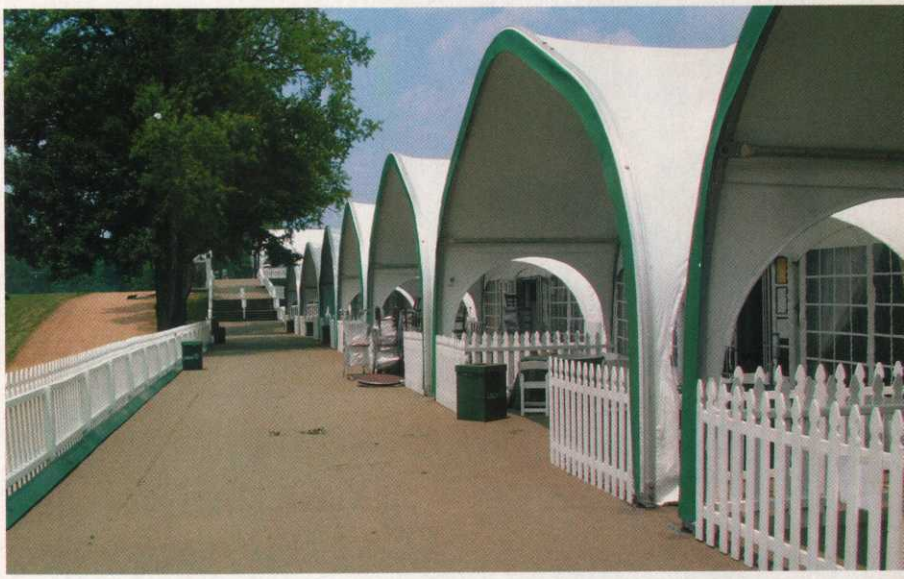

and bruises left behind by the quarter of a million people who traipsed the course. And there will be more scars revealed on the course after the many grandstands, corporate chalets, booths and tents are taken down.

"Everybody is asking me, 'How are you going to clean this up?' " Zimmers says. "They say, 'Aren't you sick about this?' But this comes with hosting a major championship."

Davis says any superintendent who hosts a tournament of this magnitude on his or her course realizes it's going to get banged up.

"When you come into something this big, both on the front end and on the back end, you have to go in knowing that you want to protect your property and your asset, which is the golf course," Davis adds.

Zimmers realizes it will take time to put Humpty Dumpty back together again. His initial intent is to convince Oakmont's members, regarded as the most demanding fraternity in golf, to be patient during the restoration process.

"Part of my job is to reinforce to the members of what we have to do, and that it's going to take time to do it," Zimmers says.

It's obvious where the galleries gathered. The brown bands of turf, which stretch from fairway to fairway, are matted down like a corn crop after the harvest. "There are a lot of areas to seed," Zimmers says.

One of the first things Zimmers had his crew do when they arrived at 7 a.m. Monday was to "vent" (Zimmers' term for aeration) Oakmont's prized greens. "The greens are a under stress; they're a little dinged up," Zimmers says. "We put needle tines in them to get oxygen to them."

*Continued on page 52*

**Oakmont, as expected, was a little dinged up after the U.S. Open. (Top left) A crew worker waters the stressed ninth green. (Top right) John Zimmers Jr. studies the course from the grandstand. (Above) A row of corporate chalets waits to be lowered.**

## Assistants Return to Assist

It was reunion of sorts for John Zimmers Jr. and several of his former employees at Oakmont Country Club during the U.S. Open. Zimmers, who has been at Oakmont for almost eight years, has employed several assistants who have moved on to be head superintendents at golf courses throughout the country. But they all returned to volunteer on Zimmers' crew for the championship. They are:

- Ron Pusateri, St. Clair (Pa.) Country Club.
- Doug Drugo, Wee Burn Country Club in Darien, Conn.
- Jim Roney, Saucon Valley Country Club in Bethlehem, Pa.
- Jim Thomas, Deal (N.J.) Golf & Country Club.
- Brent Palich, Sand Ridge Golf Club in Chardon, Ohio.
- Travis Livingston, Sewickley (Pa.) Heights Golf Club.
- Eric Snelsire, GlenRiddle Golf Club in Ocean City, Md.
- Scott Cook, Cedarwood Country Club in Fort Mill, S.C.
- Jason Hurwitz, Fox Chapel (Pa.) Golf Club.



