

# Vitazyme highlights for 2016

The Vitazyme program worked excellently in the many parts of the world where it was used in 2016. Note the following highlights from this past year.

1. In Ukraine, Vitazyme is being used for several crops on a wide scale, in particular on corn, soybeans, sunflowers, and wheat by a large farming company. Other farmers in the country are also using the program. Results from research trials on winter wheat, corn, soybeans, sugar beets, and sunflowers in this booklet show excellent yield and quality improvements.
2. The agrichemical company Syngenta has begun using a special formulation of Vitazyme for treating soybean seeds in Brazil, after extensive trials of the product over a wide variety of soils and climatic regimes. The product outperformed other standard products to which it was compared. None of these results are included in this booklet due to proprietary considerations.
3. University of Missouri studies on Vitazyme with and without glyphosate added to the foliar application showed results just as dramatic as in 2014. The product greatly reduced the damage done to populations of beneficial microbes in the rhizosphere from glyphosate additions, and greatly reduced the incidence of Fusarium infections in the roots of both corn and soybeans, bringing them to the levels of the control treatments. Moreover, manganese oxidizing bacteria were reduced and manganese reducing bacteria were increased with Vitazyme, showing its powerful effect in overcoming the negative metal chelating effects of glyphosate in the rhizosphere.
4. Studies with tomatoes, berries, and other crops in Mexico and Latin America continue to reveal very positive responses to the Vitazyme program. For example, one study showed a 19% yield increase with tomatoes and a 32:1 cost:benefit ratio while using the program that resulted in much greater income to the farmer.
5. A South Dakota State University study on nitrogen efficiency for corn showed that Vitazyme not only increased the efficiency of nitrogen utilization, but increased the yield of corn by 21 bu/acre at a reduced nitrogen level (75 lb/acre), giving the reduced N rate the same yield as the full N rate (218 bu/acre).
6. The use of Vitazyme together with a vegetable-based adjuvant called WakeUp Summer produced a remarkable yield increase of 23% (11.3 bu/acre) above the untreated control half of the field. This result is similar to results with soybeans in 2015, and points towards the value of these two products when mixed together in a new formulation.
7. Use of Vitazyme with cotton in a replicated trial in the Sub-Saharan region of Africa showed excellent yield responses when applied in a number of different regimes, although the best results were with a combined seed and foliar treatment. Yield increases of up to 95% were achieved.



# Apples *Vitazyme on Apples (Young Trees)—A Synergism Study with Quantum*

**Researchers:** W.H. Palmer, Scott Palmer, and Kevin Meredith  
**Research Organization** Reality Research, Lyons, New York  
**Location:** Springbrook Orchards, Alton, New York  
**Varieties:** Evercrisp on G41 rootstock, Evercrisp on B9 rootstock, NY1/Snapdragon on G11 rootstock, and NY1/Snapdragon on G41 rootstock  
**Soil:** sandy loam with 3.1% organic matter, 7.3 pH, 7.1 C.E.C., good fertility, and good drainage  
**Row spacing:** 15 feet  
**In-row spacing:** 3 feet  
**Tree age:** 1 year  
**Planting date:** June 1, 2014  
**Experimental design:** An apple orchard containing two varieties with three different dwarfing rootstocks was selected and divided into 30-foot plots, with four replications per treatment, in a non-randomized design with no tillage. Each plot area contained 450 ft<sup>2</sup>. Vitazyme was applied alone as a soil drench, as was Quantum alone, and then both were combined,



*Excellent growth responses were discovered with Vitazyme on young apple trees in western New York.*

Treatment	Variation	Rate <sup>1</sup>	Application date	Stage
1. Control	—	—		
2. Quantum	Light	64 oz/acre	June 25	At planting
	VSC	64 oz/acre	June 25	
	Light	64 oz/acre	July 17	Leaf-out
	VSC	64 oz/acre	July 17	
3. Vitazyme	Standard	16 oz/acre	June 25	At planting
	Standard	16 oz/acre	July 17	Leaf-out
	Standard	16 oz/acre	August 21	
	Standard	16 oz/acre	September 19	
4. Jumpstart		64 oz/acre	June 25	At planting
	Quantum	Light	32 oz/acre	June 25
	Quantum	VSC	32 oz/acre	June 25
	Vitazyme	Standard	16 oz/acre	June 25
Jumpstart		64 oz/acre	July 17	Leaf-out
	Quantum	Light	32 oz/acre	July 17
	Quantum	VSC	32 oz/acre	July 17
	Vitazyme	Standard	16 oz/acre	July 17
Jumpstart		64 oz/acre	August 21	
	Quantum	Light	32 oz/acre	August 21
	Quantum	VSC	32 oz/acre	August 21
	Vitazyme	Standard	16 oz/acre	August 21
Jumpstart		64 oz/acre	September 19	
	Quantum	Light	32 oz/acre	September 19
	Quantum	VSC	32 oz/acre	September 19
	Vitazyme	Standard	16 oz/acre	September 19

all on four dates. The objective of the study was to determine the effect of the products on trunk caliper, tree height, and branching, three major growth factors important to fruit growers.

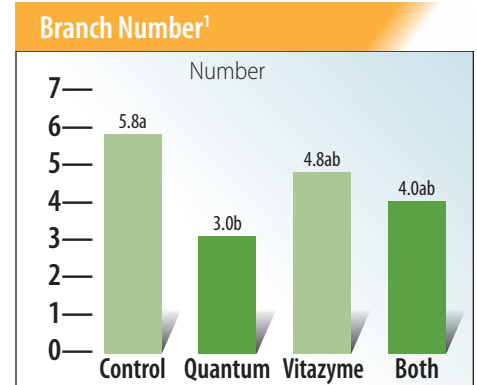
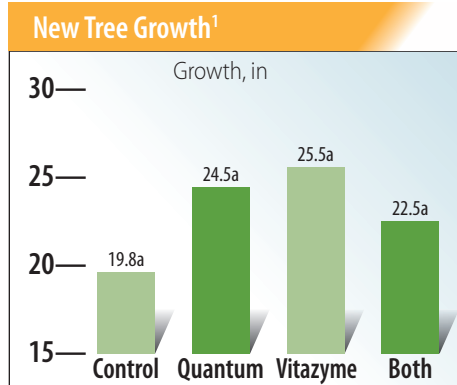
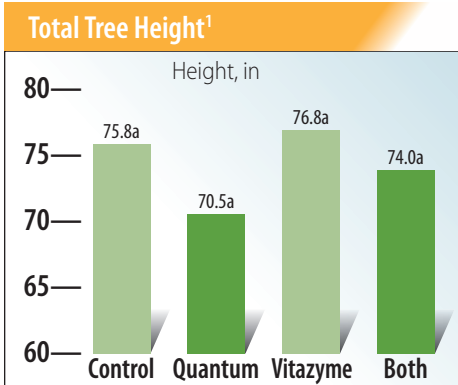
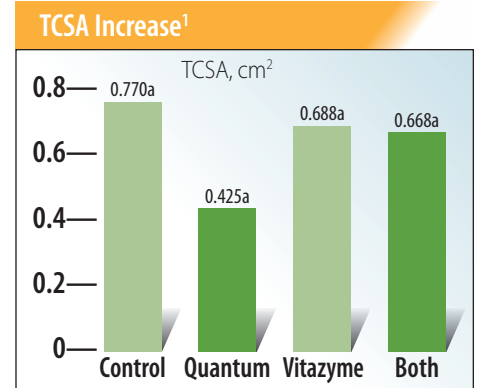
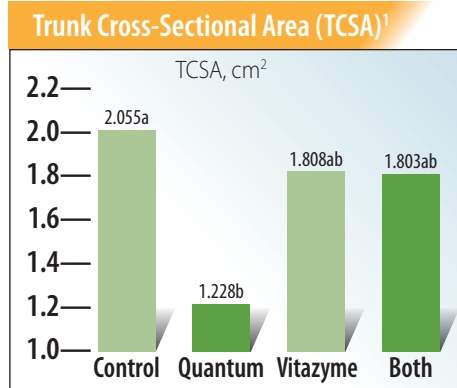
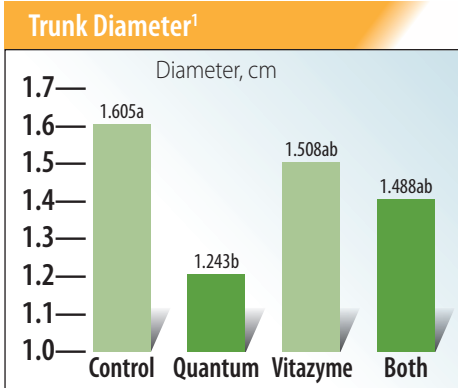
**Fertilization:** none

**Growth results:** An ARM statistical package was used to analyze the data. All measurements were made October 20, 2015.

**Conclusions:** A growth study with newly planted apple trees in New York revealed that soil-applied Quantum products and Vitazyme, alone or in combination, produced variable results depending upon the tree variety and rootstock. Vitazyme increased tree height and new leader growth the most for Evercrisp on G41 rootstock, and branch number for NY1 on G41 rootstock. Vitazyme also excelled with increases in trunk cross-sectional area (TCSA) on NY1 and G41 rootstock. Quantum products performed well only with Evercrisp on B9 rootstock, increasing TCSA, height, and branch number the most. The combined products performed less well than the products did when applied alone, the exception being branch number with NY1 on G11 rootstock. Each product appears to have a place in young apple tree growth, but more work needs to be done on various varieties and rootstocks to ascertain the best uses of each.

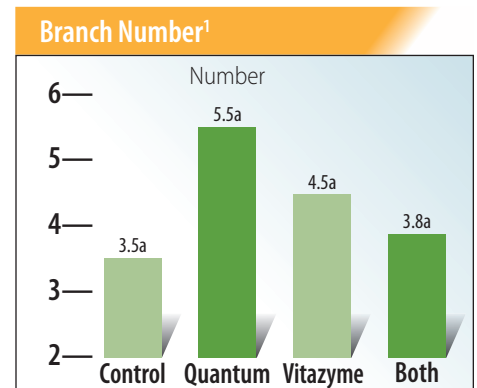
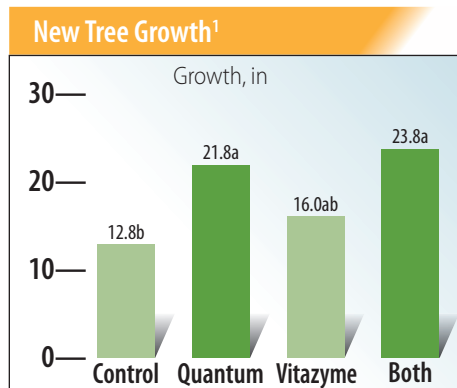
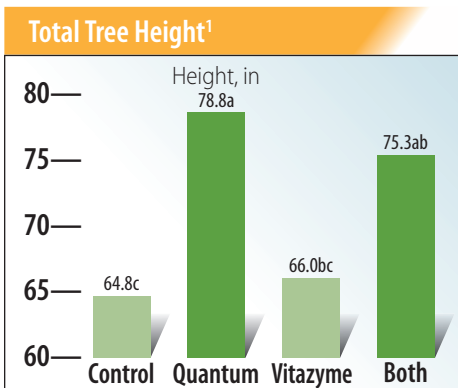
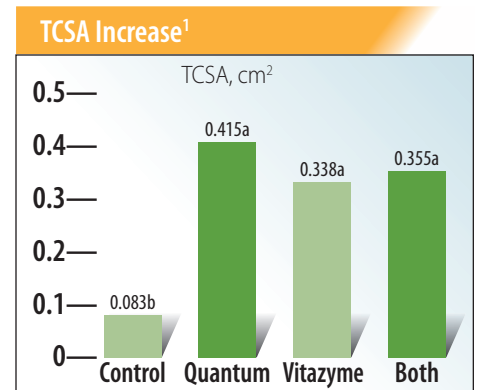
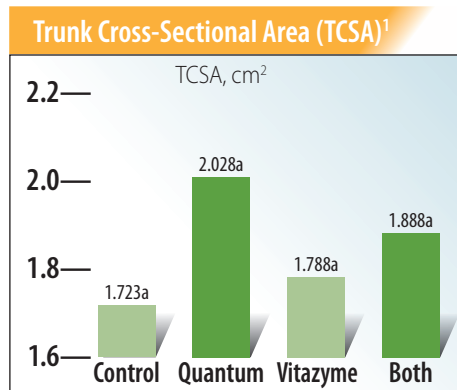
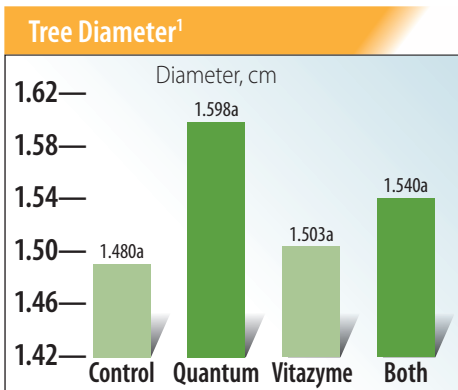
<sup>1</sup> Soil drench in 100 gal/acre of water. Nozzles were spaced 2 inches apart, and the spray on both sides of the row covered 100% of the soil surface

## Evercrisp on G41 rootstock (medium-dwarfing)



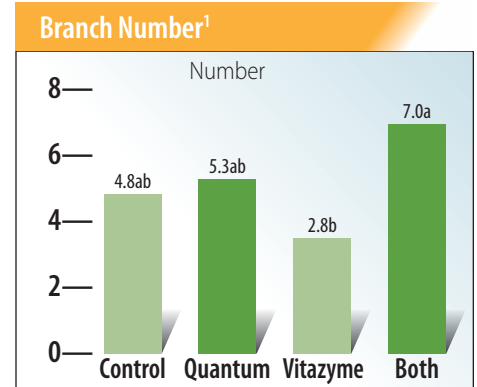
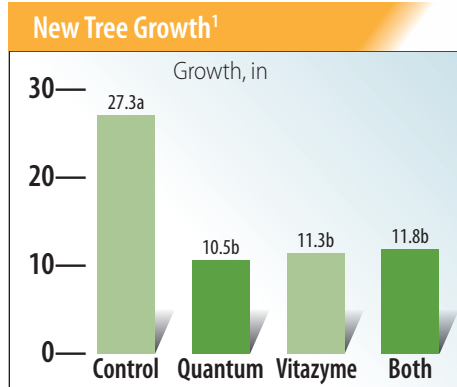
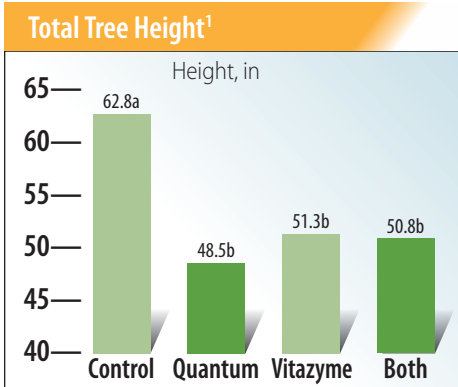
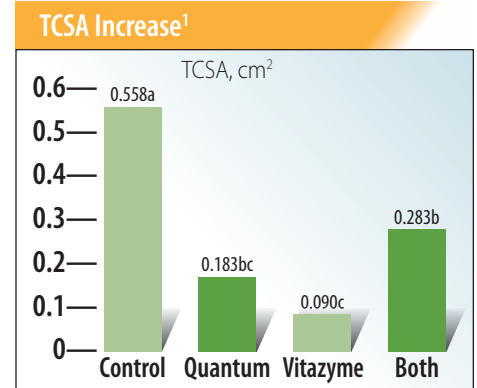
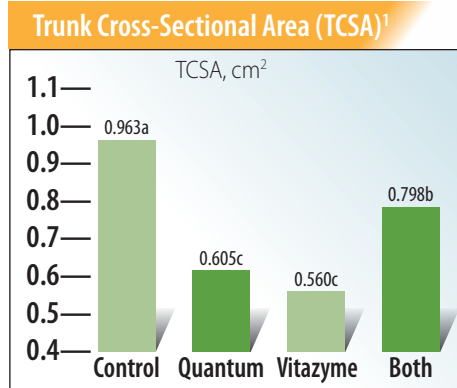
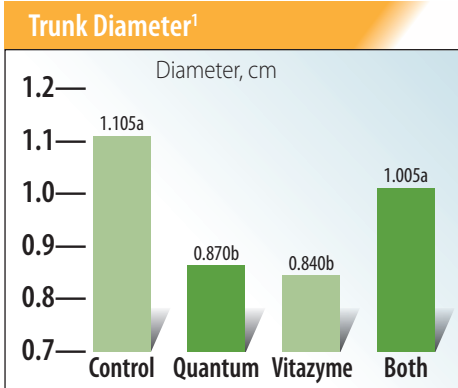
<sup>1</sup>Means followed by the same letter are not significantly different at P=0.10.

## Evercrisp on B9 rootstock (full-dwarfing)



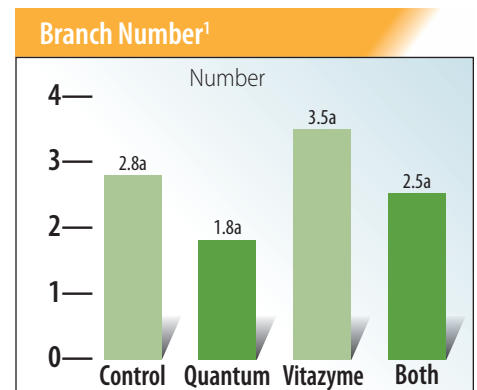
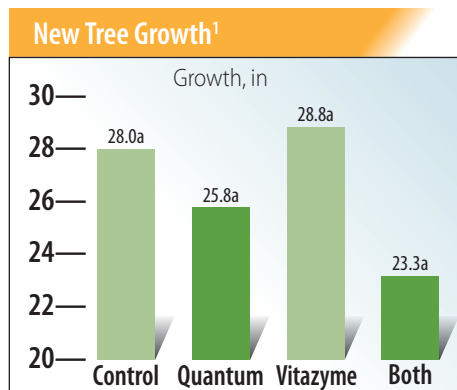
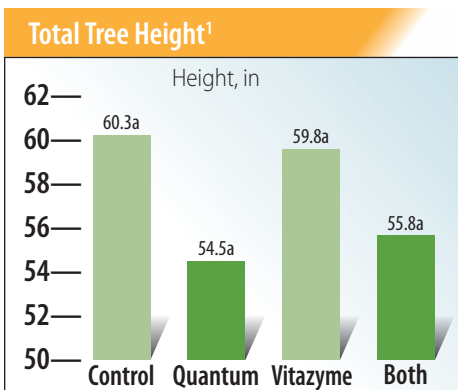
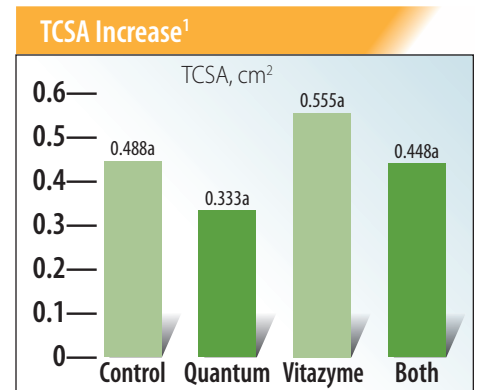
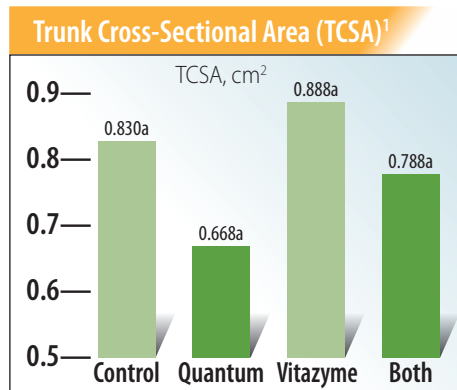
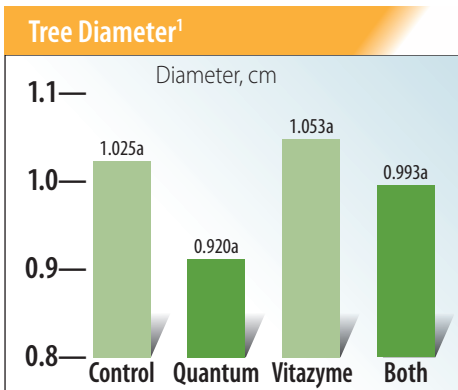
<sup>1</sup>Means followed by the same letter are not significantly different at P=0.10.

## New York 1/Snapdragon on G11 rootstock (medium dwarfing)



<sup>1</sup>Means followed by the same letter are not significantly different at P=0.10.

## NY 1/Snapdragon on G41 rootstock (medium dwarfing)



<sup>1</sup>Means followed by the same letter are not significantly different at P=0.10.



# Blackberries with Vitazyme application

**Researcher:** Agronomist Pedro Pablo Barrera Barrera  
**Grower:** Pedro Pablo Barrera Barrera  
**Location:** New Santa Rosa, Santa Rosa Department, Guatemala  
**Altitude:** 1,000 m  
**Variety:** Tupy  
**Blooms per year:** 2.5  
**Plant age:** 4 years  
**Experimental design:** A blackberry planting was treated three times with Vitazyme on 0.7 ha to determine the effect of the product on berry yield and plant parameters.

