BIOZYME
Global Training Module
1. Presentation & Composition:

- Liquid formula for seed treatment, foliar spray, in furrow or drip irrigation application (pH=4.5)

- Contents:

  - Plant extracts
  - Macronutrients: Mg (0.14%); S (0.44%)
  - Micronutrients: Mn (0.12%); Fe (0.49%); Zn (0.37%); B (0.3%)
2. Mode of action:

- Induce over expression of genes linked to hormones involved in fruit set & fruit growth
  *(University of Mexico, 2013)*

- Activate metabolic pathways such as Cytokinin, Gibberelins, Auxin, Cell differentiation-division-elongation
  *(University of Southern Illinois, 2014 - University of Mexico, 2015)*

Refer to Annex 1 for further Independent Research Peer Review Citations
2. Mode of action:

Influence of Biozyme on the ramifications development (blue color is indicating cytokinin activity):

- **H₂O**
- **Biozyme**
- **Synthetic cytokinin**
2. **Mode of action:**

Influence of Biozyme on root development (blue color is indicating auxin activity):

- **H₂O**
- **Biozyme**
- **Auxin**
3. **Crop benefits:**

Biozyme activates different key physiological pathways, depending on its application timing.

### Improved Physiological pathways:

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Germination</th>
<th>Vegetative growth</th>
<th>Reproduction</th>
<th>Maturation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral uptake</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell division (roots, stems &amp; leaves)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorophyll &amp; Photosynthesis activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit set &amp; fruit growth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrient &amp; carbohydrates translocation to growing fruit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Grower benefits:

- **Fruiting crops**: promote higher flowering and fruit setting: increase number of marketable fruits, size, uniformity & quality

- **Row crops**: promote better germination and vegetative growth, leading to higher yield

- Easy-to-use, compatible with most PPP and fertilizers (ST, foliar or drip)
## 5. Crops & global recommendations for foliar applications:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Rate</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruting vegetables Berries</td>
<td>0.5 L/ha</td>
<td>2-3 sprays: 1st application at first flower stage, then repeat every 2-3 weeks</td>
</tr>
<tr>
<td>Leafy vegetables</td>
<td>0.5 L/ha</td>
<td>3 sprays: 2-3 pairs of leaves, then every 2 weeks</td>
</tr>
<tr>
<td>Fruit trees (pome &amp; stone fruits, nuts, citrus)</td>
<td>0.5 L/ha</td>
<td>2-3 sprays: bloom, petal fall, fruit appearance</td>
</tr>
<tr>
<td>Vine &amp; table grape</td>
<td>0.5 L/ha</td>
<td>3 sprays: beginning bloom, after fruit set, pea size</td>
</tr>
<tr>
<td>Leguminous crops (peas, soybean, beans)</td>
<td>0.5 L/ha</td>
<td>1-2 sprays: budding stage to beginning of flowering, then repeat after 2-3 weeks</td>
</tr>
<tr>
<td>Cereals</td>
<td>0.5 L/ha</td>
<td>1-2 sprays: end of tillering, then flag leaf</td>
</tr>
</tbody>
</table>
6. Technical data summary:

% Marketable yield increase in FRUTING CROPS ï FOLIAR APPLICATION:

**Tomato**
- + 2 to 42%
- + 6 to 22% number of fruits
- 21 trials Europe & Africa
- 2 to 6 appl. 0.5 to 1 L/ha

**Cucumber**
- + 8 to 10%
- 11 trials Europe & Asia
- 2 to 3 appl. 0.5 to 1 L/ha

**Cantaloupe**
- + 30%
- Tunisaia trial
- 3 appl. 1 L/ha

**Apple**
- + 3 to 14%
- Europe & Africa trials
- 1 to 2 appl. 1.5 to 2.5 L/ha

**Peach**
- + 9 to 17%
- Brazil trials
- 4 appl. 0.25 to 0.5 L/ha

**Banana**
- + 18 to 38%
- Brazil trials
- 4 appl. 0.25 to 0.5 L/ha

**Raspberry**
- + 15 to 40%
- Mexico trials
- 2 appl. 0.5 to 1 L/ha

**Wine grape**
- + 4%
- Brazil trial
- 1 appl. 0.5 L/ha
6. Technical data summary:

% Yield increase in ROW CROPS ï FOLIAR APPLICATION:

**Soybean**
- + 7%
- 6 trials Argentina
- 1 appl. 0.5 L/ha. R1 stage

**Cereals**
- (wheat & barley)
  - + 6 to 7%
  - 12 trials Argentina
  - 1 appl. 0.25 L/ha. BBCH 31

**Sugarcane**
- + 5 to 12%
- 7 trials Argentina & Brazil
- 1 appl. 0.25 to 0.75 L/ha.
- 30-60 cm tall stage

**Dry Bean**
- + 8 to 10%
- 4 trials Argentina & Brazil
- 1-2 appl. 0.25 to 0.5 L/ha.
- R5 stage

**Potato**
- + 27 to 33%
- 2 trials Brazil & Columbia
- 2 to 4 appl. 0.5 to 0.8 L/ha
- Beginning Tuberization + every 14 days
### 6. Technical data summary:

