

Dry Beans *Recovery from Hail Damage*

Researchers: Agustin Peralta, Modesto Sánchez, and Israel Calva

Farmer: Modesto Sánchez

Research organization: Quimica Lucava

Location: La Purisima Hidalgo, Municipality of Tochtepec, Puebla, Mexico

Variety: Seminis 8551

Experimental design: A dry bean field that was injured by hail was treated on 70 rows with Vitazyme at 1 liter/ha. The purpose of the study was to evaluate the ability of the product to influence bean yield after hail damage compared to the untreated control.

1 Control 2 Vitazyme

Fertilization: The entire field received a foliar fertilizer treatment.

Vitazyme application: 1 liter/ha sprayed on the leaves on August 22, 2014, at ten days after the hail damage

Growth observation: The Vitazyme treated area produced the following effects compared to the untreated control/area:

- More flowers and pods
- Quicker plant recovery from the hail damage
- Fewer insect pests

Harvest date: October 20, 2014

Yield results:

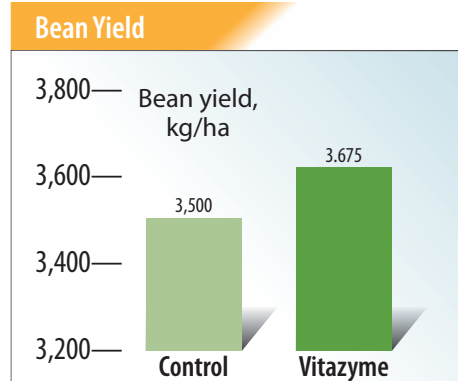
Treatment	Yield kg/ha	Yield change kg/ha
Control	3,500	—
Vitazyme	3,675	175 (+5%)

Increase in bean yield with Vitazyme: 5%

Income results: At a price of 0.60 USD/kg, increase in dry bean income with Vitazyme: 105 USD/ha, with a single, 1 L/ha Vitazyme application (cost 32 USD/ha, including labor) for a net profit of 73 USD/ha.

Increase in bean income with Vitazyme: 105 USD/ha

Conclusion: This dry bean study in Mexico showed that Vitazyme is able to aid in the rapid recovery of bean plants from hail damage. The yield was increased by 5%, with extra income of 105 USD/ha and a net profit of 73 USD/ha with a single application. The plants were less stressed than in the control areas, having more flowers and pods, and fewer insect pests.



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2014 Crop Results

Vitazyme on Dry Beans

Researchers: Pierrot Maei and Valdimir Vincent

Location: Croix des Missions, Haiti

Planting date: unknown

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

Research organization: Acra Industries, Haiti

Variety: Sequia 347-87

1. Control

Fertilization: unknown

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

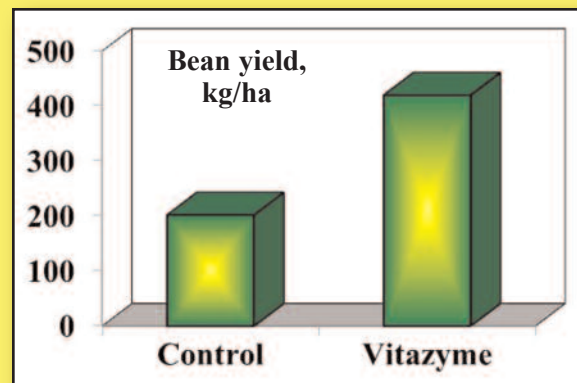
Harvest date: unknown

Yield results:

Treatment	Yield kg/ha	Yield change kg/ha
Control	201.7	—
Vitazyme	419.7	218.0 (+108%)

**Increase in bean yield
with Vitazyme: 108%**

2. Vitazyme



Conclusions: A dry bean study in Haiti revealed a great increase in yield with Vitazyme application, the yield more than doubling in this trial. This program is shown to hold great promise in helping to alleviate food production problems in this developing country.

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2013 Crop Results

Vitazyme on Dry Beans

Researcher: Hermilo Sanchez Sanchez, Ph.D.
of Puebla, San Juan Acateno, Teziutlan, Puebla, Mexico
Soil type: Pellic vertisol (clayey, dark, high fertility)

University location: Autonomous University
Variety: Strike
Planting date: August 13, 2013

Tral location: field at Tepalcingo, Mexico Row spacing: 1.0 meter Seeding rate: 30 kg/ha
Experimental design: A dry bean trial was laid out in a Latin square using four treatments and four replications, with each plot five rows wide (1 meter apart) and 5 meters long (25 m²). The total plot area was 16 plots, or 400 m². The purpose of the trial was to evaluate the effect of two Vitazyme applications on the growth, yield, and quality of dry beans under normal field conditions.

Treatment	Seed treatment ¹	Soil/Foliar treatment ²
	ml/ha on seeds	liters/ha
1. Control	0	0
2. Vitazyme 1	200	0.5
3. Vitazyme 2	250	1.0
4. Vitazyme 3	300	1.5

¹For four plots (100m²), 300g of seed were treated with 2.0, 2.5, and 3.0 ml of Vitazyme along with 3.0, 2.5, and 2.0 ml of water for Treatments 2, 3, and 4, respectively. A total of 5 ml of solution was used for the 300 g of seed in each case.
²For four plots (100 m²), 2 liters of water were sprayed on the plants and soil, mixed with 5, 10, and 15 ml of Vitazyme for Treatments 2, 3, and 4 respectively.

Fertilization: unknown

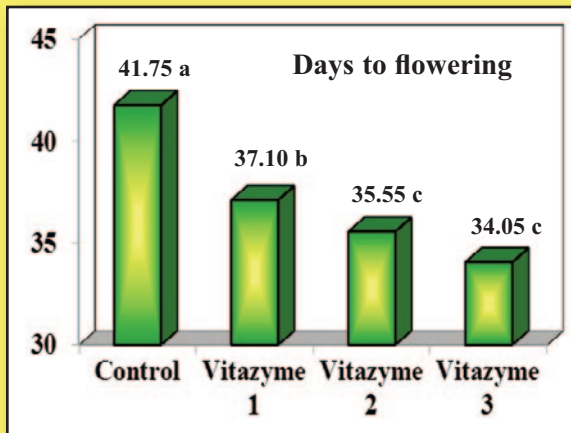
Vitazyme application: Seed treatments were performed by mixing the Vitazyme and water with 300 g of seeds in a plastic bag; then the seeds were dried for 15 to 30 minutes and planted that day or the following day. The soil and foliar sprays were done using a calibrated backpack sprayer, with a 200 liters/ha output.