**1 Control 2 Vitazyme**

**Fertilization and Vitazyme application:** See the table below. All applications were foliar.

Application	DAD <sup>1</sup>	Growth stage	Application rates <sup>2</sup>		Purpose of application
			Vitazyme	Application rates <sup>1</sup>	
1	30	Vegetative	1 liter/ha		Stimulate elongation of shoots
2	45	Pre-flower and blossom	1 liter/ha		Stimulate flower buds; increase fruit set
3	75	Fruit-set	1 liter/ha		Increase size and consistency of fruit

<sup>1</sup>DAD = days after defoliation; <sup>2</sup>Application volume was 571 liters/ha of spray solution. The water was corrected to pH 4.5 to 5.5.

**Application method:** 16-liter sprayer

**Growth results:**

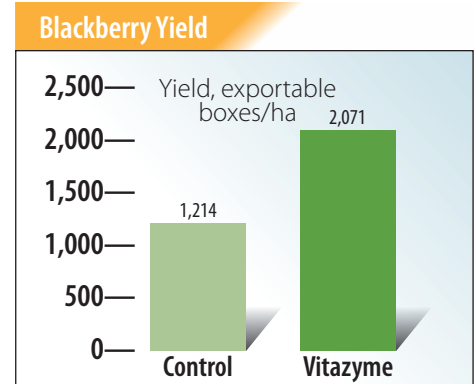
1. Vitazyme did not damage the fruit in any way.
2. Chlorophyll levels were increased, and senescence delayed.
3. Plants were more vigorous and less susceptible to disease.
4. Flowering was stimulated and extended.
5. Fruit set was improved, achieving 32 buds per rosette.
6. Fruits were of greater size and weight.
7. Fruit uniformity was improved.
8. Non-productive male shoots were caused to differentiate into productive female shoots.

**Yield results:**

Treatment	Yield <sup>1</sup>	Yield change
	boxes/ha	boxes/ha
Control	1,214 <sup>a</sup>	—
Vitazyme	2,071	857 (+71%)

<sup>a</sup>Yield of the previous crop

**Increase in yield with Vitazyme: 71%**



**Conclusions:** Three 1 liter/ha foliar Vitazyme applications increased blackberry production by 71% in this trial. Besides, the fruit was of superior quality in terms of size and weight. The treated plants were also healthier, and tended to differentiate into productive female shoots.



# Corn with Vitazyme application—A Soil Microbiology Study with Roundup (Glyphosate)



Dr. Nathan displays the Vitazyme treated corn ears on the right, and the control ears on the left. The difference in kernel development is obvious.



Note the superior rooting and ear development for the Vitazyme treatment at the Greenley Center trial.

**Researcher:** Manjula Nathan, Ph.D., and Robert Kremer, Ph.D.

**Research institution:** University of Missouri Department of Plant and Soil Sciences, and the USDA-ARS, Columbia, Missouri

**Location:** Greenley Memorial Research Center, Novelty, Missouri

**Variety:** Unknown

**Soil type:** clayey

**Row spacing:** 30 inches

**Experimental design:** A small plot corn trial was conducted using four replications and four treatments, to evaluate the effect of Vitazyme and Roundup (glyphosate), alone and in combination, on the yield of corn, as well as the effects of these products on the rhizosphere soil microbial populations of Fusarium and beneficial bacteria. Soil residues of glyphosate were also evaluated.

Treatment	In-furrow bu/acre	Foliar, 8-leaf stage bu/acre
1. Control	0	0
2. Glyphosate	0	36 oz/acre
3. Vitazyme	13/oz/acre	13 oz/acre
4. Vitazyme + Glyphosate	13/oz/acre (Vitazyme only)	13 oz/acre + 36 oz/acre

**Fertilization:** Nitrogen, phosphorus, and potassium were applied before planting according to soil test recommendations.

**Vitazyme application:** See the treatment plan.

**Glyphosate application:** See the treatment plan.

**Weed control for the control and Vitazyme treatments:** These plots were sprayed with herbicides before planting.

**Growing season weather:** favorable for corn growth

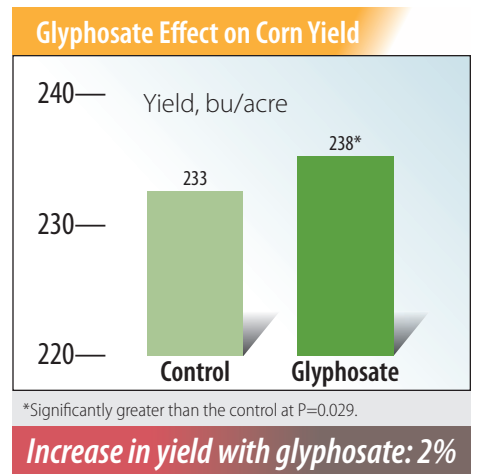
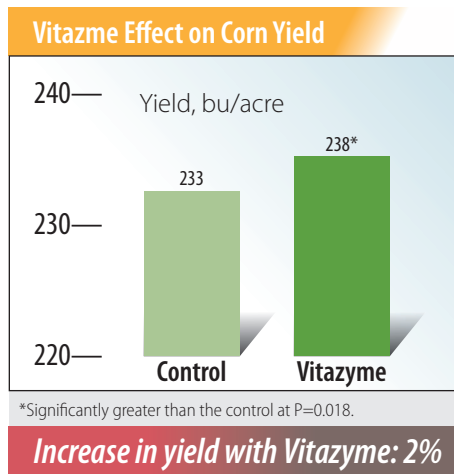
**Yield results:**

Treatment	Yield bu/acre	Yield change bu/acre
1. Control	229	—
2. Glyphosate	237	8 (+3%)
3. Vitazyme	238	9 (+4%)
4. Vitazyme + Glyphosate	239	10 (+4%)
P>F	0,079	

**Increase in corn yield**

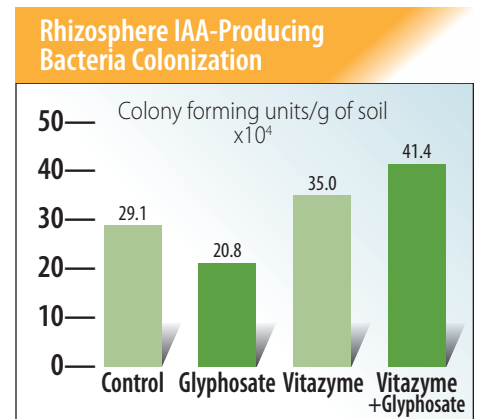
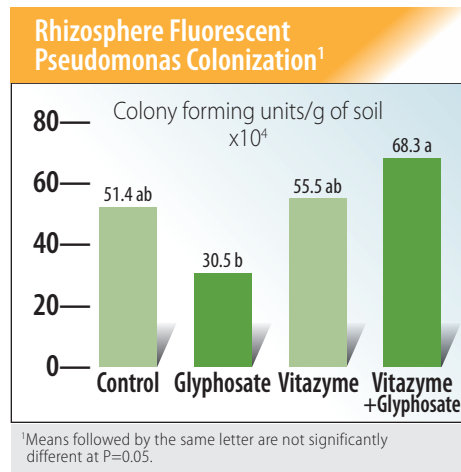
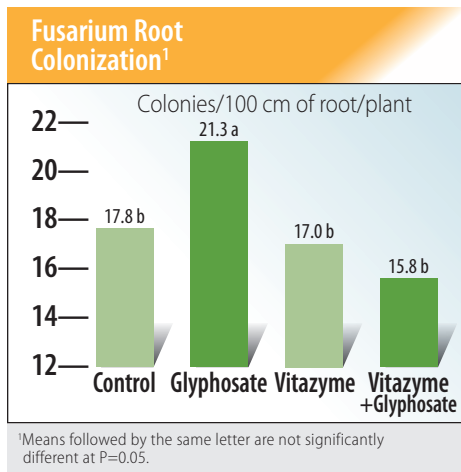
*Glyphosate* .....3%  
*Vitazyme* .....4%  
*Vitazyme + Glyphosate* ...4%

Yield differences were almost significant at P=0.05, with the combined products yielding the most.



For the Vitazyme and glyphosate yield analyses, all plots treated with that material were compared with all plots that were not treated with it.

## Soil microbial results:



### Changes in Fusarium Colonization

**Glyphosate** ..... +20%  
**Vitazyme** ..... -4%  
**Vitazyme + Glyphosate**... -11%

### Changes in Fluorescent Pseudomonas Colonization

**Glyphosate** ..... -41%  
**Vitazyme** ..... +8%  
**Vitazyme + Glyphosate**... +33%

### Changes in IAA-Producing Bacteria Colonization

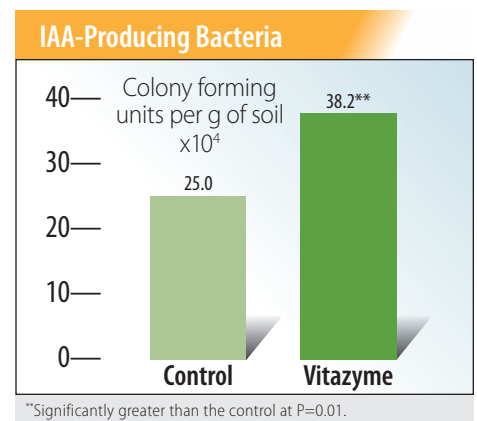
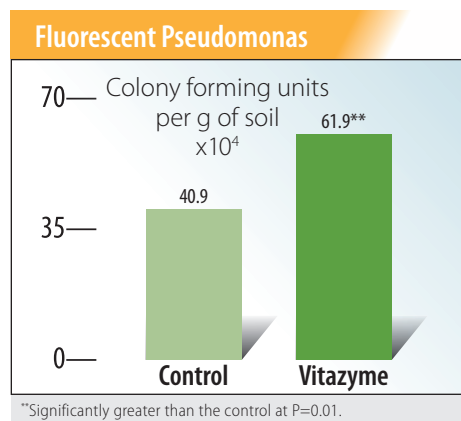
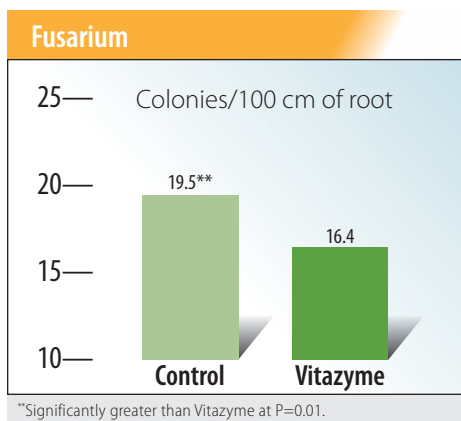
**Glyphosate** ..... -29%  
**Vitazyme** ..... +20%  
**Vitazyme + Glyphosate**... +42%

Glyphosate increased Fusarium infection, but Vitazyme combined with glyphosate reduced the infection below both Vitazyme and the control.

Glyphosate reduced Fluorescent Pseudomonas colonization by 41% below the control, while Vitazyme + Glyphosate increased levels well above the control and Vitazyme levels.

Glyphosate reduced IAA-producing bacteria below the control, while Vitazyme increased the levels, and the combined products increased levels by 42% above the control.

## Vitazyme Effects on Fusarium and Bacterial Organism Colonization

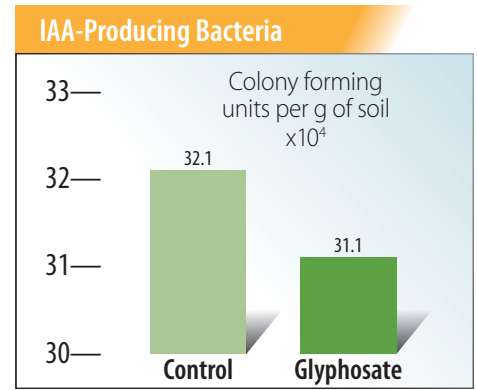
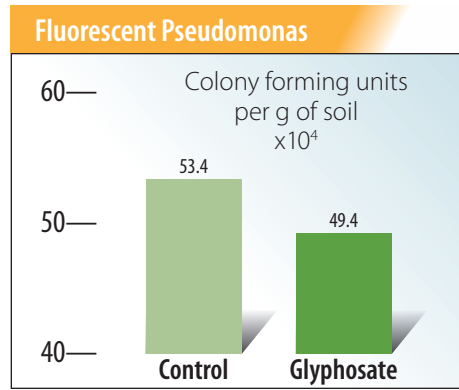
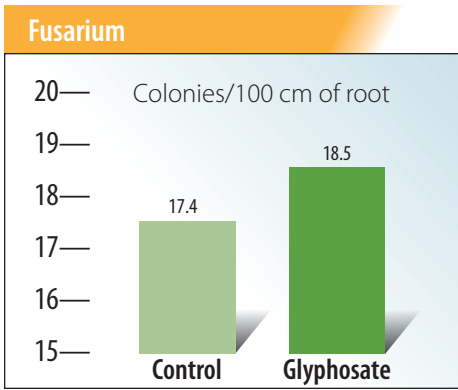


### Changes with Vitazyme

**Fusarium** ..... -16%  
**Fluorescent Pseudomonas** ... +51%  
**IAA-Producing Bacteria** ..... 53%

All Vitazyme treated plots were compared with all untreated plots, which revealed a highly significant reduction in Fusarium with Vitazyme, while beneficial bacteria increased by significant 51% and 53% levels.

## Glyphosate Effects on Fusarium and Bacterial Organism Colonization



### Changes with Glyphosate

*Fusarium* ..... +6%  
*Fluorescent Pseudomonas* ..... -7%  
*IAA-Producing Bacteria* ..... -3%

All glyphosate treated plots were compared with all untreated plots, which revealed a trend toward more *Fusarium* lesions and fewer beneficial bacteria, though none of these differences are significant.

### Fatty Acids, Oxidizers, Reducers, Glyphosate, and Enzyme Levels in Rhizosphere Soil

Treatment	TPLFA <sup>1</sup> nm/g soil	Mn Oxidizers <sup>2</sup> cfu/g soil x10 <sup>4</sup>	Mn Reducers <sup>3</sup> cfu/g soil x10 <sup>4</sup>	Red/Ox Ratio <sup>4</sup> cfu/g soil x10 <sup>4</sup>	Glyphosate <sup>5</sup> ug/kg soil	B-Glucosamine Activity <sup>6</sup> ug PNP/g soil/hr
1. Control	133	6.25	8.47	1.38	274	173
2. Glyphosate	105 (-21%)	11.9 (+90%)	6.08 (-28%)	0.604 (-56)	940 (+243%)	147 (-15%)
3. Vitazyme	121 (-9%)	4.25 (-32%)	8.85 (+4%)	2.09 (+51%)	501 (+83%)	262 (+51%)
4. Vitazyme + Glyphosate	122 (-8%)	5.66 (-9%)	8.97 (+6%)	1.64 (+19%)	1,000 (+265%)	216 (+25%)
P>F	0.077	0.154	0.334	0.391	0.383	0.683

<sup>1</sup>TPLFA = total phospholipid fatty acids; <sup>2</sup>manganese oxidizing bacteria; <sup>3</sup>manganese reducing bacteria; <sup>4</sup>ratio of manganese reducing to oxidizing bacteria; <sup>5</sup>soil glyphosate levels; <sup>6</sup>soil level of this enzyme.

### Vitazyme Effects on Fatty Acids, Oxidizers, Reducers, Glyphosate, and Enzymes

Treatment	TPLFA nm/g soil	Mn Oxidizers cfu/g soil x10 <sup>4</sup>	Mn Reducers cfu/g soil x10 <sup>4</sup>	Red/Ox Ratio cfu/g soil x10 <sup>4</sup>	Glyphosate ug/kg soil	B-Glucosamine Activity ug PNP/g soil/hr
1. Control	119	9.07*	7.27	0.991	607	160
2. Vitazyme	122	5.04	8.91	1.86**	750	239**
P>F	0.718	<b>0.019</b>	0.218	<b>0.001</b>	0.148	<b>0.009</b>

\*Significantly greater than the control at P=0.05; \*\*Significantly greater than the control at P=0.01.

All Vitazyme treated plots were compared with all untreated plots. Note that manganese oxidizers were significantly reduced with Vitazyme, while manganese reducers increased. The reduced form of Mn is the form utilized by plants. This change in

oxidation state for Mn resulted in a highly significant increased in the Red/Ox Ratio with Vitazyme. The soil enzyme level was also significantly increased with Vitazyme.

### Glyphosate Effects on Fatty Acids, Oxidizers, Reducers, Glyphosate, and Enzymes

Treatment	TPLFA nm/g soil	Mn Oxidizers cfu/g soil x10 <sup>4</sup>	Mn Reducers cfu/g soil x10 <sup>4</sup>	Red/Ox Ratio cfu/g soil x10 <sup>4</sup>	Glyphosate ug/kg soil	B-Glucosamine Activity ug PNP/g soil/hr
1. Control	127	5.33	8.66	1.73	387	218
2. Glyphosate	113 (-11%)	8.77* (+65%)	7.52 (-13%)	1.12*** (-35)	970*** (+151)	181 (-17%)
P>F	0.083	<b>0.038</b>	0.380	<b>0.008</b>	<b>0.001</b>	0.158

\*Significantly greater than the control at P=0.001.. \*\*Significantly different than the other treatment at P=0.01.



All glyphosate treated plots were compared with all untreated plots. Phospholipids and soil enzymes were reduced by glyphosate, as were Mn reducers while Mn oxidizers were significantly increased (+65%) above the control. The Red/Ox Ratio was reduced by 35%, meaning few Mn<sup>++</sup> ions were available with glyphosate, and glyphosate residues were increased by an amazing 151% with the glyphosate treatment.

**Conclusions:** This University of Missouri small-plot corn trial, using a Vitazyme in-furrow and foliar application, with and without glyphosate for the foliar application, and with glyphosate alone, revealed that Vitazyme remediated the negative effects of the herbicide on soil organisms and other parameters. Yield was increased by 5 bu/acre — as for glyphosate — and Fusarium root infection was significantly decreased by 16%; at the same time, Fluorescent Pseudomonas and IAA-producing bacteria

were significantly increased. Manganese-reducing bacteria were increased by Vitazyme, and Mn-oxidizing bacteria were significantly reduced with Vitazyme, while soil B-glucosamine activity was increased as well. Glyphosate, on the other hand, produced opposite effects from Vitazyme by increasing Mn-oxidizers and Fusarium infection, while reducing beneficial microorganisms like Fluorescent Pseudomonas, IAA-producing bacteria, and Mn-reducers, while reducing phospholipid fatty acids and soil enzyme activity. Most notably, when Vitazyme was added to the glyphosate before spraying, the negative effect of the glyphosate on Fusarium and beneficial bacteria were reversed. These data indicate that, besides being a yield booster, Vitazyme, when applied with glyphosate herbicide, can remediate the damage this herbicide can do to the plant and soil, and thus is a natural remedy for farmers to add along with glyphosate in the sprayer tank.



## Corn with Vitazyme application

**Researcher:** V. V. Plotnikov

**Research institution:** Agro Expert International, Vinnytsya, Ukraine

**Location:** L. L. C. Zlahoda, Vyshnivtsi Village, Onuphriy District, Kirovohrad Region, Ukraine

**Variety:** DKS 3511, FAO 330

**Planting date:** April 29, 2016

**Seeding rate:** 70,000 seeds/ha

**Previous crop:** winter wheat

**Soil type:** dark gray podzolic (2.6% organic matter)

**Cultivation:** disking to 6-8 cm, plowing to 20-22 cm, harrowing, and cultivation to 4-5 cm

**Rainfall:** 500-550 mm

**Experimental design:** A corn field was divided into a Vitazyme treated and untreated area, with the objective of determining the effect of this product on the yield of the grain.

① Control ② Vitazyme

**Fertilization:** 115 kg/ha of N pre-plant; at planting instead of 12-52-0 kg/ha of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O in-row

**Vitazyme application:** 1.0 liter/ha on the leaves and soil at the 7 to 8-leaf stage on June 2, 2016

### Yield results:

Treatment	Grain yield tons/ha	Yield change tons/ha
Control	4.8	—
Vitazyme	6.4	1.6 (+33%)

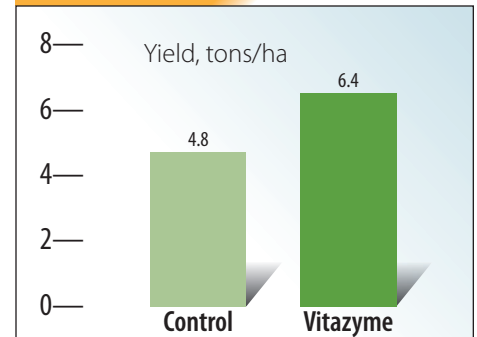
**Increase in grain yield with Vitazyme: 33%**

**Income results:** Vitazyme increased net profit by 263 USD/ha.

**Conclusions:** A corn trial in central Ukraine using Vitazyme at 1.0 liter/ha on the leaves and soil produced a 33%

yield increase. Profits were substantially increased proving the viability of this product for corn production in central Ukraine. A yield increase of this magnitude resulting from the 127 kg/ha of N used in this trial reveals the improvement in nitrogen efficiency this program affords.

### Grain yield





# Corn with Vitazyme application

**Researcher:** V. V. Plotnikov

**Research institution:** Agro Expert International, Vinnytsya, Ukraine

**Location:** Family Enterprise Kolyvailo, Miziakivs'ki Hutory Village, Vinnytsya Region, Ukraine.

**Variety:** DKS 4408 FAO 340

**Planting date:** April 25, 2016

**Seeding rate:** 75,000 seeds/ha

**Previous crop:** winter wheat

**Soil type:** Chernozem (3.0% organic matter)

**Cultivation:** disking to 6-8 cm, plowing to 20-22 cm, harrowing, and cultivation to 4-5 cm

**Rainfall:** 500-550 mm

**Experimental design:** A corn field was divided into a Vitazyme treated and untreated area, with the objective of determining the effect of this product on the yield of the grain.

