Vital Earth Resources
706 East Broadway, Gladewater, Texas 75647
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2012 Crop Results

Vitazyme on Bananas

A Nursery Study

Researchers: Rodolfo Valenzuela and Cristhian Mazariegos, Foragro Development, Guatemala City, Guatemala, and Sergio Cordero, Supervisor, Producciones Agricolas del Sur, Guatemala
Location: La Blanca, Ocos Municipality, San Marcos Department, Guatemala *Variety*: Cavendish
Experimental design: In a banana nursery greenhouse, rows of young plants 74 meters long x 1 meter wide, with plants in 1 kg bags, were selected to evaluate the effect of Vitazyme plus Silfact surfactant on banana plant growth. Several beds were used for each treatment.

1. Control 2. Vitazyme + Silfact on 4-week plants 3. Vitazyme + Silfact on 5-week plants

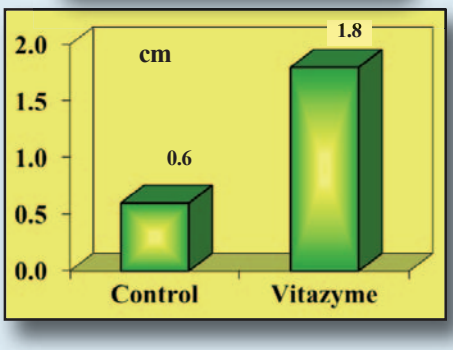
Vitazyme application: **Treatment 2** (4-week plants): (1) 50 ml of Vitazyme in 16 liters of water (0.31%) sprayed with a backpack sprayer on February 20, 2012; (2) 80 ml of Vitazyme in 16 liters of water (0.5%) sprayed with a backpack sprayer about three weeks later on March 13, 2012. **Treatment 3** (5-week plants): (1) 75 ml of Vitazyme in 16 liters of water (0.47%) sprayed with a backpack sprayer on February 20, 2012; (2) 80 ml of Vitazyme in 16 liters of water (0.5%) sprayed with a backpack sprayer about three weeks later on March 13, 2012.

Silfact application: This surfactant of Foragro was applied with all Vitazyme applications at 5 ml/16 liters of water (0.031%).

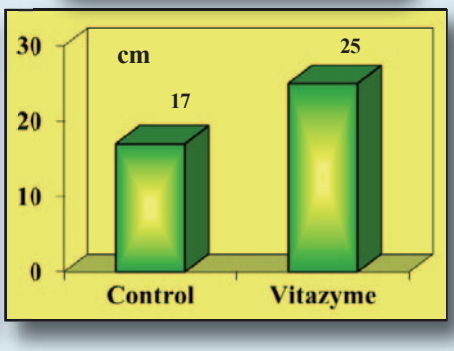
Growth results: Values for all parameters were collected on April 11, 2012, 51 days after the first treatment was made.

Trial With 4-Week Plants (Treatment 2)

