

# Looking for answers

Opinions vary, but researchers agree biostimulants are another tool for fertility programs

**B** iostimulants remain an elusive commodity in a golf course superintendent's fertility program arsenal. However, at least they've escaped the "snake oil" reputation they carried a decade ago.

The reasons for this mystery are many because several questions surround biostimulants. First, what are biostimulants? Simply, they're materials in minute quantities that promote plant growth and metabolism. The greatest benefit is increased stress tolerance from heat, drought, ultraviolet light and even some diseases. They do this partly by stimulating root growth and partly by promoting antioxidant activity and stimulation of primary metabolic processes.

The dilemma is that there are many biostimulants on the market. Which ones work, and which are ineffective? And, because many superintendents put several products in their spray tanks to save application time, which product provide the most benefit? Finally, how much do year-to-year weather conditions factor in?

## POSITIVE RESEARCH

Gordon Kauffman III, Ph.D., is an agronomist with Grigg Brothers Foliar Fertilizers, headquartered in Albion, Idaho. His doctoral thesis at Penn State University examined the constituents of selected biostimulants and how the products function to improve turfgrass

performance under environmental stress.

"Field studies can be highly variable," he says. "The best method is to study these products in a rigorously controlled environment. Current research, which examines physiological responses, shows biostimulants can enhance root growth. Using visual examinations such as top growth or color can be more difficult to determine effectiveness."

The results of Kauffman's study support evidence for a positive growth-regulating effect from biostimulant application.

"The fact that certain biostimulants promote growth similar to the growth hormones auxin and cytokinin means it might be altering the plant's hormonal balance to favor more normal metabolism during stress," he says. "Applications of these biostimulants improved the heat tolerance associated with photosynthetic efficiency and overall quality of perennial ryegrasses."

Biostimulants can improve turf's physiological fitness, says Geoff Simril, senior technical manager for Milliken Turf Products. Scientific research conducted by Virginia Tech shows seaplant extract can increase plant antioxidant levels and make turf more stress tolerant. Research also shows seaplant extract can increase the turf's photosynthetic rate and capacity, making it more efficient by manufacturing its own food and increasing carbohydrate reserves.

"The scientific evidence of the benefit of seaplant extract is overwhelming, so it makes

good agronomic sense to incorporate quality seaplant extract in any greens management program," he says.

Kauffman recommends using biostimulants as a supplement to a sound fertility program. For best results, they should be applied in foliar form sequentially prior to the onset of stress to make the plant more tolerant. They're also effective as a granular application prior to the onset of stress. He urges superintendents to follow two simple steps when considering which biostimulant to use:

"First, understand what's in the product," he says. "Biostimulants fall into three categories, including humic substances, hormone containing products and amino acid containing products. Secondly, know what you're applying and always use a quality supplier. The product should be backed by some sort of research, either from a university or an independent firm."

## VALID SKEPTICISM

The skepticism superintendents have for some biostimulants is well placed because of limited research, says A.J. Turgeon, Ph.D., a professor of turfgrass management at Penn State University.

"Years ago, the initial reaction to plant growth regulators was negative," he says. "Now, today's (plant growth regulators) play an integral role in a golf course's turfgrass management program. Superintendents should take





the same approach with biostimulants. Take a small quantity of the product and apply it to several different test sites on the course. Observe the results to determine if there are significant differences. Only then will they gain confidence in these products.”

Turgeon cites research by Xunzhong Zhang, Ph.D., and Richard Schmidt, Ph.D., of Virginia Polytechnic Institute and State University, which showed antioxidants play a significant role in alleviating oxidant stress, usually induced by drought or high temperatures. Additionally, turfgrasses with high levels of antioxidants produce better root and shoot growth, maintain higher leaf moisture content, and lower disease incidence in normal and stressful environments.

One of Zhang’s and Schmidt’s conclusions states: “During the past 10 years, we have evaluated many kinds of biostimulants for use in the turfgrass industry. These products exert beneficial influences either through hormonal effects or by raising antioxidant levels. Although biostimulants can be synthetic chemicals, naturally occurring organic materials are excellent sources of biostimulants. For example, humic acid and seaweed extract are two commonly used turf biostimulants.”

#### INFORMATION NEEDED

Clark Rowles, CGCS, of Nakoma Golf Club in Madison, Wis., has views that sum up the position of many superintendents. Rowles used

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Photo: David Wolff



Clark Rowles, CGCS, says biostimulants can provide certain benefits, but it was difficult for him to tell year in and year out whether they worked or not because conditions weren't consistent. Photo: David Wolff



biostimulants for a number of years but recently his fertility program has moved away from these products.

"When I frequently used biostimulants, I was at a facility with multiple courses," he says. "There was an opportunity to do one thing on a particular course and something else on another. Biostimulants can provide certain benefits, but it was hard for me to tell year in and year out whether or not they worked because conditions were not consistent.

"We had a hot year in 1995 with excessive humidity, and many guys were losing grass," Rowles adds. "I was sitting on 90 acres of bentgrass and didn't lose much turf. Was it a product I was using that contained biostimulants that made the difference, or was it timely applications of fungicide or the fertility program I had going on? That's where university research can be more beneficial than what we do in the field because we don't set up the experiments looking at the science end. We apply a variety of products and hope they work in conjunction with other products to provide us a benefit. Superintendents don't want checks on their golf courses such as leaving an untreated 10-foot-by-10-foot square in the middle of a fairway or the

corner of a green. Their job is on the line, so they won't do it. Universities take various areas and let them become stressed or even die, but on a golf course, that can be unacceptable."

