CropHealth Advising & Research
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To | Date

Thursday February 28, 2013

6 pages from Mario Lanthier

WORLD CONGRESS ON BIOSTIMULANTS

The event was held in November in Strasbourg (France).

It was organized by New Ag International, a magazine focusing on "high tech horticulture". Website http://www.newaginternational.com.

The Congress was attended by 705 persons from 50 different countries, a mixture of researchers, manufacturers, crop consultants and money fund investors (looking to invest in upstart companies).

Biostimulants: What are they?

Pierdomenico Perata, Congress Scientific Committee, Italy (http://www.sssup.it/perata)

Biostimulants are products that regulate and enhance plant physiological processes.

They are not fertilizers – but they improve plant nutrition.

They are not pesticides – but they protect from disease infection.

They are not growth regulators – but they stimulate plant growth.

Biostimulants are usually derived from natural sources – seaweed extracts, humic acid, amino acids, plant extracts, soil microorganisms, silicates, trace elements or manure fermentation. They are complex molecules that may contain plant hormones, leading to multiple and synergestic effects.

They are applied in small quantities to influence plant respiration, photosynthesis, nucleic acid synthesis and nutrient ion uptake. Research on biostimulants is fairly new and the science is not fully developed. The impact is most obvious when the plant is under stress, but it is unclear the products are useful under optimized growth condition.

THE WORLD MARKET FOR BIOSTIMULANTS

Giuseppe Natale, Valagro spa Italy (http://www.valagro.com/en/corporate/about-us/welcome-to-valagro)

The "European Biostimulants Industry Consortium" was formed in 2011 and now comprises 31 members (EBIC, website http://www.biostimulants.eu/). Progress is much slower in the United States, with the newly-created Biostimulant Coalition counting 11 members (http://www.biostimulantcoalition.org/).

In Europe, market value is estimated at 200 and 400 million euros, or 2% of the total market for agricultural inputs and 12% of the total market for fertilizers. Sales are growing at 10% per year, in part because of commercial products now becoming available, in part because of government legislation restricting the use of pesticides.

REGULATION IN EUROPE

By Patrick du Jardin, University of Liège, Belgium
(http://www.gembloux.ulg.ac.be/institution/les-departements/sciences-agronomiques/biologie-vegetale/)

In early 2012, a scientific review of the topic was prepared for the European Commission. The aim of the report was to define what is "unique" about biostimulants, and whether a new commercial product should be registered as a fertilizer, a pesticide or a new category of products [1].

The author reviewed 250 articles in peer reviewed scientific journals, with the first use of "biostimulant" dating back to 1997. He concluded:

> *"Biostimulants are defined more by what they do than by what they are, since the category includes a diversity of substances. They stimulate growth, but they do much more. Stress tolerance is perhaps the most important benefit".*

Impact on plants	Humic substances	Organic minerals	Chemical elements	Seaweed	Chitin	Anti-transpirants	Amino acids
Inside the plant	No	Yes	Yes	Yes	No	Yes	Yes
Outside the plant	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Physical effect	No	Yes	Yes	Yes	No	Yes	Yes
Metabolic effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hormonal effects	Yes	Yes	No	Yes	No	Yes	Yes
Nutrition efficiency	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Abiotic stress response	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Biotic stress response	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[1] The 38-page report is an excellent technical review of the topic and is available on-line at http://ec.europa.eu/enterprise/sectors/chemicals/files/fertilizers/final_report_bio_2012_en.pdf

THE SCIENCE OF BIOSTIMULANTS

Mechanisms of plant defenses

By J.P. Metreaux, University of Fribourg Switzerland (http://www.unifr.ch/plantbiology/eng/Home/research/metraux)

The knowledge of plant defense mechanisms has been growing since the 1980s. Scientists today work on a complex model of multiple pathways and reactions.

Generally, plants recognize a pathogen attack with a genetic response that leads to production of proteins to increase cell wall thickness, act as antibiotics or physically isolate the pathogen. Commercial biostimulants try to mimic one of these pathways.

