try reaction to their products has given them enough optimism to invest in more research and development.

"We see that as a major growth area," said John Sedivy, director of business development for ROOTS. "This is not our last biofungicide by any means."

David Warman, business manager of turf and ornamentals for AgraQuest, said his company is developing a fungicide to combat pythium, which should be available at the end of 2007, as well as a natural insecticide he hopes will be on the market by 2008.

Sedivy echoed the view of Tomaso-Peterson that because of failures of companies that came before the present group, superintendents might not take the new products seriously.

He called many of the predecessors "unscrupulous," and said many superintendents are wary about new products.

Superintendent Jeff Carlson has no choice but to use biologicals because his Vineyard Golf Club is forbidden to use synthetic fungicides. Located on the Massachusetts island of Martha's Vineyard, regulators closely monitor the chemical use of the fouryear-old course. He uses EcoGuard in his battle with dollar spot on the A-1 greens. Carlson even set up his own trials to test the product and said it appears to lessen dollar spot severity.

"We saw a difference," said Carlson, who is not formally affiliated with any of the products he uses. "It has real fungicidal properties that I don't see in other biological products out there."

He still gets dollar spot every year, but his goal is to prevent the pitting that can occur when it's at its worst. He said his program is working better than some other areas where he is also experimenting with biologicals.

"I don't lay around in the wintertime wondering what I'm going to do next year," he said of his dollar spot problem. "I do that with weeds and bugs."

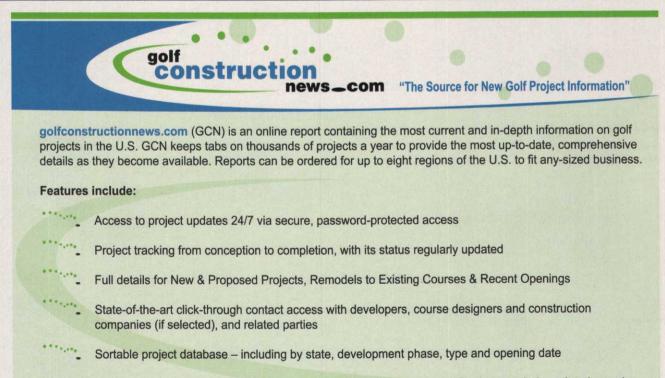
Carlson pays a little more than \$12 per gallon for EcoGuard, and a greens application runs about \$250. He sprays about every 10 days during the course of a season. Carlson does not spray tees, which are L-93, or fairways, which are 70-percent fescue/30-percent colonial bent.

Tomaso-Peterson said she found good results when she applied EcoGuard every seven days in combination with a pound of organic fertilizer.

She foresees cost-conscious golf courses as the first to embrace the new biologicals because it can mitigate the use and ultimately the expense of synthetic-based pesticides.

"I think you can do a lot of control for a lot of diseases," she said. "For the low-budget golf courses, what a wonderful thing."

Pioppi is a contributing editor for Golfdom.



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few months ago I had the opportunity to travel almost 3,000 miles through South Africa visiting golf courses and sod farms. Although a week in Africa does not qual-

ify me as a geopolitical expert, unless I am on cable news, my views of Africa are changing. Prior to leaving, my perception was that most of the developed world has disregarded Africa. The problems that the continent has and continues to face — genocide, AIDS, apartheid, civil war and famine — seem insurmountable.

However, Africa is also home of tremendous natural beauty and ecological diversity. It is a continent that contains abundant natural resources, and it is the cradle of mankind. There are countries, like Botswana, that have stable democracies that are seeing an infusion of foreign capital. Ecotourism is growing and indirectly has fueled wildlife protection and conservation initiatives.

In South Africa, infrastructure issues, poverty, unemployment, crime, crippling diseases and integration continue to plague it 12 years after the first national election. But as its economy continues to grow, albeit modest, (inflation was more than 10 percent in 2002, but it has ebbed to 5.5 percent; and the GNP is growing faster than 4 percent) an expanding middle class is likely. In conjunction with a growing economy and subsequent disposable incomes, golf is on the rise.