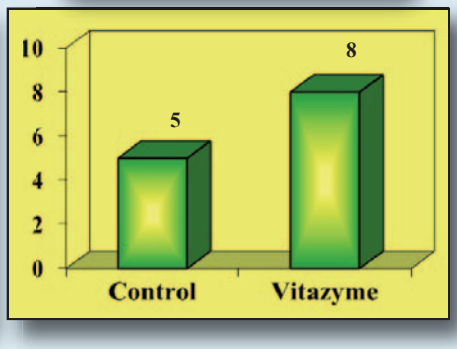
Trunk Diameter



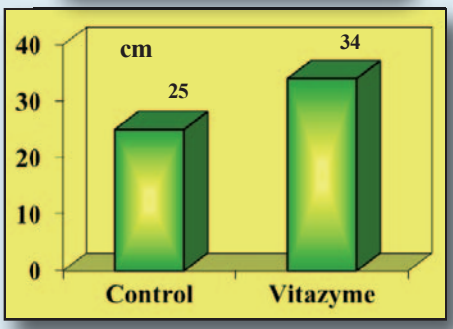
Plant Height



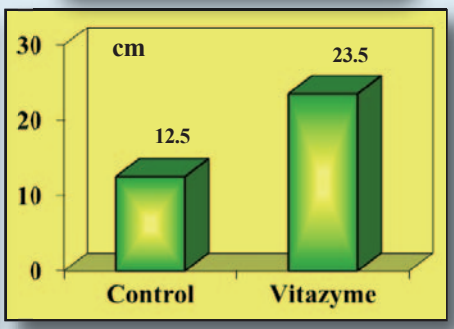
Leaf Number



Leaf Length

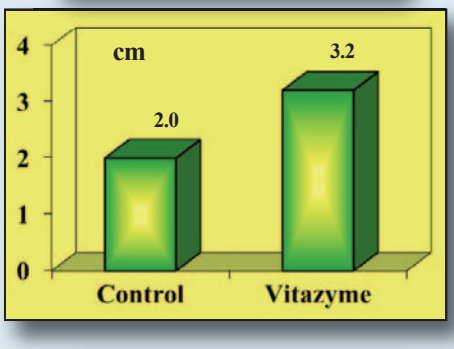


Leaf Width

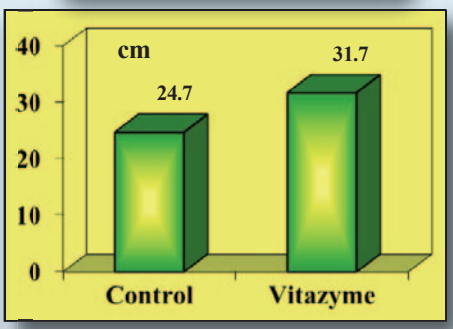


Trial With 5-Week Plants (Treatment 3)

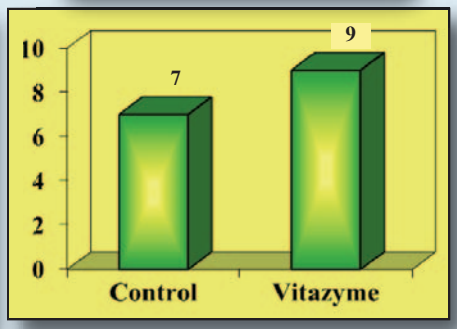
Trunk Diameter



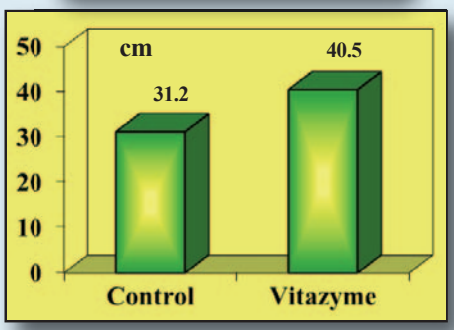
Plant Height



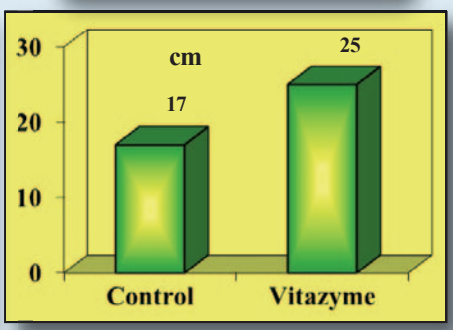
Leaf Number



Leaf Length



Leaf Width



Increases with Vitazyme		
	4-week plants	5-week plants
Trunk diameter	1.2 cm (+200%)	1.2 cm (+60%)
Plant height	8 cm (+47%)	5 cm (+20%)
Leaf number	3 (+60%)	2 (+29%)
Leaf length	9 cm (+36%)	9.3 cm (+30%)
Leaf width	11 cm (+88%)	8 cm (+47%)

Note that every parameter was increased with Vitazyme applications, especially trunk diameter (200% and 60% for Treatments 2 and 3, respectively). Plant height, leaf number, and leaf length and width were also markedly improved, by 20% to 88%.

Conclusions: The researchers stated the following:

"1. Plants treated with Vitazyme in both treatments showed a better growth versus plants that did not receive treatment.
2. The plants that received the application of Vitazyme had a larger diameter [of stem] than the control.
3. Both treatments that received the application of Vitazyme had a larger diameter than the control.
4. In the variables leaf number, length, and width [of leaves] all treatments that received Vitazyme application gave better results than the untreated control.
5. The root system showed thicker roots in the Vitazyme treated plants.

