On the Forefront of Turf Research

Dr. Wayne R. Kussow
Department of Soil Science
University of Wisconsin-Madison

Every year turf researchers gather at the Crop Science Society of America meetings to exchange information on current research. Abstracts of some of the research being reported this year serve as the basis for this article. These provide a good overview of what problems are being researched around the country and what the researchers are observing.

A note of caution is necessary. Many of these research projects are in their infancy. First-year observations in field research projects can be misleading.

Our old nemesis, *Poa annua,* continues to receive attention. Researchers at Ohio State University report that monthly foliar applications of Fe or Fe+Mg significantly reduced the poa population in a bentgrass fairway. How or why this occurred is unknown.

Research in California on poa invasion of creeping bentgrass substantiated that the extent of invasion depends on the quality of the bentgrass turf. The more open the turf, the more susceptible to invasion by poa. Poa invasion of different bentgrass plots was tracked for 5 years. At the end of this time, creeping bentgrasses with poa populations of 15% or less were Southshore, Cato, Crenshaw, and C-N-C. Bentgrass stands having more than 25% poa were Regent, Penncross, and Emerald.

Numerous studies have shown that early morning dew removal from turfgrass significantly reduces dollar spot incidence, sometimes by as much as 80%. Researchers in Kentucky have examined the effects of different methods of dew removal. These methods included mowing, vacuuming, and wet and dry sponge rolling. Over three seasons, mowing was the most effective dew removal method on bentgrass greens. Seasonal reductions in dollar spot severity ranged from 45 to 63%. On fairways, vacuuming was most effective. It reduced dollar spot 85 to 95% over two years.

Another cultural practice being investigated for effects on disease is the use of plant growth regulators. University of Illinois field trials have shown that application of Cutless and Primo on bentgrass suppresses dollar spot. Primo also reduced the severity of brown patch but Cutless had no effect. As the researchers have pointed out, these observations suggest that Primo and Cutless can have fungicidal properties, but one has to keep in mind that they also reduce disease recovery rates through suppression of leaf extension rates.

A common belief is that morning shading of putting greens leads to more rapid declines in quality than does afternoon shade. This belief has no scientific basis, which is why the issue is being studied by researchers at Ohio State University. Their first-year observations failed to disclose any differences in the effects of time-of-day and shading intensity on bentgrass putting green quality. However, measures of root weights and leaf pigment concentrations suggest that morning shade may prove more detrimental in the long run. It seems to me that what needs to be factored into this study are duration of leaf wetness and water use rates. Disease pressure and the tendency to over- or under-irrigate could well be significant contributors to declines in putting green quality.

On the management side, creeping bentgrass establishment on a 100% sand-based green constructed by Iowa State researchers was enhanced when fertilization program included applications of humic acid and molasses. Research at North Carolina State University suggests that the primary role of humic acids in 100% sand cultures is that of increased bentgrass uptake of P.

Concern that cultivation of sand topdressed native soil greens will mix the native soil with the sand and lead to surface pore sealing is being studied at Michigan State University. The effects of water injection (WI) and hollow time (HT) cultivation are being compared. No differences in sand-soil mixing were evident after one year of cultivation. By the end of the second year, WI-cultivated plots had more sand in the native soil and less sand in the topdressing layer than did the HT-cultivated plots. How these differences influence putting green quality remains to be seen.

Other researchers at Michigan State University are examining the long-term effects of pgr's and rolling on putting quality and speed on greens with different root zone compositions. Early results have shown that ball speed is greatest with the combination of pgr + rolling, but the

influences vary with putting green construction.

Root zone mix composition is the subject of research underway at Ohio State University, North Carolina State University, and Rutgers University. In all locations, the emphasis is on inorganic amendments. These projects have shown that:

(1) Calcined diatomaceous earth and calcined clay increase water and K retention in the root zone.

(2) Zeolite, as well as calcined diatomaceous earth and calcined clay, increases water retention as compared to 100% sand. At the same time, hydraulic conductivity is reduced but remains higher than normally recommended. Increased retention of nitrate and ammonium was also observed.

(3) Addition of organic and inorganic amendments to sand reduces the bulk density of the root zone and generally increase total porosity. Changes in air-filled porosity depend on the rate of addition and type of amendment. All amendments generally reduce root zone hydraulic conductivity.

All three projects are in their infancy and none have contributed uniquely new information. Hopefully, as the studies progress, the researchers will be able to relate laboratory measures of root zone bulk density, total and air-filled porosity, and hydraulic conductivity to the long-term performance of putting greens.

Concern that some inorganic root zone amendments lack physical stability is being investigated at Cornell University. Laboratory testing indicates that the six zeolites, calcined diatomaceous earth and calcined clay tested are stable to weathering and traffic.

Sand particle shape has been shown by Penn State University researchers to influence root zone mix properties. Sub-angular grained sand, when compared to sand with rounded grains, underwent a greater decrease in bulk density when peat was added. Sand particle shape effects on changes in total porosity when blended with peat varied with the sand:peat ratio. Capillary porosity was highest in the angular sand mixes. Sand particle shape had little influence on the reduction in hydraulic conductivity observed when the sands were blended with peat. While these observations are interesting, they will not become useful pieces of information until the dependencies of long-term putting green performance on these various properties of root zone mixes are clearly defined.

The final research project I want to report on is a study at the University of Tennessee. This 10-year investigation of the use of geotextiles as the intermediate layer between a USGA root zone mix and the underlying gravel is now in its eighth year. All 10 of the geotextiles tested have increased root zone water retention and none have clogged. Eight of the geotextile greens have percolation rates ranging between 8 and 12 inches/hour. All of the geotextile greens are judged to be more effective and more reliable than a green constructed with an intermediate ("choker") sand layer.

When results of this study were reported four years ago, there was a great deal of skepticism regarding the use of geotextiles in place of the intermediate sand layer. This year's report should dispel some of that skepticism. What needs to be done now is research how a geotextile green performs when subjected to all the stresses normally imposed on putting greens.