VITAZYME®

2002 Field Trial Results

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

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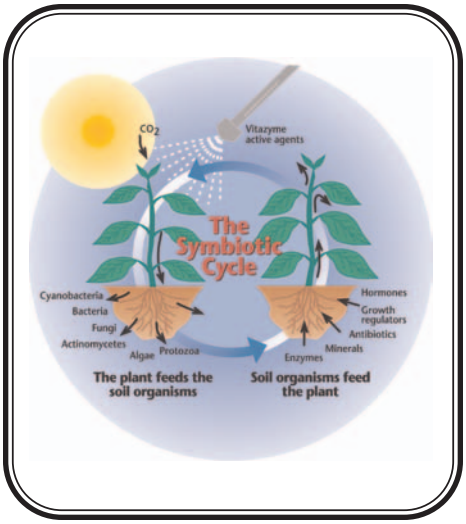
2002 Vitazyme Field Trial Results

This is the eighth year of major testing of Vitazyme for a wide array of crops across the United States and in other countries. As in other years, the product has done very well over a wide range of soil and climate conditions, including areas across the Corn Belt of the U.S. where growing conditions were very unfavorable. Sometimes excellent growing conditions reduce crop responses, but not in 2002.

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

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:

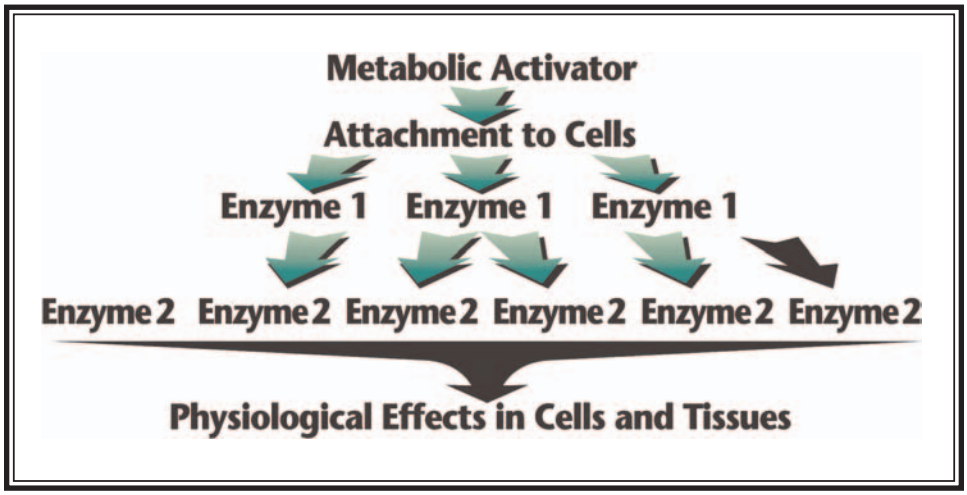
Soil Organic Matter			Previous Crop		Compaction		Soil NO_3-N Test		
Low(<1.5%)	Medium(1.5-3%)	High(>3%)	Non-legume	Legume	Much	Little	Low	Medium	High
1	2	3	1	3	1	3	2	4	6
Total additive score:	15 14	13 12	11	10	9	8	7	6	5
Apply this % of optimum N:	← 50-60% →		← 60-70% →				← 70-80% →		

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 2002

Results with Vitazyme during 2002 continued the trend of excellence since testing began in 1995. Weather was favorable for high yields in many parts of the country, especially the Corn Belt where parts of Iowa registered record yields, though in some areas of New York and the Northeast, East, and Southeast, as well as in much of the Plains, rain was in short supply while temperatures soared

While sometimes the response to Vitazyme is lessened in situations favorable to high yields — good moisture and fertility — places where the growing conditions were excellent in 2002 still elicited fine responses from the product. The results contained in this data summary booklet speak for themselves in that regard.

Some Highlights for 2002

1 Incorporating Vitazyme with American Minerals products — Granusol – Mn (35% Mn), Greenup –6+16, and Southeast Mix — at the production facility resulted in very good yield responses, when compared with those products alone. Such a synergism with corn, cotton, beans, and pasture grasses will enable these products to gain a significant edge in response compared to conventional fertilizers.

2 Silage corn and alfalfa treated with Vitazyme in replicated trials in New York produced high yields of forage, which translated into a higher calculated milk output and income per acre according to the University of Wisconsin Milk 2002 calculations.

3 A number of potato trials in Maine, North Dakota, and Colorado proved that the product consistently and profitably improves yields, but also enhances the size gradation of the tubers to a more favorable range. This was especially important in Colorado, where growers are aiming for yield maximization of the medium sized tubers for seed production.

4 Some results on beans from at-planting applications in the Red River Valley of Minnesota were diminished due to some very heavy early-season rains and cool weather, whereas applications at bloom provided excellent responses to Vitazyme. It is concluded that if soil oxygen levels are restricted early in the season due to cool, wet weather in heavy, compacted soils — wherein root damage and microbial inactivation can both be expected — a later application should be made until the primary problem of soil compaction is ameliorated.

5 Potato trials in Maine proved that three applications of Vitazyme — at planting, at tuber initiation, and a few weeks before harvest — probably constitute the best program in order to obtain the best responses.

6 Effects on turf grass have been phenomenal, with even a single summer application in one case enabling a large grower to cut and sell tightly-knit sod while the untreated area was loosely-knit and unsaleable.

7 Trees and shrubs responded excellently to Vitazyme in a large tree nursery operation, continuing the usual effects that are seen when treating trees and ornamentals.

The excellent consistency of Vitazyme's effects under a wide variety of soil and climactic conditions, for all types of crops tested, coincides with results of previous years. These results continue to accumulate across North America as well as in England, Ecuador, Korea, the Caribbean, and other places the product is being used.

Vitazyme Field Tests for 2002

Alfalfa (New Seeding)

University of Wisconsin Alfalfa/Grass Evaluations – Milk 2000

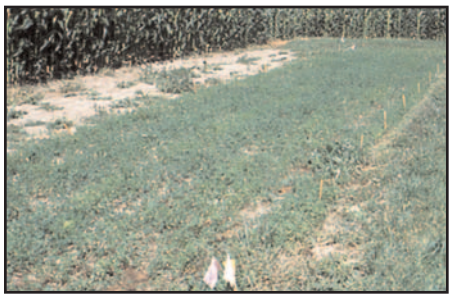
Location: Stutzman's Research Farm, Arkport, New York
Variety: Doebler's EX 468 *Soil type*: silt loam *Planting date*: July 1, 2002
Experimental design: A small plot design was set up, with five replicates in a randomized complete block arrangement, with two treatments and five replications.

1. Control **2. Vitazyme**

Samples of the forage were collected at harvest from each plot, packed in ice, and sent to the University of Wisconsin Alfalfa/Grass Evaluation Laboratory in Marshfield, Wisconsin, from which Milk 2000 calculations were made. Data were statistically analyzed using Analysis of Variance and the Tukey-Kramer test.

Fertilization: none
Vitazyme application: 13 oz/acre to the seeds and soil before the seeds were rolled into the soil
Harvest date: October 1, 2002
Weather during the growing period: Rain and cold temperatures early in the season required replanting twice before a good stand was established.
Yield results: Forage was harvested on October 1, 2002, and sent to the University of Wisconsin Alfalfa/Grass Evaluation Laboratory for weighing and yield determinations.

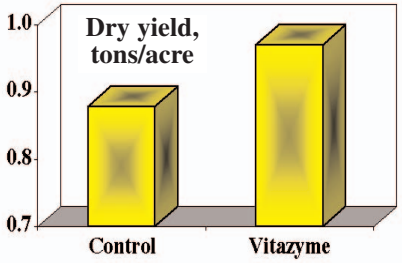
	Precipitation	Growing degree days
June	5.3	497
July	2.6	624
August	1.6	511
September	?	484



The alfalfa research plots at Stutzman's Research Farm showed an increase in yield , milk per acre, and income per acre with Vitazyme.

Treatment	Wet yield[1]	Change	Dry yield[2]	Change
	tons/acre			
Control	3.34 b	—	0.878 b	—
Vitazyme	3.54 a	0.20 (+6%)	0.970 a	0.092 (+10%)

[1]Means followed by different letters are significantly different at P = 0.21 according to the Tukey-Kramer test.
[2]Means followed by different letters are significantly different at P = 0.04 according to the Tukey-Kramer test. Dry yield is adjusted to 100% dry matter.



Quality results: Several forage quality parameters were measured at the laboratory in Marshfield, Wisconsin, but few of them showed a significant difference between the two treatments. Only digestible neutral detergent fiber and the NRC 48-hour digestible neutral detergent showed significant differences between the two treatments. Thus, there appeared to be little difference in forage quality between the Vitazyme and control treatments, which is contrary to the other forage tests that have shown a superior forage quality when Vitazyme was used.

Treatment	Crude protein (CP)*	Acid detergent fiber (ADF)	Neutral detergent fiber (NDF)	Digestible NDF	Ash
	% of dry matter	% of dry matter	% of dry matter	% of NDF	% of dry matter
Control	21.0 a	27.4 a	36.0 a	40.9 a	11.3 a
Vitazyme	21.6 a	27.7 a	36.0 a	38.4 b	10.7 a
Level of significance	P = 0.32	P = 0.82	P = 0.96	P = 0.03	P = 0.43
$LSD_{0.01}$ (if valid)				LSD = 1.6	

* Means followed by different letters are significantly different as P = 0.10.

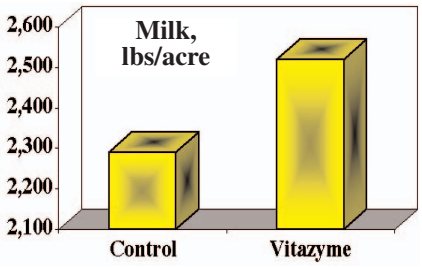
Treatment	Nonfibrous carbohydrate (NFC)*	Net energy for lactation (NEL)*	NRC 48-hr digestibility*	Base forage dry matter intake*
	% of dry matter	Mcal/lb		lb/day
Control	31.7 a	0.613 a	30.66 a	32.36 a
Vitazyme	33.0 a	0.613 a	28.99 b	32.27 a
Level of significance	P = 0.16	P = 0.90	P = 0.08	P = 0.95
$LSD_{0.01}$ (if valid)			LSD = 1.52	

* Means followed by different letters are significantly different at P = 0.10.

Milk output results: The yield and quality parameters were used by the Milk 2000 program to calculate estimated milk output for each plot harvested. The milk per day from the forage, and the milk per ton of forage, were not significantly different for the two treatments, but **the milk output per acre was significantly improved (at P = 0.03) by Vitazyme over the control, by 10%, or 229 lb/acre, a reflection of the improved overall alfalfa yield (+10%).**

Treatment	Milk per day from the forage*	Milk per ton of forage*	Milk per acre*	Change
	lb/day	lb/ton	lb/acre	lb/acre
Control	36.6 a	2,614 a	2, 290 b	——
Vitazyme	35.0 a	2,583 a	2,519 a	+229 (+10%)
Level of significance	P = 0.49	P = 0.45	P = 0.03	
$LSD_{0.1}$ (if valid)			LSD = 155	

* Means followed by different letters are significantly different at P = 0.10.



Income increase from the milk: At a price of $15.00/cwt for the milk, the increased income for the use of Vitazyme on this alfalfa is $34.35/acre.

Conclusions: In this alfalfa forage study in New York, Vitazyme significantly increased the yield for the first cutting, by 10% over the control. Few quality parameters were significantly changed. however, so that the total milk output per acre was also increased by 10% above the control, which amounted to a $34.35/acre increase in milk income.

- ***Increase in dry yield: 10%***
- ***Increase in milk per acre: 229 lb/acre***
- ***Increase in milk income: $34.35/acre***

Alfalfa (Regrowth)

University of Wisconsin Alfalfa/Grass Evaluations – Milk 2000

Location: Stutzman's Research Farm, Arkport, New York
Variety: Doebler's Phirst
Soil type: silt loam
Planting date: June 10, 2002
Harvest date: October 1, 2002

Experimental design: A small plot design with five replicates in a randomized complete block design was laid out in an alfalfa field that had been established in the spring. This test utilized regrowth after the first cutting. Forage samples were collected and packed in ice in a cooler, and sent to the laboratory at Marshfield, Wisconsin.

1. Control **2. Vitazyme**

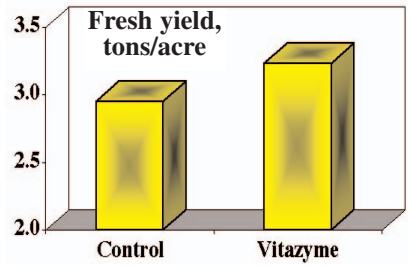
Fertilization: none

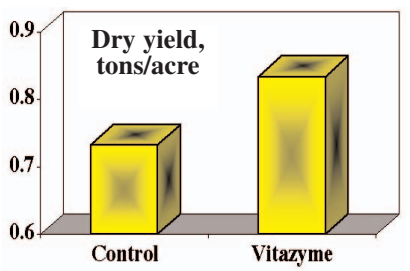
Vitazyme application: 13 oz/acre to the leaves and soil at 3 to 4-inch height of regrowth, on August 15

Yield results: The forage was harvested and sent to Wisconsin for weighing and analysis, and plot values were statistically analyzed for significant differences using COHORT software. Vitazyme increased the yield of Alfalfa above the control by 9% (fresh weight), or 14% (dry weight). These differences are not significant due to sizable variations in yield among the various plots, thus raising the experimental error.

Treatment	Fresh yield[1]	Change	Dry yield[1]	Change
	tons/acre		tons/acre	
Control	2.95 a	——	0.732 a	——
Vitazyme	3.23 a	+0.28 (+9%)	0.834 a	+0.102 (+14%)

[1]Means followed by the same letter are not significantly different at P = 0.10 (Tukey Kramer). The dry yield is adjusted to 100% dry matter.





Forage quality results: Samples of the forage from each plot were sent to the University of Wisconsin Alfalfa/Grass Evaluation Laboratory in Marshfield, Wisconsin. The values determined were then statistically analyzed to determine significant differences of treatment means using COHORT software and the Tukey-Kramer test. Differences in values within each mean were quite large, so no significant differences were detected.

Treatment	Crude protein (CP)	Acid detergent fiber (ADF)	Neutral detergent fiber (NDF)	Digestible NDF	Ash
	% of dry matter	% of dry matter	% of dry matter	% of NDF	% of dry matter
Control	23.2 a	19.6 a	27.08 a	43.1 a	11.3 a
Vitazyme	22.8 a	20.1 a	28.08 a	43.2 a	11.6 a

Treatment	Non-fibrous carbohydrate (NFC)	Total digestible nutrients (TDN)	Net energy of lactation (NEL)	Dry matter intake (DMI)	Forage, % of total DMI
	% of dry matter	% of dry matter	M cal/lb	lb/day	%
Control	39.1 a	66.5 a	0.69 a	43.5 a	0.83 a
Vitazyme	38.2 a	65.5 a	0.67 a	41.5 a	0.79 a

Vitazyme applied to alfalfa in this greenhouse study significantly improved growth and root mass over the control.

Milk production calculations: Milk 2000 calculations were made based upon the quality and yield parameters shown to the right. Even though the differences were not significant, the Vitazyme treated alfalfa was calculated to produce 268 lb/acre more milk than the untreated control.

Income increase: With milk at $15.00/cwt, the increase in milk value is 2.68 cwt/acre, or $40.20/acre for this second cutting of alfalfa forage.

Conclusions: Vitazyme increased alfalfa production by 14% in this replicated New York study, while forage quality was not affected significantly in this test. In other tests forage quality has been substantially improved with Vitazyme. This translated to a $40.20/acre increase in milk output as calculated by the University of Wisconsin's Milk 2000 Alfalfa/Grass Evaluation System.

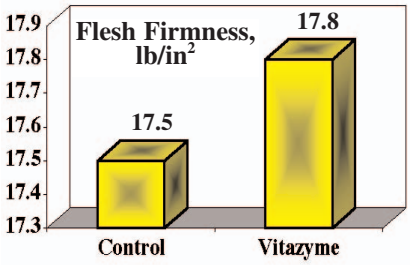
Treatment	Milk per day from the forage[1]	Milk per ton of forage[1]	Milk per acre[1]	Change
	lb/day	lb/ton	lb/acre	lb/acre
Control	62.2 a	3,103 a	2,513 a	——
Vitazyme	57.7 a	3,031 a	2,245 a	+ 268

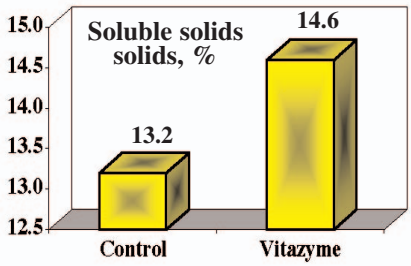
[1]Means followed by the same letter are not significant at P = 0.10 according to the Tukey-Kramer test.

- ***Increase in milk income: $40.20/acre***
- ***Increase in fresh yield: 9%***
- ***Increase in dry yield: 14%***

Apples

Area 1





Location: Williamson, New York
Soil type: silt loam, 25 in to a hardpan
Variety: McIntosh, selection Red Max
Tree age: 13 years, on dwarf root stock
Experimental design: Two areas of Red Max apples were treated with Vitazyme, and adjoining areas were left untreated. Quality determinations were made by the field man of the apple processing company that purchased the apples.

1. Control 2. Vitazyme

Fertilization: foliar urea sprays six times, all before June 15, along with the fungicide, at 5 lb/acre (30 to 40 lb of urea/acre total); 400 lb/acre K_2SO_4 in the fall; 1.5 lb/acre Solubor 4 to 5 times with the urea and fungicide

Vitazyme application: 13 oz/acre on the leaves using an air-blast sprayer about July 15; 13 oz/acre again on September 1, 12 to 18 days before harvest

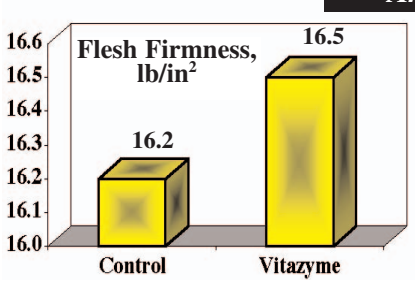
Harvest date: Area 1, September 12; Area 2, September 18

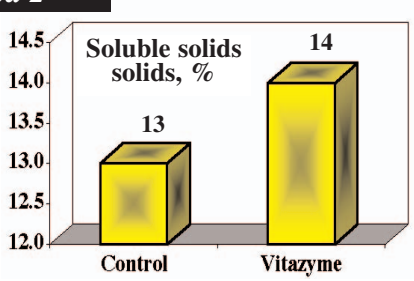
Fruit quality: No yield checks were made on the fruit harvest, but quality determinations were made for both areas, on soluble solids (the juice was used from five apples, sampled at four places on each fruit, using the juice expressed during the pressure tests) and pressure (a small penetrometer was pressed into the flesh of five apples, using the average of four places on each fruit).

Conclusions: Vitazyme applied twice to the leaves of apples in this New York test, the first treatment in midsummer and the second treatment about two weeks before harvest, **significantly improved the dissolved solids** (mostly sugars)

These apples grown in New York State responded to Vitazyme by producing more soluble solids, and had firmer flesh, reducing the bruising potential.

Area 2





of the fruit, and also s**trengthened the flesh of the apples**. These observations are in line with the usual effect of the product to strengthen cell walls and increase the sugar content by improving the intensity of photosynthesis ... and thus increasing carbon fixation and sugar production. These improvements translate into sweeter, tastier fruit that will store longer without bruising, reducing deterioration.

- ***Increase in soluble solids: 1.0 to 1.4 brix***
- ***Improvement in flesh firmness: 0.3 lbs/in²***

Black Beans

Beans raised using Vitazyme normally display excellent production, as noted here.

Researcher: John Egeland *Variety*: Unknown
Location: Fisher, Minnesota *Soil type*: clay loam
Planting date: May 19, 2002 *Seeding rate*: 47 lb/a
Experimental design: A field totalling 96 acres was divided into two parts, 46 acres left untreated and 50 acres treated with Vitazyme **1. Control 2. Vitazyme**
Fertilization: unknown, except for some commercial starter incorporated into the soil before planting.
Vitazyme treatment: 13 oz/acre with herbicide and starter fertilizer before planting
Harvest date: October 3, 9, and 10, 2002
Yield results: Actual truck weights were taken to insure an accurate yield calculation.

Beans treated with Vitazyme seldom show no response, but may if the root and soil microbial growth are seriously restricted due to cold or flooding.

Treatment	Bean yield	Yield Change	Bean moisture	Test weight	Split beans	Grade
	lb/acre	lb/acre	%H_2O	lb/bu	%	
Control	1,767	——	18.3	58.5	7.5	2
Vitazyme	1,730	(–) 37 (–2%)	20.0	58.0	7.5	2

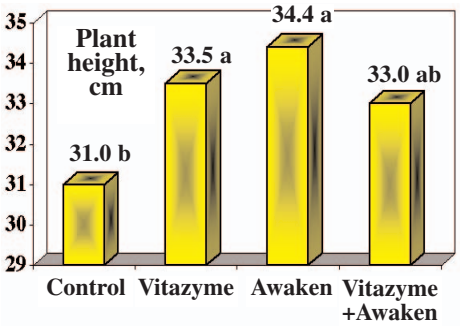
Conclusions: **Due to strong soil compaction (from high soil magnesium and machine traffic) and very heavy rains early in the season, soil microbial activity in the rhizosphere was severely curtailed so that Vitazyme's active agents could not produce the increases in growth that normally occur with its use;** its mode of action is primarily through rhizosphere stimulation. A later application would have caused significant rhizosphere stimulation and yield improvements, as was experienced in several other tests conducted on the farm with field beans and wheat.

Bush Beans

Location: Vital Earth Resources Research Greenhouse, Gladewater, Texas *Variety*: Kentucky Wonder
Soil type: Bowie very fine sandy loam *Population*: 7 seeds/pot, thinned to 3/pot *Pot type*: 1 gallon
Planting date: November 21, 2001 *Harvest date*: January 8, 2002, 48 days after planting
Experimental design: A complete block design was set up using eight replicates for each of four treatments. The soil was carefully packed into each pot, watered evenly, and then treated with the materials. Plants were watered on demand, and grown in the greenhouse at about 70°F for a high and 55°F for a low temperature.

1. **Control**
2. **Vitazyme only**
3. **Awaken only**
4. **Vitazyme + Awaken**

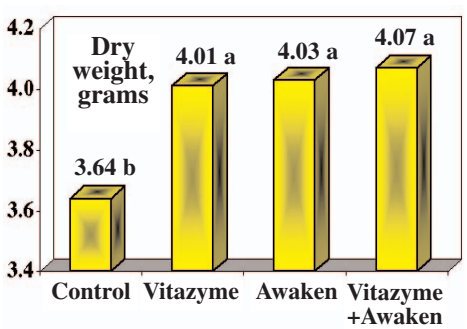
Vitazyme application: After planting on November 21, 100 ml of a 0.01% Vitazyme solution was applied to the soil surface of each pot for Treatment 2. This rate is higher than recommended, but used so as to obtain a 50-50 mixture of the two products.
Awaken application: Awaken was applied to the soil surface of the pots of Treatment 3 as 100 ml of 0.01% solution; this is equivalent to 71 oz/acre, the recommended rate for this experiment. The Awaken for Treatment 4 was mixed at the same percentage with 0.01% Vitazyme, which was also applied at 100 ml/pot.



* Means followed by the same letter are not significantly different at P=0.10, according to the Tukey-Kramer Test. $LSD_{0.10}$=1.5 cm.

Product specifications: **Vitazyme:** a liquid fermentation product of various plant materials, organisms, simple and complex carbohydrates, and other materials to yield a multiple mode of action - multiple active agent metabolic stimulator containing natural growth regulators (triacontanol, etc.), vitamins (B-complex, etc.), enzymes, and other phytoactive substances that are biologically active at very low application rates. Producer: Vital Earth Resources, Gladewater, Texas.
Awaken: a macro/micronutrient solution for plant growth stimulation having 16% N,

Vitazyme treated beans usually produce more fruit that are more mature and uniform in size, as shown in this study



* Means followed by the same letter are not significantly different at P=0.10, according to the Tukey-Kramer Test. LSD_{010}=0.38 g.

