

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 synergistic 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”.

	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/metreaux>)

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).

POSTERS: UNIVERSITY RESEARCH

Poster from university researchers in Alsace, France

Elicitation of defense reactions in Grapevine (*Vitis vinifera* L.) associated with Arbuscular Mycorrhizal Fungi and treated with Bion® or methyl jasmonate

Vicartien Brunson¹, Pascale Maillo², Laurence Benbrahim³, Armelle Gollet¹, Bernard Walter¹

¹ Université de Haute Alsace, Laboratoire Vigne, Biotechnologies et Environnement (L.V.B.E.)
33 rue Herrliheim, 68000 Colmar, France.
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1 Introduction

Bion[®] is a formulation of BTH and ASM, both salicylic acid analogs. BTH and ASM are salicylic acid analogs used for tomato, lettuce and wheat cultures protection. Bion[®] and methyl jasmonate, a jasmone acid derivative, are stimulants of plant defense reactions against fungal and bacterial pathogens.

This work aimed at determining the effects of Bion[®] and methyl jasmonate on the expression of a set of defense related genes: pathogenesis related (PR) proteins (PR1 and PR2) and defense biosynthetic genes on grapevine plants (*Vitis vinifera* cv. Pinot Noir) associated with Arbuscular Mycorrhizal Fungi (AMF). The inoculation of roots by AMF could induce a "priming" resistance. AMF (mycorrhizal induced resistance) can be an alternative to the use of chemical inputs in grapevine culture.

2 Methods

4 Conclusions

- ❑ Bion[®] and methyl jasmonate induced defense gene expression more strongly in plants associated with Arbuscular Mycorrhizal Fungi suggesting a priming mechanism.
- ❑ Several signalisation pathways were stimulated by Bion[®] and Methyl jasmonate
- ❑ In AMF colonized plants, the stimulations were increased or maintained for several genes until 48h.

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

Effect of GA142 seaweed extract as biostimulant on plant mineral uptake and development

Alessandra Trinchera, Andrea Marcucci, Marco Renzaglia, Elvira Rea

CRA-RPS – Research Centre for Plant-Soil System, Via della Navicella 2, Rome (IT)

The objective
Assessing biostimulant properties of the GA142 seaweed extract (SE) on both plant nutrition and development by a bioassay and growth experiments.

Materials and methods

I preliminary bioassay → biostimulation test and identification of a optimal rate

Crop: Zee mast L. (cv. Suavia, class 300)
SE rates: 0 (control), 1/500 v/v, 1/500 v/v, 1/400 v/v, 1/300 v/v, 1/200 v/v dilutions
Nutrient supply: Hoagland and Arnon nutrient solution (NS) → 0% NS, 50% NS, 100% NS
Sampling: at first true leaf (early-stage before cropping cycle)
Plant parameters: root and shoot dry weight, root length and plant parameters: root and shoot dry (fresh) weight, root length and nutrient: total dry biomass, root and shoot nutrient content (P, K, Ca, Mg, Na, Fe, Mn, Cu, Zn, B, Pb, Ni, Cl, Co)
Statistical: statistical results evaluated by ANOVA

Results and discussion

EFFECTS OF THE SPECIFIC SEAWEED EXTRACTS ON GROWTH, YIELDING AND FRUIT QUALITY OF SWEET PEPPER GROWING IN NON-HEATED TUNNELS

Agnieszka J. Stepowska
Research Institute of Horticulture

AIM: „From seedlings to fruit” – determine the effect of the *A. nodosum* filtrate by Göemar on pepper cultivation under cover

MATERIALS AND METHODS: 2007-2008

I. seedlings treated with 0,1% GA142 (Göemar Goteo) April

a1 - control, (watering)
a2 – applied to roots 2 times during production
a3 – applied to roots 4 times during production

II. plant treatment in non-heated tunnel following I.a1

A1 - control, (watering)
A2 - 0,1% GA142 (Göemar Goteo 3x to roots, V-VI)
A3 - 0,1% GA142 (Göemar Goteo 3x to roots, V-VI) +0,1% GA14 (Göemar BM86 3x foliar, VI-VII)
A4 - 0,1% GA14 (Göemar BM86 3x foliar, VI-VII)

RESULTS

287 cm² 283 cm² 178 cm²
23 cm² 23 cm² 23 cm²
20 cm 18 cm 18 cm
φ 5,6 mm φ 5,3 mm φ 4,6 mm

1st class: 6,7 kg/m² (7% of total marketable 5,3 kg/m²)
2nd class: 4,4 kg/m² (7% of total marketable 3,3 kg/m²)
3rd class: 4,0 kg/m² (7% of total marketable 3,3 kg/m²)

1st class picking (kg/m²)
1st class: marketable total
2nd class: marketable total

whole gathering (kg/m²)
1st class: marketable total
2nd class: marketable total

The legend: control, GA142, GA14+GA14, GA14

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

A046
Innovative Bio-Organic Products for Agriculture: International Practical Implementation
 Patented in North America, Russia & CIS
 E. Fomicheva, V. Mokhov, A. Bautina

www.Fast2Grow.com • Houston, TX USA
 info@Fast2Grow.com
 www.GreenTect.TD.ru • Moscow, Russia
 info@GreenTect.TD.ru