White fly control: Confidor 350 SC

Rust control: Manzate 80 WP

Statistical evaluations: The Statistical Analysis System (SAS) was used to evaluate treatment means, and the Tukey test (P = 0.05) was used to separate these means. In all of the following data sets, means followed

by the same letter are not significantly different at $P = 0.05$.



Reduction in Days to Flowering

Vitazyme 1	4.65 days
Vitazyme 2	6.20 days
Vitazyme 3	7.70 days

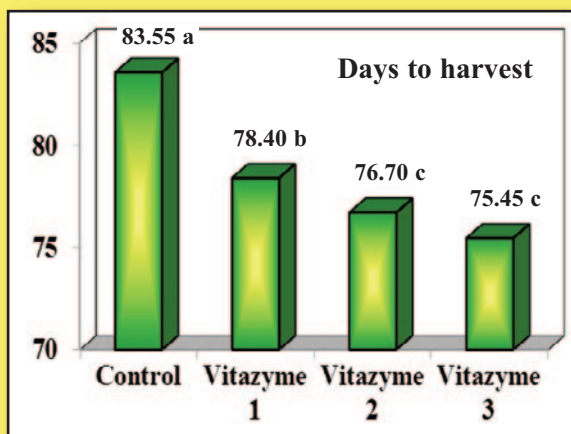
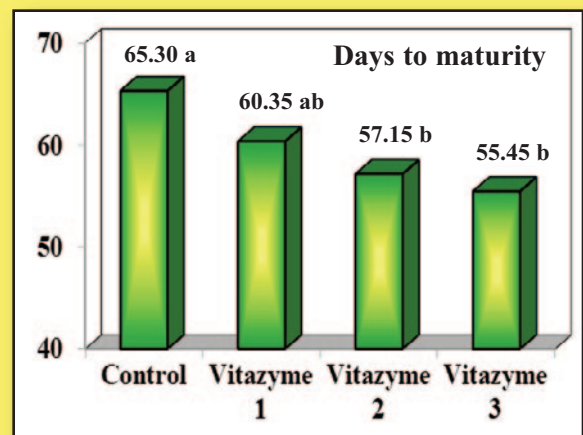
Days to blossom results:

Over a week was cut off from the time from planting to flowering for the highest Vitazyme rate, while both of the other rates reduced flowering time by 4.65 and 6.20 days, all significant reductions.

Reduction in Days to Maturity

Vitazyme 1	4.95 days
Vitazyme 2	8.15 days
Vitazyme 3	7.85 days

Days to maturity results: The number of days to complete pod formation were counted.



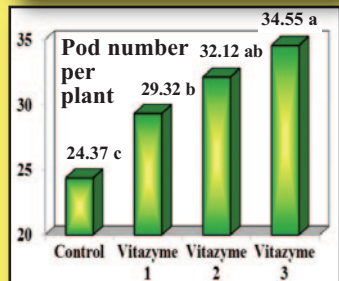
Reduction in Days to Harvest

Vitazyme 1	5.15 days
Vitazyme 2	6.85 days
Vitazyme 3	8.10 days

Nearly 10 days were cut off the time to pod formation for the highest Vitazyme application, while about 5 and 8 days were removed for the lowest and medium rates. The two highest

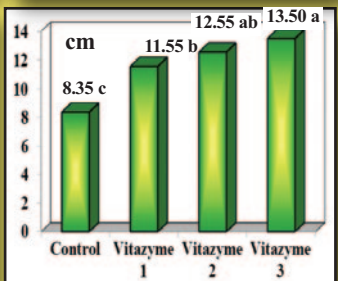
rates were significantly reduced in time to maturity compared to the control.

Pods Per Plant¹



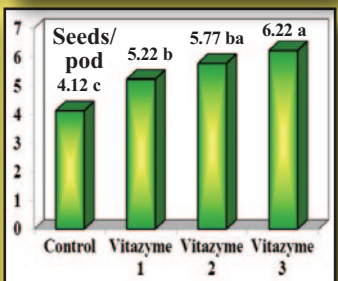
¹Ten random plants from each plot were counted, 20 days after flowering.

Pod Length¹



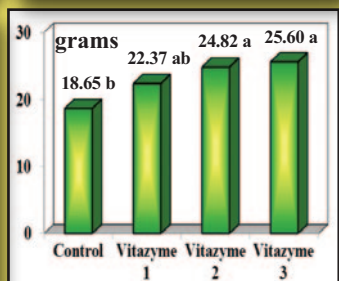
¹Ten random pods from each plot were selected, and pods were measured from the base of the stem to the pod tip.

Seeds Per Pod¹



¹Seed number from ten random pods for each plot were counted.

100-Seed Weight¹



¹The weight of 100 seeds from the seeds collected in the seeds per pod analysis was determined.

Increase in Pods with Vitazyme	
Vitazyme 1	20%
Vitazyme 2	32%
Vitazyme 3	42%

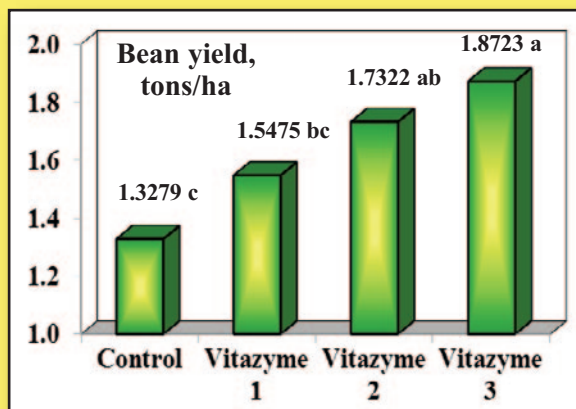
Increase in Pod Length with Vitazyme	
Vitazyme 1	38%
Vitazyme 2	50%
Vitazyme 3	62%

Increase in Seeds/Pod with Vitazyme	
Vitazyme 1	27%
Vitazyme 2	40%
Vitazyme 3	

Increase in 100-Seed Weight with Vitazyme	
Vitazyme 1	20%
Vitazyme 2	33%
Vitazyme 3	37%

Days to harvest results:

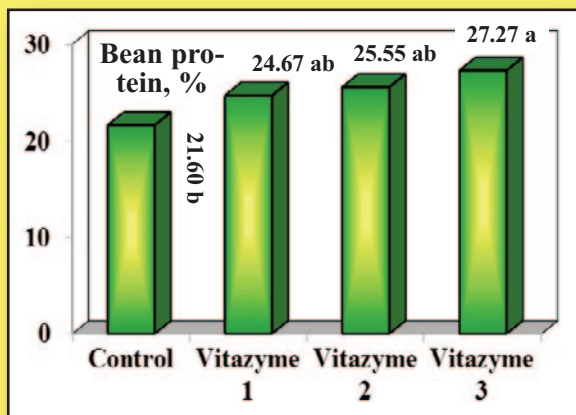
All Vitazyme treatments significantly reduced the time to harvest, the time reduction greater as the rate



Bean Yield Increase	
Vitazyme 1	17%
Vitazyme 2	30%
Vitazyme 3	41%

increased, with up to an 8.10 day decrease with the highest rate.

