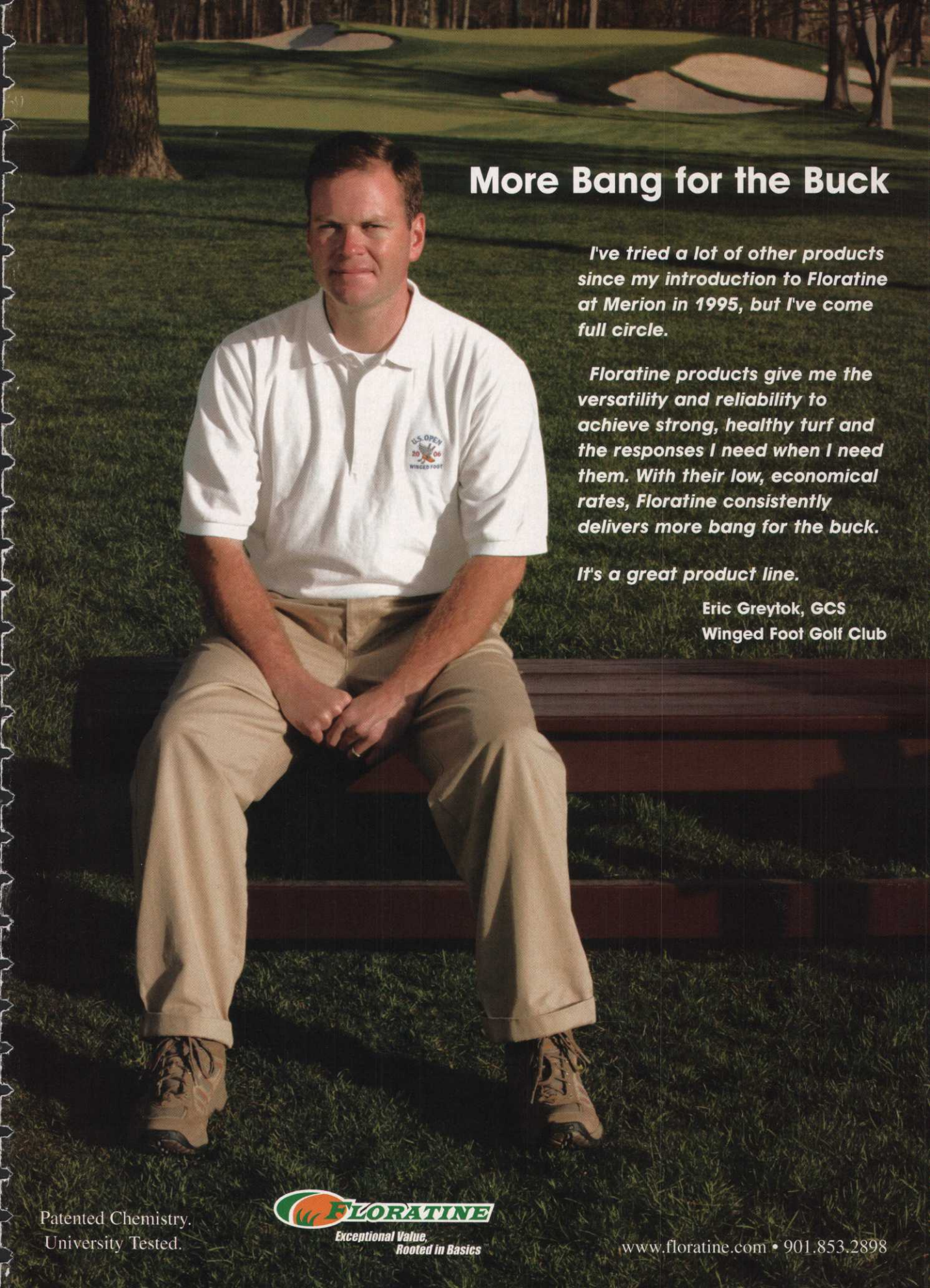

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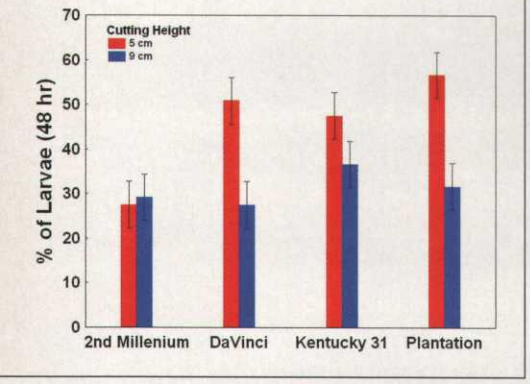
FIGURE 1



Higher cutting reduced larval settling response on three of four cultivars.