Our product is an organic, powerful, cost effective Bio-Stimulant (Bio-Fertilizer) derived from proprietary microbiological fermentation process utilizing organic waste matter. Ecologically friendly bio-organic product with unique combination of ingredients and qualities:

- ORGANIC liquid concentrate (we are approved for organic distribution by the United States Organic Materials Review Board – OMRI listed)
- Foliar application, seed or root treatment for achieving the highest potential.
- Contains multiple essential "PGPB" Plant Growth Promoting Bacteria in combination with macro and micro nutrients.
- PGPB creates fundamental phytohormones, amino acids peptides, and other important attributes for the plant growth developments.
- Vitamins A, C, B1, B2, B6 & B12, with humic and fulvic compounds.
- Promotes plant immunity, substantially increases yield, protects against diseases and is an anti-stress solution.
- Enhances the plant ability to use nutrients and reduces nutrient losses due to the harsh environments.
- Can be used effectively with any other fertilizers/chemicals such as pesticides, herbicides, fungicides.
- Influences metabolic processes such as respiration, photosynthesis, nucleic acid synthesis and ion uptake.
- Improves water holding capacity.
- Reduces mineral fertilizer needs by up to 30% depending on the crops.
- Guarantees High Yield, High Quality! Our products increase protein, sugar, vitamins and other necessary crop nutrient contents.

OMRI LISTED
 For Organic Use

Our Product vs Control % Increase	
Yield - Wheat - 2011 (per/ha)	45%
Yield - Wheat - 2012 (per/ha)	36%
Yield - Potato - 2011 (per/ha)	45%
Yield - Rice - 2011 (per/ha)	10%
Yield - Beets - 2011 (per/ha)	36%
Yield - Corn - 2011 (per/ha)	50%
Crude Protein - Hay	116%

BIO-STIMULANTS

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

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MEMBER TESTED AND RECOMMENDED
 National Plant Product Testing Club

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.

Biochim the value of experience the strength of innovation
 Genova special

SUNRED®. A BOTANICAL EXTRACT-BASED BIOSTIMULANT. ENHANCES POLYPHENOLS ACCUMULATION AND IMPROVES QUALITY OF MUSTS

Vanina Ziosi¹, Dullio Porro², Franco Vitali³, Giulio Giovannetti¹, Antonio Di Nardo³

INTRODUCTION
 SUNRED® is a biostimulant containing phenylalanine, methionine, monosaccharides and botanical extracts rich in oxylinins, cyclopentanonic compounds involved in several ripening-related processes. SUNRED® has been shown to be effective in improving fruit colour and anthocyanin and soluble sugar accumulation in apple, cherry, table grape, and tomato. In the present work, the effect of SUNRED® on grapevine polyphenol accumulation and quality parameters of musts was investigated.

MATERIALS AND METHODS
 Trials were carried out on grapevines (*Vitis vinifera* L.) cv Cabernet Sauvignon, Prosecco, and Pinot grigio grown in

RESULTS AND DISCUSSION
 1. SUNRED® IMPROVES FRUIT COLOUR AND RIPENING UNIFORMITY
 In all cultivars, SUNRED® improved fruit colour development and ripening uniformity (Fig. 1).

2. SUNRED® STIMULATES POLYPHENOL ACCUMULATION
 In Cabernet Sauvignon, SUNRED® significantly enhanced anthocyanin and total polyphenol accumulation in must. A similar trend was observed in Prosecco. However, not statistically significant (Table 2).

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

A-109 **Cytoplant®-400: a natural biostimulant for increase yield and quality on fruit trees**

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INTRODUCTION
 Cytoplant®-400 is a natural biostimulant manufactured and marketed by DAYMSA. Cytoplant®-400 is certified for its use in Organic Agriculture by different European certification bodies.

The activity of Cytoplant®-400 is due to the combination of several active substances contained in the natural extracts. This activity is determined and controlled by bioassay of what is called equivalent cytokinin activity. By means of this bioassay, the activity of a product can be compared with the activity that a synthetic cytokinin would have, as kinetin is, at a determined concentration. Cytoplant®-400 possess a cytokinin activity equivalent to 400 ppm of kinetin.

Cytoplant®-400 is used in several crops: in table grapes is shown an effective tool for seedless cultivars, improving size without a reduction in color and improving the fertility of buds; in vegetables the product increase the number of marketable fruits, etc.

Two foliar applications of Cytoplant®-400 were made at phenological stage 42 (pre-harvest) and second at fruit set. Graphic 3 show an increase of 6.5% in total production, 66% of total yield was harvested on the first pick compared to a 47.5% in 4. In control, as it is shown in Graphic 4.

Graphic 3. Production (kg/ha) Cherry tree

Product	Production (kg/ha)
Control	~47.5%
Cytoplant®-400	~54%

Graphic 4. Production (kg/ha) Peach tree

Product	Production (kg/ha)
Control	~47.5%
Cytoplant®-400	~54%

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>).