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

2013 Crop Results

Vitazyme on Sugar Cane

Researcher: Juan Carlos Diaz, Ph.D.
Farmer: Eng. Jose Isabel Hernandez Soto
Location: El Monte Farm, Villa Corona, Jalisco, Mexico
Variety: 2086
Starting date of study: May 8, 2012
Experimental design: A recently harvested sugar cane field was divided into a Vitazyme treated and control area to evaluate the effect of two foliar applications on crop yield. The treated area was 1.0 ha.
Fertilization: unknown
Vitazyme application: (1) 1.5 liters/ha (20 oz/acre) on the ratoon field on May 8; (2) 1.5 liters/ha (20 oz/acre) on the growing field sometime later
Yield results: Yields were not available, but the increase in millable stalks with Vitazyme was 16.5%.

Increase in millable stalks with Vitazyme: 16.5%

Conclusion: Two applications of Vitazyme on this ratoon sugar cane field in Mexico produced an excellent millable stalk increase of 16.5%.

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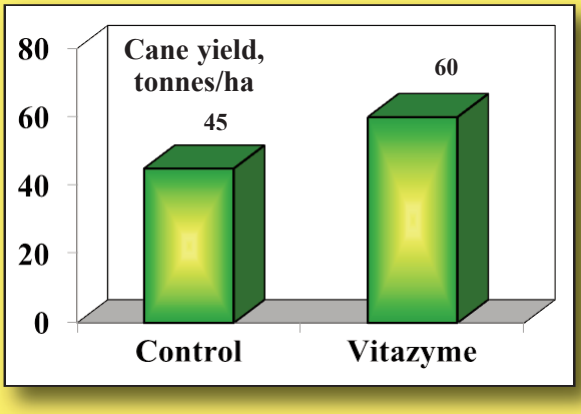
2013 Crop Results

Vitazyme on Sugar Cane

Researcher: unknown *Farmer*: Nguyen Dire Tinh *Location*: Ea Po—Cir Jut District, Viet Nam
Variety: unknown *Age of cane*: two years
Experimental design: A sugar cane field was divided into a Vitazyme treated and an untreated control area, each being 0.7 ha, to determine the effect of the product on cane yield.

1. Control **2. Vitazyme**

Fertilization: unknown
Vitazyme application: 3 liters/ha, applied at the beginning of the rainy season on April 18, 2012, and again on June 18, 2012
Yield results: The field was harvested on January 20, 2013.



Increase in yield with Vitazyme: 33%

Vitazyme, using two foliar applications, gave a very high 33% increase in sugar cane yield.

Income results: Extra cost from Vitazyme: 2,520,000 VND/ha
Added income from the crop: 12,780,000 VND/ha
Return On Investment: 5.07:1

Conclusions: This sugar cane trial in Viet Nam revealed that two Vitazyme applications produced a 33% yield increase over the untreated control. This increase netted the farmer nearly 13 million VND/ha more income, and resulted in a 5.07:1 Return On Investment. This program is proven to be excellent for use with sugar cane in Viet Nam.

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2013 Crop Results

Vitazyme on Sugar Cane, Ratoon

Researcher: Yen Thao Tran *Farmer*: unknown *Location*: Mekong Delta, Viet Nam

Experimental design: A recently harvested sugar cane field was divided into a Vitazyme treated and control portion to investigate the effect of the product on sugar yields and profits for ratoon cane.

1. Control **2. Vitazyme**

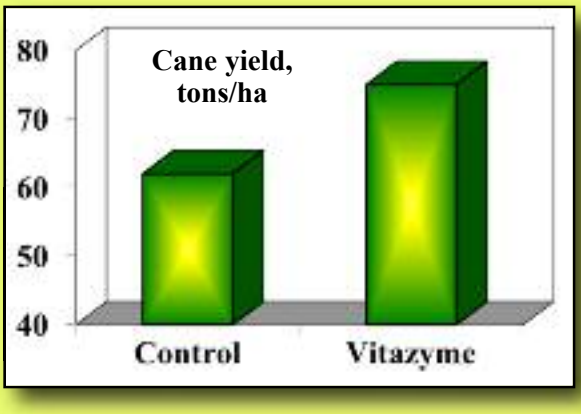
Fertilization: standard for the area and soil type

Vitazyme application: three applications: (1) 2 liters/ha, using 0.5 liter in a 200 liter barrel of water, with four barrels per hectare, applied when the first sprouts appeared with rains after harvest; (2) 2 liters/ha, using the same method as for (1), after one month; (3) 3 liters/ha, using 0.5 liter in a 200 liter barrel of water, with six barrels per hectare one month after the second application.

Yield results:

Treatment	Cane yield	Yield change
	tons/ha	tons/ha
Control	62	—
Vitazyme	75	13 (+21%)

Increase in yield with Vitazyme: 21%



Income results: The price of sugar cane is about 970 VND/kg. Increased income for this trial is 13,000 kg/ha x 970 VND/kg = 12.61 million VND/ha

Conclusions: A ratoon sugar cane trial in Viet Nam, using three applications, provided an excellent 21% yield increase (13 tons/ha), which gave 12.61 million additional VND/ha. This result is consistent with previous studies with Vitazyme on sugar cane in Viet Nam.

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2012 Crop Results

Vitazyme on Sugar Cane

Researcher: Adhe *Research Organization*: PT. Aneka Pangan Bermutu
Location: Dusun Barsari, Prigan - Pasuruan, East Java *Variety*: Bulu Lawang
Soil type: Andosol *Planting date*: November 29, 2011

Experimental design: One hectare of a sugar cane field was divided into a control (5,000m^2) and a Vitazyme treated area (5,000m^2), to determine the effects of the product on sugar cane growth and yield.

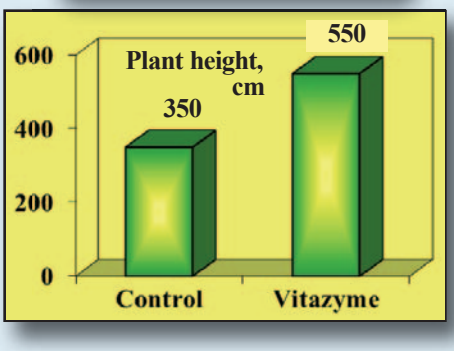
1. Control **2. Vitazyme**

Fertilization: normal for the area

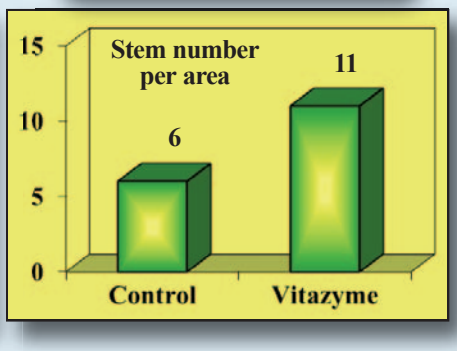
Vitazyme application: at planting, a 1% solution on the seed pieces; 1 liter/ha on the plants and soil on December 21, 2011 (about 1 month), and on March 30, 2012 (about 4 months)

Crop characteristics: Evaluations were taken near harvest time, the end of September, 2012. Values are an average of several plants.

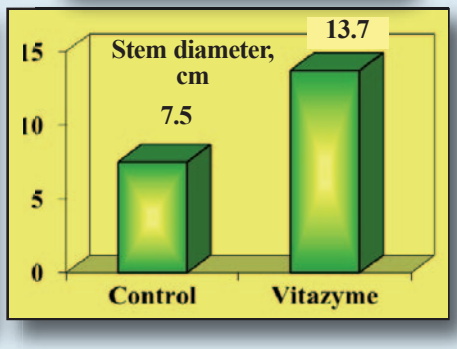
Plant Height



Stem Number



Stem Diameter



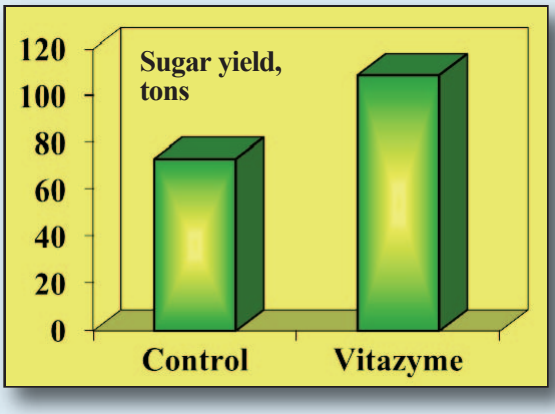
Increase with Vitazyme	
Plant height	57%
Stem number	83%
Stem diameter	83%

All plant growth parameters were markedly improved by Vitazyme.

Sugar cane yield: Harvesting was completed on September 28, 2012, 10 months after planting.

Treatment	Cane yield	Yield change
	tons	tons
Control	73.20	—
Vitazyme	108.89	35.69 (+49%)

Increase in yield with Vitazyme: 49%



Conclusions: This sugar cane trial in East Java, Indonesia, compared Vitazyme treatment (on the seed pieces, and two subsequent soil and foliar applications) with an untreated control. The Vitazyme treated cane grew more aggressively, greatly outdoing the control in terms of height (+57%), stem number (+83%), and stem diameter (+83%). Yield of the cane was dramatically increased (+49%) with Vitazyme, showing the great utility of this product for improving sugar cane culture in Indonesia.

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2008 Crop Results

Vitazyme on Sugar Cane

Researcher: Unknown
Location: Sancti-Spiritus, Cuba
Variety: Melones
Soil Type: unknown

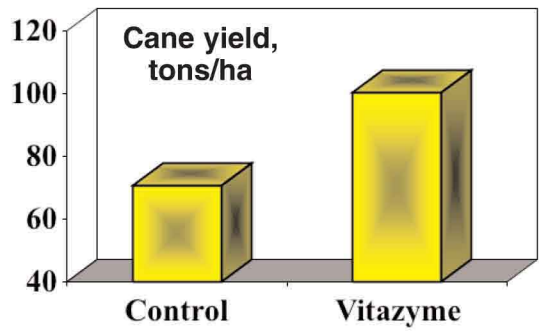
Experimental design: A sugar cane field was divided into a control area of 4.7 ha, and a Vitazyme treated area of 4.7 ha to determine the effect of the product on crop production.

1. Control **2. Vitazyme**

Fertilization: unknown
Vitazyme application: unknown
Yield results:

Treatment	Total cane yield	Area yield	Change
	tons/4.7 ha	tons/ha	tons/ha
Control	332.2	70.7	—
Vitazyme	471.8	100.4	29.7 (+42%)

Increase in sugar cane yield: 42%



Conclusions: This commercial sugar cane trial in Cuba, despite having few details of the test, revealed an amazing 42% yield increase with Vitazyme. The product continues to display excellent results in this tropical country, following several years of highly positive research on sugar cane.

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2007 Crop Results

Vitazyme on Sugar Cane

Results of Demonstration Trials for Vitazyme, Fitomas-E, and Enerplant in Cuba During the 2007 Harvest Season

Demonstration editor: Juan C. Diaz
Organization: National Sugarcane Research Institute (INICA), Havana, Cuba
Purpose of the trials: These trials were designed to evaluate the relative merits of the three products that have been extensively tested in Cuba for the past three years.

Vitazyme. Produced by Vital Earth Resources, Gladewater, Texas, U.S.A.
Fitomas-E. Produced by the government of Cuba.
Enerplant. Produced by Biotec Internacional, Mexico

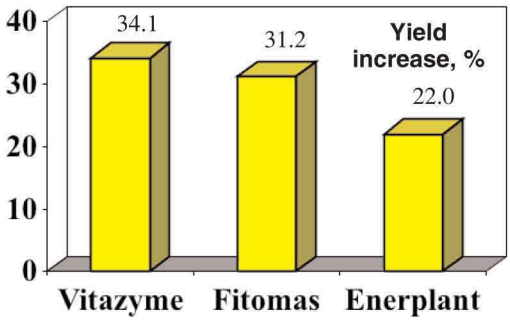
[The following text and tables were generated by Juan C. Diaz.]

Sugar yields in the 2007 harvest season of the Fitomas-E, Enerplant, and Vitazyme biostimulant demonstration trials showed marked increases in the three products, with an overall mean of 12.2 t/ha or 34.2% above the untreated controls and all other conditions being the same. Among the three biostimulants, in the overall mean of all provinces, Vitazyme recorded the largest yield increase (17.0 t/ha and 34.1%), Fitomas recorded the next highest increase (10.5 t/ha and 31.2%), while Enerplant recorded the smallest increase (8.9 t/ha and 22%; Table 1).

Table 1. ***Yield summary of the 2007 season biostimulant demonstration trials.***

		Biostimulant				Untreated Control			Difference	
Biostimulant	No. Trials	Area	% applied 06	Production	Yield	Area	Production	Yield		
		ha		tons	tons/ha	ha	tons	tons/ha	tons/ha	%
Fitomas	70	1099.2	2.7	48738.8	44.3	492.1	16633.7	33.8	**10.5**	**31.2**
Enerplant	3	221.9	2.1	10956.5	49.4	58.7	2373.8	40.5	**8.9**	**22.0**
Vitazyme	4	175.6	3.4	11754.9	66.9	40.6	2025.9	49.9	**17.0**	**34.1**
Nation	77	**1496.7**	**2.7**	**71450.2**	**47.7**	**591.3**	**21033.4**	**35.6**	**12.2**	**34.2**

Average Sugarcane Yield Increases for Three Products - 2007



Fitomas, with the overall mean of 10.5 t/ha and 31.2% yield increase above the untreated control (Table 2), showed the highest increase in Matanzas Province and smallest increase in Holguin. Moreover, its smallest increases were recorded in the eastern provinces of Holguin, Santiago de Cuba, and Guantanamo. (Information from Las Tunas and Granma Provinces are pending.) The other two biostimulants showed best results precisely in the eastern provinces: Vitazyme in Holguin and Santiago, and Enerplant in Santiago showed higher yield increases than Fitomas.

On the other hand, both Vitazyme (Table 4) and Enerplant (Table 3)

showed yield increases that also endorse their technical and economic effectiveness. Vitazyme, in all the Santiago de Cuba trials and half of the Holguin trials, was split into two applications, which was previously recommended as an alternative to three, upon the guarantee of minimum yield response.

