

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

2014 Crop Results

Vitazyme on Apples (Nursery Stock)

Researchers: Jacob Hesseltine and Bruce Hesseltine, Vital Grow Distribution LLC, Waterville, Washington
Farmer: C&O Nursery Location: Quincy, Washington Variety: Bud 9 (apple rootstock)
Planting date: May 20, 2014 Plant density: 12 x 56 inches
Experimental design: In a 17-acre field, rows 1 to 50 on the western side of the field were treated with Vitazyme as a root dip and a soil application, leaving the remaining rows as untreated controls.

1. Control

2. Vitazyme

Fertilization: unknown

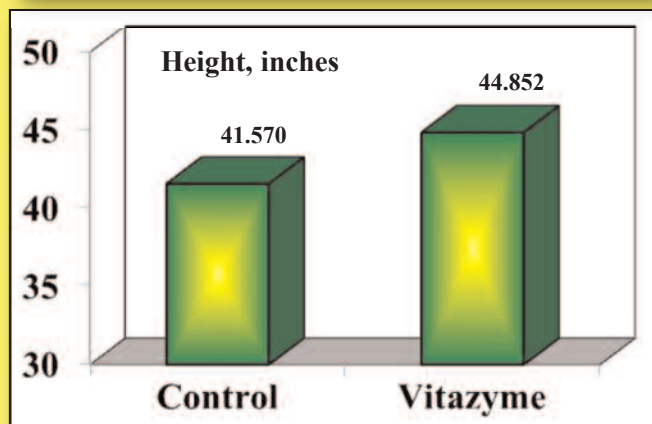
Vitazyme application: (1) 5% root dip at planting on May 20; (2) 16 oz/acre on the soil by rill irrigation on June 20; (3) 16 oz/acre by rill irrigation on July 20; (4) 16 oz/acre by rill irrigation on August 20.

Growing season weather: favorable

Harvest date: Trees will be allowed to grow until the fall of 2015.

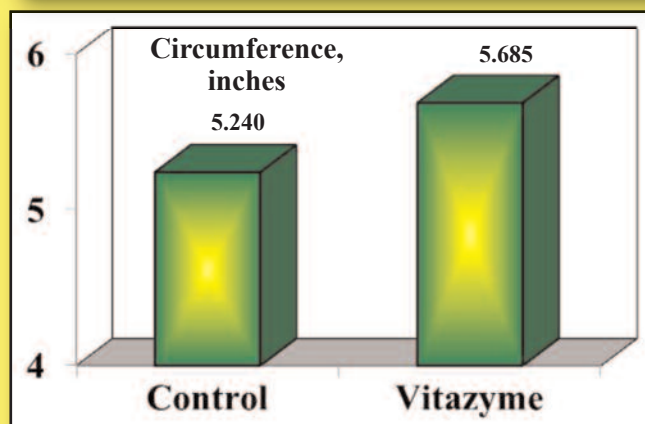
Growth results: On October 20, tree height and circumference were measured for every tenth tree for 100 trees, a few rows in from either side of the treatment dividing line.

Tree Height



**Increase in tree height with
Vitazyme: 8%**

Trunk Circumference



**Increase in trunk circum-
ference with Vitazyme: 8.5%**

Conclusions: An apple nursery study, using Bud 9 rootstock and Vitazyme as a root dip and three subsequent monthly applications, resulted in an 8% increase in tree height over the growing season, as well as an 8.5% increase in trunk circumference. These improvements show the viability of this program to assist more rapid development of young fruit trees in Washington. The trees will continue on the program until the fall of 2015, when harvested trees will be sold by trunk caliper; greater caliper increases will mean improved sales revenue for the nursery.

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2014 Crop Results

Vitazyme on Apples (Nursery Stock)

Researchers: Jacob Hesseltine and Bruce Hesseltine, Vital Grow Distribution LLC, Waterville, Washington

Farmer: C&O Nursery

Location: George, Washington

Variety: M-9337 (apple rootstock)

Planting date: May 20, 2014

Plant density: 12 x 56 inches

Experimental design: Fourteen acres of a nursery were divided in half, with Vitazyme used to treat one half, as a dip at planting and also later; half of the field served as a control. The purpose of the study was to discover the value of this product to accelerate tree growth.

1. Control

2. Vitazyme

Fertilization: unknown

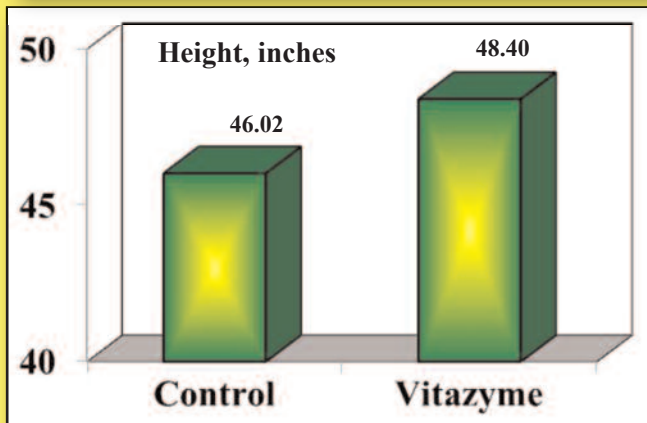
Vitazyme application: (1) 5% root dip at planting on May 20; (2) 16 oz/acre on the soil by drip irrigation on June 20; (3) 16 oz/acre by drip irrigation on July 20; (4) 16 oz/acre by drip irrigation on August 20. Product was applied through an injector in the drip irrigation system.

Growing season weather: favorable

Harvest date: Trees will be grown until sale the fall of 2015.

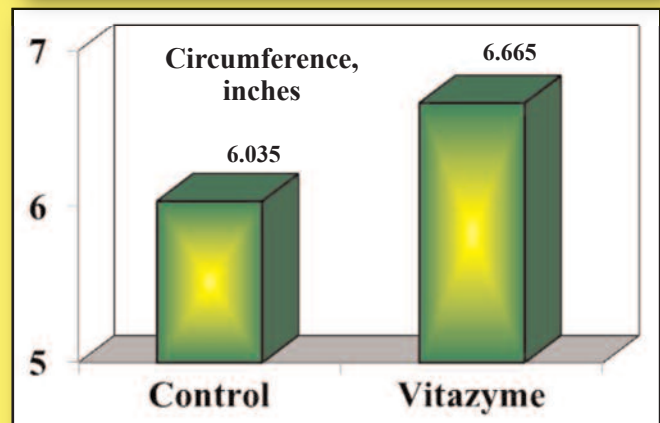
Growth results: On October 20, tree height and circumference were measured for every tenth tree for 100 trees, a few rows in from either side of the treatment dividing line.

Tree Height



**Increase in tree height with
Vitazyme: 5%**

Trunk Circumference



**Increase in trunk circum-
ference with Vitazyme: 10%**

Conclusions: This apple nursery trial in central Washington, wherein Vitazyme was applied as a root dip and three times later through drip irrigation, revealed that tree height was increased by 5%, and trunk circumference by 10%. The excellent improvements in tree growth obtained in this trial show the ability of the program to aid nursery growers in accelerating tree caliber to improve sales income. The program will continue through the fall of 2015 when the stock will be harvested and sold.

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2014 Crop Results

Vitazyme on Apples

Researchers: Casimir Lorentz, Quincy Farm Chemicals, and Jacob Hesseltine, Vital Grow Distribution LLC, Waterville, Washington

Farmer: Weber Orchards

Location: Quincy, Washington

Variety: Red Delicious

Tree age: 26 years (grafted to M111 in 2004)

Tree density: 18 feet between rows, 11 feet in-row (0.004545 acre/tree), or 220 trees/acre

Rootstock: M111

Soil type: sandy loam

Experimental design: Three blocks of Red Delicious apples, 12.5 acres each, were selected to evaluate the effects of Vitazyme on apple yield and quality. Five rows through the middle of each block were treated, and the remaining untreated rows served as controls. Four Vitazyme applications were made.

1. Control

2. Vitazyme

Fertilization: standard nutrient program

Vitazyme application: (1) 16 oz/acre at pink; (2) 16 oz/acre at petal fall; (3) 16 oz/acre at first cover; (4) 16 oz/acre on September 15 (three weeks before harvest). An air-blast sprayer delivering 80 gal/acre, driven at 3.5 mph, was used to apply the product.

Growing season weather: favorable, except for some mid-summer heat that slowed growth.

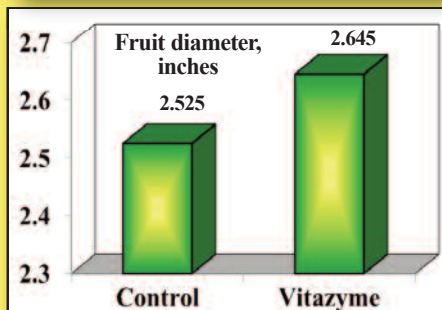
Harvest date: October 6 to 9, 2014

Harvest dates for sampling: (1) August 12; (2) October 6 (at harvest time)

Apple yield and quality results: Twelve random, average apples from each treatment were selected, and values were averaged.

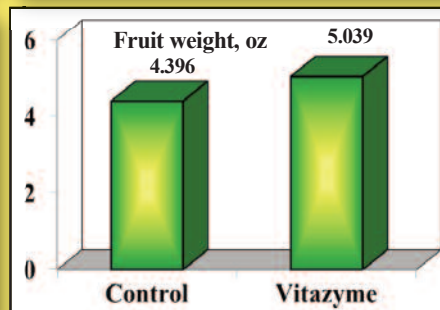
August 12, 2014, Sampling

Fruit Size¹



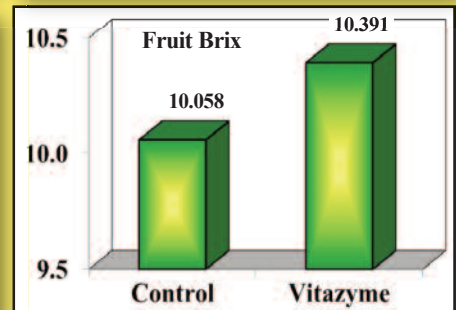
¹Determined using a Cranston fruit sizer.

Fruit Weight¹



¹Determined using a Matrix-500 digital scale.

Fruit Brix¹



¹Determined using an Atago PAL-1 refractometer.

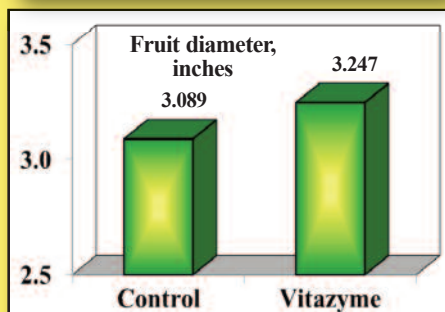
**Increase in fruit
size with Vitazyme:
5%**

**Increase in fruit
weight with
Vitazyme: 15%**

**Increase in fruit
Brix with Vitazyme:
0.333 %-point**

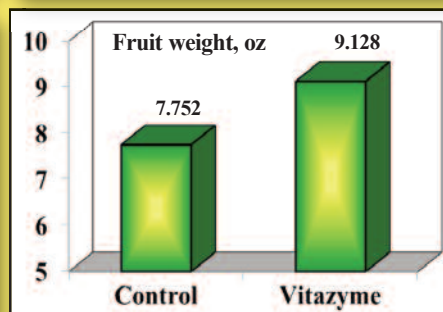
October 6, 2014, Sampling

Fruit Size¹



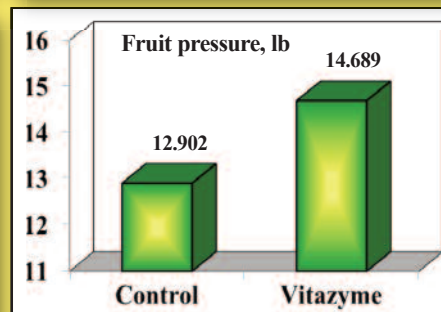
¹Determined using a Cranston fruit sizer.

Fruit Weight¹



¹Determined using a Matrix-500 digital scale.

Fruit Pressure¹



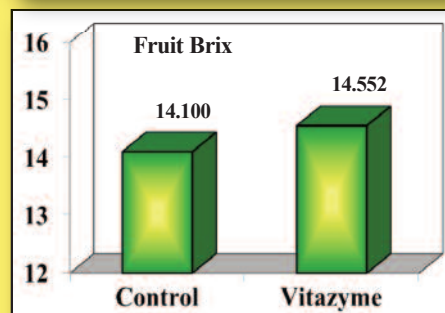
¹Determined using a QA Supplies penetrometer.

Increase in fruit size with Vitazyme: 5%

Increase in fruit weight with Vitazyme: 18%

Increase in fruit pressure with Vitazyme: 14%

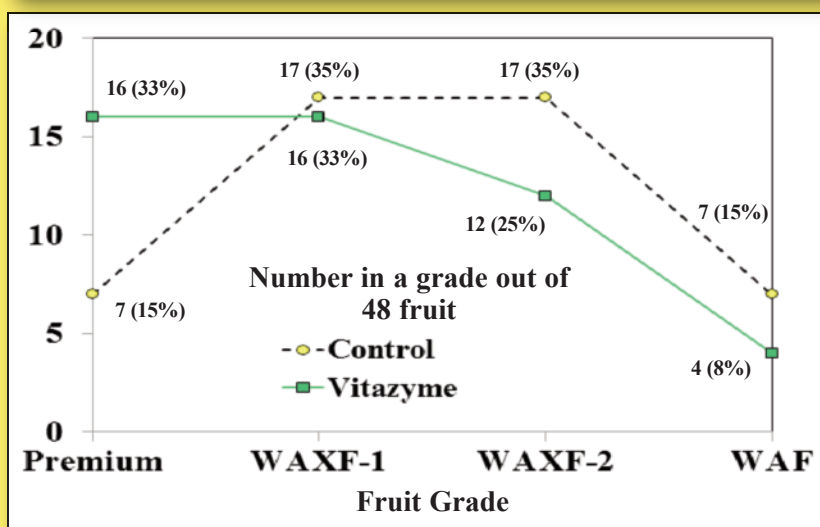
Fruit Brix¹



¹Determined using an Atago PAL-1 refractometer.

Increase in fruit Brix with Vitazyme: 0.452 %-point

Apple Grade Out of 48 Fruit¹



¹Premium is the highest grade, followed by WAXF-1 (WA Extra Fancy-1), WAXF-2 (WA Extra Fancy-2), and WAF (WA Fancy). Grading was assisted by Sherry Hesseltine, a fruit grader with 15 years of experience.

The size, weight, pressure, and Brix were in all cases for both dates, increased substantially with Vitazyme. Fruit grade was moved greatly towards the higher grade as well, especially as evidenced by the percentage in the "premium" grade (33% vs. 15%).

Conclusions: This Red Delicious apple study in Washington revealed that Vitazyme, applied three times early and once late during fruit development, improved fruit size (5%), fruit weight (15 to 18%), fruit Brix (up to 0.452 percentage-point), and fruit pressure (14%), while moving fruit grade toward the more valuable premium grade. Storability and transport would be enhanced due to greater fruit pressure. Yield of apples likely was increased by about 18%, though no actual measurements were made, since apple weight was improved by that amount and fruit numbers per acre were similar. These results show great efficacy of Vitazyme for apple production in central Washington.

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2014 Crop Results

Vitazyme on Apples

Researchers: Casimir Lorentz, Quincy Farm Chemicals, and Jacob Hesseltine, Vital Grow Distribution LLC, Waterville, Washington

Farmer: Weber Orchards

Location: Quincy, Washington

Variety: Fuji

Tree age: 26 years (grafted to M111 in 2004)

Tree density: 18 feet between rows, 11 feet in-row (0.004545 acre/tree), or 220 trees/acre

Rootstock: M111

Soil type: sandy loam

Experimental design: A 3-acre block of Fuji apples was selected to evaluate the effect of four applications of Vitazyme on apple yield and quality. Five rows in the middle of the block were treated, leaving the remainder of the trees as untreated controls.

1. Control

2. Vitazyme

Fertilization: standard nutrient program

Vitazyme application: (1) 16 oz/acre at pink; (2) 16 oz/acre at petal fall; (3) 16 oz/acre at first cover; (4) 16 oz/acre on September 15 (three weeks before harvest). An air-blast sprayer delivering 80 gal/acre, driven at 3.5 mph, was used to apply the product.

