VITAZYME®

1998 Field Trial Results

A SUMMARY OF EXPERIMENTS USING VITAZYME SOIL AND PLANT BIOSTIMULANT ON FIELD AND HORTICULTURAL CROPS

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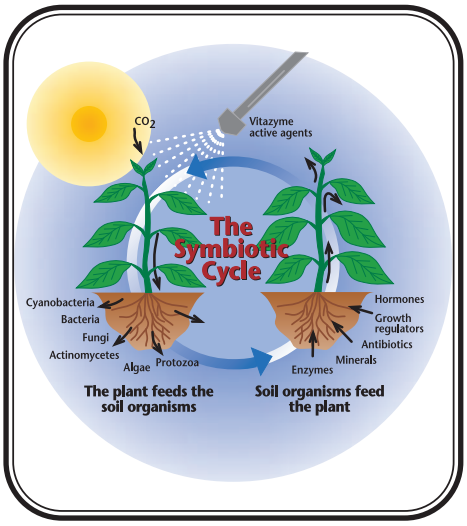
The fourth major year of Vitazyme testing has now been completed. Results of many of these trials are summarized in this booklet. As shown in previous editions, results were equally as good in 1998 as in 1996 and 1997. Of special note this year are the results with soybeans at Iowa State University. In that replicated study, the two-application program increased bean yield by 4.5 bushels per acre.

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 yield a large physiological response from very little applied 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.

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% →				

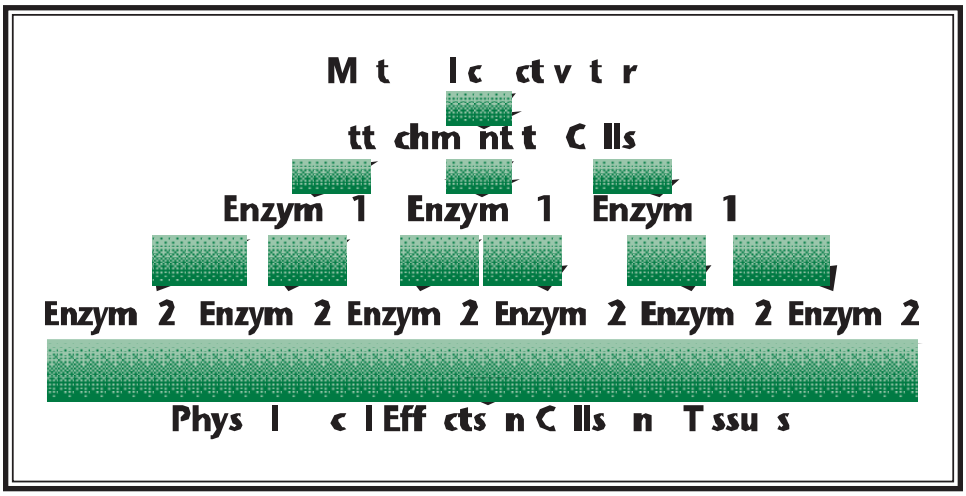
1 If possible, analyze the soil at a reputable laboratory and correct mineral deficiencies and imbalances with expert consultation.

2 Reduce nitrogen fertilizer applications for non-legumes using this test:
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.



Some major Vitazyme issues

After four years of persistent replicated research, approval was gained in December from the Iowa Pesticide and Fertilizer Advising Committee to market Vitazyme in Iowa. Registration should be completed in January. Vitazyme is the first such product to be approved in Iowa.

Use of straight Vitazyme directly from the container was tried in numerous field studies with soybeans. The product was mixed with the seed while filling the planter, to evaluate whether the direct seed treatment would work. If successful, this would open the use of Vitazyme at planting time for nearly all growers, whether they had seed row application equipment or not. Use rates have generally been 6 to 8 oz/acre, totally on the seed, when using this method. Yield increases to date have been substantial, consistent, and highly profitable, meaning that we will likely recommend this treatment for all crops.

While a record number of Vitazyme trials were established across the nation in 1998, a record number of trials failed to produce data due to poor weather conditions, especially in California. In one case, a test on garlic failed along with the other 8,000 acres, all due to a fungal attack. We hope for better success in 1999.

Azaleas

Location: Gladewater, Texas *Variety*: azaleas [*Rhododendron calendulaceum*]

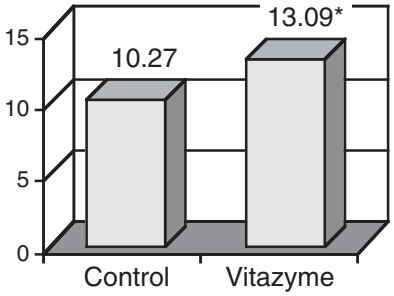
Planting date: October 23, 1996

Experimental conduct and design: A 12 treatment experiment using four replicates, with variables of municipal solid waste compost, fertilizer, and Vitazyme, was completed in one-gallon pots. Three major potting mixes were devised, (0,19, and 28% compost), each receiving fertilizer or no fertilizer (sub-plots), and Vitazyme (100 ml per pot of a 0.01% solutions) or no Vitazyme (sub-sub-plots). The experiment proceeded over 50 weeks, after which total stem length, branch number, and leaf number of each plant were measured.

Comments: Significant interactions also occurred between Vitazyme and both the compost (P=0.059) and the fertilizer (p=0.0008). In each case, whenever Vitazyme was added there was an excellent increase in growth with increasing levels of added compost or fertilizer.

These azalias display the interaction of Vitazyme with both fertilizer and compost. Note the larger size on the right.

Azalea dry weight, g



*Significantly greater than the control at P=0.05.

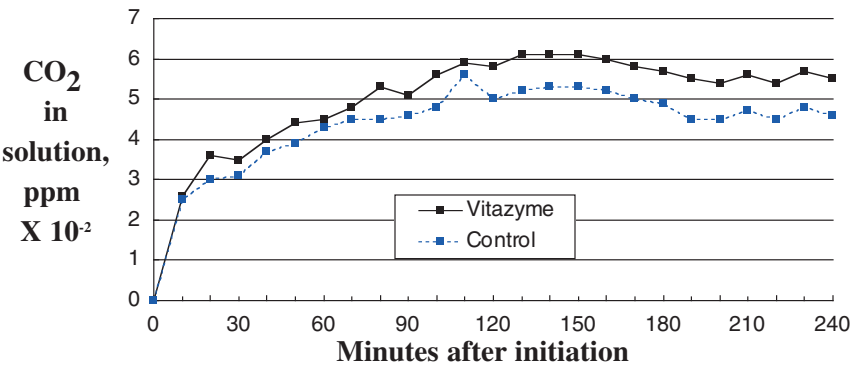
Vitazyme bioassays

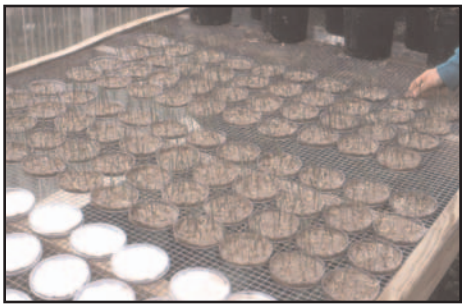
A laboratory bioassay has been developed which utilizes the following ingredients :

50ml distilled water in a 100 ml beaker
2 g sugar (sucrose)
3 g dry yeast (Fleischmann's)
1 ml (2%) ISA solution (a buffer)
1 to 5 drops biostimulant

A control having no biostimulant was always included in the studies. These ingredients were allowed to evolve CO_2, and over a given time interval the CO_2 in solution was measured with a CO_2 electrode attached to an analyzer. The output was mV (millivolts), which was correlated with a series of known CO_2 concentrations, to generate a standard curve. This curve then was used to determine the CO_2 in the sample analyzed.

CO_2 Bioassay with Vitazyme (4/6/98)





Bioassays of any type take time and detailed analysis. The wheat sprouted in petri dishes as shown here is yet one more way to evaluate product efficacy.

