25th edition



A SUMMARY OF EXPERIMENTS USING VITAZYME SOIL, SEED, & PLANT TREATMENT ON FIELD, ORCHARD, & GREENHOUSE CROPS



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ntroduction How Vitazyme works within the plant-soil system.

his is the twenty-fifth edition of Vitazyme crop reports, documenting research results from around the world on the successful use of this versatile biostimulant for all soils and climates.

For those unfamiliar with Vitazyme soil and plant biostimulant and its recommended program, please review the information given below to understand how the material works within the plant-soil system.

Improved Symbiosis: The Secret of Vitazyme's Action

Il plants that grow in soils develop an intimate relationship between the roots and the organisms that populate the root zone. The teeming billions of bacteria, fungi, algae, cyanobacteria, protozoa, and other organisms that grow along the root surfaces— the rhizosphere are much more plentiful than in the bulk of the soil. This is because roots feed the organisms with dead root epidermal cells as well as compounds exuded from the roots themselves. The plant may inject 25% or more of its energy, fixed in



the leaves as carbohydrates, amino acids, and other compounds, into the root zone to feed the organisms, for a very good purpose.

The microorganisms which feed on these exuded carbon compounds along the root surfaces benefit the plant in many ways, creating a beautiful symbiotic relationship. The plant feeds the bacteria, fungi, algae, and other microbial species in the rhizosphere, which in turn secrete enzymes, organic acids, antibiotics, growth regulators, hormones, and other substances which are absorbed by the roots and transported to the leaves. The acids help dissolve essential minerals, and reduced iron releases anionic elements. Organism types include mycorrhizae,

cyanobacteria and various other bacteria, fungi, and actinomycetes.

Vitazyme contains "metabolic triggers" that stimulate the plant to photosynthesize more efficiently, fixing more sunlight energy in the form of carbon compounds to increase the transfer of carbohydrates, proteins, and other growth substances into the root zone. These active agents may enter the plant through either the leaves or the roots. Root growth and exudation are both enhanced. This enhancement activates the metabolism of the

Treat the seeds, transplant roots, or seed **4** pieces whenever possible at planting. To treat seeds, typically use 250 ml/ha in the minimum water for good seed coverage. Mixing 1 liter/ton of seeds is also very effective. Dip roots or transplants in a 0.5 to 1% solution, or spray with a 5% solution.

Apply Vitazyme to the soil and/or leaves according to recommendations. In most cases use 1 to 1.5 liters/ha per application, from one to three times during the growing season.

Nitrogen Fertilizer Reduction Guide with Vitazyme Obtain a score for each of these four items

| Soil O | Soil Organic Matter | | Previous Crop (| | C | Compaction | | Soil NO ₃ -N Test | | | | |
|---------------------|--|---------------------------|---------------------|-------------|----|------------|-------------|------------------------------|---|-------------|------|---------------|
| Low (<1.5%) 1 | Medium (1.5-3%) 2 | High (>3%) 3 | Non- legume 1 | Legume 3 | Mu | ıch | Little 3 | Low 2 | I | Medium 4 | Hi | gh б |
| Add the | Add the scores above to find the N-reduction | | | | | | | | | | | |
| Total sco | re | | 15 1 | 4 13 | 12 | 11 | 10 | 9 8 | ; | 7 | 6 | 5 |
| % of opti | mum N to | apply | ← | 50-60% — | | | - 60-70 | % — | > | ← 70 | -80% | \rightarrow |

teeming population of rhizosphere organisms to a higher level, triggering a greater synthesis of growth-benefiting compounds and a faster release of minerals for plant uptake. Thus, the plant-microbial symbiosis is stimulated.

Very small amounts of these metabolic triggers in Vitazyme are needed to greatly improve plant and rhizosphere microbe response. This is because of the enzyme cascade effect. Successive tiers of enzymes are activated in plant and microbial tissues to give a large physiological response from very little activator.

In short, Vitazyme enables the plant to better express its genetic potential by reducing the stresses that repress that expression.

/itazyme may be used for crop production at any degree of technology, from animal power and low inputs to GPS-guided tractor power and high fertility inputs. Please consult the Vitazyme User's Guide for details.

General use for field crops Enzyme2 Enzyme2 Enzyme2 Enzyme2 Enzyme2 Enzyme2 with less than optimal fertilization levels, when soil testing is not possible:

- Apply normal levels of organic and
- commercial fertilizers.

General use for field crops with optimal fertilization and soil testing:

Test the soil at a reputable laboratory,

 and obtain expert fertilization recommendations.

Fertilizer nitrogen rates may be **Z** • lowered somewhat, depending on soil conditions; refer to the table above.

Treat the seeds using a seed treater to achieve about 1 liter/ton of seed of actual product, or apply 1 liter/ha in-furrow at planting, with or without starter fertilizer.

Apply Vitazyme to the soil and/or leaves 4. according to recommendations.

Remember that Vitazyme is a complement to other sound, sustainable crop management practices. Incorporate crop rotations, minimal tillage, erosion control, and adapted plant varieties whenever possible.

Metabolic Activator Attachment to Cells Enzyme 1 Enzyme 1 Enzyme 1

Physiological Effects in Cells and Tissues

Vitazyme Field Tests for 2021

Vitazyme Highlights from throughout the world.

Vitazyme Highlights for 2021

This is the 26th year of field, orchard, greenhouse, and laboratory trials with Vitazyme in many parts of the world, and on a variety of soil types within assorted climatic regimes. Once again the product has shown great consistency in yield responses for many crop types, as the following highlights of these results reveal. Not only the standard green Vitazyme was used in these trials, but the organic version as well in different localities.

Six replicated trials in Hungary, with apples, cucumbers, peppers, grapes, strawberries and tomatoes, revealed that Organic Vitazyme consistently improved the yields and quality of these crops, and more so than a competing product that was included in all of the trials. For apples the yields were increased by 9% at the 2 liter/ha (26 oz/acre) rate, at the same time that fruit sugar was significantly improved. Cucumbers experienced up to a 55% yield increase using the 2 liter/ha rate, and grape yield increased by 6%, while pepper yields were raised by 17% and tomato yields by 8% at the same rate. Strawberry yield improved 14% at this same 2 liter/ha rate at the same time that fruit sugar increased by 9%. Improvements in crop quality are not often noted at the same time that the yield increases for many biostimulant products, but this dual effect is usually realized with Vitazyme.

2. As in past years, trials in Ukraine proved to be consistently positive during 2021. Winter wheat test fields performed very well using a variety of application methods, rates, and timing, both in-furrow and foliar. Grain yields responded with up to 20% gains, and in every case in which grain gluten and protein were measured, these quality factors improved by about 2 and 1 percentage points, respectively. Potato yields were improved by from 25 to 36% in three different size classes, soybean and sunflower production were improved by 15%, and canola yield by 37% above the control.

3. For several years Vitazyme plus the microbial additive Bio Seed have performed very well together, this year in trials in western Tennessee with rice and corn. For rice, the dry Bio Seed was applied in-furrow at 50 grams/acre, while Vitazyme was sprayed on the leaves just before flooding, the result being a 16% yield increase. With both products applied in-furrow at planting the increase was 13% above the control. These two products have proven to be highly synergistic. With corn, the same applications resulted in a 27 to 28% yield increase.

4. Studies in Mexico continued to reveal the marked potential of the program in those more tropical growing environments.

Corn yield improved by 23%, cucumbers by a remarkable 70%, and avocados by 44% with Vitazyme in university-sponsored studies.

5. The International Biostimulant Congress, conducted every two years and this year in Hollywood, Florida, once again featured a Vitazyme presentation. Dr. Robert Kremer of the University of Missouri presented a paper revealing the excellent potential of the product to complement what is known as the solar corridor system, whereby alternating rows are planted to a low-growing cover crop, which allows more sunlight to reach the lower leaves and boost photosynthesis and yields.

Research work has begun with i-Cultiver, based in Tracy, California, to evaluate the effects of Vitazyme on crop yield, and also effects on rhizosphere and endophytic microbes. The work will expand to incorporate research on the brassinosteroids in the product at The Carnegie Institute.

7 Field studies with the South Dakota Soybean Association showed that soybean yields in central and eastern South Dakota were elevated consistently by 7 to 22% during a hot and dry growing season.

Ann les with Organic Vitazyme application

Vitazyme Field Tests for 2021



Researcher: Bence Kiraly, Natalia Simon, and Jeno Simon

Research organizations: Biotek Agriculture Hungary Kft., 6636 Martely, hrsz.: 013818, Hungary;

Vital Earth Resources, Inc., Gladewater, Texas, USA

Location: Szentes-Lapisto, Csongrad-Csanad State, Hungary Variety: Gala (Malus domestica) Farm cooperator: Rudolf Gabor, Pomarium Kft., Szentes, Hungary Tillage: conventional Orchard establishment: October 25, 2012 Row spacing: 4 meters In-row spacing: 1 meter

Soil traits: clay loam (Chernozem), 2.5% organic matter, 6.44 pH, good fertility, fair drainage

Experimental design:

A small-plot apple trial was established in a randomized complete block design, with six replications, on plots that were 4m x 5m (20m^Z per plot). Two biostimulants were used to measure yield, quality, and growth parameters in an effort to evaluate the value of these products in apple production. Treatments are shown in the table on the right.

Fertilization: unknown Organic Vitazyme application:

See rates and timing in the table.

| Treatment | Product applications | | | | | | |
|--|----------------------|--------------|--------------|--------------|--|--|--|
| incutinent | April 17 | May 19 | June 18 | July 26 | | | |
| 1. Control | 0 | 0 | 0 | 0 | | | |
| 2. Amalgerol | 4 liters/ha | 4 liters/ha | 4 liters/ha | 4 liters/ha | | | |
| 3. Organic Vitazyme | 0.5 liter/ha | 0.5 liter/ha | 0.5 liter/ha | 0.5 liter/ha | | | |
| 4. Organic Vitazyme | 1 liter/ha | 1 liter/ha | 1 liter/ha | 1 liter/ha | | | |
| 5. Organic Vitazyme | 2 liters/ha | 2 liters/ha | 2 liters/ha | 2 liters/ha | | | |
| Crop stage, BBCH scale | 57; 60 | 69; 80 | 73; 60 | 79; 60 | | | |
| Average height | 3 m | 3 m | 3 m | 3 m | | | |
| Interval from previous appl. | 0 | 32 days | 30 days | 38 days | | | |
| Tree/Row cover volume (m ³ /ha) | 10,000 | 11,000 | 12,500 | 12,500 | | | |
| Method of treatment | foliar spray | foliar spray | foliar spray | foliar spray | | | |

Amalgerol application: See rates and timing in the table. Amalgerol is a mixture of seaweed extracts, mineral oil, essential oils, and herbal extracts, and is "Qualified Organic" according to EC regulation number 834/2007, for organic use. It is produced by Hechenbichler, Innsbruck, Austria.

Pest control: 21 applications of fungicides from March 26 to July 12, spaced from 3 to 19 days apart, using a rotation of Astra Rezonxiklorid, Delan Pro, Faban, ATS, Dagonis, Mospilan, Aliette, Insegar, Flint Max, Coragen, Movento, and Karate Zeon. **Phytotoxicity results:** No phytotoxicity effects were noted.

Crop vigor results:

| | | Assessment date* | | | | | | |
|--|------|------------------|----------|----------|---------|--|--|--|
| Treatment | Rate | June 2 | July 2 | August 9 | Average | | | |
| | L/ha | % | % | % | % | | | |
| 1. Control | 0 | 94.5 b | 94.0 c | 94.5 b | 94.3 | | | |
| 2. Amalgerol | 4 | 97.2 a | 96.8 ab | 97.7 a | 97.2 | | | |
| 3. Organic Vita | 0.5 | 94.5 b | 95.8 abc | 96.7 a | 95.7 | | | |
| 4. Organic Vita | 1 | 96.8 a | 96.8 ab | 97.2 a | 96.9 | | | |
| 5. Organic Vita | 2 | 97.7 a | 97.7 a | 98.0 a | 97.8 | | | |
| LSD (P=0.10) | | 2.1 | 2.1 | 2.5 | | | | |
| CV | | 2.23 | 2.14 | 2.55 | | | | |
| Treatment F 0.0427 0.0530 0.1545 | | | | | | | | |
| *Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test. | | | | | | | | |

Crop vigor was improved by both products, the highest being for the 2 liter/ha Organic Vitazyme application.



Leaf chlorophyll results: A Minolta SPAD meter was used to measure the chlorophyll in 20 leaves/ plot on July 9, and these values were averaged. Both Vitazyme (at 1 and 2 liters/ha) and Amalgerol increased leaf chlorophyll significantly on July 9, by up to 0.61 SPAD units.

| Treatment | Rate | Leaf chlorophyll* | | | | |
|---|------|-------------------|--|--|--|--|
| | L/ha | SPAD units | | | | |
| 1. Control | 0 | 47.28 с | | | | |
| 2. Amalgerol | 4 | 47.83 a | | | | |
| 3. Organic Vita | 0.5 | 47.53 b | | | | |
| 4. Organic Vita | 1 | 47.65 ab | | | | |
| 5. Organic Vita | 2 | 47.82 a | | | | |
| LSD (P=0.10) | | 0.23 | | | | |
| CV | | 0.43 | | | | |
| Treatment F 0.0034 | | | | | | |
| *Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test. | | | | | | |

Leaf Chlorophyll Chlorophyll, SPAD units 48.0— 47.83 47.82 47.65 47.53 47.5— 47.28 47.0-46.5-46.0-Control Org Vita 0.5 Org Vita 1 Org Vita 2 Amal Treatment

Apple yield results: The harvest was completed on July 9.

| Treatment | Rate | Yield* | | | |
|--|------|-----------------|--|--|--|
| | L/ha | kg/plot | | | |
| 1. Control | 0 | 112.00 с | | | |
| 2. Amalgerol | 4 | 119.57 ab (+7%) | | | |
| 3. Organic Vita | 0.5 | 116.10 bc (+4%) | | | |
| 4. Organic Vita | 1 | 119.97 a (+7%) | | | |
| 5. Organic Vita | 2 | 122.63 a (+9%) | | | |
| LSD (P=0.10) | | 4.62 | | | |
| CV | | 3.93 | | | |
| Treatment F 0.0078 | | | | | |
| *Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test. | | | | | |

Fruit yield increase with Organic Vitazyme at 2 liters/ha: 9% Organic Vitazyme at 2 liters/ha significantly improved apple yield by 9%, and at 1 liter/ha by 7%, the same as did Amalgerol. The 0.5 liter/ha Organic Vitazyme rate increased the yield non-significantly, by 4%.



Fruit sugar content results: Twenty fruit from each plot were analyzed and averaged. While differences in sugar levels in the various treatments were not great, there was a significant tendency for Organic Vitazyme and Amalgerol to increase fruit sugar, by 0.35 % for the Organic Vitazyme 2 liter/ha rate.

| Treatment | Rate | Fruit Sugar* | | | |
|---|------|--------------|--|--|--|
| | L/ha | kg/plot | | | |
| 1. Control | 0 | 13.33 c | | | |
| 2. Amalgerol | 4 | 13.63 ab | | | |
| 3. Organic Vita | 0.5 | 13.55 abc | | | |
| 4. Organic Vita | 1 | 13.58 abc | | | |
| 5. Organic Vita | 2 | 13.68 a | | | |
| LSD (P=0.10) | | 0.27 | | | |
| CV | | 2.0 | | | |
| Treatment F 0.2462 | | | | | |
| *Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test. | | | | | |



Fruit acidity results: There were no significant differences in fruit acidity.

Unmarketable fruit results: While there were no significant differences in unmarketable fruit among the five treatments, the smallest loss was for Vitazyme at 2 liters/ha, with a value of 3.41%, versus a loss of 4.64% for the control treatment.
 Conclusions: An apple trial, using small plots and six replications, in Hungary showed that Vitazyme, applied at 2 liters/ha on four dates, gave the greatest yield, which was significant and 9% greater than the control. Organic Vitazyme at 1 liter/ha produced a 7% yield increase, as did the Amalgerol. The 2 liter/ha Organic Vitazyme rate also produced the least unmarketable fruit, at 3.41% compared to 4.64% for the control. Fruit sugar was marginally but significantly superior for the 2 liter/ha Organic Vitazyme treatment, as was the Amalgerol treatment. Fruit acidity did not vary much for the five treatments, but leaf chlorophyll was significantly higher for all four biostimulant applications, the highest being for the 2 liter/ha Organic Vitazyme treatment. This greater carbon fixation potential likely accounted for the highest yield and fruit sugar levels of Treatment 5. No phytotoxicity was noted for any treatments.

Avocados with Vitazyme application

Vitazyme Field Tests for 2021

Researcher: Dr. Alberto M. Garcia Munguia **Research Organization:** University of Aguascalientes, Agricultural Science Center, Phytotechniques Department, Jesus Maria, Aquascalientes, 20131, Mexico

Location: Municipality of Periban, Michoacan State, Mexico **Variety:** Hass **Age of planting:** over five years **Initiation date of the trial (first application):** December 4, 2020

Experimental design: An avocado grove was partitioned to include a series of randomized block, using four replications, with experimental units containing two trees each. Trees were spaced 4 meters apart in the rows and rows were space 7 meters apart. Each plot was 56m², and each treatment of eight total trees was 224m².

🚺 Control 😢 Vitazyme

Vitazyme applications: Four foliar

sprays, each at 1 liter/ha (13 oz/acre), at 30-day intervals beginning at the vegetable growth stage. Applications were made December 4, 2020, and January 3, February 2, and March 4 of 2021. A motorized sprayer was used, with 1 liter of Vitazyme in 1,000 liters of water sprayed per hectare (about 100 gallons/ acre), using adjustable cone nozzles.