**(Top) It's obvious where the galleries gathered. Brown bands of turf stretch from fairway to fairway. (Middle) John Zimmers Jr. addresses his crew late Monday morning about the "restoration" of the course. (Bottom) Tom Haluck (left) and Brian Fritz pick up plywood and load it on a utility vehicle. For three months, Fritz and Haluck's sole duty was to lay down plywood on the turf to create a temporary road for construction and vendor vehicles.**

*Continued from page 51*

The fact that the temperature on this sunny and hazy day is nearly 90 degrees has Zimmers even more concerned about the greens. It is a topic of discussion, as Zimmers takes a call on his radio from his tournament assistant Brendon Clark.

"How we doing with our water and syringe team?" Zimmers asks him.

"We'll have to hit the greens three or four times this afternoon to cool them off," Clark answers.

While riding in his utility vehicle near the ninth green, Zimmers points to a gravel road running through the middle of the golf course. Two of the roads were built last November to provide transport for construction crews to get around the course to build the grandstands, chalets, concession stands and other structures. Zimmers will be glad when the roads are gone.

Zimmers feels the same about the many vendors, from merchandisers to the media, and their belongings. The sooner they vacate, the sooner he and his staff can restore the course.

Zimmers also keeps a watchful eye on the vendors as they dismantle their booths and haul their supplies away. He says they haven't been as careful with transporting their stuff off the course as they were with bringing it on. When Zimmers sees a vendor riding a utility vehicle where he shouldn't, he chases after him like a state trooper after a speeding sports car. Then Zimmers stops him and scolds him.

"We have to make sure they still understand that we have rules," Zimmers says.

Overall, the course looks in decent shape, considering what it could have looked like. The weather was sunny and dry for the most part during the championship. A rainy week could have meant a mud fest, which could have produced some unsightly course damage.

It's about 2 p.m., the time Zimmers told his crew to go home for the day. Most of the crew members are going on about 20 hours of sleep during the past four days.

"I stressed to the guys that they have to manage themselves," Zimmers says. "They just can't just push, push, push."

About 2:30 p.m., Zimmers happens upon two of his crew members — Brian Fritz and

Tom Haluck — who are picking up plywood and loading it onto a utility vehicle. Zimmers glances at his watch and reminds them that it's past time to go home.

For three months, Fritz and Haluck's sole duty has been to lay down plywood on the turf to create a temporary road for construction and vendor vehicles. And when the vehicles pass through, they pick up the plywood. It's a thankless chore, albeit an important one, and Zimmers says he's proud of their effort.

Remarkably, Zimmers doesn't look like someone who has had about four hours of sleep for each of the past four nights. He looks tanned and alert. There's no sign of him enduring a U.S. Open hangover, with the exception of an occasional yawn.

He might be fueled by adrenaline. It's obvious the fond memories of hosting his first Major tournament are fresh in his mind. He says it still hasn't hit him that it's over.

"Somebody said to me last night, 'That was great. What are you doing to do next?' I felt like saying, 'I'm going to Disney World.' "

The memories will be etched in Zimmers' mind long after he's retired from the profession. Some of them are simple, like walking the course and listening to the spectators talk. Or how relaxed he felt after removing his shoes for a few minutes after being on his feet for hours.

Zimmers says he will never forget how his staff, especially his assistants — Bentley, Clark, David Delsandro and Chris Markel — performed so gracefully under pressure. "I've never seen them at the level they were at," he says. "I'm so proud of what the assistants and the entire staff accomplished."

Some of his memories are more sentimental. As with any Major tournament, a course's maintenance staff is augmented with volunteers to help with all of the work. Zimmers' staff included about 125 volunteers, many of whom are his peers and friends, such Paul R. Latshaw, his mentor; Paul B. Latshaw, certified superintendent of Muirfield Village Golf Club; Matt Shaffer, superintendent of Merion Golf Club; Eric Greytok, superintendent of Remington Ranch; and several former assistants. It was so good to spend time with them and have them part of the event, says Zimmers, who misses them now that they're gone.

"There's an emptiness," he says softly.

Perhaps the greatest memory Zimmers will retain is the reception he received from Oakmont's members, who are known as a tough bunch of people who rarely exhibit a tender side. After the tournament, several of them took to the 18th green — proud of their course for hosting its eighth U.S. Open. They were also proud of their course's superintendent. Their eyes welled with tears as they hugged Zimmers and congratulated him on his efforts.

Says a touched Zimmers, who fought back tears of his own, "*That* was my trophy." ■

## It Wouldn't Be a U.S. Open Without Some Grumblings

*By Larry Aylward*

Mike Davis

It wouldn't be a U.S. Open if there weren't players and media who didn't gripe about the host course's setup. Phil Mickelson and a few others took their turns to grumble about the setup at Oakmont Country Club near Pittsburgh last month during the championship.

Mickelson, who missed the cut after shooting 77 for the second round, blamed the course's setup for injuring him. He also called Oakmont's rough "dangerous."