2% K_2O, 0.02% B, 0.15% Cu (chelated), 0.15% Fe (chelated), 0.15% Mn (chelated), 0.0006% Mo, and 2.7% Zn of which 0.15% is chelated. Awaken also contains as a major component the material called ACA (Agricultural Crop Additive). ACA's active component is zinc ammonium phosphate, the mechanism of action of which has not been fully characterized. Producer: United AgriProducts (UAP).

Height results: On January 8, all of the plant roots were washed clean of soil, and the plants were measured for height. The plants were then dried in a drying oven at 115°F for 48 hours. There were some differences in plant height among the four treatments. The control treatment was significantly shorter than the Awaken and Vitazyme treatments, but not shorter than the combined Vitazyme-Awaken treatment.

Dry weight results: These results showed highly significant differences among treatment means. The dry weights of the bean plants treated with Vitazyme, Awaken, or the two together were significantly greater than Vitazyme or the control in this study.

Conclusions: Vitazyme and Awaken alone, or in combination, significantly improved growth and dry matter accumulation for bush beans above the control in this greenhouse study.

Cabbage

University of Costa Rica

The untreated cabbages in this replicated research study were normal but not outstanding. Maturity for the control was usual, but compare this result to the picture on the right.

Location: Agronomic Research Center, San Jose, Costa Rica, in conjunction with Organic Planet International Corporation

Variety: a standard green heading type

Soil type: unknown

Transplanting date: unknown

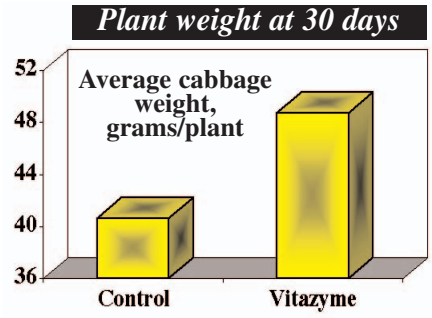
Experimental design: A small plot study involving two treatments of cabbages was established. The two treatments were as follows:

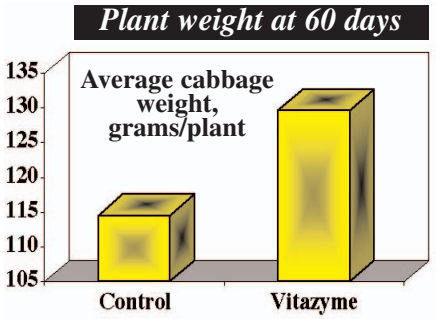
1. Control 2. Vitazyme

Fertilization: unknown

Vitazyme application : A dilute application of Vitazyme was made to the cabbages of the treated plots 15 days after transplanting, and again 30 days after transplanting.

Compared to the control treatment on the left, the Vitazyme treated cabbages were more mature and had much bigger heads on the same date.





Growth and harvest results: At 30 days after transplanting (15 days after the first Vitazyme application) a sampling of the weights of plants was made. This sampling was repeated at 60 days after transplanting (30 days after the second application).

Conclusions: This cabbage study in Costa Rica has shown that Vitazyme can significantly increase the growth of cabbages, beginning at two weeks after the first application and up to at least 45 days later. The following conclusions are offered:

1. Vitazyme stimulates crop development from the early stages of growth.
2. Vitazyme emerges as a good alternative for improving production of vegetable crops.
3. The weight increase generated by Vitazyme is important for producing greater income.

- ***Yield increase at 30 days: 20%***
- ***Yield increase at 60 days: 13%***

Corn

A Weed Control and Yield Study

Research firm: Agricultural Custom Research and Education Services (ACRES)

Previous crop: soybeans

Soil type: Maxfield silty clay loam

Soil characteristics: organic matter, 9%; pH, 6.7; CEC, 20.5 meq/100 g

Tillage: field cultivator and spring tooth harrow

Planting rate: 27,000 seeds/acre

Row spacing: 30 inches

Location: Cedar Falls, Iowa

Planting depth: 1.5 inches

Variety: Kruger 9912 RR

Planting date: May 7, 2002

Experimental design: The purpose of the study was to . . .

(1) Evaluate the effect of Vitazyme on the ability of Roundup (glyphosate) to better control various weed species
(2) Evaluate the effect of Vitazyme to improve corn yield.
(3) Evaluate the effect of Vitazyme and Roundup on soil and root mycorrhizal colonization.

A uniform soil area was selected on a field which had received no previous biostimulant or fertility plot treatments. A Latin square design was set up with four replications on four treatments, each plot being 10 X 40 ft (0.00918 acre). All data was statistically analyzed using ANOVA, and Bartlett's Test.

1. **Roundup, 100% rate**
2. **Roundup, 100% rate + Vitazyme**
3. **Roundup, 25% rate**
4. **Roundup, 25% rate + Vitazyme**

Fertilization: 160 lb/acre N as 28-0-0 (UAN) over all areas, preplant incorporated
Vitazyme application: 20 oz/acre on the seeds at planting, on May 7, 2002
Glyphosate application: (1) 32 oz/acre of Roundup Ultra sprayed on June 17 to Treatments 1 and 2; (2) 8 oz/acre of Roundup Ultra sprayed on June 12 to Treatments 3 and 4
Weed control evaluations: On three dates – June 20, July 3, and August 9 – evaluations were made for each plot on the percentage of weeds controlled by glyphosate.

Giant Foxtail

Treatment	Evaluation date		
	June 20	July 3	August 9
	% control		
1. Roundup, 100% rate	100.0 a	99.0 a	99.0 a
2. Roundup, 100% rate+Vitazyme	100.0 a	99.0 a	94.3 a
3. Roundup, 25% rate	99.5 a	94.0 b	96.3 a
4. Roundup, 25% rate+Vitazyme	97.3 a	95.0 b	92.5 a

The 25% glyphosate application reduced the control of giant foxtail slightly but not significantly, except on July 3 when the control was somewhat less. Vitazyme did not improve foxtail control at the reduced herbicide level.

Smooth Pigweed

Treatment	Evaluation date		
	June 20	July 3	August 9
	% control		
1. Roundup, 100% rate	96.5 a	93.5 a	94.3 a
2. Roundup, 100% rate+Vitazyme	98.3 a	93.3 a	93.8 a
3. Roundup, 25% rate	85.0 b	76.3 b	73.8 b
4. Roundup, 25% rate+Vitazyme	82.5 b	76.3 b	72.5 b

For all three evaluation dates the reduced Roundup rate caused a reduction in weed control, by up to 21% less on August 9. Vitazyme did not enhance the degree of pigweed control at any of the evaluation dates.

Dandelion

Treatment	Evaluation date		
	June 20	July 3	August 9
	% control		
1. Roundup, 100% rate	95.0 a	100.0 a	100.0 a
2. Roundup, 100% rate+Vitazyme	99.5 a	100.0 a	100.0 a
3. Roundup, 25% rate	85.0 bc	97.5 a	100.0 a
4. Roundup, 25% rate+Vitazyme	82.5 c	87.5 b	100.0 a

A reduced Roundup application rate for dandelions significantly reduced control on June 20 and July 3, but by August 9 all treatments had 100% control. Vitazyme significantly reduced the dandelion kill on July 3, and also reduced it on June 20, proving that the product had somewhat of a protective effect on the dandelions at 25% Roundup.

Velvetleaf

Treatment	Evaluation date		
	June 20	July 3	August 9
	% control		
1. Roundup, 100% rate	96.5 a	96.5 a	93.8 a
2. Roundup, 100% rate+Vitazyme	96.5 a	95.5 a	92.0 a
3. Roundup, 25% rate	76.3 b	77.5 b	72.5 b
4. Roundup, 25% rate+Vitazyme	71.3 b	76.3 b	71.3 b

The reduced Roundup application allowed a significantly greater number of velvetleaf weeds to survive throughout the growing season. Vitazyme did not significantly affect the effectiveness of the herbicide kill percentage.

Giant Ragweed

Treatment	Evaluation date		
	June 20	July 3	August 9
	% control		
1. Roundup, 100% rate	95.8 a	97.5 a	100.0 a
2. Roundup, 100% rate+Vitazyme	95.8 a	98.8 a	100.0 a
3. Roundup, 25% rate	78.8 b	87.5 a	91.3 a
4. Roundup, 25% rate+Vitazyme	77.5 b	73.8 b	92.5 a

A reduction of Roundup to 25% of normal significantly reduced the rate of giant ragweed kill for June 20, and nearly so for July 3; no significant effect occurred for August 9. Vitazyme significantly reduced the ragweed kill for July 3 but not for the other two dates.

Common Lambsquarters

Treatment	Evaluation date		
	June 20	July 3	August 9
	% control		
1. Roundup, 100% rate	98.8 a	100.0 a	100.0 a
2. Roundup, 100% rate+Vitazyme	100.0 a	100.0 a	100.0 a
3. Roundup, 25% rate	95.0 ab	97.5 a	91.3 a
4. Roundup, 25% rate+Vitazyme	92.5 b	87.5 b	91.3 a

The reduced Roundup application significantly reduced the kill of lambsquarters compared to the full rate, except when Vitazyme was applied for June 20 and July 3. No significant differences were noted among all treatments on August 9.

Pennsylvania Smartweed

Treatment	Evaluation date	
	June 20	August 9
	% control	
1. Roundup, 100% rate	98.8 a	100.0 a
2. Roundup, 100% rate + Vitazyme	99.0 a	100.0 a
3. Roundup, 25% rate	82.5 b	100.0 a
4. Roundup, 25% rate + Vitazyme	81.3 b	100.0 a

A 25% rate of Roundup significantly reduced Pennsylvania smartweed kill on June 20, but by August 9 there was complete control of this weed. Vitazyme did not affect smartweed kill at either date.

Prickley Lettuce

Treatment	Evaluation date	
	June 20	August 9
	% control	
1. Roundup, 100% rate	97.3 a	100.0 a
2. Roundup, 100% rate + Vitazyme	100.0 a	100.0 a
3. Roundup, 25% rate	92.5 a	100.0 a
4. Roundup, 25% rate + Vitazyme	93.8 a	100.0 a

There were no significant differences among the four treatments for both June 20 and August 9 evaluation dates, although there were a few more surviving prickly lettuce plants on June 20 for the 25% Roundup rate.

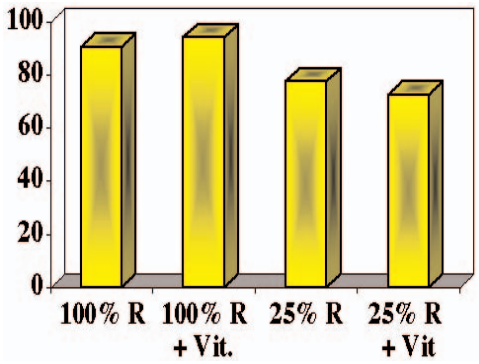
Continued on the next page

All Weeds Combined

Treatment\	Weed control
	% control
1. Roundup, 100% rate	90.5 a
2. Roundup, 100% rate + Vitazyme	94.0 a
3. Roundup, 25% rate	77.5 b
4. Roundup, 25% rate + Vitazyme	72.5 b

Considering all weeds combined, there was a significant reduction in weed control with the 25% Roundup rate versus the 100% rate. However, Vitazyme did not significantly change the weed kill at either Roundup application level.

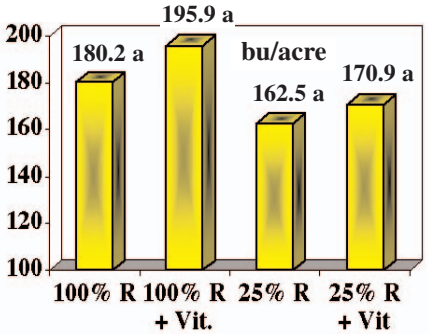
Weed control, all weeds combined, %



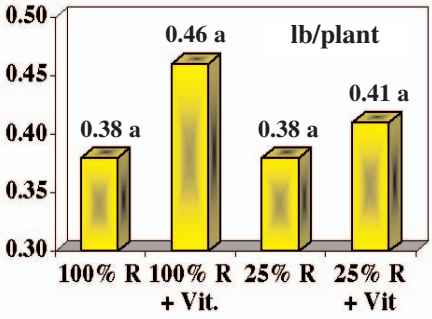
Despite no significant differences in weed kill at the two Roundup levels, there was a tendency at the 100% Roundup rate for Vitazyme to enhance the weed kill. This increase was 3.5 percentage points. However, this tendency was reversed at the low Roundup rate, **possibly implying that Vitazyme was enhancing weed recover when the glyphosate dosage was not lethal, but was aiding weed kill with the recommended, lethal dosage.**

Yield results: A Gleaner K-2 combine with Harvestmaster components was used to harvest the plots.

Grain Yield*



Grain per Plant*



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

- ***Yield increase at 100% Roundup: 9%***
- ***Yield increase at 25% Roundup: 5%***
- ***Grain per plant increase at 100% Roundup: 21%***
- ***Grain per plant increase at 25% Roundup: 8%***

Income results: The calculations below are based on a price of $2.60/bushel.

Treatment	Grain yield	Income	Change vs. control
	bu/acre	$/acre	$/acre
1. Roundup, 100% rate	180.2	468.52	——
2. Roundup, 100% rate + Vitazyme	195.9	509.34	40.82
3. Roundup, 25% rate	162.5	422.50	——
4. Roundup, 25% rate + Vitazyme	170.9	444.34	21.84

Root mycorrhizae colonization: Evaluation of the vesicular-arbuscular mycorrhizae in Treatments 1 and 2 revealed no significant differences in values. This is in contrast to a 2001 study at ACRES, when the Vitazyme treatment (in-furrow at planting, and on the soil after planting) increased the mycorrhizal population by 56% above the control. The fact that only an at-planting application was made in 2002 may have reduced the mycorrhizae response to Vitazyme.

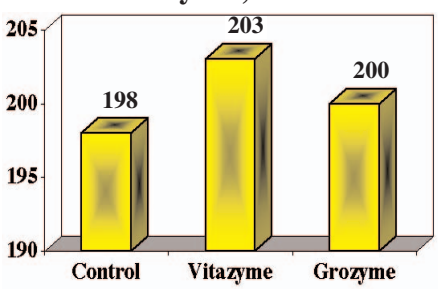
Corn treated with Vitazyme, especially if seed treated, produces a greater root mass, especially of the fine root hairs that are most effective in absorbing nutrients.

Conclusions: In this east-central Iowa corn study, Vitazyme applied at 20 oz/acre on the seeds at planting elicited good yield increases at both 100% and 25% Roundup applications, being 9% and 5% above the controls, respectively. Grain per plant was also boosted by Vitazyme, being 21% higher at the 100% Roundup rate and 8% higher at the 25% rate. Income increases were about $22 to $41 per acre. Effects of Roundup on weeds were significant, the high rate usually reducing weed populations more than the low rate, with Vitazyme having a tendency to improve the weed kill at the high rate, while slightly reducing the weed kill at the low rate.

- ***Income increase with 25% Roundup: $21.84/acre***
- ***Cost:Benefit Ratio: 3.6:1***
- ***Income increase with 100% Roundup: $40.82/acre***
- ***Cost:Benefit Ratio: 6.8:1***

Corn

Grain yield, bu/acre



Location: Blue Grass, Iowa *Variety*: LG 2637 *Previous Crop*: soybeans
Planting date: May 16, 2002 *Row spacing*: 30 inches
Soil type: Fayette clay loam *Plant population*: 30,000 seeds/acre
Planting depth: 1.5 inches *Harvest date:* November 1, 2002
Soil analysis: K, 110 ppm; organic matter, 1.5%; pH, 6.9
Experimental design: A field poor in fertility was divided into three parts for this study, a control (untreated) area and two areas for biostimulants.

1. Control **2. Vitazyme** **3. Ag Spectrum (Grozyme)**

Fertilization: 125-0-0-12.5% N-P_2O_5-K_2O-S at planting, plus 5 gal/acre Ag Spectrum "Clean Start" in the seed furrow

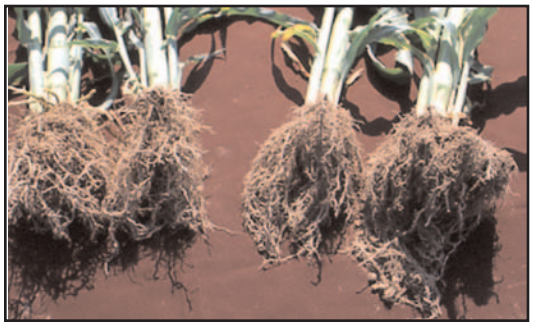
Test weight

Treatment	Test weight	Change
	lb/bu	
Control	56	—
Vitazyme	57	+1 (2%)
Grozyme	56	0

Vitazyme and Grozyme treatments: 12 oz/acre sprayed on the leaves and soil with the herbicide on June 1
Herbicide treatment: 4 qt/acre of Lariat on June 1
Income results: A price of $3.00/bu is estimated for this crop.

Treatment	Yield	Income	Income change
	bu/acre	$/acre	
Control	198	594	—
Vitazyme	203	609	+15
Grozyme	200	600	+6

Conclusions: Vitazyme applied once with the herbicide produced a 3% (5 bu/acre) yield increase on this fairly poor fertility corn field during a very good crop year. This was 3 bu/acre more yield than produced by Grozyme biostimulant. The test weight was also increased by 1 lb/bu with Vitazyme above both the control and Grozyme, and income was increased by $15.00/acre.



The treated corn on the right displays not only an expanded root mass, but larger plants and bigger, more mature ears. This always translates into a greater grain yield.

- ***Yield increase with Vitazyme: 3%***
- ***Increase in test weight with Vitazyme: 1 lb/bu***
- ***Income increase with Vitazyme: $15.00/acre***

Corn

This greenhouse study in Texas shows how Vitazyme, applied to the soil in the seed zone, triggers an abundance of both fine and coarse roots ... and bigger tops.

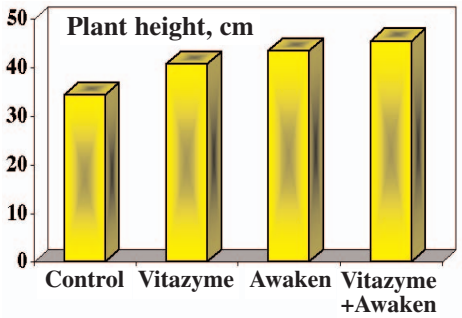
Location: Vital Earth Resources Research Greenhouse, Gladewater, Texas
Soil type: Bowie very fine sandy loam
Variety: yellow dent
Planting date: November 21, 2001
Pot type: 1 gallon
Population: 7 seeds/pot, thinned to 3/pot
Experimental design: A complete block design was set up using eight replicates for each of four treatments. The soil was carefully packed into each pot, watered evenly, and then treated with the materials. Plants were watered on demand, and grown in the greenhouse at about 70°F for a high and 55°F for a low temperature.

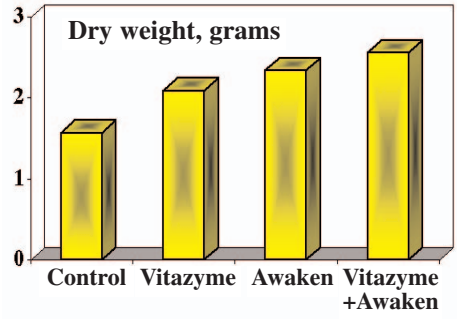
1. **Control**
2. **Vitazyme only**
3. **Awaken only**
4. **Vitazyme + Awaken**

Vitazyme application: After planting on November 21, 100 ml of a 0.01% Vitazyme solution was applied to the soil surface of each pot for Treatment 2. This rate is higher than recommended, but used so as to obtain a 50-50 mixture of the two products.
Awaken application: Awaken was applied to the soil surface of the pots of Treatment 3 as 100 ml of a 0.01% solution; this is equivalent to 71 oz/acre, the recommended rate for this experiment. The Awaken for Treatment 4 was mixed at the same percentage with 0.01% Vitazyme, which was also applied at 100 ml/pot.
Product specifications: **Awaken:** a macro/micronutrient solution for plant growth stimulation having 16% N, 2% K_2O, 0.02% B, 0.15% Cu (chelated), 0.15% Fe (chelated), 0.15% Mn (chelated), 0.0006% Mo, and 2.7% Zn of which 0.15% is chelated. Awaken also contains as a major component the material called ACA (Agricultural Crop Additive). ACA's active component is zinc ammonium phosphate, the mechanism of action of which has not been fully characterized. Producer: United AgriProducts (UAP).
Harvest date: January 8, 2002, 48 days after planting.
Height results: On January 8, all of the plant roots were washed clean of soil, and the plants were measured for height. The plants were then dried in a drying oven at 115°F for 48 hours. There were some differences in plant height among the four treatments. The control treatment was significantly shorter than the other three treatments, and the Vitazyme treatment was significantly shorter than the combined Vitazyme-Awaken treatment.
Dry weight results: These results showed highly significant differences among treatment means.

Treatment	Plant height*	Change vs. the control
	cm	
4. Vitazyme + Awaken	45.4 a	+11.1 (+32%)
3. Awaken	43.4 ab	+9.1 (+27%)
2. Vitazyme	40.7 b	+6.4 (+19%)
1. Control	34.3 c	—

* Means followed by the same letter are not significantly different at P=0.10, according to the Tukey-Kramer Test. $LSD_{0.10}$=2.0 cm.





Treatment	Dry weight*	Change vs. the control
	grams	
4. Vitazyme + Awaken	2.56 a	+1.20 (+30%)
3. Awaken	2.34 ab	+0.93 (+23%)
2. Vitazyme	2.09 b	+0.46 (+11%)
1. Control	1.57 c	—

* Means followed by the same letter are not significantly different at P=0.10, according to the Tukey-Kramer Test. LSD_{010}=0.27 g.

Conclusions: It appears that Vitazyme enhances the activity of Awaken for corn in terms of both plant height and dry tissue weight. Awaken, with its nutrients, stimulated corn growth somewhat more than did Vitazyme in this study, though not significantly. **Vitazyme and Awaken appear to work well together, displaying a noticeable synergism.**

- ***Increase in dry weight with Vitazyme + Awaken: 30%***
- ***Increase in plant height with Vitazyme + Awaken: 32%***

Corn (Silage)

Plus Milk 2000 Calculations

Location: Stutzman's Research Farm, Arkport, New York
Soil type: silt loam
Soil pH: 6.6
Row spacing: 30 inches
Planting date: June 7, 2002
Variety: Agway 3311
Population: 26,000 plants/acre
Harvest date: September 20, 2002

Experimental design: A randomized complete block design was set up to evaluate three treatments on silage corn. Five replicates were used, with each plot 10 x 50 ft (0.01148 acre).

1. Control (no Vitazyme) **2. 60% nitrogen, plus Vitazyme** **3. 100% nitrogen, plus Vitazyme**

Weed control: Python at 4 oz/acre; Atrazine at 1 lb/acre; Banvel at 2 oz/acre
Fertilization: All areas received 125 lb/acre of a 10-30-10 starter, and no P or K.

Treatment	Manure[1]	Organic Matter[2]	Urea	Total
		lb N/acre		
1	40	95	0	135
2	40	95	57	192
3	40	95	95	230

[1] Estimated at 1.0% N, and a 20%/yr. release = 40 lb/acre. Applied the fall of 2001. [2] About 4% soil organic matter: at 0.19% N/acre = 3,800 lb/acre x 2.5% annual release = 95 lb N/acre.

