

Tomatoes *with Vitazyme application*

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Research organizations:

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Project abstract: Vitazyme is a liquid biostimulant consisting of vitamins, enzymes and other growth stimulating components. This study was conducted in part to determine the mechanisms involved in Vitazyme activity. Greenhouse-grown tomatoes treated with Vitazyme produced more fruit over multiple harvests. Preliminary data show increases in tomato lycopene and beta-carotene levels. Work was performed by i-Cultiver, Inc. which provides independent research and consultation services to agriculture, food, and forestry industries.

Background information: Vitazyme is produced by Vital Earth Resources, Inc., Gladewater, TX. I-Cultiver is conducting basic research to determine its mechanisms of activity in promoting crop production and quality.

Summary of previously reported work

- Khanna and Syltje, 2021 – Tomato plants (N=8) were grown in the greenhouse. Treatment with Vitazyme increased the number of tomatoes produced by 54% and the weight of tomatoes produced by 18%, beyond the standard grower's program.
- Khanna et al, 2022 – Brassinosteroids (BR) are well known plant growth regulating phytohormones and are listed as a major component of Vitazyme. We developed a bioassay to test BR activity. We used *Arabidopsis det2*-mutant (deficient in BR) seedlings, which exhibit stunted growth in darkness. We found that the BR-specific growth defects in *sdet2* seedlings could be rescued by the addition of Vitazyme in growth medium, indicating that Vitazyme influences plant growth and development in part through BR activity.

i-Cultiver's complete Vitazyme Reports are available: (<https://i-cultiver.com/vitazyme/>)

Purpose of the study: This study was performed to assess whether Vitazyme application increases tomato fruit production in the greenhouse.

Materials and Methods:

Plant growth and Vitazyme application

Seeds of the MoneyMaker var. of tomato (*Solanum lycopersicum*) were surface sterilized (Menhiferber et



(a) Tomatoes growing in the trial greenhouse; (b) Vitazyme treated fruit is on the right; (c) The typical Vitazyme treated fruit on the right is larger than the control fruit.

al., 2021). Seeds were germinated in soil (Sunshine Mix #1) and all plants were grown for 25 weeks in a greenhouse room under controlled conditions with supplemented light to maintain long days and fans to control high temperature fluctuations. Peters Professional 20/20/20 water soluble fertilizer was applied (1:64 ppm) once per week, as well as a disease suppression program consisting of Floramite and Decathlon at a rate of ¼ tsp per gallon of water, mixed/agitated, was applied through a controlled sprayer at the rate of 1-2 gal per 100 plants.

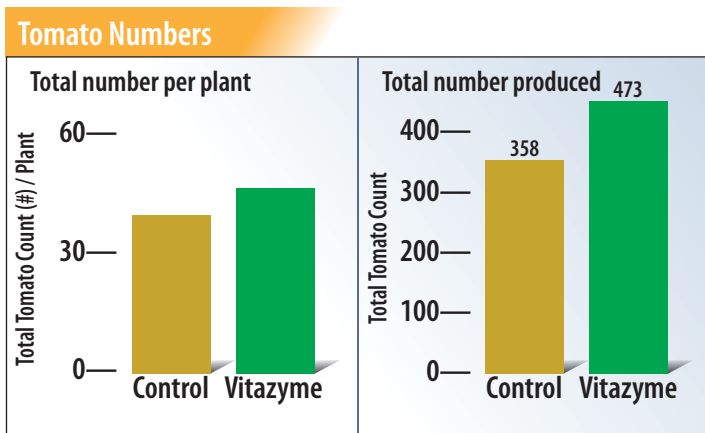
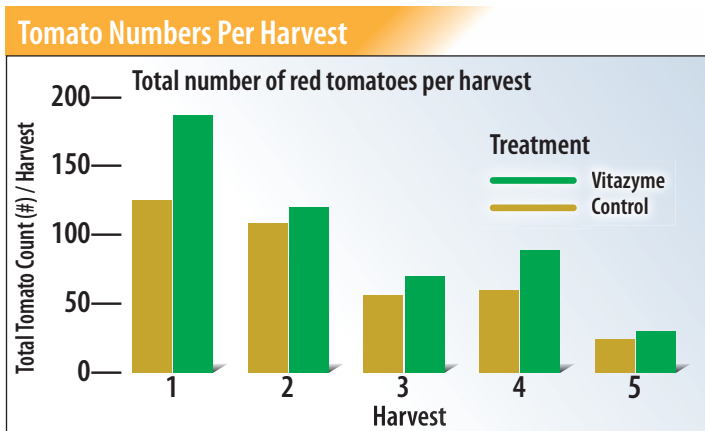
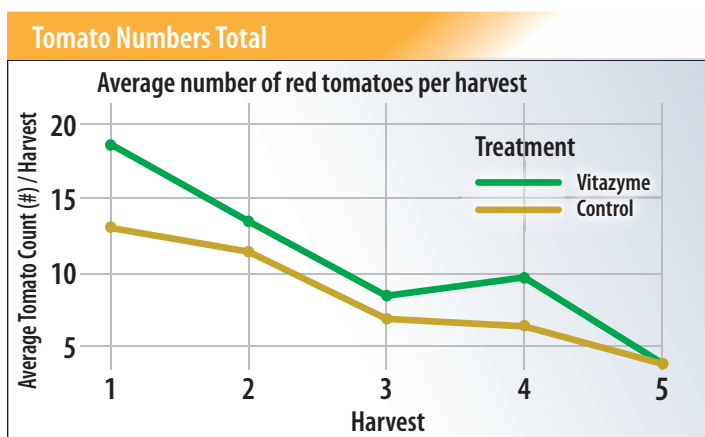
Vitazyme (see Vitazyme website in ref.) plants were treated according to manufacturer's instructions by spraying a 1% solution (1 ML/100ML) on leaves and over soil surface (root zone) to the dripping point. It was applied every two weeks throughout the active growth phase, until flowering stage. The total volume of 1% spray needed per plant increased for each application as the plants grew bigger. The control plants did not receive Vitazyme spray. Ripened fruit (2/3rd or more red) was harvested at week 19 after germination. Fruit was harvested four

more times in weeks 21, 22, 24, and 25, with a total of five harvests in six weeks.

Lycopene and B-carotene quantification

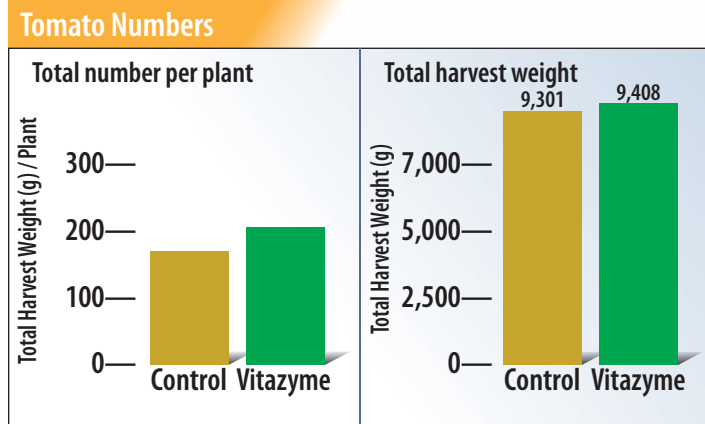
Fresh red-tomato fruit was randomly selected from non-treated and treated plants. Lycopene and B-carotene were quantified using a modified protocol based upon the standardized rapid spectrophotometric method described (Anthon and Barrett, 2007). Pigments were quantified by measuring absorbance at 444, 503, and 700 nm.

Results: Tomato Numbers

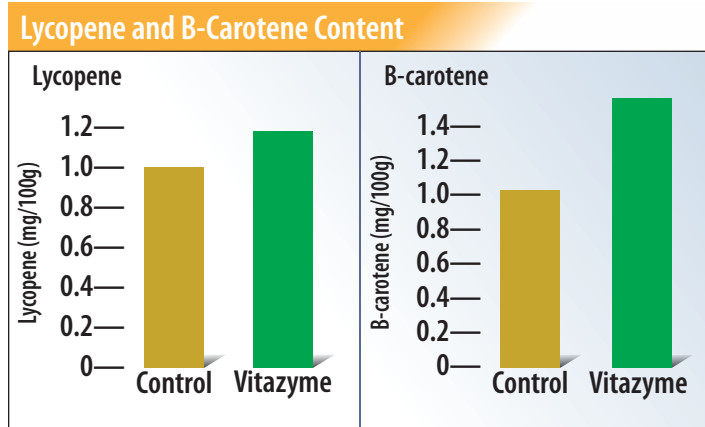


Increase in tomato number with Vitazyme: 32%

Plants treated with Vitazyme produced more tomatoes. After the first harvest in week 19, plants continued to produce new tomatoes, albeit with fewer tomatoes produced overall in later weeks. Vitazyme treated plants maintained higher number of fruit throughout the harvest period compared to controls. The total number of tomatoes produced per plant was higher with Vitazyme treatment. Overall, Vitazyme plants produced 32.12% more fruit than control plants.



Tomato weight increased marginally with Vitazyme in this trial. In the previous trial (Khanna and Sylie, 2021), there was a 54.14% increase in the number of tomatoes produced and a 17.80% increase in total weight of red tomatoes produced with Vitazyme treatments. There was an incidence of powdery mildew during this trial, which may account for the overall reduction in tomatoes produced. However, the second trial is consistent with the previous test in increased number of tomatoes produced and a trend towards increased tomato weight. Future studies will confirm this trend.



Increase in lycopene content with Vitazyme: 14%

Increase in B-carotene content with Vitazyme: 45%

Lycopene is a red carotenoid that gives tomatoes, carrots, strawberries and other fruits and vegetables their bright red color. Lycopene concentration changes during ripening and is impacted by environmental and other factors influencing tomato development. In this study, ripened tomatoes of matched developmental stage were randomly selected for lycopene quantification. Vitazyme treatment increased lycopene in the tomatoes tested by 14%.

B-Carotene is a yellow-orange carotenoid. Similarly to lycopene, there was an increase of 45% in B-carotene levels in Vitazyme treated tomatoes. These studies need to be repeated in the future with more tomatoes and different crops to establish the effect of Vitazyme on pigment biosynthesis.

Note: Both, lycopene and B-carotene have strong antioxidant properties. These pigments are chemoprotective substances and have been linked to the prevention of cancer (Marti et al., 2016).

Discussion: In 2020, fresh and processed tomatoes harvested in the U.S. were valued at approximately \$1 billion (Tomatoes, Agricultural Marketing Resource Center, 2021). USDA 2012 Census report showed that total acreage for tomato production was reduced by 10%, while the number of growers increased by 20%. In the past 25 years, tomato yield has increased from 35,000 lb/acre to over 50,000 lb/acre, with still a significant untapped potential for increasing yields.

Plant performance is closely tied to environmental signals, stress responses, and nutrient availability. The plant's decision to flower and produce fruit is mediated through its inherent genetic capacity and ability to respond to its local environment.

Throughout its life cycle, intrinsic chemical signals shape plant growth and development in response to the extrinsic conditions. Phytohormones, such as BR, were determined to be an active component of Vitazyme (Khanna et al., 2022). As a growth stimulant, Vitazyme is likely to mediate plant-intrinsic pathways. Plant growth responses are closely integrated to environmental cues and availability of nutrients.

Improved understanding at the molecular level of the interplay between local conditions, and plant responses to the added agricultural inputs, such as Vitazyme biostimulant, is crucial for realizing the maximal benefit product to manufacturers and the end users.

We are continuing to determine how Vitazyme acts in promoting crop performance. In the two trials,

Vitazyme significantly increased fruit number and fruit weight (in the first trial), and preliminary results showed higher lycopene and B-carotene levels. Vitazyme is applied on other crops as well (see the Vitazyme website).

- References and Notes:** Anthon, G., and Barrett, D.M. (2007) Standardization of a rapid spectrophotometric method for lycopene analysis. *Proc. Xth IS on the Processing Tomato*. Eds.: A. B'Chir and S. Colvine, *Acta Hort.* 758, ISHS 200.
- Khanna, R. and Syltie, P.W. (2021) Vitazyme increased tomato (*Solanum lycopersicum*) fruit production. *i-Cultiver Technical Bulletin: 1121-VER*.
- Khanna, R., Ortiz, A., Reed, R., Khatiwada, P., Wang, Z., and Syltie, P.W. (2021), Plant growth regulators, brassinosteroids are an active component of Vitazyme Biostimulant. *i-Cultiver Technical Bulletin: 0922-VER*.
- Marti, R., Rosello, S., and Cebolla-Cornejo, J. (2016) Tomato as a source of carotenoids and polyphenols targeted to cancer prevention. *Cancers*, 8, 58: doi:10.3390/cancers8060058.
- Mehiferber, E.C., McCue, K.F., Ferrel, J.E., Koskella, B., and Khanna, R. (2022) Temporally selective modification of the tomato rhizosphere and root microbiome by volcanic ash fertilizer containing micronutrients. *Applied and Environmental Microbiology* 12;88(7): doi:<http://10.0.4.104/aem.0049-22>.
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Manufacturer's User Guide, The Vitazyme Program. <https://vitalearth.com/wp-content/uploads/2015/12/Vitazyme-User-Guide.pdf>.



Tomatoes with Vitazyme application



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

Researcher: Rajnish Khanna, PhD.

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

Variety: Moneymaker (*Solanum lycopersicum*)

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

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

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

Pest control: Floramite and Decathlon were applied at 0.25 teaspoon per gallon of water, along with the Peters fertilizer.

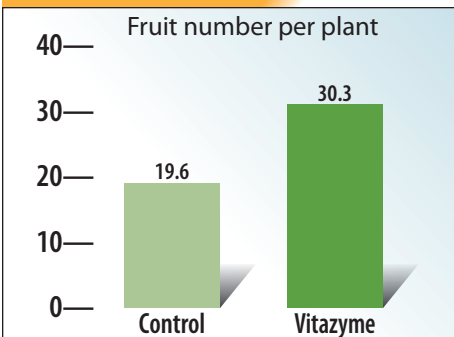
Yield results: Twenty-two weeks after transplanting the tomatoes from each pot were counted and weighed.

Treatment	Fruit number*	Number change	Fruit yield*	Yield change
	number/plant	number/plant	lb/plant	
Control	19.6 b	—	1.12 b	—
Vitazyme	30.3 a	10.7 (+54%)	1.32 a	1.59 (+18%)

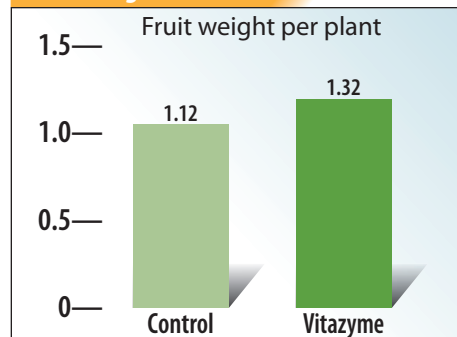
*Means followed by the same letter are not significantly different at P=0.05. The treatment P for fruit yield is 0.025.

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

Fruit Number/Plant



Fruit Weight/Plant



Increase in fruit number with Vitazyme: +54%

Increase in fruit weight with Vitazyme: +18%



Tomatoes with Organic Vitazyme application

Researcher: Bence Kiraly, Natalia Simon, and Jenó Simon

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

Location: Csengele-Csongrad-Csanád State, Hungary

Farm cooperater: Sandor Kuscora, Csengele, Hungary

Variety: Tyking (*Solanum lycopersicum*) **Planting date:** June 1, 2021 **Planting depth:** 8 cm **Row spacing:** 50 cm

In-row spacing: 40 cm **Soil traits:** clay loam, 0.6% organic matter, 7.07 pH, good fertility **Tillage:** conventional

Experimental design: A site was selected to establish a tomato trial, using small plots of 2 x 6 meters (12m²), having six replications, in a randomized complete block design. Five treatments were used to compare the effects of two biostimulants on the growth, yield, and quality of tomatoes.

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

Fertilization: unknown

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

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

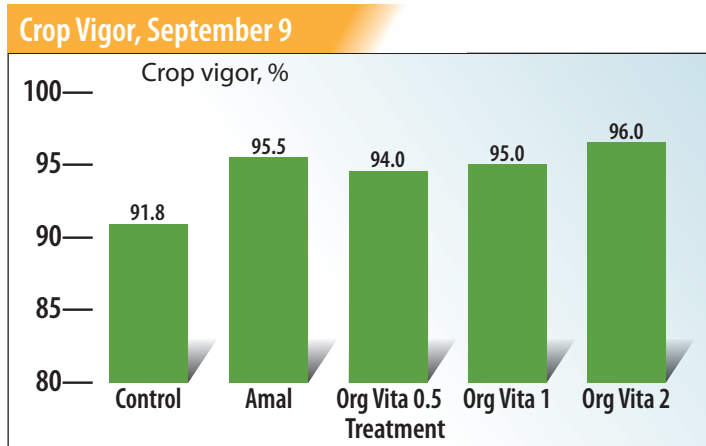
Pest control: July 14—Cuproxat FW fungicide at 4 liters/ha, and Judo insecticide at 1.2 liters/ha; August 11—Thiovit Jet fungicide at 5 kg/ha, and Karate Zeon 5 CS at 0.2 liter/ha

Phytotoxicity results: No phytotoxicity was detected for either product.

Crop vigor results:

Treatment	Rate	Assessment date*		
		July 28	September 2	September 9
	L/ha	%	%	%
1. Control	0	92.3 c	92.7 b	91.8 c
2. Amalgerol	4	95.0 ab	95.0 ab	95.5 a
3. Organic Vita	0.5	92.7 bc	94.0 ab	94.0 b
4. Organic Vita	1	94.2 ab	94.7 ab	95.0 ab
5. Organic Vita	2	95.5 a	96.0 a	96.0 a
LSD (P=0.10)		2.4	2.0	1.8
CV		2.53	2.16	1.92
Treatment F		0.1227	0.1057	0.0063

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



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

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

Treatment	Rate	Plant height*
	L/ha	SPAD units
1. Control	0	76.7 a
2. Amalgerol	4	78.1 a
3. Organic Vita	0.5	77.1 a
4. Organic Vita	1	78.0 a
5. Organic Vita	2	78.7 a
LSD (P=0.10)		2.6
CV		3.39
Treatment F		0.6959

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

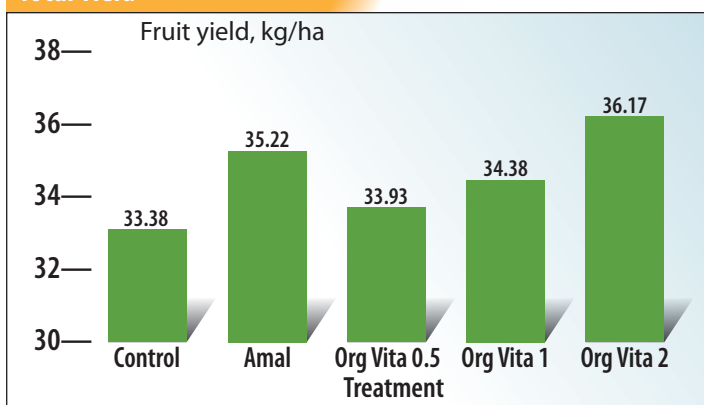
There were no significant differences in plant height among the five treatments, although the tallest plants were produced by Organic Vitazyme at 2 liters/ha.

Crop yield results:

Treatment	Rate	Picking Date*			
		September 2	September 9	September 16	Total
	L/ha	kg/plot	kg/plot	kg/plot	kg/plot
1. Control	0	8.81 c	10.98 c	13.59 a	33.38 c
2. Amalgerol	4	9.59 b	11.56 ab	14.08 a	35.22 ab (+6%)
3. Organic Vita	0.5	9.16 bc	10.97 c	13.80 a	33.93 c (+2%)
4. Organic Vita	1	9.33 b	11.19 bc	13.86 a	34.38 bc (+3%)
5. Organic Vita	2	10.14 a	11.89 a	14.14 a	36.17 a (+8%)
LSD (P=0.10)		0.50	0.53	0.58	1.00
CV		5.34	4.72	4.20	2.91
Treatment F		0.0026	0.0307	0.4951	0.0010

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

Total Yield



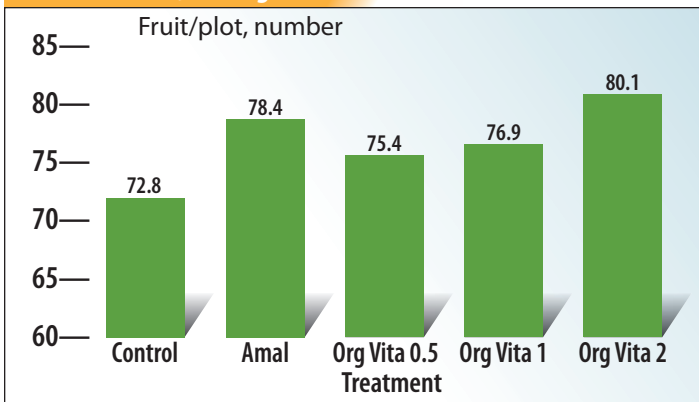
Organic Vitazyme at 2 liters/ha produced the greatest yield (+8%), which was significantly higher than all other treatments except Amalgerol (+6%). This 2 liter/ha rate yield was significantly greater than Amalgerol at P=0.10).

Fruit per plot results:

Treatment	Rate	Counting Date*			
		September 2	September 9	September 16	Total
	L/ha	number/plot	number/plot	number/plot	number/plot
1. Control	0	57.8 c	71.8 b	88.7 a	72.8
2. Amalgerol	4	64.5 ab	76.5 ab	94.2 a	78.4 (+8%)
3. Organic Vita	0.5	60.5 bc	73.3 b	92.5 a	75.4 (+4%)
4. Organic Vita	1	62.2 b	75.2 ab	93.2 a	76.9 (+6%)
5. Organic Vita	2	66.7 a	79.2 a	94.3 a	80.1 (+10%)
LSD (P=0.10)		3.2	3.3	4.1	
CV		5.16	4.44	4.47	
Treatment F		0.0017	0.0108	0.1559	

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

Fruit Per Plant, Average



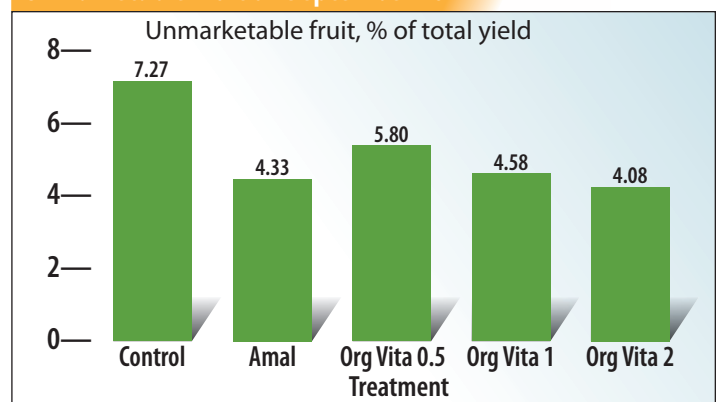
The Organic Vitazyme treatment at 2 liters/ha in most cases produced significantly more fruit than all but the Amalgerol treatment, but exceeded that treatment by 2% (8 vs. 6%). Organic Vitazyme at 0.5 and 1 liter/ha were consistently greater than the control, but usually not significantly greater.