Fertilization: unknown, but uniform over all areas

Results: The data were completed on March 18, 2021, 104 days after the first application of Vitazyme on December 4, 2020.



Fruit yield increase with Vitazyme: 44%



Average fruit weight increase with Vitazyme: 44% **Conclusions:** An avocado replicated experiment in Michoacan State, Mexico, revealed that Vitazyme, as four 1 liter/ha (13 oz/acre) applications every 30 days beginning with the vegetative stage, produced excellent yield and fruit size improvements above the untreated control trees. The yield increase of 2,709 lb/acre (3.05 MT/ha), a 44%. Fruit dimensions were improved by 12% (length) and 13% (diameter). These results show the great value of Vitazyme as a simple, efficient way of improving avocado yield and fruit size in Michoacan State, Mexico.



Average fruit length increase with Vitazyme: 12%



Average fruit diameter increase with Vitazyme: 13%

Canola (Winter) with Vitazyme Bio application

Vitazyme Field Tests for 2021

Researcher: V.V. Plotnikov

Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York **Location:** "Alfa" Farm, Berezivka District, Odessa Region, Ryasnopol Village, Ukraine; southern Ukraine (270-3350 mm of rain per year) **Variety:** Klavir KL

Planting date: August 29, 2020

Planting rate: 0.35 million seeds/ha

Previous crop: winter wheat

Tillage: disking to 5-6 cm, deep disking to 18-20 cm, cultivation to 3-4 cm

Soil type: Chernozem (4.3% organic matter)

Experimental design: A canola field was divided into a Vitazyme Bio treated portion, with an untreated portion left as a control, to evaluate the effect of this product as a foliar spray on seed yield.

1 Control 😢 Vitazyme Bio

Fertilization: 16-16-16% N-P₂0₅-K₂0 with the seeds at planting; 81 kg/ha N in the spring

Vitazyme Bio application: 0.5 liter/ha, sprayed on the leaves and soil on April 26, 2021, at early bloom (BBCH 59). Vitazyme Bio is the same as Organic Vitazyme, which is marked under that name in different parts of the world.

Yield results:

| Treatment | Yield | Yield change |
|-----------------|---------|--------------|
| | tons/ha | tons/ha |
| 1. Control | 2.20 | — |
| 2. Vitazyme Bio | 3.02 | 0.82 (+37%) |
| | | |

Increase in seed yield with Vitazyme Bio: 37%



The application of only 0.5 liter/ha of Vitazyme Bio at early bloom caused a great increase in seed yield: 0.82 ton/ha (37%).

Income results: The 0.82 ton/ha yield increase resulted in a net income increase of \$611/ha.

Conclusions: A winter canola split-field trial in southern Ukraine, using 0.5 liter/ha of Vitazyme Bio sprayed on the leaves at early bloom, resulted in a 0.82 ton/acre (37%) yield increase. This increase provided an additional \$611/ha income, showing the considerable utility of this program for winter canola production.

Corn with Vitazyme application

Researcher: Jonathan Jaschen **Research organization:** ACRES Research, Inc., Cedar Falls, Iowa **Location:** Fairbank, Iowa **Variety:** P0622Q (*Zea mays L.*) **Plant population:** 34,000 plants/acre **Planting depth:** 25 inches **Row spacing:** 30 inches **Tillage:** conventional **Planting date:** April 30, 2021

Experimental design: A small-plot replicated corn trial was established in a randomized complete block design, using six replications, with plots that were 15 x 30 feet (450 ft²). The purpose of the trial was to evaluate the effect of Vitazyme, alone and combined with PurYield slow-release polymer-coated urea or urea alone, on the yield of the corn.

1 Urea

- 😢 Urea + Vitazyme in-furrow
- 🕄 Urea + PurYield
- Urea + PurYield + Vitazyme in-furrow
- 5 Urea + Vitazyme impregnated into PurYield

| Treatment | Urea, ¹ untreated | Urea, ¹ PurYield | Urea,² Vita +PurYield | Vitazyme, ³ in-furrow |
|--|---------------------------------|--------------------------------|---------------------------|-------------------------------------|
| | lb/acre N | lb/acre N | lb/acre N | oz/acre |
| 1. Urea | 150 | 0 | 0 | 0 |
| 2. Urea + Vitazyme in-furrow | 150 | 0 | 0 | 13 |
| 3. Urea + PurYield | 75 | 75 | 0 | 0 |
| 4. Urea + PurYield+ Vitazyme in-furrow | 75 | 75 | 0 | 13 |
| 5. Urea + Vitazyme impregnated into PurYield | 75 | 0 | 75 | 0 |
| ¹ Urea (46-0-0% N-P ₂ 0 ₅ -K ₂ 0) was applied April 21 to the soil surface, 9 d ² Vitazyme was incorporated into the PurYield fertilizer, 15 day release ³ 13 oz/acre at planting. | days before planti e time. | ng. The PurYielc | l release time was 15 day | S. |

Fertilization: Nitrogen was applied at 150 lb/acre as urea, alone or encapsulated in a polymer as PurYield. Treatment 5 had Vitazyme added to the urea and polymer at the factory.

Vitazyme application: Treatments 2 and 4 received Vitazyme in-furrow along with the seed at planting on April 30.

Weed control: May 12— Degree Xtra pre-emergent herbicide at 3.2 qt/acre; June 18— Calisto Xtra post- emergent herbicide at 22 oz/acre + RoundUp herbicide at 32 oz/acre

Harvest date: October 18, 2021. The middle four rows of each plot were harvested for data; harvested area: 5 x 30 ft (150 ft²) *Grain moisture results:* There were no significant differences in grain moisture among the five treatments. *Yield results:* Grain yields are adjusted to 15.5% moisture.

| Treatment | Yield* | Yield change | | | | |
|---|------------|-----------------|---------|--|--|--|
| | bu/acre | bu/acre | | | | |
| 1. Urea | 211.56 a | — | | | | |
| 2. Urea + Vita in-furrow | 211.46 a (| (0) | | | | |
| 3. Urea + PurYield | 215.51 a | 3.95 | (+1.9%) | | | |
| 4. Urea + PurYield+ Vita in-furrow | 218.70 a | 7.14 | (+3.4%) | | | |
| 5. Urea + PurYield with Vita | 218.93 a | 7.37 | (+3.5%) | | | |
| LSD (0.05) | 14.65 | | | | | |
| CV | 5.65 | | | | | |
| Treatment F | 0.7086 | | | | | |
| *Means followed by the same letter are not significantly different at P=0.05. | | | | | | |

Yield increase

Urea + PurYield vs. Urea + PurYield + Vitazyme 3.19 bu/acre (+1.5%)



Yield increase

Urea vs. Urea + PurYield 3.95 bu/acre (+9%)

- **Growing conditions for 2021:** Rainfall and temperatures were good throughout the growing season, though a severe windstorm blew over many of the stalks after the corn had mostly matured. Though harvesting of the lodged crop was rather difficult, the results were not adversely affected.
- **Conclusions:** A small-plot replicated corn trial in eastern lowa in 2021 compared the effects of nitrogen fertilizer-applied as urea alone or in a 50-50 combination with polymer-coated, slow release urea called PurYield—with Vitazyme in-furrow at planting, and Vitazyme incorporated directly into the PurYield urea polymer. Yield results showed no significant differences, but trends in the data revealed the following.
 - PurYield at 50% of the urea N had a tendency to increase the yield (Treatment 1 vs. Treatment 3), by 3.95 bu/acre, indicating that more N was being utilized and not lost due to leaching or denitrification.
 - Vitazyme applied in-furrow at planting along with urea and PurYield, compared to those same N applications with Vitazyme (Treatment 3 vs. Treatment 4) boosted the yield by 3.19 bu/acre (+ 1.5%).
 - Vitazyme applied either in-furrow or incorporated into the PurYield urea polymer (Treatment 4 and 5) produced about equal yield increases above 50% urea N and 50% PurYield N, showing that Vitazyme incorporated into the urea polymer was not inactivated during the manufacturing process.

While the yield increases of PurYield slow-release N and Vitazyme were not significant in this trial, they show that these two products are very compatible when applied separately or incorporated.

Corn with Vitazyme application



The top row of corn ears represents urea at 150 lb/acre with Vitazyme in-furrow, while the less filled ears below received the same urea application but no Vitazyme. Note the better ear fill with Vitazyme.

Vitazyme applied either in-furrow with the seed, or directly into the PurYield polymer urea, produced the same excellent responses to root and ear development.



Vitazyme Field Tests for 2021

Researcher: Jonathan Jaschen

Research organization: ACRES Research, Inc., Cedar Falls, Iowa

Location: Cedar Falls, Iowa Variety: P0622Q (Zea mays L.) Plant population: 34,000 plants/acre
 Planting depth: 2.5 inches Row spacing: 30 inches Tillage: conventional Planting date: May 8, 2021
 Experimental design: A small-plot replicated corn trial was established in a randomized complete block design, using six replications, with plots that were 15 x 30 feet (450 ft²). The purpose of the trial was to evaluate the effect of Vitazyme, alone and combined with PurYield slow-release polymer-coated urea or urea alone, on the yield of corn.

| U | Urea | |
|---|--------|--|
| 2 | Urea + | |

Vitazyme in-furrow

- 🕄 Urea + PurYield
- Urea + PurYield + Vitazyme in-furrow
- Urea + Vitazyme impregnated into PurYield

| Treatment | Urea, ¹ untreated | Urea, ¹ PurYield | Urea,² Vita +PurYield | Vitazyme, ³ in-furrow | | |
|--|---------------------------------|--------------------------------|--------------------------|-------------------------------------|--|--|
| | lb/acre N | lb/acre N | lb/acre N | oz/acre | | |
| 1. Urea | 150 | 0 | 0 | 0 | | |
| 2. Urea + Vitazyme in-furrow | 150 | 0 | 0 | 13 | | |
| 3. Urea + PurYield | 75 | 75 | 0 | 0 | | |
| 4. Urea + PurYield+ Vitazyme in-furrow | 75 | 75 | 0 | 13 | | |
| 5. Urea + Vitazyme impregnated into PurYield | 75 | 0 | 75 | 0 | | |
| | | | | | | |

¹Urea (46-0-0% N-P₂0₅-K₂0) was applied April 21 to the soil surface, 9 days before planting. The PurYield release time was 15 days. ²Vitazyme was incorporated into the PurYield fertilizer, 15 day release time. ³13 oz/acre at planting. *Fertilization:* Nitrogen was applied at 150 lb/acre as urea, alone or encapsulated in a polymer as PurYield. Treatment 5 had Vitazyme added to the urea and polymer at the factory.

Vitazyme application: Treatments 2 and 4 received Vitazyme in-furrow along with the seed at planting on May 8. Weed control: May 11—Degree Xtra pre-emergent herbicide at 3.2 qt/acre; June 18—Calisto Xtra post-emergent herbicide at 22 oz/acre + RoundUp Powermate at 32 oz/acre

Harvest date: October 18, 2021. The middle four rows of each plot were harvested for data; harvested area: 5 x 30 ft (150 ft²) *Grain moisture results:* There were no significant differences in grain moisture among the five treatments. However, Treatment

4, PurYield with Vitazyme in-furrow, produced the dryest corn, being 0.79 percentage point dryer than Treatment 3, which had the same fertility regime but without Vitazyme (17.08%) vs. 16.29%), which was significant at P=0.12 and within the 0.65% LSD.

| Treatment | Yield* | Yield change | | | | |
|---|---------|-----------------|----------|--|--|--|
| | bu/acre | bu/acre | | | | |
| 1. Urea | 171.6 a | — | | | | |
| 2. Urea + Vita in-furrow | 174.9 a | + 3.3 | (+1.9%) | | | |
| 3. Urea + PurYield | 180.0 a | + 8.4 | (+4.9%) | | | |
| 4. Urea + PurYield+ Vita in-furrow | 168.2 a | - 3.4 | (- 2.0%) | | | |
| 5. Urea + PurYield with Vita | 177.3 a | + 5.7 | (+3.3%) | | | |
| LSD (0.05) | 10.3 | | | | | |
| CV | 4.9 | | | | | |
| Treatment F | 0.1761 | | | | | |
| *Means followed by the same letter are not significantly different at P=0.05. | | | | | | |

Yield results: Grain yields are adjusted to 15.5% moisture.



Growing conditions for 2021: Rainfall and temperatures were good throughout the growing season.

Conclusions: A small-plot corn trial, utilizing urea, polymercoated urea (PurYield) having a 15 day release period, along with Vitazyme either in-furrow at planting or incorporated into the polymer granule, revealed no significant yield differences at P=0.05. However, Vitazyme in-furrow increased the yield above the control by 3.3 bu/acre (1.9%), and 50% PurYield urea produced an 8.4 bu/acre increase above the control (4.9%). When Vitazyme was applied in-furrow along with 50% urea as PurYield. The yield for some unknown reason was depressed, but when Vitazyme was incorporated into the PurYield granule, the yield responded by 9.1 bu/acre (5.3%) above the Vitazyme in-furrow treatment with the same urea applications. These results indicate no loss of Vitazyme effectiveness when incorporated into the PurYield polymer urea granule, and the possible effectiveness of PurYield delayed release urea to improve corn yields.

Corn Grain Yield Increase with Comparisons

Trt. 1 vs. Trt. 2—Urea vs. Vitazyme + Urea 3.3 bu/acre (+1.9%) **Trt. 1 vs. Tr. 3**—Urea vs. 50% PurYield 8.4 bu/acre (+4.9%) **Trt. 4 vs. Trt. 5**— 50% PurYield + Vitazyme in-furrow vs. 50% PurYield with Vitazyme incorporated 9.1 bu/acre (+5.3%)



Researchers: Dr. Alberto M. Garcia Munguia **Research Organization:** University of Aguascalientes, Agricultural Sciences Center, Phytotechniques Department, Jesus Maria, Aguascalientes, 20131, Mexico

Location: Municipality of Guasave, Sinaloa State, Mexico Variety: Pioneer P3260W Planting date: December 8, 2020 Planting rate: 90,000 seeds/ha (26.235 kg of seed)

Experimental design: A small-plot corn study was situated in a randomized block design, with four replications. Plots were four rows wide, the row distance being 0.8 meter, giving a 3.2 meter plot width that was 5.0 meters long. Each plot was 16m², and each treatment totaling 64m².

🚺 Control 😢 Vitazyme

Vitazyme application: (1) a seed treatment just before planting of 0.25 liter/ha (4 oz/acre) in 0.25 liter/ha of water to achieve good seed coverage; (2) a foliar spray of 1.0 liter/ha (13 oz./acre), 30 days after planting, using a 400 liter/ha (40 gallon/ha) spray volume and cone nozzles.

Fertilization: unknown, but uniform over all areas

Results: The corn crop was harvested and evaluated on May 17, 2021, 160 days after planting.



decrease with Vitazyme: -1%

Vitazyme: 23%

Fresh root

24.6

Vitazyme

26— weight, grams

23.3

Control

Fresh root weight increase

with Vitazyme: 6%

Root Weight, fresh

24—

22—

20—



Dry root weight increase with Vitazyme: 93%

Root Length Root length, 20cm 18.1 15— 14.4 10-5-0-Vitazyme Control

> Root length increase with Vitazyme: 26%





Increase in average ear number per plant with Vitazyme: 9% **Conclusions:** A small-plot replicated study on corn in Sinaloa State, Mexico, comparing Vitazyme applied as a seed treatment (0.25 liter/ha, or 4 oz/acre), along with a 1 liter/ha (13 oz/acre) foliar spray 30 days later, revealed that all growth and yield parameters responded positively to the program. Grain yield increased by a considerable 23%, reflecting improvements in germination (+7%), root weight (6%) fresh and 93% dry), root length (+26%), stalk diameter (+9%), plant height (+34%), leaf chlorophyll (+6%), plant weight (+30% fresh and +118% dry), ear weight (+12%), and ears per plant (+9%). The brassinosteroids and other growth promoters in Vitazyme clearly triggered a wide array of beneficial growth responses, which illustrates it efficacy in corn production in Sinaloa State, Mexico.

Corn with Vitazyme application

Researchers: Robert J. Kremer, Timothy M. Reinbott, Paul W. Syltie, Manjuala V. Nathan, and C. LeRoy Deichman **Research organization:** School of Natural Resources and Division of Plant Science and Technology, University of Missouri, Columbia, Missouri **Location:** Bradford Research Farm, Columbia, Missouri

A Research Paper Presented At the International Biostimulant Congress in Miami, Florida, November 2021

Title: A Brassinosteroid- based Biostimulant Integrated With An Innovative Crop System Improves Maize Productivity *Justification:* (1) Farmers need alternatives to current industrial agriculture production models.