Pod and seed results:



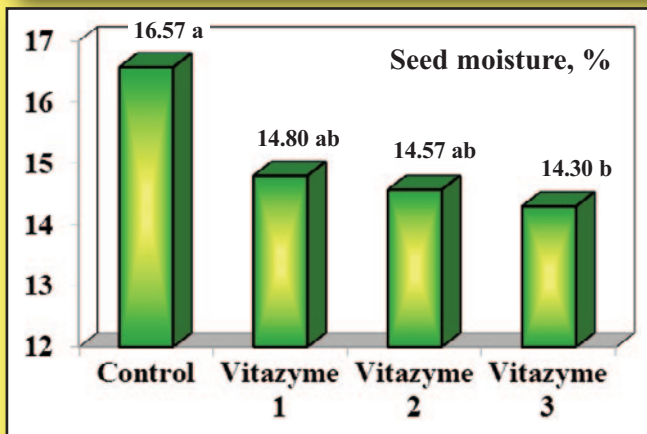
Increase in Bean Protein	
Vitazyme 1	14%
Vitazyme 2	18%
Vitazyme 3	26%

All pod and seed parameters improved with Vitazyme application, the higher application rates giving bigger increases. Pod length increased the most — up to 62% — while 100-seed weight increased from 20 to 37%.

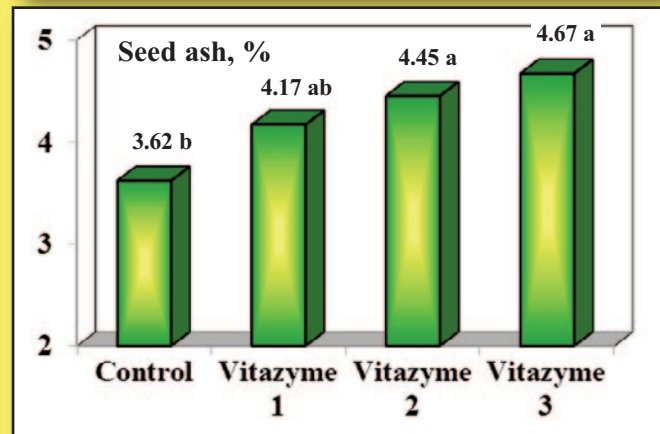
Yield results: Harvesting was completed on October 20,

2013. The seeds produced by 10 representative plants from each plot were weighed.

Seed Moisture



Seed Ash



Reduction in Seed Moisture

Vitazyme 1 -1.77%-points
Vitazyme 2 -2.00%-points
Vitazyme 3 -2.27%-points

Increase in Seed Ash

Vitazyme 1 15%
Vitazyme 2 23%
Vitazyme 3 29%

Yield of beans increased with the rate of Vitazyme application, moving from 17% at the lowest rate to 41% at the highest rate.

Protein results: Protein was measured using the Kjeldahl method on beans from each plot.

The all-important nutritional parameter of protein increased significantly by a remarkable 26% with the high rate of Vitazyme addition. The low rate resulted in a 14% protein increase, and the medium rate an 18% increase, both large but not significant.

Seed moisture and ash results: Association of Official Analytical Chemists methods were used.

Moisture percentage of the seeds was reduced as Vitazyme application levels increased, at the same time that ash levels (mineral contents) increased, showing that the product improves the uptake of soil elements for improved nutritional value.

Conclusions of the Mexican researcher:

1. The Product Vitazyme, applied as a seed treatment at dosages of 200, 250 and 300 ml/30 kg of seeds/hectare, followed by a leaf spray in early bloom at 0.5, 1.0 and 1.5 liters/ha, respectively, induced a significant effect on the variables days to flowering, days to physiological maturity, and days to harvest, as well as on the number of pods per plant, length of pods, and the number of seeds per pod, recording significant statistical differences as compared to the untreated control.

2. There was a significant effect of the Vitazyme, applied as a seed treatment at dosages of 200, 250 and 300 ml/30 kg of seeds/hectare, followed by a leaf spray in early bloom at 0.5, 1.0 and 1.5 l/ha, respectively, on bean yield, since it recorded statistically higher values than the untreated control.

3. With regard to grain quality variables, only the rate of 300 ml/30 kg of seeds/hectare seed treatment followed by a leaf spray of 1.5 l/ha, induced statistical differences with the control; however, all Vitazyme treatments in every tested rate recorded better values than the untreated control.

4. There were no toxic effects on the dry bean crop after applying Vitazyme, in seed treatment at rates of 200, 250 and 300 ml/30 kg of seeds/hectare, followed by a foliar spray in early bloom at 0.5, 1.0 and 1.5 liters/hectare, respectively.

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2007 Crop Results

Vitazyme on Dry Beans

Researchers: Jorge Gonzalez Acosta and Wilberto Gonzalez Marrero

Organization: Ministry of Sugar, Camilo Cienfuegos Agricultural Enterprise

Location: Pedro Gonzalez Farm, Havana Province, Cuba

Variety: unknown

Watering: rainfed

Planting date: October 15, 2006

Soil type: unknown

Experimental design: A 1.86 hectare field was divided, and one part was treated with two applications of Vitazyme to evaluate its capability to increase yields.

1. Control

2. Vitazyme

Fertilization: according to recommendations

Vitazyme application: 1 liter/ha on November 5, 2007 (20 days after planting), and another 1 liter/ha on December 30, 2006, 54 days later

Growing season observations: The Vitazyme treatment was noted to have the following benefits versus the control:

- More than 17 pods/plant, which was greater than the control
- More beans/pod
- Greater stalk vigor and diameter
- More rapid plant growth
- A greater number of leaves

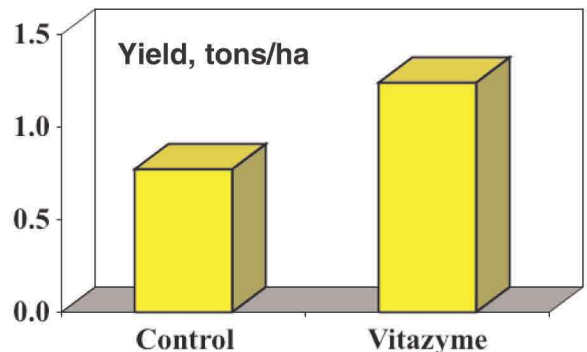
Harvest date: February 15, 2007

Yield results:

Treatment	Yield	Change
	tons/ha	tons/ha
Control	0.77	—
Vitazyme	1.24	0.47 (+61%)
Historic yield	0.69	—

Increase in bean yield: 61%

Dry Bean Yield



Conclusions: This Cuban dry bean study showed the great capability of Vitazyme to improve dry bean yield (+61%). Compared to both the control and the historical average yield, the growth of the plants and their yield were markedly improved. This simple, inexpensive treatment yields excellent economic returns for not only dry beans, but for all crops with which it is used in Cuba.