Vitazyme treatments: (1) 13 oz/acre dribbled over the dry fertilizer placed 2 in x 2 in below and beside the seeds, at planting for Treatments 2 and 3; (2) 13 oz/acre sprayed over the leaves and soil at the V6 stage of Treatments 2 and 3

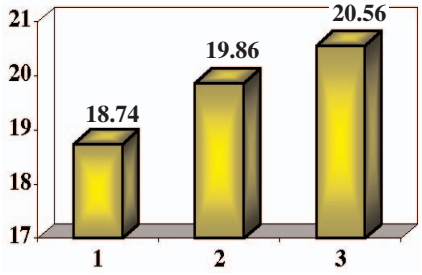
Weather during the growing season: Rain and temperatures were favorable for corn growth during June and early July, but hot and dry weather prevailed through much of July and August.

days	Precipitation	Growing degree
June	5.3	497
July	2.6	624
August	1.6	511

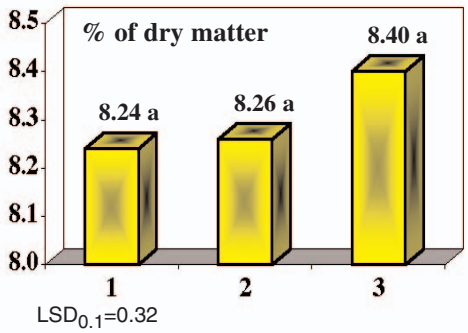
Yield results: Silage yields were determined in all plots on September 20.

Quality and feeding value results: Several feeding value parameters were investigated from silage samples sent from each plot to Marshfield, Wisconsin. All samples were packed in ice and mailed to the laboratory of the University of Wisconsin Corn Silage Evaluation System – Milk 2000; they arrived in excellent condition. The Tukey-Kramer test was used to evaluate significant differences between treatment means in an analysis of variance.

Yield, tons/acre

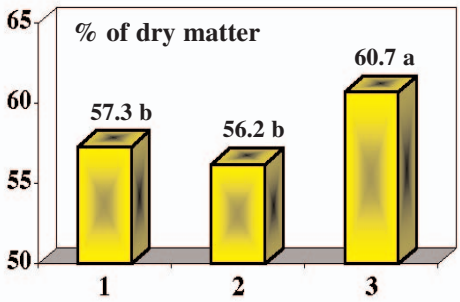


Crude Protein



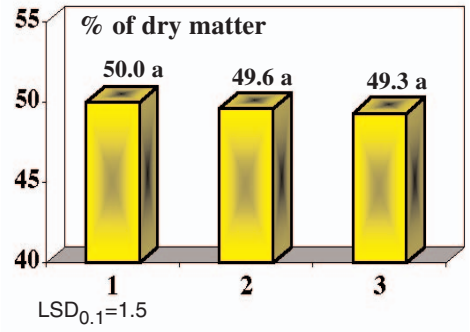
$LSD_{0.1}$=0.32

Neutral Detergent fiber Digestibility



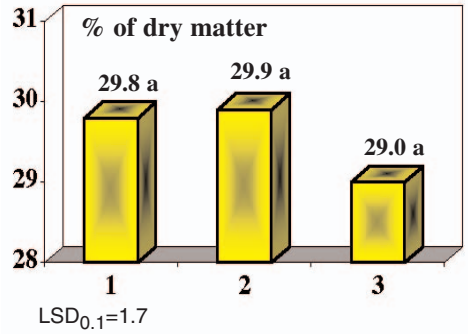
$LSD_{0.1}$=1.7; P=0.0035**
Trt.3>Trt. 1 and 2 at P=0.10 (Tukey Kramer)

Neutral Detergent Fiber



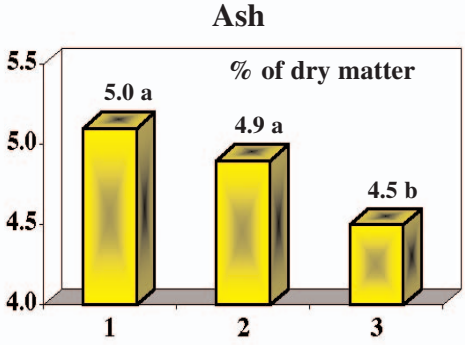
$LSD_{0.1}$=1.5

Starch



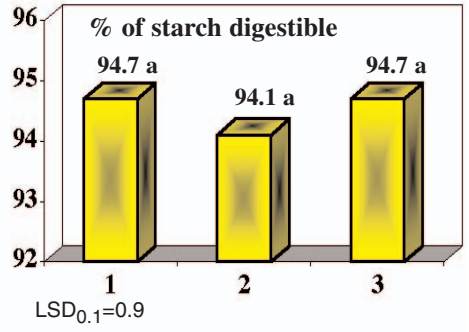
$LSD_{0.1}$=1.7

Ash



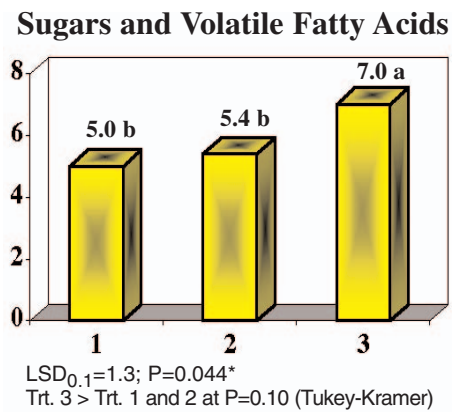
$LSD_{0.1}$=0.3; P=0.025*
Trt. 1 and 2 > Trt. 3 at P=0.10 (Tukey-Kramer)

Starch Digestibility

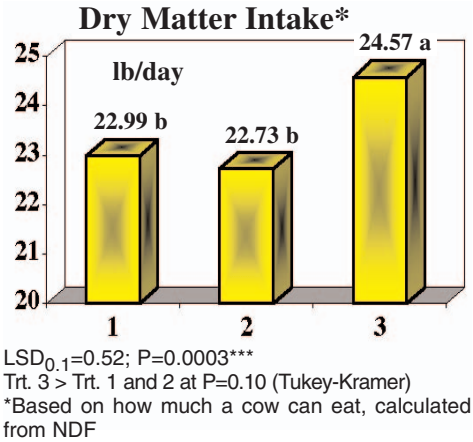


$LSD_{0.1}$=0.9

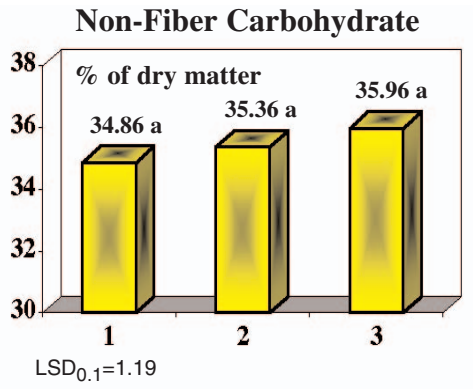
Growth of silage corn at Stutzman's Research Farm was as prolific for the reduced nitrogen rate as for the full nitrogen rate when Vitazyme was applied.



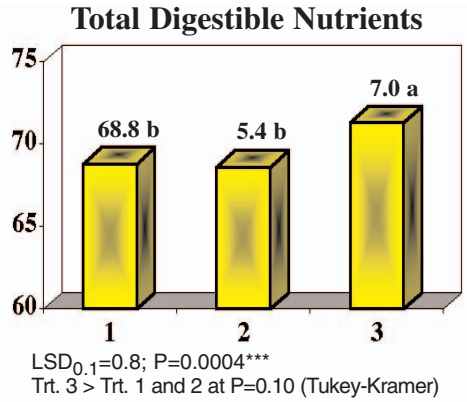
$LSD_{0.1}$=1.3; P=0.044*
Trt. 3 > Trt. 1 and 2 at P=0.10 (Tukey-Kramer)



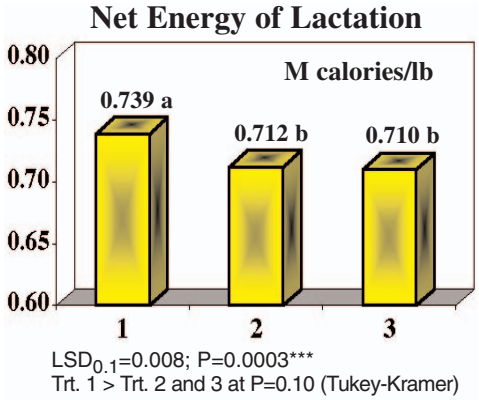
$LSD_{0.1}$=0.52; P=0.0003***
Trt. 3 > Trt. 1 and 2 at P=0.10 (Tukey-Kramer)
*Based on how much a cow can eat, calculated from NDF



$LSD_{0.1}$=1.19

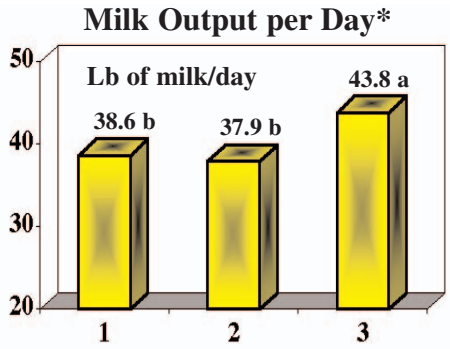


$LSD_{0.1}$=0.8; P=0.0004***
Trt. 3 > Trt. 1 and 2 at P=0.10 (Tukey-Kramer)

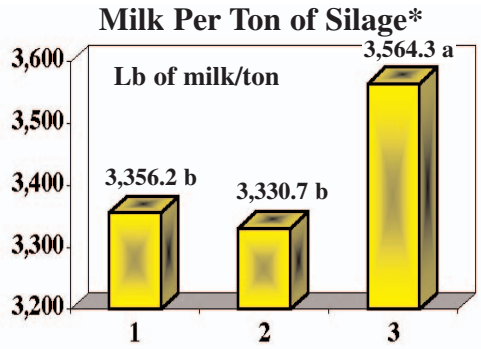


$LSD_{0.1}$=0.008; P=0.0003***
Trt. 1 > Trt. 2 and 3 at P=0.10 (Tukey-Kramer)

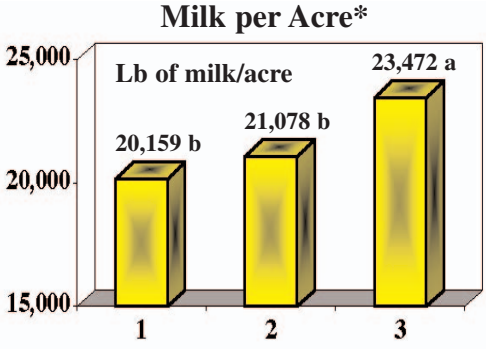
Calculated milk production: Based on Milk 2000 calculations of feeding value of the silage coupled with per acre yields, the following values of milk output have been calculated for each of the three treatments.



$LSD_{0.1}$=1.6; P=0.0002***
Trt. 3 > Trt. 1 and 2 at P=0.10 (Tukey-Kramer)
*This figure approximates a balanced ration based on several assumptions, and incorporates both yield and quality parameters.



$LSD_{0.1}$=69.0; P=0.0004***
Trt. 3 > Trt. 1 and 2 at P=0.10 (Tukey-Kramer)
*This value is an index of how much milk would be produced from a ton of silage based on the quality of the silage.



$LSD_{0.1}$=0.52; P=0.0003***
Trt. 3 > Trt. 1 and 2 at P=0.19 (Tukey-Kramer)
*This figure is an index of (milk/ton of silage) (tons of silage/acre) = milk/acre.

Results and conclusions: **A Summary of Digestibility and Components of Silage Treatments**
(Treatments are arranged from the highest on the left to the lowest on the right.)

Crude protein (CP)	**3**	**2**	**1**	**Ash**	**1**	**2**	**3**
Neutral detergent fiber (NDF)	**1**	**2**	**3**	**Starch digestibility**	**3**	**=1**	**2**
NDF digestibility	**3**	**1**	**2**	**Non-fiber carbohydrate (NFC)**	**3**	**2**	**1**
Starch	**2**	**1**	**3**	**Sugars and volatile fatty acids**	**3**	**2**	**1**
Total Digestible nutrients (TDN)	**3**	**1**	**2**	**Net energy of lactation (NEL)**	**1**	**2**	**3**
Dry matter intake (DMI)	**3**	**1**	**2**				

Yield and Quality of the Silage

The yield was the highest for the 100% N + Vitazyme, being 10% greater than the untreated control treatment; the 60% N+Vitazyme treatment proved to give the second highest yield. **Thus, Vitazyme on top of the 100% N program produced an excellent yield, while a reduction of fertilizer N by 40% with Vitazyme actually resulted in a 6% gain in yield above the control with no Vitazyme.** Silage quality was significantly improved by Vitazyme for the 100% N level, with significant boosts in neutral detergent fiber, sugars and volatile fatty acids, total digestible nutrients, and dry matter intake. These improvements in crop quality, coupled with a higher yield, resulted in a significant increase in milk production as will be shown on the next page.

Milk Production from the Silage

Treatment 3 (100% + Vitazyme) produced the highest milk output per cow, milk per ton of silage, and milk per acre of all three treatments, exceeding the other two by the amounts shown in the table below. There was little difference in production between the reduced N treatment with Vitazyme (Treatment 2) and the control (Treatment 1).

Treatment	Milk output per day	Change vs. 1	Milk per ton of silage	Change vs. 1	Milk per acre	Change vs. 1
	lb/day	lb/day	lb/ton	lb/ton	lb/acre	lb/acre
3. 100% N + Vitazyme	43.3	+4.7 (+12%)	3,564.3	+208.1 (+6%)	23,472	+3,313 (+16%)
2. 60% N + Vitazyme	37.9	– 0.7 (– 2%)	3,330.7	– 25.5 (– 1%)	21,078	+919 (+6%)
1. Control (no Vitazyme)	38.6	——	3,356.2	——	20,159	——

Improvements with Vitazyme applied with 100% dry N fertilizer:

- ***Milk output per day per cow: +12%***
- ***Milk per ton of silage: +6%***
- ***Milk per acre: +16%***

Income changes: The income for the three treatments is based on a price of $15.00/cwt of milk.

Treatment	Milk per acre	Gross income	Change
	lb/acre	$/acre	$/acre
1. Control (no Vitazyme)	20,159	3,023.85	——
2. 60% N + Vitazyme	21,078	3,161.70	+137.85
3. 100% N + Vitazyme	23,472	3,520.80	+496.95

- ***Income increase with 100% N + Vitazyme: $496.95/acre***
- ***Income increase with 60% N + Vitazyme: $137.85/acre***

Corn (Silage)

Location: Blue Grass, Iowa
Variety: Baldridge 705 silage corn
Previous crop: corn
Soil type: unknown
Planting date: May 1, 2001
Population: 28,000 seeds/acre
Row spacing: 30 inches
Soil fertility: very high P and K
Tillage: ripped the fall of 2000, and field cultivated in the spring
Experimental design: A field was divided into three sections, each treated differently:

1. **Control: the usual fertilizer program**
2. **Ag Spectrum Program: Ag Spectrum starter plus Grozyme biostimulant**
3. **Vitazyme: the control program plus Vitazyme**

Fertilization: All three areas received 100 lb/acre N plus 5 lb/acre sulfur at planting. All areas also received 50 lb/acre of additional N sidedressed, with 5 lb/acre of sulfur. Treatments 1 and 3 received 5 gal/acre of Liquid Grow 8-19-3 starter in the furrow at planting, while Treatment 2 received 5 gal/acre of Ag Spectrum Clean Start+Kickoff in the furrow at planting.

Vitazyme and Grozyme applications : 12 oz/acre of Vitazyme with the herbicide for Treatment 3; 12 oz/acre of Grozyme with the herbicide for Treatment 2

Pesticide applications: 2.3 qt/acre of Harness Extra herbicide; Force insecticide

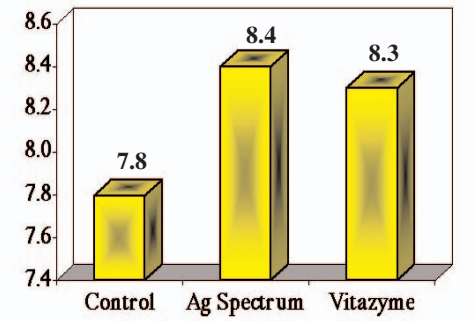
Growth results: **The Vitazyme treated corn was about one foot taller than the other two treatments during much of the growing season.**

Yield results: Silage yields were not determined.

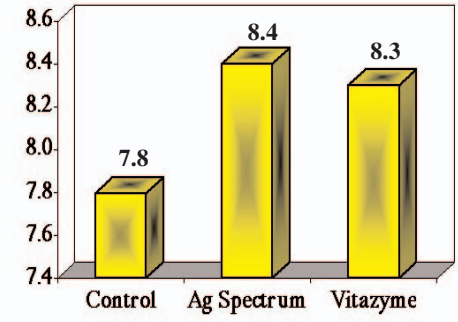
Silage quality results: Samples of silage were sent to Alvey Laboratory, Inc., at Belleville, Illinois, for an analysis of quality parameters. All parameters are expressed on a dry matter basis.

As with the other corn pictures shown earlier, root growth with Vitazyme, especially when applied to the seeds, is superior to the untreated control.

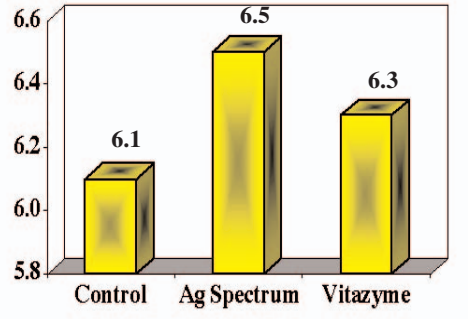
Crude Protein %

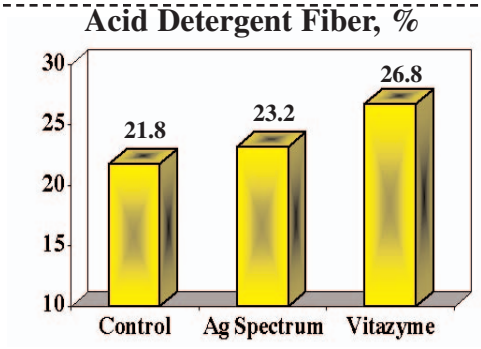


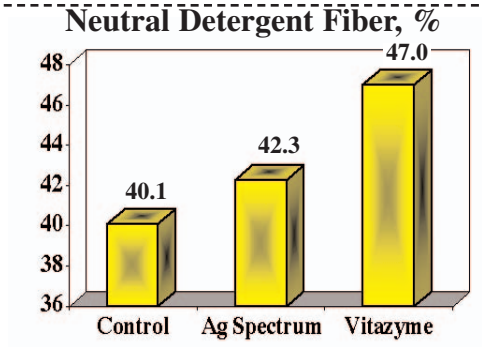
Available Protein %

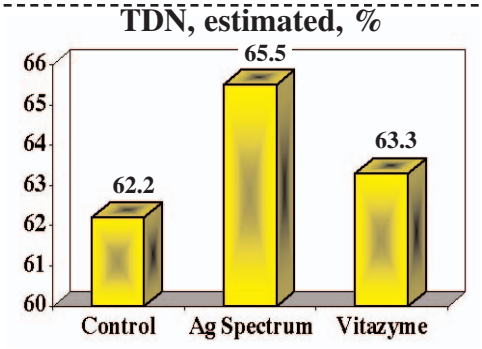


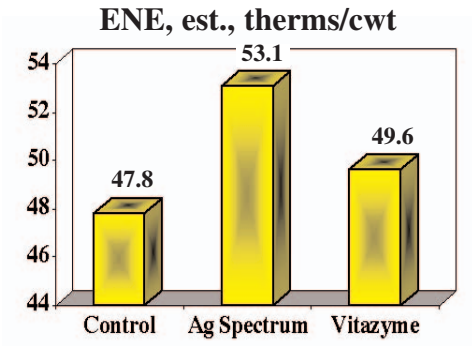
Digestible Protein %

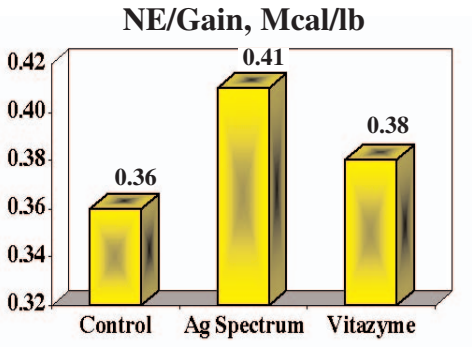


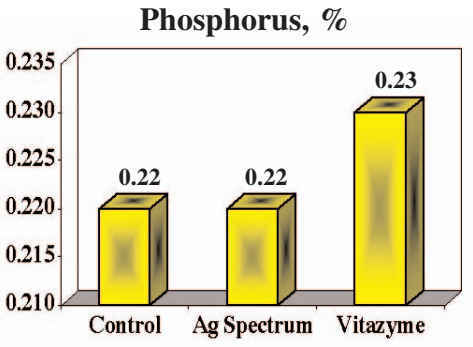


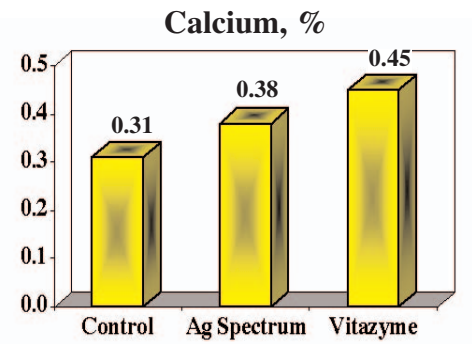


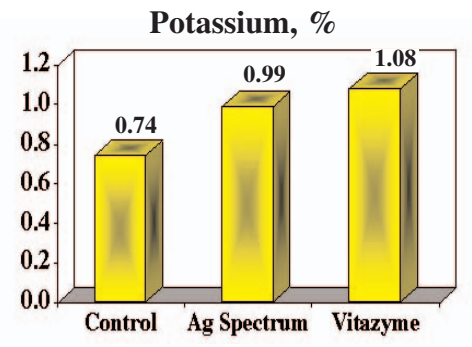


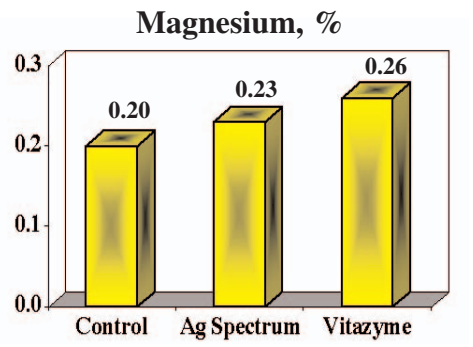












Conclusions: The growing season from mid-July through the end of the season was very dry, which limited yields for the silage corn. However, some significant quality differences appeared and are summarized below.

Parameter	Ag Spectrum	Vitazyme	Parameter	Ag Spectrum	Vitazyme
	increase over control			increase over control	
Crude protein	7%	6%	ENE, estimated	11%	4%
Available protein	7%	6%	NE per gain	14%	6%
Digestible protein	7%	3%	Phosphorus	0	5%
Acid detergent fiber	6%	23%	Calcium	23%	45%
Neutral detergent fiber	5%	17%	Potassium	34%	46%
TDN, estimated	5%	2%	magnesium	15%	30%

Both Vitazyme and the Ag Spectrum program gave good increases in silage quality. The Ag Spectrum program involved the addition of a specific starter fertilizer and some other materials which were not included in the Vitazyme treatment, so it is difficult to ascertain which materials caused benefits for the Ag Spectrum program. **Crude and available protein increases were nearly identical for both programs**, but Vitazyme increased fiber the most, while the Ag Spectrum program increased TDN and energy parameters the most. **Vitazyme increased mineral levels in the silage for all elements, which increases were consistently much more than the control and always more than for the Ag Spectrum program.**

Corn – Mycorrhizal Colonization

Agricultural Custom Research and Environmental Services

Location: ACRES Research Farm, Cedar Falls, Iowa
Soil Type: Kenyon loam
Row spacing: 30 inches
Planting date: May 9, 2001
Tillage: no-till
Population: 29,900 seeds/acre
Harvest results: All of the yield data is reported in another document.
Variety: Pioneer 33P67
Previous crop: soybeans
Planting depth: 1.5 inches
Herbicide: half rate of Buctril (2.25 qt/acre) and Accent (0.67 oz/acre)
Experimental design: A randomized complete block design was established with several treatments using plots that were 15 ft x 50 ft, with four replications. The center four rows of each plot were treated as specified (IF = in-furrow; BC = broadcast). Six of the ten treatments used in this study were sampled for mycorrhizae and are listed on the following page.

