

### ***Vital Earth Resources***

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

## **2010 Crop Results**

# **Vitazyme on Grapes, Table**

Grower: Agricola Bauza

Researcher: Syngenta

Location: Parcel 26 of Agricola

Bauza, Punta Peuco, Metropolitan Region, Chile

Variety: Crimson Seedless

Sprayer rate: 1,000 liters/ha (nebulizer sprayer)

Experimental design: A vineyard of Crimson Seedless grapes was divided into a Vitazyme treated area as well as an Ethrel treated control. The purpose of the study was to evaluate the effects of the product on grape yield, maturity, and advancement of coloration of the crop, and grape quality parameters versus the control.

**1. Vitazyme, 2.0 liters/ha twice**

**2. Ethrel**

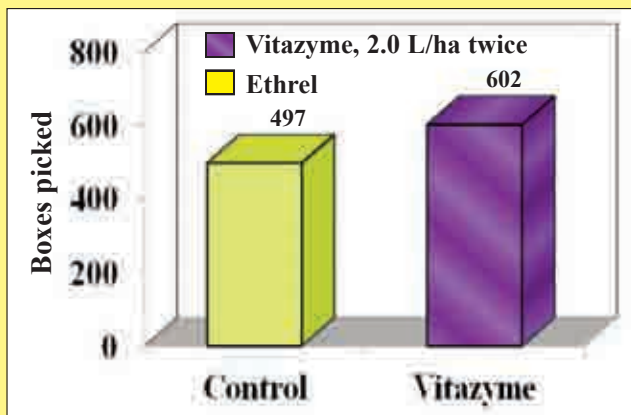
Fertilization: as recommended

Ethrel application: as recommended

Vitazyme application: 2.0 liters/ha applied 15 days before veraison, and 2.0 liters/ha applied at veraison

Grape sugar: Both treatments produced a Brix value about the same: Vitazyme, 19.9; Control, 20.1.

Grape yield: One picking was made, on March 3 and 4, 2010.



**Increase in grape yield  
with Vitazyme: 105 boxes  
(21%)**

Conclusion: The researchers concluded the following:

- The Vitazyme treatment produced 21% more boxes than did the Ethrel treated control.
- The color of the Vitazyme treated berries was much more homogenous within the clusters than for the control, which facilitated the harvest. There were also few green berries in the treated area.
- There were real differences between the two treatments in terms of Brix, despite the increased yield of the Vitazyme treatment.
- The differences between the treatments were marked 15 days before harvest, but near the end of harvest these differences were diminishing.

Vitazyme is shown by this trial to produce superior yields, more than Ethrel, without diminishing quality parameters.

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# 2010 Crop Results

## Vitazyme on Grapes, Table

Grower: Agricola La Cabana

Researcher: Syngenta

Location: Coltauco, Region VI, Chile

Variety: Thompson Seedless

Spacing: 4.0 x 2.0 meters

Sprayer rate: 70 liters/ha (EES sprayer)

Experimental design: A vineyard of Thompson Seedless grapes was divided into a Vitazyme treated parcel, along with an untreated area alongside to evaluate the effects of the product on grape yield and maturity.

**1. Vitazyme, 2.0 liters/ha twice**

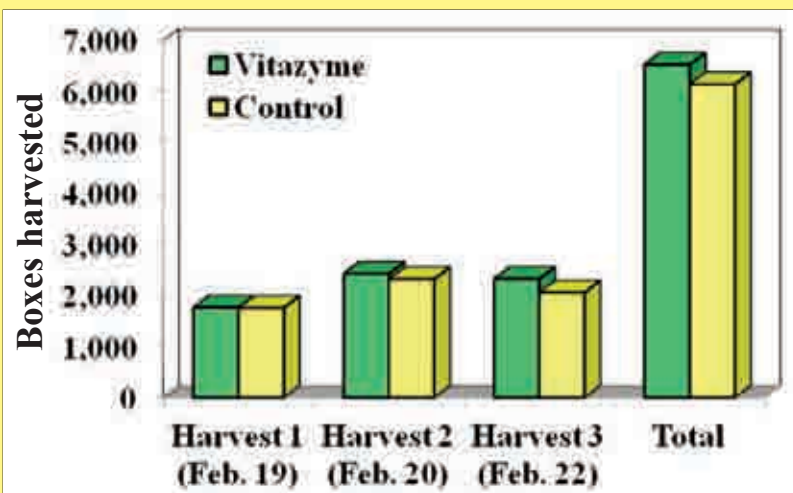
**2. Control**

Fertilization: as recommended

Vitazyme application: 2.0 liters/ha applied 15 days before veraison (December 7, 2009), and 2.0 liters/ha applied at veraison (December 12, 2009)

Grape yield: Three harvests were made, on February 19, 20, and 22, 2010.

Treatment	Harvests							
	Feb. 19	%	Feb. 20	%	Feb. 22	%	Total	Change
1. Vitazyme, 2 L/ha twice	1,765	0%	2,433	+5	2,329	+13	6,527	381 (+6%)
2. Control	1,758	---	2,324	---	2,064	---	6,146	---



**Grape harvest increase  
with Vitazyme: 6%**

Conclusion: This Chilean table grape study revealed that Vitazyme, applied at 2.0 liters/ha twice, resulted in a 6% yield increase across three harvests. A 1.5 liters/ha rate would likely have given a greater yield response.

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# 2010 Crop Results

## Vitazyme on Grapes, Table

Grower: Fundo Santa Marta      Researcher: Syngenta      Location: Santa Marta, Metropolitan Region, Chile

Variety: Flame Seedless

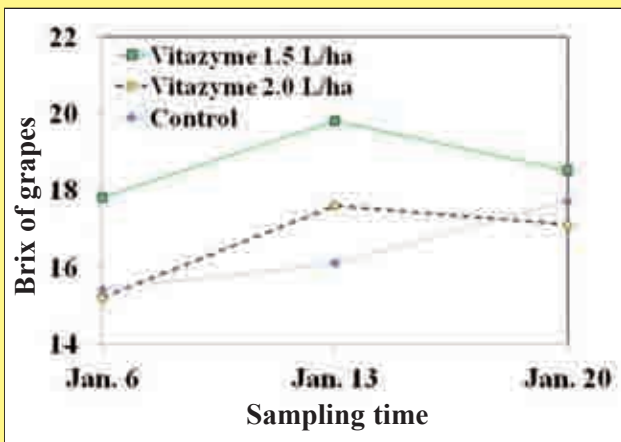
Experimental design: A vineyard was divided into two Vitazyme treatments, plus an untreated control, to evaluate the effects of the product on grape maturity and coloration, yield, and sugar content.

Treatment	Rates and timing	
	15 days before verasion	At verasion
	----- liters/ha -----	
1. Vitazyme	1.5	1.5
2. Vitazyme	2.0	2.0
3. Control	0	0

Fertilization: as recommended

Vitazyme application: 1.5 liters/ha both times for Treatment 1; 2.0 liters/ha both times for Treatment 2

Grape sugar results: Sugar was measured at three times, before and during harvest.



Treatment	Brix values				
	1-6	1-13	1-20	Ave	Change
1. Vitazyme, 1.5 L/ha	17.8	19.8	18.5	18.7	2.3 (+14%)
2. Vitazyme, 2.0 L/ha	15.2	17.6	17.1	16.6	0.2 (+1%)
3. Control	15.4	16.1	17.7	16.4	---

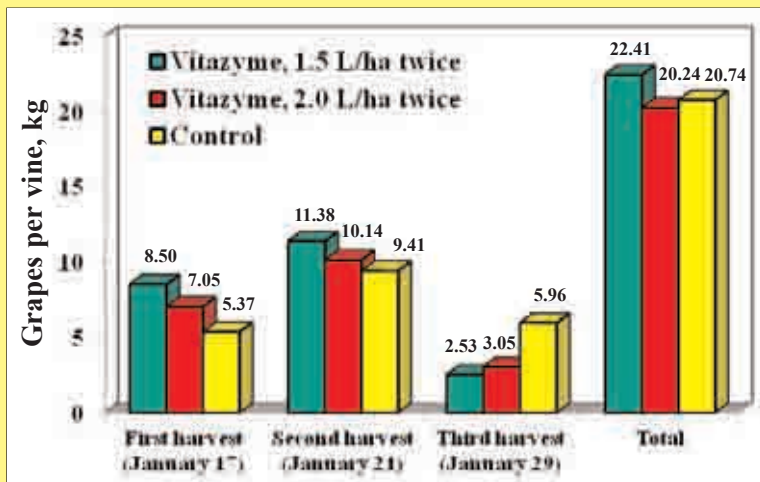
### Increase in Brix with Vitazyme

1.5 L/ha twice ..... 2.3 Brix

2.0 L/ha twice ..... 0.2 Brix

Yield results: Three pickings were made.

Treatment	Grape pickings				Change
	Jan. 17	Jan. 21	Jan. 29	Total	
	----- kg/vine -----				
1. Vitazyme, 1.5 L/ha	8.50	11.38	2.53	22.41	1.67 (+8%)
2. Vitazyme, 2.0 L/ha	7.05	10.14	3.05	20.24	(-) 0.50 (-2%)
3. Control	5.37	9.41	5.96	20.74	---



### Increased yield with Vitazyme

#### First Picking

1.5 L/ha .... 3.13 kg/vine (+58%)

2.0 L/ha .... 1.68 kg/vine (+31%)

#### Second picking

1.5 L/ha .... 1.97 kg/vine (+21%)

2.0 L/ha .... 0.73 kg/vine (+8%)

#### Total pickings

1.5 L/ha ..... 1.67/vine (+8%)

**Conclusion:** This fresh grape trial in Chile, using Vitazyme twice at either 1.5 or 2.0 liters/ha, revealed that the product improves early coloration and maturity of Thompson Seedless grapes. Not only was the time to harvest improved (by 58% for 1.5 liters/ha, and 31% for 2.0 liters/ha for the first, more profitable harvest), but the total yield was increased by the 1.5 liters/ha treatment (+8%). In addition, grape sugar was improved with Vitazyme, by an average of 2.3 Brix for the 1.5 liters/ha rate, and by 0.2 Brix for the 2.0 liters/ha rate. According to Syngenta, “The T1 [1.5 liters/ha] treatment represents a real breakthrough and increased crop yield compared with the control and T2 [2.0 liters/ha]”.

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# 2010 Crop Results

## Vitazyme on Grapes, Table

Grower: Fundo Santa Marta  
Chile

Researcher: Syngenta

Location: Santa Marta, Metropolitan Region,

Variety: Thompson Seedless

Experimental design: This trial utilized a vineyard that was divided into two Vitazyme treatments besides a control. The purpose of the trial was to evaluate the product's ability to enhance the coloration and maturity of grapes, while increasing yield and quality.

Treatment	Rates and timing	
	15 days before veraison	At veraison
	----- liters/ha -----	
1. Vitazyme	1.5	1.5
2. Vitazyme	2.0	2.0
3. Control	0	0

Fertilization: as recommended

Vitazyme application: 1.5 liters/ha for Treatment 2 at both times, and 2.0 liters/ha for Treatment 2 at both times

Grape sugar results: Sugar was measured at four times during February.

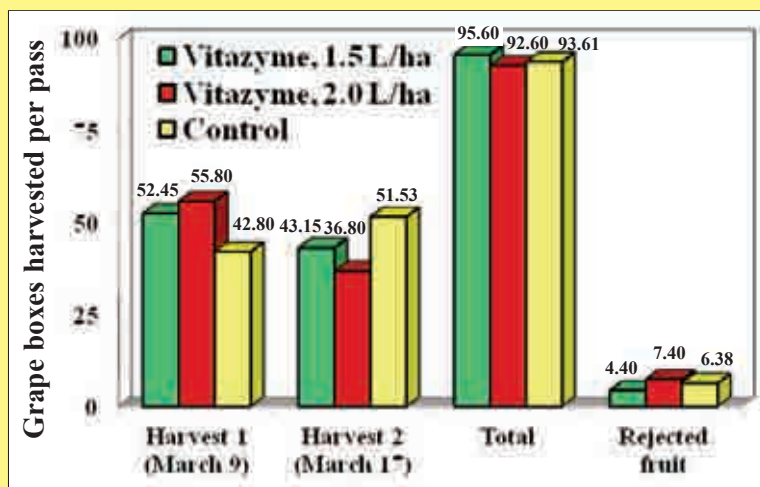
Treatment	Brix values			
	2-10	2-19	2-25	3-4
1. Vitazyme, 1.5 L/ha	12.8	14.1	15.1	15.7
2. Vitazyme, 2.0 L/ha	13.3	14.1	15.1	15.7
3. Control	13.1	14.3	15.4	15.7

The Brix values varied little for the three treatments from February 10 to March 4, and on the last sampling day the values all converged at 15.7 Brix.

Grape yield results: Two pickings were made.

Treatment	Picking yields						Rejected fruit
	March 9	%	March 17	%	Total	Change	
	----- boxes/picking -----				---- total boxes ----		boxes
1. Vitazyme, 1.5 L/ha	52.45	(+25%)	43.15	(-16%)	95.60	1.99 (+2%)	4.40
2. Vitazyme, 2.0 L/ha	55.80	(+33%)	36.80	(-29%)	92.60	(-) 1.01 (-1%)	7.40
3. Control	42.08	---	51.53	---	93.61	---	6.38

### Grape Yield



#### Increased yield with Vitazyme

##### First picking

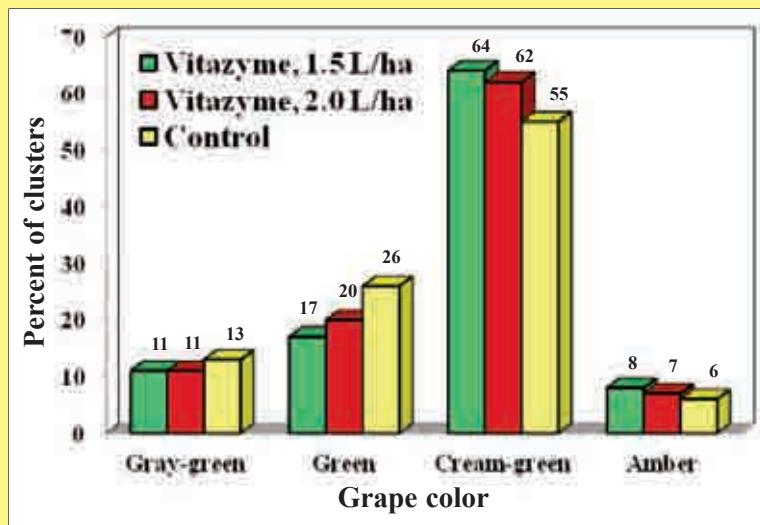
1.5 L/ha	.....	+25%
2.0 L/ha	.....	+33%

##### Total pickings

1.5 L/ha	.....	+2%
----------	-------	-----

**Refused fruit reduced at  
1.5 liters/ha: -31%**

### Distribution of Fruit Color (ASOEX)



Grape color results: For the grapes harvested, a color evaluation was made.

Vitazyme increased the percentage of grapes in the cream-green category, which fetches a much greater price than does the green category, often twice as much.

Conclusion: This Chilean fresh grape trial, using 1.5 and 2.0 liters/ha of Vitazyme applied twice, revealed that the yield of first-picked grapes was increased by 25% and 33% by the 1.5 and 2.0 liters/ha rates, respectively, compared to the control. This allowed the farmer to sell more of his grapes at a higher price. Besides, the amount of refused fruit at the 1.5 liters/ha rate was reduced by 31%. According to Syngenta, “Vitazyme in doses of 1.5 and 2.0 L/ha were harvested earlier. This advance [in maturity] allowed a harvest of about 20% more fruit 10 days earlier.” The color of the fruit was also positively influenced by Vitazyme: both rates increased the percentage of the cream-green clusters, which sell for a much higher price than the gray-green, green, or amber fruit. Fruit sugar was not affected by any treatments in this study. These results confirm the great utility of Vitazyme to enhance grape yield, quality, and color in Chile.

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# 2010 Crop Results

## Vitazyme on Grapes, Table

Grower: Fundo El Retiro, DDC

Researcher: Syngenta

Location: Pudahuel, Metropolitano Region, Chile

Variety: Thompson Seedless

Spacing: 3.75 X 2.5 meters

Sprayer: vineyard micron sprayer delivering 1,000 liters/ha

Experimental design: A vineyard of Thompson Seedless table grapes was divided into four treatments, three of them Vitazyme and the fourth the control. The purpose of the trial was to evaluate the product's effects on grape yield and maturity at specific dates.

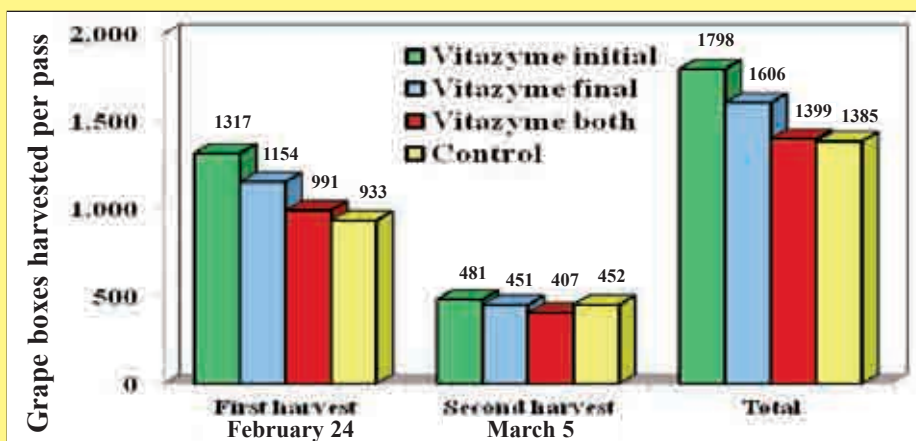
Treatment	Applications	
	Initial	Final
	----- liters/ha -----	
1. Vitazyme	1.5	0
2. Vitazyme	0	1.5
3. Vitazyme	1.5	1.5
4. Control	0	0
*The "Initial" and "Final" application times were not specified in the research document, but probably were "15 days before veraison" for "Initial", and "At veraison" for "Final."		

Fertilization: as recommended

Vitazyme application: 1.5 liters/ha at the specified times in Treatments 1, 2, and 3

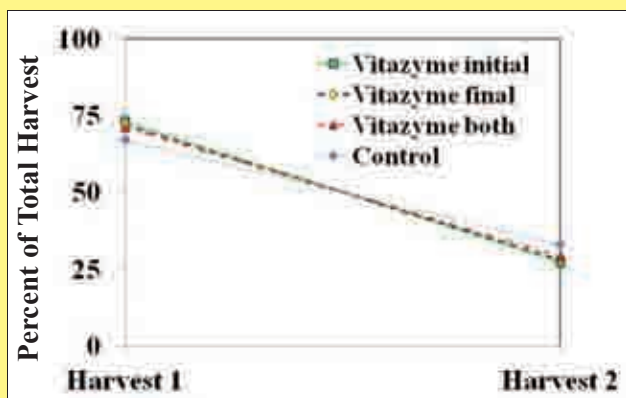
Grape yield results:

Treatment	Harvest 1	Percent	Harvest 2	Percent	Total
	boxes	%	boxes	%	boxes
1. Vitazyme (initial)	1,317	73	481	27	1,798 (+30%)
2. Vitazyme (final)	1,154	72	451	28	1,606 (+16%)
3. Vitazyme (both)	991	71	407	29	1,399 (+1%)
4. Control	933	67	452	33	1,385 ---





### Percent of Grapes Per Picking



### Percent of First Harvest Grapes

Vitazyme initial .....	73
Vitazyme final .....	72
Vitazyme both .....	71
Control .....	67

### Yield Increase With Vitazyme

Vitazyme initial .....	30%
Vitazyme final .....	16%
Vitazyme both .....	1%

**Conclusion:** In this Thompson Seedless grape trial in Chile, Vitazyme applied at the “initial” time caused a remarkable 30% yield increase, while marginally improving the maturity and coloration of the grapes, by 6% more than the control (73% vs. 67%) on February 24. The “final” Vitazyme treatment gave an excellent 16% yield increase on February 24, advancing fruit color development, while also improving the percentage of the initial picking by 5 percentage points more than the control. The Vitazyme applications did not improve the maturity and yield of the grapes by much, showing that, in this situation, only one application was required to achieve excellent early coloration and high final yield.



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# 2010 Crop Results

## Vitazyme on Grapes, Table

Grower: Felipe Guerra, Del Monte Fresh Produce

Researcher: Syngenta

Location: Region V, Chile (Metropolitana)

Variety: Flame Seedless Spacing: 3.5 x 1.75 meters

Sprayer: ESS, 75 liters/ha

Experimental design: A vineyard of Flame Seedless grapes for fresh market was treated with Vitazyme in two areas; the other areas received conventional programs. The purpose of the trial was to evaluate the effect of the treatments on color and quality parameters of the grapes, as well as the time to maturity of the harvested fruit relative to exportation requirements.

Treatment	Application rate		Application time	
	liters/ha	15 days before verison	At veraison	
1. Ethrel	0.5	0	X	
2. Vitazyme	2.0	X	X	
3. Control	2.0	0	0	

Fertilization: as recommended

Vitazyme application: 2.0 liters/ha each time for Treatment 2

Ethrel application: 0.5 liters/ha for Treatment 1

Grape quality results: Brix results are at harvest.

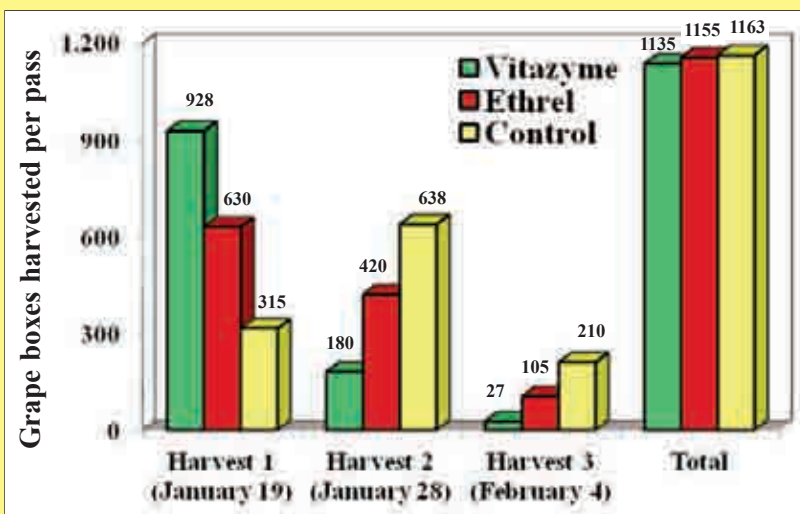
Treatment	Brix values
Ethrel and Control	15.5 to 16.5 (x=16.00)
Vitazyme	16.5 to 18.0 (x=17.25)

**Increase in Brix with Vitazyme**

**Average of 1.25 Brix**

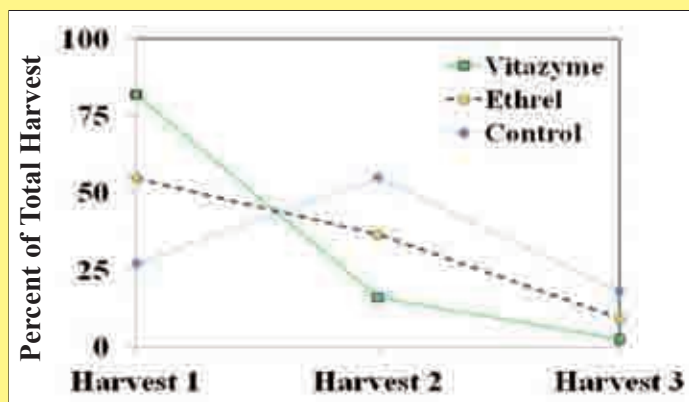
Splitting of the grapes was less with the Vitazyme treatment than with the other two.

Grape harvest results: Grapes were harvested when the color was acceptable for table use, meaning they had achieved a red color. Three harvests were recorded.



Treatment	Harvest 1	Percent	Harvest 2	Percent	Harvest 3	Percent	Total
	boxes	%	boxes	%	boxes	%	boxes
2. Vitazyme	928	81.8	180	15.9	27	2.3	1135
1. Ethrel	630	54.5	420	36.4	105	9.1	1155
3. Control	315	27.1	638	54.9	210	18.0	1163

### Percent of Grapes Per Picking



### Percent of First Harvest Grapes

Vitazyme .....	81.8
Ethrel .....	54.5
Control .....	27.1

**Conclusion:** This Flame Seedless table grape study in Chile revealed that Vitazyme greatly increased the percentage of grapes harvested on the January, 2010, first harvest; the percentages of Ethrel and untreated grapes harvested on the first harvest were 54.5 and 27.1%, respectively, while the Vitazyme treatment produced 81.8% of the yield for the first harvest. The product greatly advanced coloration of the skins. This early maturity with Vitazyme markedly improved the income of the farmer by allowing him to market more grapes earlier, to reach the more lucrative early market. Besides, the Vitazyme treated grapes had more sugar — thus tasted better — and there were fewer split grapes with the treatment. Ethrel was the second best treatment in terms of earlier maturity, followed by the control. The total harvest was about the same for all three treatments.

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# 2010 Crop Results

## Vitazyme on Grapes, Table

Grower: Prohens

Researcher: Syngenta

Location: Apacheta, Copiapo, Chile

Variety: Flame Seedless

Experimental design: A grape vineyard was separated into two Vitazyme treatments with Ethrel, and Ethrel alone, to evaluate the effect of the products and combinations on sugar content, berry size, yield, and maturity of the crop.

Treatment	Vitazyme applications		Ethrel*
	15 days before veraison	At veraison	
	liters/ha		
1, Vitazyme + Ethrel	1.5	1.5	0.7
2, Vitazyme + Ethrel	2.0	2.0	0.7
3, Ethrel only	0	0	0.7

\*Applied 15 days before coloration.

Fertilization: as recommended

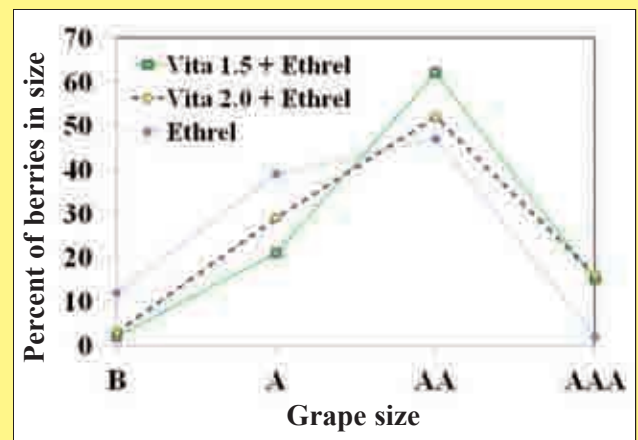
Vitazyme application: 1.5 liters/ha twice for Treatment 1, and 2.0 liters/ha twice for Treatment 2

Grape sugar results: Five dates were selected to determine grape sugar: November 19 and 26, and December 3, 10, and 17, 2009. There were no major differences in Brix for the three treatments during the one-month period, as the sugar for all three increased from about 13.5 to 14.0, 15.0, 16.1, and 17.1 brix.

Grape size results: The size of the grapes was measured near harvest.

Treatment	Grape size*			
	B	A	AA	AAA
	% of berries			
1. Vita (1.5 L/ha) + Ethrel	2	21	62	15
2. Vita (2.0 L/ha) + Ethrel	3	29	52	16
3. Ethrel	12	39	47	2

\*B=16.0 to 17.5 mm; A=17.5 to 19.0 mm; AA=19 to 21 mm; AAA>21 mm.



### Grape size

#### Size AA

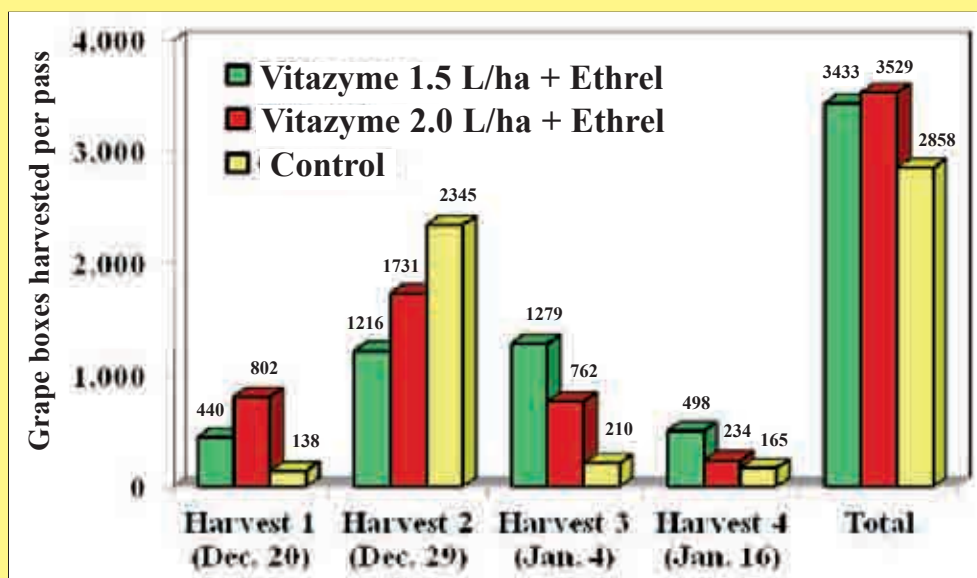
Vita 1.5 + Ethrel ..... 62%  
Vita 2.0 + Ethrel ..... 52%

#### Size AAA

Vita 1.5 + Ethrel ..... 15%  
Vita 2.0 + Ethrel ..... 16%

Yield results: Four harvests were made, on December 20 and 29, 2009, and on January 4 and 16, 2010.

Treatment	Picking yields								Total	Change
	Dec. 20	%	Dec. 29	%	Jan. 4	%	Jan. 16	%		
	----- boxes/picking -----								----- total boxes -----	
1. Vita (1.5 L/ha) + Ethrel	440	+219	1,216	-48	1,279	+509	498	+202	3,433	575 (+20%)
2. Vita (2.0 L/ha) + Ethrel	802	+481	1,731	-26	762	+263	234	+42	3,529	671 (+23%)
3. Ethrel	138	---	2,345	---	210	---	165	---	2,858	---



Conclusion: This table grape study in Chile in 2009 and 2010 revealed that Vitazyme plus Ethrel proved to be superior to Ethrel treatment alone. Although grape sugar was not improved by Vitazyme, the AA size of the fruit was increased substantially by either the 1.5 liters/ha treatment twice (+62%), or by the 2.0 liters/ha treatment twice (+52%). Size AAA grapes were increased as well by both treatments, by 15% to 16%. Harvested yield was dramatically improved with Vitazyme, by 20% with the 1.5 liters/ha rate and by 23% with the 2.0 liters/ha rate. The early harvest percentage when Vitazyme was added with Ethrel was increased greatly as well by 440 to 802%. According to the researchers, “Vitazyme improved harvest of grapes 9 days earlier, and increased the boxes harvested per hectare. This was due to an early harvest of many boxes, and the treatment helped reduce the number of clusters that were not harvested.”