Mickelson, of course, injured his left wrist prior to the tournament hitting out of deep rough around the greens during a practice round at Oakmont. But he vowed to play in the championship and did before bowing out at 12-over par after two days of play.

"It's disappointing to dream, as a kid, about winning the U.S. Open and spend all this time getting ready for it and have the course setup injure you," Mickelson said after the second round.

While complaints about the setup are expected, Mickelson's comments surprised Mike Davis, the United States Golf Association's (USGA) senior director of rules and competitions, and John Zimmers Jr., Oakmont's golf course superintendent.

"[His comments] got me, they got our membership, and they got the USGA," Zimmers told *Golfdom*. "Simply put, 99 percent of the players said it was the hardest U.S. Open they have ever played in. But it was absolutely the fairest one, too. It was a true test of golf."

Davis said the USGA thought Mickelson's comments were "perplexing."

"Maybe in this litigious society, where you're not responsible for anything that happens to you, maybe this was just something where he didn't want to be responsible, and he wanted to put the blame on someone else," Davis said. "I don't think the USGA is ready to all of the sudden have no rough at the U.S. Open because somebody hurt his wrist in it three weeks before. But having said that, I will say Phil is a good player, and he was playing such great golf coming into the U.S. Open that it's too bad he hurt his wrist."

Mickelson wasn't the only one making a stink. Rory Sabbatini said he might go fishing the next time the U.S. Open is held at Oakmont. Several media members criticized the setup as well. One report said "Oakmont was on the edge of being close to impossible Friday afternoon, and the USGA responded by twice watering the greens overnight, then again two hours before the third round."

Zimmers said the course was "far from being unplayable." The greens were watered not in a panic to slow down the greens but because he and his crew were simply tending to the golf course, Zimmers said. "That's what we should do," he added.

Throughout the tournament, Zimmers said he and USGA staff members measured the course's firmness to ensure fair playability. "We wanted to make sure we were giving them the same golf course they had during the practice rounds," he added.

On the final day of the championship, Zimmers said he thought of the late Henry Fownes, who designed Oakmont in 1903 to be the toughest golf course in the country. With Angela Cabrera winning the tournament at 5-over par, it struck Zimmers that Fownes had succeeded. "He must be very proud," Zimmers said. ■

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TURFGRASS TRENDS

NEONICOTINOIDS

# Neonicotinoids Show Good Control With Sucking Insects

*By David J. Shetlar*

Over the last decade, the U.S. Environmental Protection Agency has been undergoing the process of reviewing previously registered pesticides under the dictates of the Food Quality Protection Act. This process uses higher standards for pesticide residues, potential exposure to "higher risk" groups such as children and pregnant women, total lifetime exposures and other factors.

The bottom-line result of this effort has been the restriction of most of the organophosphate and carbamate insecticides from urban landscape use. Most of these insecticides still can be used in agricultural production, but few companies wanted to go through the expense of supporting these insecticides for urban residential use when they were off patent, and there was no guarantee that EPA would allow the materials to be used even after gathering the new data. This has forced the chemical companies to look at alternate chemistries with a keen eye toward finding more selective materials and molecules that pose fewer risks to humans and the environment.

One of the first insecticides to satisfy this lower-risk category was imidacloprid. This was one of about a half-dozen molecules that were variously called nicotinoids, chloronicotinoids, thianicotinoids and similar names. Neonicotinoid is now the general category name accepted by most chemists. As the name implies, these chemicals resemble natural nicotine, and these molecules bind to the nicotinic-acetychloline receptor sites of post-synaptic nerves. The result is that neural transmission between two nerves is greatly restricted or even stopped. Apparently, insects and some other invertebrates can have 20 times or more of these specific nicotinic receptor sites than found in vertebrates. This results in a significant difference in susceptibility to neonicotinoids between insects and vertebrates. While imidacloprid was the first neonicotinoid to be registered for turf, the others in this category were generally received registrations in agricultural, nursery and greenhouse sites before residential turf registrations were obtained.

