

29TH EDITION



COMPILED BY
PAUL W. SYLTIE, PH.D,
DIRECTOR OF RESEARCH

VITAZYME 2024 FIELD TEST RESULTS



CONTROL

VITAZYME

A SUMMARY
OF EXPERIMENTS USING
VITAZYME SOIL, SEED, & PLANT TREATMENT
ON FIELD, ORCHARD, & GREENHOUSE CROPS

Vital Earth Resources, 706 East Broadway
Gladewater, Texas 75647, USA
(903)845-2163 • www.vitalearth.com





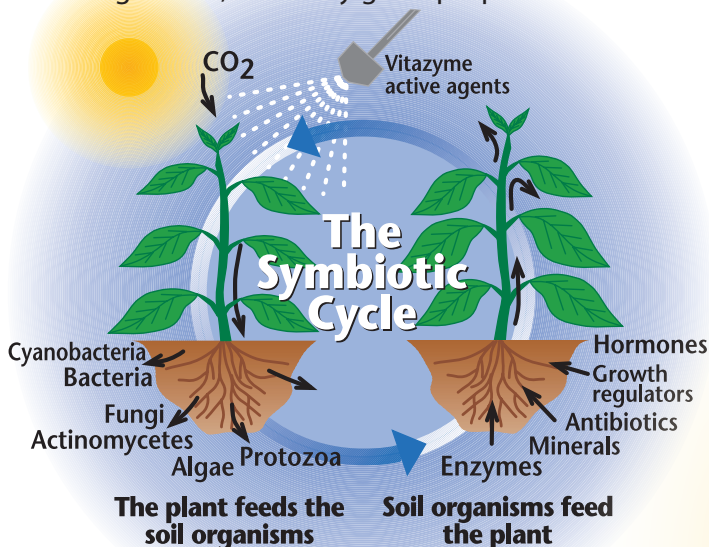
Introduction *How Vitazyme works within the plant-soil system.*

This is the twenty-ninth edition of Vitazyme crop reports, documenting research results from around the world on the successful use of this versatile biostimulant for all soils and climates.

For those unfamiliar with Vitazyme soil and plant biostimulant and its recommended program, please review the information given below to understand how the material works within the plant-soil system.

Improved Symbiosis: The Secret of Vitazyme's Action

All plants that grow in soils develop an intimate relationship between the roots and the organisms that populate the root zone. The teeming billions of bacteria, fungi, algae, cyanobacteria, protozoa, and other organisms that grow along the root surfaces—the rhizosphere—are much more plentiful than in the bulk of the soil. This is because roots feed the organisms with dead root epidermal cells as well as compounds exuded from the roots themselves. The plant may inject 25% or more of its energy, fixed in the leaves as carbohydrates, amino acids, and other compounds, into the root zone to feed the organisms, for a very good purpose.



The microorganisms which feed on these exuded carbon compounds along the root surfaces benefit the plant in many ways, creating a beautiful symbiotic relationship. The plant feeds the bacteria, fungi, algae, and other microbial species in the rhizosphere, which in turn secrete enzymes, organic acids, antibiotics, growth regulators, hormones, and other substances which are

absorbed by the roots and transported to the leaves. The acids help dissolve essential minerals, and reduced iron releases anionic elements. Organism types include mycorrhizae, cyanobacteria and various other bacteria, fungi, and actinomycetes.

Vitazyme contains “metabolic triggers” that stimulate the plant to photosynthesize more efficiently, fixing more sunlight energy in the form of carbon compounds

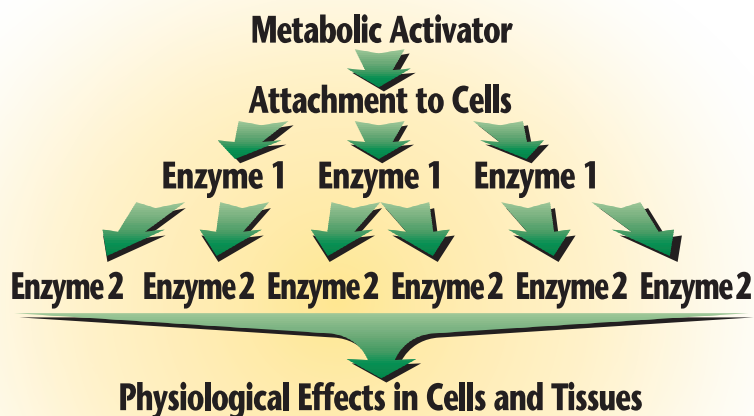
Nitrogen Fertilizer Reduction Guide with Vitazyme

Obtain a score for each of these four items

Soil Organic Matter			Previous Crop		Compaction		Soil NO ₃ -N Test						
Low (<1.5%)	Medium (1.5-3%)	High (>3%)	Non-legume	Legume	Much	Little	Low	Medium	High				
1	2	3	1	3	1	3	2	4	6				
Add the scores above to find the N-reduction													
Total score			15	14	13	12	11	10	9	8	7	6	5
% of optimum N to apply			← 50-60% →			← 60-70% →			← 70-80% →				

to increase the transfer of carbohydrates, proteins, and other growth substances into the root zone. These active agents may enter the plant through either the leaves or the roots. Root growth and exudation are both enhanced. This enhancement activates the metabolism of the teeming population of rhizosphere organisms to a higher level, triggering a greater synthesis of growth-benefiting compounds and a faster release of minerals for plant uptake. Thus, the plant-microbial symbiosis is stimulated.

Very small amounts of these metabolic triggers in Vitazyme are needed to greatly improve plant and rhizosphere microbe response. This is because of the **enzyme cascade effect**. Successive tiers of enzymes are activated in plant and microbial tissues to give a large physiological response from very little activator.



In short, Vitazyme enables the plant to better express its genetic potential by reducing the stresses that repress that expression.

Vitazyme may be used for crop production at any degree of technology, from animal power and low inputs to GPS-guided tractor power and high fertility inputs. Please consult the Vitazyme User's Guide for details.

General use for field crops with less than optimal fertilization levels, when soil testing is not possible:

1. Apply normal levels of organic and commercial fertilizers.
2. Treat the seeds, transplant roots, or seed pieces whenever possible at planting. To treat seeds, typically use 250 ml/ha in the minimum water for good seed coverage. Mixing 1 liter/ton of seeds is also very effective. Dip roots or transplants in a 0.5 to 1% solution, or spray with a 5% solution.
3. Apply Vitazyme to the soil and/or leaves according to recommendations. In most cases use 1 to 1.5 liters/ha per application, from one to three times during the growing season.

General use for field crops with optimal fertilization and soil testing:

1. Test the soil at a reputable laboratory, and obtain expert fertilization recommendations.
2. Fertilizer nitrogen rates may be lowered somewhat, depending on soil conditions; refer to the table above.
3. Treat the seeds using a seed treater to achieve about 1 liter/ton of seed of actual product, or apply 1 liter/ha in-furrow at planting, with or without starter fertilizer.
4. Apply Vitazyme to the soil and/or leaves according to recommendations.

Remember that Vitazyme is a complement to other sound, sustainable crop management practices. Incorporate crop rotations, minimal tillage, erosion control, and adapted plant varieties whenever possible.

Vitazyme Field Tests for 2024



Vitazyme Highlights *Continued Proof of Increasing Fertilizer Efficiency.*

Vitazyme Highlights for 2024

Once again the Vitazyme program has proven its ability to improve the uptake and utilization of fertilizer — not just nitrogen but all fertilizer elements. A special effort was made in 2024 to trial several crops in different locations to build upon the successes of previous years. Here are short reviews of some of these trials.

1. Corn — Ukraine. Kernel Company, one of the world's largest seed oil producers, trialed corn in the Cherkasy Region, comparing 46, 70, and 92 kg/ha of N with 1 liter/ha of Vitazyme, applied at the 10-leaf stage, to 92 kg/ha of N without Vitazyme. In spite of the late application, the 46 and 70 kg/ha of N rates with Vitazyme yielded only slightly less than the 92 kg/ha of N rate, and this high rate with Vitazyme produced an additional 0.27 ton/ha (3%) of grain over the untreated corn.

2. Corn — Tennessee. At the International Agricenter in Memphis, plant emergence and plant vigor were enhanced at all fertilizer levels by Vitazyme applied at planting and at 6-8 leaves. The yield of the treated corn was improved at the 100, 75, 50, and 25% fertilizer levels by from 1 to 11%.

3. Corn — South Dakota. At South Dakota State University, a trial under irrigation comparing Vitazyme application at V8 with an untreated control at each of three nitrogen levels — 0, 80, and 120 lb/acre — revealed a 3% yield increase at 0 N, a whopping 13% increase (24 bu/acre) at 80 N, and little change at 120 N. The Vitazyme + 80 lb/acre of N yield of 189 bu/acre was statistically equal to the 120 lb/acre of N yield, showing

that reduced N plus Vitazyme can boost corn yields to optimum levels.

4. Cotton — Tennessee. Four fertilizer levels — 100, 75, 50, and 25% of optimum — with or without Vitazyme on cotton in western Tennessee proved that plant emergence was enhanced with Vitazyme, but especially both seed and lint yield. Seed and lint were increased by 7, 6, 16, and 11% with Vitazyme at the 100, 75, 50, and 25% fertilizer rates, respectively. Especially impressive was the 16% increase at the 50% fertilizer level, revealing the improvement of efficiency of use with only half of the recommended fertilizer rate.

5. Sunflowers — Ukraine. With four nitrogen rates — 0, 28, 37, and 46 kg/ha — Vitazyme at 37 kg/ha produced a massive 0.62 ton/ha seed increase, which was 23% greater than the no-Vitazyme treatment. Fertilizer efficiency was proven once again in this trial performed by Kernel Company.

6. Peppers — Tennessee. A pepper trial at the International Agricenter near Memphis compared Vitazyme against an untreated control at 100, 75, and 50% of the recommended optimal fertilizer rate. At each fertilizer rate, Vitazyme increased the total pepper weight by from 6% (at 75% fertilizer) to 35% (at 50% fertilizer).

7. Tomatoes — Tennessee. In a parallel trial to the pepper trial in Tennessee (see 6 above), Vitazyme applied at the 3-5 leaf stage and again at first flower significantly enhanced plant vigor at all fertilizer levels, and increased fruit number by up to 11% at the 100% fertilizer rate.



Avocados with Vitazyme application

Researcher: Javier Acevedo **Research organization:** Syngenta, Santiago, Chile; Integra, Quillota, Chile
Farm cooperators: Agrícola Middletong **Field location:** Tabolango, Valparaiso region, Chile
Variety: Hass on Zutano rootstock **Planting date:** 2012 **Row spacing:** 4 m **In-row spacing:** 2 m
Planting rate: 1,250 plants/ha; the trees placed on 60 cm ridges

Soil: Clay loam texture with imperfect drainage

Experimental design: Healthy, high-productivity orchards in the Valparaiso region were used for the trial. Three trees per treatment were selected for flower monitoring, and 15 trees per treatment were selected for productivity evaluations. Foliar applications of Cultar (paclobutrazol) and Vitazyme were made with a wetting volume of 1000 L/ha. All practices in each orchard were the same for all plots except for the number of Vitazyme applications. Parameters measured were open flowers, flowers per panicle, large flowers, and fruit production.



Avocados are a major export crop in Chile, and perform excellently in the Chilean climate and respond excellently to Vitazyme.

1 Cultar 2 Vitazyme 3 Cultar + Vitazyme

Treatment	Cultar		Vitazyme	
	March 1	March 15	March 21	March 28
1.	1.5 L/ha	—	—	—
2.	1.5 L/ha	1 L/ha	—	—
3.	1.5 L/ha	1 L/ha	1 L/ha	—
4.	1.5 L/ha	1 L/ha	1 L/ha	1 L/ha

Fertilization: unknown

Cultar application: 1,5 L/ha sprayed on all trees on March 1, 2019. Cultar is a systemic plant growth regulator containing 250 g/L of paclobutrazol (triazole).

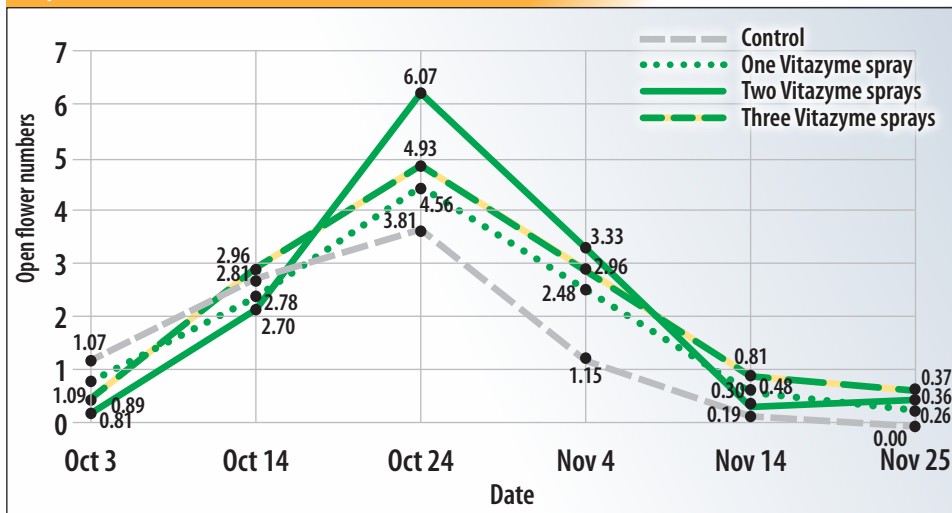
Vitazyme applications: 1 L/ha on the dates shown above, using an orchard sprayer.

Irrigation: Drip irrigation with 2 L/hour emitters per plant. A second lateral was added over a year ago, having 2 L/hour emitters spaced every 50 cm, which provided 2 mm/hour

Open flower number: Means followed by the same letter are not significantly different at P = 0.05, according to Duncan’s Multiple Range Test. The range of values is also given.

Treatment	October 3	October 14	October 24	November 4	November 14	November 25
	-----number of open flowers-----					
1.	1.07 ± 2.16 a	2.81 ± 2.27 a	3.81 ± 2.65 b	1.15 ± 1.06 b	0.19 ± 0.48 b	0.00 ± 0.00 a
2.	1.04 ± 2.14 a	2.70 ± 1.92 a	4.56 ± 3.60 ab	2.48 ± 2.34 a	0.48 ± 0.80 ab	0.26 ± 0.71 a
3.	0.81 ± 1.39 a	2.78 ± 2.42 a	6.07 ± 3.76 a	3.33 ± 3.64 a	0.30 ± 0.54 b	0.36 ± 0.78 a
4.	0.89 ± 1.63 a	2.96 ± 1.95 a	4.93 ± 2.43 ab	2.96 ± 2.07 a	0.81 ± 0.92 a	0.37 ± 0.69 a

Open Flower Numbers



It is clear that Treatment 3, two Vitazyme sprays, produced the highest amount of open flowers on both October 24 and November 4. The three Vitazyme sprays did next best, and the control treatment gave the fewest open blossoms after October 14.

Increase in open flowers with Vitazyme

	Oct 24	Nov 4
One Vitazyme spray (T2)	20%	116%
Two Vitazyme sprays (T3)	59%	190%
Three Vitazyme sprays (T4)	29%	66%

Increase in flowers per panicle with Vitazyme

One Vitazyme spray (T2)23%
 Two Vitazyme sprays (T2)26%
 Three Vitazyme sprays (T2)31%

Flowers per panicle on October 19:

Treatment	Flowers per panicle ²	Change in flowers ¹
	number	number
T1	41.74 ± 13.62 b	—
T2	51.37 ± 14.94 a	9.63 (+23%)
T3	52.67 ± 17.20 a	10.93 (+26%)
T4	54.78 ± 119.63 a	13.04 (+31%)

¹Means followed by the same letter are not significantly different at P = 0.05 according to the Kruskal Wallance Test

Productivity factors:

Treatment	Weight/Tree ¹	Change	Number Tree ¹	Change	Fruit weight ¹	Change
	kg/tree	kg/tree	number	number	g/fruit	g/fruit
T1	10.19 ± 7.09 a	—	62.22 ± 42.62 a	—	163.73 ± 36.11 c	—
T2	7.67 ± 3.53 a	(-) 3.10 (-30%)	48.14 ± 21.60 a	(-) 14.08 (-23%)	159.29 ± 35.93 c	(-) 4.44 (-3%)
T3	11.71 ± 5.35 a	1.52 (+15%)	65.44 ± 26.07 a	3.22 (+5%)	179.00 ± 37.73 a	15.27 (+9%)
T4	14.00 ± 8.78 a	3.81 (+37%)	81.22 ± 47.57 a	19.00 (+31%)	172.36 ± 35.70 b	8.63 (+5%)

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

Change in fruit weight/tree with Vitazyme

One Vitazyme spray -30%
 Two Vitazyme sprays +15%
 Three Vitazyme sprays... +37%

Change in fruit number/tree with Vitazyme

One Vitazyme spray -23%
 Two Vitazyme sprays +5%
 Three Vitazyme sprays... +31%

Change in fruit weight with Vitazyme

One Vitazyme spray -3%
 Two Vitazyme sprays +9%
 Three Vitazyme sprays +5%

There were no significant differences among the four treatments for fruit weight/tree and fruit number/tree, though the two and three Vitazyme application treatments showed a distinct trend to benefit both parameters. Fruit weight for the control and the single Vitazyme application showed no difference, but the two and three L/ha applications showed significant increases, of 9% and 5% respectively.

Large fruit: The percentage of large fruit (size 32 to 50, over 200 g), were determined. There was a definite trend for greater fruit weight with increasing Vitazyme applications, with two applications giving the greatest increase.