Continued from page 48

ance to insect feeding damage, tall fescue is reputed to be highly tolerant, possibly because of its large, tough root and shoot tissue (Murray and Powell, 1979).

Another reason that tall fescue may be more resistant to insects is that fescue plants often harbor a fungal endophyte (*Neotyphodium coenophialum*) that forms a symbiotic relationship with the turf plant and enables the plant to produce several chemical compounds in the leaf and leaf sheath called alkaloids. It is these alkaloids that provide a chemical defense against surface-feeding insects (Prestidge et al, 1982; Siegel et al, 1987; Murphy et al, 1993).

Many other benefits of endophytes have also been observed. For example, increased seedling survival has been observed in endophyte-enhanced tall fescue where the soil was infested with the fungal organism *Rhizoctonia zeae* (Gwinn and Gavin, 1992). Mature endophyte-enhanced cultivars generally possess enhanced growth and recovery, greater drought tolerance (Arachevaleta et al, 1989; West et al, 1990), and superior deterrence to nematode and mammalian herbivory (Bacon and Siegel, 1988; Siegel, et al, 1985). Endophytes may also help in terms of fertilizer use, since endophyte-infected Chewings fescue was shown to have a higher nitrogen uptake capacity than non-endophyte fescue (Richardson et al, 1999). The relationship of endophytes with disease suppression is unclear. However, in a greenhouse experiment, endophyte-enhanced tall fescue recovered more quickly from brown patch (*Rhizoctonia solani*) than nonendophyte-enhanced tall fescue (Burpee, 1992).

Currently, there is very little scientific data regarding the effect of simply varying common management practices like mowing and nitrogen fertilization on endophyte expression and insect feeding habits. A previous greenhouse study demonstrated that tall fescue alkaloid concentrations increased when mowing height increased from 1 to 3 inches (Salminen, et al, 2003).

Several alkaloids are produced in the leaf and their relative amounts may also be influenced by nitrogen source. In solution culture, Chewings fescue (*Festuca rubra* L. ssp. cummutata Gaud.) produced two main alkaloids, ergovaline and peramine, with slightly higher ergovaline produced for ammonium fertilized plants (Richardson et al, 1999). It is unclear, however, how the concentrations of each of these compounds actually affect insect herbivory.

Additionally, previous research demonstrated that simply overseeding endophyte-enhanced perennial ryegrass into a Kentucky bluegrass turf significantly reduced bluegrass billbug populations and damage (Richmond et al, 2000). No information, however, is available regarding the effect of overseeding turf-type tall fescue on turf insects. It also is unclear what level of endophyte infection is actually required to reduce insect populations and damage in tall fescue.

In the recent 2001 National Turfgrass Evaluation Program tall fescue cultivar test, a tremendous variation in endophyte levels were observed among the 160 entries which ranged from 0 percent to 94 percent of the seeds infected (Mohr et al, 2002). Thus, if the overall goal in designing a turfgrass management system is to provide a persistent, high quality turf that requires the fewest cultural inputs, especially with respect to insecticide applications, more information regarding the effect of varying cultural practices on endophyte enhanced grasses would be helpful in making reliable management recommendations to turf managers.

Preliminary research

A greenhouse study at Purdue University investigated the effect of two typical lawn mowing heights (2 inches and 3.5 inches) on the feeding habits and survival of a common surface-feeding insect, black cutworm (*Agrotis ipsilom*, Hufnagel). This was studied using mature turf from four commercially available and widely planted tall fescue cultivars (DaVinci, Kentucky-31, 2nd Millennium and Plantation) which varied considerably in their level of endophyte infection (44 percent to 92 percent).

Initially, black cutworm neonates (newly hatched larvae) were fed freshly harvested leaf tissue in a non-choice petri dish experiment and 3rd instar larvae were caged in pots to assess sur-

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vival (Photo 1). In general, neonates showed a stronger preference for clippings harvested from turf maintained at 2 inches with fewer larvae settling on clippings from three of the four cultivars in a 48-hour larvae settling study (Fig. 1).

