Future trends in turfgrass research

Science and Technology

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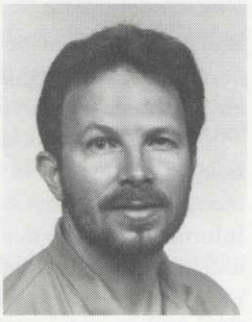

PREDICTING THE future is something I hesitate to do because I find, that once the future has arrived, I'm usually wrong. At the risk of being wrong again, I think there are some clear trends to where turfgrass science and technology are heading in the future. A number of these trends are shaped by the overwhelming changes in which our society and planet find themselves in the present.

In the next 10 years and beyond, our lives will be considerably different than they are now. For example, the poor distribution of global wealth and an additional one billion people will present challenges for everyone. Issues of waste management and utilization of resources will predominate the social and political agendas worldwide. The increase in population, coupled with the decline in usable green space, will place increasing emphasis on managing and maintaining turfgrasses and ornamental plants as conservation measures. The pressure to increase food production will come into conflict with the increased pressure to effectively deal with the growing pollution of the planet. This in turn will continue to fuel the growing movement to limit pesticide use.

Societal distrust

So what does all of this have to do with trends in turfgrass science? First, there has been a growing societal distrust for science. This has arisen because of the perceived neglect of scientists in addressing societal problems in favor of high-profile projects with questionable long-term benefits. This has been amplified in recent years because of policies of several preeminent universities on the use (or misuse) of federal funds. As a result of this controversy, science infrastructure and scientists will have to become more accountable to society.

Those of us involved in science will have to increase our efforts to "educate" an increasingly skeptical society as to the long-term benefits of basic scientific research. This education will help refocus a larger part of scientific resources on answering the basic questions involved in societal problems. Basic research will be required to address increasing problems of pollution, waste management, conservation of environmental and natural resources, pesticide use and exposure, agricultural and health issues. This education will come only when society endorses the goals of basic research and engages financially in a greater part of the scientific effort. This will require everyone, the society in general and turfgrass managers specifically, to become more scientifically literate.

What are the specific areas in science that will effect turfgrass management in the next century? If we look at science at large, some of the more recent and revolutionary developments have come in the biological sciences. The advent of recombinant DNA technology is changing all aspects of the plant sciences. This revolution will continue into the 21st century, with novel forms of plant resistances to pests, increased plant adaptation and productivity, novel industrial uses of plants and microbes, such as in the production of chemicals, medicines, and for bioremediation.

Biotechnology has been leading and will continue to lead our technological revolution. Modern biotechnology will greatly affect turfgrass management, particularly in pest control and other forms of varietal improvement. Turfgrass plants and turfgrass-associated microbes are proving to be quite amenable to genetic manipulation using modern tools of recombinant DNA technology. This aspect of biology will find increasing turfgrass applications in the future, such as the genetic engineering of specific desirable traits from other organisms into turfgrass varieties. Furthermore, research into the manipulation and management of microorganisms for the purposes of pest control will greatly benefit from the advances in recombinant DNA biology.

Turfgrass as a recycler

It is becoming clear that turfgrasses, in addition to providing an esthetically pleasing living environment as well as a recreational surface, will find important uses in cleaning up our environment. The great filtering properties of turfgrasses coupled with their abilities to support high levels of microbial activity, make them an ideal tool for bioremediation.

Furthermore, because of their non-food-crop status, turfgrasses will become a repository of unwanted, recycled, or reformulated waste materials and agricultural and industrial by-products. Research into environmental aspects of turfgrass management will become increasingly important in the elevation of turfgrass to its proper place as an important resource.

Turfgrass science in the 21st century will be considerably more technical than in the past. Turfgrass research will place greater emphasis on environmental issues employing some of the latest biotechnology for the management of pests and stresses as well as in

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University of Rhode Island study

Tall fescues are more efficient at leaf growth

A study at the University of Rhode Island tested six varieties each of three turfgrass species for their ability to take up nitrogen and their ability to turn that nitrogen into leaf growth. Six varieties of tall fescue, bluegrass and perennial ryegrass were rated for their ability to produce clippings, nitrogen leaf concentrations, and efficiency of nitrogen use. Over the growing season, the tall fescue varieties produced an average of 50% more leaf tissue while having the lowest leaf nitrogen content and the greatest nitrogen-use efficiency. Table 1. below lists the results of this study.

TGT's view: *Tall fescue varieties would be excellent choices for turf areas that have limited fertility or that have limited budgets for control or preventative applications. Tall fescue's efficient use of available nitrogen combined with that species insect and disease resistance make it an excellent choice for low maintenance areas.* —CS

Table 1

Species	Leaf Growth	Nitrogen Leaf Content	Nitrogen Use Efficiency
Ryegrass	0% increase	16% increase	4% increase
Bluegrass	28% "	12% "	0% "
T. fescue	50% "	0% "	21% "

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include *Cosmarium, Coccomyxa, Cylindrocystis, Dactylothece, Mesotaenium, Klebsormidium,* and *Ourococcus*. All but the latter two are capable of producing surface crusts and slime. The two most abundant genera of cyanobacteria in turfgrasses include Nostoc and Oscillatoria. The latter genus has been implicated as the primary cause of slime formation on golf greens. The cyanobacteria are also known for their abilities to fix atmospheric nitrogen, which, in some instances, may actually contribute to the nitrogen nutrition of the turfgrass plant.

Algae are strictly dependent on adequate soil moisture for activity. Algal problems occur whenever the soil remains wet for prolonged periods of time and where the soil surface is exposed or the turfgrass stand is thin and weak. Although fertility has no clear relationship to algal activity,the use of acidifying fertilizers such as ammonium sulfate can enhance algal colonization.

In addition to the more conspicuous colonies of algae on the surface of turfgrass soils, many algae colonize the surfaces of plants. Although in greenhouse ornamental production, many of these plant-colonizing algae can be detrimental to plant growth, their effects on turfgrass plants are largely unknown.

Challenges for the Future

Soil contains an extremely rich wealth of biological resources in the form of microorganisms. These microbes influence all of the important processes related to plant nutrition and the general maintenance of plant health. Furthermore, soil microbial communities provide a genetic resource of potentially useful products and processes that can be exploited for the management of turfgrasses. The challenge to turfgrass managers is to become experts, not only in the management of what they can see above-ground, but to master the management of the beneficial soil microorganisms to achieve the maximum, sustainable means of plant nutrition and plant protection.

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enhancing fertility and horticultural properties. This emphasis will reflect sources of future funding for turfgrass research as well as a renewed sense of accountability among scientists and academic institutions in addressing and solving problems facing our society.

Because of the increased technical competence and knowledge base required of turfgrass professionals in coming years, we at *Turfgrass Trends* will do our best to keep you abreast of the latest developments in turfgrass science and technology as well as in management and regulatory issues affecting your profession. Information management will be central to your abilities to keep up with a rapidly changing societal, political, and scientific environment.