Unmarketable fruit results:

Treatment	Rate	Harvest date*		
		September 2	September 9	September 16
	L/ha	%	%	%
1. Control	0	8.55 a	5.53 a	7.27 a
2. Amalgerol	4	6.57 b	3.98 b	4.33 cd
3. Organic Vita	0.5	6.59 b	4.26 b	5.80 b
4. Organic Vita	1	6.25 b	3.86 b	4.58 c
5. Organic Vita	2	5.03 c	3.35 c	4.08 d
LSD (P=0.10)		0.34	0.49	0.43
CV		5.17	11.76	8.34
Treatment F		0.0001	0.0001	0.0001

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

Unmarketable Fruit on September 16



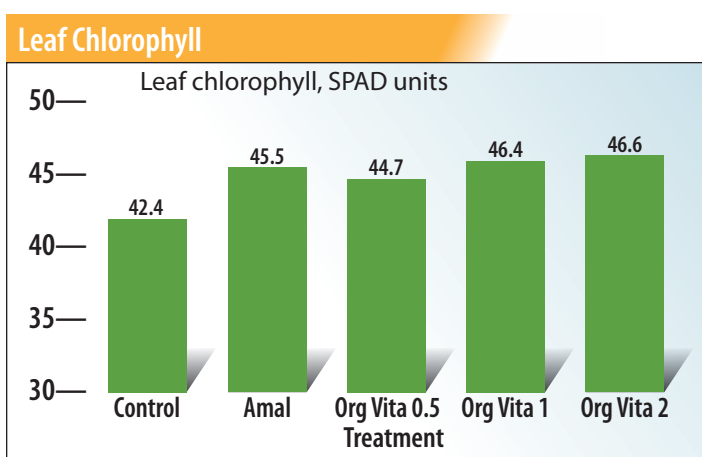
Unmarketable fruit was the least for Organic Vitazyme at 2% (4.08%), which statistically was less than all but the Amalgerol treatment (4.33%). The other two Organic Vitazyme treatments also were significantly less than the control.

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

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

Treatment	Rate	Leaf chlorophyll*
	L/ha	SPAD units
1. Control	0	42.4 b
2. Amalgerol	4	45.5 a
3. Organic Vita	0.5	44.7 a
4. Organic Vita	1	46.4 a
5. Organic Vita	2	46.6 a
LSD (P=0.10)		2.1
CV		4.62
Treatment F		0.0144

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



Increase in leaf chlorophyll above control, SPAD units

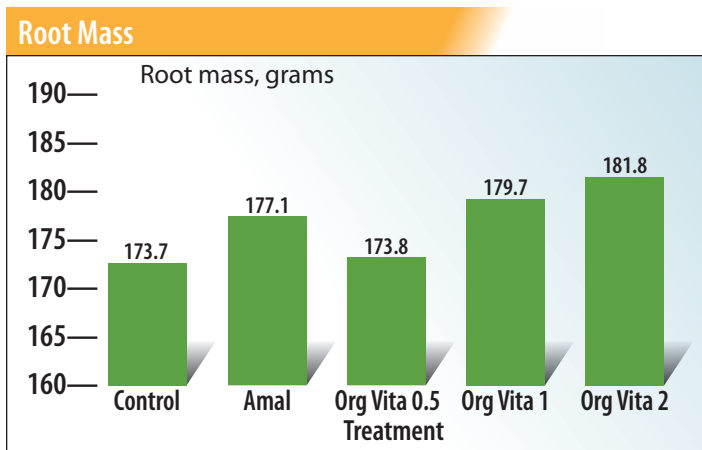
Organic Vitazyme, 2 liters/ha	4.2
Organic Vitazyme, 1 liter/ha	4.0
Amalgerol, 4 liters/ha	3.1
Organic Vitazyme, 0.5 liter/ha	2.3

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

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

Treatment	Rate	Root weight*
	L/ha	grams
1. Control	0	173.7 c
2. Amalgerol	4	177.1 bc (+2%)
3. Organic Vita	0.5	173.8 c (+0%)
4. Organic Vita	1	179.7 ab (+3%)
5. Organic Vita	2	181.8 a (+5%)
LSD (P=0.10)		3.4
CV		1.92
Treatment F		0.0014

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



Conclusions: A small-plot tomato trial in Hungary, which compared three rates of Organic Vitazyme (0.5, 1, and 2 liters/ha) and Amalgerol (4 liters/ha) to an untreated control revealed that the 2 liter/ha rate of Organic Vitazyme was the best treatment for all parameters measured. No product produced phytotoxic effects. Crop vigor, plant height, yield, fruit per plot, unmarketable fruit, fruit sugar, leaf chlorophyll, and root mass were all the most positive for this Organic Vitazyme treatment, in all cases significantly better than the control except for plant height and fruit sugar. Amalgerol and Organic Vitazyme at 1 liter/ha were usually ranked second and third for improvements of these parameters. The all-important crop yield was improved by 8% with Organic Vitazyme at 2 liters/ha, followed closely by Amalgerol at 6%; the 0.5 and 1 liter/ha rates of Organic Vitazyme increased the yield by 3% and 2%, but not significantly above the control. Rejected fruit was significantly less for Organic Vitazyme at 2 liters/ha (4.08%), followed closely by Amalgerol (4.33%) and Organic Vitazyme at 1 liter/ha (4.58%).



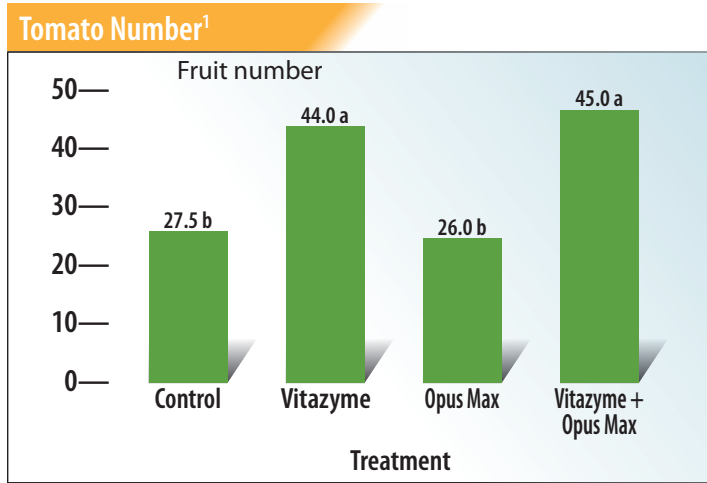
Tomatoes with Vitazyme application—A Study With Opus Max Proprietary Carrier

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

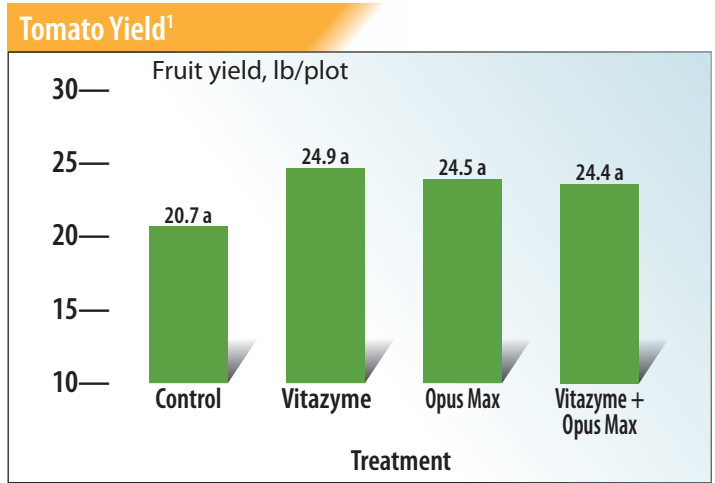
Treatment	Vitazyme ¹		Opus Max	
	With transplant	Six leaves	With transplant	Six leaves
	oz/acre	oz/acre	ml/ha	ml/ha
1. Control	0	0	0	0
2. Vitazyme	13	13	0	0
3. Opus Max	0	0	50	50
4. Vitazyme + Opus Max	13	13	50	50

¹13 oz/acre = 1 liter/ha.

Fertilization: equal for all plots
Vitazyme application: 13 oz/acre (1 liter/ha) in the root zone at transplanting on June 14, and 13 oz/acre (1 liter/ha) sprayed on the leaves at the six-leaf stage on July 15, at 31 days
Opus Max application: 50 ml/ha in the root zone at transplanting on June 14, and 50 ml/ha sprayed on the leaves at the six-leaf stage on July 15, at 31 days. Opus Max contains naturally occurring minerals anchored to a charged particle. This particle forms supramolecular structures with active ingredients to localize their action and increase efficacy.
Growing season weather: favorable **Harvest date:** September 16, 2021



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



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

LSD (P=0.05) 16.0 fruit
CV 28.1
Replicate F..... 0.703
Treatment F 0.0405

LSD (P=0.05) 4.2 lb/plot
CV 11.08
Replicate F..... 1.178
Treatment F 0.1492

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



Tomatoes with Vitazyme marketed as Vitazyme Foliar in this region.

Researchers: Daniel Penã and Candelario Gomez

Research organization: Duwest Dominicana, Dominican Republic

Location: Juan Carlos Perez Farm, Navarette, Santiago Province, Dominican Republic

Variety: salad tomato

Trial initiation: March, 2019

Experimental design: A 0.25 hectare plot of salad tomatoes was treated with Vitazyme Foliar, and compared to an adjoining untreated area, to evaluate the effect of the product on yield, quality, and phytotoxicity.

1 Control 2 Vitazyme

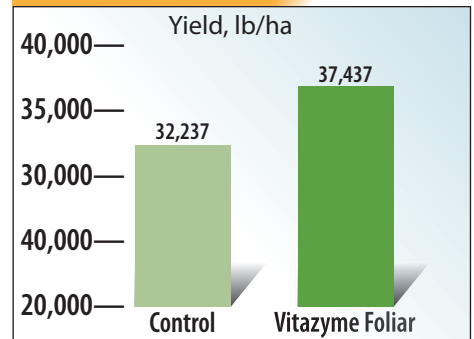
Fertilization: unknown

Vitazyme Foliar application: three foliar sprays of 1 liter/ha each time

Yield results:

Treatment	Tomato Yield			Total Yield	Yield Change
	Picking 1	Picking 1	Picking 1		
	-----lb/ha-----			lb/ha	lb/ha
Control	12,495	5,923	13,819	32,237	—
Vitazyme Foliar	11,684	11,353	14,400	37,437	5,200 (+16%)

Tomato Yield



Increase in tomato yield with Vitazyme Foliar: 16%

Quality results:

The fruit number per plant was about equal for these treatments, but fruit size was larger and the fruit more uniform with Vitazyme Foliar application, allowing for a better price. Treated plants were also healthier and were still growing actively at the conclusion of the trial.

Income results:

The added income from the 16% yield increase was a substantial US\$1,820/ha, which gives a net increase after a US\$60/ha Vitazyme cost of US\$1,740/ha.

Conclusion:

- The Vitazyme Foliar treated plot showed a 5,200 lb/ha or 16% greater yield than the untreated commercial control.
- The application of Vitazyme Foliar biostimulant positively impacts fruit quality by improving fruit shape, size, and color.
- The added yield provided a substantial US\$1,740/ha more net return to the farmer.
- For the grower, Vitazyme Foliar biostimulant is a good tool, because, in addition to increasing yield, it improves quality, and thus allows negotiating better prices.



Tomatoes with Vitazyme application

Researcher: Leonel Yaeggy
Research organization: Duwest Guatemala, Guatemala
Farmer: Juan Canel
Location: Tejar, Department of Chimaltenango, Guatemala
Variety: Atitlan
Planting date: November 14, 2018
Experimental design: A tomato field was treated in part with Vitazyme, applied to 2,500 plants, in an effort to compare the effect of the product on plant characteristics (roots, height, branches, and fruit number), yield, and disease resistance as compared to a Kelpak treated area alongside.



The Vitazyme treated tomatoes on the left show excellent color and growth, whereas the untreated plants on the right are afflicted with bacterial wilt and canker.

① Kelpak ② Vitazyme

Fertilization: unknown

Vitazyme application: four times: (1) 1 liter/ha as a root drench at transplanting on November 14, 2018; (2) 1 liter/ha foliar spray 30 days later on December 14, 2018; (3) 1 liter/ha foliar spray 61 days after transplanting on January 14, 2019; (4) 1 liter/ha foliar spray 95 days after transplanting on February 17, 2019

Kelpak application: Kelpak is a seaweed extract, and was applied according to company specifications which were 2.85 liters/ha per application.

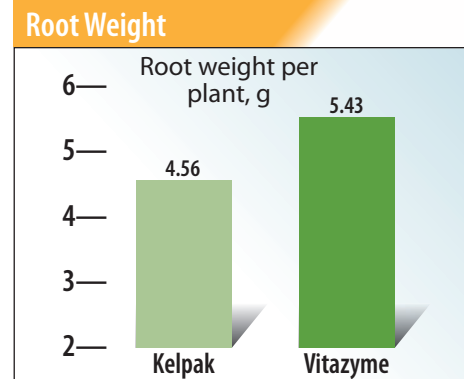
Growth results:

Evaluation of roots at 30 days after transplanting

Treatment	Root weight ¹ g/plant	Weight change g/plant
1. Kelpak	4.56	—
2. Vitazyme	5.43	0.87 (+19%)

¹Average of three plants, fresh weight.

Increase in root weight per plant: 19%



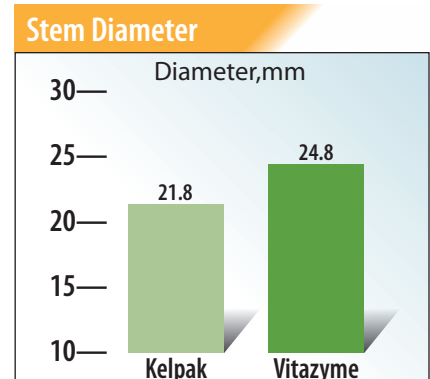
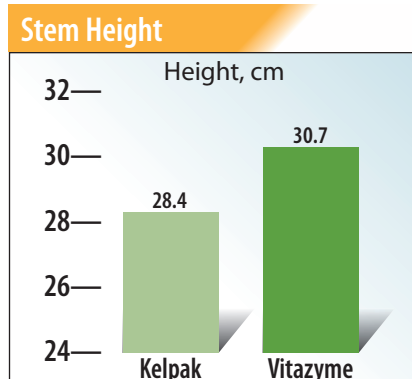
Evaluation of stem height and diameter at 60 days after transplanting

Treatment	Stem height ¹ cm	Height change cm	Stem diameter ² mm	Diameter change mm
1. Kelpak	28.4	—	21.8	—
2. Vitazyme	30.7	2.3 (+8%)	24.8	3.0 (+14%)

¹From ground level to the plant top, average of 10 plants.
²The widest part of the stem, average of 10 plants.

Increase in stem height with Vitazyme: 8%

Increase in stem diameter with Vitazyme: 14%



Evaluation of plant height and floral branches at 90 days after transplanting

Treatment	Plant height ¹ cm	Height change cm	Floral branches ² number	Branch change number
1. Kelpak	66.8	—	12.6	—
2. Vitazyme	72.7	6.1 (+9%)	15.7	3.1 (+25%)

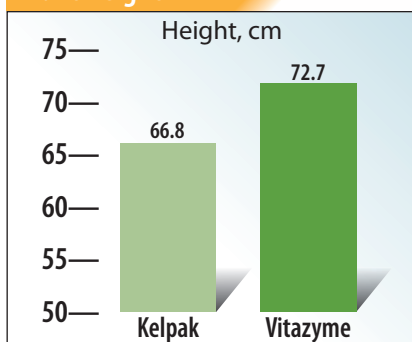
¹From ground level to the plant top, average of 10 plants.

²Number of floral branches with well-formed fruit, average of 10 plants.

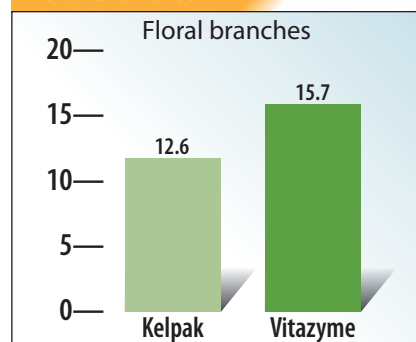
Increase in plant height with Vitazyme: 9%

Increase in floral branches with Vitazyme: 25%

Plant Height



Floral Branches



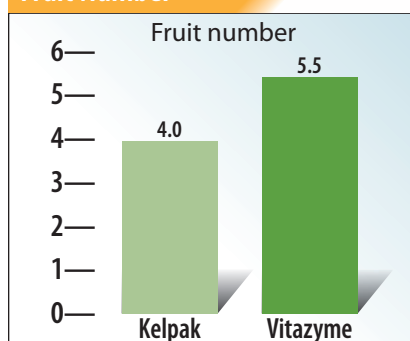
Evaluation of fruit on the first floral branch

Treatment	Fruit number ¹ number	Number change number
1. Kelpak	4.0	—
2. Vitazyme	5.5	1.5 (+38%)

¹Average of 10 plants for the fruit number on the first floral branch.

Increase in fruit number on the first floral branch with Vitazyme: 38%

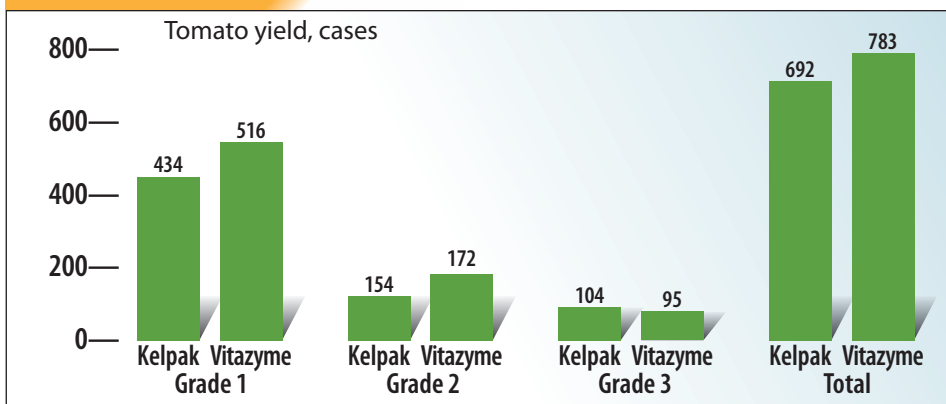
Fruit Number



Yield results: Harvest began 120 days after transplanting on March 14, 2019.

Treatment	Grade of harvested fruit						Total yield	Yield change
	Grade 1	Change	Grade 2	Change	Grade 3	Change		
-----cases-----								
Kelpak	434	—	154	—	104	—	692	
Vitazyme	516	82 (+19%)	172	18 (+12%)	95	-9 (-9%)	783	91 (+13%)

Tomato Yield



Yield Change with Vitazyme

Grade 1 +19%
Grade 2 +12%
Grade 3 -9%
Total +13%

Non-uniform quality evaluation			
Treatment	Percent of fruit grade		
	Grade 1	Grade 2	Grade 3
-----% of total-----			
Kelpak	4	12	25
Vitazyme	4	8	18

Conclusions: This tomato trial in Chimaltenango, Mexico, using four Vitazyme applications and compared with standard Kelpak applications, showed the following.

- 19% more roots 30 days after transplanting
- Taller plants (+8%) with thicker stems (+14%) 60 days after transplanting
- Taller plants (+9%) with more floral branches (+25%) 90 days after transplanting
- More fruit on the first floral branch (+38%)
- Greater total yield of fruit (+13%), with more fruit in the best grades: 19% more of Grade 1, and 12% more of Grade 2
- Fewer “non-uniform” or stained fruit
- Considerably less incidence of bacterial wilt and canker (*Clavibacter michiganensis*)

The Vitazyme program for tomatoes is shown to be considerably superior to the Kelpak program in terms of all plant growth, yield, and disease parameters measured.



Tomatoes with Vitazyme application

Researchers: Giovanni Gomez (Magussa), Luciano Frias (Quimica Lucava), and Juan C. Diaz, Ph.D. (Ag Biotech), Marco A. Casillas, and Juan Carlos Baltazar

Research organization: Chimica Lucava S. A., Celeya, Guanajuato, Mexico

Location: La Noria Farm, Casillas Agricultural Group, Autlan, Jalisco, Mexico

Variety: Saladette T16

Row spacing: 1.4 meters

Experimental design: A tomato trial on 1 hectare in a trellised area, using 1,512 m², was selected for a Vitazyme trial to evaluate the effect of this product on the growth and yield of the tomato crop. Both treatments were assessed on 1,512 m² each.

1 Control 2 Vitazyme

Fertilization: unknown

Vitazyme application: 0.5 liter/ha application to the leaves and soil every 15 days: August 15 and 29, September 12 and 26, and October 10

Growth results: The treated area had an average height of 175 cm, 15 cm more than the control, which averaged 160 cm. Vitazyme also produced considerably more foliage with the treated plants, as evidenced in the accompanying photos.

Yield results: A typical plant from both treatments was selected and evaluated, and then actual picked yields were evaluated (see the next page).

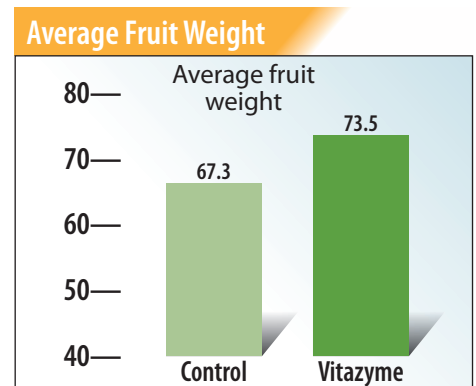
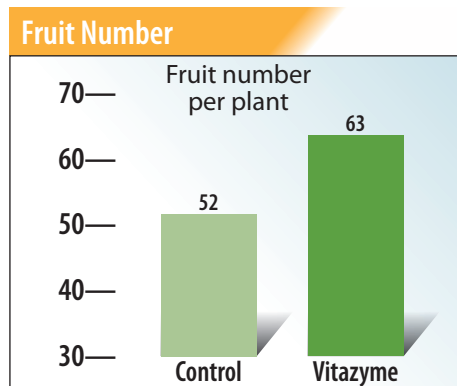
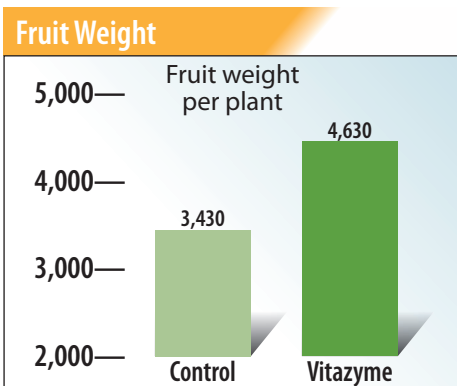


The treated tomatoes on the left display considerably greater leaf growth and row fill than the untreated plants on the right.



This Magussa tomato trial revealed the potential for Vitazyme to increase not only the total number of fruit, but their average weight as well.

	Control	Vitazyme	Change
Fruit weight per plant, grams	3,430	4,630	+1,200 (+35%)
Fruit number per plant	52	63	+12 (+24%)
Average fruit weight, grams	67.3	73.5	+6.2 (+9%)



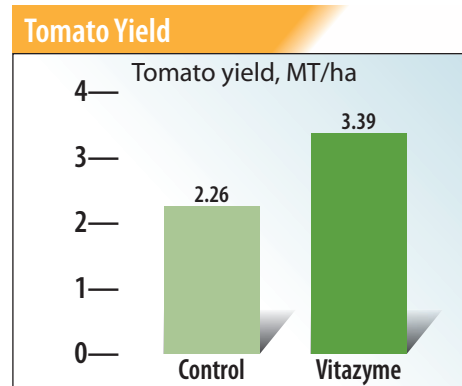
Increase in fruit weight: 35%

Increase in fruit number: 24%

Increase in average fruit weight: 9%

Actual picked fruit weights were determined for the treated and control areas (1,512 m² each) A 50% yield increase is evident, which increase is equivalent to 1.13 MT/ha (see the chart below). The data below is for the third picking, and with pickings every three days for two months, then 20 pickings would be made.

Parameter	Control	Vitazyme	Change
Cases per 1,512 m ²	20	28	8 (+40%)
Gross case weight, grams	17,860	19,070	—
Empty case weight, grams	765	765	—
Net case weight, grams	17,095	18,305	1,210 (+7 %)
Yield per 1,512 m ² , kg	342	513	171 (+50%)
Total yield, MT/ha	2.26	3.39	1.13 (+50%)



Increase in tomato yield with Vitazyme: 50%

Conclusions: In this Autlan, Jalisco, Mexican tomato study, applying Vitazyme five times every 15 days at 0.5 liter/ha, resulted in excellent growth and yield responses

These excellent results show the great value of using Vitazyme for tomato production in Mexico.

Fruit weight per plant.....+ 35%
Fruit number per plant+ 24%
Plant height.....+ 9 %
Harvested cases per picking+ 40%
Net fruit weight per harvested case+ 7%
Fruit yield per hectare.....+ 50%



Tomatoes with Vitazyme application

Researchers: K. Bruce Kirksey, Ph.D.