Growing season weather: favorable, except for some mid-summer heat that slowed growth.

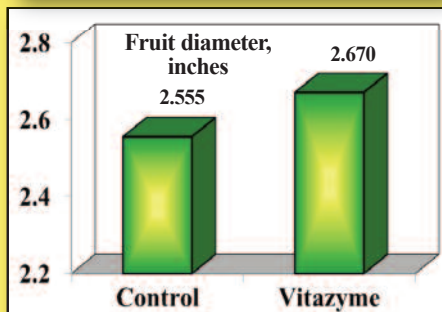
Harvest date: October 16, 2014

Harvest dates for sampling: (1) August 12; (2) October 6, 7 to 10 days before harvest

Apple yield and quality results: Twelve randomly-selected apples for both treatments were selected, and values were averaged.

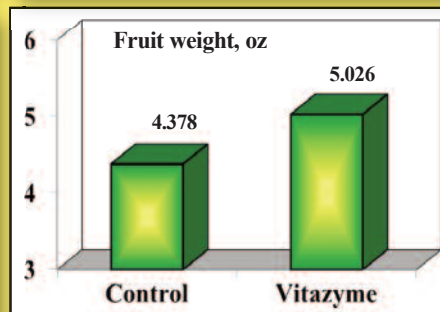
August 12, 2014, Sampling

Fruit Size¹



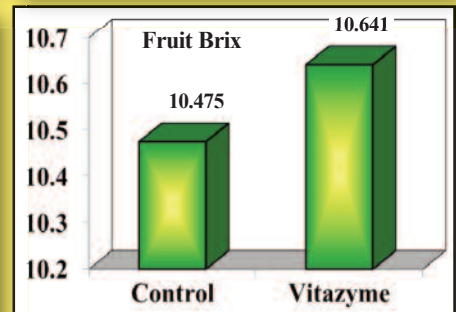
¹Determined using a Cranston fruit sizer.

Fruit Weight¹



¹Determined using a Matrix-500 digital scale.

Fruit Brix¹



¹Determined using an Atago PAL-1 refractometer.

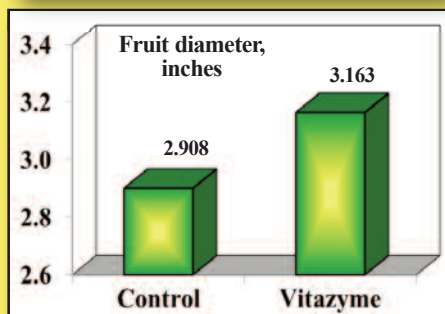
**Increase in fruit
size with Vitazyme:
5%**

**Increase in fruit
weight with
Vitazyme: 15%**

**Increase in fruit
Brix with Vitazyme:
0.166 %-point**

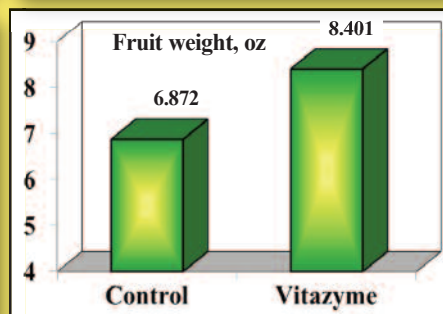
October 6, 2014, Sampling

Fruit Size¹



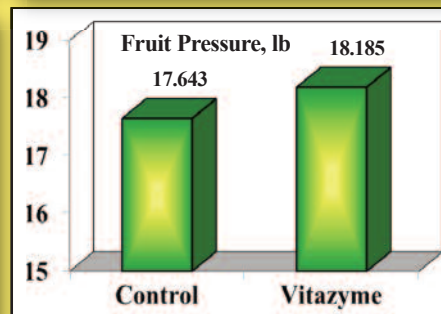
¹Determined using a Cranston fruit sizer.

Fruit Weight¹



¹Determined using a Matrix-500 digital scale.

Fruit Pressure¹



¹Determined using a QA Supplies penetrometer

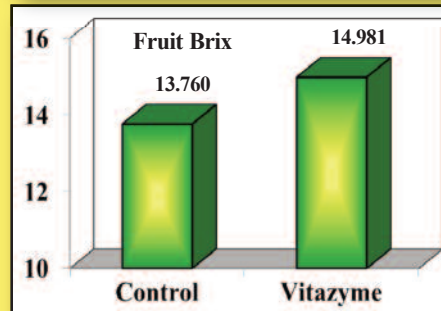
Increase in fruit size with Vitazyme: 9%

Increase in fruit weight with Vitazyme: 22%

Increase in fruit pressure with Vitazyme: 3%

Conclusions: A Fuji apple in-orchard study in central Washington, using Vitazyme four times, proved that apple size, weight, pressure, and Brix all increased for both sampling dates: August 12 and October 6. Final size increase was 9%, weight was 22%, pressure was 3%, and Brix was 1.221 percentage-points. Assuming that fruit set was similar for both treatments, then total yield of apples would have been improved by about 22%, proportional to the increase in fruit weight. This program is shown to be highly effective for increasing apple yield, income, quality, and storability for apple growers in Washington.

Fruit Brix¹



¹Determined using an Atago PAL-1 refractometer.

Increase in fruit Brix with Vitazyme: 1.221 %-points

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2013 Crop Results

Vitazyme on Apples, Organic

Researcher: Jacob Hesseltnie

Location: Golden Harbor Orchards, Orondo, Washington

Sprayer: Fan-atomizer, 100 gal/acre, 4 mph

Soil type: sandy loam; pH 7.0

Tree density: 1,500 to 2,500/acre (high density, super spindle/central leader system)

Experimental design: A 4-acre block of Ambrosia organically grown apples was treated with the Vitazyme program to determine effects of the product compared with an untreated area on the other side of a field road.

1. Control

2. Vitazyme

Fertilization: spring: 13% feather meal, Metalosate micronutrients (Mn, B, Fe, Cu, P); midseason: K.

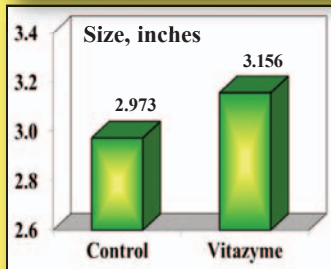
Vitazyme application: 21.3 oz/acre (1.64 liters/ha) sprayed at pink (April 25), petal fall (May 4), and first cover (May 15)

Weather for 2013: favorable for apple development

Crop load: medium to high

Fruit quality results: On September 19, 48 average apples were harvested and graded from several trees in several rows from the two treatments. The following data were determined.

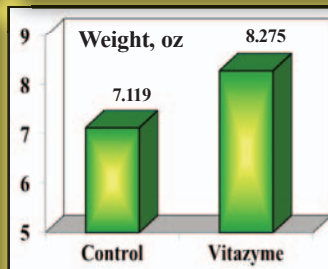
Fruit Size¹



¹Using a Cranston fruit sizer.

**Increase with
Vitazyme: 6%**

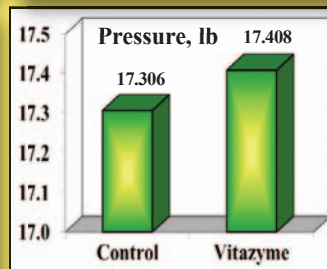
Fruit Weight¹



¹Using a Matrix-500 digital scale.

**Increase with
Vitazyme: 16%**

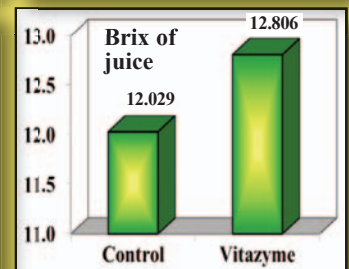
Fruit Pressure¹



¹Using a QA Supplies penetrometer.

**Increase with
Vitazyme: 1%**

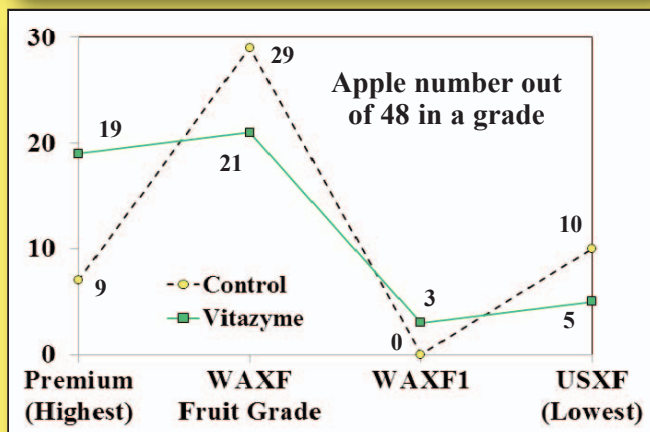
Fruit Brix¹



¹Using an Atago PAL-1 refractometer.

**Increase with
Vitazyme: 7%**

Washington State Organic Fruit Grade¹



¹This grading system is based on color, the highest grade being Premium and the lowest grade USXF; assisted by Sherry Hesseltine.

Yield results: No yield data were taken.

Conclusions: This apple study, comparing three applications of Vitazyme on Ambrosia organic apples with no applications, revealed that this product improved the quality of the fruit significantly. Not only were fruit size (+6%), weight (+16%), pressure (+1%), and Brix (+7%, or 0.8 percentage-point) improved, but the fruit grade was moved toward better coloration, such that 40% of the Vitazyme treated apples received the Premium grade, compared to only 19% of the untreated apples. Had yields been determined, the treated apples would have yielded considerably better than the control apples, and given a much higher income per acre. The value of the Vitazyme program for organic apples in Washington is thus revealed.

Vitazyme greatly improved coloration of the apples, moving the grades to higher levels as indicated by the graph and the table below.

Percentage of apples in a grade

Grade	Control	Vitazyme
Premium	19%	40%
WAXF	60%	44%
WAXF1	0%	6%
USXF	21%	10%

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2013 Crop Results

Vitazyme on Apples

Researcher: Jacob Hesseltine

Location: Gebbers Farms, Brewster, Washington

Sprayer: Turbo Mist, 200 gal/acre, 1.5 mph

Tree density: 3 x 11 feet

Experimental design: A 10-acre block of Gala apples was divided in half, with Vitazyme applied four times to one half and Stimplex applied at the same times to the other half. Evaluations were made of the effectiveness of each product to improve apple yield and quality.

1. Stimplex

Fertilization: The standard nutrient program for the orchard.

Vitazyme application: 16 oz/acre at full pink (May 10), petal fall (May 20), first cover (June 3), and pre-harvest (August 2)

Stimplex application: 48 oz/acre at the same dates as for Vitazyme

Weather for 2013: favorable for apple development

Quality results: On August 30, 48 randomly selected fruit from each treatment were harvested and evaluated for quality parameters.

Growers: Mac Gebbers and Franco Lucas

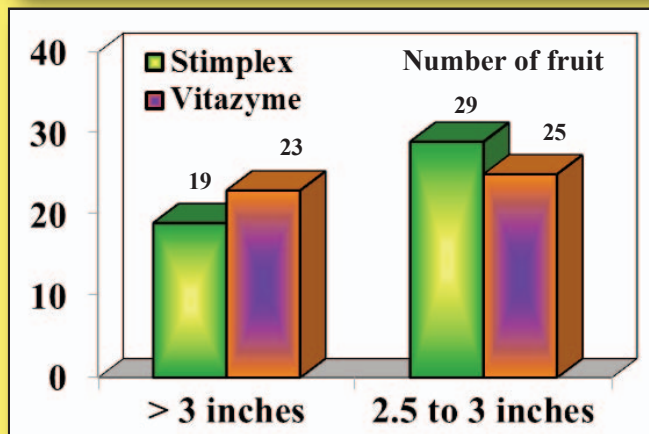
Variety: Gala

Tree age: 3 and 4 years

Rootstock: 9 clone

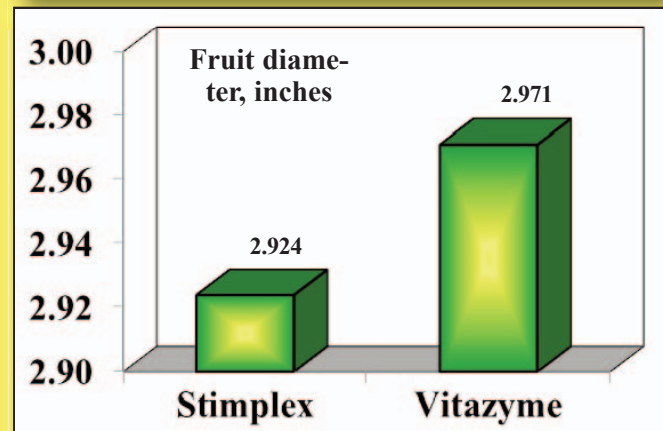
2. Vitazyme

Fruit Size¹



¹A Cranston fruit sizer was used.

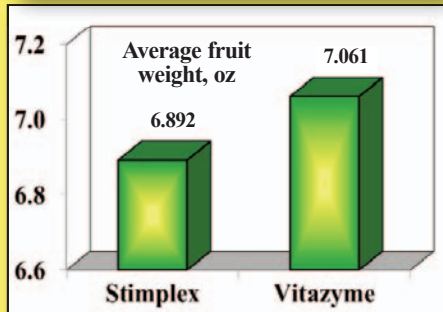
Average Fruit Size



**Increase in fruit size with
Vitazyme: 1.6%**

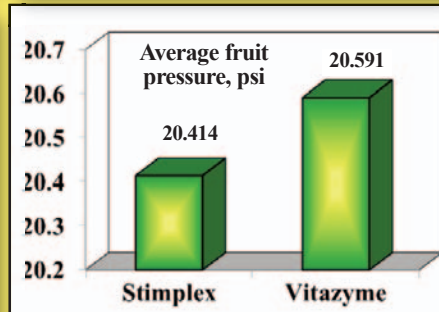
Vitazyme moved the fruit to a larger size compared with Stimplex, the average apple being 0.047 inch (1.6%) larger.

Fruit Weight¹



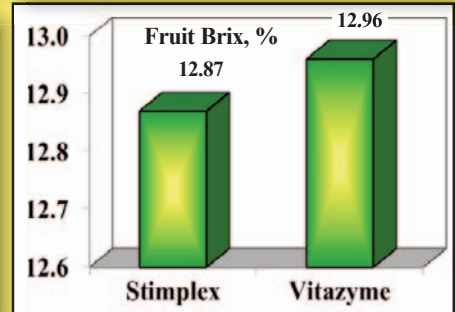
¹A Matrix-500 digital scale was used.

Fruit Pressure¹



¹A QA Supplies penetrometer was used.

Fruit Brix¹



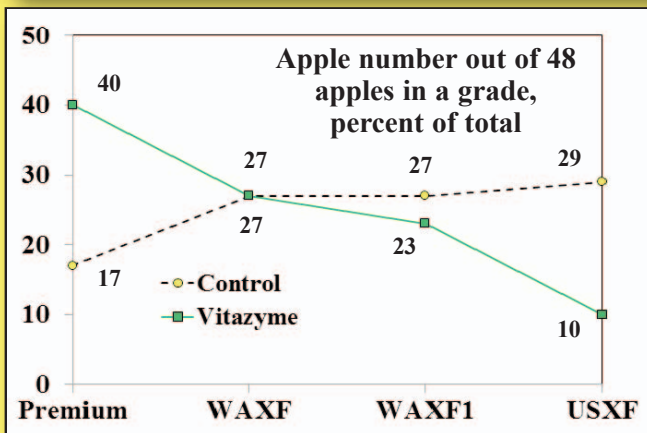
¹An Atago PAL-1 refractometer was used.

Increase in fruit weight: 2.5%

Increase in fruit pressure: 0.9%

Increase in fruit Brix: 0.09%-point

Fruit Grade (Washington State System)¹



These data clearly show that Vitazyme improved the fruit grade markedly as compared with Stimplex. There were many more Premium apples and far fewer USXF apples.

Grade Improvement With Vitazyme

Increase in Premium grade: 23%
Decrease in USXF grade: 19%

¹This grading system is based on fruit color, the highest grade being Premium and the lowest grade being USXF. The grading was assisted by Sherry Hesseltine who has over 15 years of experience in fruit grading.

Yield results: No yield determinations could be made.