The use of Vitazyme in nursery plantain banana by two foliar sprayings at 0.5% v/v (1 liter/200 liters of water), 5 and 8 weeks from planting, is recommended."

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2012 Crop Results

Vitazyme on Bananas

A Nursery Study by Dole

Researcher: Ing. J. Vargas and Juan Jose Aycart M., Ph. D.
Research organization: Ubesa Dole, Ecuador Division, in cooperation with Summer Zone, Quito, Ecuador
Location: Babahoya, Ecuador *Variety*: Cavendish *Soil type*: greenhouse mix
Experimental design: A banana nursery was divided into three sections, with a conventional fungicide, a biological fungicide plus humic acid plus biological stimulators, and a biological fungicide plus Vitazyme treatment applied to the three areas. The purpose of the test was to evaluate the effects of the treatments in deterring infections of *Fusarium* and *Rhizoctonia* in the plant root systems.

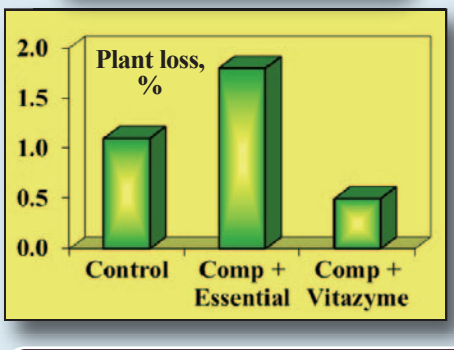
1. **Conventional fungicides (Citex and Phyton)**
2. **Companion 2-3-2 (biological fungicide) + Essential 1-0-1 (humic acid + biostimulants)**
3. **Companion 2-3-2 (biological fungicide) + Vitazyme**

Fertilization: standard for the nursery
Vitazyme treatment: 5 ml in 20 liters of water ro completely drench the plant roots and potting soil, along with Companion 2-3-2.
Companion 2-3-2 treatment: 5 ml in 20 liters of water, along with Vitazyme (Treatment 3) or Essential 1-0-1 (Treatment 2) as a root and potting soil drench. The product is a biological fungicide containing *Bacillus* GBO3 (>65 million cells/ml), which produces natural antibiotics.
Essential 1-0-1 treatment: 5 ml in 20 liters of water, along with Companion 2-3-2 in Treatment 2. The product is a "complete" biostimulant and nutritional supplement containing marine algae, humic acids, 20 amino acids, gibberellic acid, carbohydrates, vitamins, and hydrolyzed protein.
Growth, survival, and pathogen results: The plant source was Costa Rica.

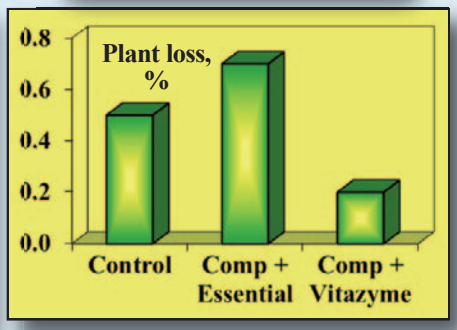
Treatment	Trial time	Transplant date	Transplants	Mortality of plants							
				Transplanting		Injury		Mutation		Fungi[1]	
	weeks		number	number	%	number	%	number	%	number	%
1. Conventional	43	Oct. 25, 2010	12,471	131	1.1	56	0.5	450	3.6	471	3.8
2. Companion + Essential	47	Nov. 27, 2010	11,845	207	1.8	80	0.7	47	0.4	38	0.3
3. Comparison + Vitazyme	46	Nov. 19, 2010	11,771	63	0.5	18	0.2	80	0.7	70	0.6

[1]Fungi responsible for infection include *Fusarium* and *Rhizoctonia*.