Research organization: Agricenter International, Memphis, Tennessee

Location: Memphis, Tennessee **Variety:** Mountain Merit

Soil type: Falaya silty loam; good fertility and drainage; pH= 6.3

Experimental design: A small-plot replicated tomato trial was established to evaluate the effect of Vitazyme on the yield and profitability for tomatoes. Plots were 10 x 30 ft, with four replications..

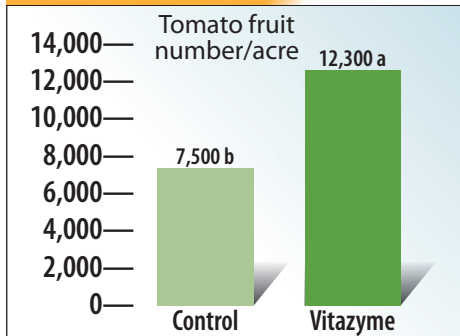
① Control ② Vitazyme

Fertilization: unknown

Vitazyme application: 13 oz/acre (1 liter/ha) at four times; (1) transplant drench (July 5), (2) early bloom (August 10), (3) fruit set (August 23), and (4) first picking (September 10)

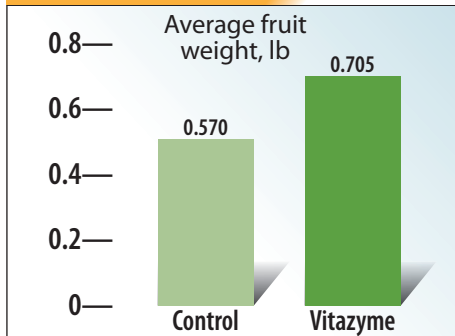
Yield results: Six pickings were completed, picking all fruit with a “star” on the bottom, or with at least a slight tinge of red.

Fruit Number Per Acre¹

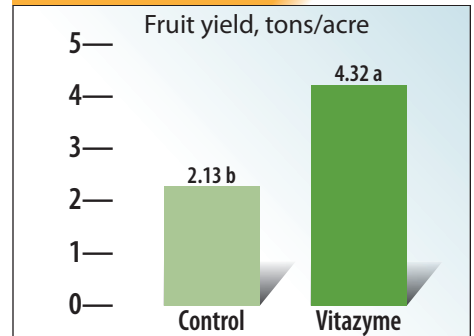


¹Standard error = 860 fruit/acre. Means followed by the same letter are not significantly different at P = 0.05.

Fruit Weight



Fruit Yield¹



¹Standard error = 0.24 tons/acre. Means followed by the same letter are not significantly different at P = 0.05.

Increase in fruit/acre with Vitazyme: 4,800 (+64%)

Increase in fruit weight with Vitazyme: 0.135 lb (+24%)

Increase in fruit yield with Vitazyme: 2.19 tons/acre (+103%)

Income results:

Control	Extra income	Extra costs	Added profit
	\$/acre	\$/acre	\$/acre
Control	—	—	—
Vitazyme	1,753	34	1,719

Return on investment: 51 : 1

Conclusion: A small-plot tomato trial in Tennessee, using four Vitazyme applications of 13 oz/acre from transplanting to first picking, produced excellent responses in terms of fruit number per acre (+64%), fruit average weight (+24%), and total fruit yield (+103%). By more than doubling the yield, the added profit from these four applications was \$1,719/acre, a return on investment of 51:1, showing the great effectiveness of this program for tomato production.



Tomatoes with Vitazyme application

Researcher: Eng. Raul Ortega,
Quimica Lucava

Farmer: Florencio Baltazar Garcia

Location: Agricola Tarriba Farm, Cruz de
Elota, Sinaloa, Mexico

Variety: D R D 8579 Saladet, as transplants

Soil type: stony

Transplanting date: September 15, 2015

Experimental design: A tomato field was divided into a Vitazyme treated area (four applications) and an untreated control area to determine the effect of this product on tomato yield and growth parameters.

1 Algaenzyme & Nh Root 2 Vitazyme

Fertilization: unknown

Vitazyme application: (1) root dip of 17 transplant trays (500 ml in 100 liters of water, or 0.5% v/v); (2) 1 liter/ha spray on October 17, 2015; (3) 1 liter/ha spray on November 15, 2015; (4) 1 liter/ha spray on December 15, 2016.

Control application: Algaenzyme at 5 ml/liter, Nh Root at 5 ml/liter

Growth results:

September 22, 2015 (7 days after dipping and 5 days after transplanting), treated seedlings were superior to the controls:

- Taller
- Plumper
- More vigorous
- Darker green leaves
- Better overall development

November 11, 2015 (57 days after the dipping treatment and 25 days after the first foliar application), treated plants were better than the controls:

- Greater leaf and biomass growth
- Dark green color (more chlorophyll)
- Reduced high temperature stress
- Better flower retention and fruit set

November 24, 2015 (after the second foliar application), Vitazyme treated plants were superior in the following ways:

- Greater leaf development
- Dark green color (more chlorophyll)
- Stronger stems, with 9 mm diameter vs. 8 mm for the control
- More flowering, with 3 to 4 inflorescences/plant and 5 to 6 flowers in each
- Greater fruit set and fewer aborted flowers

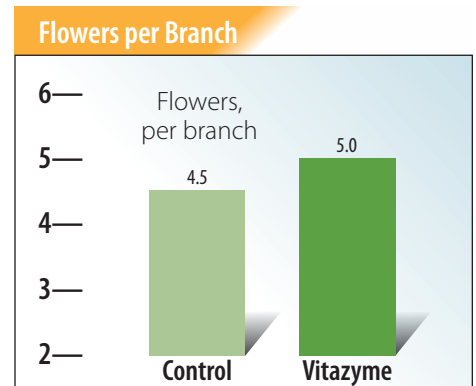


Tomatoes in a Mexican trial treated with Vitazyme increased in both yield (19%) and quality, after a tray dip and three foliar sprays.

The following results were collected on January 15, 2016

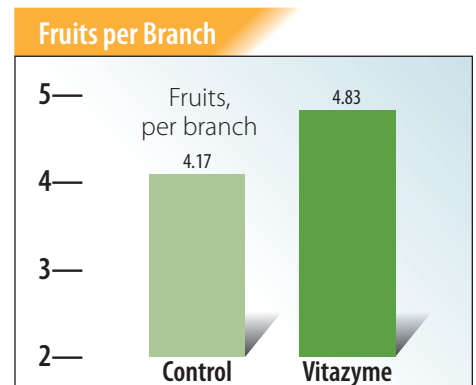
Treatment	Flowers/branch number	Flowers change number
Control	4.5	—
Vitazyme	5.0	0.5 (+11%)

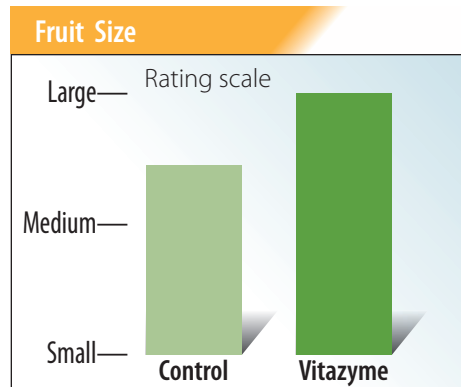
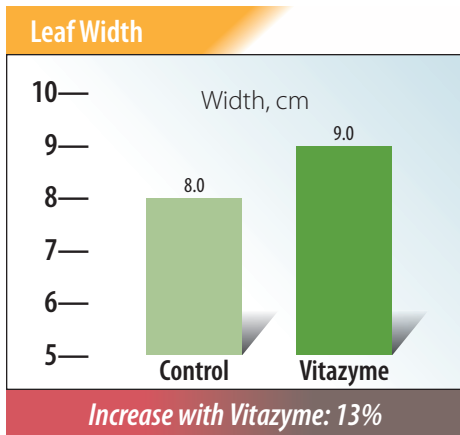
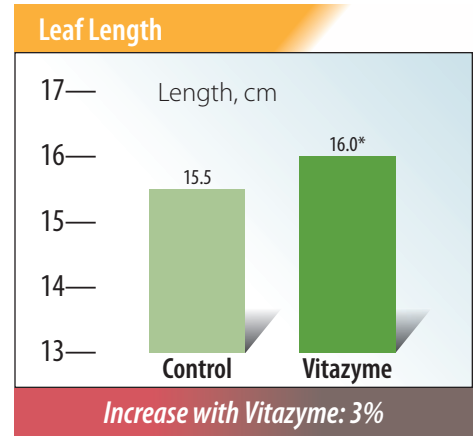
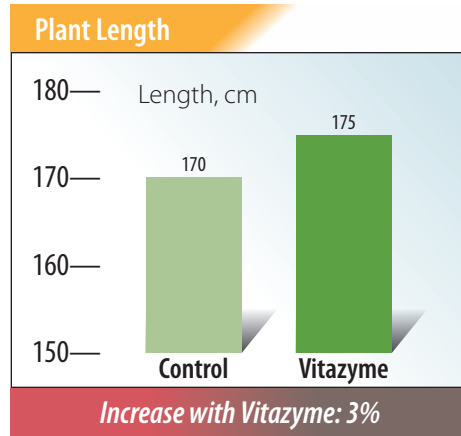
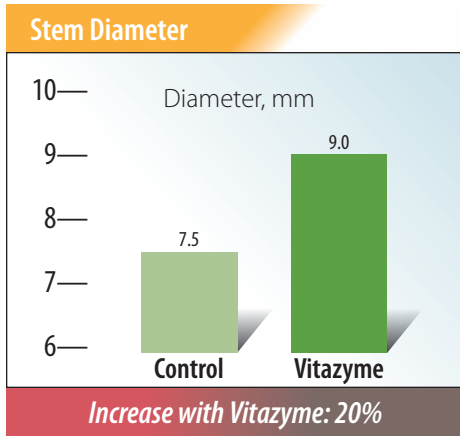
Increase in flowers/branch with Vitazyme: 11%



Treatment	Fruits/branch number	Fruits change number
Control	4.17	—
Vitazyme	4.83	0.66 (+16%)

Increase in fruits/branch with Vitazyme: 16%



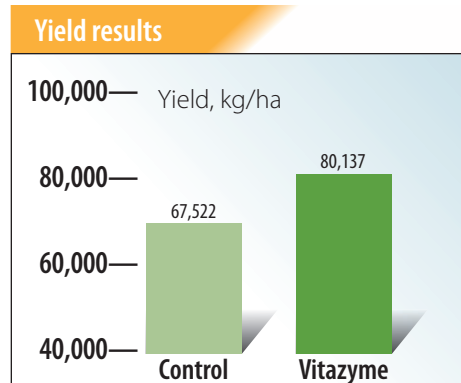


Harvest dates: 22 pickings from December 21, 2015, to March 12, 2016
Yield results:

Treatment	Baskets ¹ number	Yield tons/ha	Yield change tons/ha
Control	1,397	67,522	—
Vitazyme	1,658	80,137	3,154 (+19%)

¹Each basket weighed 7.25 kg.

Increase in tomato yield with Vitazyme: 19%



Income increase: Based on a price of \$0.25/kg, and a cost of Vitazyme at \$20.00/liter, plus \$3.75/ha labor cost with four applications, the total treatment cost was \$95.00/ha.

Extra net income with Vitazyme: \$3,058.75/ha

Cost : Benefit of Vitazyme: 32 : 1

Conclusions: With the Vitazyme four applications program (one root dip and three foliar sprays), each at 1 liter/hectare, in variety DRD8579 indeterminate tomato, since first application, greater growth, vigor, more intense green color, then larger stem diameter, plant length, leaf length and width, greater fruit set and flower fixing, with more flowers and fruits per branch and less aborted flowers, in the Vitazyme-treated area, compared to the control area (which had two other biostimulant products applied), were observed.

At harvest, the quality was higher with Vitazyme, shown in fruits of greater size than the control, mostly of categories L and XL, and of more uniform size.

Overall cumulative yield from 22 pickings between December, 2015, and March, 2016, was higher than the control by 12.6 tons per hectare (18.68%), that resulted in added profits or revenues of US \$3058.75 per hectare, and a cost-benefit ratio of 32 with Vitazyme.



Tomatoes with Vitazyme application

Researchers: V. V. Plotnikov and V. V. Rohach

Research Organization: Vinnytsia State Pedagogical University, Ministry of Education and Science of Ukraine, Vinnytsia, Ukraine

Location: "Berzhan P. G.", Horbanovka Village, Vinnytsia District, Ukraine

Variety: Roma

Planting rate: 40,000/ha

Seed planting date: March 3, 2015, in hot frames

Seedling planting date: May 12, 2015

Soil type: gray podzolic; humus = 2.2%, hydrolyzed N = 8.4 mg/100 g of soil, P = 15.8 mg/100 g of soil, exchangeable K = 12.4 mg/100 g of soil, pH = 5.5

Replications: 5

Experimental design: Plot areas of 33 m² were configured for a tomato trial, using five replications. Vitazyme was applied to five of the plots to determine the effects of the product on plant growth and yield compared to the untreated control.

1 Control 2 Vitazyme

Fertilization: a mineral fertilizer giving 50, 40, and 30 kg/ha of N-P₂O₅-K₂O

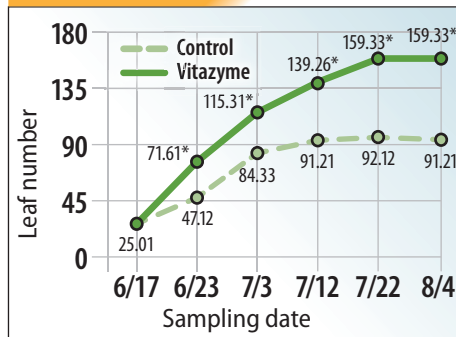
Vitazyme application: 1 liter/ha with a backpack sprayer the morning of June 17, 2015, at bud stage; control plots were sprayed with water only

Growth results:



Roma tomatoes grown in Ukraine produced an excellent 12% yield increase and a 14% improvement in profitability.

Leaves Per Plant

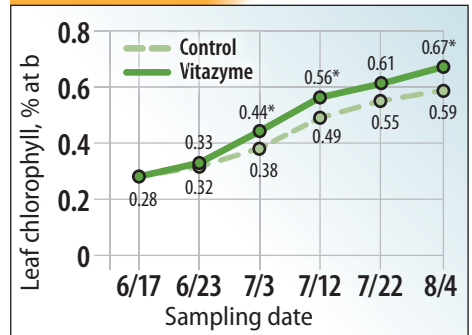


*Significantly different than the control at P=0.05.

Increase in leaf area /plant with Vitazyme

6/23/15	+143%
7/3/15	+181%
7/12/15	+71%
7/22/15	+45%
8/4/15	+29%

Leaf chlorophyll¹



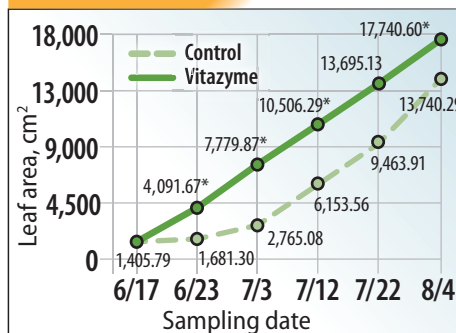
*Significantly greater than the control at P=0.05.

¹Calculated as follows: $X = \frac{C(V)}{(P)(1000)}$, where X=pigment content (% per leaf, net weight), C=pigment concentration (mg/liter), V=extract volume (ml), and P=weight of plant material (mg).

Increase in leaves/plant with Vitazyme

6/23/15	+52%
7/3/15	+37%
7/12/15	+53%
7/22/15	+73%
8/4/15	+75%

Leaf Area Per Plant¹



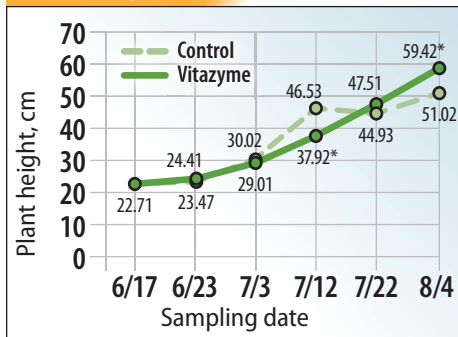
*Significantly different than the control at P=0.05.

¹Calculated as follows: $S = \frac{n(m_1)(S_2)}{m_2}$, and $S_2 = \pi r^2$, where S= leaf area (cm²), n= leaf number, m₁= leaf weight (g), m₂= cutting weight (g), S₂= cutting area (cm²), π=3.14, and r= cutting radius (cm).

Increase in leaf chlorophyll with Vitazyme

6/23/15	+3%
7/3/15	+16%
7/12/15	+14%
7/22/15	+11%
8/4/15	+14%

Plant Height

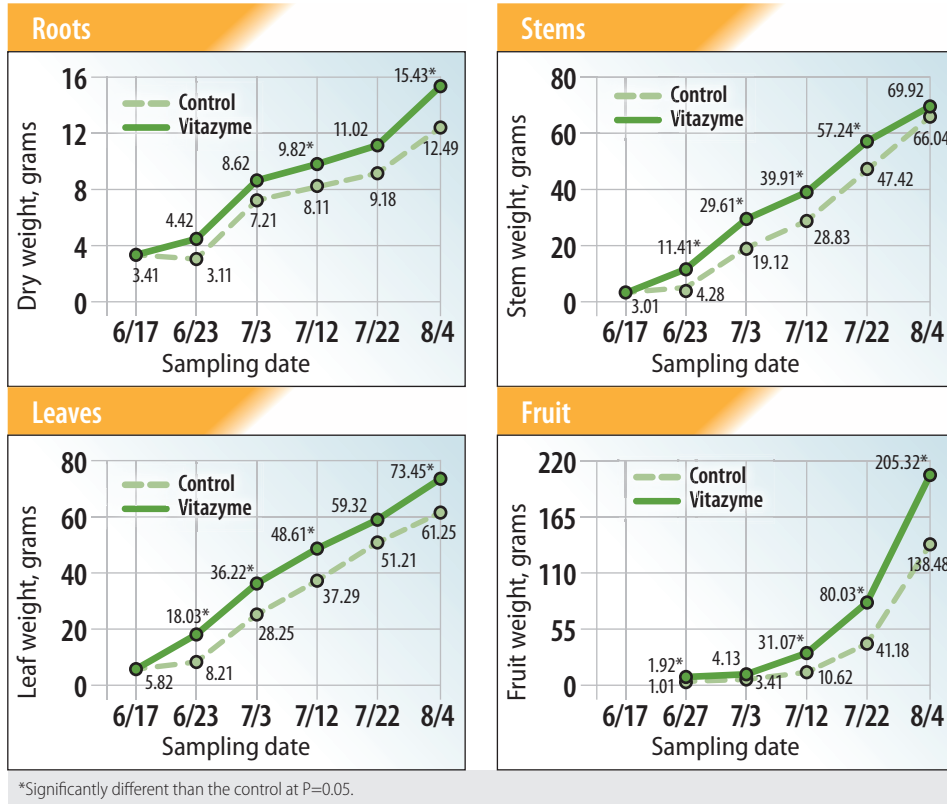


*Significantly different than the control at P=0.05.

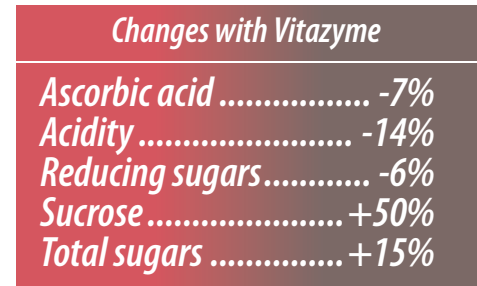
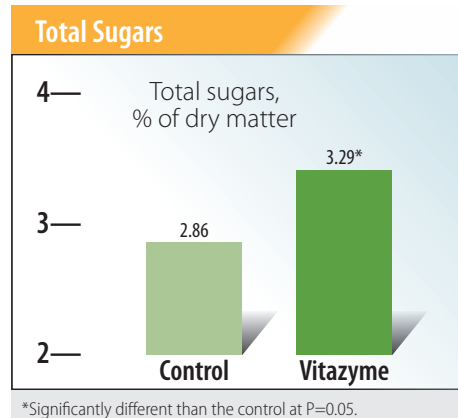
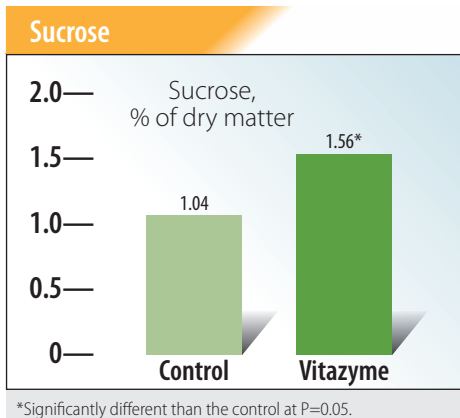
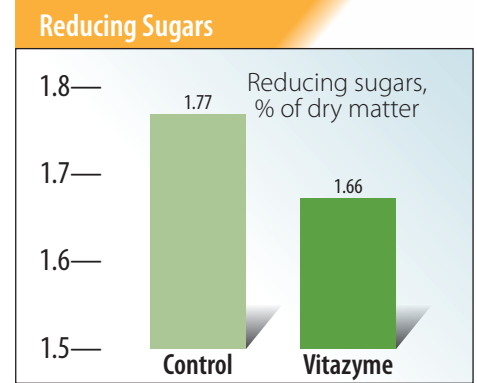
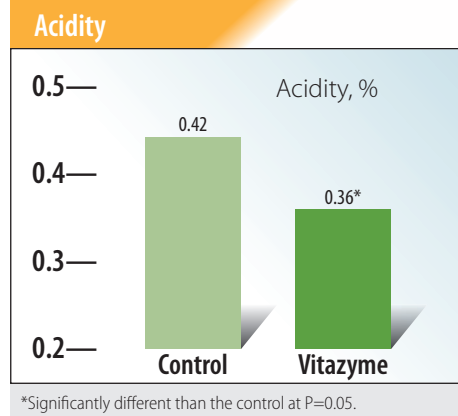
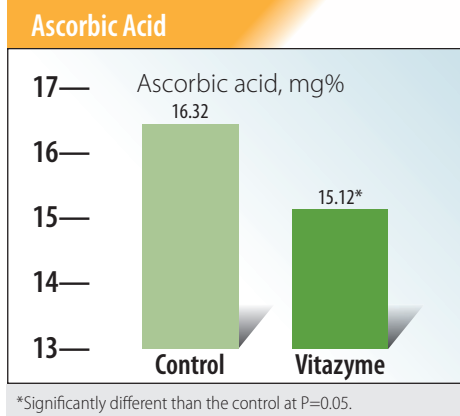
Change in plant height with Vitazyme

6/23/15	+4%
7/3/15	-3%
7/12/15	-19%
7/22/15	+6%
8/4/15	+16%

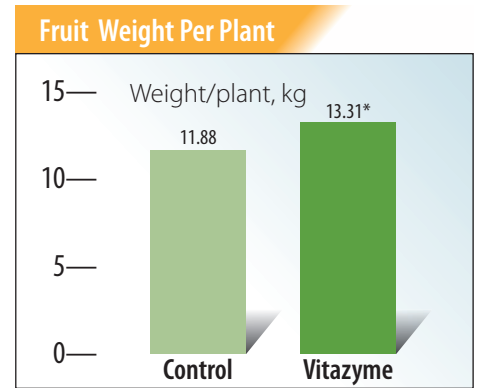
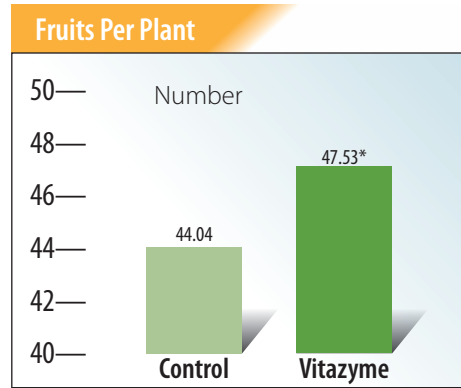
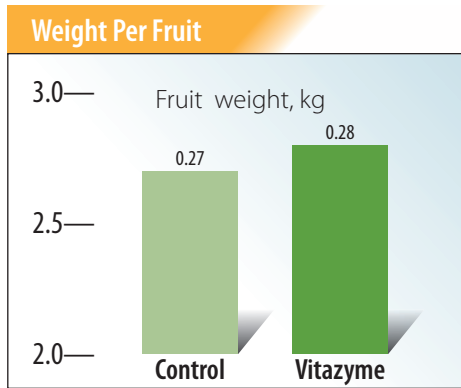
Plant Organ Dry Weights



Quality results:

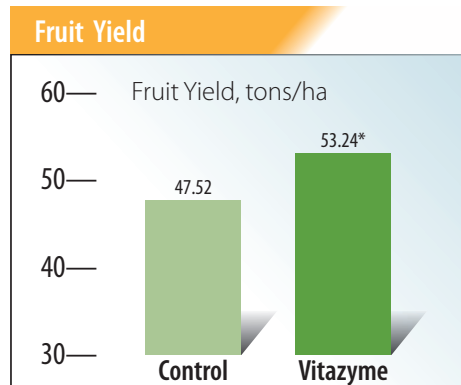
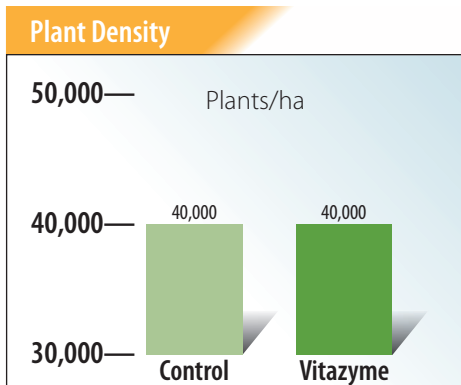


Yield results:



*Significantly greater than the control at P=0.05.