% Yield increase in ROW CROPS - SEAD TREATMENT:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Yield Increase</th>
<th>% Emergence</th>
<th>Trials</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybean</td>
<td>+ 2 to 28%</td>
<td>+10 to 37%</td>
<td>33 trials Argentina &amp; Brazil</td>
<td>1 to 4 mL/Kg</td>
</tr>
<tr>
<td>Dry Bean</td>
<td>+ 2 to 21%</td>
<td></td>
<td>7 trials Brazil</td>
<td>1 to 4 mL/Kg</td>
</tr>
<tr>
<td>Corn</td>
<td>+ 5 to 38%</td>
<td>+3 to 33%</td>
<td>21 trials Brazil &amp; Mexico</td>
<td>2 to 8 mL/Kg</td>
</tr>
<tr>
<td>Rice</td>
<td>+ 2 to 7%</td>
<td>+4 to 40%</td>
<td>7 trials Brazil</td>
<td>0.5 to 3 mL/Kg</td>
</tr>
<tr>
<td>Cotton</td>
<td>+ 4 to 17%</td>
<td></td>
<td>5 trials Brazil</td>
<td>2 to 8 mL/Kg</td>
</tr>
<tr>
<td>Grass</td>
<td>+ 5 to 39%</td>
<td>+ 8 to 34%</td>
<td>5 trials Brazil.</td>
<td>1 to 4 mL/Kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+5 to 79%</td>
<td>aerial part length</td>
<td></td>
</tr>
</tbody>
</table>

Annex 1: Relevant Independent Research Peer Review Citations:

• BIOZYME applied as a foliar application enhanced zinc uptake much higher than typical mineral zinc application alone in soybean plants even in soils with acceptable levels of available zinc in Brazil. Zinc fertilization increased soybean yield, even in a soil with micronutrient availability above critical level. (Ferreira, L., et al, 2012).

• BIOZYME applied to citrus trees ‘Washington Navel’ and ‘Thomson’ (Citrus sinensis (L) Osb.) increased fruit set and final fruits retained per plant (Galvan et al, 2010).

• The use of BIOZYME complemented the mineral fertilization in lettuce production increasing commercial yields (Garcia, A., and J. Leon, 2010).

• In Ghana, Africa, BIOZYME as a foliar application increased total fruit yields in treated plants, slightly increased the chlorophyll content of the leaves, and increased seed number per fruit seemingly played a significant role in enhancing the yield of tomato, and may be applied at a rate of 500 ml ha⁻¹ for maximum effect (J. Ofosu-Anim, E. T. Blay & L. Bening, 2007).

• Plants treated with BIOZYME resulted in higher fruit set, yield, higher fruit weight and volume, more total soluble solids, higher total sugars and longer shelf life (Sharma et al 2009).

• The application of BIOZYME to pepper plants (Capsicum annuum) can increase plant nitrate assimilation and increase foliar dry weight and fruit yield per plant (Romero, L, 2002).

• BIOZYME can increase tuber number, sets and commercial seed when applied to potato seed production (Caldiz, D, 1996).

• Foliar application of BIOZYME to pepper (Capsicum annuum L.) grown under greenhouse induced higher levels and content of nonstructural carbohydrates, glucose, sucrose, and fructose (Belekbir et al, 1996).

• BIOZYME significantly improved emergence rate, percent emergence, final stand and number of ears of sweet corn in the first planting, and the percent emergence final stand, plant dry weight, and number of ears in the second planting (Campos-Cruz, et al 1994).

• BIOZYME can increase yield and weight of fruit in tomato Lycopersicum sculentum (Quintalan and Rojas 1990)
Annex 2: Other Information & Recommendations

STABILITY
BIOZYME is a stable product and remains without changes for up to 24 months. BIOZYME requires storage under regular conditions of humidity and temperature and under such circumstances the properties of its effectiveness is kept for up to 24 months.

STORAGE AND TRANSPORT CONDITIONS
Store it in cool, dry places. Keep in its original packaging and closed. Keep away from food, drink, animal feeding and medicine.

COMPATIBILITY
BIOZYME is compatible with most insecticides, fungicides, herbicides and fertilizers of agricultural use. BIOZYME does not produce plant toxicity when used at the recommended rates.

DIRECTIONS FOR FOLIAR USE
BIOZYME should be applied as a foliar spray, mixed with enough water to ensure proper plant coverage. BIOZYME can be applied using any type of spraying equipment.
### Annex 2: Other Information & Recommendations

#### PHYSICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance and odour</td>
<td>Green turbid liquid with characteristic smell</td>
</tr>
<tr>
<td>Solubility in water</td>
<td>Miscible</td>
</tr>
<tr>
<td>Vapour pressure (mm of Hg)</td>
<td>17.5</td>
</tr>
<tr>
<td>Boiling point (°C)</td>
<td>110.6°C</td>
</tr>
<tr>
<td>Freezing point</td>
<td>-5-6°C</td>
</tr>
<tr>
<td>pH (10% dilution)</td>
<td>3.5 to 4.5</td>
</tr>
<tr>
<td>Relative density</td>
<td>1.154 g/ml</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>Not explosive</td>
</tr>
<tr>
<td>Flammability</td>
<td>Not flammable</td>
</tr>
</tbody>
</table>