



VITAZYME[®]

2007 Field Trial Results

**A SUMMARY OF EXPERIMENTS USING
VITAZYME SOIL AND PLANT BIOSIMULANT
ON FIELD, ORCHARD, AND GREENHOUSE CROPS**

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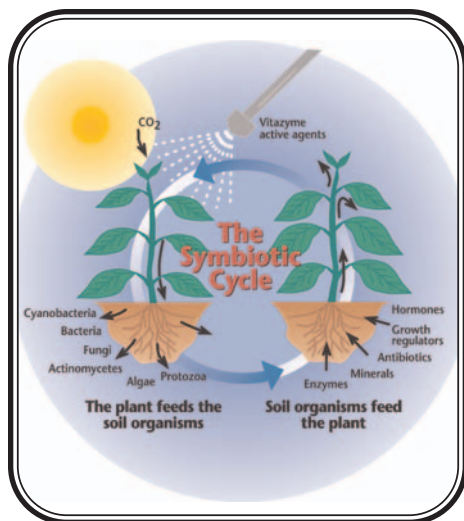
2007 Vitazyme Field Trial Results

For the twelfth consecutive year a summary of Vitazyme field trials is presented to convey the great value of this crop biostimulant to enhance crop production. Over a wide variety of crops, soils, and climatic conditions, various production programs involving Vitazyme have performed extremely well across the United States and in many foreign countries. The consistency of crop responses has been noteworthy.

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

All 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 up to 25% or more of its energy, fixed in the leaves as carbohydrates, amino acids, and other compounds, into the root zone to feed these 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

Vitazyme should be used within the context of a complete crop management system, never by itself. Vitazyme will optimize your existing program by enabling the plant to grow better, thus increasing productivity. Follow this easy-to-use five-point program.

- 1 If possible, analyze the soil at a reputable laboratory and correct mineral deficiencies and imbalances with expert consultation.
- 2 Reduce nitrogen fertilizer applications for non-legumes using this test:

Soil Organic Matter			Previous Crop		Compaction		Soil NO ₃ -N Test		
Low(<1.5%)	Medium(1.5-3%)	High(>3%)	Non-legume	Legume	Much	Little	Low	Medium	High
1	2	3	1	3	1	3	2	4	6
Total additive score:			15	14	13	12	11	10	9
Apply this % of optimum N:			50-60%		60-70%		70-80%		

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 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.

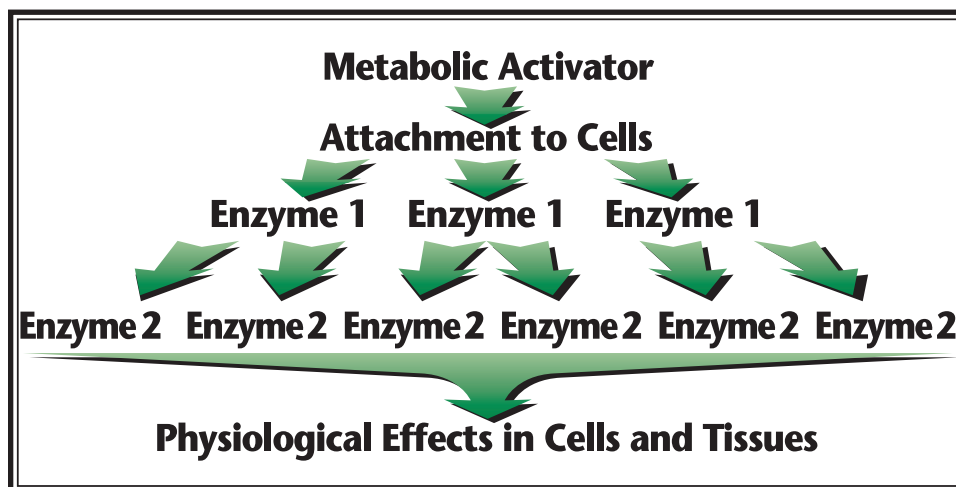
In short, Vitazyme enables the plant to better express its genetic potential by reducing the stresses that repress that expression.

Reduce the application each time the fertilizer normally is applied. Legumes normally need no added nitrogen. Vitazyme will accelerate legume nitrogen fixation.

- 3 Treat the seeds or transplant roots, if possible at planting. Treat seeds with a dilute Vitazyme solution, such as 1 liter of a 5% solution for every 50 kg of seed. Mix the seeds thoroughly in a seed or cement mixer or on a tarp. **For excellent results apply the solution directly on the seed row with a planting attachment. Dip or spray transplant roots with a 1% or 2% solution.**

- 4 Apply Vitazyme to the soil and/or foliage. Follow instructions for each crop. In most cases from 10 to 20 oz/acre can be applied per application at one to three times during the cropping cycle. A fall application on stubble is effective to accelerate residue breakdown.

- 5 Integrate other sound, sustainable management practices into a total program. Use crop rotations, minimum tillage, soil conservation practices, and adapted plant varieties.



Vitazyme Highlights for 2007

The year 2007 produced a wide variety of growing conditions across the United States and Canada. Most noteworthy was a major drought which encompassed much of the northern Corn Belt during the summer months, but in many areas rain arrived in a nick of time to salvage the crop. Here are a few highlights for the year.

Some Highlights for 2007

1 A repeat of the Texas A&M cotton study produced excellent responses, even better than in 2006. Ample rainfall may have contributed to part of this response, but a third application of Vitazyme 28 days after the bloom application likely was a contributing factor. Fiber length and strength were enhanced by Vitazyme, as were plant height (+6%), nodes per plant (+6%), nodes above white flower (+5%), and lint yield (+6%). Nitrogen efficiency was

markedly improved: at 60lb/acre of N, Vitazyme outyielded the 120 lb/acre N rate without Vitazyme by 9% (89.3 lb/acre).

2 Sugar cane responses to Vitazyme in Cuba in large scale field trials have again shown the excellent utility of the program. Of the three products tested nationwide, Vitazyme did the best, averaging a 34.1% increase in sugar yield, mostly with ratoon cane.

3 Trials on former sugar cane land in Cuba continued to show remarkable improvements with vegetables. Carrots showed an 11% increase, tomatoes a 68% increase, cabbage a 220% increase, and dry beans up to a 61% yield increase.

4 Apple and pear trials in New York continued to prove the program's utility for improving the size and quality of fruit. A nursery trial produced young trees that were 14% taller with an 8% increase in trunk diameter after on summer's growth. Other trials gave up to a 29% increase in

yield, with higher brix and fruit pressure.

5 Studies in Ukraine for 2007 were extremely positive. Potatoes, grapes, sugar beets, sunflowers, onions, tomatoes, cabbage, and other crops responded with highly profitable yield increases ... up to 25% in sugar beets. Plans continue to move the program into Russia, Moldova, and surrounding countries in 2008.

6 Both raisin and wine grapes performed very well in 2007, as in previous years. For the fourth consecutive year, wine grapes at San Miguel showed a most excellent yield increase of 27%. The plants had stronger canes and greater leaf chlorophyll, the leaves being retained longer to help store vine energy late in the season. The average grape yield increase for four years is 29%, with improvement in wine quality.

7 Corn and soybean yields in tests conducted in southwestern Ontario, for registration purposes, were 16% and up to 34%, respectively, despite a serious drought.

Vitazyme Field Tests for 2007

Apples

Researchers: Agr. Assistance

Tree density: 500 trees/acre

Experimental design: Vitazyme was tested on a commercially producing orchard to determine the effect of the product on apple quality and yield. Seven random trees were evaluated for the Vitazyme treated and the untreated parts of the orchard; all other treatments were the same throughout the orchard. The trees selected had similar vigor and crop load.

Location: Wayne County, New York

Tree age: 6 years

Variety: Honeycrisp

Rootstock: M9

1. Control

2. Vitazyme

Fertilization: unknown

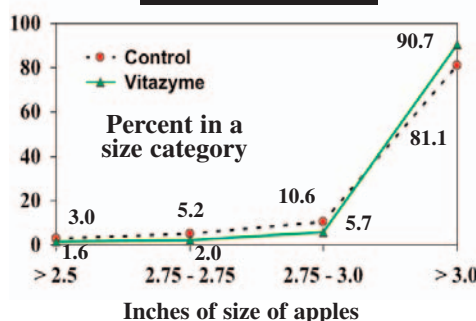
Vitazyme application: 16 oz/acre at pink, bloom, petal fall, and on August 13 using an airblast sprayer giving 67 gallons/acre at 4 mph

Weather for 2007: warm and near-record dry, with 8 to 10 inches of rainfall during the April to September growing season

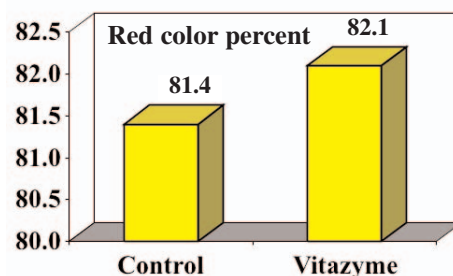
Yield results: On September 18, seven trees having similar full crop loads and good vigor were harvested from each treatment.

Fruit quality:

Fruit Grade

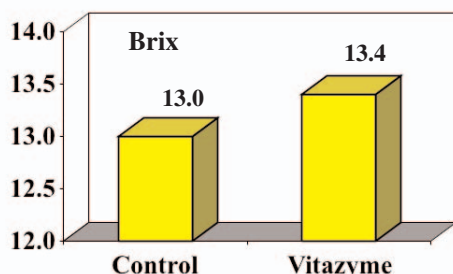


Red Color*



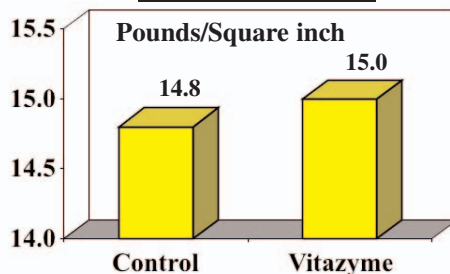
*Fruit rating visually estimated from 100 apples/tree.

Brix*



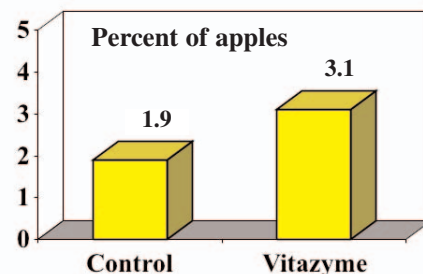
*Using 10 apples per tree.

Fruit Pressure*



*Using 10 apples per tree.

Bitter Pit



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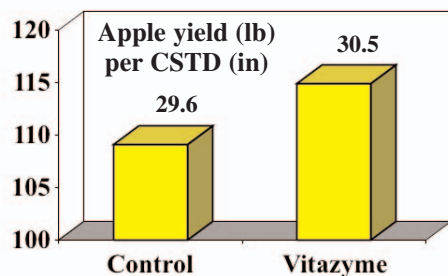
Most apple quality parameters were improved with Vitazyme, especially fruit weight and brix. Fruit finish was nearly identical for the two treatments, and a higher percentage of "bitter bit" was related to the larger size of fruit with Vitazyme applications.

Fruit yield:

Quality improvements with Vitazyme

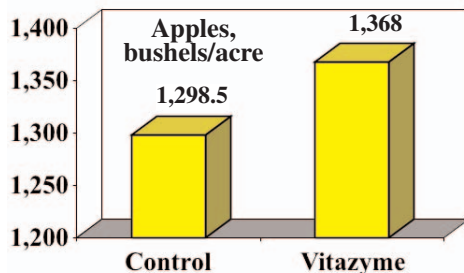
- Increased > 3.0 inch size: 9.6%
- Better red color: 0.7%
- Higher brix: 0.4
- Stronger pressure 0.2 psi

Yield Per CSTD*

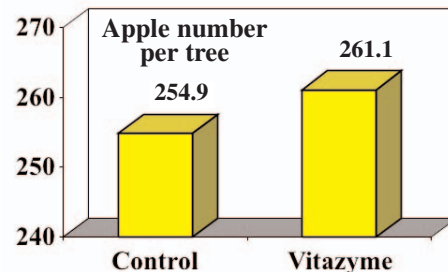


*Cross-sectional tree diameter

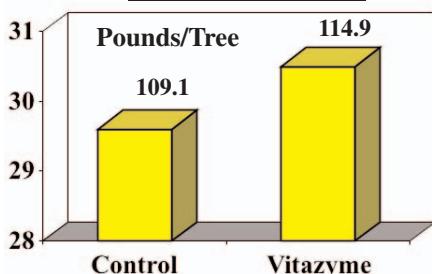
Estimated Yield



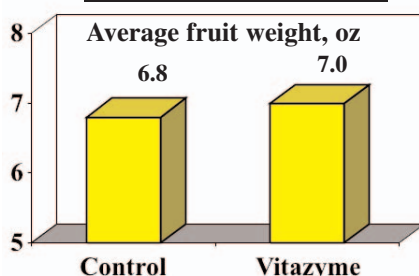
Apples Per Tree



Tree Yield



Mean Fruit Weight



Yield improvements with Vitazyme

- Increased apple weight/tree: 5.8 lb
- Higher yield/CSTD: 0.9 lb/in
- More apples per tree: 6.2
- Increased fruit weight: 0.2 oz
- Higher total apple yield: 69.7 lb/acre

More apples per tree, having a larger average size, led to a small increase in per acre yield of apples.

Conclusions: This honeycrisp apple trial was summarized by the researcher as follows:

"No differences in fruit finish or any signs of leaf or fruit phytotoxicity were observed in this evaluation. There was a trend toward larger fruit size in the Vitazyme treatment (7.0 oz/fruit) compared to the untreated standard (6.8 oz/fruit) — and a corresponding increase in the percentage of harvested fruit over 3.0 diameter (90.7% vs 81.1%). The Vitazyme program also increased soluble solid levels by 0.4 brix. Bitterpit (stipping) was a problem in the trial site this very dry season despite regular foliar calcium applications. The Vitazyme treated fruit showed slightly more bitterpit incidence (3.1%) vs. the untreated Honeycrisp trees (1.9%) — likely a direct result of increased fruit size. The largest commercial challenge to growing Honeycrisp is maintaining good return cropping levels — so return bloom counts will be made at this trial site in spring 2008."

Apples

Researchers: Agr. Assistance

Rootstock: M9

Experimental design: A nursery field was divided into Vitazyme treated and untreated areas to determine the product's effect on tree growth and development. Data were collected on groups of 10 continuous trees within seven sets of trees.

Location: Wayne County, New York

Maturity: nursery stock

Variety: Macoun

Soil type: unknown

1. Control

2. Vitazyme

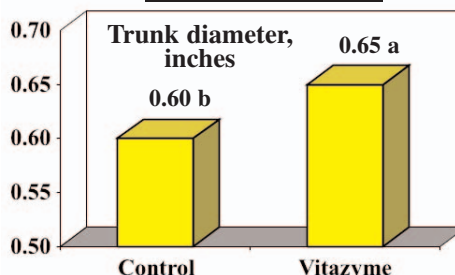
Fertilization: All areas received 200 lb/acre of $\text{Ca}(\text{NO}_3)_2$ (30 lb/acre of N).

Vitazyme application: 16 oz/acre five times as cover sprays during the growing season; 50 gallons of solution per acre at 4 mph.



These Vitazyme-treated nursery-grown apple trees show remarkable vigor, indicative of their large leaf area and high chlorophyll content.

CSTD*



*Cross sectional tree diameter
Means followed by the same letter are not significantly different at $P=0.05$ according to the Student-Newman-Keuls Test.

Weather for 2007: adequate winter and spring moisture, but a very dry and warm summer

Growth results: Two parameters were measured: (1) cross-sectional tree diameter (CSTD), a measurement of trunk diameter at the tree base to the nearest 0.1 inch, and (2) tree height, the measured height of the tree at the end of the growing season.

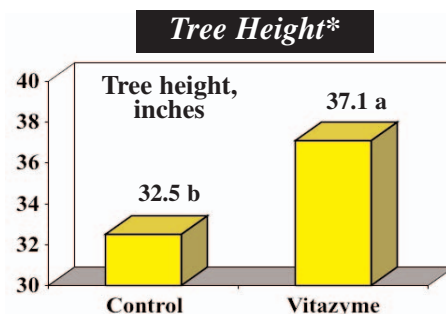
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Conclusions: In this New York nursery trial, five Vitazyme applications during the growing season substantially increased both the cross sectional tree diameter (+8%) and tree height (+14%) of these Macoun apples. These increases were both statistically greater than the controls at P= 0.05, showing the utility of this product in enhancing the growth and development of nursery apple trees.

• **Increase in CSTD: with Vitazyme: 8%**

• **Increase in tree height with Vitazyme: 14%**

*Means followed by the same letter are not significantly different at P=0.05 according to the Student-Newman-Keuls Test.



Apples Year Two

Researcher: Jim Misiti

Location: Albion, New York

Soil type: unknown

Experimental design: A 5-acre orchard was divided, and one part was treated with Vitazyme while the other part was left untreated. The purpose of the study was to evaluate the product's effects on apple yield and quality.

Grower: Oded Kalir

Variety: Ida Red

Tree age: mature grove



Vitazyme treated Ida Red apples at the Kalir orchard display the typical large size, excellent color, and heavy set noted with the product.

1. Control

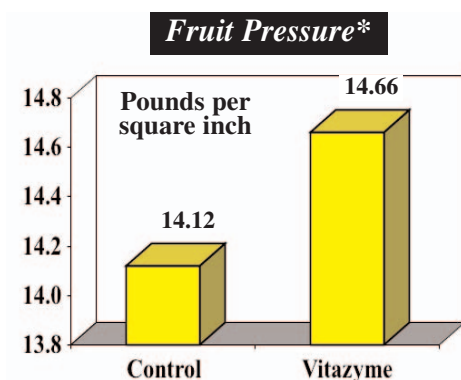
2. Vitazyme

Fertilization: unknown

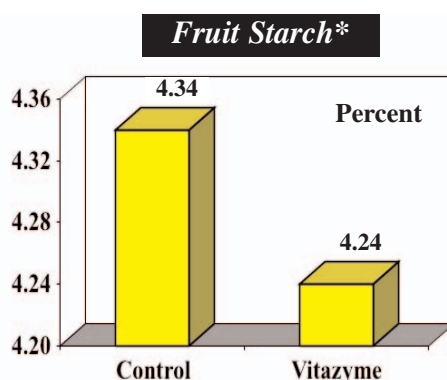
Vitazyme application: four foliar applications, each at 26 oz/acre; (1) pink bloom on May 6, (2) petal fall on May 23, (3) first cover on June 6, and (4) August 8.

Harvest date: October 18, 2007

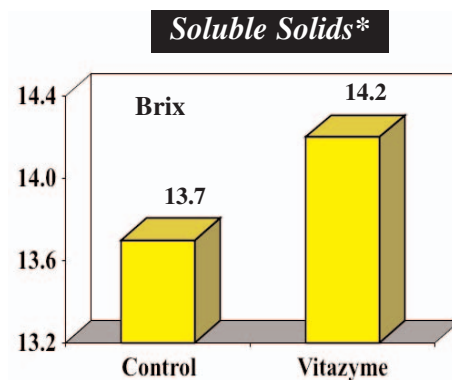
Quality results: Each value is the average of analyses performed on 50 fruit selected for each treatment on October 18. These fruit were selected from random trees within the treatments.



*Average of 50 fruit.



*Average of 50 fruit.



*Average of 50 fruit.

Vitazyme increased the strength of apple tissue cell walls to increase fruit pressure, while reducing the starch content slightly. The sugars (soluble solids) in the tissues were increased significantly with Vitazyme treatment, by a full 0.5 percentage point.

Yield results: Vitazyme did not increase apple yield in this study, so the results are not presented here.

Conclusions: This Ida Red apple study in western New York proved that Vitazyme's active agents, for the second year in a row, improved fruit pressure, and therefore crispness and storability. Likewise, as for 2006 the starch content of the fruit was slightly less with product application. However, whereas in 2006 there was no change in fruit brix, this study revealed a significant increase in fruit sugars of 0.5 percentage point.

Unlike last year, when the yield with Vitazyme was increased by 16%, the yield was not increased in 2007. It is believed that the very wet fall and winter of 2006-2007 contributed to a reduced response of the treated area in 2007, since the Vitazyme area has a wetter soil condition.

• **Increase in fruit pressure: 0.54 percentage point**

• **Decrease in fruit starch: 0.10 percentage point**

• **Increase in soluble solids: 0.5 percentage point**

Apples

Farmer: Douglas Fox
Variety: Rome (processing)



Apples trees on the right were treated with Vitazyme at the Fox orchard, and had darker green leaves, more fruit, and larger fruit.

Yield results:

Treatment	Bins*	Yield	Yield**	Change
	number	bushels	bu/acre	bu/acre
Control	7	140	1,400	—
Vitazyme	9	180	1,800	400 (+29%)

*Each bin held 20 bushels.

**At 0.1 acre per 11 rows, then per acre yield was 10 times the 11-row yield.

increase translated into \$1,344/acre additional income from a very nominal cost input. With results such as this, there is every reason for apple growers throughout New York to reap the benefits of this increased production.

• **Increase in apple yield: 29%**

Researcher: Peck Babcock
Row spacing: 20 feet
Tree age: over 50 years
Trees per acre: 109

Experimental design: A small apple orchard was divided into rows treated with Vitazyme and some left untreated. The objective was to discover the effect of the product on fruit yield and profitability. Eleven rows was 0.1 acre.

1. Control

Fertilization: Sul-Po-Mag (0-22-0% N-P₂O₅-K₂O, 11% Mg, 23% S) at 250 lb/acre on April 22; Ca(NO₃)₂ (15-0-0% N-P₂O₅-K₂O, 19% Ca) at 250 lb/acre on July 10; 20-20-20% N-P₂O₅-K₂O as a foliar spray five times.

Vitazyme application: (1) 14 oz/acre at pink (May 9); (2) 14 oz/acre at petal fall (May 29)

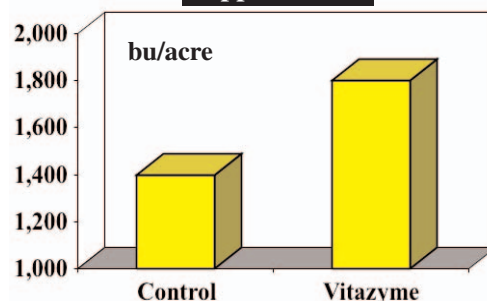
Foliar analysis: Leaves were sampled on August 24 and analyzed for elements, but differences were not uniform or great so are not presented here.

Income results: At \$3.36 per bushel, the income results for this trial are shown below.

Conclusions: This New York processing Rome apple trial revealed that Vitazyme produced a reasonable 29% increase in yield. This yield

Location: Sodus, New York
In-row spacing: 20 feet
Trees per row: 11
Soil type: unknown

Apple Yield



Apple Income

Treatment	Yield	Income	Change
	bu/acre	\$/acre	\$/acre
Control	1,400	4,704	—
Vitazyme	1,800	6,048	1,344

• **Increase in income: \$1,344/acre**

Apples (2006)

Researcher: Agr. assistance
Rootstock: M9

Experimental design: A Crispin orchard was divided into a treated and untreated area to evaluate the effect of Vitazyme on blisterspot incidence during a very wet year, fruit finishing rating, and fruit weight. Five replicate samplings were selected for each treatment.

1. Control

2. Vitazyme

Fertilization: unknown

Vitazyme application: 16 oz/acre at pre-bloom, petal fall, first cover, and several weeks before harvest

Sampling date: unknown

Results: One-hundred apples were randomly picked from each treatment two weeks before harvest, and evaluated for cleanliness (not infested with blisterspot), finish (glossiness), and weight. There were no significant differences in the incidence of blisterspot or fruit finish, but there were in average weight.

Conclusions: In this western New York Crispin apple study, while no effect of Vitazyme was found on blisterspot or fruit finish, there was a highly significant increase in fruit weight of 4%. This increase is consistent with several other studies conducted with various apple varieties during the last few years.

