PANEL 2

Innovation in farm practices

Moderated by Martin HLAVÁČEK
Hydrolysis-derived biostimulants: a case study for more sustainable farming

Chiara MANOLI
Vice chair of Italy Task Force, EBIC Regulatory Affairs, ILSA
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29 January 2020
ELO Innovation Conference – Climate Positive Farming
European Parliament, Brussels
European Biostimulants Industry Council (EBIC)

56 member companies

Breakdown by size (based on global turnover and headcount)

- Micro
- Small
- Medium
- Large
- Very large

www.biostimulants.eu
@biostimulantsEU
What are biostimulants?

Biostimulants stimulate natural processes to enhance:

1. nutrient uptake, nutrient efficiency
2. tolerance to abiotic stress
3. crop quality

With benefits for yield and vigour

Raw materials include seaweeds, plant extracts, humic and fulvic acids, hydrolysed proteins and others
Biostimulants help plants access and use more of the nutrients in and applied to soils

Enhancing early root growth

Stimulating root production of substances

Providing additional beneficial micro-organisms

**Biostimulants:** Towards a more **sustainable** agri sector

- **Enhanced root development**
- **Enhanced nutrient use efficiency**
- **Improved abiotic stress tolerance**
- **Help soil health by fostering development of beneficial soil microorganisms**

**Key benefits**:

- Enhanced nutrient and water use efficiency
- Fewer losses of N2O (a greenhouse gas) to the environment
- Farmers' crops can bounce back from climate stresses (e.g.: heat and drought), improving farmer livelihoods despite ever more volatile conditions
- Healthier soil retains more water, better resists erosion and stores more carbon
Biostimulants are a Key Enabling Technology for achieving **Circular Agriculture**

- **Biostimulants help to reduce nutrient losses to the environment**
  - By improving the efficiency of conventional crop inputs

- **Many biostimulants are sourced from renewable resources**
  - Plant and seaweed extracts
  - Discarded plant materials repurposed as raw materials

- **Some PBs are derived from re-valorised animal byproducts from agrifoodchain or other industry**

- **Conversion of wastes into raw materials for biostimulants helps to reduce waste streams**
The new EU Fertilising Products Regulation will unlock the European Single Market for biostimulants.
ILSA IS AN ITALIAN SMALL-MEDIUM ENTERPRISE FUNDED IN 1956.

ITS CORE BUSINESS IS BASED ON ORGANIC-BASED FERTILIZERS AND PLANT BIOSTIMULANTS.

Today it is one of the top players in the international market of biostimulants and specialty fertilizers for professional agriculture

Headquarters in Italy

Worldwide presence:
> 70 distributors
7 subsidiaries
4 representative offices
AGRICULTURAL SUSTAINABILITY STARTS BEFORE THE FIELD ...
A CASE OF STUDY:
ILSA hydrolysis-derived biostimulants

WHAT THEY ARE:
- Biostimulants deriving from a variety of *animal residues and plant sources*
- Biostimulants produced by *enzymatic* or *thermal hydrolysis*

WHAT THEY CONTAIN:
- Free aminoacids
- Peptides
- Polyamines, betaines and related substances
- Other non-protein components
## Case study #1

### Enzymatic hydrolysate of plant origin (VIRIDEM)

<table>
<thead>
<tr>
<th>Cellular mechanism*</th>
<th>Physiological function</th>
<th>Agricultural function</th>
<th>Economic and environmental benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Stimulation of PAL enzyme</td>
<td>☐ Protection of flavonoids against UV and oxidative damage</td>
<td>☐ Increase of crop tolerance to abiotic stress</td>
<td>☐ Higher crop yield under stress condition</td>
</tr>
<tr>
<td>☐ Stimulation of enzyme and gene expression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ Reduction of flavonoids under abiotic stress</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*(Ertani et al., 2012 – University of Padova, Italy)*

*Table based on du Jardin, 2015*
Case study #1

Enzymatic hydrolysate of plant origin
(VIRIDEM)

Results presented during the 17th International Symposium of CIEC on “PLANT NUTRIENT MANAGEMENT UNDER STRESS CONDITIONS” - Cairo, 2008
Case study #1

Enzymatic hydrolysate of plant origin (VIRIDEM)