Overall, there are about 450 golf courses in the country, but we would only consider about 100 of those as having a budget with buying power. Currently, there are more than 20 golf course projects with internationally recognized architects in some stage of planning or construction. Almost all are tied to commercial/ home development. One course opening soon, Pinnacle Point in Mossel Bay, has a stretch of seven golf holes along the Indian Ocean that is as dramatic as Pebble Beach or Old Head. It is also one of the first courses to establish seashore paspalum in its fairways and rough.

The predominant turfgrass species is kikuyugrass. It is found throughout the country on golf course fairways, tees and roughs, as well as athletic fields and lawns. The largest sod farm (Evergreen, 750 hectares), located outside of

Brave New World Economy

BY KARL DANNEBERGER



EMERGING MARKETS LIKE SOUTH AFRICA CAN OFFER VENUES THAT SHOWCASE THE GREEN INDUSTRY'S POSITIVE IMPACT ON NATIONAL WEALTH Johannesburg, harvests mostly kikuyugrass. Ironically, Johannesburg is located in the Transvaal region, the home of *Cynodon transvaalensis*, one of the parents of the bermudagrass hybrids. For the most part, the bermudagrass cultivars used in South Africa are locally selected.

Temperatures around Johannesburg are extremely hot during the summer, but they can drop below freezing in winter. Kikuyugrass will go dormant in the winter while remaining green in the southern regions, including Cape Town, where moderate temperatures exist year round. The more moderate temperatures in the coastal areas allow for cool-season turfgrass use. For example, the Links Course at Fancourt, which hosted the 2003 Presidents Cup, has a mix of cool-season fairway turfgrasses composed of mostly perennial ryegrass.

Putting greens are predominantly creeping bentgrass, including many cultivars used in the United States. For example, Penn A1, Penn A4, L93 and Dominant are common, and the latest turfgrass equipment and products are available to superintendents from many of the international vendors.

One last geopolitical observation: 15 years ago, people wondered why anyone would care about turf in China with its litany of problems. In 2008, the Olympic Games, which will be known as the "Green Games," are in Beijing, and the rise in its citizens' quality of life (at least in urban centers) has been well documented. Maybe the golf and green industry, in a small way, can contribute to a better way of life in South Africa, too. The World Cup is coming there in 2010.

Karl Danneberger, Ph.D., Golfdom's science editor and a turfgrass professor from The Ohio State University, can be reached at danneberger. 1@osu.edu.

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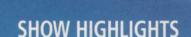
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TURFGRASS TRENDS

WEED CONTROL

Roundup Ready Creeping Bent has Application Trial

Research explores nondestructive transitional methods

By Travis W. Gannon and Fred H. Yelverton

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-Continued on page 48

IN THIS ISSUE

OUR SPONSORS



Continued from page 47

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.

Toratine

QUICK TIP

Despite its benefits. golfers tend to frown on deep plowing rootzones twice a year. So manufacturers continue to develop innovative aerification technology to provide versatile approaches for maintaining physically beneficial rootzones. Good soil chemistry and biology also contribute to good tilth. Products like Maxiplex, CalpHlex and Thatch Buster can be valuable tools in promoting appropriate soil aggregation and thatch evolution in conjunction with conscientious cultural practices.

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.

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.

Continued on page 50

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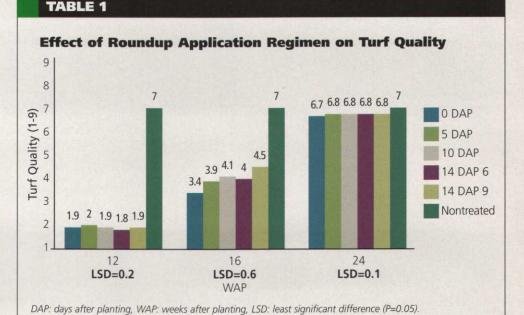


2500E





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.



Continued from page 48

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-*Continued on page 52*