• **Increase in apple weight: 4%**

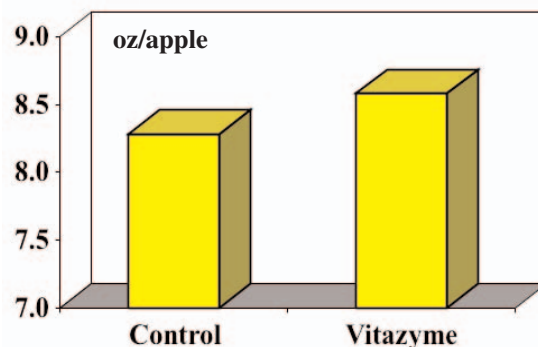
Location: Wayne County, New York
Application: airblast sprayer

Variety: Crispin
Application rate: 50 gallons/acre

Average Apple Weight

Treatment	Apple weight*	Weight increase
	oz/apple	oz/apple
Control	8.28 b	—
Vitazyme	8.58 a	0.30 (+4%)

*Average of 100 fruit per replicate.



Barley

Researcher: Patrick O'Neil

Organization: Agro-Engineering, Alamosa, Colorado

Variety: malting barley

Planting rate: 90 lb/acre

Planting date: April 10, 2007

Experimental design: A center-pivot field of barley was divided into a 60 acre untreated and a 30 acre Vitazyme treated area to determine if the product would improve barley yield and quality.

Location: Mosca, Colorado

Soil type: sandy loam

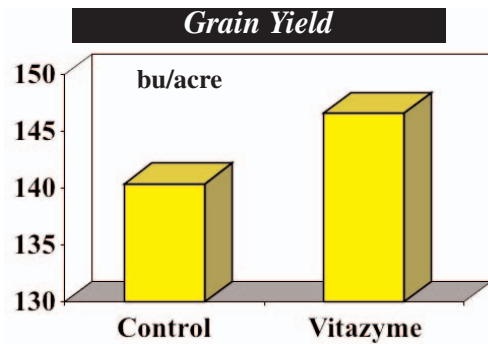
Irrigation: center-pivot



Note the greater plant mass, larger root systems, longer heads, and overall greater yield potential of the Vitazyme treated malting barley grown in the San Luis Valley of Colorado.

1. Control

2. Vitazyme



Treatment	Yield	Change
	tons/acre	tons/acre
Control	140.4	—
Vitazyme	146.6	6.2 (+4%)

Fertilization: 200 lb/acre of nitrogen was achieved for total residual soil nitrogen plus pre-plant applications, and applications in irrigation water following planting

Vitazyme application: (1) 13 oz/acre at the first true irrigation, soon after emergence, and (2) 13 oz/acre during late tillering

Weather: some hail damage late in the season

Harvest date: swathed in late July, and combined in early August

Harvest results: A one-acre strip was combined and weighed in a truck for both the treated and untreated areas.

Conclusions: This malting barley trial in southern Colorado proved that Vitazyme, at two applications through irrigation water, improved the yield by 4%. The level of protein for the two treatments was not available at the time this report was written.

• Increase in grain yield: 4%

Bush Beans

Researcher/Farmer: Kludt Brothers, Inc.

Soil type: sandy loam

Planting depth: 1.5 inches

Experimental design: A uniform 32-acre field was divided into a 10-acre untreated area and a 22-acre Vitazyme treated area. The objective of the test was to determine if Vitazyme would increase bean yield.

Location: Kendall, New York

Planting rate: 120,000/acre

Planting date: May 24, 2007

Variety: Venture

Row spacing: 30 inches

Irrigation: none

1. Control

2. Vitazyme

Fertilization: 200 lb/acre of 0-0-60% N-P₂O₅-K₂O spread dry before planting; 28 gal/acre of 10-34-0% N-P₂O₅-K₂O applied at planting beside and below the seeds

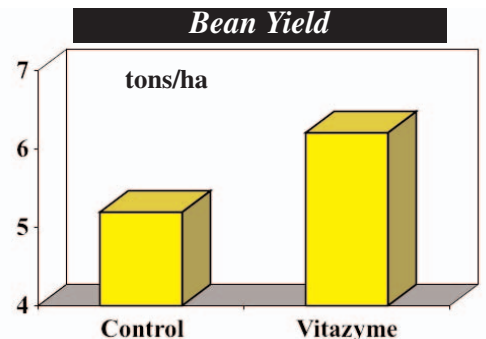
Vitazyme application: 13 oz/acre with the starter fertilizer at planting

Harvest date: July 23

Yield results:

Treatment	Yield	Change
	tons/acre	tons/acre
Control	5.20	—
Vitazyme	6.21	1.01 (+19%)

Income results: At \$200 per ton, the increased value of the beans from Vitazyme (1.01 tons/acre) was \$202/acre.



• Increase in bean yield: 19%

• Increase in income: \$202/acre

Conclusions: Vitazyme applied at planting to these beans in New York produced an excellent 19% yield increase, which could not be detected by field observations. This yield increase translated to \$202/acre more income. Vitazyme continues to show its great effectiveness for beans as well as other vegetable crops in New York and other states and countries.

Cabbage

Researcher/Farmer: Kludt Brothers, Inc.

Soil type: sandy loam

In-row spacing: 18 inches

Experimental design: A cabbage field was divided into a portion treated with Vitazyme at planting, and an area alongside treated with Black Label (a United Agri-Products material) to compare final yield.

Location: Kendall, New York

Planting rate: 11,600 plants/acre

Irrigation: none

Variety: Morton (a kraut variety)

Row spacing: 30 inches

Planting date: May 7, 2007

1. Black Label

2. Vitazyme

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Fertilization: 350 lb/acre of 0-0-60% N-P₂O₅-K₂O applied pre-plant; 13 gal/acre 7-21-7% N-P₂O₅-K₂O starter at planting; 34 gal/acre of 30% N sidedressed

Vitazyme application: 13 oz/acre in the starter fertilizer at planting

Black Label application: the correct amount according to label directions

Chlorophyll levels: On August 15, a Minolta SPAD meter was used to evaluate the leaf chlorophyll level. Results are given below.

Treatment	SPAD values*	Change
	----- SPAD units -----	
Control	69.6	—
Vitazyme	72.2	+2.6

*Average of 30 leaves per treatment.

ues were not saved; only the increase was recorded. Yields below are based on the field average for 2007.

Treatment	Yield		Yield change
	lb/acre	tons/acre	tons/acre
Control	80,600	40.30	—
Vitazyme	82,150	41.08	0.78 (+2%)

along with such a material to improve its efficacy, since it works by improving nutrient availability. This 2% yield enhancement resulted in a \$50.70/acre increase in income.

• **Increase in leaf chlorophyll: 2.6 SPAD units**

• **Increase in cabbage yield: 2%**

Cabbage, Organic

Researchers: Jorge Gonzalez Acosta and Wilberto Gonzalez Marrero

Organization: Ministry of Sugar, Camilo Cienfuegos Agricultural Enterprise

Location: Villena Farm, Havana Province, Cuba

Planting date: September 1, 2006

Experimental design: A 0.02 ha area was selected to evaluate the effectiveness of Vitazyme in promoting cabbage yields. The crop was treated twice, and observed carefully throughout the growing cycle.

1. Control

2. Vitazyme

Fertilization: according to recommendations

Cabbage Yield

Treatment	Yield	Increase
	tons/ha	tons/ha
Control	13.6	—
Vitazyme	43.5	29.9 (+220%)
Historical yield	6.5	

Vitazyme application: 1 liter/ha sprayed on September 20, 2006, 19 days after transplanting, and again on October 23, 33 days later

Conclusions: This Cuban cabbage trial revealed how effective Vitazyme can be in enhancing cabbage yield under organic growing conditions. This dramatic response has been rather typical with various vegetable crops receiving Vitazyme across Cuba.

• **Increase in cabbage yield: 220%**

Carrots, Organic

Researchers: Jorge Gonzalez Acosta and Wilberto Gonzalez Marrero

Organization: Ministry of Sugar, Camilo Cienfuegos Agricultural Enterprise

Location: Villena Farm, Havana Province, Cuba

Soil type: red ferralitic, organic beds

Planting date: September 30, 2006

Experimental design: A 0.02 ha area was selected to evaluate the effectiveness of Vitazyme in promoting carrot yields. The crop was treated twice, and observed carefully throughout the growing cycle.

1. Control

2. Vitazyme

Fertilization: according to recommendations

Vitazyme application: two treatments at 1 liter/ha each time

Growth observations: The Vitazyme treated carrots showed greater vegetative and root growth during the growing season.

Conclusions: This Cuban carrot trial revealed how effective Vitazyme can be in enhancing carrot yield under organic growing conditions. This excellent response (11%) continues the excellent responses obtained with the product on vegetables throughout Cuba over the past several years.



Vigorous early growth and more chlorophyll for this Vitazyme treated cabbage led to a superior yield compared to a fertilizer/humic acid treatment grown beside it.

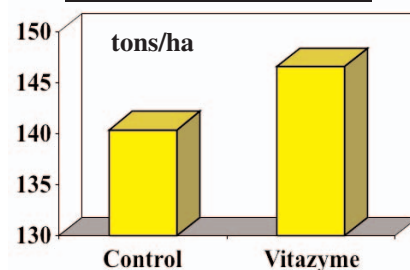
Variety: Hercules

Soil type: red ferralitic, organic beds

Watering: rainfed

Harvest date: December 30, 2006

Carrot Yield



Treatment	Yield	Increase
	tons/ha	tons/ha
Control	11.1	—
Vitazyme	12.2	1.1 (+10%)

• **Increase in carrot yield: 10%**

Corn

Researchers: Fred Vaughn and Greg Wilson

Organization: Vaughn Agricultural Research Services

Location: Branchton, Ontario, Canada

Variety: Pioneer 38P03

BBCH Scale: BCOR

Planting depth: 5cm

Planting rate: 76,000 seeds/ha

Row spacing: 76 cm

Soil temperature at planting: 13.3C

Planting Date: May 14, 2007

Field preparation: cultivation twice

Seedbed conditions: dry, fine

Soil: silt loam (31.9% sand, 53.7% silt, 14.4% clay), 6.2 pH, 14.2 meq/100 g CEC, good fertility

Weed control: unknown

Previous crop: 2004, winter wheat (with Cobutox); 2005, potatoes (with Dual + Sencor); 2006, corn (Dual + Marksman)

Experimental design: A uniform site was divided into plots that were 3x6 meters (six rows), using four treatments with six replications in a randomized complete block design. The objective of the study was to determine Vitazyme's ability to improve soybean yield with two applications.

Treatment	At planting	At 8 leaves	Nitrogen
	----- liters/ha -----		kg/ha
1. No Vitazyme	0	0	60
2. No Vitazyme	0	0	120
3. Vitazyme	1	1	60
4. Vitazyme	1	1	120



At Vaughn Research in Ontario, Canada, in 2007 Vitazyme scored impressive gains in grain yield of 16%, at both 60 and 120 kg/ha of nitrogen despite a serious drought.

Fertilization: All areas received 200 kg/ha of dry 6-24-24% N-P₂O₅-K₂O before planting. 100 liters/ha of liquid 6-24-6% N-P₂O₅-K₂O was applied in the seed furrow at planting (May 14). A 28% nitrogen solution was applied to the plots on June 8 so that the appropriate plots would receive either 60 or 120 kg/ha of nitrogen.

Vitazyme application: To Treatments 3 and 4, 1 liter/ha was applied to the seeds at planting (May 14), as a spray on the seeds just behind the disc openers, and 1 liter/ha was applied to the leaves and soil at the eight-leaf stage (June 20).

Crop emergence date: May 18, four days after planting

Harvest date: October 12, 2007. An area of 1.52 x 6.00 meters (the two center rows) was harvested for each plot.

Yield results: There were no significant differences in grain moisture content and test weight, nor were any differences discovered in stalk lodging. Thus, those data are not included below.



Note how the root system of the Vitazyme treated corn is deeper and more extensive than for the control, giving ears that usually have more rows and are filled better.

Grain Yield

Treatment	Grain yield	Change*
	bu/acre	bu/acre
1. No Vitazyme, 60 N	118.6 c	—
2. No Vitazyme, 120 N	144.3 b	25.7 (+22%)
3. Vitazyme, 60 N	137.7 b	19.1 (+16%)
4. Vitazyme, 120 N	166.8 a	48.2 (+41%)
LSD	16.3	
CV	11.37	
Bartlett's X2	3	
P (Bartlett's X2)	0.392	
Replicate F	4.315	
Replicate Prob (F)	0.0124	
Treatment F	9.158	
Treatment Prob (F)	0.0011	

Vitazyme Effect at 60 kg/ha N

Treatment	Yield	Change
	bu/acre	bu/acre
No Vitazyme	118.6 b	—
Vitazyme	137.7 a	19.1 (+16%)

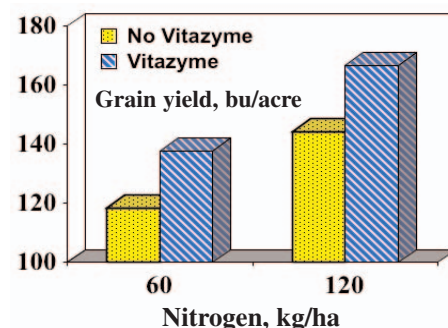
• Increase in yield at 60 kg/ha N: 16%

At both nitrogen levels, Vitazyme significantly increased grain yield at P=0.10. This increase was 16% above the control at both nitrogen levels. What is especially interesting to note is that the 60

Vitazyme Effect at 120 kg/ha N

Treatment	Yield	Change
	bu/acre	bu/acre
No Vitazyme	144.3 b	—
Vitazyme	166.8 a	22.5 (+16%)

• Increase in yield at 120 kg/ha N: 16%



kg/ha N yield (137.7 bu/acre) with Vitazyme was statistically equal to the 120 kg/ha N yield (144.3 bu/acre) without Vitazyme. This reveals a benefit of Vitazyme to improve the utilization of fertilizer nitrogen.

Income results: At \$4.00/bu, the increased incomes for the grain produced in this study are as follows:

At 60 kg/ha N.

No Vitazyme: 118.6 bu/acre x \$4.00/bu = \$474.40

Vitazyme: 137.7 bu/acre x \$4.00/bu = \$550.80

Increase with Vitazyme: \$74.40/acre

At 120 kg/ha N.

No Vitazyme: 144.3 bu/acre x \$4.00/bu = \$577.20

Vitazyme: 166.8 bu/acre x \$4.00/bu = \$667.20

Increase with Vitazyme: \$90.00/acre

Continued on the next page

Conclusions: In this southern Ontario, Canada, study of Vitazyme on corn at two nitrogen levels, Vitazyme was shown to significantly increase grain yield, by 16% above the respective control (no Vitazyme) levels. Moreover, the yield of the Vitazyme + 60 kg/ha N rate was statistically equal to the 120 kg/ha N rate without Vitazyme, demonstrating the ability of the product to improve the utilization of nitrogen. Two applications of 1 l/ha, at planting, and again at the eight-leaf stage, brought about this yield improvement. The yield increases gave significant income increases: \$74.40/acre at 60 kg/ha nitrogen, and \$90.00/acre at 120 kg/ha nitrogen.

Corn Three Nitrogen Levels

Researcher/Farmer: Curt VanNice

Location: Blue Grass, Iowa

Planting Rate: 32,000 plants/acre

Drainage: adequate

Soil type: clay loam

Experimental design: A corn field was divided into several treatments to evaluate the effects of Vitazyme on corn yield when applied twice at three different nitrogen levels. Each treatment had one replication, thus not permitting a statistical analysis.

Treatment	Vitazyme	Nitrogen
1	no	100 lb/acre
2	no	125 lb/acre
3	no	150 lb/acre
4	yes	100 lb/acre
5	yes	125 lb/acre
6	yes	150 lb/acre

Variety: LG Seeds, 2545 VT3

Row width: 30 inches

Tillage: no-till

Previous crop: corn

Planting Date: May 5, 2007

Watering: rain-fed

Soil fertility: high

Fertilization: All fertilizers were applied at planting. The 125 lb/acre nitrogen rate received 50 lb/acre 10-34-0% N-P₂O₅-K₂O, 40 lb/acre ammonium thiosulfate (12-0-0-26% N-P₂O₅-K₂O-S), and 350 lb/acre 32% UAN (32% N-P₂O₅-K₂O). The 100 and 150 lb/acre nitrogen rates were adjusted higher to achieve these levels.

Vitazyme application: 13 oz/acre on the seeds at planting, and 13 oz/acre with the post-planting herbicide at the 7-leaf stage

Herbicides: Guardman MAX at 4 qt/acre, at planting, and Glvstar Plus at 1 qt/acre, at the 7-leaf stage

Weather conditions: During the early growing season the weather was very wet, but then dry mid-season conditions prevailed. Later on, conditions were again wet. The wet periods led to considerable plant disease, and much stalk rot and lodging later in the season.

Harvest date: October 23, 2007

Yield results: All weights were determined using a weigh wagon. The grain moisture ranged from 14.6 to 16.0%, and the test weight from 55.5 to 57.5 lb/bu. These parameters appeared to be related in part to Vitazyme treatment, so are included below.

Grain Moisture

Treatment	Moisture	Change*
	%	%
1. No Vita, 100 N	16.0	—
2. No Vita, 125 N	14.6	—
3. No Vita, 150 N	15.0	—
4. Vitazyme, 100 N	14.8	-1.2
5. Vitazyme, 125 N	15.3	+0.7
6. Vitazyme, 150 N	14.0	-1.0

*At the same nitrogen rate.

Bushel Weight

Treatment	Weight	Change*
	lb/bu	lb/bu
1. No Vita, 100 N	56.0	—
2. No Vita, 125 N	56.0	—
3. No Vita, 150 N	55.5	—
4. Vitazyme, 100 N	57.5	+1.5
5. Vitazyme, 125 N	56.0	0
6. Vitazyme, 150 N	57.0	+1.5

*At the same nitrogen rate.

Grain Yield

Treatment	Yield*	Change**
	%	%
1. No Vita, 100 N	216.3	—
2. No Vita, 125 N	224.1	—
3. No Vita, 150 N	239.9	—
4. Vitazyme, 100 N	221.4	5.1 (+2.4%)
5. Vitazyme, 125 N	229.1	5.0 (+2.2%)
6. Vitazyme, 150 N	244.7	4.8 (+2.0%)

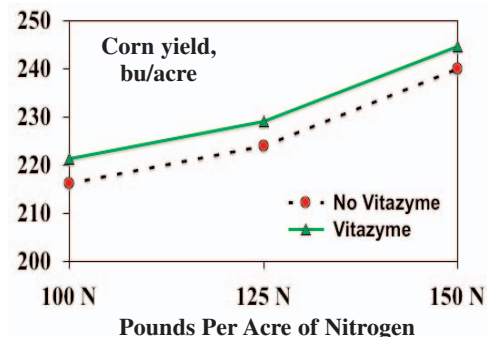
*Adjusted to 15% moisture.

**At the same nitrogen rate.

- Grain moisture was reduced with two of the three treatments, but for some reason the 125 lb/acre nitrogen treatment produced a small moisture increase.
- There appeared to be a genuine improvement in grain density with Vitazyme as reflected by increases in bushel weight with 100 and 150 lb/acre of nitrogen. These increases were substantial: 1.5 lb/bu.
- Vitazyme produced a consistent yield increase of about 5.0 bushels/acre over the three nitrogen rates evaluated.

Increase in grain yield with Vitazyme

100 lb of N/acre: 2.4%
125 lb of N/acre: 2.2%
150 lb of N/acre: 2.0%



Income results: This 5 bu/acre increase in corn grain would give an average of about \$20.00 more per acre with \$4.00/bu corn, at all nitrogen levels.

Conclusions: In this Iowa field corn study, despite excessive wetness early and late in the season, the yields were increased 2.0 to 2.4%, and bushel weights were increased up to 1.5 lb/bushel with Vitazyme, although bushel weights were rather low due to stalk rot and other diseases. Vitazyme may have had a positive effect on grain drydown rates. Yield effects were consistent, giving about a 5.0 bu/acre increase at all three nitrogen levels. These increases were very profitable: at \$4.00/bushel, then this 5 bu/acre improvement would lead to a gross increase of \$20.00/acre.

• Increase in bushel weight at 100 and 150 lb/acre N: 1.5 lb/bu

Corn

Agricultural Custom Research Education Services

Researcher: Bert Schou, Ph.D.

Location: Cedar Falls, Iowa

Variety: Pioneer 34A15 (non-GMO)

Soil: Maxfield silty clay loam (18% sand, 53% silt, 29% clay, 4.0% organic matter, pH 6.0, 16 meq/100 g cation exchange capacity)

BBCH Scale: BCOR

Fertility level: good

Watering: rain-fed

Previous crop: soybeans

Row width: 30 inches

Planting rate: 29,900 seeds/acre

Planting date: May 14, 2007

Tillage: conventional

Harvest date: October 22, 2007

Experimental design: A randomized complete block design, with six replicates and seven treatments, was established on a well-drained, uniform soil area. Plots had six rows and were 15 x 40 feet (0.0138 acre), with the center two rows being harvested for yield determination. The purpose of the trial was to investigate the effect of Vitazyme, Vitazyme Cold-Start, yucca extract, and a seawater product, alone or in combination, on crop yield. The Student-Newman-Kuels test was used to evaluate treatment means.

Fertilization: 28% nitrogen at 30 gallons/acre (90 lb/acre of nitrogen) on May 22, applied with drop nozzles from a boom sprayer every 20 inches over the entire area

Vitazyme and Cold-Start applications: 6.5 or 13 oz/acre in the row, on the seeds, and again on the leaves and soil at the 8-leaf stage (17-inch height) on June 25

Yucca applications: 6.5 or 13 oz/acre in the row, and again on the leaves and soil at the 8-leaf stage (17-inch height) on June 25

Sea-Water applications: 6.5 or 13 oz/acre in the row, and again on the leaves and soil at the 8-leaf stage (17-inch height) on June 25. This water was concentrated at low temperature from off-shore ocean water.

Yield results: The highest grain yield increase in this Iowa corn trial was with Vitazyme and Seawater, at 6.5 oz/acre twice (+15%), which was significant at $P = 0.05$. The 6.5 oz/acre rate response slightly exceeded the 13 oz/acre rate for each. These two combinations exceeded the Cold-Start and yucca results, either alone or in combination with one another.

Income results: If corn is valued at \$4.00/bu, then the income increases of the treatments are as follows:

2. Yucca alone: \$42.40/acre

3. Cold-Start alone: \$40.80/acre

4. Yucca + Cold-Start (6.5 oz): \$29.60/acre

5. Yucca + Cold-Start (13 oz): \$51.20/acre

6. Vitazyme + Seawater (6.5 oz): \$67.20/acre

7. Vitazyme + Seawater (13 oz): \$56.40/acre

Conclusions: In the words of the researcher,

"Cold Start, Yucca, Seawater, and Vitazyme significantly enhanced corn yields in a field study at Cedar falls, Iowa, in 2007. The test was conducted as a randomized complete block design with six replications, and corn yields were increased 7.4 to 14.1 bu/A or 6.5 to 14.8% compared to untreated control area yields at 113.7 bu/A. The control yields were low possibly due to a later planting May 14 and wet conditions on a silty clay soil, with much higher than normal rainfall. The best yield increase to 130.5 bu/A was with Seawater and Vitazyme both infurrow (IF) and postemergence (P) at 6.5 oz/A, and this was 16.8 bu/A or 14.8% above the controls. Thus, with \$4/bu corn this fall this would be a gross income increase of \$67.20/A. Other significant yield increases were on areas with 13 oz/A with both applications of Seawater and Vitazyme for 127.8 bu/A (14.1 bu/A or 12.4% above controls). This would have resulted in an increased gross return of \$56.40/A. Significant yield increases were also noted with 13 oz applications of yucca and Cold Start at both application times which contributed to a yield increase of 12.8 bu/A (11.3%), or a \$51/A increased gross return with treatments.