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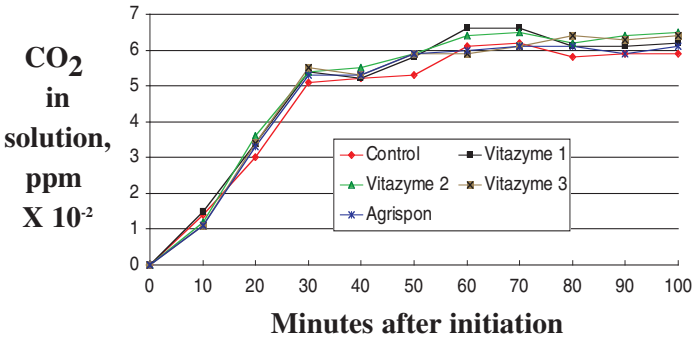
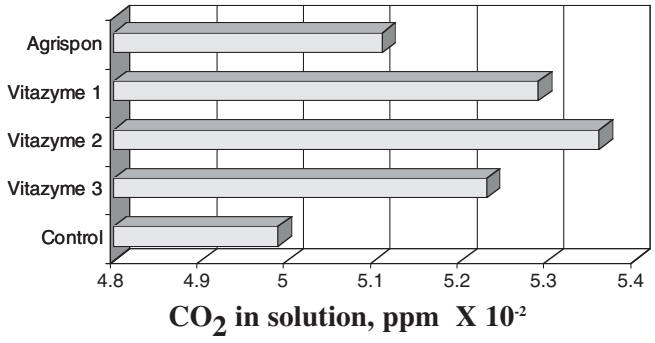
CO_2 Bioassay with Vitazyme (4/23/98)

CO_2 Evolved Over Time

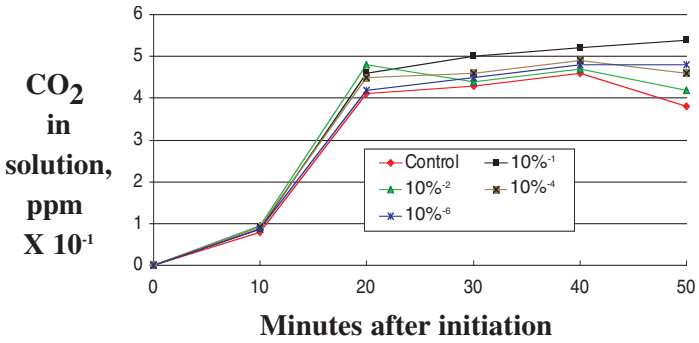


Average CO_2 Level Over 100 Minutes

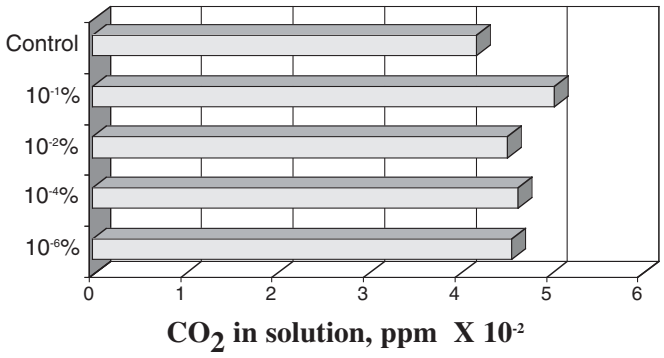


CO_2 Bioassay with Vitazyme (6/12/98)

CO_2 Evolved Over Time

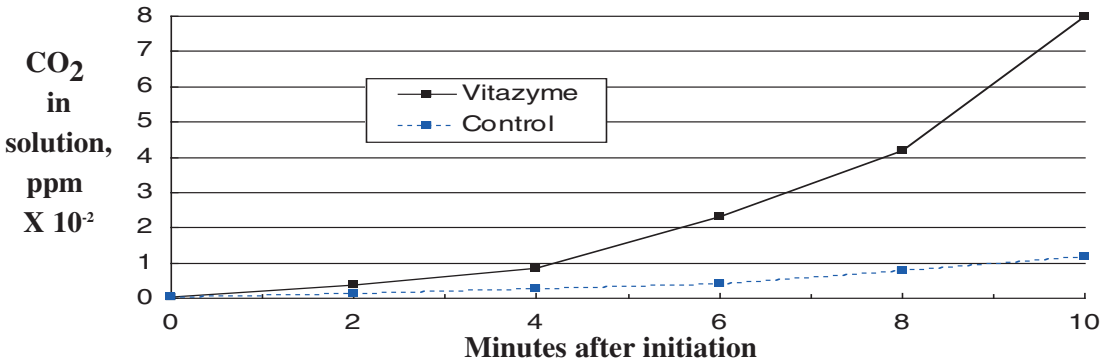


Average CO_2 Level Over 50 Minutes



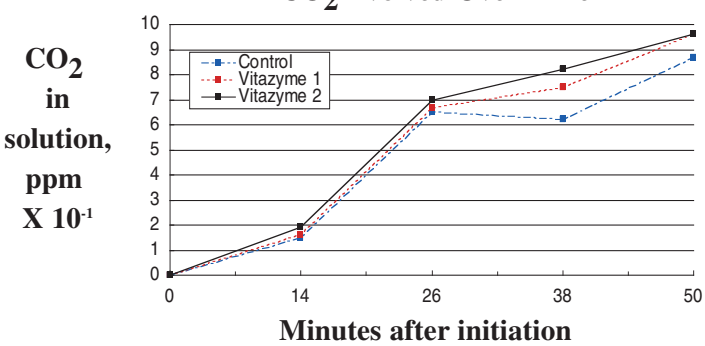
This data proves that the active agents in Vitazyme are very powerful and are effective in very dilute solutions, although the greatest activity is with the 10^{-1}% solution (0.1% of the total solution).

CO_2 Bioassay with Vitazyme (7/18/98)

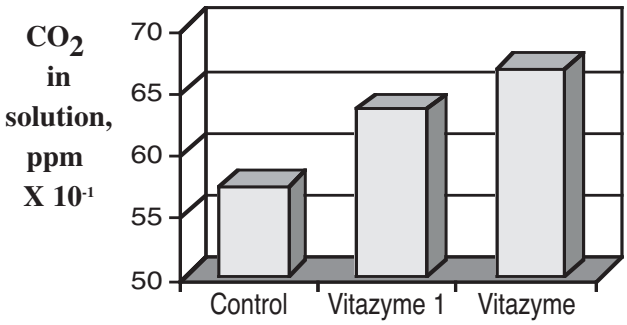


CO_2 Bioassay with Vitazyme (7/16/98)

CO_2 Evolved Over Time



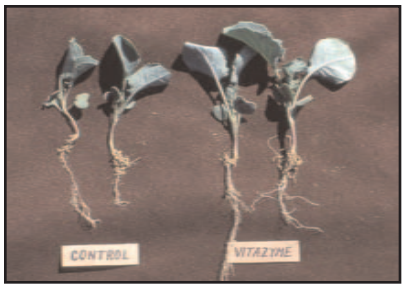
Average CO_2 Level Over 50 Minutes



Broccoli

Location: Presque Isle, Maine
Variety: unknown
Planting date: July 6, 1998 (from seed)
Experimental design: The field was divided into Vitazyme treated and untreated areas of several acres for each area:

1. **Control plus the conventional fertility program**
2. **Vitazyme plus a soil mineral balancing program**

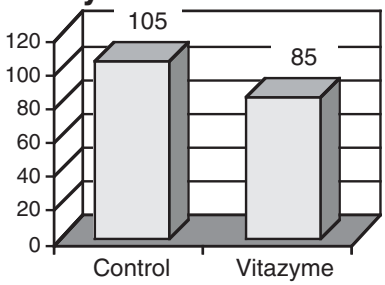


Broccoli seeds treated at planting displayed more rapid early growth, which translated into a considerably earlier harvest.

Fertilizer treatments: Base saturation balancing was utilized on the Vitazyme treatment in this study, with the following components (broadcast preplant): 250 lb/acre $(NH_2)_4SO_4$, 150 lb/acre NH_4NO_3, 200 lb/acre K_2SO_4, 15 lb/acre B (as 14% borate), and 35 lb/acre $ZnSO_4$.
Vitazyme applications:
(1) 13 oz/acre on the soil before emergence
(2) 13 oz/acre ten days before harvest.
Harvest date (of the heads):
(1) Control area: 105 days after planting
(2) Vitazyme area: 84 days after planting
Yield results: Although yield results were recorded for this study, actual data is classified. However, compared to a normal yield of broccoli for this field, the yield of the Vitazyme plus mineral balancing was greater than normally expected.
Comments: Vitazyme was used along with soil mineral balancing, so total credit for the improvement in yield cannot be attributed to Vitazyme alone. However, the 21-day reduction in time to harvest is most likely attributed to Vitazyme, since hastening of crop maturity is one of the noted effects of this biostimulant. Especially noteworthy is a marked increase in yield alongside this reduction in time to maturity.

Note the full, dense head of this broccoli plant treated with Vitazyme in New York.

Days to first harvest

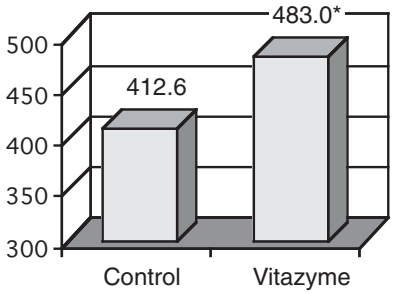


Cabbage

Location: Trinidad (Caribbean Agricultural Research and Development Institute)
Variety: Tropicana
Planting date: June 25, 1998
Planting rate: 40 plants per 20-ft row
In-row spacing: 30 cm
Harvest date: September 17, 1998

It is easy to see the difference in size of cabbage plants on July 20 in this New York production field.