(2) Alternatives include innovative management systems that enhance crop productivity on the same land area, improve soil health and environmental quality, and assure food security. (3) Biostimulants are vital components of innovative management. **Vitazyme biostimulant components:**

Brassinosteroids—plant hormones with multiple plant growth effects

- Enhance root development
- Improve nutrient uptake efficiency
- Suppress diseases
- Improve stress tolerance

1-Tricontanol—long chain fatty alcohol from plant waxes with plant

HO

- growth-regulating properties
- Increase cell division
- Increase photosynthesis
- Increase chloroplast number
- Increase chlorophyll

B-Vitamins

- Mediate energy metabolism in both plants and soil microbiome
- Stimulate root growth and resistance against phytopathogens
- Promote root colonization by plant growth promoting bacteria

Previous Vitazyme results on maize

- Increased leaf chlorophyll / photosynthetic activity (SPAD)
- Increased root biomass
- Increased grain yield $\approx 5\%$
- Increased rhizosphere microbiome diversity and abundance
- Increased beneficial plant growth-promoting rhizobacteria
- Increased rhizosphere microbiological activity (glucosidase enzyme activity)
- Decreased root colonization by potential pathogenic Fusarium species
- Decreased stress due to effects of herbicide glyphosate released into rhizosphere of transgenic hybrids

Kremer, R.J. et al. 2017. Abstr. 3rd World Congress on the use of Biostimulants in Agriculture Nathan, M. et al. 2019. Abstr. 4th World Congress on the use of Biostimulants in Agriculture



NH₂



B₁ (thiamine)

ÒН

+ Vitazyme Control

The Solar Corridor production system:

Depiction of maize planted in a solar corridor system for increased light capture





Maize twin rows (15-cm) planted with 152-cm alley or 'solar corridor'. Knox County, MO - 2011

Source: Deichman, C.L. 2009. Farming Systems Design Symposium Proceedings, pp. 87-88

Photo: F

Solar corridor planting of corn with cowpea

Deichman, C.L., Kremer, R.J. (eds.). 2019. The Solar Corridor Crop System, Elsevier Academic Press, San Diego

Benefits of the system:

- Greater access to photosynthetically active radiation
- Increased CO₂ uptake by lower leaf canopy
- Increased photosynthate production
- Similar or increased grain yields with no land area expansion
- Enhanced root biomass
- Increased root exudation of C substrates and rhizosphere microbial growth and diversity

Study objective: Determine the effects of multi-functional Vitazyme on maize growth in the

solar corridor crop production system, doing "proof of concept" studies in 2018 and 2019 *Experimental design:*

- Conduct field trials conducted at Columbia, Missouri USA on Mexico silt soil (fine, smectitic, mesic vertic epiaqualfs) in 2018 and 2019 using randomized complete block designs with four replicates
- Plant maize conventionally using minimum tillage as "monoculture" in 76-cm rows and also as "solar corridor" in 152-cm rows. Use two maize cultivars, one better adapted to the solar corridor system than the other.
- Apply Vitazyme as (1) a seed coating at planting, and (2) a foliar spray using (950 mL/ ha) at vegetative stage V6 (Abendroth et al. 2011)
- Evaluate leaf chlorophyll with a Minolta SPAD meter (Naus et al. 2010) and sample ear leaves for nutrient analysis at growth stage V18-VT
- Root sampling at stage R4
- Harvest with plot combine

Photosynthesis results: Chlorophyll levels were considerably higher for maize grown in wide rows (152 cm) than in conventional rows (76 cm), and Vitazyme provided additional increase in activity in wide-row planted Great Harvest hybrid in 2019.

Photosynthesis Results



as inter-crop

- **Leaf nitrogen results:** Leaf nitrogen in August of 2019 was reduced somewhat in the corridor system for the Pioneer hybrid, but Vitazmye boosted the leaf N for both hybrids, especially in the solar corridor system. With the Great Harvest hybrid, the monoculture system resulted in lower leaf N than for the Pioneer hybrid in the conventional system, and Vitazyme did not elevate the N level. However, Vitazyme greatly enhanced leaf N in the solar corridor row spacing.
- **Root biomass results:** At the R4 stage in September, 2019, the maize root mass was greatly increased for both cultivars for both the conventional and solar corridor systems.



Grain yield results: While the Pioneer hybrid yielded a bit more than the Great Harvest cultivar in both systems, Vitazyme increased the yield in every case.



Control

Biostimulant



Root Biomass Results



Grain Yield Results



VITAZYME 2021 FIELD TEST RESULTS | 14

Corn ear results: Ear length varied slightly in favor of a longer length of the Great Harvest hybrid. Rows per ear were greater with the Great Harvest hybrid in both the monoculture and solar corridor systems, and in all but the monoculture with the Pioneer hybrid Vitazyme increased rows per ear. Kernels per ear were markedly greater in the solar corridor system for both hybrids, and Vitazyme increased the kernels in all but the monoculture comparison for the Great Harvest cultivar.





Monoculture

Monoculture

Corridor

Corridor Mono+Vitazyme 📕 Corridor+Vitazyme

Great Harvest

Kernels Rows/Ear Results

Kernels/Ear Results

700-

Total kernels/Ea



Monoculture typical ear: 34,000 seeds/acre

Solar corridor typical ear: 34,000 seeds/acre

Unique aspects of Vitazyme in the Solar Corridor cropping system:

Solar Corridor

- Increased light exposure
- Increased CO₂ uptake
- Increased photosynthesis
- Increased nutrient uptake
- Maintained or increased maize grain yields
- Increased root biomass
- Increased soil microbe diversity
- Increased production of labile soil carbon
- Increased soil microbial activity
- Provides crop diversity and conserves soil

Vitazyme

Pioneer

- Increased photosynthesis
- Increased nutrient uptake
- Increased root biomass
- Maintained or increased maize grain yields and yield components (ear row number, ear kernel number)
- Increased soil microbe diversity

Conclusions:

- 1. Biostimulants containing brassinosteroids, triacontanol, and B vitamins supplement several facets of plant growth and soil health functions. (Hayat and Ahmad, 2011). In these studies, Vitazyme, containing these components, performed these functions.
- 2. Vitazyme, as a multifunctional biostimulant evaluated in the studies, improved these benefits when integrated in management for an intercropping practice—the solar corridor crop production system—by increasing root biomass, improving potential photosynthesis and carbon capture, and increasing economic yield.
- 3. Integration of biostimulants such as Vitazyme can be accomplished with all crop management models, and appear well-suited as a practice benefiting alternative management in the transition from industrial crop production to more sustainable and diverse production systems.



Note the far superior root development, more aggressive brace roots, and greater stalk width for the Vitazyme treated corn plants on the left



The corn plants treated with Vitazyme show considerably better root development, which has led to greater nutrient uptake and superior ear development.

Researcher: Bruce Kirksey, Ph.D. **Research organization:** Agricenter International, Memphis, Tennessee Location: Memphis, Tennessee Variety: DK64-89 Planting date: May 18, 2021 Planting depth: 1.5 inches *Row spacing:* 30 inches *Tillage:* conventional

Soil type: Falaya and Waverly silt loam, 1.8% organic matter, pH 6.5, cation exchange capacity 7.8 meg/100 g of soil, excellent fertility, good drainage

Experimental design: A small-plot research trial was designed in a randomized complete block design, using four replications with five treatments, on plots that were 10 x 30 feet (four rows per plot). The objective of the trial was to evaluate the effects of Vitazyme and Bio Seed, alone and in combination, on the yield of corn.

Fertilization: unknown, uniform over the entire area

Vitazyme application: 13 oz/acre in-furrow at planting for Treatments 2 and 4, and foliar by sprayer on June 21 at 34 days after emergence for Treatment 5

| Bio Seed application: 50 grams/acre as an in-furrow treatment for Treatments 3, 4, and 5. Bio Seed is a mixture of bacteria ar | ٦d |
|--|----|
| fungi that are beneficial to seed germination and plant development. | |

Growing season weather: favorable Harvest date: October 12, 2021

Grain moisture results: There were no significant grain moisture differences among the five treatments, which ranged from 16.4 to 16.6%.

Grain test weight results: Test weight (density) varied nonsignificantly from 54.1 to 56.1 lb/bu among the five treatments.

Yield results: An area of 5 x 25 feet was harvested by an Almaco plot combine for each plot.

| Treatment | Yield ¹ | Yield change | | |
|---|--------------------|--------------|--|--|
| | bu/acre | bu/acre | | |
| 1. Control | 138.5 c | — | | |
| 2. Vitazyme in-furrow | 156.1 b | 17.6 (+13%) | | |
| 3. Bio Seed in-furrow | 167.6 ab | 29.1 (+21%) | | |
| 4. Vita in furrow + Bio Seed in-furrow | 176.7 a | 38.2 (+28%) | | |
| 5. Vita - foliar + Bio Seed in-furrow | 176.4 a | 37.9 (27%) | | |
| LSD (P=0.05) | 12.0 | | | |
| CV | 4.77 | | | |
| Replicate F | 0.408 | | | |
| Treatment F | 0.0001 | | | |
| *Means followed by the same letter are not significantly different at P=0.05. | | | | |



| Traatmont | TICAL | Diobecuj | | | | |
|--|-----------|----------|-------------|--|--|--|
| Ireatilient | In-furrow | Foliar | In-furrow | | | |
| | 02/acre | 02/dtie | grains/acre | | | |
| 1. Control | 0 | 0 | 0 | | | |
| 2. Vitazyme | 13 | 0 | 0 | | | |
| 3. Bio Seed | 0 | 0 | 50 | | | |
| 4. Vitazyme + Bio Seed | 13 | 0 | 50 | | | |
| 5. Vitazyme + Bio Seed | 0 | 13 | 50 | | | |
| 1 13 oz/acre = 1 liter/ha. The foliar Vitazyme application was made on June 21. | | | | | | |

Vitazyme¹

Rin Spad

Increase in Grain Yield

| Vitazvme alone | +13% |
|---------------------|--------|
| Bio Seed alone | +21% |
| Vitazvme in-furrow | |
| + Bio Seed in-furr | ow+28% |
| Vitazvme foliar | |
| + Bio Seed in-furro | ow+27% |
| | |

Conclusions: A small plot replicated study on corn in western Tennessee, using Vitazyme and Bio Seed alone and in combination, revealed that all treatment yields significantly exceeded the control treatment yield by from 13 to 27%. Vitazyme and Bio Seed alone were statistically equal and a bit less in yield than the combined products. It is clear that the combined Vitazyme + Bio Seed treatments, whether Vitazyme was applied in-furrow or foliar, greatly surpassed the product applied alone. The 27 and 28% yield increases with the products applied together show the great potential for this combination to enhance corn yields in the mid-Mississippi River Valley. There were no significant effects on grain moisture at harvest or grain test-weight.

Cucumbers with Organic Vitazyme application

Vitazyme Field Tests for 2021

Researchers: Bence Kiraly, Natalia Simon, and Jeno Simon

Research organization: Biotek Agriculture Hungary Kft., 6636 Martely, hrsz. : 013818, Hungary; Vital Earth Resources, Inc. Gladewater, Texas, USA **Location:** Martely, Csongrad- Csanad State, Hungary

Farm cooperator: Jeno Simon, Hodmezovasarhely, Hungary *Variety:* Mohikan F1 (*Cucumis sativus*) *Planting date:* June 1, 2021 *Planting depth:* 3 cm *Row spacing:* 100 cm *In-row spacing:* 50 cm *Soil traits:* clay loam (Chernozem), 9.8% organic matter, 6.3 pH, 25.13 meq/100g, good fertility, good drainage *Tillage:* conventional

Experimental design: A small-plot cucumber trial was designed in a randomized complete block design with six replications, using plots 2 x 5 meters. The objective of the trial was to determine the effectiveness of two biostimulants on the yield and growth parameters of cucumbers.

Fertilization: unknown

- **Organic Vitazyme application:** See the rates and timing in the table.
- **Amalgerol application:** See the rates and timing in the table. Amalgerol is a mixture of seaweed extracts, mineral oil, essential oils, and herbal extracts, and is "Qualified Organic" according to EC regulation number 834/2007, for organic use. It is produced by Hechenbichler, Innsbruck, Austria.

| Trastmant | Product applications | | | | |
|------------------------------|----------------------|---------------|---------------|--|--|
| ireatiment | June 1 | July 8 | July 15 | | |
| 1. Control | 0 | 0 | 0 | | |
| 2. Amalgerol | 4 liters/ha | 4 liters/ha | 4 liters/ha | | |
| 3. Organic Vitazyme | 0.5 liter/ha | 0.5 liter/ha | 0.5 liter/ha | | |
| 4. Organic Vitazyme | 1 liter/ha | 1 liter/ha | 1 liter/ha | | |
| 5. Organic Vitazyme | 2 liters/ha | 2 liters/ha | 2 liters/ha | | |
| Crop stage, BBCH scale | 00:100 | 66:50 | 82:50 | | |
| Interval from previous appl. | 0 | 37 days | 7 days | | |
| Method of treatment | soil drench | foliar days | foliar days | | |
| Application amount | 10,000 liters/ha | 300 liters/ha | 300 liters/ha | | |

Pest control: July 5- Kupfer Fusilan fungicide at 2.5 kg/ha, and Sumi Alfa 5 EC insecticide at 0.3 liter/ha; July 20-Kupfer Fusilan fungicide at 2.5 kg/ha

Phytotoxicity results: No phytotoxity was detected for any treatments.

Crop vigor results:

| | | Assessment date* | | | |
|--|------|------------------|---------|---------|---------|
| Treatment | Rate | July 14 | July 19 | July 27 | Average |
| | L/ha | % | % | % | % |
| 1. Control | 0 | 86.7 d | 88.3 b | 86.7 c | 87.2 |
| 2. Amalgerol | 4 | 90.8 c | 95.2 a | 96.3 ab | 94.1 |
| 3. Organic Vita | 0.5 | 94.2 b | 94.7 a | 94.7 b | 94.5 |
| 4. Organic Vita | 1 | 95.8 ab | 96.0 a | 96.0 ab | 95.9 |
| 5. Organic Vit | 2 | 97.5 a | 97.7 a | 97.2 a | 97.5 |
| LSD (P=0.10) | | 2.7 | 3.5 | 2.2 | |
| CV | | 2.88 | 3.75 | 2.34 | |
| Treatment F | | 0.0001 | 0.0023 | 0.0001 | |
| *Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test. | | | | | |



Organic Vitazyme at 2 liters/ha produced the most vigorous plants, at 97.5% vigor, versus 87.2% for the control. All other treatments also significantly exceeded the control in every case for the three dates.

Crop yield results: Three pickings were made, and the fruit weighed for each plot.

| | Yield at Picking Date* | | | | |
|--|------------------------|---------|---------|---------|----------------|
| Treatment | Rate | July 14 | July 19 | July 27 | Total |
| | L/ha | g/plot | g/plot | g/plot | g/plot |
| 1. Control | 0 | 2895 e | 3843 c | 4497 e | 11234 e |
| 2. Amalgerol | 4 | 3914 b | 5005 b | 7274 b | 16193 b (+44%) |
| 3. Organic Vita | 0.5 | 3070 d | 4074 c | 6006 d | 13150 d (+17%) |
| 4. Organic Vita | 1 | 3737 с | 4992 b | 7025 c | 15755 c (+40%) |
| 5. Organic Vita | 2 | 4151 a | 5521 a | 7764 a | 17436 a (+55%) |
| LSD (P=0.10) | | 147 | 283 | 187 | 299 |
| CV | | 4.14 | 5.08 | 2.88 | 2.03 |
| Treatment F | | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| *Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test. | | | | | |



All yield increases were significantly greater than the control, with the following percentages.

Yield Increase Above the Control

| Amalgerol | +44% |
|-----------------------|------|
| Organic Vitazyme, 0.5 | +17% |
| Organic Vitazyme, 1 | +40% |
| Organic Vitazyme, 2 | +55% |

The 2 liter/ha Organic Vitazyme application produced the highest yields, which were significantly greater than any other treatment. Amalgerol and Organic Vitazyme at 1 liter/ ha produced similar significant yield increases.

Fruit per plant results: Twenty plants were counted, and number/plant was averaged.

| | Number at Picking Date* | | | | |
|---|-------------------------|---------|---------|---------|-------------|
| Treatment | Rate | July 14 | July 19 | July 27 | Average |
| | L/ha | number | number | number | number |
| 1. Control | 0 | 3.08 c | 3.83 ab | 3.81 e | 3.57 |
| 2. Amalgerol | 4 | 2.88 c | 3.77 ab | 5.05 d | 3.90 (+9%) |
| 3. Organic Vita | 0.5 | 3.09 c | 3.30 b | 5.61 c | 4.00 (+12%) |
| 4. Organic Vita | 1 | 3.77 b | 3.73 ab | 7.14 b | 4.88 (+37%) |
| 5. Organic Vita | 2 | 4.33 a | 4.15 a | 7.59 a | 5.36 (+50%) |
| LSD (P=0.10) | | 0.37 | 0.54 | 0.30 | |
| CV | | 10.72 | 14.36 | 5.19 | |
| Treatment F | | 0.0001 | 0.1488 | 0.0001 | |
| 'Means followed by the same letter are not significantly different at P=0.10 according to the | | | | | |



All biostimulant treatments increased the number of fruit, especially the 2 and 1 liter/ha Organic Vitazyme treatments that gave marked increases.

| Increase in Fruit Number Above the Control | | | |
|--|----------------------|--|--|
| Amalgerol | +7% | | |
| Organic Vitazyme, 1 | - <i>12%</i> ⊦37% | | |
| Organic Vitazyme, 2 | ⊦50 % | | |

Picking Date* Treatment Rate July 14 July 19 July 27 Average L/ha % % % % 1. Control 0 2.06 a 1.72 a 1.62 a 1.80 4 1.30 c 1.21 c 0.94 c 1.15 2. Amalgerol 0.5 1.77 b 1.51 b 1.17 b 1.48 3. Organic Vita 1 1.41 c 1.26 c 0.98 c 1.22 4. Organic Vita 2 1.12 c 0.87 c 1.05 5. Organic Vita 1.16 c LSD (P=0.10) 0.20 0.19 0.09 13.22 13.73 8.23 C۷ Treatment F 0.0001 0.0001 0.0001 *Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test.

