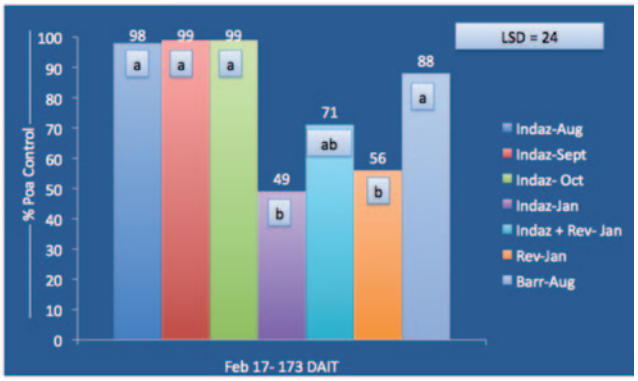
Figure 1



tillers when applied in January. Larger plants could simply be harder to control. Similarly, ethofumesate is known to decrease in control as plants become larger due to a decrease in herbicide absorption. A similar phenomenon could be occurring with indaziflam.

By April 10 rating, Revolver containing treatments control of *Poa annua* was >90% and equivalent to indaziflam alone treatments. Revolver is known for its "slowness" when applied during colder temperatures, especially in removing overseeded perennial ryegrass; however, Revolver is much more active on *Poa annua* than perennial ryegrass. As demonstrated in this study, Revolver control of *Poa annua* is just a matter of time.

Conclusion: Initial results with indaziflam are promising. There are currently no herbicides on the market that control *Poa annua* both pre and postemergence. Such a product would be well received and highly beneficial to the turfgrass industry.

Literature Cited

Myers, D.F., et al. 2009. Indaziflam/BCS-AA10717- A new herbicide for pre-emergent control of grasses and broadleaf weeds for turf and ornamentals. Proc., Weed Sci. Soc. Am. No. 386.

PURDUE UNIVERSITY

The Turf Science research program continues to reap the benefits of the extremely generous support of the Mid-West Regional Turf Foundation and many industry partners.

Pest management studies: Weed management studies have continued to evaluate the use of various novel herbicides like Tenacity for creeping bentgrass removal in Kentucky bluegrass athletic fields. This herbicide is being increasingly adopted by several regional cool-season athletic field managers and is being applied using an autumn application regimen. In addition, several continuing projects have identified various herbicide and management techniques to minimize roughstalk bluegrass encroachment in golf turf.

Insect studies have been evaluating the use of novel endophytes and entomopathogenic nematodes, as well as the role of fertilizer nutrient ratios on turfgrass health and the ability for turfgrasses to resist surface and sub-surface dwelling insects without the use of synthetic pesticides. Additionally, our entomology team has been closely monitoring a newly documented pest problem throughout the Ohio River valley, the occurrence of significant billbug damage in zoysiagrass.

Disease management: Our disease management team has been continuing to investigate various alternatives to traditional fungicides, including biorational products and the potential for disease forecasting models to better time fungicide applications. Furthermore, a multi-year study has been investigating the role of spray carrier volume on fungicide efficacy.

Species and cultivar evaluations: Bermudagrass cultivars—Being located at the northern edge of the upper transition zone, we continue to be an excellent location for the evaluation of bermudagrass cultivars for cold hardiness. In the third week of January, 2009, the air temperatures in West Lafayette plummeted to -22F without snow cover. These environmental conditions negatively affected the winter survival of several standard cultivars like Tifway and TifSport. By contrast, several cultivars with superior performance like the old "stand-bys" Midlawn, VaMont and Quickstand, and the more recent generation, Patriot, Riviera, Yukon, and GN-1, continue to perform well in successive years. In addition, there are some promising new experimental cultivars under development which show promise for the future. These have been developed by the Oklahoma State breeding program and include: OKC-7018, OKC-1119, OKC-1134 and OKS-2004.

Ryegrass—For the cool-season species several studies have focused on the perennial ryegrass. Field and laboratory studies have been conducted to determine the ploidy level of the collection of USDA ryegrass accessions and are evaluating the drought tolerance of these at three contrasting locations throughout Indiana. Using molecular techniques it was determined that in general the plants in the USDA collection as well as many of our commercially available cultivars are very much genetically similar. This information may be of use to our plant breeders as they expand their selection for plant material with improved traits for superior turf performance.

Bermudagrass overseeding: A field study was conducted over two years to determine optimum perennial ryegrass seeding rates for overseeding Patriot bermudagrass football fields and determine if multiple seeding events were superior to a single event for PRG establishment and persistence. This study was arranged in a 3 x 5 factorial with five seeding rates (12.5, 25, 50, 75, and 100 lbs/A/yr) and three application strategies (applying 100% of the seed in one application (100), 70% of total seed in the initial application plus 10% of total seed in each of three successive applications ten days apart (70/10/10/10), or four equal applications of 25% of the total seed applied ten days apart (25/25/25/25). Seed was initially planted the third week of August. The results of this study showed that ryegrass coverage rarely increased at seeding rates > 50 lbs/A/yr regardless of seeding strategy. The 25/25/25/25 seeding strategy consistently resulted in the most coverage, 55-77%, when rated in mid-Nov., regardless of seeding rate, followed by the 70/10/10/10 and 100 strategies with 46-62% and 20-52%, respectively. The relatively low ryegrass coverage values could be due to seedling competition with actively growing Patriot bermudagrass. These data indicate that when overseeding Patriot bermudagrass in the upper transition zone multiple seeding events appear to be superior to a single event and there is little benefit for exceeding seeding rates > 50 lbs/A/yr.

Cale Bigelow, Tim Gibb, Yiwei Jiang, Rick Latin, Zac Reicher and Doug Richmond: Departments of Agronomy, Botany and Plant Pathology and Entomology, respectively.

UNIVERSITY OF MASSACHUSETTS

Traffic, wear & compaction studies by J. Scott Ebdon, PhD:
Effects of Nitrogen and Potassium on Wear Stress Mechanisms in Perennial Ryegrass. Fertility trials were established to investigate the effects of five N rates in combination with three K rates on wear tolerance and associated mechanisms. Wear was applied using wear simulators fitted with metal soccer cleats. Optimum fertility for maximum wear tolerance and recovery was found to be 3 to 5 lbs N/1000ft2/yr. N rates exceeding 5 lbs caused excessive shoot growth rates, higher shoot water content and loss in cell wall components. Shoot density played a secondary role to shoot water content and leaf growth rates in accounting