## **DIRECTORY**

### **Section I Wine Grape Studies**

#### **California Wine Grapes**

Six Year Study on Wine Grapes 2004 – 2009

Yr 1 - 2004

Yr 2 - 2005

Yr 2 - 2005 Wine Evaluation

Yr 3 - 2006

Yr 4 - 2007

Yr 5 - 2008

Yr 6 - 2009

Pinot Noir 2000

Cabernet Sauvignon 2005

Testimonial 1999

#### **New York Wine Grapes**

Cabernet Franc 2009

Cayuga 2009

Pino Noir & Riesling 2009

### **Section II Raisin Grape Studies**

#### **California**

Three Year Study on Raisin Grapes 2003 – 2005

Thompson Seedless Yr 1 - 2003

Thompson Seedless Yr 2 - 2004

Thompson Seedless Yr 3 - 2005

Thompson Seedless #1 1997

Thompson Seedless #2 1997

Thompson Seedless 1998

## **Section II Raisin Grape Studies (Cont.)**

### **California (Cont.)**

Thompson Seedless #1 1999  
Thompson Seedless #2 1999  
Thompson Seedless 2000

## **Section III Table Grapes**

### **California**

Flame, Perlette, Sugraone 2008

### **Chili**

Crimson Seedless #1 2009  
Crimson Seedless #2 2009  
Thompson Seedless #1 2009  
Thompson Seedless #2 2009  
Flame Seedless 2009  
Thompson Seedless & Crimson Seedless 2009

### **Ukraine**

Aligote 2008  
Ranniy Magaracha 2008

## **Section IV New Planting & Young Vineyard**

### **California**

New Planting Thompson Seedless 2000

### **New York**

New Planting Niagara 2009

### **Chili**

Young Vineyard Response Thompson Seedless 2009

### **Ukraine**

New Planting Unknown Variety 2008

## **Section V Micro-Organism Response**

### **California**

Ruby Seedless #1 2001

## **Section V Micro-Organism Response (Cont.)**

### **California (Cont.)**

Ruby Seedless #2 2001

Ruby Seedless #3 2001

## **Section VI Application Rates**

**New Plantings**

**Established Vineyards**



## **Section I Wine Grape Studies**

### **California Wine Grapes**

Six Year Study on Wine Grapes 2004 – 2009

Yr 1 - 2004

Yr 2 - 2005

Yr 2 - 2005 Wine Evaluation

Yr 3 - 2006

Yr 4 - 2007

Yr 5 - 2008

Yr 6 - 2009

Pinot Noir 2000

Cabernet Sauvignon 2005

Testimonial 1999

### **New York Wine Grapes**

Cabernet Franc 2009

Cayuga 2009

Pino Noir & Riesling 2009

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# 2004 Crop Results

## Vitazyme on Grapes (for wine)

Researcher: John Broeker      Vineyard: Mondello Vineyards      Location: San Miguel, California

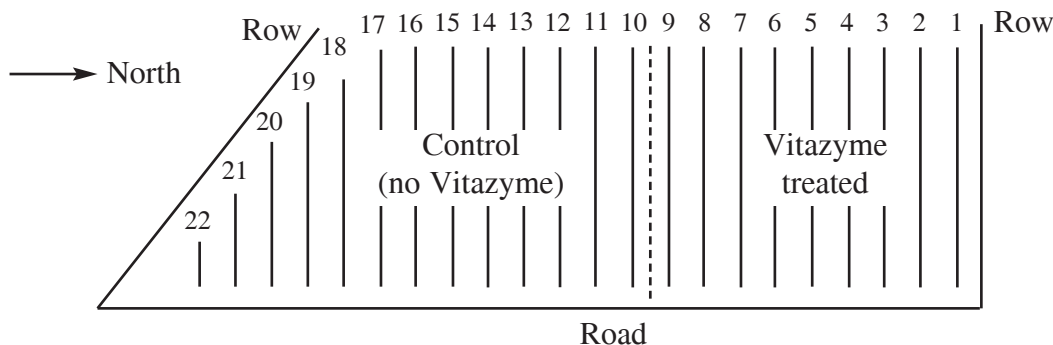
Variety: Cabernet Sauvignon      Row spacing: 12 feet between rows, 6 feet in-row

Grafting: none (self-rooted)      Grape plant age: 4 years (first harvest)      Irrigation: drip

Bunch thinning: none      Soil type: loam, high-calcium subsoil, low organic matter

Experimental design: A vineyard of grapes of equal age was partially treated with Vitazyme during the growing season to evaluate effects on grape yield and winemaking quality; all other treatments were identical. Both treatments were to be evaluated for overall effects on grape and wine quality by following through the preharvest period, and on to the actual wine itself after fermentation and aging. Eventually a taste panel will evaluate the quality of the two wines after sufficient aging.

[vineyard continues west]



Irrigation: begun the end of March and ended by late August; 21 gallons/week/ plant in three applications

Fungicides: applied as needed

Fertilization: 200 lb/acre  $(\text{NH}_4)_2 \text{SO}_4$  broadcast in March before bud break; 9-18-9 or 3-18-18 (+ micronutrients) applied every two to three weeks at 2 to 3 gallons/acre during much of the growing season, usually with sulfur after veraison; a blue-green algae solution applied in the irrigation water periodically

Vitazyme application: (1) 13 oz/acre with 9-18-9 fertilizer sprayed at bud break; (2) 13 oz/acre with 9-18-9 fertilizer + sulfur sprayed at BB-sized fruit; (3) 13 oz/acre with 19-18-9 fertilizer + sulfur sprayed at veraison

Harvest date: September 25, 2004

Chlorophyll content: On August 15, 30 random leaf samples from each treatment were analyzed with a Minolta SPAD chlorophyll meter to determine leaf chlorophyll levels. These levels relate directly to the ability of the plants to fix carbon and sunlight energy into plant structural and reproductive (grape) tissue.

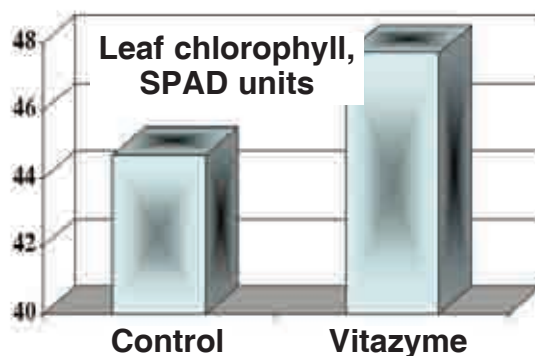
Treatment	Leaf chlorophyll			Change
	West end*	East end*	Average	
	-----	SPAD units	-----	
Control	43.2	46.1	44.7	—
Vitazyme	47.0	48.4	47.7	3.0

\* 30 leaf samples for each mean.

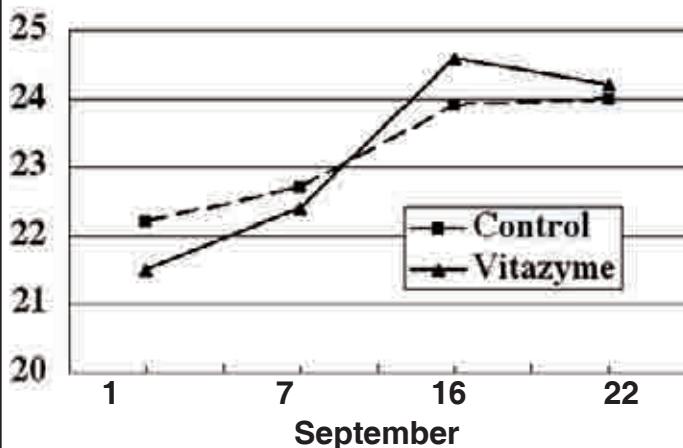
**Increase in leaf  
chlorophyll: 3.0 SPAD  
units**

**Vine growth:** According to the researcher, the Vitazyme treated vines had perhaps 33% more growth of leaves and vines than the untreated control plants.

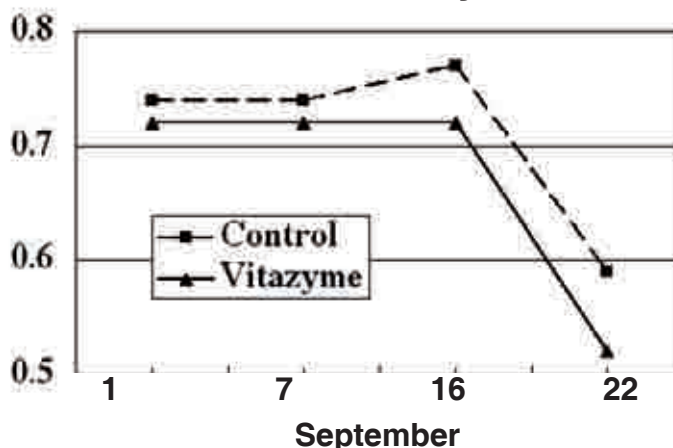
**Preharvest to harvest grape and grape juice quality:** Grapes from each treatment were randomly collected at four dates prior to harvest: September 1, 7, 16, and 22. These samples were crushed, and the juice was analyzed for brix (sugar and soluble solids), total acidity, and pH at Baker Wine and Grape Analysis, Paso Robles, California.



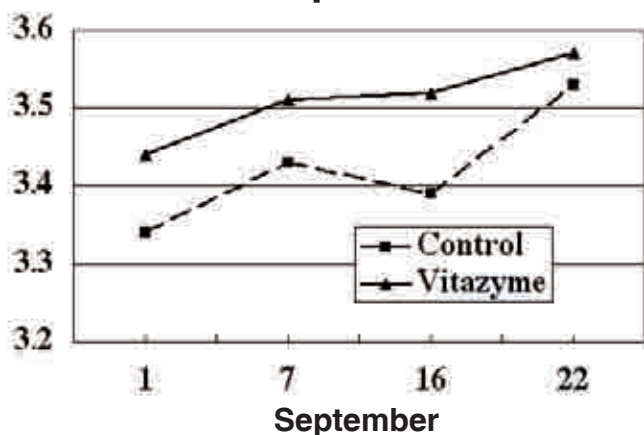
**Brix**



**Total Acidity**



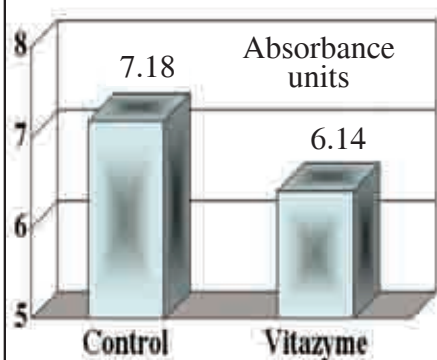
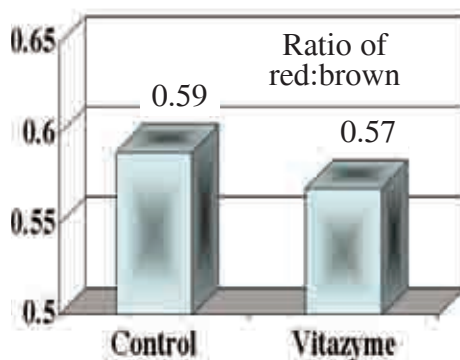
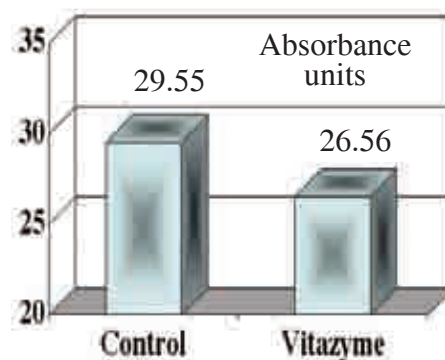
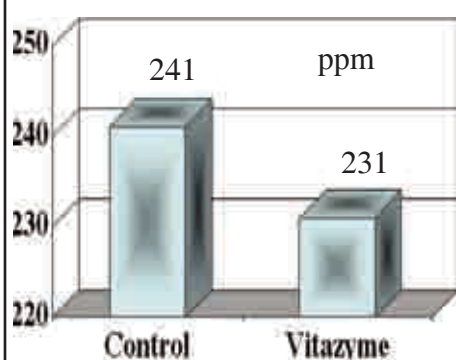
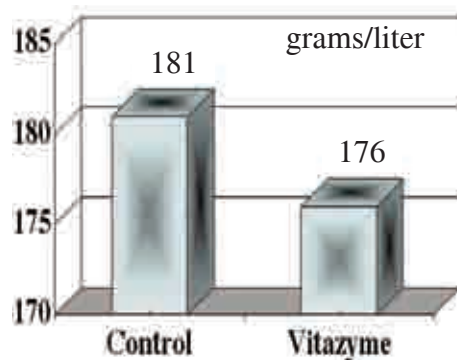
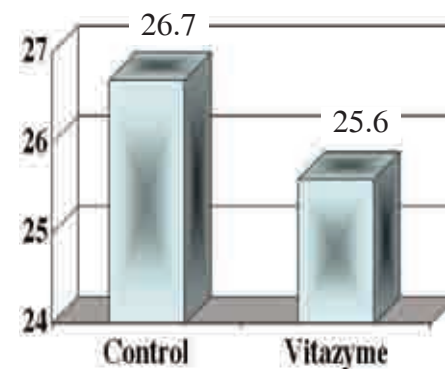
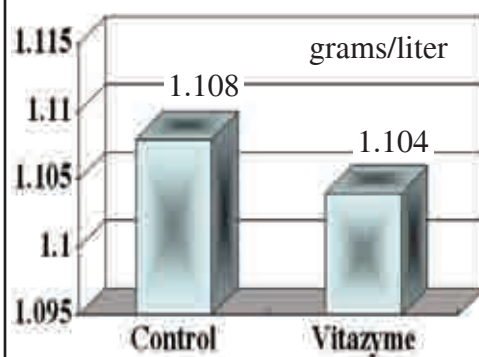
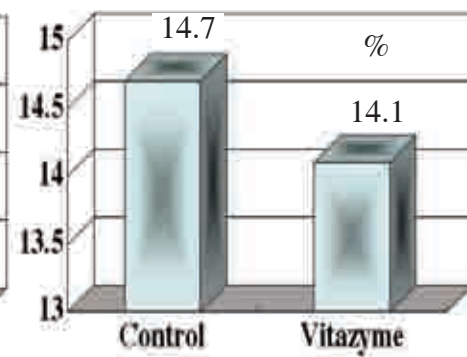
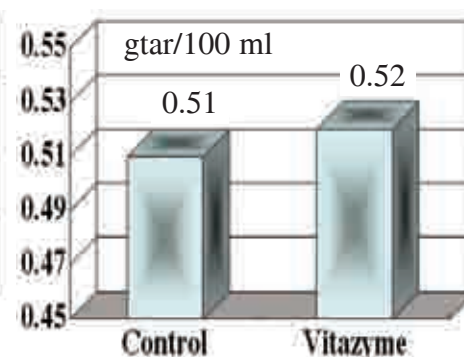
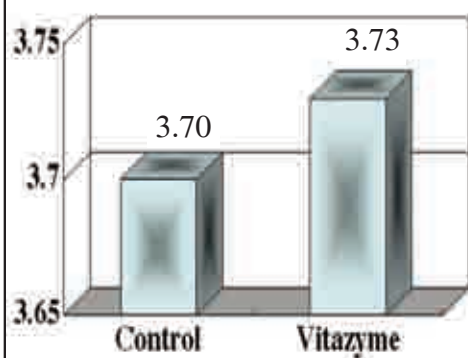
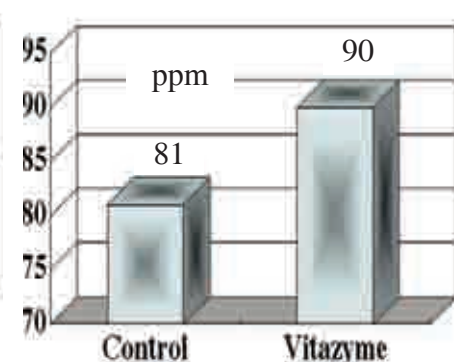
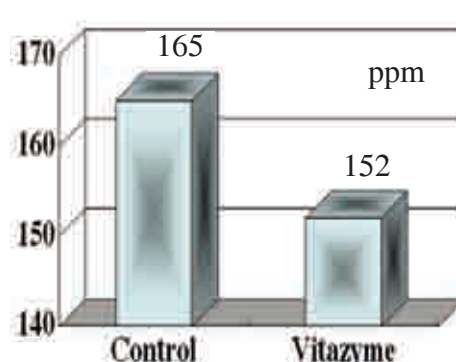
**pH**



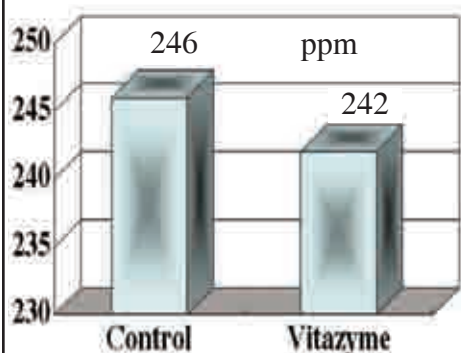
Neither of the two treatments yielded grapes that were very different in terms of brix, acidity, or pH. What is remarkable is that the Vitazyme treated grapes produced values of all three parameters that were very close in value to the untreated control grapes, showing that these plants were photosynthesizing adequately, and taking up soil minerals rapidly enough, to support a 46% greater grape load. The sugar and pH levels were nearly the same for both treatments, and total acidity is only slightly lower for the Vitazyme treatment.

Of special interest was the observation that the Vitazyme treated grapes were more full and less “raisined” (dried out) than the control grapes. This indicated (1) that the roots of the treated plants were actively taking in more groundwater later in the season, and (2) the cell walls of the treated grapes were thicker and less apt to lose water.

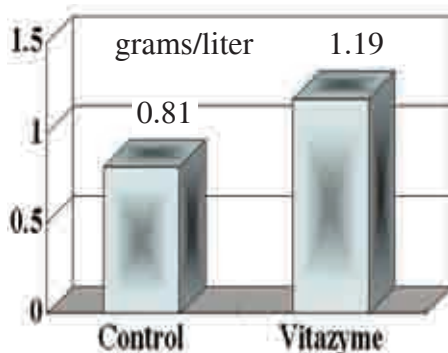
**Grape juice quality at harvest:** On September 28, 2004, the grapes were harvested, and the juice was evaluated for color and chemical factors. According to the winemaker, grape quality parameters were quite similar for both treatments. The main three — pH, total acidity, and brix — showed little variation between the two. The results of these analyses are displayed in the graphs that follow.

**Color Density****Color Hue****Total Phenolics****Anthocyanins****GF****Brix****Density****Potential Alcohol****Total Acidity****pH****Ammonia (NH<sub>3</sub>)****Amino Acids**

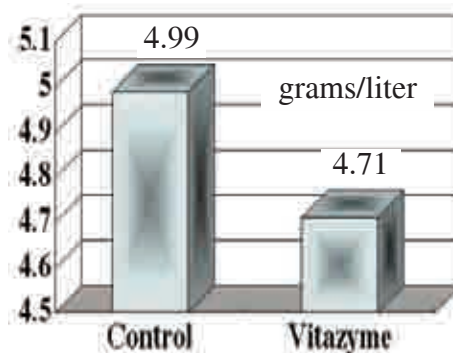
## Yeast Active Nitrogen



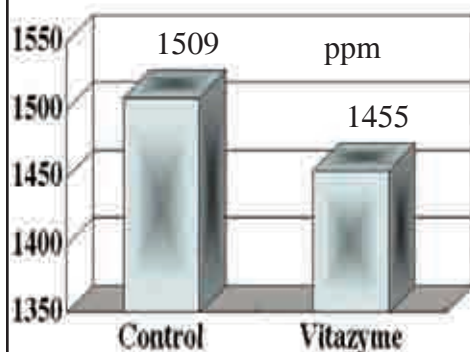
## Malic Acid



## Tartaric Acid

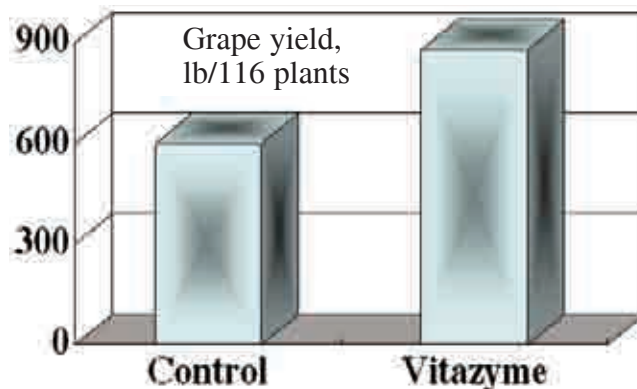


## Potassium



**Yield results:** Grapes from 116 plants of each treatment were harvested and weighed for a yield comparison on an area on the eastern end of the test area. This area was of uniform soil characteristics compared to other areas of the test area. The plants selected were separated by a few border rows to eliminate the chances of drift from the Vitazyme area to control plants. Vitazyme greatly increased grape yield in this study without reducing the quality of the grapes to a significant degree

## Grape Yield



Treatment	Grape yield lb/116 plants*	Grape yield lb/acre	Change lb/116 plants
Control	600	3,129	—
Vitazyme	877	4,574	277 (+46%)

\* 0.191736 acre.

**Grape yield increase: +46%**

**Income results:** Based on a \$300/ton value of these grapes, the extra 1,445 lb of grapes (0.7225 ton) produced \$216.75 more income per acre.

**Increased grape income: \$216.75/acre**

**Wine making:** On September 25, 2004, the grapes were picked for the study. One ton of grapes were purchased from each of the treatments, and on September 26 the winemaking process began. See the schedule below for details.

**September 26.** The grapes were destemmed, and cold soaked for 48 hours. During this time tartaric acid was added to raise the acidity to 0.7.

**September 28.** Yeast was added to the destemmed grapes, as well as yeast nutrient (diammonium phosphate, yeast cell walls, and other items), and Color Pro (an enzyme material to extract more color from the skins, and stabilize the color).

**October 6.** After 8 days of fermentation, the juice was pressed from the mash. At this point there was 3% sugar left. Malic acid bacteria were added at this point to convert the malic acid to lactic acid. The fermenting wine was then placed in stainless steel barrels. Each batch yielded 148 gallons of juice per

ton of grapes.

**October 10.** After 4 more days, half of the wine from each treatment was put in an identical oak barrel; the remaining wine was retained in a stainless steel barrel.

**Conclusions for the first year:** Vitazyme performed admirably the first year of this Cabernet Sauvignon wine grape trial in California by producing 46% more grapes than the control. The quality of this increased load of grapes did not appear to be compromised, since the quality parameters measured — color, phenolic compounds, sugars, and acids — showed only minor variations between the two treatments. The wine will be aged for at least a year, and then a tasting panel will evaluate the taste qualities of the wine produced from the two treatments. If little difference exists between the two wines at this time — or if Vitazyme improves wine quality — then it is apparent that Vitazyme can be an important factor in increasing the productivity and profitability of wine-grape vineyards.



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## 2005 Crop Results

# Vitazyme on Grapes (for wine)

## Evaluation of Wine produced in 2004

Researcher: John Broeker

Vineyard: Mondello Vineyards

Location: San Miguel, California

Variety: Cabernet Sauvignon

Experimental design: Wine was produced from the control and Vitazyme treated areas of the vineyard by Donatoni Winery, Paso Robles, California, according to the state-of-the art methods. One stainless steel barrel and one oak barrel of each grape batch were produced, beginning September 25, 2004. Initial pH, acidity, brix, and quality data of both lots are recorded in the *2004 Vitazyme Crop Results*. Additional results from the two batches are given below.

### February 17, 2005, analyses

Treatment	Ethanol	VA	pH	Total acidity	Malic acid	Lactic acid	RS	GF	Density
	%	g a a/100 ml		g tar/100 ml	g/liter	g/liter	g/100 ml	g/100 ml	mg/liter
Control	14.97	0.048	3.40	0.82	0.87	0	0.16	0.16	0.9937
Vitazyme	14.36	0.054	3.45	0.81	1.00	0	0.13	0.11	0.9947

### June 30, 2005, analyses

Treatment	Ethanol	VA	pH	Total acidity	Malic acid	Lactic acid	RS	GF	Density
	%	g a a/100 ml		g tar/100 ml	g/liter	g/liter	g/100 ml	g/100 ml	mg/liter
Control	14.77	0.056	3.42	0.83	0.94	0	0.17	0.13	0.9940
Vitazyme	14.74	0.059	3.46	0.82	1.04	0	0.17	0.12	0.9943

According to these analyses of the wine as conducted by Baker Wine and Grape Analysis, Pasa Robles, California, there are no obvious differences between the two wine lots.

Taste test: On February 8, 2005, an informal testing panel evaluated the wine from the four barrels of wine. All parties judged the wine from the stainless steel barrels as the least favorite of the the four, but **there was strong agreement that the wine produced from the Vitazyme treated wine was superior to the control wine, whether from oak barrels or stainless steel barrels.**

On January 6, 2006, a tasting panel of seven professionals sampled the two batches of wine — from the control and Vitazyme treatments — and determined that there was very little difference between the two. The Vitazyme raised wine was actually a bit more mellow, mature, and palatable, more ready to market than the control wine, which tended towards a bit more acidity. **This means that (1) the Vitazyme treated grapes, which produced 46% more grapes than the control grapes, in no way produced an inferior wine to the lower yielding treatment; on the contrary, this higher yielding wine was superior, if anything, to the lower yielding control ... and, (2) the Vitazyme wine matured faster than the control wine, making it ready to market faster and enabling the wine producer to turn over his stock faster.** Considering both points, the higher yield of grapes per acre and the more rapid turnaround of the wine stocks, **the users of Vitazyme in their vineyards will reap considerably more income per acre than those who do not use it.**



## Vital Earth Resources

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# 2005 Crop Results

## Vitazyme on Grapes (for wine)

Researcher: John Broeker

Variety: Cabernet Sauvignon

Grafting: none (self-rooted)

Bunch thinning: yes

Soil type: loam, high-calcium subsoil, low organic matter

Experimental design: A vineyard of grapes of equal age was partially treated with Vitazyme during the growing season to evaluate effects on grape yield and winemaking quality; all other treatments were identical. Both treatments were to be evaluated for overall effects on grape and wine quality by following through the preharvest period, and on to the actual wine itself after fermentation and aging. Eventually a taste panel will evaluate the quality of the two wines after sufficient aging.

Location: San Miguel, California

Vineyard: Mondello Vineyards

Grape plant age: 5 years (second harvest)

Row spacing: 12 x 6 feet

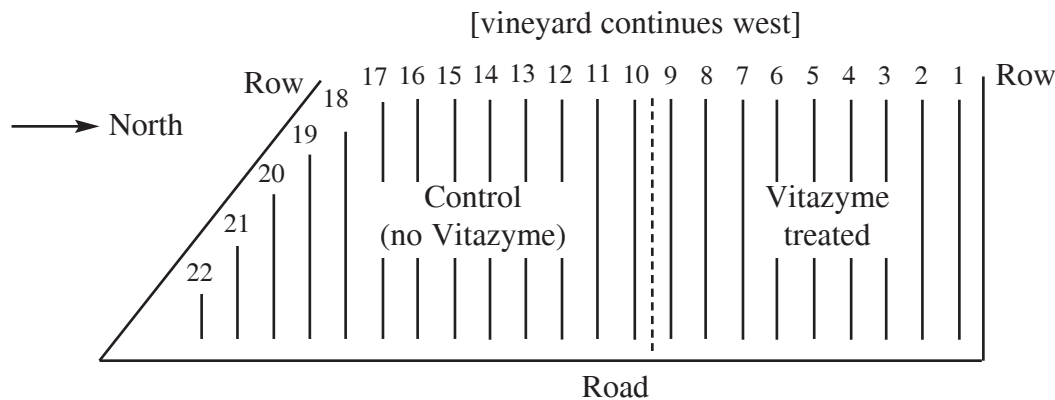
Plants/acre: 605

Yield goal: 3 tons/acre

Irrigation: drip

Shoot trimming: yes

Pruning: spur



Irrigation: semi-dryland system: four times of deep irrigation (18 to 20 hours of drip irrigation) from mid-June to late August

Fungicides: applied as needed

Fertilization: 200 lb/acre  $(\text{NH}_4)_2\text{SO}_4$  broadcast in March before bud break; 9-18-9 or 3-18-18 (+ micronutrients) applied every two to three weeks at 2 to 3 gallons/acre during much of the growing season, usually with sulfur after veraison; a blue-green algae solution applied in the irrigation water periodically

Tillage: cover crop disked in

Vitazyme application: (1) 13 oz/acre with 9-18-9 fertilizer sprayed at bud break; (2) 13 oz/acre with 9-18-9 fertilizer + sulfur sprayed at BB-sized fruit; (3) 13 oz/acre with 9-18-9 fertilizer + sulfur sprayed at veraison; (4) 13 oz/acre 8 weeks before harvest (the end of August)

Harvest date: October 25, 2005

Chlorophyll content: On August 15, 30 random leaf samples from each treatment were analyzed with a Minolta SPAD chlorophyll meter to determine leaf chlorophyll levels. These levels relate directly to the ability of the plants to fix carbon and sunlight energy into plant structural and reproductive (grape) tissue.

Treatment	Leaf chlorophyll	Change
	SPAD units	SPAD units
Control	43.6	—
Vitazyme	45.1	+1.5

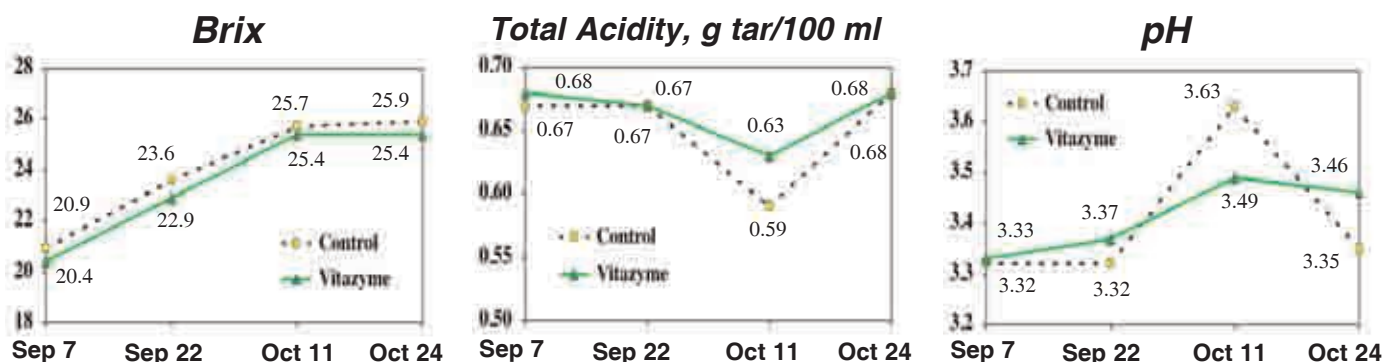
**Increase in leaf chlorophyll: 1.5 SPAD units**

**Vine growth:** The researcher noted that there was considerably more leaf and vine growth for the Vitazyme treated grapes, perhaps 30% more total leaf mass than for the control plants. An analysis of canes for the plants of the two treatments revealed the following differences (per plant):

**Control plants:** 64 feet of canes, evenly distributed in 1, 2, and 3-foot lengths

**Vitazyme plants:** 92 feet of canes, nearly half of them being about 2 feet long

**Preharvest to harvest grape and grape juice quality:** Grapes from each treatment were randomly collected at four dates before and at harvest: September 7 and 22, and October 11 and 24. These samples were crushed, and the juice was analyzed for brix (soluble solids, mostly sugars), total acidity, and pH at Baker Wine and Grape Analysis, Paso Robles, California.



Differences in brix, total acidity, and pH throughout the season were minor except for the acidity and pH values of the control sample on October 11. **Remarkably, the higher yielding Vitazyme treatment did not produce grapes that were significantly lower in sugar content, showing the ability of the product to stimulate photosynthesis, carbon fixation, and mineral uptake to provide for the heavier grape load.** During the testing period it was obvious which grape sample was treated: the grapes were larger and the bunches fuller. Despite minimal watering, Vitazyme enhanced water utilization and maintained grape fruit turgor pressure, thus likely accounting for the slightly lower brix readings of the treated grapes.

**Grape juice quality at harvest:** The grapes were harvested on October 24, 2005, and the juice was evaluated for color and chemical factors. Quality parameters were similar for both treatments.