Part of this lack of registration for the turfgrass industry appears to have been a naive thought, "Oh, that's just another neonicotinoid!" This is like stating that isofenphos (Oftanol) technical, which has a rat oral LD50 (median lethal dose, or the amount required to kill 50 percent of the tested population) of 20 mg/kg, is the same as malathion technical which has an LD50 of 1,000 mg/kg. In addition to this difference in native toxicity, isofenphos and malathion affected and were registered for control

*Continued on page 56*

## IN THIS ISSUE



## OUR SPONSORS

**TABLE 1**

**Some properties of neonicotinoids registered for turf and landscape use.**

| | LD50[a] | $H_2O$ sol.[b] | KOC[c] | Soil half-life[d] | $H_2O$ stable[e] |
|---|---|---|---|---|---|
| Nitroguanidine subgroup | | | | | |
| Imidacloprid (Merit) | 450 | 580 | 440 | 127 | 440 |
| Clothianidin (Arena) | >5000 | 327 | 166 | 148 | stable |
| Thiamethoxam (Meridian) | 1563 | 4100 | 245 | 111 | -- |
| Dinotefuran (Safari) | >2000 | 39,830 | 22 | 82 | stable |
| Pyridylmethylamine subgroup | | | | | |
| Acetamiprid (TriStar) | 217 | 2950 | 200 | 8.2 | stable |

*a Lethal dose (in mg toxicant/kg body weight) using rats and technical material.*

*b Water solubility (at neutral pH), in mg technical material per liter water.*

*c KOC - constant for binding capacity to organic carbon (the higher the number the greater potential to be bound to organic particles in the soil).*

*d Days for loss of one-half the toxicant in aerobic soil.*

*e Days for loss of one-half the toxicant in neutral water (-- = data not available).*

*Continued from page 55*

of different insect pests. We are seeing these same nuances in the neonicotinoids as well as additional differences. Each neonicotinoid seems to have a spectrum of pests for which it is uniquely suited for control and each seems to have differing systemic action.

If we look at some of the common properties listed for pesticides (Table 1), the neonicotinoids seem to have a range of attributes. The more recent introductions — clothianidin, dinotefuran and thiamethoxam — are category III and possibly IV compounds (remember that formulated products are much less toxic than the technical materials and usually end up being in category III or IV).

Imidacloprid and clothianidin have the lowest water solubilities while acetamiprid and thiamethoxam are moderately soluble, and dinotefuran is highly soluble.

In a similar vein, the KOC (the constant for organic carbon binding potential) of all the neonicotinoids is fairly low except for dinotefuran, which is very low. The larger the KOC number, the more the chemical is bound to organic matter. Perhaps this is why dinotefuran has risen to the top of the heap for control of armored scales — it is highly soluble and doesn't get bound to organic matter. It should infuse plant tissues rather than concentrate in vascular bundles. All the materials are essentially stable in neutral water, and all but dinotefuran and acetamiprid have soil residual half-lifes of more than 100 days.

Studies on honey bee toxicity has produced some interesting differences among the neonicotinoids. Dinotefuran is the most toxic (LD50 = 0.0012) followed by imidacloprid (LD50 = 0.0037), clothianidin (LD50 = 0.004), thiamethoxam (LD50 = 0.024) and acetamiprid (LD50 = 8.09). These data support the toxicological information on neonicotinoids that they have great selectivity of action on insects due to insects having many more nicotinic acetylcholine receptors.

However, applying these insecticides to plants that are in flower or about to flower can have adverse effects on nectar and pollen-feeding insects.