	Nitrogen, lb/acre		Nitrogen, lb/acre
1. Starter (6-18-6) alone	120	4. Vitazyme IF + Restore IF	120
2. Restore IF + Bacteria IF	120	5. Restore BC + Bacteria BC	120
3. Vitazyme IF	120		

[Note: **Restore** and **Bacteria** are herbal homeopathic preparations from Parametic Associates, Inc., St. Louis, Missouri.]

Fertilization: The starter (6-18-6% N-P_2O_5-K_2O) on all plots was applied with the seeds at planting, and the nitrogen was applied pre-plant as a 28% nitrogen solution.

Vitazyme application: 13 oz/acre in-furrow at planting (May 9) for the IF applications; 13 oz/acre over the soil (one week after planting May 16) for the BC applications

Restore applications: 2 oz/acre in-furrow at planting (May 9) for the IF application; 2 oz/acre over the soil (a week after planting on May 16) for the BC application.

Bacteria applications: 2 oz/acre in-furrow at planting (May 9) for the IF application; 2 oz/acre over the soil (a week after planting on May 16) for the BC application.

Mycorrhizae results: In mid-July and two months after harvest, in the last part of December, single plants from each plot were dug and sent to Mycorrhizal Applications, Inc., Grants Pass, Oregon, for analysis. The percent of endomycorrhizal colonization was determined using a grid intercept method wherein the development of spores, vesicles, arbuscules, and hyphae could be quantified. Sampled roots were placed in capsules in a 10% KOH solution in a water bath at low heat for 24 hours. The KOH was poured off and the capsules were rinsed in three complete changes of tap water. Then the capsules were placed in a 1% HCl solution for 30 minutes and immediately transferred to a water bath of Tri Pan blue for three hours and repeatedly rinsed. Roots from each sample were rinsed and chopped into segments. Segments from each capsule were examined and tallied for percent colonization and for the presence of arbuscular spores of mycorrhizal fungi using a dissecting microscope. Roots were examined in a graduated petri dish and each root intersection was tallied as mycorrhizal or non-mycorrhizal at each of 100 grid line crossings.

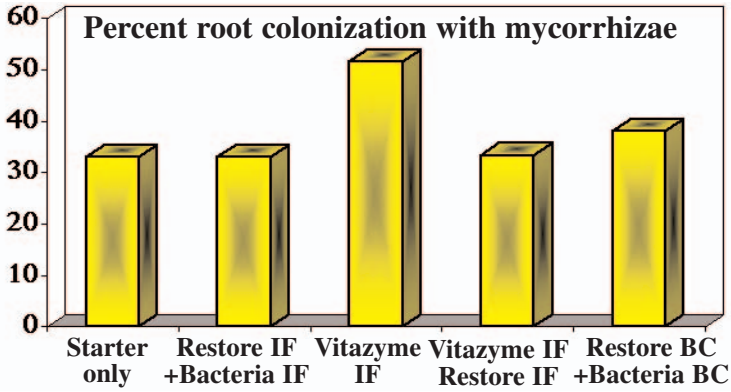
Mid-July sampling

There were only small differences among the five treatments for the mid-July sampling, so that data is not included here.

December sampling

Treatment	Nitrogen	Mycorrhizae*
	lb/acre	% colonization
3. Vitazyme IF	120	51.5 a
5. Restore BC + Bacteria BC	120	38.0 ab
4. Vitazyme IF + Restore IF	120	33.3 b
1. Starter alone	120	33.0 b
2. Restore IF + Bacteria IF	120	33.0 b

* Means followed by the same letter are not significantly different at P=0.10 according to the Tukey-Kramer Test. $LSD_{0.10}$=15.8.



• *Mycorrhizal infection increase with Vitazyme: 56%*

Conclusions: Vitazyme applied alone in the seed furrow at planting did not bring about a significant increase in vesicular-arbuscular mycorrhizal infection of root cells at midseason, but after harvest the infection rate of the Vitazyme treatment was significantly greater — by 56% — than the untreated control. Restore plus bacteria broadcast caused only a slight increase in mycorrhizal infection, and Vitazyme together with Restore in the furrow at planting did not cause an increase in infection.

It is not known why the Restore and Vitazyme together did not bring about a higher root colonization than it did. This corn study indicates that Vitazyme by itself, applied at planting on the seeds, can greatly increase mycorrhizal activity in the root zone, thus opening the potential for more nutrient uptake and growth factor generation — and higher yields — when the product is applied on or near the seeds.

Corn

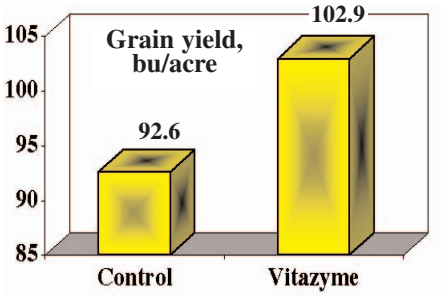
Location: Blue Grass, Iowa
Previous crop: corn
Planting date: May 1, 2001
Row spacing: 30 inches
Variety: Baldridge 705 silage corn
Soil type: unknown
Population: 28,000 seeds/acre
Soil fertility: very high P and K
Tillage: ripped the fall of 2000, and field cultivated in the spring
Experimental design: A field was divided into two sections, each treated differently:

1. **Control: the usual fertilizer program**
2. **Vitazyme: the control program plus Vitazyme**

Fertilization: Both areas received 100 lb/acre N plus 5 lb/acre sulfur at planting. Both areas also received 50 lb/acre of additional N sidedressed, with 5 lb/acre of sulfur. They received 5 gal/acre of Liquid Grow 8-19-3 starter in the furrow at planting.

Vitazyme application : 12 oz/acre of Vitazyme with the herbicide

Note the dramatic reduction in drought stress with the Vitazyme treated corn on the left. Severe leaf curling with the control started right at the treatment boundary.



Pesticide applications: 2.3 qt/acre of Harness Extra herbicide; Force insecticide
Growth results: **The Vitazyme treated corn was about one foot taller than the other treatment during much of the growing season.**
Yield results: Because of the very dry summer and fall, yields were greatly reduced from normal levels.
Conclusions: In spite of a very dry period from late July to September, Vitazyme applied with the herbicide boosted the corn grain yield by 11% over the control in this Iowa study.

- ***Yield increase with Vitazyme: 11%***

Cotton

Vitazyme treated cotton in this split-circle study was taller, with more and larger leaves containing more chlorophyll. Stems and roots were larger.

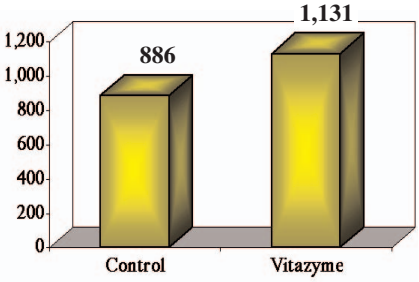
Location: Whitharral, Texas
Row spacing: 40 inches
Variety: Stoneville 2454, Roundup Ready
Planting date: May 15, 2002
Soil type: fine sandy loam
Harvest date: October 3, 2002
Experimental design: A center pivot area was divided into control and Vitazyme treated areas.

1. **Control (33 acres)**
2. **Vitazyme (33 acres)**

Fertility treatments: A preplant application of N and P were made, and 500 gal of a 11-52-0% N-P_2O_5-K_2O formulation was distributed through the center pivot system for all areas.
Vitazyme application: (1) 13 oz/acre in a 10-inch band behind each row at planting; (2) 13 oz/acre sprayed on the soil and leaves at the pinhead square stage (about July 8)
Weed control treatments: (1) Treflan applied preplant over all areas in April; (2) Roundup (glyphosate) sprayed on all areas on June 20
Nematode control treatments: Temik at 3 lb/acre at planting
Weather during the growing season: relatively moderate with some timely summer rains; not extremely hot
Yield results: The yield results above represent ginned cotton.
Quality results: An analysis of lint quality at Buster's Gin, Ltd., near Whitharral, Texas, revealed some differences in cotton quality for the two treatments (see on the right).
Income results: The selling price of the lint, considering loan value, was $0.575/lb.
Conclusions: Vitazyme applied twice in this west Texas cotton study revealed that the product initiated a 28% yield increase while improving income, fiber strength, and diameter. The stimulation of rhizospheric and photosynthetic activity thus improved growth substantially to bring about the measured improvements in cotton yield and quality.

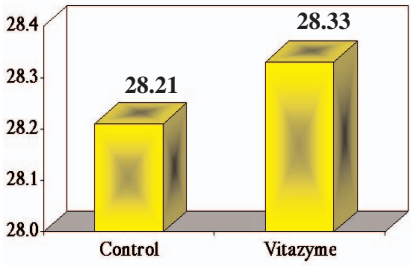
Bolls taken from the plants shown in the picture on the left were more numerous and larger than for the control plants, giving a 28% yield increase.

Lint yield, lb/acre

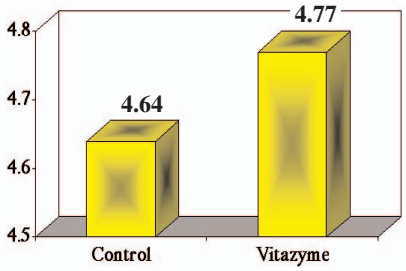


Treatment	Lint yield	Income	Change	Return per investment
	lb/acre	$/acre	$/acre	approximate
Control	886	509.45	——	——
Vitazyme	1,131	650.33	140.88	17.6:1

Fiber Strength



Micronaire



- ***Yield increase: 28%***
- ***Income increase: $140.88/acre***

Did you know ...

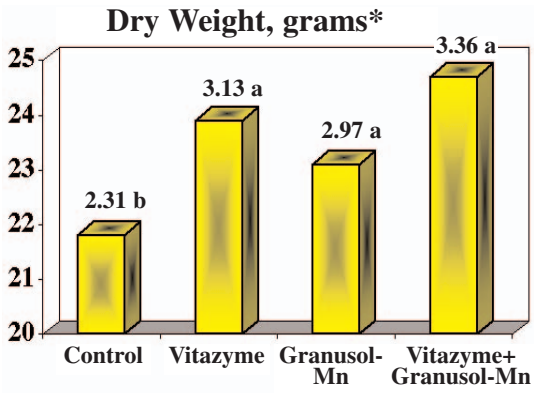
Since 1995 approximately 250 replicated and randomized, greenhouse, and farm split-field studies have been conducted with Vitazyme as the major product being investigated. In well over 90% of those studies Vitazyme has increased the economic yield substantially. As long as soil microbial activity in the root zone is not severely inhibited from excessive compaction, cold temperatures, or fertility imbalances the product will perform excellently.

Cotton (Vitazyme + Granusol)

Location: Vital Earth Resources Research Greenhouse, Gladewater, Texas
Variety: cotton (not specified) *Soil type*: Bowie very fine sandy loam
Planting date: March 19, 2002 *Pot type*: 1 gallon *Population*: 10 seeds/pot, thinned to 3
Experimental design: A complete block design was set up using eight replicates for each of four treatments. The soil was carefully packed into each pot, watered evenly, and then treated with the materials. Plants were watered on demand, and grown in the greenhouse at about 85°F for a high and 60°F for a low temperature.

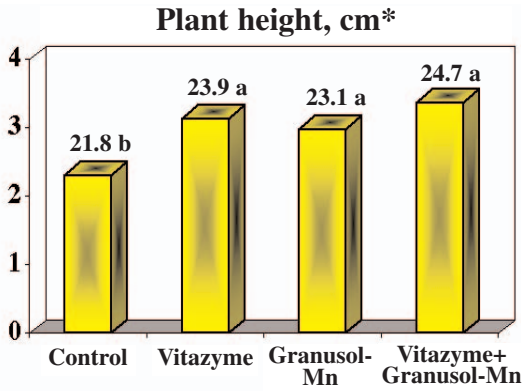
1. Control 2. Vitazyme only 3. Granusol-Mn only 4. Vitazyme + Granusol-Mn

Fertilizer application: Each pot received 0.23 gram per pot of $(NH_4)_2SO_4$ to equal a 100 lb/acre application, or 21 lb/acre of N and 20 lb/acre of S for a "starter" effect.
Vitazyme application: After planting on February 22, 50 ml of a 0.002% Vitazyme solution was applied to the soil surface of each pot for Treatment 2. This application was equal to the amount of Vitazyme contained in the Granusol-Mn of Treatment 4.
Granusol-Mn application: Granusol-Mn granules, a "Sucrate", were applied to the soil surface of the pots of Treatment 3 at 1 gram per pot; this rate equaled 10 lb/1,000 ft^2. The Granusol-Mn for Treatment 4 had been prepared earlier at the facilities of American Minerals. Two ounces of Vitazyme were mixed with the binder of 50 lb of Granusol-Mn during processing, a 0.04 oz/lb rate. At 10 lb/1,000 $ft.^2$ of Granusol-Mn application, this would then give a Vitazyme application rate of about 18 oz/acre. This product was also applied at 1 gram per pot, as for Treatment 3.
Product specifications: **Granusol-Mn:** a sucrate carboxylate containing a simple carbohydrate binder, together with various minerals (Mn, 35%; CaO, 11%; Fe, 4%; SO_3, 0.8%; Zn, 0.3%), with granules able to quickly break down in water to supply nutrients to plants. Producer: American Minerals, Dunedin, Florida.
Harvest date: May 7, 2002, 49 days after planting.
Reseeding: Because the original cotton seed planted on February 22 did not germinate well, another source of seeds was found, and the seeds were replanted in the pots on March 19. The treatments which had been applied on February 22 were not reapplied.
Growth observations: Noticeable growth differences occurred between the control plants and plants of the other treatments; the control plants were smaller throughout the test period. Towards the end of the test period several of the plants for Treatments 3 and 4 developed leaf shrinking and dieback. The reason for this problem was not clearly understood, although it could have been due to dripping water from the greenhouse ceiling onto leaf surfaces, causing a susceptibility to fungal infection on affected plants. Seriously affected plants were removed from the final analysis, and pot values for height and weight were prorated using the surviving plants.



*Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. $LSD_{0.10}$=0.45 g.

Height results: On May 7 all of the plant roots were washed clean of soil, and each plant was measured for height. An average height measurement was then calculated for the plants of each pot. There was no significant difference in the height of the Vitazyme and Granusol treatments, although the combined products produced the tallest plants. All three of the Vitazyme and Granusol treatments were significantly greater than the control at P=0.10.



*Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. $LSD_{0.10}$=1.4 cm.

Dry weight results: The plants were dried in a drying oven at 115° F for one day, and dry weights were taken to the nearest 0.01 gram. These results showed some significant differences among treatment means. The dry weight of the cotton plants was significantly increased above the control by both Vitazyme and Granusol alone — 35% and 29% respectively — but especially by the combined Vitazyme and Granusol-Mn (45%). These increases were significant at P=0.001, though the LSD for that level was not calculated.

Conclusions: Both Vitazyme and Granusol-Mn were shown in this cotton study to significantly increase both plant height and dry weight. Of particular note, however, was the marked synergism between Vitazyme and Granusol-Mn, producing the tallest plants of all four treatments (+13%) and the biggest plants (+45%). These conclusions agree with two other studies conducted with Sucrate fertilizers — Granusol Greenup -6+16 on corn, and Southeast mix on wheat — which also showed that Vitazyme and the Sucrate fertilizer together produced better growth, carbon fixation, and nutrient utilization than either product alone.

- ***Increase in height with Vitazyme + Granusol-Mn: 13%***
- ***Increase in dry weight with Vitazyme + Granusol-Mn: 45%***

Grass

Grass treated with Vitazyme at Fulton Grass Farm was much denser and well-knit than untreated areas ... allowing the cutting and sale of treated grass, but not the other.

Root and leaf density: A six-inch square of control and Vitazyme treated sod pieces were cut and washed clear of soil. The pieces were then weighed while moist.

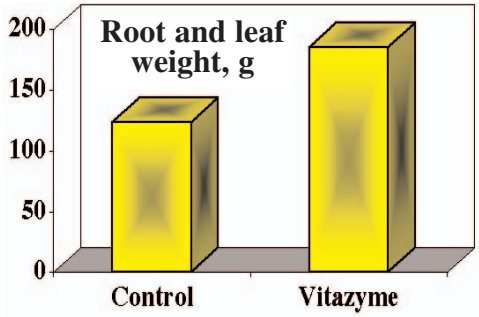
Treatment	Fresh root and leaf weight	Change vs. the control
	grams	
Control	123	—
Vitazyme	185	62 (+50%)

- ***Increase in biomass: 50%***

Location: Fulton Grass Farm, Hope, Arkansas
Grass type: centipede grass *Soil type*: heavy clay
Experimental design: An area of centipede grass several acres in extent was treated one time with Vitazyme, and compared to an adjoining field treated the same in every way but without Vitazyme.

1. Control 2. Vitazyme

Fertilizer treatments: unknown
Vitazyme application: 13 oz/acre sprayed over the surface about August 1, 2002
Growth results: Sections of sod were cut from both areas on October 25, using a sod cutter, three months after the Vitazyme treatment. These sod sections were compared and photographed.



	Control sod	Vitazyme treated sod
Root density	Poor rooting	Much thicker; roots intertwined extensively
Stability of the sod	Poor	Well-knit and strong
Leaf and shoot density	Average	Much denser

Because of the poor integrity of the control sod, this field could not be cut and sold. The Vitazyme treated sod was able to be cut and sold.

Conclusions: Vitazyme treatment for a sod farm is an excellent way to increase the root and leaf density for the production of high quality, strong sod sections.

Grass – A Testimonial

Location: Riverby Turf Farms, Telephone, Texas
Grass type: Tifgreen 419 bermuda grass
Soil type: sandy loam
Fertilizer applications: unknown
Vitazyme application: 13 oz/acre sprayed over all 1,200 acres of the turf farm on August 26, 2002
Results: Samples of newly-cut sod were examined on November 8, 2002, and the soil was washed away from areas to reveal **a well-knit sod having many aggressive rhizomes. The harvesting crew found the sod to be of excellent quality with good integrity.**

Because no untreated control areas existed (all 1,200 acres were treated), no direct comparisons could be made with treated turf. However, the manager, Rusty Goforth, commented that he was very pleased with the performance of Vitazyme in enhancing the development and quality of the turf.

Bermuda grass sprayed only three months before this picture was taken shows excellent vigor, producing aggressive rhizomes and more new leaves.

Japanese Maple (Acer palmatum L.)
A Seedling Study

Japanese maples responded to weekly Vitazyme treatments by having 22% more surviving seedlings, more leaves and height, and double the trunk diameter as the control.

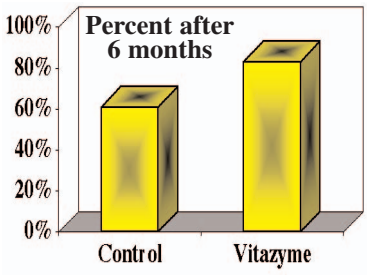
Location: Plano, Texas *Growth media*: aged, fine pine bark
Transplanting date: late April, 2002 *Pot size*: 4 inches (standard design)
Experimental design: Japanese maple seeds were germinated and grown until the first true leaves had emerged, when the seedlings were 1.5 inches in height. Then each of 36 tree seedlings was transplanted into 4-inch pots, with 18 placed in one flat and 18 in another.

1. Control 2. Vitazyme

Vitazyme treatments : Every week the treated flat was drenched with a 0.5% Vitazyme solution (0.5 oz/gallon of water), while the control flat was left untreated.
Fertilization: All pots of both treatments received one tablespoon per gallon of Miracle-Gro Water Soluble Azalea, Camellia, and Rhododendron Plant Food every two months.
Growth results: Growth parameters were measured in late October, 2002, and average values for the two treatments are given in the table on the following page.

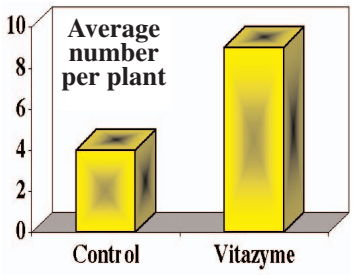
Treatment	Survival rate	Leaf number	Seedling height	Trunk diameter
Control	61%	3 to 5	3.5 in	0.0625 in
Vitazyme	83%	8 to 10	6.5 in	0.125 in

Survival Rate



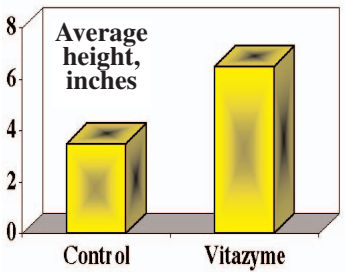
• Increase: 22 percentage points

Leaf Number



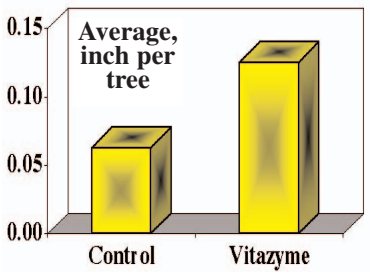
• Increase: 125%

Seedling Height



• Increase: 86%

Trunk Diameter



• Increase: 100%

Conclusions: It is clear from this study that Vitazyme, when applied regularly to Japanese maple seedlings, greatly stimulates new growth of the plants, improving the survival rate and increasing the leaf number, seedling height, and trunk diameter. This product helps stimulate the early development of tree seedlings to encourage earlier transplanting of more vigorous stock into outdoor settings.

Navy Beans

Location: Fisher, Minnesota *Variety*: Navigator *Soil type*: clay loam
Seeding rate: 47 lb/acre *Planting date*: May 25, 2002
Experimental design: A field of 75 acres was divided into three parts: an untreated control of 41.4 acres, a single Vitazyme treatment, and a double Vitazyme treatment. **1. Control 2. Vitazyme 3. Vitazyme twice**
Fertilization: A starter fertilizer was preplant incorporated for Treatment 2, and a special blend of starter fertilizer based on a soil test and the Albrecht system was preplant incorporated for Treatment 3.
Vitazyme treatment: Treatment 2: 13 oz/acre along with a herbicide and starter fertilizer, preplant incorporated on May 23; Treatment 3: (1) 13 oz/acre along with a herbicide and the special starter fertilizer blend, preplant incorporated on May 23, and (2) 16 oz/acre plus 2.5 lb/acre $MgSO_4$ and a fungicide sprayed by airplane on July 11.
Harvest date: September 21, 2002
Yield results: Actual truck weights were taken to insure an accurate yield calculation.

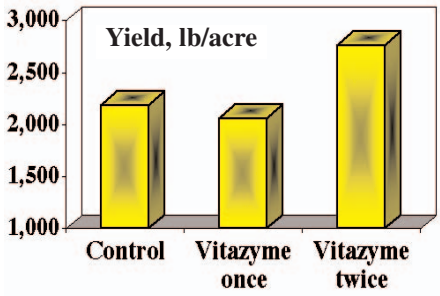
It is very easy to see the boundary of the Vitazyme treatment in this picture; the product was applied on the left side, where taller, leafier plants are visible.

Treatment	Yield	Change	Seed moisture	Split beans	Grade
	lb/acre	lb/acre	%H_2O	%	
Control	2,188	——	12.8	6.0	1
Vitazyme once	2,060	(–) 128 (–6%)	19.1	7.1	1
Vitazyme twice	2,760	572 (+26%)	17.5	2.8	1

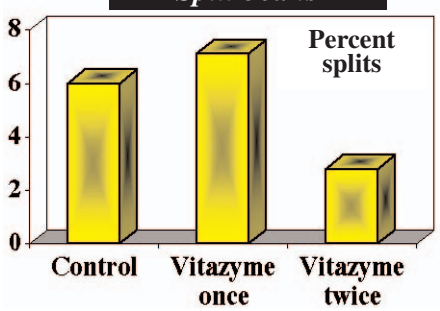
• Increase in yield (2x): 26%

• Reduction in split beans (2x): 3.2 percentage points

Navy bean yield



Split beans



Income results: The Navy beans were contracted at $0.17/lb for the first 900 lb/acre, and thereafter sold for the market price of $0.12/lb.

