Impact of BioFit N on Rhizosphere Biology, Soil Fertility and Crop Productivity

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Research at Innovak Global is initiated through observations in the field and interactions with growers that allow us to identify research and development needs in agriculture.

These technologies are then validated and developed in association with growers around the world and with leading universities and research centers.

✓ Auburn University, USA
✓ Center for Rhizosphere Biology CSU, USA
✓ CIFACITA, ESPAÑA
✓ INIFAT CUBA
✓ INIFAP, MEXICO
✓ ITSON, MEXICO
✓ Kyoto Prefectural University, JAPAN
✓ Rutgers University, New Brunswick, USA
✓ La Molina University, PERU
✓ University of Arkansas USA
✓ University of Buenos Aires, ARGENTINA
✓ University of California USA
✓ Universite Laval, CANADA
✓ Washington State Potato Comission, USA
✓ Universidad Católica, CHILE
✓ Jean Couloumbe Inst., CANADA
✓ Universiteit Hasselt, BELGIUM
✓ Universidad Sao Pablo, BRAZIL
Carboxy Formulation

Aliphatic Carboxy

Nutrients Activated

Aromatic Carboxy

Bioregulators

Oligomers

Soil Conditioner
Multi-Species Microbial Inoculant Soil Amendment for Soil Health
Restores and maintains the productive capacity of the soil
Microbial Formulation

Soil amendment
Powder
CONTAINS NON-PLANT FOOD INGREDIENTS

**Microbial inoculum 20%**
*Azotobacter chroococcum ............ 1 X 10^6 CFU/g
Bacillus subtilis........................ 1 X 10^8 CFU/g
Bacillus megaterium .................... 1 X 10^6 CFU/g
Bacillus mycoides ...................... 1 X 10^5 CFU/g
Trichoderma harzianum .................. 1 X 10^6 CFU/g
Optimizes Plant Nutrient Uptake
Azotobacter chroococcum

✓ Free living Nitrogen fixing Rhizobacteria

✓ Increases the production of auxins, cytokinins, and GA-like substances that increase plant growth and root surface area

✓ Produces an antibiotic which inhibits the growth of several pathogenic fungi in the rhizosphere
Improves Root Growth, Vigor and Health
**Bacillus subtilis, Bacillus megaterium & Bacillus mycoides**

- *Bacillus spp.* have been shown to suppress plant parasitic nematodes in many agricultural crops.

- Compete for space and food against pathogenic fungi, which prevents infection of the roots.

- Prevents disease incidences in the root, caused mainly by *Phytophthora, Fusarium, Pythium, Rhizoctonia & Verticillium*.

- Secretes substances that generate healthy roots that strengthen tolerance to pathogenic fungi attack.

- Increases total phosphorus uptake by plant.

- Increases plant growth and root surface area.
Maintains a Healthy Soil Microbiome
✓ *Trichoderma spp.* have been shown to suppress plant parasitic nematodes in many agricultural crops.

✓ *Trichoderma spp.* displace pathogenic fungi through parasitism, antibiosis and competitive exclusion that has been shown to suppress plant and soilborne disease.

✓ Releases large amounts of enzymes capable of breaking down compounds with complex structures that allow for better nutrient cycling within the soil

✓ Releases soluble and volatile metabolites with beneficial biological activity to plants and other beneficial microbes.
The ExuRoot formulation promotes:

✓ Plant Biostimulant that increases root exudation.

✓ Substantially increases microbial colonization of the rhizosphere.
Exudates of tomato roots produced from radiotraced CO₂ and incorporated by photosynthesis, after treatment with ExuRoot™; Research from Arkansas University, USA.

72 h after radiolabeling. 10 days after last application of ExuRoot™

Counts per min/mL of nutrient solution

Significant statistical differences between the treatments (α=0.05)
Abundance of prokaryota and eukaryota within the Rhizosphere (CSU, 2010)

Significant statistical differences between the treatments (α=0.05)
Nutrient extraction analysis from whole bell pepper plant

- **N**: Nitrogen
- **P**: Phosphorus
- **K**: Potassium
- **Ca**: Calcium
- **Mg**: Magnesium
- **Total**: Total Nutrients

**Comparison**:
- **Control**
- **BioFit**

The chart shows a significant increase in nutrient levels, particularly in Potassium and Total Nutrients, when using BioFit compared to the control.
Results of BioFit N Greenhouse Experiment on Potatoes - 2014

Significant statistical differences between the treatments (α=0.05)

- Root-Knot Nematode Infested Roots
- Root-Knot Nematode Infested Roots Treated with BioFit N

Root Surface Area (cm²):

- a (+76%)
- b
Root-Knot Nematode infested roots

Root-Knot Nematode infested roots treated with BioFit N
Significant statistical differences between the treatments (α=0.05)

*M. chitwoodi* Tuber Damage at the Starting J2 Population Level of 120

- **Vydate**: 2 – 30 fl. oz./ac
- **BioFit N**: 4 – 1 lb./ac
- **BioFit N**: 3 – 1 lb./ac
Tomato Roots Treated with BioFit N
Tomato Roots Control
SLV Farm #1
BioFit N Commercial Potato Field Trial - 2016

Significant statistical differences between the treatments ($\alpha=0.05$)
### SLV Farm #1
BioFit N Commercial Potato Field Trials - 2016

Total Nematode Population (population in 100 g of soil)

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Free-Living Nematodes</th>
<th>Predator Nematodes</th>
<th>Plant Parasitic Nematodes</th>
<th>Total Nematodes</th>
<th>Percentage of Beneficial Nematodes to Plant Parasitic Nematodes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>27</td>
<td>0</td>
<td>12</td>
<td>39</td>
<td>56%</td>
</tr>
<tr>
<td>BioFit N</td>
<td>36</td>
<td>0</td>
<td>9</td>
<td>45</td>
<td>75%</td>
</tr>
</tbody>
</table>
### Soil Microorganism Population

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Active Bacteria (ug/g)</th>
<th>Total Bacteria (ug/g)</th>
<th>Active Fungi (ug/g)</th>
<th>Total Fungi (ug/g)</th>
<th>Total Fungi to Total Bacteria (%)</th>
<th>Active Fungi to Active Bacteria (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BioFit N</td>
<td>25.20</td>
<td>487</td>
<td>23.20</td>
<td>304</td>
<td>62%</td>
<td>92%</td>
</tr>
<tr>
<td>Control</td>
<td>21.30</td>
<td>397</td>
<td>4.02</td>
<td>133</td>
<td>32%</td>
<td>19%</td>
</tr>
</tbody>
</table>
Pepper Plant Trials - 2016
Pepper Plant Trials - 2016

Significant statistical differences between the treatments ($\alpha=0.05$)

**Graph:**
- **Y-axis:** Root Area (cm$^2$)
- **X-axis:**
  - Control
  - BioFit N (3 - 1.8 lbs./ac)
- **Legend:**
  - a (+41%)
  - b
Pepper Plant Trials - 2016

Significant statistical differences between the treatments
($\alpha=0.05$)
Current Applied Research World Wide
Current Applied Research World Wide
Current Applied Research World Wide
Current Applied Research
World Wide
Current Applied Research World Wide