Three almost significant treatments included 6.5 oz/A of Yucca and Cold Start at both

Continued on the next page

Treatment	Vitazyme		Cold-Start		Yucca		Seawater	
	AP ¹	Post ²	AP ¹	Post ²	AP ¹	Post ²	AP ¹	Post ²
	ounces/acre							
1	0	0	0	0	0	0	0	0
2	0	0	0	0	13	13	0	0
3	0	0	13	13	0	0	0	0
4	0	0	6.5	6.5	6.5	6.5	0	0
5	0	0	13	13	13	13	0	0
6	6.5	6.5	0	0	0	0	6.5	6.5
7	13	13	0	0	0	0	13	13

¹AP = applied at planting on the seeds.

²Post = applied at the 8-leaf stage (17-inches tall) to the leaves and soil.

Grain Yield

Treatment	Grain yield ¹	Increase
bu/acre	bu/acre	
1. Control	113.7 b	—
2. Yucca, 13 oz/acre	124.3 ab	10.6 (+9%)
3. Cold-Start, 13 oz/acre	123.9 ab	10.2 (+9%)
4. Yucca + Cold-Start 6.5 oz/acre	121.1 ab	7.4 (+6%)
5. Yucca + Cold-Start, 13 oz/acre	126.5 a	12.8 (+11%)
6. Vitazyme + Seawater, 6.5 oz/acre	130.5 a	16.8 (+15%)
7. Vitazyme + Seawater, 13 oz/acre	127.8 a	14.1 (+12%)
LSD (P = 0.05)	8.2	
CV	5.59%	
Bartlett's x 2	3.68	
P (Bartlett's x 2)	0.815	
Replicate F	2.438	
Replicate Prob (F)	0.054	
Treatment F	3.207	
Treatment Prob (F)	0.0099	

¹Corrected to 15.5% moisture; means followed by the same letter are not significantly different at $P = 0.05$ according to the Student-Newman-Keuls Test.

Grain Yield Changes

Vitazyme.....	+9%
Cold-Start alone.....	+9%
Yucca + Cold-Start (6.5 oz).....	+6%
Yucca + Cold-Start (13 oz).....	+11%
Vitazyme + Seawater (6.5 oz).....	+15%
Vitazyme + Seawater (13 oz).....	+12%

application times for a yield of 121.1 bu/A, or an increase of 7.4 bu/A (6.5%) over controls. This was a gross return increase of \$29.80/A. Another area with 13 oz/A of Cold Start alone two times yielded 123.9 bu/A for a 10.2 bu/A increase, or 8.9% above controls for a gross increase of \$35.60/A. Areas with two applications of SSO (Yucca) at 13 oz/A yielded 124.3 bu/A or 10.6 bu/A, or 9.3% greater than untreated checks. This 10.6 bu/A translated to a gross income increase of \$42.40/A. The test variability was rated at 5.6%, and this was considered good for a field test.”

• Increase in income + Seawater: \$67.20/acre

Corn

Researcher: Paul W. Syltie, Ph.D.

Location: Vital Earth Resources Research Greenhouse, Gladewater, Texas

Variety: Trucker's Favorite

Soil type: very fine sandy loam

Pot size: 1 gallon

Planting rate: 10 seeds/pot, thinned to three plants

Planting date: February 6, 2007

Experimental design: A greenhouse study with corn was initiated to evaluate the effects of several growth stimulants on corn height and dry weight accumulation. A randomized complete block design was utilized with ten replicates for each of the seven treatments listed below.

1. Control

3. Vitazyme, variant 2

5. Product G-1

2. Vitazyme, variant 1

4. Vitazyme CS

6. Product G-2

7. Asset

Fertilization: No fertilizers were applied to this low fertility, low organic matter soil.

Product application: All products were applied at planting as 100 ml of the designated solution: 2, 3, and 4, 0.002% (15.8 oz/acre); 5 and 6, 0.001% (7.9 oz/acre); 7, 0.0005% (4.0 oz/acre).

Harvest date: March 14, 2007, after 36 days of growth. All plants were washed clean of soil to leave only the roots and soil. They were then dried in a drying oven at about 50°C for 48 hours.

Plant height and dry weight results: All three plants for each pot were measured for maximum leaf height and averaged, and then weighed on a scale after drying.

Treatment	Height ¹	Change	Treatment	Dry weight ¹	Change
	cm	cm		grams	grams
6 (G-2)	49.8 a	4.4 (+10%)	3 (Vita-2)	5.47 a	1.00 (+22%)
7 (Asset)	49.4 a	4.0 (+9%)	6 (G-2)	5.08 b	0.61 (+14%)
4 (Vita-CS)	49.1 ab	3.7 (+8%)	4 (Vita-CS)	5.06 bc	0.59 (+13%)
5 (G-1)	48.2 ab	2.8 (+6%)	7 (Asset)	4.97 bcd	0.50 (+11%)
3 (Vita-2)	47.3 bc	1.9 (+4%)	5 (G-1)	4.72 cde	0.25 (+6%)
2 (Vita-1)	45.7 c	0.3 (+1%)	2 (Vita-1)	4.66 de	0.19 (+4%)
1 (Control)	45.4 c	—	1 (Control)	4.47 e	—
Block P	0.5116		Block P	0.0784	
Main effects P	0.0016**		Main effects P	0.0004***	
Model P	0.0165*		Model P	0.0021**	
CV5.69%		CV	9.59%		
LSD _{0.10}	2.0 cm		LSD _{0.10}	0.35 gram	

¹Means followed by the same letter are not significantly different according to the Student-Newman-Keuls Test.

Change In Plant Height

Product G-2.....+10%
 Asset.....+9%
 Vitazyme CS.....+8%
 Product G-1.....+6%
 Vitazyme 2.....+4%
 Vitazyme 1.....+1%

Change In Plant Dry Weight

Vitazyme 2.....+22%
 Product G-2.....+14%
 Vitazyme CS.....+13%
 Asset.....+11%
 Product G-1.....+6%
 Vitazyme 1.....+4%

Conclusions: In this greenhouse study on corn, all but two treatments significantly increased plant height above the control. Product G-2 gave the greatest increase in height (10%), followed closely by Asset and Vitazyme CS. Plant dry weight showed little relationship with plant height, Vitazyme variant 2 giving the highest yield, significantly exceeding the control by 22%, and the next highest treatment — Product G-2 — by 8%. All but Product G-1 and Vitazyme variant 1 significantly exceeded the control treatment.

Corn

Researcher: Paul W. Syltie, Ph.D.

Location: Vital Earth Resources Research Greenhouse, Gladewater, Texas

Variety: Trucker's Favorite

Planting rate: 10 seeds/pot, thinned to three plants

Soil type: silt loam

Planting date: January 4, 2007

Pot size: 1 gallon

Experimental design: A greenhouse study with corn was initiated to evaluate the effects of several growth stimulants on corn height and dry weight. The experiment was arranged in a randomized complete block design with seven replicates, using seven treatments as listed below.

1. Control

3. Vitazyme, variant 2

5. Product G-1

2. Vitazyme, variant 1

4. Vitazyme CS

6. Product G-2

7. Asset

Fertilization: No fertilizers were applied to this soil containing moderate fertility.

Product application: All products were applied at planting at 100 ml/pot over the soil surface. Treatments 2, 4, and 6, 0.005% (43.7 oz/acre); Treatments 3 and 5, 0.001% (7.9 oz/acre); Treatment 7, 0.0005% (4.0 oz/acre). *Continued on the next page*

Harvest date: February 19, 2007, 46 days after planting.

Plant height and dry weight results: Plants were washed free of all soil on their roots, measured for the length of the longest leaves, and dried in a drying oven at about 50°C for 48 hours.

Treatment	Height ¹ cm	Change cm	Treatment	Dry weight ¹ grams	Change grams
2 (Vitazyme, high)	103.00 a	4.51 (+5%)	2 (Vitazyme, high)	17.28 a	3.03 (+18%)
1 (Control)	98.49 ab	—	6 (G, high)	14.42 b	0.17 (+1%)
3 (Vita-CS, low)	96.81 b	(-) 1.68 (-2%)	1 (Control)	14.25 b	—
4 (Vita-CS, high)	95.66 b	(-) 2.83 (-3%)	5 (G, low)	14.02 bc	(-) 0.23 (-2%)
6 (G, high)	94.30 bc	(-) 4.19 (-4%)	3 (Vita-CS, low)	13.93 bc	(-) 0.32 (-2%)
5 (G, low)	93.50 bc	(-) 4.99 (-5%)	4 (Vita-CS, high)	13.20 bc	(-) 1.05 (-7%)
7 (Asset)	88.40 c	(-) 10.09 (-10%)	7 (Asset)	12.10 c	(-) 2.15 (-15%)
Block P	0.1984		Block P	0.2758	
Main effects P	0.0162*		Main effects P	0.0113*	
CV7.14%		CV	16.34%		
LSD _{0.10}	6.17 cm		LSD _{0.10}	2.09 gram	

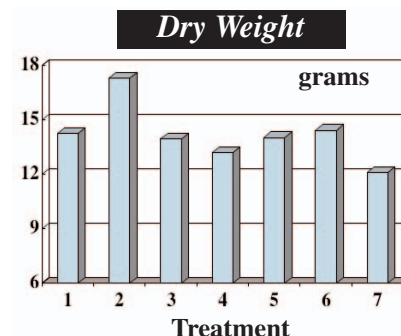
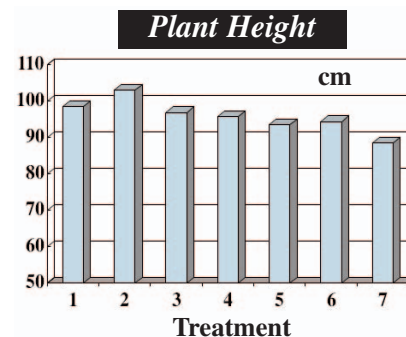
¹Means followed by the same letter are not significantly different according to the Student-Newman-Keuls Test.



Corn was treated with several products in this greenhouse trial to compare their efficacy, part of Vital Earth's ongoing research.

• **Increase in plant height:
5%**

• **Increase in plant dry
weight: 18%**



Conclusions: This greenhouse study revealed that Vitazyme alone significantly increased the growth of corn above the control, improving dry tissue weight at 46 days after planting by 18%. All of the other treatments were statistically equal to the control except Asset, although this treatment was unusually low in height and dry weight for several of the replicates due to soil structure problems (i.e., compaction) in the pots. Thus, soil porosity was low and interfered with root growth.

Corn - Popcorn

A Testimonial

Farmer: Michael Prochko

Row spacing: 30 inches

Soil type: silt loam, poorly drained, tilled at 20-foot centers

Experimental design: The farmer applied a special fertility program plus Vitazyme over the entire popcorn field. This program was compared to the results of previous years when the conventional program was used, and also compared to an adjoining sweet corn field.

Fertilization: added sulfur, high-calcium lime, boron, zinc, manganese, and copper

Vitazyme application: 13 oz/acre twice during the growing season

Weather: erratic, with a drought until late July, and then good moisture

Yield results: The crop yielded about 190 bu/acre (whole cobs with seeds), whereas a typical yield is 70 to 75 bu/acre. The crop looked very poor in June, during the drought, but when rain arrived in July the crop shaped up rapidly. An adjoining sweet corn field received no Vitazyme and special minerals, and was a total failure.

Conclusions: This Ohio popcorn field responded greatly to Vitazyme and an associated mineral program by yielding 190 bu/acre of on-the-ear popcorn. This yield was easily more than double the expected yield for this crop in the area. A local agricultural cooperative agronomist, who visited the field during pollination, said that he had never before seen such a great pollen drop in a corn field before.

Cotton

Farmer/Researcher: Blaine Middleton

Variety: Delta-Pine 164 P2R

Planting rate: 60,000 seeds/acre

In-row spacing: 4 plants/foot

Planting date: May, 2007

Location: Lamesa, Texas

Soil type: Amarillo sandy loam and a lacustrine soil

Row spacing: 36 inches

Watering: center-pivot irrigation

Continued on the next page

Experimental design: A cotton field circle was divided into Vitazyme treated and untreated areas, with 10-acre side-by-side strips selected for a comparison of cotton yield.

1. Control

Fertilization: 600 lb/acre of 6-15-5-2% N-P₂O₅-K₂O-S preplant dry; 200 lb/acre of 33% nitrogen, sidedressed on July 3

Vitazyme application: (1) 13 oz/acre at planting on the seeds; (2) 13 oz/acre on the leaves on July 2 (first square).

Water treatment: Since the water is salty for this pivot, a Water Aquatron unit was used to electronically treat the water for improved yields.

2007 weather: a very good growing season with about 35 inches of rain for the year

Ethylene, fertilizer, and fungicide treatment: ethylene, Vydate, and 1 lb/acre of 20-20-20% N-P₂O₅-K₂O applied on July 2, with Vitazyme

Harvest date: November, 2007

Yield results:

Treatment	Lint yield	Change
	lb/acre	lb/acre
Control	1,153	—
Vitazyme	1,213	60 (+5%)

• Increase in lint yield: 5%

Conclusions: This cotton trial with Vitazyme on sandy loam soils in west Texas, using electronically treated irrigation water, provided a 5% lint increase with a seed treatment and a foliar application at first square. No seed yield had yet been determined when this report was submitted.



Vitazyme treatment for the plants on the right caused greater root development, a major reason that this Lamesa cotton trial produced more lint using two applications.

Cotton

Texas A&M University

Researcher: Josh Bynum and Tom Cothren, Ph.D.

Variety: Delta and Pine 164 Bollgard II/RR Flex

Location: Texas A&M University, Department of Soil and Crop Sciences, College Station, Texas

Previous crop: cotton

Soil type: Weswood silt loam (pH, 8.1)

Planting depth: unknown

Row spacing: 40 inches

Planting rate: 52,000 seeds/acre

Planting date: April 28, 2007

Tillage: conventional

Experimental design: A site at the university's research field was selected that corresponded to the same location as an identical study in 2006. Plots were 13.3 (four rows) x 32 feet with a split-plot design, placing Vitazyme treatments in the whole plots, and nitrogen rates in the sub-plots. The two center rows of the four rows in each plot were harvested for lint yield determinations. Because there were about 30 lb/acre of residual nitrogen in the soils at planting and there could be no zero nitrogen rate, the four nitrogen rates ranged from 30 to 120 lb/acre. The purpose of the study was to evaluate the effects of Vitazyme on lint yield and quality, as well as various growth parameters, at four nitrogen levels.



At Texas A&M, College Station, the 120 lb/acre N rate with Vitazyme gave the highest yield, as seen in this photo.



In this trial, 50% of the maximum N rate plus Vitazyme gave a yield significantly greater than the 100% N rate without it.

1. Control + 30 lb/acre nitrogen

2. Vitazyme + 30 lb/acre nitrogen

3. Control + 60 lb/acre nitrogen

4. Vitazyme + 60 lb/acre nitrogen

5. Control + 90 lb/acre nitrogen

6. Vitazyme + 90 lb/acre nitrogen

7. Control + 120 lb/acre nitrogen

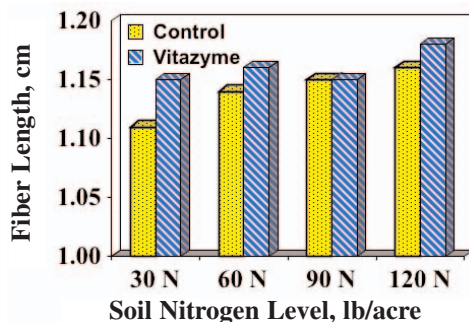
8. Vitazyme + 120 lb/acre nitrogen

Fertilization: 30, 60, and 90 lb/acre of nitrogen applied before planting to appropriate plots to provide totals of 30, 60, 90, and 120 lb/acre nitrogen

Vitazyme application: 13 oz/acre on the seeds at planting (April 24), 13 oz/acre on the leaves and soil at early bloom (June 29), and 13 oz/acre to the leaves 28 days later (July 26)

Weather: Rainfall was above average and temperatures were average during the growing season.

Harvest date: the first week of September (the 30 lb/acre N rate) to about September 19 (the 120 lb/acre N rate)



Fiber Length

Treatment	Length*	Change**
	cm	cm
1. Control, 30 N	1.11 c	—
2. Vitazyme, 30 N	1.15 b	0.04 (+4%)
3. Control, 60 N	1.14 bc	—
4. Vitazyme, 60 N	1.16 ab	0.02 (+2%)
5. Control, 90 N	1.15 b	—
6. Vitazyme, 90 N	1.15 b	0
7. Control, 120 N	1.16 ab	—
8. Vitazyme, 120 N	1.18 a	0.02 (+2%)

*Means followed by the same letter are not significantly different at P=0.05.

**Comparisons are made at the same nitrogen level.

Continued on the next page

Lint quality results: Samples of the lint from each plot were sent to a testing laboratory to determine the diameter, length, uniformity, and strength of the fibers. There were no significant differences among the treatments for diameter and uniformity. There were significant differences, however, for fiber length and strength.

Vitazyme increased fiber length significantly at 30 lb/acre nitrogen, and also increased the length at 60 and 120 lb/acre nitrogen. The overall effect was an increase in fiber length across all nitrogen treatments by 2% (0.02 cm). Nitrogen also increased fiber length as rates increased, by 4% (0.04 cm) at the 120 lb/acre rate.

• **Increase in fiber length with Vitazyme: 2%**

Fiber Strength

Treatment	Strength*	Change**
	g/tex	g/tex
1. Control, 30 N	26.1 abc	—
2. Vitazyme, 30 N	25.1 c	(-) 1.0 (-4%)
3. Control, 60 N	25.6 bc	—
4. Vitazyme, 60 N	26.6 abc	1.0 (+4%)
5. Control, 90 N	27.9 a	—
6. Vitazyme, 90 N	27.6 ab	(-) 0.3 (-1%)
7. Control, 120 N	27.4 ab	—
8. Vitazyme, 120 N	28.2 a	0.8 (+3%)

*Means followed by the same letter are not significantly different at P=0.10.

**Comparisons are made at the same nitrogen level.

Effect of Vitazyme on Fiber Length

Treatment	Length*	Change*
	cm	cm
Control	1.14 b	—
Vitazyme	1.16 a	0.02 (+2%)

*Means followed by the same letter are not significantly different at P=0.05.

Effect of Nitrogen on Fiber Length

Treatment	Length*	Change
	cm	cm
30 N	1.13 c	—
60 N	1.15 b	0.02 (+2%)
90 N	1.15 b	0.02 (+2%)
120 N	1.17 a	0.04 (+4%)

*Means followed by the same letter are not significantly different at P=0.05.

**Comparisons are made with the 30 lb/acre nitrogen rate.

• **Increase in fiber length with nitrogen: 2 to 4%**

Effect of Vitazyme on Fiber Strength

Treatment	Strength*	Change*
	g/tex	g/tex
Control	26.8 a	—
Vitazyme	26.9 a	0.1 (+3%)

*No significant difference

• **Increase in fiber strength with nitrogen: 2 to 9%**

Effect of Nitrogen on Fiber Strength

Treatment	Strength*	Change
	g/tex	g/tex
30 N	25.6 b	—
60 N	26.1 ab	0.5 (+2%)
90 N	27.8 a	2.2 (+9%)
120 N	27.8 a	2.2 (+9%)

*Means followed by the same letter are not significantly different at P=0.10.

**Comparisons are made with the 30 lb/acre nitrogen rate.

Vitazyme did not significantly increase fiber strength above the controls at any nitrogen level, but the single greatest strength was 28.2 g/tex with Vitazyme at the 120 lb/acre nitrogen rate. Increasing nitrogen rates caused an increase in fiber strength by up to 9%.

Statistical summary: Partial analysis of variance for stand counts, plant height, total nodes, nodes above white flower (NAWF) and lint yield.

Factor	Early Bloom (June 29)			Early Bloom + 28 Days (July 26)			NAWF*	Lint
	Stand Counts	Height	Node	Height	Node			
	10' row	cm	nodes/plant	cm	nodes/plant	value		lbs/acre
Control	0.6717	0.0001	0.0419	0.0001	0.0002	0.0001		0.0174
Nitrogen	0.8403	0.0001	0.0001	0.0001	0.0001	0.0001		0.0001
V*N	0.9253	0.0126	0.0437	0.0046	0.5264	0.0001		0.0014

*Nodes above white flowers.

Mean separation for each factor (Vitazyme and nitrogen) for stand counts, plant height, total nodes, NAWF and lint yield.*

Factor	Early Bloom (June 29)			Early Bloom + 28 Days (July 26)			NAWF*	Lint
	Stand Counts	Height	Node	Height	Node			
	10' row	cm	nodes/plant	cm	nodes/plant	value		lbs/acre
Vitazyme	41.25 a	70.15 a	14.05 a	77.03 a	17.51 a	5.76 a		979.19 a
No Nitrogen	41.50 a	65.96 b	13.58 b	73.06 b	16.56 b	5.47 b		919.87 b
Nitrogen:								
120 lb/acre	41.63 a	76.96 a	15.05 a	86.45 a	19.13 a	6.75 a		1096.89 a
90 lb/acre	41.63 a	72.04 b	14.45 ab	81.14 b	18.43 b	5.59 b		1053.77 a
60 lb/acre	41.00 a	69.73 c	13.95 b	75.64 c	16.90 c	5.20 c		1046.04 a
30 lb/acre	41.25 a	53.49 d	11.80 c	56.95 d	13.70 d	4.93 d		601.42 b

*Means followed by the same letter are not significantly different at P=0.05.

The tables to the left reveal that both Vitazyme and nitrogen significantly increased all growth and yield parameters for the season. Stand count was not significantly affected by either input. Of considerable interest is the fact that all parameters, except nodes per plant on July 26, showed a significant interaction between Vitazyme and nitrogen: i.e., Vitazyme boosted the response to nitrogen for these parameters.

Overall values for combined treatments were significantly boosted by Vitazyme (except stand count), while nitrogen in most cases increased parameter values, except for yield where only the 30 lb/acre N rate was significantly less than the higher three values.

Effects of Vitazyme Over All Nitrogen Rates

(All increases are significant)

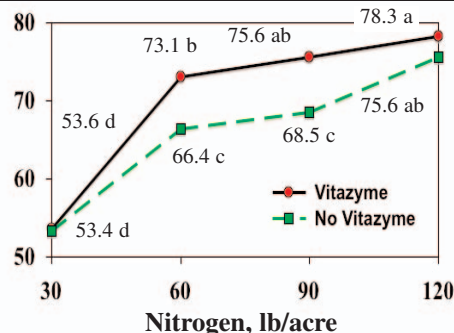
- **Increase in height, early bloom: 6%**
- **Increase in height, bloom + 28 days: 5%**
- **Increase in nodes per plant, early bloom: 3%**

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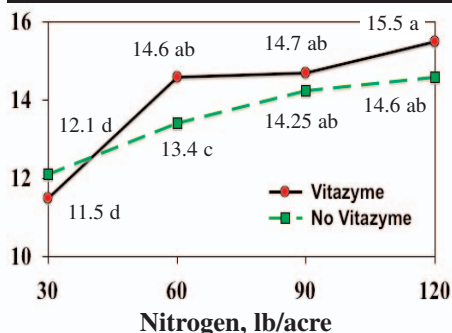
- **Increase in nodes per plant, bloom + 28 days: 6%**
- **Increase in lint yield: 6%**
- **Increase in nodes above white flowers, bloom + 28 days: 5%**

Vitazyme effects at four nitrogen levels: There was no effect of either Vitazyme or nitrogen on any stand counts. For each nitrogen level, different letters indicate significant differences in the means.