Conclusions: This Washington State Gala apple trial revealed that Vitazyme improved apple quality above Stimplex seaweed extract, with four applications of each at recommended rates. There were meaningful improvements in apple size (1.6%), weight (2.5%), pressure (0.9%), and brix (0.09%-point), but the improvement in fruit grade was remarkable, with many more Premium apples (23%) and far fewer USXF apples (-19%) with Vitazyme. Though official yield data was not measured, both the researcher and the grower noted that the younger trees on the Vitazyme treated half of the block yielded several bins more than did the younger trees on the Stimplex half.

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2012 Crop Results

Vitazyme on Apples

Symbiosis of Vitazyme with Retain PGR

Researcher: agr. assistance personnel with Robert Hudak
Ag Biotech, Livonia, New York

Variety: Jonagold

Rootstock: M7

Tree age: 4 years

Soil quality: pH = 6.3

Spray volume: 250 gal/acre (83 gal/acre three times)

Research organization: agr.assistance and

Location: Wayne County, New York

Tree density: 300/acre

Sprayer: Aire Fan airblast

Sprayer speed: 3.5 mph

Experimental design: An apple orchard was divided into two areas, with Retain applied to both areas but Vitazyme, along with the Retain, applied to one area. The purpose of the trial was to evaluate effects of Vitazyme on the apple crop when applied along with Retain. Note that Vitazyme was applied earlier to all areas in a regular spray program as well.

1. Retain

2. Retain + Vitazyme

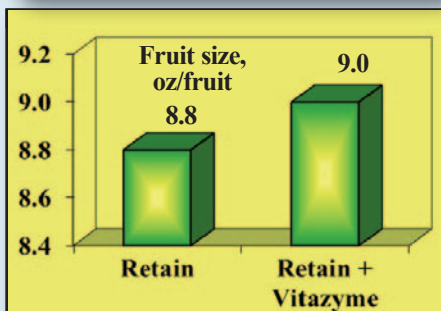
Fertilization: unknown

Vitazyme application: 16 oz/acre sprayed on the leaves at pink, petal fall, and first cover for all areas: 16 oz/acre mixed with Retain in 100 gallons of water, applied 4 weeks before harvest began

Retain application: 0.37 lb/acre (half the normal rate), sprayed on the leaves and fruit on September 8, 2012, with 100 gal of water along with 1 pint of Regulaid, to both areas, with Vitazyme for one area. Retain contains aminoethoxyvinylglycine (AVG), a naturally occurring substance in certain fermentations. This material blocks ethylene production in plant tissues and affects fruit maturation, ripening, and abscission (fruit dropping).

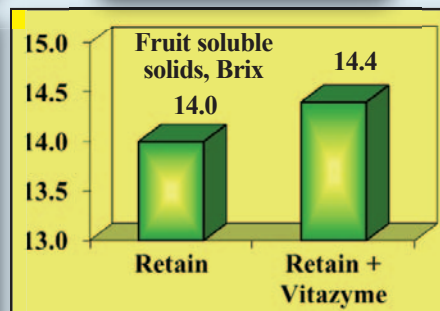
Fruit evaluation: Harvesting was performed on seven replicates (trees) for each treatment. One hundred apples were harvested and graded per treatment.

Mean Fruit Weight



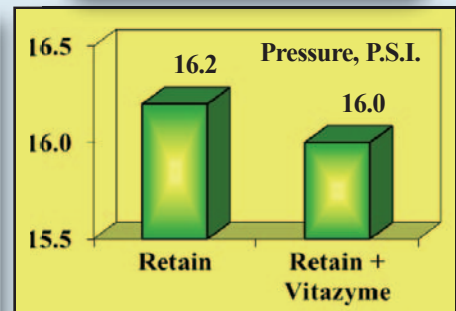
Increase in fruit weight with Vitazyme: 0.2 oz/fruit (+2%)

Fruit Brix

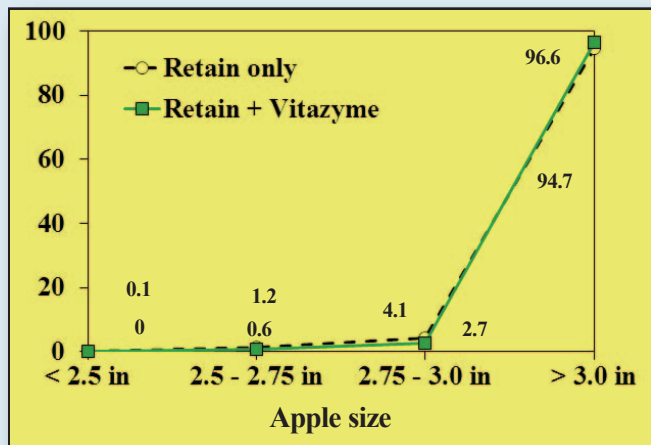


Increase in fruit Brix with Vitazyme: 0.4 point (+3%)

Fruit Pressure



Decrease in fruit pressure with Vitazyme: (-) 0.2 p.s.i. (-1%)



Vitazyme added to Retain increased the average size of the apples, reducing the 2.5 to 3.0 inch sizes but increasing the >3.0 inch size by nearly 2%.

Conclusions: This evaluation of Vitazyme with retain showed that this biostimulant increased mean fruit weight by 0.2 oz/fruit (+2%), a reflection of an increase in fruit size by 1.9% in the >3.0 inch diameter size; smaller fruit were correspondingly reduced. Vitazyme improved fruit Brix by 0.4 point (+3%), but slightly reduced fruit pressure. These results show a good synergism between the two products for the apple grower, and the value of Vitazyme to complement a Retain program.

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2011 Crop Results

Conclusions from Syngenta on apple production with Vitazyme in Chile

- Vitazyme improves apple quality in terms in fruit color and size.
- Vitazyme increased the percentage of harvested fruit, reducing the amount of fruit left on trees because of poor color.
- Vitazyme improves the profitability of the apple crop.
- Vitazyme increases tree vigor.
- The product is not the answer to all producer problems, but supports production in many ways.

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2011 Crop Results

Vitazyme on Apples

Researcher: Gonzalo Ugarte B.

Location: Wapti Fundo Marengo, Chile

Experimental design: An apple orchard was divided into three treatments, a control and two Vitazyme treatments, to determine the effect of the product on fruit color, and on yield in the earliest picking

1. Control

2. Vitazyme at 2 liters/ha

3. Vitazyme at 3 liters/ha

Fertilization: unknown

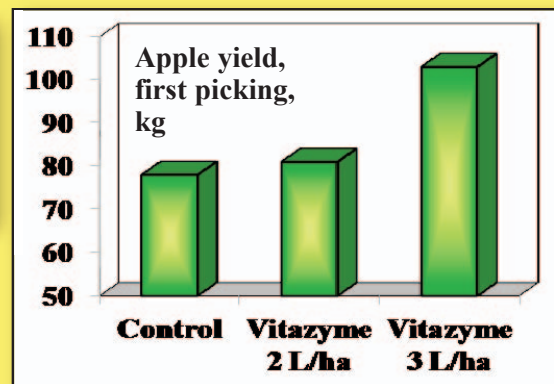
Vitazyme application: Either 2 or 3 liters/ha were sprayed on the leaves and fruit of the trees before fruit coloration.

Color results: *Vitazyme at 2 liters/ha improved the color considerably, but the 3 liters/ha rate was even more effective in developing a deep red color of the skin.*

Yield results: Two pickings were recorded, on February 18 and March 4 of 2010.

Treatment	Yield, Feb. 18	Yield, Mar. 4	Total yield
	----- kg of sample area -----		
Control	78	318	396
Vitazyme, 2 liters/ha	81 (+4%)	259	339
Vitazyme, 3 liters/ha	103 (+32%)	262	366

**Increase in earlier fruit with
Vitazyme: 4 to 32%**



Conclusion: This Gala apple trial in Chile showed that Vitazyme at both 2 and 3 liters/ha, applied before coloration, improved the color significantly at 2 liters/ha but markedly at 3 liters/ha. Because of the color improvement, more apples were able to be harvested during the first harvest on February 18, 4% more with the 2 liter/ha application and 32% more with the 3 liter/ha treatment. The total yield was not affected by Vitazyme because of the late application of the product during the growth cycle.

Vital Earth Resources

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2011 Crop Results

Vitazyme on Apples

Researcher: Gonzalo Ugarte B.

Organization: Syngenta, Santiago, Chile

Location: Wapri Fundo Marengo, Chile

Variety: Fuji

Experimental design: An apple orchard was divided into three treatments, a control and two Vitazyme treatments, to evaluate the effects of Vitazyme on fruit color and first picking yield.

1. Control

2. Vitazyme at 2 liters/ha

3. Vitazyme at 3 liters/ha

Fertilization: unknown

Vitazyme application: Two Vitazyme rates, 2 and 3 liters/ha, were sprayed on the leaves and fruit before fruit coloration.

Color results: Both the 2 and 3 liter/ha applications significantly improved fruit color at the time of the first picking.

Yield results:

Treatment	Yield, April 10
	kg for sampled area
Control	324
Vitazyme, 2 liters/ha	318
Vitazyme, 3 liters/ha	265

Conclusion: This Fuji apple trial in Chile revealed that Vitazyme at both 2 and 3 liters/ha applied before coloration, improved the color significantly, but the yield was not enhanced due to the fact that the product was applied too late in the growth cycle to stimulate yield.

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2011 Crop Results

Vitazyme on Apples

Researcher: Gonzalo Ugarte B.

Location: Agrisouth States Chile, S.A., Chile

Experimental design: An apple orchard was divided into a Vitazyme treated and untreated area to evaluate yield and color of the fruit.

Organization: Syngenta, Santiago, Chile

Variety: Gala

1. Control

Fertilization: unknown

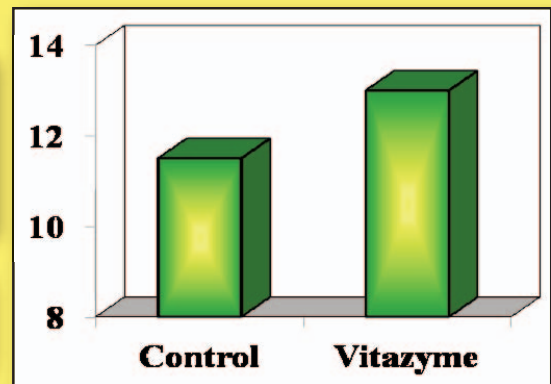
Vitazyme application: 2 liters/ha, sometime before fruit coloration.

Yield results: Two pickings were made.

2. Vitazyme

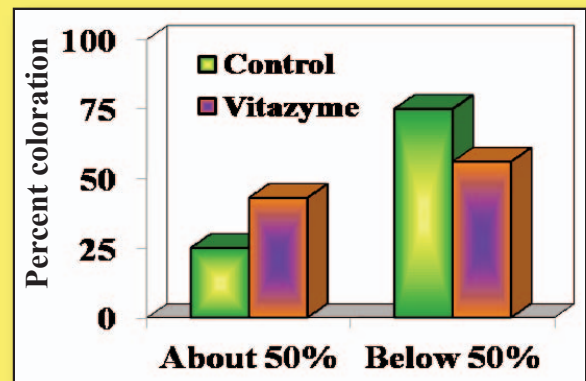
Treatment	Picking 1	Picking 2	Total	Yield change
	(units unknown)			
Control	5.5	6.0	11.5	—
Vitazyme	4.5	8.5	13.0	1.5 (+13%)

**Increase in yield with Vitazyme:
13%**



Color results: Values were taken at the fruit picking.

Treatment	Percent coloration	
	About 50%	Below 50%
	percent of fruit	
Control	25	75
Vitazyme	43	56



Conclusion: In this Chile apple study, Gala apples responded very well to 2 liters/ha of Vitazyme, increasing in yield by 13% and improving in color considerably over the untreated control; 43% of the treated apples had 50% color, while only 25% of the untreated fruit had 50% color. This program for apple yield and quality enhancement has been shown to be highly viable in Chile

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2011 Crop Results

Vitazyme on Apples

Researcher: Gonzalo Ugarte B.

Organization: Syngenta, Santiago, Chile

Location: Society Agricola Millahue, Fundo San Esteban

Variety: Gala

Experimental design: An apple orchard (variety Gala) was divided into a Vitazyme treated and an untreated area, with the objective of determining the yield, quality, and income of the crop as caused by this biostimulant.

1. Control

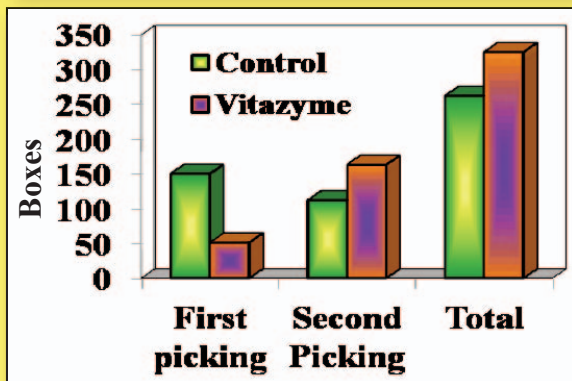
2. Vitazyme

Fertilization: unknown

Vitazyme application: 2 liters/ha, sometime before fruit coloration.

Yield results: Two pickings were made.

Treatment	First Picking	Second picking	Total	Yield change
	----- boxes -----			
Control	150	112	262	—
Vitazyme	162 (+8%)	163 (+46%)	325	63 (+24%)



Yield increase with Vitazyme

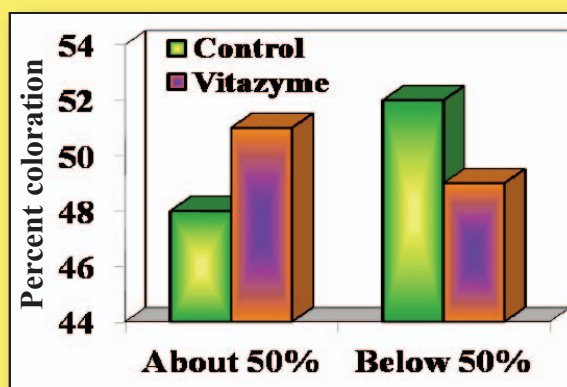
First picking +8%
Second picking +46%
Total +24%

Fruit left on the tree after harvest: Some fruit cannot be marketed due to poor color so is left on the trees after harvest.

Treatment	Fruit left on trees
Control	48%
Vitazyme	27%

Color results: Values were taken at the first picking.

Treatment	Percent coloration	
	About 50%	Below 50%
	----- percent of fruit -----	
Control	48%	52%
Vitazyme	51%	49%



Income results:

Treatment	Crop yield	Crop value*	Value increase	Return on investment**
	boxes/ha	USD/ha	USD/ha	USD return/USD invested
Control	2,105	10,527	—	—
Vitazyme	2,612	13,058	2,431	24.3

*Value of 5.00 USD/box.
 **Value of 50.00 USD/liter of Vitazyme

Increase in income with Vitazyme: 2,431 USD/ha

Return on investment with Vitazyme: 24.3 USD per 1 USD invested

Conclusion: An apple study in Chile, comparing Vitazyme (2 liters/ha) with the untreated control, resulted in excellent responses from this biostimulant. Total yield increased by 24% (+8% for the first picking and +46% for the second picking), color was improved slightly, and income was markedly increased with Vitazyme. Only 27% of the fruit was left on the trees due to poor coloration whereas the control trees had 48% fruit left. The product increased income by 2,431 USD/ha, and the return per 1 USD invested was 24.3 USD, proving this product is highly viable for apple production in Chile.

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2011 Crop Results

Vitazyme on Apples

Researcher: Gonzalo Ugarte B.

Organization: Syngenta, Santiago, Chile

Location: Society Agriculture La Rosa Sofructo, Chile

Variety: Gala

Experimental design: An apple orchard was divided into four treatments to evaluate the effects of Vitazyme, a defoliant, and a coloring agent on fruit grade and maturity for three pickings. Costs of the treatments were also tabulated.