Fresh Weight, kg/plot

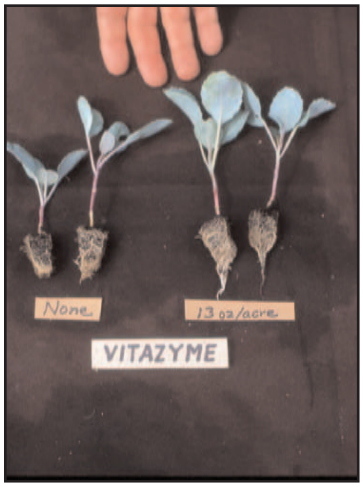


Experimental design: Four replicates of a randomized complete block design were placed on a uniform soil area. Each plot was 20X20 ft (0.0091827 acre), with eight rows per plot and 40 plants per row (320 plants per plot). Treatments were as follows:

1. **Control (no Vitazyme)**
2. **Vitazyme applied twice**

Fertility treatments: Week 2: 1 oz/plant of calcium nitrate; Week 4: 1 oz/plant of 12-12-17% N-P_2O_5-K_2O; Week 6: 1 oz/plant of 13-13-20% N-P_2O_5-K_2O.
Vitazyme applications: Vitazyme was applied as a 5% root dip at planting, and as an overall spray to the leaves and soil at 1 liter/ha (13 oz/acre) at 30 days after planting.
Comments: This trial was severely affected by rainy season flooding, which required premature harvesting. Nevertheless, marketable cabbage yield was obtained, which showed a clear and significant difference in yield. Width and height of the plants were also recorded over the duration of the study, and showed improvements with Vitazyme. For both width and height Vitazyme is shown to hasten the growth and maturity of the crop.

*Significantly greater than the control at P=0.05. $LSD_{0.05}$= 52.3.



Cabbage transplants treated with a dilute Vitazyme solution at planting showed considerably better rooting and early size at the 13 oz/acre rate.

Did you know ...

Vitazyme is being used or tested on a variety of crops in various overseas countries including England, Egypt, Mexico, Guyana, Trinidad, Barbados, and other Caribbean nations. Work with Vitazyme in other countries should increase greatly during the coming years.

Corn (Organic)

Sweet corn treated with Vitazyme on the seeds at planting grew a remarkably greater root system by July 23, when this photo was taken. Notice also the lusher, darker leaves on the right. Sugars are also usually higher.

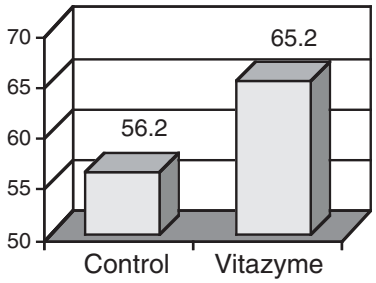
The branch roots of this treated irrigated corn in California are excellent.

<u>Location</u>: Garretson, South Dakota
<u>Variety</u>: DeKalb DK483 (100-day)
<u>Seeding rate</u>: 18,500 seeds/acre (36-inch rows)
<u>Planting date</u>: May 7, 1998
<u>Harvest date</u>: November 30, 1998, to December 4, 1998
<u>Experimental design</u>: A corn field was divided into two portions with the following treatments of about 20 acres each:

1. **Control**
2. **Vitazyme**

<u>Fertilizer treatments</u>: At planting, 3 gallons per acre of liquid fish, an herbal blend, and 2 oz/acre of Nutrapathic Soil Conditioner were applied in an 8-inch band on the soil above the seeds, and below the seed row in a strip. Ten gallons of solution per acre were used in each band.
<u>Vitazyme application</u>: 13 oz/acre was applied at planting, half in the band above the seed row and half in the band below the seeds.

SPAD units



<u>Yield results</u>: No yield results could be weighed on the control and the Vitazyme treated areas due to snow drifts in the field; a severe snow storm had struck before harvesting had commenced, and all of the snow had not yet melted when the harvest was completed.
<u>Comments</u>: The chlorophyll level of 20 randomly selected leaves for each treatment, on August 28, was much greater for the Vitazyme treatment (see the graph on the left). The Vitazyme treatment produced corn with, on the average, two more rows of corn per ear than the control treatment. According to Robin, "The Vitazyme program is a great addition to organic farming. It works excellently along with fish." Vitazyme produced a very heavy 60 lb/bu test weight.

Corn

<u>Location</u>: Seneca, Kansas
<u>Variety</u>: Hoegemeyer 2655 (110-day)
<u>Previous crop</u>: soybeans
<u>Planting date</u>: unknown

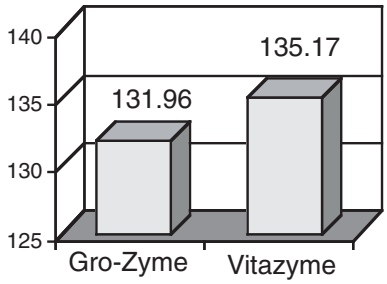
Although biostimulants have been used on the field of this Kansas test for 20 years, the growth stimulating effects of Vitazyme still appeared.

<u>Population</u>: 19,500 plants/acre (30-inch rows)
<u>Soil type</u>: clayey
<u>Herbicide</u>: post-emergent application
<u>Harvest date</u>: October 20, 1998
<u>Experimental design</u>: A corn field was divided into two parts, with the following two treatments:

1. **Control**
2. **Vitazyme**

<u>Fertilizer treatments</u>:
All areas received 30 gal/acre of 28% N preplant, as well as 500 lb/acre of high-calcium lime (96% $CaCO_3$) in the spring. Starter (5-20-5% N-P_2O_5-K_2O) was also applied over all areas directly on the seed at planting at 5 gal/acre. All areas had received Gro-Zyme biostimulant for the previous 20 years.

Grain yield, bu/acre



- ***Yield increase with Vitazyme: 2.4%***
- ***Income increase with Vitazyme: $6.74/acre***

<u>Vitazyme application</u>: 13 oz/acre was applied with the starter fertilizer directly on the seeds at planting. The control area received 13 oz/acre of Gro-Zyme in the starter fertilizer.
<u>Comments</u>: Although the entire field had been treated with Gro-Zyme for many years, Vitazyme increased the grain yield more than did an application of Gro-Zyme.

Among the various responses that are noted among all crops when Vitazyme is used, an **increase in chlorophyll content of the leaves** continues to be one of the most consistently noted responses. Oftentimes a visual difference can be seen right to the treated plot border; at other times only a chlorophyll meter can pick up the difference between treated and untreated areas. More chlorophyll means more photosynthetic activity, and a greater fixation of sunlight energy into plant mass and crop yield.

Corn

Note how greatly only 13 oz/acre of Vitazyme has stimulated corn growth.

The roots of these same corn plants from Missouri displayed a great difference in growth on July 9. A 14%, significant yield benefit was realized.

Location: Malden, Missouri (Aycock Agricultural Services)
Variety: Garst 8300
Previous crop: cotton
Row spacing: 38 inches
Planting rate: 23,600 plants/acre
Planting date: April 4, 1998
Soil type: sandy loam
Irrigation: all plots were furrow irrigated
Experimental design: A randomized complete block design with 10 replicates was established on a uniform soil area with two treatments:

1. **Control (conventional program)**
2. **Vitazyme (on top of the conventional program)**

At harvest, only three of the replicates were measured for yield due to the need to remove the corn as quickly as possible.

Fertility treatments: All areas received 175-40-40 lb/acre of N-P_2O_5-K_2O. Ninety lb/acre of N was applied preplant, and 85 lb/acre sidedressed 40 days after planting.

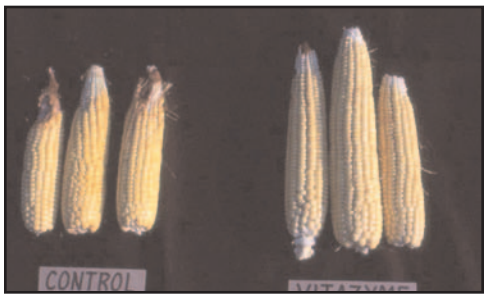
Vitazyme application: 13 oz/acre sprayed on the leaves and soil at the four -leaf stage.

Harvest date: September 5, 1998

Yield results: The grain averaged 16.7% moisture at harvest.

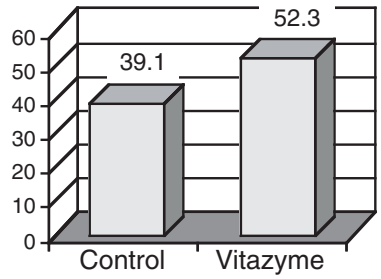
Chlorophyll levels: On July 9, 20 randomly selected leaves from each treatment were measured for chlorophyll using a Minolta SPAD meter.