Treatment	Large fruit ¹	Change in large fruit
	%	%
T1	22.0 ± 12.0 a	—
T2	27.0 ± 11.0 a	5 (+23%)
T3	36.0 ± 2.0 a	14 (+64%)
T4	28.0 ± 17.0 a	6 (+27%)

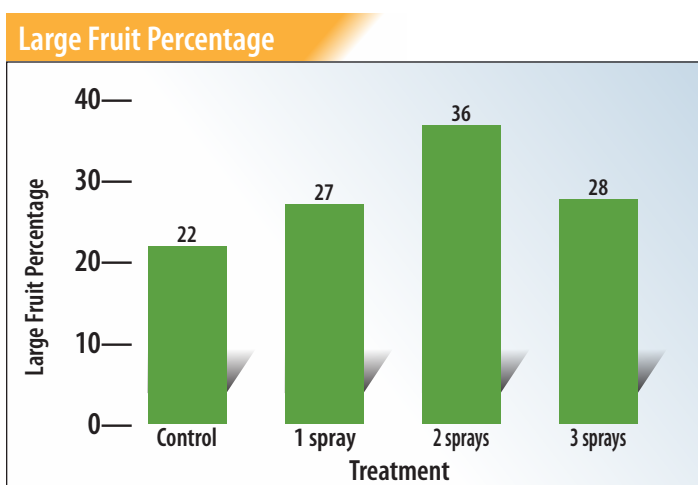
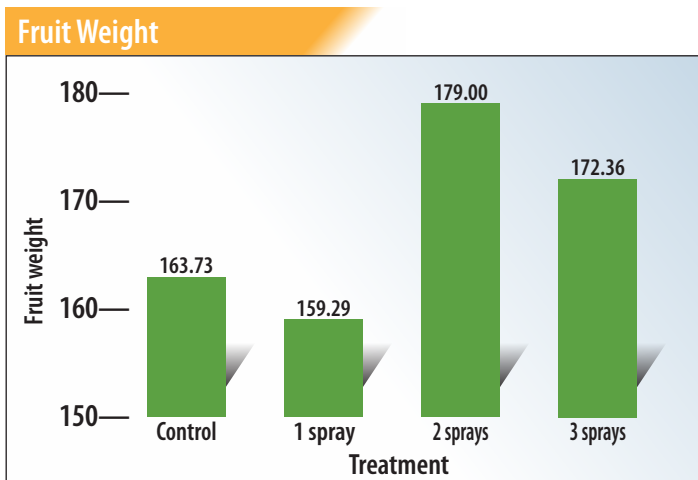
¹Means followed by the same letter are not significantly different at P = 0.05 according to the Duncan Multiple Range Test

Change in large fruit with Vitazyme

One Vitazyme spray +23%

Two Vitazyme sprays..... +64%

Three Vitazyme sprays..... +27%



Conclusions: This avocado study, conducted in 2019 in Chile, revealed very good efficacy for Vitazyme as a foliar spray when applied once, twice, or three times at one-week intervals the last half of March. These late-season applications likely improved the energy capture and carbohydrate stores of the trees for the following crop season. As a result, the productivity parameters of flowering, fruit number, fruit weight, and large fruit were improved with Vitazyme, especially for the two and three 1 L/ha applications. In some cases the increases with Vitazyme are not statistically significant, such as with flowers per panicle, fruit weight per tree, and fruit number per tree, but in these cases there was a strong trend for the product to increase the parameter at the two and three-application regimes. For some unknown reason the single application did not result in improvements for some parameters, though it did for open flowers on some dates and large fruit size. Although 2019 was a difficult year in Chile for avocado production due to extreme environmental conditions, the promotion of photosynthesis and tree metabolic functions by Vitazyme helped overcome flowering and fruit set problems caused by cold (below 10°C) temperatures.

Some highlights of this study:

- Excellent improvements in flowering (+190% more open flowers on November 4) with two 1 L/ha Vitazyme applications, and excellent responses for this same date with a single 1 L/ha application (+116%) and for three applications (+66%)
- Up to 31% more flowers per panicle on October 19 with Vitazyme
- Up to 37% greater fruit weight per tree with Vitazyme
- Up to 31% more fruit per tree with Vitazyme
- Up to 9% heavier fruit with Vitazyme
- Up to 64% more large fruit (over 200g) with Vitazyme

These results show the great efficacy of Vitazyme to improve avocado productivity in Chile.



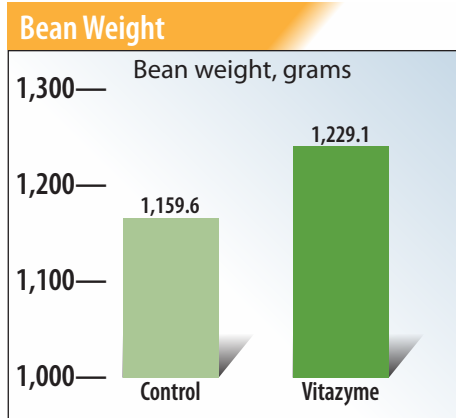
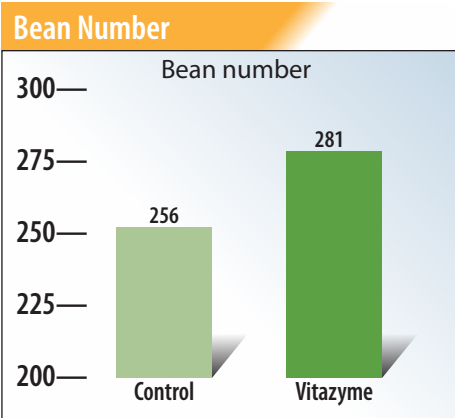
Beans with Vitazyme application

Researcher: Rajnish Khanna, Ph.D. **Research organization:** e-Cultiver, Manteca, California
Location: USDA/Plant Gene Expression Center, Albany, California **Variety:** Blue Lake
Planting date: March 21, 2024 **Potting Soil:** Sunshine Mix #1 (Sungro Horticulture) **Pot size:** 5 gal
Experimental design: A small greenhouse trial, using 17 plants per treatment, compared the effect of Vitazyme with an untreated control to determine the bean number, bean weight, and the number and weight per plant of the two treatments.

1 Control 2 Vitazyme

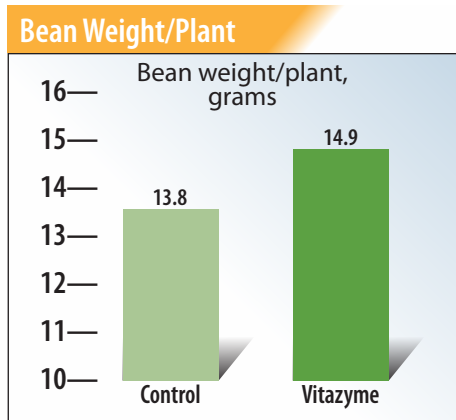
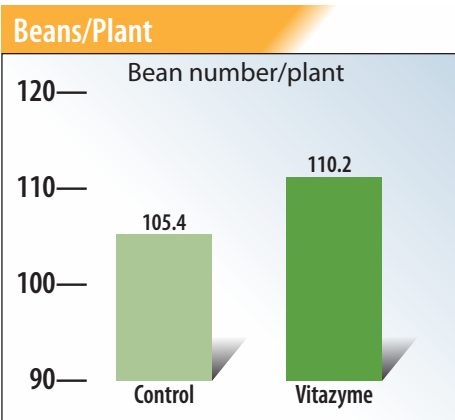
Fertilization: Peters 20-20-20 water soluble fertilizer at 1:64 ppm, once per week
Vitazyme applications: 1:100 dilution sprayed on the leaves to the dripping point, and to the soil, every two weeks
Disease suppression: Floramite and Decathlon at 0.25 tsp/gal sprayed on the leaves
Bean harvest results: The beans were harvested on July 9, 2024, and counted and weighed..

Treatment	Bean number	Number change	Bean weight	Weight change	Beans/Plant	Weight/Plant
			grams	grams		grams
1. Control	256	—	1,159.6	—	105.4	13.8
2. Vitazyme	281	25 (+10%)	1,229.1	69.5 (+6%)	110.2	14.9



Increase in bean number with Vitazyme: 10%

Increase in bean weight with Vitazyme: 6%



Conclusions: This greenhouse bean trial in California, comparing Vitazyme with an untreated control, revealed that the product improved the number of beans by 10% while increasing the total weight by 6%. This resulted in increases in both beans//plant and bean weight/plant.



Broccoli with Vitazyme application

Researcher: Rajnish Khanna, Ph.D.

Research organization: e-Cultiver, Manteca, California

Location: USDA/Plant Gene Expression Center, Albany, California

Variety: unknown

Planting date: September 1, 2024

Potting Soil: Sunshine Mix #1 (Sungro Horticulture)

Pot size: 3 gal tall

Experimental design: A small greenhouse trial, using pots for an untreated control and a Vitazyme treatment with six plants per treatment, was established to evaluate the effect of Vitazyme on the growth of broccoli.

① Control ② Vitazyme

Fertilization: Peters 20-20-20 water soluble fertilizer at 1:64 ppm, once per week

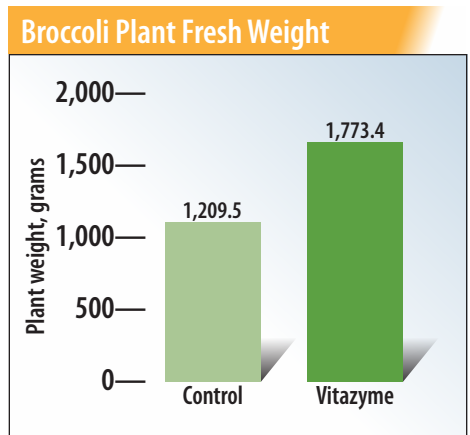
Vitazyme applications: 1:100 dilution sprayed on the leaves to the dripping point, and to the soil, every two weeks

Broccoli harvest results: The broccoli plants were harvested on December 23, and the leaves were weighed for the two treatments.

Treatment	Plant weight ¹ grams	Weight change grams
1. Control	1,209.5 b	—
2. Vitazyme	1,773.4 a	563.9 (+47%)

¹Total of six plants, fresh weight. The Vitazyme treated leaves (a) exceeded the control leaves (b) at P = 0.004.

Increase in plant weight with Vitazyme: 47%



Conclusions: A small-pot broccoli greenhouse study in California, which compared an untreated control with Vitazyme treatment of a 1% spray every two weeks, revealed considerably greater leaf and stem growth with the Vitazyme treatment about 15 weeks after planting. The increase was 47%, showing the great efficacy of this biostimulant to increase broccoli growth. This improvement would very likely have carried over to total head yield.



Corn with Vitazyme application—A Nitrogen Rate Study Under Irrigation

Researcher: Graig Reicks, Ph.D.

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

Location: South Dakota State University Experimental Farm, Aurora, South Dakota

Variety: Dekalb DKC 47-85RIB (97 day)

Planting date: May 16, 2024

Seeding rate: 32,000 seeds/acre

Soil type: Brandt silty clay loam

Row spacing: 30 inches

Planting depth: 2 inches

Experimental design: A small-plot corn trial, with four replications in a randomized complete block design, was established using plots that were four rows wide and 20 feet long. During harvest the middle two rows of each plot were harvested for data collection. The purpose of the trial was to evaluate the effect of Vitazyme, applied at planting and foliar at V6, on grain yield for three nitrogen fertilizer rates.

Fertilization: 80 and 120 lb/acre of N as urea on the appropriate plots

Vitazyme application: 13 oz/acre (1 liter/ha) on July 10 at V8

Irrigation: as needed during the summer

Growing season weather: very warm temperatures during the summer, with erratic rainfall, and drought the last half of the summer.



The ear development with Vitazyme at all three nitrogen levels is superior to the untreated control ears.

Treatment	Vitazyme	Fertilizer N lb/acre		
		0	80	120
1	o	x	o	o
2	x	x	o	o
3	o	o	x	o
4	x	o	x	o
5	o	o	o	x
6	x	o	o	x

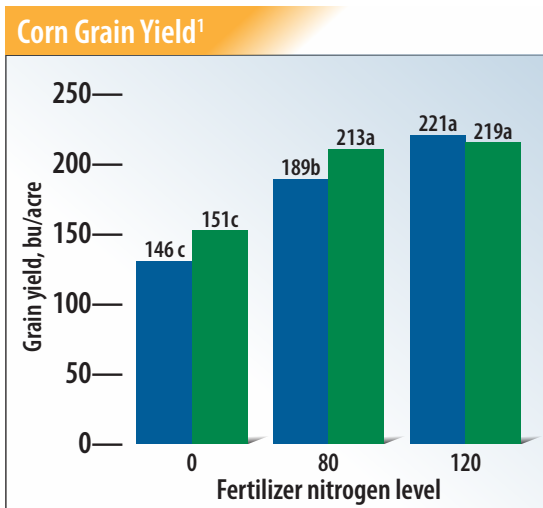


The irrigated corn trial with three fertilizer N levels is shown here at the South Dakota State University experimental farm.



Notice the much greater root development of the treated corn plants having had Vitazyme applied at the V8 stage. The 80 lb/acre of N treatment gave the biggest yield increase, which was highly significant.

Yield results:



Treatment	Grain Yield¹ bu/ha	Yield change bu/ha
1. No N	146 c	—
2. No N + Vitazyme	151 c	5 (+3%)
3. 80 N	189 b	—
4. 80 N + Vitazyme	213 a	24 (+13%)
5. 120 N	221 a	—
6. 120 N + Vitazyme	219 a	-2 (-1%)

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

Yield change with Vitazyme at three fertilizer N levels

No N..... +3%
 80 lb/acre N..... +13%
 120 lb/acre N..... -1%

There were no significant yield differences between the Vitazyme treated and untreated treatments for the 0 N fertilizer level and the 120 lb/acre level. However, at the 80 lb/acre fertilizer level there was a highly significant yield increase with Vitazyme, of 24 bu/acre (13%). The yield with Vitazyme at the 80 lb/acre N rate was statistically equivalent to the yield of both treatments at the 120 lb/acre N rate.

Conclusions: This small-plot replicated corn trial at South Dakota State University, using three fertilizer nitrogen (N) rates of 0, 80, and 120 lb/acre, with and without Vitazyme, revealed that the biostimulant did not affect yield at the 0 N and 120 lb/acre N rates. However, at the 80 lb/acre rate Vitazyme significantly boosted grain yield by 24 bu/acre over the untreated control treatment (Treatment 3). This yield was statistically equal to the yields of both the untreated and Vitazyme treated treatments at the 120 lb/acre N rates.

These results show that:

1. At least some N fertilizer is needed to gain a significant yield response with Vitazyme under these soil fertility conditions.
2. Vitazyme will significantly boost corn grain yield at less-than-optimal fertilizer N applications (80 lb/acre), to equal the yield of grain at the optimal fertilizer N level of 120 lb/acre.
3. Under high or optimal fertilizer N applications (120 lb/acre), Vitazyme will not improve corn grain yields under the soil fertility levels experienced in this experiment.

Thus, Vitazyme improves the efficiency of nitrogen fertilizer use with corn when the nitrogen is at less than optional rates under irrigated conditions.



Corn with Vitazyme application—A Fertilizer Efficiency Study

Researcher: Bruce Kirksey, Ph.D.

Research organization: Agricenter International, Memphis, Tennessee

Location: Memphis, Tennessee

Variety: DKC 65-95VT2P **Planting date:** April 25, 2024 **Planting rate:** 34,000 seeds/acre

Row spacing: 30 inches **Plant depth:** 1.5 inches

Soil type: Falaya and Waverly silt loams

Soil character: pH = 6.5, organic matter = 1.8%, cation exchange capacity = 7.8 meq/100g, excellent fertility, good drainage

Tillage: conventional

Experimental design: A small plot experiment on corn was initiated, using four replications and eight treatments — four fertilizer levels either treated or not treated with Vitazyme — to evaluate the effect of this biostimulant on the emergence, plant vigor, leaf chlorophyll content, grain test weight, and yield of the crop. Special attention was focused on the ability of Vitazyme to improve fertilizer efficiency of use.

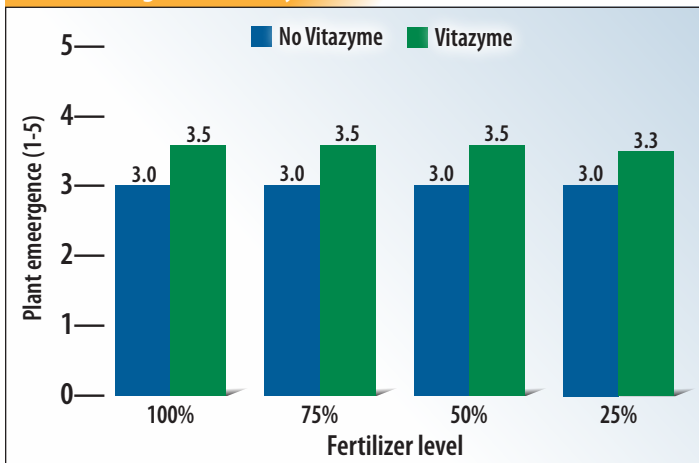
Treatment	Fertilizer	Vitazyme	
		In-furrow	Foliar
1. 100% fertilizer	100%	o	o
2. Vitazyme + 100% fertilizer	100%	x	x
3. 75% fertilizer	75%	o	o
4. Vitazyme + 75% fertilizer	75%	x	x
5. 50% fertilizer	50%	o	o
6. Vitazyme + 50% fertilizer	50%	x	x
7. 25% fertilizer	25%	o	o
8. Vitazyme + 25% fertilizer	25%	x	x

Fertilization: 100% = 200-60-60 lb/acre of N-P₂O₅-K₂O; 75% = 150-45-45 lb/acre of N-P₂O₅-K₂O; 50% = 100-30-30 lb/acre of N-P₂O₅-K₂O; 25% = 50-15-15 lb/acre of N-P₂O₅-K₂O. All fertilizer was applied in the liquid form.

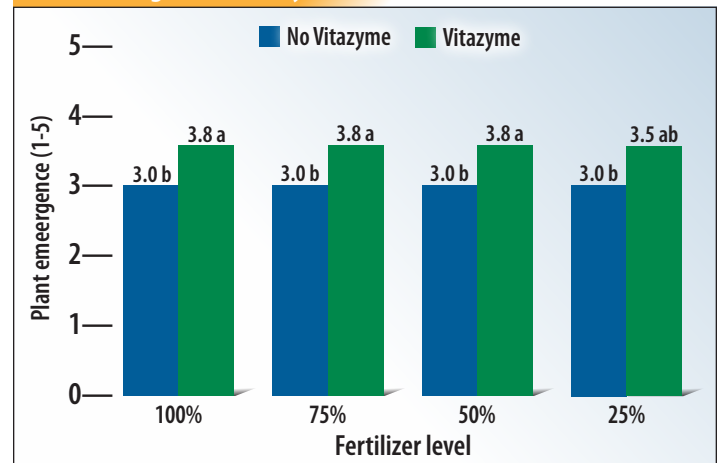
Vitazyme applications: In-furrow at 13 oz/acre (1 liter/ha) on April 25 at planting; foliar at 13 oz/acre (1 liter/ha) on June 12, 48 days after planting at 6-8 leaves

Plant Emergence results: Emergence evaluations were made on May 2 and May 6, 7 and 11 days after planting, respectively.