1. Defoliation

2. Color Up

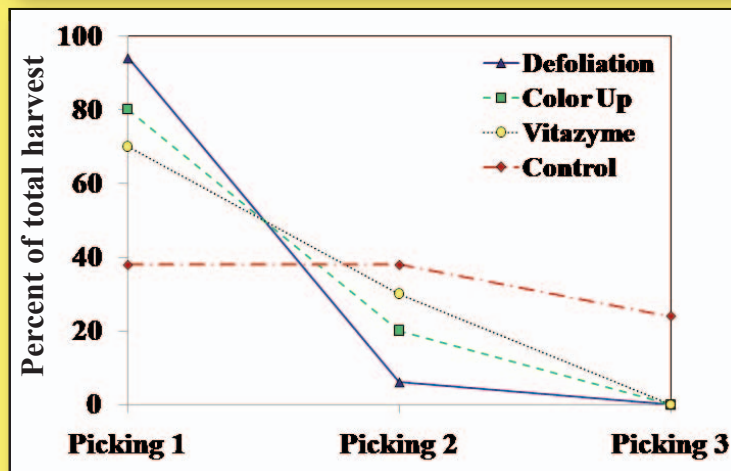
3. Vitazyme

4. Color

Vitazyme application: 2 liters/ha before fruit coloration

Yield results and color: All treatments yielded the same total yield, but picking yields varied greatly, as did costs.

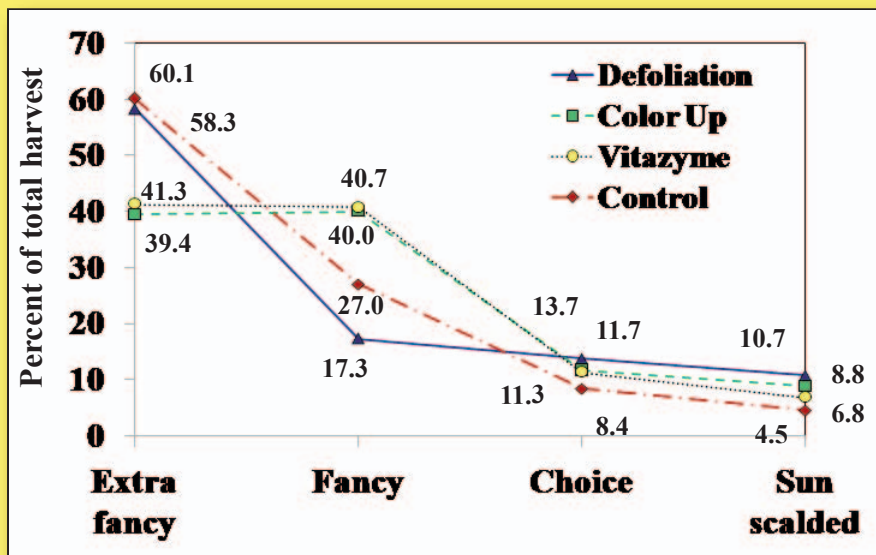
Treatment	Harvest Per Picking			
	Defoliation	Color Up	Vitazyme	Control
	kg/ha			
1	49,400 (94%)	41,000 (80%)	36,400 (70%)	20,800 (38%)
2	2,600 (6%)	10,400 (20%)	15,600 (30%)	20,800 (38%)
3	0	0	0	10,400 (24%)
Total	52,000	52,000	52,000	52,000
Cost/ha, USD	1,058	579	100	0
Cost/tons ha, USD	20.4	11.1	1.9	0



Cost Per Ton • Hectare

	USD
Defoliation	20.4
Color Up	11.1
Vitazyme	1.9

Quality results: Four fruit categories were evaluated for this study.



Conclusion: This Gala apple trial in Chile revealed that, while the yields were the same for all treatments, there were considerable differences in the coloration and maturity, the treatment cost, as well as the fruit grade at harvest. The highest percentage of apples picked at the first harvest was for defoliation (94%), while Color Up gave an 80% first picking, and Vitazyme nearly as great a picking at 70%; the control gave only 38% for the first picking. All other apples were ready at the second picking, except for the control treatment, which yielded 24% for the third picking.

The treatment cost was by far the least with Vitazyme (1.9 USD/ton • ha), while Color Up cost 11.1 USD/ton • ha. Extra fancy apples were highest for the control (60.1%), but the quality dropped rapidly for fancy and choice grades. Defoliation produced nearly as many extra fancy apples as did the control, but the percentage of fancy fruit dropped below the levels of the other three treatments. Vitazyme and Color Up produced very similar fruit quality profiles – about 40% extra fancy and 40% fancy, with 11% choice. The defoliation treatment produced the greatest number of sun-scalded fruit (10.7%). Of all treatments, Vitazyme produced the greatest cost-benefit ratio, and likely the greatest net income as well, although an analysis of fruit value for the various categories was not undertaken.

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2009 Crop Results

Vitazyme on Apples

Researcher: Francis Otto

Location: Cherry Bay Orchards, Suttons Bay, Michigan

Variety: Gala on M26

Age: 12 years

Soil: stony

Experimental design: Two blocks of an orchard of Gala apples were selected to compare the effect of Vitazyme on yield and profitability of the crop. The two blocks were separated by some distance, but located on the same slope.

1. Control

2. Vitazyme

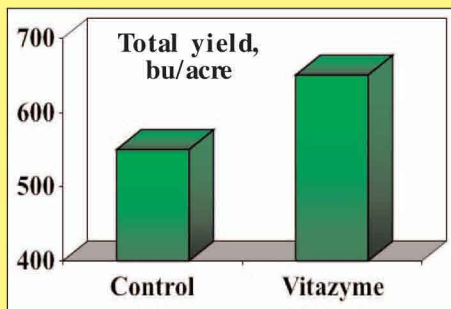
Fertilization: unknown

Vitazyme application: 16 oz/acre sprayed on the leaves at (1) pink, (2) petal fall, and (3) four weeks after petal fall

Yield results:

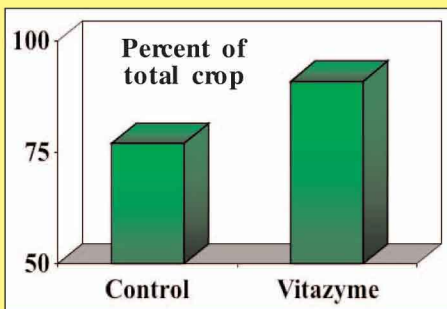
Treatment	Apple yield bu/acre	Yield change bu/acre	Apples > 2.5 in %	Size change %	Yield > 2.5" bu/acre	Yield change bu/acre
Control	550	—	77	—	423.5	—
Vitazyme	651	101 (+18%)	91	14	592.4	168.9 (+40%)

Apple Yield



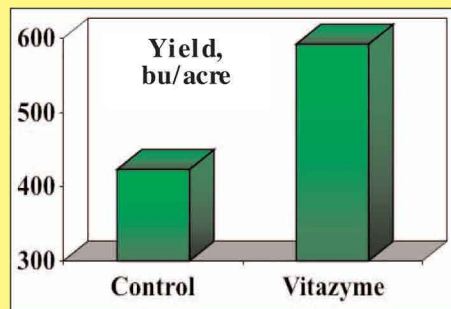
**Increase in yield with
Vitazyme: 18%**

> 2.5 Inch Apples



**Increase in > 2.5 inch
apples with Vitazyme: 14
percentage points**

Yield of > 2.5 Inch Apples



**Increase in > 2.5 inch
apples with Vitazyme: 40%**

Income results: An estimated \$11.00/bu is used to calculate these results.

Treatment	Apple yield ¹ bu/acre	Apple value \$/acre	Income change \$/acre
Control	423.5	4,658.50	—
Vitazyme	592.4	6,516.40	1,857.90

¹> 2.5 inch apples for packout.

Extra income with Vitazyme: \$1,857.90 acre

Net return for a \$33.60/acre Vitazyme investment: \$1,835.30/acre

Return on Vitazyme cost: \$82.21/dollar invested

Conclusions: This Michigan apple trial proved that Vitazyme can greatly increase apple size and total yield of marketable fruit. Apples > 2.5 inches increased by 14 percentage points above the control with Vitazyme, and the total marketable yield was 40% above the control. This increase led to a remarkable \$1,835.30/acre net improvement in income, with a return per dollar invested of \$82.21.

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2007 Crop Results

Vitazyme on Apples

Researcher: agr. assistance

Variety: Crispin

Application: airblast sprayer

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

Location: Wayne County, New York

Rootstock: M9

Application rate: 50 gallons/acre

1. Control

Fertilization: unknown

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

Sampling date: unknown

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

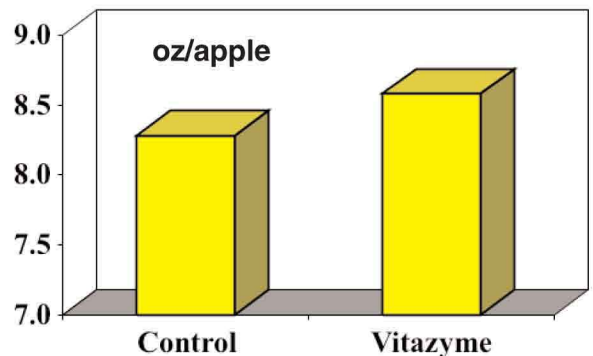
2. Vitazyme

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

*Average of 100 fruit per replicate.

Increase in apple weight: 4%

Average Apple Weight



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

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2005 Crop Results

Vitazyme on Apples

Researcher: Randy Paddock

Location: Kast Farms, Albion, New York

Variety: Empire

Experimental design: The orchard was partially treated with Vitazyme, leaving an untreated control area for comparison of sugar content (brix) and fruit pressure.

1. Control

2. Vitazyme

Fertilization: unknown, but the same for both treatments.

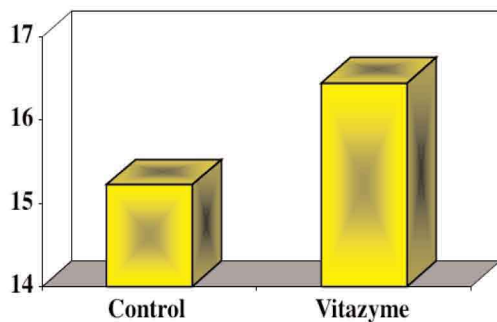
Vitazyme application: 24 oz/acre on the leaves at pink (May 5), petal fall (June 1), first cover (June 20), and August 1, 2005

Yield results: No yields were compiled for the 2005 crop because of heavy frost that greatly reduced the apple numbers. The fruit load was about 50% of normal. Even so, **the Vitazyme treatment had a heavier fruit load at midsummer than the control.**

Quality results: On September 29, 2005, the fruit size was rather small for both treatments, but there were differences in fruit quality.

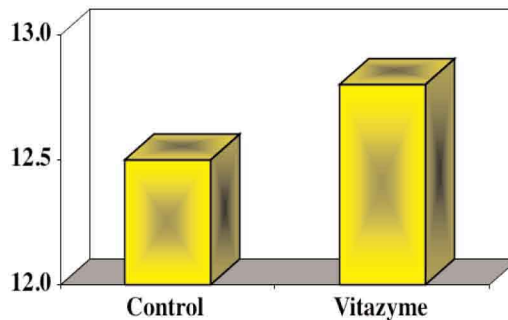
Treatment	Fruit appearance	Maturing	Pressure	Brix
Control	Normal	Normal	psi 15.22	12.5
Vitazyme	Darker and waxy	Advanced	16.44	12.8

Fruit Pressure, psi



**Increase in fruit pressure:
+1.22 percentage points**

Fruit Brix



**Increase in fruit brix:
+0.3 percentage point**

Conclusions: This study on an apple orchard with a reduced fruit load showed that Vitazyme improved fruit quality significantly by improving the firmness of the fruit, and slightly increasing the sugar content. The firmer fruit occurred despite enhanced maturity, which normally would decrease flesh firmness. This result shows the ability of Vitazyme to increase the firmness of apple fruit by encouraging the deposition of stronger cell wall compounds such as cellulose and lignin, which should enhance storability of the fruit.

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2005 Crop Results

Vitazyme on Apples

Researcher: Agr. Assistance

Location: Wayne County, New York

Variety: Empire

Population: 550 trees/acre

Tree age: 12 years (full-bearing)

Rootstock: M9

Experimental design: Vitazyme was tested on a commercial apple orchard which had some rows treated and other left untreated. At harvest, various fruit parameters were measured to evaluate effects on fruit yield and quality.

1. Control

2. Vitazyme

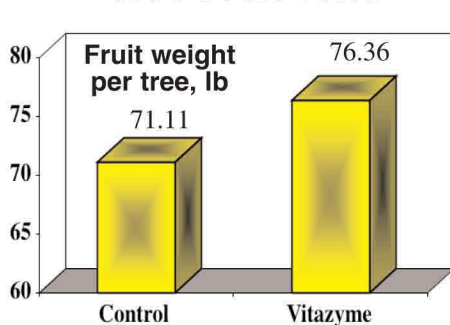
Fertilization: unknown

Vitazyme application: 16 oz/acre at pink, petal fall, first cover, and 30 days pre-harvest in 100 gallons/acre sprays

Weather for 2005: unusually cool during bloom, and then unusually hot and dry until harvest.

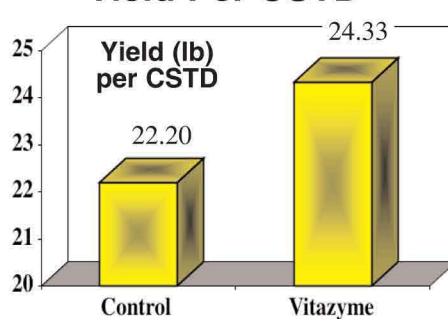
Yield results: At harvest on October 3, 2005, seven trees of similar size and crop load were selected for evaluating the two treatments.

Tree Fruit Yield



Increase in fruit weight: +7%

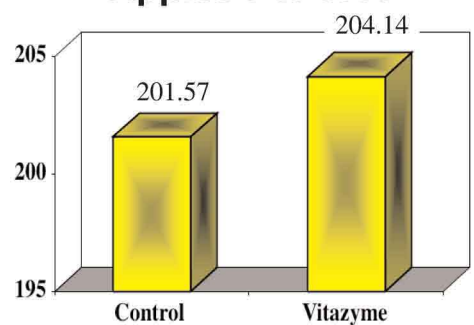
Yield Per CSTD*



*Cross-sectional tree diameter

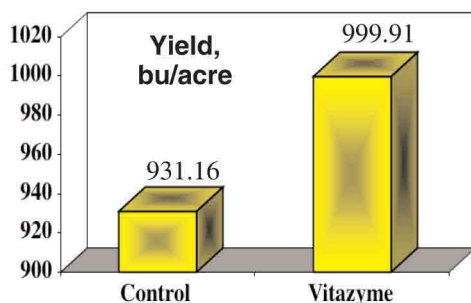
Increase in yield/CSTD: +10%

Apples Per Tree



Increase in apples/tree: +3%

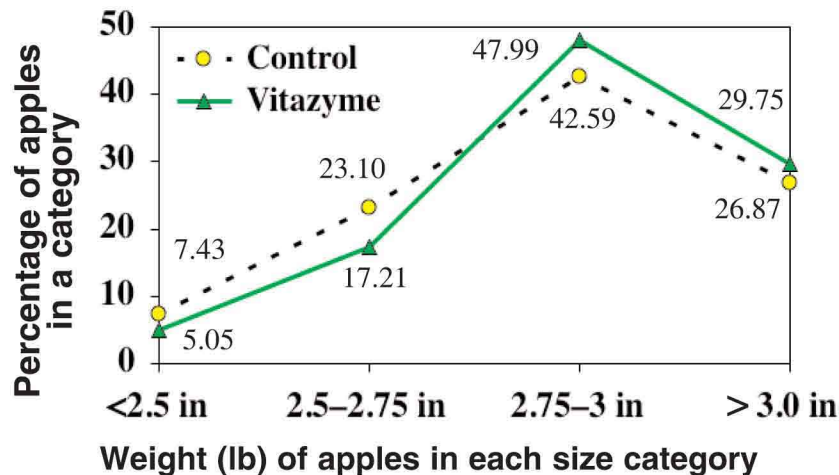
Estimated Yield



Increase in apple yield: +7.4%

Vitazyme increased all parameters relating to fruit yield, which resulted in a 7% increase in apple yield.

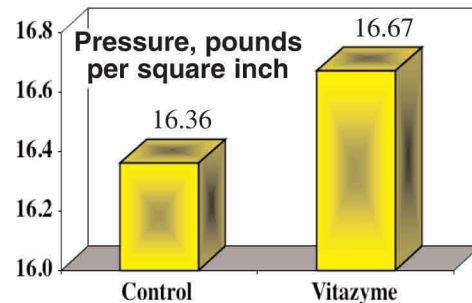
Fruit quality and size results: All fruit was sized by categories, and the weights for each category were added and percentages for each category were determined. Vitazyme produced larger fruit, especially the fruit over 3.0 inches in diameter; smaller sizes were reduced proportionately. Fruit brix and pressure also increased with Vitazyme treatment.



