FEATURE ARTICLE

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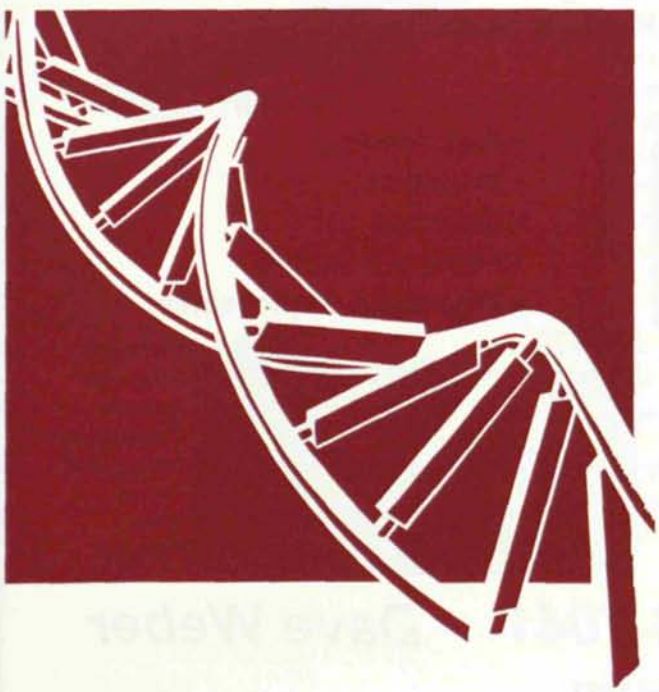
Beyond the Hype and Hysteria: An Objective—and Optimistic—Look at Biotechnology's Potential for Turfgrasses



Biotech. Many people are probably tired of hearing this word. In recent years, a flurry of genetics research has brought about a lot of hype and, unfortunately, hysteria to the topic. In the case of seeding turfgrasses, a well-tilled, fertile soil bed must first be prepared before seeding. You don't just toss seed into the wind and hope it will grow. Many biotech companies, and their counterparts in universities, have done a fairly poor job at preparing the seed bed before putting products on the market. That leaves us with the popular press and quasi-scientists relaying their personal emotions toward biotechnology. We clearly need better information.

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Many of the magical mysteries of biotechnology are really not magical at all. The more we learn and understand the mechanics and possible applications of biotechnology, the better we'll be at making informed decisions based on fact, and not emotion. Most of the so-called experts who are out to undermine advances in genetics have no experience or expertise in genetics or molecular biology. On the other hand, many geneticists who are qualified to make an informed statement have done little to promote biotechnology.

The evidence of biotechnological advances is everywhere. Table 1 lists a few of the advances that are either currently on the market or may be on the market in the future. It is clear that biotechnology is not just a fad. Many new and creative applications of biotechnology will continue to storm onto the market in years to come. Finding the cure for cancer is something that we joke about at the coffee shop, but it may not be as farfetched as we think. In fact, researchers are currently putting genes into plants that provide vaccines against the common cold. The old adage "an apple a day keeps the doctor away" may soon have much greater meaning. Medicines could be sold at the local food stand in the form of apples, and other fruits and vegetables. Who would have ever imagined several years ago that you could spray a plant with RoundUp to remove surrounding weeds? The wonders of science never cease to amaze.

TABLE 1.

Present and future advances in biotechnology

- Cloning of sheep
- Flavr Savr tomato
- RoundUp-ready soybeans
- Liberty Link hybrid corn
- Vitamin supplementation
- Anti-carcinogens
- Disease resistance
- Heat and cold resistance
- Drought resistance
- Filtration of excess nutrients
- Decomposition of pesticides
- Biological indicators
- Flowering genes
- Oil/protein production
- Cholera vaccine in potato
- Edible vaccine in apple against common cold
- Malaria vaccine in mouse milk

What are some of the issues facing the use of biotechnology today?