Furthermore, survival was also reduced by the higher cutting height on two of the four cultivars when larvae were subjected to a five-day feeding study. As expected, among cultivars, fewer larvae settled and fed on the cultivar with the highest endophyte infection level, 2nd Millennium. However, larval settling response was not well correlated with survival.

It is hypothesized that these mixed responses are most likely because of differences in leaf alkaloid concentrations which may vary with endophyte and plant genotype. The survival of 3rd instar larvae varied significantly with cultivar, but seemed to run contrary to our prediction that survival of these larger larvae would also be negatively correlated with endophyte-infection levels.

Further studies and evaluations are required before clear conclusions can be drawn, but biomass of 3rd instar larvae was less on higher-cut tall fescue.

Overall, the early results of these studies are very promising and reinforce the hypothesis that cultivar selection and simple management practices have the potential to provide safe non-chemical alternatives to managing lawn pests.

Currently for black cutworms and perhaps other surface feeding insects, it appears that in order to maximize the beneficial endophyte effects, the turf should be mowed as high as practical (e.g. 3.5 inches), which in turn will result in fewer neonates settling and surviving.

This result should cause an overall reduction in populations of black cutworms. Further studies will continue to evaluate cultivars, mowing height, nitrogen sources and field validation of these greenhouse experiments.

Cale Bigelow is an assistant professor of agronomy/turfgrass science at Purdue University in West Lafayette, Ind. He can be reached at cbigelow@purdue.edu. Doug Richmond is an assistant professor of entomology at Purdue. He can be reached at drichmond@purdue.edu.

REFERENCES

Arachevaleta M, Bacon CW, Hoeveland CS, Radcliffe DE. "Effect of the tall fescue endophyte on plant response to environmental stress. *Agron J.* 1989;81:83-90.

Bacon CW, Siegel MR. "The endophyte of tall fescue." *J Prod Agric.* 2988;1:44-55.

Burpee LL. "Assessment of resistance to *Rhizoctonia solani* in tall fescue based on disease progress and crop recovery." *Plant Dis.* 1992;76:1065-1068.

Gwinn KD, Gavin AM. "Relationship between endophyte infestation level of tall fescue seed lots and *Rhizoctonia zeae* seedling disease." *Plant Dis.* 1992;76:911-914.

Mohr MM, Meyer WA, Mansue C. 2002. "Incidence of neotyphodium endophyte in seed lots of cultivars and selections of the 2001 National Tall Fescue Test." p. [196-201]. In *2002 Rutgers Turfgrass Proceedings.* Atlantic City, New Jersey: December 10-12, 2002. New Brunswick, NJ: Cook College and the New Jersey Agricultural Experiment Station, Rutgers University, In cooperation with the New Jersey Turfgrass Association.

Murphy JA, Suichang S, Betts LL. "Endophyte-enhanced resistance to billbug (Coleoptera: Curculionidae), sod webworm (Lepidoptera: Pyralidae), and white grub (Coleoptera: Scarabeidae) in tall fescue." *Environ Entomology* 1993;22:699-703.

Murray JJ, Powell JB. "Tall fescue," pp. 293-306. *In* R.C. Buckner and L.P. Bush (eds.), Turf. Agronomy Series 20. American Society of Agronomy, Madison, Wis.

Prestidge RA, Pottinger RP, Barker GM. "An association of *Lolium* endophyte with ryegrass resistance to Argentine stem weevil." Proc. N.Z. Weed Pest Control Conf. 1982;353:119-122.

Richardson MD, Cabrera RI, Murphy JA, Zaurov DE. "Nitrogen form and endophyte infection effects on growth, nitrogen uptake, and alkaloid content in chewings fescue turfgrass." *J Plant Nutrition 1999;*22:67-79.

Richmond DS, Niemczyk HD, Shetlar DJ. "Overseeding endophytic perennial ryegrass into stands of Kentucky bluegrass to manage bluegrass billbug (Coleoptera: Curculionidae)." *J Economic Entomology* 2000;93:1662-1668.

Salminen SO, Parwinder SG, Quigley MF. "Does mowing height influence alkaloid production in endophytic tall fescue and perennial ryegrass?" *J Chem Ecology. 2003;*29(6): 1319-1328.