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2007 Crop Results

Vitazyme on Dry Beans

Researchers: Jorge Gonzalez Acosta and Wilberto Gonzalez Marrero

Organization: Ministry of Sugar, Camilo Cienfuegos Agricultural Enterprise

Location: Crucero Aurora Coop, Havana Province, Cuba

Variety: unknown

Watering: rainfed

Planting date: October 23, 2006

Soil type: unknown

Experimental design: A 6 hectare field was divided, and one part was treated with a single application of Vitazyme to evaluate its capability to increase yields.

1. Control

2. Vitazyme

Fertilization: according to recommendations

Vitazyme application: one treatment at 1 liter/ha on October 10, 2005, 20 days after planting

Growing season observations: The Vitazyme treatment was noted to have the following benefits versus the control:

- More than 15 pods/plant, which was greater than the control
- More beans/pod
- Greater stalk vigor and diameter
- More rapid plant growth
- A larger root mass

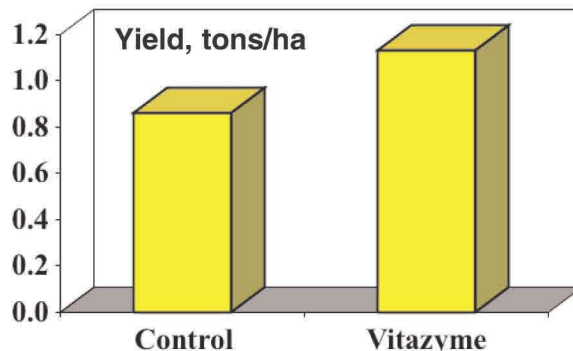
Harvest date: February 20, 2007

Yield results:

Treatment	Yield	Change
	tons/ha	tons/ha
Control	0.86	—
Vitazyme	1.13	0.27 (+31%)
Historic yield	0.69	—

Increase in bean yield: 31%

Dry Bean Yield



Conclusions: This Cuban dry bean study showed the great capability of Vitazyme to improve dry bean yield (+31%). Overall plant growth was enhanced by the product's active agents, caused by more leaf chlorophyll production and resultant greater energy capture.

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2006 Crop Results

Vitazyme on Dry Beans

Researchers: Inoel Garcia Ruiz, Maritza Sanchez Ortiz, Rigoberto Garcia Batista, and Mario Garcia Guzman

Research Organization: Villa Clara – Cienfuegos Territorial Sugarcane Research Station, Cuba

Location: Cuba

Varieties: “red” and “black” dry beans

Soil type: cambisol (non-calcic sialitic)

Planting date: November 21 and 30, 2004

Seeding rate: unknown

Experimental design: A field area was divided into five parcels that received either red or black dry beans and different Vitazyme treatments to evaluate effects on bean yield and profitability.

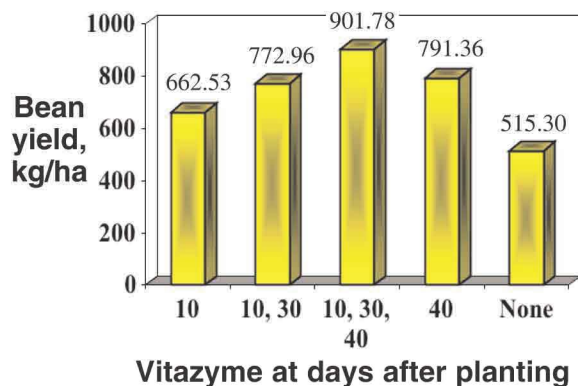
Treatment	Bean type	Area	Vitazyme application
		ha	
1.	Red	0.25	1 liter/ha 10 days after planting
2.	Red	0.50	1 liter/ha 10 and 30 days after planting
3.	Black	0.25	1 liter/ha 10, 30, and 40 days after planting
4.	Black	0.50	1 liter/ha 30 days after planting
5.	Red	0.50	Control

Fertilization: unknown

Vitazyme application: 1 liter/ha at 10, 30, and/or 40 days (at flowering) after planting using backpack sprayers

Harvest date: unknown

Yield results: Harvesting was completed manually and the beans were weighed for each plot.



Bean yield increase

Vitazyme 10 days after planting: +29%

Vitazyme 10 and 30 days after planting: +50%

Vitazyme 10, 30, and 40 days after planting: +75%

Vitazyme 40 days after planting: +54%

All Vitazyme treatments increased bean yield, up to 75% above the control, although the only fair comparisons are Treatments 1 and 2 with the control (Treatment 5), which grew red beans. The two black bean treatments produced 25% more yield than did the two red bean treatments

Growth observations: Leaf and stem growth were the best with all Vitazyme treatments compared to the control, and Treatments 3 and 4 (three applications, and one application at flowering, respectively) produced the most pods out of the five treatments.

Income results:

Treatment	Yield	Value ¹	Vitazyme costs ²	Net profit	Increased profit	Profit per invested peso
	kg/ha	pesos/ha	pesos/ha	pesos/ha	pesos/ha	pesos
1 (Vita day 10)	662.53	10,079.94	31.79	10,048.2	2,208.3	317.08
2 (Vita days 10 and 30)	772.96	11,760.06	63.58	11,696.5	3,856.6	184.96
3 (Vita days 10, 30, and 40)	901.78	13,719.97	95.37	13,624.6	5,784.7	143.86
4 (Vita day 40)	791.36	12,040.00	31.79	12,008.2	4,168.3	378.74
5 (Control)	515.30	7,839.94	—	7,839.9	—	—

¹Based on a 15.214 pesos/kg price.

²Based on a cost of 11.72 pesos/liter of Vitazyme, and a 20.07 pesos/ha application cost.