**Fertilization:** 92 kg/ha of N pre-plant; at planting, 10-26-26 kg/ha of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O in-row; 46 kg/ha of N side-dressed

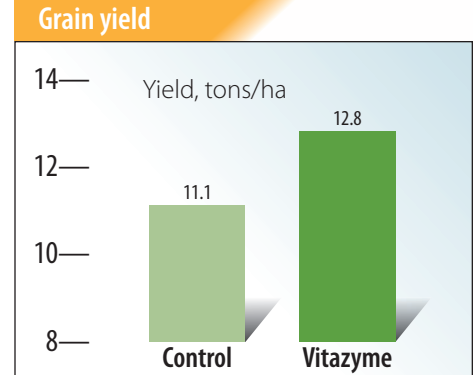
**Vitazyme application:** 1.0 liter/ha on the leaves and soil at the 7 to 8-leaf stage on May 31, 2016

① Control ② Vitazyme

## Yield results:

Treatment	Grain yield tons/ha	Yield change tons/ha
Control	11.1	—
Vitazyme	12.8	1.7 (+15%)

**Increase in grain yield with Vitazyme: 15%**



**Income results:** Vitazyme increased net profit by 281 USD/ha.

**Conclusions:** This Vitazyme foliar and soil treatment trial in Ukraine showed that only 1 liter/ha produced a 15% yield increase. Profits were also substantially increased, showing the viability of this product for corn production in central Ukraine on Chernozem soils.



**Corn** with Vitazyme application—A Nitrogen Efficiency Study



Notice the much improved root development when Vitazyme is applied to the seeds and leaves.



The research plots at South Dakota State University produced excellent yield and nitrogen efficiency data for 2016.

**Researcher:** Dr. David Clay and Graig Reicks

**Research institution:** Department of Plant Sciences, South Dakota State University, Brookings, South Dakota

**Location:** South Dakota State University, Field Research Facility, Aurora, South Dakota

**Variety:** DKC 49-72 (99-day hybrid)

**Planting date:** May 14, 2016

**Planting rate:** 32,000 seeds/acre

**Planting depth:** 2 inches

**Row spacing:** 30 inches

**Soil type:** Strayhoss-Maddox Complex, 2% slope, loam texture

**Experimental design:** A replicated randomized complete block design, with plots 6 rows wide (15 feet) and 20

feet long, was established to determine the effectiveness of Vitazyme as both a seed and a soil treatment for corn. Yield measurements were made, and also <sup>15</sup>N measurements were made using a mass spectrometer to determine the efficiency of nitrogen use within the plant. Three fertilizer nitrogen rates were used, and four replications.

**Fertilization:** Nitrogen fertilizer was applied by hand as urea (46%) to appropriate plots on June 13, 2016, when the corn was at the V3 stage.

**Vitazyme application: Seed treatment** (at planting on May 14): 112 ml of Vitazyme per 10 lb of seed, or 7.4 oz/acre sprayed on the seeds and mixed on a tarp; **Foliar treatment** (on June 29 at V 8-9) at 13 oz/acre, using a 15 gal/acre spray solution, with a non-ionic surfactant (0.25% v/v) and a backpack sprayer.

**<sup>15</sup>N determinations:** A mass spectrometer was used at the Department of Plant Science, South Dakota State University.

**Yield and nitrogen results:** At the time of this reporting, only the seed treatment results are given. The full report will be available at a later date.

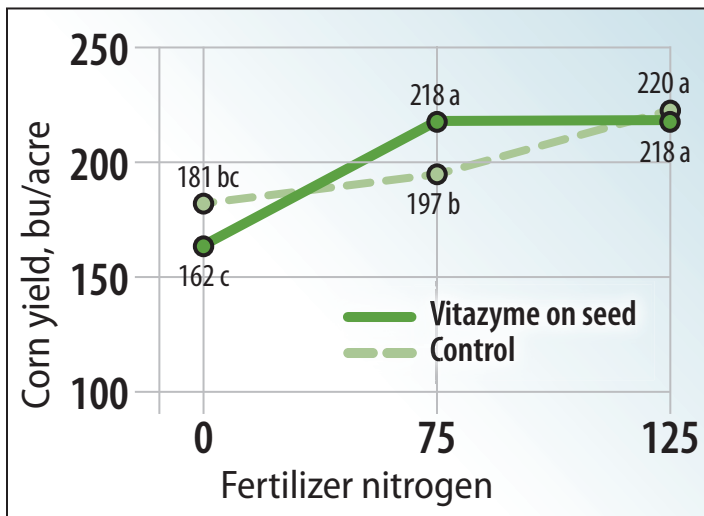
Treatment	Nitrogen fertilizer	Corn yield <sup>1</sup>	Corn grain use efficiency <sup>2</sup>
	bu/acre	bu/acre	%
1. None	125	220 a	43.3 b
	75	197 b	40.3 b
	0	181 bc	—
2. Vitazyme on seeds	125	218 a	42.6 b
	75	218 a	58.0 b
	0	162 c	

<sup>1</sup>Means followed by the same letter are not significantly at P=0.05.

<sup>2</sup>Means followed by the same letter are not significantly different at P=0.10. The calculations used to determine this value are based upon 14N and 15N ratios in the grain, and will not be presented in this report.

Nitrogen rate	Vitazyme application			
	None	Seeds	Leaves	Seeds + Leaves
lb/acre	(treatment number)			
0	1	4	7	10
75	2	5	8	11
125	3	6	9	12

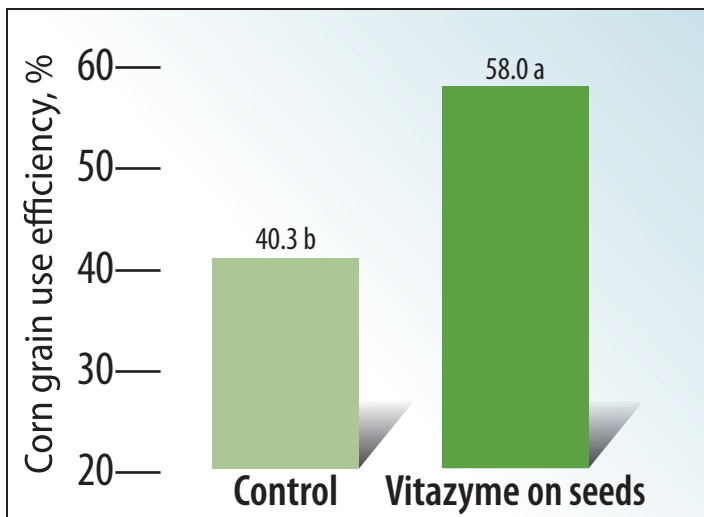
## Vitazyme Seed Treatment Effect on Corn Yield



**Increase in corn yield with Vitazyme seed treatment: 21 bu/acre, or 11%**

At the same nitrogen level, with or without a Vitazyme seed treatment, the yield increased by 11%, which was the same yield as for the high nitrogen rate (125 lb/acre) with the seed treatment. Thus, the nitrogen utilization was improved greatly with Vitazyme, as evidenced by the Corn Grain Use Efficiency value.

## Vitazyme Seed Treatment Effect on Corn Grain Use Efficiency at 75 lb/acre nitrogen



Ear and root development are improved with a seed and a foliar Vitazyme treatment, as seen here.

**Improvement in nitrogen use efficiency of the grain with Vitazyme on seeds: 17.7 %-points**

This improvement in the use of nitrogen by the seeds was dramatically shown at the reduced N rate of 75 lb/acre. It did not occur at the 125 lb/acre N rate, showing the potential of Vitazyme's active agents to greatly improve N transfer into the grain when fertilizer N is somewhat limiting.

**Conclusions:** A small plot, replicated corn trial near Brookings, South Dakota, using 12 treatments with a Vitazyme seed treatment, a foliar treatment, or both, at three nitrogen levels (0, 75, and 125 lb of N/acre), revealed a pronounced yield response at the reduced nitrogen level (75 lb/acre) for the seed treatment. The corn yield jumped by 11%, from 197 to 218 bu/acre, a highly significant increase

that equalled the seed treatment yield at the high nitrogen level (125 lb/acre). This high yield was about the same as the yield obtained at 125 lb/acre of nitrogen without Vitazyme on the seeds. Calculations of nitrogen use efficiency using <sup>15</sup>N computations revealed that, at the reduced 75 lb/acre nitrogen rate, the efficiency of nitrogen movement into the grain was greatly enhanced with the

Vitazyme seed treatment, increasing from 40.3% to 58.0%. This increase occurred at the reduced nitrogen rate only, revealing that when more fertility stress existed the brassinosteroids and other active agents in Vitazyme caused more nutrients to be translocated into the grain out of the total fertilizer added, compared to the untreated corn at the same 75 lb/acre nitrogen rate.



# Cotton with Vitazyme application

**Researcher:** Pius Elobu J.R. Ocan, J. Olinga, and P. Ogabe

**Research organization:** National Semi-Arid Resources Research Institute (NaSARRI) - SERERE, Soroti, Uganda

**Location:** NaSARRI station, Soroti, Uganda

**Variety:** BPA 2002

**Row spacing:** 75 cm

**In-row spacing:** 30 cm

**Crop cycles:** May, 2015 (Trial A), and August, 2015 (Trial B)

**Experimental design:** Two small - plot replicated randomized complete block design trials were set up with plots 5.25 x 4 meters to evaluate the effects of Vitazyme, in various applications, on the yield of cotton. A standard fungicide seed coat treatment was also used as a standard for comparison.

Treatment	Vitazyme seed treatment			Vitazyme foliar spray (2 times) <sup>1</sup>			Bronopal
	2.5%	5.0%	10.0%	0.5 liter/ha	1 liter/ha	2 liters/ha	
1. Control	o	o	o	o	o	o	o
2. Low Vitazyme, seeds	x	o	o	o	o	o	o
3. Low Vitazyme, seeds + foliar	x	o	o	x	o	o	o
4. Low Vitazyme, foliar	o	o	o	x	o	o	o
5. Medium Vitazyme, seeds	o	x	o	o	o	o	o
6. Medium Vitazyme, seeds + foliar	o	x	o	o	x	o	o
7. Medium Vitazyme, foliar	o	o	o	o	x	o	o
8. High Vitazyme, seeds	o	o	x	o	o	o	o
9. High Vitazyme, seeds + foliar	o	o	x	o	o	x	o
10. High Vitazyme, foliar	o	o	o	o	o	x	o
11. Fungicide	o	o	o	o	o	o	x

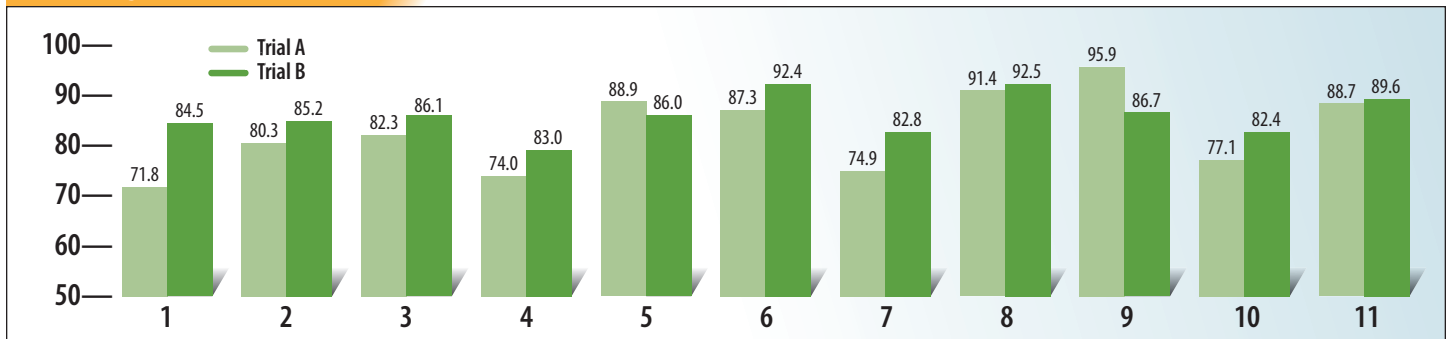
<sup>1</sup> Two applications, one at early bloom and a second 30 days later.

**Fertilization:** unknown

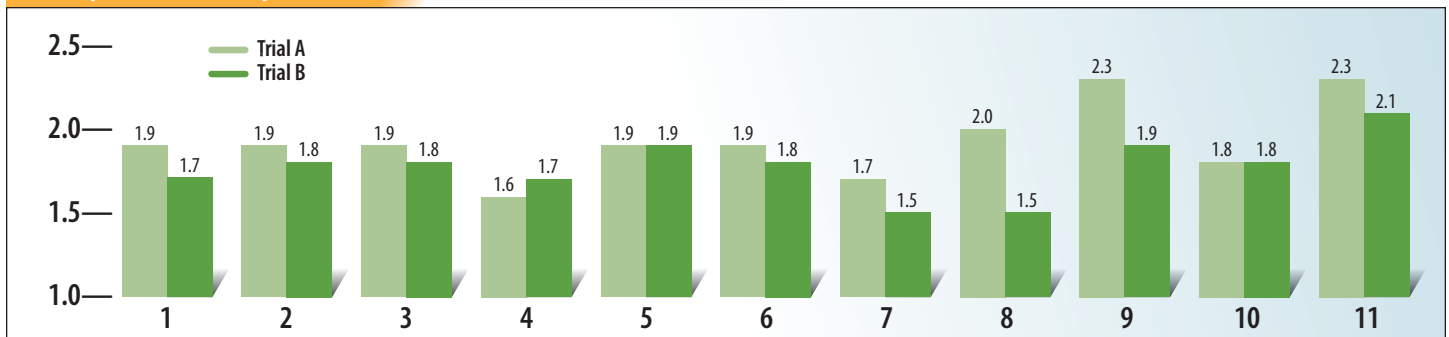
**Vitazyme application:** See above

**Plant characteristics:**

## Plant Height, cm

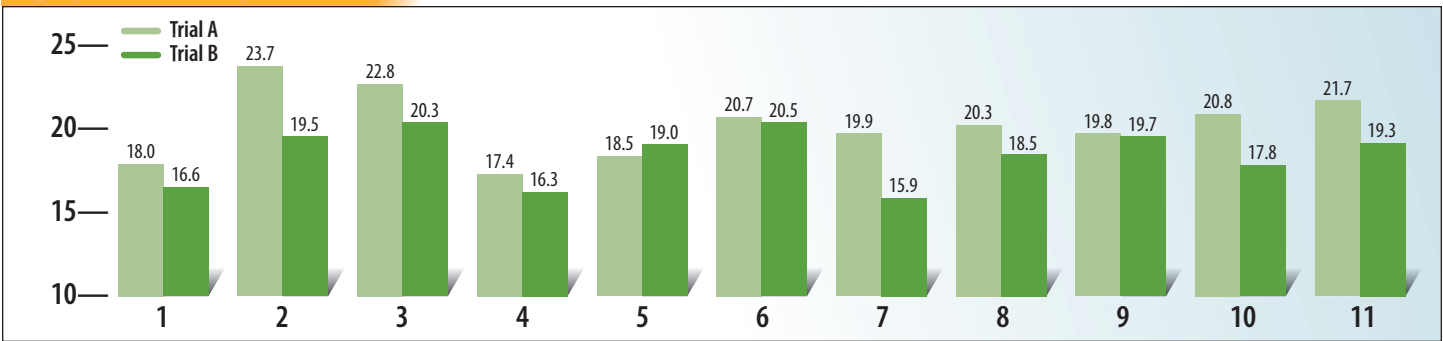


## Monopodia<sup>1</sup>, number/plant



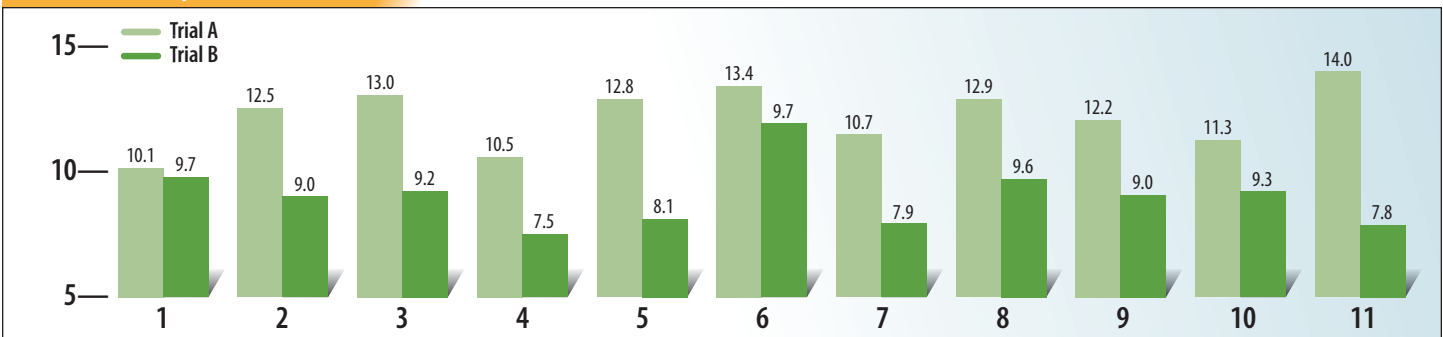
<sup>1</sup>Main plant axes.

### Sympodia<sup>2</sup>, number/plant



<sup>2</sup>Side branches off the main axes.

### Bolls, number/plant

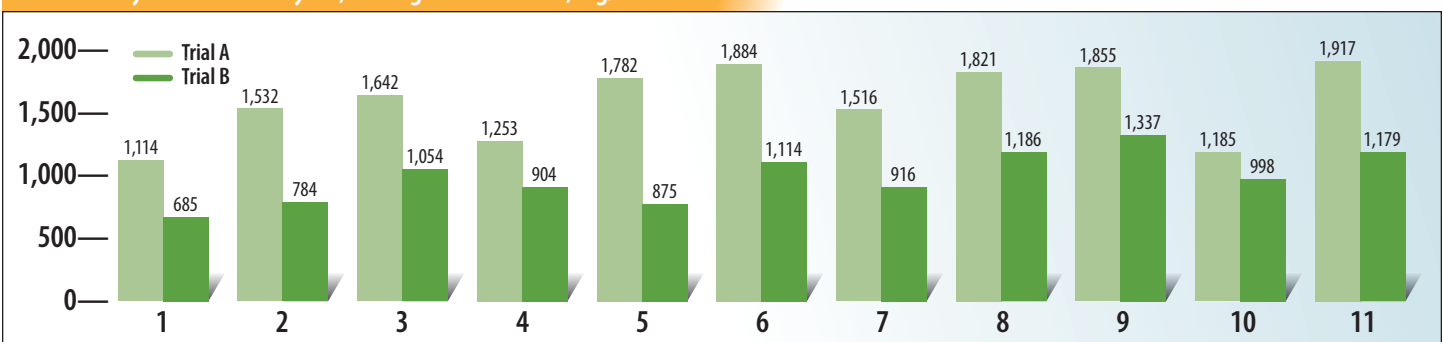


The height of the cotton plants from the fall planting were generally higher than for the spring planting, with notable exceptions for Vitazyme on the seeds (5%), and high Vitazyme levels on seeds and leaves. Monopodia values were generally higher for the May planting, as were the Sympodia, while boll numbers were without exception considerably higher for the

May planted trial. There was no discernible pattern of response for the various Vitazyme treatments, although the strictly foliar treatments without a seed treatment tended to have lower values for all growth parameters. The untreated control usually displayed the lowest values, while the standard fungicide treatment had high values.

### Yield results:

#### Increased yield with Vitazyme, average of two trials, kg/ha



This review in Trial A of the Vitazyme treatments compared to the untreated control shows some significant points.

1. The seed treatment alone was highly effective, more so than the foliar treatment alone.
2. The optimum yield increase for the seed treatment was reached by about a 5% solution.
3. The combined seed plus foliar treatments yielded the best of all, reaching the maximum with the 5% seed treatment plus the 1 L/ha foliar spray; this gave a 69% yield increase.

The standard fungicide treatment provided a 72% yield increase above the control.

Some clear observations are apparent with Trial B yield results. This trial presumably experienced greater environmental stresses than did the earlier conducted Trial A.

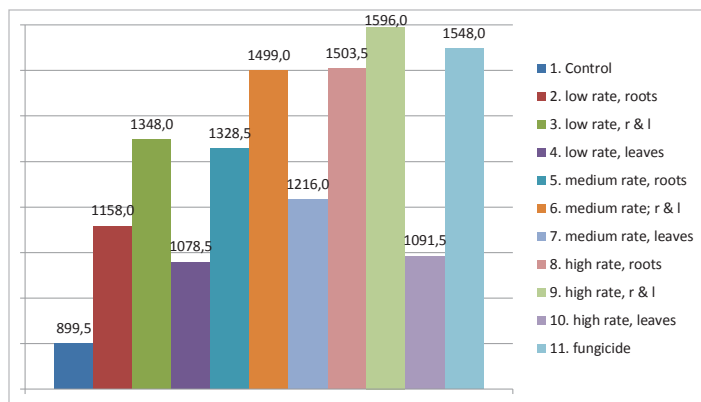
1. The seed treatment only yields escalated quickly with higher rates, moving from 14% at the 2.5% concentration to a 73% yield increase with the 10% concentration.
2. Foliar treatments were very effective, and increased yield from

32% at 0.5% L/ha to 46% at 2.0 L/ha.