Comments: The increase in leaf chlorophyll with Vitazyme treatment translated into greater carbon fixation and a significantly greater grain yield. Also noted in this study were much greater root growth, greater stalk height, and greater total leaf area with Vitazyme.



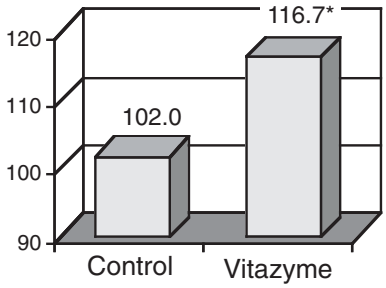
During the very dry summer of 1998, Vitazyme enabled the corn to continue filling properly in spite of heat stress.

Leaf chlorophyll, SPAD



- ***Yield increase with Vitazyme: 14%***
- ***Income increase with Vitazyme: $30.87/acre***

Grain yield, bu/acre



- ***Chlorophyll increase with Vitazyme: 34%***

Cotton - a comparison with Temik for nematode control

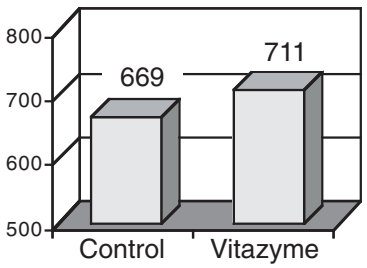
Location: Whitharral, Texas
Soil type: fine sandy loam
Planting date: May 21, 1998
Seeding rate: 16 lb/acre
Variety: Paymaster HS-26 (Roundup Ready)
Row spacing: 40 inches
Harvest date: October 21, 1998
Experimental design: A 136-acre center pivot circle was divided into two equal plots, half treated with Vitazyme and half treated with Temik nematicide.

1. **Temik**
2. **Vitazyme**

Fertility treatments: Two applications of 40 lb/acre nitrogen were made through the center pivot in June.

- ***Yield increase: 6%***
- ***Income increase: $22.68***

Lint yield, bu/acre



The treated cotton in this replicated Missouri cotton trial is more growthy and greener.

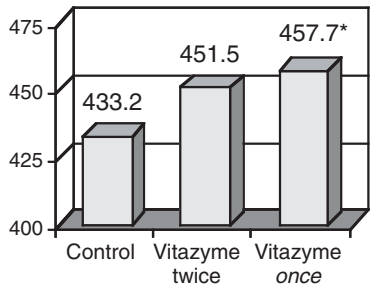
This Georgia cotton test shows the usual effect of Vitazyme to increase bolls.

Vitazyme applications: Vitazyme was sprayed at 13 oz/acre over the soil surface directly behind the planter. A second application of 13 oz/acre was sprayed on the leaves and soil the second week of June.

Comments: Vitazyme performed even better in this test than Temik, a typical but highly toxic nematicide, in controlling nematode damage to cotton. This control was achieved at less cost than with the typical toxic nematicide. An equal yield for the two treatments would have been satisfactory to justify the value of Vitazyme rather than the highly toxic Temik.

Cowpeas

Dry weight/10 plants, g



*Significantly greater than the control at P=0.05. $LSD_{0.05}$ =18.65.

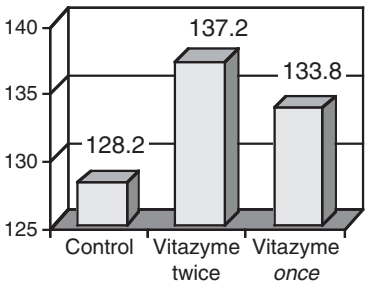
• Dry weight increase: 6%

Location: Ebini region, Guyana (Caribbean Agricultural Research and Development Institute)
Seeding date: unknown *Variety*: Minica 4
Seeding rate: unknown *Row spacing*: unknown
Harvest date: unknown
Fertility treatments: unknown
Experimental design:
A randomized complete block design with four replications was established on a uniform soil area. Each plot was 3.6X10.0 meters (0.0036 ha). Treatments were as follows:

1. Control (no Vitazyme)
2. Vitazyme applied twice
3. Vitazyme applied once

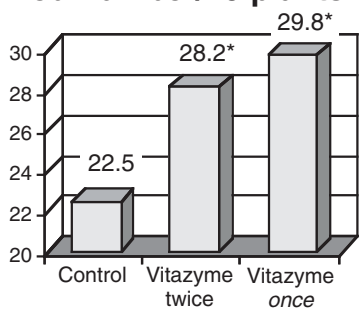
Vitazyme applications: Treatment 2: Vitazyme was applied at 1 liter/ha (13 oz/acre) to the soil after planting, and at the same rate at early bloom. Treatment 3: only the early bloom treatment was applied.

Pod weight/10 plants, g



• Pod weight increase: 7%

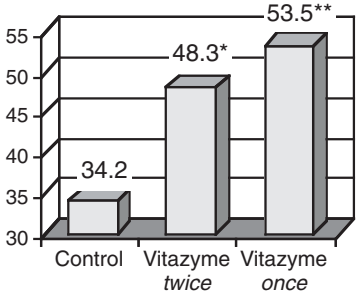
Pod number/10 plants



*Significantly greater than the control at P=0.05. $LSD_{0.05}$ =5.05.

• Pod number increase: 32%

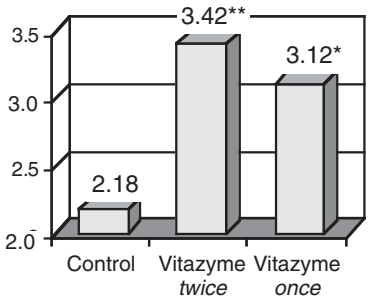
Seed weight/10 plants, g



*Significantly greater than the control at P=0.06; **significantly greater than the control at P=0.03. $LSD_{0.05}$ =15.1.

• Seed weight increase: 56%

Plot yield, kg



*Significantly greater than the control at P=0.07; **significantly greater than the control at P=0.05. $LSD_{0.05}$ =1.23.

• Yield increase: 57%

Comments: Several significant differences in plant growth parameters appeared in this cowpea test. In particular, plot yield was increased with either one or two applications, but the greatest increase (56%) was with one application. Results of this study suggest that, under the conditions of this tropical climate and these soils, one application of Vitazyme at early bloom may be sufficient.

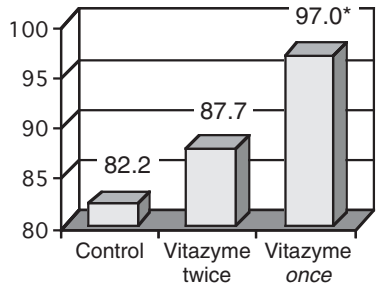
Cowpeas

Location: Ebini region, Guyana (Caribbean Agricultural Research and Development Institute)
Seeding date: unknown *Variety*: California No. 5 *Seeding rate*: unknown *Row spacing*: unknown
Experimental design: A randomized complete block design with four replications was established on a uniform soil area. Each plot was 2.7X10.0 meters (0.0027 ha). Treatments were as follows:

1. Control (no Vitazyme) **2. Vitazyme applied twice** **3. Vitazyme applied once**

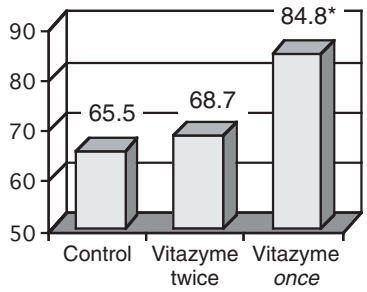
Fertility treatments: unknown
Vitazyme applications: For Treatment 2, Vitazyme was applied at 1 liter/ha (13 oz/acre) to the soil after planting but before emergence, and at the same rate at early bloom. For Treatment 3, only the early bloom treatment was applied.

Pod number per plant



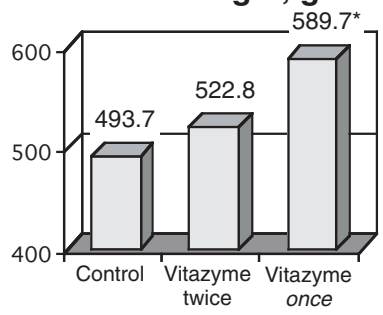
*Significantly greater than the control at P=0.10. $LSD_{0.10}$ =13.02

Seed weight, g



*Significantly greater than the control at P=0.03. $LSD_{0..05}$ =25.51.

Fresh weight, g



*Significantly greater than the control at P=0.10. $LSD_{0.10}$ =98.11.