Treatment	Color density	Color hue	Total phenolics	Antho-cyanins	GF	Density	Potential alcohol
	AU	ratio	AU	ppm	grams/liter	grams/liter	%
Control	15.49	0.48	43.40	518	200	1.234	14.2
Vitazyme	10.60	0.53	35.20	377	172	1.252	14.0

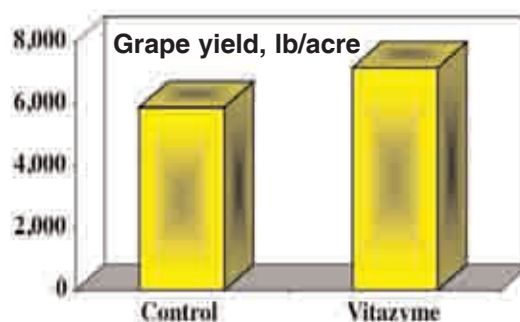
Treatment	Ammonia (NH <sub>3</sub> )	Amino acid	Yeast active nitrogen	Malic acid	Tartaric acid	Potassium
	ppm	ppm	ppm	grams/liter	grams/liter	ppm
Control	46	80	126	0.70	7.09	1,530
Vitazyme	76	97	173	1.13	6.87	1,839

**Yield results:** Grape yields were recorded for both treatments on the eastern end of the vineyard where soil characteristics were uniform. A border area between the treatments was avoided to remove possible product drift effects. Thinning had been performed equally on all areas, so Vitazyme effects were expressed entirely on grape and branch size.

Treatment	Grape yield per vine	Grape yield per acre*		Yield change
	lb/vine	lb/acre	tons/acre	lb/acre
Control	9.73	5,887	2.944	—
Vitazyme	11.86	7,175	3.588	1,288 (+22%)

\*Based on 605 plants per acre

**Increase in grape yield: 22%**



**Income results:** Based on a \$1,000/ton value of the grapes, the extra 1,288 lb (0.644 ton) of grapes produced \$644.00 more income per acre.

**Increased grape income: \$644.00/acre**

**Wine making:** On October 24, 2005, a ton of grapes from both treatments was picked and crushed, and on October 25 the winemaking process began. See the schedule below for details.

**October 25.** The grapes were destemmed and cold soaked for 48 hours. During this time tartaric acid was added to raise the acidity to 0.7.

**October 27.** Yeast was added to the destemmed grapes, as well as yeast nutrient (diammonium phosphate, yeast cell walls, and other items), and Color Pro (an enzyme material to extract more color from the skins, and stabilize the color).

**November 4.** After 8 days of fermentation, the juice was pressed from the mash. At this point there was 3% sugar left. Malic acid bacteria were added at this point to convert the malic acid to lactic acid. The fermenting wine was then placed in stainless steel barrels. Each barrel yielded 148 gallons of juice per ton of grapes.

**November 8.** After 4 more days, half of the wine from each treatment was put in an identical oak barrel; the remaining wine was retained in a stainless steel barrel.

**Conclusions for the second year:** This was the second year that Vitazyme was applied to the same grape plants in this vineyard near San Miguel, California. The Cabernet Sauvignon grapes responded very well to the product, increasing in yield by 22%, the vines also significantly increasing in length and girth. The yield increase was solely due to larger grapes in the treated area, since the bunches of both treatments were thinned the same early in the season. In spite of the higher yield, the juice brix and quality were equivalent for the two batches. These two lots of wine from the Vitazyme and control treatments will be evaluated periodically throughout the coming year for quality and taste differences.

## ***Vital Earth Resources***

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# **2006 Crop Results**

## **Vitazyme on Grapes (for wine)** **Year Three of a Continuing Study**

Researcher: John Broeker

Variety: Cabernet Sauvignon

Grafting: none (self-rooted)

Bunch thinning: yes

Soil type: loam, high-calcium subsoil, low organic matter

Experimental design: A vineyard of grapes of equal age was partially treated with Vitazyme during the growing season to evaluate effects on grape yield and winemaking quality; all other treatments were identical. Both treatments were to be evaluated for overall effects on grape and wine quality by following through the preharvest period, and on to the actual wine itself after fermentation and aging. Eventually a taste panel will evaluate the quality of the two wines after sufficient aging.

Location: San Miguel, California

Vineyard: Mondello Vineyards

Grape plant age: 6 years (third harvest)

Row spacing: 12 x 6 feet

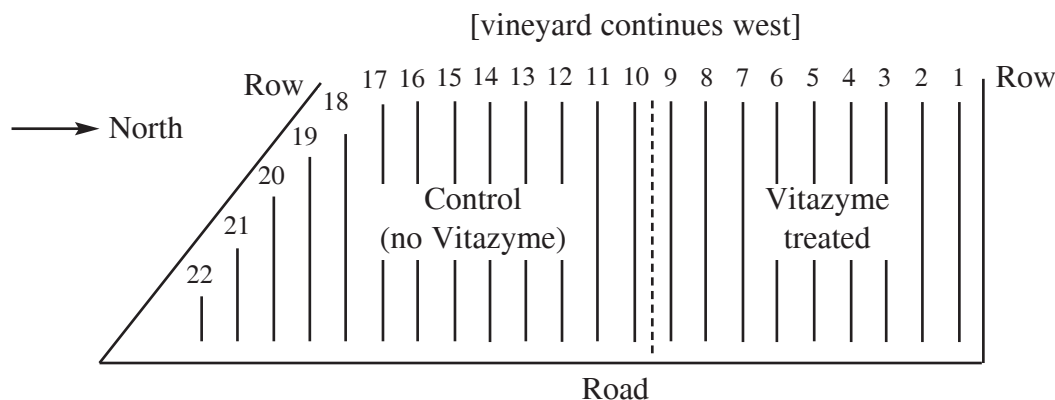
Plants/acre: 605

Yield goal: 3.5 tons/acre

Irrigation: drip

Shoot trimming: yes

Pruning: spur



Irrigation: semi-dryland system: four times of deep irrigation (18 to 20 hours of drip irrigation) from mid-June to late August

Fungicides: applied as needed

Fertilization: 200 lb/acre (NH<sub>4</sub>)<sub>2</sub> SO<sub>4</sub> broadcast in March before bud break; 9-18-9 or 3-18-18 (+ micronutrients) applied every two to three weeks at 2 to 3 gallons/acre during much of the growing season, usually with sulfur after veraison; a blue-green algae solution applied in the irrigation water periodically

Tillage: cover crop disked in

Vitazyme application: (1) 13 oz/acre with 9-18-9 fertilizer sprayed at bud break; (2) 13 oz/acre with 9-18-9 fertilizer + sulfur sprayed at BB-sized fruit; (3) 13 oz/acre with 9-18-9 fertilizer + sulfur sprayed at veraison; (4) 13 oz/acre 8 weeks before harvest (the end of August)

Harvest date: November 7, 2006

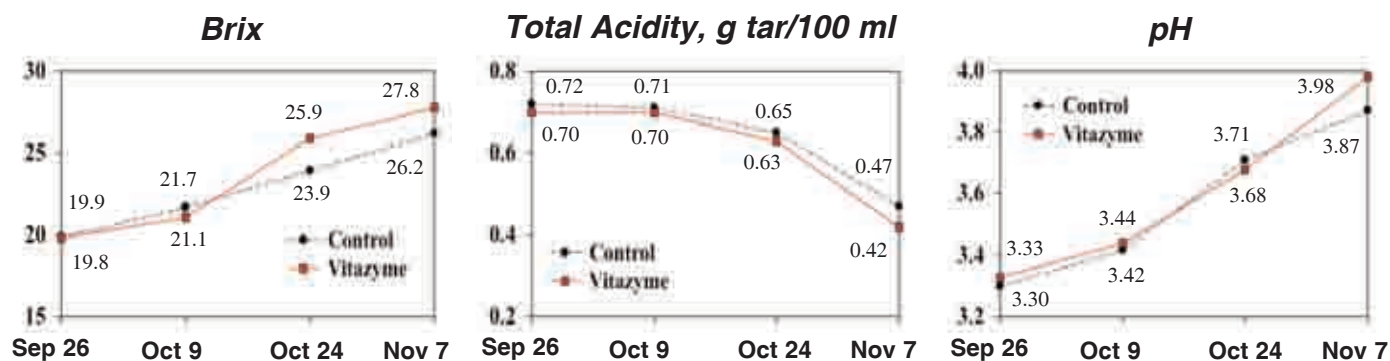
Vine growth: The researcher noted that there was considerably more leaf and vine growth for the Vitazyme treated grapes, perhaps 40% more total leaf mass than for the control plants. An analysis of canes for the plants of the two treatments revealed considerably more cane growth with Vitazyme application as well.

Leaf character at harvest: On November 7, at harvest, about 70% of the control leaves had already fallen from

the vines, whereas leaves from the Vitazyme treated plants were nearly all intact, green, and actively photosynthesizing.

**Preharvest to harvest grape and grape juice quality:** Grapes from each treatment were randomly collected at harvest. These samples were crushed, and the juice was analyzed for brix (soluble solids, mostly sugars), total acidity, and pH at Baker Wine and Grape Analysis, Paso Robles, California.

Differences in brix, total acidity, and pH throughout the season were minor. **Remarkably, the higher yield-**



**ing Vitazyme treatment did not produce grapes that were significantly lower in sugar content, but rather were higher in sugar by 1.6 points, showing the ability of the product to stimulate photosynthesis, carbon fixation, and mineral uptake to provide for the heavier grape load.**

During the testing period it was obvious which grape sample was treated: the grapes were larger and the bunches fuller. Despite minimal watering, Vitazyme enhanced water utilization and maintained grape fruit turgor pressure.

**Grape juice quality at harvest:** The grapes were harvested on November 7, 2006, and the juice was evaluated for color and chemical factors. Quality parameters were similar for both treatments.

Treatment	Color density	Color hue	Total phenolics	Antho-cyanins	GF	Density	Potential alcohol
	AU	ratio	AU	ppm	grams/liter	grams/liter	%
Control	9.70	0.47	32.60	335	226	1.071	14.4
Vitazyme	11.65	0.46	37.40	385	246	0.973	15.3

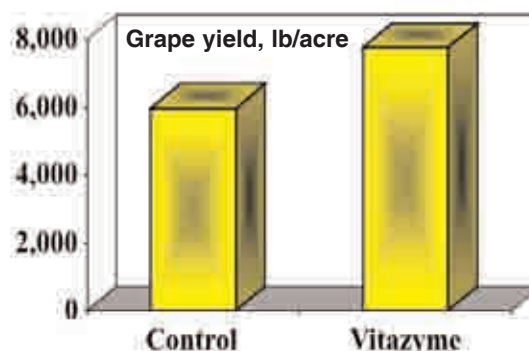
Treatment	Ammonia (NH <sub>3</sub> )	Amino acid	Yeast active nitrogen	Malic acid	Tartaric acid	Potassium
	ppm	ppm	ppm	grams/liter	grams/liter	ppm
Control	72	130	202	2.17	2.91	1502
Vitazyme	89	162	251	3.17	2.88	1664

**Yield results:** Grape yields were recorded for both treatments on the eastern end of the vineyard where soil characteristics were uniform. A border area between the treatments was avoided to remove possible product drift effects. Thinning had been performed equally on all areas, so Vitazyme effects were expressed entirely on grape and branch size.

Treatment	Grape yield per vine	Grape yield per acre*	Yield change
	lb/vine	lb/acre tons/acre	lb/acre
Control	9.85	5,959 2.980	—
Vitazyme	12.79	7,738 3.869	1,779 (+30%)

\*Based on 605 plants per acre

**Increase in grape yield: 30%**





**Income results:** Based on a \$1,200/ton value of the grapes, the extra 1,779 lb (0.889 ton) of grapes produced \$1,066.80 more income per acre.

**Increased grape income: \$1,066.80/acre**

**Wine making:** On November 7, 2005, a half ton of grapes from both treatments was picked and crushed, and that day the winemaking process began. See the schedule below for details.

**November 7.** The grapes were destemmed and cold soaked for 48 hours. During this time tartaric acid was added to raise the acidity to 0.7.

**November 9.** Yeast was added to the destemmed grapes, as well as yeast nutrient (diammonium phosphate, yeast cell walls, and other items), and Color Pro (an enzyme material to extract more color from the skins, and stabilize the color).

**November 17.** After 8 days of fermentation, the juice was pressed from the mash. At this point there was 3% sugar left. Malic acid bacteria were added at this point to convert the malic acid to lactic acid. The fermenting wine was then placed in stainless steel barrels. Each barrel yielded 148 gallons of juice per ton of grapes.

**November 21.** After 4 more days, half of the wine from each treatment was put in an identical oak barrel; the remaining wine was retained in a stainless steel barrel.

**Conclusions for the third year:** This was the third year that Vitazyme was applied to the same grape plants in this vineyard near San Miguel, California. The Cabernet Sauvignon grapes responded very well to the product, increasing in yield by 30%, the vines also significantly increasing in length and girth. The yield increase was solely due to larger grapes in the treated area, since the bunches of both treatments were thinned the same early in the season. In spite of the higher yield, the juice brix and quality were equivalent for the two batches. These two lots of wine from the Vitazyme and control treatments will be evaluated periodically throughout the coming year for quality and taste differences.

The yields for the three years of the study are as follows:

Treatment	2004 (Yr 1)		2005 (Yr 2)		2006 (Yr 3)		Average	
	Yield	Change	Yield	Change	Yield	Change	Yield	Change
----- tons/acre -----								
Control	1.565	—	2.994	—	2.980	—	2.513	—
Vitazyme	2.287	0.722 (+46%)	3.588	0.644 (+22%)	3.869	0.889 (+30%)	3.248	0.735 (+29%)

The first three years of this Cabernet Sauvignon vineyard produced an average of 29% more grapes with Vitazyme applied three times during the growing season. With the wine from these two treatments being equivalent each year — by some opinions even favoring Vitazyme — there is every reason for the grape grower to utilize Vitazyme in his production system to greatly increase yield without decreasing wine quality.

***Vital Earth Resources***

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**2007 Crop Results**

# Vitazyme on Grapes (for wine)

## Year Four of a Continuing Study

Researcher: John Broeker, and Richard Sauret, Vineyard Consultant

Location: San Miguel, California

Plants/acre: 605

Variety: Cabernet Sauvignon

Vineyard: Mondello Vineyards

Yield goal: 3.5 tons/acre

Grafting: none (self-rooted)

Irrigation: drip

Grape plant age: 6 years (third harvest)

Bunch thinning: no

Row spacing: 12 x 6 feet

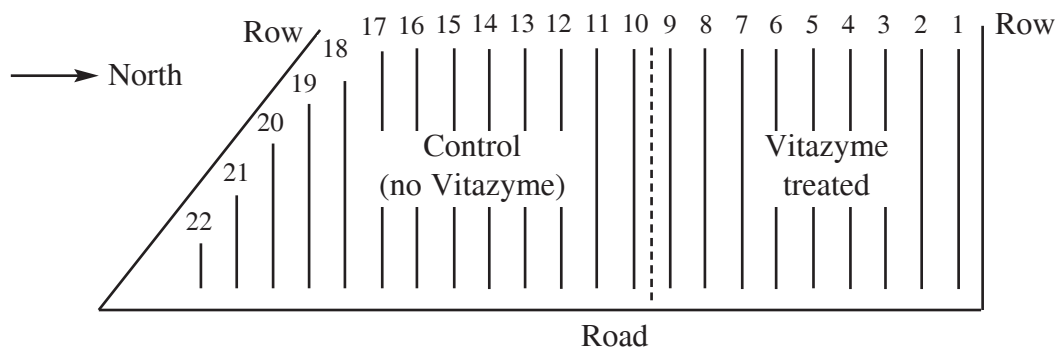
Shoot trimming: yes

Soil type: loam, high-calcium subsoil, low organic matter

Pruning: spur

Experimental design: A vineyard of grapes of equal age was partially treated with Vitazyme during the growing season to evaluate effects on grape yield and winemaking quality; all other treatments were identical. The same rows were treated as in previous years. Both treatments were to be evaluated for overall effects on grape and wine quality by following through the preharvest period, and on to the actual wine itself after fermentation and aging. Eventually a taste panel will evaluate the quality of the two wines after sufficient aging. Because of a light crop in 2006 no bunches were removed.

[vineyard continues west]



Irrigation: semi-dryland system: four times of deep irrigation (18 to 20 hours of drip irrigation) from mid-June to late August

Fungicides: applied as needed

Fertilization: No  $(\text{NH}_4)_2\text{SO}_4$  was used in 2007, but urea (low biuret) was added to the foliar spray. A 9-18-9 or 3-18-18 (+ micronutrients) was applied with urea every two to three weeks at 2 to 3 gallons/acre during much of the growing season, usually with sulfur after veraison. A blue-green algae solution was applied in the irrigation water periodically

Tillage: cover crop disked in

Vitazyme application: (1) 13 oz/acre with 9-18-9 fertilizer sprayed at bud break; (2) 13 oz/acre with 9-18-9 fertilizer + sulfur sprayed at BB-sized fruit; (3) 13 oz/acre with 9-18-9 fertilizer + sulfur sprayed at veraison; (4) 13 oz/acre 8 weeks before harvest (the end of August)

Harvest date: October 6, 2007

Vine growth: The researchers noted that there was more leaf and vine growth for the Vitazyme treated grapes, perhaps

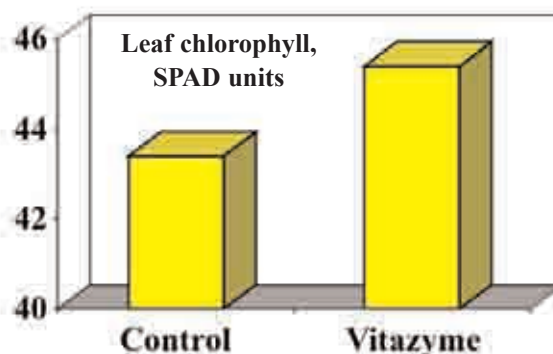


30% more total leaf mass than for the control plants. An analysis of canes for the plants of the two treatments revealed more cane growth with Vitazyme application as well.

Leaf chlorophyll: On September 6, chlorophyll was determined on the two treatments using 30 leaves for each.

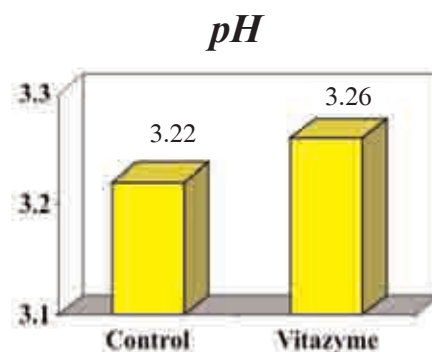
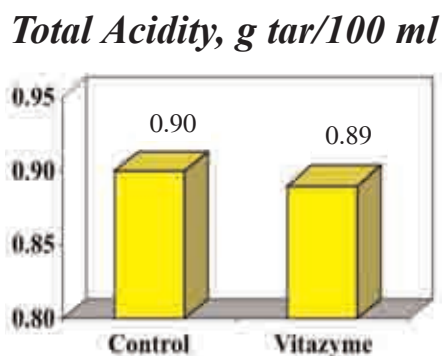
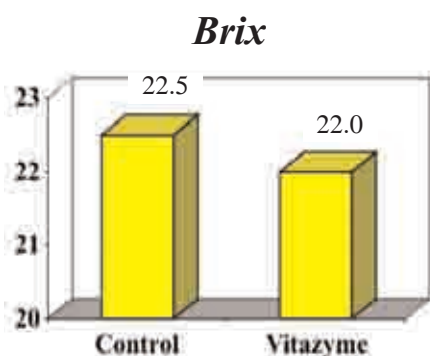
Treatment	Leaf chlorophyll	Change
	SPAD units	SPAD units
1. Control	43.4	—
2. Vitazyme	45.4	+2.0

**Increase in SPAD units: 2.0**



In-vineyard at-harvest grape and grape juice quality:

Grapes from each treatment were randomly collected at harvest. These samples were crushed, and the juice was analyzed for brix (soluble solids, mostly sugars), total acidity, and pH at Baker Wine and Grape Analysis, Paso Robles, California.



Differences in brix, total acidity, and pH were minor. **Remarkably, the higher yielding Vitazyme treatment did not produce grapes that were significantly lower in sugar content, showing the ability of the product to stimulate photosynthesis, carbon fixation, and mineral uptake to provide for the heavier grape load.** During the testing period it was obvious which grape sample was treated: the grapes were larger and the bunches fuller. During this very dry summer, Vitazyme enhanced water utilization and maintained grape fruit turgor pressure.

Grape juice quality at harvest: The grapes were harvested on October 6, 2007, and the juice was evaluated for chemical factors. Quality parameters were similar for both treatments.

Treatment	GF	Brix	Total acidity	pH	Lactic acid	VA
	g/100 ml		gtar/tooml		grams/liter	g acet/100 ml
Control	25	26.3	0.48	3.75	0.0	0.036
Vitazyme	27	27.2	0.48	3.79	0.0	0.038

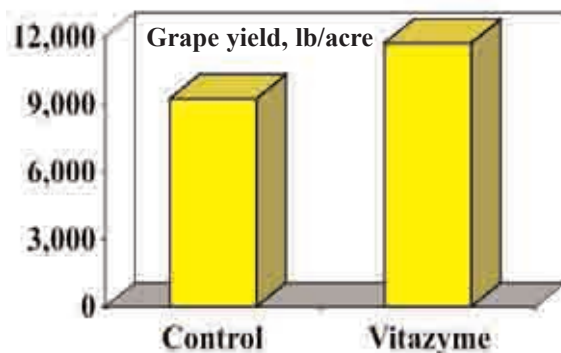
Treatment	Ammonia (NH <sub>3</sub> )	Amino acid	Yeast active nitrogen	Malic acid	Tartaric acid	Potassium
	ppm	ppm	ppm	grams/liter	grams/liter	ppm
Control	112	141	253	1.67	3.70	1,816
Vitazyme	99	146	245	1.82	3.59	1,912

**Yield results:** Grape yields were recorded for both treatments on the eastern end of the vineyard where soil characteristics were uniform. A border area between the treatments was avoided to remove possible product drift effects. Thinning had not been performed for any area, so Vitazyme effects were due to grape bunch number, bunch size, and grape size.

Treatment	Grape yield per vine	Grape yieldYield per acre*		change
	lb/vine	lb/acre	tons/acre	lb/acre
Control	15.30	9,256.5	4.628	—
Vitazyme	19.40	11,737.0	5.869	2,480.5

\*Based on 605 plants per acre

**Increase in grape yield: 27%**



At the end of the growing season, on the day of first frost (December 4), there were more total foliage and actively synthesizing leaves for the Vitazyme treatment. See the table below:

Treatment	Total leaves	Green leaves
Control	Fewer leaves	More leaves
Vitazyme	33% more leaves	About 20% more

With more green, photosynthesizing leaves remaining on the treated plants, they were able to fix more energy for plant growth the following year.

**Income results:** Based on a \$1,200/ton value of the grapes, the extra 2,480.5 lb (1.24025 tons) of grapes produced \$1488.30 more income per acre.

**Increased grape income: \$1,488.30/acre**

**Wine making:** On October 6, 2007, a half ton of grapes from both treatments was picked and crushed, and that day the winemaking process began. See the schedule below for details.

**October 6.** The grapes were destemmed and cold soaked for 48 hours. During this time tartaric acid was added to raise the acidity to 0.7.

**October 8.** Yeast was added to the destemmed grapes, as well as yeast nutrient (diammonium phosphate, yeast cell walls, and other items), and Color Pro (an enzyme material to extract more color from the skins, and stabilize the color).

**October 16.** After 8 days of fermentation, the juice was pressed from the mash. At this point there was 3% sugar left. Malic acid bacteria were added at this point to convert the malic acid to lactic acid. The fermenting wine was then placed in stainless steel barrels. Each barrel yielded 148 gallons of juice per ton of grapes.

**October 20.** After 4 more days, half of the wine from each treatment was put in an identical oak barrel; the remaining wine was retained in a stainless steel barrel.

**Conclusions for the fourth year:** This was the fourth year that Vitazyme was applied to the same grape plants in this vineyard near San Miguel, California. The Cabernet Sauvignon grapes responded very well to the product, increasing in yield by 27%, the vines also significantly increasing in length and girth. They also had more photosynthesizing leaves after harvest, until the first frost in December. The yield increase was due to larger grapes in the treated area, and possibly more bunches, but the bunch numbers were not counted. In spite of the higher yield, the juice brix and quality were equivalent for the two wine batches. These two lots of wine from the Vitazyme and control treatments will be evaluated periodically throughout the coming year for quality and taste differences.

The yields for the three years of the study are as follows:

Treatment	2004 (Yr 1)		2005 (Yr 2)		2006 (Yr 3)		2007 (Yr 4)		Average	
	Yield	Change	Yield	Change	Yield	Change	Yield	Change	Yield	Change
	----- tons/acre -----									
Control	1.565	—	2.994	—	2.980	—	4.628	—	3.042	—
Vitazyme	2.287	0.722 (+46%)	3.588	0.644 (+22%)	3.869	0.889 (+30%)	5.869	1.241 (+27%)	3.903	0.888 (+29%)

The first four years of this Cabernet Sauvignon vineyard study produced an average of 29% more grapes with Vitazyme applied four times during the growing season. With the wine from these two treatments being equivalent each year — by some opinions even favoring Vitazyme — there is every reason for the grape grower to utilize Vitazyme in his production system to greatly increase yield without decreasing wine quality.

## Vital Earth Resources

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# 2008 Crop Results

## Vitazyme on Grapes (for wine) Year Five of a Continuing Study

**Researcher:** John Broeker, and Richard Sauret, Vineyard Consultant

**Location:** San Miguel, California

**Plants/acre:** 605

**Variety:** Cabernet Sauvignon

**Vineyard:** Mondello Vineyards

**Yield goal:** 3.5 tons/acre

**Grafting:** none (self-rooted)

**Irrigation:** drip

**Grape plant age:** 8 years (fifth harvest)

**Shoot trimming:** yes

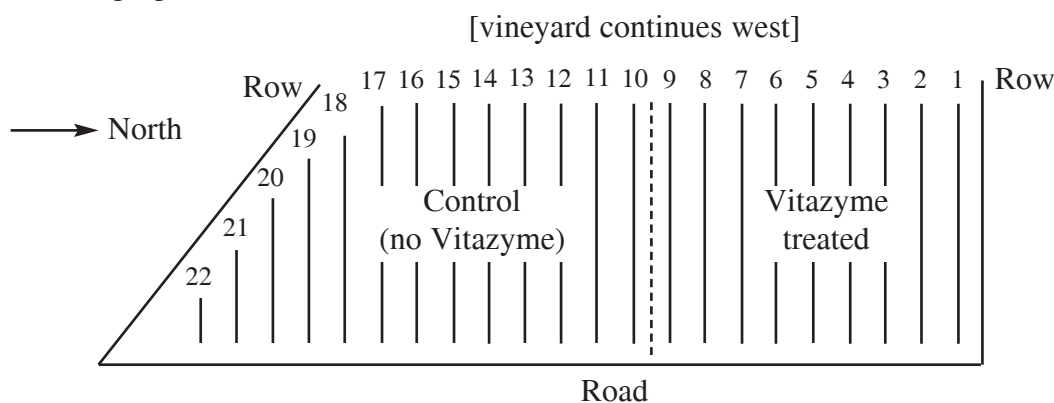
**Bunch thinning:** no

**Row spacing:** 12 x 6 feet

**Pruning:** spur

**Soil type:** loam, high-calcium subsoil, low organic matter

**Experimental design:** A vineyard of grapes of equal age was partially treated with Vitazyme during the growing season to evaluate effects on grape yield and winemaking quality; all other treatments were identical. The same rows were treated as in previous years. Both treatments were to be evaluated for overall effects on grape and wine quality by following through the preharvest period, and on to the actual wine itself after fermentation and aging.



**Irrigation:** semi-dryland system: four times of deep irrigation (18 to 20 hours of drip irrigation) from mid-June to late August

**Fungicides:** applied as needed

**Fertilization:** No  $(\text{NH}_4)_2\text{SO}_4$  was used in 2007, but urea (low biuret) was added to the foliar spray. A 9-18-9 or 3-18-18 (+ micronutrients) was applied with urea every two to three weeks at 2 to 3 gallons/acre during much of the growing season, usually with sulfur after veraison. A blue-green algae solution was applied in the irrigation water periodically

**Tillage:** cover crop disked in

**Vitazyme application:** (1) 13 oz/acre with 9-18-9 fertilizer sprayed at bud break; (2) 13 oz/acre with 9-18-9 fertilizer + sulfur sprayed at BB-sized fruit; (3) 13 oz/acre with 9-18-9 fertilizer + sulfur sprayed at veraison; (4) 13 oz/acre 8 weeks before harvest (the end of August)

**Harvest date:** October 21, 2008

**Weather conditions:** A severe frost occurred during flowering, which seriously affected pollination and berry set. In addition, heat and high winds during bloom further damaged berry set so that the yield was seriously reduced for both treatments, but more so with the Vitazyme treatment than with the control. In the Vitazyme treated area 61 plants had some form of burn, whereas the control area had 13 affected plants.

**Vine growth:** The researchers noted that there was more leaf and vine growth for the Vitazyme treated grapes, perhaps 30% more total leaf mass than for the control plants. An analysis of canes for the plants of the two treatments revealed more cane growth with Vitazyme application as well.

Treatment	GF	Brix	Total acidity	pH	Lactic acid	VA
	g/100 ml		gtar/tooml		grams/liter	g acet/100 ml
Control	20	25.4	0.50	4.02	0.1	0.047
Vitazyme	24	26.1	0.49	4.20	0.1	0.050

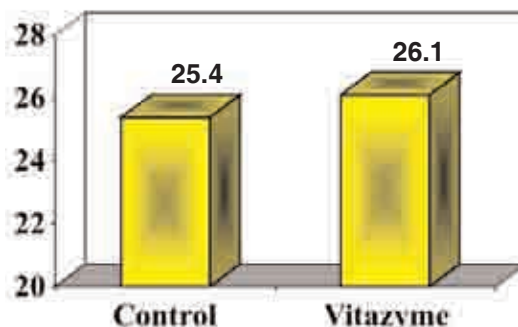
Treatment	Ammonia (NH <sub>3</sub> )	Amino acids	Yeast active nitrogen	Malic acid	Tartaric acid	Potassium
	ppm	ppm	ppm	grams/liter	grams/liter	ppm
Control	108	141	249	1.74	4.47	2,551
Vitazyme	132	175	307	2.06	4.58	3,288

Treatment	Grape yield per vine	Grape yield per acre*		Yield change
	lb/vine	lb/acre	tons/acre	lb/acre
Control	5.17	3,127	1.564	—
Vitazyme	4.80	2,904	1.452	(-)223

\*Based on 605 plants per acre

Treatment	Total leaves	Green leaves
Control	Fewer leaves	More leaves
Vitazyme	33% more leaves	About 20% more

***Brix of Juice***



**Grape juice quality at harvest:** The grapes were harvested on October 21, 2008, and the juice was evaluated for chemical factors. Quality parameters were similar for both treatments.

Note that the brix level for the Vitazyme treated grapes is 0.7 percentage point higher than for the control, indicating a higher quality juice from these treated grapes.

**Yield results:** Grape yields were recorded for both treatments on the eastern end of the vineyard where soil characteristics were uniform. A border area between the treatments was avoided to remove possible product drift effects. Because there was severe pollination disruption from a severe frost, followed by high winds and hot temperatures at bloom, during which the Vitazyme treatment was more severely affected than the control, the bunches had many aborted berries and a greatly reduced yield from previous years. Thus, the yield data have little value for 2008.

At the end of the growing season, towards the first frost, there was more total foliage and more actively synthesizing leaves for the Vitazyme treatment. See the table below:

With more green, photosynthesizing leaves remaining on the treated plants, they were able to fix more energy for plant growth the following year.

**Wine making:** On October 21, 2008, a half ton of grapes from both treatments was picked and crushed, and that day the winemaking process began. See the schedule below for details.

**October 21** The grapes were destemmed and cold soaked for 48 hours. During this time tartaric acid was added to raise the acidity to 0.7.