*Significantly greater than the control at P=0.05.



*Significantly greater than the control at P=0.05.

Increase with Vitazyme

Weight/Fruit +4%
Fruits/Plant +8%
Fruit weight/Plant..... +13%
Fruit yield +12%

Economic results: An analysis of many factors was made to determine the profitability of the Vitazyme application. Costs included tillage, oil and fuel, harrowing, cultivation, fertilizers, planting, seedlings, rent, watering, product applications, trucking, and harvesting.

Treatment	Net profit	Profit increase
	UAH/ha	UAH/ha
Control	206,248.13	—
Vitazyme	234,946.11	28,697.98 (+14%)

Increase in net profit with Vitazyme: 14%

Conclusions: This replicated tomato trial in Ukraine, using one 1 liter/ha Vitazyme application, produced an excellent 12% yield increase, and a 14% increase in profits. These results were produced because of significantly more leaves/plant (37 to 75%), leaf area/plant (29 to 181%), and leaf chlorophyll (3 to 16%). Plant parts also significantly increased in weight, in most cases, at the P=0.05 level, and sucrose and total sugars increased markedly with Vitazyme, by 50% and 15% respectively, indicating sweeter fruit with less acidity; acidity dropped by a significant 14%. These results prove how effective this program is for improving tomato yield, quality, and profitability in Ukraine.

Tomatoes *Testimonial: Comparison with a Rooting Compound*

Researcher: Lucero Fernandez and Ivan Zazueta

Research organization: Quimica Lucava, Mexico

Farmer cooperation: Gelasio Ramos, Canta Ranas Farm

Location: Abasolo Guanajuato, Mexico

Variety: unknown

Transplanting date: May 1, 2014

Experimental design: A 2-hectare tomato field was divided into a Vitazyme treated portion and a Radix 3000 treated part to evaluate the effectiveness of the two products to stimulate root growth.

① Radix 3000 ② Vitazyme

Vitazyme application: (1) seedling roots were dipped in a dilute Vitazyme solution at transplanting on May 1, 2014; (2) 1 liter/ha sprayed on the leaves and soil in June 11, 2014.

Radix 3000 application: Radix 3000 is a solution of indole-3-butyric acid (0.3%), an auxin that is designed to stimulate root growth and regeneration. It is generally applied as a 1% dilution at about 100 ml per plant. In this test the product was presumably applied at the same times and ways as for Vitazyme, using 1% solution.



Vitazyme in this Mexican tomato trial stimulated root development better than did Radix 3000, as can be clearly seen in this comparison.

Conclusion: An evaluation of plant roots at early blossoming revealed much superior rooting—of both main roots and root hairs—of the Vitazyme treated tomato plants, showing the potential of Vitazyme to replace root stimulants such as Radix 3000 in tomato culture.

Tomatoes *with Vitazyme application on Husk Tomatoes*

Researcher: Lucero Fernandez, Comparan Gomez, and Agustin Peralta

Farmer: Sergio Zarate

Research organization: Quimica Lucava

Location: El Verano Farm, Tecoman, Colima, Mexico

Variety: Husk tomato

Experimental design: A 1 hectare portion of a husk tomato field was treated with Vitazyme three times to evaluate the effect of the product on tomato yield and profitability.

1 Control 2 Vitazyme

Fertilization: unknown

Vitazyme application: (1) transplant drench at planting, 1 liter/ha in the drench water (December 16, 2014); (2) 1 liter/ha spray on January 20, 2015; (3) 1 liter/ha spray on February 18, 2015.

Harvest date: unknown. Twenty treated rows were compared with 20 untreated rows.

Yield results:

Treatment	Yield	Yield change
	kg/20 rows	kg/20 rows
Control	4,960	—
Vitazyme	6,820	1,860 (+38%)

Increase in tomato yield with Vitazyme: 38%

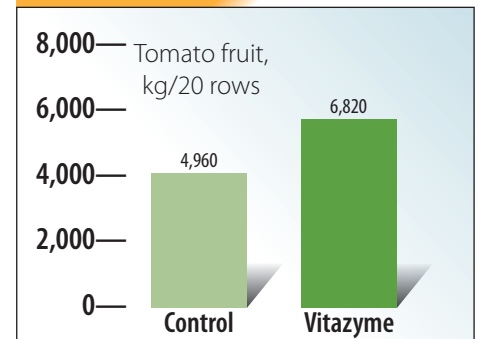
Income results:

Treatment	Income ¹	Income change
	USD/ha	USD/ha
Control	3166	—
Vitazyme	2303	864

¹ Husk tomato price = 0.464 USD/kg.

Added income with Vitazyme: 864 USD/ha

Yield results



Conclusion: This husk tomato trial in Mexico revealed how impressively Vitazyme can increase yields and profits. Three applications at 1 liter/ha improved the yield by 38%, which produced an income increase of 864 USD/ha.

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2014 Crop Results

Vitazyme on Tomatoes

Researcher: Augustin Peralta Fernando

Research organization: Quimica Lucava

Variety: unknown

Experimental design: A tomato field was divided into an untreated control area and a Vitazyme treated area, to evaluate the effect of this product on tomato fruit yield. A transplant and two foliar applications were made.

Farmer: Mauricio Portillo

Trial location: Huexca, Morelos, Mexico

Transplanting date: February 12, 2014

1. Control

2. Vitazyme, transplant and foliar (2x)

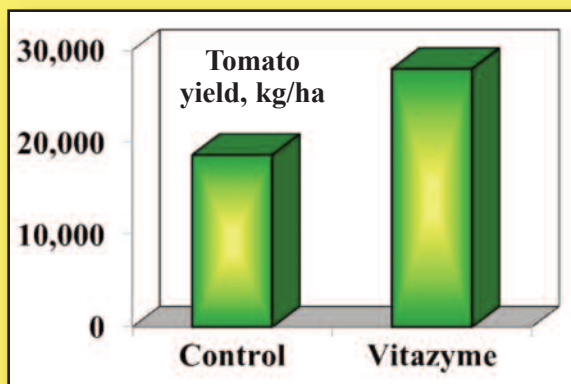
Fertilization: unknown

Vitazyme application: (1) At transplanting, the plant trays were dipped in a 0.5% solution (500 ml in 100 liters of water); (2) foliar spray 30 days after planting (March 12) of 1 liter/ha Vitazyme, with Afidox (1 liter/ha), Econil 720 (1.5 liters/ha), Actara (1 gram/liter of water), and Lucapega (250 ml/ha); (3) foliar spray during flowering of 1 liter/ha Vitazyme, with Lucambda (300 ml/ha), Protecprid 20 PS (300 g/ha), Rally 40 W (100 g/ha), Sulfochlor (1 liter/ha), and Lucapega (300 ml/ha).

Harvest date: Three pickings were made from May 20 into June, 2014.

Yield results: One hectare of both treatments was harvested for test purposes.

Treatment	Picking 1	Picking 2	Picking 3	Total	Yield Change
Control	3,732	10,635	4,293	18,660	—
Vitazyme	5,022	13,389	9,483	27,984	9,324 (+50%)



**Increase in tomato yield with
Vitazyme: 50%**

Conclusions: The comments of the researcher are given below.

1. Vitazyme had 49.5% higher yield compared to the control: 27.984 tons per hectare versus 18.66 tons per hectare, equivalent to 9.234 tons per hectare (307.8 taras of 30 kilos) higher yield with Vitazyme than the control.
2. The harvest of the Vitazyme treatment was much better also in quality, since it was observed:
 - a. Larger fruit size.
 - b. More uniform fruits.
 - c. Greater consistency of the fruit.
 - d. Better defined division of carpels of the fruit.
 - e. More uniform color.
3. In addition to the previous features, in the Vitazyme treatment the following was observed:
 - a. Greater drought stress resistance.
 - b. Less damage in the fruit by sun spot.
 - c. Greater leaf growth.
4. The growers were convinced of the effect of Vitazyme and that this product by itself makes the difference in crops.

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2014 Crop Results

Vitazyme on Tomatoes

Researcher: Waking Novembre

Research organization: Acra Industries, Haiti

Location: Mirebalais, Haiti

Variety: Jocelyne Roma

Planting date: unknown

Experimental design: This experiment was part of a multi-crop testing program that was established in December of 2011, to evaluate the efficacy of Vitazyme for increasing crop yields in Haiti. The test area was 1 hectare (10,000 m²) for the treated and control plots.

1. Control

2. Vitazyme

Fertilization: unknown

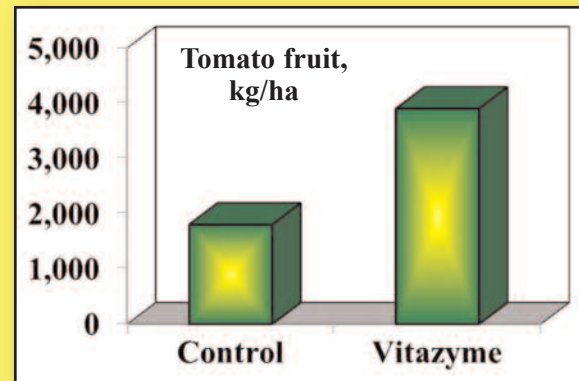
Vitazyme application: 1 liter/ha (13 oz/acre)

Harvest date: unknown

Yield results:

Treatment	Yield	Yield change
	kg/ha	kg/ha
Control	1,800	—
Vitazyme	3,900	2,100 (+117%)

**Increase in fruit yield
with Vitazyme: 117%**



Conclusions: A tomato study in Haiti revealed a great increase in yield with Vitazyme application, the fruit harvest 117% higher than for the untreated control. This program is shown to hold great promise in helping to alleviate food production problems in this developing country.

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2014 Crop Results

Vitazyme on Tomatoes

Researcher: Herman Guillermo Avila R.
 Cundinamarca, Colombia
 Romero), Municipality of Formeque, Colombia
Transplanting date: unknown

Research organization: Agroglobal S.A.,
Location: La Escuelita Farm (Mrs. Luis
Variety: Ichiban (indeterminate)
Root spacing: 1 meter

Experimental design: A tomato trial under greenhouse conditions was initiated using plots that were 4 meters wide (four rows) and 5 meters long (20 m²). The purpose of the trial was to compare the effects of Vitazyme, in three applications, on tomato yield and growth as compared to the untreated control in a replicated (three reps) completely randomized block design.

Rep 1	Rep 2	Rep 3	Vitazyme treatment*			
Vita 1	Control	Vita 2	Treatment	At 45 days	At 60 days	At 75 days
Vita 2	Vita 1	Vita 3		----- ml/liter of spray -----		
Vita 3	Vita 2	Control	Control	0	0	0
Control	Vita 3	Vita 1	Vitazyme 1	2.5	2.5	2.5
			Vitazyme 2	5.0	5.0	5.0
			Vitazyme 3	7.5	7.5	7.5

*Days after transplanting. Application rates are 0.25% (2.5 ml/liter), 0.5% (5.0 ml/liter), and 0.75% (7.5 ml/liter).

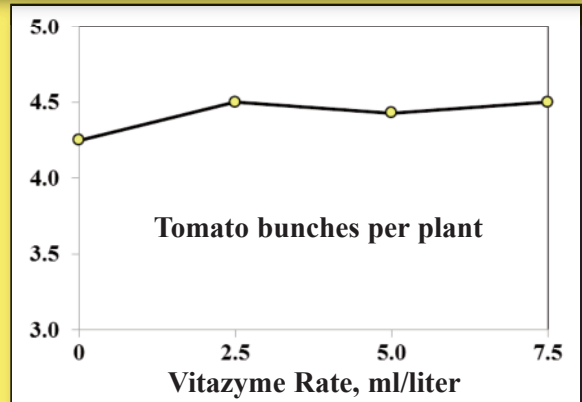
Fertilization: at recommended rates to all plots

Vitazyme application: 2.5, 5.0, or 7.5 ml/liter of spray applied at 45, 60, and 75 days after transplanting (see the table)

Plant and fruit development results: Five plants of a central row of each plot were used for these evaluations. Little effect on number per plant was noted with Vitazyme, though there was a 5 to 7% increase.

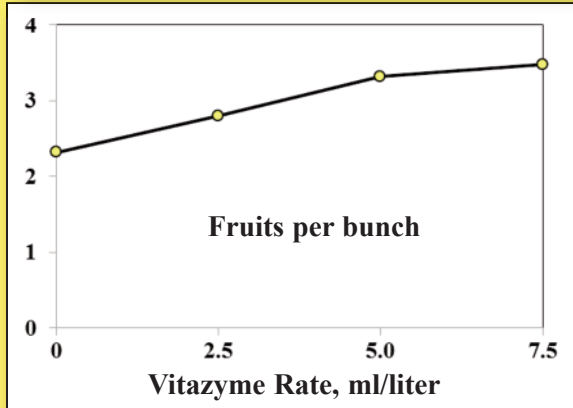
Bunches Per Plant

Treatment	Bunch number	Bunch changes
Control	4.25 a	—
Vitazyme 1	4.50 a	0.3 (+7%)
Vitazyme 2	4.43 a	0.2 (+5%)
Vitazyme 3	4.50 a	0.3 (+7%)



A nearly straight-line relationship exists between Vitazyme application rate and fruit number per bunch, the increase going from 21% at the low rate to 50% at the high rate.

Fruits Per Bunch

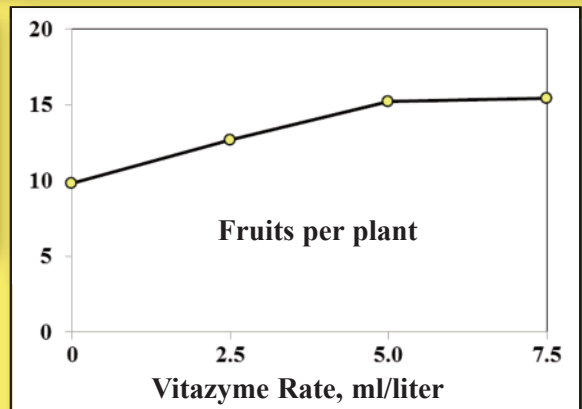


Treatment	Fruits per bunch	Fruits/bunch change
	----- fruits/bunch -----	
Control	2.32 c	—
Vitazyme 1	2.80 b	0.48 (+21%)
Vitazyme 2	3.32 a	1.00 (+43%)
Vitazyme 3	3.48 a	1.16 (+50%)

A great increase in the number of fruit per plant was noted at all three application rates, the 5.0 and 7.5 ml/liter rates giving 55 to 57% fruit increases above the control.

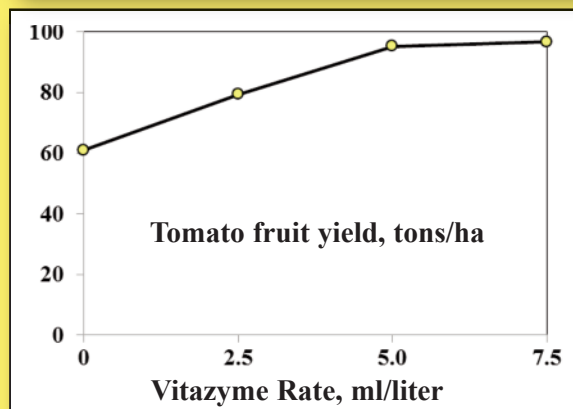
Fruits Per Plant

Treatment	Fruits per plant	Fruits/plant change
	----- fruits/plant -----	
Control	9.81 c	—
Vitazyme 1	12.68 b	2.87 (+29%)
Vitazyme 2	15.22 a	5.41 (+55%)
Vitazyme 3	15.42 a	5.61 (+57%)



Vitazyme elicited a major fruit yield increase at all three application rates, but especially at the two highest rates, when a 56 and 59% increase over the control were achieved.

Fruit Yield



Treatment	Fruit yield	Yield change
	----- tons/ha -----	
Control	61.0 c	—
Vitazyme 1	79.4 b	18.4 (+30%)
Vitazyme 2	95.3 a	34.3 (+56%)
Vitazyme 3	96.8 a	35.8 (+59%)

Conclusions: This replicated tomato study in Columbia proved that Vitazyme can greatly improve tomato fruit yield by increasing the fruit number per plant, which is a function of the number of fruits in each bunch. Application of 0.25% three times, at 45, 60, and 75 days after transplanting significantly increased fruit yield above the control, by 30%, while applications of 0.50 and 0.75% increased yields by 56 and 59%, respectively. These increases resulted from significant increases in fruits per bunch and fruits per plant.

Increase with Vitazyme at ...			
	0.25%	0.50%	0.75%
Fruits per bunch	21%	43%	50%
Fruits per plant	29%	55%	57%
Fruit yield	30%	56%	59%

Vitazyme is shown to be an excellent stimulator of plant growth and yield for Columbian tomato culture.

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2013 Crop Results

**Vitazyme on Husk Tomatoes
(*Physalis ixocarpa*)**

Researcher: Juan Carlos Diaz, Ph.D.

Farmer: Urbana Andrade Silva

Location: Tochapam, Palmarito, State of Puebla, Mexico

Variety: *Physalis ixocarpa*

Planting date: unknown

Experimental design: A field of husk tomatoes was divided into a 1.0 ha area treated with Vitazyme, and the rest of the field received Citoquin, another biostimulant. The objective of the study was to evaluate the relative effectiveness of the products on tomato growth and yield.

1. Citoquin

2. Vitazyme

Fertilization: unknown

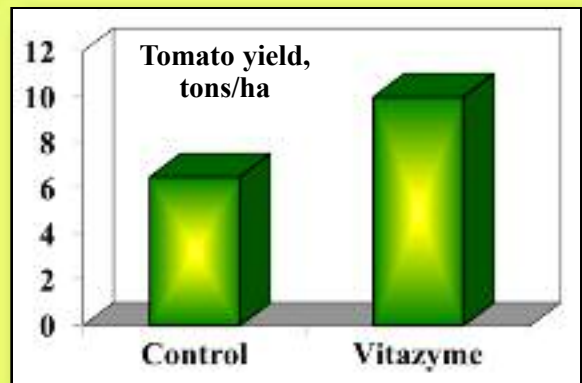
Vitazyme application: (1) 1 liter/ha at early bloom on June 5, 2012 (63 ml in each 25 liter backpack, at 200 liters/ha applied); (2) 1 liter/ha 15 days later on June 20, 2012

Citoquin application: applied in several applications (number not known) at 500 ml/ha. Citoquin has 250 ppm gibberellins, 200 ppm cytokinins, and 20 ppm auxins.

Yield results: The harvest date is not known.

Treatment	Yield tons/ha	Yield change tons/ha
Control	6.5	—
Vitazyme	10.0	3.5 (+54%)

**Increase in yield with
Vitazyme: 54%**



Growth results: Compared to Citoquin, Vitazyme produced ...

- Longer plant life
- Greater leaf area
- Darker green leaf color (more chlorophyll)

Conclusions: A husk tomato study in Mexico revealed that Vitazyme greatly increased fruit yield (+54%) from plants that had more leaf chlorophyll, were larger, and lived longer, showing that this product is an excellent adjunct to tomato culture in Mexico.

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2013 Crop Results

Vitazyme on Tomatoes

Researcher: Alejandro Reyes

Farmer: Victorino Pacheco

Location: Yecapixtla, Morelia, Mexico

Variety: red table

Experimental design: A greenhouse trial was conducted with Vitazyme on all rows except for two, which served as control rows. Both pre and post-transplant applications were made to determine the efficacy of the product for greenhouse tomato production.

1. Control

2. Vitazyme

Fertilization: unknown

Vitazyme application: During transplant growth, trays were dipped in a 1% solution. After transplanting, plants were drenched with Vitazym an undisclosed number of times.

Growth results: An evaluation in December of 2012 revealed the following with Vitazyme applications:

- **More flowers**
- **Less virus disease incidence.**

Yield results: No harvest date was given. **Two Vitazyme treated rows produced 450 kg more tomatoes than did the two untreated rows over 3.5 months of the cropping cycle.**

Conclusion: Although actual yields of the two treatments are not available in this Mexican greenhouse tomato trial, the Vitazyme treatment produced 450 kg more fruit than did the control, showing the efficacy of this program for tomato production in Mexico.

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2013 Crop Results

Vitazyme on Tomatoes

Researcher: Erg. Benjamin Hernandez Romero, Lucava, S.A.

Farmer: Eduardo Mejia

Location: Altamira, Tamaulipas, Guatemala

Variety: Tisset 8554 (salad tomato)

Row spacing: 1.9 meters

Row length: 180 meters

Experimental design: A tomato field was divided into Vitazyme treated and control areas. The treated area was 0.5 ha, which comprised 15 bed rows. The objective of the study was to determine the effectiveness of Vitazyme to affect tomato yield under irrigated conditions.

1. Control

2. Vitazyme

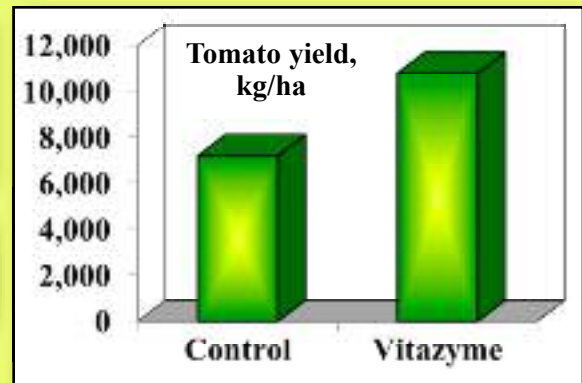
Fertilization: unknown

Vitazyme application: 1.5 liters/ha (750 ml in 50 liters of water for 0.5 ha) sprayed (1) 20 days after transplanting on October 10, 2012, at 15 to 25 cm. tall, (2) 30 to 40 days after transplanting, and (3) immediately after the first picking

Yield results: Only the first two pickings are recorded in this data.

Treatment	Yield kg/0.5 ha	Area yield kg/ha	Yield change kg/ha
Control	3,600	7,200	---
Vitazyme	5,400	10,800	3,600 (+50%)

**Increase in yield with Vitazyme:
50%**



Conclusion: The results of this Guatemala tomato trial were “extraordinary”, in the words of the researcher. A 50% yield increase was realized with the first two pickings, a result of greater and faster plant growth, superior blossoming, and more rapid development of larger fruit. These results show the potential of Vitazyme to improve the yields and profits of tomato growers in Guatemala.

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2012 Crop Results

Vitazyme on Tomatoes

Researchers: Nelson Najarro and Cristhian Mazariegos, Foragro Development, Guatemala City, Guatemala.