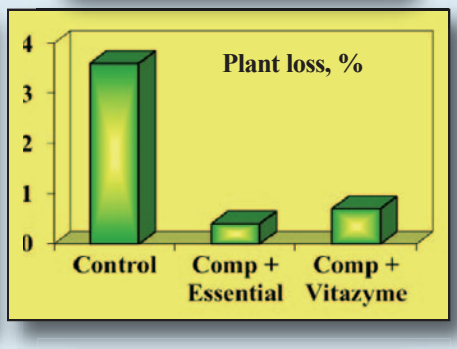
Transplant Loss



Injury Loss



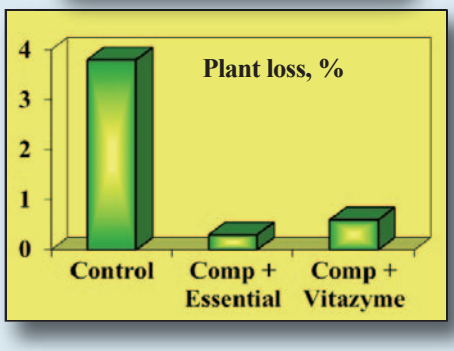
Mutation Loss



Plant Growth Rate

1. Conventional ..... Rapid
2. Companion + Essential ..... Slow
3. Companion + Vitazyme ..... Rapid

Fungi Loss



The conventional treatment (1) had a higher fungal infection rate (3.8%) than the other two (0.3% and 0.6%), but the growth rate was good. Companion + Essential (Treatment 2) had the lowest fungal loss (0.3%), but plants grew slower than for the other two treatments, while Companion + Vitazyme (Treatment 3) also had a low fungal loss (0.6%), but had high growth rates.

<u>Conclusions</u>: This greenhouse banana trial in Ecuador proved that losses of plants due to *Fusarium* and *Rhizoctonia* infection could be reduced dramatically with both Companion + Essential and Companion + Vitazyme; both treatments brought the infection rate down from 3.8% in the control to 0.3% and 0.6% for the other two. However the Companion + Essential treatment produced a slower plant growth rate than did the other two. According to the researcher, "The seedlings of the two treatments [1 and 3] achieved a more rapid development, and could be transplanted at 6 weeks, with development comparable to that of 8 weeks. The control plants normally take 8 weeks in the greenhouse before being ready to deliver to fields." This study shows that Vitazyme plus a biological fungicide greatly reduce root fungal growth and speed plant development.

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2000 Crop Results

Vitazyme on Bananas

A demonstration

Researchers: Buck Hammer and Paul Syltie
Location: Gladewater, Texas
Soil type: very fine sandy loam
Planting date: summer, 1998

Experimental design: Two banana plants of approximately equal size were planted about six feet from each other in the front of the Vital Earth Resources Research Center. During the summer of 2000 the smaller of the two plants was sprayed periodically with a 1% Vitazyme solution on the leaf surfaces.

1. Control **2. Vitazyme**

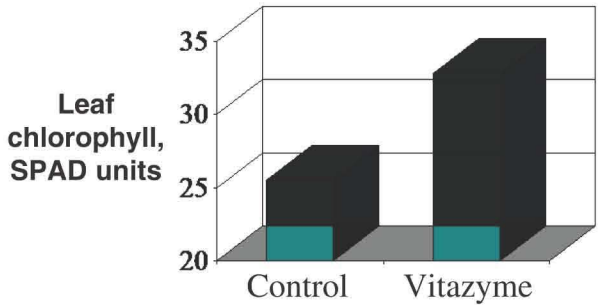
Shortly before a killing frost, an evaluation was made of growth parameters of the two plants

Vitazyme application: leaf spray application of a 1% solution three times from mid-July to October

Leaf chlorophyll: On November 13, 2000, a Minolta SPAD chlorophyll meter was used to noninvasively measure the chlorophyll in 30 randomly selected positions for each of the two plants. These values were then averaged.