Increase in mean fruit size: +5.5%

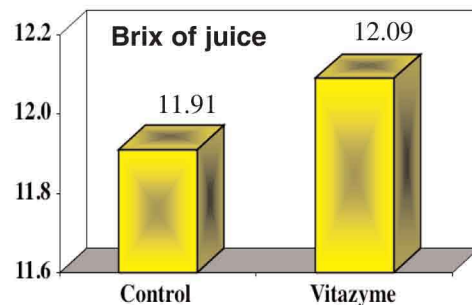
Conclusions: Vitazyme boosted the yield of Empire apples in this western New York trial. According to the investigator, “As in 2004 evaluation, in 2005 Vitazyme treated rows again produced somewhat larger fruit size (+5.5%), higher yield (7.4%), as well as an increase in percentage of 3”-plus diameter fruit. Vitazyme treated fruit were also somewhat firmer (by 0.31 psi) and had slightly higher brix levels (by 0.18 brix) than untreated trees. There were no apparent differences in fruit set, nor were any fruit color differences noted.

Fruit PSI



Increase in fruit PSI: +1.9%

Fruit Brix



Increase in brix: +1.5%

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2003 Crop Results

Vitazyme on Apples

Researcher: Jeff Alicondra, Agr. Assistance, North Rose, New York

Farmer: Jay DeBadts and Sons

Location: Sodus, New York

Variety: Empire (Royal Empire strain)

Tree age: 7-years of full bearing

Tree density: 600 trees/acre

Rootstock: M9

Experimental design: A section of the orchard was treated with a Vitazyme spray four times during the growing season. Untreated apples alongside those rows served as controls. Scoring of the yield, fruit size, fruit number, and apple quality were determined for each treatment, using trees that were as identical as possible.

1. Control

2. Vitazyme

Fertilization: unknown

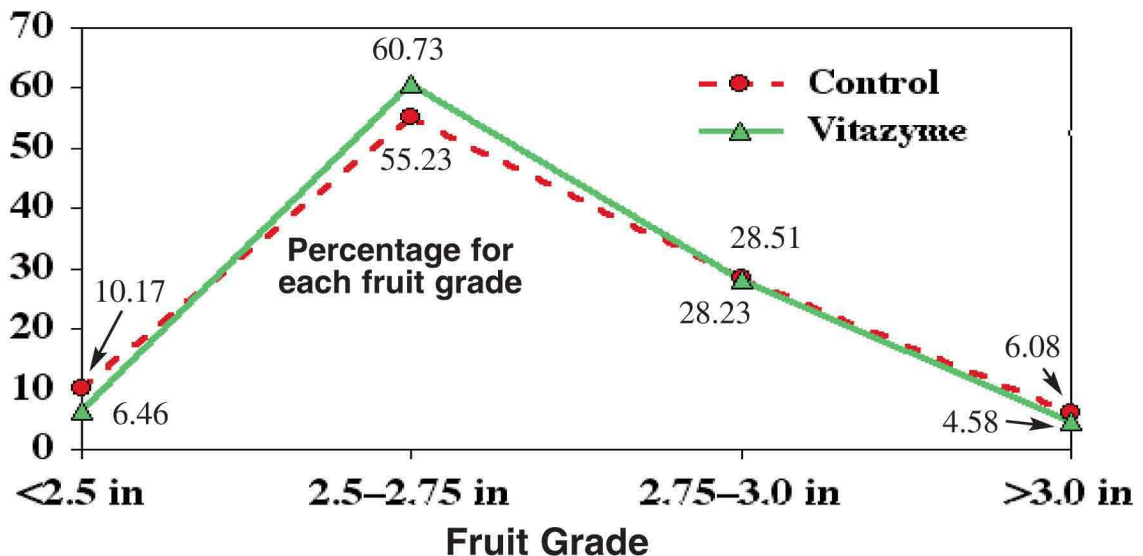
Vitazyme applications: 24 oz/acre as a foliar spray at pink, petal fall, first cover, and 30 days pre-harvest in 100 gallon/acre sprays.

Weather: The season was unusually wet and cold, and apple yields on most varieties were heavy, with fruit size excellent on most varieties except Empire, which tended to give significantly smaller fruit this year.

Yield results: No significant differences were noted in yield between the two treatments.

Quality results: For brix and pressure ratings, 10 apples per tree were tested and averaged for each treatment.

Fruit Grade

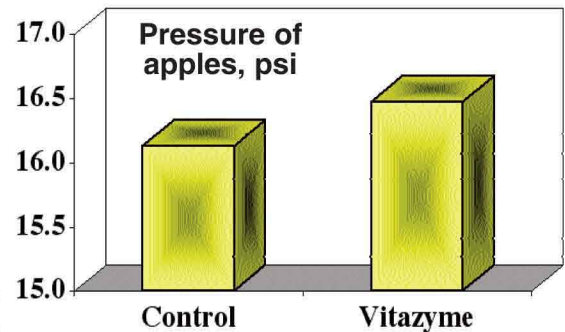


Fruit Pressure

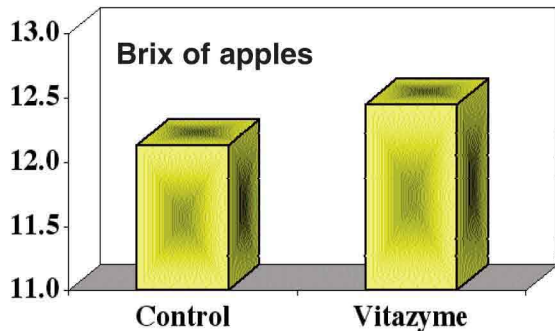
Treatment	Pressure*	Change
	psi	psi
Control	16.13	—
Vitazyme	16.47	+0.34

*An instrument is pressed into the fruit to determine resistance to pressure, and is a measure of cell and tissue strength.

Increase in fruit pressure: 0.34 point



Fruit Brix



Treatment	Brix*	Brix change
Control	12.13	—
Vitazyme	12.44	+0.31

*Measured with a refractometer

Increase in fruit brix: 0.31 point

Conclusions: This Vitazyme apple test in New York showed that, while not increasing yield, the product performed some valuable quality functions:

1. The fruit less than 2.5 inches in diameter were decreased.
2. Fruit firmness was increased by 0.34 psi.
3. Fruit brix was elevated by 0.31 point.

These results indicated that Vitazyme can improve the crispness and sweetness of apples, and also help reduce the number of small apples for a variety like Empire than has a problem with sizing.

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2004 Crop Results

Vitazyme on Apples

Year 2 — Royal Empire Strain

Farm: Jay De Badts & Sons

Location: Sodus, New York

Tree age: 8 years (full-bearing)

Researcher: Jeff Alicandro, Agr. Assistance, North Rose, New York

Variety: Empire (Royal)

Fertilization: unknown

Population: 600 trees/acre

Rootstock: M9

Experimental design: A Vitazyme test in a commercial apple orchard was continued for the second year, comparing this product to an untreated control. The objective of the study was to evaluate the effects of the product on fruit yield and quality.

1. Control

2. Vitazyme

Vitazyme application: 24 oz/acre at pink, again at petal fall, a third time at first cover, and once again 30 days before harvest, with an orchard sprayer in 100 gallons of water per acre

Weather for 2004: cool and wet, giving rise to excellent yields

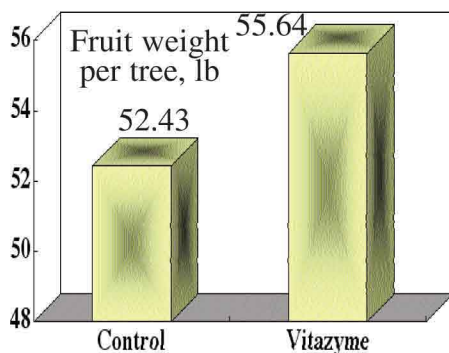
Midseason growth: Only July 26, the Vitazyme treated foliage was a bit darker green, indicating more chlorophyll, and thus photosynthesis was occurring to produce more photosynthate for a higher potential yield. Readings were taken with a Minolta SPAD Chlorophyll Meter, using 30 leaves from each treatment.

Treatment	Leaf chlorophyll	Change
	SPAD units	SPAD units
Control	46.5	—
Vitazyme	48.2	+1.7

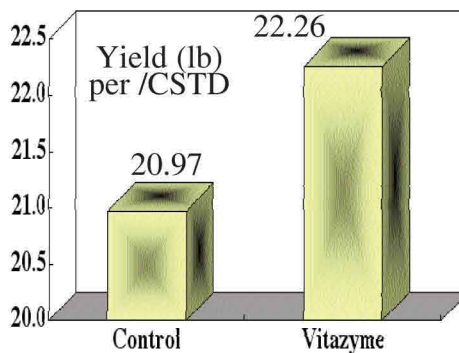
**Increase in chlorophyll:
+ 1.7 SPAD units**

Yield results: At harvest on September 25, seven trees of similar size and crop load were used for evaluating the two treatments.

Tree Fruit Yield

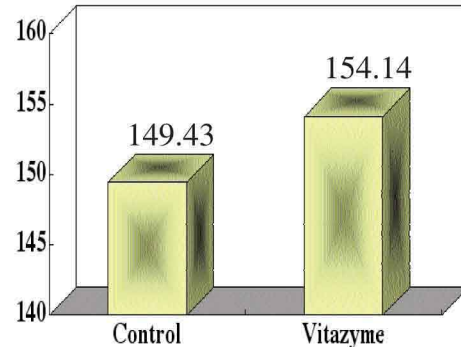


Yield Per CSTD*



*Cross-sectional tree diameter

Apples Per Tree

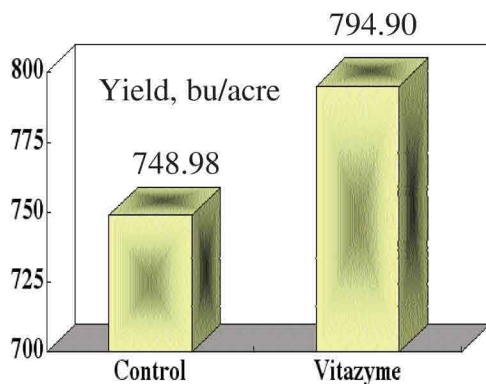


**Increase in fruit
weight: + 6%**

**Increase in
yield/CSTD: + 6%**

**Increase in
apples/tree: + 3%**

Estimated Yield



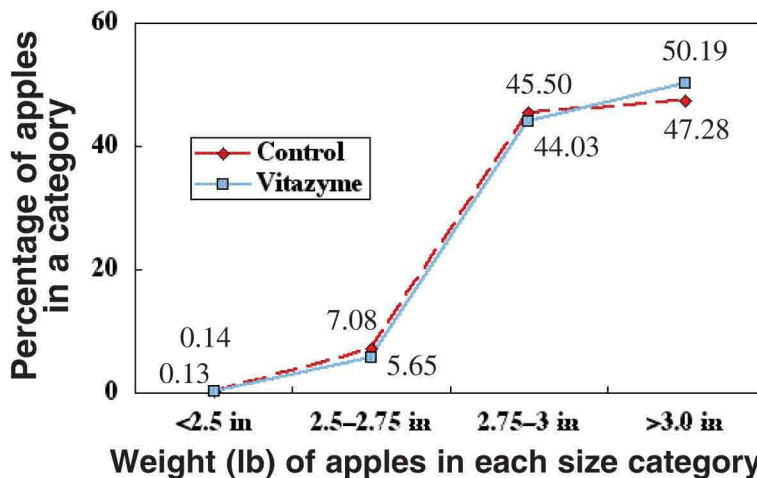
Increase in apple yield: + 6%

Vitazyme increased all yield parameters, the estimated yield by a sizeable 6% while apples per tree were also increased.

Fruit grade results: All fruit was sized by categories, and the weights for each category were added and percentages for each category were determined. Vitazyme produced larger fruit in general, increasing the sizes above 3.0" and reducing all smaller sizes versus the control treatment. In addition, the mean fruit size increased by 3%, from 5.61 to 5.78 oz. See the line graph below.

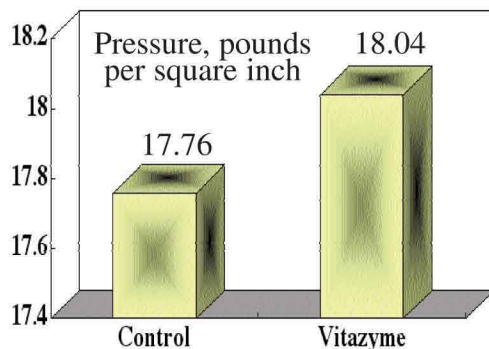
Mean Fruit Size

Treatment	Fruit size oz	Change oz
Control	5.61	—
Vitazyme	5.78	0.17 (+ 3%)

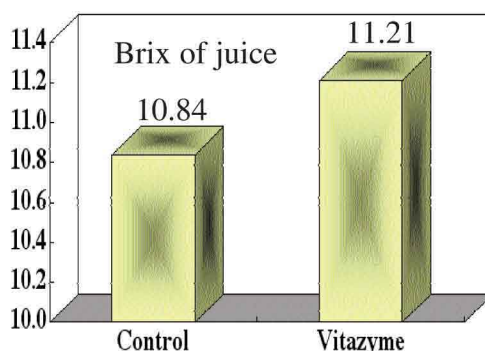


Increase in mean fruit size: + 3%

Fruit PSI



Fruit Brix



Increase in fruit PSI: + 1.6%

Increase in brix: + 3.4%

Change in both fruit psi and brix were positively influenced by Vitazyme.

Empire apples were approximated for each of the size ranges: \$2.00/bu for <2.5 in, \$4.00/bu for 2.5-2.75 in, \$6.00/bu for 2.75 -3.0 in, and \$8.00/bu for >3.0 in. By multiplying these values by the percentage of fruit within each size range, an average value per bushel of apples was calculated for both treatments. The value of the crop was then able to be calculated.

Treatment	Apple yield bu/acre	Bushel value \$/bu	Apple value \$/acre	Increase \$/acre
Control	748.98	6.79	5,085.57	—
Vitazyme	794.90	6.89	5,476.86	391.29

Increase in income: + \$391.29/acre

Increase in apple price: \$0.10/bu

Conclusions: This western New York Empire apple trial, in its second year, revealed that Vitazyme improved the yield of apples significantly (+ 6%) while increasing average apple size. Fruit quality and income were also improved. The return:cost was more than 10:1. According to the researcher, "Vitazyme treated rows produced somewhat larger fruit size, higher yield, and an increase in percent of 3"-plus fruit. Vitazyme-treated fruit were also somewhat firmer (by 0.28 psi) and had slightly higher brix levels (by 0.37 brix) than untreated trees."

Vital Earth Resources

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2004 Crop Results

Vitazyme on Apples

Farm: in Wayne County, New York

Location: Sodus, New York

Tree age: 8 years

Experimental design: A commercial apple orchard was divided into Vitazyme treated and untreated sections; The west rows were treated. The objective of the study was to evaluate effects of this product on apple yield and quality.

Researcher: Jeff Alicandro, Agr. Assistance, North Rose, New York

Variety: Gala

Population: 800 trees/acre

Rootstock: M9

1. Control

2. Vitazyme

Vitazyme application: 16 oz/acre at first cover, and once again at second cover, with an orchard sprayer in 100 gallons of water per acre

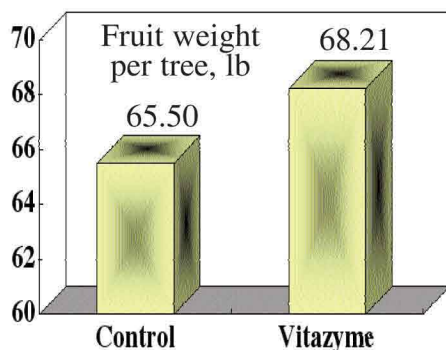
Weather for 2004: cool and wet, giving rise to excellent yields

Fertilization: unknown

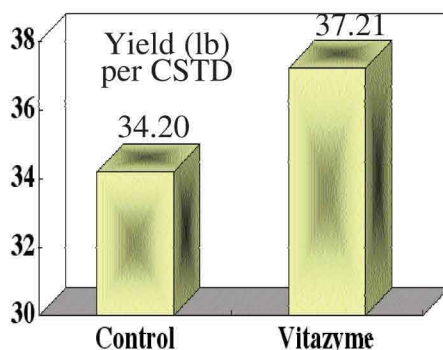
Midseason growth: On July 26, the Vitazyme treated foliage was visibly more aggressive and had a darker green color.

