Stress relief

Antioxidants benefit human health, but those found in sea plant extract can help boost turf in times of need.

John Walsh

It goes without saying that golf course turf is under an extraordinary amount of stress, especially on greens. Member expectations, height of cut, heat and traffic are a few reasons why turf — and superintendents — are stressed as much as they are these days.

However, some in the industry believe there's relief to be found, at least for the turf. Antioxidants found in sea plant extract have been shown to help turf perform better under stressful conditions. Stress relief for superintendents ... well, that's another story. But antioxidants can help them too, if only indirectly.

"Weak turf is a multiheaded monster," says Doug Middleton, vice president of Emerald Isle Ltd., a company whose brands were purchased in February by LebanonTurf. "This is one head."

At Spring Creek Ranch in Collierville, Tenn., Scott McNeer, CGCS, has been using biostimulants to maintain healthy turf for the past 14 years. **Photo courtesy of Scott McNeer**

How they work

Here's how antioxidants work: Antioxidants provide stress insurance and boost a plant's immune system, prolonging the life of the plant. When a plant is stressed, it produces fewer antioxidants.

Free radicals, which are under the umbrella of reactive oxygen species, are created naturally and continuously as plants grow. Free radical compounds, which are damaging, want to react with cell membranes to become more stable. Antioxidants, which can take several forms, such as vitamins (A, C and E) or enzymes, come between the cell membranes and free radicals, stabilizing the free radicals.

Research conducted by Erik Ervin, Ph.D., at Virginia Tech and Bingru Huang, Ph.D., at Rutgers, has shown that fertilizers don't necessarily contribute to or reduce free radicals. But adding biostimulants (a term used for different compounds that help plants with stress) via sea plant extract with the hormone cytokinin helps boost a plant's antioxidant pool to help fight damage by free radicals. Cytokinin, which can also act as an antioxidant, has been shown to increase the pool of antioxidants in turf.

"This is fine-tuning," Middleton says. "Antioxidants are an integrated approach, like a protein shake for humans. You need other cultural practices and inputs, too. It's part of an overall approach to health."

Cytokinin is responsible for triggering a plant to produce, or continue to produce, more antioxidants. It can keep chlorophyll from breaking down temporarily and allows photosynthesis to occur at a more efficient level and have that stay-green effect, Ervin says.

Through his research, Ervin identified auxins, which are hormones that tell the plant to produce more roots from the crown, in sea plant extract. Those auxins are the reason for more root growth during stress.

However, cytokinin concentrations aren't on labels of biostimulant products because those products are sold as fertilizer. Superintendents should ask their distribution or sales reps about the cytokinin or auxin levels in their products.

A new topic of discussion

The discussion of antioxidants and free radicals in turf has become more prevalent during the past few years, says Sarah Williams, Ph.D., a consultant with Emerald Isle and Ocean Organics, a seaweed processor and fertilizer formulator.

"People talked about it years ago, with biostimulants helping plants, but there was no research to back it up," Williams says. "It's been proven sea plant extract increases antioxidants, and university research has added credibility to this claim."

"We started talking about antioxidants about five years ago with work about sea plant extract," Middleton says. "It's not on many people's radar screens. The subject has come up but isn't being disseminated widely in the market yet. Superintendents have rarely thought about it before we started talking about it."

Scott McNeer, CGCS, director of operations at Spring Creek Ranch in Collierville, Tenn., has been using biostimulant products with sea plant extract religiously since 1995. McNeer began using the products blindly because, originally, he didn't know much about them. But he takes educational classes at the GCSAA Education Conference and Golf Industry Show, and he liked what he heard about biostimulants during one of the seminars. He also had talked frequently with Mike Goatley, Ph.D., a prominent biostimulant researcher, McNeer said.

"Antioxidants are good for the human body, so why not for plants?" the 13-year GCSAA member asks, admitting many superintendents don't believe in using biostimulants and about 70 percent of the superintendents in his areas don't believe in the importance of biostimulants.

McNeer's own research started in 1999, when he first became a superintendent.

"I wanted to know what was in the jug, where they came from and what they do," he said. "I still don't know what all these compounds do in the plant."

Middleton cites Ervin and Huang as two people who are on the forefront of antioxidant research. (In full disclosure, Emerald Isle financially supports Ervin's and Huang's research.)