**October 23.** Yeast was added to the destemmed grapes, as well as yeast nutrient (diammonium phosphate, yeast cell walls, and other items), and Color Pro (an enzyme material to extract more color from the skins, and stabilize the color).

**October 31.** After 8 days of fermentation, the juice was pressed from the mash. At this point there was 3% sugar left. Malic acid bacteria were added at this point to convert the malic acid to lactic acid. The fermenting wine was then placed in stainless steel barrels. Each barrel yielded 148 gallons of juice per ton of grapes.

**November 4.** After 4 more days, half of the wine from each treatment was put in an identical oak barrel; the remaining wine was retained in a stainless steel barrel.

Treatment	2004 (Yr 1)		2005 (Yr 2)		2006 (Yr 3)		2007 (Yr 4)		Average	
	Yield	Change	Yield	Change	Yield	Change	Yield	Change	Yield	Change
----- tons/acre -----										
Control	1.565	—	2.994	—	2.980	—	4,628	—	3.042	—
Vitazyme	2.287	0.722 (+46%)	3.588	0.644 (+22%)	3.869	0.889 (+30%)	5.869	1.241 (+27%)	3.903	0.888 (+29%)

**Conclusions for the fifth year:** The fifth year of this California wine grape study was very unlike the previous four years, in which the yield increase averaged 29% per year. In 2008 the highly unfavorable weather conditions at blossom time resulted in a poor berry set, especially with the Vitazyme treatment, that gave yields for both treatments about 50% lower than the previous year. Thus, the yield data for 2008 is not relevant to true treatment effects. Juice quality, however, was superior for the Vitazyme treatment in 2008, with a brix level 0.7 percentage point higher for the Vitazyme treatment. A view of the vineyard during the entire year showed superior vine and leaf growth for Vitazyme compared to the control.

The yields for the first four years of the study are as follows:

The first four years of this Cabernet Sauvignon vineyard study produced an average of 29% more grapes with Vitazyme applied four times during the growing season. With the wine from these two treatments being equivalent each year — by some opinions even favoring Vitazyme — there is every reason for the grape grower to utilize Vitazyme in his production system to greatly increase yield without decreasing wine quality.



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## **2009 Crop Results**

# **Vitazyme on Grapes, for wine**

## ***Year Six of a Continuing Study***

Researcher: John Broeker

Variety: Cabernet Sauvignon

Grafting: none (self-rooted)

Grape plant age: 9 years (sixth harvest)

Soil type: loam, high-calcium subsoil, low organic matter

Experimental design: A vineyard of grapes of equal age was partially treated with Vitazyme during the growing season to evaluate effects on grape yield and winemaking quality; all other treatments were identical. The same rows were treated as in previous years. Both treatments were to be evaluated for overall effects on grape and wine quality by following through the preharvest period, and on to the actual wine itself after fermentation and aging.

Location: San Miguel, California

Vineyard: Mand J Fronty Vineyard

Irrigation: drip

Row spacing: 12 x 6 feet

Plants/acre: 605

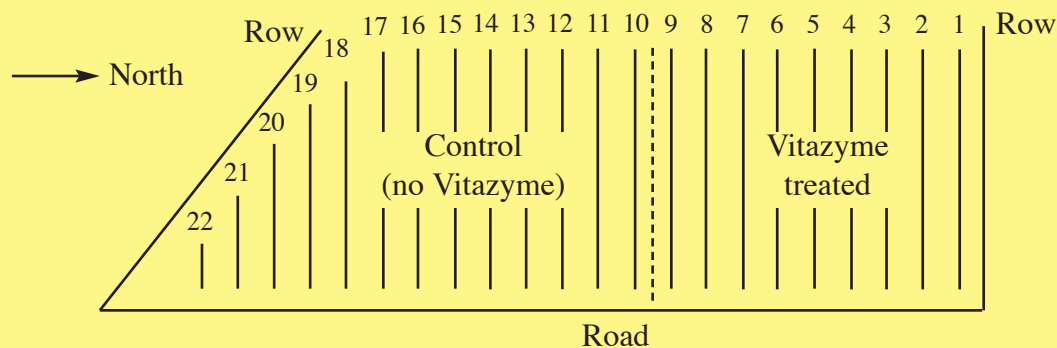
Yield goal: 3.5 tons/acre

Bunch thinning: yes

Shoot trimming: yes

Pruning: spur

[vineyard continues west]



Irrigation: semi-dryland system: four times of deep irrigation (18 to 20 hours of drip irrigation) from mid-June to late August

Fungicides: applied as needed

Fertilization: Ca (NO<sub>3</sub>)<sub>2</sub> was the main nitrogen source, plus urea (low biuret) added to the foliar spray. A 9-18-9 (+ micronutrients) was applied with urea every two to three weeks at 2 to 3 gallons/acre during much of the growing season, usually with sulfur after veraison; no sulfur was applied after July 1. A blue-green algae solution was applied in the irrigation water periodically

Tillage: cover crop disked in

Vitazyme application: (1) 13 oz/acre with 9-18-9 fertilizer sprayed at bud break; (2) 13 oz/acre at bloom; (3) 13 oz/acre with 9-18-9 fertilizer + sulfur sprayed at BB-sized fruit; (4) 13 oz/acre with 9-18-9 fertilizer + sulfur sprayed at veraison; (5) 13 oz/acre 8 weeks before harvest (the end of August)

Harvest date: October 10, 2009

Weather conditions: The year was drier than normal, resulting in greater irrigation water needs.

Vine growth: The researchers noted that there was more leaf and vine growth for the Vitazyme treated grapes, perhaps 25% more total leaf mass than for the control plants. An analysis of canes for the plants of the two treatments revealed more cane growth with Vitazyme application as well.



Wine quality: On December 29, 2009, an analysis of wine from the two lots was made by Baker Wine and Grape Analyses, Paso Robles, California.

Treatment	Ethanol	pH	Total acid	Malic acid	Lactic acid	RS	GF	Density	FSO <sub>2</sub>	VA
	%		gtar/100 ml	g/L	g/L	g/100 ml	g/100 ml	g/ml	mg/L	g aa/100 ml
Control	12.12	3.75	0.61	0.15	0.89	0.06	0.05	0.9967	12	0.037
Vitazyme	13.02	3.78	0.61	0.42	0.69	0.09	0.09	0.9956	15	0.036

The two wine lots are very similar except that the Vitazyme treated wine has more alcohol, by 0.9%. This increase is a reflection of the higher sugar (brix) of the treated grapes at harvest. The Vitazyme treated wine also has more malic acid and less lactic acid than the control wine.

### Increase in alcohol with Vitazyme: 0.9 percentage point

Yield results: Grape yields were recorded for both treatments on the eastern end of the vineyard where soil characteristics were uniform. A border area between the treatments was avoided to remove possible product drift effects. Because of severe frost damage in 2008, the plants did not perform at the optimum levels, especially the Vitazyme treated rows, which were injured more severely in 2008 than the control vines. At the end of the growing season, towards the first frost, there were more total foliage and more actively synthesizing leaves for the Vitazyme treatment.

Treatment	Grape yield per vine	Grape yield per acre		Yield change
	lb/vine	lb/acre	tons/acre	lb/acre
Control	7.096	4,293	2.148	—
Vitazyme soak	7.856	4,753	2.376	460 (+11%)
*Based on 605 plants per acre				

With more green, photosynthesizing leaves remaining on the treated plants, they were able to fix more energy for plant growth the following year.

Wine making: On October 10, 2009, a half ton of grapes from both treatments was picked and crushed, and that day the winemaking process began. See the schedule below for details.

**October 10.** The grapes were destemmed and cold soaked for 48 hours. During this time tartaric acid was added to raise the acidity to 0.7.

**October 12.** Yeast was added to the destemmed grapes, as well as yeast nutrient (diammonium phosphate, yeast cell walls, and other items), and Color Pro (an enzyme material to extract more color from the skins, and stabilize the color).

**October 20.** After 8 days of fermentation, the juice was pressed from the mash. At this point there was 3% sugar left. Malic acid bacteria were added at this point to convert the malic acid to lactic acid. The fermenting wine was then placed in stainless steel barrels. Each barrel yielded 148 gallons of juice per ton of grapes.

**November 24.** After 4 more days, half of the wine from each treatment was put in an identical oak barrel; the remaining wine was retained in a stainless steel barrel.

Conclusions for the sixth year: The sixth year of this California wine grape study, using the same treated rows as in previous years, revealed a recovery of the plants to some degree after severe frost damage in 2008. This year the Vitazyme treatment produced **11% more yield** than the untreated control, compared to the 29% average increase for the first four years of the study. Even with an 11% yield increase, the results of this program are highly profitable, especially considering that *the wine preduced with Vitazyme treated grapes has been shown to be equivalent, if not superior to, wine produced from untreated grapes alongside. Of special note is a higher alcohol content of the Vitazyme-treated wine, by 0.9 percentage point; both wine lots for 2009 are very similar.*

## ***Vital Earth Resources***

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# **2000 Crop Results**

## **Vitazyme on Grapes (Wine)**

**Grower:** Kelly McFarland, G.V.S.

**Variety:** Pinot Noir (wine grapes)

**Soil type:** sandy, very poor fertility

**Trellis system:** vertical post and wire

**Experimental design:** A few rows of a large vineyard, that was destined to be removed due to low production, were treated with Vitazyme and certain other materials through the drip irrigation system.

**Location:** Gonzales, California

**Vine age:** mature

**Spacing:** 12 ft between rows, 7 ft in rows

**irrigation:** drip

### **1. Control**

**Fertilization :** unknown

**Fungal control :** standard for the area

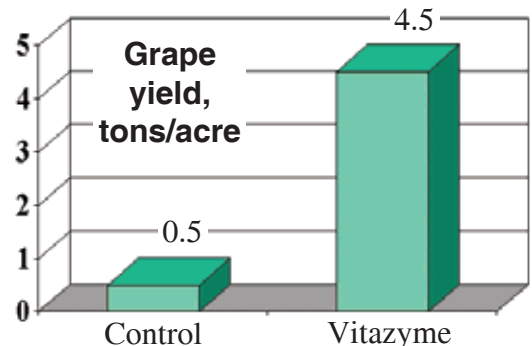
**Vitazyme and other materials:** Fall of 1999, Vitazyme at 13 oz/acre, fish at the recommended rate, and H<sub>2</sub>O<sub>2</sub>; spring of 2000, Vitazyme at 13 oz/acre; midseason in 2000, Vitazyme at 13 oz/acre. All materials were applied through the drip system.

**Yield results:** No exact yield figures were collected, but close approximations were made.

### **2. Vitazyme + other materials**

	<b>Control</b>	<b>Vitazyme</b>	<b>Change</b>
	tons/acre		
<b>Grape yield</b>	0.5*	4.5	(+4.0)

\*This value was the expected yield for the area based on harvest data from the previous few years.



**Conclusions:** Because of this great increase in grape production due to the use of Vitazyme, fish emulsion, and H<sub>2</sub>O<sub>2</sub> the grower retained this portion of the Vineyard that he was planning to remove due to low production.

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## 2005 Crop Results

# Vitazyme on Grapes (for wine)

Researcher: John Broeker  
California

Yield goal: 4 tons/acre

Irrigation: drip

Soil type: loam high-calcium subsoil, low organic matter

Experimental design: A grape vineyard was divided into two parts, one part treated with Vitazyme and the other part left untreated to evaluate the effects of the product on grape yield and quality, and on wine quality. Treatments over all areas of the vineyard were otherwise identical. Both treatments were evaluated for quality parameters during the preharvest period. The two lots of wine was also to be evaluated for quality during the following year.

Vineyard: Rainbow's End (Jim Gibbons)

Variety: Cabernet Sauvignon

Grafting: none (self-rooted)

Plants/acre: 605

Location: San Miguel,

Row spacing: 12 x 6 feet

Grape plant age: 15 years

Bunch thinning: yes

Pruning: cane

### 1. Control

### 2. Vitazyme

Irrigation: drip irrigation about 15 to 18 hours once a week, as needed, until 2 weeks before harvest

Fungicide: applied regularly as needed

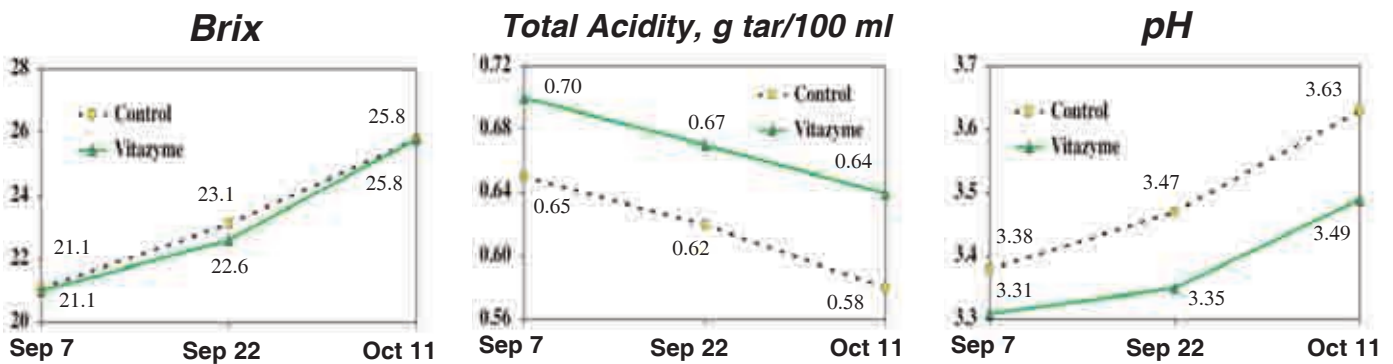
Fertilization: 9-18-9 or 3-18-18 (+ micronutrients) applied every two to three weeks at 2 to 3 gallons/acre during much of the growing season, usually with sulfur after veraison; a blue-green algae solution applied in the irrigation water periodically

Tillage: none; mowing of weeds in the interrows

Vitazyme application: (1) 13 oz/acre with 9-18-9 fertilizer sprayed at bud break; (2) 13 oz/acre with 9-18-9 fertilizer and sulfur sprayed at BB-sized fruit; (3) 13 oz/acre with 9-18-9 fertilizer + sulfur sprayed at veraison; (4) 13 oz/acre 8 weeks before harvest (the end of August)

Harvest date: October 11, 2005

Preharvest to harvest grape and juice quality: Grapes from both treatments were collected randomly on September 7 and 22, and October 11, the grapes were crushed, and the juice was analyzed for brix (soluble solids, mostly sugars), total acidity, and pH at Baker Wine and Grape Analysis, Paso Robles, California.



The sugar content of the two lots of grapes were nearly identical throughout the pre-harvest to harvest period. Total acidity was slightly higher for the Vitazyme treatment, by about 0.05 g tar/100 ml, and the pH was lower for Vitazyme than for the control throughout the period; Vitazyme produced grapes that were an ideal 3.49 pH at harvest.

**Grape juice quality at harvest:** The grapes were harvested on October 11, 2005, and the juice was evaluated for color and chemical factors. Quality parameters were similar for the two treatments

Treatment	Color density	Color hue	Total phenolics	Antho-cyanins	Density	Potential alcohol
	AU	ratio	AU	ppm	grams/liter	%
Control	13.93	0.52	39.00	453	1.292	14.2
Vitazyme	13.27	0.49	37.30	441	1.301	14.2

Treatment	Ammonia (NH <sub>3</sub> )	Amino acid	Yeast active nitrogen	Manic acid	Tartaric acid	Potassium
	ppm	ppm	ppm	grams/liter	grams/liter	ppm
Control	46	102	148	0.52	6.94	2,251
Vitazyme	54	83	137	0.99	7.21	2,105

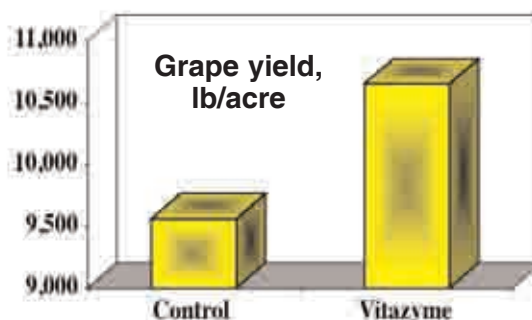
There were no major differences in the color or quality of these two lots of grapes. Vitazyme treatment did, however, produce a somewhat denser juice, likely because of a higher mineral content of the juice, such as potassium.

**Yield results:** Harvest results were collected during picking on October 11. Thinning had been performed uniformly over all areas, so product effects could be due only to changes in grape size and juice density.

Treatment	Grape yield per vine	Grape yield per acre*		Yield change
	lb/vine	lb/acre	tons/acre	lb/acre
Control	15.8	9,559	4.780	—
Vitazyme	17.6	10,648	5.324	1,089 (+11%)

\*Based on 605 plants per acre

**Increase in grape yield: 11%**



**Income results:** Based on a \$1,000/ton grape value, the extra 1,089 lb (0.545 ton) of grapes produced \$545.00 more income per acre.

**Increased grape income: \$545.00/acre**

**Wine making:** Separate lots of wine were made from both the control and Vitazyme treated grapes and will be followed for quality and flavor during the coming months.

**Conclusions:** Vitazyme treatment of Cabernet Sauvignon grapes in this California study showed that Vitazyme is capable of increasing grape size, and thus total yield (11% in this test), while not sacrificing the sugar content of the juice. All areas of the vineyard were thinned to achieve a 4 ton/acre yield, so product effects were due to larger fruit. There was little difference in color or quality parameters of the two treatments. The separate wines made from these two treatments will be followed for quality and flavor during the coming months.

***Vital Earth Resources***

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**1999 Crop Results**

**Vitazyme on Grapes (for Wine)**

**A Testimonial**

*Farmer:* Paul Anderson

*Location:* Snelling, California

I have over 100 acres of grapes along a waterway. The land slopes in two directions, and the fruit block on the highest ground, is always the last to sugar. I applied Vitazyme through the drip system at 13 oz/acre three times. This year block one was ready to go first.

**The crowning point is this: Vitazyme built Brix [sugar content] 30 days sooner!**

I kept no yield data.

## Vital Earth Resources

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# 2009 Crop Results

## Vitazyme on Grapes

Researcher: Chris Becker

Location: Anthony Road, New York

Variety: Cabernet Franc

Soil type: unknown

Vine age: mature

Experimental design: In this study, with the purpose of determining Vitazyme effects of grape yield, a 10-acre block of grapes was split into two five-acre parcels. Five acres were treated with Vitazyme.

### 1. Control

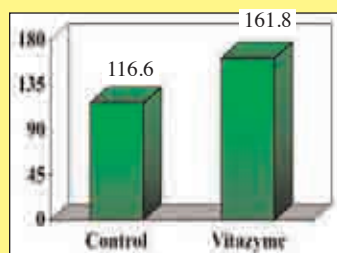
### 2. Vitazyme

Fertilization: unknown

Vitazyme applications: (1) 13 oz/acre sprayed on leaves prebloom (about June 15); (2) 13 oz/acre postbloom (about June 24); (3) 13 oz/acre at veraison

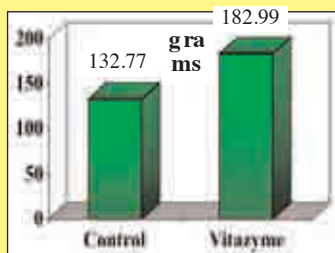
Yield results: A day or two before harvest, 10 clusters from four vines were collected from locations in the four quadrants of the treated and untreated five acres. Data collected were berry number per cluster and berry weight per cluster, and from this the individual berry weight was calculated. Each 10 cluster sample was then crushed, and brix values were determined using a refractometer.

### Berries Per Cluster



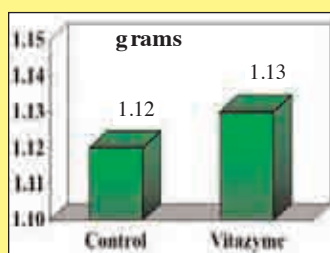
**Increase in berries per cluster with Vitazyme: 39%**

### Weight Per Cluster



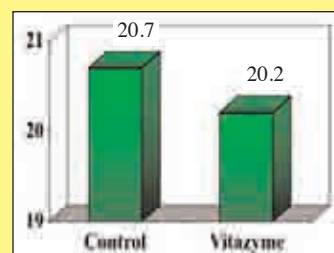
**Increase in weight per cluster with Vitazyme: 38%**

### Weight Per Berry



**Increase in weight per berry with Vitazyme: 1%**

### Brix



**Decrease in brix with Vitazyme: 0.5 %-point**

Conclusions: This split-vineyard trial in New York revealed that Vitazyme greatly improved berries per cluster (39%) and weight per cluster (38%). Weight per berry was changed little, and brix level was reduced slightly with Vitazyme. These results show that this product can improve grape yield substantially while maintaining quality of the fruit.



## Vital Earth Resources

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# 2009 Crop Results

## Vitazyme on Grapes

Researcher: Chris Becker

Location: Hosmer Vineyards, Ovid, New York

Variety: Cayuga

Soil type: unknown

Vine age: mature

Experimental design: In this study, with the purpose of determining Vitazyme effects of grape yield, a 5-acre block of grapes was split into two 2.5-acre parcels, with one parcel treated with Vitazyme.

### 1. Control

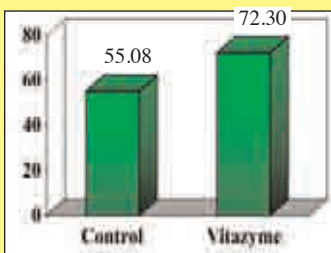
### 2. Vitazyme

Fertilization: unknown

Vitazyme applications: (1) 13 oz/acre sprayed on leaves prebloom (about June 15); (2) 13 oz/acre postbloom (about June 24); (3) 13 oz/acre at veraison

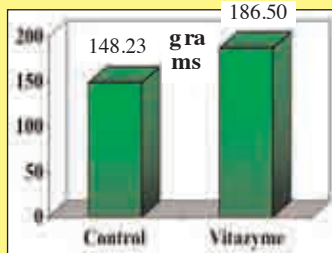
Yield results: A day or two before harvest, (October 7, 2009), 10 clusters from four vines were collected from locations in the four quadrants of the treated and untreated parcels. Data collected were berry number per cluster and berry weight per cluster, and from this the individual berry weight was calculated. Each 10-cluster sample was then crushed, and brix values were determined using a refractometer.

### Berries Per Cluster



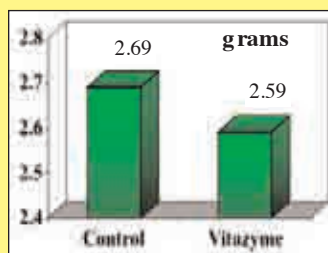
**Increase in berries per cluster with Vitazyme: 31%**

### Weight Per Cluster



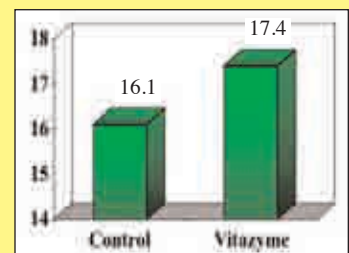
**Increase in weight per cluster with Vitazyme: 26%**

### Weight Per Berry



**Decrease in weight per berry with Vitazyme: 4%**

### Brix



**Increase in brix with Vitazyme: 1.3 %-points**

Conclusions: This New York grape study, using Vitazyme on the Cayuga variety, revealed that three applications greatly increased berries per cluster (37%) as well as weight per cluster (26%), resulting in a slight reduction in berry weight (4%) versus the control. Brix of the grapes was increased with Vitazyme, by 1.3 percentage points. These results prove that this product is an excellent adjunct to typical vineyard programs intent upon increasing both the yield and quality of grapes.

## Vital Earth Resources

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# 2009 Crop Results

## Vitazyme on Grapes

Researcher: Chris Becker, Ph.D.

Location: Rooster Hill, Penn Yan, New York

Varieties: Pinot Noir, Riesling, Cabernet Franc

Soil type: unknown

Vine age: mature

Experimental design: At this vineyard, three cultivars of grapes had two blocks each, of about 3 acres per block, all on the same soil type. About one acre from each cultivar was treated with Vitazyme. The purpose of the study was to evaluate the effects of this product on grape growth and yield.

### 1. Control

### 2. Vitazyme

Fertilization: unknown

Vitazyme application: (1) 13 oz/acre sprayed on leaves prebloom (about June 15); (2) 13 oz/acre postbloom (about June 24); (3) 13 oz/acre at veraison

Chlorophyll results: On August 3, 2009, chlorophyll determine were made on 30 representative leaves from both treatments of the Riesling variety.

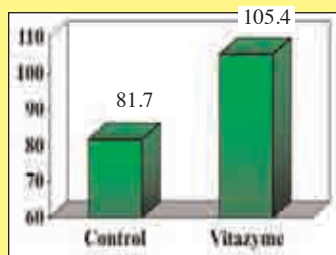
Treatment	SPAD value	Change
Control	30.1	—
Vitazyme	32.6	2.5

**Increase in leaf chlorophyll with  
Vitazyme: 2.5 SPAD units**

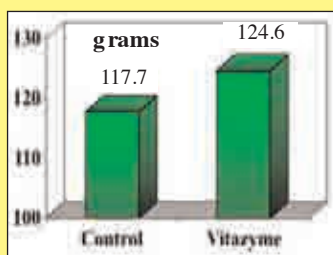
Yield results: A day or two before harvest, 10 clusters from four vines were collected from locations in the four quadrants of each treated and untreated block. Data collected were berry number per cluster and berry weight per cluster, and from this the individual berry weight was calculated. Each 10 cluster sample was then crushed, and brix values were determined using a refractometer.

### Pinot Noir Grapes

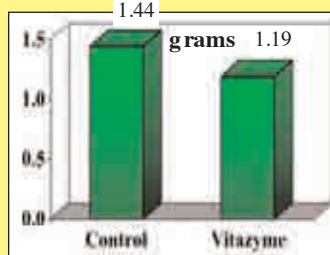
#### Berries Per Cluster



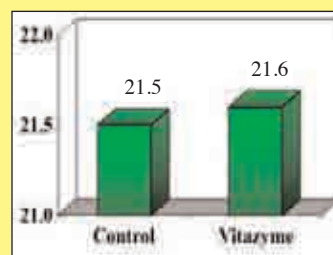
#### Weight Per Cluster



#### Weight Per Berry

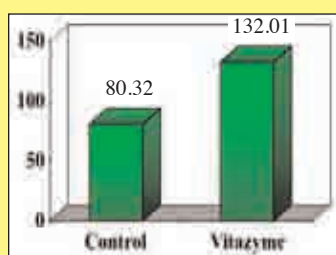


#### Brix

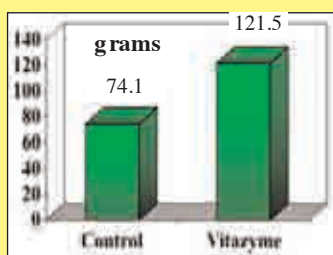


### Riesling Grapes

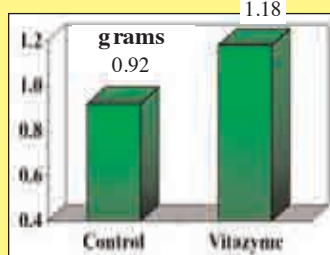
#### Berries Per Cluster



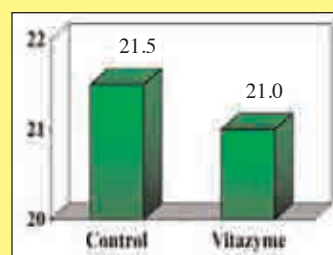
#### Weight Per Cluster



#### Weight Per Berry

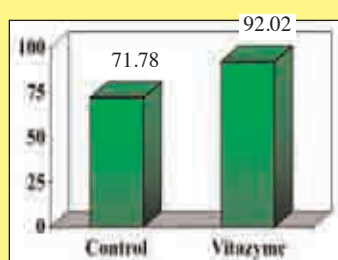


#### Brix

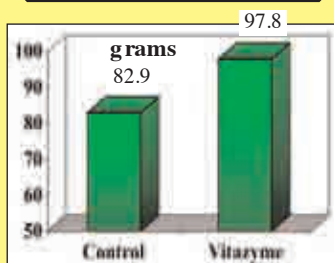


## Cabernet Franc Grapes

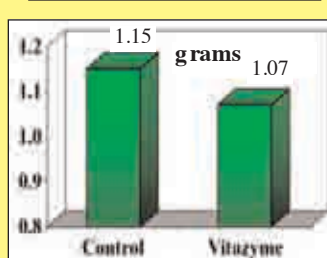
**Berries Per Cluster**



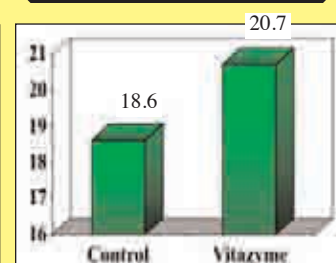
**Weight Per Cluster**



**Weight Per Berry**



**Brix**



### Change in Value with Vitazyme

Variety	Pinot Noir	Riesling	Cabernet Franc
Berries Per Cluster	+29%	+64%	+28%
Weight Per Cluster	+6%	+64%	+18%
Weight Per Berry	-17%	+28%	-7%
Brix	+0.1%-point	-0.5%-point	+2.1%-point

Conclusions: This series of three grape trials with Vitazyme in New York showed that, in all cases, the yield of grapes was much greater with Vitazyme as measured by berries per cluster and weight per cluster: increases were from 28% (Cabernet Franc) to 64% (Riesling) for berries per cluster, and from 6% (Pinot Noir) to 64% (Riesling) for weight per cluster. Berry weight was increased by 28% for Riesling grapes with Vitazyme, but reduced by 7 to 17% for the other varieties. The Pinot Noir and Riesling varieties changed little for brix with Vitazyme, but Cabernet Franc increased 2.1 points. In terms of grape yield, Vitazyme greatly improved production in this study.

## **Section II Raisin Grape Studies**

### **California**

Three Year Study on Raisin Grapes 2003 – 2005

Thompson Seedless Yr 1 - 2003

Thompson Seedless Yr 2 - 2004

Thompson Seedless Yr 3 - 2005

Thompson Seedless #1 1997

Thompson Seedless #2 1997

Thompson Seedless 1998

Thompson Seedless #1 1999

Thompson Seedless #2 1999

Thompson Seedless 2000

## Vital Earth Resources

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# 2003 Crop Results

## Vitazyme on Grapes (for Raisins)

Researcher: Jamie Hansen

Cooperating party: David Morgan, Tulare Ag Products, Tulare California

Location: LDS Fresno Raisin Vineyard, Madera, California

Variety: Thompson seedless

Soil type: very sandy to light clay

Experimental design: An 80-acre raisin vineyard was divided into 8-row blocks for half of the vineyard to evaluate grape (raisin) yield of two treatments. Each row was 1/4 mile long. Alternate 8-row blocks were treated with either Ethrel, the standard raisin grape treatment of the area, or Vitazyme three times (one time also receiving potassium, boron, and calcium supplements). Each of the two treatments was thus 40 acres in alternating strips. The data were analyzed with CoHort software using analysis of variance.