Yield results: At harvest on September 6, seven trees of similar size and crop load were used for evaluating the two treatments.

Tree Fruit Yield

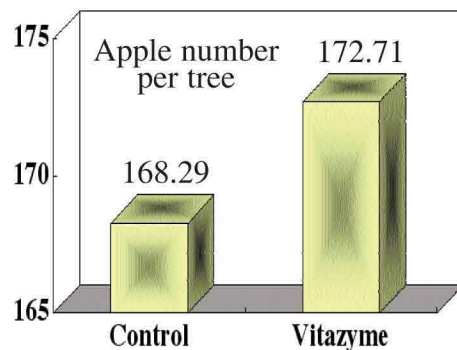


Yield Per CSTD*

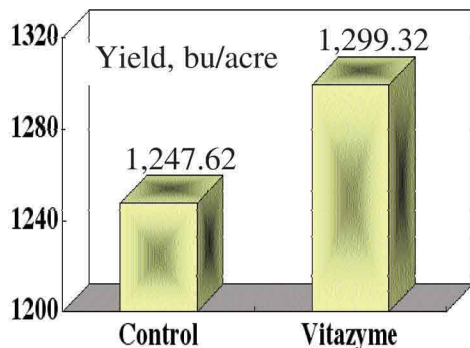


*Cross-sectional tree diameter

Apples Per Tree



Apple Yield



Increase in apple yield: + 4%

Increase in fruit weight: + 4%

Increase in yield/CSTD: + 9%

Increase in apples/tree: + 3%

Vitazyme caused an increase in fruit yield of 4%, and also increases in all measured parameters including individual tree yield (+4%), yield per cross-sectional tree diameter (+9%), and apples per tree (+3%).

Fruit grade results: All fruit was sized by categories, and the weights

of the fruit for each category were added and evaluated to determine the percentage weight of each grade. Vitazyme produced more fruit in the >3.0” category than the control, and fewer fruit in the lighter categories. The mean fruit size was increased by 4% with Vitazyme, from 6.23 to 6.32 oz. See the line graph below for the size distribution.

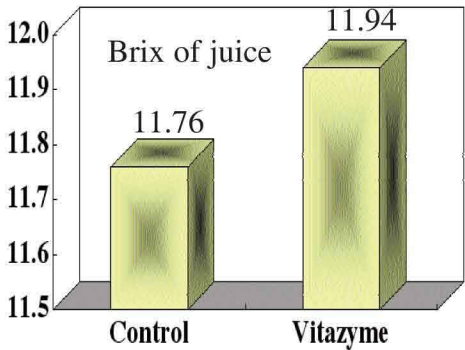
Mean Fruit Size

Treatment	Fruit size	Change
	oz	oz
Control	6.23	—
Vitazyme	6.32	0.09 (+ 4%)

Increase in mean fruit size: + 1.4%

Fruit quality results: Ten apples from each treatment were selected to evaluate fruit pressure, fruit brix, and red color. Differences between the two treatments in fruit psi and red color were minor, but the brix for the Vitazyme treated apples was 0.18 unit greater.

Fruit Brix

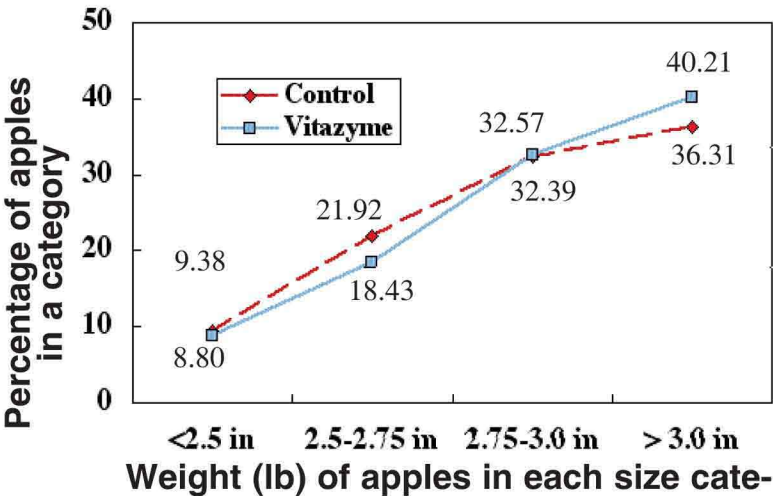


Income results: Prices for Gala apples were approximated for each of the size ranges: \$2.00/bu for <2.5 in, \$4.00/bu for 2.5-2.75 in, \$7.50/bu for 2.75 -3.0 in, and \$10.00/bu for >3.0 in. By multiplying these values by the percentage of fruit within each size range, an average value per bushel of apples was calculated for both treatments. The value of the crop was then able to be calculated,

Treatment	Apple yield	Bushel value	Apple value	Increase
	bu/acre	\$/bu	\$/acre	\$/acre
Control	1,247.62	7.13	8,895.53	—
Vitazyme	1,299.32	7.38	9,588.98	693.45

Conclusions: This western New York Gala apple trial revealed that Vitazyme boosted yield by a sizable 4% (51.7 bu/acre), and increased mean fruit weight by 4%, moving average size towards the >3-inch category. In addition, the brix level was slightly increased. Moreover, the average per bushel apple price was increased by \$0.25 with Vitazyme due a higher percentage of the more valuable larger sizes, and income per acre was increased by a sizable \$693.45, this with only two of the recommended four Vitazyme applications. The return on investment in Vitazyme for this orchard, was around 55:1.

According to the researcher, “In this evaluation the two mid-season Vitazyme applications resulted in slight increases in Gala fruit size and in somewhat higher yields. A slight trend toward improvement in soluble solid levels (brix) was also measured in the Vitazyme treatment..”



Increase in income: + \$693.45/acre

Increase in apple price: \$0.25/bu

Vital Earth Resources

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2006 Crop Results

Vitazyme on Apples

Researcher: agr.assistance

Rootstock: M9

Tree density: 650 trees/acre

Experimental design: Vitazyme was applied to part of a new non-bearing apple orchard to determine its effects on tree growth and development; the other part of the grove was left untreated. Data were collected on matched groups of 10 trees each for each treatment in seven replicates. A statistical analysis was applied to the seven replicates using the Student-Newman Keuls Test.

Location: Wayne County, New York

Variety: Gala

Maturity: second year (planted in 2005)

Soil type: unknown

1. Control

2. Vitazyme

Fertilization: Pre-bloom: 200 lb/acre of $\text{Ca}(\text{NO}_3)_2$ (30 lb/acre of N); post-bloom: 200 lb/acre of $\text{Ca}(\text{NO}_3)_2$ (30 lb/acre of N)

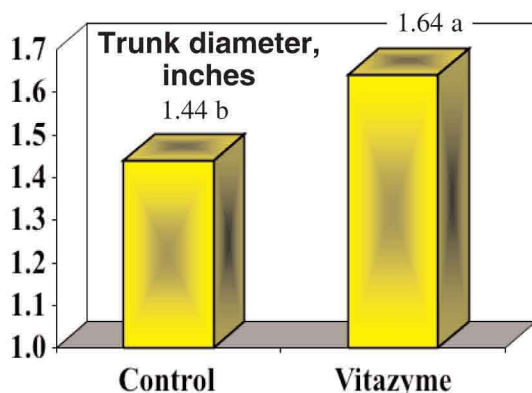
Vitazyme application: 16 oz/acre in the initial weed spray, and again at the same rate at pre-bloom, petal fall, and first cover

Fire blight control: dormant copper followed by streptomycin sprays

Weather for 2006: unusually wet and warm, resulting in very good tree growth

Growth results: Four parameters were measured at the end of the 2006 growing season, on November 4 and 5. Seven sets of 10 consecutive trees under each treatment were measured, from 14 different rows across the orchard. Since there was hardly any fire blight detected, that data is not presented below.

Final CSTD*



Treatment	Replicate							Mean ¹
	1	2	3	4	5	6	7	
Control	1.4	1.5	1.6	1.4	1.2	1.4	1.6	1.44 b
Vitazyme	1.6	1.4	1.7	1.6	1.7	1.8	1.7	1.64 a

¹Means followed by the same letter are not significantly different according to the Student-Newman-Keuls Test ($P = 0.05$).

Probabilities: Main effects, $P = 0.0382^*$

Block effects, not significant

Coefficient of variation = 9.17%

$\text{LSD}_{0.05} = 0.18$ inch

*Cross sectional trunk diameter, measured to the nearest 0.1 inch just above the rootstock grafting union.

Increase in CSTD with Vitazyme: 14%

Tree Height*

Treatment	Replicate							Mean ¹
	1	2	3	4	5	6	7	
	----- inches of height -----							
Control	56.5	55.0	47.5	50.5	53.5	49.0	51.0	51.86 b
Vitazyme	61.5	54.0	57.5	52.5	55.0	59.5	56.5	56.64 a

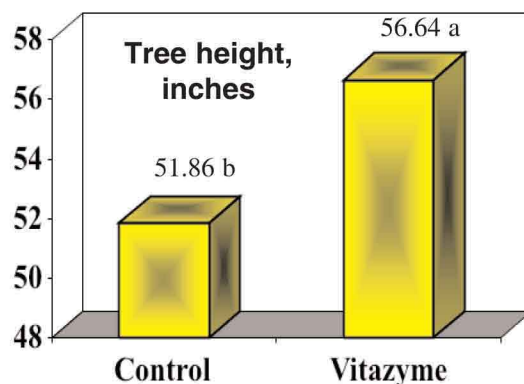
¹Means followed by the same letter are not significantly different according to the Student-Newman-Keuls Test (P = 0.05).

Probabilities: Main effects, P = 0.0265*

Block effects, not significant

Coefficient of variation = 5.64%

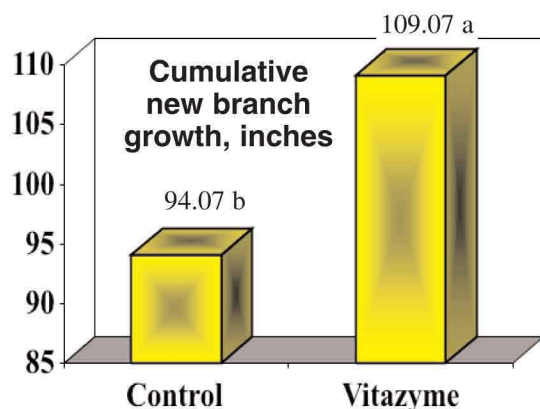
LSD_{0.05} = 4.00 inches



*Total distance from the soil to the top of the highest leader branch.

Increase in tree height with Vitazyme: 9%

Cumulative New Tree Growth*



*Total new vegetative limb growth for 2006 measured by totalling the length of all scaffold limbs plus the tree leader.

Treatment	Replicate							Mean ¹
	1	2	3	4	5	6	7	
	----- inches of diameter -----							
Control	103.0	96.0	88.5	97.5	99.0	84.5	90.0	94.07 b
Vitazyme	114.0	101.5	122.0	98.0	106.5	111.5	110.0	109.07 a

¹Means followed by the same letter are not significantly different according to the Student-Newman-Keuls Test (P = 0.05).

Probabilities: Main effects, P = 0.0178*

Block effects, not significant

Coefficient of variation = 8.46%

LSD_{0.05} = 11.23 inches

Increase in cumulative new growth with Vitazyme: 16%

Conclusions: Vitazyme proved to be an excellent stimulator of growth for young apple trees in this replicated New York study. In this year of very good tree growth, the final cross-sectional trunk diameter was increased by 14%, the tree height by 9%, and the cumulative new branch growth by 16% above the untreated control trees. Fire blight incidence was negligible for both treatments. This study shows the great efficacy of Vitazyme to enhance the growth and future productivity of apple trees.

According to the researcher, **“The Vitazyme program looks promising as a tool for helping to bring non-bearing apple blocks into production faster.”**

Vital Earth Resources

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2007 Crop Results

Vitazyme on Apples

Researchers: Agr. Assistance

Variety: Honeycrisp

Tree age: 6 years

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

Location: Wayne County, New York

Tree density: 500 trees/acre

Rootstock: M9

1. Control

Fertilization: unknown

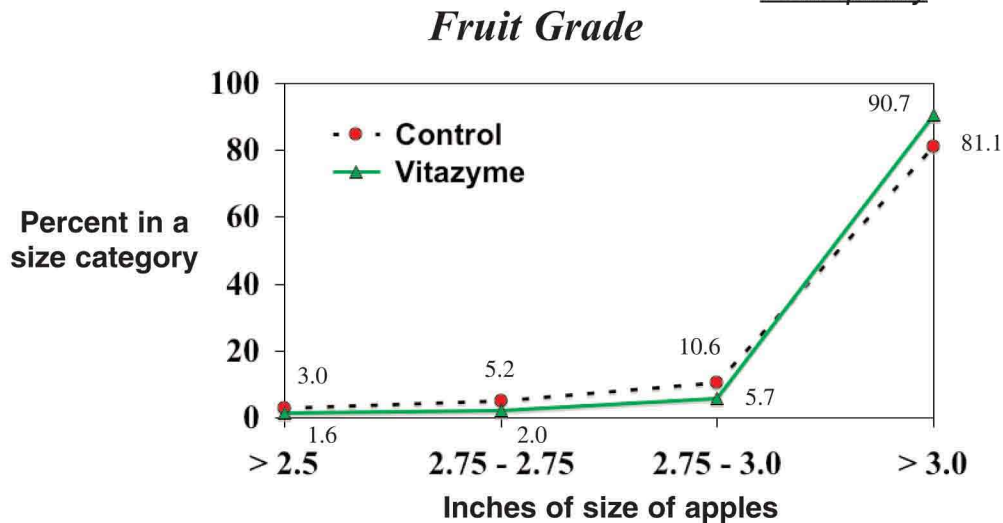
Vitazyme application: 16 oz/acre at pink, bloom, petal fall, and on August 13 using an airblast sprayer giving 67 gallons/acre at 4 mph

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

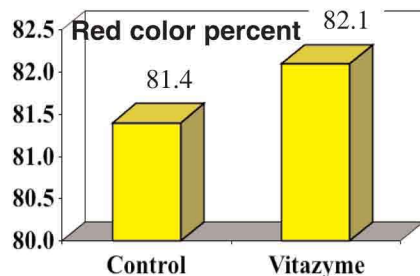
Yield results: On September 18, seven trees having similar full crop loads and good vigor were harvested from each treatment.

2. Vitazyme

Fruit quality:

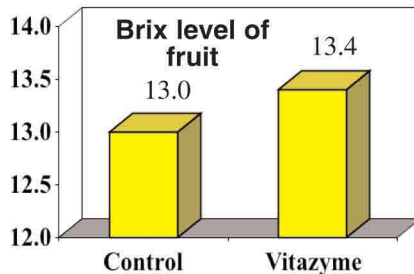


Red Color*



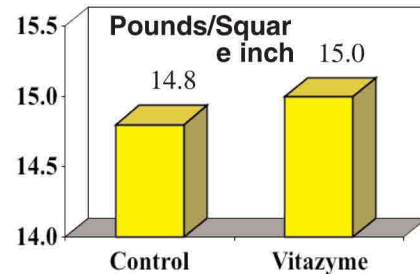
*Fruit rating visually estimated from 100 apples per tree.

Brix*



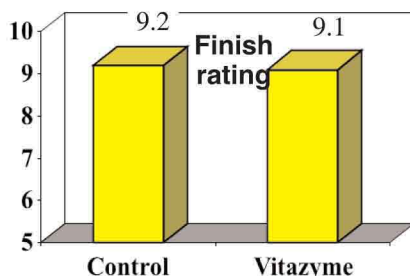
*Using 10 apples per tree.

Fruit Pressure*



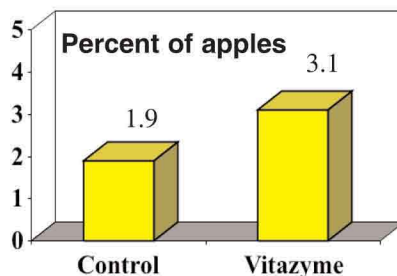
*Using 10 apples per tree.