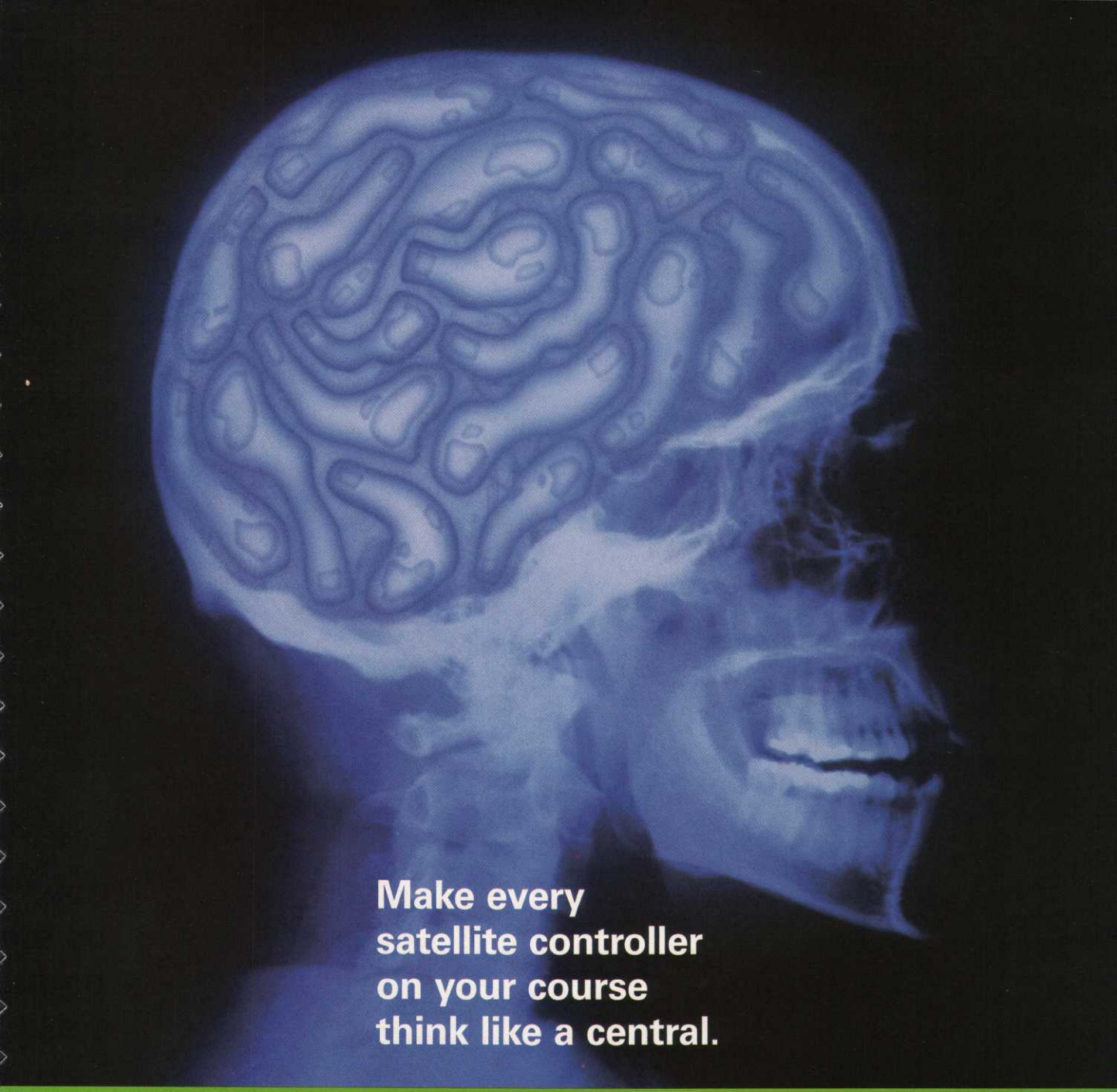
## Neonicotinoids target insects

Early data, based primarily on imidacloprid, indicated that neonicotinoids have excellent activity against sucking insects (primarily *Hemiptera*), *Coleoptera*, and hymenopterous (e.g., sawflies) pests, but poor activity against lepidopterous pests. Because caterpillars can be significant pests of turfgrasses and ornamental plants, neonicotinoids have been combined with pyrethroids. Pyrethroid combinations also appear to improve control of other surface-feeding pests, especially chinch bugs.

In our field evaluation studies, imidacloprid controlled the turfgrass ant, *Lasius neoniger*, only when applied in April or early May when the mound building was first noticed (Tables 2 and 3, p. 58). However, this control (usually 80 percent or better) did not occur until about six weeks to eight weeks after the application. We have three separate studies that demonstrated this phenomenon. However, when thiamethoxam was applied at the same time, control was nearly immediate (Table 3). In a subsequent study, applying thaimethoxam in July also resulted in control of the ants within two weeks. More recent studies have shown that clothianidin has this same rapid ant control action.

Concerning hairy chinch bug control, we have evaluated imidacloprid, clothianidin, thiamethoxam and acetamiprid and all produce excellent results in applications applied in June, July or August. However, when compared to the standard, bifenthrin, which can knock out the chinch bugs in three to five

*Continued on page 58*



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## TABLE 2

**Efficacy of insecticides for suppressing ant mounds from *Lasius neoniger* on golf course fairway No. 11, Crockett's Green Hills Golf Course, Clyde, Ohio, 1999.**

| Treatment/ | Rate | Active mounds/yd$^2$ and (% reduction)[b] | | | | |
|---|---|---|---|---|---|---|
| Formulation[a] | lb.AI/acre | 13DAT | 30DAT | 79DAT | 128DAT | 169DAT |
| Scimitar 0.88GC | 0.06 | 0.1(97) de | 3.1(57)cdefg | 4.4(31)a | 3.9(34)abcd | 3.0(40)bc |
| Scimitar 0.88GC+ | 0.06+ | | | | | |
| Merit 75WP | 0.3 | 0.0(100)e | 5.3(28)abc | 5.1(20)a | 2.5(57)e | 1.3(75)cd |
| Merit 0.5G | 0.4 | 3.4(29)b | 6.3(14)ab | 2.8(57)a | 1.4(77)abc | 0.9(83)d |
| MACH2 2LTI | 1.5 | 1.8(63)b | 3.8(48)bcdef | 6.6(43)a | 3.1(47)abc | 3.1(38)b |
| Fipronil 0.05G | 0.025 | 1.8(63)b | 4.1(43)bcde | 3.3(49)a | 0.1(98)de | 0.1(98)d |
| Talstar 0.66F | 0.1 | 0.1(97)de | 3.4(53)cdef | 5.5(14)a | 5.0(15)e | 2.8(45)bc |
| Talstar 0.66F | 0.2 | 0.0(100)e | 1.4(81)fg | 4.8(25)a | 4.6(21)e | 3.1(38)b |
| Check | -.- | 4.8(--)a | 7.3(--)a | 6.4(--)a | 5.9(--)ab | 5.0(--)a |