Table 2. ***Yield summary by provinces of the 2007 season Fitomas-E demonstration trials.***

Province	N	Fitomas-E			Untreated Control			Difference	
		Area	Production	Yield	Area	Production	Yield		
		ha	tons	tons/ha	ha	tons	tons/ha	tons/ha	%
Pinar Rio	14	377.6	15023.6	39.8	90.4	2620.3	29.0	**10.8**	**37.3**
Habana	6	61.3	2575.6	42.0	44.3	1464.6	33.0	**9.0**	**27.2**
Matanzas	4	90.4	4302.1	47.6	53.1	1629.9	30.7	**16.9**	**55.2**
Villa Clara	5	27.2	1386.9	50.9	28.9	1119.5	38.8	**12.2**	**31.4**
S. Spiritus	17	86.1	3921.0	45.5	86.6	3158.9	36.5	**9.1**	**24.9**
Ciego Avila	6	116.1	4567.5	39.3	44.2	1233.0	27.9	**11.5**	**41.1**
Camaguey	10	118.8	5151.6	43.4	91.5	3129.5	34.2	**9.1**	**26.7**
Holguin	3	74.3	4143.8	55.8	18.0	927.9	51.6	**4.2**	**8.1**
Santiago	2	117.8	6451.9	54.8	12.6	582.6	46.4	**8.3**	**18.0**
Guantanamo	3	29.7	1214.8	40.9	22.5	767.5	34.1	**6.8**	**19.9**
Nation	70	1099.2	48738.8	44.3	492.1	16633.7	33.8	**10.5**	**31.2**

Table 3. ***Yield summary by provinces of the 2007 season Enterplant demonstration trials.***

Province	N	Enerplant			Untreated Control			Difference	
		Area	Production	Yield	Area	Production	Yield		
		ha	tons	tons/ha	ha	tons	tons/ha	tons/ha	%
Camaguey	1	115.9	5000.6	43.1	26.0	926.6	35.6	**7.5**	**21.1**
Santiago	2	106.0	5955.9	56.2	32.7	1447.2	44.3	**11.9**	**26.9**
Nation	3	221.9	10956.5	49.4	58.7	2373.8	40.5	**8.9**	**22.0**

Table 4. ***Yield summary by provinces of the 2007 season Vitazyme demonstration trials.***

Province	N	Vitazyme			Untreated Control			Difference	
		Area	Production	Yield	Area	Production	Yield		
		ha	tons	tons/ha	ha	tons	tons/ha	tons/ha	%
Holguin	2	84.7	5720.8	67.5	26.8	1261.3	47.0	**20.5**	**43.7**
Santiago	2	90.9	6034.1	66.4	13.7	764.6	55.6	**10.7**	**19.3**
Nation	4	175.6	11754.9	66.9	40.6	2025.9	49.9	**17.0**	**34.1**

However, this comparison is not exactly the same in all provinces, whereas if it is carried out in those provinces in which two or three biostimulants are present, you may see, for instance, that in Santiago de Cuba (Table 5) Enerplant and Vitazyme showed similar performances, both better than Fitomas, which showed the least mean increase (8.3 t/ha). Thus, in the estate means, Vitazyme showed larger increases: 13.2 and 11.4 t/ha versus 9.0 and 9.4 t/ha with Enerplant and 7.8 and 8.5 t/ha with Fitomas, but in the provincial means Enerplant (11.9 t/ha) slightly exceeded Vitazyme (10.7 t/ha), while Fitomas had always the least increase (8.3 t/ha); in Holguin, Vitazyme showed the country's largest increase (20.5 t/ha and 43.7%) and exceeded several times that of Fitomas (4.2 t/ha and 8.1%, the country's smallest increase; Table 6).

Table 5. ***Yields of the 2007 season biostimulant trials in Santiago de Cuba.***

Biostimulant	Mill estate	Farm	With Biostimulant			Untreated Control			Diff.
			Area	Production	Yield	Area	Production	Yield	
			ha	tons	tons/ha	ha	tons	tons/ha	tons/ha
Enerplant	Chile	Armonia	51.0	2179.9	42.7	19.2	648.8	33.8	**9,0**
	America L.	Purial	55.0	3776.0	68.7	13.5	798.4	59.3	**9,4**
Overall Enerplant			**106.0**	**5995.9**	**56.2**	**32.7**	**1447.2**	**44.3**	**11.9**
Vitazyme	Chile	Verdecia	43.7	2834.5	64.9	2.2	111.1	51.7	**13,2**
	Dos Rios	Calderon	47.2	3199.6	67.8	11.6	653.6	56.4	**11,4**
Overall Vitazyme			**90.9**	**6034.1**	**66.4**	**13.7**	**764.6**	**55.6**	**10.7**
Fitomas	America L.	Purial	49.1	2476.0	50.4	5.6	236.4	41.9	**8,5**
	Mella	Baragua	68.7	3975.9	57.9	6.9	346.2	50.1	**7,8**
Overall Fitomas			**117.8**	**6451.9**	**54.8**	**12.6**	**582.6**	**46.4**	**8.3**

Table 6. ***Yields of the 2007 season Fitomas and Vitazyme trials in Holguin.***

Biostimulant	N	Biostimulant			Untreated Control			Difference	
		Area	Production	Yield	Area	Production	Yield		
		ha	tons	tons/ha	ha	tons	tons/ha	tons/ha	%
Fitomas	3	74.3	4143.8	55.8	18.0	927.9	51.6	**4.2**	**8.1**
Vitazyme	2	84.7	5720.8	67.5	26.8	1261.3	47.0	**20.5**	**43.7**

In Camaguey, Fitomas (9.1 t/ha and 26.7%) exceeded Enterplant (7.5 t/ha and 21.1%; Table 7), which indicates that the biostimulants showed a differential regional response.

Table 7. ***Yields of the 2007 season Fitomas and Enerplant trials in Camaguey.***

Biostimulant	N	Biostimulant			Untreated Control			Difference	
		Area	Production	Yield	Area	Production	Yield		
		ha	tons	tons/ha	ha	tons	tons/ha	tons/ha	%
Fitomas	10	118.8	5151.6	43.4	91.5	3129.5	34.2	**9.1**	**26.7**
Enerplant	1	115.9	5000.6	43.1	26.0	926.6	35.6	**7.5**	**21.1**

It is noteworthy that all assessed areas (as well as other biostimulant treated areas) of Santiago de Cuba province were applied by backpack sprayers (due to a limitation of boom sprayers), in spite of which a high overall cane yield increase was reached (11.2 t/ha), which was fifth among the 10 assessed provinces (Table 8), while the percentage increase (23.6%) is not among the highest due to the higher cane yields of the untreated controls in this province. In all other provinces boom sprayers were always used.

Table 8. ***Yields by provinces of the 2007 season demonstration trials with all three biostimulants combined***

Province	N	Fitomas-E			Untreated Control			Difference	
		Area	Production	Yield	Area	Production	Yield		
		ha	tons	tons/ha	ha	tons	tons/ha	tons/ha	%
Pinar Rio	14	377.6	15023.6	39.8	90.4	2620.3	29.0	10.8	37.3
Habana	6	61.3	2575.6	42.0	44.3	1464.6	33.0	9.0	27.2
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S. Spiritus	17	86.1	3921.0	45.5	86.6	3158.9	36.5	9.1	24.9
Ciego Avila	6	116.1	4567.5	39.3	44.2	1233.0	27.9	11.5	41.1
Camaguey	11	234.7	10152.2	43.3	117.5	4056.1	34.5	8.7	25.3
Holguin	5	159.0	9864.6	62.1	44.8	2189.2	48.9	13.2	27.0
Santiago	6	314.7	18441.9	58.6	59.0	2794.4	47.4	11.2	23.6
Guantanamo	3	29.7	1214.8	40.9	22.5	767.5	34.1	6.8	19.9
Nation	**77**	**1496.7**	**71450.2**	**47.7**	**591.3**	**21033.4**	**35.6**	**12.2**	**34.2**

Numerous cultivars (C294-72, C86-12, My5514, Ja64-14, C323-68, C85-1, C87-51, CP52-43, C1324-74, C1051-73, C132-81, SP7012-84, C120-76, C86-503, C86-621, C140-81, and RB745433), and various types of soil (Red Calcic Ferralitic [Eutrustox or Ferralsol], Quartzitic Ferralitic [Luvisol or Ustox, Aqualf], Fersialitic [Inceptisol, Alfisol], Sialitic [Eutropept or Cambisol], Gleyey Vertisol [Calciustert] and Alluvial [Haplustoll or Phaeozem]) were associated to different provinces, and their effects cannot be isolated in this analysis. The crop cycle in almost all trials was ratoon, and the fields always received recommended mineral fertilization.
Results of Cienfuegos, Las Tunas, and Granma provinces are pending.

Economic Analysis

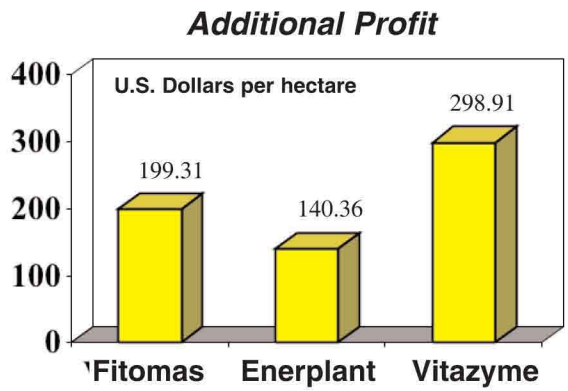
The economic analysis revealed that Fitomas-E continues to have the greatest economic benefits (Table 9), as shown by the cost-benefit ratio (4.52), and the lowest cost per additional USD (0.18 USD), due to the much lower overall cost of the product per hectare (about nine times less than the other two biostimulants), since it is of local manufacture, and due to lower cost and greater ease of application (only one operation is needed). The others require at least two applications, in spite of the fact that Vitazyme recorded the highest additional profits, thanks to its larger overall cane yield increase.
Not included were other costs, as of transportation of sugar to ports, but neither were other revenues, as those of additional molasses.

Table 9. ***Economic analysis of the 2007 season biostimulant demonstration trials.***

Indicator	Fitomas	Enerplant	Vitazyme
Additional cane (t/ha)	10.54	8.92	17.01
Additional sugar (t/ha)[a]	1.11	0.94	1.79
Cost of harvest additional cane[b]	36.88	31.21	59.52
Cost of biostimulant treatment[c]	7.20	34.40	34.40
Overall additional cost (USD/ha)	44.08	65.61	93.92
Additional income (USD/ha)[d]	243.39	205.97	392.83
Additional profit (USD/ha)	199.31	140.36	**298.91**
Cost-benefit ratio	**4.52**	2.14	3.18
Cost/additional USD	**0.18**	0.32	0.24

[a]Additional sugar = cane t/ha x 10.5% ccs (commercial cane sugar or sugar % cane).
[b]Cost of harvesting and milling additional cane: 3.5 USD/t of cane x additional cane t/ha.
[c]Cost of biostimulant treatment treatment: 26 USD of Vitazyme or Enerplant/ha of 3 USD of Fitomas/ha + 4.20 USD/ha per each spraying.
[d]Price of sugar: 0.10 USD/lb (220 USD/t).

Conclusions



1. Biostimulants Fitomas-E, Enerplant, and Vitazyme ratified once more, in the 2007 harvest season, their marked effect on sugarcane yields in all provinces, cultivars, soil types, and sprayer types evaluated.
2. Among the three biostimulants, Vitazyme recorded the highest overall cane yield increase (in most cases with two applications), followed by Fitomas-E, while Enerplant recorded the lowest overall increase.
3. A differential response to the biostimulants by regions was ratified: Fitomas-E showed its lowest yield increases in the assessed eastern provinces, while in those eastern provinces Vitazyme and Enerplant showed their largest increases, higher than Fitomas-E.
4. Fitomas-E continues to be the biostimulant of greatest economic benefit, thanks to the much lower overall cost of the product per hectare, since it is of local manufacture. It also has lower cost and greater ease of application (only one operation is needed). Vitazyme and Enerplant also offer marked economic benefits, although lower than Fitomas-E under the conditions of Cuba.

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2007 Crop Results

Vitazyme on Sugar Cane

Researcher: Marylin Enriquez, technician
Location: Capitan Alberto Torres Cooperative *Watering*: rain-fed
Variety: Ty 7017 *Field*: 16, block 5204 *Crop type*: "carry-over" ratoon
Experimental design: A production field of 2.80 ha was treated with Vitazyme to determine the effect on sugar yield compared to the expected yield.

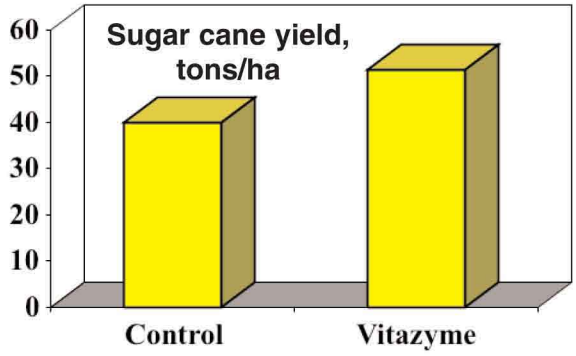
1. Control **2. Vitazyme**

Fertilization: unknown
Vitazyme application: .5 liters/ha twice (timing unknown)
Yield results: The harvest date was February 6 to 9, 2007.

Treatment	Yield	Change
	---------- tons/ha	----------
Control	40.00*	—
Vitazyme	51.45	11.45 (+29%)

*Estimated average for the field

Sugar cane yield increase: 29%



Conclusions: Vitazyme greatly enhanced the production of this sugar cane parcel, by 29% above the expected level. According to the researcher, "The Cooperative considers that the much higher actual yields, as compared to the estimated yields, were due to much greater than expected growth in the Vitazyme treated fields than the controls, from the September estimates to the actual harvest in February."

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2007 Crop Results

Vitazyme on Sugar Cane

Researcher: Marylin Enriquez, technician
Location: Capitan Alberto Torres Cooperative Farm, Hector Molina Sugar Enterprise, Cuba
Watering: rain-fed *Variety*: CP 52-43
Field: 20, block 5240 *Cane type*: ratoon
Experimental design: A production field of 5.56 ha was treated with Vitazyme to determine the effect on sugar yield compared to expected yield.