Unmarketable fruit yield results:

University of a bloc Function Accounting



The unmarketable fruit was least with Organic Vitazyme at 2 liters/ha, followed closely by Amalgerol and Organic Vitazyme at 1 liter/ha; all were significantly greater than the control and lowest Organic Vitazyme rate.

Plant height results: Measurements were made for 20 plants from each plot, and averaged.

| Treatment | Rate | Height* | | |
|---|------|----------|-------|--|
| | L/ha | cm | | |
| 1. Control | 0 | 138.7 d | | |
| 2. Amalgerol | 4 | 142.8 b | (+3%) | |
| 3. Organic Vita | 0.5 | 141.3 c | (+2%) | |
| 4. Organic Vita | 1 | 143.3 ab | (+3%) | |
| 5. Organic Vita | 2 | 144.4 a | (+4%) | |
| LSD (P=0.10) | | 1.2 | | |
| CV | | 0.82 | | |
| Treatment F | | 0.0001 | | |
| *Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. | | | | |

While height differences were not great, they were significantly higher than the control for all four biostimulant treatments, especially for Vitazyme at 2 liters/ha, which was significantly greater than all other treatments. *Leaf chlorophyll results:* Twenty leaves for each plot were measured for chlorophyll with a Minolta SPAD meter, and averaged.

| Treatment | Rate | Leaf chlorophyll* | | |
|---|------|-------------------|-------|--|
| | L/ha | SPAD units | | |
| 1. Control | 0 | 55.42 b | | |
| 2. Amalgerol | 4 | 58.05 a | (+5%) | |
| 3. Organic Vita | 0.5 | 57.73 a | (+4%) | |
| 4. Organic Vita | 1 | 58.07 a | (+5%) | |
| 5. Organic Vita | 2 | 58.15 a | (+5%) | |
| LSD (P=0.10) | | 0.77 | | |
| CV | | 1.34 | | |
| Treatment F | | 0.0001 | | |
| 'Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. | | | | |

All of the biostimulant treatments increased the leaf chlorophyll level above the control, by 4 to 5%. All of the increases were statistically equal, though Organic Vitazyme at 2 liters/ha gave the greatest increase.

Root mas results: The roots from 20 plants of each plot were dug at harvest, and cleaned, weighed, and averaged.



Increase in root mass with Organic Vitazyme at 2 liters/ha: 27%

All four treatments were statistically the same in increasing root mass above the control, but the Organic Vitazyme treatment at 2 liters/ha produced the most roots, a 27% increase.

Conclusions: A cucumber small-plot study in Hungary, using five treatments and six replications in a randomized complete block design, showed that both Organic Vitazyme at all rates and Amalgerol significantly improved the growth and yield of cucumber plants. The most effective treatment was Organic Vitazyme at 2 liters/ha, which produced the highest levels of crop vigor (+97.5%), crop yield (55%), fruit per plant (50%), height (4%), leaf chlorophyll (5%), root mass (+27%), and the least unmarketable fruit (1.05%). Other Vitazyme treatments also in many cases gave significant increases above the untreated control. Amalgerol at 4 liter/ha was usually the second highest responding treatment across the several parameters measured. Neither product displayed any phytotoxicity to the cucumber leaves.

VITAZYME 2021 FIELD TEST RESULTS 21

Cucumbers with Vitazyme application

Researchers: Dr. Alberto M. Garcia Munguia **Research Organization:** University of Aguascalientes, Agricultural Sciences Center, Phytotechniques Department, Jesus Maria, Aguascalientes, 20131, Mexico

Location: Municipality of Guasave, Sinaloa State, Mexico Variety: Feisty Planting date: December 8, 2020

Experimental design: A randomized complete block design of cucumbers, using four replications, was situated in a pattern of plots having three beds, each separated by 1.5 meters, the beds being 4.5 meters wide and 5 meters long, giving a total of 22.5 m² per plot and 90 m² per treatment.

🚺 Control 😢 Vitazyme

Vitazyme application: Three treatments: (1) 1 liter/ha (13 oz/acre) as a root dip by submerging trays of young plants, until air was released, in 200 liters of water per ha (20 gallons/acre) just before transplanting; (2) 1 liter/ha (13 oz/acre) using 400 liters of water per ha (40 gallons/acre) at three weeks after transplanting and first application; (3) 1 liter/ha (13 oz/acre) as in the second application, three weeks later.

Fertilization: unknown but uniform over all areas

Results: All data was compiled by February 2, 2021, 56 days after the first application.





Stem diameter increase with Vitazyme:15% Flowers Per Plant 30— Flower number per plant 24.3 20— 16.6 10— 16.6 10— Control Vitazyme

> Flower number increase with Vitazyme: 46%



Fruit weight increase with Vitazyme: 48%





Conclusions: This replicated cucumber study in Sinaloa State, Mexico, proved that Vitazyme applied at transplanting as a tray dip, and soil/foliar twice more during the season at 1 liter/ha (13 oz/acre), had a great impact on plant growth, fruit size, and final yield. The yield was improved by 3,524 lb/acre (3.96 metric tons/ha), or 70%, by Vitazyme, while plant height, leaf number, stem diameter, and flowers per plant were all increased. Fruit parameters such as average weight, fruits per plant, length and diameter were all improved, with fruit weight being a marked 48% greater than the untreated control fruit. Fruit Brix and leaf chlorophyll did not have any significant change between treatments. These results illustrated the great efficacy of Vitazyme for cucumber production in Sinaloa State, Mexico.

Researcher: Bence Kiraly, Natalia Simon, and Jeno Simon

Research organization: Biotek Agriculture Hungary Kft., 6636 Martely, hrsz. : o13818, Hungary; Vital Earth Resources, Inc. Gladewater, Texas, USA

Location: Forraskut, Csongrad-Csanad State, Hungary Farm cooperator: Alajos Sandor, Forraskut, Hungary Variety: Kovidinka (Vitis vinifera) Vineyard establishment: November 12, 1999 Row spacing: 3 meters In-row spacing: 3 meters Planting rate: 3,330 plants/ha Tillage: conventional

Soil traits: sand, 1.2% organic matter, 6.89 pH, good fertility

Experimental design: A vineyard was divided into plots that were 3 x 10 meters (30 m²), with five treatments and six replications in a randomized complete block design. The purpose of the trial was to evaluate the effect of two biostimulants— Amalgerol, and Organic Vitazyme (at three rates)—on the growth, yield, and grape quality of the vineyard.

| Trootmont | Pro | | | |
|------------------------------|---------------|---------------|---------------|---------------|
| neatment | May 12 | June 9 | June 23 | August 19 |
| 1. Control | 0 | 0 | 0 | |
| 2. Amalgerol | 4 liters/ha | 4 liters/ha | 4 liters/ha | 4 liters/ha |
| 3. Organic Vitazyme | 0.5 liter/ha | 0.5 liter/ha | 0.5 liter/ha | 0.5 liter/ha |
| 4. Organic Vitazyme | 1 liter/ha | 1 liter/ha | 1 liter/ha | 1 liter/ha |
| 5. Organic Vitazyme | 2 liters/ha | 2 liters/ha | 2 liters/ha | 2 liters/ha |
| Crop stage, BBCH scale | 19:100 | 63:70 | 75:60 | 79:90 |
| Average height | | 1.6 m | 2 m | 1.8 m |
| Interval from previous appl. | 0 | 28 days | 14 days | 57 days |
| Method of treatment | foliar spray | foliar spray | foliar spray | foliar spray |
| Application amounts | 500 liters/ha | 600 liters/ha | 700 liters/ha | 500 liters/ha |

Fertilization: unknown *Organic Vitazyme application:* See the rates and timing in the table.

Amalgerol application: See the rates and timing in the table. Amalgerol is a mixture of seaweed extracts, mineral oil, essential oils, and herbal extracts, and is "Qualified Organic" according to EC regulation number 834/2007, for organic use. It is produced by Hechenbichler, Innsbruck Austria.

Pest control: May 21—Microthiol Special fungicide at 2 liters/ha; May 31—Karate Zeon insecticide at 0.25 liter/ha; June 17— Kupfer Fusilan fungicide at 2.5 kg/ha and Karate Zeon insecticide at 0.25 liter/ha; July 4—Cymbal fungicide at 0.25 kg/ha; July 24—Cymbal fungicide at 0.25 kg/ha

Phytotoxicity results: No phytotoxicity was noted for either product.

Crop vigor results: The only significant vigor differences were noted at the September 2 evaluation, when the control had a bit less vigor than the other four treatments: 89.8%, versus 93.0%, 92.3%, 92.3%, and 93.2% for 2,3,4, and 5.

Leaf chlorophyll: Chlorophyll evaluations were made on 20 leaves for each plot,

and averaged, on September 2. A Minolta SPAD meter was used.

| Treatment | Rate | Leaf Chlorophyll* | | | | |
|--|------|-------------------|--|--|--|--|
| | L/ha | SPAD units | | | | |
| 1. Control | 0 | 33.4 b | | | | |
| 2. Amalgerol | 4 | 34.4 a | | | | |
| 3. Organic Vita | 0.5 | 34.4 a | | | | |
| 4. Organic Vita | 1 | 34.6 a | | | | |
| 5. Organic Vita | 2 | 34.6 a | | | | |
| LSD (P=0.10) | | 0.6 | | | | |
| CV | | 1.71 | | | | |
| Treatment F 0.0083 | | | | | | |
| *Means followed by the same letter are not significantly different according to the Student-Newman-Keuls Test. | | | | | | |

All four biostimulant treatments significantly raised the leaf chlorophyll levels by about 1 SPAD unit above control.



Yield results: Weights were taken at harvest on September 21.

| Treatment | Rate | Grape yield* | | | |
|---|------|--------------|-------|--|--|
| | L/ha | kg/plot | | | |
| 1. Control | 0 | 15.44 b | | | |
| 2. Amalgerol | 4 | 16.24 a | (+5%) | | |
| 3. Organic Vita | 0.5 | 15.86 ab | (+3%) | | |
| 4. Organic Vita | 1 | 16.08 ab | (+4%) | | |
| 5. Organic Vita | 2 | 16.47 a | (+7%) | | |
| LSD (P=0.10) | | 0.51 | | | |
| CV | | 3.19 | | | |
| Treatment F | | 0.0236 | | | |
| 'Means followed by the same letter are not significantly different according to the Student-Newman-Keuls Test. | | | | | |

Increase in grape yield with Organic Vitazyme at 2 liters/ha: 7%

Bunch number result:

| Treatment | Rate | Bunch number* | | |
|---|------|---------------|-------|--|
| | L/ha | number/plot | | |
| 1. Control | 0 | 14.8 a | — | |
| 2. Amalgerol | 4 | 15.0 a | (+1%) | |
| 3. Organic Vita | 0.5 | 14.8 a | (0%) | |
| 4. Organic Vita | 1 | 15.8 a | (+7%) | |
| 5. Organic Vita | 2 | 15.7 a | (+6%) | |
| LSD (P=0.10) | | 1.2 | | |
| CV | | 7.66 | | |
| Treatment F | | 0.4235 | | |
| [*] Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. | | | | |

Bunch weight results: There were no significant differences among the treatments for bunch weight. **Unmarketable fruit:**

| Treatment | Rate | Unmarketable fruit* | | | |
|---|------|---------------------|--|--|--|
| | L/ha | % of total | | | |
| 1. Control | 0 | 6.5 a | | | |
| 2. Amalgerol | 4 | 5.4 b | | | |
| 3. Organic Vita | 0.5 | 5.7 ab | | | |
| 4. Organic Vita | 1 | 6.0 ab | | | |
| 5. Organic Vita | 2 | 5.4 b | | | |
| LSD (P=0.10) | | 1.0 | | | |
| CV | | 17.31 | | | |
| Treatment F 0.3215 | | | | | |
| *Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. | | | | | |

The grape yield was significantly higher than the control for Vitazyme at 2 liters/ha (+7%), and Amalgorol at 4 liters/ha (+5%). All treatments gave yield increases.



Although the values did not differ significantly, Organic Vitazyme at 1 or 2 liter/ha applications increased the bunch number 6 to 7% above the control.

Increase in bunch number with Organic Vitazyme (1 liter/ha): 7%

The Organic Vitazyme (2 liters/ha) and Amalgerol treatments significantly reduced the marketable yield losses to 5.4% of the total yield versus 6.5% for the control.



Sugar content results: There were no significant differences among the five treatments in grape sugar content, all values being 15.6 or 15.7%.

Total acidity results: All treatments produced acidity values of 5.3 to 5.5 g/liter, which were not significantly different. **Conclusions:** This grape study in Hungary, using Organic Vitazyme at 0.5, 1, or 2 liters/ha applied foliar four times, and Amalgerol at 4 liters/ha, also applied four times, revealed that the yield of grapes was the highest with Organic Vitazyme, exceeding the control by 7%; Amalgerol was also significantly greater in yield than the control, by 5%. Bunch numbers were 6 to 7% higher with the 1 and 2 liters/ha Organic Vitazyme applications. Bunch weights did not differ significantly among all five treatments, but unmarketable fruit was significantly less than the control for Organic Vitazyme (2 liters/ha) and Amalgerol. Vigor of the plants showed no apparent differences among treatments, nor did bunch weight. No phytotoxic effects were noted.

Onions with Vitazyme application

Vitazyme Field Tests for 2021

A Paper Presented at the International Biostimulant Congress in Hollywood, California, November 29—December, 2021.

Differential Dehydrator Onion Yield Responses Due to Various Biostimulants and Growth Stage



This California trial with dehydrator onions, using several biostimulant materials applied usually at the 3, 5, and 7 leaf stages, proved that they can significantly improve yields. Vitazyme proved to be the best.



The dehydrator onions were carefully harvested plot-by-plot to collect the yield data from each of the several treatments during both the 2019-20 and 2020-21 seasons.

Researchers: Michael D. Rethwisch, Kassandra W. Allan, Lauren-Elizabeth Pope, and Nathan J. Tribby Research organization: University of California Cooperative Extension, Riverside County,

Palo Verde Valley Office, Blythe, California

Location: Blythe, California Variety: Olam 41 (2019-2020) and Sensient (2020-2021) Soil type: silty clay loam (2019-2020), and silty clay (2020-2021)

Experimental design: An onion field

was prepared and planted in four replications (2019-2020) or six replications (2020-2021), with multiple rows per bed. For each year, plot sizes were 25 feet x 4 beds. Recommended rates for the various products were applied foliar at different leaf stages, in an effort to evaluate the effects of each product on dehydrator onion yields. Vitazyme applications: See the table. Other product applications:

See the table

| Treatment | Company | Rate | Leaf stage, 2019-20 | | | Leaf stage, 2020-21 | | |
|--|-----------------------|--------------|---------------------|---|---|---------------------|---|---|
| ireatiment | | nate | 2 | 3 | 5 | 3 | 5 | 7 |
| Vitazyme | Vital Earth Resources | 20 oz/acre | | х | | | | |
| Vitazyme | Vital Earth Resources | 13 oz/acre | | х | Х | Х | Х | |
| Vitazyme | Vital Earth Resources | 20 oz/acre | | | | х | х | х |
| Advantigro | Wilbur-Ellis | 6 oz/acre | | х | | Х | Х | |
| Advantigro | Wilbur-Ellis | 6 oz/acre | | | | х | х | х |
| RyzUp Smartgrass | Valent | 0.2 oz/acre | х | | | | | |
| Foliar Transit | FB Sciences | 8-10 oz/acre | | х | | | | |
| Cyto power* | Mil Agro | 1 lb/acre | | х | | | | |
| Cyto power* | Mil Agro | 1 lb/acre | | | | х | х | |
| Cyto power* | Mil Agro | 1 lb/acre | | | | Х | х | Х |
| GreenSol 48 | FRIT Industries | 8 oz/acre | | | | х | х | |
| GreenSol 48 | FRIT Industries | 8 oz/acre | | | | Х | х | Х |
| *Added to this was 1 gt/acre of MultiMin and 1 lb/acre of K-Amino. | | | | | | | | |

Fertilization: unknown Yield results, 2019-2020:



Yield increase with Vitazyme

While none of the treatments—except Transit—were significantly different in yield, Vitazyme at 20 oz/acre applied at the 3rd leaf stage produced the highest yield, which was 8% greater than the control.

Yield results, 2020-2021:



Most of the treatments were not significantly different in yield, although the Cyto Power with its added multi-mineral and K-Amino yielded the most.

Overall yield results, 2019-2021: An analysis was made of dehydrator onion yields of several treatments, expressed as a percentage of untreated onions.

| Trootmont | Pato | Loofstage | Yield, % of control | | | |
|---------------------|-----------------|-----------|---------------------|-------|---------|--|
| ineachnehic | nate Leai staye | | 2020 | 2021 | Average | |
| 1. Vitazyme | 20 oz/acre | 3 | 104.8 | 108.2 | 106.5 | |
| 2. Cyto Power | 1 lb/acre | 3+5 | 107.0 | 102.2 | 104.6 | |
| 3. Advantigro | 6 oz/acre | 3+5 | 103.0 | 105.6 | 104.3 | |
| 4. Vitazyme | 13 oz/acre | 3 | 100.2 | 104.0 | 102.1 | |
| 5. Vitazyme | 13 oz/acre | 3+5 | 99.5 | 100.4 | 99.9 | |
| 6. RyzUp Smartgrass | 0.3 oz/acre | 2 | 91.9 | 103.4 | 97.7 | |
| 7. Transit Foliar | 8-10 oz/acre | 3 or 4 | 93.2 | 91.8 | 92.5 | |



Peppers with Organic Vitazyme application

Conclusions:

- Vitazyme, applied foliar at the 3rd leaf stage, produced the highest yields of dehydrator onions.
- Yield responses were fairly consistent over the two years for most products.
- Yield differences exist between products.
- Interactions between onion development stage and product and rate exist.
- The consistency of yield results over years, while involving different dehydrator onion varieties, provides high confidence levels for respectable future results.