Fruit Finish*



*Visual estimate of 100 apples/tree: 10 = perfect finish, 8-9 = very good finish

Bitter Pit

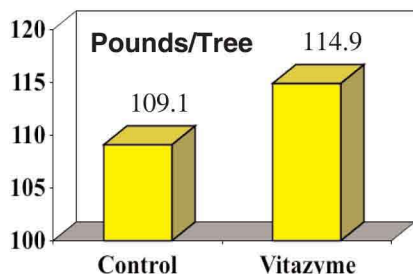


Quality improvements with Vitazyme

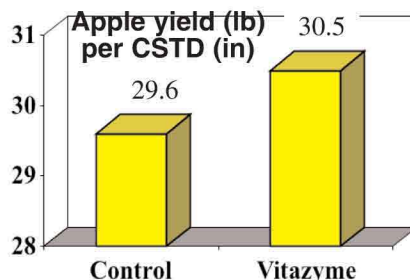
- Increased > 3.0 inch size: 9.6%
- Better red color: 0.7%
- Higher brix: 0.4
- Stronger pressure: 0.2 psi

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

Tree Yield

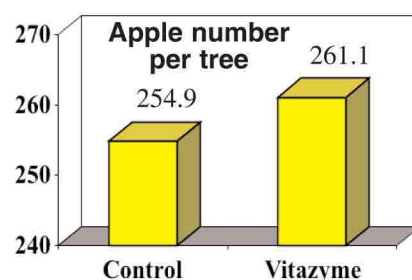


Yield Per CSTD*

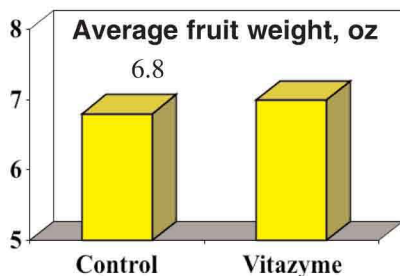


*Cross-sectional tree diameter.

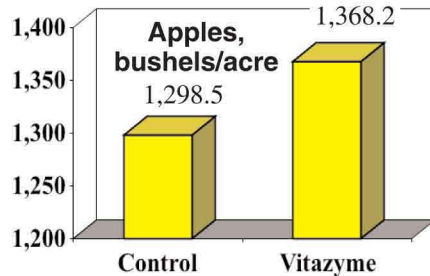
Apples Per Tree



Mean Fruit Weight



Estimated Yield



Yield improvements with Vitazyme

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

Fruit yield:

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

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

“No differences in fruit finish or any signs of leaf or fruit phytotoxicity were observed in this evaluation.

There was a trend toward larger fruit size in the Vitazyme treatment (7.0 oz/fruit) compared to the untreated standard (6.8 oz/fruit) — and a corresponding increase in the percentage of harvested fruit over 3.0 diameter (90.7% vs 81.1%). The Vitazyme program also increased soluble solid levels by 0.4 brix.

Bitterpit (stipping) was a problem in the trial site this very dry season despite regular foliar calcium applications. The Vitazyme treated fruit showed slightly more bitterpit incidence (3.1%) vs. the untreated Honeycrisp trees (1.9%) — likely a direct result of increased fruit size.

The largest commercial challenge to growing Honeycrisp is maintaining good return cropping levels — so return bloom counts will be made at this trial site in spring 2008.”

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2006 Crop Results

Vitazyme on Apples

Researcher: Jim Misiti

Grower: Oded Kalir

Location: Albion, New York

Variety: Ida Red

Soil type: unknown

Tree age: mature grove

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

1. Control

2. Vitazyme

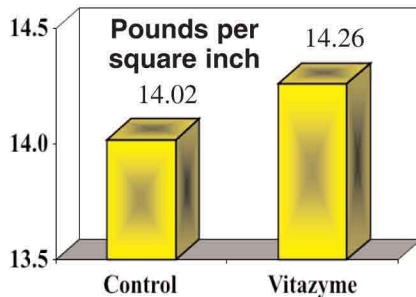
Fertilization: unknown

Vitazyme application: four foliar applications, each at 26 oz/acre; (1) pink bloom on May 13, (2) first cover on June 1, (3) third cover on June 28, and (4) August 30.

Harvest date: November 10, 2006

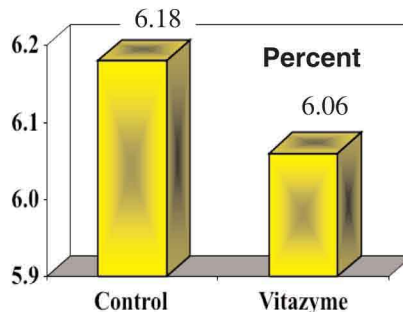
Quality results: Each value is the average of analyses performed on 30 fruit selected for each treatment on October 10, and 20 fruit selected on November 1.

Fruit Pressure*



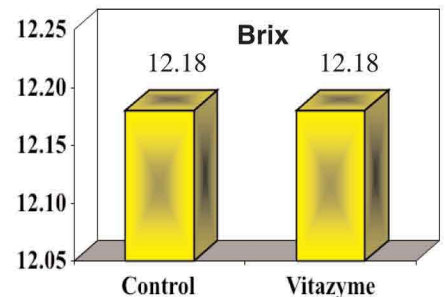
*Average of 50 fruit.

Fruit Starch*



*Average of 50 fruit.

Soluble Solids*



*Average of 50 fruit.

**Increase in pressure:
0.14 percentage point**

**Decrease in fruit starch:
0.12 percentage point**

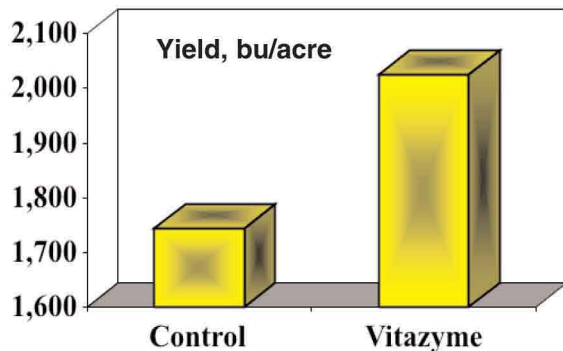
No change

Vitazyme increased the strength of apple tissue cell walls to increase fruit pressure, while reducing the starch content slightly. **Soluble solids were unchanged for the two treatments, quite remarkable since the greater fruit load did not reduce sugars in the tissue.** Thus, Vitazyme was apparently stimulating photosynthesis to fix more carbon from the air while enhancing root uptake of nutrients.

Yield results:

Treatment	Total yield	Trees	Yield	Trees	Yield	Increase	Income*
	bu	number	bu/acre	trees/acre	bu/acre	bu/acre	\$/acre
Control	1,840	211	8.72	200	1,744.1	—	6,104.35
Vitazyme	1,680	166	10.12	200	2,024.1	280.0 (+16%)	7,084.35

*Based on a value of \$3.50/bu.



Increase in apple yield: 16%

**Increase in income:
\$980.00/acre**

Conclusions: This apple study in western New York proved that four applications of Vitazyme increased apple yield by 16%, producing \$980/acre more income. At the same time there was no reduction in sugars with Vitazyme despite a heavier fruit load. The product also improved fruit pressure through the development of stronger cell walls.

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2007 Crop Results

Vitazyme on Apples Year 2

Researcher: Jim Misiti

Grower: Oded Kalir

Location: Albion, New York

Variety: Ida Red

Soil type: unknown

Tree age: mature grove

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

1. Control

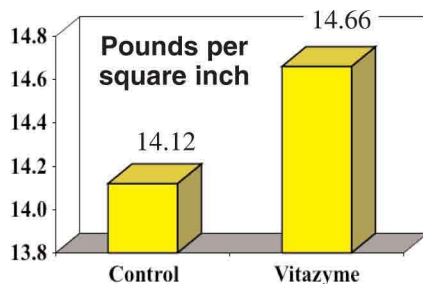
2. Vitazyme

Fertilization: unknown

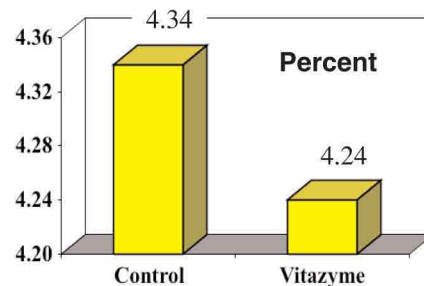
Vitazyme application: four foliar applications, each at 26 oz/acre; (1) pink bloom on May 6, (2) petal fall on May 23, (3) first cover on June 6, and (4) August 8.

Harvest date: October 18, 2007

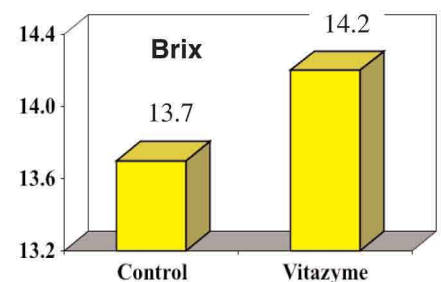
Quality results: Each value is the average of analyses performed on 50 fruit selected for each treatment on October 18. These fruit were selected from random trees within the treatments.



*Average of 50 fruit.



*Average of 50 fruit.



*Average of 50 fruit.

**Increase in pressure:
0.54 percentage point**

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

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

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

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

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

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

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2008 Crop Results

Vitazyme on Apples

Year Three of a Continuing Study

Researcher: Jim Misiti

Grower: Oded Kalir

Location: Albion, New York

Variety: Ida Red

Soil type: unknown

Tree age: mature grove

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

1. Control

2. Vitazyme

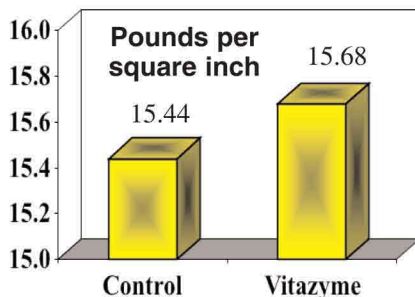
Fertilization: unknown

Vitazyme application: four foliar applications, each at 16 oz/acre; (1) pink bloom on May 1, (2) petal fall on May 21, (3) first cover on May 31, and (4) August 10.

Harvest date: November 18, 2008

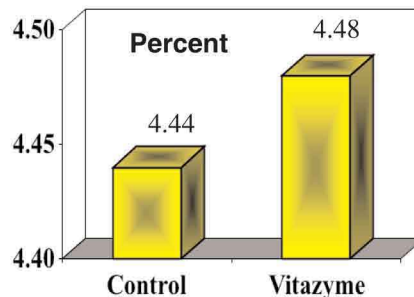
Quality results: Each value is the average of analyses performed on 50 fruit selected for each treatment on October 14.

Fruit Pressure*



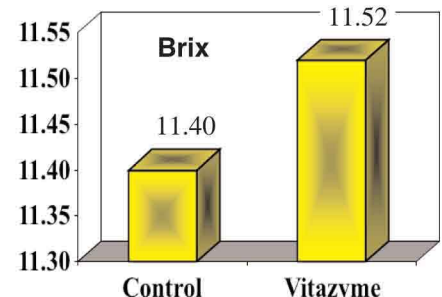
*Average of 50 fruit.

Fruit Starch*



*Average of 50 fruit.

Soluble Solids*



*Average of 50 fruit.

**Increase in pressure:
0.24 percentage point**

**Increase in fruit starch:
0.04 percentage point**

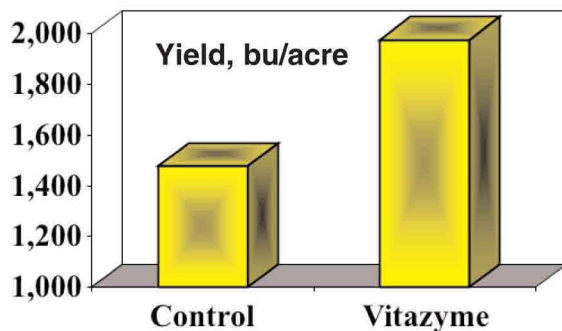
**Increase in fruit brix:
0.12 percentage point**

Vitazyme increased the strength of apple tissue cell walls to increase fruit pressure, while the starch content was also increased slightly. **Soluble solids were also increased with Vitazyme, quite remarkable since the much greater fruit load did not reduce sugars in the tissue.** Thus, Vitazyme was apparently stimulating photosynthesis to fix more carbon from the air while enhancing root uptake of nutrients.

Yield results:

Treatment	Total yield	Trees	Yield	Trees	Yield	Increase	Income*
	bu	number	bu/acre	trees/acre	bu/acre	bu/acre	\$/acre
Control	1,560	211	7.39	200	1,478.67	—	9,936.68
Vitazyme	1,640	166	9.88	200	1,975.90	497.23 (+34%)	13,278.07

*Based on a value of \$6.72/bu.



Increase in apple yield: 34%

**Increase in income:
\$3,341.39/acre**

Conclusions: This apple study in western New York proved that four applications of Vitazyme increased apple yield by 34%, producing \$3,341.39/acre more income. At the same time there was an increase in sugars with Vitazyme despite a much heavier fruit load. The product also improved fruit pressure through the development of stronger cell walls, and increased fruit starch. These results show the very great value of Vitazyme to increase apple yield and quality in western New York.

Vital Earth Resources

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2004 Crop Results

Vitazyme on Apples

Farm: S&L Farms

Location: Sodus, New York

Trells: Y-trellis

Experimental design: A commercial apple orchard was divided into Vitazyme treated and untreated sections; Block 28 was treated. The objective of the study was to evaluate effects of this product on apple yield and quality.

Researcher: Jeff Alicondro, Agr. Assistance, North Rose, New York

Variety: Macoun

Tree age: 10 + years

Population: 450 trees/acre

Rootstock: Mark

1. Control

2. Vitazyme

Vitazyme application: 24 oz/acre at pink, again at petal fall, a third time at first cover, and once again 30 days before harvest, with an orchard sprayer in 100 gallons of water per acre

Retain PGR application: All rows were treated with Retain Plant Growth Regulator 30 days before harvest to delay fruit maturity, improve fruit size, and reduce fruit drop.

Weather for 2004: cool and wet, giving rise to excellent yields

Fertilization: unknown

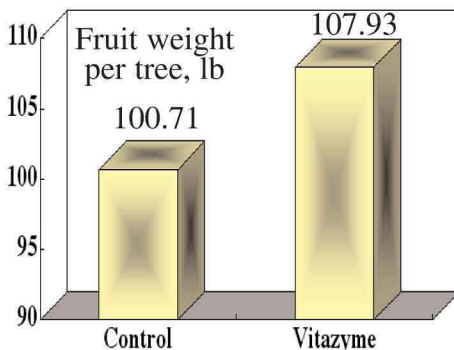
Midseason growth: On July 26, the Vitazyme treated foliage was visibly more aggressive and had a darker green color. Chlorophyll readings were taken with a Minolta SPAD Chlorophyll Meter on 30 leaves of each treatment, which revealed a significant advantage for the treated block.

Treatment	Leaf chlorophyll	Change
	SPAD units	SPAD units
Control	46.7	—
Vitazyme	49.0	+2.3

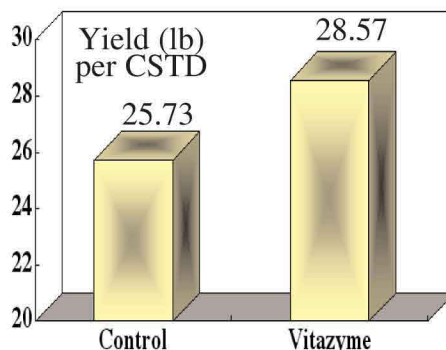
**Increase in chlorophyll:
+ 2.3 SPAD units**

Yield results: At harvest on October 9, seven trees of similar size and crop load were used for evaluating the two treatments.