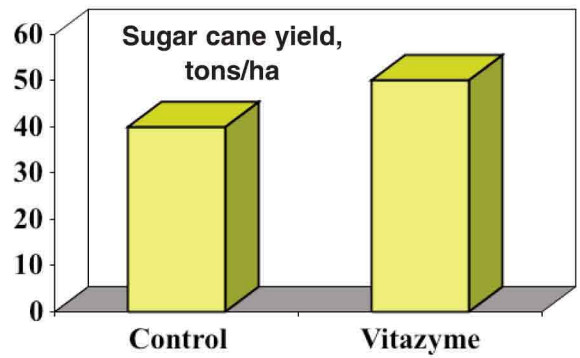
1. Control **2. Vitazyme**

Fertilization: unknown
Vitazyme application: 1.5 liters/ha twice (timing unknown)
Yield results: The harvest date was February 6 to 9, 2007.

Treatment	Yield	Change
	-------- tons/ha	--------
Control	40.00*	—
Vitazyme	50.11	10.11 (+25%)

*Estimated average for the field

Sugar cane yield increase: 25%



Conclusions: Vitazyme greatly enhanced the production of this sugar cane parcel, by 25% above the expected level. According to the researcher, "The Cooperative considers that the much higher actual yields, as compared to the estimated yields, were due to much greater than expected growth in the Vitazyme treated fields than the controls, from the September estimates to the actual harvest in February."

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2007 Crop Results

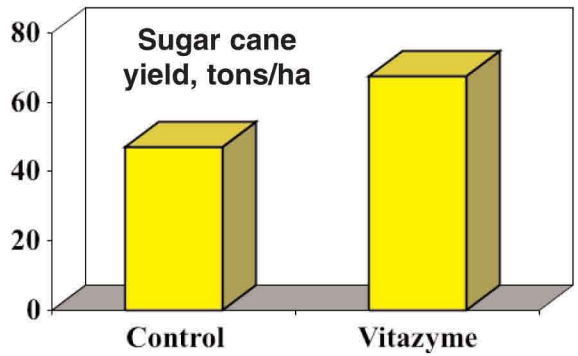
Vitazyme on Sugar Cane

Researcher: unknown
Location: Fernando Dios, Union 2, and Critino N. Canada Alto, Holguin Province, Cuba
Soil type: gleyey vertisol (calciustert) and fersialitic (inceptisol)
Cane type: ratoon
Experimental design: This study is one of several conducted in 2007 to discover the effectiveness of Vitazyme to increase sugar cane yield in the Holguin area of Cuba. Few details of the study are known except that the fields were large, in commercial production areas.

1. Control **2. Vitazyme**

Fertilization: according to recommendations
Vitazyme application: two, at 1 liter/ha each time
Yield results:

Treatment	Area	Total production	Area production	Change
	ha	tons	tons/ha	tons/ha
Control	26.8	1,261.3	47.0	—
Vitazyme	84.7	5,720.8	67.5	20.5 (+44%)



Increase in cane yield: 44%

Conclusions: In this commercial-scale Vitazyme trial in Holguin Province, Cuba, the increase in production was a very high 44% above the control. This result is included in the 2007 summary of Cuban demonstration trials on sugar cane, and continues to show the remarkable results that have been obtained with Vitazyme on crop yields throughout Cuba over several years.

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2007 Crop Results

Vitazyme on Sugar Cane

Researcher: Roberto Alvarez, Deputy Director
Location: Antonio Rojas Cooperative Farm, Hector Molina Sugar Enterprise, Cuba
Variety: CP52-43 *Field*: Field 17, Block 102
Crop type: ratoon
Experimental design: A production field of 9.39 ha was treated with Vitazyme to determine the effect on sugar yield compared to the expected yield.

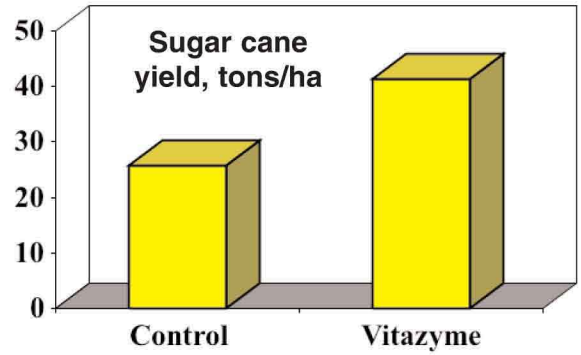
1. Control **2. Vitazyme**

Fertilization: unknown
Vitazyme application: 1.5 liters/ha twice (timing unknown)
Yield results: The harvest date was February 6 to 9, 2007.

Treatment	Yield	Change
	---------- tons/ha	----------
Control	25.70*	—
Vitazyme	41.36	15.66 (+61%)

*Estimate for the untreated field.

Increase in sugar cane yield: 61%



Conclusions: In this Cuban sugar cane trial, Vitazyme enhanced yield an amazing 61% above the expected control (untreated) yield, based on field records. Even though this field was scheduled for plowing and replanting, because of the excellent yield it will be used again. The yield increase was due to "much greater than expected growth in the Vitazyme treated fields than the controls, from the September estimates to the actual harvest in February."

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2007 Crop Results

Vitazyme on Sugar Cane

Researcher: Roberto Alvarez, Deputy Director
Location: Antonio Rojas Cooperative Farm, Hector Molina Sugar Enterprise, Cuba
Variety: CP52-43 *Field*: Field 16, Block 201
Crop type: ratoon *Watering*: rain-fed
Experimental design: A production field of 8.27 ha was treated with Vitazyme to determine the effect on sugar yield compared to the expected yield.

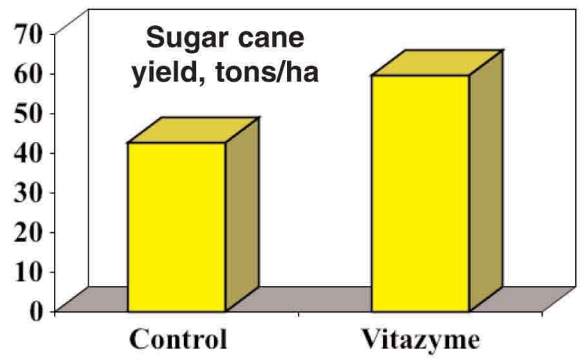
1. Control **2. Vitazyme**

Fertilization: unknown
Vitazyme application: 1.5 liters/ha twice (timing unknown)
Yield results: The harvest date was February 6 to 9, 2007.

Treatment	Yield	Change
	---------- tons/ha	----------
Control	42.80*	—
Vitazyme	59.55	16.75 (+39%)

*Estimate for the untreated field.

Increase in sugar cane yield: 39%



Conclusions: In this Cuban sugar cane trial, Vitazyme enhanced yield 39% above the expected control (untreated) yield, based on field records. Even though this field was scheduled for plowing and replanting, because of the excellent yield it will be used again. The yield increase was due to "much greater than expected growth in the Vitazyme treated fields than the controls, from the September estimates to the actual harvest in February."

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2006 Crop Results

Vitazyme on Sugar Cane

Researchers: Ramon Gonzalez Diaz, Miguel Angel Same Deli, Eng. Alberto Suarez, Eng. Alfredo Perez Naranjo, Eng. Dailin Rodriguez Tarse, and Eng. Iraida Cabrero Chacon

Location: Calderon Farm, Dos Rios Sugar Enterprise, Palma Soriano Municipality, Santiago de Cuba Province, Cuba

Varieties: C87-51 and C1051-73 *Soil type*: Cambisol *Crop cycle*: first, second, and third ratoon

Experimental design: Preliminary results of this study are reported in the 2005 edition of *Vitazyme Field Trial Results*. This experiment on large-scale fields was designed to further ascertain the efficacy of Vitazyme to enhance sugar yields on Cuban soils. Three different blocks were utilized to test effects on first, second, and third ratoon cane. The fields were divided, and part was treated with Vitazyme and part left for a control.

1. Control **2. Vitazyme**

Fertilization: according to recommendations of the Fertilizer and Amendment Recommendation Service for ratoon cane on Cambisol soils; 60 to 80 kg of nitrogen per hectare

Vitazyme application: one 1 liter/ha application for C87-51 on the first and second ratoon cane, and two 1 liter/ha applications for C1051-73 on third ratoon cane, banded over the cane rows. The first applications were made July 5 to 12, 2004, and the second application on August 6, 2004.

Harvest date: unknown

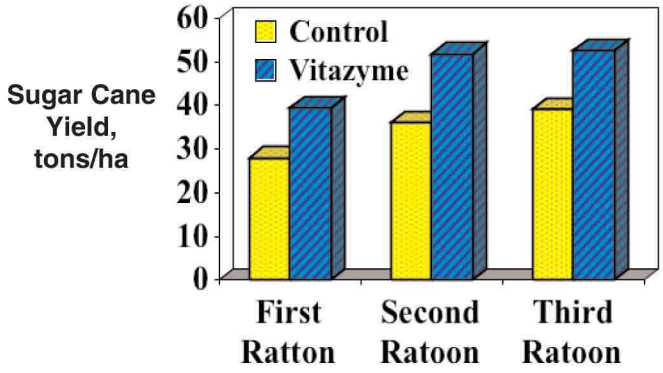
Yield results:

Block	Field	Area	Variety	Ratoon	Cane yield		
					Control	Vitazyme	Change
					---------- kg/ha ----------		
12	4, 5	12.06	C87-51	first	28.05	39.41	11.36 (+40%)
75	1, 2	15.78	C87-51	second	36.10	51.78	15.68 (+43%)
8	1, 2	7.52	C1051-73	third	39.22	52.58	13.36 (+34%)

Increase in first ratoon cane (1 liter/ha Vitazyme): 40%

Increase in second ratoon cane (1 liter/ha Vitazyme): 43%

Increase in third ratoon cane (2 liters/ha Vitazyme): 34%



Conclusions: For all three varieties of sugar cane at different ratoon stages in this Cuban trial, Vitazyme at either one or two applications produced excellent yield increases of from 34 to 43% above the control. These large sugar cane increases reveal the marked ability of this product to stimulate additional carbon fixation above usual levels in Cuban sugar cane management programs, and also illustrate how Vitazyme can improve nitrogen use efficiency, plus the more efficient use of other soil nutrients.

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2006 Crop Results

Vitazyme on Sugar Cane

Researchers: Alberto Torres and Hector Molina *Research organization*: Hector Molinas Sugar Enterprise, Capitan Alberto Torres Agricultural Production Cooperative, Cuba
Location: Cuba *Varities*: C323-68, C86-12 *Cane type*: ratoon
Fertilization: unknown *Soil type*: red ferralitic (eutrustox) and alluvial (vert-haptic phaeozen)
Experimental design: Large-scale field trials were conducted on several fields of sugar cane to evaluate the effects of Vitazyme on sugar production. Treatments were not replicated, but comparisons were made with paired fields.

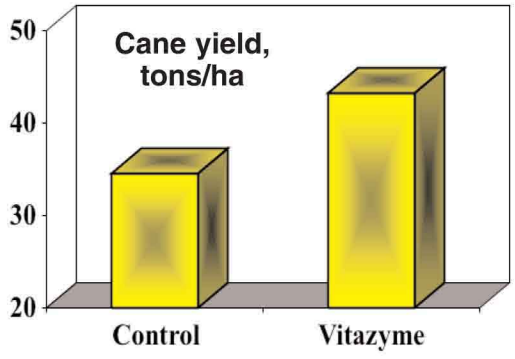
1. Control **2. Vitazyme**

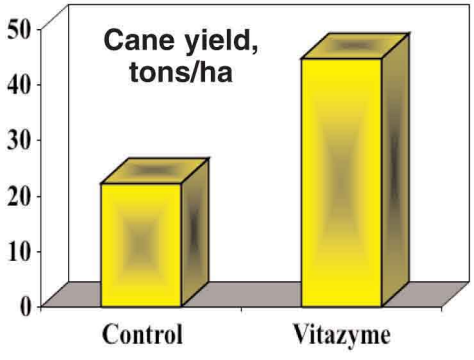
Tests On Red Ferralitic Soils

Treatment	Location	Cultivar	Yield	Change
	block/field		tons/ha	tons/ha
Control	5202/15	C323-68	34.6	—
Vitazyme[1]	5202/16	C323-68	43.3	8.7 (+25%)

[1]Three applications at 1 liter/ha each time.

Increase in cane yield with Vitazyme: 25%





Treatment	Location	Cultivar	Yield	Change	Ratoon Cycle
	block/field		tons/ha	tons/ha	
Control	5301/21	C323-68	22.4	—	4
Vitazyme[1]	5301/19	C323-68	44.7	22.3 (+100%)	13

[1]Two applications at 1.5 liters/ha each time.

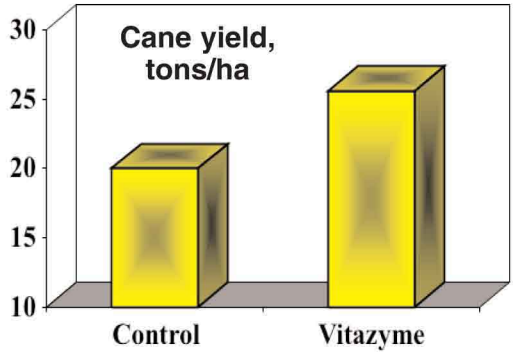
Increase in cane yield with Vitazyme: 100%

NOTE: The control treatment was in its fourth growth cycle, whereas the Vitazyme treatment was in its 13th. In spite of the usual yield reduction with long-term ratoon production, Vitazyme boosted the yield far above the four-cycle field.

Tests On Alluvial Soils

Treatment	Location	Cultivar	Yield	Change
	block/field		tons/ha	tons/ha
Control	5304/17	C86-12	20.6	
	5304/21	C86-12	13.4	
	5304/22	C86-12	26.0	
		Average	20.0	—
Vitazyme[1]	5304/15	C86-12	24.2	
	5304/19	C86-12	25.1	
	5304/20	C86-12	27.4	
		Average	25.6	5.6 (+28%)

[1]Two applications at 1.5 liters/ha each time.