Vitazyme Field Tests for 2021

Researcher: Bence Kiraly, Natalia Simon, and Jeno Simon

Research organization: Biotek Agriculture Hungary Kft., 6636 Martely, hrsz.: 013818, Hungary; Vital Earth Resources, Inc. Gladewater, Texas, USA

Location: Forraskut, Csongrad-Csanad State, Hungary Farm cooperator: Imre Illes, Forraskut, Hungary Variety: Magus F1 (*Capsicum annuum*) Planting date: June 12, 2021 Planting depth: 8 cm Row spacing: 30 cm In-row spacing: 30 cm Soil traits: sand, 0.5% organic matter, 7.62 pH, fair fertility Tillage: conventional

Experimental design:

A small-plot pepper trial was arrayed in a randomized complete block design, using six replications. Plots were 3 x 4.5 meters (13.5m²). The purpose of the trial was to evaluate the effect of two biostimulants on the growth, yield, and guality of peppers.

Fertilization: unknown

Organic Vitazyme application:

See the rates and timing in the table. *Amalgerol application:*

See the rates and timing in the table. Amalgerol is a mixture of seaweed extracts, mineral oil, essential oils, and herbal extracts, and is "Qualified

Product applications Treatment June 16 July 7 July 28 September 9 1. Control 0 0 0 2. Amalgerol 4 liters/ha 4 liters/ha 4 liters/ha 4 liters/ha 0.5 liter/ha 0.5 liter/ha 0.5 liter/ha 0.5 liter/ha 3. Organic Vitazyme 1 liter/ha 1 liter/ha 1 liter/ha 1 liter/ha 4. Organic Vitazyme 2 liters/ha 2 liters/ha 2 liters/ha 2 liters/ha 5. Organic Vitazyme 18:80 51:60 65:50 89:60 Crop stage, BBCH scale 0 Interval from previous appl. 21 days 21 days 43 days Method of treatment soil drench foliar spray foliar spray foliar spray **Application amounts** 10,000 liters/ha 300 liters/ha 300 liters/ha 300 liters/ha

Organic" according to EC regulation number 834/2007, for organic use. It is produced by Hechenbichler, Innsbruck Austria. **Pest control:** July 22—Thiovit Jet fungicide at 5 kg/ha, Cuproxat FW fungicide at 4 liter/ha, and Karate Zeon 5 CS insecticide at 0.3 liter/ha; August 16—Thiovit Jet fungicide at 5 kg/ha, Cuproxat FW fungicide at 4 liters/ha, and Karate Zeon 5 CS insecticide at 0.3 liter/ha; August 28—Cuproxat FW fungicide at 4 liters/ha

Phytotoxicity results: No phytotoxicity was noted for any treatment.

Crop vigor results: No significant differences were detected among the five treatments for the first three times of analysis, but the fourth date (September 23) did reveal significantly greater vigor for Vitazmye at 2 liters than the control. Averages for all four dates are given here.

Crop height results: Twenty-five plants were measured on August 11 for each plot and averaged.

| Treatment | Rate | Height* | | | |
|---|------|----------|--------|--|--|
| | L/ha | cm | | | |
| 1. Control | 0 | 56.43 c | _ | | |
| 2. Amalgerol | 4 | 62.26 ab | (+10%) | | |
| 3. Organic Vita | 0.5 | 60.19 b | (7%) | | |
| 4. Organic Vita | 1 | 61.90 ab | (+10%) | | |
| 5. Organic Vita | 2 | 62.82 a | (+11%) | | |
| LSD (P=0.10) | | 1.95 | | | |
| CV | | 3.22 | | | |
| Treatment F 0.0001 | | | | | |
| *Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. | | | | | |



Organic Vitazyme at 1 and 2 liters/ha significantly increased pepper height above the control (+10% and +11%), as did the Amalgerol treatment (+10%).

Crop yield results:

| | | Harvest Date* | | | | |
|--|------|---------------|--------------|--------------|---------|--|
| Treatment | Rate | September 9 | September 16 | September 23 | Total | |
| | L/ha | kg/plot | kg/plot | kg/plot | kg/plot | |
| 1. Control | 0 | 41.14 c | 51.47 c | 55.37 c | | |
| 2. Amalgerol | 4 | 43.85 ab | 56.05 ab | 61.76 ab | (+12%) | |
| 3. Organic Vita | 0.5 | 42.24 bc | 53.59 bc | 58.80 bc | (+6%) | |
| 4. Organic Vita | 1 | 44.05 ab | 55.97 ab | 62.87 ab | (+14%) | |
| 5. Organic Vita | 2 | 44.71 a | 56.55 a | 64.92 a | (+17%) | |
| LSD (P=0.10) | | 1.96 | 2.70 | 4.33 | | |
| CV | | 4.57 | 4.95 | 7.16 | | |
| Treatment F | | 0.0311 | 0.0190 | 0.0101 | | |
| [*] Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test. | | | | | | |

Organic Vitazyme at 2 liters/ha produced the greatest yield increase (+17%), followed by Organic Vitazyme at 1 liter/ha (+14%) and Amalgerol (+12%). All treatments significantly exceeded the control.

| Means followed by the same letter are not significantly different at P=0.10 according to the student-Newman-Keuls Test. |
|--|
| |



Increase in yield above the control

| Organic Vitazyme, 2 liters/ha+ | 17% |
|--------------------------------|-----|
| Organic Vitazyme, 1 liter/ha+ | 14% |
| Oraanic Vitazyme, 0.5 liter/ha | +6% |
| Amalgerol, 4 liters/ha+ | 12% |

- **Unmarketable fruit results:** An analysis of unusable fruit was made on September 9, 16, and 23. No differences were significant, but Vitazyme at 1 and 2 liters/ha produced the least unmarketable fruit. These average percentages for all three dates are shown here.
- *Fruit sugar content:* There were no significant differences in fruit sugar content. All values were from 3.9 to 4.2% sugar.
- **Leaf chlorophyll results:** All treatments were about equal, and significantly exceeded the control by about 1.0 SPAD unit, at P=0.10. Twenty leaves from each plot were measured for chlorophyll with a Minolta SPAD meter, and averaged.

Unmarketable fruit

| Organic Vitazyme, 1 liter/ha | 5.33% |
|--------------------------------|-------|
| Organic Vitazyme, 2 liters/ha | 5.55% |
| Organic Vitazyme, 0.5 liter/ha | 6.54% |
| Amalgerol, 4 liters/ha | 6.18% |
| Control | 7.48% |

Root mass results: No treatment was significantly different at P=0.10, from 20 plant roots weighed from each plot, and averaged. Treated roots varied from about 155 to 160 g/plot, which was nonsignificantly greater than the 149.3 g weight of the control. **Conclusions:** A small plot replicated pepper trial in Hungary, which evaluated the effectiveness of Organic Vitazyme at 0.5, 1, and 2 liters/ha and Amalgerol at 4 liters/ha, revealed that Organic Vitazyme at 2 liters/ha was the superior treatment in terms of plant vigor, plant height, and yield. Organic Vitazyme at 2 liters/ha increased crop vigor by 3.9 percentage points above the control, and the yield of peppers was 17% greater than the control for this treatment. The 1 liter/ha Organic Vitazyme treatment produced 14% more yield, while Amalgerol increased the yield by 12%. The height of the plants was significantly greater than the control by 10 to 11% for Organic Vitazyme at both 1 and 2%, and for Amalgerol. No significant effects were noted for phytotoxicity, fruit sugar, leaf chlorophyll, root mass, and unmarketable fruit, although both 1 and 2 liters/ha of Organic Vitazyme reduced unsalable fruit to the lowest levels, from 5.33 to 5.55% of the total yield.



Researcher: Jon Gilley **Research organization:** R.D. Offutt Corporation, Fargo, North Dakota **Location:** Atkinson, Nebraska **Variety:** Umatilla **Planting date:** May 21, 2021 **Plant spacing:** 8 to 10 inches **Experimental design:** A seed potato field was divided into control and Vitazyme treated strips, with Vitazyme applied as a seed piece treatment. Vitazyme treated beds were alternated with untreated beds. The purpose of the trial was to evaluate the effect of the Vitazyme seed treatment on plant growth and yield parameters.

Control 2 Vitazyme on the seed pieces

Fertilization: Six fertilization operations were made: (1) April 12:11-52-0 (map) % N-P₂0₅-K₂0 at 2.88 lb/acre;

- (2) May 24: 28-0-0 % N-P₂0₅-K₂0 liquid at 13 gal/acre; (3) June 14: 32 0-0 % N-P₂0₅-K₂0 liquid at 5.6 gal/acre;
- (4) June 22: 15.5-0-0-19% N-P₂0₅-K₂0-Zn granule Tropicote at 200 lb/acre; (5) July 12: 32-0-0 % N-P₂0₅-K₂0 liquid at 7.5 gal/acre;
- (6) July 19: 32-0-0 % N-P₂0₅-K₂0 liquid at 5 gal/acre

Vitazyme application: 13 oz/acre (1 liter/ha) in-furrow at planting

Growing season weather: hot and dry, with a serious hailstorm on June 22, which struck just as 50% leaf, cover had been reached **Sampling date:** September 1, 2021. Ten feet of row were sampled from the center row of six beds, which were alternating control and Vitazyme treated beds.

Sample results: The three 10-foot samples for each treatment were averaged and the data is displayed in the graphs.





Increase in tuber yield with Vitazyme: 7%

Conclusions: A seed potato trial near Atkinson, Nebraska, using Vitazyme as an in-furrow treatment in alternating beds at 13 oz/acre (1 liter/ha), caused several favorable growth responses: 6% more stems, 18% more stems/plant, 14% more total tubers, and 5% more tubers/stem. The yield was enhanced by 7% with Vitazyme, while the tuber size distribution favored larger tubers (6 oz and 10 oz.) with Vitazyme, while the control produced more small tuber (3 and 4 oz). Results were hampered by a hailstorm at 50% leaf cover, but even so Vitazyme is shown to be an excellent tool for raising seed potatoes in Nebraska.

Researcher: V.V. Plotnikov

Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York **Locations:** Continental Farmers Group, Lviv District, Lviv Region, Stariy Yarychiv Village, Ukraine;

western Ukraine (555-750 mm of rain per year) Variety: Lady Claire, F1(chipping variety) Planting date: May 4, 2021 Planting rate: 48,000 tubers/ha Previous crop: winter wheat

Tillage: disking to 6-8 cm, plowing to 32-35 cm, pre-plant harrowing to 10-12 cm

Soil type: gray-brown podzolic (2.7% organic matter)

Experimental design: A potato field was divided into a Vitazyme treated portion, with an untreated portion left as a control, to evaluate the effect of this product on tuber yield for various size grades.

🚺 Control 😢 Vitazyme

- **Fertilization:** 220 kg/ha of K_20 broadcast before fall plowing; 144-144 kg/ha N-P₂0₅ in the spring before pre-plant harrowing; 36 kg/ha of N as a summer top-dress
- Vitazyme application: (1) seed piece treatments to give 1 liter/ha, on May 4; (2) 1 liter/ha as a foliar spray at early blossom on June 17 (BBCH 60-61)
- **Yield results:** The tubers were sorted according to size class and weighed.





Vitazyme applied to the seed pieces at planting, and foliar at early bloom, greatly improved tuber formation, which produced larger and more uniform tubers, increasing yield and income.

| Increase in Size Classes with Vitazyme | | | | |
|---|--|--|--|--|
| > 22 mm | | | | |
| > 35 mm | | | | |
| > 40 mm | | | | |

Income results: For the largest diameter tubers (> 40 mm), the net return to the farmer was increased by \$1,300/ha. **Conclusions:** A potato study in Ukraine, using Vitazyme on the tubers at planting and foliar at early bloom, revealed that, compared to the untreated control, the treated plants produced greater weights in all three size categories measured. Adding the weight of all tubers >22 mm, Vitazyme increased the weight by 36%; for >35 mm the increase was 30%, and for >40mm it was 25%. For the >40 mm tubers alone the extra yield added \$1,300/ha to the farmer's income.

Rice with Vitazyme application



Rice treated with Vitazyme sprayed foliar at 23 days after planting, plus Bio Seed in-furrow at planting (left), produced superior seedheads and final yield (+16%) compared to the untreated control on the right.



The root mass of the Vitazyme treated rice plants on the right is much greater than for the untreated control plants on the left. Only 13 oz/acre of Vitazyme applied in-furrow produced this effect.

Researcher: Bruce Kirksey, Ph.D. **Research organization:** Agricenter International, Memphis, Tennessee **Location:** Memphis, Tennessee **Variety:** CL 151 **Planting rate:** 55 lb/acre **Planting depth:** 1 inch **Row spacing:** 7.5 inches **Tillage:** conventional **Planting date:** May 18, 2021

Soil: Falaya silt loam. 1.8% organic matter, 6.5 pH, 7.8 meq/100 grams cation exchange capacity, good fertility, good drainage **Experimental design:** A small-plot rice trial was established in a randomized complete block design, plots being 7 x 30 feet (nine rows per plot) with four replications. A microbial fertilizer (Bio Seed) and Vitazyme were used alone and in combination to evaluate the effect of these treatments on the yield and vigor of the rice crop.

| Treatment | Form | Rate | Application | Date | |
|---|---------------|-------------------------|------------------------|------------------|--|
| 1. Control | _ | — | _ | — | |
| 2. Vitazyme | Liquid | 13 oz/acre | in-furrow | May 18 | |
| 3. Bio Seed | Dry | 50 g/acre | in-furrow | May 18 | |
| 4. Vitazyme + Bio Seed | Liquid Dry | 13 oz/acre 50 g/acre | in-furrow in-furrow | May 18 May 18 | |
| 5. Bio Seed + Vitazyme | Dry Liquid | 50 g/acre 13 oz/acre | in-furrow foliar* | May 18 July 2 | |
| *Product was sprayed on the leaves and soil just before flooring. | | | | | |

Fertilization: unknown

Vitazyme application: in-furrow at 13 oz/acre (1 liter/ha) sprayed on the leaves and soil before flooding. See details in the table.

- **Bio Seed application:** in-furrow at 50g/acre in all cases. See details in the table. Bio Seed is a mixture of bacteria and fungi that are beneficial to seed germination and plant development.
- *Harvest date:* September 14, 2021, using an Almaco plot combine to harvest a 5 x 30 foot strip in each plot.



Plant vigor: Vigor was estimated on a 5-point scale on June 10, 23 days after planting.

The Vitazyme + Bio Seed treatment, both applied in-furrow, gave the best plant vigor at 23 days after planting. This rating was significantly better than the control and Vitazyme foliar applied + Bio Seed in-furrow.

Rice yield:

| Rice Yield | | | | | | |
|---|---------------------------|--------------|--|--|--|--|
| Treatment | Grain yield ¹ | Yield change | | | | |
| | bu/acre | bu/acre | | | | |
| 1. Control | 72.6 b | — | | | | |
| 2. Vitazyme in-furrow | 81.2 a | 8.6 (+12%) | | | | |
| 3. Bio Seed in-furrow | 78.5 ab | 5.9 (+8%) | | | | |
| 4. Vita + Bio in-furrow | 82.1 a | 9.5 (+13%) | | | | |
| 5. Vita foliar + Bio in-furrow | 84.5 a | 11.9 (+16%) | | | | |
| LSD (P=0.05) | 7.0 | | | | | |
| CV | 5.65 | | | | | |
| Treatment F 0.0253 | | | | | | |
| *Means followed by the same letter are no | ot significantly differen | t at P=0.05. | | | | |

Grain yield increase above the control

| Vitazvme in-furrow | |
|--------------------------|-------------------|
| Bio Seed in-furrow | |
| Vitazyme in-furrow + Bio | Seed in-furrow13% |
| Vitazyme foliar + Bio Se | ed in-furrow 16% |





While Vitazyme alone in-furrow significantly improved rice grain yield by 12 % above the control, with Bio Seed added with it in-furrow the yield was improved even more, to 13%, but the greatest yield was with Bio Seed in-furrow followed by Vitazyme applied to the leaves and soil 23 days later, before flooding of the plots. This gave a 16% yield increase.

Conclusions: A small-plot rice trial conducted in Memphis, Tennessee, using Vitazyme and Bio Seed, alone and in combination, in-furrow at planting except for one combined treatment where Vitazyme was applied foliar before flooding, revealed that Vitazyme alone produced a significant 12% yield increase. By applying Bio Seed together with Vitazyme, the yield was increased to 13% when both were applied in-furrow, while grain was boosted even more—to 16%—when the Vitazyme application was added as a foliar spray before flooding. Bio Seed alone increased grain yield above the control, but not significantly. The two products are shown to work remarkably well together, as has been shown in research during the 2019 and 2020 growing seasons. Plant vigor at 23 days after planting, while showing significant differences among the treatments, was not correlated well with final crop yield.