Treatment	First contract price	Value at $0.17/lb	Remaining, non-contract	Value at $0.12/lb	Total income	Income increase
	lb/day	lb/day	lb/ton	$/ton	$/acre	$/acre
Control	900	153.00	1,288	154.56	307.56	——
Vitazyme once	900	153.00	1,160	139.20	292.20	(–)15.36
Vitazyme twice	900	153.00	1,860	223.20	376.20	68.64

• Income increase with Vitazyme: $68.64/acre

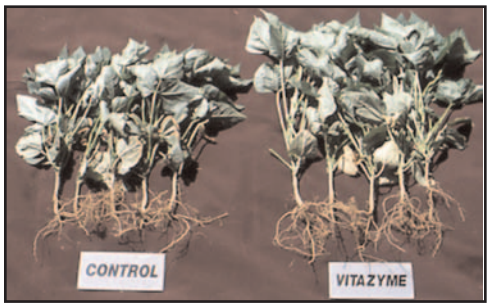
• Cost:benefit ratio of Vitazyme use: 8.6:1

Conclusions: Vitazyme applied once (preplant incorporated) in this Navy bean test in the Red River Valley of the North did not increase bean yield, but rather slightly decreased yield. This decrease was due to early season heavy rains upon compacted soils, which reduced soil air and damaged roots and rhizosphere activity, thus inhibiting Vitazyme's action. On the other hand, this preplant application plus a July foliar application greatly increased bean yield (+26%) while also decreasing the number of split beans (2.8% vs. 6.0% for the control). **This yield and quality increase was due to Vitazyme's ability to stimulate photosynthesis and rhizosphere activity, thus increasing carbon fixation and nutrient uptake while suppressing plant diseases.** The result of these effects was an increase in gross income of $68.64/acre.

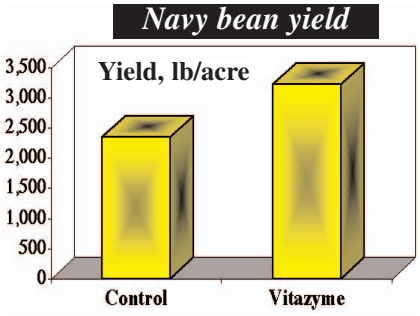
Navy Beans

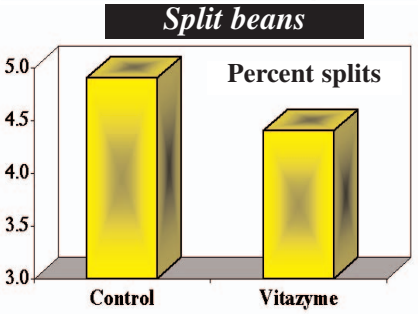
Location: Fisher, Minnesota *Variety*: Navigator *Soil type*: clay loam
Seeding rate: 47 lb/acre *Planting date*: May 26, 2002
Experimental design: A field of 94 acres was divided into two parts, a Vitazyme treated area of 10 acres and a control area of 84 acres.
Fertilization: unknown **1. Control** **2. Vitazyme**
Vitazyme treatment: 13 oz/acre on June 23, flown on by airplane, along with 2 lb/acre $MgSO_4$ and a fungicide
Harvest date: September 21, 2002
Yield results: Actual truck weights were taken to insure an accurate yield calculation.

Treatment	Yield	Change	Seed moisture	Split beans	Grade
	lb/acre	lb/acre	$\%H_2O$	%	
Control	2,342	——	17.7	4.9	1
Vitazyme	3,221	879 (+38%)	18.4	4.4 (–10%)	1



These field bean plants were dug from either side of the border between the Vitazyme treatment and the control. Note the larger plants on the right.





Income results: The Navy beans were contracted at $0.17/lb for the first 900 lb/acre, and thereafter sold for the market price of $0.12/lb.

Treatment	First contract price	Value at $0.17/lb	Remaining, non-contract	Value at $0.12/lb	Total income	Income increase
	lb/day	lb/day	lb/ton	$/ton	$/acre	$/acre
Control	900	153.00	1,442	173.04	326.04	——
Vitazyme	900	153.00	2,321	278.52	431.52	105.48

- ***Income increase with Vitazyme: $105.48/acre***
- ***Cost:benefit ratio of Vitazyme use: 26:1***

Conclusions: Vitazyme applied to Navy beans in this Red River Valley test revealed that a single June application, applied with $MgSO_4$ and a fungicide, greatly increased the bean yield (+38%) and reduced the number of split beans. This effect was due to a triggering of photosynthesis and enhanced rhizosphere activity . . . and thus an increase in nutrient uptake, carbon fixation, and bean development. A greater deposition of cellulose and lignin in cell walls likely strengthened the seed coat to reduce seed splitting. The yield increase boosted income by $105.48/acre over the control treatment.

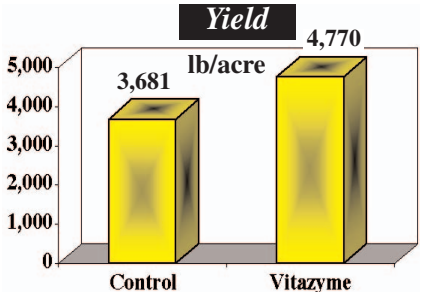
- ***Increase in yield: 38%***
- ***Reduction in split beans: 0.5 percentage point***

Peanuts

Location: Whitherral, Texas *Row spacing*: 40 inches, double row with 8 in spacing
Planting date: May 18, 2002 *Variety*: Spanish, "Tam-Span 90"
Soil type: fine sandy loam *Harvest date*: dug October 21, picked up about November 15

These west Texas peanuts received Vitazyme on June 23 along with a fungicide, and responded very well. The yield increase was 30%, a big boost in income.

Experimental design: A center pivot area was divided into halves, one half treated with Vitazyme and the other half left untreated.
1. Control **2. Vitazyme**
Fertilization: 20 lb/acre N preplant, 11-50-0 postplant
Vitazyme application: 13 oz/acre June 18, on the leaves and soil



Seed inoculation: all seeds inoculated with rhizobium bacteria at planting
Quality results: All of the peanuts graded at 77, a very high grade.
Income results: A price of $382/ton was received for the peanuts.
Quality observations: Peanuts that were collected from both treatments on August 21, and stored in plastic bags, revealed that the control peanuts developed a coating of white fungus over all pod surfaces; the Vitazyme treated peanuts developed very little fungus coating. This difference may imply the ability of Vitazyme to help the peanut plant deter fungal diseases.
Conclusions: One application of Vitazyme on the irrigated peanut field increased the yield by 30%, giving a very high return ratio of 52:1, which translated to an increase of $208/acre. This great increase in yield and return with Vitazyme is likely due in part to the synergism of Vitazyme's active agents with the rhizobium bacteria in the rhizosphere to encourage natural symbiotic nitrogen fixation.

- ***Yield increase: 30%***
- ***Cost:Benefit ratio of Vitazyme: 52:1***
- ***Increase in income with Vitazyme: $208.00/acre***

Pearl Millet

University of Mysore, Manasagangotri, Mysore, India

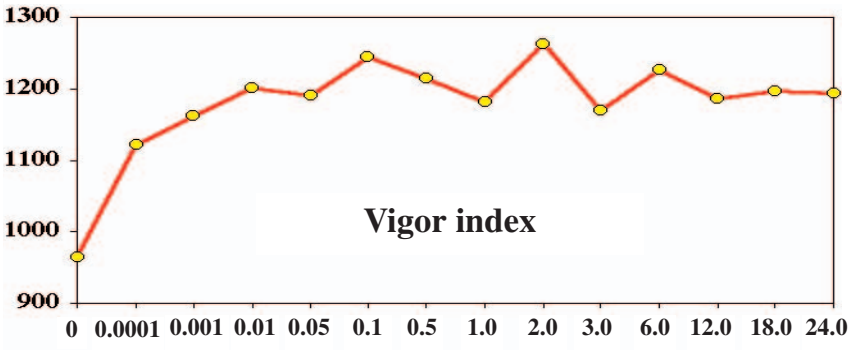
A Germination, Vigor, Yield, and Disease Resistance Study: DANIDA Project

Location: Manasagangotri, Mysore, India *Variety*: pearl millet
Institution: Department of Studies in Applied Botany, Seed Pathology, and Biotechnology, University of Mysore
Experimental design: This study was performed to evaluate the effectiveness of Vitazyme to stimulate germination, early growth and vigor, disease resistance, and yield of pearl millet in the laboratory, greenhouse, and field. Discussions will be divided into these three areas. Not many details are available on the methodologies used for this study.

Laboratory Studies

Pearl millet seeds were soaked in Vitazyme solutions of 0 to 24%(shown below) in conical flasks, with distilled water, for 6 hours. Root and shoot lengths were measured after a given growth period and compared to the control.

Pearl Millet Seedling Response to Vitazyme At Different Concentrations



Pearl millet seedlings responded well (from 16 to 31% increases in growth) at all concentrations tested in the laboratory, as low as 0.0001% and as high as 24%, showing the great range of concentrations of Vitazyme that are effective in a laboratory setting.

Greenhouse Studies

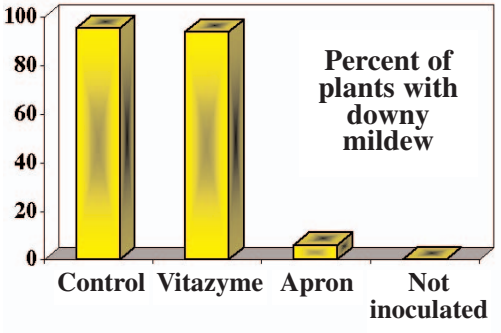
Downy Mildew (Sclerospora Graminicola)

Disease Incidence

Pearl millet seeds were soaked in a 2% Vitazyme solution for 6 hours, and sown in clay pots with a mix of 1:2:1 sand:soil:manure. The plants were then challenged with downy mildew disease organisms to evaluate the relative resistance of the plants. Pearl millet plants inoculated with downy mildew fungi, but treated with Apron 35 SD fungicide, were mostly protected from infection while the control and Vitazyme treatments had a high rate of infection. The uninoculated control showed no infection at all. Thus, Vitazyme is shown to have little effect on the incidence of downy mildew in this study.

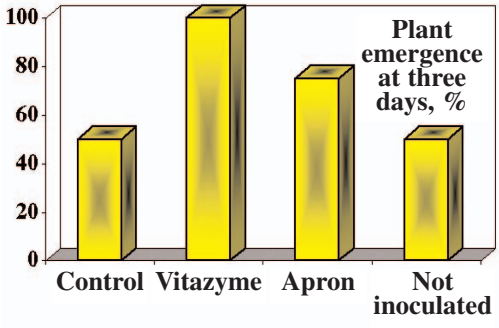
Treatment	Number of plants[1]	Number of diseased plants[1]	Plants with downey mildew
			%
Control	25.5 a	24.3 c	95.3
Vitazyme	26.5 a	24.8 c	93.6
Apron 35 SD	24.5 a	1.5 b	6.1
Uninoculated	24.8 a	0 a	0

[1]Means are not significantly different at P = 0.05 (4 reps).



Emergence of Plants in the Greenhouse

An estimate of seedling emergence at three days after planting was made for all treatments (4 reps).
This study reveals that Vitazyme can greatly stimulate the early germination of seeds, in this case more so than a fungicide treatment and untreated controls.



Treatment	Emergence in three days
Control	50%
Vitazyme	100%
Apron 35 SD	75%
Uninoculated	50%

Demonstration of Systematic Acquired Resistance (SAR)

Vitazyme (2%) was applied to pearl millet, and downy mildew organisms were applied at from one to five days later for different treatments. In this way systematic acquired resistance (SAR) could be evaluated. The treated pots were compared to untreated pots (4 reps).

Vitazyme provided a mild but constant degree of protection to pearl millet plants in a greenhouse setting in this SAR study. **This small degree of protection was the greatest at the second and fourth days of inoculation, when there were significantly fewer plants affected by mildew with Vitazyme than without it.**

Treatment	Number of plants[1]	Number of diseased plants[1]	Disease incidence	Protection[2]
			%	%
Vitazyme – first day	27.3 a	25.3 a	94.5	2.8
Control	27.3 a	26.5 a	97.1	—
Vitazyme – second day	22.5 b	20.3 b	90.2	2.9
Control	28.0 a	26.0 a	92.9	—
Vitazyme – third day	24.5 a	20.3 a	82.9	6.7
Control	25.3 a	22.5 a	88.9	—
Vitazyme – fourth day	25.3 a	20.3 b	80.2	7.8
Control	28.5 a	24.8 a	87.0	—
Vitazyme – fifth day	24.3 a	18.8 a	77.4	5.7
Control	23.5 a	19.3 a	82.1	—

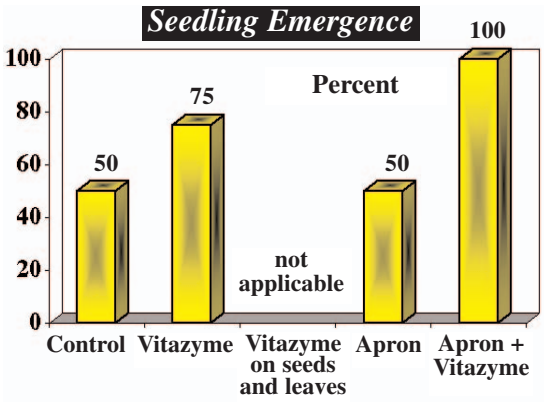
[1]Means followed by the same letter are not significantly different at P = 0.05 (4 reps).
[2]Percent protection = % diseased (Vitazyme) – % diseased (control) / % diseased (control) x 100.

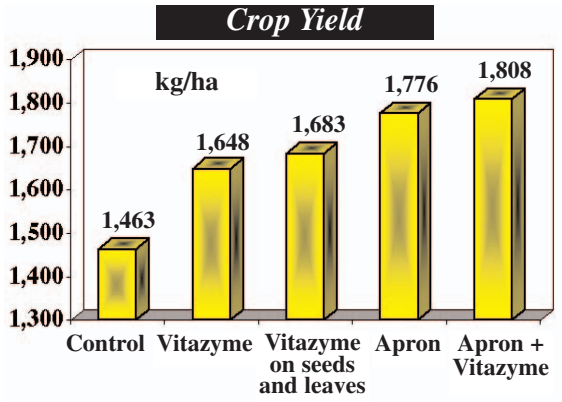
Field Studies

Pearl millet was planted in the field with 4 replicates, and downy mildew disease incidence was evaluated beside Apron fungicide. Yields were also determined.

Emergence and Yield

In this evaluation of Vitazyme performance no "infector rows" — rows of plants containing the diseases within the plots — were included. Emergence and yield were determined. Vitazyme was applied as a seed treatment as well as a foliar/soil treatment in different cases.





Vitazyme had a strong effect of improving early emergence, emergence being 25% greater at three days after planting than the control or Apron alone. However, **Apron fungicide + Vitazyme showed an excellent synergism by increasing emergence to 100% at three days.** Millet yield was increased by 13% with Vitazyme on the seeds alone, and by 15% with both a seed and foliar/soil treatment. **When combined with Apron fungicide, Vitazyme boosted yield to 24% above the control versus a 21% increase for Apron alone.**

Disease Protection Study

An evaluation was made of the incidence of Downy mildew on pearl millet plants in the field study. These evaluations were translated into percent protection figures. Vitazyme slightly reduced the incidence of downy mildew on pearl millet in this field study, but not nearly as much as did Apron 35 SD fungicide. These facts are shown by the protection index, which is much higher for Apron 35 SD than for Vitazyme.

Treatment	Number of plants[1]	Number of diseased plants[1]	Disease incidence	Protection[2]
			%	%
Vitazyme on seeds	79.3	73.4	92.6 b	2.1 b
Apron 35 SD on seeds	77.5	5.8 c	7.5 c	92.1 a
Apron 35 SD + Vitazyme on seeds	74.5	5.5 c	7.4 c	92.2 a
Control	69.8	66.0 b	94.6 a	—

[1]Means followed by the same letter are not significantly different at P = 0.05 (4 reps)
[2]Percent protection = % diseased (Vitazyme) – % diseased (control) / % diseased (control) x 100

Significant findings for this study: Vitazyme did not offer much disease protection (downy mildew) of pearl millet plants in both greenhouse and field settings for this Indian study, though it did provide a certain amount of systemic acquired resistance. However, **Vitazyme greatly stimulated the growth and yield of pearl millet in all three settings: the laboratory, greenhouse, and field.** These improvements are summarized by the Indian researcher as follows:

Vitazyme Effects on Pearl Millet in India

Vigor Index (lab):	**+ 16 to 31% above the control**
Emergence (greenhouse):	**+ 100% above the control**
(field):	**+ 50% above the control**
SAR protection (greenhouse):	**+ 2.8 to 7.8 % above the control**
Grain yield (field):	
Seed treatment:	**+ 13% above the control**
Seed treatment + Soil/Foliar:	**+ 15% above the control**
Seed treatment + Apron:	**+ 24% above the control**

Comments by Dr. S.A. Deepak:

1. **Vigor of pearl millet can be improved significantly by Vitazyme treatment.**
2. **Vitazyme treatment improves the emergence of pearl millet in pot and field conditions.**
3. **By seed treatment/foliar spray best performance in grain yield can be obtained.**
4. **Most importantly, Vitazyme is compatible with the systemic fungicide Apron 35 SD as evidenced by increasing yield over individual treatment in the field.**

Potatoes

Though photographed early in the season, the treated potatoes show great potential for a big yield advantage. Plant size and tuber number are larger.

Location: Watson Farm, Houlton, Maine *Variety*: Superior
Soil type: gravely loam *Row width*: 36 inches *Planting date*: unknown
Experimental design: A field was divided into two parts, one part (the west side) treated with conventional fertility methods and the other (the east side) with the Albrecht system along with Vitazyme.

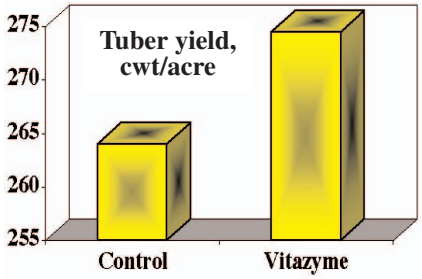
1. Control – conventional **2. Vitazyme – Albrecht system**

Fertilization: unknown
Vitazyme treatments : 13 oz/acre on the seeds at planting; 13 oz/acre on the leaves and soil at blossom time
Harvest date: unknown
Yield results: Near harvest time, two 10-foot row sections from each treatment were dug and weighed to give an estimate of yield.

Income results: At $7.00/cwt, the added 10.5 cwt/acre with the Vitazyme/Albrecht program would give $73.50/acre added income.

Treatment	Tuber number	Sample weight	Tuber < 2 in	Yield	Yield change
	no./20 ft	lb/20 ft	no./20 ft	cwt/acre	cwt/acre
Control	156	40.0	15	264.0	——
Vitazyme	175	41.5	16	274.5	+10.5 (+4%)

Conclusions: In this potato trial in Maine, Vitazyme plus the Albrecht mineral balancing program increased yield by 4%, a very profitable increase as income was boosted by $73.50/acre. In addition, there was **greater uniformity** of the tubers and, generally speaking, **more large tubers** with the Vitazyme/Albrecht treatment.



These potatoes at Houlton, Maine, reveal the larger plant size, leaf area, stem diameter, root mass, and tuber set normally associated with Vitazyme application.

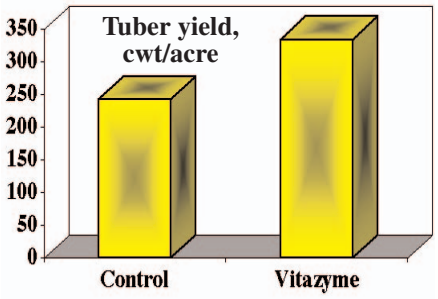
• Increase in tuber yield: 4% ***• Income increase: $73.50/acre***

Potatoes

Location: Watson Farm, Houlton, Maine *Variety*: Dark Red Norlin *Soil type*: gravely loam
Row width: 36 inches *In-row spacing*: 8 inches *Population*: 17,500 plants/acre
Experimental design: The field was divided into two parts, one treated twice with Vitazyme and the other left untreated. The fertility program was the same for both treatments. **1. Control** **2. Vitazyme**
Fertilization: unknown
Vitazyme treatments : 13 oz/acre on the seed pieces at transplanting; 13 oz/acre on the leaves and soil in July
Yield results: On August 8, 2002, two plants were sampled from each area, each plant having the same number of stems and vitality. No weights were determined at harvest, but by converting the dug weights, the yields are estimated in the following table and graph.
Income results: The potato price is estimated at $0.07/lb ($7.00/cwt), meaning that yield increases of 91.0 cwt/acre would bring $637/acre more income.

	Control	Vitazyme	Increase
	----------	cwt/acre	----------
Tuber yield	242.4	333.4	91.0

Conclusions: The grower in this study noticed a visual improvement in yield at harvest. Despite the fact that weighed yield values were not collected, the sampling in August indicated a marked improvement in yield with Vitazyme as well as a marked increase in income.



• Income increase: $637/acre ***• Increase in Tuber yield: 38%***

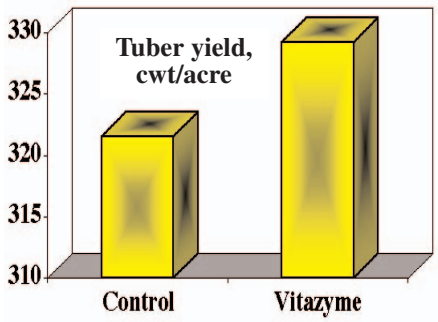
Potatoes

Tubers from the plants of the previous picture prove the effectiveness of Vitazyme to increase both tuber number and average development earlier in the season.

Location: Tri-Campbell Farms, Grafton, North Dakota
Variety: Frito Lay 1533 *Soil type*: sandy clay loam
Row spacing: 36 inches *In-row spacing*: 8 to 9 inches
Planting date: unknown
Experimental design: A potato field ("Ron's West") was divided into two parts, the north side left untreated and the south side treated with Vitazyme. Fertilization and other cultural practices were the same over the entire field.
Fertilization: unknown **1. Control** **2. Vitazyme**
Fungicides : sprayed every 7 days
Vitazyme treatments : 13 oz/acre on the seed pieces at planting; 13 oz/acre on the leaves and soil at flowering
Yield results: At harvest the tuber weights for specific areas were determined by weighing loaded trucks.

Treatment	Yield	Yield change
	cwt/acre	cwt/acre
Control	321.5	——
Vitazyme	329.2	+7.7 (+2.4%)

Income results: At $7.00/cwt, the increase of 7.7 cwt/acre gave $53.90/acre more income.



Conclusions: In this North Dakota potato study, Vitazyme increased the tuber yield by 2.4% and increased income by $53.90/acre. No changes in size distribution of the tubers were determined.

• Tuber yield increase: 2.4% ***• Income increase: $53.90/acre***

Potatoes, for Seed

Research organization: Dae Yu Company, Ltd.
Location: Bongsung-Ri, Aeyoul-Eup, Jeju-City, Korea
Planting date: Autumn of 1999, spring of 2001, fall of 2001
Variety: Daeji
Soil fertility: unknown
Soil type: unknown

Experimental design: A field area of 100 m^2 (10 "are") was used for this study. Vitazyme and three other products were compared to a control treatment for all three plantings. The five treatments were randomized and replicated three times, with five plants for each plot.

1. Control 2. Vitazyme 3. Product A–1 4. Product A–2 5. Product B

Fertilizer treatments: unknown

Vitazyme treatments : (1) 2 liters/hectare (26 oz/acre) as a 1:3,000 dilution, sprayed on the leaves and soil at 25 cm plant height; (2) the same application at early bloom

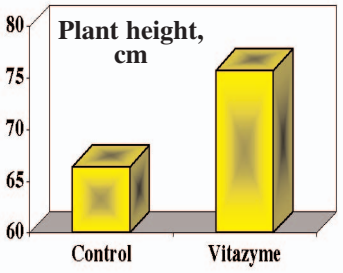
Other biostimulant treatments: The same applications as for Vitazyme, but for Product A-1 a 1:500 dilution was used; for Product A-2 a 1:1,000 dilution was used; for Product B a 1:1,000 dilution was used.