Increase in cane yield with Vitazyme: 28%

Conclusions: In this Cuban sugar cane study, Vitazyme initiated excellent cane yield responses in both the red ferralitic and the alluvial soils, but especially in the red ferralitic soils. Of note is the fact that Vitazyme, at two applications of 1.5 liters/ha, prompted a doubling of cane yield with a very mature 13-cycle ratoon cane stand when compared to a nearby cane stand in only its fourth cycle. This response was greater than for any other comparison in this study. Responses to Vitazyme ranged from 25 to 100% in increased cane yield with 3 liters/ha total application, showing that the product is highly effective for improving sugar cane production

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2005 Crop Results

Vitazyme on Sugar Cane

Preliminary Results On Large-Scale Field Trials

Researcher: Dr. Elio Angarica
Location: Calderon Cooperation Farm, Blocks 14, 12, 75, and 8
Soil type: Cambisol (Eutropept)
Farm: Dos Rios, Palma Soriano, Santiago de Cuba, Cuba
Row spacing: 1.6 meters
Variety: C8612, C87-51, C87-51, and C1051
Previous crop: sugar cane, all harvested between February and April of 2003
Experimental design: Four sugar cane fields — a new planting (Block 14, Field 1), first ratoon (Block 12, Fields 4 and 5), second ratoon (Block 75, Fields 1 and 2), and third ratoon (Block 8, Fields 1 and 2) — were divided into Vitazyme treated and control areas to evaluate the product's effects in large scale field situations.

1. Control **2. Vitazyme**

Fertilization: according to SERFE (Fertilizer Service) recommendations, or 60 to 80 kg/ha N in ratoon cane; no fertilizer for newly planted cane
Vitazyme application: a Shogun backpack sprayer with a 16 liter capacity and a 300 l/ha spray volume (hollow cone nozzles), having 50% of the area treated in 80 cm bands over the rows. Rate: 1 liter/ha.
Harvest yield estimates: Stalk diameter and length were determined for 10 samples in four plots per treatment. Stalk population counts were made in 10 meters of row in four plots per treatment as well to determine stalks per meter of row. Then all of the stalks in one meter of row were cut, counted, and weighed to determine mean stalk weight. Finally, using stalks per meter and mean stalk weight, with a row spacing of 1.6 meters, the cane yield was determined in metric tons/ha.

New Planting

Variety C8612, planted in June of 2003; age 6 months at measurement; area treated, 8.03 ha

Treatment	Stalk length	Change	Stalk diameter	Change	Stalk population	Population change
	cm	cm	cm	cm	stalks/m	stalks/m
Control	121.9	—	2.54	—	8.8	—
Vitazyme	125.9	4.0 (+3%)	2.82	0.28 (+11%)	12.3	3.5 (+40%)

Increase in stalk length: + 3%

Increase in stalk diameter: + 11%

Increase in stalks/meter: + 40%

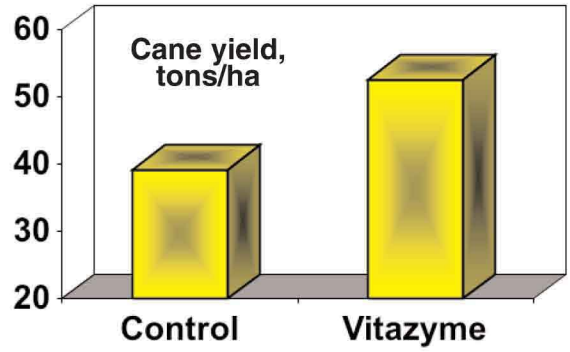
Vitazyme greatly increased new cane growth over the 6-month period of this trial.

First Ratoon

Variety C87-51; area treated, 12.06 ha; one application

Treatment	Stalk length	Length change	Stalk diameter	Diameter change	Stalk population	Population change	Stalk weight	Weight change	Yield	Yield change
	cm	cm	cm	cm	stalks/m	stalks/m	kg	kg	tons/ha	tons/ha
Control	189.2	—	2.23	—	9.03	—	0.69	—	38.94	—
Vitazyme	201.4	12.2 (+6%)	2.33	0.10 (+4%)	9.00	-0.03 (0%)	0.81	0.11 (+16%)	45.56	6.62 (+17%)

Increase in stalk length: + 6%
Increase in stalk diameter: + 4%
Increase in stalk weight: + 16%
Increase in cane yield: + 17%

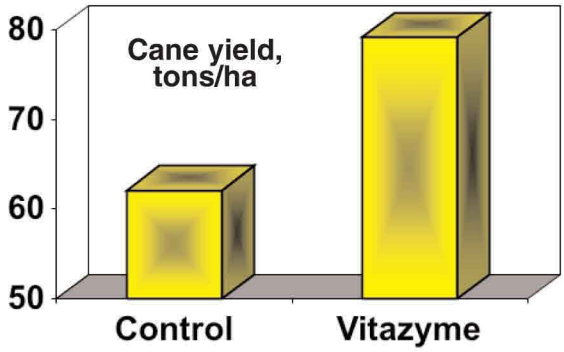


Second Ratoon

Variety C87-51; area treated, 10 ha; one application

Treatment	Stalk length	Length change	Stalk diameter	Diameter change	Stalk population	Population change	Stalk weight	Weight change	Yield	Yield change
	cm	cm	cm	cm	stalks/m	stalks/m	kg	kg	tons/ha	tons/ha
Control	216.2	—	2.33	—	11.83	—	0.84	—	62.11	—
Vitazyme	212.0	-3.8 (-2%)	2.34	0.01 (0%)	12.80	0.97 (+8%)	0.99	0.15 (+18%)	79.22	17.11 (+28%)

Increase in stalk population: + 8%
Increase in stalk weight: + 18%
Increase in cane yield: + 28%

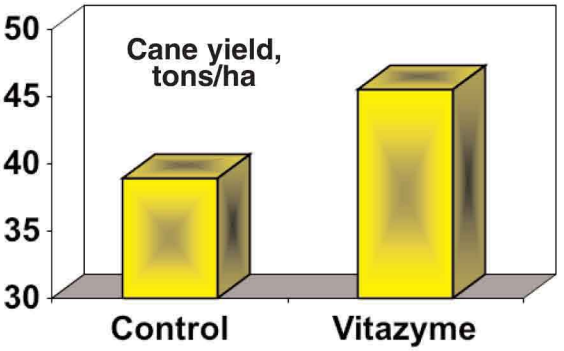


Third Ratoon

Variety C1051; area treated, 7.52 ha; two applications

Treatment	Stalk length	Length change	Stalk diameter	Diameter change	Stalk population	Population change	Stalk weight	Weight change	Yield	Yield change
	cm	cm	cm	cm	stalks/m	stalks/m	kg	kg	tons/ha	tons/ha
Control	170	—	2.51	—	8.15	—	0.77	—	39.22	—
Vitazyme	175	5 (+3%)	2.67	0.16 (+6%)	10.65	2.50 (+31%)	0.79	0.02 (+3%)	52.58	+13.36 (+34%)

Increase in stalk length: + 3%
Increase in stalk diameter: + 6%
Increase in stalk population: + 31%
Increase in stalk weight: + 3%
Increase in cane yield: + 34%



Preliminary results: Vitazyme, at 1 to 2 liters/ha total application, showed great promise in markedly increasing sugar production in these Cuban cane trials. As of the end of 2004, total cane growth and estimated cane yields increased substantially with Vitazyme, the all-important cane yield increasing by 17%, 28%, and 34% for first, second, and third year ratoon cane, respectively. Growth of newly planted cane also revealed excellent responses in stalk diameter and stalk population 6 months after planting and treating with Vitazyme.

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2005 Crop Results

Vitazyme on Sugar Cane

Researchers: Monsana, Viteri, and Monserrate
Chief supervisor: Ing. Oscar Nuñez
Location: Marcelino Matidueña, Province of Guayas, Ecuador
Variety: *Sachrum officinarum*
Soil type: clayey

Experimental design: A uniform soil area was selected alongside a water channel, where six rows were treated with Vitazyme and Stimplex seaweed to determine effects on sugarcane seed piece germination and growth.

1. Control **2. Vitazyme + Stimplex treatment of seed pieces**

Fertilization: none

Vitazyme and Stimplex application: Seed pieces were immersed before planting in a solution of 1 liter of Vitazyme and 1 liter of Stimplex in 100 liters of water.

Tiller numbers and height:

Treatment	Total seed pieces	Meters of row[1]	Shoots, Oct. 1[2]	Shoots per seed	Shoots, Oct. 18[3]	Shoots per seed	Shoots per meter of row	Average height, cm
		m						
Control	1,239	110	505	0.41	845	0.69	7.67	23.2
Vitazyme	938	96	580	0.62	949	1.01	9.97	26.0

[1]Four rows for each treatment were measured and totalled.
[2]Thirty days after planting.
[3]Forty-five days after planting.

Changes with Vitazyme + Stimplex

Increase in shoots/seed at 30 days: +51%
Increase in shoots/seed at 45 days: +46%
Increase in shoots/meter of row: +30%
Increase in shoot height: +12%

Shoot structure: Vitazyme + Stimplex produced many more secondary tillers per seed piece than did the control, and the leaves were of a stronger, more vital nature.

Conclusions: Vitazyme + Stimplex applied to the sugar cane seed pieces before planting resulted in a marked increase in tiller germination and vigor. The number of shoots per seed piece increased by 46% above the control at 45 days after planting, and shoots per meter of row by 30%. Treated shoot height also was 12% greater than the control, and the shoots were stronger with wider leaves.

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2004 Crop Results

Vitazyme on Sugar Cane

Researcher: Eng. Fidel Hernandez *Location*: Espana Rep. Estate, Mantanzas Province, Cuba
Variety: Matanzas C323-68 *Type*: ratoon *Soil type*: Eutrustox (Ferralsol)
Experimental design: A 0.3 ha plot containing three replicates was established to evaluate the effects of Vitazyme and reduced fertilizer on sugar cane yield and sugar content. Three treatments were used.

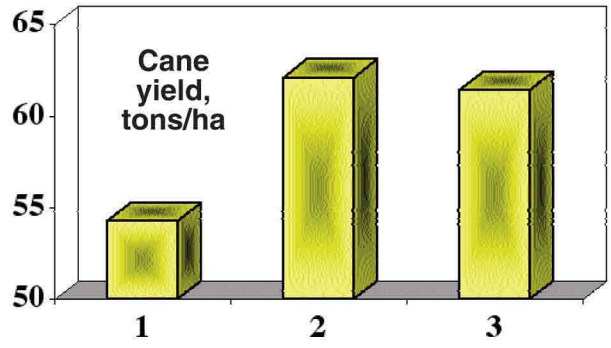
Treatment	Vitazyme	Fertilizer
1	0	100%
2	1 liter/ha x 3	100%
3	1 liter/ha x 5	75%

Fertilization: Fertilizer was applied at 100 or 75% of recommended rates to all treatments (100%: 130 kg/ha N, 100 kg/ha K_2O; 75%: 97.5 kg/ha N, 75 kg/ha K_2O).
Vitazyme application: 1 liter/ha three times broadcast monthly from the last harvest for Treatment 2, and five times for Treatment 3
Growth results:

Cane Yield

Treatment	Cane yield	Change vs. control
	tons/ha	tons/ha
1 (Control)	54.27	—
2 (100% fert. + 3x Vita.)	62.09	7.82 (+14%)
3 (75% fert. + 5x Vita.)	61.38	7.11 (+13%)

Cane yield increase: 13 to 14%

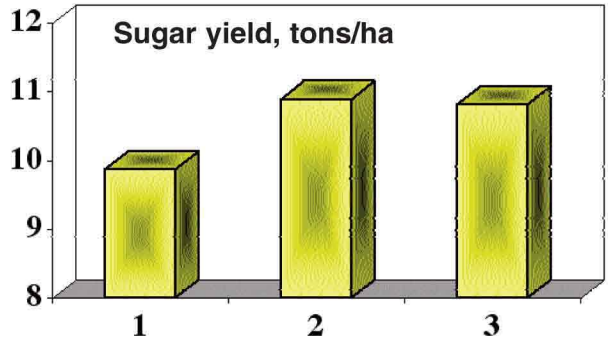


Sugar Yield

Treatment	Sugar yield*	Change vs. control
	tons/ha	tons/ha
1 (Control)	9.87 a	—
2 (100% fert. + 3x Vita.)	10.89 b	1.02 (+10%)
3 (75% fert. + 5x Vita.)	10.81 b	0.94 (+10%)

*Means followed by the same letter are not significantly different.
Standard error = 1.25 tons/ha

Sugar yield increase: 10%



Conclusions: The total cane yield was increased about the same (13 to 14%) by Vitazyme at either 100% or 75% fertilizer. This fact demonstrates that Vitazyme will enhance yields as well under reduced fertilizer regimes as under full fertilizer regimes: the 75% fertilizer treatment + Vitazyme applied five times gave about the same increase as did the 100% fertilizer treatment + Vitazyme applied three times. The sugar yield increase was about 10% for both of the Vitazyme treatments. **These increases show that Vitazyme is an excellent supplement for sugar cane production in Cuba in red Eustrustox or Ferralson soils, especially since it reveals the potential to achieve high yields while reducing fertilizer use.**

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2004 Crop Results

Vitazyme on Sugar Cane

Researcher: Eng. Rafael Zuaznabar *Location*: Manuel Fajardo Estate, Havana Province, Cuba
Variety: Co 997 *Type*: ratoon *Soil type*: Eutrustox
Experimental design: A trial of 64 m^2, having four replicates in a Latin square, was set up to evaluate the effect of Vitazyme on ratoon sugar cane at normal and reduced fertilizer levels. Four treatments were used.

