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For the first time, tools are available to "engineer" living organisms with traits desirable for particular tasks or adaptations. For example, with this technology, it is possible to introduce genes from a bacterium that encode the production of an insecticide into a plant. These "transgenic" plants constitute the new wave of resistant varieties that will appear on the market in the next decade. Efforts are currently underway to develop turfgrass varieties resistant to a number of pests using recombinant DNA technologies.

Biological control of insects, diseases, weeds, and frost injury are all biotechnologies that are dependent on recombinant DNA techniques to engineer microorganisms for use as plant bio-protectants. One of the better-known biological control agents for the control of crown gall disease of stone fruits and roses is based on a genetically-engineered bacterium. Other preparations of microorganisms used for the biological control of plant pests are likely to be genetically altered in some way in the future.

What does all of this mean to you, as a turfgrass manager. First of all, it means that, in the 21st century, you will have to be more scientifically literate than in the past: our society will be based largely on advanced technologies, such as biotechnology. Second, it means that you should start developing an informed opinion about the pros and cons of the environmental risks of such technologies. There are many aspects of recombinant microorganisms and transgenic plants that we do not understand. However, if we compare transgenic plants with those bred by conventional means, it is readily apparent that we know even less about those bred by conventional means. No technology is without risk; however, you need to be informed about biotechnology and its inherent risk relative to other products or practices currently in use.

Finally, it is important to be aware of major developments in biotechnology, because it is likely that many of the products and practices used in the future will be based on developments in biotechnology. Many of the turfgrass varieties available for your use will be products of biotechnology, a number of fertilizers, fungicides, insecticides, and herbicides will be products of biotechnology. Many of the ways in which you dispose of pesticide and non-pesticide wastes will likely be based on various biotechnologies. The use of products and processes developed from biotechnologies is certainly the direction in which science, industry, and agriculture are moving. As the turfgrass industry evolves, many of these developments will gradually be adopted. We at *Turf Grass Trends* will try to keep you abreast of the latest developments in science and technology that affect the way in which you approach turfgrass management. The challenge for all of us will be to keep pace with this rapidly changing area. ■

Benefits of reducing thatch in bluegrass turf



FIELD TIPS

Several years ago, in a test of fungicides for control of dollar spot on a disease prone turf, one of the treatments tested was not a chemical: it was a spring-time dethatching with a verticutter. One verticutting—without chemical control in the spring—reduced the incidence of Dollar Spot symptoms by 50% over the untreated control. Apparently, the verticutting disrupted the normal disease growth process and reduced the expression of symptoms.

Cutting height impacts soil temperature

Cutting height has a significant effect on soil temperatures at a depth of 1". Raising the cutting height from 1.5" to 3.0" consistently lowers the soil temperature by 5%. The tests were conducted in Silver Spring, Maryland.

Short-cut turf has three months—July, August, and September—where soil temperature conditions are at the maximum for *M. poae*—the fungus that causes Summer Patch. Tall-cut turf has only two months—July and August—where the soil temperature is ideal for *M. poae*.

MONTH	CUTTING HEIGHT	AVERAGE SOIL TEMP.
July	1.5"	86°F (30°C)
	3"	83.3°F (28.5°C)
August	1.5"	84.2°F (29.0°C)
	3"	81.5°F (27.5°C)
September	1.5"	76.75°F (24.75°C)
	3"	74.3°F (23.5°C)

COMING ATTRACTIONS

The next issue of *Turf Grass Trends* will feature in-depth articles on

- **Grubs** by Michael Villani
- **Foliar summer diseases** by Dr. Nelson
- **Biological & chemical control of broadleaf weeds** by Dr. Nelson
- **PLUS** our regular updates on the latest research findings, new products, regulatory actions, and timely tips on improving your turf management practices.

Subsequent issues will include articles on

- WETTING AGENTS AND WATERING
- SEEDS, SEEDING AND SOD
- SOIL TESTING, DORMANT FERTILIZERS AND SOIL AMENDMENTS
- TRAINING AND SEMINARS
- WINTERKILL