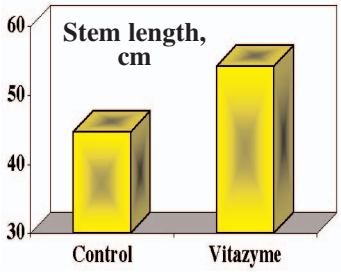
Results: No individual plot data could be obtained for this study, so only treatment means are shown.

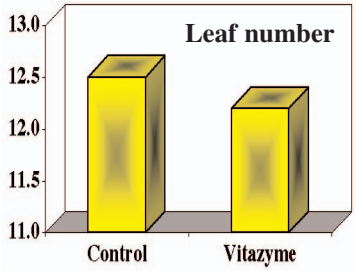
Fall Planting – Plant Response Study

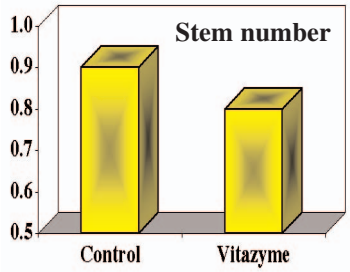
Measurements were made 45 days after planting.

Treatment	Plant height	Change	Stem length	Change	Leaf number	Change	Stem number	Change
	cm							
Control	66.4	——	44.7	——	12.5	——	0.9	——
Vitazyme	75.7	9.3 (+14%)	54.1	9.4 (+21%)	12.2	(–) 0.3 (–2%)	0.8	(–) 0.1 (–11%)
Product A-1	74.9	8.5 (+13%)	51.0	6.3 (+14%)	13.6	1.1 (+9%)	0.5	(–) 0.4 (–44%)
Product A-2	71.9	5.5 (+8%)	48.5	3.8 (+9%)	11.6	(–) 0.9 (–7%)	0.9	0 0
Product B	80.6	14.2 +21%)	56.3	11.6 (+26%)	13.2	0.7 (6%)	0.7	(–) 0.2 (–22%)





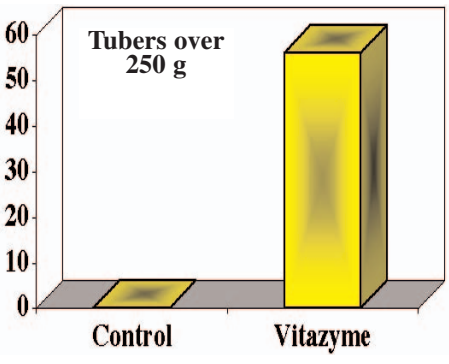


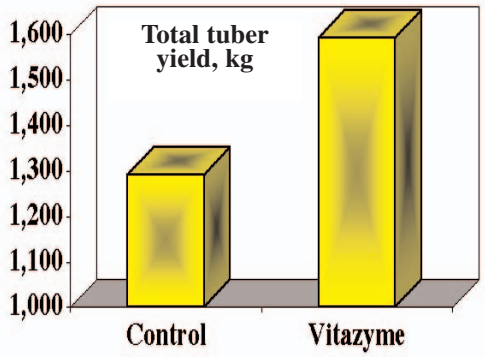


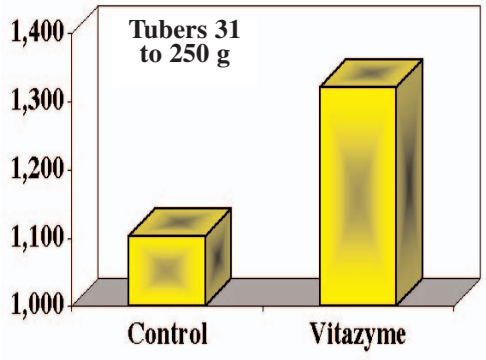
Spring Planting

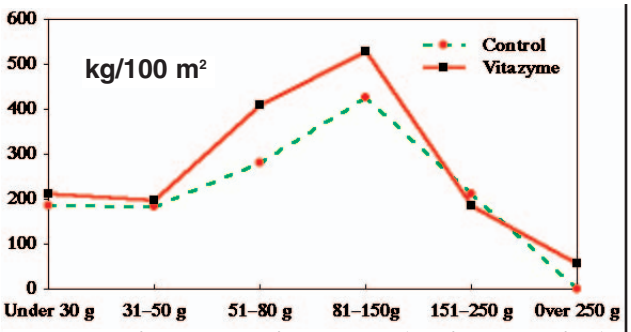
Measurements were made 90 days after planting

Treatment	Under 30g	31to 50 g	51to 80 g	81 to 150 g	151 to 250 g	Over 250g	Total	Change	31 to 250 g
	kg of tubers/100 square meters								
Control	185	183	282	426	213	0	1,290	——	1,103
Vitazyme	213	197	410	528	186	56	1,590	300(+23%)	1,321 (+20%)
Product A-1	156	145	296	408	283	0	1,288	-2 (0%)	1,132 (+2%)
Product A-2	172	170	293	529	186	31	1,380	90 (+7%)	1,177 (+7%)
Product B	183	207	308	369	203	0	1,270	(–)20 (-2%)	1,087 (-2%)







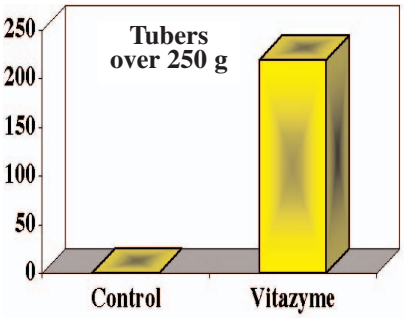


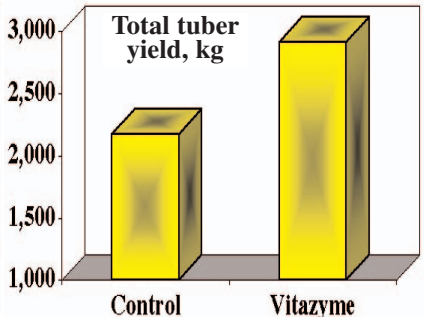
Tuber weight, by weight class (spring planting)

• Increase in tuber yield: 23%

Fall Planting

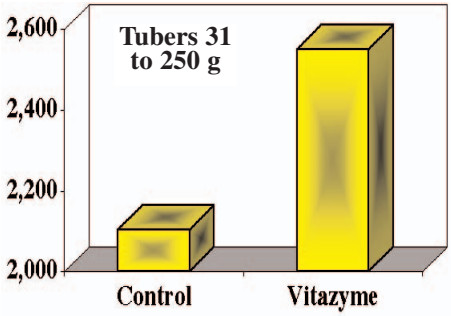
Measurements were made 90 days after planting.



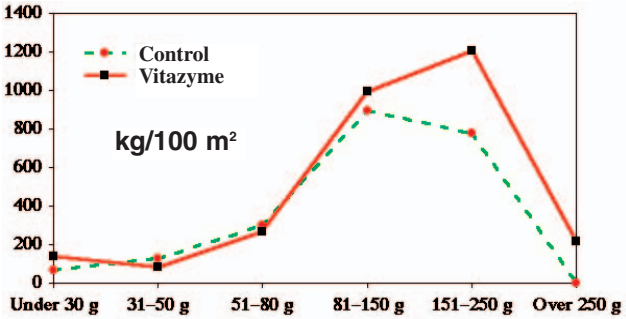


Treatment	Under 30g	31to 50 g	51to 80 g	81 to 150 g	151 to 250 g	Over 250g	Total	Change	31 to 250 g
	kg of tubers/100 square meters								
Control	69	130	299	897	778	0	2,172	——	2,103
Vitazyme	141	83	265	995	1,205	219	2,908	736 (+34%)	2,548 (+21%)
Product A-1	99	24	379	935	687	337	2,461	289 (+13%)	2,025 (–4%)
Product A-2	87	125	333	693	1,437	0	2,675	503 (+23%)	2,588 (+23%)
Product B	118	86	160	1,296	1,111	148	2,920	748 (+34%)	2,654 (+26%)

Conclusions: Vitazyme enhanced early potato growth in this Korean study by 14% in plant height and 21% in stem length. Yields of potatoes were increased by 23 to 34% above the controls, and tuber weight was increased by Vitazyme toward the larger sizes.



• Increase in tuber yield: 34%



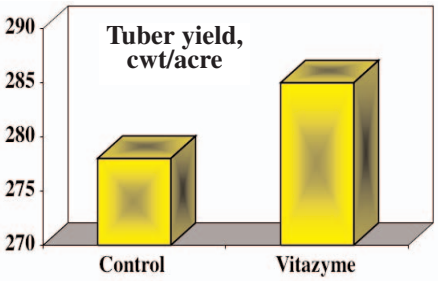
Tuber weight, by weight class (fall planting)

Potatoes

Research Organization: Agro-Engineering, Alamosa, Colorado
Farm: Sun Valley Farm
Location: Center, Colorado
Variety: Yukon Gold
Planting date: June 5, 2002
Soil type: sandy loam
Row spacing: 34 inches
Population: 10-inch spacing
Experimental design: A center pivot irrigated field was divided into Vitazyme treated and untreated areas.

1. Control **2. Vitazyme**

Fertilization: unknown
Vitazyme treatments : (1) 13 oz/acre soon after planting, through the irrigation system; (2) 13 oz/acre at the early hook stage
Harvest date: September 1, 2002
Yield results: A yield monitor evaluated 20 to 30 acres of both the control and Vitazyme treatments.



Treatment	Tuber yield	Change
	cwt/acre	
Control	278	——
Vitazyme	285	7 (+3%)

Income results: Based on an estimated price of $10.00/cwt, the income increase with Vitazyme was $70.00/acre. No size categorizations were made.

Conclusions: Vitazyme applied to these Yukon Gold potatoes increased the yield by 3%, with a $70/acre increase in gross income, but these figures do not take into account a likely improvement in the uniformity of the tubers which would increase income further. Such a size distribution was not determined in this study, but other tests in the San Luis Valley have shown that Vitazyme improves the uniformity, and therefore the marketability and price, of the tubers.

Treatment	Income	Increase
	$/acre	
Control	2,780	——
Vitazyme	2,850	70

• Income increase: $70.00/acre
(not including size distribution improvements)

Plant size differences are easily visible between the Vitazyme treated plants on the right versus the control plants in this Alamosa, Colorado, test.

• Tuber yield increase: 3%

Potatoes

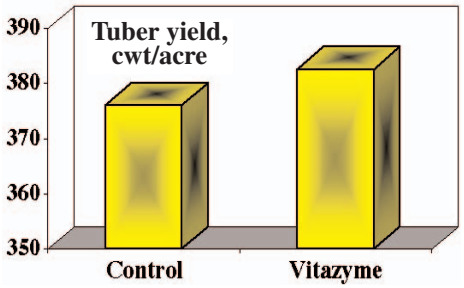
On July 24, it is apparent that Vitazyme has contributed to greater plant size and a more prolific, uniform tuber set.

Research organization: Agro-Engineering, Alamosa, Colorado *Farm*: Ford Farm
Location: Saguache, Colorado *Variety*: Yukon Gold
Planting date: June 10, 2002 *Soil type*: sandy loam
Population: 10-inch spacing *Row spacing*: 34 inches
Experimental design: A section of an irrigated (center pivot) potato field was treated with Vitazyme, and the remainder of the field served as a control.

1. Control **2. Vitazyme**

Fertilization: 130 lb/acre N, 100 lb/acre P_2O_5
Vitazyme treatments : (1) 13 oz/acre soon after planting, through the irrigation system; (2) 13 oz/acre at the early hook stage
Harvest date: September 20, 2002
Chlorophyll levels: On July 24 chlorophyll determinations were made using a Minolta SPAD meter, on 30 leaves for both the control and treated areas of the field.

Treatment	SPAD value	Change
	------ SPAD units ------	
Control	40.8	——
Vitazyme	41.8	1.0



Yield results: Four-acre samples of the Vitazyme treated and the control areas of the test area were harvested and weighed on a truck scale.

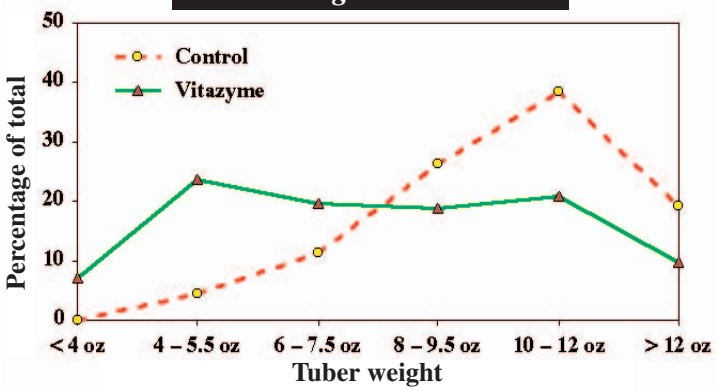
	Control	Vitazyme	Change
	---------- cwt/acre ----------		
Tuber yield	376.0	382.6	+6.6 (+2%)

Tuber size results: Samples of potatoes were collected from each treatment, and individual tubers were weighed to determine the percentages of tubers in each size range.

	< 4 oz		4 – 5.5 oz		6 – 7.5 oz		8 – 10 oz		10 – 12 oz		> 12 oz	
	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight
		lb		lb		lb		lb		lb		lb
Control	0	0	4	1.2 (4.5%)	7	3.0 (11.3%)	13	7.0 (26.4%)	15	10.2 (38.5%)	6	5.1 (19.2%)
Vitazyme	14	1.8 (7.1%)	22	6.0 (23.6%)	12	5.0 (19.7%)	9	4.8 (18.9%)	8	5.3 (20.9%)	3	2.5 (9.8%)

Income results: A price of $10.00/cwt is used in these calculations, although because of a more favorable size distribution with Vitazyme the prices actually received for the tubers with Vitazyme would be higher.

Tuber Weight Distribution



These Alamosa, Colorado, potatoes show the more abundant, uniform tuber set and larger plant size with Vitazyme as does the previous picture.

	Tuber yield	Income	Increase
	cwt/acre	$/acre	$/acre
Control	376.0	3,760	——
Vitazyme	382.6	3,826	66

Conclusions: Vitazyme increased the total yield by 2% in this field of Yukon Gold potatoes, but the size distribution of the tubers was markedly increased in the 4 to 10 oz size versus the untreated control. This change in size distribution would lead to higher prices for the producer, which prices were not easy to calculate in this study. The increase in chlorophyll content of the leaves measured in July indicated an increased fixation of energy to generate the yield increase.

• Tuber yield increase: 2%
• Increase in leaf chlorophyll: 1.0 SPAD unit
• Income increase: $66.00/acre (not including size distribution improvements)

Size Distribution Changes With Vitazyme On Potatoes

Studies in the San Luis Valley of Colorado have shown that, under the climatic and fertility conditions of that area, Vitazyme causes potato plants to produce more total tubers, with more of them in the midrange of tuber weights, a benefit to most growers in that part of the country.

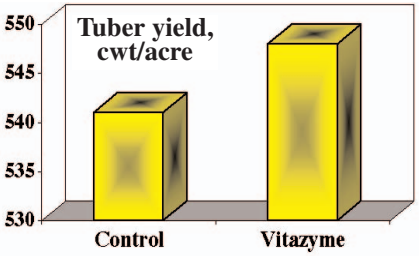
Potatoes

Research Organization: Agro-Engineering, Alamosa, Colorado
Location: Mosca, Colorado
Soil type: sandy loam
Variety: Norkota 296
Row spacing: 34 inches
Farm: Lyle Nissen Farm East
Planting date: June 10, 2002
Population: 11-inch spacing

Experimental design: A section of an irrigated (center pivot) potato field was treated with Vitazyme, while the remainder of the field served as a control. **1. Control** **2. Vitazyme**

Fertilization: 200 lb/acre N (one-third applied applied pre-plant), 150 lb/acre P_2O_5 (pre-plant), 0.25 lb/acre Zn

Vitazyme treatments : (1) 13 oz/acre soon after planting, through the irrigation system; (2) 13 oz/acre at the early hook stage



Harvest date: September 25, 2002

Leaf chlorophyll: On July 24, 2002, the leaf chlorophyll of about 30 leaves for both treatments was measured and averaged using a Minolta SPAD chlorophyll meter.

Treatment	SPAD value	Change
	----- SPAD units -----	
Control	46.0	——
Vitazyme	47.5	1.5

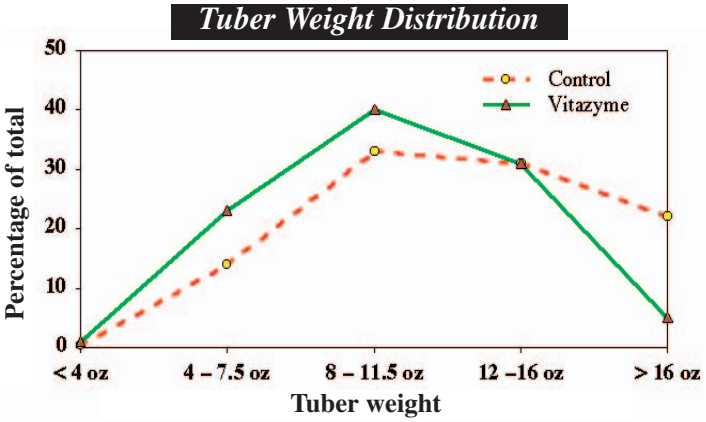
	Control	Vitazyme	Change
	----------	cwt/acre	----------
Tuber yield	541	548	7 (+1.3%)

Yield results: A 0.5-acre sample was harvested and weighed for each treatment.

Tuber weight results:

	< 4 oz		4 – 7.5 oz		8 – 11.5 oz		12 – 16 oz		> 16 oz	
	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight
		lb		lb		lb		lb		lb
Control	1	0.2 (0.4%	20	7.0 (14%)	27	16.9 (33%)	19	16.2 (31%)	12	11.4 (22%)
Vitazyme	2	0.4 (1%)	33	11.5 (23%)	35	20.2 (40%)	18	15.5 (31%)	2	2.7 (5%)

Income results: A price of $6.50/cwt is used in these calculations, although because of a more favorable size distribution with Vitazyme the prices actually received for the tubers with Vitazyme would be higher.



The Vitazyme treated plants on the right, from Colorado, display the increased biomass to be expected when Vitazyme is used; untreated controls are on the left.

	Tuber yield	Income	Increase
	cwt/acre	$/acre	$/acre
Control	541	3,516.50	——
Vitazyme	548	3,562.00	45.50

Conclusions: Vitazyme increased the yield of these Norkota potatoes by only 1.3% in this Colorado potato study, but the improvement in size distribution – drastically increasing the number of tubers in the 4 to 16 oz range – reveals how Vitazyme can increase the farmer's income in qualitative as well as quantitative terms. Many growers are interested in producing a larger number of medium-sized tubers, which Vitazyme assists in accomplishing in a significant way. An increase in leaf chlorophyll content and enhanced rhizosphere activity during the season helped the plants produce more tubers of a more uniform size.

• Tuber yield increase: 1.3% ***• Increase in leaf chlorophyll: 1.5 SPAD units*** ***• Income increase: $45.50/acre (not including size distribution improvements)***

Potatoes

Location: King Farm, Mars Hill, Maine
Row spacing: 36 inches
Kill date: September 3
Variety: FL 1833
Soil type: gravely loam
Second kill date: September 10
Planting date: May 29, 2002
Previous crop: barley

Experimental design: A field was divided into three parts to test Vitazyme at one, two, or three applications.

1. One application of Vitazyme (at planting)	2. Two applications of Vitazyme (at planting and July)	3. Three applications of Vitazyme (at planting and July and August)

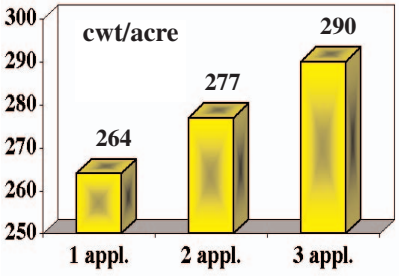
Fertilizer treatments: 1,400 lb/acre of a 14-14-17% N-P_2O_5-K_2O applied at planting (banded)

Vitazyme treatments : (1) 13 oz/acre at planting on May 29; (2) 13 oz/acre at blossoming on the leaves and soil on July 31, 2002; (3) 13 oz/acre on the leaves and soil, on August 13, 2002

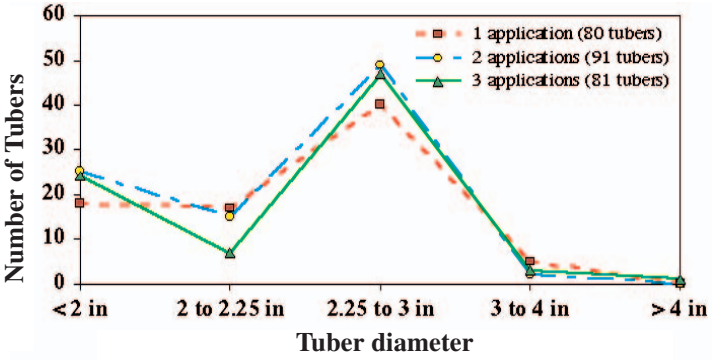
Insecticide applications: Admire in the furrow at planting

Yield results: Twelve rows from each plot were harvested and weighed on a truck scale; actual field acreage was not determined. Before harvest, 10-foot row sections were also harvested for yield estimates of all three sections. Both the weighed truck samples and the hand-dry samples were remarkably consistent, revealing 5 and 10% increases in yield with both sampling methods.

Tuber yield



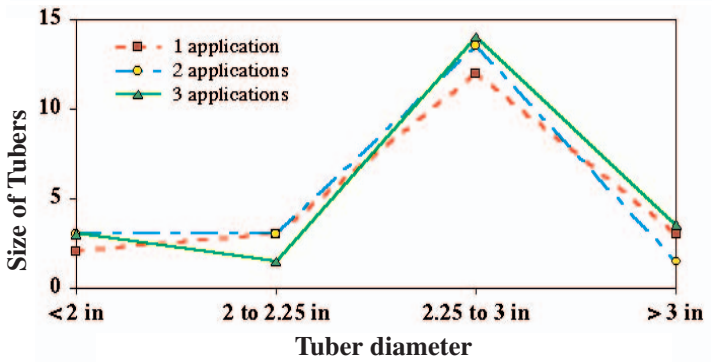
Tuber sizes: The 10-foot row samples were sized according to diameter, and the weights of these sized samples were determined. Extra applications of Vitazyme tended to produce larger tubers having more weight, as noted especially in the 2.25 to 3 inch diameter range. The largest single tuber was for three applications.



Income results: A value of $6.00 per cwt of tubers is estimated.

Abundant roots on potatoes are sometimes difficult to grow, but Vitazyme in this Maine trial proved how greatly roots can be stimulated using it; treated on the right.

Conclusions: Vitazyme applied twice increased the yield 13 cwt/acre over the single application, and when applied three times increased the yield by 26 cwt/acre over the single application.



These applications tended to increase tuber size, and resulted in increased incomes of from $78 to $156/acre, giving cost:benefit ratios of 9.8 to 13.

• Yield increase with Vitazyme:
5% with two applications
10% with three applications

Income

Treatment	Tuber yield	Total income	Income above a single application	Approximate cost:benefit ratio
	cwt/acre	$/acre	$/acre	
1. One application	264	1,584	——	——
2. Two applications	277	1,662	78	9.8
3. Three applications	290	1,740	156	13.0

Roses

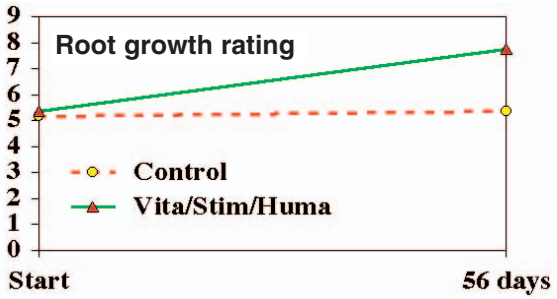
Roses are notorious for having rather weak root systems, but Vitazyme greatly increased both fine and major roots in this trial near Quito, Ecuador.