Treatment	Vitazyme*	Fertilizer
1	0	0%
2	0	100%
3	1 liter/ha x 3	50%
4	1 liter/ha x 5	100%

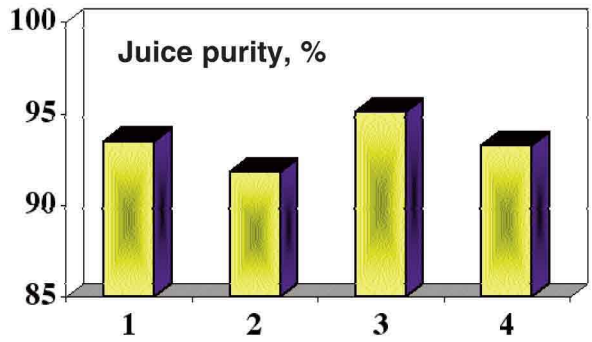
*Rates and times of applications are presumed, based on other tests performed in Cuba.

Fertilization: Fertilizer rates: 130 kg/ha N and 100 kg/ha K_2O for the 100% rate, and half for the 50% rate
Vitazyme application: one liter/ha three times for Treatments 3 and five times for Freatment 4, monthly after the last harvest
Yield results:

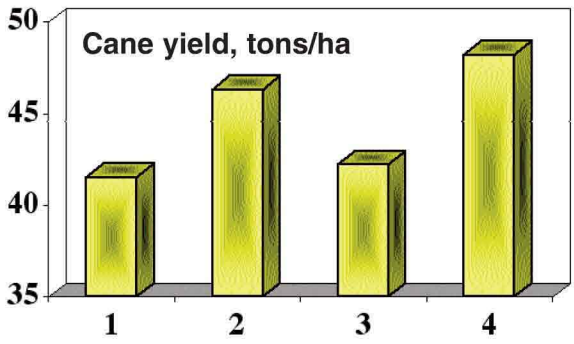
Juice Purity

Treatment	Juice purity	Change vs. Control	
		vs. Trt. 1	vs. Trt. 2
	%	%	%
1 (Control)	93.50	—	—
2 (100% Fert.)	91.81	(-)1.69 (-2%)	—
3 (50% Fert. + Vita.)	95.09	1.59 (+2%)	3.28 (+4%)
4 (100% Fert. + Vita.)	93.25	(-)0.25 (0%)	1.44 (+2%)

Change in juice purity: –2 to + 4%



Cane Yield



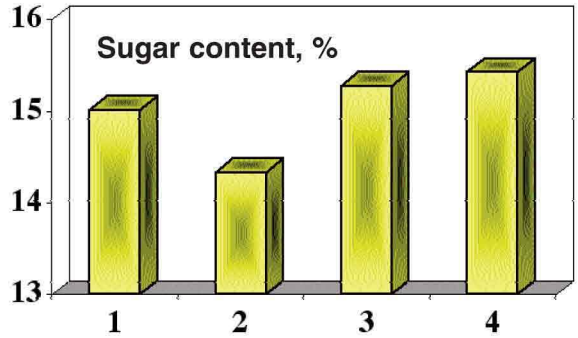
Treatment	Cane yield	Change vs. Control	
		vs. Trt. 1	vs. Trt. 2
	tons/ha	tons/ha	tons/ha
1 (Control)	41.5	—	—
2 (100% Fert.)	46.3	4.8 (+12%)	—
3 (50% Fert. + Vita.)	42.2	0.7 (+2%)	(-)4.1 (-9%)
4 (100% Fert. + Vita.)	48.2	6.7 (+16%)	1.9 (+4%)

Change in cane yield: –9 to +16%

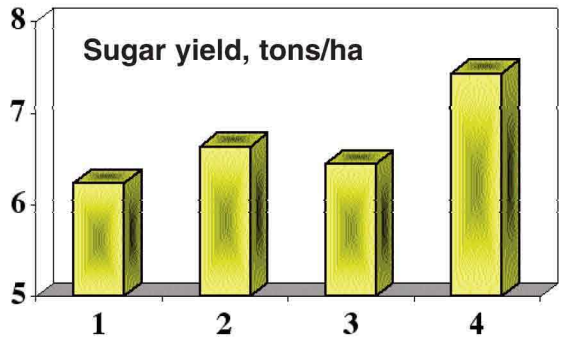
Sugar Content

Treatment	Sugar content	Change vs. Control vs. Trt. 1	Change vs. Control vs. Trt. 2
	%	%	%
1 (Control)	15.01	—	—
2 (100% Fert.)	14.33	(-)0.68	—
3 (50% Fert. + Vita.)	15.27	0.26 (+2%)	0.94 (+7%)
4 (100% Fert. + Vita.)	15.42	0.41 (+3%)	1.09 (+8%)

Increase in sugar content: 2 to 8%



Sugar Yield



Treatment	Sugar yield	Change vs. Control vs. Trt. 1	Change vs. Control vs. Trt. 2
	tons/ha	tons/ha	tons/ha
1 (Control)	6.23	—	—
2 (100% Fert.)	6.63	0.40 (+6%)	—
3 (50% Fert. + Vita.)	6.44	0.21 (+3%)	(-)0.19 (-3%)
4 (100% Fert. + Vita.)	7.43	1.20 (+19%)	0.80 (+12%)

Change in sugar yield: –3 to +19%

Conclusions: In this Cuban sugar cane study, Vitazyme had little effect on juice purity, but total cane yield was increased above the control (Treatment 1) by 2% (at 50% fertilizer) to 16% (at 100% fertilizer); the 100% fertilizer treatment without Vitazyme increased yield by 12%. Compared to the 100% fertilizer control, Vitazyme + 100% fertilizer increased cane yield by 4%, while the 50% fertilizer + Vitazyme treatment was 9% less than the 100% fertilizer treatment.

Sugar content of the cane was boosted by Vitazyme above the 0% fertilizer control by 2 to 3%, but sugar was especially increased above the 100% fertilizer control, by 7 to 8%. **These increases led to favorable sugar yield levels for both Vitazyme treatments compared to the controls.** The 100% fertilizer + Vitazyme treatment increased sugar yield by 19% above the no fertilizer control, and by 12% above the 100% fertilizer control. The 50% fertilizer + Vitazyme treatment modestly increased sugar yield, by 3% above the no fertilizer control; this yield was only 3% less than the 100% fertilizer control.

Vitazyme in this Cuban (Havana Province) demonstration trial has proven to be an effective agent for increasing the yield and sugar content of sugar cane on red Eutrustox or Ferralsol soils, in a ratoon crop.

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2004 Crop Results

Vitazyme on Sugar Cane

Researcher: Dr. Isel Creach *Location*: Santiago de Cuba, Cuba *Variety*: C89-147
Type: ratoon *Soil type*: Leptic haplustert

Experimental design: Four treatments were applied to a Latin square design, having four replicates of 64m^2, to evaluate the effect of Vitazyme on sugar cane yield at normal and 50% recommended N applications.

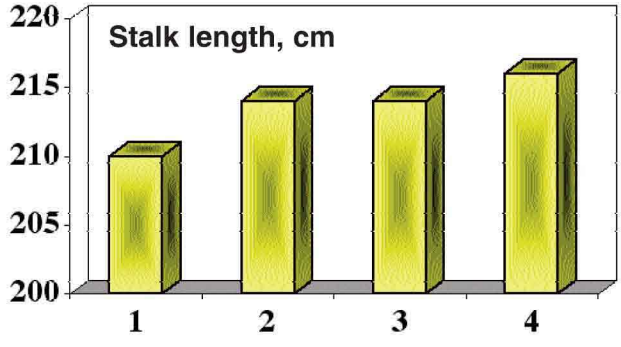
Treatment	Vitazyme	Nitrogen
1	0	0 (0%)
2	0	75 kg/ha N (100%)
3	1 liter/ha x 3	37.5 kg/ha N (50%)
4	1 liter/ha x 3	75 kg/ha N (100%)

Fertilization: Nitrogen was applied at 75 kg/ha for Treatments 2 and 4, and at 37.5 kg/ha for Treatment 3. The control (Treatment 1) received no fertilizer, as recommended for the crop cycle and soil of this study.
Vitazyme application: 1 liter/ha three times, monthly from the last harvest, for Treatments 3 and 4
Growth results:

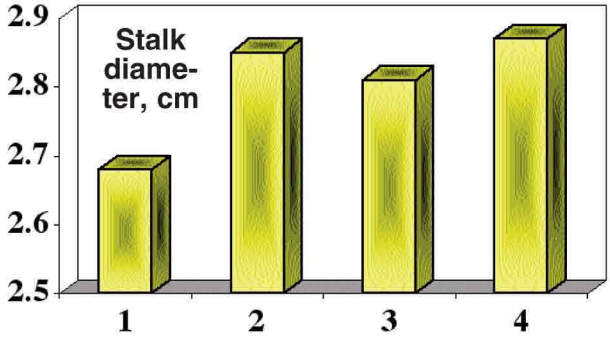
Stalk Length

Treatment	Stalk length	Change vs. Control	
		vs. Trt. 1	vs. Trt. 2
	cm	cm	cm
1 (Control)	210	—	—
2 (100% N)	214	4 (+2%)	—
3 (50% N + Vita.)	214	4 (+2%)	0
4 (100% N + Vita.)	216	6 (+3%)	2 (+1%)

Increase with Vitazyme: 1 to 3%



Stalk Diameter



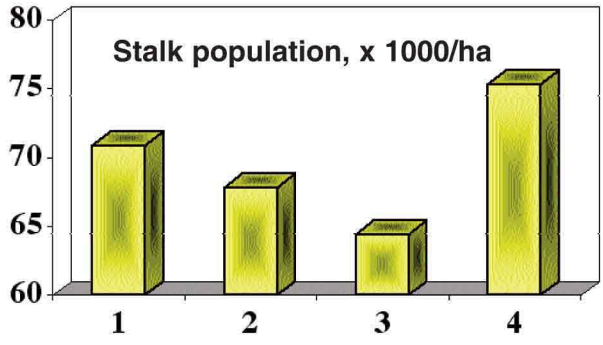
Treatment	Stalk diameter	Change vs. Control	
		vs. Trt. 1	vs. Trt. 2
	cm	cm	cm
1 (Control)	2.68	—	—
2 (100% N)	2.85	0.17 (+6%)	—
3 (50% N + Vita.)	2.81	0.13 (+5%)	(-) 0.04 (-1%)
4 (100% N + Vita.)	2.87	0.19 (+7%)	0.02 (+1%)

Increase with Vitazyme: 1 to 7%

Stalk Population

Treatment	Stalk diameter	Change vs. Control vs. Trt. 1	Change vs. Control vs. Trt. 2
	x 1000/ha	x 1000/ha	x 1000/ha
1 (Control)	70.9	—	—
2 (100% N)	67.8	(-)3.1 (-4%)	—
3 (50% N + Vita.)	64.4	(-)6.5 (-9%)	(-)3.4 (-5%)
4 (100% N + Vita.)	75.3	4.4 (+6%)	7.5 (+11%)

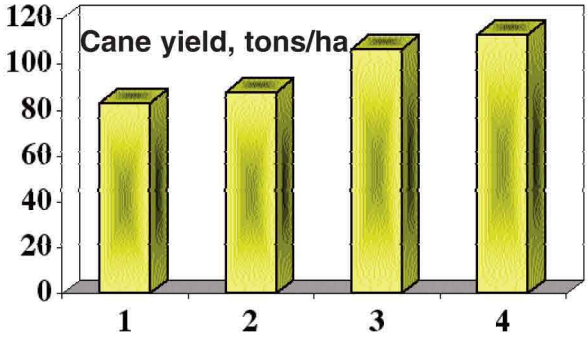
Change with Vitazyme: -9 to +11%



Vitazyme increased stalk length and diameter in most cases compared to the no nitrogen control, though stalk population was increased only by the 100% N + Vitazyme treatment (Treatment 4). Compared to the 100% N control, Vitazyme + 100% N increased stalk length (+1%), stalk diameter (+1%), and stalk population (+11%), while the 50% N + Vitazyme treatment (Treatment 3) improved none of these sugar cane growth parameters vs. Treatment 2, even though yield was significantly increased above it, as will be noted in the following analyses.

Yield and quality results:

Cane Yield



Treatment	Cane yield*	Change vs. Control vs. Trt. 1	Change vs. Control vs. Trt. 2
	tons/ha	tons/ha	tons/ha
1 (Control)	82.99 b	—	—
2 (100% N)	87.70 b	4.71 (+6%)	—
3 (50% N + Vita.)	106.66 ab	23.67 (+29%)	18.96 (+22%)
4 (100% N + Vita.)	112.89 a	29.90 (+36%)	25.19 (+30%)

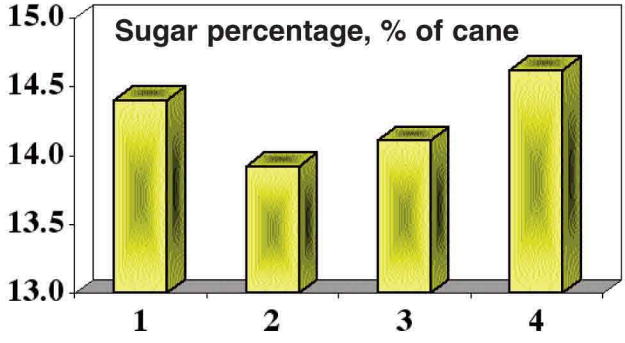
*Means followed by the same letter are not significantly different.
Standard error = 4.59 tons/ha

Increase with Vitazyme: 22 to 36%

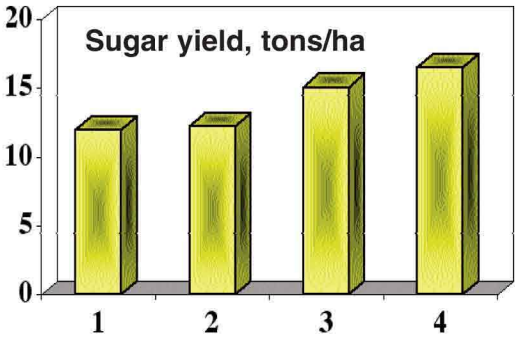
Sugar Percentage

Treatment	Stalk diameter	Change vs. Control vs. Trt. 1	Change vs. Control vs. Trt. 2
	%	%	%
1 (Control)	14.40	—	—
2 (100% N)	13.92	(-)0.48 (-3%)	—
3 (50% N + Vita.)	14.11	(-)0.29 (-2%)	0.19 (+1%)
4 (100% N + Vita.)	14.62	0.22 (+2%)	0.70 (+5%)

Change with Vitazyme: -2 to +5%



Sugar Yield



Treatment	Cane yield	Sugar yield*	Change vs. Control vs. Trt. 1	Change vs. Control vs. Trt. 2
	t/ha	t/ha	t/ha	t/ha
1 (Control)	82.99 b	11.95 c	—	—
2 (100% N)	87.70 b	12.21 c	0.26 (+2%)	—
3 (50% N + Vita.)	106.66 ab	15.05 b	3.10 (+26%)	2.84 (+23%)
4 (100% N + Vita.)	112.89 a	16.50 a	4.55 (+38%)	4.29 (+35%)

*Means followed by the same letter are not significantly different. Standard error (sugar yield) = 0.53 t/ha; standard error (cane yield) = 4.59 t/ha.

