similarly to conventional nontransgenic bentgrass cultivars grown under fairway conditions with the exception of tolerance to Roundup. Additionally, RRCB established from seed grew in similarly to nontransgenic bentgrass cultivars, indicating seeding RRCB is a viable option for RRCB establishment. Other significant differences in growth habits or characteristics were not noted during the trial period.

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