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

2012 Crop Results

Vitazyme on Tobacco

Two Sites in Guatemala

Researchers: Roberto Garcia and Eng. Cristhian Mazariegos of Foragro, Guatemala City, Guatemala; Eng. Gustavo Portillo, Head of Plant Protection, Casa Export Tobacco Company, Guatemala
Location: San Jose (km 133), Teculutan for the Jose Illescas site; San Augustin Acasaguastlan (km 145.5) for the Carlos Barrientos site *Plant spacing*: 1.2 m (38 in) between rows, 3.5 cm (13 in) in rows
Variety: NC7 *Soil type*: silty clay *Planting date*: September 30, 2011 (Illescas site); November 1, 2011 (Barrientos site) *Climate*: temperature, 27 to 38°C; relative humidity, 66% (ave.); meters above sea level, 235 (Illescas site), and 255 (Barrientos site)
Experimental design: For both trials, plots had side-by-side Vitazyme and control areas, each of 1.0 manzana (0.7 ha). The objective of the trial was to determine the yield and quality of tobacco produced by Vitazyme and untreated areas.

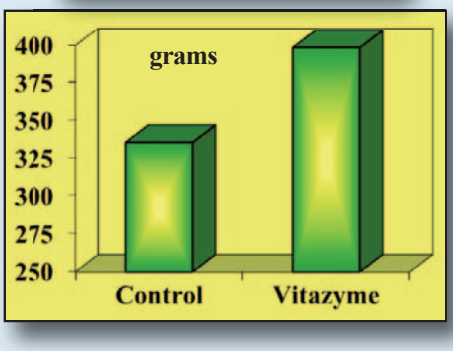
1. Control **2. Vitazyme**

Fertilization: unknown
Vitazyme application: (1) transplant drench 2 days before transplanting (700 ml in 30 liters of water, or 2.3%), in a pool having 21,000 tobacco seedlings, with 90 trays to transplant into 1 manzana (0.7 ha); applied with a watering can; (2) foliar spray of 1.0 liter/ha with a backpack sprayer 21 days after transplanting; (3) foliar spray at 1.0 liter/ha 42 days after planting
Plant and yield results: Four samplings were made of five contiguous plants for each plot during the growing season. Harvesting was completed for both trials on february 15, 2012.

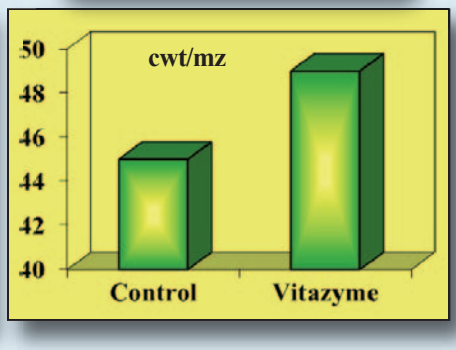
Jose Antonio Illescas Site

Treatment	Leaf chlorophyll	Root weight, fresh	Plant height	Yield
	color	grams	meters	cwt/mz
Control	pale green	335.6	1.94	45
Vitazyme	dark green	398.5 (+19%)	1.95 (+1%)	49 (+9%)

Root Weight



Leaf Yield



Other data showed increases in leaf area and thickness with Vitazyme.

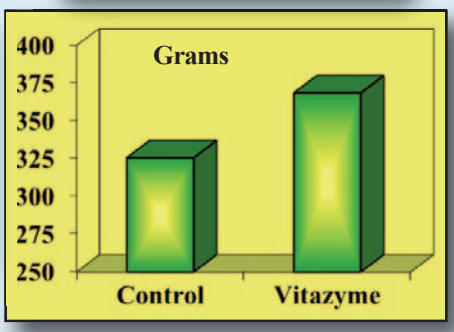
Vitazyme increased both root and leaf weights at this site, by 19% and 9%, respectively. Plant height was not affected, but treated plants were much darker green, indicating more chlorophyll with Vitazyme application.

Carlos Rolando Barrientos

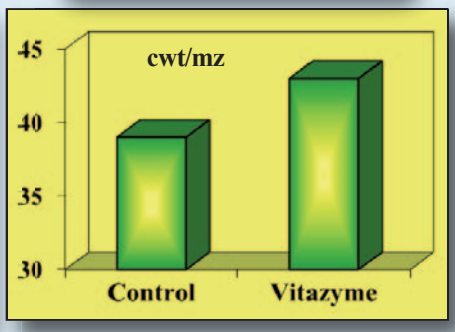
Treatment	Leaf chlorophyll	Root weight, fresh	Plant height	Yield
	color	grams	meters	cwt/mz
Control	pale green	325.6	1.94	39
Vitazyme	dark green	368.5 (+13%)	2.05 (+6%)	43 (+10%)

Other data showed increases in leaf area and thickness with Vitazyme.