Plant Emergence on May 2



Plant Emergence on May 6¹

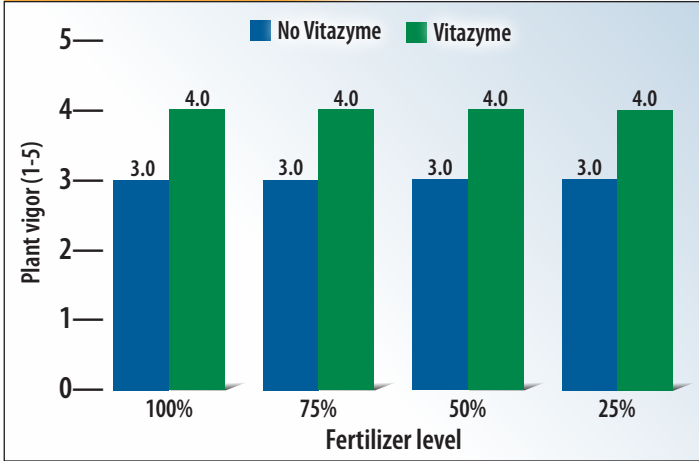


¹Means followed by the same letter are not significantly different at P = 0.05 according to ANOVA. LSD (0.005) = 0.5, CV = 10.64, treatment prob (F) = 0.0034.

On May 2, the Vitazyme treated plots at all four fertilizer levels had significantly more emerged plants than the untreated plots. Seed contact with the product had a consistent but nonsignificant effect. This effect carried through even more intensively for the May 6 evaluation, with the Vitazyme treatments having significantly more emerged plants than the untreated treatment, except at the 25% fertilizer level.

Plant vigor results: Plant vigor evaluations were made on May 6 using a scale of 1 to 5

Corn Plant Vigor on May 6



Plant vigor was consistently greater with the Vitazyme treated plots versus the untreated plots at all fertilizer levels. Because there was no error variance in the statistical analysis, there was no ANOVA performed. However, the treatment differences are real.

Increase in plant vigor with Vitazyme: 33%

Leaf chlorophyll results: Using a Minolt SPAD meter, and 10 leaf determinations per plot, there were no significant difference among the treatments. However, at the 100% fertilizer level Vitazyme treated plants had a profoundly greater chlorophyll level than the untreated treatment: 34.5 vs. 28.2. This difference would be clearly visible to the eye in the field.

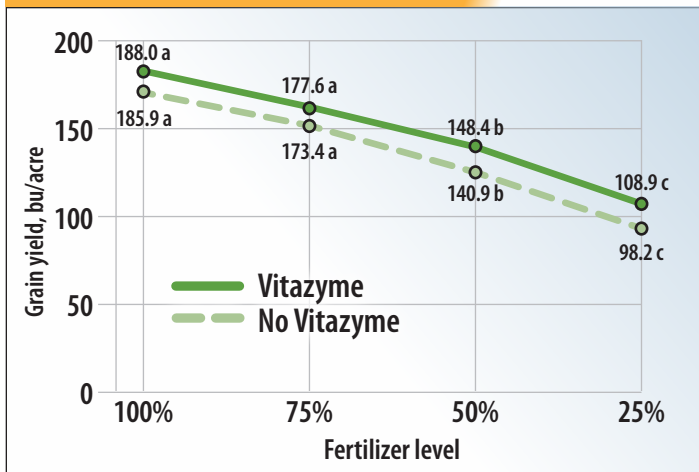
Increase in chlorophyll with Vitazyme, Treatment 2: 6.3 SPAD units

Grain moisture results: There were no significant differences among the treatments.

Grain yield results: The corn grain was harvested and weighed on August 27, 2024.

Statistical values	
LSD (0.05)	17.8 bu/acre
CV.....	7.94
Replicate F	0.6072
Treatment F	0.0001

Corn Grain Yield¹



¹Means followed by the same letter are not significantly different at P = 0.05 according to ANOVA.

Yield increases with Vitazyme at each fertilizer level	
100% fertilizer	2.1 bu/acre (1%)
75% fertilizer	4.2 bu/acre (2%)
50% fertilizer	7.5 bu/acre (5%)
25% fertilizer	10.7 bu/acre (11%)

Vitazyme improved the corn grain yield at each fertilizer level, though not significantly. This increase was greatest at the 25% fertilizer level: 11%. The fertilizer treatments greatly improved grain yield.

Yield of corn for four fertilizer treatments, average of Vitazyme and untreated treatments	
100% fertilizer	187 bu/acre
75% fertilizer	175.5 bu/acre
50% fertilizer	144.7 bu/acre
25% fertilizer	103.6 bu/acre

Conclusions: A small-plot replicated corn study in extreme western Tennessee, which evaluated the effect of Vitazyme applied in-furrow and foliar at four fertilizer levels, revealed consistent but non-significant yield increases of from 1 to 11%, the highest increase being at the 25% fertilizer rate. These results suggest an improvement in fertilizer use efficiency with Vitazyme. Plant emergence was significantly enhanced by Vitazyme at all fertilizer levels, as was plant vigor. These results show that Vitazyme is a highly effective management tool for corn production in the southern Mississippi River Valley.



Corn with Vitazyme application—A Nitrogen Rate Study

Researcher: Kernel personnel

Research organization: Kernel Company, Ukraine [Kernel is the largest producer of sunflower oil in Ukraine, and exports oils and grains worldwide, and provides storage for grains and seeds.]

Location of trial: Uman District, Cherkasy Region, Chorna Kamianka Village, Ukraine

Variety: Amarak 290

Planting date: unknown

Planting rate: unknown

Previous crop: unknown

Experimental design: A corn field in 2023 was divided into four sections, each receiving different N fertilizer or Vitazyme treatment, to determine the effect of these treatments on corn yield

Fertilization: nitrogen applied at the rates shown in the table (right).

Vitazyme application: Vitazyme applied at 1 liter/ha sprayed on the leaves and soil at the 10-leaf stage (BBCH 30) on June 23, 2023.

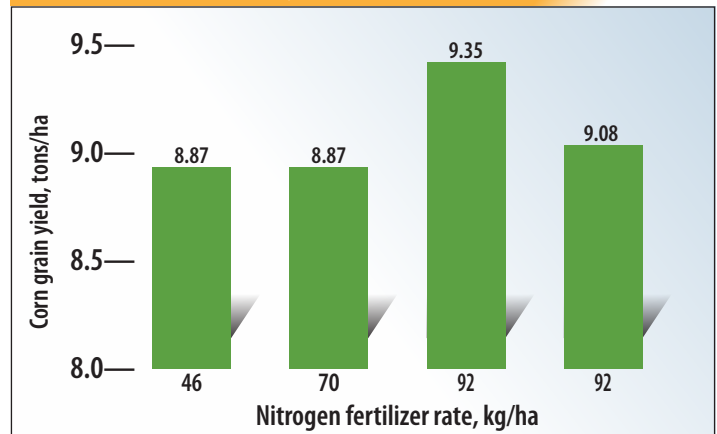
Yield results:

Treatment	Fertilizer rate kg/ha of N/ha	Vitazyme liter/ha
1	46	1
2	70	1
3	92	1
4	92	0

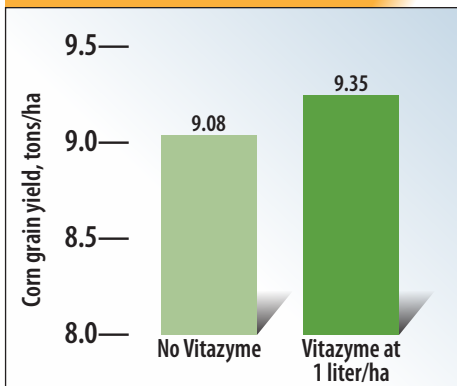
Treatment	Grain yield tons/ha	Yield change* tons/ha
1. 46 kg/ha N + Vita	8.87	—
2. 70 kg/ha N + Vita	8.87	o
3. 92 kg/ha N + Vita	9.35	+0.48 (+5%)
4. 92 kg/ha N	9.08	+0.21 (+2%)

*Yield changes are compared to Treatment 1, which has the lowest N fertilizer application.

Corn Grain Yield at Four Nitrogen Levels, With and Without Vitazyme



Corn Grain Yield at 92 kg/ha of N, With and Without Vitazyme



Corn grain yield increase at the same nitrogen level: 0.27 ton/ha (+3%)

Conclusions: A corn trial in Ukraine, which evaluated grain yield at three nitrogen (N) fertilizer levels, and the effect of Vitazyme at the highest N level, showed that moving from 46 to 70 kg/ha of N did not increase yield with Vitazyme. However, at the 92 Kg/ha of N application, 1 liter/ha of Vitazyme applied at the 10-leaf stage improved the grain yield by 0.27 ton/ha, a significant 3% increase corn yield at fairly high N rates in Ukraine.



Cotton with Vitazyme application—A Nitrogen Efficiency Study

Researcher: Bruce Kirksey, Ph.D.
Research organization: Agricenter International, Memphis, Tennessee
Location: Memphis, Tennessee
Variety: DP 1646B2FX
Planting date: June 12, 2024
Planting rate: 55,000 seeds/acre
Row spacing: 38 inches
Soil type: Falaya and Waverly silt loams
Soil character: pH = 6.5, organic matter = 1.8%, cation exchange capacity = 7.8 meq/100g, excellent fertility, good drainage
Tillage: conventional
Experimental design: A small-plot design, with four replications and plots that were 10 x 30 ft with four rows/plot, was established in a randomized complete block design, to evaluate the effect of Vitazyme and four fertilizer levels on cotton growth, leaf chlorophyll, and yield. Eight treatments were applied, as shown below.

Treatment	Fertilizer	Vitazyme	
		In-furrow	foliar
1. 100% fertilizer	100%	o	o
2. Vitazyme + 100% fertilizer	100%	x	x
3. 75% fertilizer	75%	o	o
4. Vitazyme + 75% fertilizer	75%	x	x
5. 50% fertilizer	50%	o	o
6. Vitazyme + 50% fertilizer	50%	x	x
7. 25% fertilizer	25%	o	o
8. Vitazyme + 25% fertilizer	25%	x	x

Fertilization: 100% = 100-60-60 lb/acre of N-P₂O₅-K₂O; 75% = 75-45-45 lb/acre of N-P₂O₅-K₂O; 50% = 50-30-30 lb/acre of N-P₂O₅-K₂O; 25% = 25-15-15 lb/acre of N-P₂O₅-K₂O. All fertilizer was applied in the liquid form.

Vitazyme applications: In-furrow at 13 oz/acre (1 liter/ha) on June 6, at planting; foliar at 13 oz/acre (1 liter/ha) on July 23, at 6-8 leaves (BBCH 16)



Notice the greatly improved leaf development and chlorophyll content with Vitazyme, and improved indications of square formation at this stage of growth.

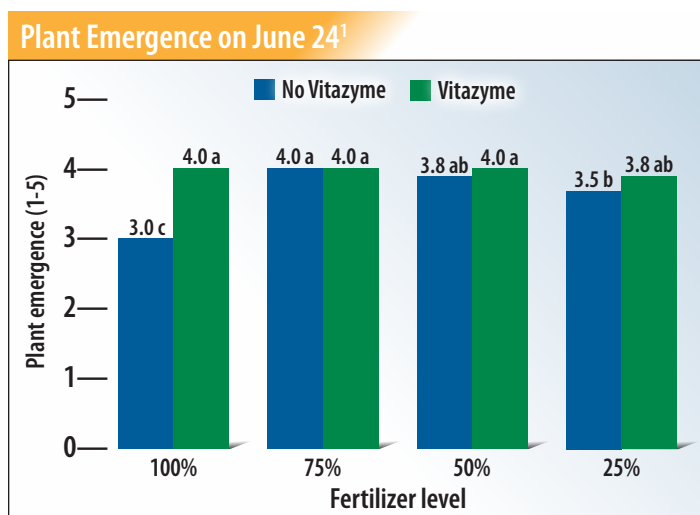
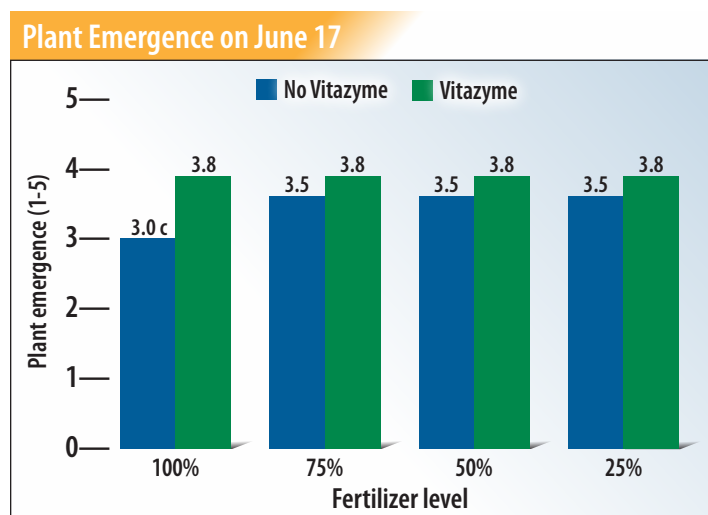


The cotton trial in western Tennessee produced excellent responses of plant emergence, vigor, and seed and lint yield with two applications of Vitazyme.



The Vitazyme treated cotton plants display much better leaf and stem growth, as well as a more extensive root system from two applications.

Plant Emergence results: On June 17, five days after planting, and again on June 24, 12 days after planting, the emergence of plants for the eight treatments was evaluated.



¹Means followed by the same letter are not significantly different according to ANOVA, at P = 0.05. LSD (0.05) = 0.48, CV = 8.73, treatment prob (F) = 0.0028.

At both dates the Vitazyme treatments showed superior plant emergence on a scale of 1 to 5, especially on June 17. However, these values were not significantly different due to high variability of the plot values. Significant differences did appear, however, on June 24, with the Vitazyme treatments exceeding the untreated values at P = 0.05 for the 100% fertilizer treatments. Especially notable is the low emergence values for the 100% fertilizer non-treated seeds.

Plant vigor results: A scale of 1 to 5 was used to evaluate plant vigor of all plots on June 24. There was a tendency for the Vitazyme treated treatments to exceed the untreated ones at all but the 50% fertilizer level. Interestingly, at the 100% fertilizer level the Vitazyme treatment (Treatment 2) exceeded the untreated plants (Treatment 1) by 43% (4.3 vs. 3.0). Differences of means were significant at P = 0.075.

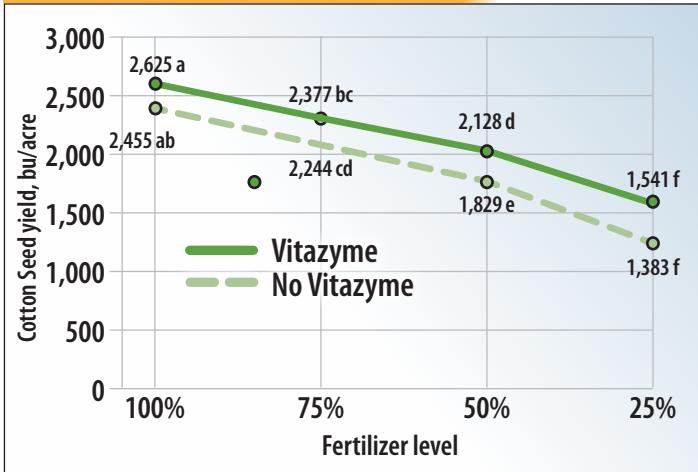
Leaf chlorophyll results: Leaf chlorophyll, measured with a SPAD meter using 10 leaves per plot, did not show significant differences between treated and untreated treatments for the four fertilizer levels. However, all but the 100% fertilizer level showed chlorophyll enhancement with Vitazyme, and the average leaf chlorophyll values over the four treated and four untreated treatments were as follows:

Treatment	Average value
SPAD units without Vitazyme (Treatments 1, 3, 5, and 7)	36.3
SPAD units without Vitazyme (Treatments 2, 4, 6, and 8)	37.4

Increase in SPAD (chlorophyll) units with Vitazyme: 1.1

Seed yield results: The cotton crop was harvested November 25, 2024, and the seeds and lint were separated and weighed separately. Both the seeds and the lint produced highly significant yield differences among the eight treatments.

Cotton Seed Yield¹



¹ Means followed by the same letter are not significantly different at P = 0.05 according to ANOVA.

Statistical values

LSD (0.05)	180.9 lb/acre
CV	5.94
Replicate F	0.2378
Treatment F	0.0001

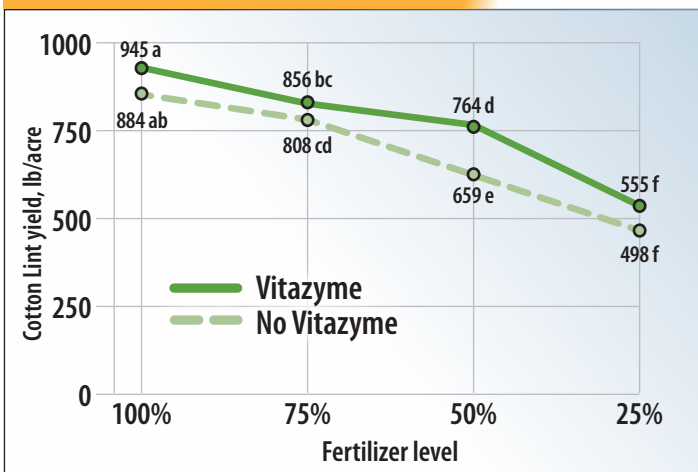
Seed yield increases with Vitazyme at each fertilizer level

100% fertilizer	7%
75% fertilizer	6%
50% fertilizer	16%
25% fertilizer	11%

Vitazyme improved cotton seed yield at all four fertilizer levels, but especially at the 50% fertilizer level, which gave a significant 16% yield increase.

Lint yield results: The lint yield was determined at the same time as the seed yield on November 25.

Cotton Lint Yield¹



¹ Means followed by the same letter are not significantly different at P = 0.05 according to ANOVA.

Statistical values

LSD (0.05)	65.1 lb/acre
CV	5.94
Replicate F	0.2378
Treatment F	0.0001

Lint yield increases with Vitazyme at each fertilizer level

100% fertilizer	7%
75% fertilizer	6%
50% fertilizer	16%
25% fertilizer	11%

At every fertilizer level Vitazyme improved lint yield. The increases were similar to seed yield increases, with the greatest increase (16%) at the 50% level.

Conclusions: A small-plot cotton trial with four replicates, using four fertilizer levels and with or without Vitazyme applied twice at 13 oz/acre (1 liter/ha) — at planting and at BBCH 16 — proved that Vitazyme, at each fertilizer level, increased both seed and lint yield. Increases ranged from 6 to 16%, the 50% fertilizer level giving the greatest increase with Vitazyme. There was a trend towards higher leaf chlorophyll with Vitazyme as well, and better plant vigor and plant emergence at the four fertilizer levels. These results show that Vitazyme is able to improve fertilizer utilization with cotton under conditions of the lower Mississippi River valley, and is a low cost, highly effective treatment when coupled with reduced fertilizer applications.