Research Organization: Summer Zone, Quito, Ecuador
Location: Agroflora, Pichincha, Tabacundo, Ecuador
Variety: Peckcoubo *Soil type*: clayey *Growth stage*: mature
Experimental design: The products Vitazyme, Stimplex (seaweed), and Huma K (humic acid) were combined in a program to treat roses. An area in a greenhouse of 640 m^2 was divided into two parts of 340 m^2 (control) and 300 m^2 (treated). There were 10 beds of 34 m^2 each in the control area, and 10 beds of 30 m^2 in the treated area. Ten plants per bed were evaluated for growth parameters at both the initial date and 56 days later, while production was measure for the first four months after treatment. **1. Control 2. Vitazyme/Stimplex/Huma K**
Vitazyme/Stimplex/Huma K applications: For each 10 beds for a treatment the following formula was used:
Water – 160 liters Vitazyme – 15.5 ml Stimplex – 160 ml Huma K – 6.8 g
Fertilization: unknown
Growth results: The trial was initiated on February 13, 2002, at which time evaluations were made for basal stems, root growth, leaf area, plant health, bud length, and flower characteristics (stem length, and blossom length and width). Evaluations were again made 56 days later, on April 10, to note changes in these parameters. Basal stems showed no response, so that data is not included here. Despite less irrigation water for the treated portion of the test, root growth was considerably greater than for the better watered control. **The treated roses also developed better secondary roots and root hairs.**

Root Growth

Treatment	At initiation*	At 56 days*	Change
	------- Average root rating per plant -------		
Control	5.16	5.36	+0.20
Vita/Stim/Hum	5.38	7.74	+2.36

*Root ratings: 1 to 10, 1 being worst and 10 being best; average of 50 plants.

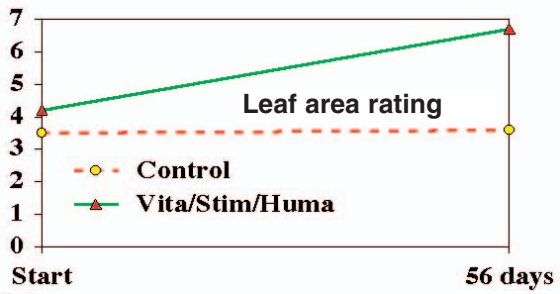


Vitazyme Treatment greatly increased leaf area of the roses, and caused them to be **noticeably greener and shinier.**

Leaf Area

Treatment	At initiation*	At 56 days*	Change
	----- Average leaf area rating per plant-----		
Control	3.5	3.6	+0.1
Vita/Stim/Hum	4.2	6.7	+2.5

*Leaf area ratings: 1 to 10, 1 being worst and 10 being best; average of 50 plants.



• Increase in root rating: 2.16

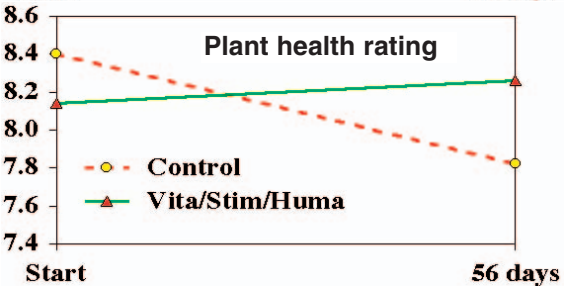
• Increase in leaf rating: 2.4

While the control roses decreased somewhat in health status, the Vitazyme treated plants were slightly healthier, showing less disease incidence that at the beginning of the test.

Plant Health

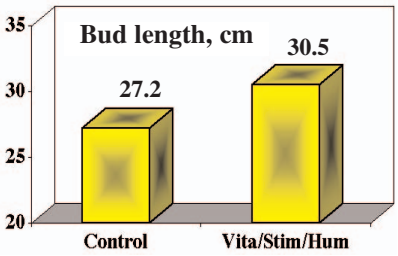
Treatment	At initiation*	At 56 days*	Change
	----- Average health rating per plant -----		
Control	8.40	7.82	–0.58
Vita/Stim/Hum	8.14	8.26	+0.12

*Plant health ratings: 1 to 10, 1 being worst and 10 being best; average of 50 plants.



• Increase in health rating: 0.70

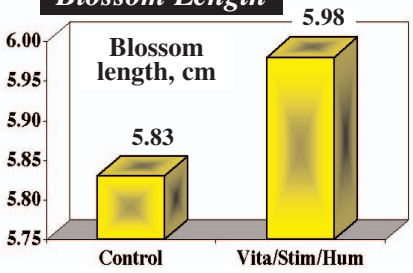
Bud Length



Measurements of bud length were made only at 56 days after treatment. At this time the treated roses had longer buds than the control plants.

• Increase in bud length: 12%

Blossom Length



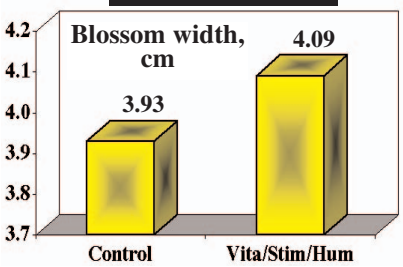
The blossom length was increased by 3% over the control with Vitazyme application.

• Increase in blossom length: 3%

Production results: A record was made of the cut flowers harvested for a period of three months, starting in mid-March and continuing through mid-June. The harvested totals for the four months were divided by the number of plants for the two harvested areas: 354 plants for the treated area and 446 plants for the control area. These values were then divided by 4 to give the harvested flowers per month per plant.

Treatment	Flower production per plant				Total flowers for 3 months
	March	April	May	June	
	----- flower number/plant -----				flower number/plant/month
Control	0.66	0.86	1.11	0.81	0.87
Vita/Stim/Hum	0.79	1.20	1.27	0.86	1.08
Change	+0.13	+0.34	+0.16	+0.05	+0.21 (+24%)

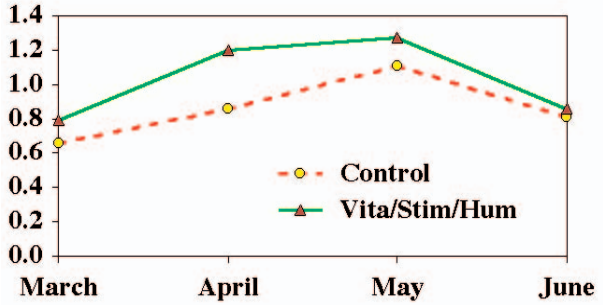
Blossom Width



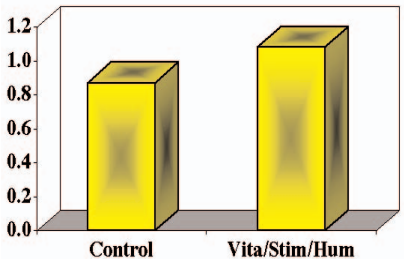
Vitazyme increased the width of the rose blossoms by 4%, about the same as for the blossom length.

• Increase in blossom width: 4%

Flowers Per Plant Per Month



Average Flowers Per Plant Per Month



Vitazyme plus Stimplex and Huma K increased the production of flowers for each plant each month by 24% above the control over the three-month period of this trial.

Income results: Rose stems per day increase: 0.21 more stems per month/30 days per month = 0.007 more stems per day x 354 plants per bed = 2.47 more stems per bed per day x 180 beds per hectare = 446 more flowers per day per hectare x 30 days per month = 13,381 more flowers per hectare per month. Average flower price = $0.25 (U.S.) x 13,381 flowers per hectare per month = $3,345.25 per hectare per month. Cost of 4 applications = $31.88 per hectare x 4 applications per month = $127.52 per hectare per month. Net extra return from Vitazyme + Stimplex + Huma K = $3.345.25 – $127.52 = $3,217.73.

Conclusions: In this Ecuadorian study, Vitazyme, Stimplex, and Huma K improved growth parameters such as root growth, leaf area, plant health, bud length, stem length, and blossom length and width such that overall production during that period was increased by 24%. This yield increase translates to added income of $3,217.73 per hectare per month.

Product Costs Per Application

Item applied	Total cost
	U.S. $/ha
Vitazyme (1.55 ml/cama 30 m)	7.37
Stimplex (1 ml/liter of water)	20.16
Huma K (227 g/ha)	4.35
Total	31.88

• Increase in flowers per plant: 24%

• Increased flower income: $3,217.73 per hectare per month

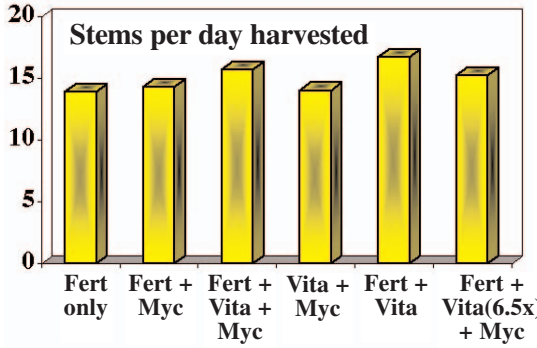
Roses – *Vitazyme and Mycorrhizae*

Research organization: Summer Zone, Quito, Ecuador *Variety*: Forever Young *Stage*: Mature
Cooperators: Harold Zuniga and Emerson Salazar, Jumbo Roses, Pichincha, Tabacundo, Ecuador
Growth pattern: raised beds in a production greenhouse *Trial initiation*: March 1, 2001 *Soil type*: clayey
Experimental design: Six treatments were selected, and each placed on four adjoining beds in the greenhouse. Each bed comprised 41.7 m², so each treatment was 167 m². For the five Vitazyme and mycorrhiza treatments the total area was 835 m²; the control treatment comprised the area on either side of the five treatments.

Treatment	Fertilizer[a]	Vitazyme[b]	Mycorrhiza[c]
		ml/bed/week	
1	X	0	0
2	X	0	X
3	X	1.55	X
4	0	1.55	X
5	X	1.55	0
6	X	10	X

[a] Nitrofoska Perfect (15-5-20-2-20-2% N, P, K, Mg, S, and Ca) was applied at 2 kg/bed at the start of the experiment.
[b] The 1.55 ml/bed/week rate is equivalent to 1.5 l/ha/month, applied as a spray on the leaves and soil surface; the 10 ml application for treatment 6 was 6.5 times the normal rate.
[c] Mycorrhizal fungi were applied at 2.25 kg/bed at the beginning of the crop cycle.

Fertilization : Nitrofoska at 2 kg/bed at the start of the experiment
Vitazyme application: 1.5 l/ha/month every week (1.55 ml/bed/wk) for Treatments 3, 4, and 5, and 9.75 ml/ha/month (10 ml/ha/week) for Treatment 6, applied by a sprayer
Mycorrhiza application: applied to the beds at 2.25 kg/bed at the start of the experiment
Growth results: Root growth, blossoms, basal stems, leaf area, and leaf color were reported previously.



Production results: Data were collected on rose stems harvested at about 80 days and 171 days after the last Vitazyme application. The total number of stems harvested was recorded for each block of four beds each (167 m²) for the six treatments. The stems harvested per day for each treatment and the stems harvested per plant per month (with 1,248 plants per treatment) were calculated along with treatment differences.

• Increased harvest with Vitazyme + Fertilizer: 20%

Flower production for 78 to 81 days after the last Vitazyme application

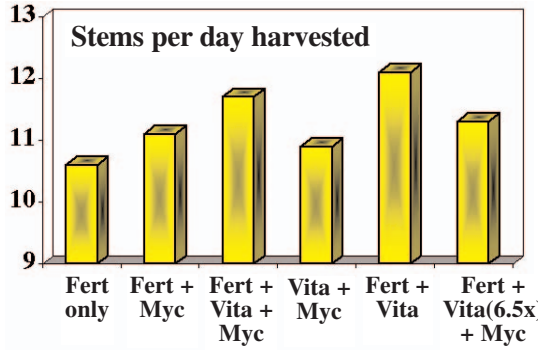
Treatment	Days of harvest since the last application	Stems harvested	Stems/day harvested	Stems/Plant/ Month	Stems/Plant/ Month increase
1. Fert only	78	1,084	13.90	0.33	——
2. Fert + Myc	79	1,128	14.28 (+3%)	0.34	0.01
3. Fert + Vita + Myc	81	1,271	15.69 (+13%)	0.38	0.05
4. Vita + Myc	78	1,093	14.01 (+1%)	0.34	0.01
5. Fert + Vita	78	1,304	16.72 (+20%)	0.40	0.07
6. Fert + Vita (6.5x) + Myc	78	1,189	15.24 (+10%)	0.37	0.04

• Increased harvest with Vitazyme + Fertilizer: 14%

Flower production for 170 to 173 days after the last Vitazyme application

Treatment	Days of harvest since the last application	Stems harvested	Stems/day harvested	Stems/Plant/ Month	Stems/Plant/ Month increase
1. Fert only	170	1,808	10.6	0.26	—
2. Fert + Myc	172	1,911	11.1 (+5%)	0.27	0.01
3. Fert + Vita + Myc	173	2,018	11.7 (+10%)	0.28	0.02
4. Vita + Myc	171	1,868	10.9 (+3%)	0.26	0
5. Fert + Vita	171	2,069	12.1 (+14%)	0.29	0.03
6. Fert + Vita (6.5x) + Myc	172	1,941	11.3 (+7%)	0.27	0.01

Conclusions: It is apparent from this rose production study that Vitazyme and fertilizer alone produced the highest number of harvested flower stems of all treatments at both 2.6 and 5.7 months after the last Vitazyme treatment. These increases were 20% and 14% above the control values, respectively. Other treatments also increased flower production. The second-best treatment was Vitazyme plus both fertilizer and mycorrhizae, which gave 13% and 10% yield increases for the first and second harvest periods, respectively, whereas the high Vitazyme application with fertilizer and mycorrhizae gave respective 10% and 7% yield increases. The least responsive treatments were fertilizer plus mycorrhizae and Vitazyme plus mycorrhizae. **These studies show that Vitazyme alone with the basal fertilizer treatment can improve rose yields best over a long time period, even several months after cessation of Vitazyme applications. It is a highly effective rose production supplement.**



Pictured here is one of many trials with Vitazyme which have been conducted in Ecuador, with excellent yield and quality improvements in flower production.

Soybeans

Location: Fisher, Minnesota *Variety*: GCS 320 5 RR *Soil type*: clay loam
Seeding rate: 67 lb/acre *Planting date*: May 22, 2002 *Harvest date*: October 15 and 16, 2002
Experimental design: An area of 46 acres was split into two parts, one area of 28 acres treated with Vitazyme once and a conventional fertilizer blend, and the other area of 18 acres treated with Vitazyme once and a special fertilizer blend.

1. Control + conventional fertilizer **2. Vitazyme + special fertilizer**

Fertilization: Both treatments received a fertilizer blend, Treatment 1 a conventional blend and Treatment 2 a special blend based on a soil test and the Albrecht method.
Vitazyme treatment: 13 oz/acre over all areas, applied by airplane, on June 27, 2002
Yield results: Actual truck weights were taken to insure an accurate yield calculation, and the highest yielding place within the test area was also determined..

Income results: This crop was contracted at $0.75/bu over market price, giving $5.76/bu at the prevailing market price.

Treatments	Yield	Change in yield	Bean moisture	Test weight	Highest yield in the area
	bu/acre	bu/acre	%H_2O	lb/bu	bu/acre
Vitazyme + conventional fertilizer	41.96	——	13.2	56	46
Vitazyme + special fertilizer	44.96	3.00 (+7%)	13.8	56	48

Treatment	Gross income	Income increase
	$/acre	$/acre
Vitazyme + conventional fertilizer	241.69	——
Vitazyme + special fertilizer	258.97	17.26

• Increase in income: $17.26/acre

Conclusions: The special fertilizer, devised after a soil test and the Albrecht system, produced a 7% yield increase over the conventional fertilization system. Both treatments received Vitazyme on July 27. This proves the superiority of the Albrecht system of fertility management to the conventional system used here.

Trees

Tree farm: AM&D Tree Farm *Location:* Canton, Texas
Tree and shrub varieties: live oak, Spanish oak, magnolia, Savannah holly, Nellie R. Stevens holly, Foster holly
Potting soil: custom mix using Vital Earth Resources raw materials
Experimental design: Several locations on the tree farm were selected amongst many tree and shrub varieties, to compare Vitazyme treatment with untreated controls in terms of branch and trunk growth. Entire series of rows were treated with Vitazyme alongside untreated series of rows.

1. Control with full fertilization **2. Vitazyme with full fertilization**

Fertilization: Different amounts of pelleted, coated fertilizer were applied in mid-March to each pot, the amount depending on the pot size, using a mixture of "Multicoat" and "Nutricoat". This slow-release fertilizer mix lasts about one year for total release. Amounts applied were as follows: 3 gallons, 40 grams; 30 gallons, 200 grams; 45 gallons, 300 grams; 65 gallons, 360 grams; 95 gallons, 430 grams.
Vitazyme application: Vitazyme was sprayed to the soil surface of each pot using a backpack sprayer, at 13 oz/acre directed only on the pot soil surfaces. Thus, the product was concentrated only in the pots. Applications were made April 5 and June 21, 2002.

New liveoak leaves and branches were stimulated by Vitazyme's active agents to growth more quickly, giving increased lengths of more than 40% by May 21.

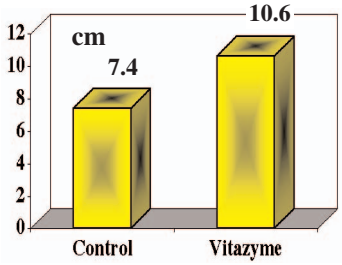
Growth Results:

Evaluations on May 21, 2002, 46 days after application one

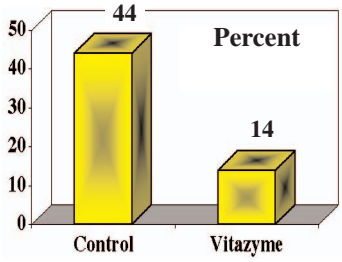
All measurements of new growth were made on unpruned branches, the branch measured from the start of new growth to the tip. A single average twig was selected for measurement from each tree or shrub. Some treated areas were not measured — such as cedar elms — due to difficulty in determining where new growth for the year began. Anomalous trees, such as those which were unusually small or unthrifty, were excluded from the measurements. Rows were selected for measurement that occupied the same relative position in the rows, such as trees that were on the west side of driving lanes to insure equal access to light.

Live Oak – golf course area (45 gal. pots)

Branch Growth



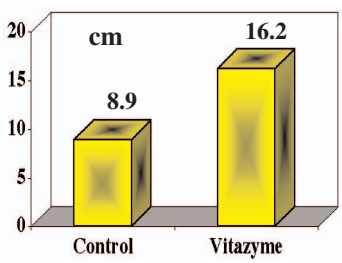
No leafing



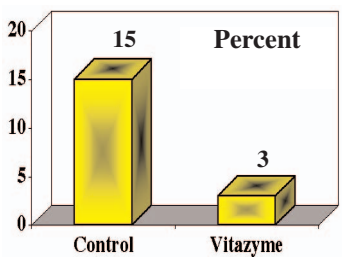
• Increased growth: 43%
• Increased early leafing: 30% more

Live Oak – north area (45 gal. pots)

Branch Growth



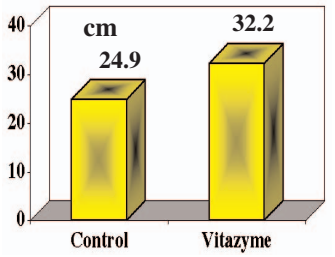
No leafing



• Increased growth: 82%
• Increased early leafing: 12% more

Red Oak – golf course area (65 gal. pots)

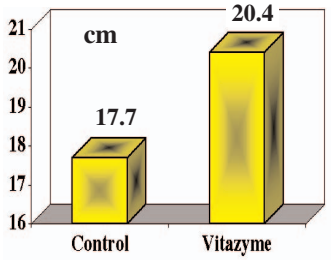
Branch Growth



• **Increased growth: 29%**

Savannah Holly, large (65 gal. pots)

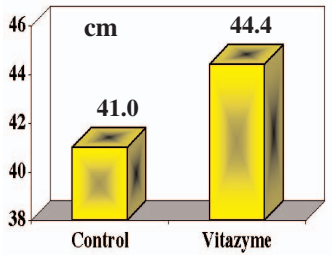
Branch Growth



• **Increased growth: 15%**

Nellie R. Stevens Holly, large (65 gal. pots)

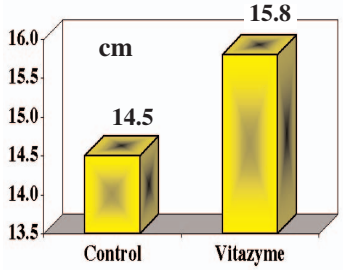
Branch Growth



• **Increased growth: 8%**

Nellie R. Stevens Holly, small (3 gal. pots)

Branch Growth

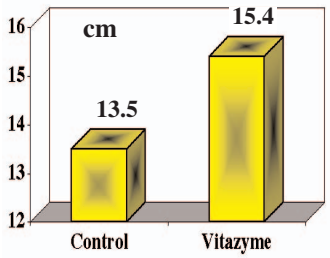


• **Increased growth: 9%**

Conclusions from the early growth data: In all cases Vitazyme increased the new branch growth of these trees and shrubs, from 8 to 82% for the trees, and from 9 to 14% for the small shrubs. Also, Vitazyme triggered substantially more early growth of liveoak trees, meaning that the trees are able to utilize the season longer for greater annual growth. Thus, Vitazyme's active agents, by six weeks after application, significantly triggered additional growth of new branches, and speeded the time to bud break for many of the trees.

Foster Holly, small (3 gal. pots)

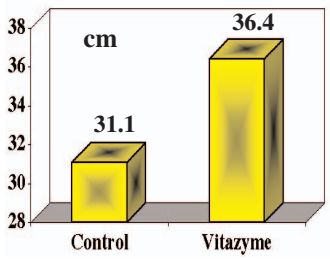
Branch Growth



• **Increased growth: 14%**

Magnolia (95 gal. pots)

Branch Growth



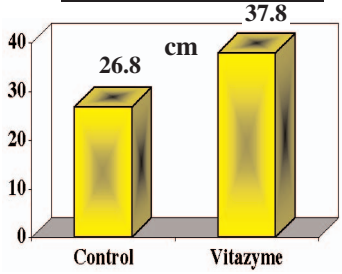
• **Increased growth: 17%**

Evaluations on September 10, 2002, 81 days after application two

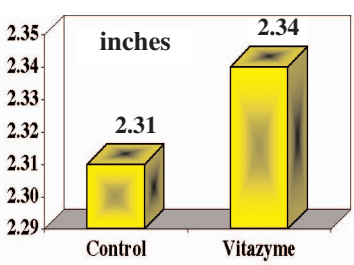
New branch growth measurements were made on new growth since the last pruning, measuring from the last cut to the tip of the new growth. One average twig was selected for each tree measured. In some cases a tree was not measured due to some anomaly, such as small size or lack of thriftiness. The caliper of the trees was determined using a tree caliper tool at six inches above the soil level of the pot. All trees were measured for caliper in a stretch of row regardless of the condition of the tree. For both new branch growth and caliper, rows of tree were selected that were growing in equivalent light conditions (such as on the exposed row along a driving lane) to reduce extraneous variability. Some areas had recently been pruned and could not be measured, and in some cases (as with the cedar elms) it was very difficult to determine where new growth had begun on a twig. Treatments in these situations were not measured.

