FEATURE ARTICLE

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Turf 2000: Looking Out, Looking In

Perspective

Anticipation of the turning of the calendar was an anxious time for many throughout the world. When the new millennium finally officially begins in 2001, we will have experienced a phenomenal amount of change in the turfgrass industry. Much of this change has been the result of scientific research that underpins technological developments. Therefore, it is an interesting time to look outward to the year 2000 and wonder about what scientific research may provide us from a biological, chemical, equipment and human resource perspective.

Biotech Tsunami

The results of biological research have produced an enormous amount of innovations in our daily lives . . . everything from new drugs that help us recover or avoid physical and mental illness to the preservation of embryos of endangered species so that we can reintroduce them if they become extinct. Now the biological research community has turned its attention on mapping the genes of every biological organism.

A tsunami is an underwater earthquake that starts out slowly in the depths of the ocean and over a short period of time can create tidal waves more than 200 feet high. The result is a complete destruction of what once was, for what will be. This natural disaster is the best analogy of how biotechnology will change the world we currently live in. The results over the next ten years will be felt widely, ranging from how we are treated medically, to how we are insured and possibly how much we have to mow our turf areas.

Researchers at the Salk Institute in San Diego, CA recently identified a gene that can be manipulated to produce a chemical that stunts plant growth. Immediately, the speculation began about insertion of this gene into grass plants that would eliminate the need for mowing. Unfortunately, there are several important steps between the Salk researchers finding a gene and having a turfgrass that doesn't need mowing. The most critical step is, simply, getting the gene into and expressed in the turfgrass plant. The research was initially conducted on tobacco (a dicot plant).

Unfortunately, many factors could prevent insertion and then expression of that stunting trait in grasses (monocots).

Next is the bigger question: do we really want a turfgrass that doesn't grow? Certainly, areas exist where we would plant acres with a "stunted" turfgrass; however, how much would actually be used on golf courses, sports turf or other heavily-trafficked areas? The fact that turf grows is fundamental to the benefits it provides from a wear tolerance and recuperative perspective. In addition, if the turfgrass blades do not expand, will they be more likely to become infected with disease or vulnerable to other forms of attack? What about competition from aggressively growing weeds? How could a turfgrass that doesn't grow colonize empty space before a weed?

Nevertheless, the trend of biotechnology will impact us in 2000 as the Scotts Company begins the process of bringing the Round-up Ready Bentgrass to the golf turf market. Within the breeding community, questions are already being raised regarding "escape" of the herbicide-resistant gene into the wild bentgrass population. In addition, focus groups are revealing some reluctance from golf turf managers, who may not understand the science behind genetic engineering. This is similar to the uneasiness that the European Community has expressed over genetically engineered food. In any event, the year 2000 will see this discussion raised to another level.

Old Dogs and New Tricks

It seems ironic that just as we are on the precipice of genetically engineered plants, we begin to look more closely at grasses that have been found on golf courses for the last 100 years. For example, many breeders are collecting and developing velvet and colonial bentgrasses for golf courses. These grasses, when established and managed correctly, can provide superior turfgrass quality and performance. In addition, Bill Meyer's research at Rutgers University has suggested incredible diversity in the velvet bentgrasses collected around the world for wear tolerance.

The most isolated landmass on the planet, Hawaii, is home to another grass that has been found on golf courses for decades. Seashore paspalum will likely receive increased attention in the year 2000 as Ronny Duncan inches closer to the release of a commercial variety. Seashore paspalum offers many benefits to the golf turf industry, including an almost unbelievable degree of salt tolerance.

Synthetic "Natural" Products

It seems odd that one of the most important pharmaceutical developments in the last century, penicillin, is derived from a microorganism. In addition, many of the most toxic compounds known to science are not synthetic, but rather are the by-products of a naturally occurring organism. Interestingly, an important debate is raging about the destruction of the rainforest, not because of the potential impact on global warming, but because of the loss of natural products that could provide important human benefits. Many pharmaceutical companies are sending "Indiana Jones"-type scientists into the rainforest to uncover the chemical mysteries these plants possess.