*a Treatments applied 27 April 1999; plots 10x15ft replicated 4x, spray volume 1.5 gal/1,000ft2; no posttreatment irrigation.*

*b Data taken 10 May, 27 May, 15 July, 2 September & 13 October based on two 1 yd2 observations from each plot. Mound count sums analyzed by ANOVA and LSD @ " = 0.05. Means followed by the same letter are not significantly different (P < 0.001, < 0.001, = 0.193ns, <0.001, and <0.001 for 13, 30, 79, 128, and 169 DAT periods, respectively).*

*Continued from page 56*

days, these neonicotinoids often take 10 to 14 days to achieve their maximum effect. In one study, we counted the different nymphal instars and adults, and imidacloprid took out the first through third instar nymphs in two to four days, but the larger nymphs took about a week to eliminate and the adults were the ones that took 10 days to 14 days to control.

Control of mole crickets with neonicotinoids has been inconsistent unless you carefully look at the timing of applications. When applied at egg lay to egg hatch, imidacloprid and thiamethoxam have produced very good results. This suggests that the mode of action is to cause the first instar nymphs to stop feeding or stop normal behavior. Of course, this is lethal for such small instars.

While imidacloprid controls the bluegrass billbug very well, it has generally produced poor control of the annual bluegrass weevil. However, recent studies with clothianidin have demonstrated that it has excellent activity against this weevil. This again illustrates that each of these neonicotinoids can affect different spectra of pests.

In our sod webworm control studies, imidacloprid has always resulted in poor control, but applications of clothianidin, thiamethoxam and acetamiprid have been quite effective. Again, this control commonly takes seven to 10 days to be maximized compared to the pyrethroids that achieve maximum control in three to five days.

In future studies, fellow entomologists and chemical companies should be encouraged to fully evaluate all of the neonicotinoids for expansion of their target spectra — especially mole crickets, chinch bug species, weevil species, caterpillar species, crane flies and scales (e.g., bermudagrass scale).

*David J. Shetlar, Ph.D. is the urban landscape entomologist at The Ohio State University in Columbus, Ohio. The "Bug Doc" can be reached at shetlar.1@osu.edu.*

## TABLE 3

**Season-long efficacy of insecticides for controlling the ant mounds of *Lasius neoniger* on a golf course fairway at Crockett's Green Hills Golf Course, Clyde, Ohio, 2000.**

| | Rate | Active mounds/yd2 and (% reduction)[b] | | | | | |
|---|---|---|---|---|---|---|---|
| Treatment[a] | lb.ai./A* | 7 DAT | 14 DAT | 28 DAT | 8 WAT | 12 WAT | 21WAT |
| Talstar 0.2G | 0.20 | 2.4ef(87) | 7.3cd(46) | 10.5a(26) | 10.1ab(0) | 10.8a(0) | 5.9a(2) |
| Fipronil 0.0143G | 0.025 | 10.6bc(37) | 11.0abc(18) | 11.1a(22) | 6.4c(20) | 2.3cd(63) | 0.8b(88) |
| Merit 75WP | 0.40 | 11.1abc(11) | 8.9bc(34) | 5.8b(60) | 0.3d(97) | 0.1d(98) | 2.4b(60) |
| Meridian 25WG | 0.26 | 5.6de(60) | 3.0de(78) | 0.8c(95) | 0.1d(98) | 0.1d(98) | 2.0b(67) |
| Meridian 25WG + | 0.26 | | | | | | |
| Scimitar 0.88GC | 0.06 | 0.4f(98) | 0.0e(100) | 1.4bc(90) | 0.5d(94) | 0.6d(90) | 1.3b(79) |
| Check | -.-- | 14.8 a | 13.4ab | 14.3a | 8.0bc | 6.4b | 6.0a |
| | ANOVA | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | =0.001 |
| | LSD@0.1 | 3.998 | 5.396 | 4.622 | 3.290 | 3.571 | 2.639 |

*a Treatments applied May 17, 2000, to plots 10 x 15 ft replicated 4x. No post-treatment irrigation. *Pound of Active Ingredient per Acre.*