Kale with Vitazyme application

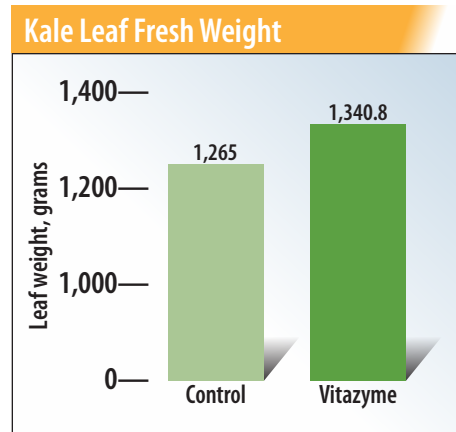
Researcher: Rajnish Khanna, Ph.D. **Research organization:** e-Cultiver, Manteca, California
Location: USDA/Plant Gene Expression Center, Albany, California **Variety:** unknown
Planting date: September 1, 2024 **Potting Soil:** Sunshine Mix #1 (Sungro Horticulture) **Pot size:** 3 gal tall
Experimental design: A small greenhouse trial, with eight plants per treatment, was set up to evaluate the effect of Vitazyme biostimulant on the growth of kale plants.

1 Control 2 Vitazyme

Fertilization: Peters 20-20-20 water soluble fertilizer at 1:64 ppm, once per week
Vitazyme applications: 1:100 dilution on the leaves to the dripping point, and to the soil, every two weeks
Kale harvest results: The kale plants were harvested on December 23, and the leaves for both treatments were weighed.

Treatment	Leaf weight ¹ grams	Weight change grams
1. Control	1,265.0 b	—
2. Vitazyme	1,340.8 a	75.8 (+6%)

¹Total of eight plants, fresh weight. The mean weight of the treated plants (a) is significantly greater than the control plants (b) at P = 0.18.



Conclusions: A small-pot greenhouse kale trial, which compared an untreated control with a Vitazyme treatment (1% solution every two weeks), revealed a fresh leaf weight increase of 6% with Vitazyme. This increase was significant at P = .18.



Lettuce with Vitazyme application

Researcher: Claudio Mondaca y Nicolas Miranda
Research organization: Syngenta, Santiago, Chile; Plant Designs, USA
Farm cooperators: Agricola Dallaserra **Field location:** La Serena, Chile **Variety:** Vanguardia (Iceberg type)
Planting date: June 19, 2024 **Row spacing:** 75 cm **In-row spacing:** 20 cm
Planting rate: 65,000 plants/ha **Tillage:** Conventional **Soil traits:** clay loam soil
Experimental design: A homogeneous sector of a field was planted with lettuce, with the field divided into two subsectors of 1 hectare each. One subsector underwent five applications, one per week for five weeks, using 0.5 liter/ha of Vitazyme in 500 cc/ha per application. The other sub-sector continued with the regular field applications. Within each sub-sector four representative plots were selected for plant evaluation. Each plot was 9 m² and contained four rows. In each plot the percentage of large (grade 1), small (grade 2), and non-marketable lettuce were determined. A subsample from the plots was taken to measure the average weight of each category.

1 Control 2 Vitazyme

Fertilization: unknown



Samples of lettuce were harvested from several sub-sectors of the field to enable a statistical analysis of the head quality and grade.

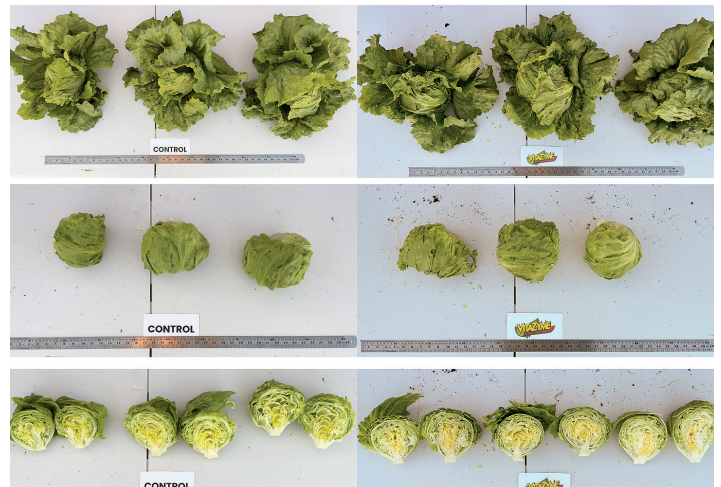
Vitazyme applications: The treated plots received 0.5 liter/ha of Vitazyme on July 9, July 17, July 24, July 31, and August 7.

Field evaluation date: September 4, 2024

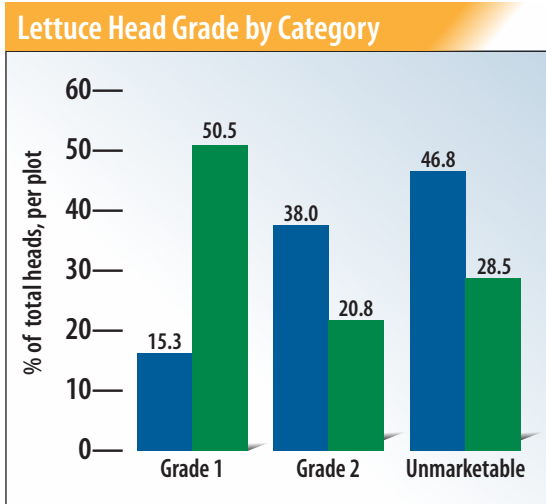
Grade results:

Treatment	Grade of head		
	1*	2**	Unmarketable***
	----- % of total -----		
Control	15.3	38.0	46.8
Vitazyme	50.5 (+230%)	20.8 (-45%)	28.5 (-39%)

*Significant difference at P = 0.005; **Significant difference at P = 0.005; ***Significant difference at P = 0.041.



Notice the markedly superior quality of the Vitazyme treated lettuce heads, in terms of size, leafiness, and internal character.



Change in lettuce head quality with Vitazyme

Grade 1 +230%

Grade 2 -45%

Unmarketable -39%



A portion of this lettuce field was treated with Vitazyme five times at 0.5 liter/ha, and showed excellent responses.

Conclusions: This lettuce head quality study in Chile, using five 0.5 liter/ha applications at one-week intervals, greatly improved the percentage of Grade 1 heads above the untreated control, by a remarkable 230%, while reducing the number of Grade 2 heads by 45% and the number of unmarketable heads by 39%. In addition, the size and weight of the Vitazyme treated lettuce heads for all three grades were noticeably greater than for the untreated controls; notice the accompanying photos of the Grade 1 heads. These results show that Vitazyme is a major benefit for lettuce growers in Chile in terms of both yield and quality.



Lettuce with Vitazyme application—A Root Growth Evaluation

Researcher: Claudio Mondaca y Nicolas Miranda

Research organization: Syngenta, Santiago, Chile; Plant Designs, USA

Research location: Santiago, Chile **Variety:** Victoriosa **Planting date:** September 10, 2024

Planting media: 90% peat (Kekkila DSM 2W) + 10% Perlite

Experimental design: A series of small pots was arranged with six replications for two treatments: an untreated control and a Vitazyme treatment. Purchased lettuce plants were planted in each pot. Twenty days after transplanting, observations were made on the root development for each pot by opening the west and east sides of the pots. Total visible rooting was evaluated using an imaging technique to determine the effect of the two treatments on root development.

1 Control 2 Vitazyme

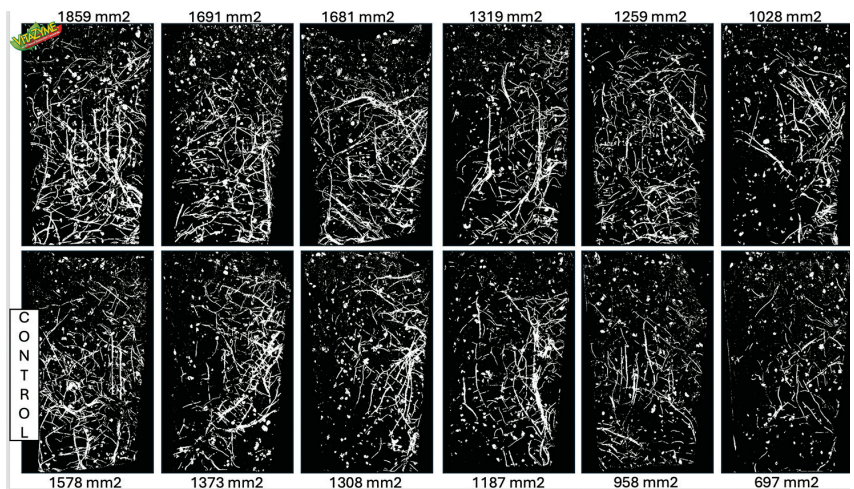
Fertilization: none

Vitazyme applications: Sprayed on the leaves to the dripping point, (1) at transplanting on September 10 using 1 ml/500ml of water (0.2%);)2) Six days later using 1 ml/1,000 ml of water (0.1%).

Root evaluation date: October 1, 2024

Root development results: Two sides of the pots, the east and the west, were removed to view the roots that were exposed along the soil-pot interface. To determine the volume of roots, an imaging technique was utilized to measure visible roots. Because of white Perlite in the soil mix that blended with the roots, and the presence of brown roots that blended with the peat, it was difficult to measure true root areas.

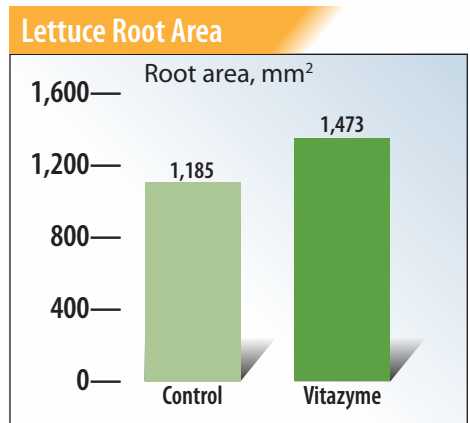
The pots for each treatment were arranged according to the amount of visible roots, from the greatest to the least. Then the roots on the west side of each pot were determined in terms of mm².



The roots of the Vitazyme treated lettuce plants (top row) had 24% greater root area than did the untreated control plants on the bottom row.

Treatment	Root area						Mean	Root area change
	1	2	3	4	5	6		
	----- mm ² /pot -----							
Control	1578	1373	1308	1187	958	697	1,185	—
Vitazyme	1859	1691	1681	1319	1259	1028	1,473	288 (+24%)

Increase in root area with Vitazyme: 24%



Conclusions: This study on lettuce root growth stimulation by Vitazyme in Chile, using two foliar applications during the first week of the study, proved that this biostimulant increased root area by 24% as compared to the untreated control. The brassinosteroids and other growth stimulators in Vitazyme are therefore shown to be very beneficial to plant growth, which leads to improved yields of not just lettuce but of any crop, since root growth is correlated closely with crop yield.



Peas with Vitazyme application

Researcher: Rajnish Khanna, Ph.D.

Research organization: e-Cultiver, Manteca, California

Location: USDA/Plant Gene Expression Center, Albany, California

Variety: unknown

Planting date: August 21, 2024

Potting Soil: Sunshine Mix #1 (Sungro Horticulture)

Pot size: 3 gal tall

Experimental design: A greenhouse experiment evaluated the influence of Vitazyme on the development of peas, comparing the treated plants with untreated control plants. Eight plants were grown for each treatment.

① Control ② Vitazyme

Fertilization: Peters 20-20-20 water soluble fertilizer at 1:64 ppm, once per week

Vitazyme applications: 1:100 dilution sprayed on the leaves to the dripping point, and to the soil, every two weeks

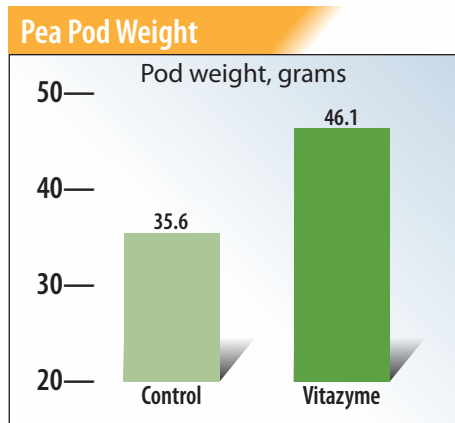
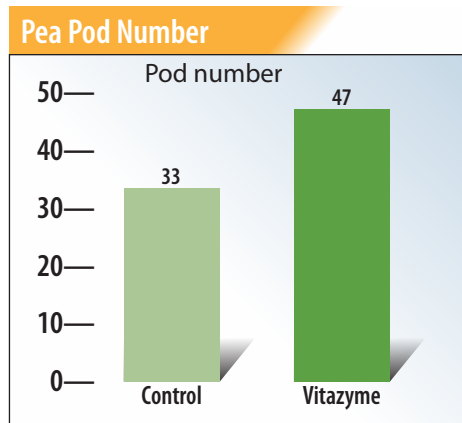
Disease suppression: Floramite and Decathlon at 0.25 tsp/gal sprayed on the leaves

Pea pod results: On October 25, 2024, the pods were harvested from each plant and weighed.

Treatment	Pod number	Pod change	Pod weight	Weight change
			grams	grams
Control	33	—	35.6	—
Vitazyme	47	14 (+42%)	46.1	10.5 (+29%)

Increase in pod number with Vitazyme: 42%

Increase in pod weight with Vitazyme: 42%



Conclusions: This greenhouse pot study with peas revealed substantial increases in pod number and pod weight with Vitazyme application. The increases were 42% and 29% respectively. These results show the good effectiveness of Vitazyme for pea production.



Peppers with Vitazyme application—A Fertilizer Efficiency Study

Researcher: Bruce Kirksey, Ph.D.

Research organization: Agricenter International, Memphis, Tennessee

Location: Memphis, Tennessee **Variety:** LaSalle **Planting date:** August 14, 2024

Planting rate: 5 plants/plot **Row spacing:** 38 inches **Soil type:** Fayette silt loam **Tillage:** conventional

Soil character: pH = 6.5, organic matter = 1.8%, cation exchange capacity = 7.8 meq/100g, excellent fertility, good drainage

Experimental design: A small-plot randomized complete block design with four replications, was established, using pepper transplants that were placed in the holes of a plastic mulch. Treatments of Vitazyme were made to three fertilizer levels to determine the effectiveness of this biostimulant to influence fertilizer efficiency of use, as determined by pepper height and weight.

Treatment	Fertilizer	Vitazyme	
		First 13 oz/acre	Second 13 oz/acre
1. 100% fertilizer	100%	o	o
2. Vitazyme + 100% fertilizer	100%	x	x
3. 75% fertilizer	75%	o	o
4. Vitazyme + 75% fertilizer	75%	x	x
5. 50% fertilizer	50%	o	o
6. Vitazyme + 50% fertilizer	50%	x	x



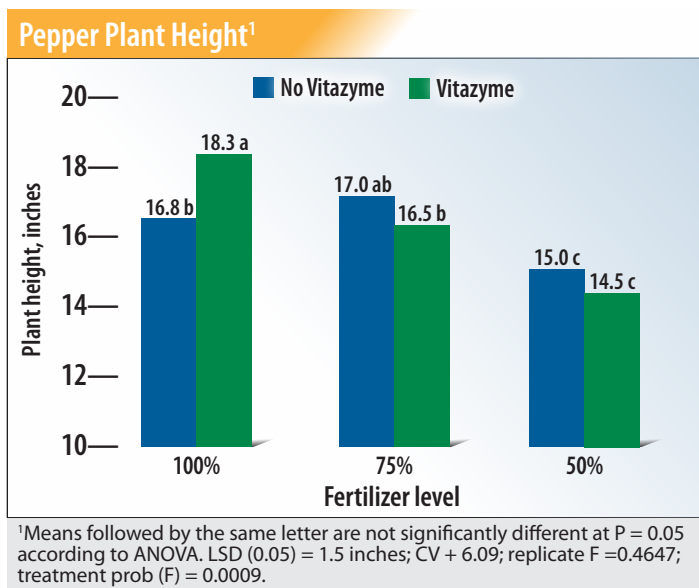
The peppers in the Tennessee trial were laid out as shown, with plastic mulch to suppress weeds and conserve moisture. Pepper yield was improved with Vitazyme at all three fertilizer levels.

Fertilization: Pre-planting: 100% = 500 lb/acre of 12-24-24% N-P₂O₅-K₂O; 75% = 375 lb/acre of 12-24-24% N-P₂O₅-K₂O; 50% = 250 lb/acre of 12-24-24% N-P₂O₅-K₂O. In season through drip irrigation: 100% = 50 lb/acre of CaNO₄ and KNO₄ in a weekly rotation; 75% = 37 lb/acre of CaNO₄ and KNO₄ in a weekly rotation; 50% = 25 lb/acre of CaNO₄ and KNO₄ in a weekly rotation.

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

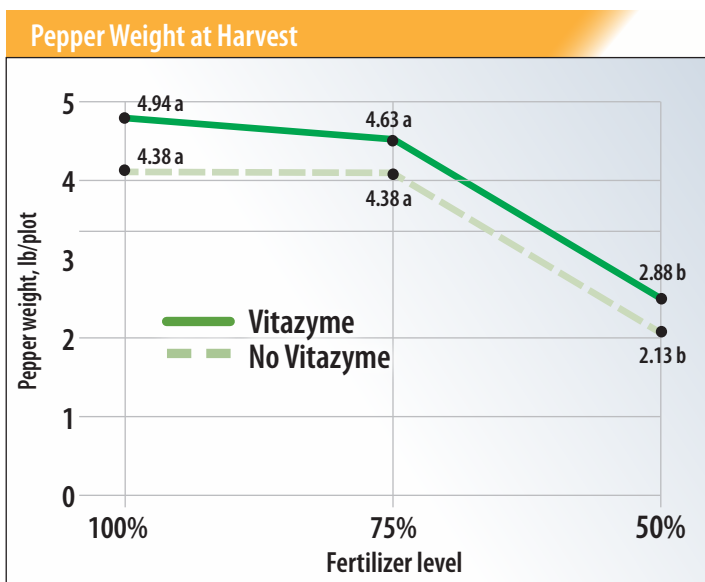
sprayed on the leaves at the 3-5 leaf stage; 13 oz/acre (1 liter/ha) sprayed on the leaves at first flower

Plant height results: The height of each plant was measured on November 6, 2024.



Vitazyme significantly increased plant height at the 100% fertilizer level, but the other fertilizer levels showed statistically equal heights for the treated and untreated treatments.

Pepper yield: Pepper fruit weights were measured at harvest on November 27, 2024. Comparisons are made at the same fertilizer level in the following discussions.