Increase in profit with vitazyme: 2,208.3 to 5,784.7 pesos/ha

Conclusions: Vitazyme in all applications substantially increased the yield of dry beans in Cuba during this study, the best treatment being three applications at 10, 30, and 40 days after planting (a 75% yield increase). this yield gave rise to an additional 5,784.7 pesos/acre above the control. The single 1 liter/ha rate at blossom gave the greatest return per invested peso. According to the researchers,

- “1. Vitazyme, applied at 1 liter/ha over the foliage and moist soil, increased dry bean yield as compared to the untreated control, regardless of the number of applications.
2. The profits, revenues, or returns per invested peso in product and application cost was greater when only one Vitazyme application was made at the beginning of the flowering stage.”

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2006 Crop Results

Vitazyme on Black Dry Beans

Researchers: Eng. Wilberto Gonzalez, and Eng. Jorge Gonzalez, Camilo Cienfuegos Agricultural Enterprise

Location: Camilo Farm and Victoria de Giron Farm of Camilo Cienfuegos Agricultural Enterprise, Havana Province, Cuba

Variety: black dry beans

Soil type: red ferralitic

Planting date: late 2005 to early 2006

Experimental design: A commercial production trial involved a split field of 2.0 ha treated and 1.0 ha not treated with Vitazyme at Victoria de Giron Farm, and 1.0 ha treated and 1.0 ha not treated at Camilo Farm.

1. Control

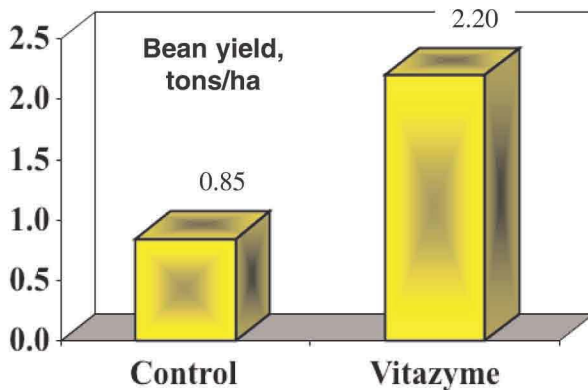
2. Vitazyme

Fertilization: unknown

Vitazyme applications: 1.0 liter/ha sprayed over the soil and leaves two times, separated by 30 days

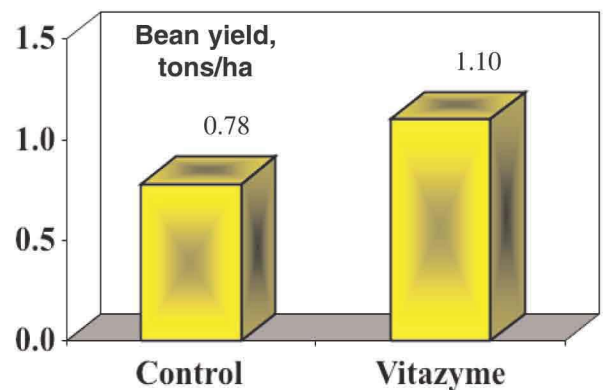
Yield results:

Victoria de Giron Farm



Increase in bean yield: 159%

Camilo Farm



Increase in bean yield: 41%

Conclusions: Vitazyme applied twice during the growing cycle in this commercial Cuban bean study revealed excellent yield increases, of 159 and 41%.

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2006 Crop Results

Vitazyme on Black Beans

Ministry of Sugar, Cuban Ministry of Agriculture

Researchers: Wilberto G. Marrero and Jorge G. Acosta

Location: Crucero Aurora Cooperative, Havana Province, Cuba

Variety: unknown

Soil type: sialitic over lime (Cambisol)

Planting rate: unknown

Row spacing: unknown

Planting date: November 10, 2005

Watering: rain-fed

Experimental design: A field of black beans was divided, part of it treated with Vitazyme and the other part left untreated. The objective was to determine the effectiveness of the product to increase bean yield.

1. Control

2. Vitazyme

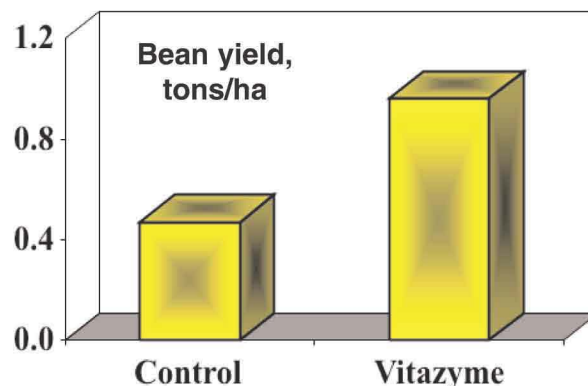
Fertilization: unknown

Vitazyme application: 1 liter/ha on the leaves and soil November 25, 2005, 15 days after planting, and also on December 12, 25 days later

Harvest date: February 28, 2006

Yield results:

Treatment	Yield	Increase
	tons/ha	tons/ha
Control	0.47	—
Vitazyme	0.96	0.49 (+104%)
Historical yield	0.69	



Increase in bean yield: 104%

Conclusions: This black bean split-field trial in Cuba revealed that Vitazyme, applied twice at 1 liter/ha each time, greatly boosted the bean yield, by 104% over the control and by 39% above the historical average yield for that area and management system. These increases occurred in spite of the year being very dry. According to the research report, "This Vitazyme treatment experienced conditions of extreme drought and results have been satisfactory, being able to produce the seeds for the next planting

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2005 Crop Results

Vitazyme on Dry Beans

Researcher: Dr. Rafael S. Herrera Garcia
Animal

Research institution: Instituto de Ciencia

Location: San Jose de las Lajas, Havana, Cuba

Variety: black dry beans

Soil type: red ferralitic (Eutruxox or Ferralsol)

Planting rate: unknown

Planting date: unknown

Experimental design: A field of black dry beans was divided into four replicates in a completely randomized design with each plot comprising 80 meters of row. Evaluations were made on yield and yield parameters to determine the effects of Vitazyme.

1. Control

2. Vitazyme

Fertilization: none

Insecticide applications: none

Vitazyme application: 1.5 liters/ha before flowering

Irrigation: none

Harvest rate: unknown

Yield results:

Treatment	Pod length ¹ cm	Change cm	Beans/pod ² number	Change number	Malformed beans ³ %	Change %	Bean yield ⁴ kg/ha	Change kg/ha
Control	7.1 b	—	4.5	—	12.6	—	142.19	—
Vitazyme	7.4 a	0.3 (+4%)	5.2	0.7 (+16%)	6.1	(-) 52%	177.35	35.16 (+25%)

¹Significant difference at P=0.01 (SE± 0.01 cm); ²significant difference at P=0.01 (SE±0.05 beans); ³significant difference at P=0.01 (SE±1.15%); ⁴significant difference at P=0.01 (SE±9.03 kg/ha).