Tree Fruit Yield

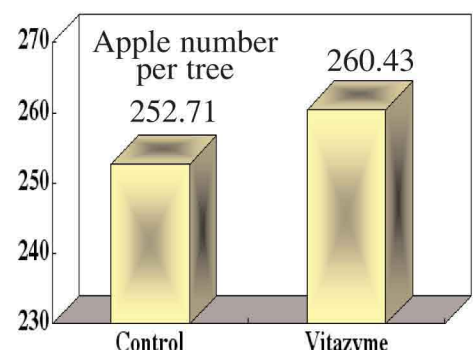


Yield Per CSTD*



*Cross-sectional tree diameter

Apples Per Tree

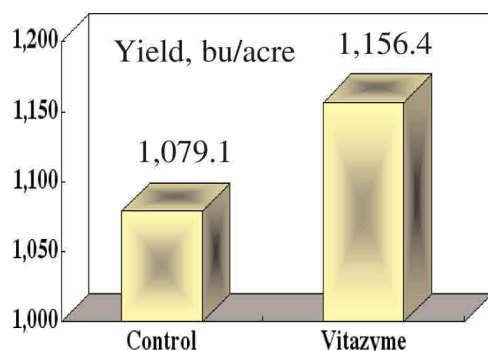


**Increase in fruit
weight: + 7%**

**Increase in
yield/CSTD: + 11%**

**Increase in
apples/tree: + 3%**

Apple Yield



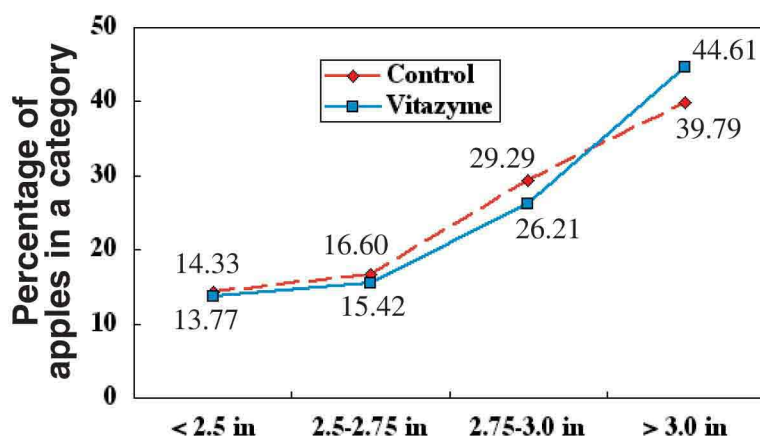
Increase in apple yield: + 6%

Vitazyme caused an increase in fruit yield (+ 7%), as well as apples per tree versus the untreated control.

Fruit grade results: All fruit was sized by categories, and the weights of the fruit for each category were added and evaluated to determine the percentage weight of each grade. Vitazyme produced more fruit in the >3.0" category than the control, and fewer fruit in the lighter categories. The mean fruit size was increased by 4% with Vitazyme, from 6.38 to 6.63 oz. See the line graph below.

Mean Fruit Size

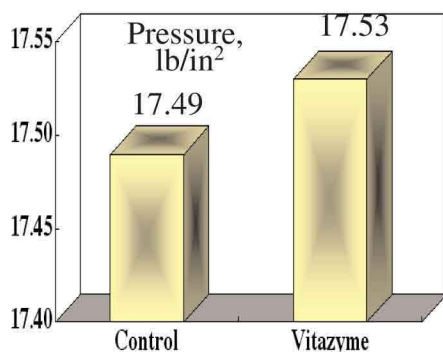
Treatment	Fruit size oz	Change oz
Control	6.38	—
Vitazyme	6.63	0.25 (+ 4%)



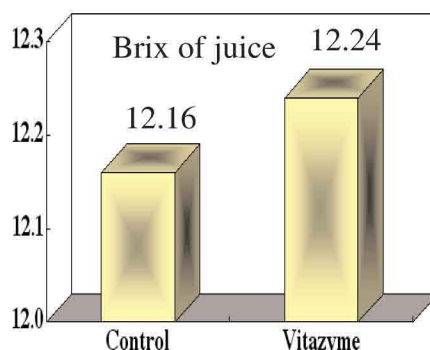
Increase in mean fruit size: + 4%

Fruit quality results: Ten apples from each treatment were selected to evaluate fruit pressure, fruit brix, and red color. Changes in fruit psi, brix, and red color were all minor, but were in all cases in favor of the Vitazyme treatment.

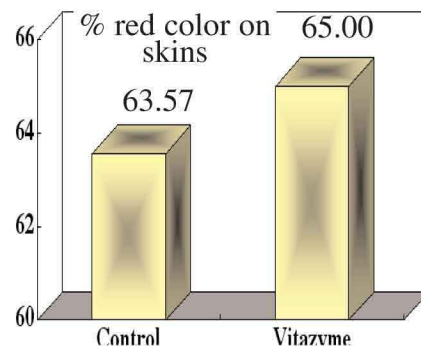
Fruit PSI



Fruit Brix



Red Color



Income results: Prices for Macoun apples were approximated for each of the size ranges: \$2.00/bu for <2.5 in, \$4.00/bu for 2.5-2.75 in, \$7.50/bu for 2.75 -3.0 in, and \$10.00/bu for >3.0 in. By multiplying these values by the percentage of fruit within each size range, an average value per bushel of apples was calculated for both treatments. The value of the crop was then able to be calculated.

Treatment	Apple yield bu/acre	Bushel value \$/bu	Apple value \$/acre	Increase \$/acre
Control	1,079.1	7.13	7,693.98	—
Vitazyme	1,156.4	7.33	8,476.41	782.43

**Increase in income:
+ \$782.43/acre**

**Increase in apple
price: \$0.20/bu**

Conclusions: This western New York Macoun apple trial revealed that Vitazyme boosted yield by a sizable 7% (77.3 bu/acre), and increased mean fruit weight by 4%, moving average size towards the >3-inch category. In addition, quality parameters such as brix, red color, and fruit PSI were slightly increased, revealing that in all cases the effects of Vitazyme on apple yield and quality were positive. Moreover, the average per bushel apple price was increased by \$0.20/bu with Vitazyme due a higher percentage of the more valuable larger sizes, and income per acre was increased by a sizable \$782.43. The return on investment in Vitazyme for this orchard, exceeded 20:1.

According to the researcher, **“In this evaluation the Vitazyme treatment resulted in larger Macoun fruit size, higher yields, and an increase in the percentage of 3-inch-plus diameter fruit.”**

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2007 Crop Results

Vitazyme on Apples

Researchers: Agr. Assistance

Variety: Macoun

Maturity: nursery stock

Experimental design: A nursery field was divided into Vitazyme treated and untreated areas to determine the product's effect on tree growth and development. Data were collected on groups of 10 continuous trees within seven sets of trees. A statistical analysis was performed for these seven replicates using the Student-Newman-Kuels Test.

Location: Wayne County, New York

Rootstock: M9

Soil type: unknown

1. Control

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

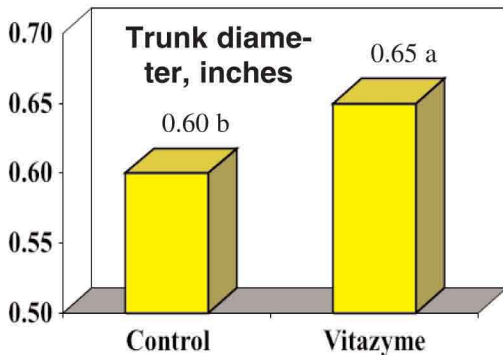
Vitazyme application: 16 oz/acre five times as cover sprays during the growing season; 50 gallons of solution per acre at 4 mph.

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

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

2. Vitazyme

CSTD*



*Cross-sectional tree diameter

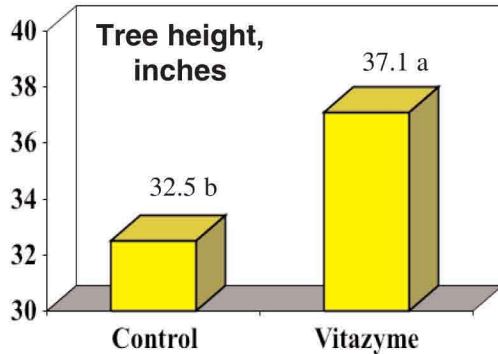
Treatment	Replicate							Mean ¹
	1	2	3	4	5	6	7	
Control	0.57	0.61	0.62	0.59	0.60	0.60	0.58	0.60 b
Vitazyme	0.67	0.64	0.68	0.63	0.59	0.65	0.66	0.65 a

¹Means followed by the same letter are not significantly different at P=0.05 according to the Student-Newman-Keuls Test.

Statistics: Main effects P 0.0099**
Block effect P 0.5598
Model P 0.1211
Coefficient of variation 4.05%

Increase in CSTD with Vitazyme: 8%

Tree Height



	Replicate							
Treatment	1	2	3	4	5	6	7	Mean ¹
	----- inches in height -----							
Control	32.5	33.5	30.0	33.5	31.0	34.5	32.5	32.5 b
Vitazyme	37.5	38.0	39.0	38.0	37.5	33.5	36.0	37.1 a

¹Means followed by the same letter are not significantly different at P=0.05 according to the Student-Newman-Keuls Test.

LSD_{0.05}..... 0.03 inch

Increase in tree height with Vitazyme: 14%

Statistics: Main effects P 0.0074**
 Block effect P 0.9524
 Model P 0.1479
 Coefficient of variation 6.19%
 LSD_{0.05}..... 2.8 inches

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

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2002 Crop Results

Vitazyme on Apples

Researcher: Jim Peters

Location: Williamson, New York

Soil type: silt loam, 25 in to a hardpan

Variety: McIntosh, selection Red Max

Tree age: 13 years, on dwarf root stock

Experimental design: Two areas of Red Max apples were treated with Vitazyme, and adjoining areas were left untreated. Quality determinations were made by the field man of the apple processing company that purchased the apples.

1. Control

2. Vitazyme

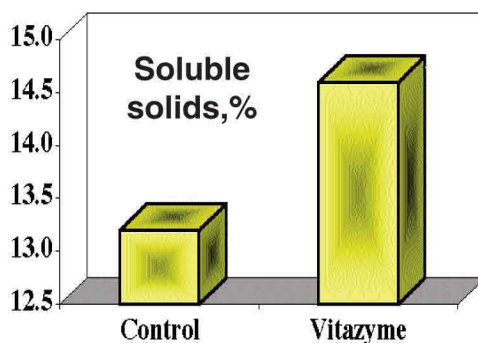
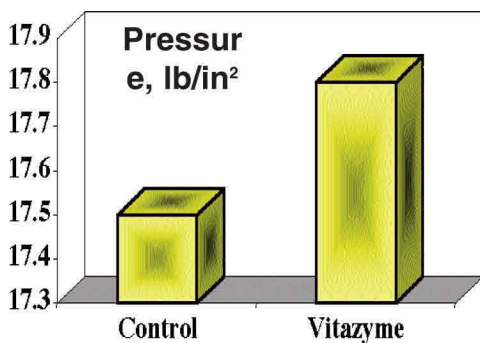
Fertilization: foliar urea sprays six times, all before June 15, along with the fungicide, at 5 lb/acre (30 to 40 lb of urea/acre total); 400 lb/acre K_2SO_4 in the fall; 1.5 lb/acre Solubor 4 to 5 times with the urea and fungicide

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

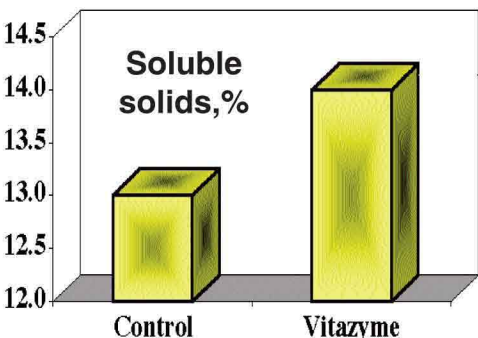
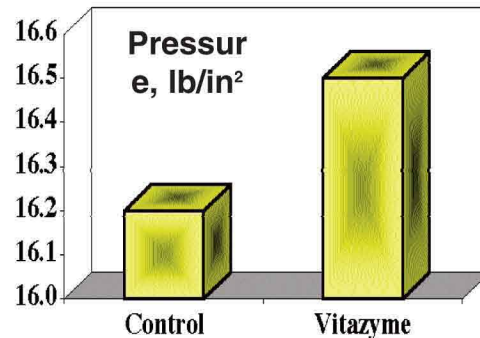
Harvest date: Area 1, September 12; Area 2, September 18

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

Flesh Firmness Area 1 Soluble Solids



Flesh Firmness Area 2 Soluble Solids



Conclusions: Vitazyme applied twice to the leaves of apples in this New York test, the first treatment in midsummer and the second treatment about two weeks before harvest, significantly improved the dissolved solids (mostly sugars) of the fruit, and also strengthened the flesh of the apples. These observations are in line with the usual effect of the product to strengthen cell walls and increase the sugar content by improving the intensity of photosynthesis ... and thus increasing carbon fixation and sugar production. These improvements translate into sweeter, tastier fruit that will store longer without bruising, reducing deterioration.

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2007 Crop Results

Vitazyme on Apples

Farmer: Douglas Fox

Variety: Rome (processing)

Tree age: over 50 years

Soil type: unknown

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

Research: Peck Babcock

Row spacing: 20 feet

Trees per row: 11

Location: Sodus, New York

In-row spacing: 20 feet

Trees per acre: 109

1. Control

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

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

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

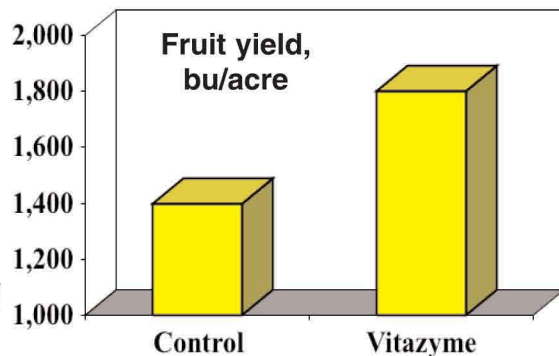
2. Vitazyme

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

*Each bin held 20 bushels.

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

**Increase in apple yield with
Vitazyme: 29%**



Yield

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

results:

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

Income results: At \$3.36 per bushel, the income results for this trial are as follows:

Conclusions: This New York processing Rome apple trial revealed that Vitazyme produced a reasonable 29% increase in yield. This yield increase translated into \$1,344/acre additional income from a very nominal cost input. With results such as this, there is every reason for apple growers throughout New York to reap the benefits of this increased production.

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2008 Crop Results

Vitazyme on Apples

Researcher: Robert deBorst, Mantissa Corporation **Location:** Cambridge, New Zealand

Variety: unknown

Tree age: young bearing trees

Experimental design: A second-year apple orchard was divided into Vitazyme treated and untreated areas to determine the effect of the product on tree development, as measured by trunk diameter.

1. Control

2. Vitazyme

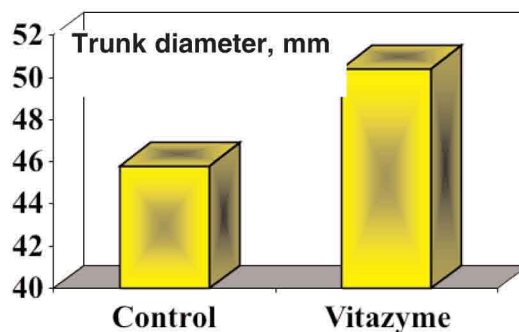
Fertilization: unknown

Vitazyme application: 1 liter/ha on the leaves and over the root zone at (1) flowering, (2) fruit set, (3) fruitlets 2 to 3 cm., and (4) three weeks before harvest

Measurement time: post-harvest, after leaf fall

Treatment	Trunk diameter*	Change
	mm	mm
Control 1	45.75	
Control 2	45.19	
Control 3	45.23	
Control 4	47.12	
Mean	45.82 b	—
Vitazyme 1	48.94	
Vitazyme 2	49.24	
Vitazyme 3	53.86	
Vitazyme 4	49.63	
Mean	50.42 a	4.6
(+10%)		
Main effects P	0.01	
CV	3.65%	
LSD _{0.05}	3.04	

*Measured at the same height for each tree. Data is treated as a completely randomized design. Means followed by the same letter are not significantly different at P=0.05, according to the Student-Newman-Keuls Test.



Increase in trunk diameter in one season: 10%

Conclusions: In this New Zealand apple study, four applications of Vitazyme markedly increased trunk diameter of these young trees by 10% above the control during a single growing season. The yield of fruit was not measured.