Statistical values	
LSD (0.05)	1.07 lb/plot
CV	0.7109
Replicate F	0.9963
Treatment F	0.0002

Pepper weight increases with Vitazyme at each fertilizer level	
100% fertilizer ...	0.56 lb/plot (+ 13%)
75% fertilizer	0.25 lb/plot (+ 6%)
50% fertilizer	0.75 lb/plot (+ 35%)

Fertilizer response, average of the two yield values at each fertilizer level	
100%....	4.66 lb/plot (+ 86% vs. the 50% level)
75% ...	4.51 lb/plot (+ 80% vs. the 50% level)
50% ...	2.51 lb/plot —

At every fertilizer level Vitazyme increased the pepper yield, from 6 to 35%. The greatest increase (35%) was at the 50% level, and the least at the 75% level (6%). All weights at the 75% and 100% fertilizer levels were statistically the same, but Vitazyme weights were higher in both cases.

Conclusions: A small-plot, replicated pepper trial in Tennessee, using three fertilizer levels — 50, 75, and 100% of optimum — and two Vitazyme applications, each at 13 oz/acre (1 liter/ha), revealed that at all fertilizer levels Vitazyme increased the pepper fruit yield. The highest increase at the same fertilizer level was at 50% fertilizer, where Vitazyme gave a 35% yield increase. All of the yield values were the same at the 75 and 100% fertilizer levels, but when Vitazyme was applied the yields were higher than the corresponding control. The fertilizer response of pepper yield over the three levels was quite impressive, being 80% and 86% for the 75% and 100% fertilizer averages versus the 50% fertilizer level. If plot variability had not been so great there would likely have been significant differences detected. Plant height was significantly greater with Vitazyme at 100% fertilizer; the 50% and 75% fertilizer levels showed no significant differences in plant height for the two treatments. These results reveal a definite trend in the response to Vitazyme for peppers, making this a highly viable management option for growers.



Radishes #1 with Vitazyme application

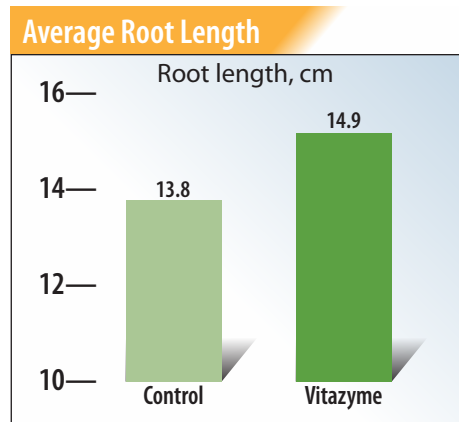
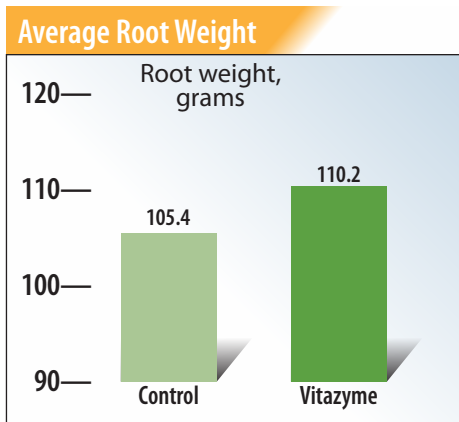
Researcher: Rajnish Khanna, Ph.D.
Research organization: e-Cultiver, Manteca, California
Location: USDA/Plant Gene Expression Center, Albany, California
Variety: Daikon
 Planting date: February 21, 2024
Potting Soil: Sunshine Mix #1 (Sungro Horticulture)
Pot size: 5 gal tall
Experimental design: A greenhouse radish trial was initiated to discover the effect of Vitazyme biostimulant on the weight and length of the radish roots, as compared to the untreated control plants. Seventeen plants for each treatment were used.



The Vitazyme treated radishes on the right produced greater average root weights and lengths than the untreated controls roots on the left.

① Control ② Vitazyme

Fertilization: Peters 20-20-20 water soluble fertilizer at 1:64 ppm, once per week
Vitazyme applications: 1:100 dilution sprayed on the leaves to the dripping point, and to the soil, every two weeks
Disease suppression: Floramite and Decathlon at 0.25 tsp/gal sprayed on the leaves
Radish weight and length results: The radishes were harvested on April 26, 2024, and were weighed and measured.



Increase in root weight with Vitazyme: 5%

Increase in root length with Vitazyme: 8%

Conclusions: This California radish greenhouse study showed that Vitazyme increased the weight and length of the plants by 5 and 8% respectively versus the untreated control. Moreover, the heaviest and longest roots were produced with Vitazyme, showing that this biostimulant is a very good complement to radish production.

Treatment	Weight grams	Weight change grams	Length cm	Length change cm	Heaviest root grams	Longest root grams
1. Control	105.4	—	13.8	—	226.7	22.9
2. Vitazyme	110.2	4.8 (+5%)	14.9	1.1 (+8%)	355.8	30.1



Radishes #2 with Vitazyme application

Researcher: Rajnish Khanna, Ph.D.
Research organization: e-Cultiver, Manteca, California
Location: USDA/Plant Gene Expression Center, Albany, California
Variety: Daikon
Planting date: March 21, 2024
Potting Soil: Sunshine Mix #1 (Sungro Horticulture)
Pot size: 5 gal tall
Experimental design: A small greenhouse experiment using Daikon radishes was initiated in a pot study. Seventeen plants received Vitazyme treatment while seventeen others served as untreated controls to evaluate the effect of the biostimulant on the weight and root length of the radishes.



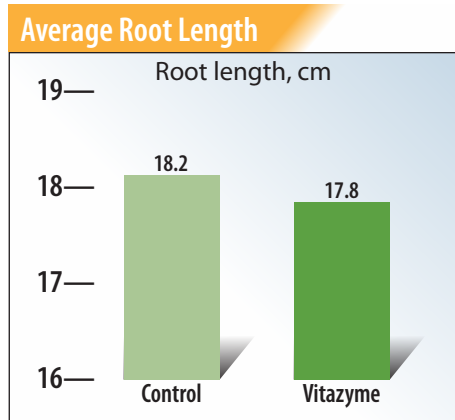
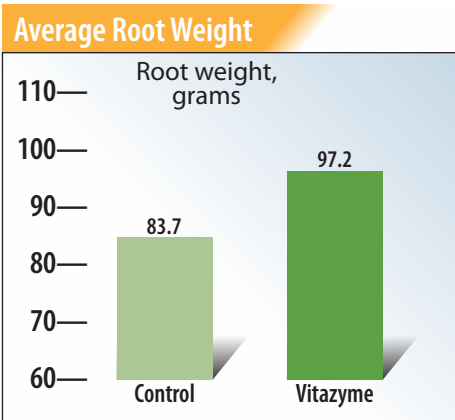
The untreated control radishes had a smaller root diameter than did the roots of the Vitazyme treated plants, which were sprayed every two weeks.

1 Control 2 Vitazyme

Fertilization: Peters 20-20-20 water soluble fertilizer at 1:64 ppm, once per week
Vitazyme applications: 1:100 dilution sprayed on the leaves to the dripping point, and to the soil, once per week
Disease suppression: Floramite and Decathlon at 0.25 tsp/gal sprayed on the leaves
Radish weight and length results: The radishes were harvested on June 22, 2024, and were weighed and measured.



Vitazyme treatment on these radishes caused a 16% greater average root weight than for the untreated control plants, despite having slightly shorter roots.



Increase in root weight with Vitazyme: 16%

Conclusions: This Daikon greenhouse radish trial in California, comparing Vitazyme treatment with an untreated control, produced a 16% root weight advantage for Vitazyme. The root lengths for the treated plants were nearly the same length as for the untreated ones, suggesting that the width of the Vitazyme treated plants were greater. This trial suggests a distinct advantage for using Vitazyme biostimulant on radishes.

Treatment	Weight*	Weight change	Length	Length change	Heaviest root	Longest root
	grams	grams	cm	cm	grams	cm
1. Control	83.7	—	18.2	—	311.7	16.0
2. Vitazyme	97.2	13.5 (+16%)	17.8	-0.4 (-2%)	200.6	25.0

*Weight and length are averaged for all 17 plants of each treatment.



Radishes #3 with Vitazyme application

Researcher: Rajnish Khanna, Ph.D.

Research organization: e-Cultiver, Manteca, California

Location: USDA/Plant Gene Expression Center, Albany, California

Variety: Plum purple Daikon

Planting date: March 21, 2024

Potting Soil: Sunshine Mix #1 (Sungro Horticulture)

Pot size: 5 gal tall

Experimental design: A small greenhouse experiment using Daikon radishes was initiated in a pot study. Nine plants received Vitazyme treatment while nine others served as untreated controls to evaluate the effect of the biostimulant on the weight and root length of the radishes.

1 Control 2 Vitazyme

Fertilization: Peters 20-20-20 water soluble fertilizer at 1:64 ppm, once per week

Vitazyme applications: 1:100 dilution on the leaves to the dripping point, and to the soil, once per week

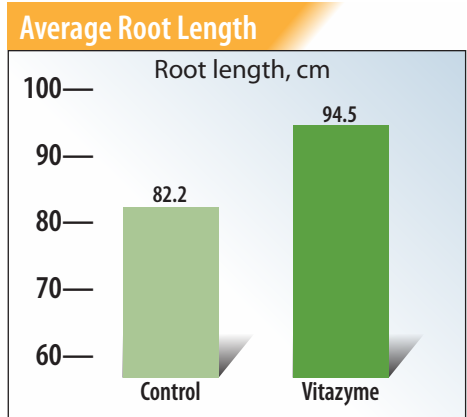
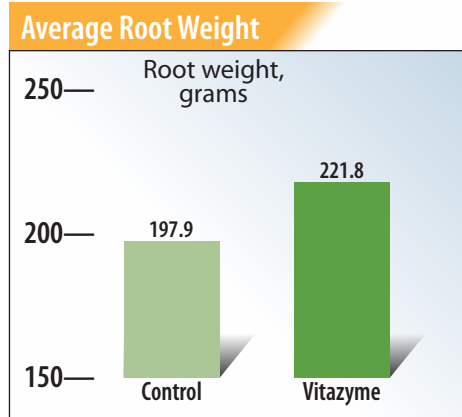
Disease suppression: Floramite and Decathlon at 0.25 tsp/gal sprayed on the leaves

Radish weight and length results: The radishes were harvested on June 26, 2024, and were weighed and measured.

Treatment	Weight	Weight change	Length	Length change
	grams	grams	cm	cm
1. Control	197.9	—	82.2	—
2. Vitazyme	221.8	23.9 (+12%)	94.5	12.3 (+15%)

Increase in root weight with Vitazyme: 12%

Increase in root length with Vitazyme: 15%



Conclusions: This greenhouse radish study, comparing Vitazyme treated and untreated plants, revealed that Vitazyme increased the average root weight by 12%, while increasing the average root length by 15%. These results show that this biostimulant is capable of improving radish growth significantly, making it a natural choice for gardeners and farmers.



Soybeans with Vitazyme application

Researcher: Jonathan Jaschen
Research organization: Heritage Ag Research, Fairbank, Iowa
Field location: Readlyn, Iowa
Variety: P22A67E
Planting date: June 2, 2024
Planting rate: 140,000 seeds/acre
Planting depth: 1.5 inches
Row spacing: 30 inches
Soil type: Readlyn silty clay loam (4.5% organic matter, 7.4 pH, 22 meq/100g cation exchange capacity)
Soil analysis: P₁ very high (about 55 ppm); K very high (about 290 ppm); Ca high (about 3,200 ppm); Mg very high (about 430 ppm); percent base saturations: 75% Ca, 18% Mg, 3.8% K); results from Midwest Laboratories, Omaha, Nebraska

Experimental design: A small plot soybean experiment (plots 15 x 30 ft), using five replications in a randomized complete block design, with six rows per plot, was established to evaluate the effect of Vitazyme — in seven different treatment patterns — on the yield and test weight of the crop as compared to the untreated control.



Note the superior podding and leaf canopy for the Vitazyme treated plants in this Iowa study. Leaf chlorophyll is also greater for the treated plants.

Treatment	Application			
	Seed ¹	In-furrow	Foliar V3	Foliar R1 ²
1	o	o	o	o
2	x	o	o	o
3	o	x	o	o
4	o	o	x	o
5	o	o	o	x
6	x	o	o	x
7	o	x	o	x
8	o	x	x	x

¹5% Vitazyme on the seeds before planting.
²Early R1



The pods stripped from ten plants for the control and Vitazyme seed-treated plants show a distinct increase for the treated plants.

Fertilization: none

Vitazyme applications: See the table above

Growing season weather: Adequate to excessive rainfall until August; then very dry into September. A very heavy rainfall after planting affected germination. Temperatures were above normal in the midsummer.

Harvest date: October 7, 2024, using a TR88 Split Plot #3 on two rows (5 X 30 ft)

Bean test weight results: The control treatment had a test weight of 57.9 lb/bu, a bit less than the Vitazyme treatments, which registered 58.0 to 58.1 lb/bu. These differences were not significant.

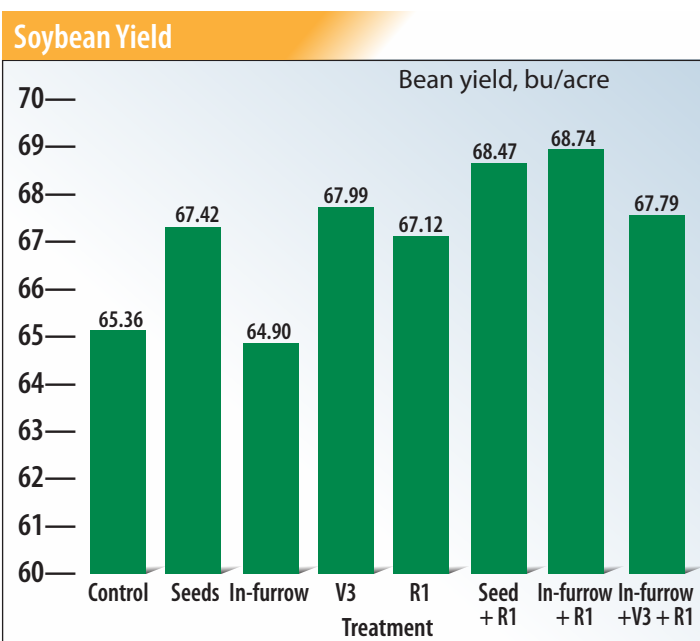
Bean yield results:

Treatment	Bean yield ¹ bu/acre	Yield change bu/acre
1. Control	65.36 b	—
2. Seeds only	67.42 ab	2.06 (+3%)
3. In-furrow	64.90 b	-0.46 (-1%)
4. Foliar at V3	67.99 ab	2.63 (+4%)
5. Foliar at early R1	67.12 ab	1.76 (+3%)
6. Seeds + R1	68.47 ab	3.11 (+5%)
7. In-furrow + at R1	68.74 a	3.38 (+5%)
8. In-furrow + V3 +R1	67.79 ab	2.43 (+4%)
LSD (0.10)	3.147	—
CV	4.35	—
Treatment	0.716	—
Replicate	8.299	—

¹Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test.

Soybean yield increase with Vitazyme	
Seed only	3%
Foliar at V3	4%
Foliar at R1.....	3%
Seeds at R1.....	5%
In-furrow + R1	5%
In-furrow + V1 +R1.....	4%

All but Treatment 3 showed a yield increase with Vitazyme, of from 3 to 5%, the greatest increase being with Treatment 7: in-furrow + R1.



Conclusions: This small-plot, randomized and replicated soybean trial in east-central Iowa, using various combinations of Vitazyme applications, revealed a consistent yield increase with Vitazyme of from 3 to 5% (2.06 to 3.38 bu/acre), except for the in-furrow treatment. It is not known why this treatment did not perform similarly to the other Vitazyme treatments. The best results were for Treatment 7, the in-furrow + foliar R1 application, which gave a 3.38 bu/ acre increase above the control. At current soybean prices (December, 2024) of \$9.95/ bu, this yield increase is worth \$33.63. With two 13 oz/acre (1 liter/ha) applications at a cost of \$12.00/acre, the return on investment is \$2.80 per dollar invested for this application regimen.



Soybeans with Vitazyme application

Researcher: Greig Reicks, Ph.D.

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

Location: South Dakota State University Experimental Farm, Aurora, South Dakota

Variety: Dekalb AG!4XF4 (1.4 maturity rating) **Planting date:** June 3, 2024

Seeding rate: 160,000 seeds/acre **Soil type:** Brandt silty clay loam **Row spacing:** 30 inches

Planting depth: 2 inches

Experimental design: A small-plot soybean research trial was initiated on the SDSU experimental farm using plots that were four rows wide and 20 feet long. The purpose of the study was to evaluate the effect of Vitazyme biostimulant on the yield of the soybeans, from harvesting the middle two rows of each plot. Four replications were used. Both irrigated and non-irrigated areas were used.

1 Control 2 Vitazyme

Fertilization: none

Vitazyme application: 13 oz/acre (1 liter/ha) as a foliar spray at V5, on July 18

Irrigation: as needed during the summer

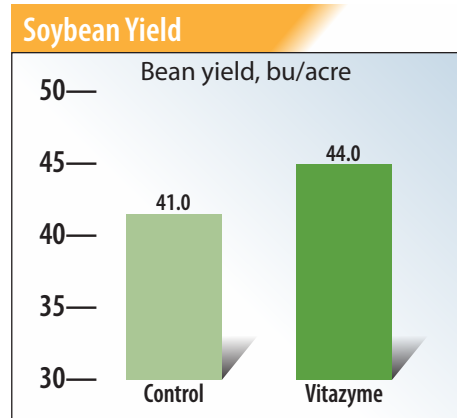
Growing season weather: hot and dry the latter half of the summer

Yield results:

Treatment	Bean Yield ¹ bu/acre	Yield change bu/acre
1. Control	41.0 b	—
2. Vitazyme	44.0 a	3.0 (+7%)

¹Means followed by the same letter are not significantly different at P=0.09.

Increase in soybean yield with Vitazyme: 7%



Conclusions: This small-plot replicated soybean study in eastern South Dakota, which compared an untreated control with Vitazyme applied at 13 oz/acre (1 liter/ha), revealed a 3.0 bu/acre yield increase (7%) with Vitazyme. This increase for the irrigated plots was significant at P = 0.09. The non-irrigated soybeans showed a 2.1 bu/acre increase (5%) with Vitazyme (41.0 vs. 38.9 bu/acre); this increase was significant at P = 0.25. The reason for the yields being quite low is likely due to a late planting date. The fact that a 5 to 7% yield increase was realized from a single application at V5 indicates that a seed or in-furrow treatment would very likely have improved the yield increase substantially more; the recommended program for Vitazyme with soybeans is an in-furrow or seed treatment plus a foliar treatment at early bloom.