This approach to using natural products also has some history in the turf and landscape industry. For example, the black walnut tree (Juglans nigra) has been reported for centuries to inhibit plant growth through the production of a potent natural herbicide or allelochemical, juglone. Juglone is a chemical produced in the bark and living root system of the black walnut tree and can persist in the soil for several months after the removal of the tree.

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More recently, the turfgrass industry has been impacted by the development of new pesticide chemistries derived from naturally occurring products. Active ingredients in products such as Heritage from Zeneca and Conserve from Dow Agrosciences are derived from fungal organisms. These are highly active products

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that are receiving increased attention because of their ability to fast-track through the EPA registration process. At least one company, Zeneca (as it once was known), is continuing this pursuit by developing a new chemistry of herbicides from extracts of the Australian bottlebrush plant.

The next logical step to this process is to elucidate the genetic control of natural product chemistry. Once a gene that is responsible for chemical production is identified in a plant, similar to the growth-stunting gene described above, it can then be inserted into turfgrass plants so that it can be produced for protection from pests. This process is underway in various stages at the University of Illinois and here at Cornell University with the fineleaf fescues. Identifying this process in a turfgrass already suspected of producing weed-suppressive chemicals will allow the process of insertion and expression to proceed more quickly.

Direct Injection

Concern over the impact of turfgrass management on environmental quality reached a fever pitch in the last two decades of the 20th century. While the volatility of the debate has been reduced by a combination of industry sensitivity, scientific research and mutual awareness and understanding, much work remains. For example, under the leadership of Greg Lyman, the environmental education specialist at Michigan State University, the focus is turned to water quality and the point-source contamination issues that exist on golf courses. Point-source problems occur when there is direct contamination of a water source at the beginning or end of the pipe, such as a wellhead, or discharge into a pipe that empties into a stream.

The Michigan Environmental Stewardship Program has been working in partnership with golf turf managers, environmental advocacy groups and state regulators to improve point-source awareness and remedy potential problems. Of course, the issues range from fuel storage to equipment washing. However, one that might be easily fixed is the mixing and loading of pesticide sprayers.

Many golf turf maintenance facilities have added pesticide management areas that include completely contained storage and mixing areas. However, some researchers in Europe and now at Cornell University have been working to develop a system that eliminates the need to mix large (100 gallons or greater) amounts of water and pesticide and drive around the course. Instead of mixing concentrated pesticides and

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fertilizers into water, the chemicals are attached in their original container to the sprayer. The existing tank is filled with clean water as usual and as the operator proceeds to apply the chemical, it is directly injected to the water, not in the spray tank, but rather at the nozzle. This eliminates the need for mixing and loading areas and especially for rinsing large tanks that have been contaminated. Prototype units are under development, and when combined with the variable rate technology that integrates GPS/GIS information as well as spectral radiance sensors, the precision of chemical application is likely to increase and the environment will benefit.

Strength of Diversity

Some of the most popular and highly rated GCSAA seminars are the Spanish language series of courses. You would be hard-pressed to find too many golf turf maintenance operations that do not have a multicultural workforce that includes Spanish-speaking or other ethnic groups. As a result, golf turf managers have recognized the importance of developing communication skills that help maximize their human resources.

Still, many have begun to recognize that whether the culture is Spanish, Mexican, South American or Asian, it is not just about the language. Important cultural issues exist that influence work ethic, such as religious and social issues. A significant amount of research is being conducted across the U.S. in the arena of labor relations and human resource management to improve our understanding of a culturally diverse workforce and thereby improve management systems.

Clearly, as the demands on golf turf managers increase and management teams (superintendent and assistant superintendent) become more transient, a well-managed workforce, both technically and socially, will insure that course quality will not be reduced. Honoring the diversity of your workforce is win-win for the entire operation and staff. In fact, all the wonderful advancements that may be available to our industry in 2000 and beyond will be useless unless we have a competent and valued staff to implement our management schemes. So in the end, the best prediction for the future is that people still matter and with improved understanding of each other, technology really has the chance to make the world a better place.

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