### 1. Ethrel

### 2. Vitazyme

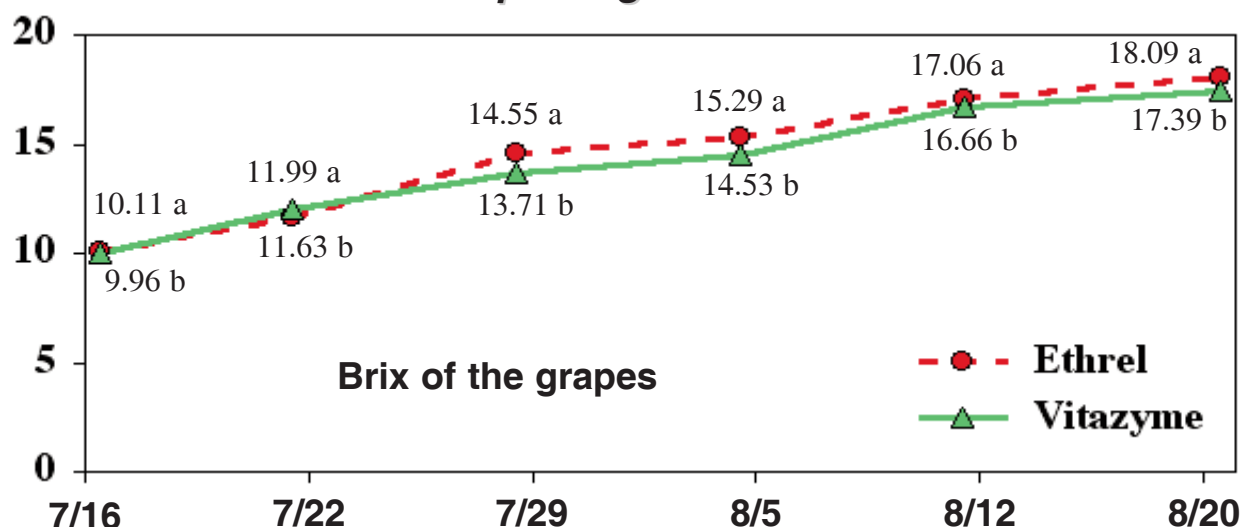
Fertilization: nothing in addition to adequate N, P, and K from well water

Vitazyme application: Vitazyme was applied to the leaves of the grapes by an air-blast sprayer four times at 2 weeks before bloom, at bloom with gibberellins, at BB-sized fruit, and at veraison. The third spray also received a Tulare Ag Products combination of potassium, calcium, and boron.

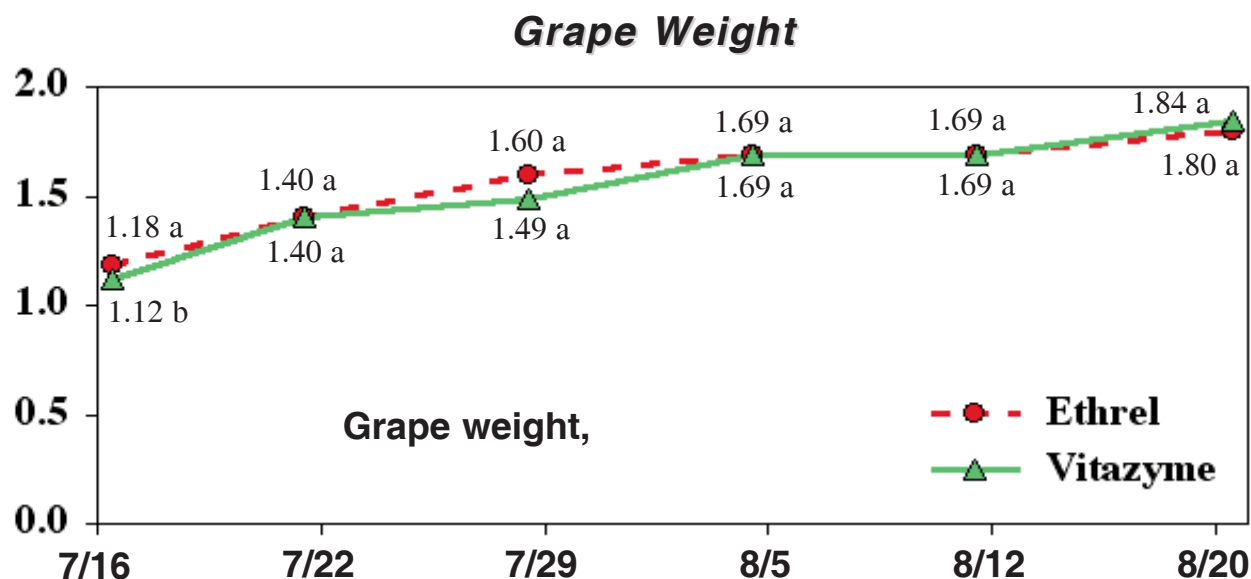
Ethrel application: Ethrel [(2-Chloroethyl) phosphonic acid], also known as Ethepon, is a synthetic plant growth regulator that releases ethylene into the plant system. The effect of ethylene is to hasten sugar production so one can harvest earlier, or get more total sugar into the grapes. The product was sprayed on four times, the same times that the Vitazyme was applied.

Grape sugar results: Grapes from selected rows and locations of both treatments were analyzed by University of California personnel with a refractometer to determine Brix, and grapes were also weighed from those locations. A statistical analysis was performed on those values to determine significant differences.

### Grape Sugar Content



[Means followed by different letters are significantly different at P=0.05.]



[Means followed by different letters are significantly different at P=0.05.]

It will be noted that the sugar content of the Ethrel treated grapes was consistently a bit higher than the Vitazyme treated grapes. In addition, it was discovered that sandier soils tended to increase the sugar content more for Vitazyme than for Ethrel treatment.

There was little difference in grape size as affected by treatment, although towards the end of the season the Vitazyme treatment produced slightly (though not significantly) larger berries. As for sugar content, the sandier soils produced larger berries, on average, with Vitazyme than for Ethrel treatment.

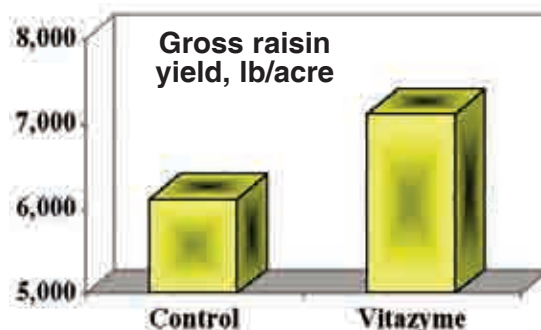
**Harvest date:** September 4, 2003

**Yield results:** All grapes were harvested by volunteer labor and placed on paper trays between the rows. They were left to dry for 3 to 4 weeks before being picked up and delivered to the raisin packing facility.

### Gross Raisin Yield

Treatment	Raisins	Raisins	Increase
	total lb	lb/acre	lb/acre
Ethrel	244,570	6,114.3	—
Vitazyme	284,570	7,114.3	1,000.0 (+16%)

**Increase with Vitazyme: 16%**

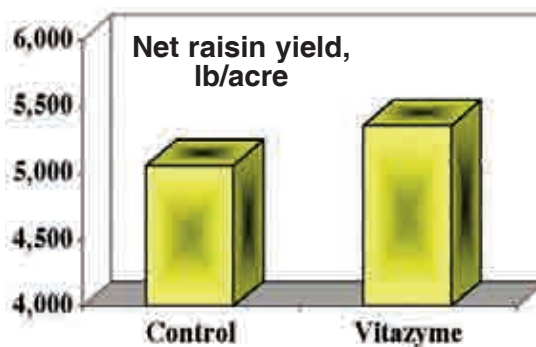


### Net Raisin Yield

The raisins were graded through a machine that used an air current to remove the fruit that was too light, i.e. mostly skins with little sugar deposition.

Treatment	Raisins	Raisins	Increase
	total lb	lb/acre	lb/acre
Ethrel	202,174	5,054.4	—
Vitazyme	214,201	5,355.0	300.6 (+6%)

**Increase with Vitazyme: 6%**





**Conclusions:** In this San Joaquin Valley raisin grape test, Vitazyme (with one of the four sprays also containing some potassium, calcium, and boron) increased total raisin production by 16% above the standard Ethrel treatments. However, the net raisin production was increased less by Vitazyme – by 6% – and while this is still a substantial increase in yield, it is believed that the net yield increase would have been considerably higher, perhaps approaching 16%, if the growing season had been more normal. Due to cool conditions during parts of the summer the progress of the vines and grapes was retarded, so that towards the end of the season the grapes were not reaching their usual high sugar content as soon as normal. Thus, at harvest the Vitazyme treated grapes had a lower sugar content because the heavier load of grapes had too little time to develop a 21 to 22% sugar content, whereas the lighter load of grapes with the Ethrel treatment achieved a higher sugar content due to less grapes to fill.

Ethrel treated grapes had a slightly higher sugar content than the Vitazyme treated grapes throughout the growing season, except for the July 22 determination. Grape size varied little between the two treatments during the July 17 to August 20 testing period.

This study proved that Vitazyme, together with some foliar minerals at one stage of development, performed better in terms of gross and net yield than the “standard of the industry” Ethrel treatments. Further studies will be performed during 2004 to confirm and expand upon these conclusions.

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## 2004 Crop Results

# Vitazyme on Grapes (for Raisins)

## Continuation of a 2003 raisin study

Researcher: Jamie Hansen Cooperating party: David Morgan, Tulare Ag Products, Tulare, California

Location: LDS Fresno Raisin Vineyard, Madera, California

Variety: Thompson seedless

Soil type: very sandy to light clay

Experimental design: This test is a continuation of the raisin study begun in 2003, with treatments being essentially on the same rows as in 2003. An 80-acre raisin vineyard was divided into four treatments in a randomized fashion, assisted by University of California personnel. The 112 rows were arranged as 4-row reps for three treatments, and 16 row reps for the combined Ethrel and Vitazyme treatment. The objective of the study is to compare effects of Vitazyme, Ethrel, and a combination of the two on grape development and yield for raisin production.

- |            |                          |
|------------|--------------------------|
| 1. Control | 3. Vitazyme + K          |
| 2. Ethrel  | 4. Vitazyme + K + Ethrel |

Fertilization: Nothing in addition to adequate N, P, and K from well water

Vitazyme application: (1) 13 oz/acre at pre-bloom cluster stretch, (2) 13oz/acre at post-bloom berry set, (3) 13 oz/acre at berry softening, and (4) 13 oz/acre 14 to 21 days before harvest, all applied by airblast sprayer. Some potassium was added with the Vitazyme.

Ethrel application: Ethrel [(2-Chloroethyl) phosphonic acid], also known as Ethephon, is a synthetic plant growth regulator that releases ethylene into the plant system. The effect of ethylene is to hasten sugar production so harvest can occur earlier, and more total sugars accumulate in the grapes. The product was sprayed once, on June 18 at berry softening.

Grape sugar results: Grapes from selected rows and locations for all four treatments were analyzed with a refractometer to determine brix. Bunches were marked, and grapes from just below the shoulder were analyzed at each date from these same bunches. These data are shown below, and in the graph on page 2.

### Grape Sugar Content

Treatment		6/29	7/6	7/10	7/17	7/24	7/31		
8/9	8/16	-----				-----brix-----			
1. Control		11.45	14.05	16.50	17.20	17.85	19.37	19.87	21.52
2. Ethrel		12.20	14.17	16.00	17.55	18.40	19.70	20.35	21.62
3. Vitazyme + K		12.37	14.65	16.35	18.50	19.00	20.02	20.92	22.30
4. Vitazyme + Eth.		12.35	14.51	15.95	17.60	18.05	19.95	20.07	21.12

The control treatment in all cases, except at the last determination on 8/16, produced the least sugar, while Vitazyme + K, on every day except 7/10, produced the most sugar. Ethrel and Vitazyme + K + Ethrel tended to produce grapes having a higher sugar content than the control.

Grape size results: Grape weights were determined by University of California personnel on seven dates from 6/24 to 8/5, but variations in values were rather erratic and hard to explain. These results are therefore not included in this report.

**Harvest date:** 80% completed on August 21, and 100% completed on August 28

**Yield results:** All grapes were harvested by volunteer labor and placed on paper trays between the rows. They were left to dry for 3 to 4 weeks before being picked up and delivered to the Sunmaid raisin packing plant.

The raisins were graded at the Sunmaid raisin processing facility, and all light or inferior raisins were removed. Those retained for the weights given here are C grade or better. No gross raisin weights are reported, since grades were similar for all treatments. The gross weight of all treatments was 445,010

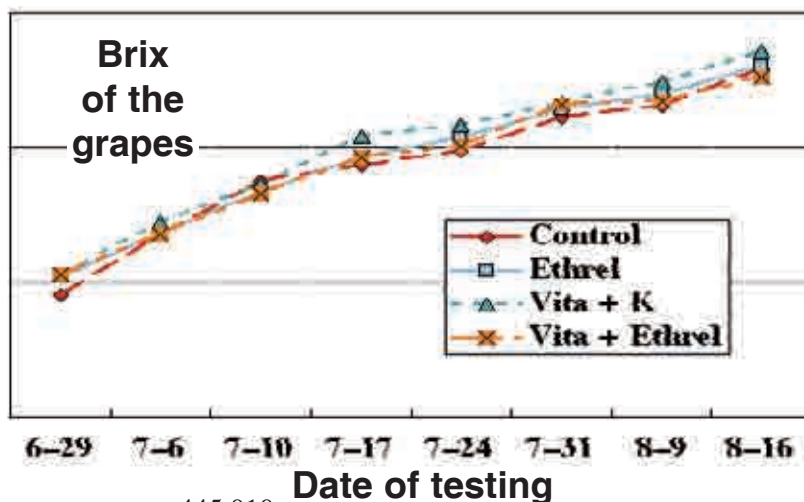
lb, and the net weight was 394,271 lb, a loss of 50,739 lb or 11% of the gross weight. This loss was very low compared to 2003, when weather conditions combined to produce grapes with a low sugar content. Losses that year averaged 21%.

24

18

12

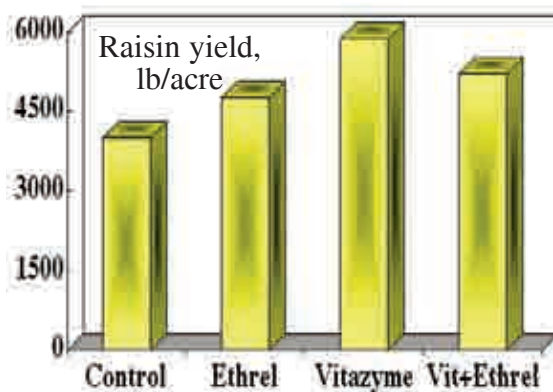
6



## Net Raisin Yield

Treatment	Raisins		Area*	RaisinsIncrease
	total lb	acres		
1. Control	44,516	11.11	4,007	—
2. Ethrel	51,186	10.76	4,757	750 (+19%)
3. Vitazyme + K	65,033	11.11	5,854	1,847 (+ 46%)
4. Vitazyme + K + Eth.	222,952	242.71	5,220	1,213 (+ 30%)

**Increase with Vitazyme: + 46%**  
**Increase with Vitazyme (+K) + Ethrel: + 30%**



**Income results:** An estimated price of raisins for 2004 is \$1,210/ton.

Treatment	Yield	Yield	Value	Increase
	lb/acre	tons/acre	\$/acre	\$/acre
1. Control	4,007	2.0035	2,424.24	—
2. Ethrel	4,757	2,3785	2,877.99	453.75
3. Vitazyme + K	5,854	2.9270	3,541.67	1,117.43
4. Vitazyme + K + Eth.	5,220	2.6100	3,158.10	733.86

**Income increase with Vitazyme: + 1,117.43/acre**

**Conclusions:** In the second year of a continuing study of Vitazyme + K and Ethrel effects on grape (raisin) yields, Vitazyme + K again outproduced the Ethrel treatment, by a 30% margin in 2004 versus a 6% margin in 2003. This increase in yield meant an extra \$1,117.43/acre income above the control. In contrast, Ethrel produced a 19% yield increase, giving \$453.75 extra yield above the control. The extra income of Vitazyme + K above the Ethrel treatment was \$663.66/acre. In contrast, the combined Vitazyme + K + Ethrel produced a yield and income response intermediate to the other two treatments, although, according to the vineyard manager, if the timing of Ethrel application in relation to Vitazyme + K application had been better, this combination treatment may have been superior to Vitazyme + K. Continuing studies at the same location in 2005 will hopefully answer this question.

## **Vital Earth Resources**

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# **2005 Crop Results**

## **Vitazyme on Grapes (for raisins)**

### ***Year three of a continuing raisin study***

Researcher: Jamie Hansen      Cooperating party: David Morgan, Tulare Ag Products, Tulare, California

Location: LDS Fresno Raisin Vineyard, Madera, California

Variety: Thompson seedless

Soil type: Very sandy to light clay

Irrigation: drip

Experimental design: This test is the third year of a continuing study beginning in 2003 to evaluate the effects of Ethrel and Vitazyme (plus other Tulare Ag products), alone or in combination, on the yield and quality of raisin grapes. An 80-acre, 112 row raisin vineyard was divided into seven treatments on a replicated basis throughout the vineyard, each treatment applied to rows in all parts of the acreage to reduce treatment error and produce accurate results.

<b>Treatment</b>	<b>Ethrel</b>	<b>Vitazyme</b>	<b>Finisher 21</b>	<b>Cal Ocho 8%</b>	<b>Fulvic acid</b>	<b>Dry Humates</b>
1	O	O	O	O	O	O
2	X	O	O	O	O	O
3	O	X	X	X	X	X
4	X	O	X	X	O	O
5	X	X	X	X	O	O
6	X	O	X	X	X	X
7	X	X	X	X	X	X
<b>Dates applied</b>	6/30	5/7, 5/23, 6/28, 8/13	6/28	5/7, 6/28	3/18, 5/7, 5/23, 6/28, 8/13	10/2004

Fertilization: The whole vineyard received adequate N, P, and K in the irrigation well water. Liquid humate was applied to all areas through the irrigation water from May to August (1,000 gallons total). Zinc and boron were applied foliar at recommended rates to all areas on May 7 along with other materials. Copper and sulfur (for phomopsis) were sprayed with the fulvic acid on all areas on March 18.

Ethrel treatment: Ethrel [(2-chloroethyl) phosphonic acid], also known as Ethephon, is a synthetic plant growth regulator that releases ethylene into the plant system. Ethylene hastens sugar production so harvest can occur earlier and more sugars can accumulate. The product was sprayed once, on June 30, at veraison.

Vitazyme application: Vitazyme was applied foliar at 13 oz/acre along with other agents on May 7, May 23, June 28, and August 13 to appropriate treatments.

Finisher 21 application: Finisher 21 is a 21% potassium (K<sub>2</sub>O) formulation that was applied foliar at recommended rates, along with other agents, on June 28 only to the appropriate treatments.

Cal Ocho 8% application: Cal Ocho 8% is an 8% calcium formulation, with CaO and carbohydrates, which was applied foliar with other agents on May 7 and June 28 to the appropriate treatments

**Fulvic acid application:** Fulvic acid was applied foliar at 1 quart/acre with other agents on March 18, May 7, May 23, June 28, and August 13 to the appropriate treatments.

**Dry humate application:** Dry humate acid was applied at 10 lb/acre to appropriate areas in October of 2004.

**Gibberellin application:** Gibberellic acid was sprayed foliar along with other agents at recommended rates on May 23 only, near full bloom.

**Weather conditions:** The spring was cool and wet, June was very hot (to 100°F), giving early veraison by one week, and the summer and fall were quite warm as well.

**Grape sugar and weight results:** One-hundred grapes from 16 selected rows of each of four treatments were analyzed with refractometers by University of California personnel on five dates: July 13, July 19, July 27, August 4, and August 10. These grapes were also weighed.

### ***Grape Sugar Content***

Treatment	July 13	July 19	July 27	August 4	August 10
	----- brix -----				
Control	10.4	13.5	16.0	17.4	18.5
Ethrel	10.8	13.0	15.8	18.1	18.9
Vitazyme + K	11.2	13.4	15.8	17.3	18.0
Vitazyme + Ethrel	10.9	13.5	15.7	17.8	18.7

All four treatments produced sugar levels within 0.9 percentage point, the Ethrel treatment producing 18.9 brix with the Vitazyme + Ethrel treatment giving 18.7 brix. The control and Vitazyme + K produced slightly less brix; 18.5 and 18.0, respectively.

### ***Grape Weight***

Treatment	July 13	July 19	July 27	August 4	August 10
	----- grams/100 berries -----				
Control	127.0	144.4	173.2	181.6	181.2
Ethrel	141.9	155.3	181.5	194.8	198.2
Vitazyme + K	144.2	146.4	168.4	178.2	184.2
Vitazyme + Ethrel	142.9	160.5	178.5	195.7	199.9

The largest grapes were produced by the Vitazyme + Ethrel treatment, followed closely by the Ethrel treatment. The control treatment produced the lightest grapes

**Harvest date:** August 26 to September 3, 2005

**Yield results:** The grapes were harvested by volunteer labor and placed on paper trays between the rows. After 3 to 4 weeks of drying they were picked up and delivered to the Sunmaid raisin packing plant.

The raisins were graded at the Sunmaid raisin plant, and all light and inferior raisins were removed. Those retained for yield results were grade C or better. No gross weights were reported.

### ***Net Raisin Yield***

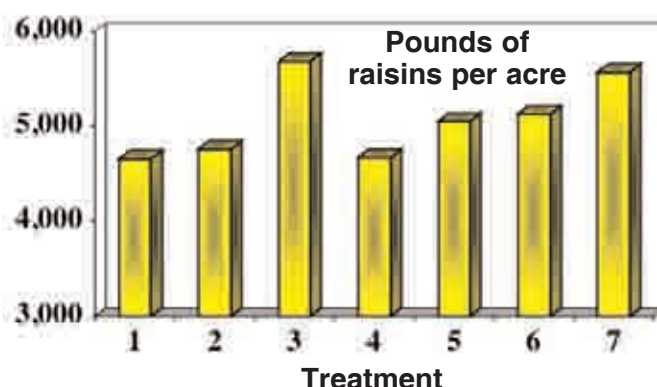
Treatment	Raisins	Raisins <sup>1</sup>	Raisins <sup>2</sup>	Increase
	total lb.	lb/row	lb/acre	lb/acre
1. Control	53,293	1,665.4	4,663	—
2. Ethrel	52,752	1,701.6	4,764	101 (+2%)
3. Vitazyme + all others	64,977	2,030.5	5,685	1,022 (+22%)
4. Ethrel + Fin 21 + Cal 8%	51,772	1,670.0	4,676	13 (0%)
5. Ethrel + Vitazyme + Fin 21 + Cal 8%	54,154	1,805.1	5,054	391 (+8%)
6. Ethrel + all others	58,634	1,832.3	5,130	467 (+10%)
7. Ethrel + Vitazyme + all others	59,720	1,990.6	5,574	911 (+20%)

<sup>1</sup>One row contained about 180 vines.

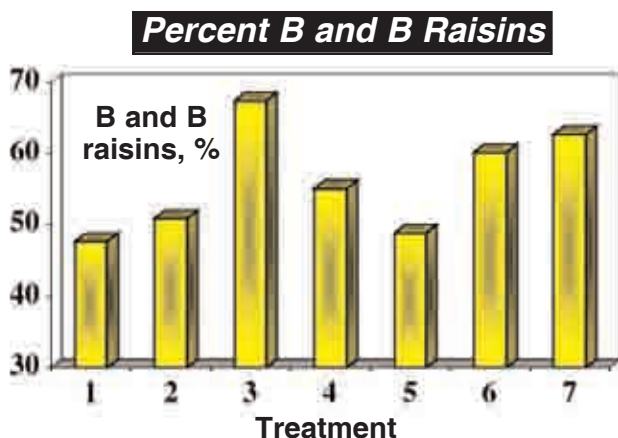
<sup>2</sup>One acre contained 2.8 rows.

**Increase with Vitazyme + all other items (no Ethrel): +22%**  
**Increase with Ethrel only: +2%**  
**Increase with Ethrel + all other items (no Vitazyme): +10%**  
**Increase with Vitazyme + Ethrel + all other items: +20%**

Raisin quality results: Results were obtained at the Sunmaid raisin processing facility.



Treatment	Substandards	Change	B and B	Change
	% of total	percentage points	% of total	percentage points
1. Control	9.9	—	47.7	—
2. Ethrel	6.9	-3.0	51.0	+3.3
3. Vitazyme + all others	6.5	-3.4	67.5	+19.8
4. Ethrel + Fin 21 + Cal 8%	7.2	-2.7	55.2	+7.5
5. Ethrel + Vitazyme + Fin 21 + Cal 8%	6.8	-3.1	48.9	+1.2
6. Ethrel + all others	5.9	-4.0	60.2	+12.5
7. Ethrel + Vitazyme + all others	6.0	-3.9	62.7	+15.0



All treatments showed a substantial reduction in substandard raisins, the greatest reduction being for Ethrel + all others and Vitazyme + Ethrel + all others. The highest quality of raisins was for Vitazyme + all others and Vitazyme + Ethrel + all others.

Income results: The price of raisins to the farmer is about \$1,210 per ton.

Treatment	Yield	Raisin value	Change in value
	lb/acre	\$/acre	\$/acre
1. Control	4,663	2,821.12	—
2. Ethrel only	4,764	2,882.22	61.10
6. Ethrel + all others	5,130	3,103.65	282.53
3. Vitazyme + all others	5,685	3,439.43	618.31

**Increase in income with Vitazyme + other materials: \$618.31/acre**

Conclusions: The third year of this California raisin study showed results similar to the previous two years: Vitazyme plus other Tulare Ag Products materials substantially improved raisin yield and quality above both the control (+22%) and the Ethrel only (+20%) treatments. Ethrel, together with other Tulare Ag Products and Vitazyme, produced a raisin yield increase slightly lower than the Vitazyme treatment without Ethrel (+20%). Other treatments increased raisin raisin yield from 0 to 10% above the control. **Vitazyme compared to Ethrel, adding all other Tulare Ag Products materials, produced a 12% net raisin yield advantage.**



Raisin quality was substantially improved by Vitazyme as well. The product assisted in raising the net raisin yield as well. While all treatments reduced substandard raisins from 2.7 to 4.0%, the percentage of high grade raisins (B and B) was the highest for Vitazyme + other Tulare Ag Products materials (+19.8% above the control), the second highest increase being the same treatment plus Ethrel (+15.0% above the control.)

Income with the Vitazyme plus other Tulare Ag products was increased by \$618.31 above the control, and by \$335.78 above the similar treatment when Ethrel was used instead of Vitazyme.

Vitazyme and other Tulare Ag Products materials have for the third year been shown to produce the highest yields of the highest quality raisins. ***Ethrel did well only when combined with Tulare Ag Products materials, but that 10% yield increase was dwarfed by the Vitazyme treatment with those same inputs (+22%).***

***Since Vitazyme and other components in the study have been shown to produce sugar (Brix) levels similar to Ethrel treated grapes — Ethrel being used primarily to increase grape brix levels— and the yields are substantially increased above the Ethrel treatments, there is no apparent reason to apply Ethrel to grapes if Vitazyme and its program are utilized.*** This is especially true when considering the vine damage that Ethrel causes, since it produces ethylene, which triggers senescence in the vines.

## ***Vital Earth Resources***

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# **1997 Crop Results**

## **Vitazyme on Grapes (Raisins)**

Researcher: Nick Nazaroff

Location: Kerman, California

Variety: Thompson seedless, for raisins

Maturity: mature vines

Soil type: sandy loam

Vine spacing: 12 ft x 7 ft

Experimental design: Three fields were selected for testing, and divided into treated and untreated portions: the Modoc Farm, the Church Farm, and the Floyd Farm.

### **1. Control**

### **2. Vitazyme**

Fertility and Vitazyme treatments (Vitazyme was applied to test areas only):

	<u><b>Modoc Farm</b></u>	<u><b>Church Farm</b></u>	<u><b>Floyd Farm</b></u>
First application	<b>April 7 - Root zone</b> Vitazyme (13 oz/acre) Nitrogen (75 lb/acre UN 32) Tracite (1 qt/acre 0-0-15)	<b>April 6 - Root zone</b> Vitazyme (13 oz/acre)	<b>July 28 - Foliar</b> Vitazyme (13 oz/acre)
Second application	<b>May 14 - Foliar</b> Vitazyme (13 oz/acre) Bayfolan (2 pt/acre) Wettable S (3 lb/acre)	<b>May 14 - Foliar</b> Vitazyme (13 oz/acre) Bayfolan (2 pt/acre) Wettable S (3 lb/acre)	<b>None</b>
Third application	<b>July 28 - foliar</b> Vitazyme (13 oz/acre) Tracite (1 qt/acre 6% Ca)	<b>None</b>	<b>None</b>

Harvest: All grapes were harvested by hand on trays between the rows for drying. Because of rains during harvest, it was possible to separate control raisins from treated raisins on the Modoc Farm only. Yield estimates were obtained for the Church and Floyd Farms.

Yield and quality results:

### ***Modoc Farm***

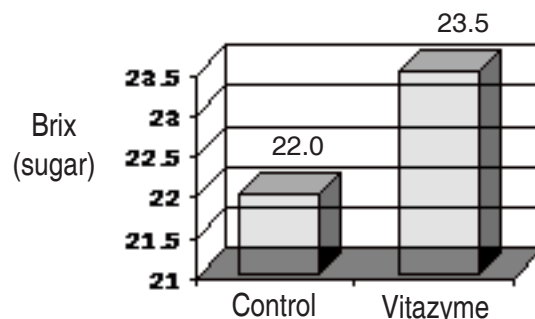
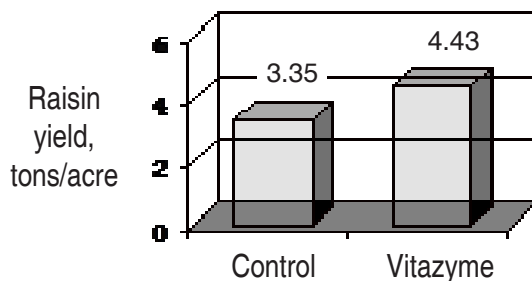
	Plot size	Tray number	Total weight	Tons per acre	Grade* ("B&B")	Substandard	Moisture content	Brix
	acres	number	lb	tons/acre	grade	%	%	
<b>Control</b>	12.3	18,502	82,466	3.35	78.4	3.34	9.97	22.0
<b>Vitazyme</b>	5.0	7,262	44,346	4.43	79.6	3.10	9.90	23.5

\*Determined by a wind machine which blows lighter raisins over a barrier.

**Increase in yield:  
1.08 tons/acre (+32%)**

**Increase in grade:  
1.2 points**

**Increase in Brix (sugar):  
1.5 percentage points**



Income results: The estimated raisin price is \$0.45/lb.

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
Total income	\$3,015.00/acre	\$3,987.00	\$972.00

**Income increase:  
\$972.00/acre**

Comments: (1) The grower said the following: "The [added income] is absolutely unbelievable. Never have I seen such an increase. What is even more exciting is that the fruit canes for this coming year are mature."

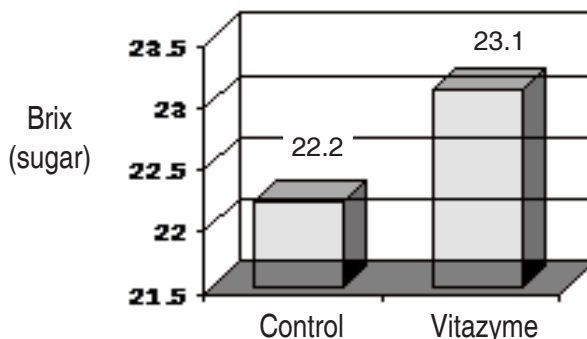
(2) The fruit canes matured in spite of a large crop in 1997; normally they do not all mature after a heavy crop because the roots, while filling grapes for the current crop, are unable to support adequate growth for the canes. The prospects for a good or excellent crop in 1998 are thus much improved.

## Church Farm

**Estimated yield increase:\***  
**1,500 lb/acre**

\*Based on bin filling.

**Increase in Brix (sugar):  
0.9 percentage points**



**Reduction in substandard fruit:\* 1.5 percentage points**

\*Mostly from immature grapes.