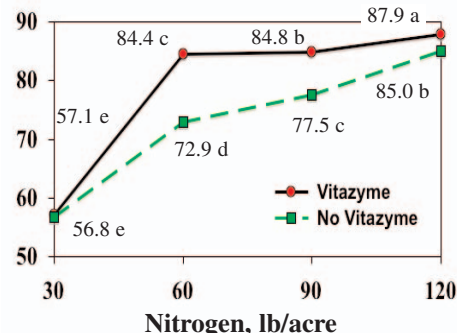
Plant Height (cm) - Early Bloom



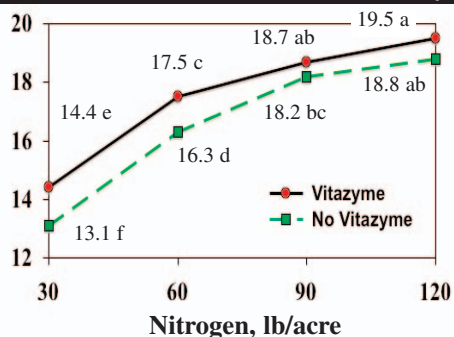
Nodes Per Plant - Early Bloom



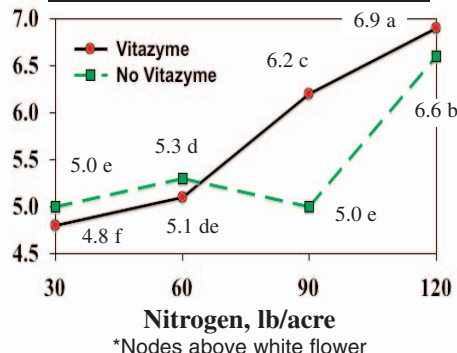
Plant Height (cm) - Bloom + 28 days



Nodes Per Plant - Bloom + 28 days

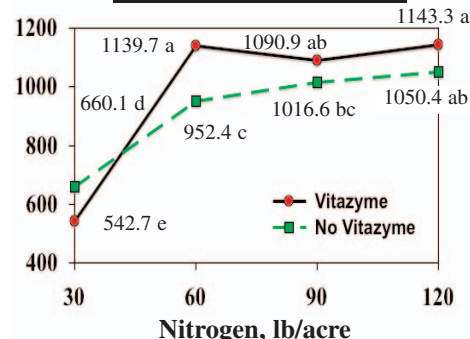


NAWF* - Bloom + 28 days



*Nodes above white flower

Lint Yield (lb/acre)



Obvious in all of these six graphs is the effect of Vitazyme to significantly boost cotton growth and yield parameters above the untreated controls, at all but the 30 lb/acre N rate. The yield was somewhat less with Vitazyme at the 30 lb/acre N rate, presumably because the growth and nodes provided by Vitazyme could not be filled by an inadequate nitrogen supply. NAWF (nodes above white flower), a reliable indicator of final lint yield, was significantly greater than the control with Vitazyme at the higher nitrogen rates, and the final yields bore this out. These lint yields for the 60, 90, and 120 lb/acre nitrogen rates are summarized below.

Nitrogen rate	Lint yield		Yield increase with Vitazyme	
	Vitazyme	No Vitazyme		
lb/acre	lb/acre	lb/acre	lb/acre	percent
120	1,143.3	1,050.4	92.9	9
90	1,090.9	1,016.6	74.3	7
60	1,139.7	952.4	187.3	20

Of considerable interest in this table is the fact that, at the 50% nitrogen rate (60 lb/acre), Vitazyme produced nearly an identical yield as did the 100% nitrogen rate (120 lb/acre) with Vitazyme. Moreover, the lint yield with Vitazyme at the 50% nitrogen rate exceeded the lint yield without Vitazyme at the 100% nitrogen rate by 89.3 lb. or 9%. This yield increase despite a reduced nitrogen application

shows the capability of Vitazyme within the soil-plant system to promote the improved utilization of nitrogen.

Conclusions: This replicated cotton study at Texas A&M university revealed that Vitazyme significantly impacted all growth and yield parameters in a positive direction. Over all nitrogen levels, these parameters produced the following significant effects at P=0.05:

Height at early bloom	6%
Nodes per plant at early bloom	3%
Height at 28 days after early bloom	5%
Nodes per plant at 28 days after early bloom	6%
Nodes above white flower at 28 days after early bloom	5%
Lint yield	6%

The improved growth parameters translated into a 6% lint yield increase. Especially noteworthy is the fact that, at 60 lb/acre of nitrogen, Vitazyme increased the lint yield by an amazing 20% above the untreated control, this yield about equaling the 120 lb/acre nitrogen rate yield and exceeding the 120 lb/acre nitrogen rate alone by 89.3 lb/acre. This effect demonstrates the ability of Vitazyme to help the plant better utilize nitrogen, and allow the grower to reduce nitrogen applications without sacrificing yield ... in this case by reducing such applications by 50%. Yield increase with Vitazyme was 9% at the 120 lb/acre nitrogen rate, and 7% at the 90 lb/acre rate. Nodes above white flower at 28 days after early bloom was an accurate predictor of final lint yield.

Fiber length was significantly enhanced by both Vitazyme (2%) and nitrogen (up to 4%), while fiber strength was improved by up to 9% by nitrogen. Vitazyme with the 120 lb/acre nitrogen rate, however, produced the single greatest fiber strength value of any treatment.

Cotton

Farmer/Researcher: Blaine Middleton
Soil type: Pertullis and Amarillo sandy loams
In-row spacing: 4 plants/foot
Experimental design: A cotton field circle was divided into Vitazyme treated and untreated areas, with 10-acre side-by-side strips selected for a comparison of cotton yield.

Location: Lamesa, Texas
Planting rate: 60,000 seeds/acre
Watering: center-pivot irrigation

Variety: Delta-Pine 164 P2R
Row spacing: 36 inches
Planting date: May 28, 2007

1. Control

2. Vitazyme

Fertilization: 600 lb/acre of 6-15-5-2% N-P₂O₅-K₂O-S preplant dry; 200 lb/acre of 33% nitrogen, sidedressed on July 3

Vitazyme application: (1) 13 oz/acre at planting on the seeds; (2) 13 oz/acre on the leaves on July 2.

Water treatment: Since the water is salty for this pivot, a Water Aquatron unit was used to electronically treat the water for improved yields.

2007 weather: a very good growing season with about 35 inches of rain for the year

Ethylene, fertilizer, and fungicide treatment: ethylene, Vydate, and 1 lb/acre of 20-20-20% N-P₂O₅-K₂O applied on July 2, with Vitazyme

Harvest date: November 13, 2007

Yield results:

Treatment	Lint yield lb/acre	Change lb/acre	Seed yield lb/acre	Change lb/acre
Control	1,351	—	2,184	—
Vitazyme	1,396	45 (+3%)	2,345	161 (+7%)

Conclusions: This cotton trial with Vitazyme on sandy loam soils in west Texas, using electronically treated irrigation water, revealed a 3% lint and 7% seed increase with a seed treatment and a foliar application at early bloom.

• Increase in lint yield: 3%

• Increase in seed yield: 7%

Cowpeas

Researcher: Paul W. Syltie, Ph.D.

Variety: Red Ripper

Location: Vital Earth Resources Research Greenhouse, Gladewater, Texas

Soil type: very fine sandy loam

Pot size: 1 gallon

Planting rate: 12 seeds/pot, thinned to three plants

Planting date: February 6, 2007

Experimental design: A greenhouse study with cowpeas was initiated to evaluate the effects of several growth stimulants on cowpea height and dry weight accumulation. A randomized complete block design was utilized with ten replications for each of the seven treatments listed below.

1. Control

5. Product G-1

2. Vitazyme, variant 1

6. Product G-2

3. Vitazyme, variant 2

7. Asset

4. Vitazyme CS

Fertilization: No fertilizers were applied to this low fertility, low organic matter soil.

Product application: All products were applied at planting as 100 ml of the designated solution: 2, 3, and 4, 0.002% (15.8 oz/acre); 5 and 6, 0.001% (7.9 oz/acre); 7, 0.0005% (4.0 oz/acre).

Harvest date: March 26, 2007, after 48 days of growth. All plants were washed clean of soil to leave only the roots and soil. They were then dried in a drying oven at about 50°C for 48 hours.

Plant height and dry weight results: All three plants for each pot were measured for maximum leaf height and averaged, and then weighed on a scale after drying.

Treatment	Height ¹ cm	Change cm	Treatment	Dry weight ¹ grams	Change grams
4 (Vita-CS)	32.0 a	0.6 (+2%)	4 (Vita-CS)	5.07 a	0.67 (+15%)
3 (Vita-2)	31.9 a	0.5 (+2%)	5 (G-1)	4.97 a	0.57 (+13%)
7 (Asset)	31.8 ab	0.4 (+1%)	7 (Asset)	4.59 b	0.19 (+4%)
1 (Control)	31.4 ab	—	2 (Vita-1)	4.50 bc	0.10 (+2%)
2 (Vita-1)	31.3 ab	(-) 0.1 (0%)	6 (G-2)	4.43 bc	0.03 (+1%)
5 (G-1)	31.3 ab	(-) 0.1 (0%)	1 (Control)	4.40 bc	—
6 (G-2)	30.8 b	(-) 0.6 (-2%)	3 (Vita-2)	4.21 c	(-) 0.19 (-0.4%)
Block P	0.0467*		Block P	0.7087	
Main effects P	0.5843		Main effects P	0.0003***	
Model P	0.1147		Model P	0.0080**	
CV	4.84%		CV	9.50%	
LSD _{0.10}	1.1 cm		LSD _{0.10}	0.33 gram	

¹Means followed by the same letter are not significantly different according to the Student-Newman-Keuls Test.



Greenhouse-grown Red Ripper cowpeas treated with Vitazyme show the characteristic accelerated growth, greater chlorophyll, and stronger stems versus the control.

then weighed on a scale after drying.

Conclusions: This cowpea greenhouse study showed that there was very little difference in plant height among the seven treatments. However, dry weight production varied significantly. Vitazyme-CS significantly exceeded the control by 15%, as did Product G-1, by 13%. All of the other treatments statistically equaled the control for dry plant weight.

Change In Plant Dry Weight

Vitazyme CS.....+15%
 Product G-1.....+13%
 Asset.....+4%

Dry Beans

Researchers: Jorge Gonzalez Acosta and Wilberto Gonzalez Marrero

Organization: Ministry of Sugar, Camilo Cienfuegos Agricultural Enterprise

Location: Pedro Gonzalez Farm, Havana Province, Cuba

Planting date: October 15, 2006

Experimental design: A 1.86 hectare field was divided, and one part was treated with two applications of Vitazyme to evaluate its capability to increase yields.

Variety: unknown

Watering: rainfed

Soil type: unknown

Harvest date: February 15, 2007

1. Control

Fertilization: according to recommendations

Vitazyme application: 1 liter/ha on November 5, 2007 (20 days after planting), and another 1 liter/ha on December 30, 2006, 54 days later

Growing season observations: The Vitazyme treatment was noted to have the following benefits versus the control:

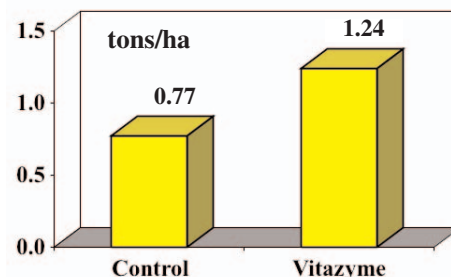
- More than 17 pods/plant, which was greater than the control
- More beans/pod
- Greater stalk vigor and diameter
- More rapid plant growth
- A greater number of leaves

2. Vitazyme

• **Increase in bean yield: 61%**

Conclusions: This Cuban dry bean study showed the great capability of Vitazyme to improve dry bean yield (+61%). Compared to both the control and the historical average yield, the growth of the plants and their yield were markedly improved. This simple, inexpensive treatment yields excellent economic returns for not only dry beans, but for all crops with which it is used in Cuba.

Dry Bean Yield



Dry Beans

Researchers: Jorge Gonzalez Acosta and Wilberto Gonzalez Marrero

Organization: Ministry of Sugar, Camilo Cienfuegos Agricultural Enterprise

Location: Crucero Aurora Coop, Havana Province, Cuba

Planting date: October 23, 2006

Experimental design: A 6 hectare field was divided, and one part was treated with a single application of Vitazyme to evaluate its capability to increase yields.

Variety: unknown

Watering: rainfed

Soil type: unknown

Harvest date: February 20, 2007

1. Control

Fertilization: according to recommendations

Vitazyme application: one treatment at 1 liter/ha on October 10, 2005, 20 days after planting

Growing season observations: The Vitazyme treatment was noted to have the following benefits versus the control:

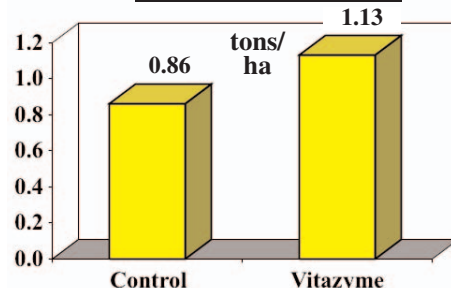
- More than 15 pods/plant, which was greater than the control
- More beans/pod
- Greater stalk vigor and diameter
- More rapid plant growth
- A larger root mass

2. Vitazyme

• **Increase in bean yield: 31%**

Conclusions: This Cuban dry bean study showed the great capability of Vitazyme to improve dry bean yield (+31%). Overall plant growth was enhanced by the product's active agents, caused by more leaf chlorophyll production and resultant greater energy capture.

Dry Bean Yield



Grapes (for wine)

Year Four of a Continuing Study

Researcher: John Broeker, and Richard Sauret, Vineyard Consultant

Location: San Miguel, California

Vineyard: Mondello Vineyards

Grape plant age: 6 years (third harvest)

Soil type: loam, high-calcium subsoil, low organic matter

Experimental design: A vineyard of grapes of equal age was partially treated with Vitazyme during the growing season to evaluate effects on grape yield and winemaking quality; all other treatments were identical. The same rows were treated as in previous years. Both treatments were to be evaluated for overall effects on grape and wine quality by following through the preharvest period, and on to the actual wine itself after fermentation and aging. Eventually a taste panel will evaluate the quality of the two wines after sufficient aging. Because of a light crop in 2006 no bunches were removed.

Irrigation: semi-dryland system: four times of deep irrigation (18 to 20 hours of drip irrigation) from mid-June to late August

Fungicides: applied as needed

Variety: Cabernet Sauvignon

Yield goal: 3.5 tons/acre

Grafting: none (self-rooted)

Row spacing: 12 x 6 feet

Plants/acre: 605

Irrigation: drip

Bunch thinning: no

Pruning: spur

Shoot trimming: yes

Continued on the next page

Fertilization: No $(\text{NH}_4)_2\text{SO}_4$ was used in 2007, but urea (low biuret) was added to the foliar spray. A 9-18-9 or 3-18-18 (+ micronutrients) was applied with urea every two to three weeks at 2 to 3 gallons/acre during much of the growing season, usually with sulfur after veraison. A blue-green algae solution was applied in the irrigation water periodically

Tillage: cover crop disked in

Vitazyme application: (1) 13 oz/acre with 9-18-9 fertilizer sprayed at bud break; (2) 13 oz/acre with 9-18-9 fertilizer + sulfur sprayed at BB-sized fruit; (3) 13 oz/acre with 9-18-9 fertilizer + sulfur sprayed at veraison; (4) 13 oz/acre 8 weeks before harvest (the end of August)

Harvest date: October 6, 2007

Vine growth: The researcher noted that there was more leaf and vine growth for the Vitazyme treated grapes, perhaps 30% more total leaf mass than for the control plants. An analysis of canes for the plants of the two treatments revealed more cane growth with Vitazyme application as well.

Leaf chlorophyll: On September 6, chlorophyll was determined on the two treatments using 30 leaves for each.

In-vineyard at-harvest grape and grape juice quality: Grapes from each treatment were randomly collected at harvest. These samples were crushed, and the juice was analyzed for brix (soluble solids, mostly sugars), total acidity, and pH at Baker Wine and Grape Analysis, Paso Robles, California.

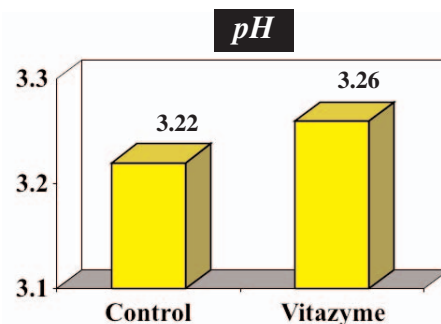
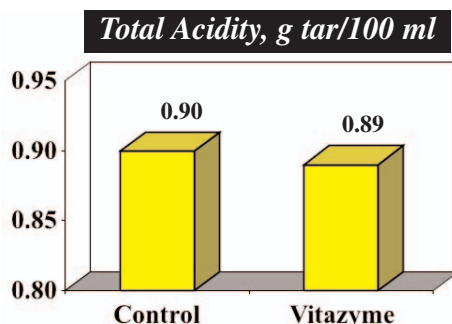
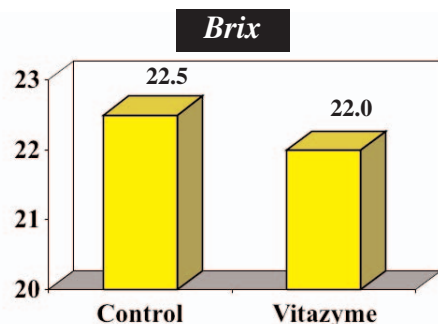


For the fourth year Vitazyme was applied four times to the right side of this vineyard, giving superior growth.



Notice how the treated grape bunch is much tighter, having more grapes and bunch weight. Yield increase was 27%.

Treatment	Leaf chlorophyll	Change
	SPAD units	SPAD units
1. Control	43.4	—
2. Vitazyme	45.4	+2.0



Differences in brix, total acidity, and pH were minor. **Remarkably, the higher yielding Vitazyme treatment did not produce grapes that were significantly lower in sugar content, showing the ability of the product to stimulate photosynthesis, carbon fixation, and mineral uptake to provide for the heavier grape load.** During the testing period it was obvious which grape sample was treated: the grapes were larger and the bunches fuller. During this very dry summer, Vitazyme enhanced water utilization and maintained grape fruit turgor pressure.

Grape juice quality at harvest: The grapes were harvested on October 6, 2007, and the juice was evaluated for chemical factors. Quality parameters were similar for both treatments.

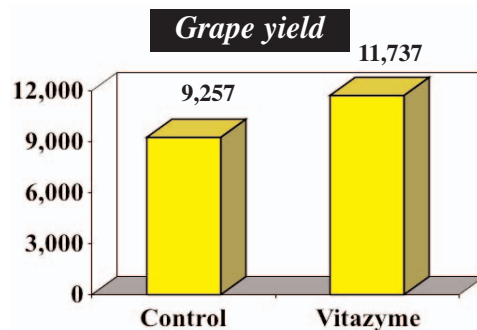
Treatment	GF	Brix	Total acidity	pH	Lactic acid	VA	Ammonia (NH_3)	Amino acid	Yeast active nitrogen	Malic acid	Tartaric acid	Potassium
	g/100 ml		gtar/ml		grams/liter	g acet/ 100 ml	ppm	ppm	ppm	grams/liter	grams/liter	ppm
Control	25	26.3	0.48	3.75	0.0	0.036	112	141	253	1.67	3.70	1,816
Vitazyme	27	27.2	0.48	3.79	0.0	0.038	99	146	245	1.82	3.59	1,912

Yield results: Grape yields were recorded for both treatments on the eastern end of the vineyard where soil characteristics were uniform. A border area between the treatments was avoided to remove possible product drift effects. Thinning had not been performed for any area, so Vitazyme effects were due to grape bunch number, bunch size, and grape size.

At the end of the growing season, on the day of first frost (December 4), there were more total foliage and actively synthesizing leaves for the Vitazyme treatment. See the table below:

Treatment	Total leaves	Green leaves
Control	Fewer leaves	Fewer leaves
Vitazyme	33% more leaves	About 20% more

With more green, photosynthesizing leaves remaining on the treated plants, they were able to fix more energy for plant growth the following year.



*Based on 605 plants per acre

Continued on the next page

Income results: Based on a \$1,200/ton value of the grapes, the extra 2,480.5 lb (1.24025 tons) of grapes produced \$1488.30 more income per acre.

Wine making: On October 6, 2007, a half ton of grapes from both treatments was picked and crushed, and that day the winemaking process began. See the schedule below for details.

October 6. The grapes were destemmed and cold soaked for 48 hours. During this time tartaric acid was added to raise the acidity to 0.7.

October 8. Yeast was added to the destemmed grapes, as well as yeast nutrient (diammonium phosphate, yeast cell walls, and other items), and Color Pro (an enzyme material to extract more color from the skins, and stabilize the color).

October 16. After 8 days of fermentation, the juice was pressed from the mash. At this point there was 3% sugar left. Malic acid bacteria were added at this point to convert the malic acid to lactic acid. The fermenting wine was then placed in stainless steel barrels. Each barrel yielded 148 gallons of juice per ton of grapes.

October 20. After 4 more days, half of the wine from each treatment was put in an identical oak barrel; the remaining wine was retained in a stainless steel barrel.

Conclusions for the fourth year: This was the fourth year that Vitazyme was applied to the same grape plants in this vineyard near San Miguel, California. The Cabernet Sauvignon grapes responded very well to the product, increasing in yield by 27%, the vines also significantly increasing in length and girth. They also had more photosynthesizing leaves after harvest, until the first frost in December. The yield increase was due to larger grapes in the treated area, and possibly more bunches, but the bunch numbers were not counted. In spite of the higher yield, the juice brix and quality were equivalent for the two wine batches. These two lots of wine from the Vitazyme and control treatments will be evaluated periodically throughout the coming year for quality and taste differences.

The yields for the three years of the study are as follows:

Treatment	2004 (Yr 1)		2005 (Yr 2)		2006 (Yr 3)		2007 (Yr 4)		Average	
	Yield	Change	Yield	Change	Yield	Change	Yield	Change	Yield	Change
-----tons/acre-----										
Control	1.565	—	2.994	—	2.980	—	4,628	—	3.042	—
Vitazyme	2.287	0.722 (+46%)	3.588	0.644 (+22%)	3.869	0.889 (+30%)	5.869	1.241 (+27%)	3.903	0.888 (+29%)

The first four years of this Cabernet Sauvignon vineyard study produced an average of 29% more grapes with Vitazyme applied four times during the growing season. With the wine from these two treatments being equivalent each year — by some opinions even favoring Vitazyme — there is every reason for the grape grower to utilize Vitazyme in his production system to greatly increase yield without decreasing wine quality.

• **Increase in SPAD units: 2.0**

• **Increase in grape yield: 27%**

• **Increase in grape income: \$1,488.30/acre**

Grapes (for raisins)

Year Five of a Continuing Study

Researcher: Jamie Hansen

Cooperating party: David Morgan, Tulare Ag Products, Tulare, California

Location: LDS Fresno Raisin Vineyard, Madera, California

Variety: Thompson seedless

Soil type: Very sandy to light clay

Irrigation: drip

Experimental design: This test is in its fifth year of a continuing raisin study that began in 2003. The study was designed initially to evaluate the effects of Ethrel and Vitazyme (plus other Tulare Ag products), alone or in combination, on the yield and quality of raisin grapes. In 2006, however, the study was modified to evaluate the best possible combinations of Ethrel and seaweed treatments on top of a background application of Vitazyme, potassium (Finisher 21), calcium (Cal Ocho 8%), and fulvic acid. Then, in 2007 the treatments were again modified to include a seaweed product (Excite), with or without Vitazyme. An 80-acre, 112-row raisin vineyard was divided into seven treatments on a replicated basis throughout the vineyard, with each treatment applied to rows in different areas of the vineyard to produce accurate results. Each treatment covered about 11 acres. All treatments had vines pruned to five or six canes.

Treatment	Excite 2-18-36	Excite 1-1-17	Vitazyme	Finisher 21	Cal Ocho 8%
	lb/acre	lb/acre	lb/acre		
1	4.5	0	16	X	X
2	4.5	0	0	X	X
3	8.0	0.5	0	X	X
4	0	2.0	0	X	X
5	0	0	16	X	X
6	0	1.0	16	X	X
7	0	1.0	0	X	X
Dates applied	5/2, 6/2 6/22	5/2, 6/2, 6/22	5/2, 6/2, 6/22	6/22	6/22

Fertilization: The whole vineyard received adequate N, P, and K in the irrigation well water. Some micronutrients were applied at specific times, including Cu and wettable S (April 2), Zn and B (May 2), and wettable S (June 22).