*b Data taken 25 May, 1 June, 15 June, 13 July, 10 August and 12 October based on the same central 2 yd$^2$ area observed each time within each plot. ANOVA and LSD on plot totals. Means followed by the same letter are not significantly different at " = 0.05 (NOTE: confidential products removed).*

# How Do The New Bentgrasses Stack Up?

## Declaration, Kingpin, Authority, 007, Memorial and T-1 deserve some consideration

*By Cale A. Bigelow*

Several studies throughout the United States document the performance of the most recent generation of bentgrass that arrived on the scene in the 1990s. One study in central North Carolina evaluated 20 cultivars at two locations (Durham and Pinehurst) and reported that all cultivars tested provided appearance or quality equal or better than Penncross (Bruneau et al., 2001).

At the Pinehurst location on a restricted air movement putting green, the effects of mowing heights of 5/32-inch versus 1/8-inch and fungicide (whether to go with or without) were monitored closely.

The results showed that in the restricted air movement environment four cultivars — A-1, Crenshaw, G-6 and L-93 — were generally superior to Penncross, but varied slightly depending upon the specific management regime examined.

In this era of decreasing maintenance budgets and increasing labor and fuel costs, one area that might be prone to a reduction in spending would be the area of pesticides. Thus, a primary interest for many golf course managers has been cultivar disease resistance. Previous studies have shown significant differences among cultivars.

In a Northern location in Wisconsin, Penncross, Penn G-2 and Penn A-4 were evaluated. In that study the cultivars ranked Penncross better than G-2 and A-4 for dollar spot resistance. The researchers suggested the higher shoot density of the G-2 and A-4 may have contributed to increased spread of the dollar spot fungus from leaf to leaf. In the North Carolina study, several cultivars had good dollar spot resistance including A-1, A-4, Cato, Dominant Blend, G-2, G-6, L-93, Penncross, Pennlinks, Providence and Mariner.

It was interesting to note that no cultivar had better dollar spot resistance than Penncross, which was more resistant than Backspin, Century, Crenshaw, Imperial and 18th Green. In addition, several cultivars were noted for good brown patch resistance at both mowing heights studied. These included Cato, L-93 and Providence.

Some may ask if it isn't broke, then why try and fix it? We have grasses like the Penn A and G series and other cultivars like L-93 with very good dollar spot resistance, so why change?

Even today, more than 15 years after its introduction, many respected golf course managers and agronomists still recommend A-4 or the A-1/A-4 blend for new putting greens and "gas and grass" renovations. Perhaps people are comfortable with it just because of its track record and the fact that these cultivars are proven performers at some of the most well-recognized golf courses. But that philosophy has never satisfied turfgrass scientists and breeders as we are constantly striving to improve conditions and provide practical solutions to modern management challenges.

### How cultivars rate

Today there are even more choices in bentgrasses. Based on my experience and that of some other turfgrass scientists, many of these cultivars appear to have much narrower regions of adaptation. Some cultivars perform very well in certain regions while they are poor performers in other locations.

Additionally, there seems to be some reluctance to adopting the most recent generation of high shoot density bentgrasses due to a perceived increase in maintenance requirements. This has resulted in some breeders marketing their bentgrasses as the ones that provide "championship conditions without the championship maintenance needs" compared to "the forgiving bents."

Regardless, some improvements have been made. What follows is a short discussion on my observations regarding these advancements.

Our recent cultivar evaluations for putting green use have been associated with our participation in the 2003 National Turfgrass Evaluation Program putting green trial in which we also included several "industry standards" of local interest. Our trial is located on a clay-based native soil push-up research putting green that has accumulated approximately 3 inches of a sand topdressing mixture. It is located in full sun, receives about 3 pounds of nitrogen per 1,000 square feet per year, irrigation to supple-

*Continued on page 60*

**TABLE 1**

**Visual quality, shoot density and canopy smoothness ratings of 26 creeping bentgrass cultivars grown on a native soil research putting green at Purdue University, West Lafayette, Ind.**

