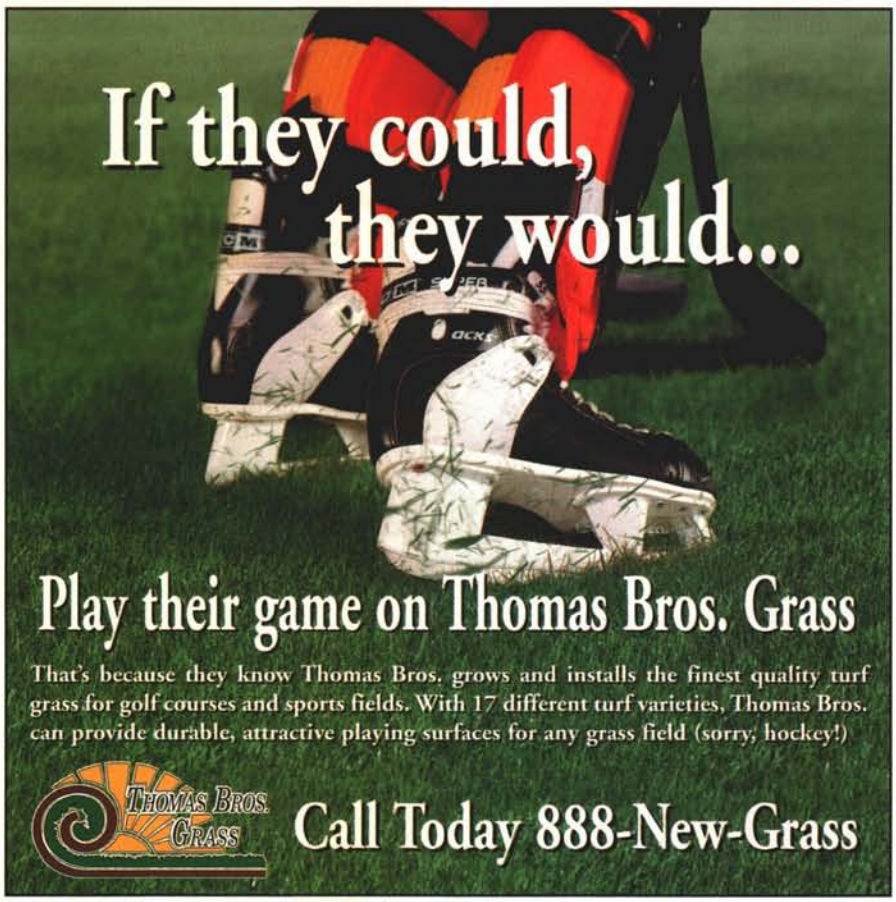
Biostimulants



by Kevin Hattori

The ultimate goal of any successful turfgrass management program is to have great-looking, green grass above the ground with a structurally correct, well-anchored root system below. Effective biostimulants help achieve these standards by addressing many facets of turf health.

Biostimulants improve root mass and length. They increase fertilizer efficiency and allow you to reduce nitrogen application rates. Biostimulants also provide plants with higher resistance to certain types of stress.

What are biostimulants?

Biostimulants fall into the category of hormones and growth regulators (PGRs). The materials trigger a physiological plant response, such as cell division. Results can include improved root growth or increased nodulation.

Some substances found in nature that have biostimulant properties include humic acid, amino acids, enzymes, and vitamins. Others have been synthesized into forms like indolbutyric acid (IBA).

In an ideal world, turfgrass would synthesize the hormones needed to sustain optimal growth and development. Every plant contains cytokinins and cytokinin-like properties as part of its metabolic activity. However, under stress, plants usually don't produce amounts substantial enough to sustain growth.

In high-stress situations, plants are often unable to synthesize what they need. This is where biostimulants come into play.

Kelp

Kelp is probably the best-known and most universally recognized natural source of biostimulants. It's the most widely used biostimulant in agriculture and turfgrass management.

Kelp contains many important PGRs, like cytokinins, gibberellins, and indoles. Its micronutrients play a major role in a plant's ability to resist attacks by pests and disease.

All kelp is not equally suitable for use as biostimulant material. Many species have been studied to determine their respective strengths.

One species that has been studied to great lengths is Ascophyllum nodosum (cold-water kelp).[1] It has long been considered a source of important PGRs, and it contains a large number of amino acids.

Microorganisms

Soil microorganisms can be likened to chemical factories. They help produce

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many beneficial growth substances. By applying microorganisms to the soil and around the root shaft, you can bring about dramatic changes in plant growth and development.

In the rhizosphere (the soil zone adjoining living plant roots), a broad range of microorganisms produce cytokinin-like biostimulants along with enzymes and amino acids. Hormones produced by microbes are called phytohormones. This group can be broken down into the following primary classes: auxins, gibberellins, cytokinins, ethylene, and abscisic acid. Secondary (but still important) substances in this category include amino acids, organic acids, carbohydrates, nucleic acid derivatives, vitamins, and other growth substances.

Bacillus subtilis is a good example of a beneficial microorganism that helps produce PGRs. In an Auburn University study, it was shown to effectively increase root mass, nodulation, and early emergence, and to suppress diseases like Rhizoctonia and Fusarium.[2]

Humic substances

Humic acid is often included under the term biostimulants, because it triggers plant responses that are similar to hormonal ones. However, humic acid is such a complex molecule that it is difficult to determine whether a hormonal response is caused by the acid itself, or by one of its components. It's also possible that such responses are due to increased/improved availability of micronutrients and macronutrients.

Regardless, humic acid increases overall plant root growth, plant vigor, and general plant health. Adding humic materials can trigger a chain reaction which causes soil microorganisms to synthesize and excrete PGRs into the rhizosphere. This can dramatically improve plant growth and development.

Caution

Don't go overboard. Excessive amounts of biostimulants can actually cause reverse effects, such as stunted growth. Also, some products on the market intentionally reduce foliar top growth of turfgrasses.

A delicate balance must be maintained. Always use caution when mixing different products together. Each has different effects on your turfgrass.

For instance, one product works by temporarily inhibiting synthesis of gibberellic acids in turfgrass. This causes decreased elongation of turfgrass cells and internode length. If applied in conjunction with another product that's high in gibberellic acid, the original product's effectiveness would be negated.

References

1. Senn, T.L.; Aitken, J.B.; Acock, B. 1964. The Characteristics and Effects of Humic Acids Derived from Leonardite.

2. Backman, Paul A.; Brannen, Phillip M.; and Mahaffee, Walter F. 1994. Plant Response and Disease Control Following Seed Inoculation with Bacillus subtilis.

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