Sugar cane yield was significantly increased above both the no N control and the 100% N control by Vitazyme, by from 29 to 36%. Compared to the 100% N control, Vitazyme significantly boosted total yield at the 100% N level (29%), and almost at the 50% N level as well (22%). Sugar percentage of the cane was not significantly affected.

Increase with Vitazyme: 23 to 38%

The all-important sugar yield was boosted by a highly significant 38% (4.55 tons/ha) by Vitazyme + 100% N above the no N control, and by 35% (4.29 tons/ha) above the 100% N control. **The 50% N + Vitazyme treatment (Treatment 3) increased the sugar yield a substantial 23% above the 100% N control, representing a savings in nitrogen fertilizer while at the same time increasing sugar yield.**

Economic calculations by the Cuban researchers: The three Vitazyme treatments, plus the control treatment, were evaluated for income using two sugar prices. The results are shown below.

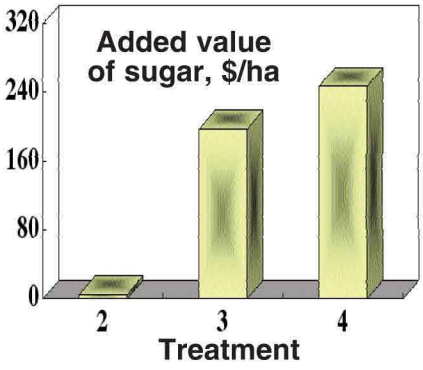
Treatment	Cumulative Vitazyme rate	Cane yield	Increased cane yield	Sugar yield	Sugar increase[1]	Extra cost of production	Added value of sugar at[2] ... $0.06/lb	Added value of sugar at ... $0.07/lb	Added income of sugar at ... $0.06/lb	Added income of sugar at ... $0.07/lb
	l/ha	t/ha	t/ha	t/ha	t/ha	$/ha	$/ha	$/ha	$/ha	$/ha
1 (no N)	0	82.99	—	9.13	—	—	—	—	—	—
2 (100% N)	0	87.70	4.71	9.65	0.52	63.61	**68.74**	**80.24**	**5.13**	**16.63**
3 (50% N)	3	106.66	23.67	11.73	2.60	146.41	**343.72**	**401.18**	**197.31**	**254.77**
4 (100% N)	3	112.89	29.90	12.42	3.29	187.77	**434.94**	**507.65**	**247.17**	**319.88**

[1] At 11% recoverable sugar of the cane yield.

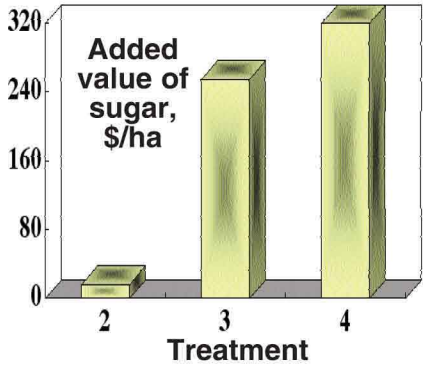
[2] Sugar values are $132.20/ton (for $0.06/lb) and $154.30/ton (for $0.07/lb).

Added Value of Sugar from Vitazyme Use

At $0.06/lb



At $0.07/lb



Treatment	Extra cost per dollar of added sugar ... at $0.06/lb	at $0.07/lb
	$/lb	$/lb
1 (no N)	—	—
2 (100% N)	0.92	0.79
3 (50% N)	0.43	0.37
4 (100% N)	0.43	0.37

Treatments 3 and 4 both gave excellent returns on investment, with only $0.43/lb extra cost per dollar of added sugar (at $0.06/lb), and $0.37 extra cost per dollar of added sugar (at $0.07/lb). Treatment 3 was especially of interest because it received only 50% of the recommended nitrogen along with

Vitazyme, but still produced added returns as high as did the 100% nitrogen plus Vitazyme treatment. *Conclusions*: **In this Cuban sugar cane trial, Vitazyme applied three times during the growing season substantially and significantly improved the growth, cane yield, and sugar yield versus both the no N control and the 100% N control.** The sugar yield was improved by a highly significant 35% above the 100% N level with Vitazyme applied at the same N level. **Only 50% N + Vitazyme also increased yield above the 100% N, by 23%, showing how effective both Vitazyme + standard fertilization, and Vitazyme along with reduced fertilizer, are in promoting more profitable sugar production in Cuba on haplustert or calcaric-eutric vertisol soils, for a ratoon sugar cane crop.**

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2004 Crop Results

Vitazyme on Sugar Cane

Researcher: Dr. Isel Creach *Location*: Santiago de Cuba, Cuba *Variety*: C86-12
Type: new planting *Soil type*: Haplustert *Row spacing*: 1.6 meters
Experimental design: A sugar cane trial having four replicates in a Latin rectangle of 64 m^2 was established to evaluate the growth and yield of this crop in response to various Vitazyme applications. Fertility was used as recommended for newly planted cane. Twelve treatments were used.

	Vitazyme			
Treatment	**Rate**	**Applications**	**Cumulative dosage**	**Placement**
	l/ha		l/ha	
1	0	0	0	—
2	0.5	3	1.5	broadcast
3	0.5	3	1.5	band
4	0.5	5	2.5	broadcast
5	0.5	5	2.5	band
6	1	3	3	broadcast
7	1	3	3	band
8	1	5	5	broadcast
9	1	5	5	band
10	1% + 1*	2	soak + 2	broadcast
11	2.5% +1*	2	soak + 2	broadcast
12	5% + 1*	2	soak + 2	broadcast

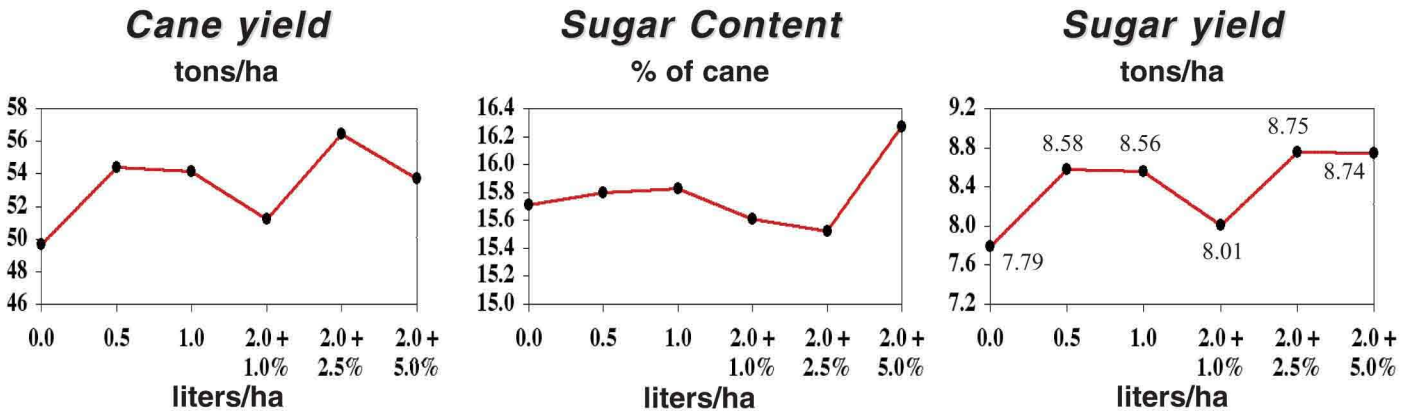
*Cane sets were soaked in the indicated solutions (v/v) for 5 minutes before planting.

Fertilization: None was needed in the plant cane cycle investigated, and in the soil type utilized, as recommended in Cuba for newly planted cane.
Vitazyme application: 1 liter/ha (13 oz/acre) monthly from planting
Individual treatment growth and yield results: The results for individual treatments for both growth and yield parameters showed that Vitazyme treatments, in all but one case, exceeded the control. Highest treatment values for sugar yield were as follows:

Treatment	Cane yield	Sugar yield	Sugar increase vs. control
	tons/ha	tons/ha	tons/ha
6	58.31 (+18%)	9.25	1.46 (+19%)
8	57.81 (+17%)	9.13	1.34 (+17%)
5	55.79 (+12%)	9.00	1.21 (+16%)
3	57.22 (+15%)	8.79	1.00 (+13%)
11	56.44 (+14%)	8.75	0.96 (+12%)

Growth and yield trends: An analysis was made of growth and yield parameters to display the trends of these parameters in this study.

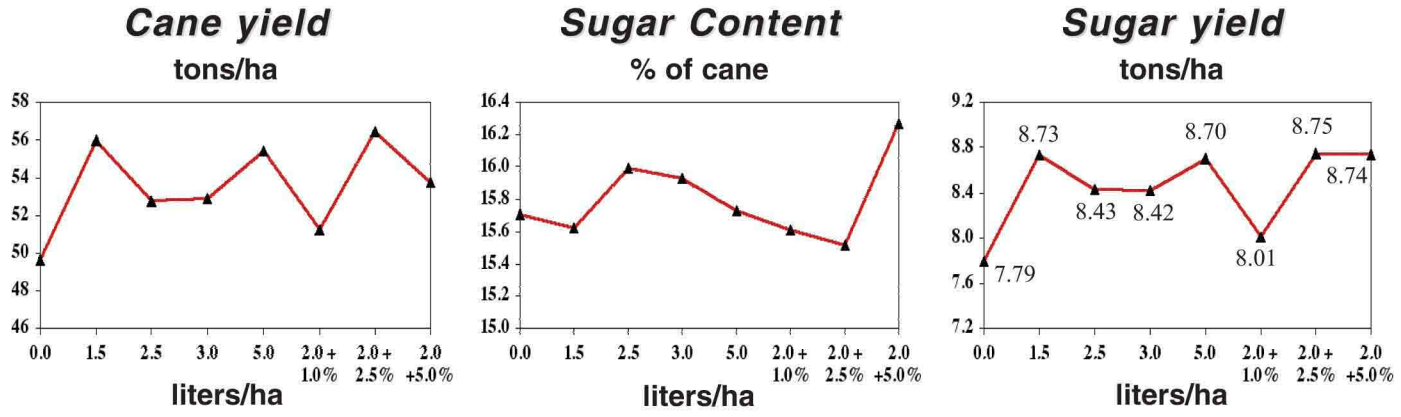
Rate of Vitazyme



Vitazyme in all cases raised cane and sugar yields, Both the 2.5 and 5.0% soaks plus two applications gave the best sugar increases.

- Sugar yield increase at 0.5 liter/ha — 0.79 ton/ha (+10%)
- Sugar yield increase at 1.0 liter/ha — 0.77 ton/ha (+10%)
- Sugar yield increase at 2 liters/ha + a 1.0% soak — 0.22 ton/ha (+3%)
- Sugar yield increase at 2 liters/ha + a 2.5% soak — 0.96 ton/ha (+12%)
- Sugar yield increase at 2 liters/ha + a 5.0% soak — 0.95 ton/ha (+12%)

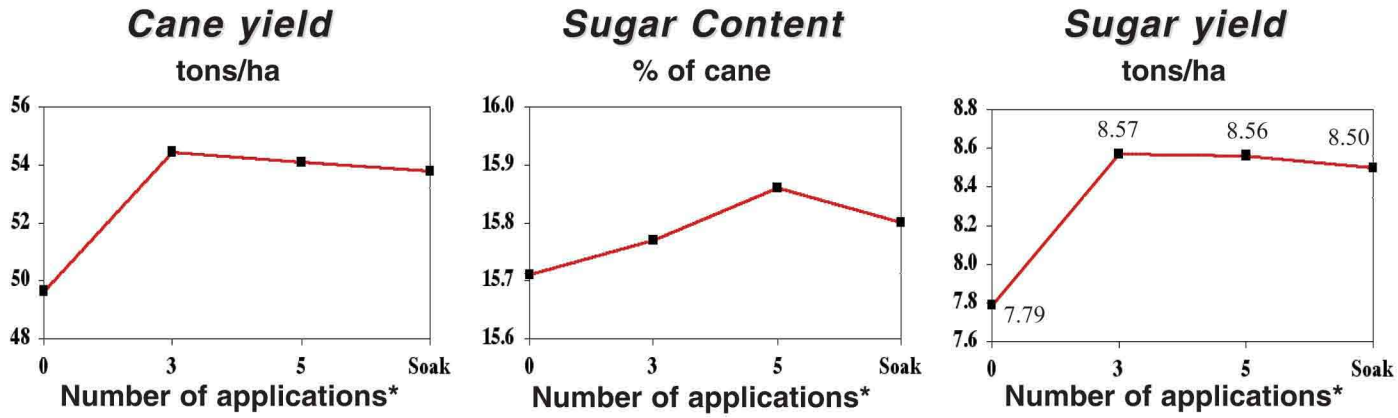
Cumulative Vitazyme Application



All Vitazyme cumulative applications increased sugar and cane yields, the highest increases being for 1.5, 5, and 2 liters/ha (with 2.5 and 5.0% soaks). Sugar content of the cane was affected little except for the 2 liter/ha + 5.0% soak, which boosted sugar to 16.27% of the cane.

- Sugar yield increase at 1.5 liters/ha — 0.94 ton/ha (+12%)
- Sugar yield increase at 2.5 liters/ha — 0.64 ton/ha (+8%)
- Sugar yield increase at 3 liters/ha — 0.63 ton/ha (+8%)
- Sugar yield increase at 5 liters/ha — 0.91 ton/ha (+12%)
- Sugar yield increase at 2 liters/ha + a 1.0% soak — 0.22 ton/ha (+3%)
- Sugar yield increase at 2 liters/ha + a 2.5% soak — 0.96 ton/ha (+12%)
- Sugar yield increase at 2 liters/ha + a 5.0% soak — 0.95 ton/ha (+12%)

Number of Vitazyme Applications



* The soak had two applications as well.