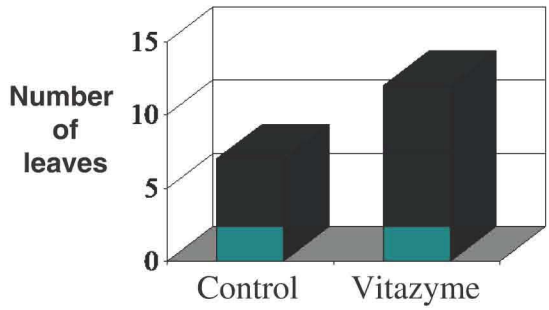
Leaf Chlorophyll

	Control	Vitazyme	Change
		SPAD units	
Leaf chlorophyll	25.5	32.8	+7.3



Increase in leaf chlorophyll: 7.3 SPAD units

Total leaves: On November 13, 2000, the total leaves for each plant were counted.



Total Leaves

	Control	Vitazyme	Increase
Total leaves	7	12	5(+71%)

Increase in leaves: 71%

Conclusions: In spite of the Vitazyme treated plant being the smallest initially, this plant quickly accelerated in growth after being treated. Leaf chlorophyll increased to fix more carbon and enhance plant growth such that the total leaf number by mid-November was 71% higher for the Vitazyme treated plant. While a single replicate does not prove such growth increases, yet these results give a strong indication of how well Vitazyme can improve banana growth.

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2001 Crop Results

Vitazyme on Bananas

A demonstration

Researcher: Buck Hammer and Paul Syltie

Planting date: summer, 1998

Location: Vital Earth Resources Research Center, Gladewater, Texas

Soil type: Bowie fine sandy loam

Experimental design: This study continued the experiment begun in 2000. Two banana plants that were of nearly equal vigor and size the spring of 2000 were treated through the summer of 2000, giving a large advantage to the Vitazyme treatment. Treatments were continued the summer of 2001.

1. Control **2. Vitazyme**

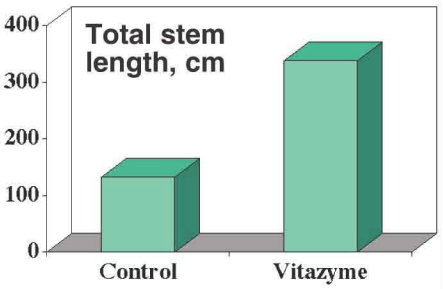
Fertilizer treatments : Both plants received a 6-inch layer of turkey manure compost (Vital Earth Premium Grade Compost) to about a foot in radius from the stem of the plants.

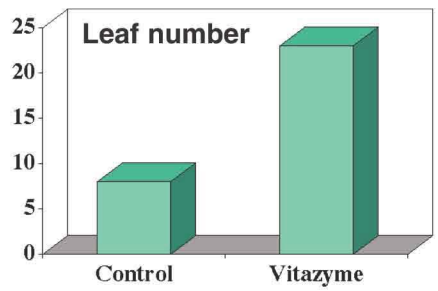
Vitazyme treatment: a leaf spray application of a 1% solution three times from June through September of 2001

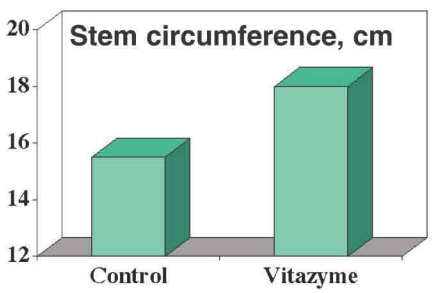
Leaf chlorophyll: On October 19, a Minolta SPAD meter was used to evaluate the chlorophyll in the top five leaves of the main stem plants for each treatment (10 subsamples per plant).

Leaf chlorophyll

	Control	Vitazyme	Change
		SPAD Units	
Leaf chlorophyll	29.8	30.2	0.4







Growth parameters: On October 19 a series of measurements were made to evaluate differences in the two plants. The main plants looked quite similar in 2001, likely due to the compost application to both stems, but the Vitazyme plant had many more tillers.