Strawberries with Organic Vitazyme application

Researcher: Bence Kiraly, Natalia Simon, and Jeno Simon

Research organization: Biotek Agriculture Hungary Kft., 6636 Martely, hrsz. : 013818, Hungary; Vital Earth Resources, Inc. Gladewater, Texas, USA

Location: Kiszombar, Csongrad-Csanad State, Hungary Farm cooperator: Antal Toth, Kiszombar, Hungary Variety: Camarosa (Fragaria spp.) Planting date: March 7, 2020 Row spacing: 80 cm In-row spacing: 30 cm Soil traits: clay loam, 2.2% organic matter, 6.61 pH, good fertility Tillage: conventional

Experimental design: A small-plot experiment to evaluate the effect of Organic Vitazyme and Amalgerol biostimulants on strawberries was conducted in 2021. Plots were 2 x 5 meters (10 m² area), using six replications, in a randomized complete block design. The objective of the study was to evaluate the effect of these product and rates on strawberry growth, production, and quality.

| Trootmont | Proc | | | |
|------------------------------|------------------|---------------|---------------|---------------|
| neatment | April 9 | April 20 | May 6 | May 21 |
| 1. Control | 0 | 0 | 0 | |
| 2. Amalgerol | 4 liters/ha | 4 liters/ha | 4 liters/ha | 4 liters/ha |
| 3. Organic Vitazyme | 0.5 liters/ha | 0.5 liter/ha | 0.5 liter/ha | 0.5 liter/ha |
| 4. Organic Vitazyme | 1 liter/ha | 1 liter/ha | 1 liter/ha | 1 liter/ha |
| 5. Organic Vitazyme | 2 liters/ha | 2 liters/ha | 2 liters/ha | 2 liters/ha |
| Crop stage, BBCH scale | 49;80 | 60;60 | 67;90 | 73;90 |
| Average height | 12 cm | 15 cm | 22 cm | 24 cm |
| Interval from previous appl. | 0 | 11 days | 16 days | 15 days |
| Method of treatment | plant drench | foliar spray | foliar spray | foliar spray |
| Application amounts | 10,000 liters/ha | 300 liters/ha | 300 liters/ha | 300 liters/ha |

Fertilization: none

Organic Vitazyme application: See the rates and timing in the table.

Amalgerol application: See the rates and timing in the table. Amalgerol is a mixture of seaweed extracts, mineral oil, essential oils, and herbal extracts, and is "Qualified Organic" according to EC regulation number 834/2007, for organic use. It is produced by Hechenbichler, Innsbruck, Austria.

Pest control: March 30—Stomp herbicide at 4 liters/ha; April 20—Quadris fungicide at 0.8 liter/ha, and Benevia insecticide at 0.75 liter/ha; May 6—Quadris fungicide at 0.8 liter/ha

Crop vigor results:

| | | Assessment date* | | | | |
|---|------|------------------|--------|--------|---------|--|
| Treatment | Rate | May 28 | June 2 | June 7 | June 11 | |
| | L/ha | % | % | % | % | |
| 1. Control | 0 | 91.7 b | 90.8 b | 89.2 b | 88.3 b | |
| 2. Amalgerol | 4 | 96.8 a | 96.3 a | 97.7 a | 97.7 a | |
| 3. Organic Vita | 0.5 | 95.5 a | 96.5 a | 97.3 a | 97.3 a | |
| 4. Organic Vita | 1 | 96.3 a | 96.8 a | 98.0 a | 98.2 a | |
| 5. Organic Vita | 2 | 97.2 a | 97.5 a | 98.5 a | 98.2 a | |
| LSD (P=0.10) | | 2.19 | 2.30 | 2.74 | 1.81 | |
| CV | | 2.31 | 2.41 | 2.87 | 1.89 | |
| Treatment F | | 0.0021 | 0.0004 | 0.0001 | 0.0001 | |
| [*] Crop vigor assessment by the Student-Newman-Keuls method; means followed by the same letter are not significantly different at P=0.10. | | | | | | |



All four treatments were significantly greater than the control at all four dates, though Organic Vitazyme at 1 and 2 liters/ha gave the highest values.

Phytotoxicity results: Neither product showed any phytotoxicity to the plants at any time. *Yield results:*

| Treatment | Rate | May 28 | June 2 | June 7 | June 11 | Total |
|--|------|--------|--------|--------|---------|---------|
| | L/ha | g/plot | g/plot | g/plot | g/plot | g/plot |
| 1. Control | 0 | 2704 d | 3878 d | 4729 c | 3963 d | 15274 d |
| 2. Amalgerol | 4 | 2910 b | 4137 c | 5071 b | 4351 bc | 16469 c |
| 3. Organic Vita | 0.5 | 2810 c | 4211 c | 5031 b | 4302 c | 16354 c |
| 4. Organic Vita | 1 | 3103 a | 4309 a | 5100 b | 4396 b | 16907 b |
| 5. Organic Vita | 2 | 3143 a | 4403 a | 5292 a | 4528 a | 17366 a |
| LSD (P=0.10) | | 88 | 77 | 104 | 74 | 238 |
| CV | | 3.01 | 1.85 | 2.08 | 1.72 | 1.45 |
| Treatment F | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| *Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test. | | | | | | |



Yield increase above the control

| Amalaerol, 4 liters/ha+8% | |
|-----------------------------------|--|
| Organic Vitazyme, 0.5 liter/ha+7% | |
| Organic Vitazyme, 1 liter/ha+11% | |
| Organic Vitazyme, 2 liters/ha+14% | |

Both 1 and 2 liters/ha of Organic Vitazyme significantly increased the strawberry yield above the control especially the 2 liter/ha rate (+14%), while Amalgerol and 0.5 liter/ha Organic Vitazyme increased the yield less, by 8% and 7%, respectively.

Fruit number/plot - results:

| | Harvest date* | | | | | |
|--|---------------|--------|---------|----------|----------|--|
| Treatment | Rate | May 28 | June 2 | June 7 | June 11 | |
| | L/ha | number | number | number | number | |
| 1. Control | 0 | 80.8 c | 130.0 c | 137.2 b | 121.8 b | |
| 2. Amalgerol | 4 | 92.7 b | 137.5 b | 139.8 ab | 124.5 ab | |
| 3. Organic Vita | 0.5 | 90.3 b | 138.3 b | 145.8 a | 126.5 ab | |
| 4. Organic Vita | 1 | 97.3 a | 142.3 b | 141.5 ab | 127.3 ab | |
| 5. Organic Vita | 2 | 98.8 a | 144.7 a | 140.7 ab | 129.0 a | |
| LSD (P=0.10) | | 3.7 | 3.6 | 4.6 | 4.0 | |
| СV | | 3.99 | 2.60 | 3.27 | 3.21 | |
| Treatment F | | 0.0001 | 0.0001 | 0.0534 | 0.0458 | |
| *Means followed by the same letter are not significantly different at P=0.10 according to the Student- Newman-Keuls Test. | | | | | | |



At all four harvest dates the number of strawberries harvested was significantly greatest with the 2 liter/ ha Organic Vitazyme treatment (+11%), followed by the other treatments, with the exception of the June 7 harvest, when the 0.5 liter/ha Organic Vitazyme number was the greatest.

Fruit weight results:

| | | Harvest date* | | | | |
|------------------------|---|---------------|---------|----------|---------|--|
| Treatment | Rate | May 28 | June 2 | June 7 | June 11 | |
| | L/ha | grams | grams | grams | grams | |
| 1. Control | 0 | 33.50 a | 29.86 a | 34.55 b | 32.57 b | |
| 2. Amalgerol | 4 | 31.43 b | 30.10 a | 36.29 ab | 35.13 a | |
| 3. Organic Vita | 0.5 | 31.12 b | 30.45 a | 34.51 b | 34.02 a | |
| 4. Organic Vita | 1 | 31.90 b | 30.27 a | 36.07 ab | 34.52 a | |
| 5. Organic Vita | 2 | 31.80 b | 30.44 a | 37.64 a | 35.11 a | |
| LSD (P=0.10) | † | 1.02 | 0.80 | 1.52 | 1.23 | |
| CV | | 3.20 | 2.67 | 4.26 | 3.59 | |
| Treatment F | | 0.0065 | 0.6837 | 0.0095 | 0.0101 | |
| *Means followed by the | *Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman- Keuls | | | | | |

Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test.



Fruit weight was significantly greatest for the untreated control at the first picking, but that situation reversed by the time of the last harvest, when all four treatments produced significantly heavier fruit than did the control.

Unmarketable fruit results:

| | Harvest date* | | | | |
|--|---------------|--------|--------|--------|---------|
| Treatment | Rate | May 28 | June 2 | June 7 | June 11 |
| | L/ha | % | % | % | % |
| 1. Control | 0 | 4.7 a | 2.2 a | 2.3 a | 3.3 a |
| 2. Amalgerol | 4 | 4.0 a | 2.1 a | 2.1 a | 1.9 b |
| 3. Organic Vita | 0.5 | 3.1 a | 2.0 a | 1.3 a | 2.1 b |
| 4. Organic Vita | 1 | 4.0 a | 1.6 a | 1.7 a | 1.4 b |
| 5. Organic Vita | 2 | 3.7 a | 1.5 a | 1.4 a | 1.7 b |
| LSD (P=0.10) | | 1.2 | 0.7 | 0.7 | 0.6 |
| CV | | 31.17 | 36.94 | 42.21 | 30.34 |
| Treatment F | | 0.3336 | 0.3582 | 0.1150 | 0.0005 |
| [*] Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test. | | | | | |

Unmarketable yield

| Control | 3.1% | loss |
|-----------------------|------|------|
| Amalaerol, | 2.5% | loss |
| Organic Vitazyme, 0.5 | 2.1% | loss |
| Oraanic Vitazvme, 1 | 2.2% | loss |
| Organic Vitazyme, 2 | 2.1% | loss |

The unmarketable yield was not significantly different for any of the five treatments except for the final picking, when the control produced significantly more unmarketable berries than did the other four treatments. Considering all four pickings, the unmarketable yield was as shown on the left:

Sugar control results:

| | | Harvest date* | | | | |
|--|------|---------------|---------|---------|---------|--|
| Treatment | Rate | May 28 | June 2 | June 7 | June 11 | |
| | L/ha | Brix | Brix | Brix | Brix | |
| 1. Control | 0 | 9.92 a | 9.82 a | 8.83 b | 9.17 b | |
| 2. Amalgerol | 4 | 9.98 a | 9.93 a | 10.07 a | 10.57 a | |
| 3. Organic Vita | 0.5 | 10.00 a | 9.92 a | 10.05 a | 10.38 a | |
| 4. Organic Vita | 1 | 9.97 a | 10.07 a | 10.28 a | 10.50 a | |
| 5. Organic Vita | 2 | 10.05 a | 10.13 a | 10.37 a | 10.73 a | |
| LSD (P=0.10) | | 0.48 | 0.34 | 0.47 | 0.49 | |
| CV | | 4.83 | 3.38 | 4.77 | 4.79 | |
| Treatment F | | 0.9926 | 0.5152 | 0.0001 | 0.0001 | |
| "Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls | | | | | | |

Test. Twenty fruit were sampled for each plot and averaged.

Average Sugar Content for Four Pickings

| Control | 9.44 Brix |
|-----------------------|------------------|
| Amalgerol, | 10.14 Brix (+7%) |
| Organic Vitazyme, 0.5 | 10.09 Brix (+7%) |
| Organic Vitazyme, 1 | 10.21 Brix (+8%) |
| Organic Vitazyme, 2 | 10.32 Brix (+9%) |

For all four pickings the control berries had the least sugar, but significantly less for the last two pickings. All other values were statistically the same, but the Organic Vitazyme at 2 liters/ha in all cases produced the sweetest fruit. **Plant diameter results:** The size of the leaf canopy of the plants did not differ significantly among all five treatments. **Leaf chlorophyll results:** A Minolta SPAD meter was used to evaluate 20 leaves for each treatment, and these values were averaged.

> A O

| Treatment | Rate | Leaf Chlorophyll on June 2 |
|-----------------|------|-------------------------------|
| | L/ha | SPAD units |
| 1. Control | 0 | 30.9 b |
| 2. Amalgerol | 4 | 35.6 a |
| 3. Organic Vita | 0.5 | 35.5 a |
| 4. Organic Vita | 1 | 35.5 a |
| 5. Organic Vita | 2 | 36.2 a |
| LSD (P=0.10) | | 1.3 |
| CV | | 3.76 |
| Treatment F | | 0.0035 |

Both Amalgerol and Organic Vitazyme at all levels significantly increased leaf chlorophyll above the control, with the 2 liter/ha Vitazyme treatment increasing it the most (5.3 SPAD units).

| Above the Control, SPAD units | | | | |
|-------------------------------|-----|--|--|--|
| malaerol | +4. | | | |
| rganic Vitazyme, 0.5 | +4. | | | |

| Organic Vitazyme, | 1+4.6 |
|---------------------|-------|
| Organic Vitazyme, . | 2+5.3 |



Conclusions: This small-plot replicated strawberry study in Hungary showed that both Organic Vitazyme, at 0.5, 1, and 2 liter applications four times, and Amalgerol, also with four applications, improved most parameters measured during the course of the trial. The 2 liter/ha Organic Vitazyme treatment was superior to the other three for yield (+14%), fruit number (+11%), unmarketable fruit (2.1% less), fruit sugar content (+9% Brix), and leaf chlorophyll (+5.3 SPAD units). It is presumed that the superior chlorophyll content of the leaves of Treatment 5 accounted for the highest values for yield, sugar, and other parameters. Amalgerol and the other two Organic Vitazyme treatments also increased most measurements above the control, oftentimes significantly.

Researchers: Graig Reicks and B.J. McNeil **Research organization:** South Dakota Soybean Association and South Dakota State University, Brookings, South Dakota **Location:** Siegling South field, Miller, South Dakota **Variety:** LS 1380HP

Planting date: June 7, 2021 Row spacing: 30 inches

Soil type: Chernozem (Mollisol); Tetonka silt Ioam (0-2 % slopes), Houdek-Prosper Ioams (0-2% slopes), Houdek-Prosper Ioams (1-6% slopes), Dudley silt Ioam, nearly level

Experimental design: An organic soybean field was divided into Organic Vitazyme and untreated areas, in an effort to determine the effect of this biostimulant on soybean yield.

1 Control 😢 Organic Vitazyme

Fertilization: unknown

Vitazyme application: 13 oz/acre applied by air on July 16, 2021, at 9:30 a.m., using a spray rate of 5 gal/acre on 12 acres

Growing season weather: very hot and dry; 16.5 inches of precipitation to December of 2021. This caused slow germination.

Harvest date: October 7, 2021

Yield results:

| Treatment | Yield | Yield change |
|---------------------|-------|--------------|
| | bu/ha | bu/ha |
| 1. Control | 21.12 | — |
| 2. Organic Vitazyme | 25.74 | 4.62 (+22%) |



Increased bean yield with Organic Vitazyme: 22%



Vitazyme Field Tests for 2021

Note the greater abundance of pods and superior rooting and nodulation of the Vitazyme treated plants from the *McNeil farm* on the right.



The soybeans on the Siegling farm were well-filled to the top of the plants, giving good yields in spite of the heat and drought.



The Vitazyme treated soybeans at the McNeil farm displayed greater overall plant growth and root development, leading to more pods and a higher final yield.

Conclusions: A field-scale soybean trial in central South Dakota proved that Organic Vitazyme, at 13 oz/acre (1 liter/ha) applied in-furrow at planting, increased soybean yield by 4.62 bu/acre, a 22% increase. These results show the potential for Organic Vitazyme to be a major contributor to soybean production in South Dakota, especially with organic production programs.

Sovbeans with Vitazyme application



Chris Fischbach stands in the Vitazyme treated section of the trial field of soybeans.

Researchers: Graig Reicks and Chris Fischbach

Research organization: South Dakota Soybean Association and South Dakota State University, Brookings, South Dakota Location: Mansfield, South Dakota Variety: REA RX1529 Seeding rate: 150,000 seeds/acre Planting date: May 17, 2021 Row spacing: 30 inches

Soil type: silt loam, Chernozem (Mollisol)

Experimental design: A soybean field was selected to receive Vitazyme applied in-furrow in strips, alongside untreated areas, to determine the effect of this biostimulant on the yield of soybeans.

1 Control 🕗 Vitazyme

Fertilization: none

Vitazyme application: 13 oz/acre (1 liter/ha) in-furrow at planting on May 17

Growing season weather: sparse but timely rains, and very warm June to August

Harvest date: September 23, 2021

Yield results: A field combine with a yield monitor was used. Three replications as strips were used for a statistical analysis.

| Treatment | Rep 1 | Rep 2 | Rep 3 | Average* | Yield change |
|--|---------|---------|---------|----------|--------------|
| | bu/acre | bu/acre | bu/acre | bu/acre | bu/acre |
| Control | 37.55 | 41.69 | 45.64 | 41.63 b | _ |
| Vitazyme | 41.90 | 43.71 | 48.33 | 44.65 a | 3.02 (+7%) |
| *The viold difference was significant at D=0.02 using a one tailed paired t test | | | | | |

*The yield difference was significant at P=0.02 using a one-tailed paired t-test.

Soybean Yield



Increase in bean yield with Vitazyme: 7%

Conclusions: In this South Dakota soybean trial, where Vitazyme was applied infurrow at 13 oz/acre (1 liter/ha) at planting, the yield was increased significantly (P=0.02) by 3.02 bu/acre during a year having very warm temperatures. This represented a 7% yield increase, showing the highly profitable value of this simple application for soybean production in South Dakota.



The pods removed from three average plants for each treatment show a considerable advantage for the Vitazyme treated plants.