3. The combined seed and foliar treatment produced profound yield increases that increased from 54% at the low rates to 95% at the high rates.

The fungicide treatment produced a 72% yield increase, which was less than the highest Vitazyme yield.

### Lint Yield Results for the Two Combined Trials



Lint Yield (kg/ha) by Vitazyme rate level and target(s) in Uganda 2015 cotton trial (all treatments, except 4 & 10, were significantly different by Anova & LSD at P=0.05).

### Increased yield with Vitazyme, average of 2 trials

**Seed treatment only:** 2.5%..... +29%  
 5.0%..... +48%  
 10.0% ..... +67%

**Foliar treatment only:** 0.5 L/ha..... +20%  
 1.0 L/ha..... +35%  
 2.0 L/ha..... +21%

**Seed + foliar treatment:** Low ..... +50%  
 Medium ..... +67%  
 High ..... +77%

**Conclusion:** This replicated cotton trial in Uganda, which compared low, medium, and high applications of Vitazyme to the seed and leaves only, and also to both, as compared to an untreated control and a fungicide treatment, revealed that Vitazyme produced consistently high yield responses for all applications. This was especially true for Trial B, which was presumably a more stressed trial judging by the lower yields compared to Trial A. In Trial B, yield responded dramatically to both the seed and foliar treatments alone—from 14 to 73%—but the combined seed and foliar treatments gave impressive yield responses of 54% at the low application rates, to 95% at the high rates. Trial A, which produced higher yields, increased yields by 47 to 69% with the combined treatments, while the seed treatment alone boosted yields by 60% with only 5% Vitazyme applied to the seeds alone; the foliar applications alone in this trial raised the yield somewhat less than did the seed treatment alone. The fungicide treatment increased yields by 72% for both trials A and B.

This cotton experiment was greatly hampered in its interpretation by the failure to include any combined fungicide–Vitazyme treatments. It is very possible that a synergism would have been detected with this combination. Until such trials are conducted, it can be said that Vitazyme is a highly effective asset for cotton producers in the semi-arid regions of Africa, doing as well as the standard fungicide treatment.





# Eggplant with Vitazyme application

**Researcher:** V. V. Plotnikov and V. V. Rohach

**Research Organization:** Vinnytsia State Pedagogical University, Ministry of Education and Science of Ukraine, Vinnytsia, Ukraine

**Location:** "Berzhan P. G.", Horbanovka Village, Vinnytsia District, Ukraine

**Variety:** Diamond

**Planting rate:** 33,000/ha

**Planting date:** March 3, 2015, in hot frames

**Seedling planting date:** May 12, 2015

**Soil type:** gray podzolic; humus = 2.2%, hydrolyzed N = 8.4 mg/100 g of soil, P = 15.8 mg/100 g of soil, exchangeable K = 12.4 mg/100 g of soil, pH = 5.5

**Replications:** 5

**Experimental design:** An area of 33 m<sup>2</sup> per plot was selected from a uniform soil area to treat with Vitazyme one time, in order to evaluate the effect of this product on growth parameters and yield.

**Fertilization:** a mineral fertilizer giving 50, 40, and 30 kg/ha of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O

**Vitazyme application:** 1 liter/ha with a backpack sprayer the morning of June 17, 2015; control plants were sprinkled with water only at the same time

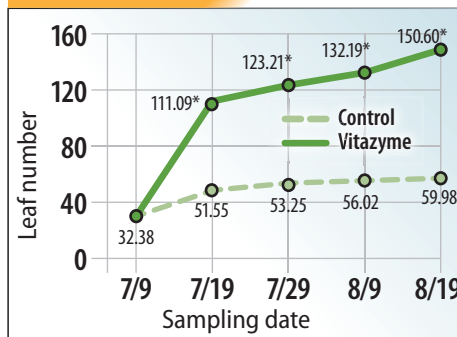
**Growing season weather:** generally favorable for crop development.

**Growth results:**



Eggplant fruit treated with Vitazyme tend to be larger and of higher quality than their untreated counterparts.

## Leaves Per Plant

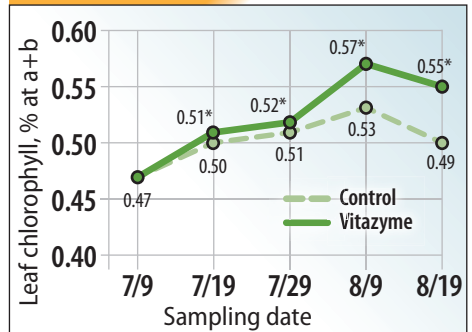


\*Significantly greater than the control at P=0.05.

## Increase in leaf area with Vitazyme

7/19/15.....	+41%
7/29/15.....	+69%
8/9/15.....	+62%
8/19/15.....	+45%

## Leaf chlorophyll



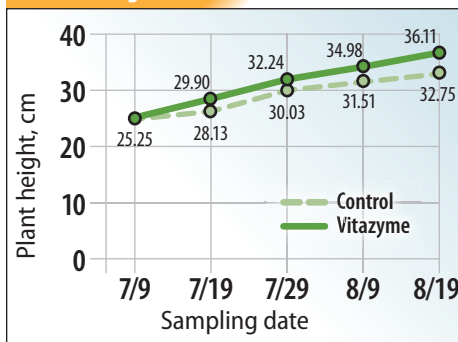
\*Significantly greater than the control at P=0.05.

<sup>1</sup> Calculated as follows:  $X = \frac{(C \cdot V) (100)}{(P) (1000)}$ , where X=pigment content (% per leaf, net weight), C=pigment concentration (mg/liter), V=extract volume (ml), and P=weight of plant material (mg).

## Increase in leaves/plant with Vitazyme

7/19/15.....	+115%
7/29/15.....	+137%
8/9/15.....	+136%
8/19/15.....	+151%

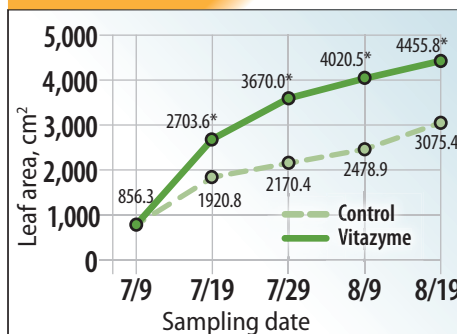
## Plant Height



## Increase in plant height with Vitazyme

7/19/15.....	+6%
7/29/15.....	+7%
8/9/15.....	+11%
8/19/15.....	+10%

## Leaf Area Per Plant<sup>1</sup>



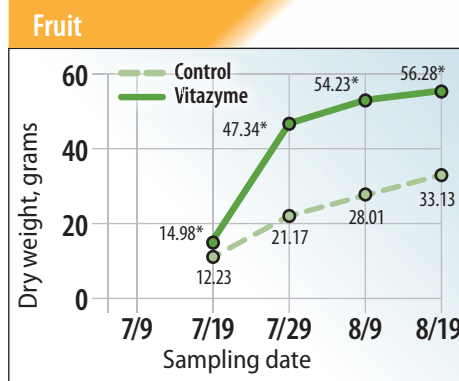
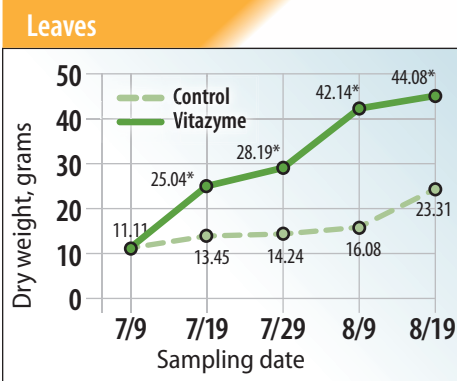
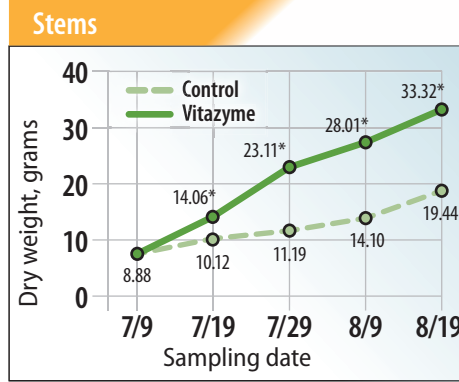
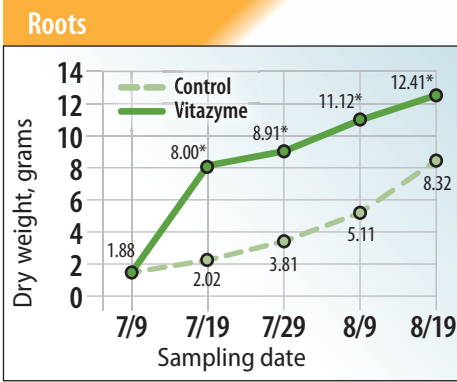
\*Significantly greater than the control at P=0.05.

<sup>1</sup> Calculated as follows:  $S = \frac{(n)(m_1)(S_2)}{m_2}$ , and  $S_2 = \pi r^2$ , where S= leaf area (cm<sup>2</sup>), n= leaf number, m<sub>1</sub>= leaf weight (g), m<sub>2</sub>= cutting weight (g), S<sub>2</sub>= cutting area (cm<sup>2</sup>), π=3.14, and r= cutting radius (cm).

## Increase in leaf chlorophyll with Vitazyme

7/19/15.....	+2%
7/29/15.....	+2%
8/9/15.....	+8%
8/19/15.....	+12%

## Plant Organ Dry Weights

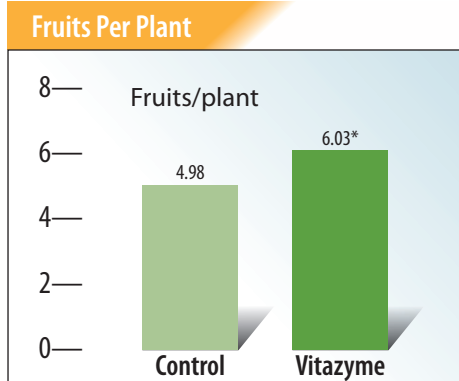
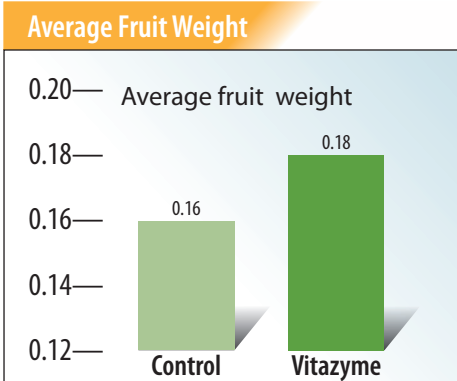


\*Significantly greater than the control at P=0.05.

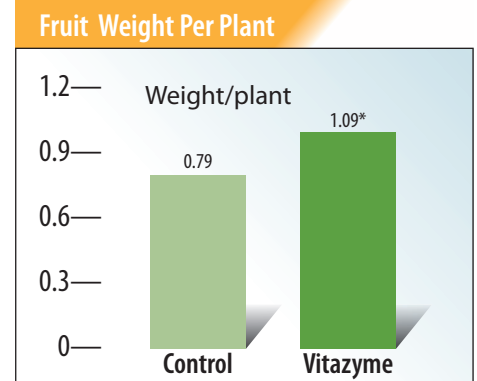
**Economic results:** An analysis of many factors was made to determine the profitability of the Vitazyme application. Costs included tillage, oil and fuel, harrowing, cultivation, fertilizers, planting, seedlings, rent, watering, product applications, trucking, and harvesting.

**Conclusions:** An eggplant experiment in Ukraine, using a single 1 liter/ha Vitazyme spray application, produced excellent yield responses. Yield increased by an excellent 40%, with profit rising by 47% as well. These great increases resulted from increased growth responses of total leaves (115 to 151%), leaf area per plant (41 to 69%), and leaf chlorophyll (2 to 12%). As a result, plant roots, stems, leaves, and fruit were uniformly and significantly improved above the untreated controls at all four evaluation dates. The resulting fruit weight, fruits per plant, and fruit weight per plant led to the increased yield and profitability. This program shows great potential to improve eggplant productivity in Ukraine.

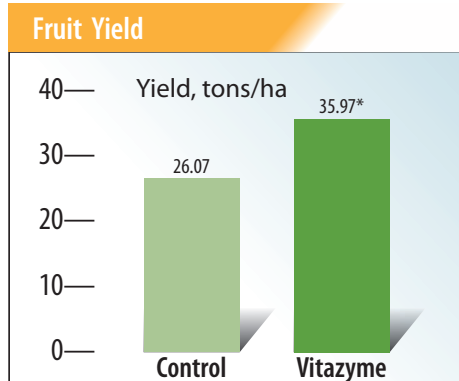
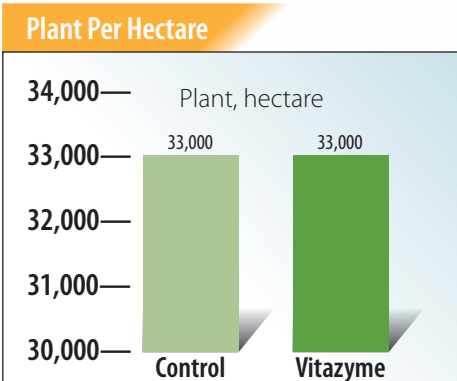
## Yield results:



\*Significantly greater than the control at P=0.05.



\*Significantly greater than the control at P=0.05.



\*Significantly greater than the control at P=0.05.

Treatment	Net profit UAH/ha	Profit increase UAH/ha
Control	145,627.13	—
Vitazyme	214,447.13	68,820.00

**Increase in net profit with Vitazyme: 47%**

**Increase with Vitazyme**

**Average fruit weight... +13%**  
**Fruits/plant ..... +21%**  
**Fresh weight/plant..... +40%**  
**Fruit yield ..... +40%**



# Onions with Vitazyme application



Fifteen days after the third application there is a pronounced advantage in size for the Vitazyme treated onions (left).



The leaves of the treated plants (right) have more chlorophyll than the control plants, and the bulbs are larger 15 days after the second application.

**Researchers:** Eng. Lucero Fernandez of Quimica Lucava, and Eng. Antonio Medina Hernandez (MEDFER)

**Farm owner:** Martin Perez Heredia

**Location:** San Francisco del Rincon, Guanajuato, Mexico

**Variety:** Carte Blanche

**Treatment initiation:** July 29, 2016

**Experimental design:** An onion field was divided into a Vitazyme treated (3 ha) and an untreated control area (3 ha) to determine the effect of this product on the growth and yield of white onions.

## ① Control ② Vitazyme

**Fertilization:** unknown

**Vitazyme application:** (1) 1 liter/ha by drip irrigation immediately after planting on July 29; (2) 1 liter/ha by spray on leaves and soil on August 29; (3) 1 liter/ha by spray on leaves and soil on September 29

**Growth evaluations:** Fifteen days after each application an evaluation was made of onion growth.

**Evaluation 1:** Vitazyme treated plants had larger root systems with thicker roots.

**Evaluation 2:** Treated plants had more roots that were thicker and healthier, and there were more small roots on the stem disc. They also had a much thicker phylodium, with more distinct veins and a darker green color.

**Evaluation 3:** Plants treated with Vitazyme had much more abundant roots, the phylodium was much thicker, the bulbs were larger and more uniform, and there was less Pink Root disease.

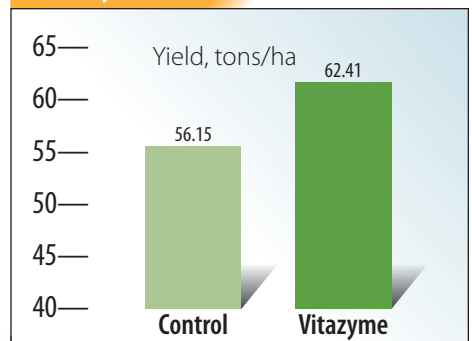
**Harvest date:** October 20 to 22, 2016 (83 to 85 days after transplanting)

### Yield results:

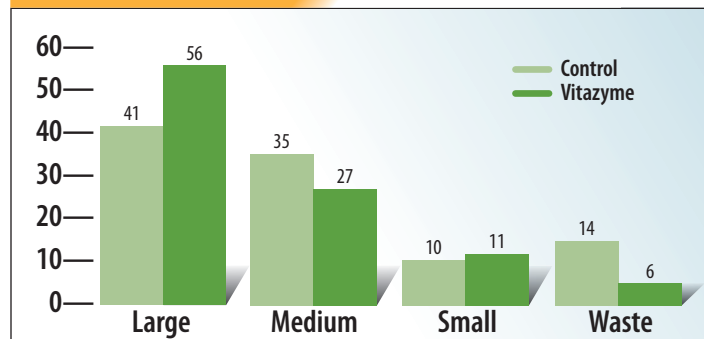
Treatment	Yield tons/ha	Yield change tons/ha
Control	56.15	—
Vitazyme	62.41	6.26 (+11%)

**Yield increase with Vitazyme: 11%**

### Onion yield



### Onion Size Distribution %



### Income results:

**Increased income with Vitazyme: 1,565 USD/ha**

**Increased profit with Vitazyme: 1,493.75 USD/ha**

**Cost : Benefit ratio: 21:1**

**Conclusions:** An onion trial in Mexico, using three applications of Vitazyme at 1 liter/ha, revealed that this product produced superior root and leaf growth, chlorophyll development, and bulb size while reducing the incidence of Pink Root disease. The yield was increased by 11%, and the bulb size was moved towards the larger size category with considerably less waste. Profit was increased by 1,493.75 USD/ha, with a 21-times return for each dollar invested in the product. These data validate the great usefulness of Vitazyme for onion growers in Mexico.



# Peppers with Vitazyme application

**Researchers:** V. V. Plotnikov and V. V. Rohach

**Research Organization:** Vinnytsia State Pedagogical University, Ministry of Education and Science of Ukraine, Vinnytsia, Ukraine

**Location:** "Berzhan P, G", Horbanovka Village, Vinnytsia District, Ukraine

**Variety:** Antei

**Planting rate:** 66,000/ha

**Seed Planting date:** March 9, 2015, in hot frames

**Seedling planting date:** May 15, 2015

**Soil type:** gray podzolic; humus = 2.2%, hydrolyzed N = 8.4 mg/100 g of soil, P = 15.8 mg/100 g of soil, exchangeable K = 12.4 mg/100 g of soil, pH = 5.5

**Replications:** 5

**Experimental design:** An area of 33 m<sup>2</sup> per plot was selected from a uniform soil area to treat with Vitazyme one time, in order to evaluate the effect of this product on growth parameters and yield.

**1 Control 2 Vitazyme**

**Fertilization:** a mineral fertilizer giving 50, 40, and 30 kg/ha of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O

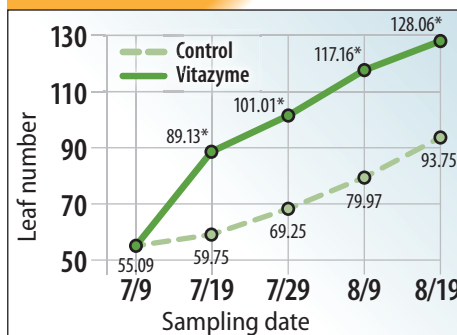
**Vitazyme application:** 1 liter/ha with a backpack sprayer the morning of July 9, 2015; control plants were sprinkled with water only at the same time

**Growth results:**



Pepper fruit treated with Vitazyme tends to be larger and of higher quality than their untreated counterparts.

**Leaves Per Plant**

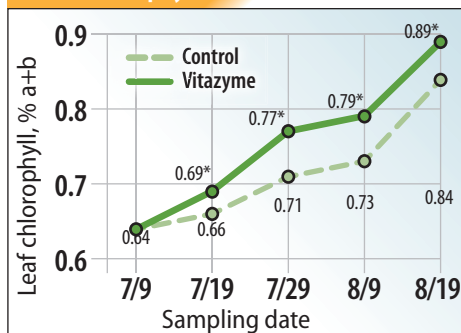


\*Significantly greater than the control at P=0.05.

**Increase in leaf area with Vitazyme**

7/19/15.....	+14%
7/29/15.....	+24%
8/9/15.....	+38%
8/19/15.....	+52%

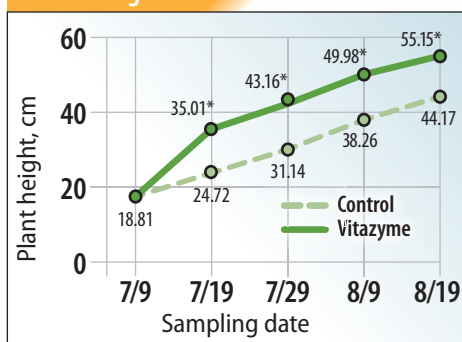
**Leaf chlorophyll**



\*Significantly greater than the control at P=0.05.

<sup>1</sup> Calculated as follows:  $X = \frac{C(V)(100)}{P(1000)}$ , where X=pigment content (% per leaf, net weight), C=pigment concentration (mg/liter), V=extract volume (ml), and P=weight of plant material (mg).