Soybeans with Vitazyme application

Researcher: V. V. Plotnikov

Research organization: Agro Expert International, Kaharlyk, Ukraine; Plant Designs International, Rochester, New York; National Academy of Agrarian Sciences of Ukraine, Institute of Feed and Agriculture of Podillia, Ukraine

Location: Vinnytsia District, Vinnytsia Region, Agronomichne Village, Ukraine

Variety: Titan Elite

Planting date: May 13, 2024

Seeding rate: 0.81 million seeds/ha

Previous crop: perennial ryegrass

Soil type: gray podzolic (1.8% organic matter)

Soil preparation: plowing to 20-22 cm, harrowing, disking in two tracks to 8-10 cm

Experimental design: A soybean field was divided into an untreated control area and a Vitazyme treated area, to evaluate the effects of this biostimulant on soybean growth and yield.

1 Control 2 Vitazyme

Fertilization: none

Bacteria inoculation: Rhizobium inoculant on the seeds at planting

Vitazyme application: 1 liter/ton of seed at planting

Herbicide application: Ogorodnik (Metribuzin at 700g/kg) at 0.65 kg/ha

Plant growth parameter results: Selected plants were dug, measured, and the data were averaged.



The seed treated soybeans on the right are much leafier and taller than the untreated control plants on the left.



At harvest the Vitazyme treated soybeans yielded an amazing 34% more beans than the untreated control, besides being heavier and higher in protein.

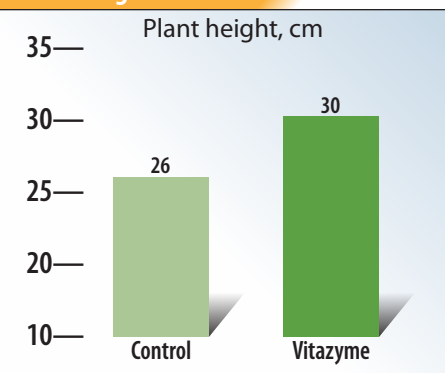
(1) Results at the fourth trifoliate (BBCH 15) on June 21, 2024

Leaf Color

Control plants: light green
Vitazyme plants: rich, dark green

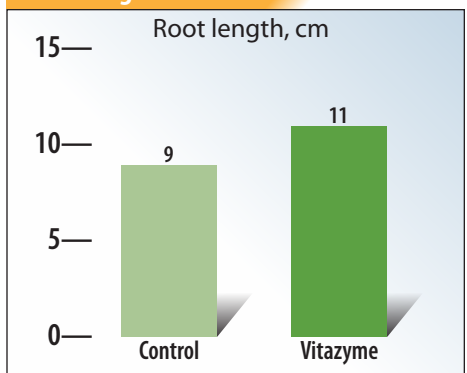
The herbicide had hampered chlorophyll development in the plants, but Vitazyme overcame the problem in the treated area.

Plant Height



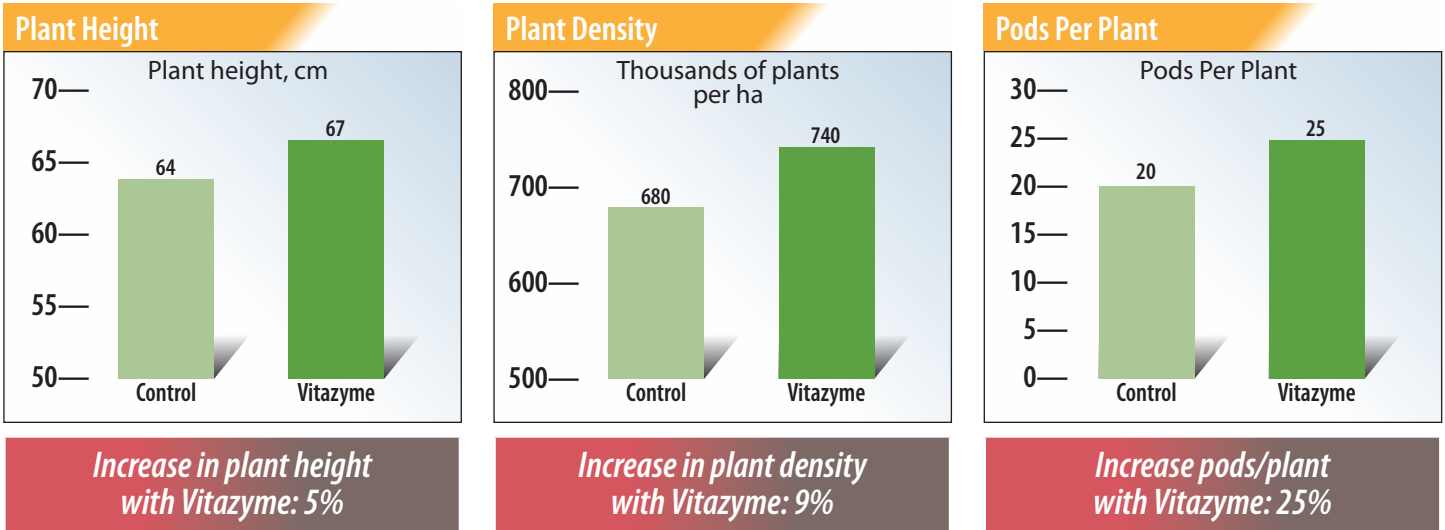
Increase in plant height with Vitazyme: 15%

Root Length



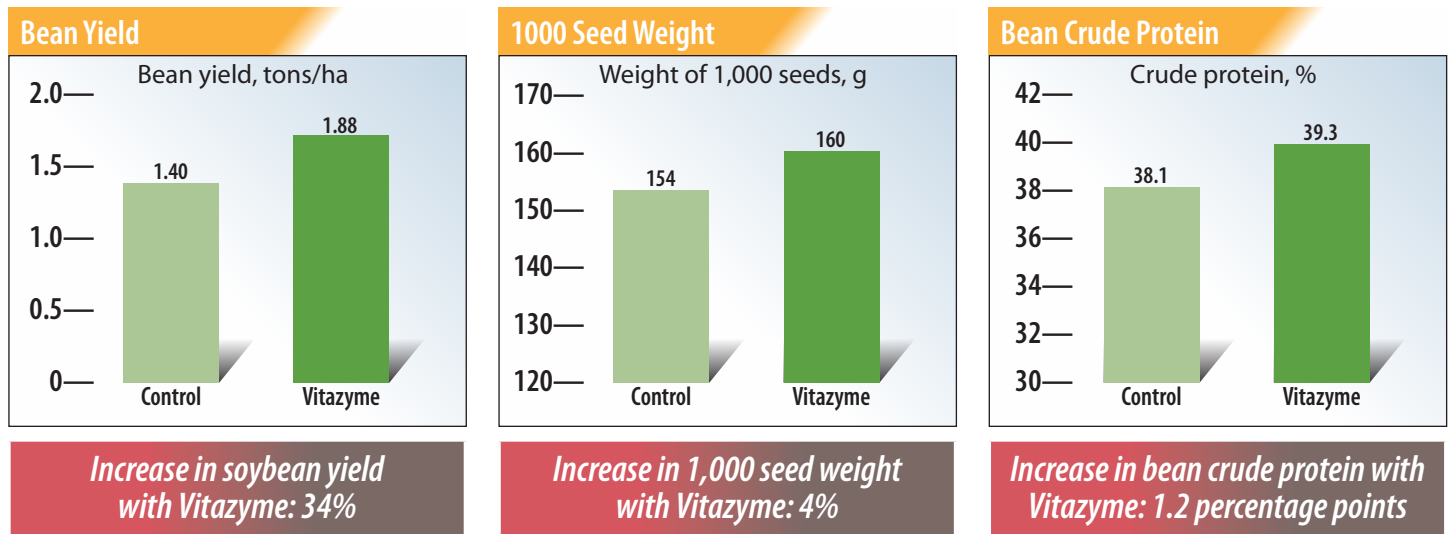
Increase in root length with Vitazyme: 22%

(2) Results at crop maturity (BBCH 95) on September 23, 2024



All plant growth parameters — height, density, roots, and pods/plant were increased with the Vitazyme seed treatment, especially root length (22%) and pods/plant (25%).

Yield and quality results: Besides bean yield, 1000 seed weight and crude protein content were measured.



Income results: The income for the farmer with Vitazyme was increased by \$203/ha, from an extra 0.48 ton/ha of yield.

Conclusions: A field-scale soybean trial in Ukraine, using Vitazyme applied to the seeds before planting at 1 liter/ton of seed, resulted in substantial improvements in plant growth at the fourth trifoliolate and full maturity stages. Plant height was increased by 15% and 5% at the two analysis times, respectively, while root length, plant density, and pods/plant were all improved; pods/plant increased by 25% above the control. At harvest, the yield was improved by 34%, while bean quality in terms of 1000 seed weight and crude protein increased by 4% and 1.2 percentage points, respectively. This yield improvement netted the farmer an extra \$203/ha. This trial emphasizes the great efficacy of the Vitazyme program for soybean growers in Ukraine.



Soybeans with Vitazyme application

Researcher: V. V. Plotnikov
Research organization: Cherkasy Experimental Station of Bioresources, Ukraine, and Plant Designs International, Rochester, New York
Location: Zolotonyskyi District, Cherkasy Region, Village of Drabovo – Baryatynske, Ukraine
Variety: Favor, F2
Planting date: May 12, 2024
Seeding rate: 700,000 seeds/ha
Previous crop: corn
Soil type: chernozem (Mollisol; 3.9% organic matter)
Soil preparation: plowing to 20-25 cm, harrowing, cultivation to 4-5 cm
Experimental design: A soybean field was divided into a Vitazyme treated portion, and the rest of the field served as an untreated control. The purpose of the trial was to evaluate the effect of the biostimulant on relieving herbicide stress and improving bean yield.



This field of cv. Favor soybeans shows excellent growth in response to Vitazyme applied twice, at 0.5 liter/ha at the second trifoliolate and at early bloom.

1 Control 2 Vitazyme

Fertilization: 8-24-24 kg/ha of N-P₂O₅-K₂O as a preplant amendment
Vitazyme application: 0.5 liter/ha sprayed on the leaves and soil at the second trifoliolate state (BBCH 13) on June 5, tank mixed with the herbicide below; 0.5 liter/ha sprayed on the leaves and soil at early bloom (BBCH 55) on June 26
Herbicide application: Korum (bentazone at 480 g/liter) plus Imazamax (22.4 g/liter) at 2 liters/ha sprayed on the soil

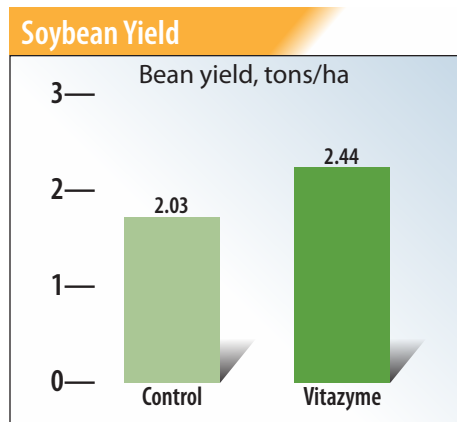


At harvest the Vitazyme treated soybeans, shown here, are growthy and well podded. The yield of the Vitazyme treated field section yielded 20% more than the untreated control

Yield results:

Treatment	Bean yield tons/ha	Yield change tons/ha
1. Control	2.03	—
2. Vitazyme	2.44	0.41 (+20%)

Increase in soybean yield with Vitazyme: 20%



Income results: By applying two 0.5 liter/ha sprays of Vitazyme on the soybean crop, the additional 0.41 ton/ha yield netted the farmer \$152 more per ha.

Conclusions: A Ukrainian soybean trial on a chernozem soil in the Cherkasy Region proved that Vitazyme biostimulant could overcome the effects of herbicide stress, when tank-mixed with the herbicide, to give a substantial 0.41 ton/ha (20%) yield increase. These results show that Vitazyme, incorporated into soybean management programs, is a highly effective adjunct for soybean growers in Ukraine, especially when a negative effect of a herbicide is anticipated.



Soybeans *with Vitazyme application*

Researcher: V. V. Plotnikov
Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York
Location: LLC "PK Zorya Podillia," Haysyn District, Vinnytsia Region, Rozivka Village, Ukraine
Variety: Medoc, F2
Planting date: May 7, 2024
Seeding rate: 500,000 seeds/ha
Previous crop: corn
Soil type: dark gray podzolic (2.7% organic matter)
Soil preparation: mulching (crushing plant residue), deep cultivation to 20-22 cm, harrowing, cultivation to 4-5 cm
Experimental design: A soybean field was divided into Vitazyme treated and untreated areas, with the objective of evaluating the effect of this biostimulant on the yield and quality of the beans at harvest.



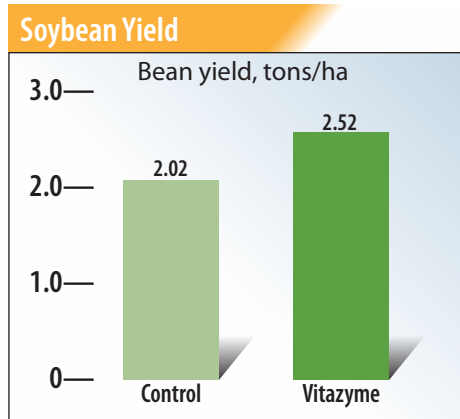
The Vitazyme seed treated soybeans show much better plant development at this mid-season period, and yielded 25% more than the untreated control plants, besides being heavier in weight and containing more protein.

1 Control 2 Vitazyme

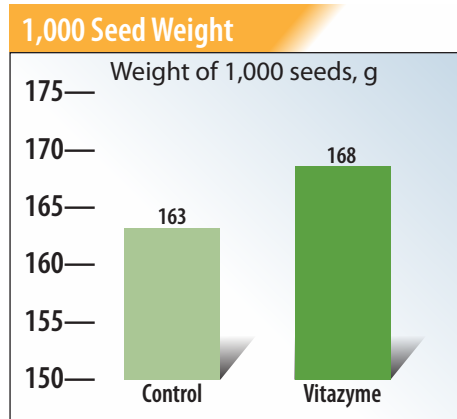
Fertilization: none
Vitazyme application: 1 liter/ton of seeds applied before planting
Yield and quality results:



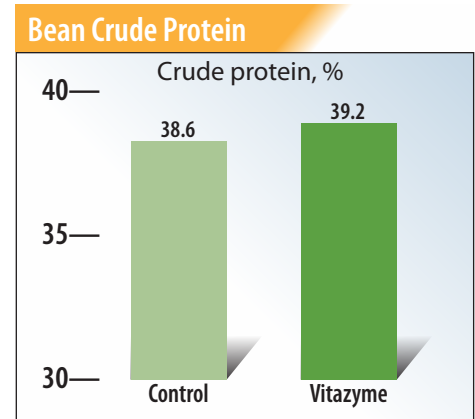
The planting machinery and personnel are shown getting ready to install the soybean trial at Rozivka Village



Increase in soybean yield with Vitazyme: 25%



Increase in 1,000 seed weight with Vitazyme: 3%



Increase in bean crude protein with Vitazyme: 0.6 percentage point

Income results: A 1 liter/ton of seed treatment with Vitazyme increased the net income to the farmer by \$211/ha.

Conclusions: This Ukrainian field-scale soybean trial, using 1 liter/ton of Vitazyme applied to the seeds before planting, revealed an excellent response to the biostimulant. The yield was increased by 0.50 ton/ha (25%), while at the same time the quality of the yield was improved: the 1000 seed weight increased by 3%, and the bean crude protein by 0.6 percentage point. At the same time, farm income was increased by \$211/ha. These responses reveal how effective this simple and non-toxic biostimulant treatment can be for soybean growers.



Sunflowers *a Nitrogen Rate Study*

Researcher: Kernel personnel

Research organization: Kernel Company, Ukraine [Kernel is the largest producer of sunflower oil in Ukraine, and exports oils and grains worldwide, and provides storage for grains and seeds.]

Location of trial: Uman District, Cherkasy Region, Chorna Kamianka Village, Ukraine

Variety: SiExperto **Planting date:** unknown

Planting rate: unknown **Previous crop:** unknown

Experimental design: A sunflower field in 2023 was divided into several treatments to evaluate the effect of Vitazyme on the application of four different nitrogen fertilizer rates with sunflowers. Sunflower yield was evaluated for each treatment.

Fertilization: nitrogen applied at the rates given in the table to right.

Vitazyme application: Vitazyme applied at 1 liter/ha sprayed on the leaves and soil at the 10-leaf stage (BBCH 30) on June 23, 2023.

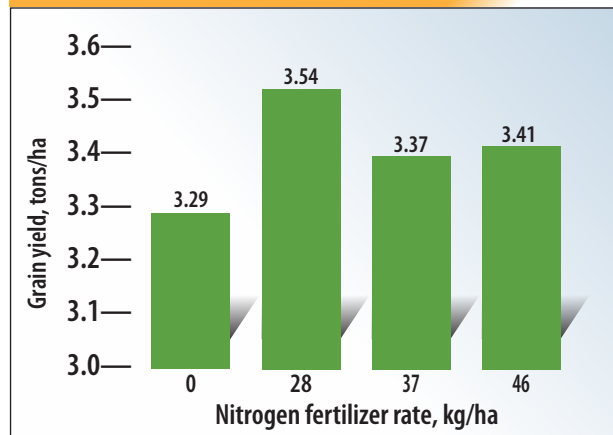
Treatment	Fertilizer rate kg of N/ha	Vitazyme liter/ha
1	0	1
2	28	1
3	37	0
4	37	1
5	46	1

Yield results:

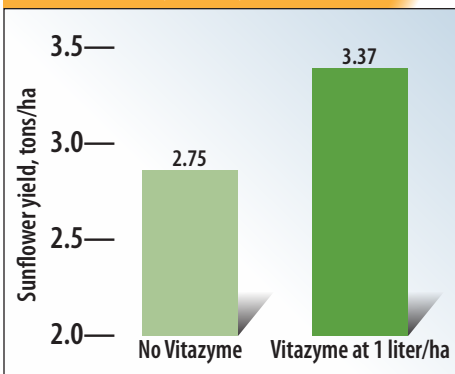
Treatment	Grain yield tons/ha	Yield change* tons/ha
1. No N + Vitazyme	3.29	—
2. 28 kg/ha N + Vitazyme	3.54	+0.25 (+8%)
3. 37 kg/ha N	2.75	-0.54 (-16%)
4. 37 kg/ha N + Vitazyme	3.37	+0.08 (+2%)
5. 46 kg/ha N + Vitazyme	3.41	+0.12 (+4%)

*Yield of Treatments 2, 3, 4, and 5 compared to the no-nitrogen Treatment.