**Control: 4.1%**

**Vitazyme: 2.6%**

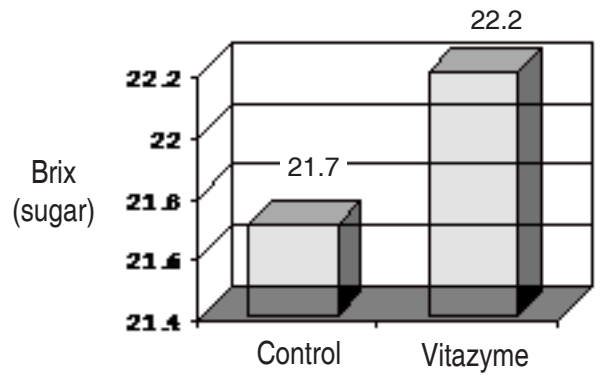
**Estimated income increase: \$675.00/acre**

## ***Floyd Farm***

**Estimated yield increase:\***  
**500 lb/acre**

\*Based on bin filling.

**Increase in Brix (sugar):**  
**0.5 percentage points**



**Estimated income increase: \$225.00/acre**

## 1997 Crop Results

# Vitazyme on Grapes (Raisins)

Researchers: Evon Nazaroff

Location: Kerman, California

Variety: Thompson seedless

Maturity: mature vines

Soil type: sandy loam

Vine spacing: 12 ft x 7 ft

Experimental design: Two fields were selected for testing. Each was divided into a treated and untreated portion.

### 1. Control

### 2. Vitazyme

Fertility treatments: Both the Vitazyme and control treatments were fertilized the same for each field.

Vitazyme treatments: (1) 13 oz/acre on March 28, 1997, with a 12-inch-wide band sprayed alongside the row berm. This application was before the first irrigation of the year, with 10 gal/acre sprayer output.

(2) 13 oz/acre on May 24, 1997, to the foliage. This was about two weeks after bloom when the grapes were buckshot size. Fifty gallons/acre were foliar sprayed.

Harvest date: All grapes were harvested by hand and placed on trays between the rows for drying.

## Test 1

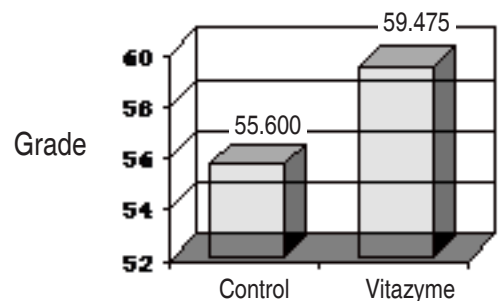
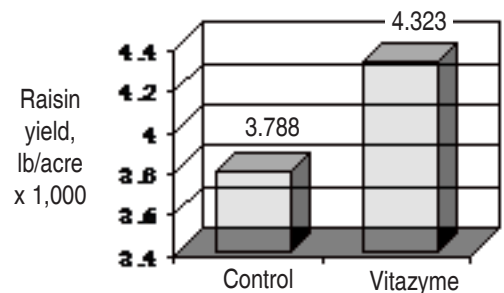
Treatment	Bin weight	Total weight	Grade ("B & B")*	Substandard	Brix (sugar)
	lb	lb/acre	grade	%	
Control	901.0	3,788	55.600	11.5	—
Vitazyme	965.7	4,323	59.475	10.1	+0.5

\*Determined by a wind machine that blows lighter raisins over a barrier.

Increase in yield:  
535 lb/acre (+14%)

Reduction in substandards:  
1.4 points

Increase in grade: 3.875 points



### Income results:

Treatment	Base return <sup>1</sup>	Increase	Grade premium <sup>2</sup>	Substandard premium <sup>3</sup>	Increase over control
	\$/acre	\$/acre	\$ increase/acre	\$ increase/acre	\$/acre
<b>Control</b>	\$1,704.60	—	—	—	—
<b>Vitazyme</b>	\$1,945.35	\$240.75	\$16.75	\$27.24	\$284.74

<sup>1</sup>Calculated at \$0.45/lb.

<sup>2</sup>With a 3.875 point higher “B & B”, at \$0.45/lb then there was a \$7.75/ton higher grade payment.

<sup>3</sup>With a 1.4% reduction in substandard raisins, or 28 lb/ton more raisins at \$0.45/lb, the increase was \$12.60/ton.

**Income increase: \$284.74/acre**

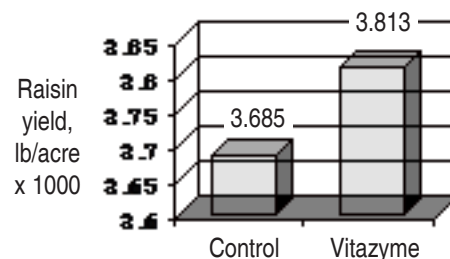
## **Test 2**

Treatment	Bin weight	Total weight	Grade (“B & B”)*	Substandard
	lb	lb/acre	grade	%
<b>Control</b>	959.64	3,685	54.75	12.40
<b>Vitazyme</b>	992.86	3,813	54.40	9.35

\*Determined by a wind machine that blows lighter raisins over a barrier.

**Increase in yield: 128 lb/acre (+3.4%)**

**Reduction in substandard: 3.05 points**



### Income results:

Treatment	Base return <sup>1</sup>	Increase	Substandard premium <sup>2</sup>	Increase over control
	\$/acre	\$/acre	\$ increase/acre	\$/acre
<b>Control</b>	\$1,658.25	—	—	—
<b>Vitazyme</b>	\$1,715.85	\$57.60	\$52.33	\$109.93

<sup>1</sup>Calculated at \$0.45/lb.

<sup>2</sup>With a 3.05% reduction in substandard raisins, or 61 lb/ton more yield, then at \$0.45/lb the increase was \$27.45/ton.

**Income increase: \$109.93/acre**

**Comments:** During the growing season the Vitazyme treated areas displayed superior growth, especially in sandy areas with weaker, nematode-infested vines. A better selection of canes was noted during pruning in the treated areas. The vines are becoming stronger as a result of Vitazyme use.



## 1998 Crop Results

# Vitazyme on Grapes (for Raisins) (1998 Study)

Grower: Elmer Huter

Variety: Thompson seedless

Soil type: sandy loam

Irrigation: all rows were irrigated

Experimental design: A 20-acre field of good uniformity was divided into two portions, a treated area having 31 rows and a control area having 30 rows (0.3279 acre/row):

### 1. Control (conventional program)

### 2. Vitazyme (on top of the conventional program)

Fertility treatments: All areas received 20 gal/acre of CAN-17 (calcium ammonium nitrate with 17% N, giving about 37 lb/acre N) and "liquid potassium" (amount unknown), injected into the root zone about June 8, 1998. No other fertilizers were applied.

Vitazyme applications: (1) 13 oz/acre were sprayed on the vines at match-head size, about a week after bloom, the first part of June. (2) 13 oz/acre were sprayed on the vines at berry softening, in early July.

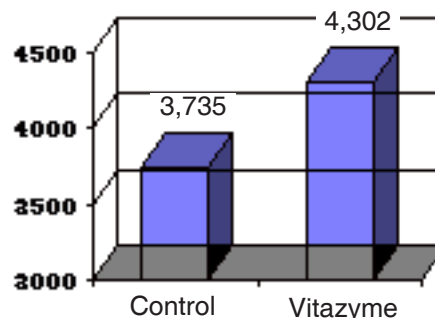
Harvest: All grapes were harvested by hand and placed on trays between the rows for drying.

Yield and quality results:

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
Total yield, lb	36,735 (28 bins)	43,722 (33 bins)	6,987
Yield per row, lb	1,224.5	1,410.4	185.9
Yield per acre, lb	3,734.7	4,301.7	567.0 (+15%)

**Raisin increase: 15%**

**Raisin yield, lb/acre**



Quality parameters were slightly better for the control treatment.

Substandard: control, 3.4%; Vitazyme, 4.9%. B&B: control, 83.1%; Vitazyme, 80.0%. Failed due to mold: control, 5.9%; Vitazyme, 6.3%.

Income results: The price of raisins is estimated at \$1,284.00/ton, or \$0.642/lb.

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
Raisin value, gross	\$2,397.68/acre	\$2,761.69/acre	\$364.01/acre

**Income increase: \$364.01/acre**

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## 1999 Crop Results

# Vitazyme on Grapes (for Raisins)

Grower: Elmer Huter

Variety: Thompson seedless

Soil type: sandy loam

Irrigation: all rows were irrigated

Experimental design: A 20-acre field of good uniformity was divided into two portions, a treated area having 9.5 acres and a control area having 9.5 acres (0.3279 acre/row). **This is the second year in the Vitazyme study.**

Location: Kerman, California

Maturity: mature vines (about ten years old)

Vine spacing: 12 ft x 7 ft

### 1. Control (conventional program)

### 2. Vitazyme (on top of the conventional program)

Fertility treatments: All areas received 20 gal/acre of CAN-17 (calcium ammonium nitrate with 17% N, giving about 37 lb/acre N) and "liquid potassium" (amount unknown), injected into the root zone in early June. No other fertilizers were applied.

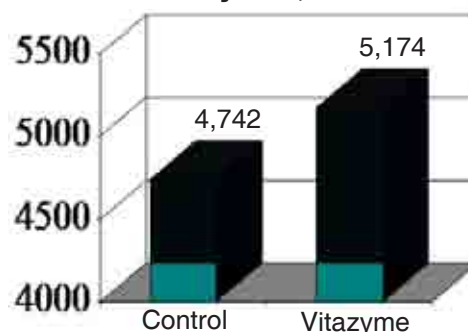
Vitazyme applications: (1) 13 oz/acre were sprayed on the vines at match-head size, about two weeks after bloom, the first part of June. (2) 13 oz/acre were sprayed on the vines at berry softening, in early July.

Harvest: All grapes were harvested by hand and placed on trays between the rows for drying.

Yield and quality results:

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
Total yield, lb	45,049 (37 bins)	49,150 (40 bins)	4,101
Yield per acre, lb	4,742	5,174	432 (+9%)

Raisin yield, lb/acre



**Raisin increase 9%**

Quality parameters were similar for both treatments.

Substandard: control, 5.0%; Vitazyme, 5.0%. B&B: control, 74.8%; Vitazyme, 77.8%. Moisture: control, 10.8%; Vitazyme, 11.9%.

Income results: The price of raisins is estimated at \$1,220.00/ton, or \$0.61/lb actual net value.

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
Raisin value, gross	\$2,892.62/acre	\$3,156.14/acre	\$263.52/acre

**Income increase: \$263.52/acre**

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## 1999 Crop Results

# Vitazyme on Grapes (for Raisins)

Grower: Elmer Huter

Variety: Thompson seedless

Soil type: sandy loam

Irrigation: all rows were irrigated

Experimental design: A 40-acre field of good uniformity was divided into two portions, a treated area having 18.5 acres and a control area having 18.5 acres:

### 1. Control (conventional program)

### 2. Vitazyme (on top of the conventional program)

Fertility treatments: All areas received 20 gal/acre of CAN-17 (calcium ammonium nitrate with 17% N, giving about 37 lb/acre N) and "liquid potassium" (amount unknown), injected into the root zone in early June. No other fertilizers were applied.

Vitazyme applications: (1) 13 oz/acre were sprayed on the vines at match-head size, about two weeks after bloom, the first part of June. (2) 13 oz/acre were sprayed on the vines at softening, in early July.

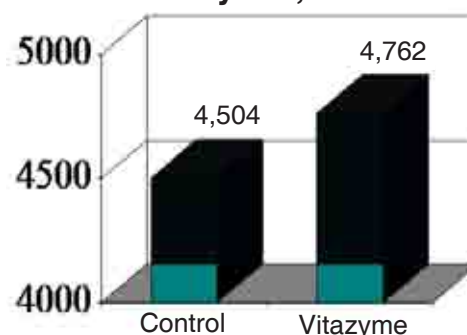
Harvest: All grapes were harvested by hand and placed on trays between the rows for drying.

Yield and quality results:

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
Total yield, lb	83,322 (66 bins)	88,099 (70 bins)	4,777
Yield per acre, lb	4,504	4,762	258 (+6%)

**Raisin increase 6%**

Raisin yield, lb/acre



Quality parameters were slightly better for the control treatment.

Substandard: control, 2.25%; Vitazyme, 4.00%. B&B: control, 84.1%; Vitazyme, 80.0%. Moisture: control, 11.4%; Vitazyme, 11.5%.

Income results: The price of raisins is estimated at \$1,220.00/ton, or \$0.61/lb.

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
Raisin value, gross	\$2,747.44/acre	\$2,904.82/acre	\$157.38/acre

**Income increase: \$157.38/acre**

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## 2000 Crop Results

# Vitazyme on Grapes (Raisins)

Researcher: Evon Nazaroff, Boghosian Brothers Farming

Location: Fowler, California

Variety: Thompson seedless

Soil type: sandy loam

Vine age: mature

Trellis system: overhead

Spacing: 12 ft between rows, 7 ft in the rows

Experimental design: A 47-acre grape vineyard was divided into two portions: control (9 acres) and Vitazyme treated (38 acres).

### 1. Control

### 2. Vitazyme

Fertilization: 40 lb N/acre (as UN-32) through the drip system early in the season, and 20 lb N/acre (as Ca-NH<sub>4</sub>NO<sub>3</sub>) and soluble K through the drip system at berry softening

Fungal control: sulfur every 10 days for powdery mildew control; another fungicide applied at another time

Insect larvae control: Kryocide

Irrigation: drip system, at 12 gal/plant three times weekly

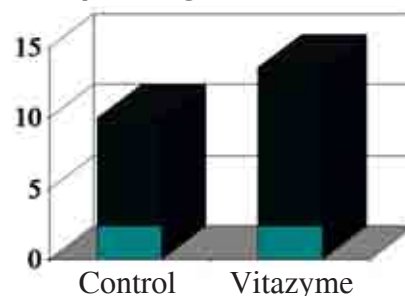
Vitazyme treatment: (1) 13 oz/acre foliar 10 days after blossom; (2) 13 oz/acre foliar at berry softening

Yield results: The grapes were hand-picked from the overhead trellis and delivered to the Boghosian Brothers raisin processing plant. There they were heat dried for golden raisins.

	Control	Vitazyme	Change
	SPAD units		
Grape weight (moist)	9.97	13.56	(+) 3.59 (+36%)

**Grape yield increase: 36%**

Grape weight, tons/acre



Income results: The value of the fresh grapes is \$80/ton.

	Control	Vitazyme	Change
	\$/acre		
Gross income	797.60	1,084.80	(+) 287.20

**Income increase:  
\$287.20/acre**

Quality results: Quality of the grapes is related to density, or amount of solids in the fruit. Weights of control and Vitazyme bins were weighed and averaged.

	Control	Vitazyme	Change
	average lb/bin		
Bin weight	1,069.0	1,101.6	(+) 32.6 (+3%)

**Grape density  
increase: 3%**

Conclusions: Vitazyme applied twice to the leaves of those overhead trellised grapes produced an excellent 36% yield increase, amounting to \$287.20/acre more income. The Vitazyme treated grapes also contained a higher concentration of sugars and minerals (i.e., more dry matter), which would translate to a higher raisin yield after dry-down.

## **Section III Table Grapes**

### **California**

Flame, Perlette, Sugraone 2008

### **Chili**

Crimson Seedless #1 2009

Crimson Seedless #2 2009

Thompson Seedless #1 2009

Thompson Seedless #2 2009

Flame Seedless 2009

Thompson Seedless & Crimson Seedless 2009

### **Ukraine**

Aligote 2008

Ranniy Magaracha 2008

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## 2008 Crop Results

# Vitazyme on Grapes

Researcher: Jeff Bergeron Grower organization: Richard Bagdasarian, Inc.

Location: Sunny Mecca, California (Coachella Valley)

Varieties: Flame, Perlette, and Sugraone (table varieties)

Soil type: unknown

Vine spacing: unknown

Experimental design: Three vineyards were selected to evaluate the effect of Vitazyme on table grape quality. The Flame variety was treated on 2.2 acres at the Mecca Star Ranch, the Perlette variety on 4.7 acres at the Sultan Ranch, and the Sugraone variety on 2.7 acres at the Pasha 3 Ranch.

### 1. Control

### 2. Vitazyme

Fertilization: unknown

Vitazyme application:

Variety	Pre-bloom 1		Pre-bloom 2		BB-shot		Final	
	Date	Rate*	Date	Rate*	Date	Rate*	Date	Rate*
Flame	March 5	14.8	March 27	13.9	April 14	13.9	April 29	13.9
Sugraone	March 7	14.9	April 11	13.4	April 18	13.4	April 29	13.4
Perlette	March 4	11.7	April 7	13.0	April 18	13.0	April 29	13.0
*Rate in ounces/acre								

Quality results: Observations on grape quality are as follows.

### **Grape Quality Results, Vitazyme vs. Control**

#### Flame grapes (Mecca Star Ranch)

Fuller, deeper red color

More even coloring of grapes in bunches

One size larger

#### Sugraone grapes (Pasha 3 Ranch)

Firmer, crisper fruit

Greener color

One size larger

#### Perlette grapes (Sultan Ranch)

Somewhat crispier fruit

[Note: This was an old vineyard that was pulled out after harvest.]

Conclusions: Vitazyme applied to three table grape varieties in the Coachella Valley of California, using four applications, improved the quality markedly with the Flame and Sugraone varieties. These grapes were deeper and more evenly colored than the control treatments alongside, and were a size larger. The Perlette grapes showed a bit more crispness of the fruit, but were produced on old vines that were removed after harvest; the unthrifty growth of this old stock is likely the reason for a less intensive response from Vitazyme.

This test has shown that Vitazyme will improve table grape quality significantly.



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## 2009 Crop Results

# Vitazyme on Grapes, table use

## Quality Assessments

Researcher: Rodrigo Garcia

Farm coopereator: Viticulture and Fruitculture Association, Chile

Variety: Crimson Seedless

Soil type: unknown

Experimental design: A vineyard of Crimson Seedless grapes was divided into three sections: a control and two Vitazyme treatments. The objective of the study was to evaluate the product's effect on grape quality with applications before and after varasion and an elimination of the applications at shoot growth and bloom.

1. Control

2. Vitazyme, 1.0 liter/ha

3. Vitazyme twice, 1.5 liters/ha

Fertilization: unknown

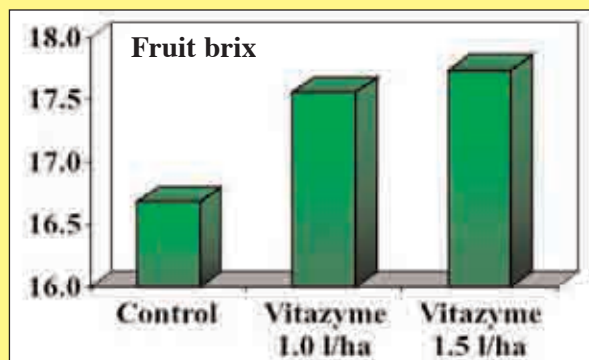
Vitazyme application: either 1.0 or 1.5 liters/ha for the two Vitazyme treatments before verasion and again at the same rate after verasion.

Quality results: Brix levels and the maturity of the grapes at various times were measured in this study.

### Fruit Brix (March 19)

Treatment	Brix	Yield change
1. Control	16.68	—
2. Vitazyme, 1.0 liter/ha	17.56	0.88
3. Vitazyme, 1.5 liters/ha	17.74	1.06

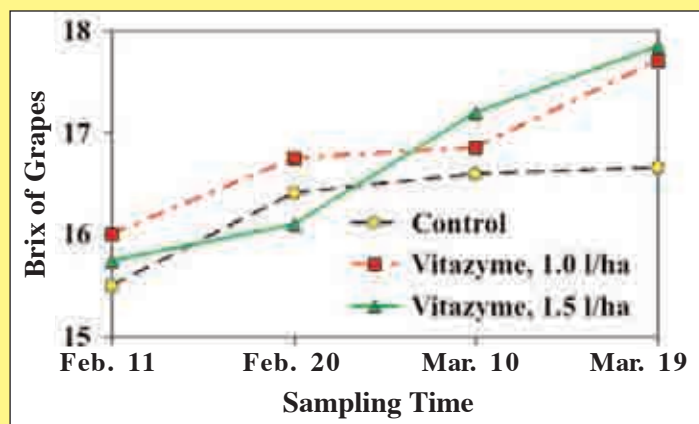
### Final Brix Levels



### Increase in brix with Vitazyme

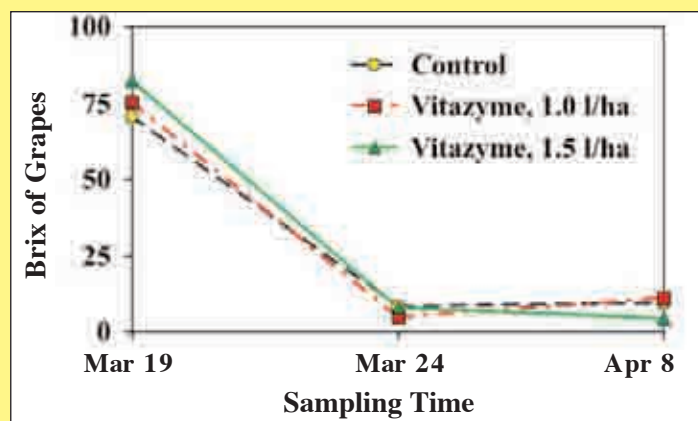
1.0 liters/ha twice .....	0.88%
1.5 liters/ha twice .....	1.06%

### Brix Levels Over Time

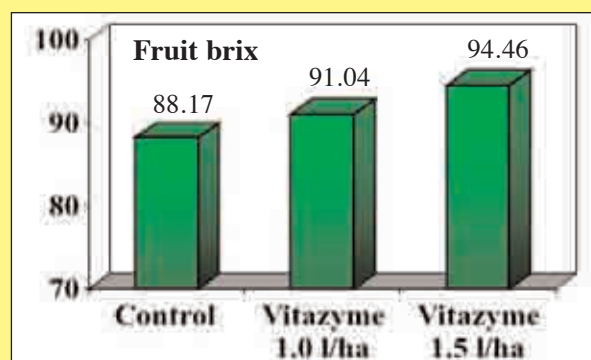


## Grape Maturity

*Percent of Total Harvest, by Date*



*Percent of Harvest by Apr 8*



- Increase in percent harvest at 1.0 liter/ha: 2.87%
- Increase in percent harvest at 1.5 liters/ha: 6.29%

Conclusons: These Crimson Seedless table grapes in Chile responded excellently to Vitazyme, especially to the 1.5 liters/ha rate applied before and after verasion. This treatment resulted in a 1.06 points increase in brix, and percent harvested grapes by April 8 of 94.46%. The 1.0 liter/ha Vitazyme rate resulted in a 0.88 point brix increase above the the control, and a 91.04% harvest by April 8, versus 88.17% for the control. This product has proven itself in this study to be a powerful adjunct to traditional viticulture practices in Chile.

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# 2009 Crop Results

## Vitazyme on Grapes, table use

Researcher: unknown

Variety: Crimson Seedless

Experimental design: A vineyard of Crimson Seedless grapes was divided into three areas: a control and two Vitazyme treatments. The objective of the study was to evaluate the product's effects on fruit maturity, fruit yield, and grape color at harvest.

Farm coopereator: Santa Marta-Paine, Chile

Soil type: unknown

1. Control

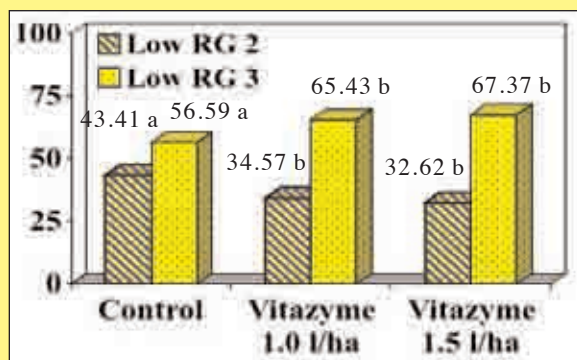
2. Vitazyme, 1.0 liter/ha

3. Vitazyme twice, 1.5 liters/ha

Fertilization: unknown

Vitazyme application: either 1.0 or 1.5 liters/ha for the two Vitazyme treatments before veraison, and again at the same rate after veraison.

Color results: Fruit color was determined at harvest and analyzed statistically.



Both Vitazyme treatments improved the development of red color for these Crimson Seedless grapes, increasing the full RG3 values significantly above the control, and reducing the low RG2 levels below the control.

**Improvement in color with Vitazyme  
(1.5 liters/ha): 10.78% full RG 3**

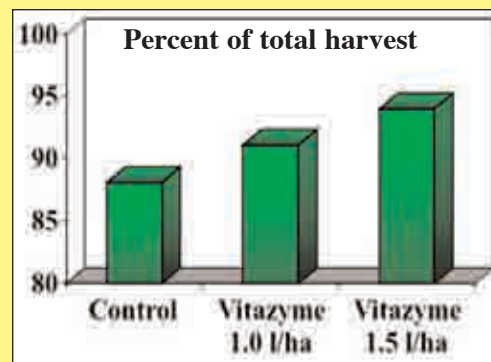
Grape maturity results: Records were kept of the percent of total harvest for three dates to determine the maturity of the grapes.

## Grape Maturity

Treatment	Harvest date			Total
	March 19	March 24	April 8	
1. Control	70.6	8.1	9.4	88.1
2. Vitazyme, 1.0 liter/ha	75.1	4.9	11.1	91.1
3. Vitazyme, 1.5 liters/ha	82.1	7.4	4.5	94.0

**Increase in harvest by April, 1.5  
liters/ha: 5.9%**

## Percent of Harvest by Apr. 8



Grape yield:

## Grape Yield

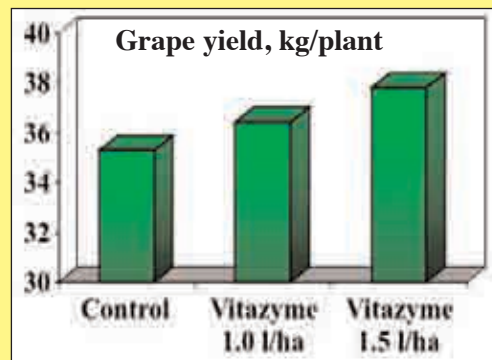
Treatment	Fruit harvest			Total
	March 19	March 24	April 8	
	----- kg/plant -----			
1. Control	28.26	3.24	3.78	35.28
2. Vitazyme, 1.0 liter/ha	30.03	1.96	4.42	36.41 (+3%)
3. Vitazyme, 1.5 liters/ha	32.85	3.14	1.80	37.79 (+7%)

### Increase in grape yield

**Vitazyme, 1.0 liter/ha ..... 3%**

**Vitazyme, 1.5 liters/ha ..... 7%**

### Total Grape Yield by Apr. 8



Conclusions: In this Chilean table grape trial, using Vitazyme at 1.0 and 1.5 liters/ha twice, the grapes responded favorably in terms of maturity, grape color, and final yield. Both Vitazyme rates did well, but the 1.5 liters/ha rate did a bit better than the 1.0 liter/ha rate, improving red color significantly by 10.78% full RG3, maturity by 5.9%, and yield by 7%. These results show the effectiveness of the product for fresh table grape production in Chile.

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# 2009 Crop Results

## Vitazyme on Grapes, table use Quality Assessments

Researcher: Rodrigo Garcia      Farm cooperator: Javier Polanco and Juan Alessandrini, Polpaico, Region Metropolitana, near Santiago, Chile      Soil type: unknown      Plant density: 816 plants/ha  
Plant spacing: 3.5 x 3.5 meters      Vineyard age: mature      Irrigation: 800 liters/ha  
Varieties: Thompson Seedless (Parcel 221) and Crimson Seedless (Parcel 202)  
Experimental design: Two varieties of seedless grapes were selected in vineyards having uniform soils and management. The design was randomized complete blocks, with four replications, and six plants per plot. The purpose of the trial was to evaluate the brix level and grape size of the two varieties in response to Vitazyme, Biozyme TF, and Citogrower applications.

Treatment	Rate	1°	2°	3°	Verasion	Shoot 30 cm	Berry 2 mm	Fruit set
	liters/ha							
1. Control	0							
2. Vitazyme	1.0	X	X	X	X			
3. Vitazyme	1.0				X	X	X	X
4. Biozyme TF	2.0	X	X	X				
5. Citogrower	2.0	X	X	X				

Fertilizer: unknown

Vitazyme applications: See the rates and timing in the above table.

Biozyme TF application: This product is 1.0% phytohormones, 0.6% amino acids, and 1.8% oligoelements. it was applied at 2.0 liters/ha three times at the timing shown above.

Citogrower application: Citogrower is a solution of soluble phosphorus, potassium, and adenine, applied at 2.0 liters/ha with timing as shown in the table above.

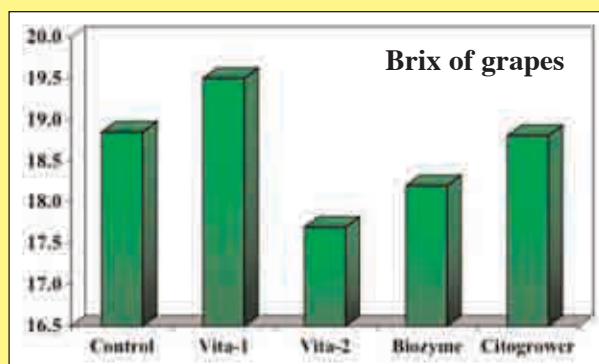
Harvest quality date: Thompson seedless grapes were harvested February 12, 2009, and the Crimson seedless grapes on March 10, 2007. Brix levels and berry size were measured for each plot of both varieties.

### Thompson Seedless

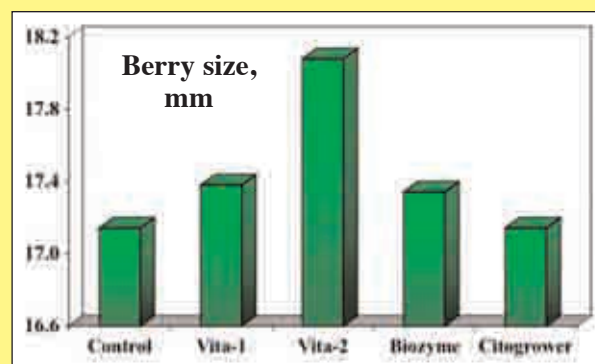
Treatment	Brix level*	Change	Berry size*	Change
			mm	mm
1. Control	18.85 a	—	17.14 a	—
2. Vitazyme 1, 4x	19.50 a	+0.65	17.38 a	0.24 (+1%)
3. Vitazyme 2, 4x	17.70 a	-1.15	18.08 a	0.94 (+5%)
4. Biozyme TF, 3x	18.20 a	-0.65	17.34 a	0.20 (+1%)
5. Citogrower, 3x	18.80 a	-0.05	17.14 a	0 (0%)

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

### Brix Level



### Berry Size



The brix levels and berry sizes were not significantly different for the five treatments, although the first Vitazyme regime gave a 0.65 percentage point increase in brix, whereas both Vitazyme regimes, especially the second one, gave the largest berry sizes; the second Vitazyme regime gave a 0.94 mm average berry size increase.