Parameter	Control	Vitazyme	Change
Main stem plus tillers	**1**	**4**	**3 (+300%)**
Heights:			
Main stem, cm	132	133	1 (+1%)
Tillers	—	107, 83, 15	
Total stem length, cm	**132**	**338**	**206 (+156%)**
Leaf number:			
Main stem	8	8	
Tillers	0	6, 6, 3	
Total leaves	**8**	**23**	**15 (+188%)**
Longest leaf, cm	59	56	3 (-5%)
Widest leaf, cm	29	29	0
Stem circumference at 10 cm, cm	**15.5**	**18.0**	**2.5 (+16%)**

Conclusions: Vitazyme continued to improve overall banana plant growth into the second year of this study. Although a liberal compost application to both plants tended to mask differences in soil fertility and growth elicited by Vitazyme so noted in 2000, differences in growth were still marked, especially in tillering . . . where Vitazyme encouraged three tillers to none for the untreated plant.

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2003 Crop Results

Vitazyme on Bananas (Organic)

Researcher/Farmer: Grupo Agricola Prieto
Location: Los Angeles, Pasaje, El Oro, Ecuador
Variety: Cavendish *Soil type*: unknown (alluvial) *Tree spacing*: standard
Cultuval system: certified organic (BCS)
Experimental design: An organically operated banana field was split into two parts: conventionally treated, and Vitazyme added to the regime. The control treatment for some reason did not receive the usual organic amendments during the duration of the trial, so the production data is quite low. Monthly and bimonthly Vitazyme treatments were used. Root counts, nematodes, soil nutrients, and leaf nutrients were gathered twice for the first part of the study.

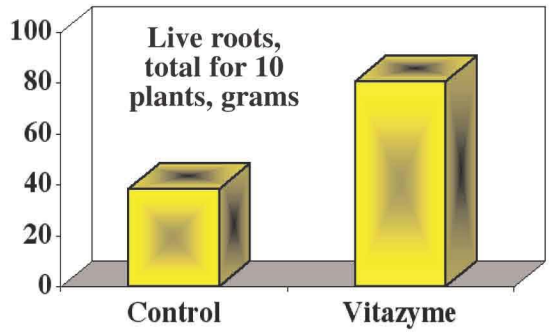
1. Vitazyme monthly **2. Vitazyme bimonthly** **3. Control**

Fertilization: Only certified organic fertilizer was applied to the treatments. For some unknown reason the control received no fertility amendments during the trial period.
Vitazyme application: Treatment 2 received 1 liter/ha each month, while Treatment 1 received 1 liter/ha every two months.
Irrigation: The control and Treatment 1 were watered as needed, but Treatment 2 was given less water than required due to irrigation system problems, which resulted in somewhat reduced yields.
Soil analyses: No major differences in soil nutrient levels were noted during the first part of the growing season, so this data is not included here.
Plant growth: Root growth was evaluated on May 2, 2003, for the control and Vitazyme treatments (1). Analyses were made at Nemalab, S.A., in Machala, Ecuador.

Treatment	Live roots*	Change
	g/10 plants	grams
Control	38.5	—
Vitazyme	80.6	42.1 (+109%)

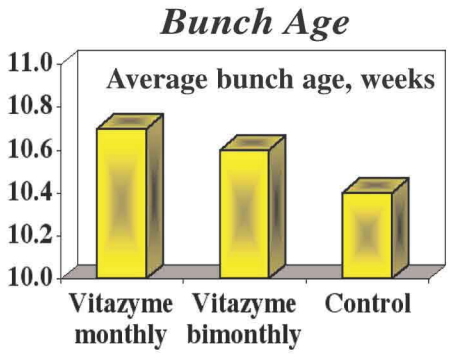
*Grams of live roots per 10 plants for 10 dm^3 of soil