| Cultivar | Mean Annual Quality 2004-2006 | Mean Summer Quality 2004-2006 | Shoot Density Aug. 2005 | Canopy Smoothness Aug. 2005 |
|---|---|---|---|---|
| | visual ratings (1-9 scale) | | | |
| Benchmark | 7.6 | 7.7 | 8.0 | 6.7 |
| Declaration | 7.6 | 7.6 | 7.0 | 7.7 |
| Kingpin | 7.5 | 7.5 | 8.7 | 7.0 |
| Penn A1 | 7.5 | 7.5 | 7.7 | 8.0 |
| Authority | 7.4 | 7.4 | 8.3 | 8.3 |
| IS-AP9 | 7.4 | 7.4 | 8.0 | 7.7 |
| 007 | 7.4 | 7.4 | 8.3 | 7.7 |
| Memorial | 7.4 | 7.4 | 7.3 | 8.3 |
| T-1 | 7.3 | 7.3 | 8.0 | 7.7 |
| Mackenzie | 7.2 | 7.3 | 8.8 | 6.0 |
| Shark | 7.2 | 7.2 | 8.3 | 8.0 |
| Penn A4 | 7.1 | 7.1 | 7.8 | 8.3 |
| CY-2 | 7.1 | 7.1 | 7.3 | 8.0 |
| Tyee | 7.1 | 7.1 | 8.7 | 5.7 |
| Bengal | 7.0 | 7.0 | 7.7 | 7.3 |
| 13-M | 7.0 | 7.0 | 7.0 | 8.0 |
| LS44 | 7.0 | 7.0 | 7.3 | 8.3 |
| Alpha | 7.0 | 7.0 | 8.0 | 8.0 |
| Independence | 6.8 | 6.8 | 8.3 | 7.7 |
| L93 | 6.5 | 6.5 | 7.3 | 8.7 |
| Pennlinks II | 6.4 | 6.4 | 5.7 | 8.3 |
| Backspin | 6.4 | 6.4 | 6.0 | 8.7 |
| Pennlinks | 6.2 | 6.2 | 5.0 | 8.7 |
| Crenshaw | 5.9 | 5.9 | 6.7 | 9.0 |
| Providence | 5.8 | 5.8 | 5.3 | 9.0 |
| Penncross | 5.7 | 5.7 | 5.0 | 9.0 |
| LSD (0.05) | 0.4 | 0.4 | 1.0 | 1.0 |

*Quality was rated on a 1-9 scale where 9= optimum greenness, density and uniformity values > 6 equal acceptable putting green turf. Shoot density was rated on a 1-9 scale where 9=densest turf. Canopy smoothness was rated on a 1-9 scale where 9=smoothest canopy following one full day of active growth.*

*To determine statistical differences among cultivars, subtract one cultivar's mean from another cultivar. Statistical differences occur when this value is larger than the corresponding LSD value (LSD 0.05).*

*Continued from page 59*

ment natural rainfall and is mowed daily during the growing season at 0.140 inches with a triplex mower, core cultivated twice annually and supplementally topdressed with a moderate amount of sand on two other occasions during periods of active growth.

Fungicides are applied primarily to control dollar spot on a curative basis. These soil and moderate maintenance intensity programs are fairly common throughout our region.

Following three consecutive years of evaluations, I have broken the bentgrasses out into three tiers. The first tier includes 10 cultivars (Benchmark, Declaration, Kingpin, Penn A1, Authority, 007, Memorial, T-1, MacKenzie and an experimental IS-AP9) that have shown consistently high overall appearance. This attributed primarily to very high shoot density, fine leaf texture and consistent seasonal color as well as good to excellent dollar spot resistance (Table 1). Many of these cultivars, eight of the 10, are relatively new to the market.

The second tier includes 13 cultivars that have also generally performed well, but do not rate with the best of the best.

The third tier is a group of cultivars with poor performance relative to the best and surprisingly includes many widely planted cultivars (Penncross, Providence, Pennlinks, Pennlinks II, Backspin and Crenshaw). These cultivars do not rate as highly because they possess coarser leaves, less shoot density or a noticeable loss in summer shoot density, and in some cases, they are very prone to dollar spot. In general, those cultivars in the third tier can perform adequately for some lower-end golf courses with lower expectations. However, better cultivar choices are available for this portion of the cool-humid region and should be strongly considered.

This trial is an excellent one in which to observe genetic improvement, particularly among the Penn cultivars. There are several generations represented, and a one-time industry standard, Penncross, is among one of the poorest performers. This should be no surprise as it is more than 50 years old. Only slightly better than Penncross is Pennlinks, which is no different than Pennlinks II. Both of these, however, are inferior to Penn A-4, which is only barely similar to the most superior Penn A-1, which has the highest numerical value/ranking. In our trial, the major difference associated with the higher value of Penn A-1 versus A-4 is the severe susceptibility of A-4 to dollar spot in our study location.

Now the real question, which I frequently get: If I were asked to recommend a cultivar for putting greens from the Penn family, I would probably lean toward A-1 rather than A-4.

I would also strongly encourage someone to consider Declaration, Kingpin, Authority, 007, Memorial and T-1. These cultivars from my data have shown that they all maintain a high level of late-summer shoot density; the

*Continued on page 62*