**Increase in brix with Vitazyme:  
0.65%**

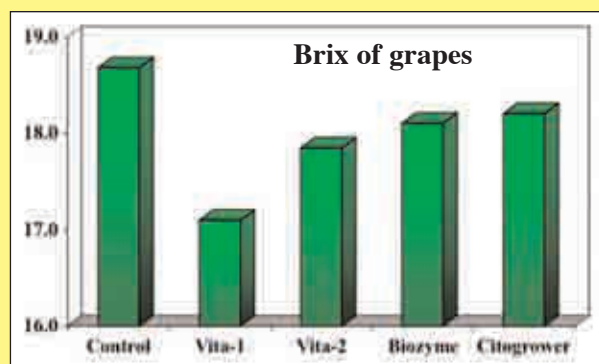
**Increase in berry size with  
Vitazyme: 0.94 mm**

### Crimson Seedless

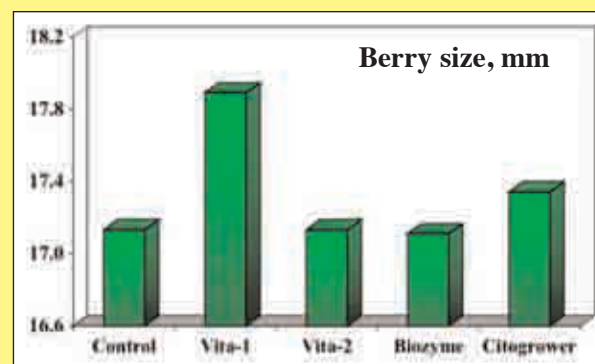
Treatment	Brix level*	Change	Berry size*	Change
			mm	mm
1. Control	18.68 a	—	17.13 b	—
2. Vitazyme 1, 4x	17.10 b	-1.58	17.89 a	0.76 (+4%)
3. Vitazyme 2, 4x	17.85 ab	-0.83	17.13 b	0 (0%)
4. Biozyme TF	18.10 a	-0.58	17.11 b	-0.02 (0%)
5. Citogrower	18.20 a	-0.48	17.34 b	0.21 (+1%)

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

### Brix Level



### Berry Size



With this variety, the control for some reason gave the greatest brix level of the grapes, but this value was statistically the same as all but the first Vitazyme regime. Berry size was significantly greater with the first Vitazyme regime than for all other treatments: an increase of 0.76 mm above the control was 4% greater with Vitazyme.

**Increase in berry size with Vitazyme: 0.76 mm**



Conclusions: In this Chilean table grape study using Vitazyme (two regimes, applied four times), Biozyme TF, and Citogrower, with two varieties, Vitazyme performed the best by increasing brix by up to 0.65 percentage point above the control (Thompson Seedless), and berry size by 0.94 mm (Thompson Seedless) and 0.76 mm (Crimson seedless) above the control. Vitazyme is shown to be an excellent product for improving both brix and berry size of table grapes in Chile ... the only exception being the brix levels of Crimson Seedless, where all four treatments were less than the control.

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## 2009 Crop Results

# Vitazyme on Grapes, table use

## Quality Assessments

Researcher: Rodrigo Garcia

Farm coopereator: Viticulture and Fruitculture Association, Chile

Variety: Thompson Seedless

Soil type: unknown

Experimental design: A vineyard of Thompson Seedless grapes was divided into three sections for a control and two Vitazyme treatments. The objective of the study was to evaluate the product's effect on grape quality with applications before and after varasion, and an elimination of the applications at shoot growth and bloom.

1. Control

2. Vitazyme, 1.0 liter/ha

3. Vitazyme twice, 1.5 liters/ha

Fertilization: unknown

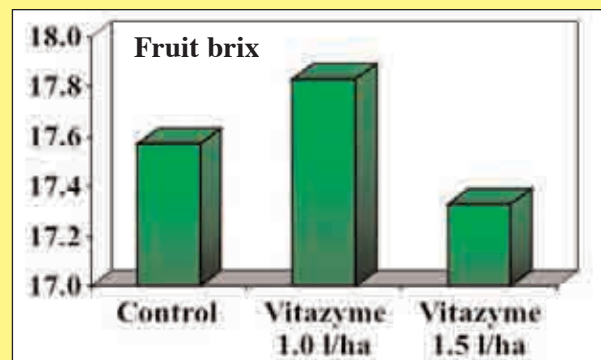
Vitazyme application: either 1.0 or 1.5 liters/ha for the two Vitazyme treatments before verasion and again at the same rate after verasion.

Quality results: Brix levels and the maturity of the grapes at various times were measured in this study.

### Fruit Brix

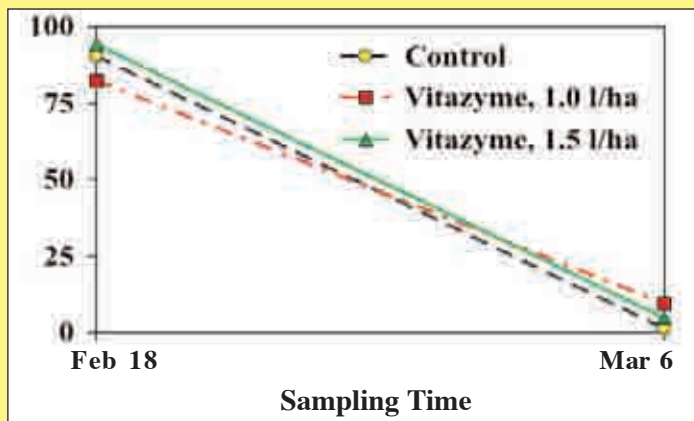
Treatment	Brix	Yield change
1. Control	17.57	—
2. Vitazyme, 1.0 liter/ha	17.83	0.26
3. Vitazyme, 1.5 liters/ha	17.33	(-) 0.24

**Increase in brix with Vitazyme (1.0 l/ha): 0.26 percentage points**

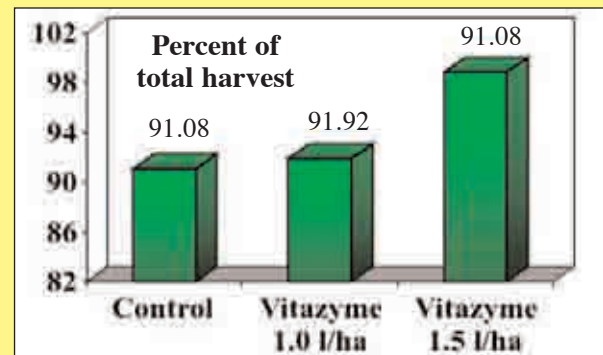


### Grape Maturity

#### Percent of Total Harvest, by Date



#### Percent of Harvest by Mar 6

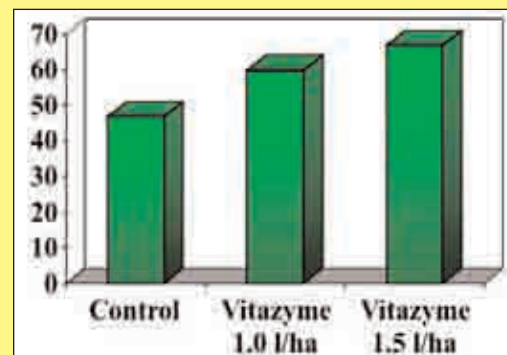


**Increase in percent harvest at 1.5 l/ha: 7.76%**

### **Fruit Color at Harvest**

Treatment	Percent of bunches			
	Lack color	Light green	Green	Yellow green
	----- % -----			
1. Control	16.34	18.59	46.76	18.31
2. Vitazyme, 1.0 liter/ha	10.22	10.84	59.75	19.10
3. Vitazyme, 1.5 liters/ha	11.60	8.40	66.67	13.33

### **Percent Green Grapes**



The green-colored grapes are the best quality. Of this color, the changes with Vitazyme are given below.

- **Increase in percent green grapes at 1.0 l/ha: 12.99%**
- **Increase in percent green grapes at 1.5 l/ha: 19.91%**

Conclusions: This Sygenta test of Vitazyme, at 1.0 and 1.5 liters/ha applied twice — once before and once after veraison — revealed that the product did little to alter the sugar (brix) content of the fruit at harvest, but enhanced maturity of the fruit, especially at the 1.5 liters/ha rate. The 1.5 liters/ha rate increased harvestable bunches by 7.76% at the last recorded harvest date. Fruit color was also enhanced with Vitazyme, the desired green color being 19.91% higher at the 1.5 liters/ha rate than for the control; the 1.0 liter/ha rate gave to 12.99% increase. The greater percentage of green fruit was likely due to the product's chlorophyll enhancing effect throughout the plant, including the fruit skins. Vitazyme is shown to be an excellent adjunct to table grape production in Chile, enhancing maturity as well as grape color.

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## 2009 Crop Results

# Vitazyme on Grapes, table use

## Quality Assessments

Researcher: Rodrigo Garcia Farm cooperator: Viticulture and Fruitculture Association, Chile

Variety: Flame Seedless Soil type: unknown

Experimental design: A vineyard of Flame Seedless grapes was divided into three sections for a control and two Vitazyme treatments. The objective of the study was to evaluate the product's effect on grape quality with application's before and after veraison, and an elimination of the applications at short growth and bloom.

1. Control      2. Vitazyme twice, 1.0 liter/ha      3. Vitazyme twice, 1.5 liters/ha

Fertilization: unknown

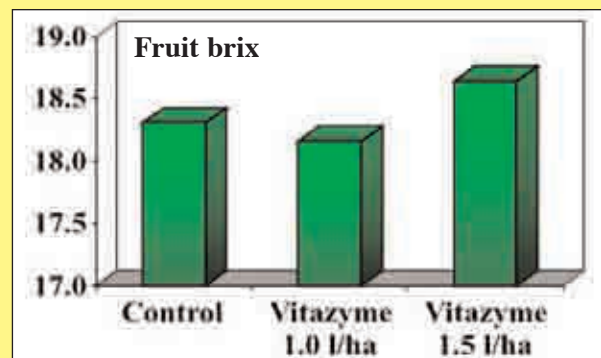
Vitazyme application: either 1.0 or 1.5 liters/ha for the two Vitazyme treatments before veraison, and again at the same rate after veraison

Quality results: Brix levels and the maturity of the grapes at various times were measured in this study.

### Fruit Brix (Jan. 19)

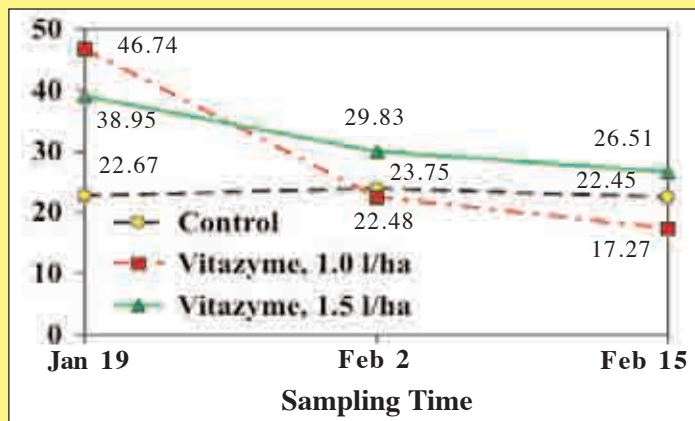
Treatment	Brix	Yield change
1. Control	18.31	—
2. Vitazyme, 1.0 liter/ha	18.16	(-) 0.15
3. Vitazyme, 1.5 liters/ha	18.64	0.33

**Increase in brix with Vitazyme(1.5 l/ha): 0.33 percentage points**

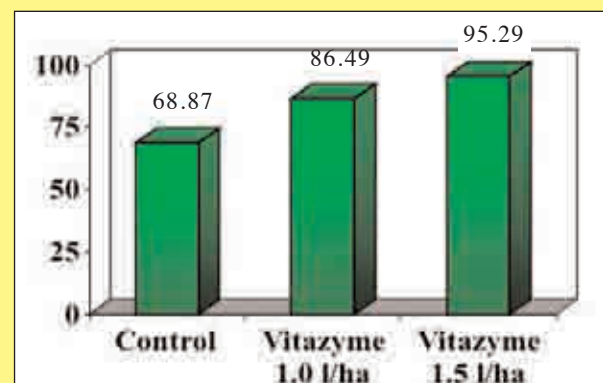


### Grape Maturity

#### Percent of Total Harvest, by Date

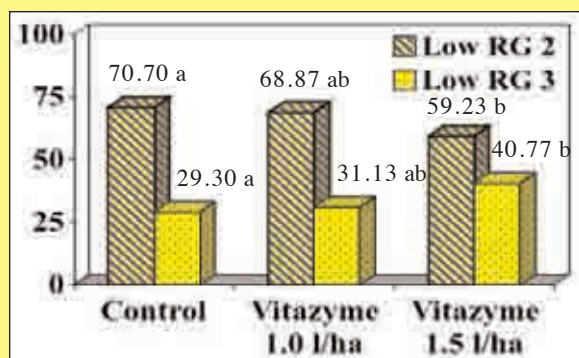


#### Percent of Harvest by Feb. 15



- Increase in percent green grapes at 1.0 l/ha: 17.62%
- Increase in percent green grapes at 1.5 l/ha: 26.42%

**Color results:** At harvest, the color of the grapes were measured in terms of red intensity.



The higher treatment level of Vitazyme caused a significant improvement in red coloration versus the untreated control, as evidenced by the higher Full RG3 level and the significantly lower RG2 level. The color improvement with the 1.0 liter/ha Vitazyme rate was midway between the control and 1.5 liter/ha rate.

**Improvement in color with Vitazyme (1.5 liters/ha): 11.47% full RG3**

**Conclusions:** This table grape study in Chile revealed that Vitazyme at 1.5 liters/ha, applied twice, once before and once after veraison, substantially increased grape brix (+0.33) and greatly enhanced the early maturation of the fruit. By February 15, 95.29% of the harvest was already collected with this treatment. In contrast, only 22.68% of the control grapes were harvested on January 19. The Vitazyme 1.0 liter/ha rate, applied twice, gave a small reduction in fruit brix, but enhanced maturity of the grapes substantially, to 86.49% of the total harvest by February 15. The 1.5 liter/ha Vitazyme rate significantly colored the grapes better than the control grapes. Vitazyme, especially at 1.5 liters/ha twice, has been shown by this study to be an excellent treatment for table grapes.

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# 2009 Crop Results

## Vitazyme on Grapes, table use Quality Assessments

Researcher: Rodrigo Garcia  
near Santiago, Chile

Soil type: unknown

Vineyard age: mature

Experimental design: Two seedless table grape varieties were used to evaluate the effectiveness of Vitazyme, Biozyme TF, and Citogrower for improving table grape quality. a randomized complete block design was used with four replications and six plants per plot. The vineyards were uniform in soil quality and management.

Farm cooperator: Fdo. San Luis de la Morera, Codegua, Region VI,

Varieties: Thompson Seedless and Crimson Seedless

Plant density: 816 plants/ha

Plant spacing: 3.5 x 3.5 meters

Irrigation volume: 800 liters/ha

### Thompson Seedless

Treatment	Rate	Stage				Verasion
		1	2	3	4	
	liters/ha					
1. Control	—					
2. Vitazyme	1.0	X	X	X	X	X
3. Biozyme TF	2.0	X	X	X	X	
4. Citogrower	2.0	X	X	X	X	
*GA (Thompson)	ppm	25	40	40	30	
*GA (Crimson)	ppm	10	20	0	0	

\*GA = gibberellic acid.

Fertilizer applications: unknown

Vitazyme applications: See the notes and timing in the above table.

Biozyme TF application: This product is 1.0% phytohormmes, 0.6% amino aids, and 1.8% oligoelements. It was applied at 2.0 liters/ha three times as shown above.

Citogrower application: This is a solution of soluble phosphorus, potassium, and adenine, applied at 2.0 liters/ha, with timing as shown in the table above.

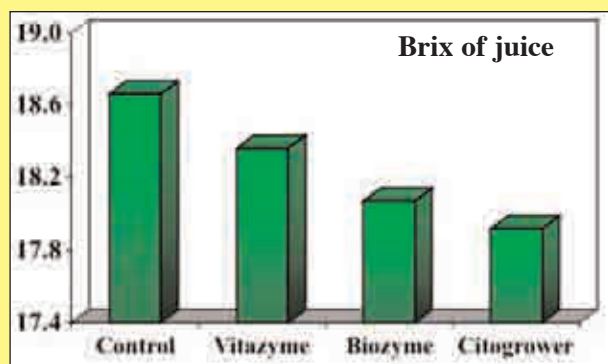
Harvest quality data: The Thompson Seedless grapes were harvested February 15, 2009, and the Crimson Seedless grapes were harvested on March 10, 2009. Brix levels and berry size were measured for both varieties.

### Thompson Seedless

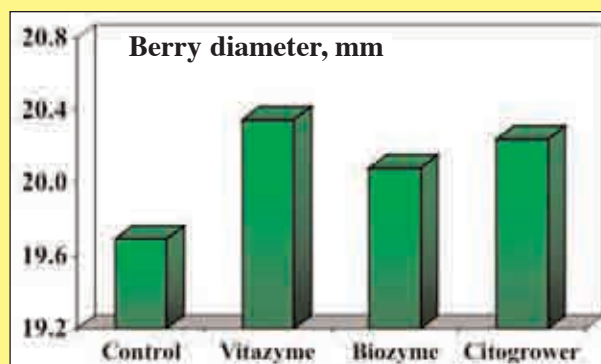
Treatment	Brix level*	Change	Berry size*	Change
			mm	mm
1. Control	18.66 a	—	19.69 a	—
2. Vitazyme 5x	18.36 a	-0.30	20.35 a	0.66 (+3%)
3. Biozyme TF 4x	18.07 a	-0.59	20.08 a	0.39 (+2%)
4. Citogrower 4x	17.92 a	-0.74	20.24 a	0.55 (+3%)

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

### Brix Level



### Berry Size



These Thompson seedless grapes showed a lower, though nonsignificant, brix reading with all three treatments versus the control. The grape size was increased by all three treatments, though not significantly, but the most by the Vitazyme treatment.

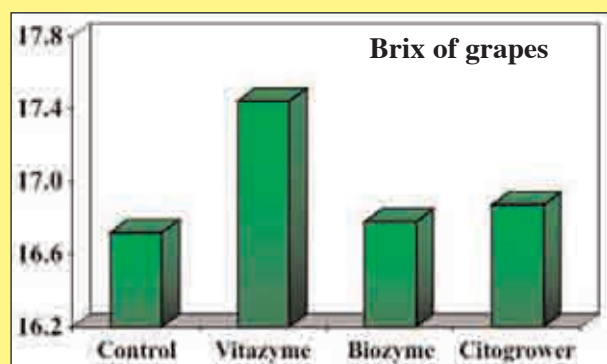
**Increase in berry size with Vitazyme: 0.66 mm**

### Crimson Seedless

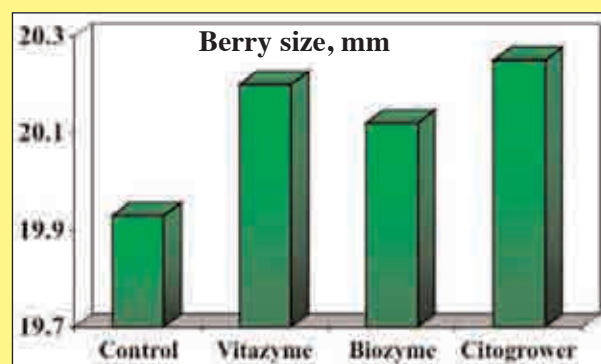
Treatment	Brix level*	Change	Berry size*	Change
			mm	mm
1. Control	16.72	—	19.93 a	—
2. Vitazyme 5x	17.44 a	0.72	20.20 a	0.27 (+1%)
3. Biozyme TF 4x	16.78 a	0.06	20.12 a	0.19 (+1%)
4. Citogrower 4x	16.87 a	0.15	20.25 a	0.32 (+2%)

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

### Brix Level



### Berry Size



These Crimson Seedless grapes produced juice that was not significantly different amongst all four treatments, but the five Vitazyme applications produced by far the greatest sugar increase above the control: 0.72 percentage point. Berry size was improved, though nonsignificantly, for all three treatments, the Vitazyme and Citogrower treatments giving the biggest increase: 0.27 mm and 0.32 mm, respectively.

**Increase in brix with Vitazyme:  
0.72%**

**Increase in berry size with  
Vitazyme: 0.27 mm**



Conclusions: This table grape study in Chile revealed that Vitazyme produced consistent improvements in grape berry diameter for both varieties, about equal to Citogrower, although these increases were not significant. The increases for Vitazyme were 0.66 mm for Thompson Seedless and 0.27 mm for Crimson Seedless. For some reason, all three treatments caused brix levels to be slightly lower than the control for the Thompson Seedless grapes, but these differences were not significant. For the Crimson Seedless grapes, however, Vitazyme improved the brix level by 0.72 percentage point; again, this difference was not significantly greater than the control. Despite lack of significant differences in the data, Vitazyme produced, on average, the best overall brix levels and largest berry sizes in this table grape study.

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## 2008 Crop Results

# Vitazyme on Grapes

## Crimea National Institute of Grape and Vine Research

Researcher: staff personnel      Location: Crimea National Institute of Grape and Vine Research, Ukraine

Variety: Aligote      Soil type: south blacktop (Mollisol)

Soil characteristics: 1 to 2% organic matter; pH 7.0 to 8.5

Experimental design: A vineyard of table grapes was divided into two Vitazyme treatments besides the standard (control) applications of fertility and pesticide treatments. The treatments were as follows:

1. Control
2. Vitazyme, three applications at 1 liter/ha
3. Vitazyme, three applications at 2 liters/ha (first two), and 1 liter/ha (last one)

Fertilization: unknown

Pesticide applications: standard for the station

Vitazyme applications:

Treatment	Vitazyme application rate		
	Pre-flower <sup>a</sup>	BB-size grapes <sup>b</sup>	Verasion <sup>c</sup>
	-----liters/ha-----		
1	0	0	0
2	1	1	1
3	2	2	1
<sup>a</sup> May 30, 2007			
<sup>b</sup> June 25, 2007			
<sup>c</sup> August 20, 2007			

Fruit sugar results: No actual sugar values for the grapes were given, but the difference between the control and the treated grapes are as follows:

**Increase in grape sugar with Vitazyme, Treatment 1: 4.3 percentage points**

**Increase in grape sugar with Vitazyme, Treatment 2: 5.8 percentage points**

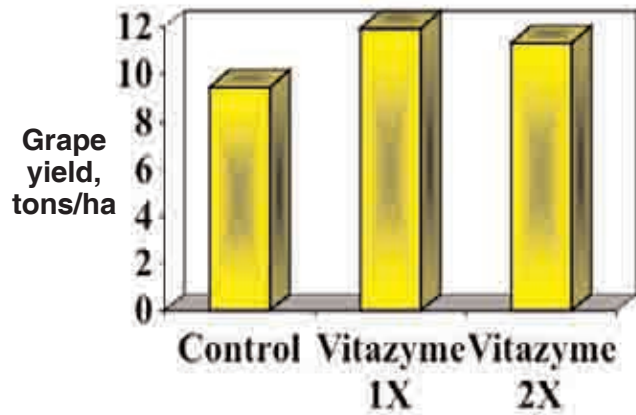
Treatment	Yield	Yield
change		
	tons/ha	tons/ha
1. Control	9.48	—
2. Vitazyme, 1 liter/ha three times	11.97	2.49 (+26%)
3. Vitazyme, 2 liters/ha + 1 liter/ha	11.35	1.87 (+20%)

### Yield increase with Vitazyme

**Vitazyme, 1liter/ha ..... 26%**

**Vitazyme, 2 liters/ha ..... 20%**

Yield results:



**Conclusions:** This southern Ukraine study at the Crimea National Institute of Grape and Wine Research showed that Vitazyme, applied at either 1 liter/ha three times, or 2 liters/ha twice with a last application of 1 liter/ha, significantly increased both grape yield and sugars. The sugars increased by 4.3 to 5.8 percentage points, while the yield was boosted by 20 to 26%, the highest increase with the 1 liter/ha rate applied three times. The grape program using Vitazyme has proven to be a highly effective means by which both yields and sugar content can be raised at a minimal input cost. The increased photosynthesis and nutrient uptake triggered by the product's active agents were able to fill the extra yield of grapes with abundant sugars so that they were sweeter than the lower yielding control.

## 2008 Crop Results

# Vitazyme on Grapes

## ***Crimea National Institute of Grape and Vine Research***

Researcher: staff personnel      Location: Crimea National Institute of Grape and Vine Research, Ukraine

Variety: Ranniy Magaracha (table grape)      Soil type: south blacktop (Mollisol)

Soil characteristics: 1 to 2% organic matter; pH 7.0 to 8.5

Experimental design: A vineyard of table grapes was divided into two Vitazyme treatments besides the standard (control) applications of fertility and pesticide treatments. The treatments were as follows:

1. Control
2. Vitazyme, three applications at 1 liter/ha
2. Vitazyme, three applications at 2 liters/ha (first two), and 1 liter/ha (last one)

Fertilization: unknown

Pesticide applications: standard for the station

Vitazyme applications:

Treatment	Vitazyme application rate		
	Pre-flower <sup>a</sup>	BB-size grapes <sup>b</sup>	Verasion <sup>c</sup>
	----- liters/ha -----		
1	0	0	0
2	1	1	1
3	2	2	1

<sup>a</sup>May 30, 2007  
<sup>b</sup>June 25, 2007  
<sup>c</sup>July 19, 2007

Fruit sugar results: No actual sugar values for the grapes were given, but the difference between the control and the treated grapes are as follows:

**Increase in grape sugar with Vitazyme, Treatment 1: 2.5 percentage points**

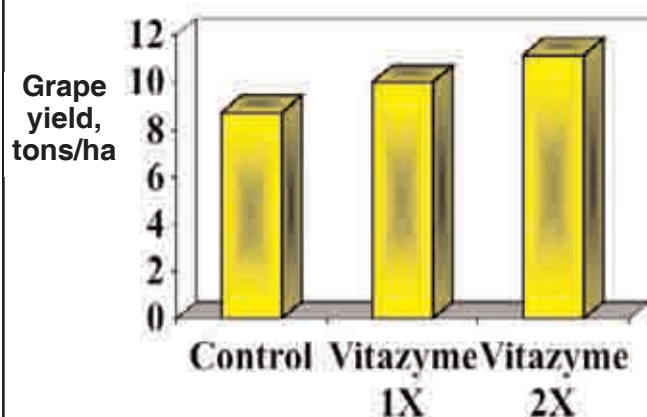
**Increase in grape sugar with Vitazyme, Treatment 2: 4.3 percentage points**

Treatment	Yield	Yield
change		
	tons/ha	tons/ha
1. Control	8.72	—
2. Vitazyme, 1 liter/ha three times	10.00	1.28 (+15%)
3. Vitazyme, 2 liters/ha + 1 liter/ha	11.15	2.43 (+28%)

### Yield increase with Vitazyme

**Vitazyme, 1liter/ha ..... 15%**  
**Vitazyme, 2 liters/ha ..... 28%**

Yield results:



Conclusions: In this Ukrainian table grape study, Vitazyme was shown to produce much greater yields and a higher sugar content when applied at either 1 liter/ha three times, or at 2 liters/ha twice and 1 liter/ha once ... but especially in the latter case, where the grape sugar and yield were nearly doubled compared to the 1 liter/ha rate. Yield increases were from 15 to 28%, while grape sugar also rose – by from 2.5 to 4.3 percentage points – showing that despite higher yields the plants were still able to produce more sugars to further fortify the heavier load with additional soluble solids. This study proves the great viability of Vitazyme to aid in table grape production in Ukraine.

## **Section IV New Planting & Young Vineyard**

### **California**

New Planting Thompson Seedless 2000

### **New York**

New Planting Niagara 2009

### **Chili**

Young Vineyard Response Thompson Seedless 2009

### **Ukraine**

New Planting Unknown Variety 2008

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# 2000 Crop Results

## Vitazyme on Grapes New Planting

Researcher: Kip Green

Location: Kerman, California

Planting date: new canes the winter of 1999/2000 Variety: Thompson seedless

Experimental design: A row of eight newly planted grape plants, each about equal in size and vitality, were selected for the study. Every other grape plant in the row received two applications of solution (see below) at one gallon per vine each time for the four treated plants.

### 1. Control

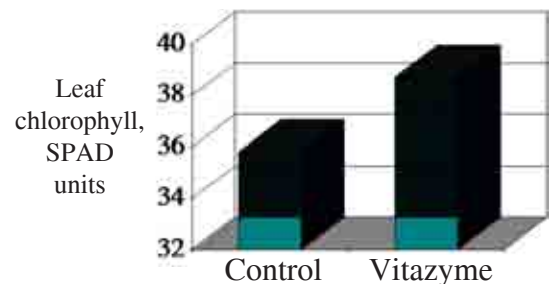
### 2. Vitazyme

Fertility treatments: 0.15 oz of fulvic acid per gallon of water, along with Vitazyme, about July 15 and August 10; one gallon per vine

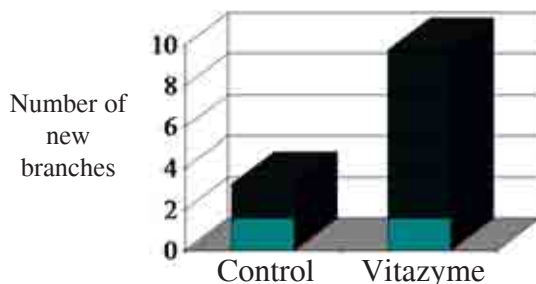
Vitazyme treatments: 0.15 oz per gallon of water; about July 15 and August 10, along with the fulvic acid; one gallon per vine

Chlorophyll levels: On August 31, the leaves of each treatment were analyzed for chlorophyll using a Minolta SPAD meter. About 10 leaves having the same relative maturity were analyzed from each treatment.

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
	-----	SPAD units	-----
<b>Leaf chlorophyll</b>	35.8	38.7	2.9



Growth results: On August 31, 2000, measurements were taken of each new branch sprouted on the new plants. The number of branches and the length of each were recorded and averaged.



### New Branch Number

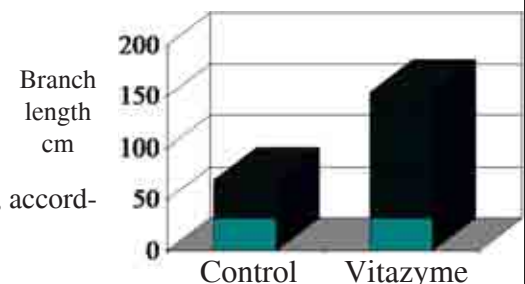
	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
<b>Branch number</b>	3.25 b	9.75 a	6.50

Means followed by the same letter are not significantly different at  $P = 0.10$ , according to Tukey's Honestly Significant Difference Test.

### Total Branch Length

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
	-----	inches	-----
<b>Branch length</b>	69.3 b	153.8 a	84.5

Means followed by the same letter are not significantly different at  $P = 0.11$ , according to Bartlett's Test.





**Conclusions:** Application of Vitazyme to these newly planted grape plants produced a remarkable improvement in their development, as evaluated by the total length of new growth and the number of branches. Vitazyme stimulated the production of new growing points on the vines, and increased their growth rate dramatically. This growth rate increase was confirmed by the increase in leaf chlorophyll content, which would enhance the rate of CO<sub>2</sub> fixation and improve overall rhizosphere activity. Fulvic acids were also added to the solution, so this test did not absolutely isolate Vitazyme effects. However, past experience has shown that Vitazyme together with other organic amendments will elicit a synergism, which is likely to have occurred in this study.

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# 2009 Crop Results

## Vitazyme on Grapes New Planting

Researcher: Chris Becker, Ph.D.

Location: Phelps, New York

Variety: Niagara

Planting date: June 12, 2009

Soil type: clay loam

Experimental design: Half of a new planting of 100 Niagara rooted grapes were treated with Vitazyme to determine the effect of the product on root development and growth of new plantings. They were planted in alternate sections of 25 treated and 25 untreated.

### 1. Control

### 2. Vitazyme root soak

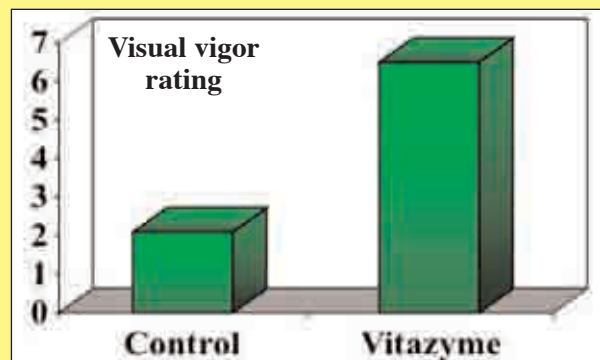
Vitazyme treatment: Fifty vines received a 12 hour soaking of their roots in a 1.0% Vitazyme solution before planting ; the control vines were soaked in water only.