Conclusions: [Report of the Cuban researcher:] “This trial was carried out under adverse conditions, since after planting other field operations (irrigation, fertilization, pesticides, and cultivation) were not implemented. Under these conditions Vitazyme application showed positive effects on bean yield.”

“In spite [of the fact] that the area did not receive cultural attention and Vitazyme was applied before flowering:

- There was greater pod length and number of beans, as well as [a] smaller number of malformed beans when Vitazyme was applied.
- Yield increased by 24.73% when Vitazyme was applied.
- Under adverse trial conditions (no irrigation, fertilization, and pesticides) Vitazyme showed positive effects.”

“It is recommended to carry out new trials under actual crop production conditions.”

Changes with Vitazyme

Pod length	+4%
Beans/pod	+16%
Malformed beans	-52%
Bean yield	+25%

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2004 Crop Results

Vitazyme on Black Beans

Vegetable Study by the Cuban Tobacco Institute

Researcher: unknown Location: near Havana, Cuba Variety: unknown Soil type: unknown
Planting rate: unknown Planting date: unknown Seeding rate: unknown
Experimental design: A field of black beans was treated with Vitazyme except for one portion of the field, the purpose of the test being to discover possible positive effects of this biostimulant on black bean production.

1. Control

2. Vitazyme

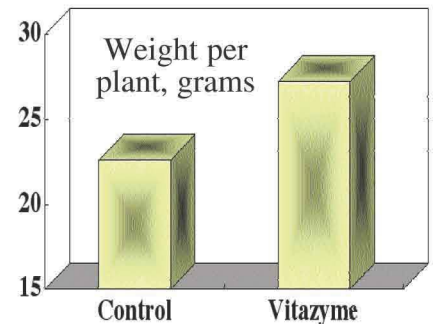
Fertilization: unknown

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

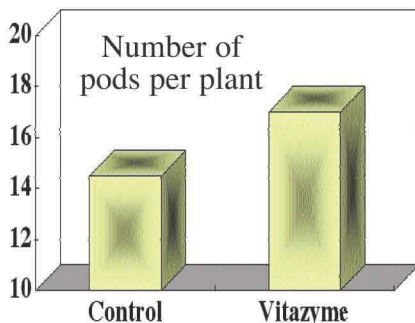
Growth effects: At an unknown date various growth parameters were measured. Ten average plants were measured for each parameter.

Parameter	Control	Vitazyme	Change
Weight per plant, grams	22.6	27.2	+4.6 (+20%)
Pods per plant	14.5	17.0	+2.5 (+17%)
Seeds per plant	72.0	86.0	+16.0 (+22%)
Seeds per pod	4.96	5.05	+0.09 (+2%)
Yield per plant, grams	13.4	16.4	+3.0 (+22%)

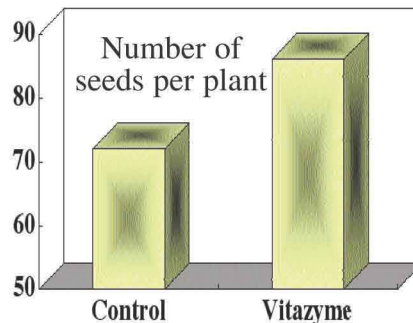
Weight Per Plant



Pods Per Plant



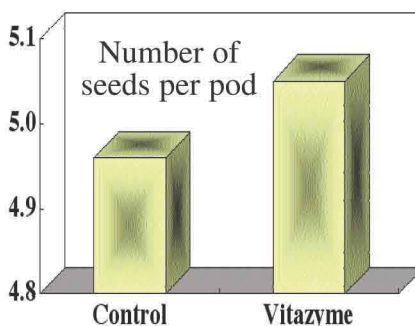
Seeds Per Plant



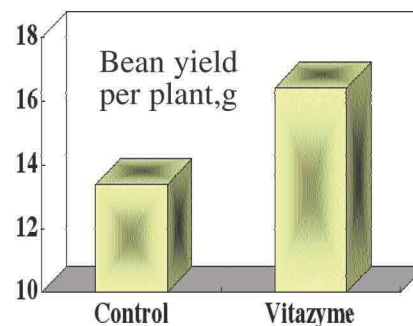
Increase in ...

- weight/plant: + 20%
- pods/plant: + 17%
- seeds/plant: + 22%
- seeds/pod: + 2%
- yield/plant: + 22%

Seeds Per Pod



Yield Per Plant



Conclusions: Vitazyme applied only one time to black beans in this Cuban test caused about 20% increases in plant growth (weight, pods, seeds, and yield per plant), while the seeds per pod were nearly the same for both treatments. Vitazyme is shown to be an excellent amendment to increase black bean yield in Cuba.

Vital Earth Resources

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2002 Crop Results

Vitazyme on Navy Beans

Researcher: Eltjo van Cingel

Researcher: John Egeland

Location: Fisher, Minnesota

Variety: Navigator

Soil type: clay loam

Seeding rate: 47 lb/acre

Planting date: May 26, 2002

Experimental design: A field of 94 acres was divided into two parts, a Vitazyme treated area of 10 acres and a control area of 84 acres.

1. Control

2. Vitazyme

Fertilization: unknown

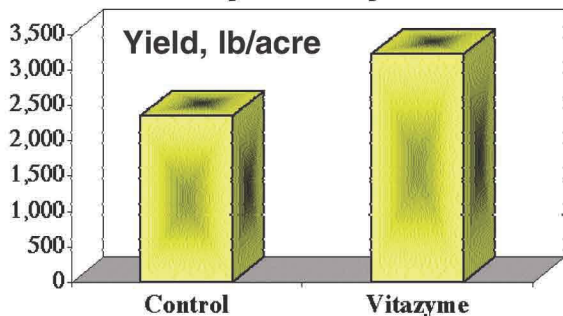
Vitazyme treatment: 13 oz/acre on June 23, flown on by airplane, along with 2 lb/acre MgSO₄ and a fungicide

Harvest date: September 21, 2002

Yield results: Actual truck weights were taken to insure an accurate yield calculation.