- 4 applications (each 15 dd) – 1.5 kg/ha
- In 2017 a dry and hot summer persisted until the first week of September bringing forward the harvest

<table>
<thead>
<tr>
<th>Sugar content (saccarose % w/w)</th>
<th>Polyphenols at 280 nm (in gallic acid)(mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ILSA’s entry</td>
<td>Untreated control</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>1.600</td>
</tr>
<tr>
<td>24.5</td>
<td>1.580</td>
</tr>
<tr>
<td>24</td>
<td>1.560</td>
</tr>
<tr>
<td>23</td>
<td>1.540</td>
</tr>
<tr>
<td>22.5</td>
<td>1.520</td>
</tr>
<tr>
<td>22</td>
<td>1.500</td>
</tr>
<tr>
<td>21.5</td>
<td>1.480</td>
</tr>
<tr>
<td>21</td>
<td>1.460</td>
</tr>
<tr>
<td>20.5</td>
<td>1.440</td>
</tr>
<tr>
<td>20</td>
<td>1.420</td>
</tr>
<tr>
<td></td>
<td>1.400</td>
</tr>
</tbody>
</table>
Case study #2

Enzymatic hydrolysate of animal origin
(GELAMIN)

Cellular mechanism

- Endogenous indole-3-acetic acid (IAA) induces modification of the root cells

Physiological function*

- Modification of morphology of the roots

Agricultural function

- Facilitation of nutrient uptake under stress condition

Economic and environmental benefits

- Higher/maintenance crop yield under stress conditions

*(Ertani et al., 2013 – University of Padova, Italy)

Table based on du Jardin, 2015
Case study #2

Enzymatic hydrolysate of animal origin
(GELAMIN)

- 6 applications (each 7 dd) – 10 kg/ha
- 2018 was characterized by a rainy spring.
- The transplant of watermelons occurred under water stagnation conditions

Harvesting (10/07/2018)

Average degree Brix

- 12.6
- 12

Quintals harvested

- 370
- 450

(Ertani et al., 2013 – University of Padova, Italy)

Tolerance to Heat and Water Stress
## Case study #3

### Thermal hydrolysate of animal origin

( APR – PATENTED PROCESS)

<table>
<thead>
<tr>
<th>Cellular mechanism*</th>
<th>Physiological function*</th>
<th>Agricultural function</th>
<th>Economic and environmental benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular regulation of genes encoding members of the high affinity nitrate transport system under nutritional deficiency</td>
<td>The high affinity nitrate transport play a crucial role in determining the global NUE in condition of limited nutritional inputs</td>
<td>Increase of biomass under nutritional deficiency</td>
<td>Higher crop yield under stress conditions</td>
</tr>
</tbody>
</table>

*(Trevisan et al., 2019 – University of Padova, Italy)*

Table based on du Jardin, 2015
Case study #3

Thermal hydrolysate of animal origin
(APR – PATENTED PROCESS)

- Rate to fulfill 2.5% of N demand
- Trials under nutrient deficiency (-22.5% NPK)

<table>
<thead>
<tr>
<th>Entries</th>
<th>Max diameter of the stem (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>77.5% NPK</td>
<td>30.4 a</td>
</tr>
<tr>
<td>77.5% NPK + plant biostimulant</td>
<td>31.1 ab</td>
</tr>
<tr>
<td>97.5% NPK</td>
<td>33.6 b</td>
</tr>
<tr>
<td>100% NPK</td>
<td>34.1 b</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Entries</th>
<th>Final fresh biomass (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% NPK</td>
<td>386.6 a</td>
</tr>
<tr>
<td>80% NPK + plant biostimulant</td>
<td>533.6 b</td>
</tr>
<tr>
<td>100% NPK</td>
<td>540.6 b</td>
</tr>
</tbody>
</table>
Hydrolysis-derived biostimulants help farmers to achieve climate positive farming

They are derived from renewable raw materials and manufactured by environmentally-friendly processes.

They help plants to grow in critical environmental conditions.

They support crops to maintain a marketable quality and yield, even under abiotic stress.

TO SUMMARISE...
Hydrolysis-derived biostimulants: a case study for more sustainable farming

Thank you

Chiara Manoli
Vice-Chair of Italy Task Force, EBIC
Regulatory Affairs, ILSA