Root Weight



Leaf Yield



As at the Jose Illescas site, both the root weight and leaf yield were increased with Vitazyme, by 13% and 10%, respectively. In addition, leaf length was increased by 6%.

Foliar analysis results: Leaves from one of the sites were harvested and analyzed for nutrients.

Treatment	N	P	K	Ca	Mg	S	B	Cu	Fe	Mn	Zn
	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
Control	3.56	0.42	5.00	3.03	0.57	3075	42.5	20.2	158.5	57.0	64.5
Vitazyme	3.19	0.37	4.37	2.55	0.47	2930	39.1	18.8	219.5	50.5	46.9

The nutrient composition of the control leaves was highest, but this did not improve tobacco quality above the Vitazyme treated leaves.

Conclusions: A study on tobacco at two farms in Guatemala compared Vitazyme treatment with an untreated control. The conclusions of the researchers is as follows:

"1. The biological efficacy of Vitazyme in increasing leaf blade size and thickness, as well as coloring of tobacco curing, as compared to the untreated controls, was demonstrated.
2. Tobacco plant root growth was greater, with more weight and volume of secondary and adventitious

roots in the Vitazyme treatments.

3. Leaf analysis did not indicate damage to the quality of the leaves by the use of Vitazyme.
4. Higher yields of tobacco per unit area rendered production increases of 4 cwt (hundred weight) per manzana (0.7 ha), or 0.45 tons/ha (9 to 10%, according to trials) in the Vitazyme treatment compared with the untreated control....

   The application of Vitazyme in tobacco crops, by carrying out three applications during the [growth] cycle, the first as a drench at transplanting, and the second and third by foliar sprays at 3 and 6 weeks after planting, all at a rate of 0.7 liter/manzana (1.0 liter/ha), is recommended."

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2006 Crop Results

Vitazyme on Tobacco

Researcher: Lisette Monzon Herrera
Research Organization: Tobacco Research Institute (TABACUBA), Cuba
Location: near Havana, Cuba
Experimental design: A tobacco study was designed to test the ability of Vitazyme to improve tobacco production, fertilizer utilization, seed germination, seedling production, and tobacco quality under Cuban technology and growing conditions. The phases of the study are discussed below.

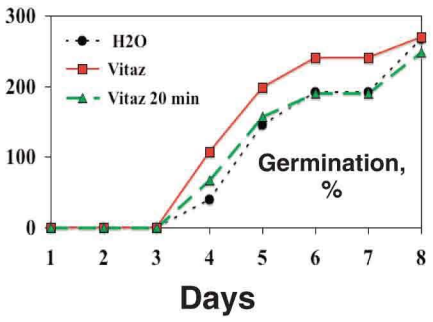
Stimulation of Germination

Seeds of Criollo 98, Habana 2000, GAA-955 cultivars were placed in Petri dishes (100 per dish), with three reps per cultivar. The temperature was maintained at 28°C, and germination was measured at 7 and 14 days.

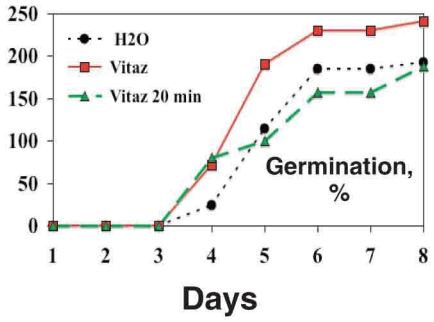
Treatments

1 — seeds were soaked in distilled water in the Petri dish
2 — seeds were soaked in a 5% Vitazyme solution in the Petri dish
3 — seeds were pre-soaked for 20 minutes in a 5% Vitazyme solution, then placed in distilled water in the Petri dish

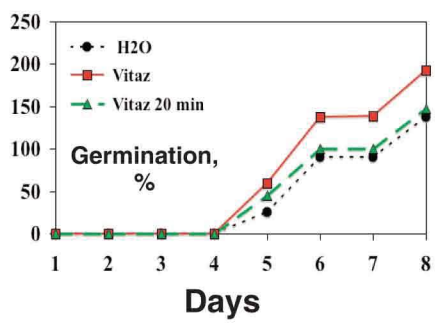
Habana 2000



Criollo 98



GAA-955



Germination increase with Vitazyme at 8 days

Habana 2000 ..... 2%
Criollo 98 ..... 19%
GAA-955 ..... 38%

In all three varieties, 5% Vitazyme added to the Petri dishes increased seed germination, though not significantly. The pre-soaked seeds increased final germination percentage for only the GAA-955 cultivar. The great increase in germination with the poorly germinating GAA-955 cultivar was especially noteworthy.