Vitazyme application: Vitazyme was applied foliar at 16 oz/acre, along with other materials, on May 2 (pre-bloom), June 2 (3.5 weeks post-bloom), and June 22 (verasion).

Excite application: This seaweed with an analysis of 2-18-36% N-P₂O₅-K₂O (Excite 2-18-

Continued on the next page

36) or 1-1-17 (Excite 1-1-17), was applied at 0.5, 1, 2, 4.5, or 8 lb/acre for the indicated treatments on May 2, June 2, and June 22.

Finisher 21 application: Finisher 21 is a 21% potassium (K₂O) formulation that was applied foliar at the recommended rate, along with other materials to all treatments on June 22.

Cal Ocho 8% application: Cal Ocho 8% is an 8% calcium formulation, with CaO and carbohydrates. It was applied foliar at the recommended rate with other agents to all treatments on June 22.

Gibberellin application: A single gibberellic acid application was made to the leaves at the recommended rate on May 9 (bloom stage), along with Pristine.

Weather conditions: The summer was very hot, reaching over 100° F many days.

Harvest date: August 25 to September 1

Yield results: The grapes were harvested by volunteer labor and placed on paper trays between the rows. After 3 to 4 weeks of drying they were picked up and delivered to the Sunmaid raisin packing plant.

The raisins were graded at the Sunmaid raisin plant, and all light and inferior raisins were removed. Those retained for yield results were grade B or better.



Thompson seedless grapes at the LDS Raisin Vineyard reveal a marked increase in bunch size and berry filling as a result of Vitazyme application. Sugars were also enhanced with the product.

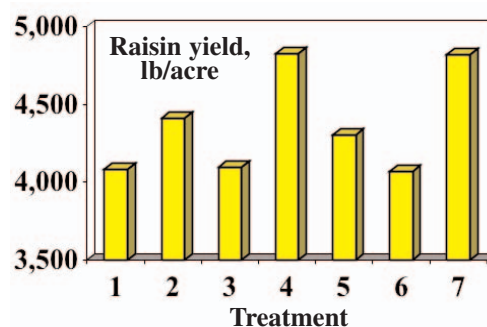
Raisin Yield

Treatment	Raisin yield ¹ lb/row	Raisin yield ² lb/acre	Yield change ³ lb/acre	%
1. Vitazyme + Excite 2-18-36 (4.5 lb)	1,459.4	4,086.3	—	
2. Excite 2-18-36 (4.5 lb)	1,575.0	4,410.0	+323.7 (vs. 1)	+8
3. Excite 2-18-36 (8.0 lb)	1,463.3	4,097.2	—	
+ Excite 1-1-17 (0.5 lb)				
4. Excite 1-1-17 (2.0 lb)	1,722.6	4,823.3	+2.3 (vs. 7)	0
5. Vitazyme	1,536.1	4,301.1	+214.8 (vs.1)	+5
			+233.5 (vs. 6)	+6
6. Vitazyme + Excite 1-1-17 (1.0 lb)	1,452.7	4,067.6	—	
7. Excite 1-1-17 (1.0 lb)	1,721.8	4,821.0	+753.4 (vs. 6)	+19

¹One row contained about 180 vines.

²One acre contained 2.8 rows.

³Compared to a control that is treated the same except for one variable.



Excite 1-1-17, at both the 1 and 2 lb/acre rates, gave nearly identical highest yields, followed by Excite 2-18-36 at the 4.5 lb/acre rate. Vitazyme provided the next highest yield, at 4,301.1 lb/acre, while combinations of Vitazyme and Excite, or of both Excite formulations, provided the lowest yields.

Raisin Quality

Treatment	Substandards % of total	Substand. change percentage points	B and B % of total	B and B change percentage points
1. Vitazyme + Excite 2-18-36 (4.5 lb)	2.4	—	81.1	—
2. Excite 2-18-36 (4.5 lb)	1.6	-0.8 (vs. 1)	79.5	-1.6 (vs.1)
3. Excite 2-18-36 (8.0 lb)	3.5	—	71.2	—
+ Excite 1-1-17 (0.5 lb)				
4. Excite 1-1-17 (2.0 lb)	2.7	+0.5 (vs. 7)	81.6	+5.0 (vs. 7)
5. Vitazyme	1.9	-0.5 (vs. 1)	80.2	-0.9 (vs. 1)
		-1.1 (vs. 6)		+4.9 (vs. 6)
6. Vitazyme + Excite 1-1-17 (1.0 lb)	3.0	—	75.3	—
7. Excite 1-1-17 (1.0 lb)	2.2	-0.8 (vs. 6)	76.5	+1.2 (vs. 6)

Conclusions: The interpretation of this raisin grape study for 2007 is rather difficult, in particular because all treatments in the vineyard received Vitazyme in 2006. The carryover effects of this product are well-known, so Treatments 2, 3, 4, and 7, while not receiving the product this year, nevertheless were affected by it.

Besides this difficulty, a comparison of Vitazyme alone (Treatment 5) with all of the other treatments carries with it the problem of comparing a non-nutrient biostimulant material with nutrient-containing seaweed formulations. Vitazyme works in part by making nutrients more available so by itself may reveal less growth response. Aside from these difficulties, it is apparent that Excite 1-1-17 at either the 1.0 or 2.0 lb/acre rate, applied three times, gave the highest yields. This seaweed formulation outperformed Excite 2-18-36 at the 4.5 lb/acre rate, or a combination of the two seaweeds (Excite 2-18-36 at 8.0 lb/acre + Excite 1-1-17 at 0.5 lb/acre). Vitazyme in combination with Excite 2-18-36 (4.5 lb/acre) or Excite 1-1-17 (1.0 lb/acre) produced yields less than the seaweed formulations at the same rate by themselves. Vitazyme alone produced a yield about average for the entire vineyard this year. Quality effects of the treatments showed no particular pattern, except that the two seaweed products together (Treatment 2), while producing one of the lowest yields, also produced the lowest B and B percentage and the highest level of substandard raisins.

It is of interest to know that Treatment 5 has received essentially the same

Continued on the next page

Cascade treatments each year for the past five years. A brief summary of 2003 to 2006 is given below.

It is instructive to note that, due to the unusual heat for part of the summer, the yields of grapes for 2007 were less than for any other year except 2006. During 2006, Vitazyme alone produced 4,110 lb/acre of raisins; Vitazyme + 1.0 or 2.0 lb/acre of Excite 2-18-36 gave somewhat lower yields: 3,844 and 3,721 lb/acre, similar to the yield depression in 2007. Only with Ethrel at 25% in 2006 did Excite 2-18-36 and Vitazyme combine to produce the highest yield (4,256 lb/acre).

There is an intricate interplay of growth regulators

within plants that is very difficult, if not impossible, to understand completely. Excite contains cytokinins, while Vitazyme contains brassinosteroids, triacontanol, glycosides, B Vitamins, and enzymes. Nutrient additions further affect not only the production of native growth regulators but also influence the effects of applied growth regulators.

Thus, based upon the results of two successive years of highly stressed midsummer growing conditions, it may be said that Vitazyme together with the rate of seaweed in these studies do not tend to improve grape yield. Excite 1-1-17 at 1.0 or 2.0 lb/acre three times a year shows promise for improving yields. These treatments applied in 2007 ought to be applied once again in 2008 to see, once the carryover effects of Vitazyme for all areas are reduced, if these results will be repeated.

Year	Design	Findings
yields in lb/acre		
2003	Comparison of Vitazyme with Ethrel	16% more raisins with Vitazyme (5,355 lb vs. 5,054 lb) Slightly more sugar with Ethrel (+0.7% at harvest)
2004	Comparison of Vitazyme with Ethrel and K	Vitazyme with K (5,854 lb) gave a 46% increase above the control (4,007 lb); Ethrel (4,7575 lb) gave a 19% increase while Vitazyme + Ethrel + K (5,220) gave only a 30% increase above the control. Vitazyme + K had the highest sugar (+0.8 at harvest)
2005	Comparison of Vitazyme with Ethrel and K, Ca, and fulvic acid	Vitazyme + nutrients (5,685 lb) gave the highest yield, 20% above the untreated control, while Ethrel alone (4,764 lb) gave a 2% increase. Ethrel combined with nutrients (5,130 lb) increased yield by 10%, and all inputs together (5,574 lb) gave a 20% increase. Ethrel gave a slightly higher (+0.4%) sugar than the control; Vitazyme was 0.5% less.
2006	Vitazyme and Ca, K, and fulvic acid over all areas, with 1 or 2 lb/acre rates of Excite 2-18-36, and 25, 50, and 100% rates of Ethrel	Vitazyme + 25% Ethrel + 1 lb Excite (4,256 lb) gave the highest yield (+15%); other treatments were variable in response. Vitazyme + 25% Ethrel gave the highest B and B%

Oranges

Introduction: In 2006 a series of six studies of Vitazyme on oranges was initiated. These were coordinated by Jody Wollenman of Monte Vista Ranches, Lindsay, California, who separated the six blocks into half treated and half untreated; all other treatments and practices of the two halves of each block were the same. The objective of the studies was to determine if Vitazyme could increase the yield, quality, and profitability of oranges.

Location	Variety	Leaf chlorophyll ^a		
		Control	Vitazyme	Change
		SPAD units	SPAD units	SPAD units
Survivor's Trust No. 3	Washington	76.2	76.8	+0.6
Survivor's Trust No. 2	Washington	77.6	80.4	+2.8
Wollenman Farms 41	Late Lane	72.5	76.6	+4.1
McCord Ranch	Fukumoto/Carrizo	79.2	82.0	+2.8
Ruth Wollenman	Frost Nucellar	68.7	71.7	+3.0
Wollenman Farms, Sieta	Washington	74.3	77.5	+3.2
Average		74.8	77.5 ^b	+2.7
— Analysis of Variance using locations as replicates —				
— Student-Newman-Keuls Test —				
Block P	0.0005***			
Main effects P	0.0021**			
Model P	0.0005***			
Root Mean Square Error	0.819			
Coefficient of variation	1.08			
LSD (0.05)	1.2 SPAD units			

^aDetermined by averaging the Minolta SPAD Meter values on 30 representative leaves from similar positions on several trees from the same sunlight aspect, for each treatment (such as all from the south side for the two treatments, or all from the north side).

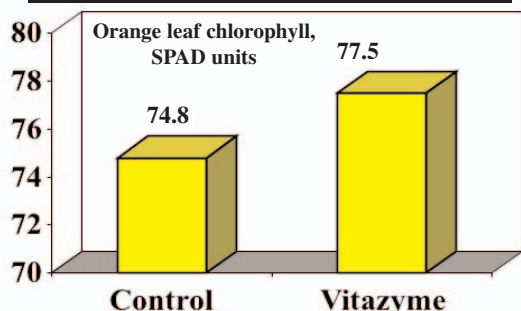
^bSignificantly greater than the control at P = 0.05 according to the Student-Newman-Keuls Test.

According to the researcher, only two of the six blocks were able to have their yields harvested and recorded separately. Due to the major freeze of 2007, the packing house through which he shipped was required to jump around within many of the treated and control blocks, harvesting the least frost-affected fruit so that the buyers would receive only fruit not affected by the frost. Then, once these areas were harvested, the pickers moved to areas more affected by the frost until finally the most frost-affected areas were picked.

As the researcher said, "Because of this [skipping around during harvest] the packing house could not separate the control from test blocks on three out of our five locations. Of these, I can only report what I visually observed, which was quite encouraging." One of the six blocks, having an early variety called Early Fukumota Naval, was reported in the *Vitazyme 2006 Field Trial Results*.

On August 23, 2006, the six orange blocks were evaluated for chlorophyll content and overall responses to Vitazyme. The chlorophyll content of all six blocks, and a statistical analysis, is indicated on the left. *Continued on the next page*

Average Leaf Chlorophyll, Six Sites



• **Increase in leaf chlorophyll: 2.7 SPAD units**



Frost Nucellar oranges grown near Lindsay, California, were larger and better colored in this sample harvested in February of 2007.



Vitazyme treated Washington Navel oranges produced very well in 2007, increasing the yield per acre of cartons by 8%.

The number of cartons per acre was increased a remarkable 50% by Vitazyme, and even though they were somewhat smaller the much greater number far exceeded the control area production to give an overall high income increase.

Income results: The price for the oranges depended on size, larger fruit being of more value in the market.

Treatment	Yield	Price	Net return	Change
	cartons/acre	\$/carton	\$/acre	\$/acre
Control	435	13.69	5,955	—
Vitazyme	635	11.02	6,998	+1,043

Fruit quality was improved greatly by Vitazyme, producing the following effects:

- No "puff"
- Few split fruit
- Few dropped fruit

Production was dramatically increased, by 50% above the untreated area, and though the fruit was smaller — with lower value — there was a dramatic increase in income of \$1,043/acre for the treated area. These results display the great value of Vitazyme for growing oranges in California.

Orange Block 1 (03 - GAE)

Researcher: Jody Wollenman, Monte Vista Ranches

Location: Lindsay, California

Rootstock: trifoliate

Production history: poor quality fruit

Soil type: unknown

Tree spacing: 18 ft x 16 ft

Experimental design: This 19.5 acre block of oranges was divided into a 10-acre untreated and a 9.5-acre Vitazyme treated area to determine the product's effects on orange yield, quality, and income.

1. Control

2. Vitazyme

Fertilization: No soil nitrogen was applied in 2006, but potassium and phosphorus were applied by drip irrigation on May 4 (5 gal/acre of a 0-15-15% N-P₂O₅-K₂O) and on July 10 (5 gal/acre of a 0-10-20% N-P₂O₅-K₂O), for a total of about 12 lb/acre of P and 16 lb/acre of K.

Vitazyme application: (1) Foliar at bloom at 16 oz/acre (April 25, 2006); (2) soil applied by drip irrigation at 16 oz/acre (August 25, 2006); (3) soil applied by drip irrigation at 16 oz/acre (October 31, 2006); (4) soil applied by drip irrigation at 16 oz/acre (January 30, 2007)

Growth observations: The Vitazyme treated area of the block showed more vigorous growth and darker green leaves, having more chlorophyll (3.0 SPAD units).

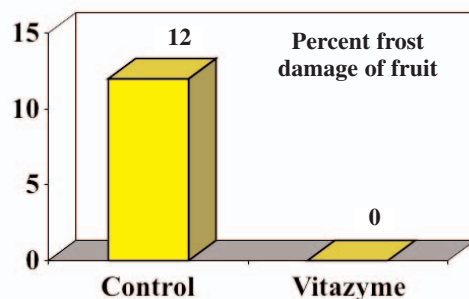
Yield results: Both blocks were harvested over the period of February 13 to March 3, 2007.

Quality results: See the table to the right.

Fruit damage: A severe frost hit the orange growing regions of the San Joaquin Valley in January of 2007. The extra sugar content and fruit toughness on the treated side of the block stopped any frost damage, while the untreated control suffered considerable frost damage.

Yield results:

Quality parameter	Control	Vitazyme
"Puff" in fruit skins	some	none
Split fruit	many	few
Dropped fruit	much	little
Fruit size	88/carton	98/carton



Treatment	Area	Bins	Total	Cartons	Average size	Cartons
	acres	bins	cartons	Per acre	Change	per tree
Control	10.0	189	4,347	435	—	3.2
Vitazyme	9.5	262	6,028	635	200 (+50%)	4.2 (+31%)

• **Increase in cartons per acre: 50%**

• **Increase in cartons per tree: 31%**

Conclusions: This orange study with Vitazyme showed the great utility of the product to improve leaf chlorophyll (and thus photosynthesis) and nutrient uptake, increasing the sugar content of the leaves and fruit to reduce the freezing point and eliminate frost damage. This effect was most important for a year when frost damage was common for oranges during a January hard freeze.

• **Increase in income: \$1,043/acre**

Continued on the next page

Orange Block 2 (02 - SIE)

Researcher: Jody Wollenman, Monte Vista Ranches

Rootstock: rough lemon

Production history: poor fruit quality

Frost control: wind machines

Experimental design: This 38.5-acre block of oranges was divided into 14 acres treated with Vitazyme (south side) and 24.5 acres left untreated (north side). The study was designed to evaluate yield, quality, and profitability of orange production.

1. Control

Fertilization: No soil nitrogen was applied in 2006, but potassium and phosphorus were applied by drip irrigation on May 4, 2006 (5 gal/acre of a 0-15-15% N-P₂O₅-K₂O), and on July 10 (5 gal/acre of a 0-10-20% N-P₂O₅-K₂O), for a total of about 12 lb/acre of P and K.

Vitazyme application: (1) Foliar at bloom, 16 oz/acre (May 16, 2006); (2) foliar later, 16 oz/acre (August 8, 2006); (3) soil applied by drip irrigation, 16 oz/acre (October 26, 2006); (4) soil applied by drip irrigation, 16 oz/acre (January 30, 2007)

Growth observations: The Vitazyme treated area of the block revealed excellent growth and more leaf chlorophyll, by 3.2 SPAD units.

Quality results: See the table below.

Quality parameter	Control	Vitazyme
Color of fruit	Above average	Average
Fruit shape	Very round	Some misshapen

The number of cartons per acre was increased by a sizable 8% with Vitazyme, and the increase in cartons per tree by 6% due to more fruit produced per tree.

Income results: The price for the fruit depends on its size, so the larger control fruit netted more per carton in the market.

Treatment	Yield	Price	Net return	Change
	cartons/acre	\$/carton	\$/acre	\$/acre
Control	1,055	12.31	12,987	—
Vitazyme	1,142	11.95	13,647	660

• Increase in income: \$660/acre

Location: Lindsay, California

Age of trees: 70 years

Soil type: unknown

Variety: Washington Navel

Watering: drip irrigation

Tree spacing: 22 ft x 20 ft

2. Vitazyme

Yield results: Both blocks were harvested over the period of March 12 to March 26, 2007.

Treatment	Area	Bins	Cartons			Average size	Cartons per tree
			Total	Per acre	Change		
	acres	bins	cartons	--- cartons/tree ---		oranges/carton	cartons/tree
Control	24.5	1,124	25,852	1,055	—	80	10.8
Vitazyme	14	695	15,987	1,142	87 (+8%)	88	11.4 (+6%)

• Increase in cartons per acre: 8%

• Increase in cartons per tree: 6%

Conclusions: This orange grove near Lindsay, California, showed how Vitazyme can increase the fruit quality (better color and rounder) and numbers versus the untreated control. With more photosynthesis and nutrient uptake capacity the trees were able to support a larger fruit load (1,142 versus 1,055 cartons/acre), giving an overall increased income of \$660/acre.

Orange Block 3 (01-41)

Researcher: Jody Wollenman, Monte Vista Ranches

Age of trees: 10 years

Frost control: wind machines

Experimental design: This orange block of 10 acres was divided into equal portions, half treated with Vitazyme and half left untreated. The objective of the study was to evaluate the product's effects on orange quality, yield, and profits..

Fertilization: No soil nitrogen was applied in 2006, but potassium and phosphorus were applied by drip irrigation on May 4, 2006 (5 gal/acre of a 0-15-15% N-P₂O₅-K₂O), and on July 10, 2006 (5 gal/acre of a 0-10-20% N-P₂O₅-K₂O), for a total of about 12 lb/acre of P and 16 lb/acre of K.

Vitazyme application: (1) Foliar at bloom at 16 oz/acre (May 16, 2006); (2) foliar at bloom at 16 oz/acre (July 12, 2007); (3) soil applied by drip irrigation at 16 oz/acre (October 11, 2006); (4) soil applied by drip irrigation at 16 oz/acre (January 31, 2007)

Growth observations: The Vitazyme treated area had superior growth, including more leaf chlorophyll (4.1 SPAD units).

Yield results: Both blocks were harvested from March 20 to May 4, 2007.

Yield and conclusions:

"Due to the freeze of 2007, our packing company was unable to keep the picking separate. However, what I did observe was that **the Vitazyme applied block had an obvious increase in production which was noticeable up to the exact row of application. With this variety of 'late' navels this is extremely exciting since it tends to alternate bear, with sizes that grow too large. The larger the crop, the smaller the orange.**"

Pears

Researchers: Agr, Assistance

Tree age: 15 years (full-bearing)

Experimental design: A pear orchard was divided into Vitazyme treated and untreated portions, with the objective of determining whether or not this product could change fruit yield and quality.

1. Control

Fertilization: unknown

Vitazyme application: 16 oz/acre at pink, bloom, petal fall, and first cover using 100 gallons/acre at 3 mph

Weather for 2007: warm and near-record dry, with 8 to 10 inches of rainfall during

2. Vitazyme

Location: Wayne County, New York

Rootstock: unknown

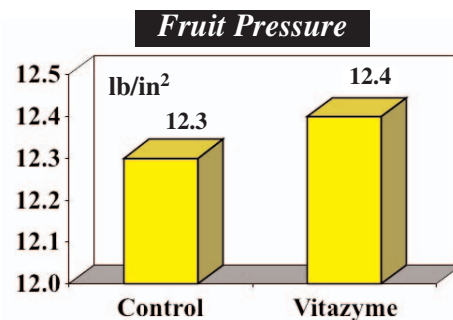
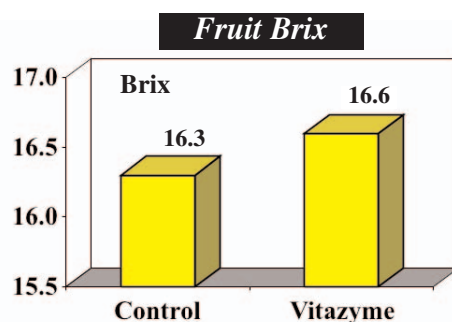
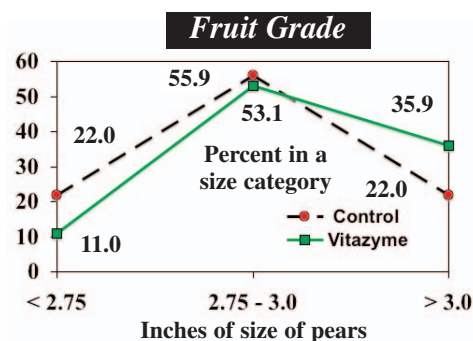
Variety: Bosc

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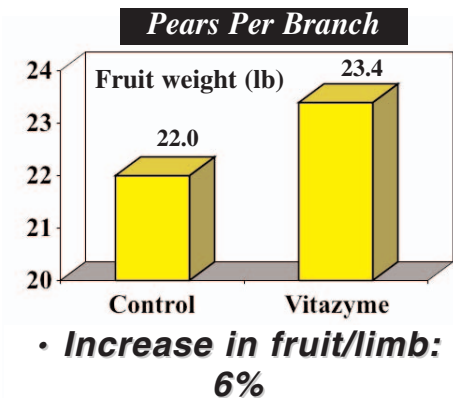
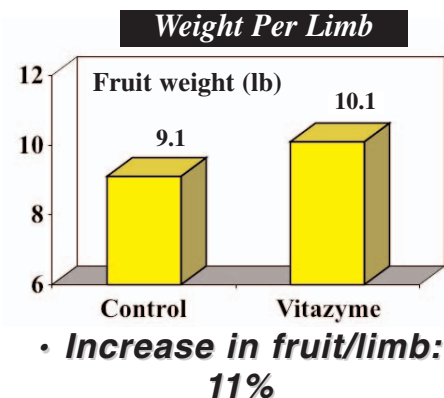
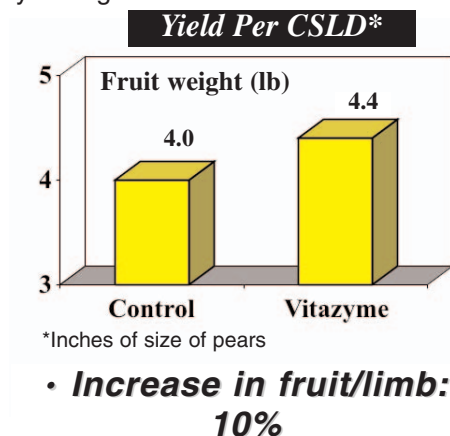
the April to September growing season

Collection of results: On September 27, seven typical limbs for each treatment were selected and evaluated.