Sunflower Yield As Affected by N-Rate and Vitazyme



Sunflower Yield at 37 kg/ha of N As Affected by Vitazyme



Yield increase with Vitazyme at the same N level: 0.62 ton/ha (+23%)

Conclusions: This sunflower field trial in the Cherkasy Region of Ukraine, using four different nitrogen fertilizer rates, with Vitazyme applied at 1 liter/ha at the 10-leaf stage to all but one treatment, revealed that the product in every case increased sunflower seed yield considerably. Without Vitazyme, even with 37 kg/ha of N applied, the yield was only 2.75 tons/ha, whereas all of the Vitazyme treatments greatly exceeded this no-Vitazyme but fertilized treatment by up to 0.79 ton/ha (Treatment 2 versus Treatment 3). The yields of the higher N rates, of 37 and 46 kg/ha of N, did not exceed the yield of the lower N rate of 28 kg/ha for some unknown reason, but all of the Vitazyme treatment yields were similar — including the unfertilized Treatment 1 — varying by only 0.25 tons/ha. These results show the great effectiveness of Vitazyme treatment in enhancing sunflower yield in Ukraine, even in the absence of N fertilizer.



Tomatoes *with Vitazyme application*

Researcher: Rajnish Khanna, Ph.D.

Research organization: e-Cultiver, Manteca, California

Location: USDA/Plant Gene Expression Center, Albany, California

Variety: unknown

Planting date: July 3, 2024

Potting Soil: Sunshine Mix #1 (Sungro Horticulture)

Pot size: 3 gal

Experimental design: A greenhouse trial with tomatoes, using 16 plants for the control and 16 plants for the Vitazyme treatment, was established to evaluate the number of fruit produced as well as their total weight for each treatment.

① Control ② Vitazyme

Fertilization: Peters 20-20-20 water soluble fertilizer at 1:64 ppm, once per week

Vitazyme applications: 1:100 dilution sprayed on the leaves to the dripping point, and to the soil, every two weeks

Disease suppression: Floramite and Decathlon at 0.25 tsp/gal sprayed on the leaves

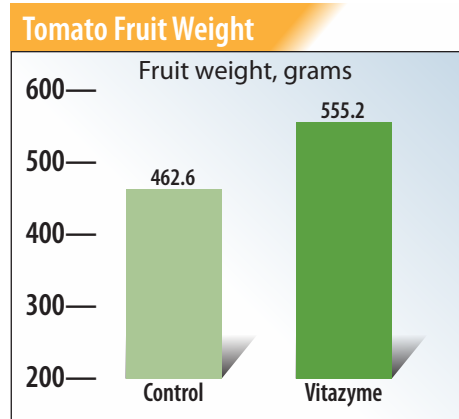
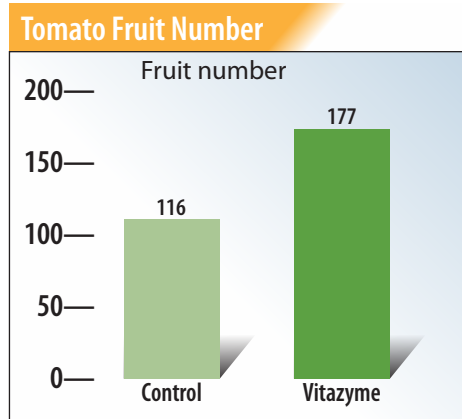
Tomato fruit results: The tomato fruit were harvested on September 17, 2024, then counted and weighed.

Treatment	Fruit number	Number change	Fruit weight	Weight change
			grams	grams
1. Control	116	—	462.6	—
2. Vitazyme	177*	61 (+53%)	555.2**	92.6 (+20%)

*Significantly greater than the control at P=0.02.
 **Significantly greater than the control at P=0.21.

Increase in tomato number with Vitazyme: 53%

Increase in fruit weight with Vitazyme: 20%



Conclusions: This greenhouse tomato trial in California proved that Vitazyme application significantly increased the number of tomato fruit of 16 plants by 53%, while increasing tomato weight by 20%. These results show the great effectiveness of this biostimulant for tomato production.



Tomatoes with Vitazyme application—A Fertilizer Efficiency Study

Researcher: Bruce Kirksey, Ph.D. **Research organization:** Agricenter International, Memphis, Tennessee
Location: Memphis, Tennessee **Variety:** Big Boy **Planting date of transplants:** August 14, 2024
Row spacing: 38 inches **Planting rate:** 5 plants/plot (transplants) **Soil type:** Fayette silt loam
Tillage: conventional **Soil character:** pH = 6.5, organic matter = 1.8%, cation exchange capacity = 7.8 meq/100g, excellent fertility, good drainage

Experimental design: A small-plot randomized complete block design (four replications) for a tomato trial, the transplants placed in the holes of a plastic mulch, was established, with Vitazyme applied to three fertilizer levels. The purpose of the trial was to determine the effectiveness of Vitazyme in improving fertilizer efficiency of use for a late-season planting.

Treatment	Fertilizer	Vitazyme	
		First 13 oz/acre	Second 13 oz/acre
1. 100% fertilizer	100%	o	o
2. Vitazyme + 100% fertilizer	100%	x	x
3. 75% fertilizer	75%	o	o
4. Vitazyme + 75% fertilizer	75%	x	x
5. 50% fertilizer	50%	o	o
6. Vitazyme + 50% fertilizer	50%	x	x



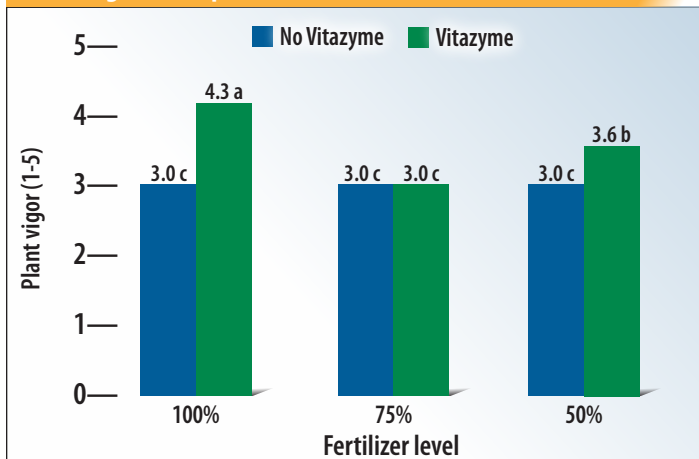
The tomato trial in western Tennessee utilized plastic mulch for weed and evaporation suppression. The number of fruit was increased at all three fertilizer levels, along with plant vigor, using Vitazyme two times.

Fertilization: Pre-planting: 100% = 500 lb/acre of 12-24-24% N-P₂O₅-K₂O; 75% = 375 lb/acre of 12-24-24% N-P₂O₅-K₂O; 50% = 250 lb/acre of 12-24-24% N-P₂O₅-K₂O. In-season through drip irrigation: 100% = 50 lb/acre of CaNO₄ and KNO₄ in a weekly rotation; 75% = 37 lb/acre of CaNO₄ and KNO₄ in a weekly rotation; 50% = 25 lb/acre of CaNO₄ and KNO₄ in a weekly rotation.

Vitazyme applications: 13 oz/acre (1 liter/ha) sprayed on the leaves at the 3-5 leaf stage; 13 oz/acre (1 liter/ha) sprayed on the leaves at first flower

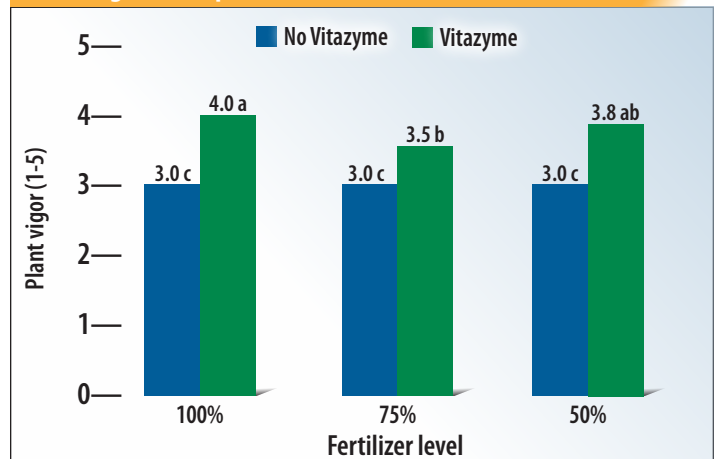
Plant vigor results: Plant vigor was evaluated on a scale of 1 to 5 on September 11 and September 25.

Plant Vigor on September 11¹



¹Means followed by the same letter are not significantly different at P = 0.05 according to ANOVA. LSD (0.05) = 0.5; CV + 10.0; replicate F = 0.766; treatment prob (F) = 0.0003.

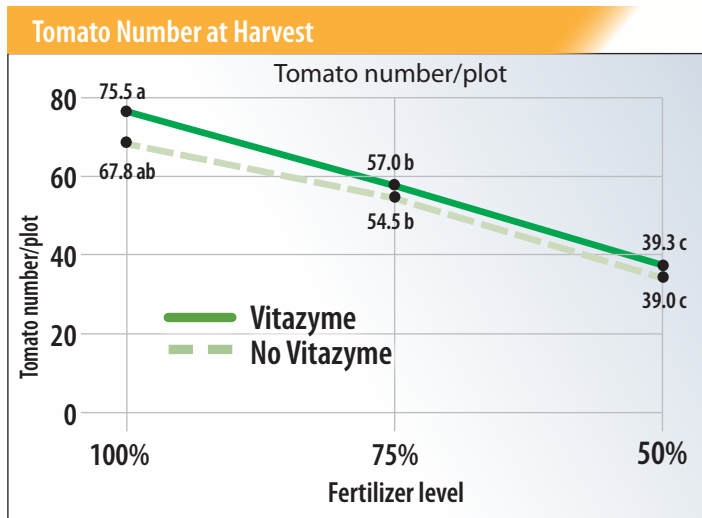
Plant Vigor on September 25¹



¹Means followed by the same letter are not significantly different at P = 0.05 according to ANOVA. LSD (0.05) = 0.5; CV + 9.75; replicate F = 0.766; treatment prob (F) = 0.0013.

Notice that plant vigor is statistically better with Vitazyme at each fertilizer level for both dates except in one case.

Tomato number results: The tomatoes from each plot were harvested on November 27. Comparisons are made at the same fertilizer level in the following discussions.



Statistical values	
LSD (0.05)	14.6
CV.....	17.42
Replicate F	0.5274
Treatment F	0.0003

Tomato number increases with Vitazyme at each fertilizer level	
100% fertilizer	11%
75% fertilizer	5%
50% fertilizer	1%

Tomato number increased significantly with fertilizer rate, but nonsignificantly with Vitazyme at each rate, though the increase was 11% at the 100% fertilizer rate.

Fertilizer response, average of the two tomato number values at each fertilizer level	
100%.....	71.7 (+ 83% vs. the 50% level)
75%	55.8 (+ 42% vs. the 50% level)
50%	39.2 —

Conclusions: A small-plot, replicated irrigated study in extreme western Tennessee, using three fertilizer levels (50, 75, and 100% of optimal) and two Vitazyme applications at each fertilizer level, showed that Vitazyme significantly improved plant vigor during the growing season. The yield of fruit as determined by tomato numbers per plot was not significantly changed by Vitazyme at each fertilizer level, but was increased by up to 11% at the 100% fertilizer level. Increasing fertilizer levels increased fruit number quite dramatically, from 42 to 83% above the 50% fertilizer level. These results indicate a trend towards an increase in fertilizer efficiency of use with Vitazyme.



Winter Canola with Vitazyme application—A Fertilizer Efficiency Study

Researcher: V. V. Plotnikov

Research organization: Agro Expert International, Kaharlyk, Ukraine; Plant Designs International, Rochester, New York; National Academy of Agrarian Sciences of Ukraine, Institute of Feed and Agriculture of Podillia, Ukraine

Location: Vinnytsia District, Vinnytsia Region, Agronomichne Village, Ukraine; central Ukraine (440-590 mm of rain per year)

Variety: Monopolist Elite

Planting date: September 7, 2023

Planting rate: 1 million seeds/ha

Previous crop: winter wheat

Tillage: disking to 6-8 cm, plowing to 20-22 cm, pre-planting cultivation with a combined Europack unit to 2.5-3.5 cm

Soil type: gray podzolic (2.0% organic matter)

Experimental design: A canola field was divided into an untreated control and a Vitazyme treated portion to evaluate the effect of this product on growth parameters before winter, and then on growth effects as well as seed yield and quality in 2024.

1 Control 2 Vitazyme

Fertilization: unknown

Vitazyme application: seed treatment before planting at 1.0 liter/ton of seed and 1.5 liters/ton of seed

Plant growth parameter results: The plants for both treatments were evaluated on November 27, 2023, when fall growth had ceased. Plant values were averaged.



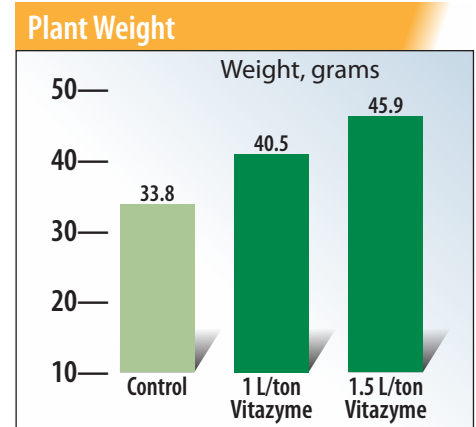
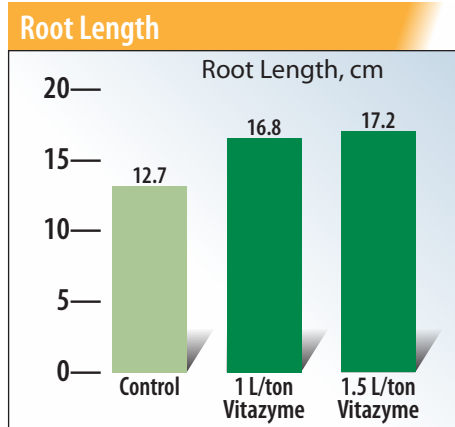
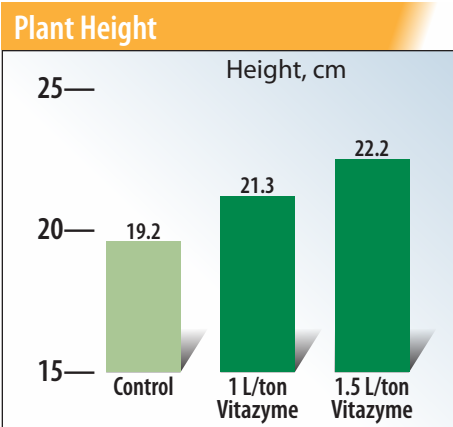
The superiority of leaf growth for the Vitazyme treatments in this photograph is clearly seen, compared to the untreated control plants on the bottom.



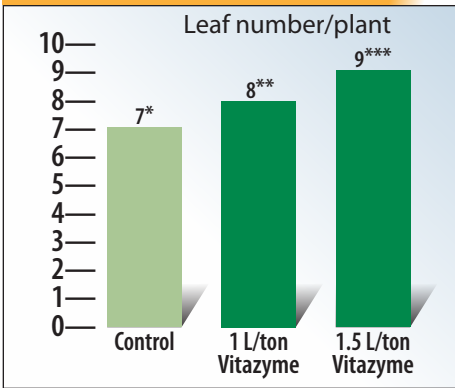
The Vitazyme treated area to the right is clearly noted for being taller and denser, and the treated plant laid out on the right is much more growthy than the untreated plants.



This photo shows the small plot combine used to harvest samples of the Vitazyme treated and control areas of the field trial. The yields of the Vitazyme treatments were 12% and 15% greater than the untreated control plot.



Leaf Number Per Plant



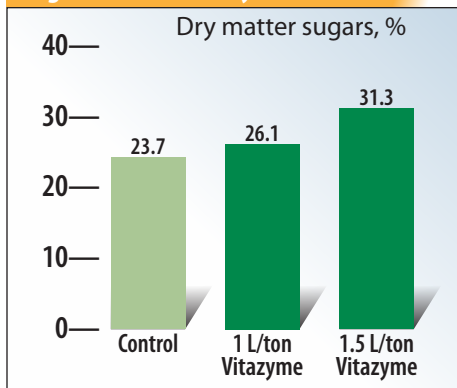
Plant maturity rating:
*BBCH 24 **BBCH 25 ***BBCH 26

Increase in plant growth parameters with Vitazyme

	1 liter/ton	1.5 liters/ton
Plant height	11%	16%
Root length	32%	35%
Plant weight	20%	36%
Leaf number	14%	29%

Winter hardiness results: The ability of the canola crop to withstand winter cold was evaluated with the sugar concentration analysis before winter. Plants were harvested on November 27, 2023, and the sugar content was determined.

Sugar Content of Dry Matter

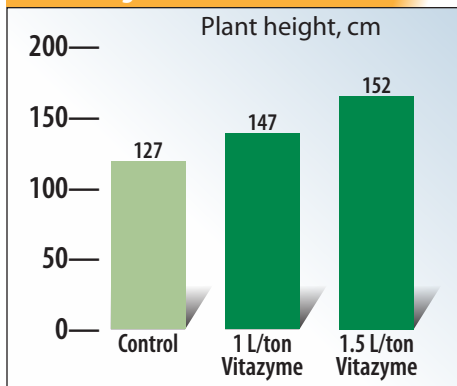


Sugar content increase with Vitazyme

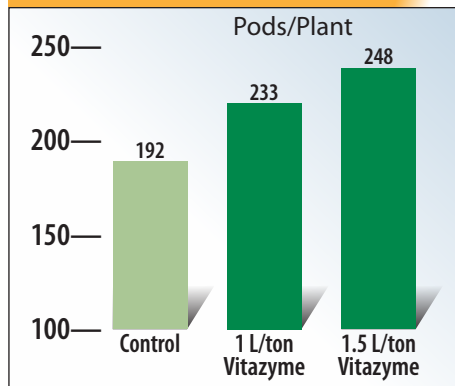
1 liter/ton of seed 10%
1.5 liters/ton of seed 32%

Spring growth parameter results: On June 21, 2024, plant height and pod number/plant were measured.