Biostimulants can be effective in the lab but not in the field. This is because of genetic variability in the host plant, the pathogen being able to adapt rapidly to a modified host, or environmental conditions. For a grower to adopt a commercial product, the supporting research must be based on field experiments.

Biostimulants and water stress

by Eduardo Blumwald, University of California at Davis (http://blumwald.ucdavis.edu/)

"In California today, water is the most expensive input for agriculture crops, much more than nitrogen."

Commercial food crops were bred for taste but not for stress resistance. This lab is working to enhance plant tolerance to water stress by maintaining optimum cytokinin levels during stress via IPT gene expression (isopentenyltransferase).

Biostimulants will condition the plant for coping with adverse external factors. The effect may not be seen until 4 to 6 weeks after application. There is a drawback: if the plant defense system is activated in absence of stress, too much resources may go to production of defence proteins at the expense of food production (fruit or seeds).

"Timing is critical. Get it wrong and it will not work!"

Seaweed extracts as biostimulants

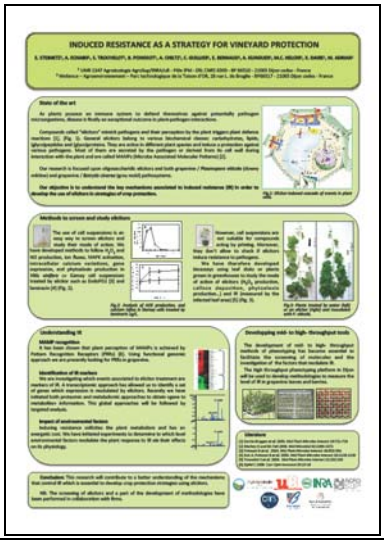
by B. Prithiviraj, Dalhousie University Nova Scotia (http://www.dal.ca/faculty/agriculture/environmental-sciences/faculty-staff/our-faculty/balakrishnan-prithiviraj.html)

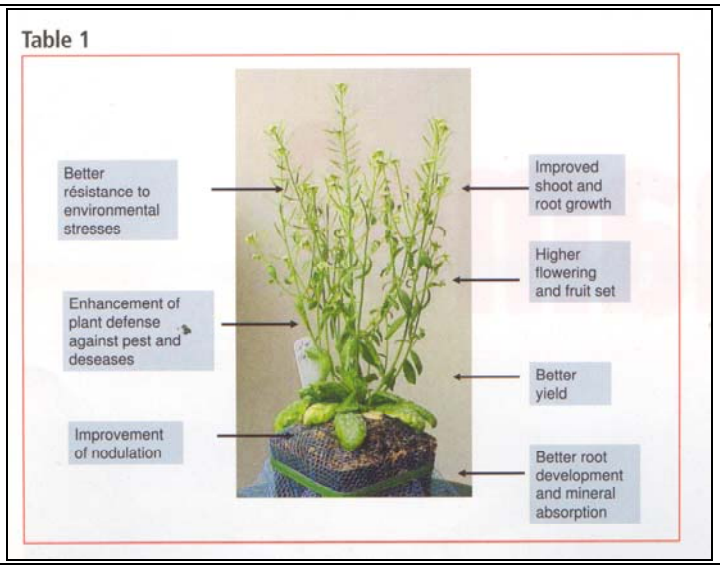
Dr. Prithiviraj is recognized as "the most reputable researcher on the topic" in the world. His work in Nova Scotia was done with the brown seaweed *Ascophyllum nodosum*. Results published in scientific journals indicate that seaweed:

- Improved growth and vigour of barley seedlings (J Plant Growth Regulation, 2008)
- Induced tolerance to frost stress in Arabidopsis (Planta, 2009)
- Protected against oxidative and thermal stress in spinach (Food Chemistry, 2011)
- Alleviates salinity stress in Arabidopsis (coming publication).

POSTER SESSION

The conference had 47 oral presentations (22 scientific, 12 on products, 13 legislation).
Picture: There was also a room with displays of commercial products and 170 posters.
Posters present results of on-going research or specialized projects.
Our company presented a poster on our experiments with compost tea recipes.