• Pod number increase:18% • Seed weight increase:29% • Fresh weight increase:19%

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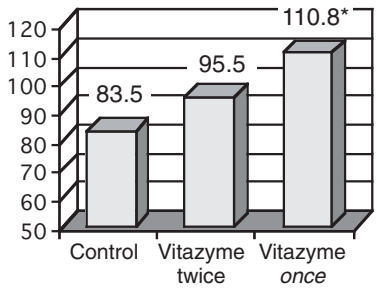
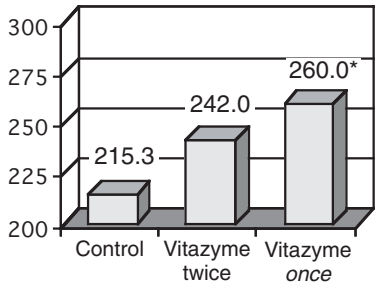
Weight per pod, g



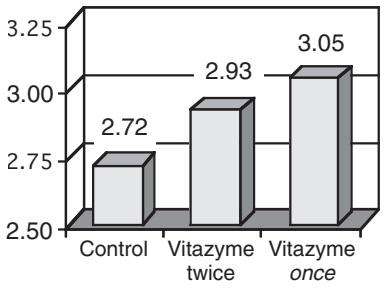
*Significantly greater than the control at P=0.03. $LSD_{0..05}$ =25.51.

Dry weight/5 plants, g



*Significantly greater than the control at P=0.15. $LSD_{0.10}$ =58.45.

Plot yield, kg



- ***Pod weight increase: 33%***
- ***Dry weight increase: 21%***
- ***Yield increase: 12%***

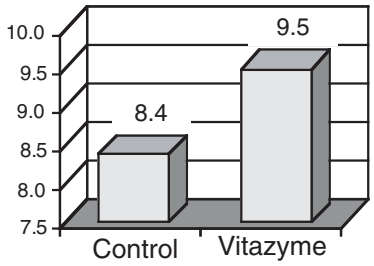
Harvest date: unknown

Comments: In this Caribbean study with cowpeas, Vitazyme significantly improved nearly all plant parameters examined, including plant fresh and dry weights, pod weight and number, and seed weight. Plot yield was not significantly increased, but the yield for one application at bloom was 12% higher than the control. It is apparent that, under the conditions of this study, only one application of Vitazyme, at 1 liter/ha (13 oz/acre) at bloom, was sufficient to elicit the significant effects noted.

Burfordi Holly

Researcher: Paul W. Syltie, Vital Earth Resources Research Center
Location: Gladewater, Texas
Variety: dwarf burfordi [*Ilex cornuta burfordii nana*]
Planting date: October 23, 1996
Experimental conduct and design: A 12 treatment experiment using four replicates, with variables of municipal solid waste compost, fertilizer, and Vitazyme, was completed in one-gallon pots. Three major potting mixes were devised, each receiving fertilizer or no fertilizer (sub-plots), and Vitazyme or no Vitazyme (sub-sub-plots). The experiment proceeded over 50 weeks, after which total stem length, branch number, and leaf number of each plant were measured.
Comments: Besides improving stem length and branch number, Vitazyme displayed a highly significant interaction with both the compost and the fertilizer; the combination of the three triggered greater growth of stems, branches, and leaves than any of the three alone. Vitazyme and fertilizer without compost also interacted in improving stem length and leaf number significantly. Thus, the nutrient enhancing effect of Vitazyme is confirmed by this study.

Branch number



*Significantly greater than the control at P=0.07; $LSD_{0.05}$ =1.3.

- ***Stem length increase: 15%***
- ***Branch number increase: 13%***

Kidney beans (Organic)

Vitazyme stimulates the proliferation of Rhizobium nodules in legumes, such as on these kidney beans in New York. More nitrogen fixation occurs, and consequently higher yields are obtained.

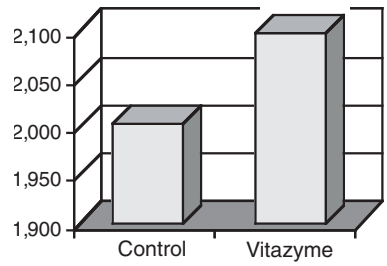
Researcher: Klaas Martens
Planting date: June 23, 1998
Planting rate: 80 lb/acre
Row spacing: 30 inches
Soil type: sandy loam
Previous crop: soybeans
Experimental design: A field of about 10 acres was divided into four portions, one of which was the untreated control and another the Vitazyme treatment. The two treatments were ...

1. Control (no Vitazyme)
2. Vitazyme at early bloom

Fertility treatments: In 1997, 0.5 ton/acre of chicken manure plus 8 tons/acre of composted leaves were applied to all areas of the field. Then 200 lb/acre of a 2-4-2% N-P_2O_5-K_2O organic starter (with gypsum) was applied at planting.
Vitazyme application: Vitazyme was applied to the soil and foliage at 13 oz/acre (in 10 gal/acre of water) on July 17 (early bloom).

Location: Penn Yan, New York
Variety: Drake (dark red)

Yield, lb/acre



- ***Yield increase: 5%***
- ***Income increase: $55.12***

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Harvest date: September 25. Six rows of 1,535 ft in length (0.52858 acre) were harvested and weighed from either side of a six-row buffer strip along the boundary between the two treatments.

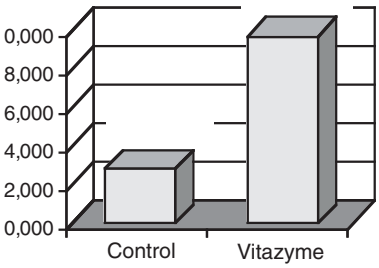
Red kidney beans in New York on July 14 show a pronounced response to seed-applied Vitazyme.

Peanuts shed soil better with Vitazyme

A farmer near Honey Grove, Texas, tried Vitazyme on a portion of his peanut crop in 1998. A serious problem of soil clinging to the peanut shells was reduced significantly as a result. More work using Vitazyme to help solve this problem is planned for 1999.

Onions

Onion yield, lb/acre

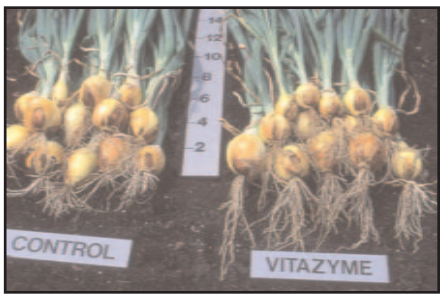


• *Yield increase: 16%*

Location: Brighton Plantation, St. George, Barbados
Variety: Arad (Hazera)
Planting date: January 22, 1998
Harvest date: May 29, 1998
Experimental design: A randomized complete block design with four replicates was set up on a uniform area. Each individual plot was 5.5 ft long by 5.0 ft wide (four double rows). There were 12 such plots. The treatments were as follows:

1. **Control**
2. **Vitazyme**

Fertilizer treatments: Three bags (150 kg) per acre of a 12-12-17-2% N-P_2O_5-K_2O were applied at planting. Drip irrigation was supplemented with NH_4NO_3, KNO_3, H_3PO_4, and micronutrients.

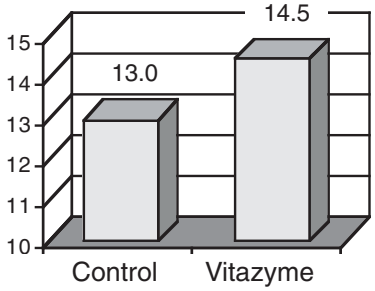


These onions grown in New York are larger than the control in this July 21 photo. The tops were also larger and chlorophyll content was higher, thus increasing growth.

Vitazyme treatments: Vitazyme at 13 oz/acre at the third leaf stage, and 7 oz/acre at bulb initiation, sprayed over the plants and soil.
Irrigation: two drip lines situated on each bed.
Pest control: insects: Tambo, Orthene, Padan, Sherpa, and Diazinon; fungi: Benlate, Phyton, Zinc, and Bravo; weeds: manual control.
Comments: In this tropical environment, Vitazyme substantially improved onion yield over the control. Onion size was also slightly improved, with more of the treated bulbs over 6 cm versus the control.

Pansies

Blossoms and buds/plant



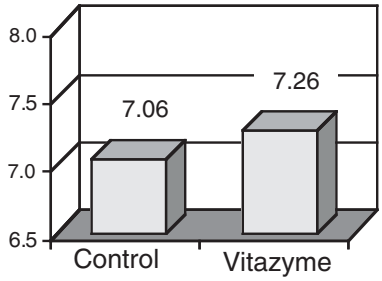
*Significantly greater than the control at P=0.05; $LSD_{0.05}$ = 1.5.