Fruit quality: Brix and fruit pressure were measured for 10 pears per branch (rep).



Vitazyme produced fruit that was larger (35.9 vs. 22.0% fruit greater than 3.0 inches), and contained more sugars and slightly stronger fruit cells.

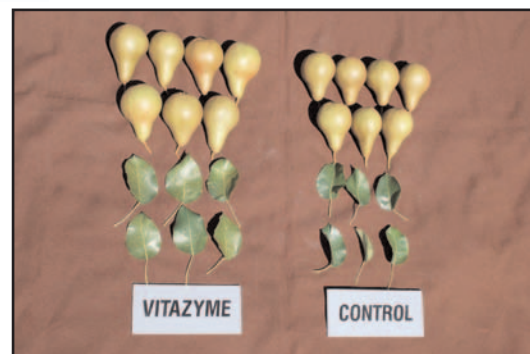


Fruit yield: Vitazyme improved all fruit yield parameters, including fruit weight per limb (+11%), yield per CSLD (+10%), and pear number per branch (+6%).

Conclusions: According to the researcher,

“There was a trend toward larger fruit size in the Vitazyme treatment (7.1 oz/fruit) compared to the untreated standard (6.6 oz/fruit) — and a corresponding increase in the percentage of harvested fruit over 3.0 inches in diameter (35.9% vs. 22%). The Vitazyme program also increased soluble solid levels by 0.3 brix despite the high soluble solid levels which were produced this very sunny growing season.

One of the largest commercial challenges to growing Bosc pears is maintaining good return cropping levels, so a return bloom evaluation will be made at this trial site in the spring of 2008.”



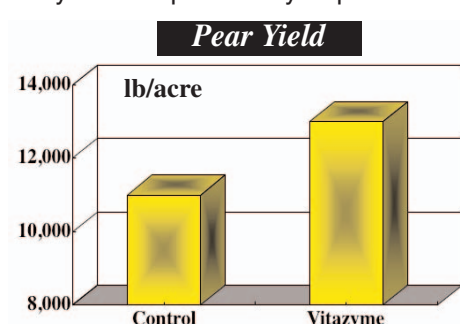
The Vitazyme treated pears are larger and sweeter, coming from trees having larger leaves containing more chlorophyll.

Pears

Researcher: Randy Paddock, Paddock Agricultural Services

Location: Appleton, New York (Singer Farms)

Experimental design: A pear orchard was divided into a Vitazyme treated portion and a normally treated portion (balance of the area). The entire field was similar in soil fertility. The purpose of the study was to determine the effect of Vitazyme on the yield and profitability of pears.



Fertilization: 100 lb/acre of muriate of potash (0-0-60% N-P₂O₅-K₂O) applied in early spring, plus a foliar spray of zinc and boron at bloom

Vitazyme application: 24 oz/acre sprayed on the leaves 7 days after petal fall, 17 days after petal fall, and 30 days after petal fall

Yield results: Harvest weights were made for each treatment and are given in the table below.

Treatment	Yield	Increase
	lb/acre	lb/acre
Control	11,000	—
Vitazyme	13,000	2,000 (+18%)

It is clear that Vitazyme produced a dramatic response in this pear study, increasing yield by 18% above the control.

Income results: The increased 2,000 lb/acre of

Continued on the next page

pears, at \$0.22/lb., resulted in a greater return from Vitazyme of \$440.00/acre.

Conclusions: This pear study with Vitazyme near Lake Ontario in New York shows the potential of the product to improve pear yield. Presumably the increased photosynthesis and overall plant metabolism, stimulated by the product's active agents, especially in triggering rhizosphere activity, enabled a greater fixation of carbon and uptake of nutrients by the trees.

• **Increase in pear yield: 18%**

• **Increase in pear income: \$440/acre**

Peppers

A Testimonial

Farmer: Michael Prochko

Varieties: sweet, hot, and other varieties

Spacing: double rows spaced 5 feet

Mulching: plastic mulch over rows

Experimental design: The farmer applied a special fertility program plus Vitazyme over the entire 4.0-acre pepper area. He compared this program to previous years' results with the same cropping system.

Fertilization: added sulfur, high-calcium lime, boron, zinc, manganese, and copper

Vitazyme application: 13 oz/acre to the leaves and foliage at intervals

Weather: erratic, with a drought until late July, and then good moisture

Yield and quality results: All varieties yielded excellently, the Excursion variety producing many peppers of 1.25 lb! The hot and pablano peppers were exceptionally large and prolific, with a rapid turnover of the new fruit after picking. There were more peppers produced than he could market this year with the Vitazyme program.

Conclusions: Vitazyme in this pepper production system in Ohio produced large numbers of very sizable and tasty fruit. The product enabled the plants to make optimum use of the native and applied plant nutrients.

Potatoes

Researcher: Sergei Velichko and Zhenya Moskalov

Location: Dnepropetrovsk, Agro Oven, Ukraine

Planting date: April 30, 2007

Soil type: mollisol

Experimental design: A field was divided into a Vitazyme treated and untreated area to determine the effect of the product on increasing tuber yield. Another product, called Amcolon B, a fertilizer, was added to Vitazyme to evaluate a possible synergism.

Organization: Agrimatco – Ukraine, Kiev, Ukraine

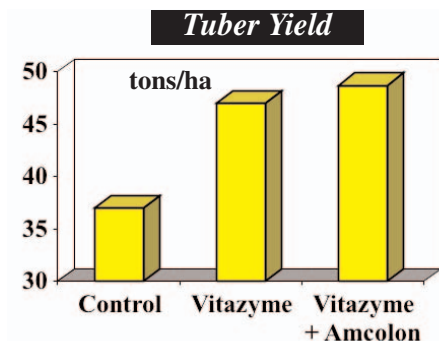
Variety: Sante

Watering: center-pivot irrigation

Planting rate: unknown



In a Ukraine irrigated production field, this trial revealed how greatly Vitazyme triggered greater leaf and stem growth, resulting in a higher tuber yield.



1. Control

2. Vitazyme

3. Vitazyme + Amcolon

Fertilization: autumn of 2006, 300 kg/ha of 16-16-16% N-P₂O₅-K₂O; spring of 2007, before planting, 150 kg/ha of 16-16-16% N-P₂O₅-K₂O

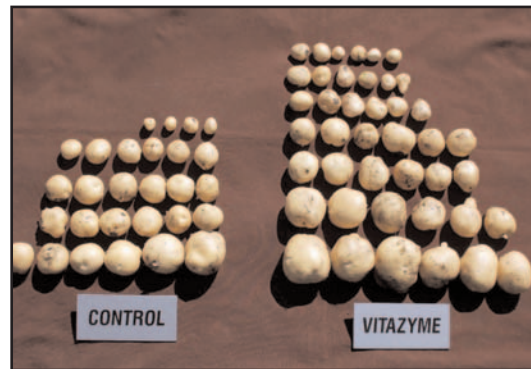
Vitazyme application: three foliar treatments of 1 liter/ha each time: (1) bud formation; (2) flower initiation (25 days after the first application); (3) four weeks before harvest, on August 23, 2007

Amcolon application: A 30-0-22.5-3.5 (Mg)-1.5 (B) + TE product (applied with Vitazyme at an unknown rate)

Harvest date: September 28, 2007

Yield results: See the table to the right

Conclusions: In this Ukrainian potato trial using Vitazyme and Amcolon B, the beet yield responded very well to Vitazyme with a 27% yield increase. Amcolon B increase yield an additional 5%. This added yield substantially increased production and profits for this potato grower.



This white potato variety in Ukraine responded to Vitazyme treatment with markedly greater tuber numbers that were larger and more uniform.

• **Increase in tuber yield: 27%**

Treatment	Yield tons/ha	Yield change tons/ha
1. Control	37.0	—
2. Vitazyme	47.0	10.0 (+27%)
3. Vitazyme + Amcolon	48.7	11.7 (+32%)

Potatoes

A Quality Study

Farmer: confidential

Variety: Russet Burbank

Soil parameters: Results of four analyses in different sectors of the field: exchange capacity, 4.71 to 5.66 meq/100 g; pH, 6.4 to 6.7; organic matter, 1.3 to 1.6%; N, 46 to 52 lb/acre; SO₄-S, 20 to 32 lb/acre; P₂O₅, 702 to 849 lb/acre; Ca, 1,108 to 1,416 lb/acre; Mg, 226 to 284 lb/acre; K, 200 to 394 lb/acre; Na, 37 to 69 lb/acre; B, 1.16 to 1.34 lb/acre; Fe, 812 to 1,008 lb/acre; Mn, 136 to 216 lb/acre; Cu, 2.6 to 5.0 lb/acre; Zn, 47.6 to 57.0 lb/acre; percent base saturations for Ca (56 to 63%), Mg (20 to 21%), K (5 to 9%), Na(5%), H (5 to 9%).

Row width: 36 inches

Planting date: April 20 to April 23

Experimental design: A potato field was divided into Vitazyme treated and untreated areas, with the objective of evaluating the effects of the product on tuber quality and yield.

Location: Hancock, Wisconsin

Soil texture: loamy sand

Plant population: unknown

Harvest date: unknown



In Wisconsin, the Vitazyme treated tubers of this variety are clearly more uniform than for the control, and the tuber number is greater, giving 4% more usable yield.

1. Control

2. Vitazyme

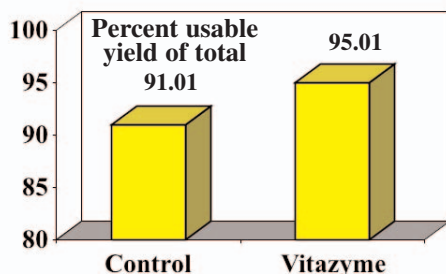
Fertilization: All areas received the following: 2,000 lb/acre 80-89 grade lime, 500 lb/acre 0-0-60% N-P₂O₅-K₂O, 586 lb/acre 7-28-14-5.4-2.2-1.23-1.55-1.15% N-P₂O₅-K₂O-S-Ca-Mg-B-Zn, 0.5 lb/acre B, 428 lb/acre (NH₄)₂SO₄, 322 lb/acre urea, 500 lb/acre Cal-Sul, 5 lb/acre 0-50-30-5-1% N-P₂O₅-K₂O-Ca-Mg, 5 lb/acre 20-20-20% N-P₂O₅-K₂O, 20 ga/acre 18-0-0-5-1% N-P₂O₅-K₂O-Ca-Mg. In addition, the Vitazyme treatment received a total of 4 lb/acre MgSO₄ and 6.25 lb/acre Beau-Ron (B).

Vitazyme application: (1) 13 oz/acre on May 17, and (2) 13 oz/acre on June 27

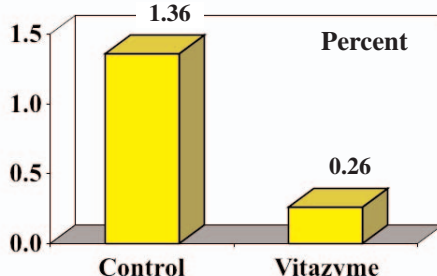
Weather conditions: a very warm and dry mid-summer period

Tuber quality: About 700 to 850 pounds of tubers were sampled per treatment, and half of this weight was graded.

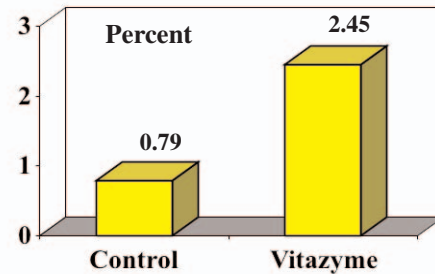
Usable Yield



Hollow Heart



Soft Rot



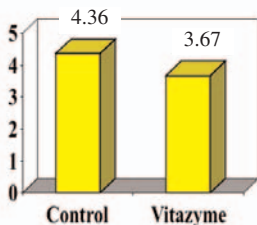
• **Increase in usable yield:**
4.0 percentage points

• **Reduction in hollow heart:**
1.10 percentage point

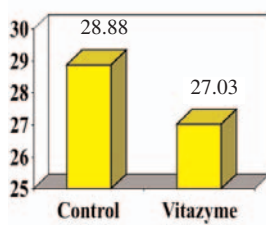
• **Increase in soft rot:**
1.66 percentage point

Tuber Size Distribution

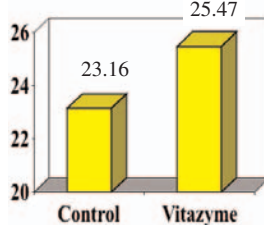
Smalls, %



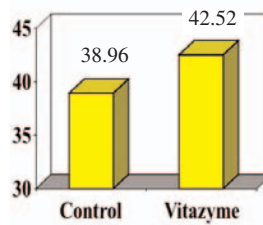
> 10 oz, %



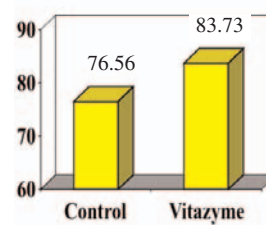
7 to 10 oz, %



Minimum to 10 oz, %



U.S. No. 1, %



Vitazyme improved all of the quality parameters noted here, including usable yield, hollow heart, soft rot, and size distribution of the tubers. Of special note is the increase in number of U.S. number 1 grade tubers (7.17 percentage points more).

Increase in Large Tubers With Vitazyme

7 to 10 oz.....+2.31 percentage points
Min. to 10 oz.....+3.56 percentage points
U.S. No. 1.....+7.17 percentage points

Reduction in Small Tubers With Vitazyme

Small.....-0.69 percentage point
>10 oz.....-1.85 percentage points

Continued on the next page

Yield results: A truck collected the tubers from a measured row length, and the load was weighed.

Treatment	Total yield	Usable yield	Usable yield	Yield change
	cwt/acre	%	cwt/acre	cwt/acre
Control	568	91.01	516.9	—
Vitazyme	562	95.01	534.5	17.5 (+3%)

• **Increase in usable yield: 4%**

Conclusions: This north central Wisconsin potato trial revealed that Vitazyme, together with $MgSO_4$ and additional boron, produced superior potatoes and 3% more usable tubers. Of this improved usable yield, there were 7.17% more U.S. number 1 grade tubers, and more 7 to 10 oz and minimum to 10 oz sizes. Besides, there was a reduction in small tubers, and those less than 10 oz. Percent usable yield was 4.0 percentage points higher, hollow heart (caused by boron deficiency) was reduced by 1.1 percentage points, and soft rot was decreased by 1.66 percentage points. This program caused a definite improvement in production and quality.

Rice

Effects of Vitazyme with reduced nitrogen levels

Researcher: Le Nhu Kieu

Location: Viet Nam

Few details of this study are known except for the levels of fertilization. Several farmers were involved in testing Vitazyme with different levels of nitrogen in two soil areas — an “infertile” area, and a “fertile” alluvial area — in both large and small-scale settings, and applying the product one, two, three, or four times for the small plot studies. Only the yield was determined at different nitrogen levels.

“Infertile” Soil

A. Small Area

Results were inconclusive, so are not presented here.

B. Large Area

Treatment	Vitazyme	Nitrogen	Phosphorus	Potassium
	liters/ha	kg/ha N	kg/ha P_2O_5	kg/ha K_2O
1	0	80 (100%)	60	80
2	1.5	40 (50%)	60	80

Yield results:

Treatment	Farmer*/Yield					Average**	Change
	A	B	C	D	E		
	kg/ha						
1	4,217	3,667	3,290	3,895	4,120	3,838 b	—
2	4,275	3,727	3,408	4,200	4,381	3,998 a	160 (+4%)

*A, Duong Van Chuyen (1,500m², cv. Khang dan); B, Cao Thi Hai (2,110 m², cv. Huong thom); C, Pham Nguyet Ha (2,102 m², cv. Huong thom); D, Doan Thi Phu (2,308 m², cv. Khang dan); E, Le Thi Phung (2,400 m², cv. Khang dan).

**Means followed by the same letter are not significantly different at P=0.05 according to the Student-Newman-Keuls Test.

Statistics using locations as replicates	
Block P value	0.0014**
Main effect P value	0.0361*
Model P value	0.0018**
Coefficient of variation	2.09%
LSD _{0.05}	143 kg/ha
(Student-Newman-Keuls Test)	

• **Increase in yield with Vitazyme at 50% N: 4%**

Conclusions: On these “infertile” soil sites, the small plots gave reasonable yield responses from Vitazyme despite reductions in nitrogen from 30 to 70%. However, the small plot study lacked a 100% nitrogen + Vitazyme control. There also appeared to be some variability in soil fertility amongst the small plots, as evidenced by the uneven yields in the four check plots. Additionally, it is possible that there were migrating influences of Vitazyme and fertilizers in these small plots, as sometimes occurs when small plots are very close together. For these reasons, minimal value should be placed on the data from this experiment.

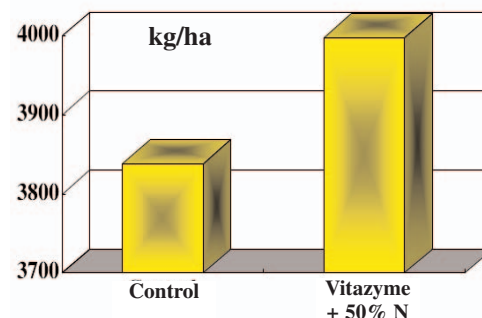
The large area tests, on the other hand, gave excellent responses to Vitazyme with only 50% of the usual nitrogen. Despite this major reduction in nitrogen application (by 50%), the Vitazyme treatments produced an average of 4% more yield. This increased utilization of nitrogen with Vitazyme is typical of the response gained on other crops besides rice, enabling the farmer to obtain equal or greater yields while reducing costly nitrogen applications by 20 to 50%.

“Fertile” Alluvial Soil

A. Small Area

Results were inconclusive, so are not presented here.

Rice Yield

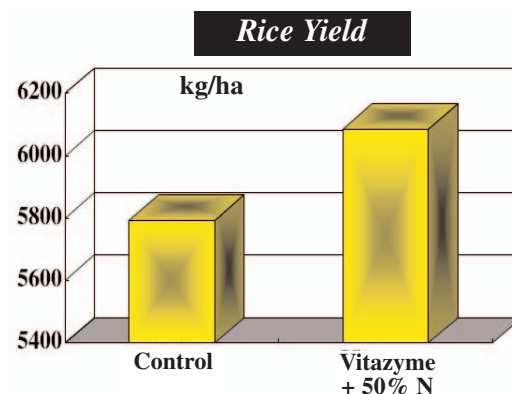


B. Large Area

Treatment	Vitazyme	Nitrogen	Phosphorus	Potassium
	liters/ha	kg/ha N	kg/ha P ₂ O ₅	kg/ha K ₂ O
1	0	90 (100%)	60	80
2	1.5	45 (50%)	60	80

Yield results: All fields used the variety Q5.

Farmer	Area of test	Control*	Vitazyme*
	m ²	kg/ha	kg/ha
Trinh Van Khoan	1,260	5,590	6,563
Nguyen Thi Hong	720	6,092	5,844
Tran Thi Hien	540	6,195	5,731
Do Thi Hop	180	5,631	5,428
Nguyen Van Hieu	540	5,699	5,387
Tran Van Dien	360	6,099	5,610
Vu Thi Bac	720	5,075	5,704
Nguyen Thi Kien	360	5,900	5,844
Nguyen Thi Nghia	360	5,764	6,379
Nguyen Thi Hoa	540	5,590	6,300
Tran Van Huan	720	5,780	6,626
Trinh Van Chu	1,152	6,269	6,481
Trinh Van Toan	360	5,893	6,300
Vu Van Tuan	360	5,741	6,242
Nguyen Van Tien	540	5,695	6,226
Nguyen Thi Thue	360	5,670	6,105
Mean		5,793 b	6,048 a
Change		—	255 (+4%)
Statistics using locations as replicates			
Block P value	0,43		
Main effect P value	0.05*		
Model P value	0,30		
Coefficient of variation	5.76%		
LSD _{0.05}	257 kg/ha (Student-Newman-Keuls Test)		
*Means followed by the same letter are not significantly different at P=0.05 according to the Student-Newman-Keuls Test.			



• Increase in yield with Vitazyme at 50% N: 4%

Conclusions: As for the “infertile” soil area tests, the small plots in the “fertile” soil did not give positive results in boosting rice yield with Vitazyme when nitrogen was reduced by 30 to 70%. The reasons for this are not clear, but may be related to the migration of Vitazyme’s active agents and fertilizers from plot to plot when the treatments are placed in close proximity to one another. See the comments in the previous section as well.

However, with the larger plots the yield of rice treated with Vitazyme + 50% of the high

nitrogen level increased significantly (P=0,05). This increase was 4% above the untreated control. Because such an excellent yield response was gained while reducing nitrogen fertilizer, the obvious benefits for farmers and the entire nation are readily apparent. Great savings in fertilizer cost and increases in grain sales provide the most ideal combination for Viet Nam to prosper in the age of modern agriculture.

Income results: Using the price of rice at \$350/metric ton, and the cost of urea at \$450/metric ton (or \$1.00/kg of nitrogen), the following calculations are made.

Treatment	Yield	Grain value	Increase in value	Nitrogen rate	Nitrogen cost	Nitrogen savings	Increased income with Vitazyme
	tons/ha	\$/ha	\$/ha	kg/ha	\$/ha	\$/ha	\$/ha
“Infertile” Soil							
Control	3.838	1,343.30	—	80	80.00	—	—
Vitazyme	3,998	1,399,30	56.00	40	40.00	40.00	96.00
“Fertile” Alluvial Soil							
Control	5.793	2,027.55	—	90	90.00	—	—
Vitazyme	6.048	2,116.80	89.25	45	45.00	45.00	134.25

Increased income with Vitazyme using 50% nitrogen fertilizer

- ❑ “Infertile” soil area: \$96.00/ha
- ❑ Alluvial soil area: \$134.25/ha

Rice

Researcher: Roberto Alvarez, Deputy Director

Location: Antonio Rojas Cooperative Farm, Hector Molina Sugar Enterprise, Cuba

Experimental design: A rice field of 0.5 ha was treated with Vitazyme and compared to an untreated field alongside to evaluate effects on rice yield.

Variety: unknown

Planting date: unknown

1. Control

2. Vitazyme

Fertilization: unknown

Vitazyme application: seed soaking of 5% Vitazyme for 48 hours, plus 1 liter/ha 32 days after planting

Yield results:

Treatment	Yield	Change
	tons/ha	tons/ha
Control	2.72	—
Vitazyme	5.55	2.83 (+104%)

Conclusions: This commercial rice test in Cuba revealed that a 5% seed soak plus 1 liter/ha additional Vitazyme increased grain yield by 104%. The product's active agents presumably allowed the plants to make better use of soil nitrogen and other nutrients, and increase crop yield accordingly. Vitazyme is shown to be an excellent adjunct to rice culture in Cuba.

• Increase in rice yield: 104%

Roses

Researcher: Ing. Hemerson Salazar

Variety: Limbo

Planting date: June 15, 2007

Experimental design: Rose beds (5) were treated with Vitazyme, another biostimulant, and a microbial inoculant to compare the response of the rose plants to the materials.

1. Control

2. Vitazyme

3. "Companion" biostimulant

4. "Essential" (*Bacillus subtilis*)



In this Ecuador rose study, the treated young plants have more chlorophyll and are larger than those of the control.

Location: Roma Verde, Machachi, Pichincha, Ecuador

Watering: drip irrigation

Type of culture: greenhouse

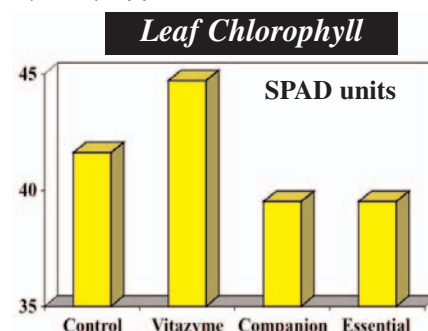
Fertilization: a nutrient solution containing N (200 ppm), P (30 ppm), K (220 ppm), Ca (80 ppm), Mg (40 ppm), B (2 ppm), Fe (3 ppm), Mn (2 ppm), and Mo (1 ppm), using 35,000 l/ha each day.