**Plant Height**

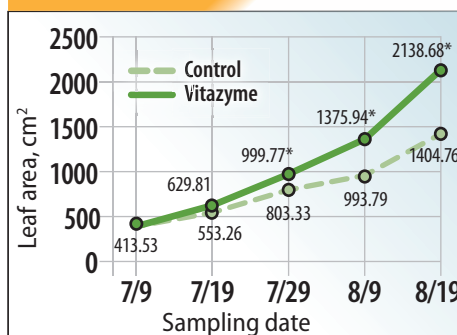


\*Significantly greater than the control at P=0.05.

**Increase in leaves/plant with Vitazyme**

7/19/15.....	+49%
7/29/15.....	+46%
8/9/15.....	+47%
8/19/15.....	+37%

**Leaf Area Per Plant<sup>1</sup>**



\*Significantly greater than the control at P=0.05.

<sup>1</sup> Calculated as follows:  $S = \frac{n(m_1)(S_2)}{m_2}$ , and  $S_2 = \pi r^2$ , where S= leaf area (cm<sup>2</sup>), n= leaf number, m<sub>1</sub>= leaf weight (g), m<sub>2</sub>= cutting weight (g), S<sub>1</sub>= cutting area (cm<sup>2</sup>), π=3.14, and r= cutting radius (cm).

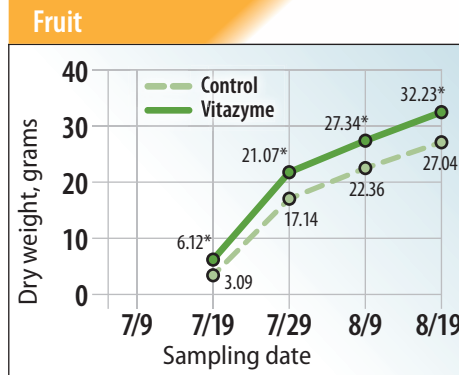
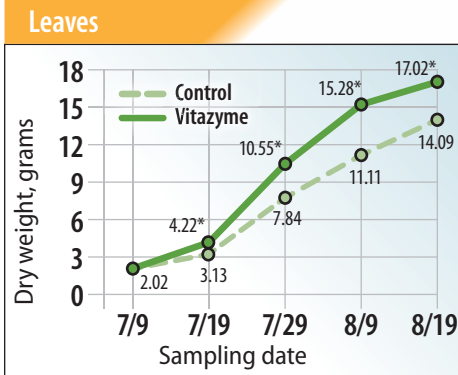
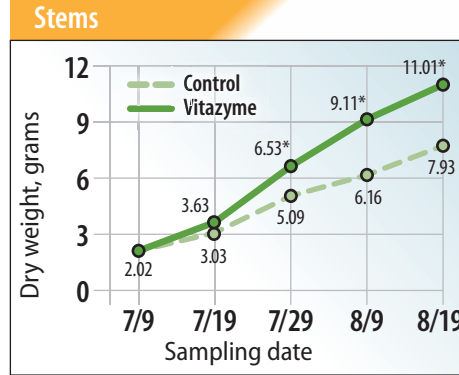
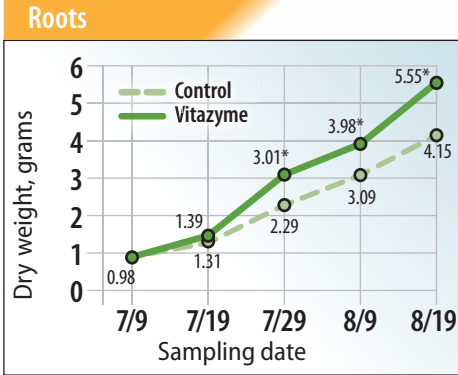
**Increase in plant height with Vitazyme**

7/19/15.....	+42%
7/29/15.....	+39%
8/9/15.....	+31%
8/19/15.....	+25%

**Increase in leaf chlorophyll with Vitazyme**

7/19/15.....	+5%
7/29/15.....	+8%
8/9/15.....	+8%
8/19/15.....	+6%

## Plant Organ Dry Weights

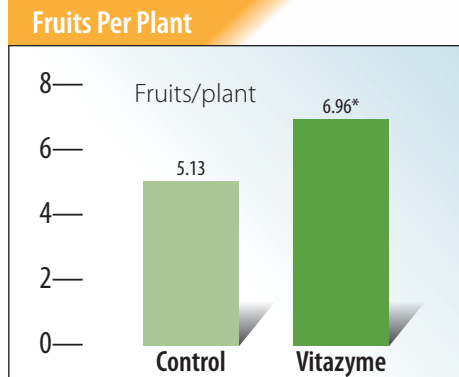
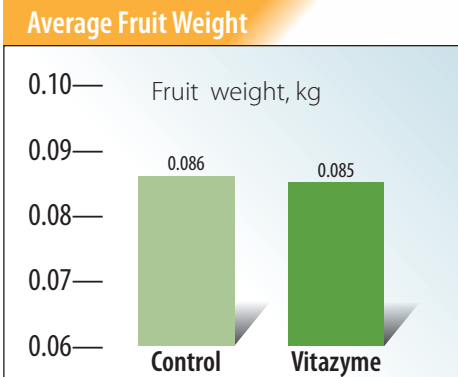


\*Significantly greater than the control at P=0.05.

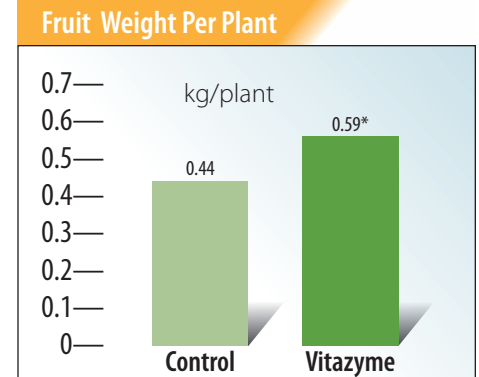
**Economic results:** An analysis of many factors was made to determine the profitability of the Vitazyme application. Costs included tillage, oil and fuel, harrowing, cultivation, fertilizers, planting, seedling, rent, watering, product applications, trucking, and harvesting.

**Conclusions:** A bell pepper study in Ukraine, using one 1 liter/ha foliar application, revealed that the yield increased by 34%, with a net profit increase of 42%. This yield and profit improvement resulted from significant increases in plant height (up to 42%), leaves/plant (37 to 49%), leaf area/plant (14 to 52%), and leaf chlorophyll (5 to 8%). Improvements in root, stem, leaf, and fruit yields were significant in most cases for the four dates measurements were made. These results reveal the great effectiveness of Vitazyme for pepper production in Ukraine.

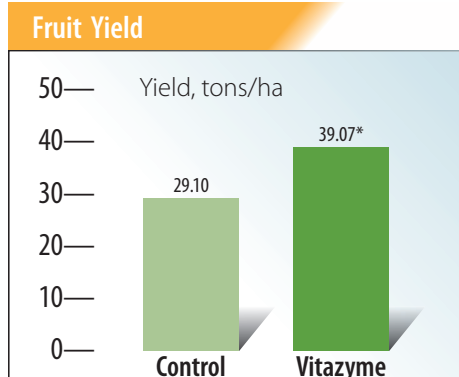
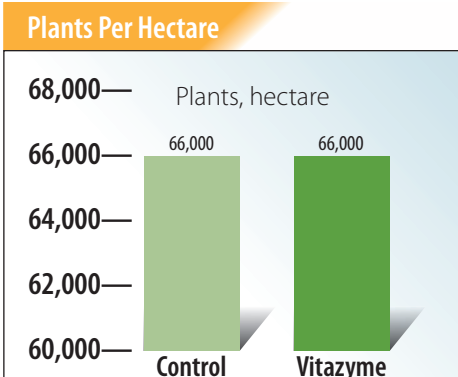
## Yield results:



\*Significantly greater than the control at P=0.05.



\*Significantly greater than the control at P=0.05.



\*Significantly greater than the control at P=0.05.

Treatment	Net profit UAH/ha	Profit increase UAH/ha
Control	162,411.51	—
Vitazyme	230,375.23	67,963.72 (+42%)

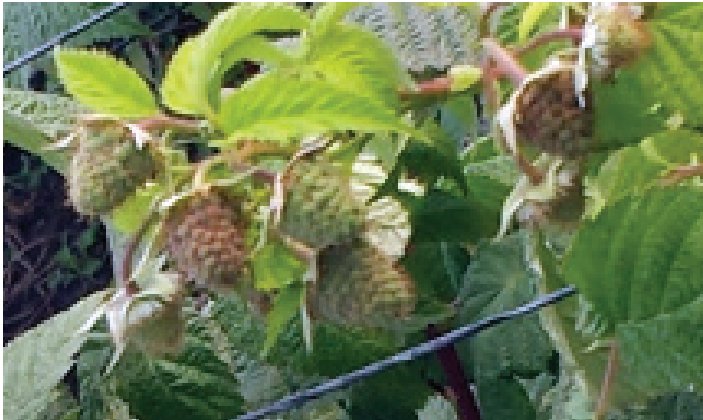
**Increase in net profit with Vitazyme: 42%**

**Increase with Vitazyme**

**Fruits/plant ..... +36%**  
**Fruit weight/plant..... +34%**  
**Fruit yield ..... +34%**



# Raspberries with Vitazyme application



The untreated raspberries lacked the size, quality, and numbers that the treated berries had.



Vitazyme treated raspberries in this Mexican trial show good size and quality, and superior numbers, compared to the untreated control berries.

**Researchers :** agronomists from Quimica Lucava.

**Research Organization:** Quimica Lucava

**Location:** Quina Farm, Irapuato, Guanajuato, Mexico

**Variety:** Unknown

**Initiation of trial:** December 15, 2015

**Experimental design:** A 1 hectare area of a raspberry planting, under plastic cover, was treated with Vitazyme three times to discover the effect of this product on the growth and yield of fruit.

**Fertilization:** unknown

**Vitazyme application:** three foliar spray treatments of 1 liter/ha each time, on December 15, 2015, and January 20 and February 11, 2016.

**Growth results:** There was a marked increase in the number of fruits per plant of the treated plants: about 6 to 9 more per plant. This difference in fruit load was very obvious.

### Yield results:

Treatment	Cases picked <sup>1</sup>	Yield	Yield change	Harvest waste/loss
	cases/ha	kg/ha	kg/ha	kg/ha
Control	189	378	—	16.0
Vitazyme	205	410	32 (+9%)	13.6 (-15%)

<sup>1</sup>Average case weight = 2 kg.

**Conclusions:** A raspberry trial in Mexico, having three Vitazyme applications over a three-month period, revealed that this product greatly improved berry set and final yield, by 9% above the untreated control. Moreover, the wasted berries at harvest were 15% less with the Vitazyme treatment, showing that the cell wall strength of the fruit was greater, and the overall condition of the fruit was improved. This program is shown to be highly viable for raspberry growers in Mexico.



# Soybeans *A Study on Synergism with WakeUp Adjuvant*

**Researcher:** Jerry Carlson  
**Research organization:** Renewable Farming LLC,  
 Cedar Falls, Iowa  
**Location:** Cedar Falls, Iowa  
**Variety:** Asgrow 2431 (2.4 maturity)  
**Planting date:** May 5, 2016  
**Seeding rate:** 140,000 seeds/acre  
**Row spacing:** 30 inches  
**Experimental design:** A 153-acre soybean field of uniform soil types was split in half, with one half treated with Vitazyme and WakeUp Summer (a vegetable-based adjuvant), and the other half serving as the untreated control. The purpose of the study was to evaluate the effect of these two products, applied together on the growth and yield of soybeans, and to see if the results for 2016 would confirm results from 2015.



*Soybeans treated with Vitazyme produced excellent yields that were amplified by adding Wakeup to the spray solution.*

**1 Control 2 Vitazyme + WakeUp Summer**

**Fertilization:** 2.5 tons/acre of chicken litter spread uniformly over the field in the spring of 2016  
**Vitazyme and WakeUp Summer application:** 13 oz/acre of Vitazyme and 4 oz/acre of WakeUp Summer, mixed together, and sprayed foliar at early bloom on June 24, 2016  
**Weed control:** Ledger on May 6; Flexstar GT+Select on June 14; excellent weed control  
**Growth results:** After product application there were highly visible differences between the two sides of the field. **The treated side was more growthy and lush-appearing, and at senescence the plants remained greener about 7 days longer than the untreated control half of the field.** This required the combine operator to wait a week to combine the treated acres.  
**Harvest date:** October 3, 2016 (control side) and October 10, 2016 (treated side)  
**Yield results:** The moisture content of the soybeans for both halves of the field, though they were harvested a week apart, was 13.6%. A combine monitor on a combine with a 30-foot header recorded the yield of the entire field, as displayed on the accompanying map. Based on the yield monitor printout, the yield is calculated below:

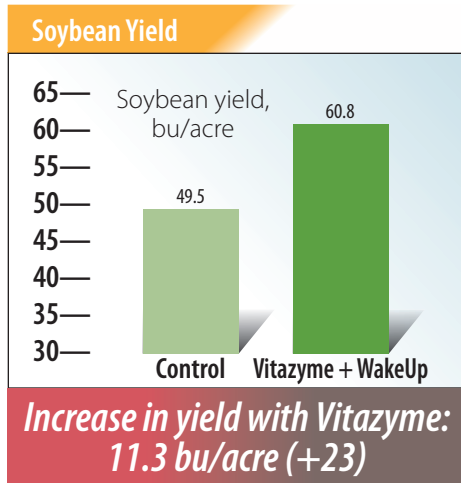
Treatment	Dark green <sup>1</sup>	Light green	Yellow	Orange	Purple	Red <sup>2</sup>
	----- % of area in the half-field -----					
Control	1	7	60	14	10	8
Vitazyme + WakeUp	28	32	27	6	5	2

<sup>1</sup>This area is termed > 70.0 bu/acre. A value of 72.0 bu/acre is estimated.  
<sup>2</sup>This area is termed < 30.0 bu/acre. A value of 28.0 bu/acre is estimated.

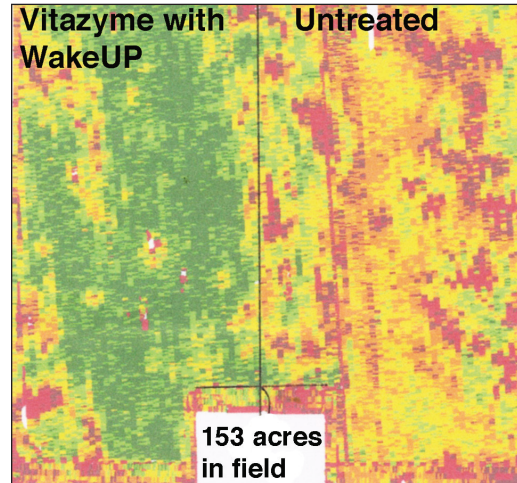
Treatment	Area	Yield <sup>1</sup> , >70	Yield <sup>1</sup> , 60-70	Yield <sup>1</sup> , 50-60	Yield <sup>1</sup> , 40-50	Yield <sup>1</sup> , 30-40	Yield <sup>1</sup> , <30	Total yield	Yield
	acres	----- bushels -----						bushels	bu/acre
Control	76.5	55.1	348.1	2,524.5	482.0	267.8	171.4	3,788.9	49.5
Vitazyme + WakeUp	76.5	1,542.2	1,591.2	1,136.0	206.6	133.9	42.8	4,652.7	60.8

<sup>1</sup>All yield values are calculated as follows: (area) (percent of area/100) x yield for that area. Area yields were estimated at the middle of the range, i.e. the yellow area, having 50 to 60 bu/acre, was assumed to average 55 bu/acre.

This increase in soybean yield was across all soil types. By laying a soils map on top of the yield monitor map, it appears that the same soil type yielded about 10 bu/acre more with Vitazyme + WakeUp Summer.



**Conclusions:** This soybean trial in a split field arrangement in east-central Iowa revealed that Vitazyme and WakeUp Summer, sprayed foliar at approximately early bloom, improved plant growth and



bean yield substantially, by 11.3 bu/acre (23%) on a good crop year. The treated plants showed more aggressive growth and stayed green a week longer than did the untreated control plants. Considering the excellent synergism observed between these two products in a 2015 trial on a nearby farm, wherein Vitazyme increased soybean yield by 5.1 bu/acre and WakeUp Summer added 2.1 bu/acre to this yield, the combination of the two products is seen to be an excellent application for soybeans in eastern Iowa.



# Soybean with Vitazyme application—A Soil Microbiology Study with Roundup (Glyphosate)



Root development with Vitazyme is excellent compared to the control and the glyphosate treatments, but Vitazyme overcame the negatives of glyphosate and produced an excellent plant response when the two were combined.



Dr. Kremer displays the Vitazyme treated soybeans on the right, which have much better rooting and leaf development than the control plants on the left.

**Researcher:** Manjula Nathan, Ph.D., and Robert Kremer, Ph.D.

**Research institution:** University of Missouri Department of Plant and Soil Sciences, and the USDA-ARS, Columbia, Missouri

**Location:** Greenley Memorial Research Center, Novelty, Missouri

**Soil type:** clayey

**Row spacing:** 30 inches

**Experimental design:** A small plot soybean trial was conducted using four replications and four treatments, to evaluate the effect of Vitazyme and Roundup (glyphosate), alone and in combination, on the yield of soybean, as well as the effects of these products on the rhizosphere soil microbial populations of Fusarium and beneficial bacteria, root mass, and Rhizobium nodulation. Soil residues of glyphosate were also evaluated.

**Fertilization:** Nitrogen, phosphorus, and potassium were applied before planting according to soil test recommendations.

**Vitazyme application:** See the treatment plan.

**Glyphosate application:** See the treatment plan.

**Weed control for the control and Vitazyme treatments:**

These plots were sprayed with herbicides before planting.

**Growing season weather:** favorable for soybean growth

**Yield results:**

Treatment	Yield bu/acre	Yield change bu/acre
1. Control	60.0	—
2. Glyphosate	66.0	6.0 (+10%)
3. Vitazyme	62.4	2.4 (+4%)
4. Vitazyme + Glyphosate	67.0	7.0 (+12%)

### Increase in soybean yield

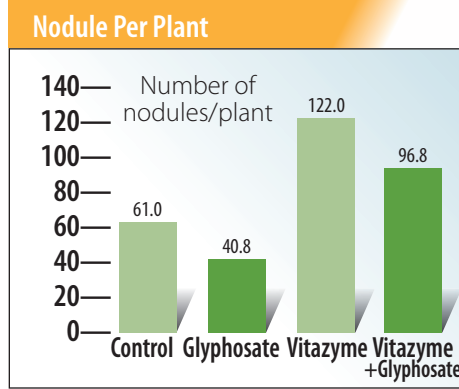
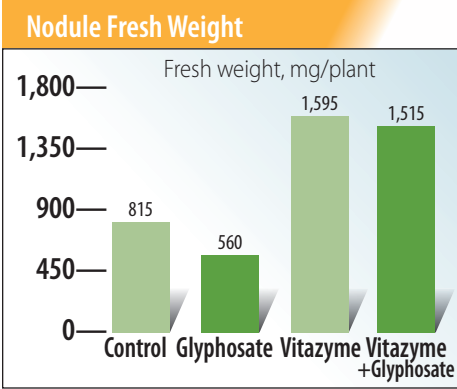
Glyphosate ..... 10%  
 Vitazyme ..... 4%  
 Vitazyme + Glyphosate . 12%

Yield means were not significantly different, but showed responses for all treatments.

Treatment	In-furrow	Foliar, early bloom
1. Control	0	0
2. Glyphosate	0	36 oz/acre
3. Vitazyme	13/oz/acre	13 oz/acre
4. Vitazyme + Glyphosate	13/oz/acre (Vitazyme only)	13 oz/acre + 36 oz/acre

### Soybean nodulation results:

Treatment	Nodule fresh weight mg/plant	Weight change mg/plant	Nodules/Plant nodules	Nodule change nodules
1. Control	815	—	61.0	—
2. Glyphosate	560	(-) 255 (-31%)	40.8	(-) 2.02 (-33%)
3. Vitazyme	1,595	780 (+96%)	122.0	61.0 (+100%)
4. Vitazyme + Glyphosate	1,515	700 (+86%)	96.8	35.8 (+59%)



### Changes in nodule weight

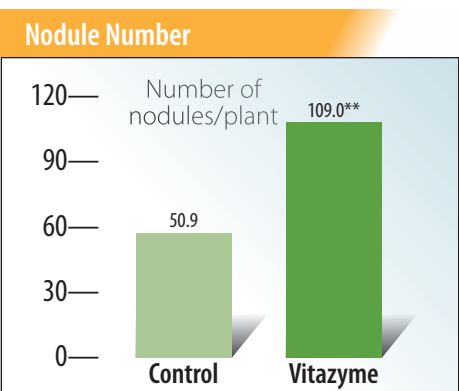
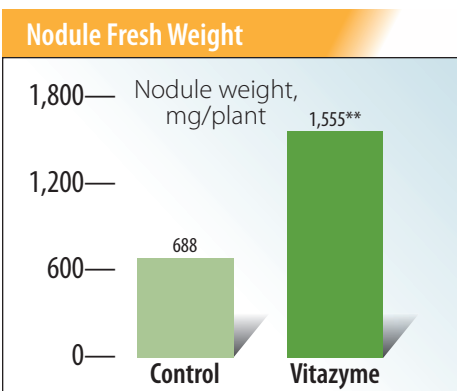
Glyphosate ..... -31%  
 Vitazyme ..... +96%  
 Vitazyme + Glyphosate... +86%

### Changes in nodule number

Glyphosate ..... -33%  
 Vitazyme ..... +100%  
 Vitazyme + Glyphosate... +59%

Although the fresh nodule weight and nodule number means were not significant, the differences were great, with Vitazyme giving the highest values and Vitazyme + Glyphosate being nearly as high as Vitazyme alone. This indicates a remediation affect of Vitazyme on the negative impacts of glyphosate.