Location: San Manuel Chaparron, Department of Jalapa, Guatemala

Variety: Toliman

Soil type: silty clay

Climate: temperature, 25 to 35°C; relative humidity, 55% average

Planting rate: 4,500 plants/plot

Transplanting date: August 24, 2011

Altitude: 830 meters

Experimental design: Within a field of 0.5 ha receiving transplanted tomatoes, two plots of 2,500 m² were marked to evaluate tomato growth and yield characteristics caused by Vitazyme treatment versus an untreated control.

1. Control

2. Vitazyme

Fertilization: technical standard for high tomato production

Vitazyme treatment: (1) a drench of 500 ml of Vitazyme in 200 liters of water (0.25%) applied to the root zone of each treatment on August 25, 2011, two days after transplanting; (2) a repeat of the first treatment, 13 days later on September 6, 2011; (3) a foliar spray of 2.5 ml of Vitazyme per liter of water (0.25%) on September 13, 2011, 18 days after transplanting; (4) a repeat of the third treatment, 30 days after transplanting on September 26, 2011.

Flower and fruit results: On October 14 and 24, 45 and 65 days after transplanting, flowers and fruits per plant were counted.

45 days after transplanting

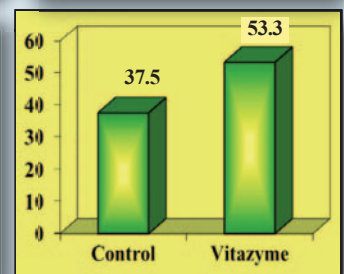
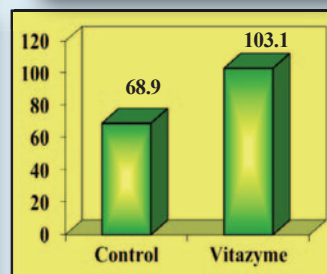
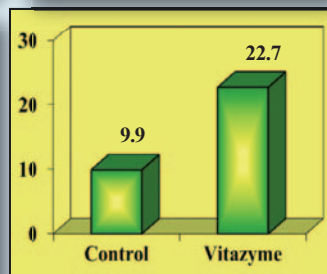
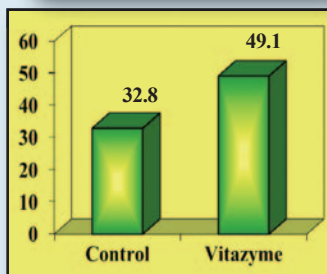
65 days after transplanting

Flowers

Fruits

Flowers

Fruits



Increase with Vitazyme

	<u>45 days a.t.*</u>	<u>65 days a.t.*</u>
Flowers	16.3 (+50%)	34.2 (+50%)
Fruits	12.8 (+129%)	15.8 (+42%)

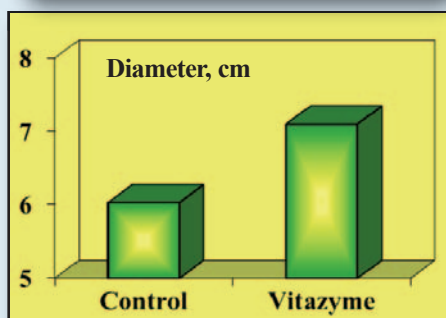
*a.t. = after transplanting

At both evaluation times the number of flowers and fruits were greatly increased with Vitazyme. In both cases, a 50% flower increase was realized, while 42% to 129% increases in fruit were produced.

Yield results: Five pickings were made, on December 1, 15, 22, and 29 of 2011, and on January 5 of 2012. Fruit characteristics were also measured at each picking.

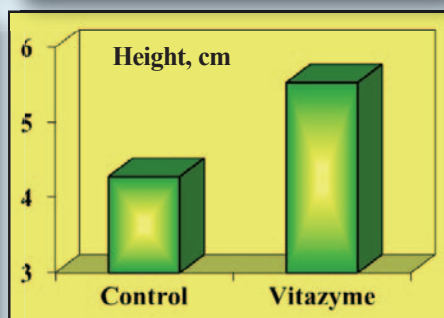
Treatment	Fruit diameter	Fruit height	Fruit weight	Fruits/plot	Yield/plot
	cm	cm	grams	number	kg
<u>December 1, 2011</u>					
Control	6.42	4.42	98.6	6,230.5	614.2
Vitazyme	7.33	5.42	106.0	7,836.5	830.7
<u>December 15, 2011</u>					
Control	6.50	4.50	102.58	12,094.5	1,240.7
Vitazyme	7.75	6.08	106.00	16,792.5	1,780.0
<u>December 22, 2011</u>					
Control	7.08	5.08	105.1	23,456.0	2,464.8
Vitazyme	8.58	7.00	107.2	28,733.8	3,079.3
<u>December 29, 2011</u>					
Control	6.25	4.42	83.4	21,623.5	1,803.8
Vitazyme	7.00	5.42	88.5	26,121.7	2,311.8
<u>January 5, 2012</u>					
Control	3.92	3.00	66.5	10,628.5	706.8
Vitazyme	4.83	3.75	79.0	13,434.0	1,061.3
	<u>Average</u>	<u>Average</u>	<u>Average</u>	<u>Total fruits/ha</u>	<u>Totaltons/ha</u>
Control	6.03	4.28	91.2	296,132	27.32
Vitazyme	7.10	5.53	97.3	371.674	36.25

Fruit Diameter, Ave.



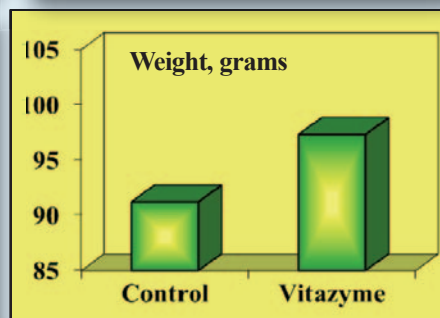
Increase in fruit diameter with Vitazyme: 18%

Fruit Height, Ave.



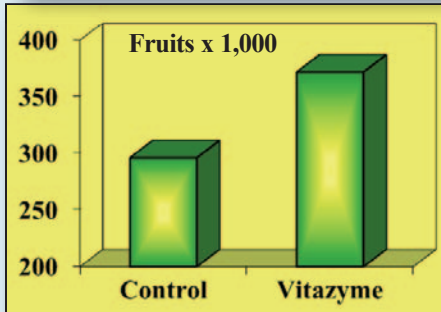
Increase in fruit height with Vitazyme: 29%

Fruit Weight, Ave.



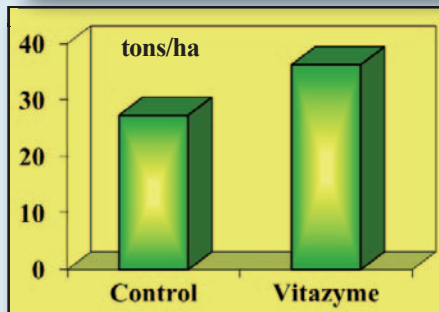
Increase in fruit weight with Vitazyme: 7%

Total Fruits Per



Increase in fruits per hectare with Vitazyme: 26%

Total Yield Per



Increase in yield per hectare with Vitazyme: 33%

All parameters of yield were improved by the four Vitazyme treatments: fruit diameter (18%), fruit height (29%), fruit weight (7%), fruits/ha (26%), and most importantly fruit yield (33%).

Conclusions: This Guatemalan tomato trial proved the great effectiveness of Vitazyme – applied four times during the growth cycle – to spur plant and fruit development and yield. Treated plants produced many more flowers and fruits during development (at 45 and 65 days after transplanting) than did the untreated control plants, exceeding the controls by 50% in flowers and 42% to 129% in fruits. During the five harvests, Vitazyme gave large increases in average fruit diameter (18%), fruit height (29%), fruit weight (7%), fruit per hectare (26%), and yield per hectare (33%). With major improvements in both size and yield, these effects of Vitazyme on the tomato crop prove its great efficacy for tomato growers in Guatemala.

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2008 Crop Results

Vitazyme on Tomatoes

Researcher: unknown

Variety: Volium

Watering: sprinkler irrigation

Seeding rate: unknown

Experimental design: A tomato field was divided into a Vitazyme treated portion and a control (untreated) portion to evaluate the effect of the product on tomato production.

Location: Zaporizge, Tavriya Skif, Ukraine

Soil type: unknown

Planting date: May 10, 2007

1. Control

2. Vitazyme

Fertilization: Soil application, preplant: 300 kg/ha 16-16-16% N-P₂O₅-K₂O; twice during vegetative growth 200 kg/ha 16-16-16% N-P₂O₅-K₂O. Foliar application: urea (45% N) twice at 7 kg/ha, and "rossasol" twice at 7 kg/ha.

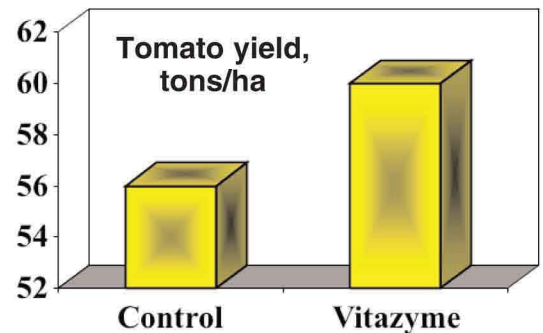
Vitazyme application: 1 liter/ha on the leaves and soil June 20, 2007, and again the first part of July, 2007

Harvest date: Harvest began August 1, 2007, and proceeded for several weeks.

Yield results:

Treatment	Fruit yield	Yield
increase		
	tons/ha	tons/ha
Control	56	—
Vitazyme	60	4 (+7%)

Increase in tomato yield: 7%



Conclusions: This Ukrainian study on tomatoes proved that Vitazyme can significantly increase the yield of tomatoes, using two foliar applications of the product during production. A root drench at planting using a dilute solution would likely have improved the yield even more.

Vital Earth Resources

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2007 Crop Results

Vitazyme on Tomatoes

Cuban Ministry of Sugar

Researchers: Jorge Gonzalez Acosta and Wilberto Gonzalez Marrero

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

Variety: unknown

Soil type: red ferralitic (ferralsol)

Water source: irrigation

Planting date: July 1, 2006

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

1. Control

2. Vitazyme

Fertilization: unknown

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

Plant observations during growth:

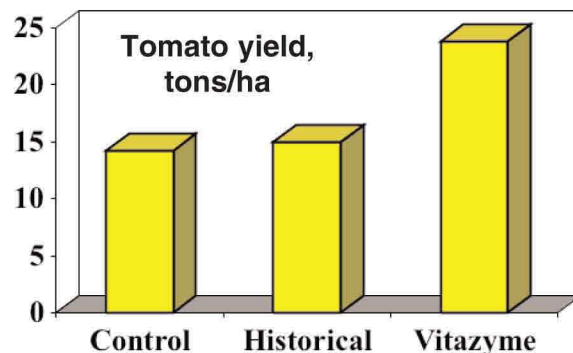
	<u>Control</u>	<u>Vitazyme</u>
Number of fruit	10 to 15 per plant	16 to 20 per plant
Foliage development	Less development	Larger leaves, more flowers
Fruit size	Smaller fruit	Larger fruit

Yield results:

<u>Treatment</u>	<u>Yield</u>	<u>Change</u>
	tons/ha	tons/ha
Control	14.2	—
Vitazyme	23.8	9.6 (+68%)
Historic yield	15.0	—

**Yield increase with Vitazyme:
68%**

Tomato Yield



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

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2004 Crop Results

Vitazyme on Tomatoes

Researcher: Isel Creach Rodriguez, Ph.D.

Location: Santiago de Cuba Experiment Station, Dos Rios, Palma Soriano, Santiago de Cuba

Variety: unknown

Soil type: Leptic haplustert

Transplanting date: January 1, 2004

Experimental design: Two areas of equal size (180 m²) were planted to tomatoes. One of the plots was treated with Vitazyme while the other was left untreated, and comparisons were made to evaluate treatment differences. There were 302 plants in the Vitazyme plot and 320 plants in the control plot.

1. Control

2. Vitazyme

Fertilization: unknown

Vitazyme application: 1 liter/ha twice, once at transplanting on January 20, 2004, and again on February 11, 2004

Growth results: Measurements of plant height and leaves/plant were made from randomly selected plants on January 21 and February 6, while fruit counts were made on February 23. Because of the experimental design of this study no detailed analyses of variance were made, although simple statistics were calculated.

Plant Height

January 21, 2004

Sample	Control	Vitazyme
	cm	cm
1	20	23
2	16	25
3	19	25
4	15	23
5	17	22
6	20	24
7	19	23
8	18	23
9	17	24
10	19	25
Mean	18.0	23.7 (+32%)

February 6, 2004

Sample	Control	Vitazyme
	cm	cm
1	32	55
2	35	52
3	43	54
4	38	54
5	42	53
6	39	55
7	35	55
8	44	50
9	42	52
10	39	54
Mean	38.9	53.4 (+15%)

Increase in plant height: 32%

Increase in plant height: 15%

Fruit Per Plant (February 23, 2004)

Sample	Control	Vitazyme
	----- fruit per plant -----	
1	28	31
2	22	38
3	23	32
4	20	35
5	19	30
6	19	31
7	22	31
8	21	32
9	21	33
10	19	31
Mean	21.4	32.4 (+42%)

Increase in fruit/plant: 42%

Yield results: Three pickings were evaluated in this study, and an estimated yield was also made for all projected pickings based on past plot studies.

Fruit Weight

Picking	Control			Vitazyme		
	Weight	Fruits	Mean weight	Weight	Fruits	Mean weight
	g	number	g	g	number	g
1 (March 5)	1,000	30	33.3	1,200	30	40
2 (March 12)	600	40	15.0	1,400	40	35
3 (March 18)	800	40	20.0	1,400	40	35
Mean			22.8			36.8 (+61%)

Increase in fruit weight: 61%

Estimated Yield

Control			Vitazyme		
Yield/plant	Plant number	Yield/plot	Yield/plant	Plant number	Yield/plot
0.5 kg	320	160 kg	1.2 kg	302	362.4 kg

Estimated yield increase: 125%

Conclusions: This tomato trial at Santiago de Cuba revealed some profound responses of tomatoes to two Vitazyme applications. Plant height at 21 days after transplanting was 32% greater with Vitazyme, while at 37 days after planting the height difference was 15% above the control. The number of fruit/plant was 42% greater than the control plants at 54 days after planting. Moreover, the average tomato weight averaged from three pickings was 61% greater with Vitazyme treatment, and the projected yield estimate was 125% greater than the control, despite the plot having 18 fewer plants. Clearly, Vitazyme represents as tremendous benefit for tomato production in Cuba.

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2006 Crop Results

Vitazyme on Tomatoes, a Seed Germination and Seedling Study

Researchers: S. Umesha¹, P. Hariprasad², S.A. Deepak³, S.T. Girish⁴, and Paul Sylie⁵

^{1,2}Department of Applied Botany, Seed Pathology, and Biotechnology, University of Mysore, Manasagangotri, Mysore, India

³National Institute for Agro-Environmental Sciences, Tsukuba, Japan

⁴Department of Botany and Microbiology, Yuvaraja's College, University of Mysore, India

⁵Vital Earth Resources, Gladewater, Texas, U.S.A.

Location: University of Mysore, Mysore, India

Variety: PKM-1, from the seed storage division of the University of Mysore

Experimental design: Various Vitazyme dilutions were prepared for seed soaking, and after drying were used to test seed germination, seedling vigor, seed mycoflora, field emergence, and dry seedling weight. Standard statistical methods were used for analysis of variance, and Duncan's Multiple Range Test at $P=0.05$ was used to compare treatment means.

Vitazyme treatment: Dilutions were used as follows: 0 (control), 0.001, 0.01, 0.1, 1, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 25, and 30%, prepared with sterile distilled water. Seeds were soaked at 26°C for 6 hours on a rotary shaker at 100 rpm, and then blot dried.

Seed Germination and Seedling Vigor

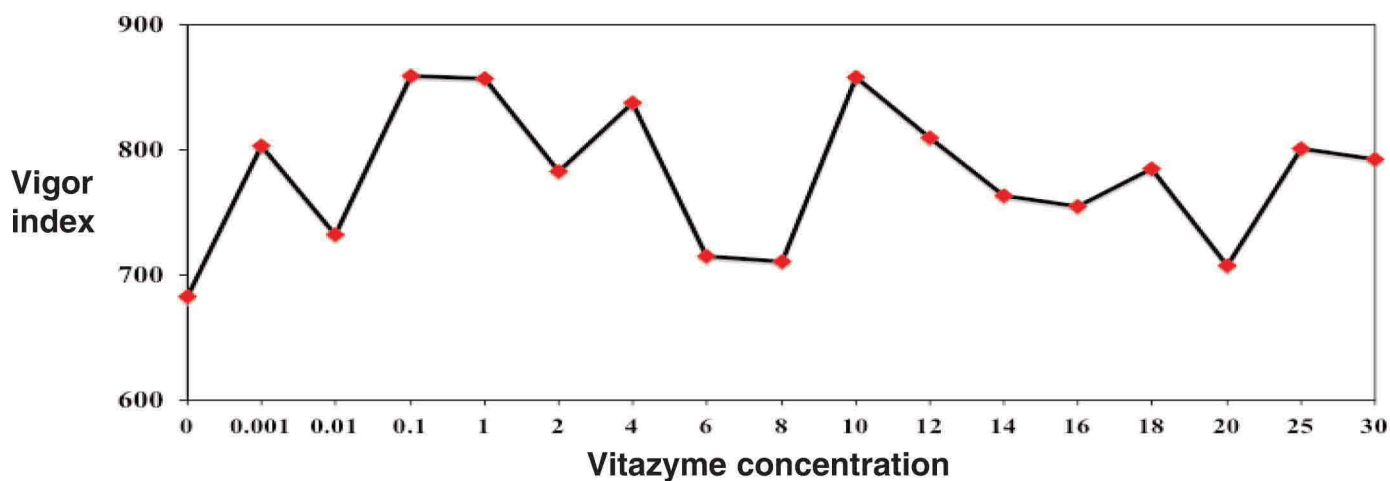
Methods recommended by the International Seed Testing Association were used. Seeds were rolled up on wet germination sheets and incubated in a seed germinator at $27\pm 2^\circ\text{C}$. Germination was determined as the percent of seeds sprouted and the vigor index was calculated as (mean root length + mean shoot length)(% germination). There were 4 replicates of 100 seeds each, repeated three times.

Vitazyme Concentration	Germination (%)	MRL (CMS)	MSL (CMS)	Vigor index
Control	63 ^{ab}	5.1±0.3 ^{ab}	5.6±0.8 ^b	683 ^f
0.001	63 ^{ab}	5.6±0.2 ^{ab}	7.1±0.4 ^{ab}	803 ^{abc}
0.01	60 ^b	5.2±0.2 ^{ab}	7±0.2 ^{ab}	732 ^{def}
0.1	67 ^{ab}	5.9±0.5 ^{ab}	6.8±0.8 ^{ab}	859 ^a
1	66 ^{ab}	5.8±0.5 ^{ab}	7.1±0.9 ^{ab}	857 ^a
2	61 ^{ab}	5.6±0.9 ^{ab}	7.2±0.3 ^{ab}	783 ^{bcd}
4	68 ^{ab}	6.1±0.2 ^a	6.1±0.2 ^{ab}	838 ^{ab}
6	62 ^{ab}	4.9±0.4 ^{ab}	6.6±0.3 ^{ab}	715 ^{ef}
8	60 ^b	5.3±0.6 ^{ab}	6.4±0.8 ^{ab}	711 ^{ef}
10	65 ^{ab}	5.6±0.3 ^{ab}	7.6±0.4 ^a	858 ^a
12	64 ^{ab}	5.5±0.4 ^{ab}	7.2±0.9 ^a	810 ^{abc}
14	61 ^{ab}	5.0±0.3 ^{ab}	7.4±0.2 ^a	763 ^{cde}
16	61 ^{ab}	5.0±0.3 ^{ab}	7.3±0.8 ^a	755 ^{cde}
18	64 ^{ab}	4.8±0.2 ^b	7.4±0.2 ^a	785 ^{bcd}
20	61 ^{ab}	4.8±0.4 ^b	6.7±0.7 ^{ab}	707 ^{ef}
25	70 ^a	4.7±0.9 ^b	6.7±0.8 ^{ab}	801 ^{abc}
30	64 ^{ab}	5.8±0.2 ^{ab}	6.5±0.3 ^{ab}	792 ^{abcd}

Values are the means of four replicates of 100 seeds each and repeated thrice.

MRL – Mean root length; MSL - Mean shoot length

Several Vitazyme treatments increased seed germination, and all Vitazyme treatments increased the vigor index versus the control. The 0.1, 1, 4, and 25% dilutions gave 66 to 70% responses, compared to 63% for the control, with vigor indices of up to 859, versus 683 for the control.



Increase in vigor index at 10% Vitazyme: 26%

Seed Mycoflora (Fungi)

The Vitazyme concentrations showing the greatest increase in seed quality parameters were selected to use in this study. The soaked seeds were subjected to a standard blotter method for analysis of seed mycoflora. The seeds were incubated at 25±2°C and in 12 hours of light followed by 12 hours of darkness. After 7 days of incubation the fungi were examined with stereo binocular microscopes. Four replicates of 100 seeds each were repeated three times.

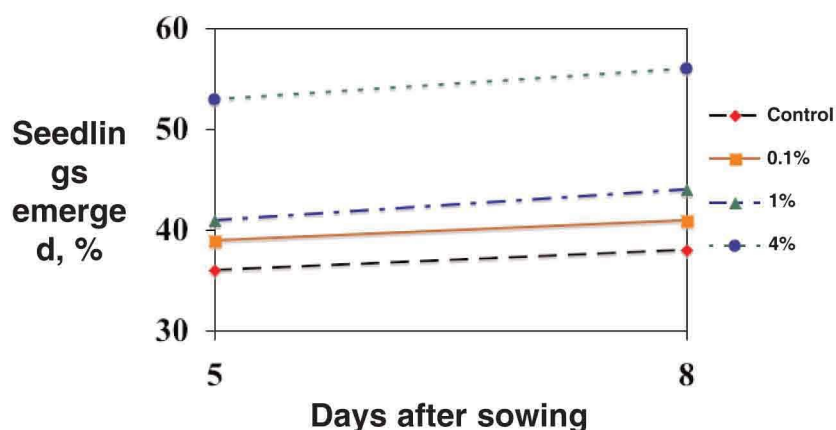
No significant changes were brought by Vitazyme in internal or external seed mycoflora.

Seedling Emergence

The same treatments used for the fungi tests were used in this evaluation. Seeds were sown in 20 x 30 meter plots using normal agronomic practices. Each treatment had four rows (each row a replicate) of 100 seeds each in a randomized block design for two seasons. Seedling emergence was recorded from day 3 to day 16.

Days after sowing	Vitazyme concentration			
	Control	0.001%	1%	4%
	----- seedlings emerged (%) -----			
5	36±1.1 ^f	39±0.5 ^{de}	41±0.5 ^d	53±0.5 ^b
8	38±0.3 ^{ef}	41±0.5 ^d	44±1.0 ^c	56±1.0 ^a

Values are the means of four replicates of 100 seeds each and repeated twice.



All concentrations of Vitazyme increased rice seedling field emergence, especially the 4% soak.

Increase in seedling emergence at 8 days after planting with 4% Vitazyme: 47 percentage points

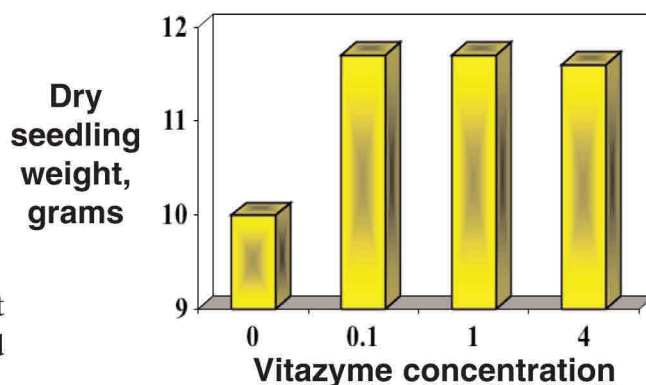
Dry Seedling Weight

Twelve-day-old seedlings were carefully removed from the soil and washed to remove soil particles, oven dried at 60°C for 48 hours, and weighed. Four replicates of 100 seedlings each were repeated three times.