Seedling Production Floating Trays

A floating tray seedbed area was devised with the Criollo 98 cultivar, using four replications. The substrate was composed of 70% black peat, 25% rice hulls, and 5% zeolite plus a 20-8-20% N-P_2O_5-K_2O fertilizer. Vitazyme was sprayed on the seedlings and mats as a 2% solution at planting.

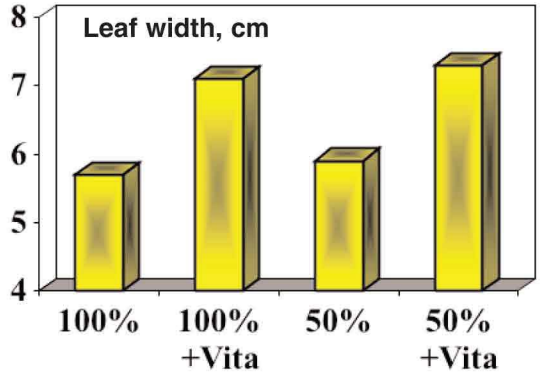
Treatments

1 – 100% fertilizer
2 – 100% fertilizer + Vitazyme
3 – 50% fertilizer
4 – 50% fertilizer + Vitazyme

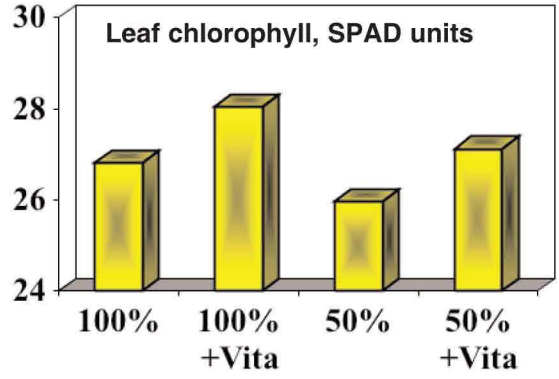
Treatment	Leaf length[1]	Change	Leaf width[2]	Change	Height	Change	Chlorophyll[3]	Change	Transplant quality
	cm	cm	cm	cm	cm	cm	SPAD units	SPAD units	
1 (100% fert)	5.7 b	—	3.79 b	—	14.28 a	—	26.81 b	—	4.5 a
2 (100% fert + Vita)	7.1 a	1.4 (+25%)	4.18 a	0.39 (+10%)	14.56 a	0.28 (+2%)	28.04 a	(+) 1.23	4.4 a
3 (50% fert)	5.9 b	—	3.85 b	—	14.22 a	—	25.96 b	—	3.8 b
4 (50% fert + Vita)	7.3 a	1.4 (+24%)	4.28 a	0.43 (+11%)	13.89 a	0.33 (-2%)	27.12 a	(+) 1.16	4.1 a

[1]Measurement from the largest leaf.
[2]Measurement of width from the longest leaf.
[3]A Minolta SPAD chlorophyll meter was used.

Leaf Length



Leaf Chlorophyll



Increase in leaf length with Vitazyme (100% fertilizer): 25%
Increase in leaf length with Vitazyme (50% fertilizer): 24%

Increase in leaf chlorophyll with Vitazyme: 1.16 to 1.23 SPAD units

Vitazyme increased overall leaf growth and photosynthesis in the floating trays at both the 100% and 50% fertilizer levels. These changes were especially helpful to produce higher quality transplants at the 50% fertilizer rate.

Covered Tobacco Production

Two large plots under greenhouse plastic cover, one with 100% fertilizer and the other with 50% fertilizer, were divided into four treatments and three replications in a randomized complete block design. Vitazyme was applied by dipping seedling roots (variety Criollo 98) in a 2% solution at transplanting, and by spraying the plants 25 days later.

Treatments

100% fertilizer

1 – Control
2 – Vitazyme at transplanting and 25 days
3 – Vitazyme at transplanting
4 – Vitazyme at 25 days

50% fertilizer

1 – Control
2 – Vitazyme at transplanting and 25 days
3 – Vitazyme at transplanting
4 – Vitazyme at 25 days

Leaf Wifth, cm

Treatment	Leaf grade				
	CG	CF	CL	UM	LP
50% fertilizer:					
1 (Control)	22 c	25 c	25 c	29 b	24 c
2 (Vita 2x)	24 ab	25 c	28 ab	30 ab	27 b
3 (Vita planting)	25 ab	25 c	26 bc	28.5 b	25.5 c
4 (Vita 25 days)	25 ab	27 bc	27 b	31 a	26 bc
100% fertilizer:					
1 (Control)	26 a	28 ab	27 b	29 b	27 b
2 (Vita 2x)	23.5	27 bc	27 b	29 b	29 a
3 (Vita planting)	26.5 a	30 a	29 a	30 ab	27 b
4 (Vita 25 days)	25.5 ab	27 bc	27 b	30 ab	26 bc