The Vitazyme treated plants show greater mass in both the roots and the tops, as well as a greater stem diameter and pod number. Note the greener leaves at this late stage of development.



Sovbeans with Vitazyme application



Note the greater biomass, greater pod number, and greener pods of the Vitazyme treated soybean plants, and the considerably better root system versus the untreated control.



Pods removed from two typical plants from each treatment show the greater number of pods and more four-bean pods with Vitazyme treatment.

Researchers: Graig Reicks and Cory Strom

Research organization: South Dakota Soybean Association and South Dakota State University, Brookings, South Dakota **Location:** Kimball, South Dakota **Variety:** 16 x 628 Mustang

Plant population: 138, 507 seeds/acre

Planting date: May 16, 2021

Row spacing: 30 inches

Soil type: Chernozem (Mollisol); Plankinton silt loam,

Mobridge—Plankintion silt loams, Highmore-Java Complex, and Java-Glenham loams (6-9% slopes)

Experimental design: A soybean field was treated in one portion with Vitazyme applied in-furrow to evaluate the effect of this biostimulant on the yield of soybeans.

🚺 Control 🙆 Vitazyme

Fertilization: (1) broadcast pre-plant, 100 lb/acre of 11-52-0 % $N-P_2O_5-K_2O + 20$ lb/acre AMS; (2) in-furrow, 2.5 gal/acre of 7-23-0-1.5-0.5% $N-P_2O_5-K_2O-S-Zn$

Vitazyme application: 13 oz/acre (1 liter/ha) mixed with the starter fertilizer, in-furrow at planting

Growing season weather: dry and hot; 10.9 inches of rain all year vs. 17.4 inches average for 10 years.

Harvest date: September 22 and 23, 2021

Yield results:

| Yield | Yield change | |
|---------|--|--|
| bu/acre | bu/acre | |
| 39.86 | — | |
| 42.63 | 2.77 (+7%) | |
| 0.11 | | |
| | Yield bu/acre 39.86 42.63 0.11 | |

*Two-tailed paired t-test

Increase in bean yield with Vitazyme: 7%





Yields were determined for a comparison of the two treatments using combine monitor data in adjacent strips.

Conclusions: A split-field soybean trial in central South Dakota, using Vitazyme as an in-furrow treatment along with liquid starter fertilizer, produced a 2.77 bu/acre (7%) yield increase. This increase occurred in spite of extremely hot and dry conditions throughout the summer.

Researcher: V.V. Plotnikov

Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York **Location:** Cherkasy Research Station of Bioresources, Zolotonosha District, Cherkasy Region, Draboro-Bariatynske Village, Ukraine; central Ukraine (440-590 mm of rain per year:

Variety: Aurelina, F1 *Planting date:* May 11, 2021 *Planting rate:* 0.55 million seeds/ha *Previous crop:* winter wheat *Tillage:* disking to 8-10 cm, deep loosening to 28-30 cm, cultivations to 8-10 cm, harrowing to 4-5 cm *Soil type:* Chernozem (3.9% organic matter)

Experimental design: A soybean field was divided into a Vitazyme treated portion, with an untreated portion left as a control, to evaluate the effect of this product on bean yield. The first application was made at the time of herbicide application to minimize herbicide stress.

1 Control 🕗 Vitazyme

Fertilization: 8-24-24 kg/ha of N- P₂0₅-K₂0 before planting **Vitazyme application:** 0.5 liter/ha sprayed on the leaves and soil at the 5th trifoliate on June 25, 2021; 0.5 liter/ha foliar at early bloom

Yield results:

| Treatment | Yield | Yield change | |
|-----------|---------|--------------|--|
| | tons/ha | tons/ha | |
| Control | 2.55 | — | |
| Vitazyme | 2.94 | 0.39 (+15%) | |



Increase in bean yield with Vitazyme: 15%

Income results: An additional 0.39 ton/ha with Vitazyme produced \$237/ha more income versus the untreated control. **Conclusions:** This soybean field-scale trial in Ukraine, using Vitazyme sprayed at 0.5 liter/ha at the 5th trifoliate to reduce herbicide stress, and 0.5 liter/ha at early bloom, resulted in a 0.39 ton/ha (15%) yield increase. This increase netted the farmer \$237/ha more income versus the untreated control, showing the value of this program for soybean growers in Ukraine.

Sunflowers with Vitazyme Bio application

Vitazyme Field Tests for 2021

Researcher: V.V. Plotnikov

Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York **Location:** LLC "Obriy", Vinnytsia District, Vinnytsia Region, Strointsi Village, Ukraine: central Ukraine (440-590 mm of rain per year) **Variety:** NK Kondi **Planting date:** May 5, 2021 **Planting rate:** 60,000 seeds/ha **Previous crop:** winter Wheat **Tillage:** disking to 6-8 cm, deep harrowing to 22-24 cm, cultivation in two tracks to 5-6 cm

Soil type: gray podzol (1.7% organic matter)

Experimental design: A sunflower field was divided into a Vitazyme Bio treated portion, with an untreated portion left as a control, to evaluate the effect of this product on sunflower seed yield.

1 Control 😢 Vitazyme Bio

Fertilization: 34 kg/ha of N during pre-plant tillage, and 2-24-24 kg/ha of $N-P_20_5-K_20$ at planting

Vitazyme application: 1 liter/ha sprayed on the leaves and soil on June 5, 2021, at the 6-leaf stage. Vitazyme Bio is the same as Organic Vitazyme marketed in different parts of the world.

Yield results:

| Treatment | Yield | Yield change | |
|--------------|---------|--------------|--|
| | tons/ha | tons/ha | |
| Control | 2.7 | — | |
| Vitazyme Bio | 3.1 | 0.4 (+15%) | |

Increase in seed yield with Vitazyme: 15%



Sunflower plants dug from the two treatments illustrate the effect of Vitazyme Bio to improve total plant biomass, root mass, leaf area, and head size.

Vitazyme Bio improved sunflower yield by 15% above the untreated control.

Income results: A yield increase of 0.4 ton/ha resulted in an income increase of \$277/ha.

Conclusions: In this Ukrainian fieldscale sunflower trial, where Vitazyme Bio was applied at 1 liter/ha on the leaves and soil at the 6-leaf stage, the yield was increased by 0.4 ton/ ha (15%) above the control, netting the farmer an additional \$277/ha of income. This product is shown to be highly effective for improving sunflower yield and income in Ukraine.





Sunflowers grown in the Vinnytsia region of central Ukraine show a markedly darker color of Vitazyme Bio treated plants in the lower portion of the photo. Treated plants were larger with bigger heads, and yielded 15% more.

Tomatoes with Vitazyme application



Vitazyme was applied only to Vitazyme treated plants by spraying a 1% solution prepared just before each application. Plants were grown as pictured.

Researcher: Rajnish Khanna, PhD.

Research organization: i-Cultiver, Inc., Tracy, California

Variety: Moneymaker (Solanum lycopersicum)

Experimental design: Tomato seeds were surface sterilized and germinated in a greenhouse, then transplanted into larger pots at 3 to 4 inches height. Eight potted tomato plants for the two treatments were randomized, giving eight replications, and the plants were grown for 22 weeks under favorable light and temperature conditions. Eight of the 16 plants received Vitazyme to determine the effect of this product on the growth and yield of the tomato plants.

Fertilization: Peters Professional 20/20/20 water-soluble fertilizer was sprayed every week at 64 ppm, using 1 to 2 gallons per 100 plants.

Vitazyme application: A 1% solution (1 ml/100 ml of water) was sprayed on the leaves and soil surface of the eight pots every two weeks during active growth until flowering began.

Pest control: Floramite and Decathlon were applied at 0.25 teaspoon per gallon of water, along with the Peters fertilizer. **Yield results:** Twenty-two weeks after transplanting the tomatoes from each pot were counted and weighed.

| Treatment | Fruit number* | Number change | Fruit yield* | • Yield change | |
|---|---------------|---------------|--------------|----------------|--|
| | number/plant | number/plant | lb/plant | 16 | |
| Control | 19.6 b | — | 1.12 b | — | |
| Vitazyme | 30.3 a | 10.7 (+54%) | 1.32 a | 1.59 (+18%) | |
| *Means followed by the same letter are not significantly different at $P=0.05$. The treatment P for fruit yield is 0.025 | | | | | |

Fruit Number/Diant





Increase in fruit number with Vitazyme: +54% Increase in fruit weight with Vitazyme: +18% **Conclusions:** This greenhouse pot trial, comparing Vitazyme treated tomato plants to untreated control plants, revealed that biweekly applications of a 1% solution significantly (P=0.05) increased both tomato fruit number (+54%) and fruit yield (+18%) over the 22-week trial period. These results show the great efficacy of Vitazyme for improving tomato yield in a greenhouse setting.

Researcher: Bence Kiraly, Natalia Simon, and Jeno Simon

Research organization: Biotek Agriculture Hungary Kft., 6636 Martely, hrsz. : 013818, Hungary; Vital Earth Resources, Inc. Gladewater, Texas, USA

Location: Csengele-Csongrad-Csanad State, Hungary

Farm cooperator: Sandor Kuscora, Csengele, Hungary

Variety: Tyking (Solanum lycopersicum) Planting date: June 1, 2021 Planting depth: 8 cm Row spacing: 50 cm
 In-row spacing: 40 cm Soil traits: clay loam, 0.6% organic matter, 7.07 pH, good fertility Tillage: conventional
 Experimental design: A site was selected to establish a tomato trial, using small plots of 2 x 6 meters (12m²), having six replications, in a randomized complete block design. Five treatments were used to compare the effects of two biostimulants on the growth, yield, and quality of tomatoes.

| Trootmont | Product applications | | | | |
|------------------------------|----------------------|---------------|---------------|---------------|--|
| incatinent | June 1 | June 22 | July 15 | September 2 | |
| 1. Control | 0 | 0 | 0 | | |
| 2. Amalgerol | 4 liters/ha | 4 liters/ha | 4 liters/ha | 4 liters/ha | |
| 3. Organic Vitazyme | 0.5 liter/ha | 0.5 liter/ha | 0.5 liter/ha | 0.5 liter/ha | |
| 4. Organic Vitazyme | 1 liter/ha | 1 liter/ha | 1 liter/ha | 1 liter/ha | |
| 5. Organic Vitazyme | 2 liters/ha | 2 liters/ha | 2 liters/ha | 2 liters/ha | |
| Crop stage, BBCH scale | 14;80 | 28;70 | 71;60 | 89;60 | |
| Interval from previous appl. | 0 | 21 days | 23 days | 49 days | |
| Method of treatment | soil drench | foliar spray | foliar spray | foliar spray | |
| Application amounts | 10,000 liters/ha | 300 liters/ha | 300 liters/ha | 300 liters/ha | |

Fertilization: unknown

Organic Vitazyme application: See the rates and timing in the table.

Amalgerol application: See the rates and timing in the table. Amalgerol is a mixture of seaweed extracts, mineral oil, essential oils, and herbal extracts, and is "Qualified Organic" according to EC regulation number 834/2007, for organic use. It is produced by Hechenbichler, Innsbruck, Austria.

Pest control: July 14—Cuproxat FW fungicide at 4 liters/ha, and Judo insecticide at 1.2 liters/ha; August 11—Thiovit Jet fungicide at 5 kg/ha, and Karate Zeon 5 CS at 0.2 liter/ha

Phytotoxicity results: No phytotoxicity was detected for either product.

Crop vigor results:

| | | Assessment date* | | | |
|---|------|------------------|-------------|-------------|--|
| Treatment | Rate | July 28 | September 2 | September 9 | |
| | L/ha | % | % | % | |
| 1. Control | 0 | 92.3 c | 92.7 b | 91.8 c | |
| 2. Amalgerol | 4 | 95.0 ab | 95.0 ab | 95.5 a | |
| 3. Organic Vita | 0.5 | 92.7 bc | 94.0 ab | 94.0 b | |
| 4. Organic Vita | 1 | 94.2 ab | 94.7 ab | 95.0 ab | |
| 5. Organic Vita | 2 | 95.5 a | 96.0 a | 96.0 a | |
| LSD (P=0.10) | | 2.4 | 2.0 | 1.8 | |
| CV | | 2.53 | 2.16 | 1.92 | |
| Treatment F | | 0.1227 | 0.1057 | 0.0063 | |
| *Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. | | | | | |



The two biostimulants in most cases significantly improved crop vigor above the control, especially the Organic Vitazyme at 2 liters/ha. Amalgerol produced the second best crop vigor, which was only slightly better than Organic Vitazyme at 1 liter/ha.

Plant height results: Height was measured for 20 plants/plot on July 28, and averaged

| Treatment | Rate | Plant height* | | |
|---|------|---------------|--|--|
| | L/ha | SPAD units | | |
| 1. Control | 0 | 76.7 a | | |
| 2. Amalgerol | 4 | 78.1 a | | |
| 3. Organic Vita | 0.5 | 77.1 a | | |
| 4. Organic Vita | 1 | 78.0 a | | |
| 5. Organic Vita | 2 | 78.7 a | | |
| LSD (P=0.10) | | 2.6 | | |
| CV | | 3.39 | | |
| Treatment F | | 0.6959 | | |
| *Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. | | | | |

There were no significant differences in plant height among the five treatments, although the tallest plants were produced by Organic Vitazyme at 2 liters/ha.

Crop yield results:

| | Picking Date* | | | | |
|--|---------------|-------------|-------------|--------------|----------------|
| Treatment | Rate | September 2 | September 9 | September 16 | Total |
| | L/ha | kg/plot | kg/plot | kg/plot | kg/plot |
| 1. Control | 0 | 8.81 c | 10.98 c | 13.59 a | 33.38 c |
| 2. Amalgerol | 4 | 9.59 b | 11.56 ab | 14.08 a | 35.22 ab (+6%) |
| 3. Organic Vita | 0.5 | 9.16 bc | 10.97 c | 13.80 a | 33.93 c (+2%) |
| 4. Organic Vita | 1 | 9.33 b | 11.19 bc | 13.86 a | 34.38 bc (+3%) |
| 5. Organic Vita | 2 | 10.14 a | 11.89 a | 14.14 a | 36.17 a (+8%) |
| LSD (P=0.10) | | 0.50 | 0.53 | 0.58 | 1.00 |
| CV | | 5.34 | 4.72 | 4.20 | 2.91 |
| Treatment F | | 0.0026 | 0.0307 | 0.4951 | 0.0010 |
| *Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test. | | | | | |



Organic Vitazyme at 2 liters/ha produced the greatest yield (+8%), which was significantly higher than all other treatments except Amalgerol (+6%). This 2 liter/ha rate yield was significantly greater than Amalgerol at P=0.10).

Fruit per plot results:

| | Counting Date* | | | | |
|--|----------------|-------------|-------------|--------------|-------------|
| Treatment | Rate | September 2 | September 9 | September 16 | Total |
| | L/ha | number/plot | number/plot | number/plot | number/plot |
| 1. Control | 0 | 57.8 c | 71.8 b | 88.7 a | 72.8 |
| 2. Amalgerol | 4 | 64.5 ab | 76.5 ab | 94.2 a | 78.4 (+8%) |
| 3. Organic Vita | 0.5 | 60.5 bc | 73.3 b | 92.5 a | 75.4 (+4%) |
| 4. Organic Vita | 1 | 62.2 b | 75.2 ab | 93.2 a | 76.9 (+6%) |
| 5. Organic Vita | 2 | 66.7 a | 79.2 a | 94.3 a | 80.1 (+10%) |
| LSD (P=0.10) | | 3.2 | 3.3 | 4.1 | |
| CV | | 5.16 | 4.44 | 4.47 | |
| Treatment F | | 0.0017 | 0.0108 | 0.1559 | |
| *Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test. | | | | | |



The Organic Vitazyme treatment at 2 liters/ha in most cases produced significantly more fruit than all but the Amalgerol treatment, but exceeded that treatment by 2% (8 vs. 6%). Organic Vitazyme at 0.5 and 1 liter/ha were consistently greater than the control, but usually not significantly greater.

| | Harvest date* | | | | |
|---|---------------|----------------|----------------|-----------------|--|
| Treatment | Rate | September 2 | September 9 | September 16 | |
| | L/ha | % | % | % | |
| 1. Control | 0 | 8.55 a | 5.53 a | 7.27 a | |
| 2. Amalgerol | 4 | 6.57 b | 3.98 b | 4.33 cd | |
| 3. Organic Vita | 0.5 | 6.59 b | 4.26 b | 5.80 b | |
| 4. Organic Vita | 1 | 6.25 b | 3.86 b | 4.58 c | |
| 5. Organic Vita | 2 | 5.03 c | 3.35 c | 4.08 d | |
| LSD (P=0.10) | | 0.34 | 0.49 | 0.43 | |
| CV | | 5.17 | 11.76 | 8.34 | |
| Treatment F | | 0.0001 | 0.0001 | 0.0001 | |
| *Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. | | | | | |



Unmarketable fruit was the least for Organic Vitazyme at 2% (4.08%), which statistically was less than all but the Amagerol treatment (4.33%). The other two Organic Vitazyme treatments also were significantly less than the control.

Unmarketable fruit results:

Fruit sugar results: The sugar level of 20 fruit from each plot were determined and there were no significant differences in sugar among the treatments at P=0.10 for the three harvest dates, although Organic Vitazyme at 2 liters/ha had the most sugar (4.9%), followed by Amalgerol (4.8%), Organic Vitazyme at 1 liter/ha (4.7%), and Organic Vitazyme at 0.5 liter/ha (4.6%), which equaled the control sugar of 4.6%.