Vitazyme concentration	Dry weight*
%	grams
Control	10±1.0 ^e
0.1	11.7±0.5 ^e
1	11.7±0.2 ^e
4	11.6±0.3 ^e

*The mean of four replicates of 100 seeds each.

Vitazyme at 25% seed soaking gave a 3.3% significant increase in seedling dry weight above the untreated control and the 16% soak.



Increase in dry seedling weight at 1 and 4% Vitazyme: 17%

Conclusions: For all parameters measured, Vitazyme significantly improved tomato germination and seedling performance above the untreated control, which received only distilled water. Especially effective were the 0.1, 1, and 4% concentrations for germination and seedling vigor. These three concentrations, used for the rest of the analyses, then displayed significant improvement in many cases in field seedling emergence and dry seedling weight. These results prove Vitazyme's great effectiveness as a seed treatment for tomatoes in India and other tropical countries.

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2004 Crop Results

Vitazyme on Tomatoes

Researcher: unknown

Research organization: INIFAT

Location: Cuba

Variety: INIFAT 28

Soil type: Leptic haplustert

Planting date: unknown

Transplanting date: unknown

Experimental design: A one hectare tomato field was divided into two parts, one treated with Vitazyme and the other left untreated, to determine yield and growth differences. All other treatments over the field were the same.

1. Control

2. Vitazyme

Fertilization: unknown

Vitazyme application: unknown

Yield results:

Treatment	Fruit yield	Change	Fruit number	Change
	tons/ha	tons/ha	number	number
Control	11.0	—	89,600	—
Vitazyme	13.0	2.0 (+18%)	115,200	25,600 (+29%)

Increase in tomato yield: +18%

Increase in fruit yield: +29%

Conclusions: Tomato numbers and yield were greatly increased by Vitazyme in this Cuban study. Relatively few details of this study are available.

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2004 Crop Results

Vitazyme on Tomatoes

Vegetable trial of the Cuban Ministry of Sugar

Researcher: unknown **Farm:** Aracelio Iglesias Diaz Agricultural Enterprise
Location: Mayajigua, Sancti Spiritus, Cuba **Soil type:** "gleyish" Vertisol
Varieties: Rome and Lignom **Planting date:** unknown **Plant spacing:** unknown
Experimental design: Two fields of tomatoes of the above varieties were divided so that one hectare of each received Vitazyme one time. Yield, fruit size, and other parameters were used to evaluate Vitazyme effects. Only one replicate was used.

1. Control

2. Vitazyme

Fertilization: compost only

Vitazyme application: 1 liter/ha to the plants after the first picking

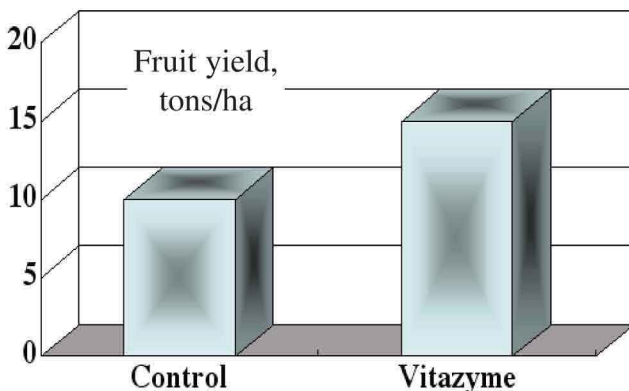
Harvest date: unknown

Yield results:

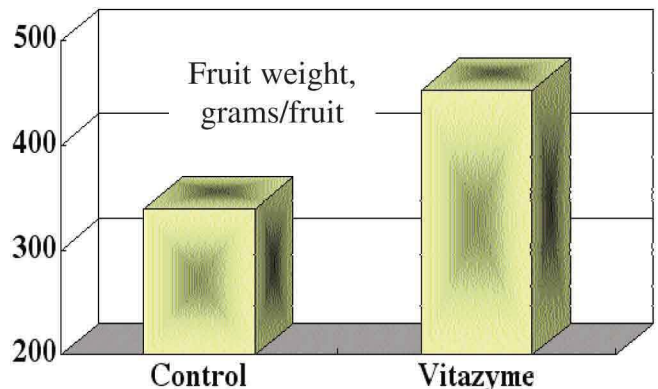
Rome Tomatoes

Treatment	Fruit yield ton/ha	Change tons/ha	Fruit weight g/fruit	Change g/fruit	Fruit color	Foliage color
Control	10	—	340	—	Light red	Light green
Vitazyme	15	5 (+ 50%)	453	113 (+ 33%)	Dark red	Dark green

Fruit Yield



Fruit Weight



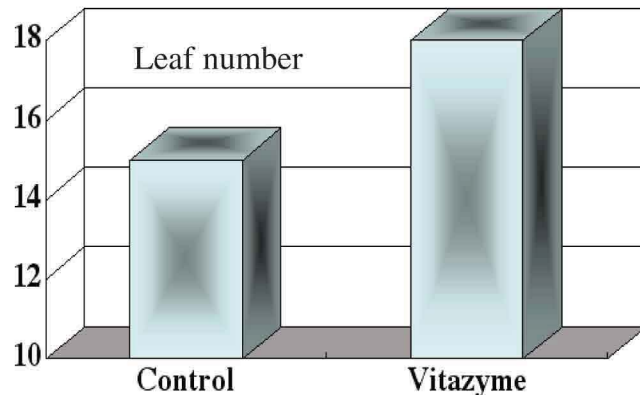
Increase in in fruit yield: + 50%

Increase in fruit weight: + 33%

Lignom Tomatoes

Treatment	Leaf number	Change
Control	15	—
Vitazyme	18	3(+ 20%)

Increase in fruit yield: + 20%



Conclusions: Vitazyme, applied only once after the first picking, caused a remarkable improvement in tomato yield: 50% for the Rome variety, and 20% for the Lignom variety. In addition, the treated Rome tomatoes were 33% heavier than the control fruit, and were darker red in color. Also, the foliage of the treated tomatoes was darker green, containing more carbon fixing chlorophyll than the foliage of the control tomatoes. In addition, after the last picking the Vitazyme treated plants continued with greater vigor and yield compared to the control.

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2003 Crop Results

Vitazyme on Tomatoes

Research Institute of Tropical Agriculture Fundamentals

Research organization: Research Institute of Tropical Agriculture Fundamentals [INIFAT]

Location: Santiago de las Vegas, City of Havana Province, Cuba

Soil type: red ferralitic

Variety: INIFAT-28, a salad tomato

Transplanting date: February 25, 2003

Previous crop: unknown

Experimental design: This study was designed to evaluate the effectiveness of Vitazyme to enhance tomato growth and yield. Six parcels of land on the INIFAT research station, each 50 m², were marked out in a pattern as shown here. Two treatments were applied, Vitazyme and an untreated control, with three replicates. Each plot received 100 tomato transplants. The data were analyzed using Analysis of Variance and Duncan's Multiple Range Test.

1. Control
2. Vitazyme

Control	Vitazyme	Control
Buffer	Buffer plot	Buffer plot
Vitazyme	Control	Vitazyme

Fertilizer treatments: standard for the institute

Vitazyme treatments: Seedlings: For the Vitazyme plots the seedlings were inserted for 10 minutes in a jar containing 60 ml in 10 l of water (a 0.6% solution) before planting.

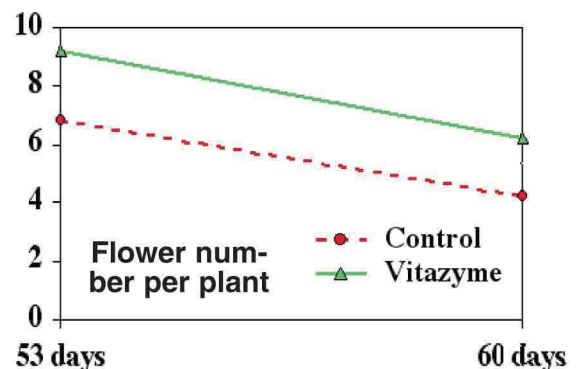
Field: A hand sprayer containing 50 ml of Vitazyme in 500 ml of water (a 1% solution) was used to apply to the leaves of the plants on March 12 (15 days after planting). A second application was made by sprayer on April 1, 34 days after planting.

Flower and fruit results: Flowers and fruits were counted on 50 plants from each plot on April 19 (53 days after planting) and April 26 (60 days after planting). These 150 plants for each treatment were then averaged to a per plant basis.

Flower Number Per Plant

Treatment	At 53 days		At 60 days	
	Flowers*	Change	Flowers*	Change
Control	6.8 b	—	4.2 b	—
Vitazyme	9.2 a	2.4 (+35%)	6.2 a	2.0 (+48%)

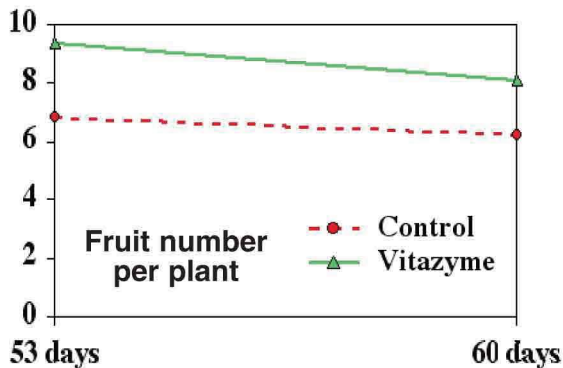
*Means followed by the same letter are not significantly different at P=0.05 according to Duncan's Multiple Range Test.



Increase in flowers at 53 days: + 35%
Increase in flowers at 60 days: + 48%

Vitazyme greatly enhanced the degree of flowering of treated plants versus untreated controls.

Fruit Number Per Plant



Treatment	At 53 days		At 60 days	
	Fruit*	Change	Fruit*	Change
Control	6.8 b	—	6.2 b	—
Vitazyme	9.4 a	2.6 (+38%)	8.1 a	1.9 (+31%)

*Means followed by the same letter are not significantly different at P=0.05 according to Duncan's Multiple Range Test.

Increase in fruit at 53 days: + 38%
Increase in fruit at 60 days: + 31%

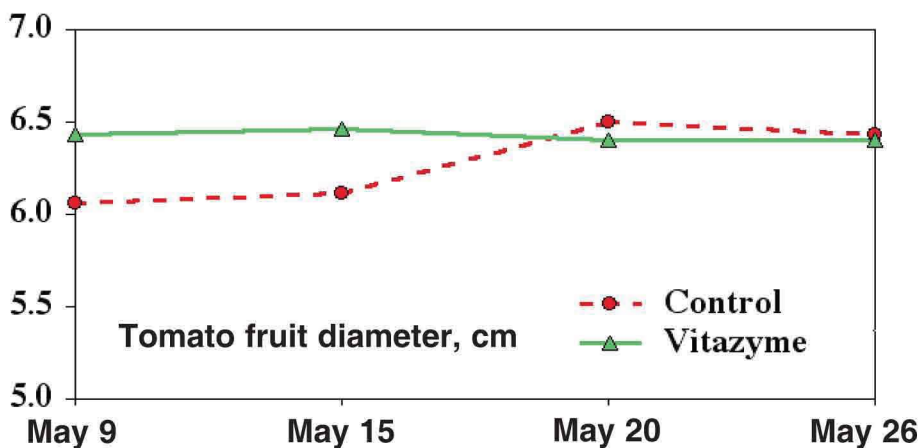
Vitazyme caused the treated tomato plants set about a third more fruit than the untreated controls.

Yield and fruit results: Tomato fruit were harvested on May 9, May 15, May 20, and May 26, which were 73, 79, 84, and 90 days after planting, respectively. Each value represents an average from 100 plants for each plot.

Fruit Diameter

Treatment	May 9*	May 15*	May 20*	May 26*	Total
Control	6.06 b	6.11 b	6.50 a	6.43 a	6.27
Vitazyme	6.43 a	6.46 a	6.40 a	6.40 a	6.42 (+2%)

*Means followed by the same letter are not significantly different at P=0.05 according to Duncan's Multiple Range Test.



The tomato fruit were significantly bigger for the May 9 and 15 harvests, but not for the May 20 and 26 harvests. The overall size of the fruit was, on average, larger with Vitazyme

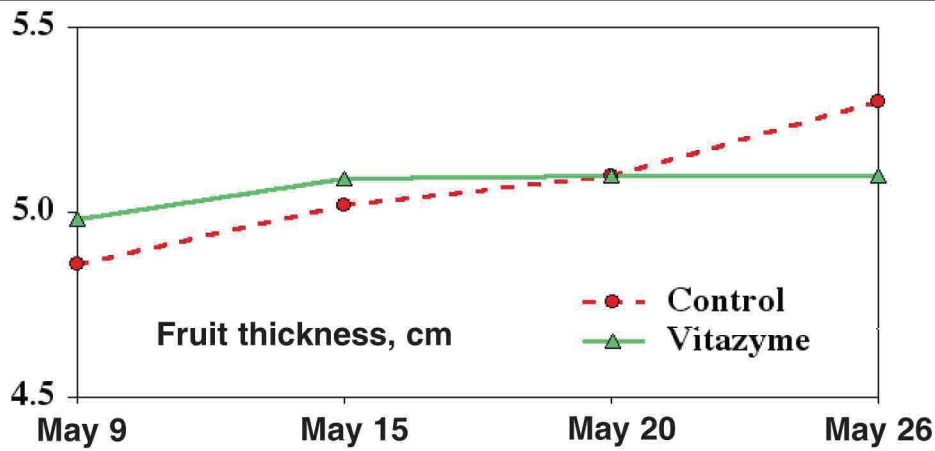
**Increase in
fruit diameter:
0.15 cm**

Fruit Height (Thickness)

Treatment	May 9*	May 15*	May 20*	May 26*	Total
Control	4.86 a	5.02 a	5.10 a	5.30 a	5.06
Vitazyme	4.98 a	5.09 a	5.10 a	5.10 a	5.06

*Means followed by the same letter are not significantly different at P=0.05 according to Duncan's Multiple Range Test.

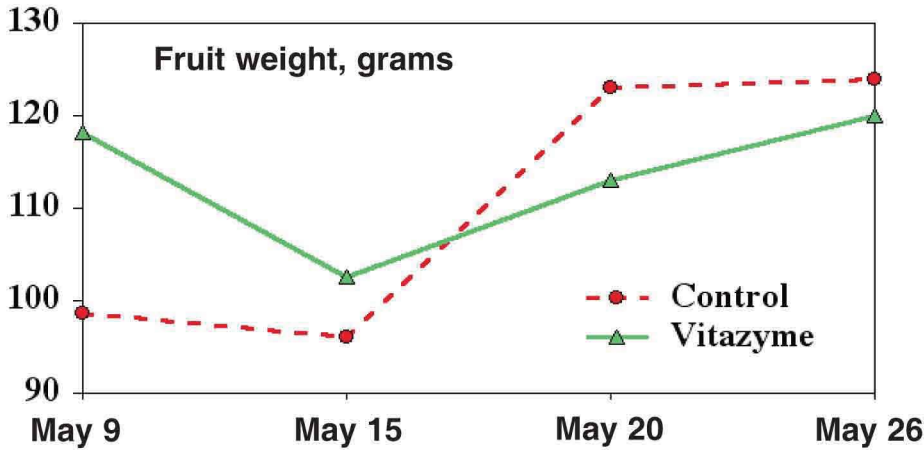
The height or thickness of the fruit did not differ greatly throughout the trial, being somewhat greater for Vitazyme at the beginning and a bit greater for the control at the end ... in line with the diameter changes.



Fruit Weight

Treatment	May 9*	May 15*	May 20*	May 26*	Total
	fruit weight, grams				
Control	98.6 b	96.1 b	123.0 a	124.0 a	110.4
Vitazyme	118.2 a	102.6 a	113.0 b	120.0 a	113.4 (+3%)

*Means followed by the same letter are not significantly different at P=0.05 according to Duncan's Multiple Range Test.

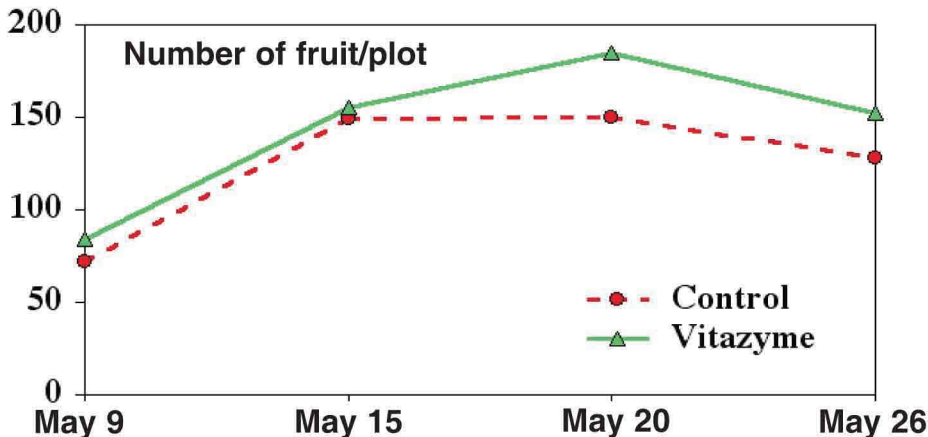


The Vitazyme treated fruit were significantly heavier for the first two harvests, but the control significantly outweighed the Vitazyme treatment on May 20. On May 26, fruit from the two treatments were statistically equal, but overall weight favored Vitazyme by 3%.

Increase in tomato fruit weight: +3%

Fruit Per Plot

Treatment	May 9	May 15	May 20	May 26	Total
	number of fruit/plot				
Control	72	149	150	128	448
Vitazyme	84	155	185	152	576 (+29%)

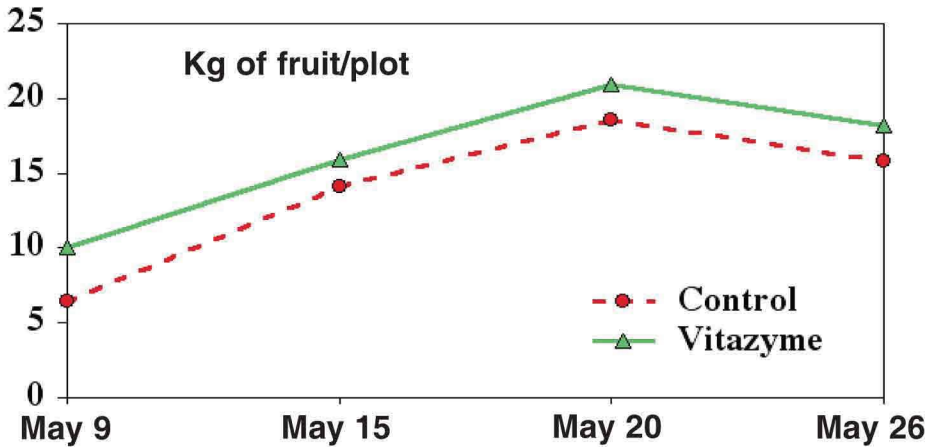


The total fruit from all plots shows a decided advantage from Vitazyme for all four harvest periods, giving an increase in total fruit of 29%.

Increase in fruit per plot: 29%

Yield Per Plot

Treatment	May 9	May 15	May 20	May 26	Total
			kg of fruit/plot		
Control	6.4	14.1	18.6	15.8	56.0
Vitazyme	10.0	15.9	20.9	18.2	65.0 (+16%)



The average yields of the various plots showed an increase with Vitazyme over the control at every picking, giving an overall yield increase of 16%

Increase in plot yield: +16%

Conclusions: A replicated research study using the tomato variety INIFAT-28 near Havana, Cuba, produced results that were highly favorable for Vitazyme. Using 100 plants per plot, the degree of statistical significance with fruit diameter and thickness, as well as fruit weight, was in most cases favorable to the Vitazyme treatment, while fruit numbers and harvested weights always favored Vitazyme. These data are summarized below.

Changes in Tomatoes with Vitazyme

- Change in flowers at 53 days: + 35%
- Change in flowers at 60 days: + 48%
- Change in fruit number at 53 days: + 38%
- Change in fruit number at 60 days: + 31%
- Change in fruit diameter: + 2% (0,15 cm)
- Change in fruit thickness: no change
- Change in fruit weight: + 3%
- Change in fruit number per plot: + 29%

The conclusions of the INIFAT study in terms of fruit number and yield are summarized in the table below.

Treatment	Number of fruit	Yield
	number	tons
Control	89,600	11.0
Vitazyme	115,200	13.0
Increase (%)	28	18

According to INIFAT researchers, **“The effectiveness of the growth and yield enhancing product ‘Vitazyme’ was manifested in the tests conducted. The application stimulates the number of fruits per plot, with a slight increase in the weight of each fruit. As a consequence, agricultural yields are 18% greater than when the product is not applied.”**

Vital Earth Resources

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2001 Crop Results

Vitazyme on Tomatoes

Daegu University, South Korea

Research coordinator: H.W. Chung

Researcher: unknown

Location: Greenhouse at Daegu University, Hayang Eup, Kyungju City, Kyungbuk, Korea

Soil type: "market bed" soil

Pot number: 26

Variety: House Doterang

Transplanting date: January 6, 2001

Seeding date: December 22, 2000

Experimental design: The pots were placed in a randomized design using three treatments and four replicates (2 plants per plot). The treatments were as follows:

1. Control

2. Vitazyme

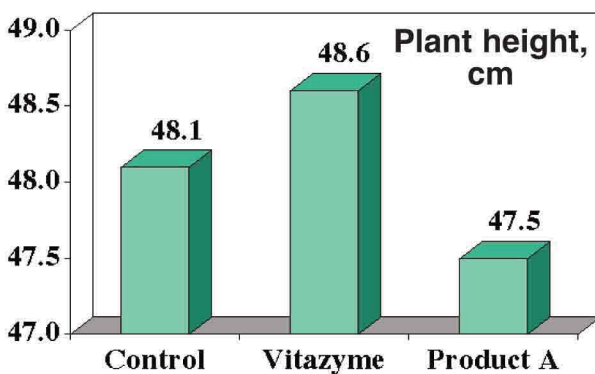
3. Product A

Fertilization: unknown

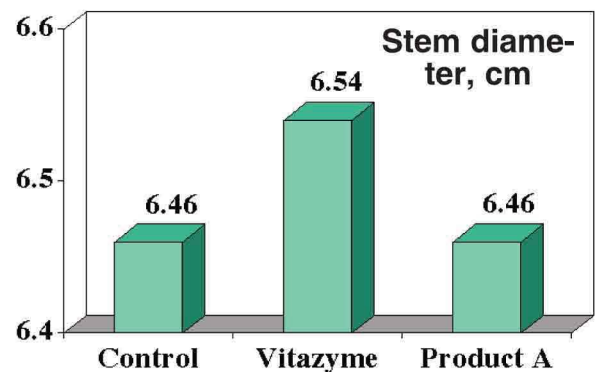
Vitazyme application: A 1:2,000 dilution (0.05%) was used in this study as a foliar spray on February 16 and 26, and March 6.

Data collection: Data were compiled on March 8, 2001.