Vitazyme application: 2 ml/liter of water (0.2%) applied at certain undefined times

Other biostimulant applications: unknown

Leaf chlorophyll results:

Treatment	Leaf chlorophyll	Change
	SPAD units	
Control	41.6	—
Vitazyme	44.7	+3.1
"Companion"	39.5	-2.1
"Essential"	39.5	-2.1



Growth and yield results: Vitazyme was observed to improve root growth and leaf chlorophyll of the plants, although the difference in top growth between treatments 2, 3, and 4 was hard to see visually.

Conclusions: In the words of the researcher, "During the rehearsal we observed that there was no meaningful difference in the size of the plants between Vitazyme and the other two products, but Vitazyme showed a larger root development and higher index of chlorophyll in the leaves. Vitazyme is being used on a constant basis, and the crops have generally improved."

Soybeans

Researchers: Fred Vaughn and Greg Wilson

Location: Branchton, Ontario, Canada

Seedbed conditions: dry, fine

Soil temperature at planting: 28.6°C

Previous crops: 2005, potatoes (with Dual + Sencor); 2006, winter wheat (with Cobutox 600)

Soil: silt loam (31.9% sand, 53.7% silt, 14.4% clay), 6.2 pH, 14.2 meq/100 g CEC, good fertility

Experimental design: A uniform site was divided into plots that were 3x6 meters (six rows), using four treatments with six replications in a randomized complete block design. The objective of the study was to determine Vitazyme's ability to improve soybean yield with two applications. The treatments are shown at left.

Treatment	At planting	Early bloom
	liters/ha	liters/ha
1. Control	0	0
2. Vitazyme, 50%	0.5	0.5
3. Vitazyme, 100%	1.0	1.0
4. Vitazyme, 200%	2.0	2.0

Organization: Vaughn Agricultural Research Services

Variety: Pioneer 91M80

Field preparation: cultivation twice

Planting date: May 24, 2007

BBCH Scale: BSOY

Row spacing: 76 cm

Planting depth: 3.5 cm

Planting rate: 101 kg/ha

Fertilization: 240 kg/ha of 6-24-24% N-P₂O₅-K₂O dry fertilizer spread over the trial site before planting

Vitazyme application: All rates were applied to appropriate plots on May 24 (to the seeds in

Continued on the next page

the row) and June 26 (over the leaves and soil, using a 100 l/ha sprayer rate).

Crop emergence date: May 30, six days after planting

Weed control: Roundup (glyphosate) at 1 liter/ha on June 13, and at 1.5 liters/ha on July 19

Weather conditions: hot and dry during the middle and late part of the growing season

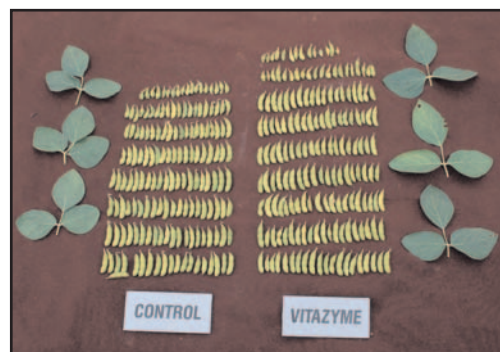
Harvest date: October 12, 2007.

An area of 1.52 x 6.00 meters (the two center rows) was harvested for each plot.

Yield results: There were no significant differences in moisture content or bushel weight among the four treatments, so those values are not included here.



Treated soybean plants in the Vaughn Research Canadian trial were taller, having larger leaves and more chlorophyll.



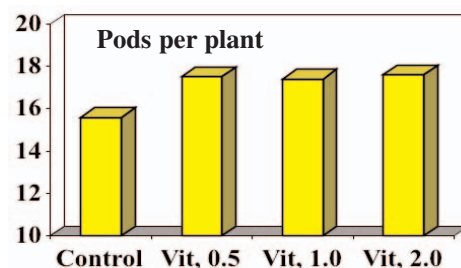
Note the greater numbers of pods for the Vitazyme treated soybeans, as well as the larger and darker green leaves.

Pod Counts

Treatment	Pods/Plant*	Pod change
	Pods	Pods
1. Control	15.6 b	—
2. Vitazyme, 0.5 l/ha	17.5 a	1.9 (+12%)
3. Vitazyme, 1.0 l/ha	17.4 a	1.8 (+12%)
4. Vitazyme, 2.0 l/ha	17.6 a	2.0 (+13%)
LSD (P = 0.05)	1.7	
CV	8.24	
Bartlett's X2	3.899	
P (Bartlett's X2)	0.273	
Replicate F	5.022	
Replicate Prob (F)	0.0067	
Treatment F	2.626	
Treatment Prob (F)	0.0885	

*Average of 20 plants

Vitazyme caused a 12 to 13% increase in pods per plant for the three treatment levels, which were significant at P = 0.05.



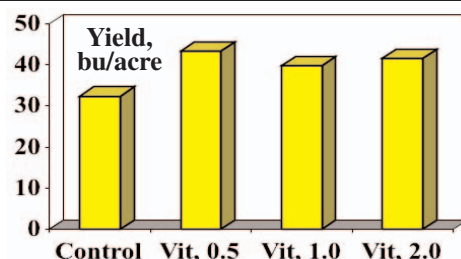
Pod Count Changes

Vitazyme, 0.5 l/ha.....+12%
 Vitazyme, 1.0 l/ha.....+12%
 Vitazyme, 2.0 l/ha.....+13%

Soybean Yield

Treatment	Yield	Yield change
	bu/acre	bu/acre
1. Control	32.4 b	—
2. Vitazyme, 0.5 l/ha	43.3 a	10.9 (+34%)
3. Vitazyme, 1.0 l/ha	39.8 a	7.4 (+23%)
4. Vitazyme, 2.0 l/ha	41.5 a	9.1 (+28%)
LSD (P = 0.05)	3.68	
CV	7.63	
Bartlett's X2	1.472	
P (Bartlett's X2)	0.689	
Replicate F	2.146	
Replicate Prob (F)	0.1156	
Treatment F	15.358	
Treatment Prob (F)	0.0001	

All three Vitazyme treatments provided an increase in yield of from 23 to 34%, all of which were significantly different at 0.001%.



Soybean Yield Changes

Vitazyme, 0.5 l/ha.....+34%
 Vitazyme, 1.0 l/ha.....+23%
 Vitazyme, 2.0 l/ha.....+28%

Income results: At a soybean price of \$9.00/bushel, the increased income for the treatments is as follows:

Conclusions: Vitazyme applied to soybeans in this Canadian study, at 0.5, 1.0, and 2.0 liters/ha applied at planting and early bloom, brought about an excellent yield enhancement at all application levels: 23 to 34%. These yield increases resulted in improved crop income of from \$66.60 to \$98.10/acre, excellent increases for very nominal extra input costs. This study shows the great potential for Vitazyme to enhance the production of soybeans across the southern areas of Canada where this crop is grown.

Soybean Income

Treatment	Yield increase	Income increase
	bu/acre	bu/acre
Vitazyme, 0.5 l/ha	10.9	98.10
Vitazyme, 1.0 l/ha	7.4	66.60
Vitazyme, 2.0 l/ha	9.1	81.90

Sugar Beets

Researcher: Sergei Velichko and Zhenya Moskalov

Location: Visnitsa, Olgopil, Ukraine

Watering: center-pivot irrigation

Experimental design: A field was divided into a Vitazyme treated and untreated area to determine the effect of the product on increasing sugar beet yield. Another product, called Amcolon B, a fertilizer, was added to Vitazyme to evaluate a possible synergism.

Organization: Agrimatco – Ukraine, Kiev, Ukraine

Variety: Hamber

Soil type: mollisol

Planting date: first part of April

Planting rate: unknown

1. Control

Fertilization: autumn of 2006, 350 kg/ha of Kalimag super (potassium and magnesium sulfates), and 150 kg/ha of MAP (12-52-0% N-P₂O₅-K₂O); June 15, 200 kg/ha of ammonium nitrate and lime

Vitazyme application: two foliar treatments of 3 liters/ha each time: (1) June 11, at 4 to 5 leaves; (2) June 29 at 8 leaves

Amcolon application: A 30-0-22.5-3.5 (Mg)-1.5 (B) + TE product, applied with Vitazyme at 3.0 liters/ha

Harvest date: unknown

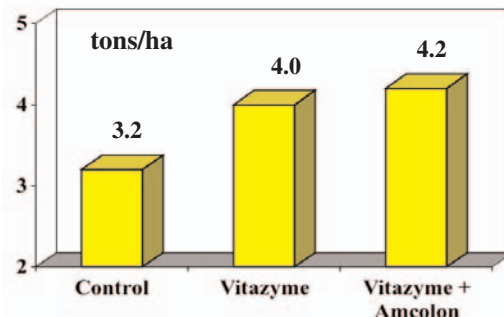
Yield results: Twelve average plants from each treatment were harvested and weighed.

Conclusions: In this Ukrainian sugar beet trial, Vitazyme alone increased the beet yield by 25% over the control, while additional foliar fertilizer nutrients (N, K, Mg, and B) further boosted yield by 31%. Thus, the efficacy of Vitazyme to improve sugar beet yield, and synergize with foliar nutrients, is demonstrated in this farm study.

2. Vitazyme

3. Vitazyme + Amcolon

Sugar Beet Yield



• **Increase in beet yield: 25%**

Sugar Cane

Results of Demonstration Trials for Vitazyme, Fitomas-E, and Enerplant in Cuba During the 2007 Harvest Season

Demonstration editor: Juan C. Diaz

Organization: National Sugarcane Research Institute (INICA), Havana, Cuba

Purpose of the trials: These trials were designed to evaluate the relative merits of the three products that have been extensively tested in Cuba for the past three years.

Vitazyme. Produced by Vital Earth Resources, Gladewater, Texas, U.S.A.

Fitomas-E. Produced by the government of Cuba.

Enerplant. Produced by Biotec Internacional, Mexico

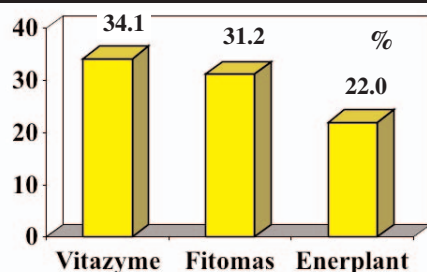
[The following text and tables were generated by Juan C. Diaz.]

Sugar yields in the 2007 harvest season of the Fitomas-E, Enerplant, and Vitazyme biostimulant demonstration trials showed marked increases in the three products, with an overall mean of 12.2 t/ha or 34.2% above the untreated controls and all other conditions being the same. Among the three biostimulants, in the overall mean of all provinces, Vitazyme recorded the largest yield increase (17.0 t/ha and 34.1%), Fitomas recorded the next highest increase (10.5 t/ha and 31.2%), while Enerplant recorded the smallest increase (8.9 t/ha and 22%; Table 1).

Table 1. Yield summary of the 2007 season biostimulant demonstration trials.

Biostimulant	No. Trials	Biostimulant				Untreated Control			Difference vs. Control	
		Area	% applied	06 Production	Yield	Area	Production	Yield		
		ha		tons	tons/ha	ha	tons	tons/ha	tons/ha	%
Fitomas	70	1099.2	2.7	48738.8	44.3	492.1	16633.7	33.8	10.5	31.2
Enerplant	3	221.9	2.1	10956.5	49.4	58.7	2373.8	40.5	8.9	22.0
Vitazyme	4	175.6	3.4	11754.9	66.9	40.6	2025.9	49.9	17.0	34.1
Nation	77	1496.7	2.7	71450.2	47.7	591.3	21033.4	35.6	12.2	34.2

Average Sugarcane Yield Increases for Three Products - 2007



Fitomas, with the overall mean of 10.5 t/ha and 31.2% yield increase above the untreated control (Table 2), showed the highest increase in Matanzas Province and smallest increase in Holguin. Moreover, its smallest increases were recorded in the eastern provinces of Holguin, Santiago de Cuba, and Guantanamo. (Information from Las Tunas and Granma Provinces are pending.) The other two biostimulants showed best results precisely in the eastern provinces: Vitazyme in Holguin and Santiago, and Enerplant in Santiago showed higher yield increases than Fitomas. On the other hand, both Vitazyme (Table 4) and Enerplant (Table 3) showed yield increases that also endorse their technical and economic effectiveness. Vitazyme, in all the Santiago de Cuba trials and half of the Holguin trials, was split into two applications, which was previously recommended as an alternative to three, upon the guarantee of minimum yield response.

Continued on the next page

Table 2. Yield summary by provinces of the 2007 season Fitomas-E demonstration trials.

Province	N	Fitomas-E			Untreated Control			Difference vs. Control	
		Area	Production	Yield	Area	Production	Yield		
		ha	tons	tons/ha	ha	tons	tons/ha	tons/ha	%
Pinar Rio	14	377.6	15023.6	39.8	90.4	2620.3	29.0	10.8	37.3
Habana	6	61.3	2575.6	42.0	44.3	1464.6	33.0	9.0	27.2
Matanzas	4	90.4	4302.1	47.6	53.1	1629.9	30.7	16.9	55.2
Villa Clara	5	27.2	1386.9	50.9	28.9	1119.5	38.8	12.2	31.4
S. Spiritus	17	86.1	3921.0	45.5	86.6	3158.9	36.5	9.1	24.9
Ciego Avila	6	116.1	4567.5	39.3	44.2	1233.0	27.9	11.5	41.1
Camaguey	10	118.8	5151.6	43.4	91.5	3129.5	34.2	9.1	26.7
Holguin	3	74.3	4143.8	55.8	18.0	927.9	51.6	4.2	8.1
Santiago	2	117.8	6451.9	54.8	12.6	582.6	46.4	8.3	18.0
Guantanamo	3	29.7	1214.8	40.9	22.5	767.5	34.1	6.8	19.9
Nation	70	1099.2	48738.8	44.3	492.1	16633.7	33.8	10.5	31.2

Table 3. Yield summary by provinces of the 2007 season Enterplant demonstration trials.

Province	N	Enerplant			Untreated Control			Difference vs. Control	
		Area	Production	Yield	Area	Production	Yield		
		ha	tons	tons/ha	ha	tons	tons/ha	tons/ha	%
Camaguey	1	115.9	5000.6	43.1	26.0	926.6	35.6	7.5	21.1
Santiago	2	106.0	5955.9	56.2	32.7	1447.2	44.3	11.9	26.9
Nation	3	221.9	10956.5	49.4	58.7	2373.8	40.5	8.9	22.0

Table 4. Yield summary by provinces of the 2007 season Vitazyme demonstration trials.

Province	N	Vitazyme			Untreated Control			Difference vs. Control	
		Area	Production	Yield	Area	Production	Yield		
		ha	tons	tons/ha	ha	tons	tons/ha	tons/ha	%
Holguin	2	84.7	5720.8	67.5	26.8	1261.3	47.0	20.5	43.7
Santiago	2	90.9	6034.1	66.4	13.7	764.6	55.6	10.7	19.3
Nation	4	175.6	11754.9	66.9	40.6	2025.9	49.9	17.0	34.1

However, this comparison is not exactly the same in all provinces, whereas if it is carried out in those provinces in which two or three biostimulants are present, you may see, for instance, that in Santiago de Cuba (Table 5) Enerplant and Vitazyme showed similar performances, both better than Fitomas, which showed the least mean increase (8.3 t/ha). Thus, in the estate means, Vitazyme showed larger increases: 13.2 and 11.4 t/ha versus 9.0 and 9.4 t/ha with Enerplant and 7.8 and 8.5 t/ha with Fitomas, but in the provincial means Enerplant (11.9 t/ha) slightly exceeded Vitazyme (10.7 t/ha), while Fitomas had always the least increase (8.3 t/ha); in Holguin, Vitazyme showed the country's largest increase (20.5 t/ha and 43.7%) and exceeded several times that of Fitomas (4.2 t/ha and 8.1%, the country's smallest increase; Table 6).

Table 5. Yields of the 2007 season biostimulant trials in Santiago de Cuba.

Biostimulant	Mill estate	Farm	With Biostimulant			Untreated Control			Diff.
			Area	Production	Yield	Area	Production	Yield	
			ha	tons	tons/ha	ha	tons	tons/ha	tons/ha
Enerplant	Chile	Armonia	51.0	2179.9	42.7	19.2	648.8	33.8	9,0
	America L.	Purial	55.0	3776.0	68.7	13.5	798.4	59.3	9,4
Overall Enerplant			106.0	5995.9	56.2	32.7	1447.2	44.3	11.9
Vitazyme	Chile	Verdecia	43.7	2834.5	64.9	2.2	111.1	51.7	13,2
	Dos Rios	Calderon	47.2	3199.6	67.8	11.6	653.6	56.4	11,4
Overall Vitazyme			90.9	6034.1	66.4	13.7	764.6	55.6	10.7
Fitomas	America L.	Purial	49.1	2476.0	50.4	5.6	236.4	41.9	8,5
	Mella	Baragua	68.7	3975.9	57.9	6.9	346.2	50.1	7,8
Overall Fitomas			117.8	6451.9	54.8	12.6	582.6	46.4	8.3

Table 6. Yields of the 2007 season Fitomas and Vitazyme trials in Holguin.

Province	N	Biostimulant			Untreated Control			Difference vs. Control	
		Area	Production	Yield	Area	Production	Yield		
		ha	tons	tons/ha	ha	tons	tons/ha	tons/ha	%
Fitomas	3	74.3	4143.8	55.8	18.0	927.9	51.6	4.2	8.1
Vitazyme	2	84.7	5720.8	67.5	26.8	1261.3	47.0	20.5	43.7

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In Camaguey, Fitomas (9.1 t/ha and 26.7%) exceeded Enterplant (7.5 t/ha and 21.1%; Table 7), which indicates that the biostimulants showed a differential regional response.

Table 7. Yields of the 2007 season Fitomas and Enerplant trials in Camaguey.

Province	N	Biostimulant			Untreated Control			Difference vs. Control	
		Area	Production	Yield	Area	Production	Yield		
		ha	tons	tons/ha	ha	tons	tons/ha	tons/ha	%
Fitomas	10	118.8	5151.6	43.4	91.5	3129.5	34.2	9.1	26.7
Enerplant	1	115.9	5000.6	43.1	26.0	926.6	35.6	7.5	21.1

It is noteworthy that all assessed areas (as well as other biostimulant treated areas) of Santiago de Cuba province were applied by backpack sprayers (due to a limitation of boom sprayers), in spite of which a high overall cane yield increase was reached (11.2 t/ha), which was fifth among the 10 assessed provinces (Table 8), while the percentage increase (23.6%) is not among the highest due to the higher cane yields of the untreated controls in this province. In all other provinces boom sprayers were always used.

Table 8. Yields by provinces of the 2007 season demonstration trials with all three biostimulants combined

Province	N	The three biostimulants			Untreated Control			Difference vs. Control	
		Area	Production	Yield	Area	Production	Yield		
		ha	tons	tons/ha	ha	tons	tons/ha	tons/ha	%
Pinar Rio	14	377.6	15023.6	39.8	90.4	2620.3	29.0	10.8	37.3
Habana	6	61.3	2575.6	42.0	44.3	1464.6	33.0	9.0	27.2
Matanzas	4	90.4	4302.1	47.6	53.1	1629.9	30.7	16.9	55.2
Villa Clara	5	27.2	1386.9	50.9	28.9	1119.5	38.8	12.2	31.4
S. Spiritus	17	86.1	3921.0	45.5	86.6	3158.9	36.5	9.1	24.9
Ciego Avila	6	116.1	4567.5	39.3	44.2	1233.0	27.9	11.5	41.1
Camaguey	11	234.7	10152.2	43.3	117.5	4056.1	34.5	8.7	25.3
Holguin	5	159.0	9864.6	62.1	44.8	2189.2	48.9	13.2	27.0
Santiago	6	314.7	18441.9	58.6	59.0	2794.4	47.4	11.2	23.6
Guantanamo	3	29.7	1214.8	40.9	22.5	767.5	34.1	6.8	19.9
Nation	77	1496.7	71450.2	47.7	591.3	21033.4	35.6	12.2	34.2

Numerous cultivars (C294-72, C86-12, My5514, Ja64-14, C323-68, C85-1, C87-51, CP52-43, C1324-74, C1051-73, C132-81, SP7012-84, C120-76, C86-503, C86-621, C140-81, and RB745433), and various types of soil (Red Calcic Ferralitic [Eutrustox or Ferralsol], Quartzitic Ferralitic [Luvisol or Ustox, Aqualf], Fersialitic [Inceptisol, Alfisol], Sialitic [Eutropept or Cambisol], Gleyey Vertisol [Calciustert] and Alluvial [Haplustoll or Phaeozem]) were associated to different provinces, and their effects cannot be isolated in this analysis. The crop cycle in almost all trials was ratoon, and the fields always received recommended mineral fertilization.

Results of Cienfuegos, Las Tunas, and Granma provinces are pending.

Economic analysis: The economic analysis revealed that Fitomas-E continues to have the greatest economic benefits (Table 9), as shown by the cost-benefit ratio (4.52), and the lowest cost per additional USD (0.18 USD), due to the much lower overall cost of the product per hectare (about nine times less than the other two biostimulants), since it is of local manufacture, and due to lower cost and greater ease of application (only one operation is needed). The others require at least two applications, in spite of the fact that Vitazyme recorded the highest additional profits, thanks to its larger overall cane yield increase.

Not included were other costs, as of transportation of sugar to ports, but neither were other revenues, as those of additional molasses.

Table 9. Economic analysis of the 2007 season biostimulant demonstration trials.

Indicator	Fitomas	Enerplant	Vitazyme
Additional cane (t/ha)	10.54	8.92	17.01
Additional sugar (t/ha) ^a	1.11	0.94	1.79
Cost of harvest additional cane ^b	36.88	31.21	59.52
Cost of biostimulant treatment ^c	7.20	34.40	34.40
Overall additional cost (USD/ha)	44.08	65.61	93.92
Additional income (USD/ha) ^d	243.39	205.97	392.83
Additional profit (USD/ha)	199.31	140.36	298.91
Cost-benefit ratio	4.52	2.14	3.18
Cost/additional USD	0.18	0.32	0.24

^aAdditional sugar = cane t/ha x 10.5% ccs (commercial cane sugar or sugar % cane).

^bCost of harvesting and milling additional cane: 3.5 USD/t of cane x additional cane t/ha.

^cCost of biostimulant treatment treatment: 26 USD of Vitazyme or Enerplant/ha of 3 USD of Fitomas/ha + 4.20 USD/ha per each spraying.

^dPrice of sugar: 0.10 USD/lb (220 USD/t).

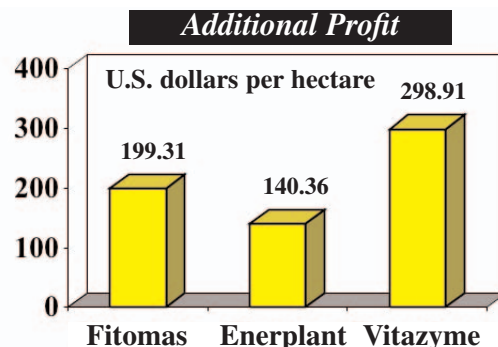


Vitazyme greatly stimulated sugar cane growth and sugar yield in this research trial in Cuba. This result is typical of the many such trials conducted in Cuba.