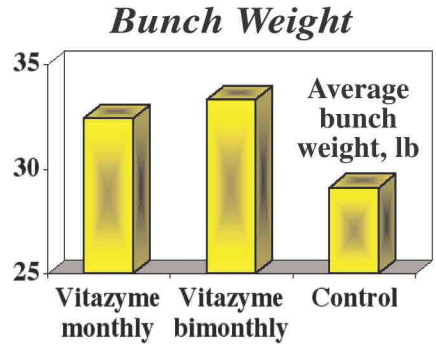
Increase in live roots: 109%

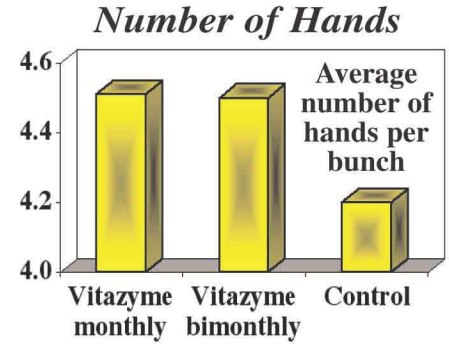


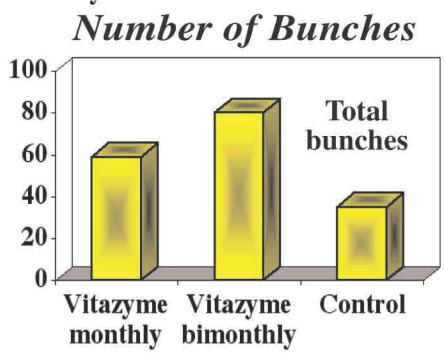
Yield results: Yield totals were tallied for each treatment over a period of 8 weeks, and included the average age of the bunch at harvest, weight of the bunch, and the number of hands on the bunch. Totals of all bunches are given in the table, and averages are then calculated, for bunch age, weight, and hands.

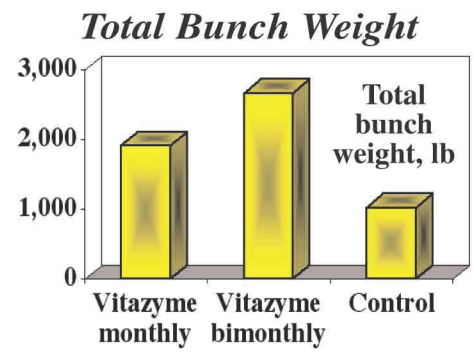
Week	Treatment 1 (Vitazyme monthly)				Treatment 2 (Vitazyme bimonthly)				Treatment 3 (control)			
	No.	Age	Weight	Hands	No.	Age	Weight	Hands	No.	Age	Weight	Hands
		week	lb	number		week	lb	number		week	lb	number
36	15	165	497	66	21	231	714	95	6	66	188	27
37	4	41	138	20	9	88	315	46	5	51	139	21
38	11	114	360	51	15	158	472	64	7	70	209	30
39	11	118	350	48	12	130	384	51	6	62	166	23
40	3	30	90	13	5	50	165	23	2	20	54	9
41	4	41	129	20	5	52	165	24	3	31	86	13
42	7	80	232	32	9	99	307	41	3	33	89	12
43	4	40	115	16	4	40	138	16	3	30	88	12
Totals	59	629	1,911	266	80	848	2,660	360	35	363	1,019	147
Average		**10.7**	**32.4**	**4.51**		**10.6**	**33.3**	**4.50**		**10.4**	**29.1**	**4.20**











Increase in total bunch number (Vitazyme bimonthly): 129%
Increase in total bunch weight (Vitazyme bimonthly: 161%

Conclusions: This study on organic bananas in Ecuador revealed that the age of the bunches at harvested was slightly less for the control. The bunch weight was greatest for the Vitazyme applied every other month: this weight was 0.9 lb/bunch more than the monthly applied treatment, and 4.2 lb/bunch more than the control. Hands/bunch was identical for both Vitazyme treatments, but was 0.3 hands/bunch less for the control. Vitazyme greatly improved overall root growth, increasing live root mass by 109% over the control. Vitazyme applied every other month produced the greatest number of bunches, and the greatest total weight, exceeding the monthly applied Vitazyme and especially the control.

Caution must be taken in extrapolating these results too far, because the control treatment did not receive any organic fertilizers during this study, and the monthly applied treatment (Treatment 1) did not receive adequate irrigation water at times. These factors very likely contributed to the the less than expected performance of the monthly applied treatments, and to lower production than expected for the control. The monthly treated plants actually appeared stronger than the bimonthly treated bananas.

Of additional interest is the fact that the mother–son–grandson succession of tillers was noticeably improved with both Vitazyme treatments. If the trial had been monitored through another generation of bunches, the effect of Vitazyme reducing the time from flowering to harvest would have been quite dramatic.