## Effect fo Vitazyme on Soybean Nodulation



### Increase with Vitazyme

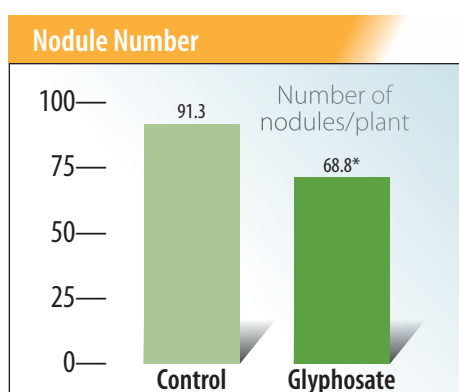
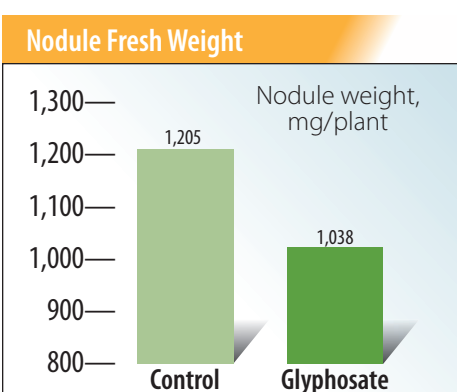
Nodule fresh weight... +126%  
 Nodule number ..... +114%

All Vitazyme treated plots were compared with all untreated plots, producing a remarkable increase in nodulation with Vitazyme.

\*\*Significantly greater than the control at P=0.001.

\*\*Significantly different than the control at P=0.001.

## Effect fo Glyphosate on Soybean Nodulation



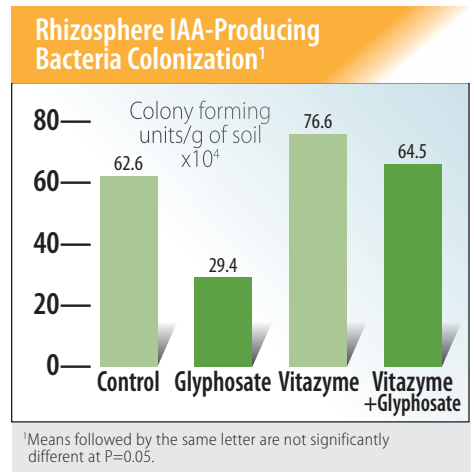
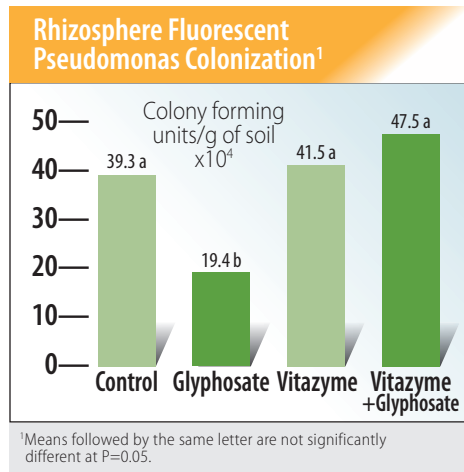
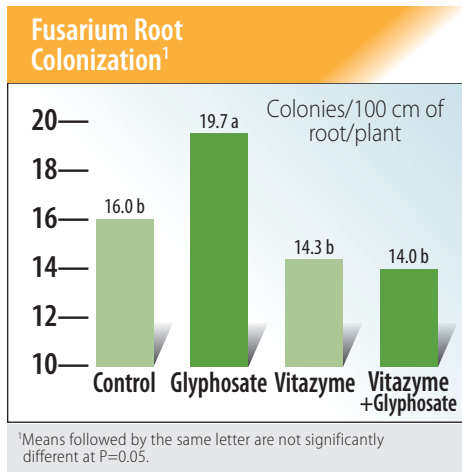
### Decrease with Glyphosate

Nodule fresh weight..... -14%  
 Nodule number ..... -25%

All glyphosate treated plots were compared with all non-glyphosate treated plots. The data reveal that this herbicide reduces soybean nodulation, and thus nitrogen fixation.

\*Significantly less than the control at P=0.05.

**Soil microbial results:**



**Changes in Fusarium Colonization**

Glyphosate ..... +23%

Vitazyme ..... -11%

Vitazyme + Glyphosate... -13%

**Changes in Fluorescent Pseudomonas Colonization**

Glyphosate ..... -51%

Vitazyme ..... +6%

Vitazyme + Glyphosate... +21%

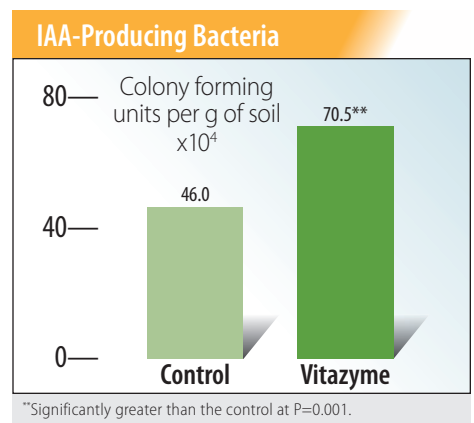
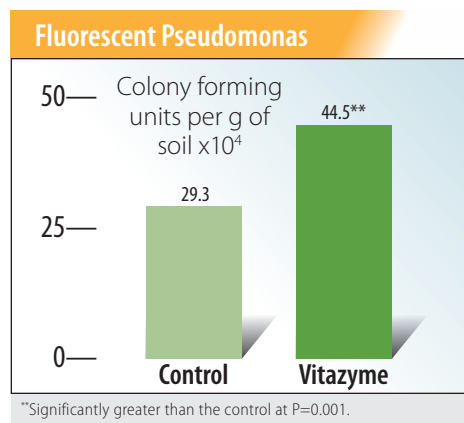
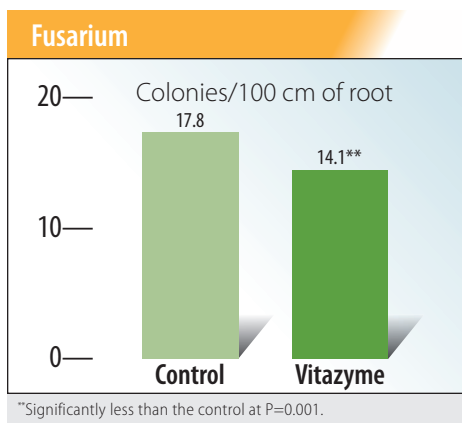
**Changes in IAA-Producing Bacteria Colonization**

Glyphosate ..... -53%

Vitazyme ..... +22%

Vitazyme + Glyphosate..... +3%

**Vitazyme Effects on Fusarium and Beneficial Organism Colonization**



**Changes with Vitazyme**

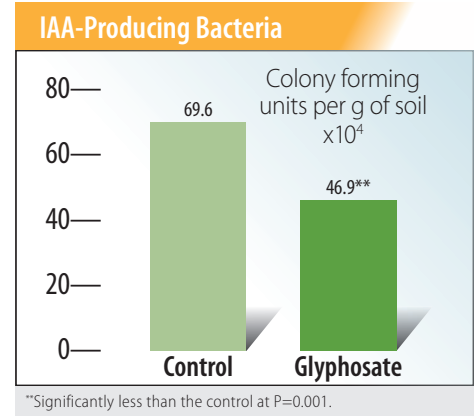
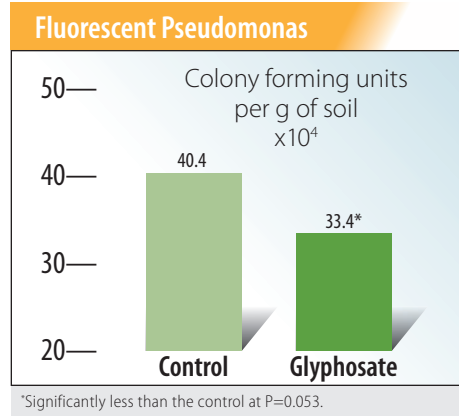
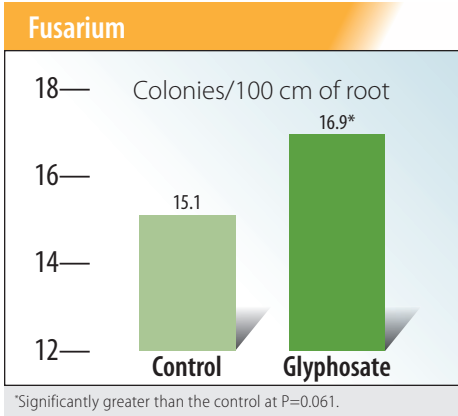
Fusarium ..... -21%

Fluorescent Pseudomonas ... +52%

IAA-Producing Bacteria .... +53%

All Vitazyme treated plots were compared with all untreated plots, showing a highly significant reduction in Fusarium colonies and highly significant increases in beneficial bacteria.

## Glyphosate Effects on Fusarium and Bacterial Organism Colonization



**Changes with Glyphosate**

**Fusarium** ..... +12%

**Fluorescent Pseudomonas** ..... -17%

**IAA-Producing Bacteria** ..... -33%

All glyphosate treated plots were compared with all non-glyphosate plots, which reveals an increase in the incidence of Fusarium colonization while beneficial bacteria are substantially reduced.

### Fatty Acids, Oxidizers, Reducers, Glyphosate, and Enzyme Levels in Rhizosphere Soil

Treatment	TPLFA <sup>1</sup> nm/g soil	Mn Oxidizers <sup>2</sup> cfu/g soil x10 <sup>3</sup>	Mn Reducers <sup>3</sup> cfu/g soil x10 <sup>3</sup>	Red/Ox Ratio <sup>4</sup> cfu/g soil x10 <sup>3</sup>	Glyphosate <sup>5</sup> ug/kg soil	B-Glucosamine Activity <sup>6</sup> ug PNP/g soil/hr
1. Control	156	6.25	9.72	1.57	185	132
2. Glyphosate	87 (-44%)	7.18 (+15%)	2.63 (-73%)	0.39 (-75%)	135 (-27%)	103 (-22%)
3. Vitazyme	106 (-32%)	5.23 (-16%)	10.8 (+11%)	2.17 (+38%)	98 (-47%)	158 (+20%)
4. Vitazyme + Glyphosate	108 (-31%)	8.57 (+37%)	14.9 (+53%)	1.77 (+13%)	105 (-43%)	175 (+33%)
P>F	0.071	0.334	<b>0.015</b>	<b>0.027</b>	0.419	0.107

<sup>1</sup>TPLFA = total phospholipid fatty acids; <sup>2</sup>manganese oxidizing bacteria; <sup>3</sup>manganese reducing bacteria; <sup>4</sup>ratio of manganese reducing to oxidizing bacteria; <sup>5</sup>soil glyphosate levels; <sup>6</sup>soil level of this enzyme.

### Vitazyme Effects on Fatty Acids, Oxidizers, Reducers, Glyphosate, and Enzymes

Treatment	TPLFA nm/g soil	Mn Oxidizers cfu/g soil x10 <sup>3</sup>	Mn Reducers cfu/g soil x10 <sup>3</sup>	Red/Ox Ratio cfu/g soil x10 <sup>3</sup>	Glyphosate ug/kg soil	B-Glucosamine Activity ug PNP/g soil/hr
1. Control	121	6.72	6.17	0.980	160	118
2. Vitazyme	107(-13%)	6.90 (+3%)	12.9* (+109%)	1.97**(+101%)	101(-37%)	167*(+42%)
P>F	0.432	0.878	<b>0.006</b>	<b>0.001</b>	0.118	<b>0.006</b>

\*Significantly different than the control at P=0.01; \*\*Significantly different than the control at P=0.001.

All Vitazyme treated plots were compared with untreated plots. Note the great increase in the beneficial manganese oxidizers, that convert Mn to its divalent plant available form. This gave

rise to a higher Mn reduced/Mn oxidized ratio. Soil enzyme levels were also increased with Vitazyme. Soil glyphosate levels were reduced by 37% overall with Vitazyme.

### Glyphosate Effects on Fatty Acids, Oxidizers, Reducers, Glyphosate, and Enzymes

Treatment	TPLFA	Mn Oxidizers	Mn Reducers	Red/Ox Ratio	Glyphosate	B-Glucosamine Activity
	nm/g soil	cfu/g soil x10 <sup>3</sup>	cfu/g soil x10 <sup>3</sup>	cfu/g soil x10 <sup>3</sup>	ug/kg soil	ug PNP/g soil/hr
1. Control	131	5.74	10.3	1.87	141	145
2. Glyphosate	97 (-26%)	9.88 (+72%)	8.78 (-15%)	1.08**(-42%)	120 (-15%)	139 (-4%)
P>F	0.079	0.104	0.449	<b>0.001</b>	0.538	0.669

\*Significantly less than the control at P=0.001.

All glyphosate treated plots were compared with non-glyphosate plots, resulting in fewer phospholipid fatty acids, more manganese oxidizers, and fewer manganese reducers, showing the nature of this herbicide to make Mn less available, as evidenced by the lower Red/Ox ration.

**Conclusions:** A University of Missouri replicated soybean study showed that Vitazyme, when applied with glyphosate herbicide for the foliar application, did an excellent job remediating the damage done by the herbicide to soil and root organisms. While glyphosate increased Fusarium damage (+12%), Vitazyme reduced the incidence (-21%). Conversely, beneficial soil microbes like Fluorescent Pseudomonas were increased by 52% with Vitazyme and reduced by 17% by glyphosate; IAA-producing bacteria were increased by 53% with Vitazyme and decreased by 33% with glyphosate. Combining the two products moved both pathogenic and beneficial organism levels to near the control levels. Soybean nodule fresh weight and number were also greatly enhanced by Vitazyme treatment (96 and 100%, respectively), while Vitazyme coupled with glyphosate brought nodule parameters nearly to the levels

for Vitazyme; glyphosate alone greatly crippled nodulation. The highly important manganese reducing bacteria were enhanced by Vitazyme but inhibited by glyphosate; when the two were combined, the reducing bacteria increased even above the Vitazyme alone, to 53% above the control. Soil enzyme activity was also enhanced with Vitazyme—by 20% above the control—while this enhancement increased to 33% when paired with glyphosate. Glyphosate alone reduced enzyme level by 22%. The best soybean yield increase was with Vitazyme+glyphosate, a 12% (7 bu/acre) improvement about the control. These results are similar to those produced in 2014 at the University of Missouri Bradford Research Center, and show the great efficacy of Vitazyme to reduce the harmful effects of glyphosate on soybean nodulation and rhizosphere microbial populations.



# Soybeans with Vitazyme application

**Researcher:** V. V. Plotnikov  
**Research institution:** Agro Expert International, Vinnytsya, Ukraine

**Location:** State Enterprise Research Farm Drabivske, Drabovo-Bariatynske Village, Drabiv District, Cherkasy Region, Ukraine

**Variety:** Diamond, selected seed

**Planting date:** April 29, 2016

**Seeding rate:** 750,000 seeds/ha

**Previous crop:** winter wheat

**Soil type:** Chernozem (3.9% organic matter)

**Cultivation:** disking to 6-8 cm, plowing to 20-22 cm, harrowing, and cultivation to 4-5 cm

**Rainfall:** 500-550 mm

**Experimental design:** A soybean field was divided into a Vitazyme treated and untreated area, with the objective of determining the effect of this product on the yield and quality of the beans.

**Fertilization:** at planting; 16-16-16 kg/ha of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O in-row

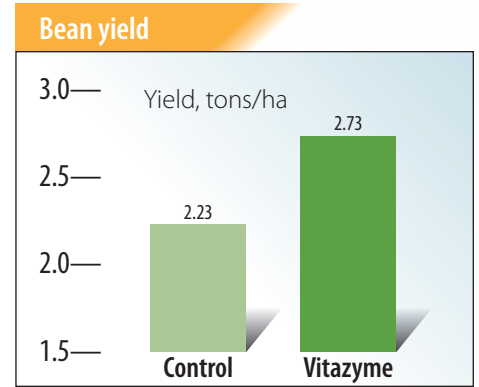
**Vitazyme application:** 1.0 liter/ton on the seeds before planting, on April 24, 2016; 0.5 liter/ha on the leaves and soil at early bloom, on June 23, 2016

① Control ② Vitazyme

## Yield results:

Treatment	Bean yield tons/ha	Yield change tons/ha
Control	2.23	—
Vitazyme	2.73	0.50 (+22%)

**Increase in bean yield with Vitazyme: 22%**



**Income results:** Vitazyme increased net profit by 184 USD/ha.

**Conclusions:** A soybean split-field trial in central Ukraine, on Chernozem soil, revealed that 1 liter of Vitazyme per ton of seed, coupled with a 0.5 liter/ha foliar and soil spray, increased the yield by 22%, a great response that should assure farmers of the viability of this new technology. The yield increase produced a greater net return of 184 USD/ha as well.



# Sugar Beets with Vitazyme application

**Researcher:** V. V. Plotnikov  
**Research institution:** Agro Expert International, Vinnytsya, Ukraine  
**Location:** Farming Enterprise Shyrokostup, Subivka Village, Kaharlyk District, Kyiv Region, Ukraine  
**Variety:** Daria KWS  
**Planting date:** October 2, 2015  
**Seeding rate:** 100,000 seeds/ha  
**Soil type:** podzolized Chernozem (3.2% organic matter)  
**Cultivation:** disking to 6-8 cm, plowing to 25-27 cm, harrowing, and cultivation to 4-5 cm  
**Rainfall:** 500-550 mm  
**Experimental design:** A sugar beet field was divided into Vitazyme treated and untreated areas, with the objective of determining the effect of this product on the yield and quality (sugar content) of the beets.



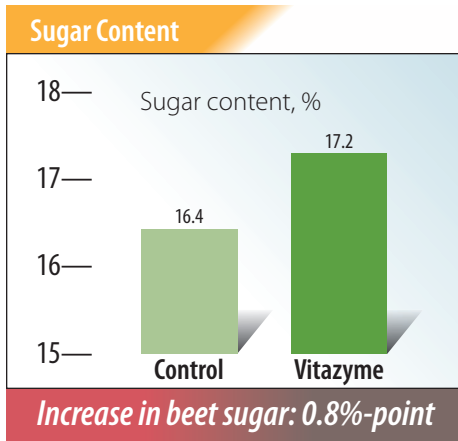
Sugar beets growth in Ukraine have consistently shown superb responses to Vitazyme, as shown in this sampling.

**1 Control 2 Vitazyme**

**Fertilization:** 100 tons/ha of manure the fall of 2015; 60-60-60 kg/ha of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O pre-plant; 120 kg/ha at N sidedressed

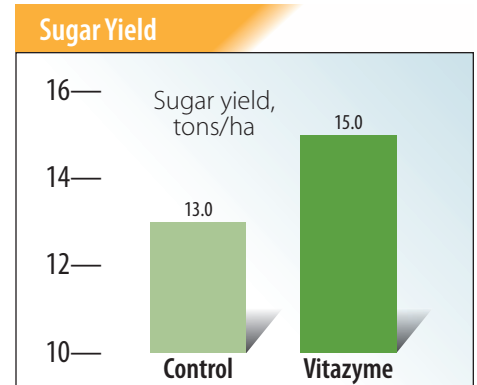
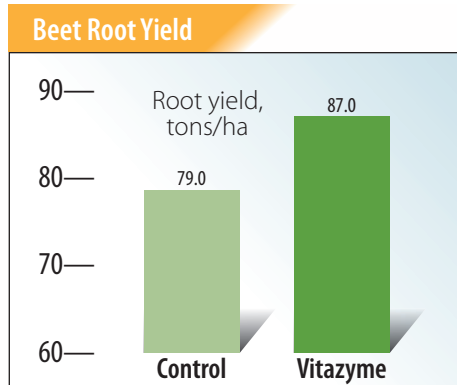
**Vitazyme application:** 1.0 liter/ha sprayed on the leaves and soil on June 21, 2016

**Quality results:**



**Yield results:**

Treatment	Beet yield tons/ha	Yield change tons/ha	Sugar yield tons/ha	Yield change tons/ha
Control	79.0	—	13.0	—
Vitazyme	87.0	8.0 (+10%)	15.0	2.0 (+15%)



**Income results:** Vitazyme increased net profit by 258 USD/ha.

**Conclusions:** A sugar beet trial in Ukraine, using 1.0 liter/ha of Vitazyme applied mid-season, revealed excellent responses in terms of beet yield (10%), sugar content of the beets (+ 0.8 %-point), and consequently total sugar yield (+ 15%). These results point towards the great value of this program for benefitting sugar beet growers in Ukraine, in particular in terms of increased net profit.

*Increase with Vitazyme*

**Beet yield..... +10%**  
**Sugar yield..... +15%**



# Sunflowers with Vitazyme application

**Researcher:** V. V. Plotnikov  
**Research institution:** Agro Expert International, Vinnytsya, Ukraine  
**Location:** L. L. C. Zelen'ky, Zelen'ky Village, Myroniv'skyi District, Kyiv Region, Ukraine  
**Variety:** NK Condi  
**Planting date:** May 5, 2016  
**Seeding rate:** 50,000 seeds/ha  
**Soil type:** podzolized  
**Soil type:** podzolized Chernozem (3.3% organic matter)  
**Cultivation:** disking to 6-8 cm, plowing to 20-22 cm, harrowing, and two cultivations to 4-5 cm  
**Rainfall:** 500-550 mm  
**Experimental design:** A sunflower field was divided into a Vitazyme treated and untreated area, with the objective of determining the effect of this product on the yield of the seeds.