Ervin has been researching the benefits of sea plant extract and cytokinin for nine years.

"In the turf industry, I'm one of the only ones doing detailed physiological research, other than those spraying product and looking at the results visually," he says.

What's in the jug?

Few products in the marketplace have antioxidant properties, Middleton says, adding that anything with sea plant extract will have antioxidants. Some companies add vitamins to their

products and others sell straight vitamin products. Typically, though, the higher the level of technology in a product, the higher the price.

Williams suggests superintendents look for biostimulants and make sure the products are backed by university research. And she reminds superintendents that not all fertilizers, which provide nutrients for plants, have sea plant extract.

"Companies have been looking into this and tweaking their formulations," Williams says. "Not all sea plant extracts are created equal. Different extracts will have different amounts of cytokinin, and you need a high enough level of cytokinin to trigger the response of the antioxidant pool."

It's important that superintendents look for zeatin riboside, a type of cytokinin, Williams says.

Products with sea plant extract are used more frequently on cool-season turf, yet there's not much difference in how it benefits different varieties, such as creeping bentgrass or *Poa annua*. Biostimulants are also starting to be used more frequently on warm-season grass, Middleton says.

"Now, more people are staying in Florida, and there are 12 months of high expectations, so stress levels have increased," he says, adding that, historically, stress management hasn't been as big a deal with warm-season grass because it's more heat-tolerant.

In terms of gallons sold, 60 percent of Emerald Isle's business is related to cool-season turf and 40 percent is related to warm-season turf; 75 percent of its business is for greens, 15 percent is for tees and 10 percent is for fairways.

McNeer said those who use biostimulants should be applying them to tees and fairways, in addition to greens, but one would need an unlimited budget to do that. However, he admits to having a difficult time proving the products are worth it.

"I believe the plants are healthier because of my biostimulant use," he says. "It's a budget-oriented type of product. They're not hugely expensive, but if you have a low budget, you have a hard time justifying sea plant extract and humic products. The results aren't as visible, so these products aren't as popular as they could or should be."

Timing is everything

Timing, too, is a key aspect regarding antioxidants in turf. It's important to increase the antioxidant pool well before times of stress. Middleton suggests applying biostimulants throughout the year because turf on greens is mowed all the time, which results in the plant's losing its ability to store nutrients.

"Typically, our product is a third of the annual load of fertility and half the annual cost," he says.

There hasn't been much research conducted about the optimal amount of water used to apply biostimulants. One to three gallons of water per 1,000 square feet is recommended.

"The carrier volume has increased over the years because of what the fungicide people say," Middleton says.

Ervin, who has completed a number of trials, always has a nonheat or nondrought stress control when testing optimal conditions versus stress conditions.

"I see no response from these products on plants under optimal conditions," he says. "Hormone levels get depleted during stress, so use these products during prestress conditioning. You don't have to use them as early as March, but use them May through September. There's usually no need to use them more than four or five months."

McNeer applies biostimulants year-round, yet the rates fluctuate. Right before and right after winter he might not apply any. He averages about 40 foliar applications yearly on his greens, and 90 percent of those applications have a good dose of sea plant extract.

Super knowledge

Superintendents are interested in antioxidants, Ervin says, citing a survey conducted by Keith Karnok, Ph.D., at the University of Georgia, showing 75 percent or more of the participants in his seminars say they use some type of biostimulant.

Plants treated with products containing biostimulants show greater root growth than the control shown on the left. **Photo by Erik Ervin**

"Superintendents are hungry for information that backs up their use of biostimulants to make them more confident," Ervin says. "I'm happy to see someone putting science behind these products."

Some superintendents know quite a bit about biostimulants from attending seminars, Web-based education and their own testing.

"Some buy from seaweed wholesalers, cutting out the middleman, and mix their own batches," Ervin says.

McNeer uses sea plant extract products for three reasons: overall plant health (density), less disease pressure and drought stress (plants are more moist).

"I long for the day we get the research that shows these products are as useful as nitrogen," he says.

Editor's note: You can find more information about biostimulants and how antioxidants affect turfgrass health at www.turf.cses.vt.edu/ervin, or by reading "Questions and answers about biostimulants" in the June 2003 issue of GCM.

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