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Conclusions:

1. Biostimulants Fitomas-E, Enerplant, and Vitazyme ratified once more, in the 2007 harvest season, their marked effect on sugarcane yields in all provinces, cultivars, soil types, and sprayer types evaluated.
2. Among the three biostimulants, Vitazyme recorded the highest overall cane yield increase (in most cases with two applications), followed by Fitomas-E, while Enerplant recorded the lowest overall increase.
3. A differential response to the biostimulants by regions was ratified: Fitomas-E showed its lowest yield increases in the assessed eastern provinces, while in those eastern provinces Vitazyme and Enerplant showed their largest increases, higher than Fitomas-E.
4. Fitomas-E continues to be the biostimulant of greatest economic benefit, thanks to the much lower overall cost of the product per hectare, since it is of local manufacture. It also has lower cost and greater ease of application (only one operation is needed). Vitazyme and Enerplant also offer marked economic benefits, although lower than Fitomas-E under the conditions of Cuba.



Sugar Cane

Researcher: Roberto Alvarez, Deputy Director

Variety: CP52-43

Crop type: ratoon

Location: Antonio Rojas Cooperative Farm, Hector Molina Sugar Enterprise, Cuba

Field: Field 17, Block 102

Experimental design: A production field of 9.39 ha was treated with Vitazyme to determine the effect on sugar yield compared to the expected yield.

1. Control

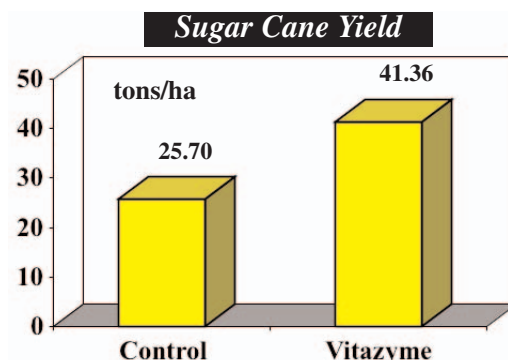
2. Vitazyme

Fertilization: unknown

Vitazyme application: 1.5 liters/ha twice (timing unknown)

Yield results: The harvest date was February 6 to 9, 2007.

Conclusions: In this Cuban sugar cane trial, Vitazyme enhanced yield an amazing 61% above the expected control (untreated) yield, based on field records. Even though this field was scheduled for plowing and replanting, because of the excellent yield it will be used again. The yield increase was due to "much greater than expected growth in the Vitazyme treated fields than the controls, from the September estimates to the actual harvest in February."



• **Increase in sugar cane yield: 61%**

Sugar Cane

Researcher: Roberto Alvarez, Deputy Director

Variety: CP52-43

Location: Antonio Rojas Cooperative Farm, Hector Molina Sugar Enterprise, Cuba

Field: Field 16, Block 201

Crop type: ratoon

Watering: rain-fed

Experimental design: A production field of 8.27 ha was treated with Vitazyme to determine the effect on sugar yield compared to the expected yield.

1. Control

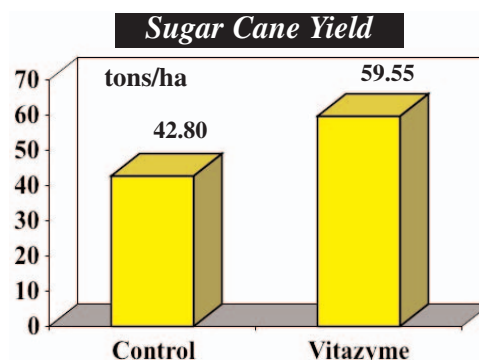
2. Vitazyme

Fertilization: unknown

Vitazyme application: 1.5 liters/ha twice (timing unknown)

Yield results: The harvest date was February 6 to 9, 2007.

Conclusions: In this Cuban sugar cane trial, Vitazyme enhanced yield 39% above the expected control (untreated) yield, based on field records. Even though this field was scheduled for plowing and replanting, because of the excellent yield it will be used again. The yield increase was due to "much greater than expected growth in the Vitazyme treated fields than the controls, from the September estimates to the actual harvest in February."



• **Increase in sugar cane yield: 39%**

Sugar Cane

Researcher: unknown

Location: Fernando Dios, Union 2, and Critino N. Canada Alto, Holguin Province, Cuba

Cane type: ratoon

Soil type: gleyey vertisol (calciustert) and fersialitic (inceptisol)

Experimental design: This study is one of several conducted in 2007 to discover the effectiveness of Vitazyme to increase sugar cane yield in the Holguin area of Cuba. Few details of the study are known except that the fields were large, in commercial production areas.

1. Control

2. Vitazyme

Fertilization: according to recommendations

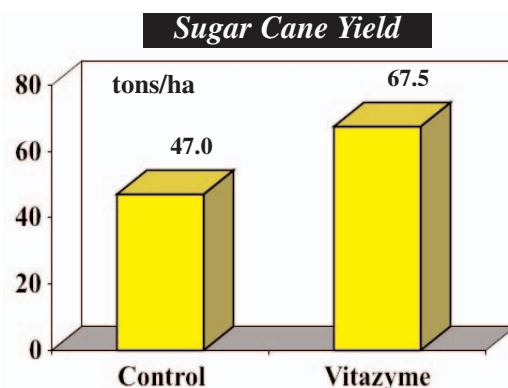
Vitazyme application: two, at 1 liter/ha each time

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The obvious benefits of Vitazyme for new plantings of sugar cane in Cuba are noted in this photo: much larger plants.

Conclusions: In this commercial-scale Vitazyme trial in Holguin Province, Cuba, the increase in production was a very high 44% above the control. This result is included in the 2007 summary of Cuban demonstration trials on sugar cane, and continues to show the remarkable results that have been obtained with Vitazyme on crop yields throughout Cuba over several years.



• **Increase in sugar cane yield: 44%**

Sugar Cane

Researcher: Marylin Enriquez, technician

Location: Capitan Alberto Torres Cooperative

Crop type: "carry-over" ratoon

Experimental design: A production field of 2.80 ha was treated with Vitazyme to determine the effect on sugar yield compared to the expected yield.

1. Control

Variety: Ty 7017

Watering: rain-fed

Field: 16, block 5204

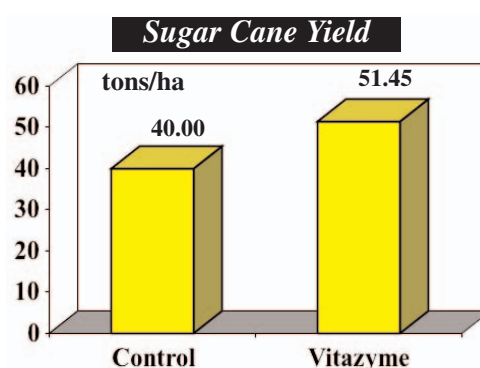
2. Vitazyme

Fertilization: unknown

Vitazyme application: 1.5 liters/ha twice (timing unknown)

Yield results: The harvest date was February 6 to 9, 2007.

Conclusions: Vitazyme greatly enhanced the production of this sugar cane parcel, by 29% above the expected level. According to the researcher, "The Cooperative considers that the much higher actual yields, as compared to the estimated yields, were due to much greater than expected growth in the Vitazyme treated fields than the controls, from the September estimates to the actual harvest in February."



• **Increase in sugar cane yield: 29%**

Sugar Cane

Researcher: Marylin Enriquez, technician

Location: Capitan Alberto Torres Cooperative Farm, Hector Molina Sugar Enterprise, Cuba

Field: 20, block 5240

Experimental design: A production field of 5.56 ha was treated with Vitazyme to determine the effect on sugar yield compared to expected yield.

1. Control

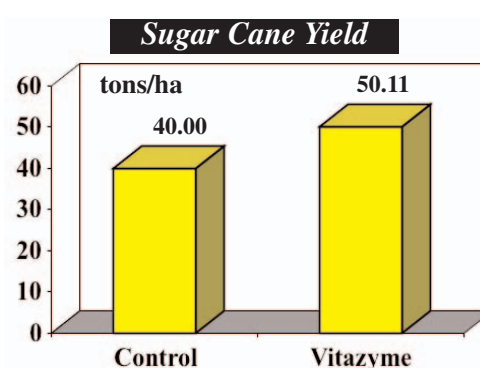
2. Vitazyme

Fertilization: unknown

Vitazyme application: 1.5 liters/ha twice (timing unknown)

Yield results: The harvest date was February 6 to 9, 2007.

Conclusions: Vitazyme greatly enhanced the production of this sugar cane parcel, by 25% above the expected level. According to the researcher, "The Cooperative considers that the much higher actual yields, as compared to the estimated yields, were due to much greater than expected growth in the Vitazyme treated fields than the controls, from the September estimates to the actual harvest in February."



• **Increase in sugar cane yield: 25%**

Tomatoes

Cuban Ministry of Sugar

Researchers: Jorge Gonzalez Acosta and Wilberto Gonzalez Marrero

Location: "Camilo Cienfuegos" Agricultural Enterprise, Havana Province, Cuba [Villena covered crop facility]

Variety: unknown

Water source: irrigation

Experimental design: A tomato field was divided into a Vitazyme treated and untreated portion to determine the effect of the product, on a commercial basis, on tomato yield. The treated area was 540 m².

Soil type: red ferrallitic (ferralsol)

Planting date: July 1, 2006

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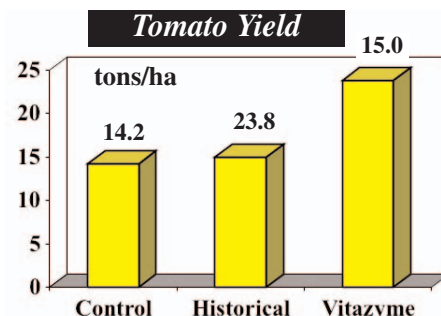
• Increase in tomato yield: 68%

1. Control
2. Vitazyme

Fertilization: unknown

Vitazyme application: 1 liter/ha on July 21, 15 days after transplanting, and 1 liter/ha on August 21, 45 days after transplanting

Plant observations during growth:



This tomato trial, while not in Cuba, reveals the potential Vitazyme has to improve yields for this important crop.

	Control	Vitazyme
Number of fruit	10 to 15 per plant	16 to 20 per plant
Foliage development	Less development	Larger leaves, more flowers
Fruit size	Smaller fruit	Larger fruit

Conclusions: This Cuban tomato study proved that two applications of Vitazyme greatly boosted fruit yield above the control (+68%), as well as above the historical yields for that site (+62%)

Watermelons

A Testimonial

Farmer: Michael Prochko

Location: Jefferson, Ohio

Fertility level: good

Varieties: red seeded, red unseeded, and yellow unseeded types ("personal-sized")

Soil type: silt loam, poorly drained, tilled at 20-foot centers

Spacing: unknown

Mulching: plastic

Experimental design: The farmer applied a special fertility program plus Vitazyme over the entire watermelon area. He compared this program to previous years' results with the same cropping system.

Fertilization: added sulfur, high-calcium lime, boron, zinc, manganese, and copper

Vitazyme application: 13 oz/acre to the leaves at intervals

Weather: erratic, with a drought until late July, and then good moisture

Yield and quality results: These small, "personal-sized" watermelons were very sweet and highly prolific during the production season. According to the farmer, "The melons developed a real following, and people got very upset when their production shut down."

Conclusions: Vitazyme was shown in this Ohio watermelon program to be an integral part of the farmer's highly successful production system.

Wheat (Winter)

Value of a Seed Application Using 50% Nitrogen

Researcher/Farmer: Jim Dolezal

Varieties: Wesley hard red winter, Antelope hard red white

Row spacing: 10 inches

Planting dates: September 12 to October 3, 2006

Experimental design: A 160-acre block having uniform soils was selected to compare three hard winter wheat varieties — one of them white and two of them red — with all fertility treatments equal, the only difference being that Vitazyme was applied to the seeds of two varieties (hard red wheats) but not to the highest-yielding white wheat variety. Only about 50% of the usual nitrogen rate was applied. Vitazyme was applied in the spring to all areas. The field design and varieties were as follows:

Wesley hard red winter wheat 40 acres	Antelope hard red winter wheat 40 acres
Antelope hard white winter wheat 80 acres	Wahoo hard red winter wheat 40 acres

Field	Fertilizer		Vitazyme	
	N	P	Seed	Foliar
Wesley	X	X	X	X
Antelope	X	X	O	X
Wahoo	X	X	X	X

Location: Julesburg, Colorado

Seeding rate: 52 lb/acre

Planting depth: 1.25 inches

Soil type: sandy loam

Fertilization: All areas received 22 lb/acre of P_2O_5 in-furrow at planting, as well as 25 lb/acre of N sprayed foliar in March of 2007. This nitrogen rate was a bit less than 50% of the usual 55 to 58 lb/acre recommended nitrogen rate.

Vitazyme application: All but the Antelope variety received 13 oz/acre of Vitazyme applied through tubes behind the seed drop tubes. In the spring, Vitazyme at 13 oz/acre was applied over all areas with the foliar sprayed nitrogen.

Weather for 2007: good rains, about 17 inches from planting in 2006 to the end of the 2007 growing season

Harvest date: July 10 and 11, 2007

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Yield results:

Variety	Vitazyme		Yield	Increase vs. Wesley
	Seed	Foliar		
			bu/acre	bu/acre
Wesley red	X	X	65.1	22.5 (+53%)
Wahoo red	X	X	0	14.6 (+34%)
Antelope white	O	X	42.6	—

Conclusions: This wheat yield study in northeastern Colorado revealed that with a 50% reduction in nitrogen, yields were still excellent when Vitazyme was applied. However, it was essential that Vitazyme be applied to the seeds at planting to achieve the highest yield potential. The two hard red winter wheat varieties — Wesley and Wahoo — having similar yield potential, yielded from 57.2 to 65.1 bu/acre, while the Antelope hard white wheat, having inherently a greater yield

potential than the red wheats, produced only 42.6 bu/acre. Because the Antelope white wheat did not receive a fall at-planting Vitazyme application while both red wheat varieties did, all other fertilizer and spring Vitazyme applications being equal across all areas, it is deduced that **a fall at-planting Vitazyme application of 13 oz/acre is very important to achieve optimum dryland wheat yields.**

• **Increase in wheat yield with a Vitazyme seed treatment: 34 to 53%**

Zoysia Grass

Researcher: Eddie Pearson

Location: Tri-Tex grass, Tioga, Texas

Variety: Jamur

Soil type: silty clay

Planting date: April 1, 2007

Experimental design: A new zoysia grass field was planted to plugs in a 6 inch x 6 inch grid. One acre of this area received Vitazyme twice, while the rest of the field was left untreated. All areas were fertilized and treated the same. The purpose of the test was to evaluate the ability of Vitazyme to affect grass root and leaf growth.

1. Control

2. Vitazyme

Fertilization: 85 lb/acre of 34-0-0% N-P₂O₅-K₂O every two weeks from May 1 to August; then 5 gal/acre of 32-0-0% N-P₂O₅-K₂O (+ Fe) on August 15, 2006

Vitazyme application: 13 oz/acre (1 liter/ha) at planting on April 1, 2006 (using a small sprayer), and the same rate in late May, 2006, using a field sprayer

Growth results: On March 2, 2007, five plugs were collected from the treated area using a 3-inch diameter plug cutter. Likewise, five plugs were collected from the control area. The plugs were soaked in water for several hours and washed free of all soil, and then dried in a drying oven at about 130°F until totally dry. The plugs were then weighed, and the weights were statistically analyzed using a completely randomized design.



The Zoysia grass treated with Vitazyme on the right reveals a considerably greater plant mass, with many more fibrous roots.

Tissue Dry Weight

Replicate	Control ^a	Vitazyme ^a
	grams	grams
1.	4.04	6.16
2.	2.40	7.79
3.	4.32	6.88
4.	2.92	7.25
5.	3.23	6.00
Mean	3.38 b	6.82 a
Change	—	3.44 (+102%)

Main effects P = 0.0001***

Model P = 0.0001***

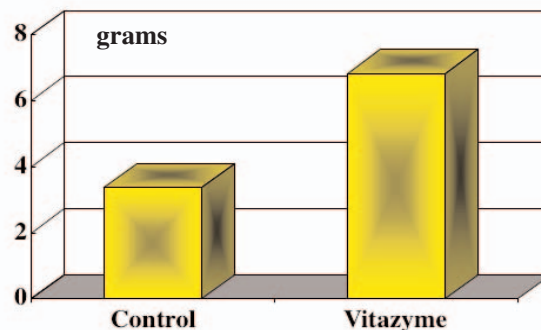
CV = 15.11%

LSD_{0.05} = 1.12 grams

The plugs were soaked in water for several hours and washed free of all soil, and then dried in a drying oven at about 130°F until totally dry. The plugs were then weighed, and the weights were statistically analyzed using a completely randomized design.

Conclusions: The ability of Vitazyme to greatly improve zoysia grass yield is displayed by this study, where two applications caused a 102% increase in total dry matter accumulation over the test period. This program can greatly improve grass growth for turf farms or in turf applications of all sorts.

Plant Dry Weight



• **Increase in plant dry weight with Vitazyme: 102%**

“Cultivators of the earth are the most valuable citizens. They are the most vigorous, the most independent, the most virtuous, and they are tied to their country and wedded to it’s liberty and interests by the most lasting bonds.”

Thomas Jefferson

15-Minute Soils Course

Lesson 23 of The Vital Earth News — Agricultural Edition. Summer, 2006 (Volume 13, Number 2):

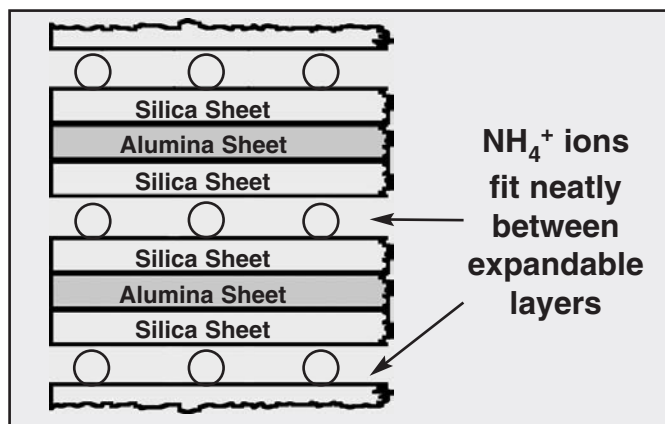
Nitrogen: How It Can Be Lost

Lesson 20 covered the elusive nature of nitrogen (N) in soils and how microorganisms play such a key role in its fixation (immobilization) and its release into plant-available forms (mineralization and nitrification). This lesson will emphasize the losses of N from soils.

Ammonium Fixation

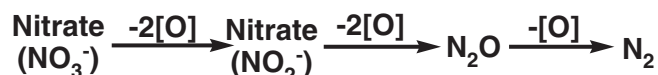
Both organic (humus) and inorganic (clay) soil fractions can “fix” ammonia in forms and locations that are inaccessible to plant roots. Anhydrous ammonia (NH_3) can react with organic matter to form compounds that are resistant to breakdown — perhaps aromatics and quinones — but scientists are uncertain what they are.

Clay minerals of the 2:1 type of lattice (vermiculite, illite, and smectite) can “fix” NH_4^+ and K^+ between the expandable plates of the structure, so roots cannot easily extract them. These ions are just the right size to easily fit into cavities of the lattices. See the diagram below.

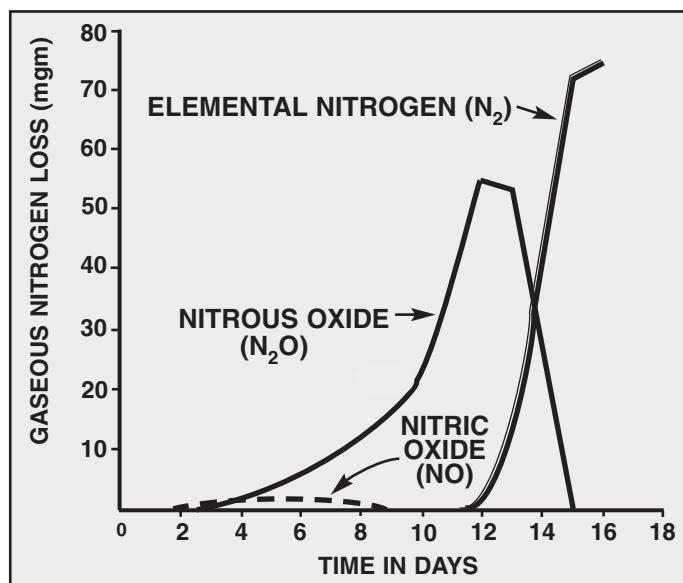


Gaseous Loss of N

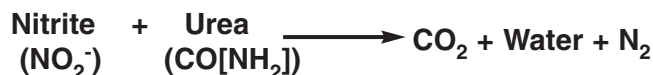
Under conditions of low oxygen, such as in poorly drained and compact soils, considerable N can be lost to the air. Though not well understood, it is thought that this process of **denitrification** is caused by various microbes in three major steps ([O] = oxygen):



Nitrous oxide (N_2O) is the gas most commonly lost under field conditions, but in some situations gaseous nitrogen (N_2) is formed. One experiment gave the result shown below.



Urea fertilizer can also help nitrite break down to gaseous nitrogen (N_2). Certain other salts, sulfur compounds, and carbohydrates can also bring about this loss, mainly in slightly acidic conditions. This type of loss is chemical and does not require microorganism intervention. Urea itself can be lost (5 to 20%) as NH_3 if not tilled in soon after spreading.



Even when conditions for soil absorption of anhydrous ammonia are good, losses as N gases can be large. Large quantities of nitrite are

thought to build up as soil organisms are killed, and rather than being converted to plant-usable nitrate the N is lost as N gases.

Losses of added and native N as gases is often at least 10 to 15% of the total, but can easily reach 40% under poor drainage, heavy N applications, and poor incorporation. In some cases in sandy soils in warmer climates, virtually no NO_3^- may remain two weeks after addition.

Leaching and Erosion Losses of N

Only the nitrate (NO_3^-) ion is normally mobile in soils. It can easily be carried by percolating water into the subsoil, out of reach of roots, eventually polluting groundwater, streams, and lakes. Heavy applications of ammonium nitrate, or high rates if nitrification in climates having heavy rainfall — especially with sandy soils — will lead to large leaching losses of N. Soil erosion also removes the richest N-fraction of soil.

Temporary Losses of N by Carbon

When the soil contains a high level of carbonaceous material containing relatively little N — a high carbon-nitrogen ratio — the microbes breaking down the residues will grab the limited N supply and deprive roots of enough for effective growth. This deficiency will continue until the raw organics are broken down to humic substances and microbes die to release excess N.

What the Farmer Can Do

To limit losses of N in soils a number of approaches can be used.

1. Strive for soil conditions that supply N at the rate plants need it. Then there will be sufficient N for optimum plant growth and no excess for denitrification and leaching. Such a condition is achieved through adding N in organic form (manures, compost, etc.), and allowing microbes to degrade the material and release N.

2. Limit amounts of fertilizer N application at any one time, especially anhydrous ammonia, so gaseous losses will be minimized.

3. Build a highly porous, high organic matter soil to discourage denitrification and erosion.

4. Limit tillage and return residues so organic stores will be built and erosion will be reduced.

Remember: the soil and its microbe population are not “dumb”, but will deal with the excesses and

deficiencies of all elements effectively if given the opportunity. They will denitrify excesses or fix N from the air if given the tools. This “intelligence” resides amongst a wide array of beneficial soil organisms — from bacteria to fungi to earthworms and mites — all of which are the farmer’s greatest assets.



Soil erosion removes the very best of the soil first, especially organic matter, which contains the greatest amount of soil nitrogen,

See How Much You Learned

- Soil nitrogen (N) can be lost through...
 - leaching
 - denitrification
 - clay fixation
 - all three of these
- Ammonium and potassium ions can neatly fit into the interlayers of some clays. T or F
- The gaseous loss of N in soils is called _____.
- The loss of N from fertilizer additions is not a serious problem. T or F
- A typical loss of fertilizer N from farmland might be about _____ %.
- It is important to build a high level of organic matter in the soil, and build good structure, to limit N losses. T or F
- What does it mean that soils have “intelligence” in regard to N levels?

Answers: 1. d. 2. T. 3. denitrification. 4. F. 5. 10 to 15%. 6. T. 7. The soil will get rid of excessive N levels and build up (“fix”) N if levels are too low, given the proper tools.