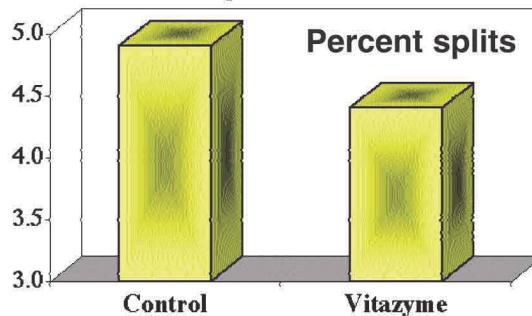
Treatment	Yield	Change	Seed moisture	Split beans	Grade
	lb/acre	lb/acre	%H ₂ O	%	
Control	2,342	—	17.7	4.9	1
Vitazyme	3,221	879 (+38%)	18.4	4.4 (-10%)	1

Navy bean yield



Increase in yield: 38%

Split beans



**Reduction in split beans:
0.5 percentage point**

Income results: The Navy beans were contracted at \$0.17/lb for the first 900 lb/acre, and thereafter sold for the market price of \$0.12/lb.

Treatment	First contract price	Value at \$0.17/lb	Remaining, non-contract	Value at \$0.12/lb	Total income	Income increase
	lb/acre	\$/acre	lb/acre	\$/acre	\$/acre	\$/acre
Control	900	153.00	1,442	173.04	326.04	—
Vitazyme	900	153.00	2,321	278.52	431.52	105.48

Income increase with Vitazyme: \$105.48/acre

Cost:benefit ratio of Vitazyme use: 26:1

Conclusions: Vitazyme applied to Navy beans in this Red River Valley test revealed that a single June application, applied with $MgSO_4$ and a fungicide, greatly increased the bean yield (+38%) and reduced the number of split beans. This effect was due to a triggering of photosynthesis and enhanced rhizosphere activity . . . and thus an increase in nutrient uptake, carbon fixation, and bean development. A greater deposition of cellulose and lignin in cell walls likely strengthened the seed coat to reduce seed splitting. The yield increase boosted income by \$105.48/acre over the control treatment.

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2002 Crop Results

Vitazyme on Navy Beans

Researcher: Eltjo van Cingel

Researcher: John Egeland

Location: Fisher, Minnesota

Variety: Navigator

Soil type: clay loam

Seeding rate: 47 lb/acre

Planting date: May 25, 2002

Experimental design: A field of 75 acres was divided into three parts: an untreated control of 41.4 acres, a single Vitazyme treatment, and a double Vitazyme treatment.

1. Control

2. Vitazyme

3. Vitazyme twice

Fertilization: A starter fertilizer was preplant incorporated for Treatment 2, and a special blend of starter fertilizer based on a soil test and the Albrecht system was preplant incorporated for Treatment 3.

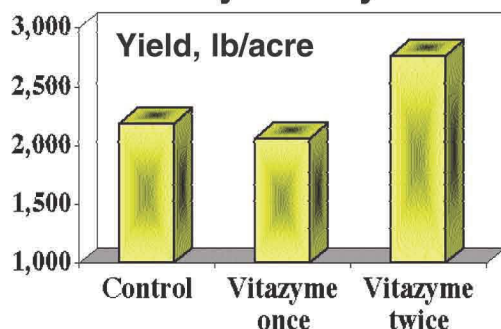
Vitazyme treatment: Treatment 2: 13 oz/acre along with a herbicide and starter fertilizer, preplant incorporated on May 23; Treatment 3: (1) 13 oz/acre along with a herbicide and the special starter fertilizer blend, preplant incorporated on May 23, and (2) 16 oz/acre plus 2.5 lb/acre MgSO₄ and a fungicide sprayed by airplane on July 11.

Harvest date: September 21, 2002

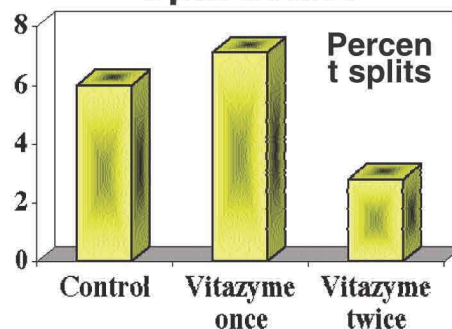
Yield results: Actual truck weights were taken to insure an accurate yield calculation.

Treatment	Bean yield lb/acre	Yield Change lb/acre	Seed moisture %H ₂ O	Split beans %	Grade
Control	2,188	—	12.8	6.0	1
Vitazyme once	2,060	(-) 128 (-6%)	19.1	7.1	1
Vitazyme twice	2,760	572 (+26%)	17.5	2.8	1

Navy bean yield



Split beans



Increase in Yield (2X): 26%

Reduction in split beans (2X): 3.2 percentage points

Income results: The Navy beans were contracted at \$0.17/lb for the first 900 lb/acre, and thereafter sold for the market price of \$0.12/lb.

Treatment	First contract price	Value at \$0.17/lb	Remaining, non-contract	Value at \$0.12/lb	Total income	Income increase
	lb/acre	\$/acre	lb/acre	\$/acre	\$/acre	\$/acre
Control	900	153.00	1,288	154.56	307.56	—
Vitazyme once	900	153.00	1,160	139.20	292.20	(-)15.36
Vitazyme twice	900	153.00	1,860	223.20	376.20	68.64

Income increase with Vitazyme (2X): \$68.64/acre

Cost:Benefit ratio of Vitazyme use (2X): 8.6:1

Conclusions: Vitazyme applied once (preplant incorporated) in this Navy bean test in the Red River Valley of the North did not increase bean yield, but rather slightly decreased yield. This decrease was due to early season heavy rains, upon compacted soils, which reduced soil air and damaged roots and rhizosphere activity, thus inhibiting Vitazyme's action. On the other hand, this preplant application plus a July foliar application greatly increased bean yield (+26%) while also decreasing the number of split beans (2.8% vs. 6.0% for the control). **This yield and quality increase was due to Vitazyme's ability to stimulate photosynthesis and rhizosphere activity, thus increasing carbon fixation and nutrient uptake while suppressing plant diseases.** The result of these effects was an increase in gross income of \$68.64/acre.

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2000 Crop Results

Vitazyme on Field Beans

Farmer: Mike Humphrey

Location: Twin Falls, Idaho

Variety: Small red beans

Soil type: good quality, with 25% low-productivity "white" soils; Portneuf silt loam

Planting date: June 19, 2000

Experimental design: A field of small red beans was treated conventionally except for a strip through the center of the field that received Vitazyme.

1. Control

2. Vitazyme

Fertilization: unknown

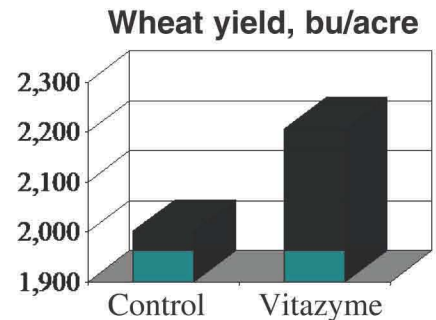
Vitazyme application: The seeds were treated with a 5% Vitazyme solution before planting, plus 13 oz/acre sprayed on the soil after planting, and another 13 oz/acre sprayed on the leaves and soil at early bloom.