① Control ② Vitazyme

**Fertilization:** at planting, 16-16-16 kg/ha of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O in-row  
**Vitazyme application:** 1.0 liter/ha on the leaves and soil at the 8-leaf stage, on June 17, 2016

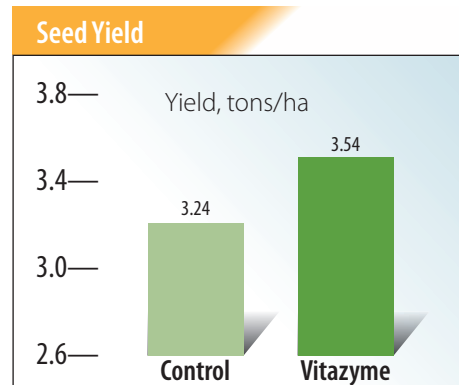
**Yield results:**

Treatment	Seed yield tons/ha	Yield change tons/ha
Control	3.24	—
Vitazyme	3.54	0.30 (+9%)

**Increase in seed yield with Vitazyme: 9%**



Sunflowers treated with Vitazyme in Ukraine have consistently produced superior yields of both tonnage and oil content.



**Income results:** Vitazyme increased net profit by 104 USD/ha.

**Conclusions:** This Vitazyme soil and foliar trial in Ukraine showed that only 1 liter/ha produced a 9% yield increase. Profits were substantially increased by 104 USD/ha, revealing the value of this product for sunflower production in Ukraine.





# Tomatoes with Vitazyme application

**Researcher:** Eng. Raul Ortega,  
Quimica Lucava

**Farmer:** Florencio Baltazar Garcia

**Location:** Agricola Tarriba Farm, Cruz de  
Elota, Sinaloa, Mexico

**Variety:** D R D 8579 Saladet, as transplants

**Soil type:** stony

**Transplanting date:** September 15, 2015

**Experimental design:** A tomato field was divided into a Vitazyme treated area (four applications) and an untreated control area to determine the effect of this product on tomato yield and growth parameters.

① **Algaenzyme & Nh Root** ② **Vitazyme**

**Fertilization:** unknown

**Vitazyme application:** (1) root dip of 17 transplant trays (500 ml in 100 liters of water, or 0.5% v/v); (2) 1 liter/ha spray on October 17, 2015; (3) 1 liter/ha spray on November 15, 2015; (4) 1 liter/ha spray on December 15, 2016.

**Control application:** Algaenzyme at 5 ml/liter, Nh Root at 5 ml/liter

**Growth results:**

September 22, 2015 (7 days after dipping and 5 days after transplanting), treated seedlings were superior to the controls:

- Taller
- Plumper
- More vigorous
- Darker green leaves
- Better overall development

November 11, 2015 (57 days after the dipping treatment and 25 days after the first foliar application), treated plants were better than the controls:

- Greater leaf and biomass growth
- Dark green color (more chlorophyll)
- Reduced high temperature stress
- Better flower retention and fruit set

November 24, 2015 (after the second foliar application), Vitazyme treated plants were superior in the following ways:

- Greater leaf development
- Dark green color (more chlorophyll)
- Stronger stems, with 9 mm diameter vs. 8 mm for the control
- More flowering, with 3 to 4 inflorescences/plant and 5 to 6 flowers in each
- Greater fruit set and fewer aborted flowers

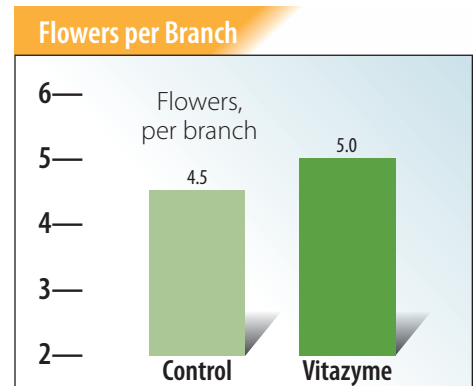


Tomatoes in a Mexican trial treated with Vitazyme increased in both yield (19%) and quality, after a tray dip and three foliar sprays.

The following results were collected on January 15, 2016

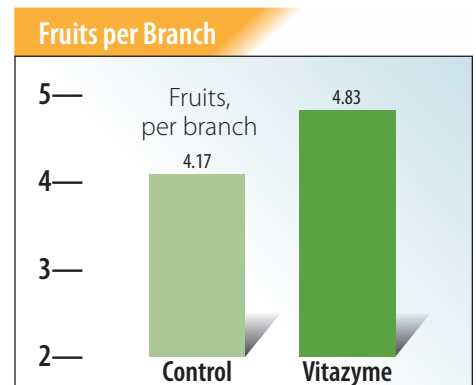
Treatment	Flowers/branch number	Flowers change number
Control	4.5	—
Vitazyme	5.0	0.5 (+11%)

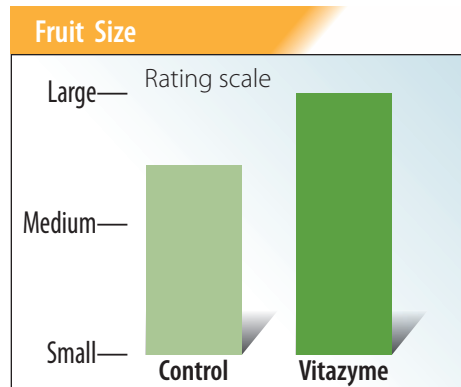
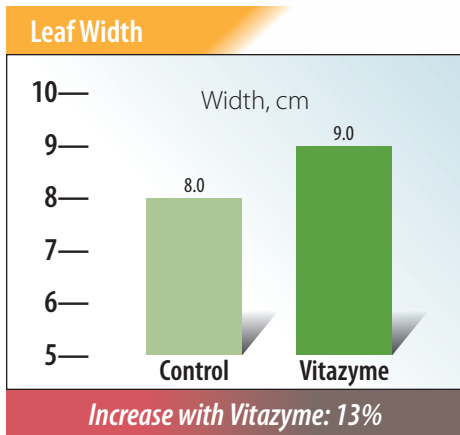
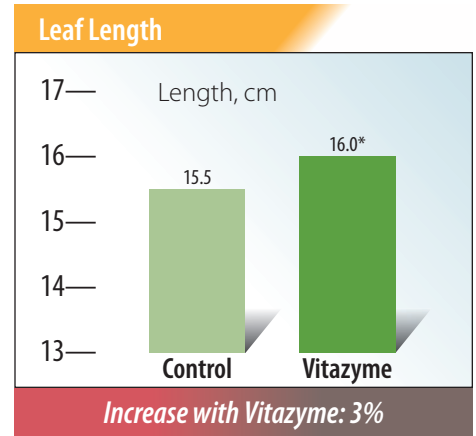
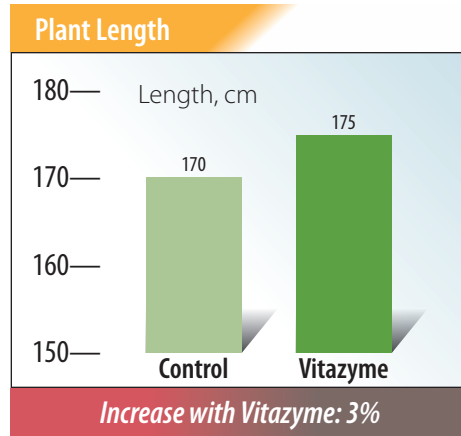
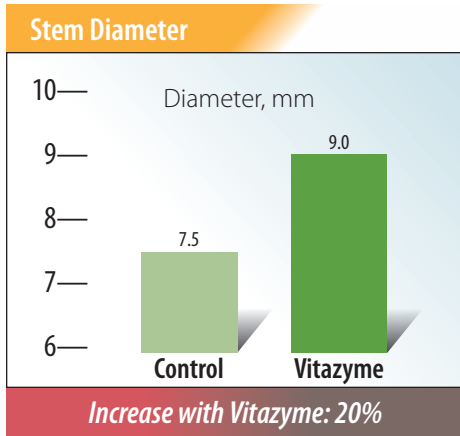
**Increase in flowers/branch with Vitazyme: 11%**



Treatment	Fruits/branch number	Fruits change number
Control	4.17	—
Vitazyme	4.83	0.66 (+16%)

**Increase in fruits/branch with Vitazyme: 16%**



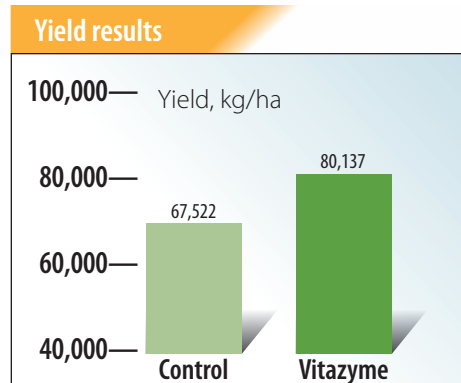


**Harvest dates:** 22 pickings from December 21, 2015, to March 12, 2016  
**Yield results:**

Treatment	Baskets <sup>1</sup> number	Yield tons/ha	Yield change tons/ha
Control	1,397	67,522	—
Vitazyme	1,658	80,137	3,154 (+19%)

<sup>1</sup>Each basket weighed 7.25 kg.

**Increase in tomato yield with Vitazyme: 19%**



**Income increase:** Based on a price of \$0.25/kg, and a cost of Vitazyme at \$20.00/liter, plus \$3.75/ha labor cost with four applications, the total treatment cost was \$95.00/ha.

**Extra net income with Vitazyme: \$3,058.75/ha**

**Cost : Benefit of Vitazyme: 32 : 1**

**Conclusions:** With the Vitazyme four applications program (one root dip and three foliar sprays), each at 1 liter/hectare, in variety DRD8579 indeterminate tomato, since first application, greater growth, vigor, more intense green color, then larger stem diameter, plant length, leaf length and width, greater fruit set and flower fixing, with more flowers and fruits per branch and less aborted flowers, in the Vitazyme-treated area, compared to the control area (which had two other biostimulant products applied), were observed.

At harvest, the quality was higher with Vitazyme, shown in fruits of greater size than the control, mostly of categories L and XL, and of more uniform size.

Overall cumulative yield from 22 pickings between December, 2015, and March, 2016, was higher than the control by 12.6 tons per hectare (18.68%), that resulted in added profits or revenues of US \$3058.75 per hectare, and a cost-benefit ratio of 32 with Vitazyme.



# Tomatoes with Vitazyme application

**Researchers:** V. V. Plotnikov and V. V. Rohach

**Research Organization:** Vinnytsia State Pedagogical University, Ministry of Education and Science of Ukraine, Vinnytsia, Ukraine

**Location:** "Berzhan P. G.", Horbanovka Village, Vinnytsia District, Ukraine

**Variety:** Roma

**Planting rate:** 40,000/ha

**Seed planting date:** March 3, 2015, in hot frames

**Seedling planting date:** May 12, 2015

**Soil type:** gray podzolic; humus = 2.2%, hydrolyzed N = 8.4 mg/100 g of soil, P = 15.8 mg/100 g of soil, exchangeable K = 12.4 mg/100 g of soil, pH = 5.5

**Replications:** 5

**Experimental design:** Plot areas of 33 m<sup>2</sup> were configured for a tomato trial, using five replications. Vitazyme was applied to five of the plots to determine the effects of the product on plant growth and yield compared to the untreated control.

**1 Control 2 Vitazyme**

**Fertilization:** a mineral fertilizer giving 50, 40, and 30 kg/ha of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O

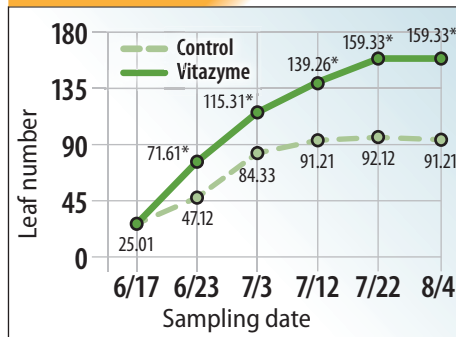
**Vitazyme application:** 1 liter/ha with a backpack sprayer the morning of June 17, 2015, at bud stage; control plots were sprayed with water only

**Growth results:**



Roma tomatoes grown in Ukraine produced an excellent 12% yield increase and a 14% improvement in profitability.

**Leaves Per Plant**

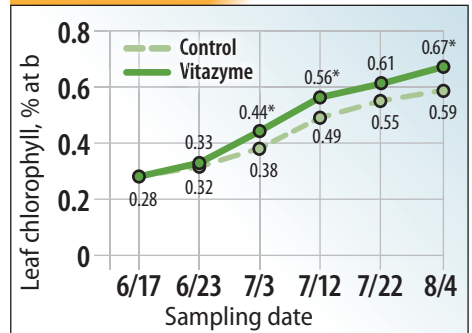


\*Significantly different than the control at P=0.05.

**Increase in leaf area /plant with Vitazyme**

6/23/15	+143%
7/3/15	+181%
7/12/15	+71%
7/22/15	+45%
8/4/15	+29%

**Leaf chlorophyll<sup>1</sup>**



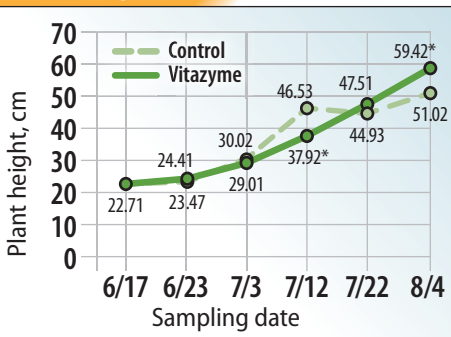
\*Significantly greater than the control at P=0.05.

<sup>1</sup>Calculated as follows:  $X = \frac{C(V)}{(P)(1000)}$ , where X=pigment content (% per leaf, net weight), C=pigment concentration (mg/liter), V=extract volume (ml), and P=weight of plant material (mg).

**Increase in leaves/plant with Vitazyme**

6/23/15	+52%
7/3/15	+37%
7/12/15	+53%
7/22/15	+73%
8/4/15	+75%

**Plant Height**

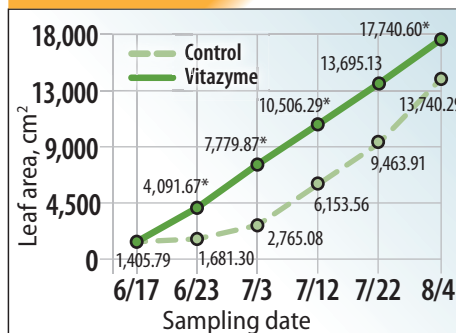


\*Significantly different than the control at P=0.05.

**Change in plant height with Vitazyme**

6/23/15	+4%
7/3/15	-3%
7/12/15	-19%
7/22/15	+6%
8/4/15	+16%

**Leaf Area Per Plant<sup>1</sup>**



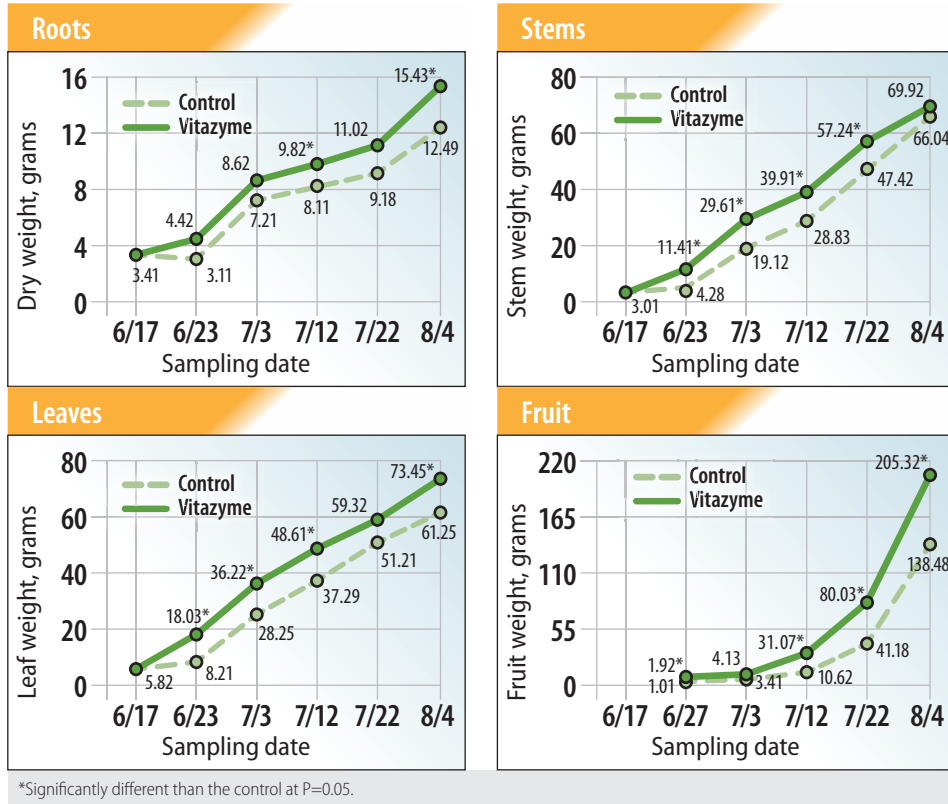
\*Significantly different than the control at P=0.05.

<sup>1</sup>Calculated as follows:  $S = \frac{n(m)(S_2)}{m_2}$ , and  $S_2 = \pi r^2$ , where S= leaf area (cm<sup>2</sup>), n= leaf number, m<sub>1</sub>= leaf weight (g), m<sub>2</sub>= cutting weight (g), S<sub>c</sub>= cutting area (cm<sup>2</sup>), π=3.14, and r= cutting radius (cm).

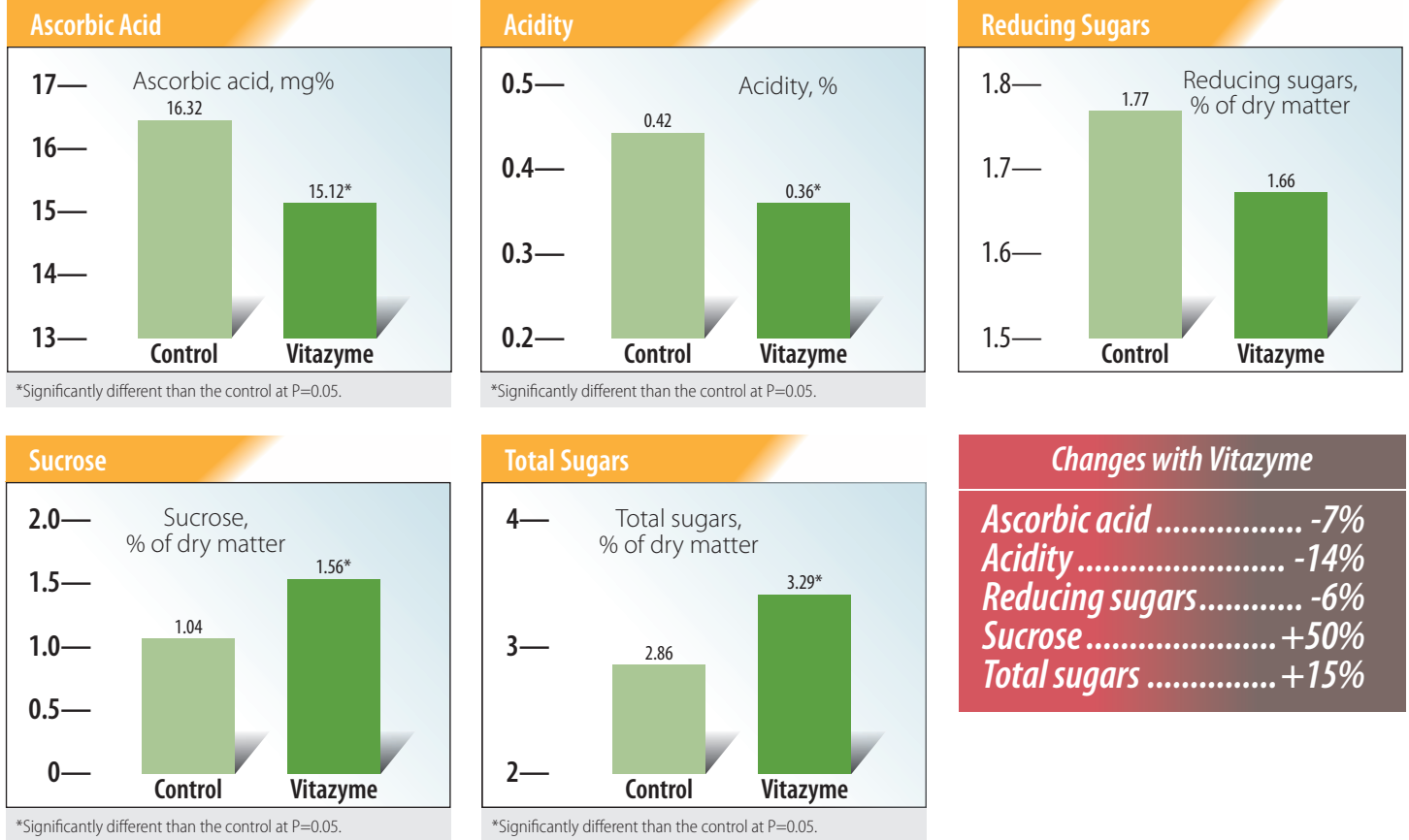
**Increase in leaf chlorophyll with Vitazyme**