Here are a few examples:

- Bt corn with toxins that kill European corn borer, and possibly Monarch butterflies.
- Allergic reactions in humans to soybeans containing genes from Brazil nuts.
- Herbicide-resistant plants hybridizing with weed species making resistant weeds.
- Herbicide drift to nontarget plants adjacent to herbicide-resistant fields.
- Ethics of cloning and preserving humans and animals.

It is true that we don't always know the long-term effects of biotechnology, but every effort is being made to assess risks associated with the use of genetically modified organisms. If you remember, or read in history books about, the skepticism asso-

ciated with electricity, the gasoline engine, microwave ovens and DNA as the code for life, you know we'll always find resistance to new technologies. I remember when it was recommended that you leave the room when you turn on your microwave oven. We are currently seeing the same skepticism with gamma-irradiated foods, high-fat diets and the use of biotechnology. The bottom line is: with exponential growth of the human population, how do we optimize agricultural systems to feed the ever-growing population in the future? How can we decrease pesticide usage to reduce groundwater contamination and maintain crops at minimal costs? How can we get more out of crops when usable crop acreage is continually decreasing? The answers to these questions have been and are being solved with the help of biotechnology.

What are potential issues facing the use of biotechnology in turfgrasses?

As listed above, similar issues face turfgrasses. There are concerns where herbicide-resistant grass is planted. If grasses are allowed to flower, can herbicide-resistant grasses cross-pollinate with weedy species making herbicide-resistant weeds? Even more importantly, how do we prevent pollination of non-transgenic grasses in seed production fields? How easy will it be to transfer a herbicide-resistant grass from the golf course to your home lawn via your shoes? No simple answers to these questions exist, but I think there are many possible solutions. These solutions must first be tested scientifically and without bias.

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How can we make biotechnology work for us in turfgrasses?

You may have noticed that I've only mentioned problems associated with herbicide resistance in turfgrasses. A multitude of other applications for biotechnology in turfgrass are out there. At the University of Illinois, we have been searching for genes associated with resistance to gray leaf spot in perennial ryegrass. Our work, in collaboration with other universities and companies, may eventually lead to gray leaf spot-resistant grasses with the aid of DNA transformation. We are also working toward similar studies with dollar spot and brown patch resistance. In addition, several turfgrass researchers have made great strides in the area of stress tolerance. If we can find a gene for drought resistance, transfer of these genes to other plants may be a fairly simple step with biotechnology.

Besides these very practical approaches, more novel uses may arise in the future. What if we produced phosphorescent grasses to illuminate borders around airports or highways? What if we found a way to use grass clippings in pharmaceuticals, or for fiber production? What if we designed a grass to decompose agricultural chemicals, and used them to buffer run-off areas to reduce groundwater contamination? The Salk Institute recently reported a gene that stunts plants when they reach maturity. Imagine having to mow your grass only once every one or two months. We could save taxpayers an enormous amount of money by reducing, or even eliminating, the need to mow grasses along the entire U.S. interstate highway system. The possibilities are endless, but not without obstacles.

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Please encourage your colleagues and peers to learn as much as they can about biotechnology. We need to support sound science and promote the exploration of turfgrass genetics. Biotechnology involves not only transferring genes from corn or bacteria, but doing the tedious work of gene identification, sequencing and mapping in turfgrasses. Many turfgrass researchers have avoided this process completely and have focused solely on transferring genes from non-turfgrass organisms. Our progress will ultimately be stifled if we refuse to search for genes from turfgrasses for turfgrass use. As we sit on grant review boards where biotechnology projects are being considered, it is important to look to the future and not to quick Band-Aid fixes. Genetics research is not always adequately applied, like finding how much more nitrogen to apply, or determining the effectiveness of a new fungicide. Genetics builds on bits and pieces of information until we can clearly see the big picture. Then we can make the profound scientific leaps that other large agricultural crops have made.