Plant height

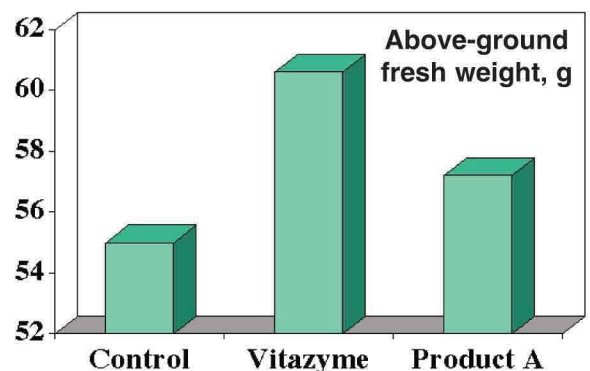


Stem diameter



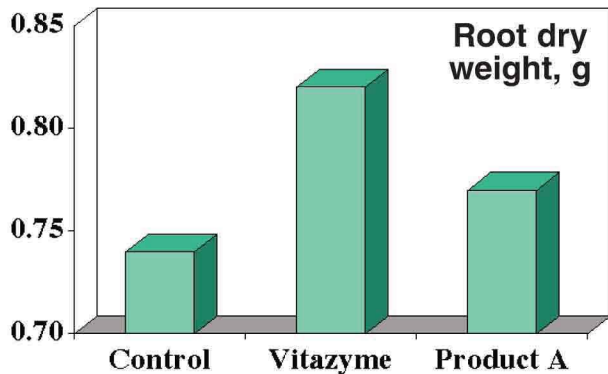
Fresh weight, above-ground portion

Treatment	Above-ground fresh weight	Change
(Control)	55.0	—
(Vitazyme)	60.6	+5.6 (+10%)
(Product A)	57.2	+2.2 (+4%)



Increase in above-ground fresh weight with Vitazyme: 10%

Root dry weight



Treatment	Root dry weight	Change
(Control)	0.74 g	—
(Vitazyme)	0.82	+0.08 (+11%)
(Product A)	0.77	+0.03 (+4%)

Increase in root dry weight with Vitazyme: 11%

Conclusions: Tomatoes in this Daegu University replicated trial performed very well with Vitazyme, increasing in fresh above-ground weight by 10% and in root dry weight by 11%. These increases should translate to higher yields and income versus the control and Product A if carried out to plant maturity. Vitazyme stimulates plant metabolism and growth of both leaves and roots through its powerful natural activators.

Vital Earth Resources

706 East Broadway, Gladewater, Texas 75647
(903) 845-2163 FAX: (903) 845-2262

2001 Crop Results

Vitazyme on Tomatoes

Producer: OPC Farms, Inc.

Location: Lemoorie, California

Planting date: first part of April

Row spacing: 60 inches, 14 inches in the row

Experimental design: A 155-acre field was used, with a 10-acre strip treated with Vitazyme.

Personnel: Steve Dabbs and Frank Costamagna

Variety: Heinz 410, a round cannery processing type

Soil type: unknown

Population: about 7,500 plants/acre

1. Control (most of the field)

2. Vitazyme

Fertilizer treatments: Fertilizers were applied according to a soil analysis. Preplant: 500 lb per acre of 3-10-10+Zn (1 gal/acre). Sidedress: 150 lb/acre of UN-32.

Vitazyme treatments: (1) Preplant, before transplanting, shanked in at 13 oz/acre 6 inches on either side of the rows, 2 inches above furrow level; (2) Sidedressed at 13 oz/acre in May, when UN-32 was applied at early blossom

Harvest date: August 2, 2001

Yield results: There was considerable variation in plant population across the field due to insect-borne diseases. Some insects were blown in by high winds from the Sierra foothills during the growing season and caused severe wilt disease and dieback. Thus, no accurate yield results could be obtained.

Quality results: Two major criteria were used to determine tomato quality: (1) color and (2) percent solids. Values from five loads each for the control and Vitazyme areas were used.

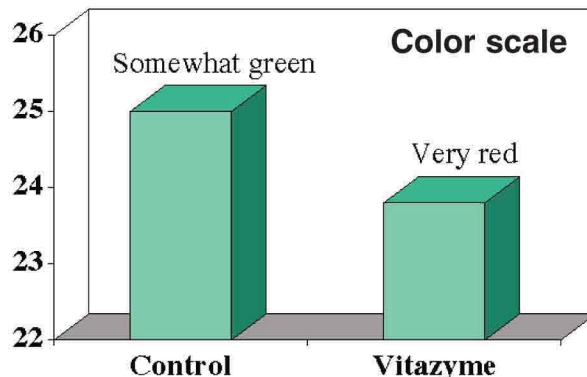
Tomato Color

	Control	Vitazyme	Change
	----- color scale -----		
Deepness of red*	25.0	23.8**	1.2

*Tomato color is evaluated by grinding the fruit and evaluating redness of the internal flesh. Green=30, red=24 (the ideal color).

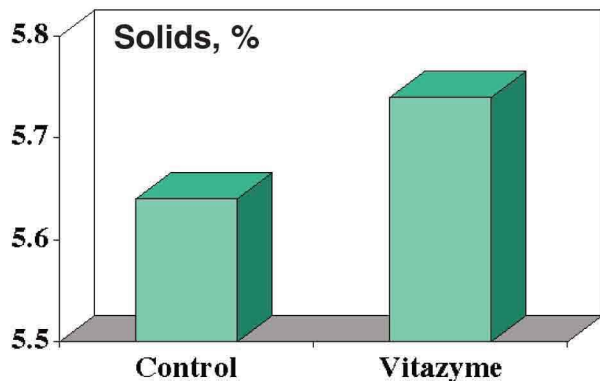
** Significantly different from the control at P=0.10, using a completely randomized design and the Tukey-Kramer Test.

Vitazyme produced a deep red internal tomato color which was ideal for processing. The control produced a greener colored tomato that was less desirable.



Improvement in color: 1.2 points

Percent Solids



	Control	Vitazyme	Change
	----- % -----		
Solids	5.64	5.74*	(+) 0.10

* Significantly greater than the control at P=0.19, using a completely randomized design and the Tukey-Kramer Test.

Improvement in solids: 0.1%

Income increase: There was a significant improvement in tomato yields with Vitazyme due to an increase in density of the fruit (0.1%).

Increase in yield due to an extra 0.1% solids 2.6087 tons/acre

Value of tomatoes (approximate) \$48.00/ton

Increase in income with Vitazyme: \$125.22/acre

Conclusions: Vitazyme significantly improved tomato quality in this large-scale commercial test. Both color and solids of the treated tomatoes were improved, yielding about 2.61 tons/acre more with \$125/acre more income as a result.

Vital Earth Resources

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2000 Crop Results

Vitazyme on Tomatoes ***A testimonial***

Grower: Steve Maze

Location: Fredonia, New York

Experimental design: An entire fresh market tomato production area was treated with Vitazyme and evaluated.

Researcher: Jim Barber, Agway, Inc.

Soil type: clay loam

1. Control

2. Vitazyme

Vitazyme applications: 13 oz/acre in the transplant water, and two more 13 oz/acre applications with cover sprays, beginning at fruit set

Fertilization: balanced fertilizer applications with regular cover sprays, especially fungicide sprays after fruit set

Comments: Jim Barber: **“The yield was higher than usual. Overall plant health was superior, and quality was consistent throughout the season. This treated crop, although planted later than some other fields in the area, was the first to ripen. Also, this crop continued to yield late in the season when others had quit, with good quality even late in the season.”**

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2000 Crop Results

Soil Foodweb Analysis of Vitazyme Effects On a Tomato Crop

Field researcher: Shepard Smith, Sunbow Farms, Corvallis, Oregon

Laboratory analyst: Elaine Ingham, Ph.D., Soilfoodweb Inc., Corvallis, Oregon

Experimental setup: Four 100-ft long rows, spaced 3 ft apart, were transplanted on June 3, 2000 (seeded April 5). The varieties Heinz (paste type), Celebrity, and Abe Lincoln (medium-large types) were used, and rows were divided into replicates of about 15 ft long. Five replicates for the control and Vitazyme treatments were selected, using 15-ft row sections randomly selected from the eastern side (three sections for each treatment) and western side (three sections for each treatment).

Soil sampling, laboratory analyses, and Vitazyme applications: All samples were analyzed for the following:

- | | | |
|-------------------------------|----------------------------|--------------|
| (a) Total and active bacteria | (b) Total and active fungi | (c) Protozoa |
| (d) Nematodes | (e) Mycorrhizal fungi | |

June 4: soil samples collected for analysis (all plots)

June 4: Vitazyme sprayed at 200 ml/plant of a 0.5% solution

June 12: soil samples collected for analysis (all plots)

July 3: soil samples collected for analysis (all plots)

July 3: Vitazyme sprayed at 200 ml/plant of a 0.5% solution

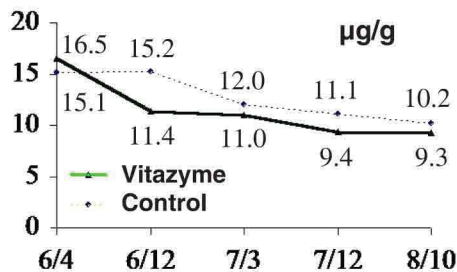
July 12: soil samples collected for analysis (Vitazyme plots only)

August 3: Vitazyme sprayed at 200 ml/plant of a 0.5% solution

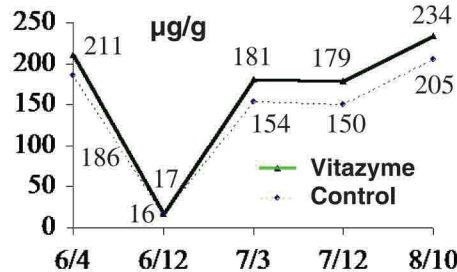
August 10: soil samples collected for analysis (all plots)

Results of analyses: All laboratory analyses were performed at the Soilfoodweb laboratory at Corvallis, Oregon. The control analyses for 7/12 are interpolated, since no evaluations were made.

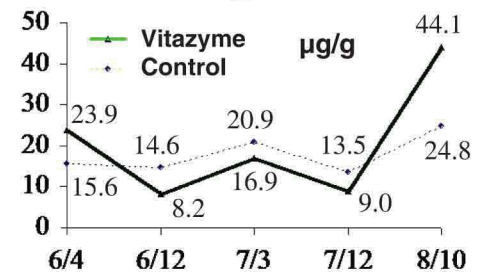
Active Bacterial Biomass



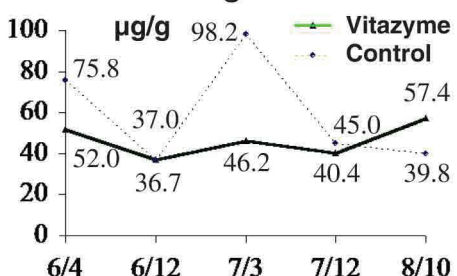
Total Bacterial Biomass



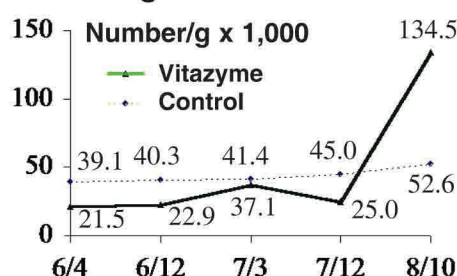
Active Fungal Biomass



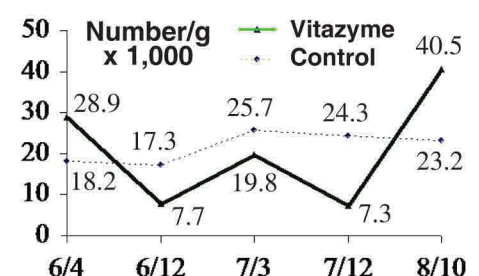
Total Fungi Biomass

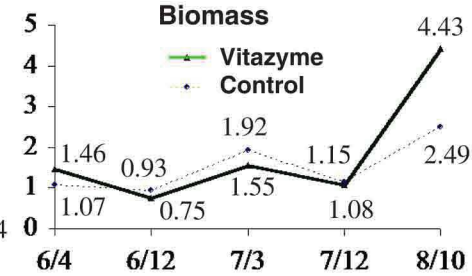
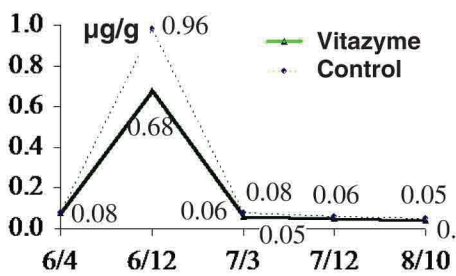
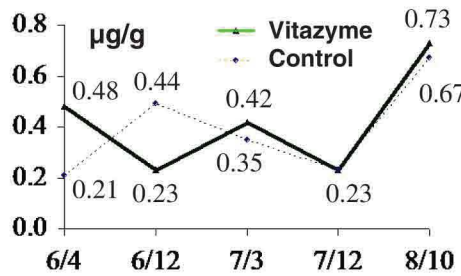
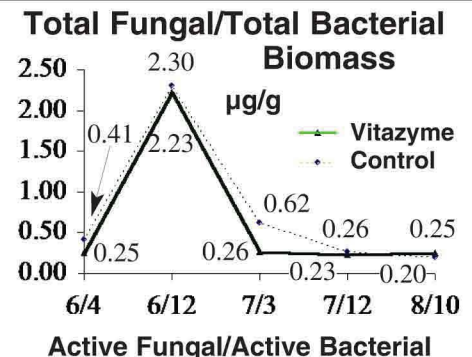
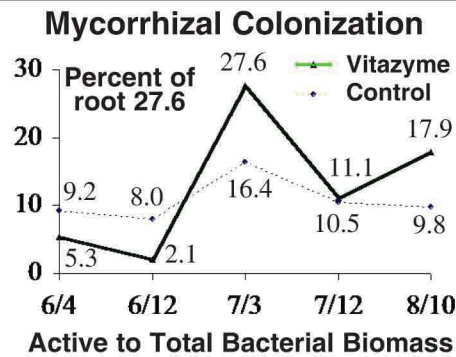
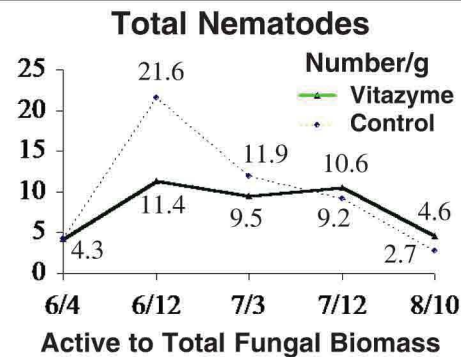


Flagellate Protozoa



Amoebae Protozoa





Analysis of the data:

June 4

The control treatments in general had better roots, as discovered before the first Vitazyme application on June 4.

June 12

Vitazyme had lower levels of active bacterial and fungal biomass, but about the same total biomass of each. There were fewer ciliate protozoa, indicating improved aeration and soil structure with Vitazyme. With Vitazyme there was less mycorrhizal colonization.

July 3

The Vitazyme treated soil had more total bacterial biomass, and a greater mycorrhizal population of the tomato roots (27.6% vs. 16.4%). The total fungal/total bacterial ratio was lower with Vitazyme, a favorable response.

July 12

A good number of bacteria-feeding nematodes was detected with Vitazyme, though fungi, bacteria, and mycorrhizae numbers were rather low. Active fungi to active bacteria ratios for the Vitazyme treatment were moving towards a good ratio, although nitrogen release was low, typical of the warm and dry summer period.

August 10

Warmer midsummer temperatures caused the Vitazyme treatments to exceed the control in nearly all categories:

- Total bacterial biomass (234 vs. 205 µg/g)
- Active fungal biomass (44.1 vs. 24.8 µg/g)
- Total fungal biomass (57.4 vs. 39.8 µg/g)
- Flagellate protozoa (134.5 vs. 52.6/g)
- Total nematode numbers, mostly beneficial (4.8 vs. 2.7/g)
- Mycorrhizal colonization (17.9 vs. 9.8%)
- Total fungal to total bacterial biomass (0.25 vs. 0.20)
- Active fungal to active bacterial biomass (4.43 vs. 2.49)
- Plant-available N-supply from predators (230 vs. 105 lb/acre)

Starting with inferior roots at the beginning of the test period, the soil foodweb composition and performance improved over the course of the growing season for these tomatoes as the three Vitazyme applications had their effect. By August 10 a more favorable level of fungi to bacteria had developed, flagellate protozoa had increased, mycorrhizae colonization was nearly double the control, and plant-available nitrogen had suddenly shot up. It is very likely that these effects of Vitazyme on the soil foodweb can explain many of the benefits to plant growth noted with its use.

Time	Plant Available N-Supply from Predators	
	Control	Vitazyme
6/4 (pre-treatment)	169	140
6/12	161	121
7/3	204	174
7/12	—	133
8/10	105	230

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2000 Crop Results

Vitazyme on Tomatoes

Caribbean Chemicals International

Agronomist: Fayaz Shah

Location: Aranguez, Trinidad, West Indies

Variety: Gempride

Transplanting date: November 3, 1999

Harvest date: January 19, 2000, and thereafter

Experimental design: An area of a field comprising 50 "banks", each with about 10 plants each (about 500 plants), was treated with Vitazyme. Plot size was 10x150 ft. An untreated area alongside was the control.

Fertility treatments: equal for all plots

Vitazyme treatments: Vitazyme was applied at 30 ml/gallon (about 1%) on the following dates: November 10, November 25, December 9, and December 29, 1999. These dates were 7, 22, 36, and 56 days after transplanting. Each plant received about 2 tbsp. of the Vitazyme solution when it was applied. The application was 3.27 liters/hectare.

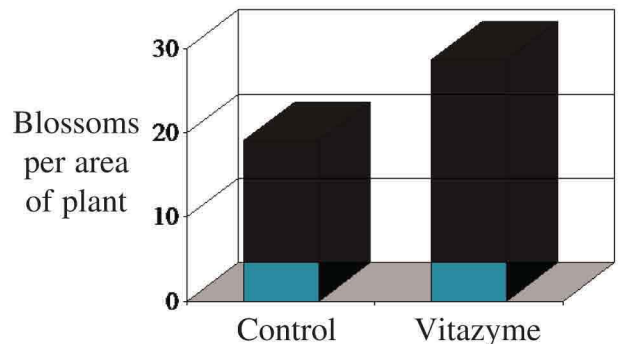
Growth results:

Flowers

An 8-inch X 8-inch frame was placed at random on top of 10 randomly selected plants, and the number of flowers was counted for the control and treated areas.

<u>Treatment</u>	<u>Flowers</u>	<u>Increase</u>
Control	19.1 b	--
Vitazyme	28.7 a	9.6 (+50%)

Means followed by the same letter are not significantly different at $P = 0.05$. $LDS_{0.05} = 2.7$.

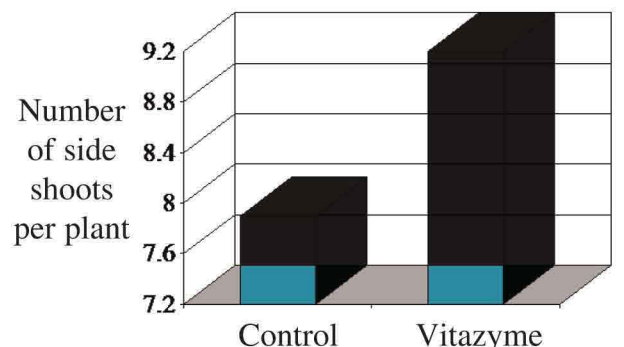


Side Shoots

The number of lateral shoots was counted on 10 randomly selected plants for both treatments. The control plants had thinner stems on average.

<u>Treatment</u>	<u>Side shoots</u>	<u>Increase</u>
Control	7.9 b	--
Vitazyme	9.2 a	1.3 (+16%)

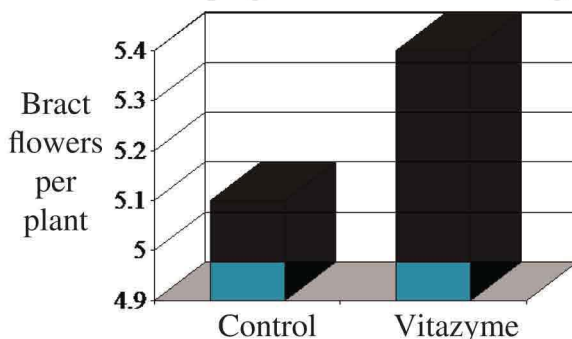
Means followed by the same letter are not significantly different at $P = 0.05$. $LDS_{0.05} = 1.1$.



Flowers On a Bract

The number of flowers contained on a bract (cluster of blossoms) was counted for 10 random plants of both treatments. Three of the Vitazyme treated bracts already had young fruit developing at the time of counting.

<u>Treatment</u>	<u>Bract flowers</u>	<u>Increase</u>
Control	5.1	--
Vitazyme	5.4	0.3 (+6%)

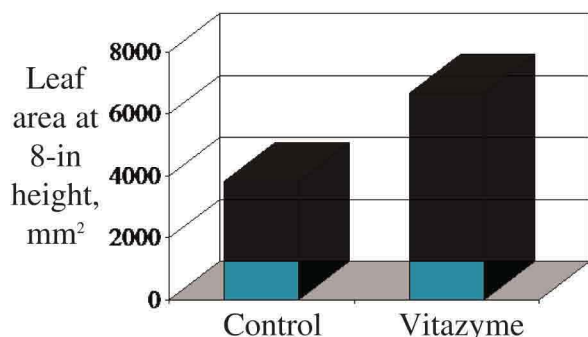


Leaf Area at 8-inch Height

Ten plants were selected randomly from each treatment, and the leaf area at the 8-inch height was measured.

<u>Treatment</u>	<u>Leaf area at 8-in, mm²</u>	<u>Increase</u>
Control	3,823 b	--
Vitazyme	6,674 a	2,851 (+75%)

Means followed by the same letter are not significantly different at P = 0.05. $LDS_{0.05} = 1,408 \text{ mm}^2$.



Fruits and Flowers On Two Plants

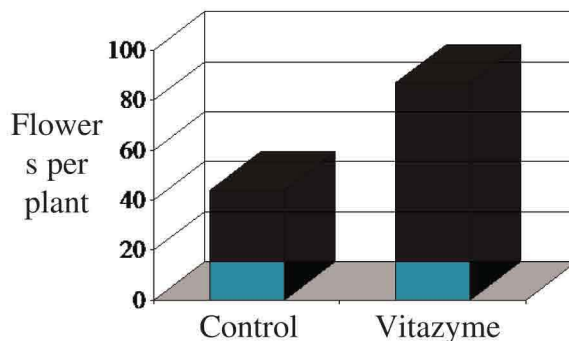
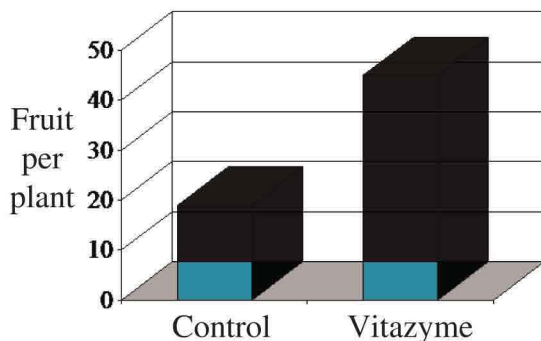
Two representative plants from each plot were pulled out, and the fruits and flowers were counted for each.

<u>Treatment</u>	<u>Fruit per plant</u>	<u>Increase</u>
Control	19 a	--
Vitazyme	45 a	26 (+137%)

No statistical differences appeared due to high variability of only two reps.

<u>Flowers per plant</u>	<u>Increase</u>
44 b	--
87 a	43 (+98%)

Means followed by the same letters are not significantly different at P = 0.05. $LSD_{(0.05)} = 6.4$.



Side Shoots, Plant Height, and Stem Circumference

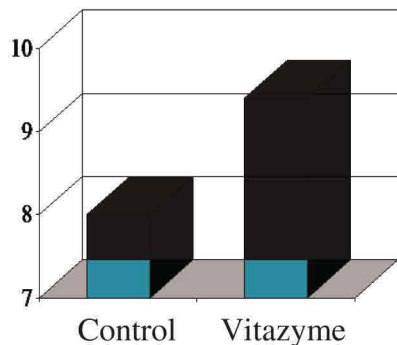
For 10 randomly selected plants for each treatment at a particular date, the number of side shoots, height, and stem thickness at 1 inch above soil level were measured.

<u>Treatment</u>	<u>Side shoots</u>	<u>Increase</u>	<u>Height, m</u>	<u>Increase</u>	<u>Stem circumference, mm</u>	<u>Increase, mm</u>
Control	8.0 a	--	1.16 b	--	39 b	--
Vitazyme	9.4 a	1.4 (+18%)	1.33 a	0.17 (+15%)	46 a	7 (+18%)

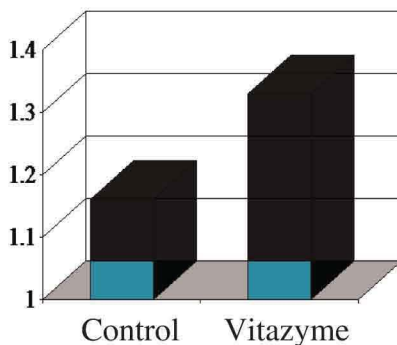
Means followed by the same letter are not significantly different at P = 0.05. LSD_{0.05} = 0.08.