Vitazyme in every case increased cane yield and sugar yield. The sugar increase was uniform for all three applications, as was the sugar content of the cane.

- Sugar yield increase with three applications — 0.78 ton/ha (+10%)
- Sugar yield increase with five applications — 0.77 ton/ha (+10%)
- Sugar yield increase with a seed piece soak plus two applications — 0.71 ton/ha (+9%)

Economic calculations by the Cuban researchers: Six treatments, including the control, were evaluated for income using two sugar prices. The five Vitazyme treatments used in these calculations are those listed previously.

Treatment	Cumulative Vitazyme rate	Cane yield[1]	Increased cane yield	Sugar yield[2]	Sugar increase	Extra cost of production	Added value of sugar at[3] ...		Added income of sugar at ...	
							$0.06/lb	$0.07/lb	$0.06/lb	$0.07/lb
	l/ha	t/ha	t/ha	t/ha	t/ha	$/ha	$/ha	$/ha	$/ha	$/ha
1	0	49.64b	—	6.23	—	—	—	—	—	—
6	3	58.31a	8.67	7.40	1.17	66.35	**154.67**	**180.53**	**88.32**	**114.18**
8	5	57.81a	8.17	7.30	1.07	88.60	**141.45**	**165.10**	**52.85**	**76.50**
5	2.5	55.79ab	6.15	7.20	0.97	61.53	**128.23**	**149.67**	**66.70**	**88.14**
3	1.5	57.22a	7.58	7.03	0.80	50.53	**105.76**	**123.44**	**55.23**	**72.91**
11	4.5	56.44ab	6.80	7.00	0.77	75.80	**101.79**	**118.81**	**25.99**	**43.01**

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

[2] Sugar yield = Cane yield x % Sugar x 0.80.

[3] Sugar values are $132.20/ton (for $0.06/lb) and $154.30/ton (for $0.07/lb).

Treatment	Extra cost per dollar of added sugar ...	
	at $0.06/lb	at $0.07/lb
	$/lb	$/lb
1	—	—
6	0.43	0.37
8	0.63	0.54
5	0.48	0.41
3	0.48	0.41
11	0.74	0.64

Conclusions: In this Cuban sugar cane study in a new planting, Vitazyme increased the total sugar yield by about 10% for all treatments versus the untreated control. The best overall treatments appeared to be three broadcast applications (1 liter/ha), five broadcast applications (1 liter/ha), and five banded foliar applications (0.5 liter/ha). These were followed closely by the 2.5 or 5.0% five-minute seed piece soaks plus two Vitazyme applications. The most cost-effective treatment is the three broadcast 1 liter/ha foliar applications. Vitazyme is seen to be a very good supplement for improving the growth and yield of newly planted sugar cane in Cuba.

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2004 Crop Results

Vitazyme on Sugar Cane

Researcher: Eng. Martin Morales *Location*: Holguin, Cuba *Variety*: C323-68
Type: ratoon *Soil type*: Calciustert

Experimental design: A Latin rectangle design with four replicates, on 64 m^2, was prepared to evaluate the effect of Vitazyme, in various application rates and times, with full and reduced fertility levels, on the growth and yield of sugar cane. The twelve treatments are listed below

1. Control **2. Vitazyme**

Treatment	Vitazyme				Fertilizer
	Rate	Applications	Cumulative dosage	Placement	
	l/ha	number	l/ha		% of recommended
1	0	0	0	—	0
2	0	0	0	—	100
3	1	3	3	broadcast	100
4	1	3	3	band	100
5	0.5	3	1.5	band	100
6	1	3	3	broadcast	75
7	0.5	5	2.5	band	100
8	0.5	5	2.5	band	75
9	0.5	5	2.5	band	50
10	1	5	5	broadcast	100
11	1	5	5	broadcast	75
12	1	5	5	broadcast	50

Fertilization: 100% recommendation: 130 kg/ha N and 176 kg/ha P_2O_5/acre
Vitazyme applications: See the table above. Timing of the applications was monthly after the last harvest.
Individual treatment growth and yield results: Growth and yield results were inconsistent. Nevertheless the highest yielding individual treatments were as follows:

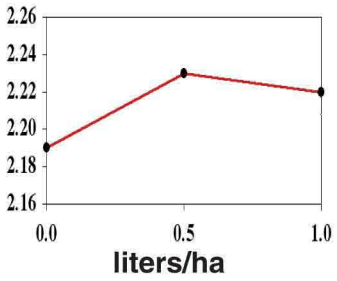
Treatment	Cane yield	Cane yield increase vs. ...		Sugar yield	Cane yield increase vs. ...	
		No fertilizer	100% fertilizer		No fertilizer	100% fertilizer
	tons/ha	tons/ha	tons/ha	tons/ha	tons/ha	tons/ha
10	78.43	25.0 (+47%)	12.5 (+19%)	12.06	4.60 (+62%)	2.33 (+24%)
4	75.16	21.7 (+41%)	9.2 (+14%)	11.30	3.84 (+52%)	1.57 (+16%)
7	76.47	23.0 (+43%)	10.5 (+16%)	10.95	3.49 (+47%)	1.22 (+13%)
3	65.67	12.2 (+23%)	—	9.67	2.21 (+30%)	—

Growth and yield trends: An analysis was made of the various growth and yield parameters to show the trends of these parameters under the conditions of this study. Both Vitazyme and the fertilizer were evaluated.

Rate of Vitazyme

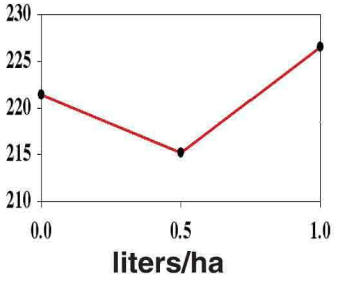
Stalk Diameter

cm



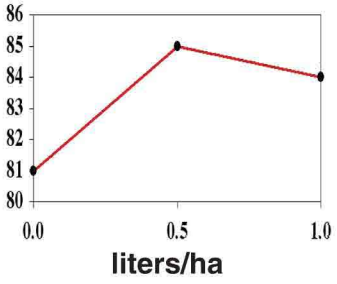
Stalk Length

cm



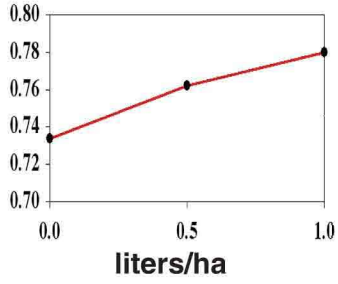
Stalk Population

1000x/ha



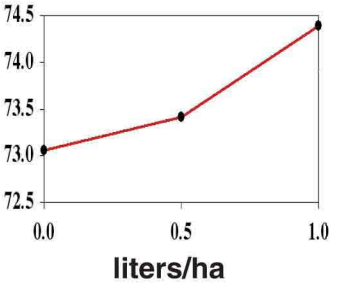
Stalk Weight

kg



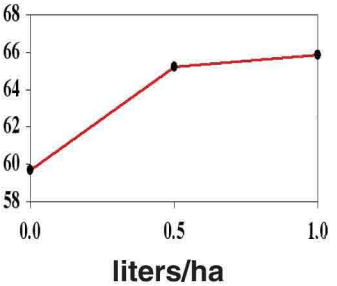
Juice Purity

%



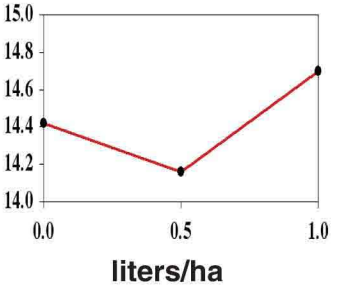
Cane Yield

tons/ha



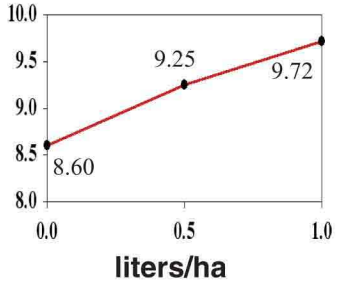
Sugar Content

% of cane



Sugar Yield

tons/ha



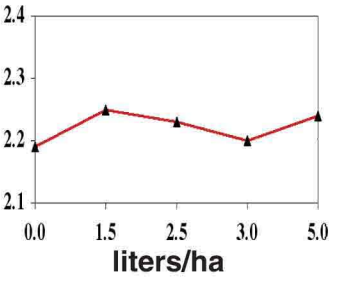
There is a trend for increasing rates of Vitazyme to improve all parameters, especially the all-important sugar yield component.

- **Sugar yield increase at 0.5 liter/ha — 0.65 ton/ha (+8%)**
- **Sugar yield increase at 1.0 liter/ha — 1.12 ton/ha (+13%)**

Cumulative Vitazyme Application

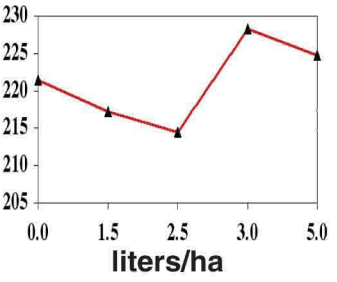
Stalk Diameter

cm



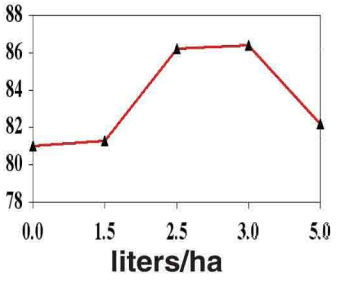
Stalk Length

cm



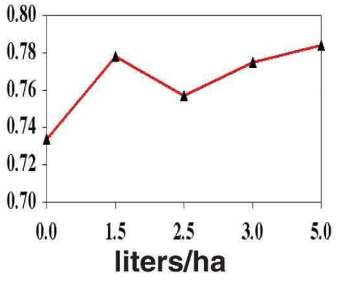
Stalk Population

1000x/ha



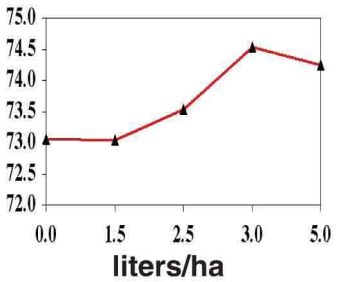
Stalk Weight

kg



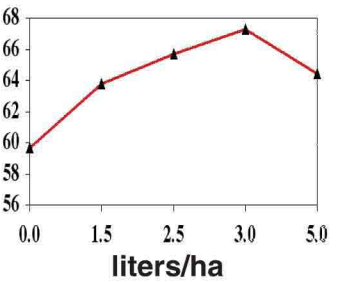
Juice Purity

%



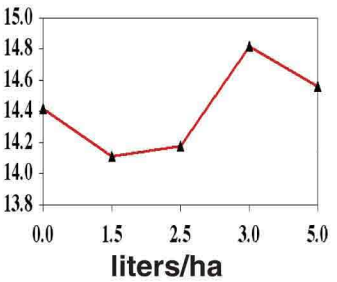
Cane Yield

tons/ha



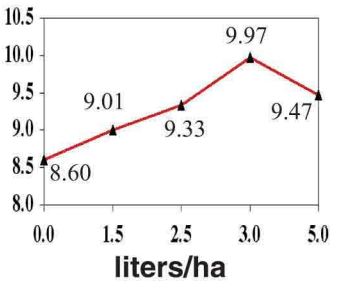
Sugar Content

% of cane



Sugar Yield

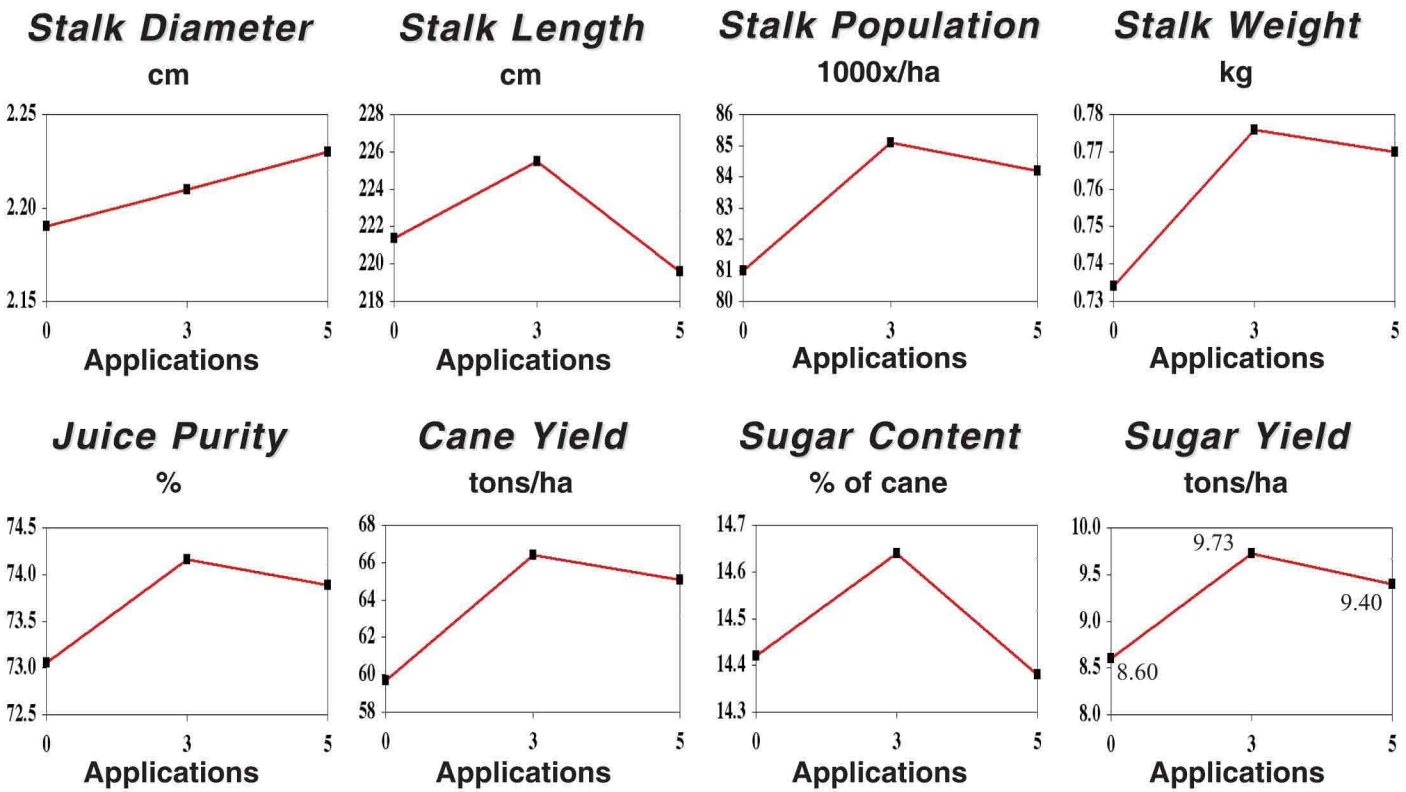
tons/ha



The trend of the total Vitazyme applications is for, in most cases, the growth parameter to increase with the rate but then drop off at the highest rate of Vitazyme (5 liters/ha). The exceptions are stalk diameter and stalk weight. Yields of cane and sugar yield, as well as percent sugar in the cane, are all highest for the 3 liters/ha total application, but drop off for the 5 liters/ha application. These data confirm that at the 5 liter total application some of the active agents in Vitazyme are oversaturating enzyme systems in the plant, and the 3 liter total amount is sufficient for optimum plant activity.