It's human nature for superintendents to look for a magic bullet that will give them an edge. Biostimulants always will be popular because there's the perception they do something, Rowles says.

"If you look at a product label, there's a certain amount of fertilizer in it, primarily some form of nitrogen," he says. "The biostimulant might not be the primary ingredient based on percentages of ingredients in the product. Is the biostimulant itself causing the benefit, or is it the fertilizer attached to it causing the response?"

Rowles' fertility program includes biostimulants. He has found calcium and silica in the biostimulant package improves his turf conditions the most.

"Calcium seems to provide some benefit for shaded turf," he says. "I spray it as a foliar product, but I can also get it through various granular products. And, some fungicide programs provide significant benefits to the plant. One group of products, in particular where the active ingredient is phosphorus acid, seems to

stimulate the plant's own defense mechanisms. With the advent of new fungicides and the potential to handle disease pressures better, we're not allowing the stressors to get to the plant as has been the case in the past. So, does that mean we need to supplement turf health with biostimulants? I don't know we need to."

Because application time is at a premium, superintendents tend to put multiple products in the spray tank – fertilizers, fungicides, growth regulators, insecticides and even biostimulants. The only products Rowles applies separately are those that need to be watered in immediately or products containing herbicides.

"Many people in this business are doing so many things at one time they don't really know what's working for them," he says. "How do we know it's not that little tickle of nitrogen that's causing a response in the plant? I can't say biostimulants don't enhance the turf's ability to handle stress, but if I don't have stress, they're not necessarily needed, and therefore are they a valuable product to use?"

Kevin Cavanaugh is a former Florida golf course superintendent who's now vice president and director of golf operations of Floratine Products Group. He used biostimulants extensively





on his golf courses.

"From first-hand knowledge, I know superintendents want root mass and density to predispose their turf to the strong stresses of weather and low heights of cut," he says. "I used the benefits of biostimulants to obtain a healthier and stronger plant to be better able to do my job."

However, superintendents face a dilemma, Simril says.

"Their goal is to grow a healthy plant, but players care most about surface conditions like speed, roll and color," he says. "Extremely low mowing heights necessary to provide that surface compromise their agronomic goals. Biostimulants, like quality seaplant extract and fulvic acid, play an integral part in giving the plant what it needs and the players what they want."

#### CRITICAL RESEARCH

Rowles references biostimulant research conducted by Frank Rossi, Ph.D., of Cornell University, saying Rossi found that areas receiving an adequate amount of N-P-K perform as well as plots with biostimulants.

"It seems like the best plots contain fertilizer, so where's the benefit coming from?" Rowles asks. "Do biostimulants make the fertilizer more

efficient? That could be."

In his research, Rossi summarizes that the results of three years of evaluation of organic and microbial products (also known as biostimulants) have offered insight into various aspects of product performance. In general, the results of the study show the performance of most of the biostimulants isn't consistently or substantially different from traditional fertilizer applications.

"However, a few product lines appear to offer nitrogen-use reductions," Rossi states in the report. "Yet, in years of high disease pressure, some of these treatments break down and allow increased disease levels.

"Much more needs to be learned about these products and programs," the report states. "This study has shown that although there are some differences, in general, traditional fertilizer applications provide acceptable putting green turf. Nonetheless, where resources allow, there might be circumstances in which incorporating certain products and programs would be beneficial."

#### ANOTHER USEFUL TOOL

Some turf experts agree biostimulants have a place in golf course fertility programs. Douglas Soldat, Ph.D., is an assistant professor of

Because many superintendents put several products in their spray tanks to save application time, it can be difficult to determine which biostimulants provide the most benefit. Photo: David Wolff

turfgrass and urban soils at the University of Wisconsin-Madison. While biostimulants can increase stress tolerance under specific conditions, he says superintendents shouldn't apply these products indiscriminately. They should be tested initially on various spots around the course.

"From the research I've seen, superintendents have to decide if the small benefits are worth the price," he says. "However, there's no question biostimulants can be another tool in a sound fertility program."

Biostimulants give added protection against the rigors of stress, Kauffman says.

"Research has shown there's a synergy between fungicides and biostimulants," he says. "They're another tool in a superintendent's toolbox; that's how I view these products."

While an intern at Augusta National, Cavanaugh helped test various biostimulant products to determine their effectiveness.

"We were able to talk to the people who developed the products to build a fertility program that was right for the course," he says. "Superintendents first should identify what they want to achieve on their surfaces. Then contact biostimulant companies to find out how to use natural growth hormones in the proper ratio. Finally, call superintendents who use biostimulants and then try them on your course

Still, more is being learned about seaweed extract as an important biostimulant, Turgeon says.

"We're in the beginning stages of this research," he says. "In the future, there will be more information about specific formulations. However, it's known that an application of antioxidants before the onset of stress and then applying them regularly through this period provides beneficial results, particularly on bentgrass greens." **GCI**

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