Means followed by the same letter are not significantly different at P = 0.05. LSD_{0.05} = 4.9.

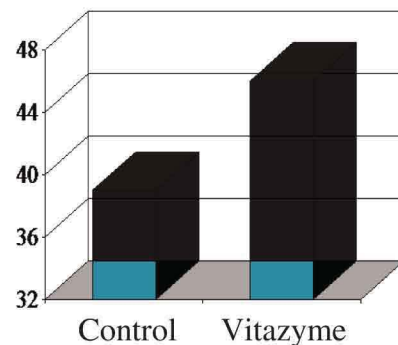
Side shoots



Height, m



Stem circum., mm

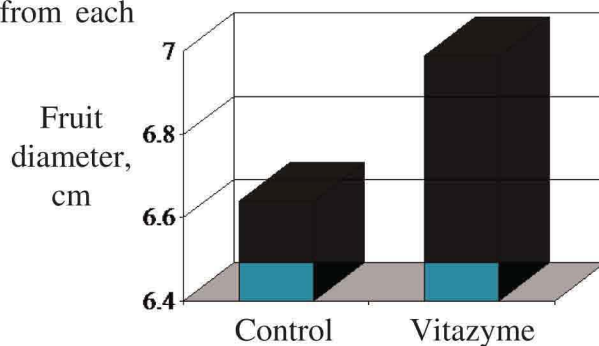


Fruit Diameter

For the first harvest five representative fruit were selected from each treatment, and the diameters were measured and averaged.

<u>Treatment</u>	<u>Fruit diameter, cm</u>	<u>Increase</u>
Control	6.64 b	--
Vitazyme	6.99 a	0.35 (+5%)

Means followed by the same letter are not significantly different at P = 0.05. LDS_{0.05} = 0.15.



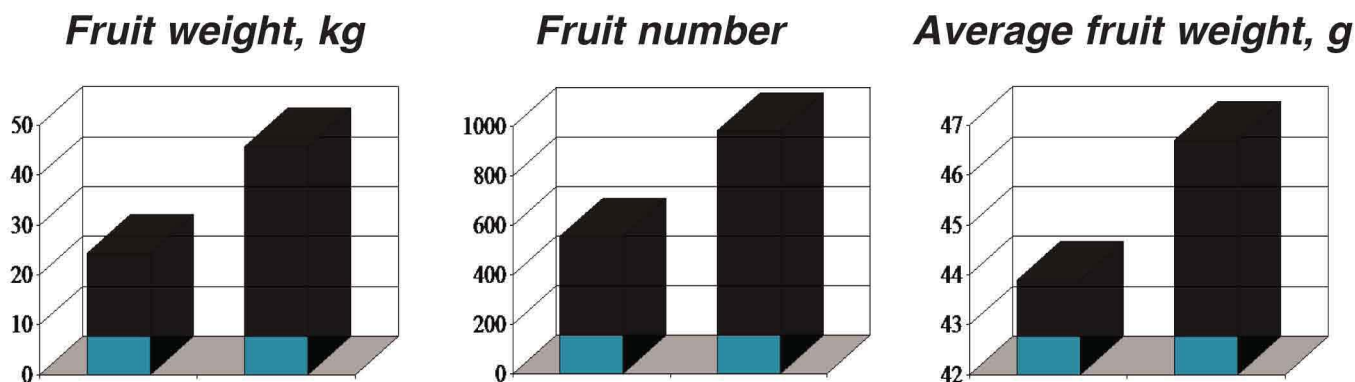
In-Field "Taste Test"

Participants in this study were given five fruits from each treatment and asked to select the superior flavor of fruit. Vitazyme treated tomatoes received higher taste ratings than did the control tomatoes.

Yield results: Tomatoes were harvested on several dates from the two treatments, and records were kept on fruit weight and number of fruit. From these values the average fruit weights were calculated. Harvest dates were January 19, 25, and 31, February 3, 7, 11, 14, 18, 21, 25, and 28, and March 3 and 8, 2000. Green and small fruit was also tabulated, but are not included in the data on the next page.

<u>Treatment</u>	<u>Fruit weight</u> -----kg-----	<u>Increase</u>	<u>Fruit number</u> -----number-----	<u>Increase</u>	<u>Average fruit weight</u> -----grams/fruit-----	<u>Increase</u>
Control	24.333	--	554	--	43	-- (54.1 lb)
Vitazyme	45.792	21.459 (+88%)	980	426 (+77%)	46.7	2.8 (+6%) (101.8 lb) (47.3 lb)

A statistical analysis of these data was not conducted because fruit weight and fruit number were for the entire plots. No replicated plot samples were collected.



Conclusions: Vitazyme greatly enhanced tomato production in this Trinidad study. Growth parameters as well as total production were substantially improved, as summarized in the following table.

Yield increase: 88%

Parameter	Control	Vitazyme	Increase
Flower number (early)	19.1 b	28.7 a	+50%
Side shoots (early)	7.9 b	9.2 a	+16%
Flowers on a bract (early)	5.1	5.4	+6%
Leaf area at the 8-in height, mm ²	3,823 b	6,674 a	+75%
Fruit per plant	19	45	+137%
Flowers per plant	44 b	87 a	+98%
Plant height, m	1.17 b	1.33 a	+15%
Side shoots (late)	8.0	9.4	+18%
Stem circumference, mm	39 b	46 a	+18%
Fruit diameter, cm	6.64 b	6.99 a	+5%
Taste test	--	Superior	
Total fruit weight, kg	24.333	45.792*	+88%
Total fruit number	554	980*	+77%
Average fruit weight, g/fruit	43.9	46.7*	+6%

Note: Values in bold are significantly greater than the control at P = 0.05.

* No statistics were able to be applied for these values.

Vitazyme application for this tomato crop in Trinidad proved to be highly advantageous, increasing the overall yield by 88%.

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2000 Crop Results

Vitazyme on Tomatoes ***A testimonial***

Farmer: Steve Dabbs, O.P.C. Farms, Inc.

Location: Hanford, California

Variety: 370's (plants)

Soil type: sandy loam

Irrigation: furrow

Experimental design: A production field was separated into control and Vitazyme treated areas.

1. Control

2. Vitazyme

Fertilization amount: according to soil test

Vitazyme application: 13 oz/acre at planting, 13 oz/acre knifed in with fertilizer

Observations: The Vitazyme treated plants displayed superiority to the control plants during the season, with better color and size of the plantings. At harvest the treated area was not kept totally separate from the control area, so accurate yield results were impossible. However, the following observations on the Vitazyme treated tomatoes were made.

- The fruit was bigger.
- The color was more uniform.
- The yield was likely one to two tons/acre greater . . . possibly more.
- The solids of the fruit were higher

A repeat of this study will be done in 2001 to obtain production figures.

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1999 Crop Results

Vitazyme on Tomatoes

Caribbean Agricultural Research and Development Institute (CARDI)

Researcher: Pathleen Titus

Location: Trinidad

Planting date: November 10, 1998

Variety: Kada hybrid

Planting rate: 14 plants/6-meter row

In-row spacing: 2.3 plants/meter

Experimental design: Five replicates of a randomized complete block design were placed on a uniform soil area of the Ramdial Ramtahal Farm. Each plot was 6x6 m (0.0036 ha), with six rows per plot and 14 plants per row (84 plants per plot). The rows were spaced 1.5 meters apart. Treatments were as follows:

1. Control (no Vitazyme)

2. Vitazyme applied at planting and early bloom

Fertility treatments: Planting to early bloom: 28 g/plant each week of a 12-12-17-2% N-P₂O₅-K₂O fertilizer. Flowering to the end of the trial: 28 g/plant each week of a 13-13-21 N-P₂O₅-K₂O fertilizer.

Vitazyme applications: (1) Root dip at planting, using 0.5% Vitazyme; (2) Vitazyme at 1 liter/ha sprayed on the leaves and soil at early bloom.

Harvest date: February 2, 1999

Yield results: One replicate was discarded due to bacterial wilt.

TOMATO FRUIT WEIGHT

Treatment	Replicate			
	1	2	3	4
1. Control	659	640	638	604
2. Vitazyme	688	695	659	602

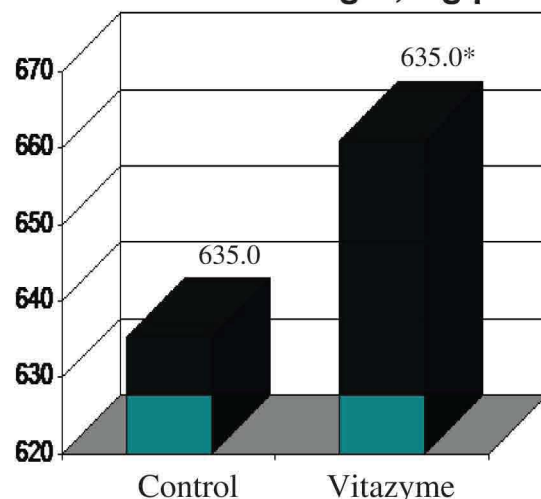
Treatment	Fresh weight, kg/plot	Increase, kg/plot
1. Control	635.3	--
2. Vitazyme	661.0 *	25.7 (+4%)

*Significantly greater than the control at P=0.10 according to Tukey's Honestly Significant Difference. $LSD_{0.10} = 27.7$.

Treatment	Fresh weight	
	Kg/hectare	Lb/acre
1. Control	176,486	159,014
2. Vitazyme	183,626 *	165,447 *

*Significantly greater than the control at P=0.10 according to Tukey's Honestly Significant Difference. $LSD_{0.10} = 27.7$.

Tomato Weight, Kg/plot



Yield increase: 6,433 lb/acre*

Income increase: \$1,929.90/acre

[*Based on an average tomato price of \$0.30lb.]

Comments: Careful examination of the tomato plants during the study revealed that both **root and shoot growth were more prolific with Vitazyme treatment.** Moreover, weekly flowering data showed that **Vitazyme treated plants flowered at least two or three days before the control plants.** **Earlier fruit development with Vitazyme** confirmed these flowering observations.

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1999 Crop Results

Vitazyme on Tomatoes

Caribbean Chemical International

Researcher: Richard Ramdin, agronomist Farmer: Subadra Samaroo Location: Trinidad, West Indies

Planting date: April 6, 1999

Harvest date: June, 1999

Variety: Kada

Experimental design: One portion of a field was selected to place three beds (reps) of tomatoes, on which 15, 20, and 30 ml/gal (about 0.5, 0.7, and 1 oz/gal, or about 0.5, 0.7, and 1%) Vitazyme rates were placed. Controls were also interspersed in these beds. The treated beds had about 90 plants each, and the control had 30 plants each.

1. Control
2. Vitazyme at 15 ml/gal on the leaves and soil
3. Vitazyme at 20 ml/gal on the leaves and soil
4. Vitazyme at 30 ml/gal on the leaves and soil

Fertility treatments: Equal for all plots

Vitazyme application: The 15, 20, and 30 ml/gal rates were applied at three times:

- (1) At transplanting to the soil and foliage
- (2) Two weeks after transplanting to the foliage
- (3) Five weeks after transplanting to the foliage

Each plant received about 2 tbsp of the Vitazyme solution each time it was applied.

Growth results:

Two weeks after the transplant application

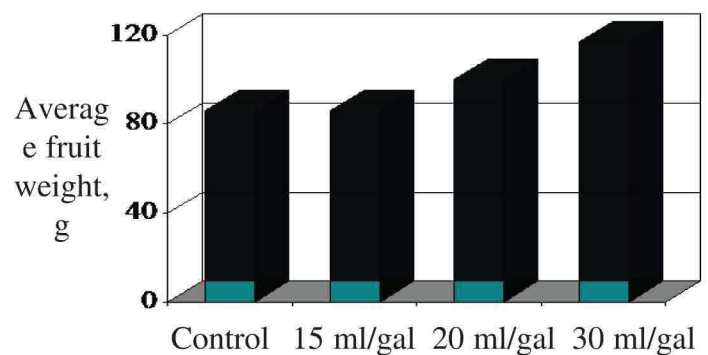
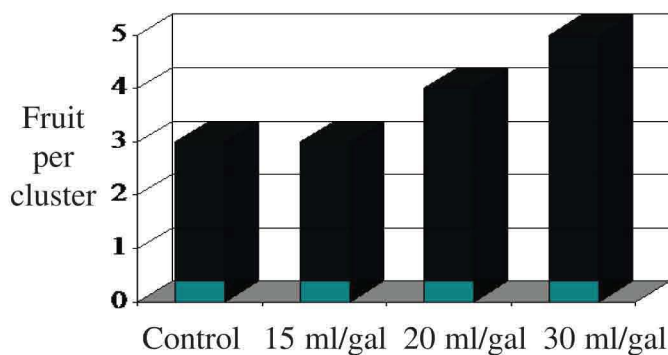
Parameter	15 ml/gal	20 ml/gal	30 ml/gal
Roots	Similar to control	Good growth	Many fibrous roots, twice the next best plot
Leaves	About 1 cm longer than controls	About 2 cm longer than the 15 ml rate	About 2 to 3 cm longer than others
Vigor	Average, like the controls	Good	Excellent

Six weeks after the transplant application

Parameter	Control	15 ml/gal	20 ml/gal	30 ml/gal
Roots	Least roots; longest roots about 12 cm long	A few more fibrous roots than controls; long roots 0.5 cm longer than controls	Good; many fibrous roots, and longest roots 2 to 3 cm longer than control	Excellent; large areas of fibrous roots, and longest roots 3 to 5 cm longer than others
Leaves	Smallest; lightest green	A bit bigger and darker than controls	Good leafing	About 3 to 5 cm longer than others
Stems	Smallest	Good	Good	Twice as thick as others
Side shoots	Fewest	3 per plant	2 to 3 per plant	4 per plant
Vigor	Least	Good	75% excellent	83% excellent
Flowering	6 weeks after transplanting; 3 flowers to bear fruit	Same time as controls (about 6 wks); fruit set 66% better than controls; 3 to 4 flowers per cluster; 2 to 3 fruit bearing	68% with flower buds 2 to 3 days before controls; 5 to 6 per cluster, and 4 to 5 fruit bearing	95% with flower buds one weeks earlier than others; 5 to 6 per cluster, and 5 fruit bearing

Yield results: No per acre yields were determined

Treatment	Pickings	Average fruit weight (10 fruit)			Fruit per clusters	Fruit color	Fruit character
		First picking	Last picking	Average			
		g	g	g			
Control	9	108	63	86	3	Light red	Light
15 ml/gal	9	108	63	86	3	Red	Light
20 ml/gal	9	124	76	100	4	Deep red	Solid, juicy
30 ml/gal	10	138	95	117	5	Deep red	Blocky, solid, juicy



Increase in fruit weight (30 ml/gal): 36%

Conclusion: The 30 ml/gal rate of Vitazyme produced the best growth and yield response in this West Indies study. Besides producing more fruit per cluster and larger fruit, the treated tomatoes flowered longer and bore fruit an extra two weeks than any other treatment.

Vital Earth Resources

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1999 Crop Results

Vitazyme on Tomatoes

Caribbean Chemical International

Researcher: Richard Ramdin, agronomist

Location: Trinidad, West Indies

Variety: Heatmaster

Transplanting date: September 19, 1999

Experimental design: A tomato field was divided into two treatments on equivalent soil types:

1. Control (no Vitazyme)

2. Vitazyme

Fertility treatments: At transplanting, 15 g/plant in the planting hole of 12-24-12; 7 to 10 days later, same as above topdressed; 3 and 5 weeks after transplanting, 15 g/plant of a 12-12-17-2(Mg); 7 and 10 weeks after transplanting, 15g/plant of a 9-6-24.

Vitazyme treatments: A 1% Vitazyme solution was sprayed over the leaves and soil on 9/21, 10/6, and 10/24.

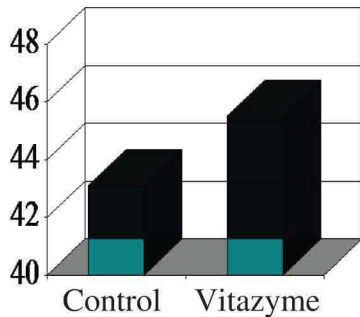
Growth and yield determinations, first time: On **November 10**, ten randomly selected plants from each treatment were selected and analyzed for the following parameters.

Plant Height

Control.....43.1 cm

Vitazyme.....45.5 cm*

(*significant at P=0.16; Bartlett Test)



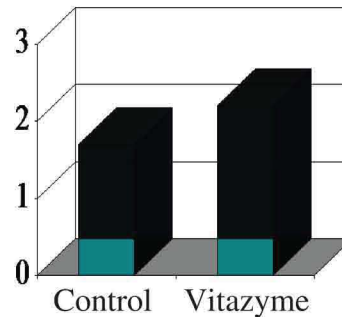
**Height
increase:
6%**

Stem Circumference

Control.....1.7 cm

Vitazyme.....2.2cm***

(***significant at P=0.001; Bartlett Test)



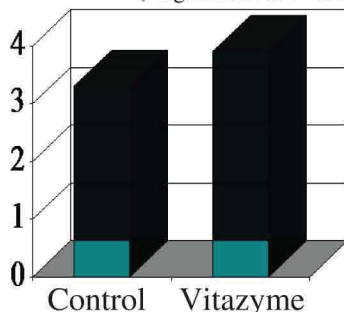
**Circum.
increase:
29%**

Fruit in First Set

Control.....3.3

Vitazyme.....3.9*

(*significant at P=0.17; Bartlett Test)

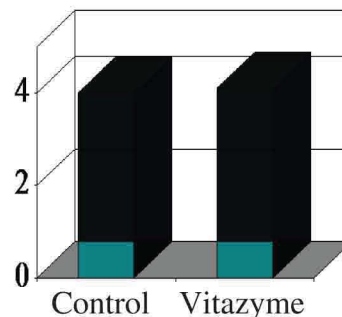


**Fruit
increase:
18%**

Side Shoots

Control.....4.0

Vitazyme.....4.1



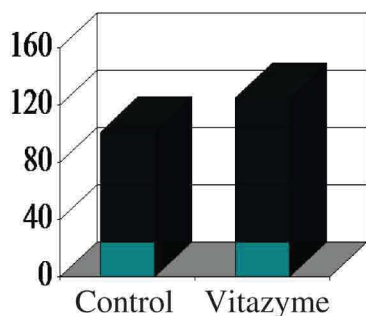
**Side shoot
increase:
3%**

Observations on November 10: The Vitazyme treated tomato plants began to flower as much as 7 days earlier than the control. The fruit size was clearly larger with the Vitazyme treatment.

Growth and yield determinations, second time: A second visit to this experiment on **December 6, 1999**, revealed the following results (averages of three representative plants from each treatment).

Plant Height

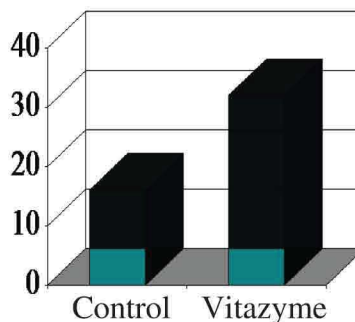
Control.....101 cm
 Vitazyme.....125 cm



**Height
 increase:
 24 %**

Root Length

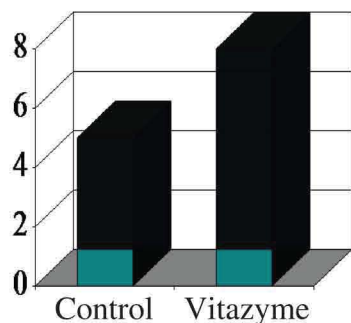
Control.....16 cm
 Vitazyme.....32 cm



**Root
 increase:
 100 %**

Shoot Number

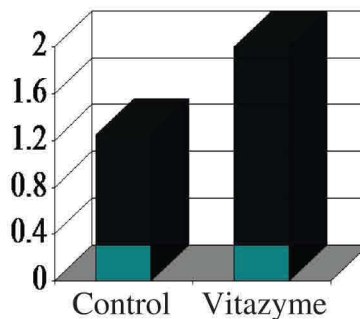
Control.....5
 Vitazyme.....8



**Shoot No.
 increase:
 60 %**

Stem Diameter

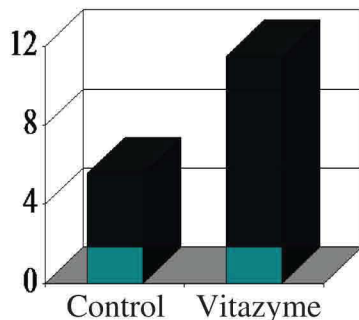
Control.....1.25 cm
 Vitazyme.....2.00 cm



**Stem Diam.
 increase:
 60 %**

Fruit Weight

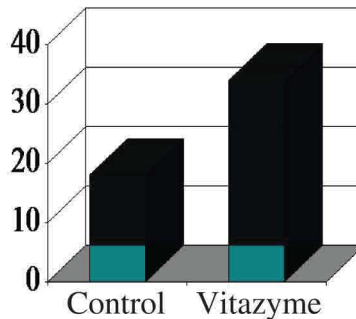
Control.....5.56 lb
 Vitazyme.....11.50 lb



**Fruit Wt.
 Increase:
 107 %**

Fruit Number

Control.....18
 Vitazyme.....34



**Fruit No.
 increase:
 89 %**

Fruit per Cluster: Control.....3/cluster (4 maximum) Vitazyme.....4/cluster (6 maximum)

Observations on December 6, 1999: The farmer and agronomist noted that the Vitazyme treated tomato plants began to flower one week earlier, and produced noticeably larger fruit.

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1998 Crop Results

Vitazyme on Tomatoes

Farmer: Gary Moll

Location: Crows Landing, California

Planting date: unknown

Variety: Roma (canning type)

Bed spacing: 60 inches (double row)

Harvest date: August 15, 1998

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 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.

Sample Weight

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
Sample weight, lb	28.5	34.0	5.5 (+19%)

Leaf Chlorophyll

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
SPAD units	50.6	55.6	5.0 (+10%)

Yield Increase

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.

Yield increase per foot of row	0.28 lb
Yield increase per acre	2,100 lb

Yield increase: 2,100 lb/acre

Income increase: The price of paste tomatoes is estimated at \$51.00/ton.

Income increase, gross	\$58.30/acre
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Income increase: \$58.30/acre

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.

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1997 Crop Results

Vitazyme on Tomatoes A Testimonial

La Jolla Ranch
Firebaugh, California

We applied Vitazyme to an eight-acre section (30 rows) of a 75-acre tomato field. A 40 gallon/acre 10-34-0 preplant fertilizer application was made, and then 12 oz/acre of Vitazyme was added directly to the seeds at planting with a starter, on April 16, 1997. We sidedressed 40 gallons/acre of UN-32, and sprayed Vitazyme over the top in April at 5 oz/acre. These were Heinz 8892 paste tomatoes.

At harvest about September 15 we were unfortunately unable to separate the yield of the Vitazyme section of the field from an adjoining 30-row section that had Kwik-Start (7-21-0), or from any untreated areas of the field. These early tomatoes were used to mix with other tomatoes that had more rot, to improve the overall grade. I would estimate the yield improvement of Vitazyme and Kwik-Start compared to the regular planting as follows:

Vitazyme: 2 to 4 tons/acre (\$100 to \$200/acre)

Kwik-Start: 1 to 2 tons/acre (\$50 to \$100/acre)

Besides the improved yield, the Vitazyme treated tomatoes were **firmer**, had **fewer green fruit**, and were **more uniform in size** than the other parts of the field. We will try more tests with Vitazyme in 1998.

Sincerely,
Ramon Chavez, Jr.

Chlorophyll content of tomato leaves on July 23, 1997 (average of 20 leaves using the SPAD meter):

	<u>North end of field</u>	<u>South end of field</u>
Control	53.2	55.6
Vitazyme	55.5	56.5