- **Sugar yield increase at 1.5 liters/ha — 0.41 tons/ha (+5%)**
- **Sugar yield increase at 2.5 liters/ha — 0.71 ton/ha (+8%)**
- **Sugar yield increase at 3 liters/ha — 1.37 tons/ha (+16%)**
- **Sugar yield increase at 5 liters/ha — 0.87 ton/ha (+10%)**

Number of Vitazyme Applications

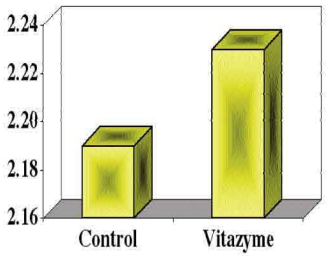


A similar trend appears with the number of applications of Vitazyme as with the cumulative level of product application ... since more applications usually mean more total product applied. Three applications for all but one parameter produced the greatest growth and yield response, indicating that enzyme systems were being saturated after that optimum level.

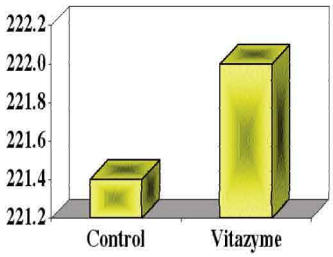
- **Sugar yield increase with three applications — 1.13 tons/ha (+13%)**
- **Sugar yield increase with five applications — 0.80 ton/ha (+9%)**

Overall Vitazyme Effects

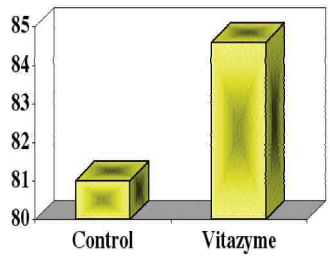
Stalk Diameter
cm



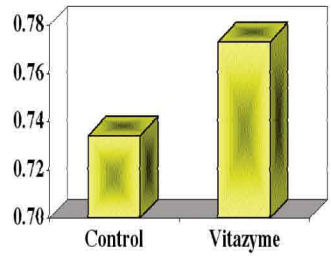
Stalk Length
cm



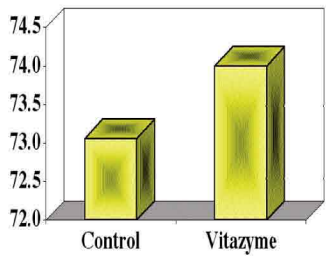
Stalk Population
1000x/ha



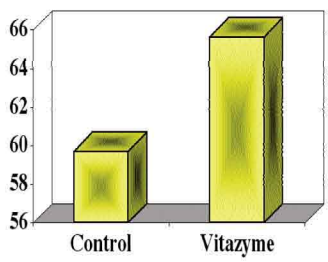
Stalk Weight
kg



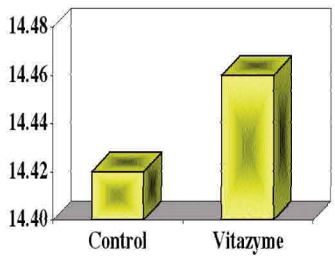
Juice Purity
%



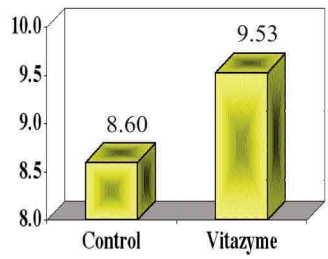
Cane Yield
tons/ha



Sugar Content
% of cane



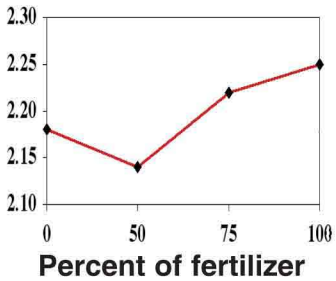
Sugar Yield
tons/ha



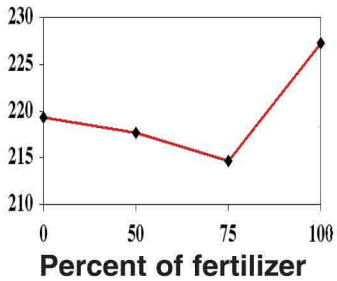
For every parameter Vitazyme increased plant performance, sometimes quite a lot. **The overall effect to increase sugar yield was 0.93 ton/ha, an increase of 11%.** Note that the "control" is the mean of the nonfertilized and 100% fertilized controls; a breakdown of overall sugar yield increases are 2.07 tons/ha (+28%) and -0.20 ton/ha (-0.2%), respectively, the latter almost equal to the 100% fertilized control.

Percent of Recommended Fertilizer

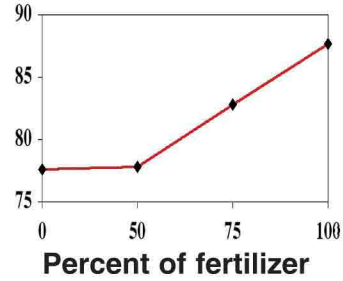
Stalk Diameter
cm



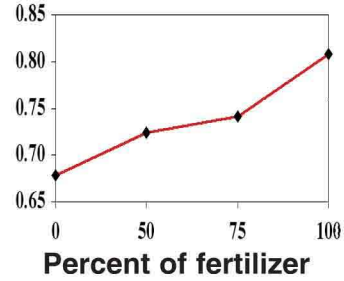
Stalk Length
cm



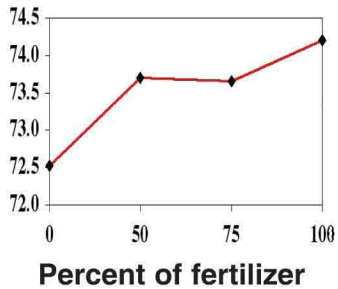
Stalk Population
1000x/ha



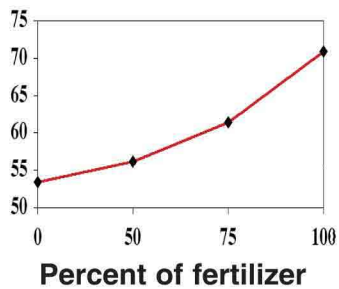
Stalk Weight
kg



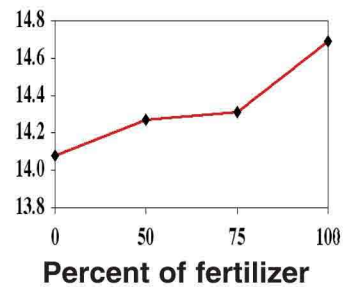
Juice Purity
%



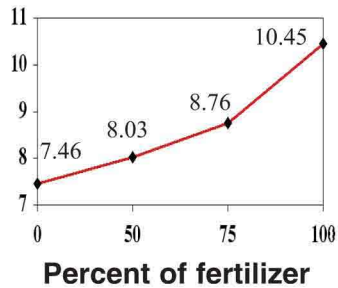
Cane Yield
tons/ha



Sugar Content
% of cane



Sugar Yield
tons/ha



As fertilizer rates increased in this sugar cane study, the growth and yield parameters in most cases increased. This was especially true for the final sugar yield, which rose in a relatively straight-line fashion as the fertilizer rate increased.

Economic calculations by the Cuban researchers: Three Vitazyme treatments, plus two control treatments, were evaluated for income using two sugar prices. The five treatments are 1, 2, 4, 7, and 10.

Treatment	Cumulative Vitazyme rate	Cane yield[1]	Increased cane yield	Sugar yield[2]	Sugar increase	Extra cost of production	Added value of sugar at[3] ...		Added income of sugar at ...	
							$0.06/lb	$0.07/lb	$0.06/lb	$0.07/lb
	l/ha	t/ha	t/ha	t/ha	t/ha	$/ha	$/ha	$/ha	$/ha	$/ha
1 (no N)	0	53.43b	—	5.97	—	—	—	—	—	—
2 (100% N)	0	65.94ab	12.51	7.78	1.81	203.75	**239.28**	**279.28**	**35.53**	**75.53**
10 (100% N)	5	78.43a	25.00	9.61	3.63	307.50	**481.21**	**561.65**	**173.71**	**254.15**
4 (100% N)	3	75.16ab	21.73	9.04	3.07	271.95	**405.85**	**473.70**	**133.90**	**201.75**
7 (100%N)	2.5	76.47ab	23.04	8.76	2.79	280.50	**368.84**	**430.50**	**88.34**	**150.00**

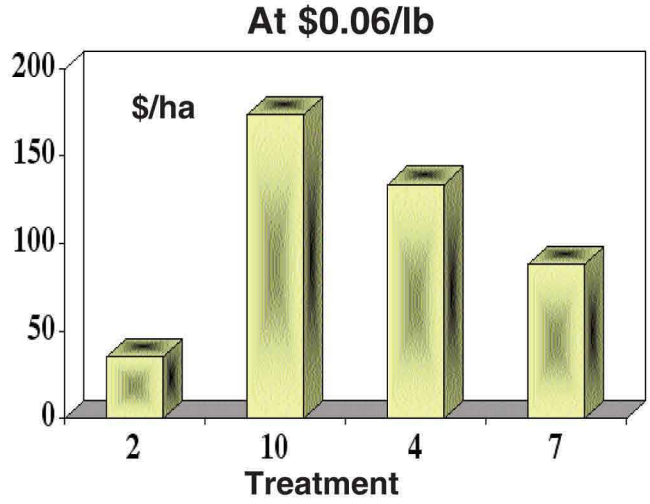
[1] Means followed by the same letter are not significantly different at P=0.05 according to Duncan's Multiple Range Test.

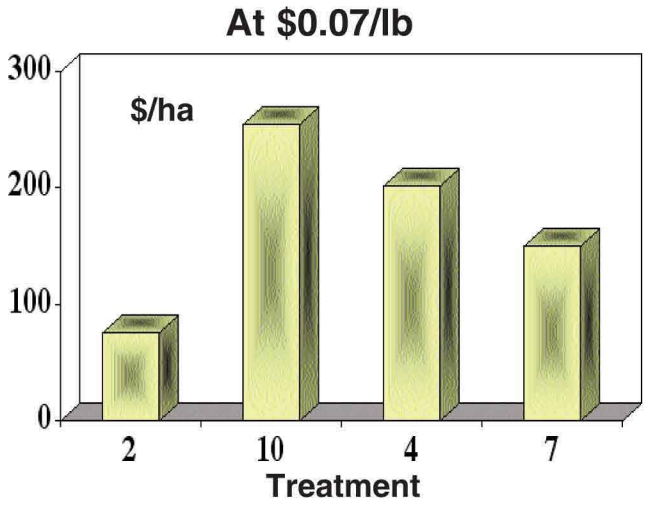
[2] Sugar yield=Cane yield x % Sugar x 0.80.

[3] Sugar values are $132.20/ton (for $0.06/lb) and $154.30/ton (for $0.07/lb).

Treatment	Extra cost per dollar of added sugar ...	
	at $0.06/lb	at $0.07/lb
	$/lb	$/lb
1 (no N)	—	—
2 (100% N)	0.85	0.73
10 (100% N)	0.64	0.55
4 (100% N)	0.67	0.57
7 (100%N)	0.76	0.65

Added Value of Sugar from Vitazyme Use





Treatments 10 and 4 gave the best overall return on investment, with only $0.64 to $0.67 extra cost per dollar of added sugar (at $0.06), and $0.55 to $0.57 extra cost per per dollar of added sugar (at $0.07),

Conclusions: In this 12-treatment sugar cane study in Cuba, **Vitazyme provided excellent growth and yield responses** despite the fact that there was considerable variation in the data. Growth parameters such as stalk diameter and length, stalk population, and stalk weight, as well as juice purity, sugar content, and cane and sugar yields increased with Vitazyme until 3 liters/ha cumulative rate for three total applications. Higher applications apparently oversaturated enzyme systems and began creating inhibitions. Fertilizer rates increased yields and growth parameters linearly as rates increased. Vitazyme treatments increased sugar yields by 2.07 tons/ha (28%) over the unfertilized control, and was practically equal to the 100% fertilizer recommendation control. The best individual Vitazyme treatments were five broadcast applications, three band applications, or three broadcast applications at 1 liter/ha each application, or five band applications at 0.5 liter/ha each time, along with 100% fertilization.

This study reveals **the considerable ability that Vitazyme has to improve Cuban sugar production on black plastic Calciustert or Vertisol soils in a ratoon crop cycle.**