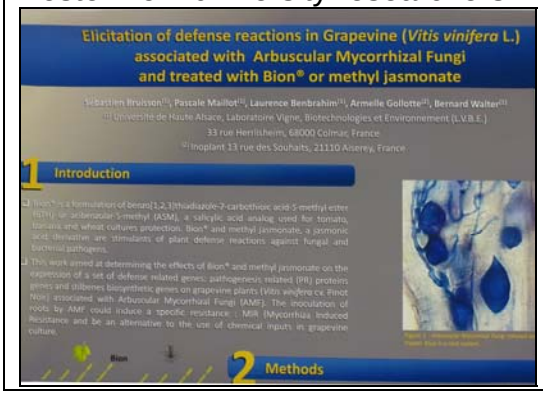


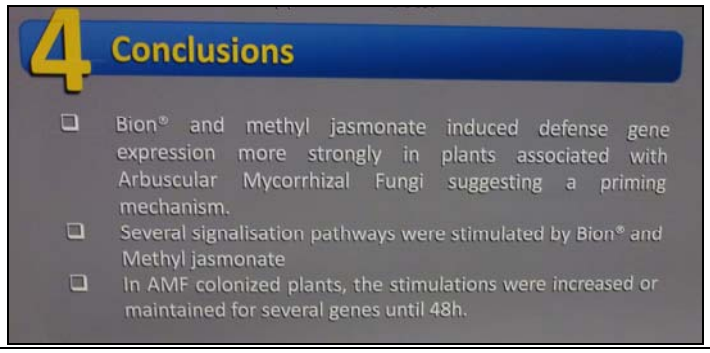
Left: Poster on research conducted in France with elicitors and grapevine diseases.
“Elicitors” are molecules that mimick a pathogen and trigger the plant defence reaction.
The aim is to understand plant mechanisms that induce resistance to diseases.

Right: Functions performed by biostimulants and their impact on plant processes.
The drawing is focused on seaweed (by J.F. Morot-Gaudry, INRA, France).

POSTERS: UNIVERSITY RESEARCH

Poster from university researchers in Alsace, France

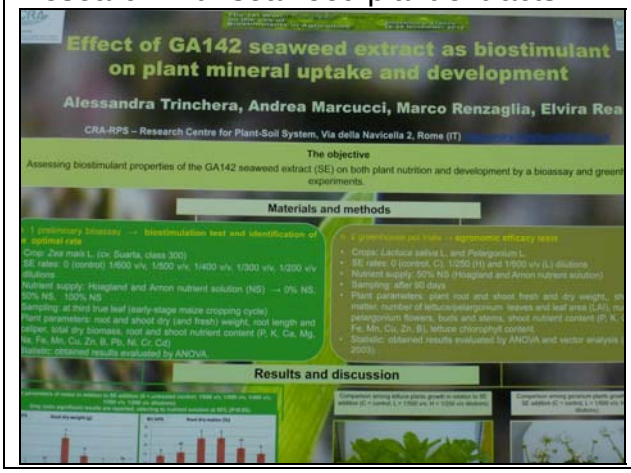


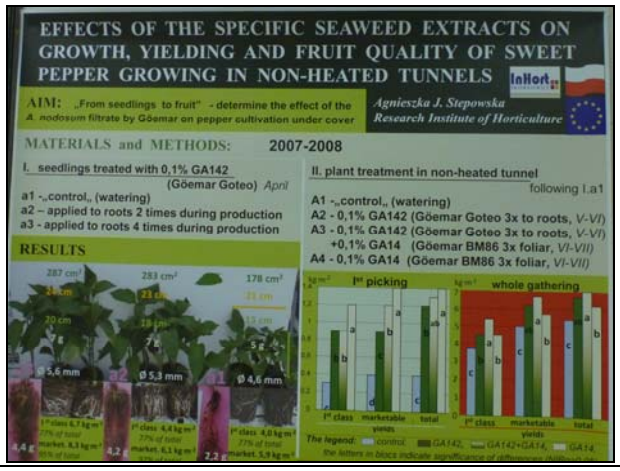


Left: Bion is a formulation of BTH and ASM, both salicylic acid analogs.
In plants, the salicylic acid pathway is a known defense pathway against infection.
The mode of action is through defense related genes that produce specific proteins.
Using this product, the plant is "primed" to fight a disease ahead of the pathogen arrival.