• *Blossom and bud increase: 16%*

Location: Gladewater, Texas (Vital Earth Resources Research Center)
Variety: pansy [*Viola wittrackiana L.*]
Planting date: October 23, 1996
Experimental conduct and design: A 12 treatment experiment using four replicates, with variables of municipal solid waste compost, fertilizer, and Vitazyme, was completed in one-gallon pots. Three major potting mixes were devised, each receiving fertilizer or no fertilizer (sub-plots), and Vitazyme or no Vitazyme (sub-sub-plots). The experiment proceeded over 50 weeks, after which total stem length, branch number, and leaf number were measured.
Results: Vitazyme interacted with compost to P = 0.01 to produce wider flowers as the compost application level increased. Vitazyme also interacted with fertilizer to produce more shoots (P=0.18), and with compost to cause greater height of the azaleas (P=0.04).
Summary: Vitazyme in this study proved to increase flower number and size, and also to interact with fertilizer and compost to increase overall plant growth. These are effects commonly observed with the material for other crops treated, and are very important for flower growers.

Vitazyme induced a greater number and size of flowers in this study.

Flower width, cm



*Significantly greater than the control at P=0.17; $LSD_{0.17}$ = 0.20.

• *Flower width increase: 16%*

Peanuts

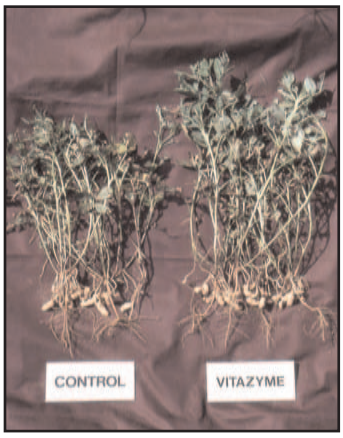
Greater numbers and sizes of peanuts resulted from this Caribbean study. Notice also the quality of the shelled nuts.

Location: St. Kitts, West Indies
Variety: Tennessee red
Seeding rate: unknown
Seeding date: about December 24, 1996
Harvest date: March 4, 1997
Experimental design: Two treatments were evaluated:

1. **Control (no Vitazyme)**
2. **Vitazyme five weeks after planting**

Fertility treatments: none
Vitazyme application: Vitazyme was sprayed at 12 oz/acre over the foliage and soil at five weeks after planting.
Yield results: A sample of four side-by-side 350-foot rows was hand-harvested for both treatments (0.0402 acre), and the peanut weights were determined as wet. The average height of the harvested peanuts was also determined for each treatment using a large sample.

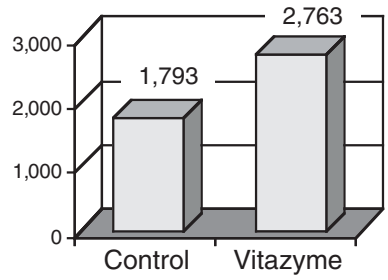
	Control	Vitazyme	Increase
Peanut height, in	10.3	15.7	5.4 (52%)



Taller plants having more leaves and a higher chlorophyll content led to a dramatic improvement in peanut yield (52%). Income was greatly increased.

Comments: The improvement in peanut growth and yield is obvious from this data, and consistent with the fact that Vitazyme works very well in tropical regions to trigger the growth and development of plants.

Yield, lb/acre



- ***Yield increase: 54%***
- ***Plant height increase: 52%***
- ***Income increase: 54%***

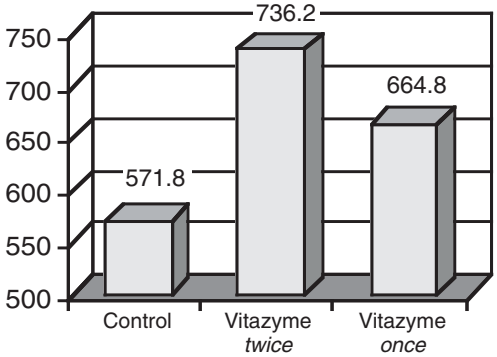
Peanuts

Location: Ebini region, Guyana (Caribbean Agricultural Research and Development Institute)
Variety: AK62
Seeding date: unknown
Seeding rate: unknown
Row spacing: unknown
Experimental design: A randomized complete block design with four replications was established on a uniform soil area. Each plot was 2.7X10.0 meters (0.0027 ha). Treatments were as follows:

1. **Control (no Vitazyme)**
2. **Vitazyme applied twice**
3. **Vitazyme applied once**

Fertility treatments: unknown
Vitazyme applications: For Treatment 2, Vitazyme was applied at 1 liter/ha (13 oz/acre) to the soil after planting but before emergence, and at the same rate at pegging. For Treatment 3, only the pegging treatment was applied.
Harvest date: unknown
Comments: Vitazyme applied to peanuts at the initiation of pegging greatly and significantly stimulated peanut growth and yield (by 21%). Peg fresh and dry weights were improved by two applications of Vitazyme, but the yield effect showed through primarily with a single 1 liter/ha (13 oz/acre) application at pegging. Plant height was negatively correlated with yield. It appears that one application of Vitazyme at pegging may be sufficient in this tropical environment to elicit the maximum yield potential of peanuts.

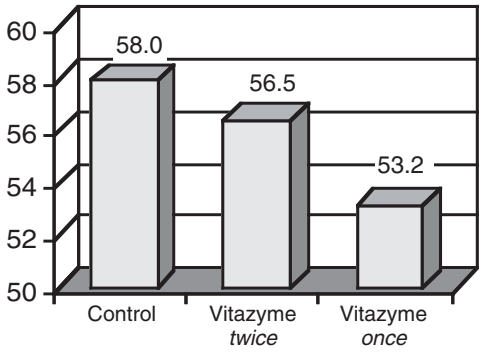
Peg fresh weight, g



*Significantly greater than the control at P=0.06.
$LSD_{0.05}$ =177.6.

- ***Peg fresh weight increase: 29%***

Plant height, cm



- ***Plant height decrease: 8%***

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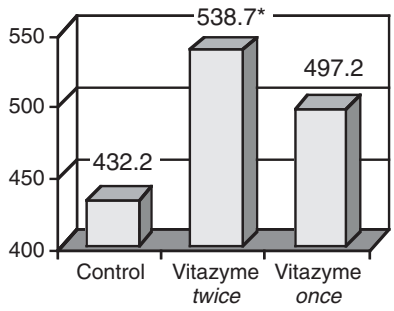
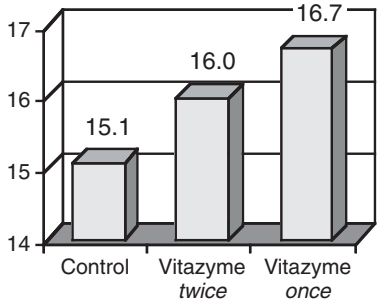
Peg dry weight, g



*Significantly greater than the control at P=0.07. $LSD_{0.05}$=113.6.

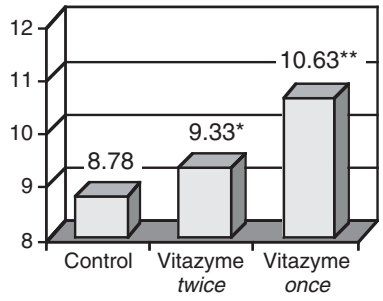
- ***Peg dry weight increase: 25%***

Peg number



- ***Peg number increase: 11%***

Plot yield, kg



*Significantly greater than the control at P=0.14; **significantly greater than the control at P=0.01. $LSD_{0.10}$ =0.74; $LSD_{0.01}$=1.29.

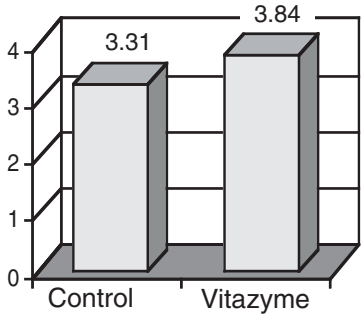
- ***Yield increase: 21%***

Plums

Location: Sacramento, California
Variety: prune plums
Soil type: clayey
Harvest date: November, 1998
Experimental design: Measurements were taken of the diameter of Vitazyme treated and untreated prune plum trees at 12 inches above ground level. Both one-year and two-year plum trees were measured. The treatments were as follows:

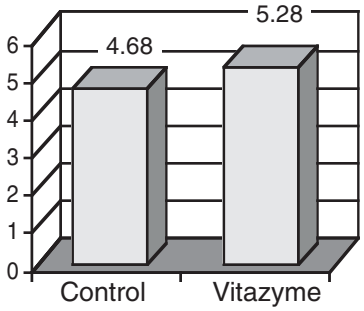
1. **Control**
2. **Vitazyme**

One-year tree diameter, in



- ***Trunk diameter: increase 16%***

Two-year tree diameter, in



- ***Trunk diameter: increase 13%***

Beautiful Vitazyme treated plums tended to ripen sooner, and were sweeter.

Fertilizer treatments: All areas received the following treatments:

February
10 gal/acre of liquid chicken compost
1 pint/acre of Vibasic BL Biological (microbes and microbial food)

May
5 gal/acre of urea ammonium nitrate (32% N)
8 oz/acre of Vibasic BL Biological

Vitazyme application: 13 oz/acre of Vitazyme applied over the root zone in June.
Comments: Vitazyme has been shown to significantly increase the growth rate of plum trees over a single growing season for both one and two-year old trees.