Live Oak – golf course area (45 gal. pots)

Branch Growth



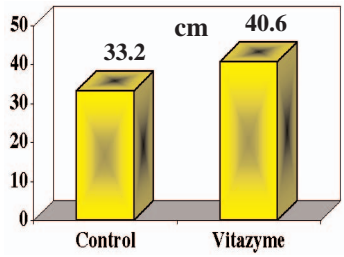
Trunk Caliper



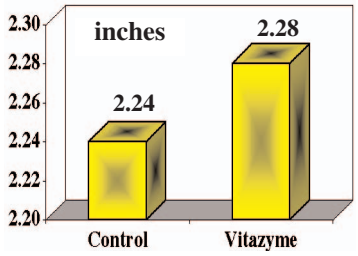
• **Increased growth: 41%**
• **Increased caliper: 1.3%**

Live Oak – north area (45 gal. pots)

Branch Growth



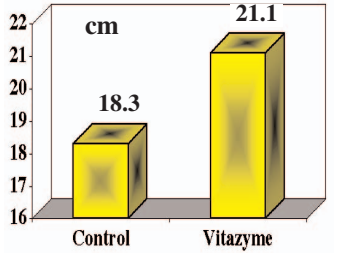
Trunk Caliper



• **Increased growth: 22%**
• **Increased caliper: 1.8%**

Savannah Holly, large (65 gal. pots)

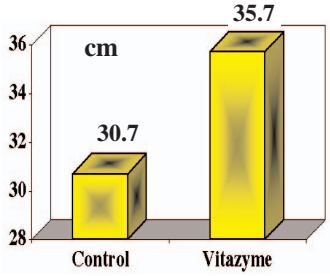
Branch Growth



• **Increased growth: 15%**

Nellie R. Stevens Holly, large (65 gal. pots)

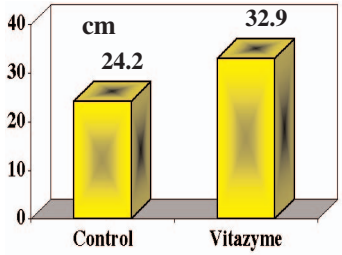
Branch Growth



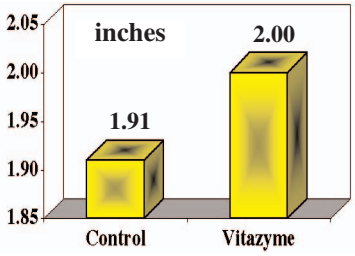
• **Increased growth: 16%**

Red Oak – golf course area (65 gal. pots)

*Branch Growth**



Trunk Caliper



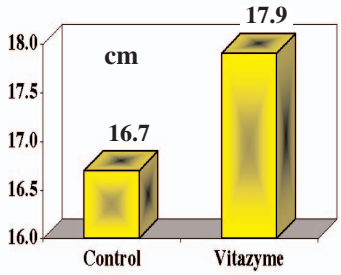
*The Vitazyme treated treated trees were much darker green and had a fuller canopy.

• **Increased growth: 36%**
• **Increased caliper: 5%**

Conclusions from the late growth data: New branch growth responses for the mid and late summer period were similar to those from the earlier measured period. Trunk diameters measured at this time showed excellent responses to Vitazyme, especially for the faster growing trees: red oak and magnolia. Liveoak trunk calipers increased a small amount versus the control, though in both cases the differences were measurable for this slow growing tree species.

Nellie R. Stevens Holly, small (3 gal. pots)

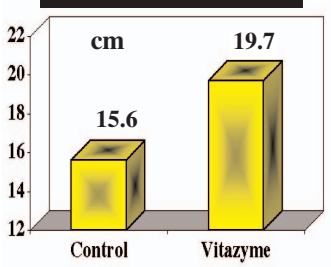
Branch Growth



• Increased growth: 7%

Foster Holly, small (3 gal. pots)

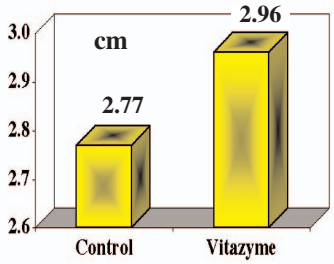
Branch Growth



• Increased growth:

Magnolia (95 gal. pots)

Trunk Caliper*



*The trees had recently been pruned, so no new growth data could be collected. Many trees had multiple lower trunks so could not be included in the measurements

• Increased caliper: 7%

Conclusions: A summary of all data collected is as follows:

Tree test	May 21		September 10	
	New growth	Bud break	New growth	Caliper
	% above the control			
Liveoak, golf course	43	30	41	1.3
Liveoak, north	82	12	22	1.8
Red oak, golf course	29		36	5
Savannah holly, large	15		15	
Nellie R. Stevens holly, large	8		16	
Nellie R. Stevens holly, small	9		7	
Foster holly, small	14		26	
Magnolia	17			7

Red oak trunk diameters were increased significantly with Vitazyme in just a few months, allowing most of the treated trees to be sold(left); untreated controls are on the right.

In all cases Vitazyme caused greater growth of new branches for all tree species measured, for both trees and holly. Percent increases in growth 46 days after the first application were similar to the increases 81 days after the second application. In all but one case the holly gave smaller growth increases than did the oak and magnolia trees, but those increases were still nearly 10% or greater.

These branch and leaf growth increases translated into increases in trunk diameter later in the season. Slow growing liveoaks increased only 1.3 to 1.8% more in trunk caliper than did the controls, but faster growing red oaks increased by 5% and magnolias by 7%. A visible improvement in appearance of the tree canopy — leaf density and color, and branch length — was noted with Vitazyme treatment to red oaks.

Vitazyme also initiated more rapid emergence of buds for the liveoak trees near the golf course. This stimulation of new growth was also apparent later in the growing season where, on September 10, it was noted that the treated trees on average had more actively extending branches than the control trees.

Vitazyme appears to be a highly effective biostimulant of new growth for trees and shrubs as shown in this tree nursery study. This rhizosphere biostimulant has been shown to advance the maturity of containerized, well-managed trees to a significant degree, and most assuredly the profitability of its use has been demonstrated as well due to its effectiveness and low cost.

Wheat – A testimonial

Location: southwestern England (Wells, Somerset County) *Variety*: feed wheat *Planting date*: October, 2001
Soil type: clayey; high Ca, low Mg, low trace minerals *Harvest date:* August, 2002
Experimental Design: Four farms had fields that were treated with the Vitazyme program in Somerset County, with control areas left untreated. No total yield data were obtained, but responses were closely estimated on all four farms.

1. Control **2. Vitazyme**

Fertilization: Typical applications were 160 to 180 lb N/acre, and 200 to 300 lb/acre of a 0-24-24% N-P_2O_5-K_2O fertilizer.
Vitazyme application: 1 liter/ha (13 oz/acre) at the early flag leaf stage, towards the end of May
Yield and quality results: Average yield increases for the Vitazyme treatments for the four farms were 0.5 to 0.8 metric tonnes/acre. The heads and grains of the Vitazyme treated wheat were larger and plumper than for the untreated control.
Conclusions: Although the Vitazyme was applied very late in the growth cycle, the responses on these four English farms were excellent. Comments of the researcher were as follows:

- **The treated wheat responded immediately to the Vitazyme, results being visible within four days of application.**
- **The treated plants were better looking, bigger, and had less grain shriveling.**
- **It is a very easy-to-use product**
- **All of the farmers are very happy and impressed with Vitazyme.**
- **In one 70-acre block, he expected 1.0 to 1.5 tonnes/acre but after treatment actually harvested over 3.0 tonnes/acre.**

• Yield increases: 0.5 to 0.8 mt/acre

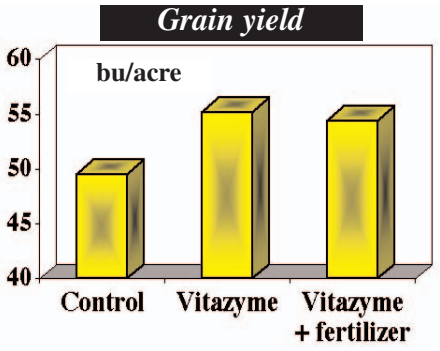
Wheat

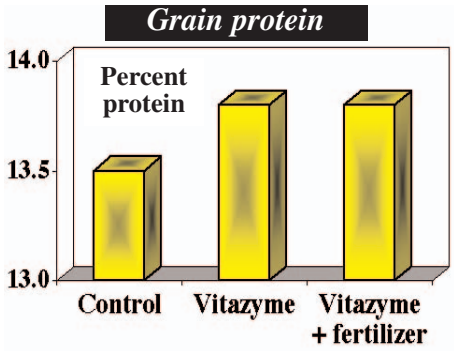
Location: Fisher, Minnesota *Variety*: Knudson hard red spring *Soil type*: clay loam
Seeding rate: 90 lb/acre *Planting date*: May 14, 2002 *Harvest date*: August 21, 2002
Experimental design: A field containing 89 acres was divided into three portions, 34 acres of an untreated control, 32 acres of Vitazyme only, and 23 acres of Vitazyme plus a fertilizer blend.

1. Control **2. Vitazyme** **3. Vitazyme + fertilizer blend**

Fertilization: Unknown for Treatments 1 and 2, but Treatment 3 had a special blend of fertilizer applied based upon a soil test and the Albrecht system of soil balancing
Vitazyme treatment: 13 oz/acre on the leaves and soil on June 17 by airplane, with a herbicide, for Treatments 2 and 3
Yield results: Actual truck weights were taken to insure an accurate yield calculation for each of the three areas. The highest yielding area of each treatment was also determined.

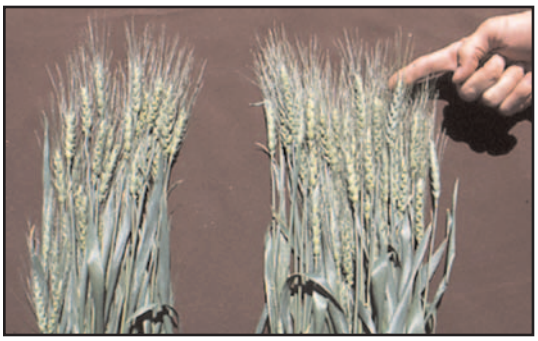
Treatment	Grain yield	Change	Protein	Highest yield	Test weight
	bu/acre	bu/acre		bu/acre	lb/bu
1. Control	49.5	——	13.5	57	58
2. Vitazyme	55.2	+5.7 (+12%)	13.8	59	58
3. Vitazyme + special blend	54.4	+4.9 (+10%)	13.8	60	57





Roots of this Red River Valley wheat are much thicker, with more fine root hairs to which soil clings, after Vitazyme treatment than for the untreated control plants.

- ***Increase in yield (2x): 12%***
- ***Increase in grain protein: 0.3 percentage point***



These wheat heads are from the same plants as in the previous picture. Better roots meant more abundant and bigger heads, and a greater yield at harvest.

Income results: This crop was contracted for $0.70/bu above the market value, so with a market value of $4.84/bu the contract price was $5.54/bu.

Treatment	Grain yield	Grain Value	Change in value
	bu/acre	$/acre	$/acre
1. Control	49.5	——	13.5
2. Vitazyme	55.2	305.81	31.58
3. Vitazyme + special blend	54.4	301.38	27.15

Conclusions: Vitazyme applied to the leaves and soil of this hard red spring wheat variety in the Red River Valley significantly increased yield (+12%) and income ($31.58/acre); yield and return were slightly lower with the special blend of fertilizer. Moreover, the grain protein was enhanced slightly (0.3 percentage point) with both Vitazyme treatments. These results illustrate the rhizosphere stimulating effects of the product's active agents to take up more nutrients, while stimulating photosynthesis to fix more carbon and thus increase yields above the untreated control.

- ***Increase in income: $31.58/acre***
- ***Cost:Benefit ratio: 7.9:1***

Wheat

Vitazyme and Southeast Mix

Location: Vital Earth Resources Research Greenhouse, Gladewater, Texas *Variety*: winter wheat
Soil type: Bowie very fine sandy loam *Planting date*: February 22, 2002 *Pot type*: 1 gallon
Population: about 80 seeds/pot (0.5 tsp) *Harvest date*: April 30, 2002, 67 days after planting.
Experimental design: A complete block design was set up using eight replicates for each of four treatments. The soil was carefully packed into each pot, watered evenly, and then treated with the materials. Plants were watered on demand, and grown in the greenhouse at about 85°F for a high and 60°F for a low temperature.

1. Control **2. Vitazyme only** **3. Southeast Mix only** **4. Vitazyme + Southeast Mix**

Fertilizer application: Each pot received 0.23 gram per pot of $(NH_4)_2SO_4$ to equal a 100 lb/acre application, or 21 lb/acre of N and 20 lb/acre of S for a "starter" effect.
Vitazyme application: After planting on February 22, 50 ml of a 0.002% Vitazyme solution was applied to the soil surface of

each pot for Treatment 2. This application was equal to the amount of Vitazyme contained in the Southeast Mix of Treatment 4. By mistake, an additional application of Vitazyme was made to Treatment 4 so that the actual amount of active ingredients was twice that of Treatment 2. Field and greenhouse trials, however, have demonstrated that a doubled rate of Vitazyme will not give a plant response that exceeds that of the usual rate.

Southeast Mix application: Regular Southeast Mix granules, a "sucrate", were applied to the soil surface of the pots of Treatment 3 at 1 gram per pot; this rate equaled 10 lb/1,000 ft^2. The Southeast Mix for Treatment 4 had been prepared earlier at the facilities of American Minerals. Two ounces of Vitazyme were mixed with the binder of 50 lb of Southeast Mix during processing, a 0.04 oz/lb rate. At 10 lb/1,000 $ft.^2$ of Southeast Mix application, this would then give a Vitazyme application rate of about 18 oz/acre. This product was also applied at 1 gram per pot, as for Treatment 3.

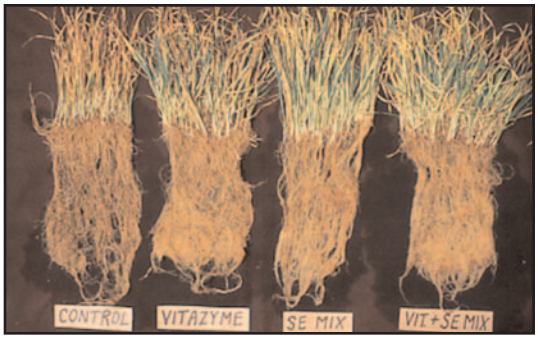
Product specifications: **Southeast Mix:** a sucrate carboxylate containing a simple carbohydrate binder, together with various minerals (Fe. 18.7%; Mn, 7.8%; Zn, 7.3%; Cu, 3.1%; B, 3.1%), with granules able to quickly break down in water to supply nutrients to plants. Producer: American Minerals, Dunedin, Florida.

Growth observations: The plants of Treatment 1 (the untreated control) began to die back towards the end of the growth period. Such a dieback did not occur for any of the other treatments. With up to 80 or more plants per pot there was great nutrient and space competition in each pot, so that performance of the products could be measured under highly stressed conditions.

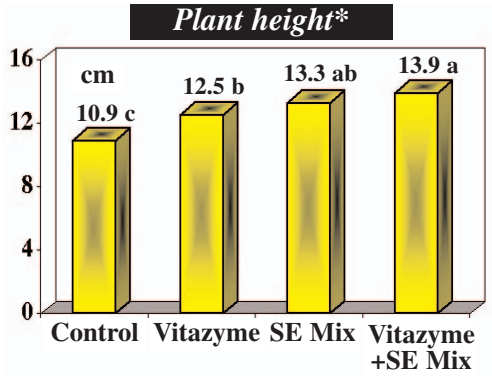
Height results: On April 30 all of the plant roots were washed clean of soil, and any weeds were removed. An average height measurement was made for the plants of each pot. Both Vitazyme and Southeast Mix significantly increased plant height over the control, by 15 to 22%, but the combined products caused a 28% increase in plant height.

Plant number results: The number of live plants was counted for each pot and subjected to a statistical analysis. There were no statistical differences among the treatments for plants per pot, but interestingly the Vitazyme and Southeast Mix pots produced the greatest number of surviving plants. Apparently the added nutrients and the biostimulant compounds of the two products helped more wheat seedlings survive. The treated pots exceeded the controls by from 3.6 to 5.4 plants per pot.

Dry weight results: The plants were dried in a drying oven at 115° F for one day, and dry weights were taken to the nearest 0.01 gram. These results showed highly significant differences among treatment means. The dry weight of the wheat seedlings was significantly increased above the control by both Southeast Mix alone (+ 13%) and especially by Southeast Mix plus Vitazyme (+ 20%), showing that soil and fertilizer nutrients were being utilized more effectively when Vitazyme was present. Vitazyme alone increased dry weight over the control by 9%, but this increase was not significant at P=0.10.

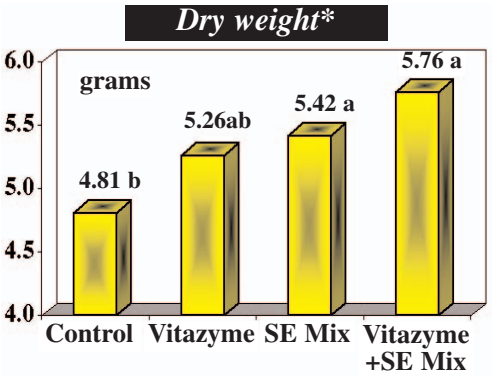


Vitazyme incorporated into a mineral fertilizer called Southeast Mix produced a good synergism, and was not deactivated by the processing of the fertilizer in the facility.



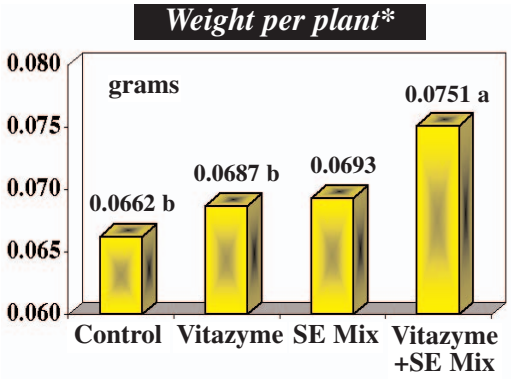
*Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. $LSD_{0.10}$=6.2.

• Increase in height with Vitazyme + SE Mix: 28%



*Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. $LSD_{0.10}$=0.52 g.

• Increase in dry weight with Vitazyme + SE Mix: 20%



*Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. $LSD_{0.10}$=0.0057 g.

• Increase in weight/plant with Vitazyme + SE Mix: 20%

Weight per plant results: The total dry weight for each pot was divided by the number of plants for each pot to obtain the average weight per plant. Even though Treatments 2, 3, and 4 had the highest plant populations, they also produced the greatest weight per plant, especially Treatment 4 where Vitazyme plus Southeast Mix yielded a 13% greater weight per plant than did the control. This shows that Vitazyme significantly improved nutrient utilization together with Southeast Mix nutrients, with plants that were significantly bigger than with either of the two products alone.

Conclusions: Both Vitazyme and Southeast Mix proved to be effective agents in stimulating wheat growth along with a nominal amount of starter nitrogen and sulfur added at planting, the Vitazyme effect due to biostimulant compounds and the Southeast Mix due to nutrients in the "sucrate" form. These stimulating effects were evident in terms of plant height, dry weight, and weight per plant at harvest. However, the combined Vitazyme and Southeast Mix proved by all means to be the most effective treatment, in all cases producing the greatest height and dry matter accumulation. These results correspond with other studies which demonstrate the ability of Vitazyme's phytoactive agents to enhance plant uptake of minerals and nitrogen from either native or applied sources.

Wheat

Note the greater plant height, leaf area, chlorophyll development, root proliferation, and heading traits in response to Vitazyme applied in this split-field farm study.

Research Farm: Nowlin Farm *Location*: Coolidge, Arizona
Variety: a pastry wheat variety *Previous crop*: unknown *Soil type*: unknown *Planting date*: unknown
Experimental design: A large field was divided into two sections: Vitazyme treated with a reduced input of certain fertilizers (101 acres), and full fertilizer without Vitazyme (86 acres).

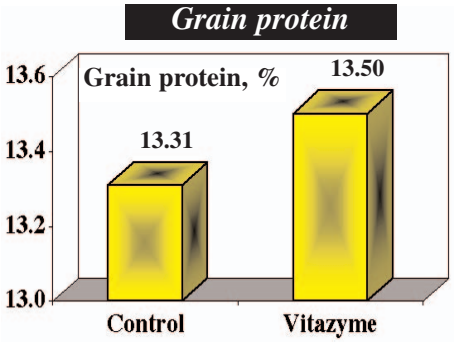
1. Control + full fertilizer **2. Vitazyme + 50% of some fertilizers**

Fertilization: 400 lb/acre N plus other inputs over all areas. At the beginning of grain filling the control area received a foliar application of 4 lb/acre of urea, 14 oz/acre of phosphorus, 36 oz/acre of ViGorator, 1.5 oz/acre of cobalt, 0.75 oz/acre of Xcite, and 0.8 oz/acre of silica. The Vitazyme treated area received Vitazyme (see below) plus 4 lb/acre of urea, 14 oz/acre of phosphorus, 18 oz/acre of ViGorator, 8 oz/acre of sulfur, and 1.5 oz/acre of silica.

Vitazyme application : 13 oz/acre to the foliage at the beginning of grain fill

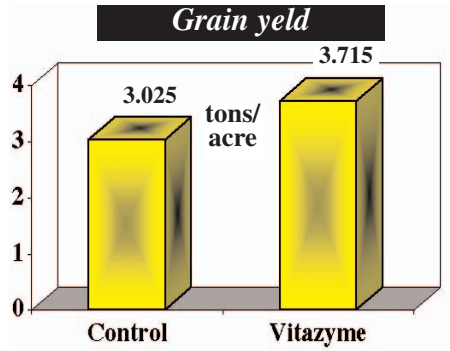
Harvest results: The last days of May the crop was harvested, and the various loads of grain were weighed from each area. These load weights were tallied for both areas. In addition, the bushel weights and protein levels for the loads were determined and averaged for the two areas.

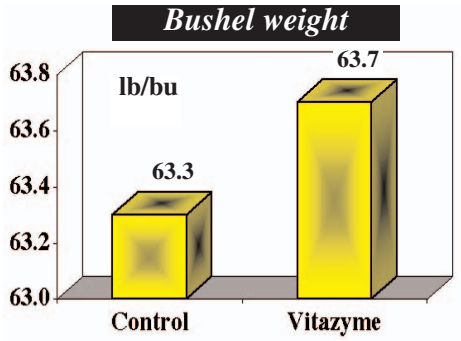
Vitazyme with reduced fertility inputs, applied late in the crop cycle, brought about a dramatic 23% increase in wheat yield in this study.



The protein of the grain was boosted by 0.19 percentage point by Vitazyme, despite the fact that some foliar applied fertility inputs were reduced by 50%. The plants were stimulated to make better use of the nitrogen and minerals available to them.

The Vitazyme treatment increased the density of the wheat grain by 0.4 lb/bushel, probably due to a higher concentration of minerals within the grain.





Income results: Because the wheat was 13.0% protein or above , the grower received a premium price of $2.00/cwt over the usual price for the wheat. This premium price amounted to $7.50/cwt.

	Control	Vitazyme	Change
		$/acre	
Crop income	453.75	557.25	103.50

Conclusions: Vitazyme together with a reduced rate of certain foliar fertilizers, applied at the beginning of grain filling, brought about an improvement in all parameters measured in this Arizona pastry wheat study. Yield was boosted by 23%, grain protein by 0.19 percentage point, bushel weight by 0.4 lb/bu, and income by $103.50/acre. These effects resulted from Vitazyme's ability to stimulate rhizosphere microflora, allowing the plant to better utilize native and applied nutrients and to generate more of its own nitrogen and growth enhancing compounds in the root zone such as growth regulators, antibiotics, various mineral-dissolving acids, and so forth.

- ***Increase in grain yield: 23%***
- ***Increase in bushel weight: 0.4 lb/bu***
- ***Increase in income: $103.50/acre***
- ***Increase in grain protein: 0.19 percentage point***

Roses – a Testimonial

A rose study was conducted at Agroflora in Tabacundo, Ecuador, under the direction of Ing. Luis Lopez, with excellent results. He stated ...

"Vitazyme increases root growth, making the plant to stay active during stress periods. When you have a better root volume this helps the plant to have better nutrition. Therefore, the resistance of the plants to pests is better, too.

"The joint use of Vitazyme+Stimplex+Huma-K increased the productivity by 17% in our roses. The use of Vitazyme alone increased the productivity by 12%."