Plant height



Pod Number Per Plant



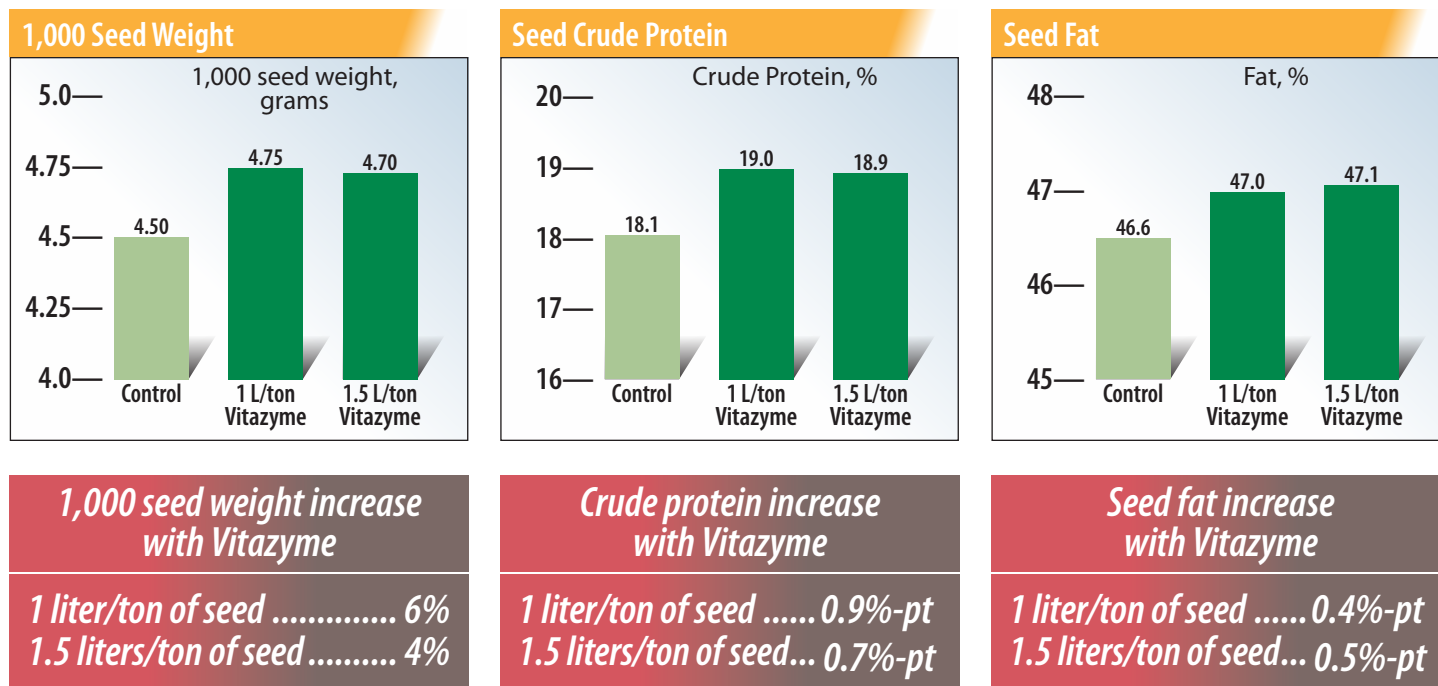
Plant height increase with Vitazyme

1 liter/ton of seed 16%
1.5 liters/ton of seed 20%

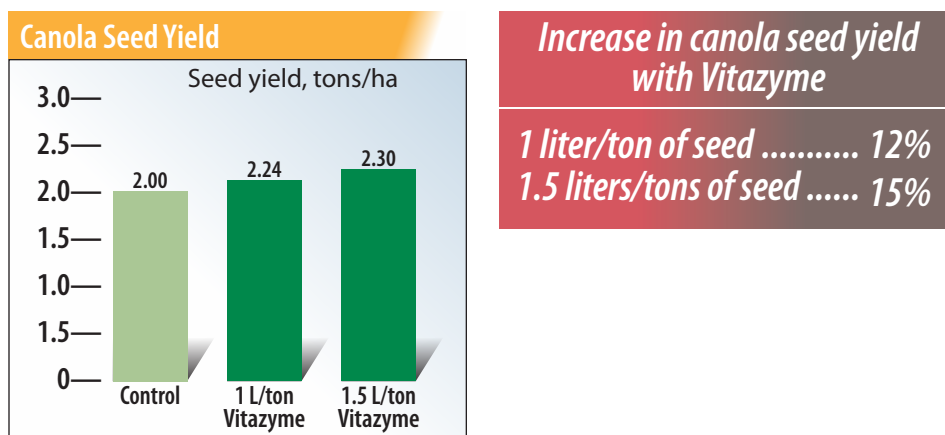
Pod number increase with Vitazyme

1 liter/ton of seed 21%
1.5 liters/ton of seed 29%

Seed quality results: Determinations were made at harvest (stage BBCH 86) of seed quality parameters.



Yield results:



Income results: The 1 liter/ton Vitazyme rate gave an income increase of \$138/ha, while the 1.5 liters/ton rate produced a \$173/ha increase.

Conclusions: This Ukrainian canola field study, which compared the effects of Vitazyme as a seed treatment at 1 and 1.5 liters/ton of seed, revealed that the fall growth of the canola plants was accelerated for all four parameters measured compared to the untreated control. These increases were highest for the 1.5 liters/ton application, and varied from 16% for plant height to 36% for plant weight. Winter, hardiness of the crop, as measured by tissue sugar content, was increased by 10 to 32% by Vitazyme. Spring measurements on plant growth showed that the Vitazyme seed treatment improved plant height by up to 20%, and pods per plant by up to 29%. Seed quality parameters were also improved by Vitazyme: 1,000 seed weight by up to 6%, crude protein by up to 0.9 percentage point, and seed fat by up to 0.5 percentage point. The yield at harvest was boosted by 0.24 ton/ha (12%) and 0.30 ton/ha (15%) by the 1 and 1.5 liters/ton treatments. Both of these treatments boosted the farmer’s income significantly, by up to \$173/ha. These results show the great viability of this biostimulant program for Ukrainian farmers with canola, with the 1.5 liters/ton of seed being the better of the two treatments.



Winter Canola with Vitazyme application

Researcher: V. V. Plotnikov
Research organization: Agro Expert International, Kaharlyk, Ukraine; Plant Designs International, Rochester, New York; National Academy of Agrarian Sciences of Ukraine, Institute of Feed and Agriculture of Podillia, Ukraine
Location: FG "Kolyvaylo," Vinnytsia District, Vinnytsia Region, Mzyakivski Khutory, Ukraine
Variety: Dominator
Planting date: September 6, 2023
Planting rate: 500,000 seeds/ha
Previous crop: winter wheat
Soil type: gray podzolic (2.0% organic matter)
Soil preparation: plowing to 20-22 cm, pre-planting cultivation with a combined Europak unit to 3-4 cm
Experimental design: A canola field was divided into an untreated control and Vitazyme treated portion to determine the effect of this biostimulant on plant development and seed yield.



At harvest the Vitazyme treated winter canola is impressively tall and dense, and yielded 12% more than the untreated control.



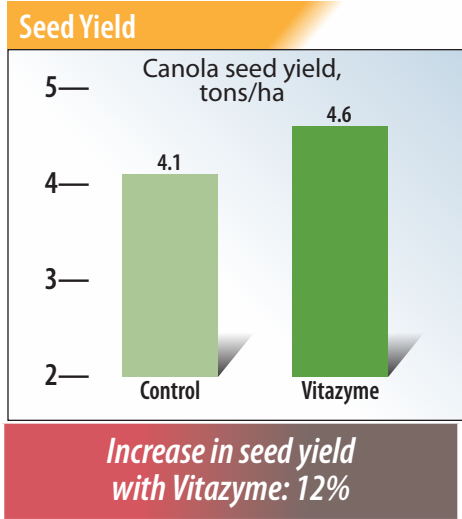
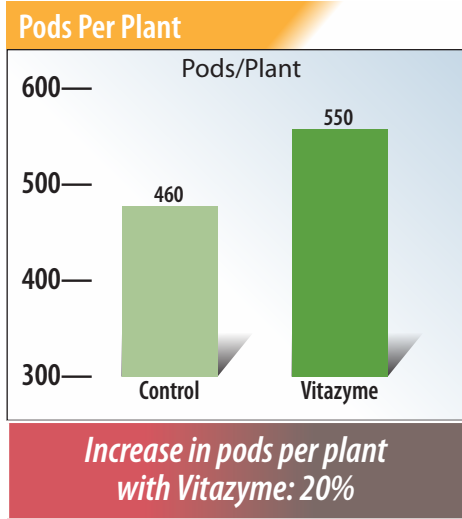
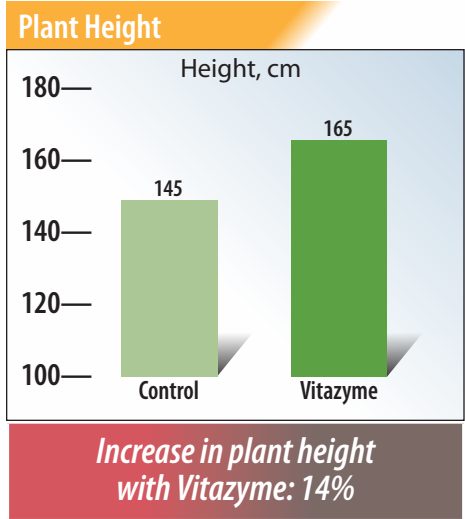
The canola on the left with a Vitazyme treatment at early flowering shows greater plant density than the untreated control plants on the right.

1 Control 2 Vitazyme

Fertilization: 152 kg/ha N and 26 kg/ha S in the spring as a top dressing
Vitazyme application: 0.5 liter/ha sprayed on the leaves and soil at early flowering (BBCH 62) on May 2, 2024, tank mixed with a fungicide and insecticide

Growth parameter results: Measurements were made on June 26, 2024.

Yield results:



Income results: This single 0.5 liter/ha application of Vitazyme increased the income of the farmer by \$276/ha.
Conclusions: A field-scale trial in central Ukraine, using a Vitazyme application of 0.5 liter/ha at early bloom, produced good improvements in plant height (14%) and pod number (20%) compared to the untreated control. These increases translated into a yield increase of 0.5 ton/ha (12%), which netted the farmer \$276/ha greater income. This simple and inexpensive biostimulant is thus shown to be highly effective in improving the farmer's production and income without concerns of product toxicity.



Winter Peas with Vitazyme application

Researcher: V. V. Plotnikov

Research organization:

Cherkasy Experimental Station of Bioresources, UkAgro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York

Location: FG "Elit," Podilskyi District, Odessa Region, Sergiyevka Village, Ukraine, (southern Ukraine, 270-350 mm of rainfall per year)

Variety: Budzhak, F3

Planting date: November 9, 2023

Seeding rate: 900,000 seeds/ha

Previous crop: winter wheat

Soil type: chernozem

(Mollisol; 3.6% organic matter)

Soil preparation: disking to 15 cm, cultivation to 6-7 cm

Experimental design:

A winter pea field was divided into a Vitazyme treated area and an untreated control area to evaluate the effect of this biostimulant on the yield of peas.

1 Control 2 Vitazyme

Fertilization: 8-34-0 kg/ha of N-P₂O₅-K₂O applied in-furrow at planting

Vitazyme application:

0.5 liter/ha sprayed on the leaves and soil at early bloom (BBCH 59) on May 5, 2024

Yield results:

Treatment	Pea Yield tons/ha	Yield change tons/ha
1. Control	3.44	—
2. Vitazyme	3.90	0.46 (+13%)

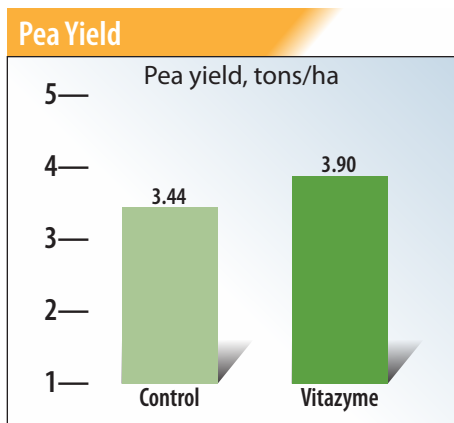
Increase in pea yield with Vitazyme: 13%



The Vitazyme treated winter peas on the right are obviously growthier, contain more chlorophyll, and have more blossoms than the untreated control peas on the left.



Here is a closeup of the treated and untreated pea plants from the field areas of the other photo. Note the leaf area, leaf color, and pod number. which greatly favor the Vitazyme treatment that yielded 13% more.



Income results: A single 0.5 liter/ha Vitazyme application resulted in an excellent improvement of farm income of \$163/ha.

Conclusions: A farm-based winter pea trial in Ukraine, utilizing a single 0.5 liter/ha application at early bloom, resulted in an excellent 0.46 ton/ha (13%) yield increase. This increase boosted the farmer's income by \$163/ha, showing the great efficacy of this biostimulant to enhance the yields and profit of winter pea growers in Ukraine.



Winter Wheat *with Vitazyme application*

Researcher: V. V. Plotnikov

Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York

Location: F G “Kolivaylo,” Vinnytsia District, Vinnytsia Region, Mizyakiivsky Khutory Village, Ukraine; central Ukraine (440-590 mm of rain per year) **Variety:** Patras, F3 **Planting date:** October 15, 2023

Planting rate: 6 million seeds/ha **Previous crop:** sunflowers

Tillage: Disking in two tracks to 20-22 cm, rolling, planting to 3 cm using a Horsh Pronto Seeder

Soil type: gray podzolic (2.0% organic matter)

Experimental design: A wheat field was divided into an untreated control area and a Vitazyme seed treated area to determine the effect of this product on grain yield and quality.

① Control ② Vitazyme

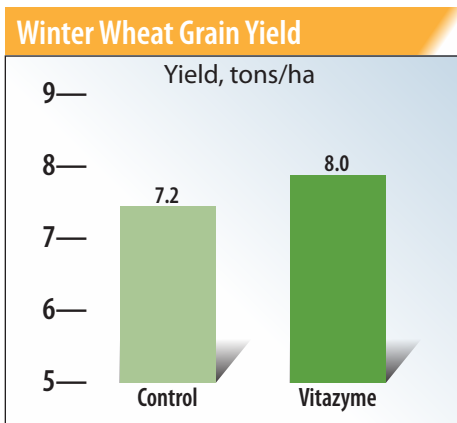
Fertilization: 130 kg/ha of nitrogen applied broadcast in the spring

Vitazyme application: 1 liter/ton of seed, applied October 14, 2023

Grain yield results:

Treatment	Grain yield tons/ha	Yield change tons/ha
1. Control	7.2	—
2. Vitazyme	8.0	0.8 (+11%)

Grain yield increase with Vitazyme: 11%



The 1 liter/ton of seed treatment yielded a very good return of 11%, or 0.8 ton/ha..



The seed-treated winter wheat shows superior emergence in the late fall. The Vitazyme treatment is on the left.

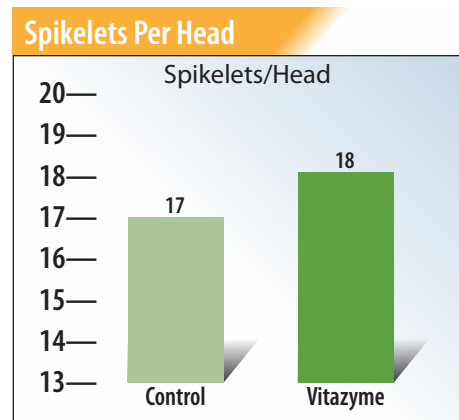
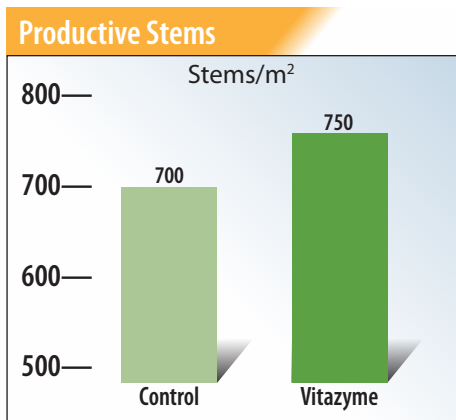
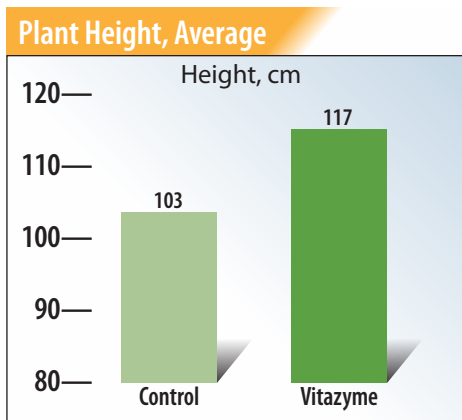


At harvest time the Vitazyme treated wheat, on the right, shows much better head development that the untreated control wheat on the left, and gave an 11% yield increase.

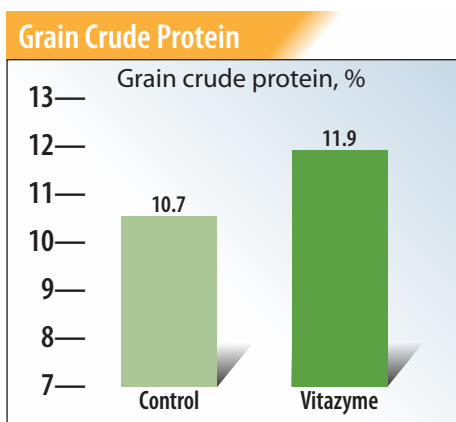
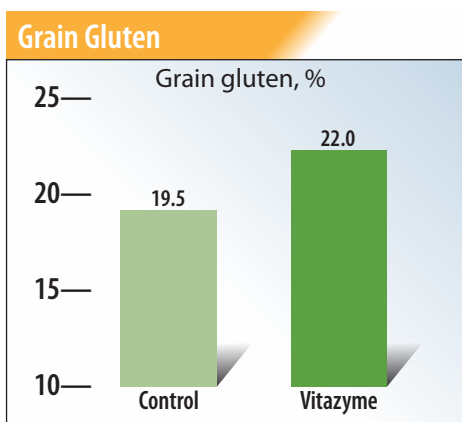


After spring green-up the Vitazyme treated wheat shows remarkably better chlorophyll development and early leaf growth compared to the control.

Plant growth measurements: On June 26, three growth parameters were measured.



Grain quality results:



Improvements in plant growth with Vitazyme

Height..... 14 cm
 Productive stems..... 50
 Spikelets/head..... 1

Increase in grain gluten with Vitazyme: 2.5 percentage points

Increase in crude protein with Vitazyme: 1.2 percentage points

The Vitazyme seed treatment increased both grain gluten and crude protein significantly.

Income results: As a result of the 11% (0.8 ton/ha) yield increase and grain quality improvements, net income for the crop was increased by \$164/ha.

Conclusions: This Ukrainian winter wheat field-scale study, which used Vitazyme seed treated wheat to compare with untreated seed, resulted in a sizeable yield increase of 0.8 ton/ha (11%). Measurements in late June revealed noticeable improvements in plant height and density, as well as spikelet number. This superior growth conspired to produce these excellent yield and quality improvements, and an improvement in income of \$164/ha.

Vital Earth Resources, 706 East Broadway • Gladewater, Texas 75647, USA • (903)845-2163 • www.vitalearth.com