Growth results: Growth differences were noted by two weeks after planting. On July 12, one month after planting, a vigoe rating was given to the vines based on shoot length, leaf size, and shoot number. On August 3, 2009, height measurements were taken of ten plants on either side of the treatment borders, and a statistical analysis of the data was conducted.

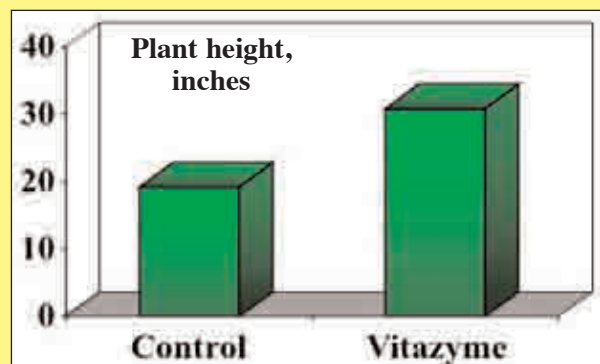
Treatment	Visual vigor*	Change
Control	2.09	—
Vitazyme soak	6.50	4.41 (+211%)

\*10=best, and 1 = poorest, averaged from 50 plants per treatment.

**Increase in vigor with Vitazyme:  
211%**



Treatment	Plant height inches	Height change inches
Control	19.2 b	—
Vitazyme soak	30.8 a	11.6 (+60%)
Main effects P	0.0002***	
Model P	0.0002***	
CV	22.5%	
LSD <sub>0.005</sub>	5.3 inches	

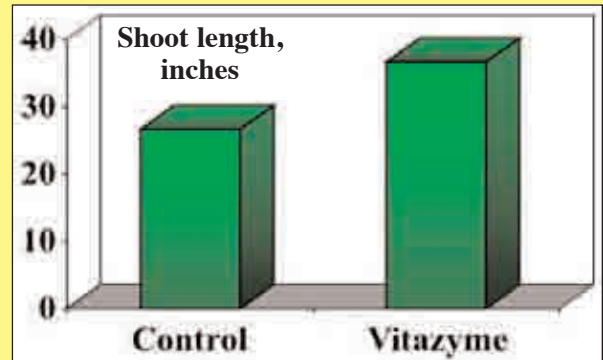


**Increase in height with Vitazyme: 60%**

At season's end another growth evaluation was made, of all 100 vines.

Treatment	Shoot length	Change
	inches	inches
Control	26.6	—
Vitazyme soak	36.6	10.0 (+38%)

**Increase in shoot length with  
Vitazyme: 38%**



Conclusions: Vitazyme applied to the newly planted Niagara grapes in New York, as a root soak for 12 hours, greatly stimulated early rooting and top growth of the plants, improving vigor by 211%, and increasing plant height by 60% above the control for a selection of 20 plants in August, and by 38% for all plants later on. This product is thus shown to possess great utility for helping quickly established new vineyard plantings.

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## **2009 Crop Results**

# **Vitazyme on Grapes**

## ***Response of plants in a young vineyard***

Researcher: Rafael Jordan

Variety: Thompson seedless

Vine spacing: 3.0 x 3.5 meters

Experimental design: A grape vineyard of 3.28 ha was selected to apply Vitazyme on a portion of the young vines. The purpose of the trial was to evaluate the effect of the product on vine growth and development as measured by trunk diameter.

Location: Agricola Chacabuco, Chile

Soil type: unknown

Vine age: 3 years (planted in 2007)

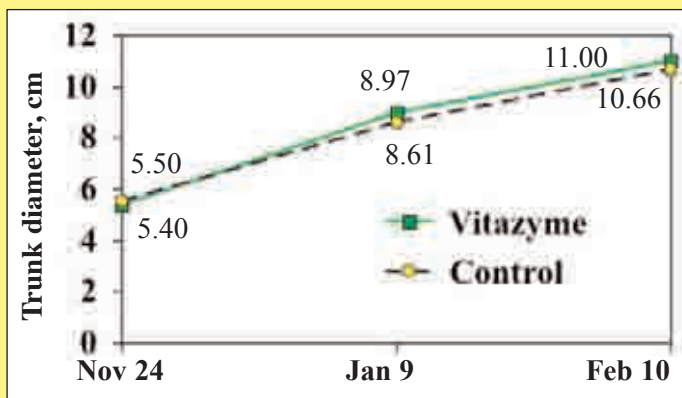
### **1. Control**

Fertilizer application: unknown

Vitazyme treatment: (1) 1.5 liters/ha on the leaves on November 25, 2008; (2) 1.0 liter/ha on the leaves on December 15, 2008

Growth results: Trunk diameter measurements were made on ten representative plants for each treatment at trial initiation (November 24), and also on January 9 and February 10. The results below show the average values for each date and treatment.

### **2. Vitazyme**



### ***Trunk diameter increase***

Treatment	Trunk diameter, cm		
	Initial	Final	Increase
	cm	cm	cm
Control	5.50	10.66	5.16 (+94%)
Vitazyme	5.40	11.00	5.60 (+104%)

**Increased truck diameter with  
Vitazyme: 10%**

Conclusions: This young grape vineyard study in Chile, using Vitazyme to encourage greater plant vigor and growth, showed that the treated vines (1.5 and 1.0 liter/ha applications) grew by 104% from the starting distance, whereas the untreated vines increased by 94%, providing a 10% vine diameter increase for the Vitazyme treated vines.. These results show the utility of Vitazyme to stimulate the increase in plant size so that the vineyard can produce more grapes at a younger age.

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## **2008 Crop Results**

# **Vitazyme on Grapes (first year)**

## **Crimea National Institute of Grape and Vine Research**

Researcher: staff personnel

Location: Crimea National Institute of Grape and Vine Research, Ukraine

Variety: unknown

Soil type: south blacktop (Mollisol)

Planting date: May 24,

2007

Soil characteristics: 1 to 2% organic matter; pH 7.0 to 8.5

Experimental design: A nursery area of the research station was selected to treat certain rows of grape plants — either new cuttings or transplants — with Vitazyme at the rates given below.

### **Cuttings**

**1. Control (untreated)**

**2. Vitazyme soak and a foliar application**

### **Transplants**

**1. Control (untreated)**

**2. Vitazyme soil drench and a foliar applica-**

**tion**

Fertilization: unknown

Pesticide applications: standard for the station

Vitazyme applications:

<b>Treatment</b>	<b>May 24, 2007</b>	<b>August 9, 2007</b>
Cuttings	5% soak, 1 hour	1 liter/ha on leaves
Transplants	2% drench on roots	1 liter/ha on leaves

Observations: The Vitazyme treated plants had larger root systems and better development of the growing points.

Conclusions: Vitazyme treatment has proven to increase root and shoot development of both new cuttings and transplants in Crimea, Ukraine, as compared to untreated controls.

## **Section V Micro-Organism Response**

### **California**

Ruby Seedless #1 2001

Ruby Seedless #2 2001

Ruby Seedless #3 2001

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## 2008 Crop Results

# Vitazyme on Grapes

## An Organism Response Evaluation

In 2001 an evaluation of grape roots was made on Kliever Farms, near Reedley, California, to determine the effects of several products on various rhizosphere organisms. The samples were evaluated by Elaine Ingham at the Soil Food Web, Corvallis, Oregon, and by BBC Laboratories, Tempe, Arizona.

Soil type: clay loam

Trellis system: standard T-bar

Variety: Ruby seedless

Spacing: 12 ft between rows, 8 ft in the row

Age: established

Vitazyme applications: The end of the drip line was disconnected and attached to a hose from a sprayer tank. Then 100 gallons of Vitazyme solution were applied in the row under 50 psi. A 13 oz/acre rate was applied, or 1.6 oz in the 100 gallons, on April 23, 2001.

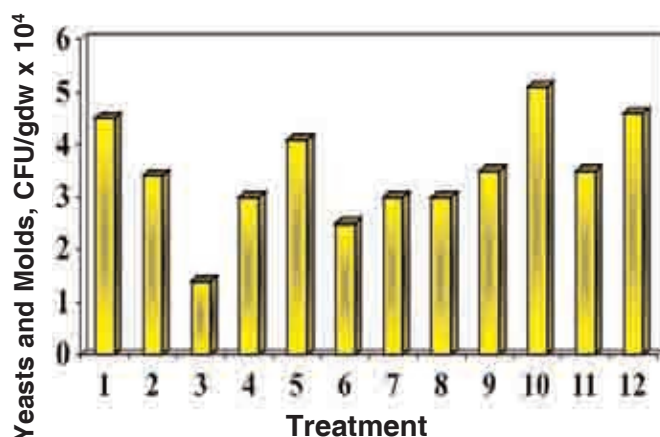
Other product application: according to the manufacturers' recommendations

Organism population results: The soil and roots of all treatments were sampled on June 18, 2001, 56 days after product application, and submitted to the laboratories on June 20, 2001. Sampling was performed by obtaining a soil core to 6 inches on the outer edge of the drip zone of 25 sites (every third plant), along with the treated row. Care was taken to clean and sterilize the probe between core samplings, and the collection bucket was cleaned and sterilized between product samplings.

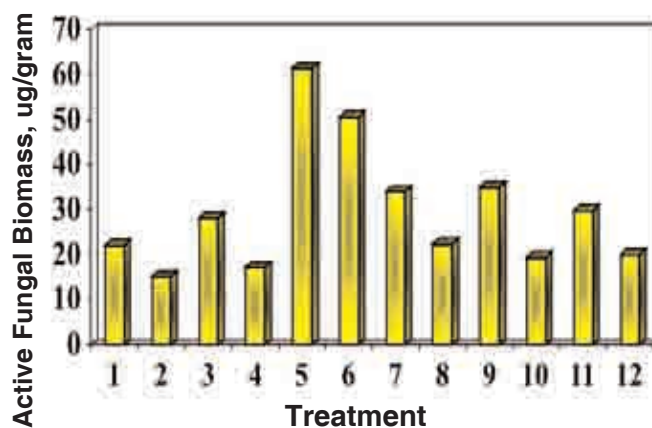
Grape row number	Material	BBC Labs	SoilFoodWeb
		Yeasts and Molds	Active Fungal Biomass
		CFU/gdw	ug/gram
29 (1)	Control	4.5 x 10 <sup>4</sup>	22.1
30 (2)	Compost tea concentrate	3.4 x 10 <sup>4</sup>	15.0
31 (3)	Awaken	1.4 x 10 <sup>4</sup>	28.2
32 (4)	ZAP	3.0 x 10 <sup>4</sup>	17.1
33 (5)	Vitazyme	4.1 x 10 <sup>4</sup>	61.5
34 (6)	Super Bio	2.5 x 10 <sup>4</sup>	50.6
35 (7)	Metazyme Extra	3.0 x 10 <sup>4</sup>	34.1
36 (8)	ZAP FFS #1	3.0 x 10 <sup>4</sup>	22.4
37 (9)	Jenner 8 Plus	3.5 x 10 <sup>4</sup>	35.0
38 (10)	ZAP FFS #2	5.1 x 10 <sup>4</sup>	19.4
39 (11)	Soilweb.com Product A	3.5 x 10 <sup>4</sup>	29.8
40 (12)	Soilweb.com Product B	4.6 x 10 <sup>4</sup>	20.0



***Yeast and Molds (BBC Labs)***



***Active Fungal Biomass (SoilFoodWeb)***



**Conclusions:** ZAP FFS #2, the control, and Soilweb.com Product B had the highest rhizosphere yeast and mold levels, from 4.5 to 5.1 x 10<sup>4</sup> CFU/gdw, but Vitazyme had nearly as high levels: 4.1 x 10<sup>4</sup> CFU/gdw. On the other hand, Vitazyme had by far the highest rhizospheric active fungal biomass of 61.5 ug/gram; the next highest level was 50.6 for Super Bio, and all other values are considerably less. These results show that Vitazyme performed the best of all eleven treatments in this California grape root zone microorganism stimulation study.

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## 2001 Crop Results

# Vitazyme on Grapes

## An Organism Response Evaluation

Vineyard operator: Kliewer Farms

Microbial evaluator: Elaine Ingham

Soil type: clay loam

Variety: Ruby seedless

Age: established

Experimental design: Eleven biological treatments were entered into a study to evaluate effects on organisms, especially fungi, in the rhizosphere of grape plants. Vitazyme was one of these treatments. An untreated control was also included. Each product and the control comprised 450 ft. of row, or 0.125 acre. Only Vitazyme and control data were made available to Vital Earth Resources.

Location: Reedley, California

Location: Soil Foodweb, Inc., Corvallis, Oregon

Trellis system: standard T-bar

Spacing: 12 ft between rows, 8 ft in the row

### 1. Control

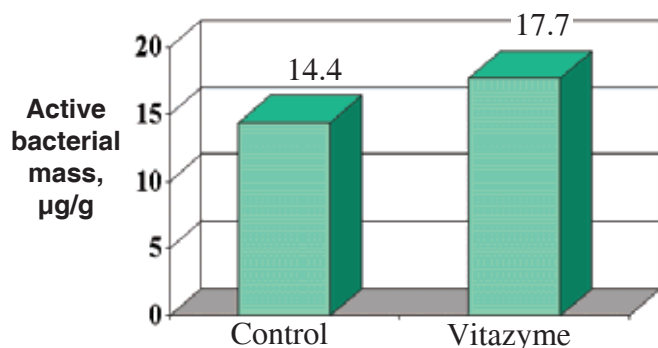
### 2. Vitazyme

Fertility program : unknown

Vitazyme application: The end of the drip line was disconnected and attached to a hose from a sprayer tank. Then 100 gallons of Vitazyme solution were applied in the row under 50 psi. A 13 oz/acre rate was applied, or 1.6 oz in the 100 gallons, on April 23, 2001.

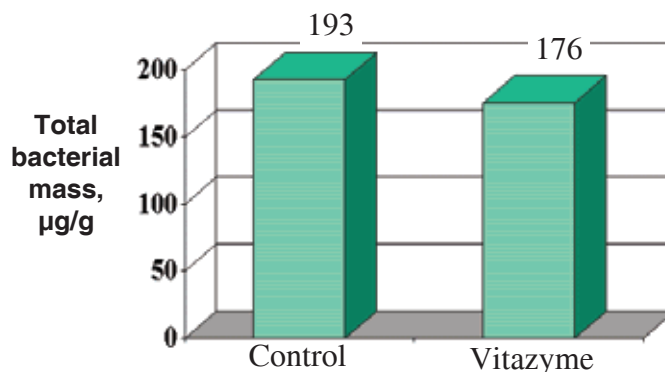
Organism population results: The soil and roots of all treatments were sampled on June 18, 2001, and submitted to the SFI laboratory on June 20, 2001. Sampling was performed by obtaining a soil core to 6 inches in the outer edge of the drip zone of 25 sites (every third plant) along the treated row. Care was taken to clean and sterilize the probe between product samplings. The results here show a comparison between the untreated control and the Vitazyme treatment on organism populations and ratios of these populations. Comments below each graph are, in part, from SFI personnel.

#### ACTIVE BACTERIAL BIOMASS



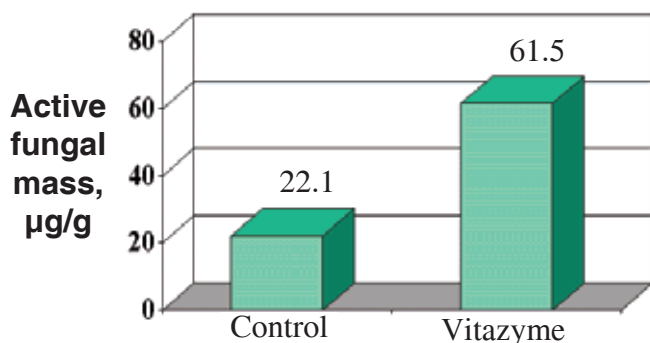
Control levels are good, and Vitazyme levels are excellent.

#### TOTAL BACTERIAL BIOMASS



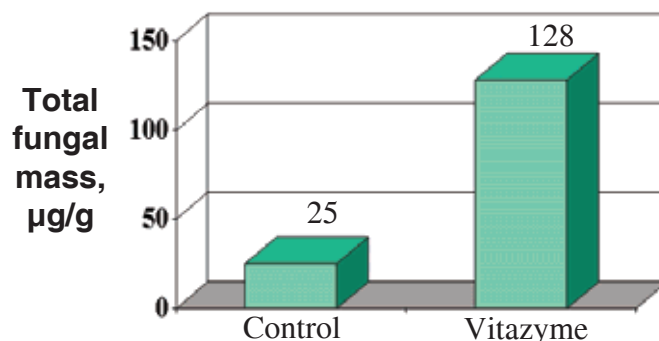
Both levels are in the excellent range.

### ACTIVE FUNGAL BIOMASS



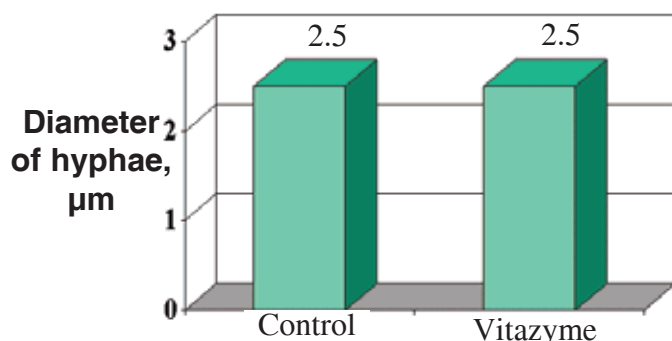
The control levels are good, but with Vitazyme excellent, prompting an SFI comment that fungal foods must have been added.

### TOTAL FUNGAL BIOMASS



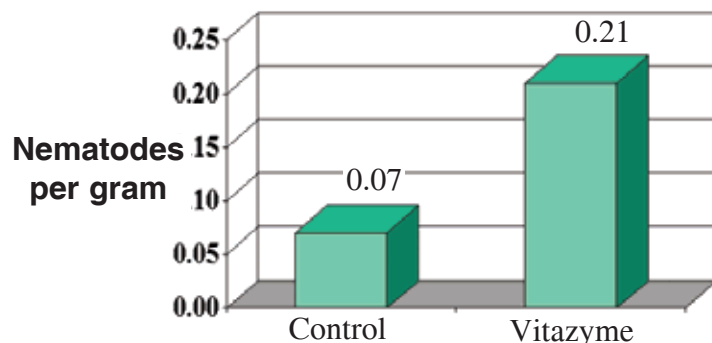
Both levels are low, but Vitazyme is helping restore levels and diversity of fungi.

### HYPHAL DIAMETER



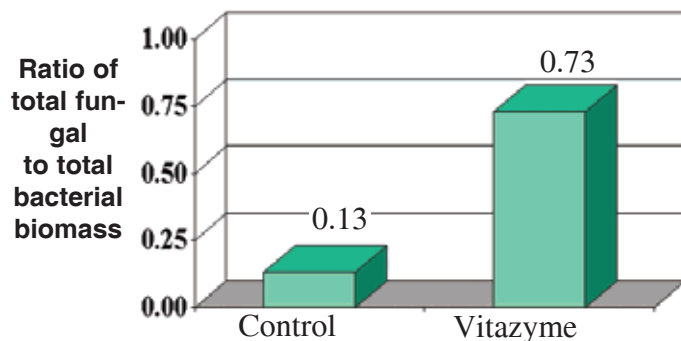
Both of these diameters indicate mainly a community of ascomycetes, typical of grasslands.

### TOTAL NEMATODE NUMBER



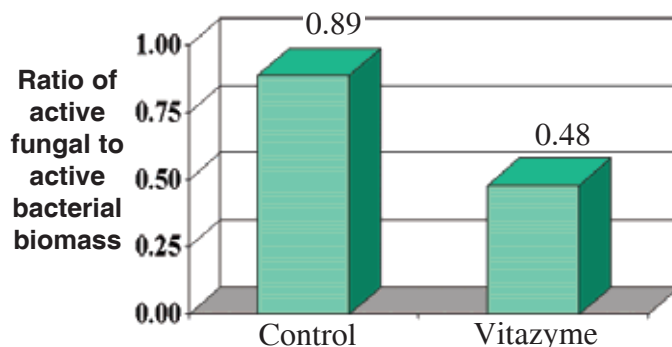
Both levels are low, and diversity is poor, but Vitazyme has enhanced numbers, especially bacterial feeders (*Mesorhabditis* and *Geomonhystera*) and also fungal feeders (*Microdorylaimus*).

### TOTAL FUNGAL TO TOTAL BACTERIAL BIOMASS



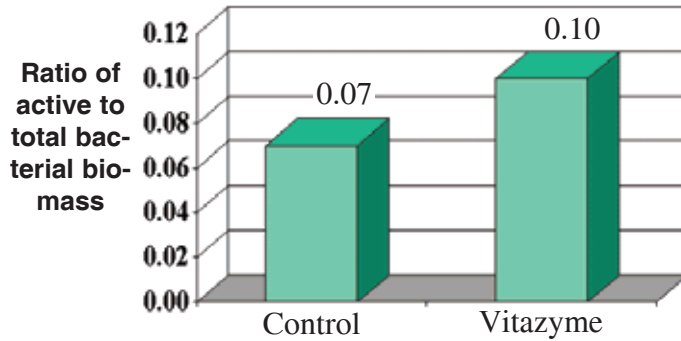
Both ratios are low, But Vitazyme is moving the fungal-bacteria balance much more in the right direction. Values of 2 to 5 are good for grapes.

### ACTIVE TO TOTAL FUNGAL BIOMASS



In both cases the fungi are quite active; but there needs to be more diversity for both.

### ACTIVE TO TOTAL BACTERIAL BIOMASS

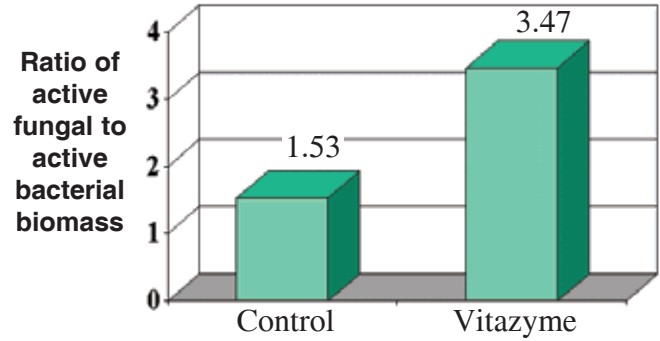


Both values are acceptable

### Pathogenic nematodes

None were detected with Vitazyme, but some ring nematodes were detected in the control.

### ACTIVE FUNGAL TO ACTIVE BACTERIAL BIOMASS



The control ratio is alright, but the Vitazyme level is especially good, within the optimum range of 2 to 5 for woody perennials. The SFI personal again think fungal food was added to kick them into high gear; such food was not added.

**Conclusions:** Vitazyme substantially improved the population of soil organisms within the soil of the drip zone of these grape plants. In particular, the following items were noted:

1. Vitazyme improved the **active bacterial biomass** above the control (+23%), into the “excellent” range.
2. Vitazyme boosted the **active bacterial biomass** by 178% above the control, into the “excellent” range.
3. Vitazyme increased the **total fungal biomass** by 412% above the control.
4. The Vitazyme treatment had three times as many **total nematodes** as the control, none of which were pathogenic species as for the control.
5. Vitazyme improved the various organism ratios:
  - **Total fungal: Total bacterial biomass**
  - **Active: Total bacterial biomass**
  - **Active fungal: Active bacterial biomass**

In summary, Vitazyme at only 13 oz/acre introduced through the drip system had a markedly positive effect on the microbiology of the soil, as determined by the Soil Foodweb analyses.

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## 2001 Crop Results

# Vitazyme on Grapes

## An Organism Response Evaluation

Vineyard operator: Kliewer Farms

Microbial evaluator: Vickie Bess

Soil type: clay loam

Variety: Ruby seedless

Age: established

Experimental design: Eleven biological treatments were entered into a study to evaluate effects on organisms, especially fungi, in the rhizosphere of grape plants. Vitazyme was one of these treatments. A untreated control was also included. Each product and the control comprised 450 ft. of row, or 0.125 acre. Only Vitazyme and control data were made available to Vital Earth Resources.

Location: Reedley, California

Location: BBC Laboratories, Inc., Tempe, Arizona

Trellis system: standard T-bar

Spacing: 12 ft between rows, 8 ft in the row

### 1. Control

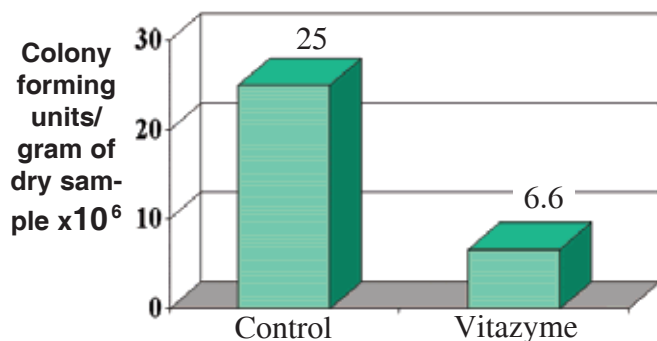
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Vitazyme application: The end of the drip line was disconnected and attached to a hose from a sprayer tank. Then 100 gallons of Vitazyme solution were applied in the row under 50 psi. A 13 oz/acre rate was applied, or 1.6 oz in the 100 gallons, on April 23, 2001.

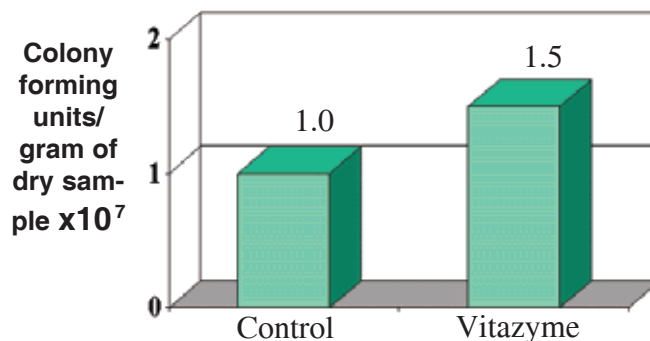
Organism population results: The soil and roots of all treatments were sampled on June 18, 2001, 56 days after product application, and submitted to the laboratory on June 20, 2001. Sampling was performed by obtaining a soil core to 6 inches on the outer edge of the drip zone of 25 sites (every third plant), along with the treated row. Care was taken to clean and sterilize the probe between core samplings, and the collection bucket was cleaned and sterilized between product samplings.

### AEROBIC HETEROTROPHIC PLATE COUNT\*



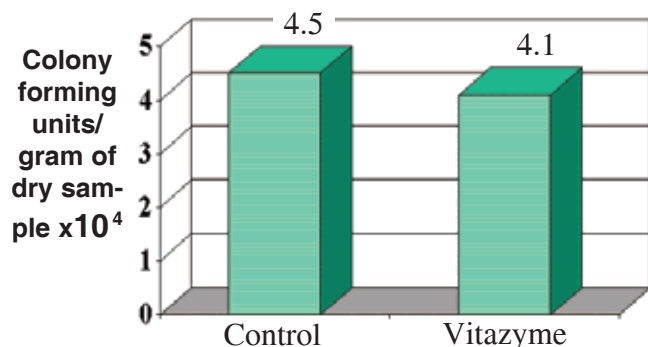
\*A modified version from *Methods of Soil Analysis*, Second Edition, ASA and SSSA; 37-5.2

### ANAEROBIC BACTERIA\*



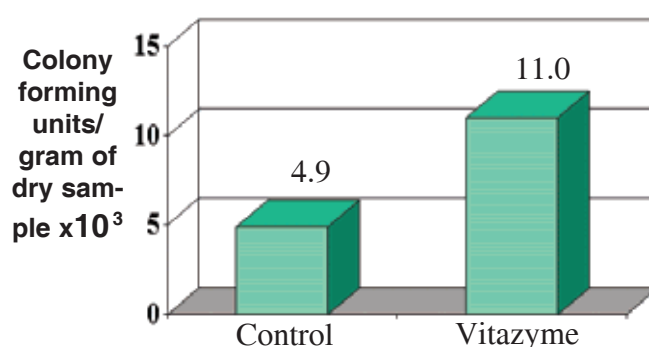
\*A modified version from *Methods of Soil Analysis*, Second Edition, ASA and SSSA; 37-5.2

### YEASTS AND MOLDS\*



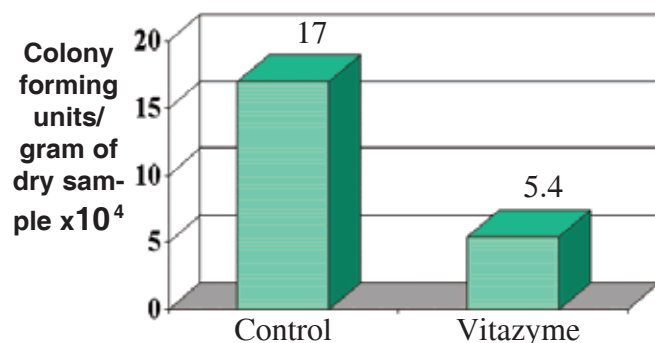
\*A modified version from *Methods of Soil Analysis*, Second Edition, ASA and SSSA; 37-8.1.2

### ACTINOMYCETES\*



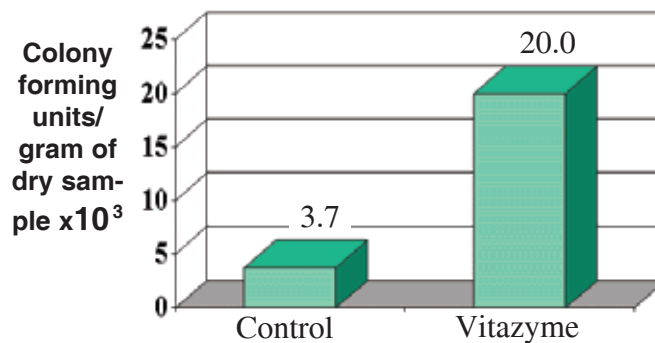
\*A modified version from *Methods of Soil Analysis*, Second Edition, ASA and SSSA; 37-8.1.3

### PSEUDOMONADS\*



\*A modified version from *Methods of Soil Analysis*, Second Edition, ASA and SSSA; 37-8.3

### NITROGEN-FIXING BACTERIA\*



\*A modified version from *Methods of Soil Analysis*, Second Edition, ASA and SSSA; 50-3

## Changes in organism populations with Vitazyme

Aerobic heterotrophs	Anaerobes	Yeasts/Molds	Actinomycetes	Pseudomonads	N-fixers
-74%	+50%	-9%	+124%	-68%	+441%

### Conclusions::

In response to Vitazyme application, all organism groups were changed. In spite of a drop in aerobic heterotrophs and pseudomonads, the anaerobic bacteria increased substantially. **Actinomycetes** increased dramatically, by 124%. These organisms are highly important in the breakdown of organic materials and the production of stable humus. They degrade lignin, and help mineralize carbon and nitrogen. They are especially important in antibiotic production.

**Anaerobic bacteria** increased by 50%; it is not known what benefits this group may have. An astounding 441% increase in **nitrogen fixing bacteria** was documented, which means that the active agents in Vitazyme are stimulating the soil to produce more of its own nitrogen, meaning less commercial nitrogen needs to be added for plant requirements.

## Section VI Application Rates

**New Plantings**  
**Established Vineyards**





# **Vitazyme Application Rates**

## **New Plantings**

Soak roots in a 1% solution or dip roots in a 5% solution before planting

Apply 1 pint/acre 3 more times during the growing season at approximately 30 day intervals

Vitazyme is compatible with all commonly used agri-chemicals and will not cause phytotoxicity.

Always mix Vitazyme with a regularly scheduled cover spray or herbicide application to avoid extra costs.

## **Established Vineyards**

Apply Vitazyme 4 times through the growing season at 1 pint/acre:

1. At 3-6 inch growth or with herbicide
2. At early bloom
3. At BB size fruit
4. At veraison