Leaf chlorophyll results: Twenty leaves on September 16 were measured for chlorophyll for each plot using a Minolta SPAD meter, and values were averaged.

| Treatment | Rate | Leaf chlorophyll* | | | |
|---|------|-------------------|--|--|--|
| | L/ha | SPAD units | | | |
| 1. Control | 0 | 42.4 b | | | |
| 2. Amalgerol | 4 | 45.5 a | | | |
| 3. Organic Vita | 0.5 | 44.7 a | | | |
| 4. Organic Vita | 1 | 46.4 a | | | |
| 5. Organic Vita | 2 | 46.6 a | | | |
| LSD (P=0.10) | | 2.1 | | | |
| CV | | 4.62 | | | |
| Treatment F | | 0.0144 | | | |
| *Means followed by the same letter are not significantly different at | | | | | |



P=0.10, according to the Student-Newman-Keuls Test.

Organic Vitazyme, 0.5 liter/ha......

| Increase in leaf chlorophyll above control, SF | AD units |
|--|----------|
| Organic Vitazyme, 2 liters/ha | 4.2 |
| Organic Vitazyme, 1 liter/ha | 4.0 |
| Amalgerol, 4 liters/ha | 3.1 |

Chlorophyll levels responded significantly to all treatments, especially the 1 and 2 liter/ ha Organic Vitazyme rates (4.0 and 4.2 SPAD units). Amalgerol increased the chorophyll level by 3.1 SPAD units.

Root Mass Results: The weights of the cleaned roots of 20 plants for each plot were averaged, on September 16. The growth stimulants in Organic Vitazyme at 2 liters/ha brought a significant 5% root mass increase versus the control, and exceeded all other treatments except the Organic Vitazyme at 1 liter/ha.

| Treatment | Rate | Root weight* | | |
|---|------|----------------|--|--|
| | L/ha | grams | | |
| 1. Control | 0 | 173.7 с | | |
| 2. Amalgerol | 4 | 177.1 bc (+2%) | | |
| 3. Organic Vita | 0.5 | 173.8 c (+0%) | | |
| 4. Organic Vita | 1 | 179.7 ab (+3%) | | |
| 5. Organic Vita | 2 | 181.8 a (+5%) | | |
| LSD (P=0.10) | | 3.4 | | |
| CV | | 1.92 | | |
| Treatment F | | 0.0014 | | |
| *Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. | | | | |



Conclusions: A small-plot tomato trial in Hungary, which compared three rates of Organic Vitazyme (0,5, 1, and 2 liters/ha) and Amalgerol (4 liters/ha) to an untreated control revealed that the 2 liter/ha rate of Organic Vitazyme was the best treatment for all parameters measured. No product produced phytotoxic effects. Crop vigor, plant height, yield, fruit per plot, unmarketable fruit, fruit sugar, leaf chlorophyll, and root mass were all the most positive for this Organic Vitazyme treatment, in all cases significantly better than the control except for plant height and fruit sugar. Amalgerol and Organic Vitazyme at 1 liter/ha were usually ranked second and third for improvements of these parameters. The all- important crop yield was improved by 8% with Organic Vitazyme at 2 liters/ha, followed closely by Amalgerol at 6%; the 0.5 and 1 liter/ha rates of Organic Vitazyme at 2 liters/ha, followed closely by Amalgerol at 6%; the 0.5 and 1 liter/ha rates of Organic Vitazyme at 2 liters/ha, followed closely by Amalgerol at 6%; the 0.5 and 1 liter/ha rates of Organic Vitazyme at 2 liters/ha, followed closely above the control. Rejected fruit was significantly less for Organic Vitazyme at 2 liters/ha, followed closely by Amalgerol at 6%; the 0.5 and 1 liter/ha (4.58%).

Tomatoes with Vitazyme application—A Study With Opus Max Proprietary Carrier

Researchers: Bruce Kirksey, Ph.D. **Research organization:** Agricenter International, Memphis, Tennessee **Location:** Memphis, Tennessee **Variety:** Better Girl

Planting date: June 14, 2021 **Planting depth:** 2 inches **Row spacing:** 7 feet **Tillage:** conventional **Soil type:** Falaya silt loam, 1.8% organic matter, pH 6.5, cation exchange capacity 7.8 meq/100 grams of soil, excellent fertility **Experimental design:** A small plot, replicated design (four replications) was established using plots that were 5 x 30 feet (150 ft² per plot)—one row per plot—to determine the tomato yield using Vitazyme and Opus Max, alone and in combination.

| Treatment | Vitazyme ¹ | | Opus Max | |
|---------------------------------------|------------------------------|------------|-----------------|------------|
| ireatilient | With transplant | Six leaves | With transplant | Six leaves |
| | oz/acre | oz/acre | ml/ha | ml/ha |
| 1. Control | 0 | 0 | 0 | 0 |
| 2. Vitazyme | 13 | 13 | 0 | 0 |
| 3. Opus Max | 0 | 0 | 50 | 50 |
| 4. Vitazyme + Opus Max | 13 | 13 | 50 | 50 |
| ¹ 13 oz/acre = 1 liter/ha. | | | | |

Fertilization: equal for all plots

Vitazyme application: 13 oz/acre (1 liter/ha) in the root zone at transplanting on June 14, and 13 oz/acre (1 liter/ha) sprayed on the leaves at the six-leaf stage on July 15, at 31 days

Opus Max application: 50 ml/ha in the root zone at transplanting on June 14, and 50 ml/ha sprayed on the leaves at the sixleaf stage on July 15, at 31 days. Opus Max contains naturally occurring minerals anchored to a charged particle. This particle forms supramolecular structures with active ingredients to localize their action and increase efficacy.

Growing season weather: favorable Harvest date: September 16, 2021





| LSD (P=0.05) | LSD (P=0.05) |
|--------------|--------------|
|--------------|--------------|

Conclusions: A small-plot tomato trial in western Tennessee, using Vitazyme and Opus Max alone and in combination, showed significant differences in fruit number, the two treatments containing Vitazyme producing significantly more fruit than the control and Opus Max alone. However, fruit yield did not vary significantly among the four treatments due to a high level of experimental error, although both Vitazyme, Opus Max, and the two combined produced about 20% more yield than the control. Further research needs to be done to better evaluate the synergism of these two products under more highly controlled conditions.



Researcher: V.V Plotnikov.

Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York **Location:** PE "AF Dzvony", Lviv District, Lviv Region, Bolotnya Village Ukraine: western Ukraine (550-750 mm of rain per year) **Variety:** Reform, F1 **Planting date:** September 25, 2020 **Planting rate:** 3.5 million seeds/ha

Previous crop: winter canola **Tillage:** disking to 10-12 cm, deep cultivation to 28 cm, pre-plant cultivation to 3-4 cm **Soil type:** dark-gray podzolic (2.2% organic matter)

Experimental design: A winter wheat field was divided into a Vitazyme Bio treated portion, with an untreated portion left as a control, to evaluate the effect of this product on grain yield and quality

🚺 Control 😢 Vitazyme Bio in the spring

Fertilization: 16-27-7 % of N-P₂0₅-K₂0 in-furrow at planting; 200 kg/ha N broadcast in the spring

Vitazyme Bio application: 0.6 liter/ha in the spring at crop stage BBCH 31.

Vitazyme Bio is the same as Organic Vitazyme in other market areas.

Yield results:

| Treatment | Yield | Yield change |
|-----------------|---------|--------------|
| | tons/ha | tons/ha |
| 1. Control | 7.5 | — |
| 2. Vitazyme Bio | 8.0 | 0.5 (+7%) |

| Increase in grain yield | |
|-------------------------|--|
| with Vitazyme: 7% | |

The spring 0.7 liter/ha spring application increased grain yield by 0.5 ton/ha (7%).



Grain quality results:



with Vitazyme Bio: 2.1%-points

with Vitazyme Bio: 1.2 %-points

Income results: The added 0.5 ton/ha yield produced a net income increase of \$167/ha.

Conclusions: This field-scale Ukrainian winter wheat trial showed that Vitazyme Bio, sprayed on the leaves in the spring, produced a yield increase of 0.5 ton/ha (7%), while increasing both grain gluten and grain crude protein by 2.1 and 1.2 %-points, respectively. These positive impacts on winter wheat show that applying Vitazyme Bio is a very profitable practice in western Ukraine, increasing net income by \$167/ha.

Wheat (Winter) with Vitazyme application

Researcher: V.V Plotnikov.

Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York **Location:** PE "AF Dzvony", Lviv District, Lviv Region, Bolotnya Village, Ukraine: western Ukraine (550-750 mm of rain per year) **Variety:** Producent, F1 **Planting date:** October 25, 2020 **Planting rate:** 4 million seeds/ha

Previous crop: soybeans **Tillage:** disking to 10-12 cm, deep cultivation to 26-28 cm, pre-planting cultivation to 3-4 cm **Soil type:** dark-gray podzolic (2.2% organic matter)

Experimental design: A winter wheat field was divided into a Vitazyme treated portion, with an untreated portion left as a control, to evaluate the effect of this product as a seed treatment on grain yield and quality.

Control 2 Vitazyme on the seeds

Fertilization: 16-27-7 kg/ha of $N-P_2O_5-K_2O$ with the seeds at planting; 200 kg/ha of N in the spring **Vitazyme application**: 0.7 liter/ha as a seed treatment at planting **Yield results:**

| Treatment | Yield | Yield change |
|-------------|---------|--------------|
| | tons/ha | tons/ha |
| 1. Control | 9.36 | |
| 2. Vitazyme | 9.95 | 0.59 (+6%) |

Increase in grain yield with Vitazyme: 6%

The 0.7 liter/ha seed treatment increased grain yield by 0.59 ton/ha.



Grain quality results:



Income results: The 0.59 ton/ha yield increase resulted in \$210/ha more net income.

Conclusions: A winter wheat split-field trial in western Ukraine, using a 0.7 liter/ha seed treatment, resulted in a 0.59 ton/ha (6%) yield increase, along with improvements in grain gluten (2.1 %-points) and grain crude protein (1.0 %-points (1.0 %-points). In addition, net income was increased by \$210/ha by this yield and quality increase, proving the effectiveness of Vitazyme as a positive crop supplement in Ukraine.

Wheat (Winter) with Vitazyme application



The improvement in plant biomass and head number and size with Vitazyme is apparent in this photo.



Vitazyme Field Tests for 2021

V.V. Plotnikov explains the virtues of the Vitazyme program to the farmer at the Grain Company Hors Farm in central Ukraine. Note the excellent wheat crop.

Researcher: V.V Plotnikov.

Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York **Location:** LLC "Grain Company Hors", Zolotonosha District, Cherkasy Region, Pogreby Village Ukraine; central Ukraine (440-590 mm of rain per year)

Variety: Mattus, F1 **Planting date:** October 15, 2020 **Planting rate:** 5.5 million seeds/ha **Previous crop:** sunflowers **Tillage:** disking in two tracks to 12-14 cm, pre-sowing cultivation to 3-4 cm **Soil type:** chernozen (4.0% organic matter)

Experimental design: A winter wheat field was divided into a Vitazyme treated portion, with an untreated portion left as a control, to evaluate the effect of this product on grain yield, especially as related to cold air temperatures early in the spring season.

1 Control 😢 Vitazyme in the spring

Fertilization: at fall planting on October 15, 2020, 9-9-9 kg/ha N-P₂0₅-K₂0 in the row with the seeds; 115 kg/ha of nitrogen in the spring *Vitazyme application:* 1 liter/ha sprayed on the leaves and soil on April 4, 2021, at BBCH 21 (early tillering), during a period of very cold air and soil temperatures.

Yield results:

| Treatment | Yield | Yield change |
|-------------|---------|--------------|
| | tons/ha | tons/ha |
| 1. Control | 5.3 | |
| 2. Vitazyme | 6.3 | 1.0 (+19%) |



As a stress reliever of cold temperatures, Vitazyme applied during this cold period in April increased the yield by 19% above the control treatment.



Income results: By improving grain yield by 1.0 ton/ha, a 1 liter/ha Vitazyme application increased income by \$336/ha. *Conclusions:* A Ukrainian winter wheat split-field study, which compared a 1 liter/ha Vitazyme treatment with an untreated control, revealed that this spring application at early tillering (BBCH 21) increased grain yield by 1.0 ton/ha (19%). Such a response is especially significant because it shows how the stress-relieving effects of the brassinosteroids have a marked effect in recovering crop growth and development during cold periods. Thus, Vitazyme is shown to be well suited to central Ukraine, where cold weather in April can hinder wheat development. The extra 1.0 ton/ha with Vitazyme netted \$336/ha more income. Wheat (Winter) with Vitazyme and Vitazyme Cold Start application

Researcher: V.V Plotnikov.

Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York **Location:** LLC "VKAF Maiaky", Odessa District, Odessa Region, Maiaky Village, Ukraine; southern Ukraine (270-350 mm of rain per year) **Variety:** Lira Odessa, F3 **Planting date:** September 9, 2020 **Planting rate:** 3.5 million seeds/ha

Previous crop: chickpeas **Tillage:** disking to 6-8 cm, disking to 10-12 cm, tillage to 3.5 cm with a Petinger aggregate **Soil type:** Chernozen (4.1% organic matter)

Experimental design: A winter wheat field was divided into a treated portion, with an untreated portion left as a control, to evaluate the effect of both Vitazyme and Vitazyme Cold Start, applied as a seed treatment, on wheat yield and grain quality.
 Fertilization: 21-24 kg/ha of N-S at pre-plant disking; 10-20-10 kg/ha of N-P₂0₅-K₂0 during planting; 80 kg/ha of N on March 24, 2021, at BBCH 22 stage (KAS urea- ammonia solution or liquid N)

Control 2 Vitazyme + Vitazyme Cold Start on the seeds

Vitazyme application: A seed treatment of 0.5 liter/ha Vitazyme + 0.3 liter/ha Vitazyme Cold Start *Yield results:*

| Treatment | Yield | Yield change |
|-------------|---------|--------------|
| | tons/ha | tons/ha |
| 1. Control | 2.75 | |
| 2. Vitazyme | 3.30 | 0.55 (+20%) |





Grain quality results:



Income results: The 0.55 ton/acre grain yield increase, and superior protein content from Vitazyme + Vitazyme Cold Start, gave an increased income of \$191/ha.

Conclusions: A split-field winter wheat trial in southern Ukraine, using Vitazyme at 0.5 liter/ha + Vitazyme Cold Start at 0.3 liter/ha on the seeds at planting, provided substantial improvements in yield (+20%), grain gluten (+2.2%-points), and grain crude protein (+1.1 %-points). Net income was also improved by \$191/ha compared to the untreated control. As shown in studies conducted during previous years in southern Ukraine, these products are highly effective in improving winter wheat yield and quality.

Researcher: V.V. Plotnikov

Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York **Location:** LLC "Step-2000", Uman District, Cherkasy Region, Stepkivka Village, Ukraine; central Ukraine (440-590 mm of rain per year) **Variety:** Bodycek, F1 **Planting date:** October 10, 2020 **Planting rate:** 4.2 million seeds/ha **Previous crop:** sunflowers

Tillage: vertical tillage with an aggregate SalFord RTS, to 15 cm, pre-sowing cultivation to 3-4 cm

Soil type: Chernozem (3.5% organic matter)

Experimental design: A winter wheat field was divided into a Vitazyme treated portion, with a competitor product Leanum as a control, to compare the effectiveness of the two products as seed treatment to increase grain yield.

Fertilization: at fall planting on October 10, 2020, 20-25-15-9 kg/ha N-N-P₂0₅-K₂0-S in the row with the seeds; 119 kg/ha of nitrogen and 24 kg/ha of S in the spring

🚺 Leanum seed treatment 😢 Vitazyme seed treatment

Vitazyme application: 1 liter/ha on the seeds before planting

Leanum application: applied at the recommended rate on the seeds before planting

Yield results:

| Treatment | Yield | Yield change |
|-------------|---------|--------------|
| | tons/ha | tons/ha |
| 1. Leanum | 7.50 | — |
| 2. Vitazyme | 7.74 | 0.24 (+3%) |



Increase in grain yield with Vitazyme: 3%

The Vitazyme seed treatment caused a 3% greater yield increase than did the Leanum product.

Income results: The extra 0.24 ton/ha grain yield with Vitazyme produced \$82/ha more income than did the Leanum seed treatment.

Conclusions: A split-field trial with winter wheat in Ukraine compared the effectiveness of Vitazyme, at 1 liter/ha on seeds, with a competitor product (Leanum), also applied to the seeds. Vitazyme increased the yield by 0.24 ton/ha (3%) more than did Leanum, showing that Vitazyme is the superior product for winter wheat yield enhancement. That 3% yield difference netted the farmer \$82/ha more income.

A Brassinosteroid-based Biostimulant Integrated with an Innovative Crop System Improves Maize Productivity

By Robert J. Kremer, Timothy M. Reinbott, Paul W. Syltie, Manjula V. Nathan, and C. LeRoy Deichman

A paper has been presented at the Biostimulants World Congress 2021 that summarized the results of field work done at the University of Missouri, headed by Dr. Robert Kremer. A novel solar corridor cropping system with corn, where every two rows in a 30-inch row spacing are planted to a cover crop such as cowpeas, showed that yields were not suppressed compared to a monoculture in which all rows were planted. Two hybrid corn varieties were used, one of which was more responsive to the solar corridor. Vitazyme applied within this system produced excellent increases in rootmass, nutrient uptake, photosynthesis, soil microbe species and numbers, and yield. Note a summary of these effects below.





Unique aspects of Vitazyme in the Solar Corridor Cropping System:





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