Right: The researchers conclude the expression of defense genes is stronger on grape plants previously colonized by mycorrhizal fungi. The stimulation lasted up to 48 hours.
Work performed at Université de Haute Alsace, France (http://www.uha.fr/).

Research with seaweed plant extracts

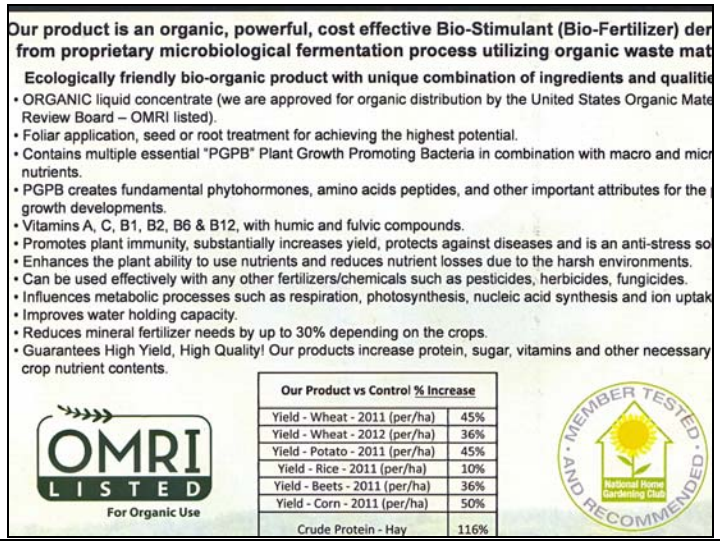




Left: Impact of one seaweed extract on plant nutrient uptake in greenhouse lettuce.
Work performed at the Research Centre for Plant-Soil Systems, Italy (http://sito.entecra.it/portale/cra_dati_istituto.php?id=202&lingua=EN).

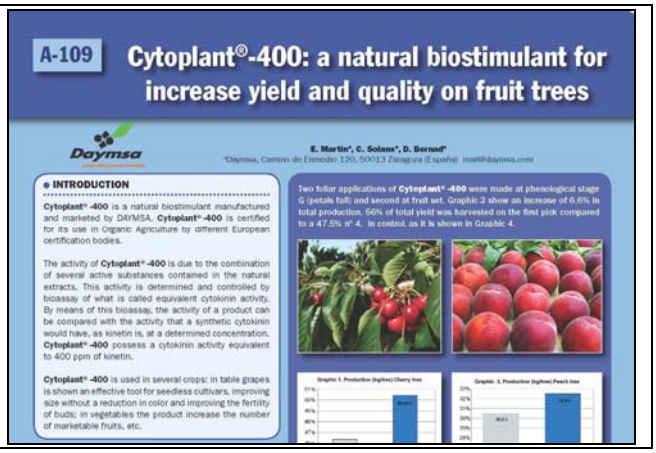
Right: Effect of seaweed extracts on growth and quality of sweet peppers in tunnels.
Research conducted at the Research Institute of Horticulture, Poland (http://www.inhort.pl/home_en.html).

POSTERS: COMMERCIAL PRODUCTS



Left: Fast-2-Grow is based on converted poulty manure.
It is derived from a fermentation process with bacterial and microbial inoculants.
The manufacturer is based in Texas (http://www.fast2grow.com/).

Right: The product has OMRI certification for use by organic growers.
It is said to enhance plant growth and development and improve plant nutrient activity.



Left: Sunred, a plant extract containing phenylalanine, mehionine and monosaccharide.
The Italy-based company is a manufacturer of fertilizers (http://www.biochim.it/).

Right: Cytoplant-400, a product "from natural extracts" with cytokinin-equivalent activity.
The manufacturer is based in Spain (http://www.daymsa.com/index.php?L=en).