Excellent tree growth and plum production have resulted from Vitazyme application in this California orchard.

Potatoes

Location: Caribou, Maine (Willie Farm) *Variety*: Atlantic
Experimental design: A large field was divided into two unequal parts, the largest part treated with Vitazyme and the smallest part left untreated.
Fertilizer treatments: A percent base saturation approach was used for both areas, by adding 500 lb/acre gypsum, 250 lb/acre K_2SO_4, 200 lb/acre $(NH_4)_2SO_4$, 150 lb/acre NH_4NO_3, 25 lb/acre S, 15 lb/acre B, and 25 lb/acre Zn.
Vitazyme application: Vitazyme at 13 oz/acre was applied to the treated area early in the growing season.

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At Caribou, Maine, on July 26, potatoes plants treated with Vitazyme were larger and higher in chlorophyll, which led to considerably improved tuber production.

This sample of typical plants reveals the 30% yield improvement that Vitazyme helped generate. Tuber number and uniformity were both improved.

Comments: It was not possible to separate the yields for the two areas; most of the area was Vitazyme treated. The following facts were noted.

- The field yield was doubled in 1998 compared to 1997. Considering the years were similar, and Vitazyme was applied to most of the field, the fertility treatments plus Vitazyme greatly enhanced tuber yield.
- According to the farmer, "We got at least a 30% yield increase for the Vitazyme area."
- Also he stated, "The summer plant sampling showed a much better root system for Vitazyme."

Potatoes

Location: Mars Hill, Maine *Varieties*: Russet Burbank and Snowden

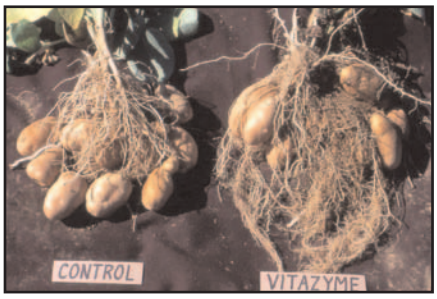
Experimental design: For both varieties a field was split into a treated and an untreated area. The Snowden variety had two different treatments.

Fertilizer treatments: All areas received nitrogen, at 196 lb/acre for the Russets and 180 lb/acre for the Snowdens.

Vitazyme application: Russet Burbank: (1) 13 oz/acre at the 6 to 8-inch stage, and (2) again at early bloom. Snowden: Area 1: 13 oz/acre at the 6 to 8-inch stage; Area 2: (1) 13 oz/acre at the 6 to 8-inch stage, and (2) again at early bloom.

Chlorophyll: On July 27, 1998, chlorophyll evaluations were made with a Minolta SPAD meter on 20 representative plants of each treatment. Results were as follows:

	Control	Vitazyme
Snowden	42.1	40.6
Russet Burbank	43.4	42.3



The root mass of the Vitazyme treated potatoes at Mars Hill, Maine, was increased remarkably above the control.

At Mars Hill, Maine, the growth of the potato plants was improved noticeably with Vitazyme, as was the size and number of tubers. Note the difference in root mass.

Comments: It was impossible to separate the yields for the different treatments. All yields gave above average yields this year. According to one worker, "The summer trials [of Vitazyme] showed much larger root systems and better tuber size."

Rice

Location: Parma, Missouri *Variety*: Cypress

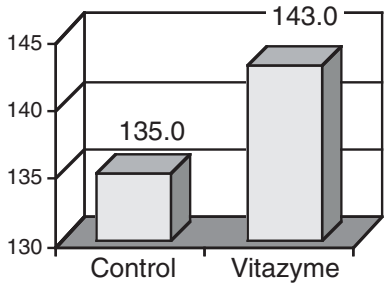
Row spacing: 7 inches (drilled) *Planting rate*: 110 lb/acre

Harvest date: September 21, 1998 *Previous crop*: rice

Planting date: April 30, 1998

Experimental design: Two side-by-side paddies of equal cropping history and soil type were selected. The treatments were as follows:

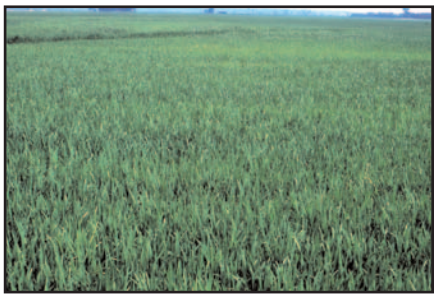
1. **Control**
2. **Vitazyme**



At harvest, four rounds were harvested from each field and the grain was weighed separately for each round, to provide four replicates for each treatment.

- ***Grain increase: 6%***
- ***Income increase: $24.00/acre***

Fertility treatments: Total nitrogen applications were 180 lb/acre of actual N. No phosphorus or potassium were applied.



A Vitazyme treated field in northeastern Arkansas shows a beautiful, uniform growth that is typical of all crops treated with this potent natural biostimulant. Application was made on the soil at planting.

Vitazyme applications: (1) 13 oz/acre on the seed at planting; (2) 13 oz/acre at the fifth leaf stage along with the herbicide application.

Ryegrass

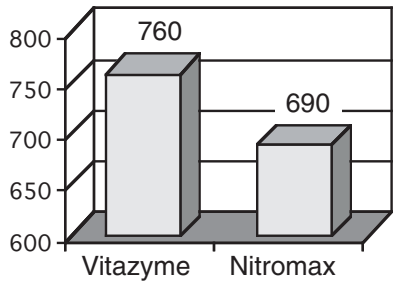
Location: Clyde, New York *Variety*: bin run, variety unknown
Soil type: Alton gravel (gravely with little silt and clay)
Planting date: fall of 1997, broadcast into standing sorghum/sudangrass ("sudax")
Experimental design: A field of 3.4 acres was divided into two equal parts, 1.7 acres receiving Vitazyme and the other 1.7 acres receiving another biostimulant called Nitromax.

1. **Vitazyme**
2. **Nitromax**

Fertility treatments: about 15 tons/acre of manure in 1997

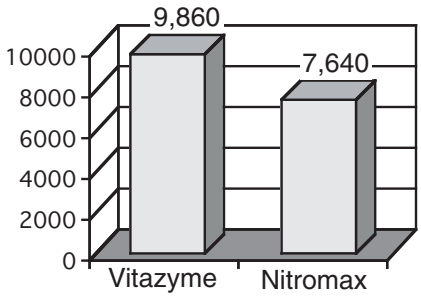
Not only did Vitazyme trigger a bountiful forage and grain yield, but benefited interseeded alfalfa.

Grain yield, lb/acre



• ***Grain increase: 10%***

Silage yield, lb/acre



• ***Silage increase: 29%***

Vitazyme and Nitromax applications: 13 oz/acre sprayed on the plants and soil at spring greenup
Harvest date: mid-May for forage, when the crop was just coming out of the boot stage; August for grain
Harvest method: the cut ryegrass was baled at 60% moisture, and wrapped in plastic; the grain was combined
Yield results: Bales from both treatments were weighed.

Conclusions: Vitazyme, compared to Nitromax, provided a superior yield increase for both forage (29%) and grain (10%) with ryegrass.

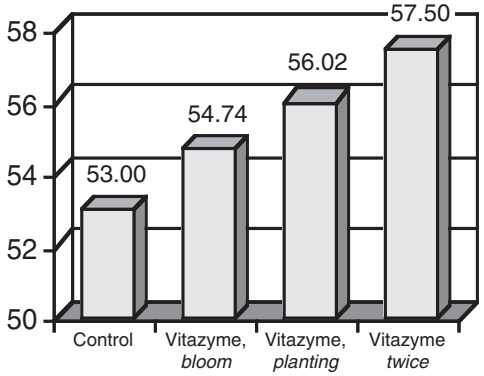
Soybeans

Location: Berkey Research Farm, Ames, Iowa (Iowa State University)
Variety: Prairie Brand B246 *Seeding date*: May 13, 1998
Seeding rate: 140,000 plants/acre *Harvest date*: September 29
Row spacing and depth: 30 inches, 1.5 inches deep
Experimental design: A randomized complete block design with six replications was set up on a Clarion
loam, with plots 10 feet wide and 40 feet long (0.009183 acre; four rows per plot). Four treatments were used:

1. **Control (no Vitazyme)**
2. **Vitazyme at early bloom**
3. **Vitazyme on the seed at planting**
4. **Vitazyme on the seed at planting, and at early bloom**

Fertility and tillage treatments: Phosphorus and potassium levels were maintained above medium soil test levels.
Vitazyme applications: Vitazyme was applied to the seed row at planting at 15 oz/acre, and on the leaves and soil at early bloom at 15 oz/acre, to appropriate plots.