Harvest date: unknown

Yield results: Two 2.5-acre strips in the Vitazyme strip were harvested and weighed, and compared to the untreated control yield, from which 18 acres was combined and weighed.

	Control	Vitazyme	Change
		lb/acre	
Bean yield	2,002	2,207	(+) 205 (+10%)

Bean yield increase: 10%



Income results: A value of \$0.18/lb is expected.

	Control	Vitazyme	Change
		\$/acre	
Income	360.36	397.26	(+) 36.90

**Income increase:
\$36.90/acre**

Conclusions: Vitazyme applied on the seeds of these red beans before planting, as well as twice on the soil and leaves during the growing season, increased bean yield by 10% and increased income by \$36.90/acre. This improvement amounted to a return on investment of 3.7:1.

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2000 Crop Results

Vitazyme on Field Beans (Organic)

Farmer: Richard and Eric Parrott, Parrott Organic Farms

Location: Twin Falls, Idaho

Variety: Great Northern beans

Planting date: June 15, 2000

Soil type and conditions: light to white in color, and a moderate slope; 40% are white, which are areas of poor yield; Portneuf silt loam

Previous crop: field beans

Experimental design: A fairly uniform 20-acre field was divided into control (8 acres) and Vitazyme treated (12 acres) areas. Soils in both areas were relatively equivalent, with 40% white soils in each area.

1. Control

2. Vitazyme

Fertilization: beef manure compost with crop residues

Irrigation: furrow irrigation of limited quantity

Vitazyme treatment: a 5% Vitazyme solution on the seeds before planting, and 12 oz/acre sprayed on the plants and soil at pre-bloom

Harvest date: September 25, 2000

Yield results:

Crop parameter	Control	Vitazyme
Final stand	Very poor on white soils due to poor germination	Good and even on white soils due to good germination
Bean quality	Good quality	Good-Plus quality
Standability	Average on good soils Poor on white soils	Better on good soils Much better on white soils
Windrow size	Average, but light on white soils	More full on all soils
Ease of harvest	Some beans lost on white soils	Hardly any beans lost on white soils
Yield	Average for organic production	Above average for organic production
Crop value*		+ 304.5 lb/acre above the control + \$106.58/acre

* A value of \$0.35/lb was received. Actual yield values for the two treatments have been kept confidential by the grower.

Bean yield increase: 304.5 lb/acre

Income increase: \$106.58/acre

Conclusions: Two applications of Vitazyme to this Great Northern field bean crop produced a sizeable yield increase of higher quality beans, that translated into \$106.58/acre more income. Such an increase produced a 21:1 income increase: product cost ratio. The yield improvement was due in part to better germination and growth on the poor "white" soil of this field, but also due to improved growth throughout the field on all soils.

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2000 Crop Results

Vitazyme on Navy Beans (Organic)

Farmer: Leon Roske

Location: Olivia, Minnesota

Variety: Schooner

Row spacing: 30 inches

Soil type: Clarion-Nicollet-Webster silty clay loam

Planting date: June 25, 2000

Experimental design: A field of Navy beans was treated with Vitazyme except for a strip that received none.

1. Control

2. Vitazyme

Fertilization: fish emulsion and molasses on the seeds at planting, and again on the leaves and soil at early bloom (see below)

Vitazyme treatment: At planting, Vitazyme (13 oz/acre) plus molasses (0.5 gal/acre) and liquid fish (2 gal/acre) were applied. At early bloom (late July) Vitazyme was again applied at 13 oz/acre, along with 0.5 gal/acre liquid fish, on the leaves and soil. This late application was made to both the control and Vitazyme treatments.

Weed control: cultivation, plus hand weeding midsummer

Harvest date: September 21, 2000

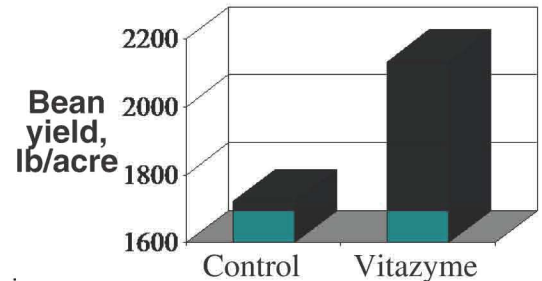
Yield results: Yield checks were made in the check strip, and on either side in the treated areas. These yields were weighed at a local grain elevator.

	Control*	Vitazyme	Change
	lb/acre		
Bean yield	1,721	2,132	(+)411 (+24%)

* Only the north treated side is included here since the south strip had a low area that reduced yield by 67 lb/acre.

Bean yield increase*: 24%

given the second Vitazyme application.



* The increase may have been greater had the control not been

Income results: A value of \$0.30/lb for organically grown Navy beans is expected.

	Control	Vitazyme	Change
	\$/acre		
Bean value	516.30	639.60	(+)123.30

**Income increase:
\$123.30/acre**

Conclusions: Vitazyme applied to these Navy beans grown in Southern Minnesota provided a substantial yield increase (+24%), as well as a large increase in income (\$123.30/acre). The yield and income increases may have been greater had the control strip not received the benefit of the second Vitazyme application. A serious dry period late in the growing season and a late planting reduced the yield potential somewhat, but even so a good yield was obtained.

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1999 Crop Results

Vitazyme on Black Turtle Beans

Researcher: Lewis Bickle, Bickle Farm

Location: Dansville, New York

Planting date: June 5, 1999

Variety: black turtle soup beans

Row spacing: 30 inches

Harvest date: October 23

Experimental design: A level, uniform field was divided into four strips (about 10 acres each), treated with different products, one of which was Vitazyme. An untreated control was also maintained.

1. Control (no Vitazyme)

2. Vitazyme

Fertilizer treatments: 200 lb/acre KCl broadcast preplant; 350 lb/acre 7-28-9 at planting

Vitazyme application: Vitazyme at 13 oz/acre was sprayed over the leaves and soil just before blossom on July 21, 1999.

Yield results:

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
Bean yield, bu/acre	32.5*	46.5	14.0 (+43%)

*Liberal yield estimate by the farmer.

Yield increase: 43%

Income increase: Bean value: \$9.00/bu (\$0.15/lb)

Income increase: \$126.00/acre

Comments: The Vitazyme treated beans were larger than those of the control. There was more white mold with the Vitazyme treatment.

Bean Yield, bu/acre