6/23/15	+3%
7/3/15	+16%
7/12/15	+14%
7/22/15	+11%
8/4/15	+14%

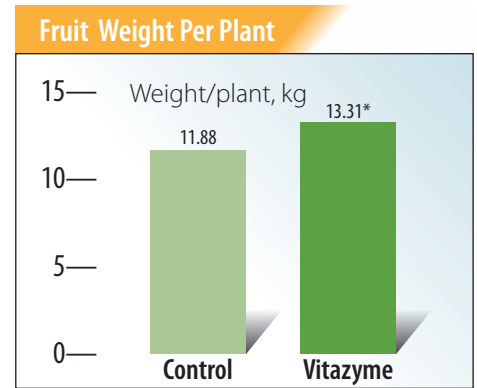
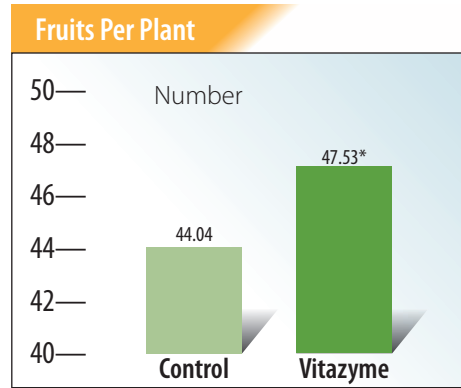
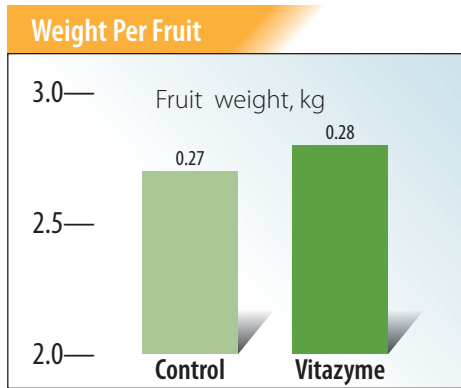
## Plant Organ Dry Weights



### Quality results:

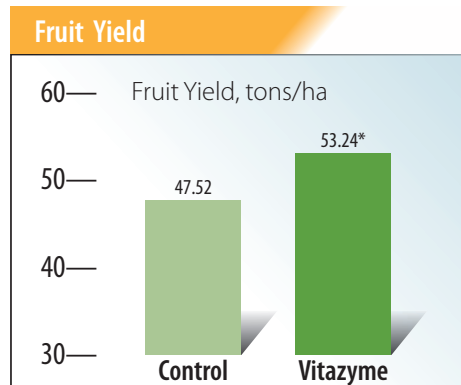
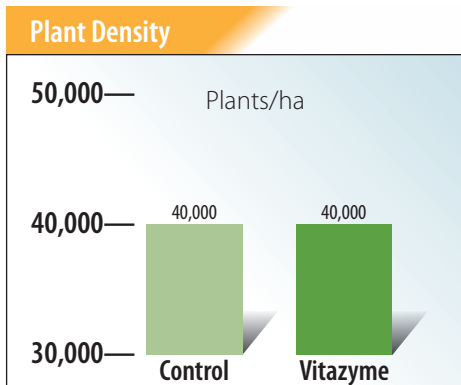


**Yield results:**



\*Significantly greater than the control at P=0.05.

\*Significantly greater than the control at P=0.05.



\*Significantly greater than the control at P=0.05.

**Increase with Vitazyme**

- Weight/Fruit ..... +4%
- Fruits/Plant ..... +8%
- Fruit weight/Plant..... +13%
- Fruit yield ..... +12%

**Economic results:** An analysis of many factors was made to determine the profitability of the Vitazyme application. Costs included tillage, oil and fuel, harrowing, cultivation, fertilizers, planting, seedlings, rent, watering, product applications, trucking, and harvesting.

Treatment	Net profit	Profit increase
	UAH/ha	UAH/ha
Control	206,248.13	—
Vitazyme	234,946.11	28,697.98 (+14%)

**Increase in net profit with Vitazyme: 14%**

**Conclusions:** This replicated tomato trial in Ukraine, using one 1 liter/ha Vitazyme application, produced an excellent 12% yield increase, and a 14% increase in profits. These results were produced because of significantly more leaves/plant (37 to 75%), leaf area/plant (29 to 181%), and leaf chlorophyll (3 to 16%). Plant parts also significantly increased in weight, in most cases, at the P=0.05 level, and sucrose and total sugars increased markedly with Vitazyme, by 50% and 15% respectively, indicating sweeter fruit with less acidity; acidity dropped by a significant 14%. These results prove how effective this program is for improving tomato yield, quality, and profitability in Ukraine.



# Watermelons with Vitazyme application



Notice how the Vitazyme treated watermelons have a richer red color and stronger rinds than the control melons. The sugar content was nearly 1% higher.

The Obst Farms watermelon trial showed good-sized melons for the control, but inferior quality compared to the treated melons.

**Researcher:** Eddie Pearson

**Farmers:** Tim Obst, Paul Obst Farms

**Location:** Alamo, Texas

**Varieties:** Fascination, Jamboree

**Planting date:** as transplants at an unknown date

**Experimental design:** A watermelon field was divided into a 65-acre Vitazyme treated area and an untreated control area to evaluate the effects of the Vitazyme applications on melon growth and yield.

**1 Control 2 Vitazyme**

**Fertilization:** in December, 25 gal/acre of 5-35-WO4 liquid fertilizer

**Vitazyme application:** 13 oz/acre in mid-March, and again in mid-April

**Growth observations:** The Vitazyme treated area was very robust, with a high concentration of melons.

**Disease observations:** The program had a crop protectant effect, preventing a leaf fungal disease outbreak which devastated adjoining fields that were planted at the same time; they could not be harvested.

**Melon quality:** See below.

**Yield results:** 795,700 lb from the 65 acres, or 12,242 lb/acre



The treated watermelons were very aggressive in their growth during the season, and resisted a leaf fungal disease that decimated adjoining fields.

**Conclusion:** According to Tim Obst, "I have never seen a watermelon crop like this ever before in all my years of raising this crop! I will use the program again!"

The yield was extremely good with Vitazyme, the fungal disease was held in check, and the quality of the melons, in terms of sugar content, was improved versus the untreated controls. **Sugars increased nearly 1%**, and phosphorus, zinc, copper, and sulfur were improved.

Sugar and Mineral Analysis of the Fruit (Texas) Plant and Soil Laboratory, Edinburg, Texas													
Treatment	Brix	N	P	K	Na	Ca	Mg	Zn	Fe	Mn	Cu	B	S
	%	-----mg/100g-----											
Control	9.05	107.4	23.3	138.8	1.3	129	15.5	0.11	0.74	0.089	0.075	0.33	5.73
Vitazyme	9.97	81.4	24.3	166.6	0.7	10.3	15.8	0.15	0.35	0.077	0.091	0.30	7.74
	+0.92 pt.	-24%	+4	-20%	-46%	-20%	+2%	+36%	-53%	-13%	+21%	-9%	+35%



# Winter Wheat with Vitazyme application

**Researcher:** V. V. Plotnikov

**Research institution:** Agro Expert International, Vinnytsya, Ukraine

**Location:** Farming Enterprise Kolyvailo, Miziakivs'ki Hutory Village, Vinnytsya Region, Ukraine

**Variety:** Acteur

**Planting date:** October 2, 2015

**Seeding rate:** 6 million/ha

**Soil type:** gray podzolic (2.0% organic matter)

**Cultivation:** disking to 6-8 cm, plowing to 20-22 cm, and two cultivations to 4-5 cm

**Rainfall:** 500-550 mm

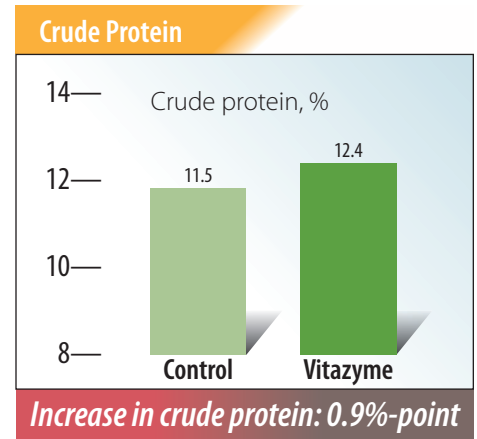
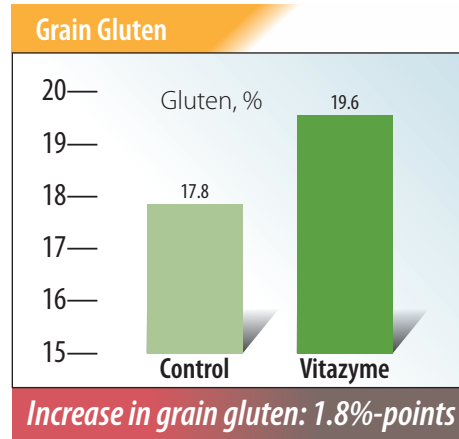
**Experimental design:** A winter wheat field was divided into a Vitazyme treated and untreated area, with the objective of determining the effect of this product on the yield and quality of the grain.

## ① Control ② Vitazyme

**Fertilization:** at planting, 30-30-30 kg/ha of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O in-row; in the spring, 120 kg/ha of N

**Vitazyme application:** 1.0 liter/ha on the seeds before planting, on September 30, 2015

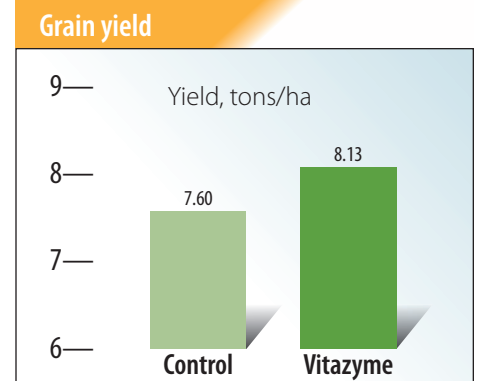
### Quality results:



### Yield results:

Treatment	Grain yield tons/ha	Yield change tons/ha
Control	7.60	—
Vitazyme	8.13	0.53 (+7%)

**Increase in grain yield with Vitazyme: 7%**



**Income results:** Vitazyme increased net profit by 93.2 USD/ha.

**Conclusions:** This Vitazyme seed treatment trial in Ukraine showed that only 1 liter/ton of seed produced a 7% yield increase, while improving grain gluten and protein by 1.8 and 0.9 percentage points, respectively. Profits were substantially increased, showing the viability of this product for winter wheat production in central Ukraine.



# Winter Wheat with Vitazyme application

**Researcher:** V. V. Plotnikov

**Research institution:** Agro Expert International, Vinnytsya, Ukraine

**Location:** Private Agricultural Enterprise Polianka, Polianka Village, Harbuzyn District, Mykolayiv Region, Ukraine.

**Variety:** Zolotokolosa, first reproduction

**Planting date:** September 25, 2015

**Seeding rate:** 5.5 million/ha

**Previous crop:** peas

**Soil type:** gray podzolic (3.2% organic matter)

**Cultivation:** disking to 6-8 cm, plowing to 20-22 cm, and one cultivation to 4-5 cm

**Rainfall:** 300-350 mm

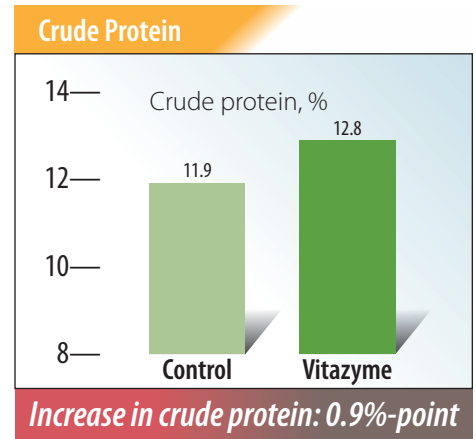
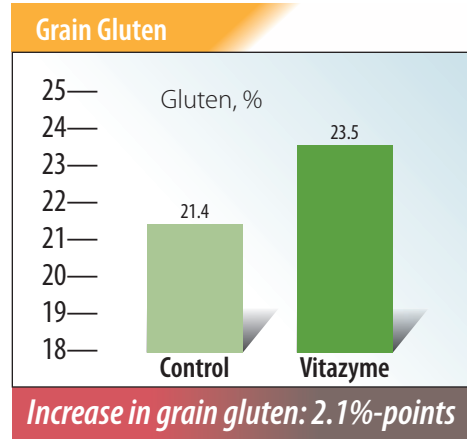
**Experimental design:** A winter wheat field was divided into a Vitazyme treated and untreated area, with the objective of determining the effect of this product on the yield and quality of the grain.

① Control ② Vitazyme

**Fertilization:** at planting, 16-16-16 kg/ha of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O in-row; in the spring, 120 kg/ha of N

**Vitazyme application:** 1.0 liter/ton on the seeds before planting, on September 21, 2015

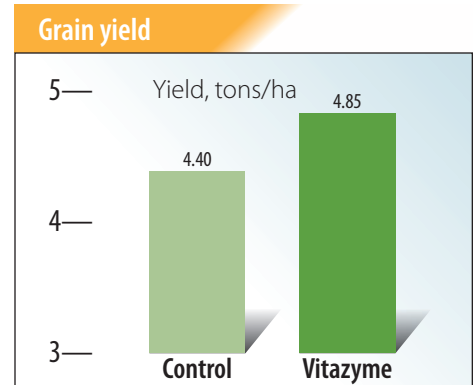
**Quality results:**



**Yield results:**

Treatment	Grain yield tons/ha	Yield change tons/ha
Control	4.40	—
Vitazyme	4.85	0.45 (+10%)

**Increase in grain yield with Vitazyme: 10%**



**Income results:** Vitazyme increased net profit by 78.3 USD/ha.

**Conclusions:** This Vitazyme trial using a 1.0 liter/ton seed treatment in Ukraine showed that this minimal amount of product produced a 10% yield increase, while improving grain gluten and protein by 2.1 and 0.9 percentage points, respectively. Profits were substantially increased, showing the great value of this product for winter wheat production in southern Ukraine on podzolic Chernozem soils.





# Winter Wheat with Vitazyme application

**Researcher:** V. V. Plotnikov

**Research institution:** Agro Expert International, Vinnytsya, Ukraine

**Location:** Agricultural L. L. C. Rozkishna, Novosilka Village, Holovaniv'skyl District, Kirovohrad Region, Ukraine.

**Variety:** Zolotokolosa, first reproduction

**Planting date:** September 28, 2015

**Seeding rate:** 5.5 million/ha

**Previous crop:** soybeans

**Soil type:** podzolic Chernozem (3.1% organic matter)

**Cultivation:** plowing to 20-22 cm, and two cultivations to 4-5 cm

**Rainfall:** 500-550 mm

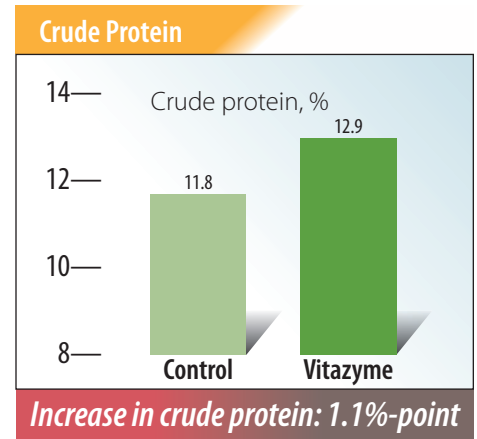
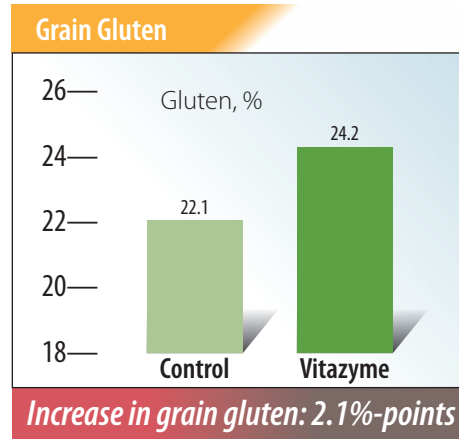
**Experimental design:** A winter wheat field was divided into a Vitazyme treated and untreated area, with the objective of determining the effect of this product on the yield and quality of the grain.

**1 Control 2 Vitazyme**

**Fertilization:** at planting, 15-15-15 kg/ha of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O in-row; in the spring, 105 kg/ha of N

**Vitazyme application:** 1.0 liter/ton on the seeds before planting, on September 23, 2015

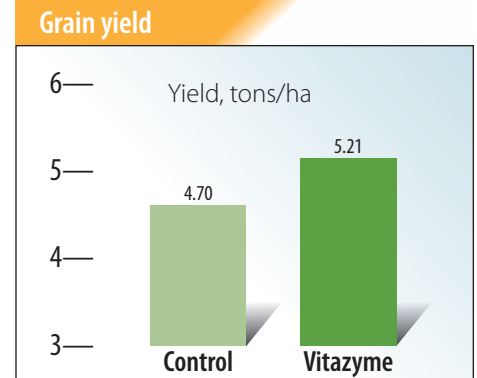
**Quality results:**



**Yield results:**

Treatment	Grain yield tons/ha	Yield change tons/ha
Control	4.70	—
Vitazyme	5.21	0.51 (+11%)

**Increase in grain yield with Vitazyme: 11%**



**Income results:** Vitazyme increased net profit by 89.5 USD/ha.

**Conclusions:** This Vitazyme seed treatment trial in Ukraine showed that only 1 liter/ton of seed produced an 11% grain yield increase, while improving grain gluten and protein by 2.1 and 1.1 percentage points, respectively. Profits were substantially increased, showing the viability of this product for winter wheat production in central Ukraine on a high organic matter podzolic Chernozem soil.



# Winter Wheat with Vitazyme application

**Researcher:** V. V. Plotnikov

**Research institution:** Agro Expert International, Vinnytsya, Ukraine

**Location:** Private Enterprise Urozhay, Volodymyrivka Village, Domaniv's'Kyi District, Mykolayiv Region, Ukraine.

**Variety:** Pylypivka, selected grain

**Planting date:** September 30, 2015

**Seeding rate:** 5.5 million/ha

**Previous crop:** sunflowers

**Soil type:** podzolic Chernozem (3.3% organic matter)

**Cultivation:** disking to 6-8 cm, plowing to 20-22 cm, and one cultivation to 4-5 cm

**Rainfall:** 300-350 mm

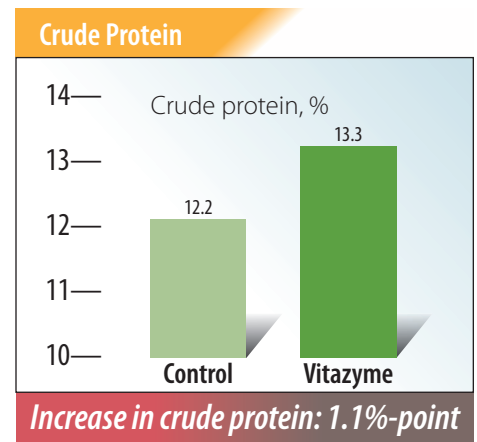
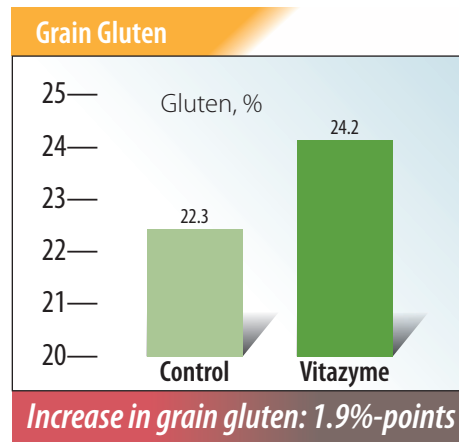
**Experimental design:** A winter wheat field was divided into a Vitazyme treated and untreated area, with the objective of determining the effect of this product on the yield and quality of the grain.

① Control ② Vitazyme

**Fertilization:** at planting, 30-30-30 kg/ha of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O in-row; in the spring, 120 kg/ha of N

**Vitazyme application:** 1.0 liter/ton on the seeds before planting, on September 25, 2015

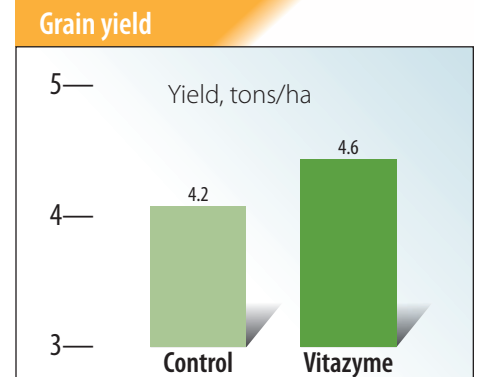
## Quality results:



## Yield results:

Treatment	Grain yield tons/ha	Yield change tons/ha
Control	4.2	—
Vitazyme	4.6	0.4 (+10%)

**Increase in grain yield with Vitazyme: 10%**



**Income results:** Vitazyme increased net profit by 69.0 USD/ha.

**Conclusions:** A Vitazyme seed treatment trial in southern Ukraine showed that only 1 liter/ton of seed produced a 10% yield increase, while improving grain gluten and protein by 1.9 and 1.1 percentage points, respectively. Profits were also increased, showing the viability of this product for winter wheat production in southern Ukraine on high organic matter soils.