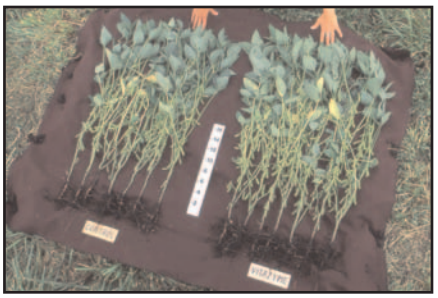
Yield, bu/acre



• ***Overall yield increase: 8.5%***

• ***Income increase, Vitazyme twice: $27.00/acre***

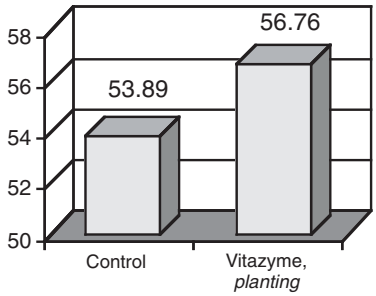
Plots in this Iowa State replicated study , on close inspection, produced visible growth differences.



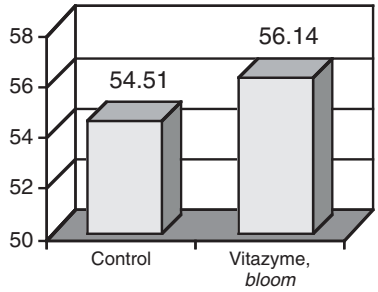
Samples reveal taller, leafier plants having bigger root systems and a noticeably greater load of pods.

Notice also the greater number of Rhizobium nodules for the Vitazyme treated plants.

Seed yield, bu/acre



Foliar yield bu/acre



- ***Seed yield increase: 5.3%***
- ***Foliar yield increase: 3.0%***

Conclusions: Vitazyme significantly increased soybean yields in central Iowa when applied on the foliage at early bloom, on the seeds at planting, and on both the seeds and foliage. The greatest increase was with both the seed and foliar applications. This dual application translated to a 4.5 bu/acre increase, or an increase in income of $27.00/acre. Vitazyme is therefore viewed as a highly profitable amendment for soybeans in central Iowa, as has been demonstrated in several other tests in the state as well.

Soybeans

Location: Malden, Missouri (Aycok, Agriculture Services)
Variety: Asgrow 5601 Roundup Ready
Planting rate: 40 lbs/acre *Planting date*: June 27, 1998
Row spacing: 38 inches *Harvest date*: October 30
Experimental design: A randomized complete block design with 10 replications was placed on a uniform field having two treatments:

1. Control 2. Vitazyme

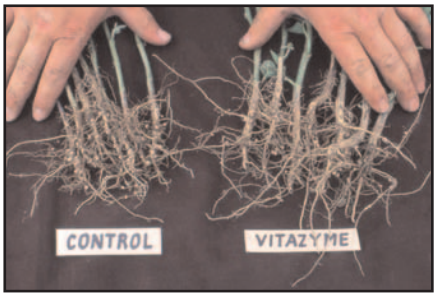
At harvest only four replications were saved to speed harvesting of the crop.
Fertilizer treatments: All areas received 50 lb/acre K_2O.
Vitazyme applications: (1) 13 oz/acre in a 19-inch band over the seed row at planting with pre-emergent chemicals; (2) 13 oz/acre over the leaves and soil at early bloom.
Yield results: The average bean moisture was 14.2% at harvest. No effort was made to determine the moisture of the individual treatments.

These soybeans display the typical Vitazyme response when seed-applied: faster early growth, larger plants, and more chlorophyll.

	Control	Vitazyme
Soybean yield, bu/acre	34.8	36.3

- ***Yield increase: 4%***
- ***Chlorophyll increase: 9%***
- ***Income increase: $9.30/acre***

Leaves of treated soybean plants are usually more numerous and larger, as in this Missouri test.



A greatly expanded root system and thicker, stronger stems resulted from Vitazyme application in this test. Such an improvement nearly always boosts yields.

Chlorophyll levels: On July 9, 20 randomly selected leaves from each treatment were measured for chlorophyll using a Minolta SPAD meter.
Comments: A clear advantage in leaf chlorophyll was noted for Vitazyme early during the growth cycle. Also noted were larger plants shortly after emergence, with larger root systems. This advantage in carbon fixation translated into a small yield increase in this study.

Soybeans: a comparison with RenewPlus

Treatment	Dry weight*
Control	21.52 c
RenewPlus	23.35 b
Vitazyme	25.88 a
$LSD_{0.05}$	1.70

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

Location: Gladewater, Texas (Vital Earth Resources Research Center)
Variety: Pioneer 9592
Seeding rate: 10 seeds/pot, thinned to 3 plants/pot
Soil type: sandy loam (from Arkansas)
Planting date: February 12, 1997 *Harvest date*: April 8
Pot type: one gallon
Vitazyme and RenewPlus treatments: 0.1% solution, 100 ml applied to each pot after planting and thorough watering
Data collected: The roots were washed free of soil, and the plants were dried at about 115 degrees F in a drying oven, after which weights were taken.

Note the superb root growth with Vitazyme.

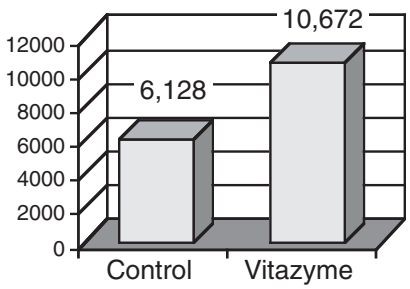
Rice is the most commonly grown cereal crop worldwide, feeding more people than wheat or corn. The potential for Vitazyme to improve the yields and quality of this grain is indicated by a study in southeastern Missouri, where Vitazyme increased the yield of paddy rice (cv. Cypress) by 8.0 bu/acre. This 8% yield increase, multiplied by the millions of acres of rice grown worldwide, illustrates why this program would be a most prosperous adjunct for countless rice farmers around the world.

Squash

Though planted later, the Vitazyme treated squash caught up quickly and greatly surpassed the untreated control in terms of overall growth and total yield. (July 26)

Location: Easton, Maine
Variety: Buttercup (Burgess)
Planting date: Vitazyme area, June 13; control, May 31
Experimental design: A one-acre field was divided into equal portions of 0.5 acres each, with 12 rows total. Half (6 rows) was treated with Vitazyme, and half (6 rows) was not.
Vitazyme application: Vitazyme was sprayed on the leaves and soil early in the growing cycle.
Fertilizer treatments: All areas received 250 lb/acre $(NH_4)_2SO_4$, 250 lb/acre K_2SO_4, 175 lb/acre NH_4NO_3, 30 lb/acre $ZnSO_4$, and 15 lb/acre borate.

Yield, lb/acre



- ***Yield increase: 74%***

Yield results: About 15% of the control area was washed out by erosion due to heavy spring rains. The final yield is adjusted for this loss by increasing the control yield by 15%. The squash were placed in 4x4-ft wooden potato crates at harvest.
Comments: Vitazyme dramatically improved squash yield in this test, showing that cucurbits can be greatly enhanced with Vitazyme's active agents. Only one application was necessary to produce this response. This response was achieved in spite of the fact that the Vitazyme treated squash were planted two weeks later than the control squash.

Tomatoes

Location: Crows Landing, California
Planting date: unknown
Planting date: unknown
Variety: Roma (canning type)
Bed spacing: 60 inches (double row)
Experimental design: An 80-acre tomato field was treated in two 10-acre blocks (20 acres total) with Vitazyme, on top of the commercial program being utilized.

1. Control **2. Vitazyme**

Fertility treatments: conventional for the area
Vitazyme applications: (1) 13 oz/acre mixed with sidedress fertilizer at about 6 to 8 in height (about early bloom); (2) 13 oz/acre sprayed with a fungicide at fruit filling.

- ***Yield Increase: 2,100 lb/acre***
- ***Income Increase: $58.30/acre***

Yield results: On August 7, three equivalent random plants were harvested from each side of a treatment division. Chlorophyll determinations were also made on 20 randomly selected leaves for each treatment, using a Minolta SPAD meter.

	Control	Vitazyme	Increase
Sample weight, lb	28.5	34.0	5.5 (+19%)

	Control	Vitazyme	Increase
SPAD units	50.6	55.6	5.0 (+10%)

This flourishing Vitazyme treated tomato field in New York displays a typical vigorous response.

Tomatoes grown with Vitazyme in the California test described here were larger than for the control.

It was not possible to determine exact harvest weights due to custom harvesting. However, an accurate estimate of the increase was made by measuring the length of row to obtain a full load for each treatment.
Comments: In spite of a lack of total yield records, the accurate estimated increase in yield and income proved that Vitazyme is a highly viable product for tomato production in California's central valley.
Conclusions: Vitazyme produced a small (5%) but highly profitable yield increase in this study.