Siegel MR, Latch GCM, Johnson MC. "*Acremonium* fungal endophytes of tall fescue and perennial ryegrass: Significance and control." *Plant Dis.* 1985;69:179-183.

Siegel MR, Latch GCM, Johnson MC. "Fungal endophytes of grasses." Annu. Rev. *Phytopathology.* 1987;25:293-315.

West CP, Oosterhuis DM, Wullschleger SD. 1990. Osmotic adjustment in tissues of tall fescue in response to water deficit. Environ. Exp. Bot. 30:149-156.

TURFGRASS TRENDS

SECTION STAFF

Managing Editor
Curt Harler
440-238-4556;
440-238-4116 (fax)
curt@curtharler.com

Graphic Designer
Tracie Martinez
216-706-3776;
216-706-3712 (fax)
tmartinez@questex.com

Golfdom Staff Contact
Thomas Skernivitz
216-706-3758;
216-706-3712 (fax)
tskernivitz@questex.com

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BLTs

SIMPLE YET SUCCULENT, BACON, LETTUCE AND TOMATO SANDWICHES (MINUS THE MAYO) EPITOMIZE SUMMERTIME

BY MARK LUCE

When I was about 11, my grandfather got it into his noggin to raise pigs. Already with a farm full of cows, bees, cats, dogs, wheat, milo, alfalfa and even some corn, Grandpa claimed the pigs were just a commodity, another way to bring in a small stream of cash.

I know better. He tended pigs because he loved bacon.

Whether wrapped up in wax paper for a harvest lunch break or with chips for dinner, Grandma's BLTs — with each element coming straight from the farm — brought satisfaction every time.

Grandma's summer sandwiches created a BLT connoisseur — me. I have wolfed them down from coast to coast, from middle-of-nowhere mom 'n' pop diners, seemingly abandoned truck-stops, all variations of Denny's, and even once in a high-end restaurant more geared to *foie gras* and mixed grill.

These culinary expeditions, ranging from double-deckers on white, to an avocado addition on the West Coast, have led to firm (but sometimes supple) opinions on what makes the perfect BLT. Let us address them, part by juicy part.

Bacon — The heart of the concoction, which even the most maladroit short-order cook can't mangle too badly. Like most things in life, the more you spend on Mr. Piggy, the better he tastes. If there's a legitimate meat market in your area, the bacon there will be significantly thicker than the skinny store brands. Flavored bacons can be outstanding, especially applewood-smoked. Be wary of charring the stuff when frying it. Never, under any circumstances, nuke bacon for the microwave robs it of its soul.

Tomato — If you have access to heirloom tomatoes, use them on your sandwich. Sure, they're more expensive and often as strangely shaped as they are colored. For taste, though, no other type of tomato comes close. Their acidic sweet fluids complement the "B" and "L" beautifully. When cutting, slice 'em thick.

Lettuce — Romaine or red leaf lettuce only. Cut big leaves that will more than cover the bread.

Bread — Sourdough makes the best BLTs but never discount the cheaper wheat breads, which seem to do a workman-like job absorbing tomato juices whirled with bacon grease without getting too soggy.

Accoutrements — Not many folks know that the devil himself first crafted mayonnaise. Its color, texture and ingredients have more in common with Crisco than the claims of "clouds of creamy goodness" that I sometimes hear. The plain BLT speaks to simplicity. The properly made sandwich renders any condiments unnecessary.

Hamlet never asked, "To Toast or Not to Toast?" But the spin on his famous soliloquy makes me feel like the indecisive Prince of Denmark, since for all the sandwich eating, I still don't have a preference on this final piece to the BLT puzzle. Straight toasting can make crunchy-good sandwiches on a winter's day, while no-toast seems better geared toward warmer weather. However, a variation may be the answer — butter one side of each piece of bread and pretend you're making a grilled cheese. The resulting mix between toasted and doughy mirrors the relationship between the bacon and tomato.

Remember, too, the proper order: lettuce layered on bottom, bacon packed in middle, tomatoes on top.

Enjoy your lunch.

Mark Luce lives in Kansas City, Mo., where he's found a masterful BLT at a restaurant called The Cigar Box.

PHOTO BY: ISTOCKINTERNATIONAL INC.

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