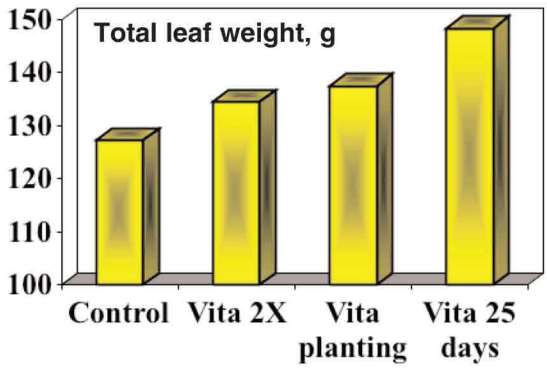
Leaf Length, cm

Treatment	Leaf grade				
	CG	CF	CL	UM	LP
50% fertilizer:					
1 (Control)	42 bc	46 c	48 c	50 a	46 a
2 (Vita 2x)	43 ab	48 bc	51.5 ab	51.5 a	47 a
3 (Vita planting)	43.5 ab	47 c	51 bc	49.0 a	44.5 a
4 (Vita 25 days)	44 ab	49 b	51 bc	52.5 a	44.5 a
100% fertilizer:					
1 (Control)	46 a	51 a	50.5 bc	51.5 a	47 a
2 (Vita 2x)	39 c	49 b	50 bc	52 a	56 a
3 (Vita planting)	47 a	52 a	54 a	51.5 a	45 a
4 (Vita 25 days)	46 a	49 b	49 bc	50.5 a	45.5 a

Fresh Leaf Weight, grams

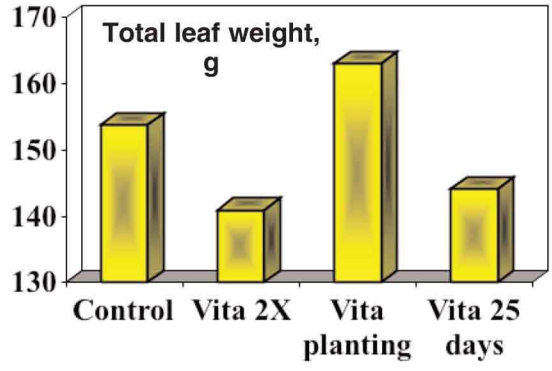
Treatment	Leaf grade					Total
	CG	CF	CL	UM	LP	weight
50% fertilizer:						
1 (Control)	17.3 c	21.15 e	25.8 c	30.9 b	32.2 ab	127.35
2 (Vita 2x)	20.9 bc	23.2 cde	25.8 c	32.2 ab	32.4 a	134.5
3 (Vita planting)	22.95 b	21.45 de	29.3 bc	31.4 b	32.4 a	137.5
4 (Vita 25 days)	21.25 b	25.85 bcd	31.35 abc	38.7 a	31.25 ab	148.4
100% fertilizer:						
1 (Control)	27.05 ab	28.55 ab	33.25 ab	34.45 ab	30.45 ab	153.75
2 (Vita 2x)	21.05 ab	25.9 bcde	29.85 abc	35.55 ab	28.6 b	140.95
3 (Vita planting)	28.10 a	32.25 a	33.90 a	35.45 ab	33.35 a	163.05
4 (Vita 25 days)	22.65 b	26.5 bc	28.05 bc	37.55 ab	29.4 ab	144.15

50% Fertilizer



Increase in leaf weight (25 days): +17%

100% Fertilizer



Increase in leaf weight (planting): +6%

For plant height and stalk diameter only one significant difference appeared, so that data is not included in this report. However, heights were slightly greater for the 50% fertilizer treatments than for the 100% treatments. Stalk diameters were about the same for both fertilizer levels and for all treatments within each level.

Tobacco Smoking Qualities

Parameter	Effect of the three Vitazyme treatments
Leaf elasticity	Maintained between good and acceptable for all treatments
Color	Acceptable for all treatments
Ash quality	Acceptable for all treatments
Combusion quality	Normal for all treatments

In general, the best tobacco quality was noted with the 50% fertilizer level plus Vitazyme, and in particular with Vitazyme applied 25 days after transplanting.

Conclusions from the Cuban researcher:

- The product Vitazyme can be used as a germination booster in seeds of low germination percentage.
- With the use of Vitazyme mineral fertilization can be reduced up to 50%, in tobacco seedling production, without affecting seedling quality. The 50% mineral fertilization reduction represents a saving of $548.00 USD for each 1.9 ha, using 1 liter of Vitazyme.
- The performance of the variables after a 50% reduction in fertilization was quite close to that of 100% fertilization, and consequently we consider that a reduction to 75% of normal fertilization combined with Vitazyme application could yield the best results.
- The results of the leaf quality analyses were excellent for the 50% fertilization combined with Vitazyme application at 25 days after transplanting treatment, in covered tobacco production.