



Wheat with Vitazyme—A Synergism Study with Flobond SC-100 Polymer

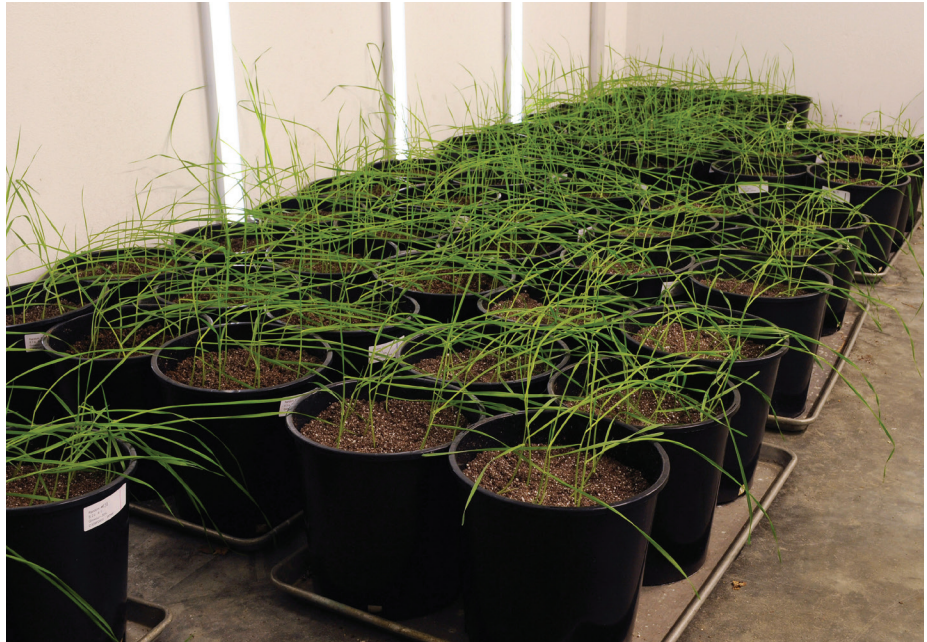
Researcher: Amanda Ver Helst
Research organization: SGS North America, Inc., Brookings, South Dakota
Location: Brookings, South Dakota
Variety: Prevail hard red spring wheat
Planting date: September 10, 2020
Soil: Sungro Propagation Mix
Planting rate: 10 seeds per pot
Experimental design: A growth chamber experiment, using six replications, was designed to evaluate the effect of Vitazyme alone, and Vitazyme plus Flobond SC-100 polymer, as a pretreated seed coating on the germination and early growth, leaf and root growth, and shoot and root mass of hard red spring wheat under varying degrees of water stress.

Treatment	Amount of water			
	100%	75%	50%	25%
1. Vitazyme	x	x	x	x
2. Vitazyme + SC-100	x	x	x	x
3. Control	x	x	x	x

Fertilization: potting mix pre-formulation
Vitazyme application: Seeds for Treatment 1 and 2 were treated with a seed treater at 415 ml/100g of seed, which is the equivalent of about 6 oz/acre as applied by the seeds.
SC-100 application: After the seeds were treated with Vitazyme for Treatment 2, the seeds were coated with 1% Flobond SC-100 polymer.
Watering regime: The following watering schedule was followed.

Watering rate	Soil amount	Initial water added	Weekly water added
	g/pot	g/pot	ml/pot
100%	2032	3736	467
75%	2032	2802	350
50%	2032	1868	234
25%	2032	934	117

Harvest date: October 14, 2020
Plant stand results: Counts for plants were made on September 14, 15, 16, 18, 22, and 28, and October 24.



Wheat planted in pots for this SGS early growout study was evaluated for emergence at several times early in the growth cycle, and at harvest the plant heights and weights were determined.

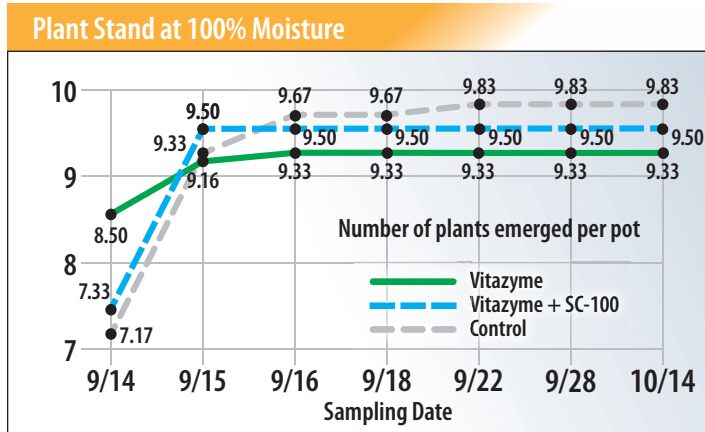


The wheat in these pots was seeded at ten seeds per pot, and counted frequently at the beginning of the study to determine any improvements in emergence, based on the amount of water received and the treatment.

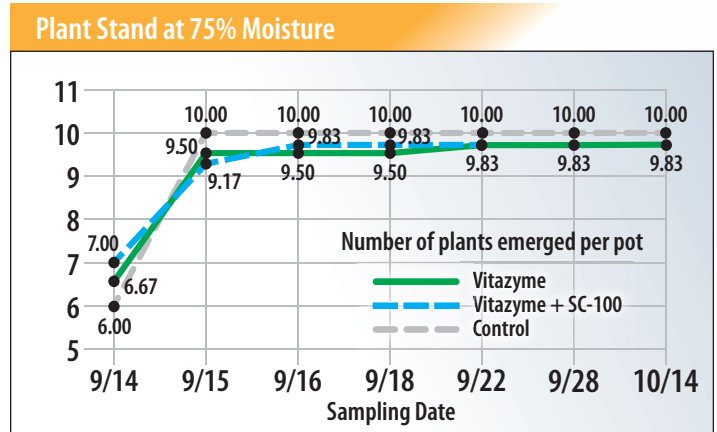
Plant stand results:

PLANT STAND OVER TIME

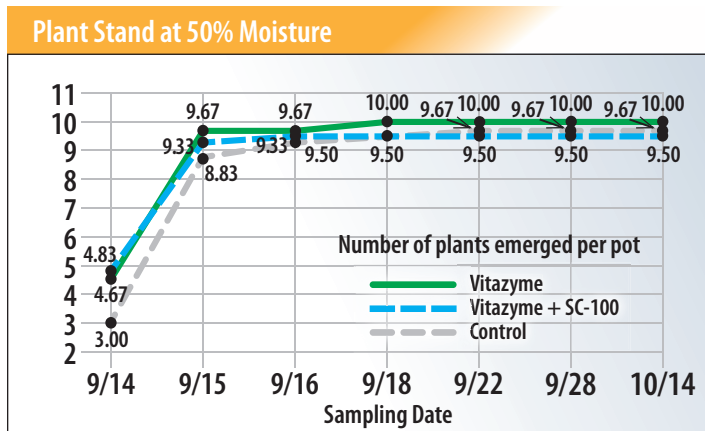
Plant Stand at 100% Moisture



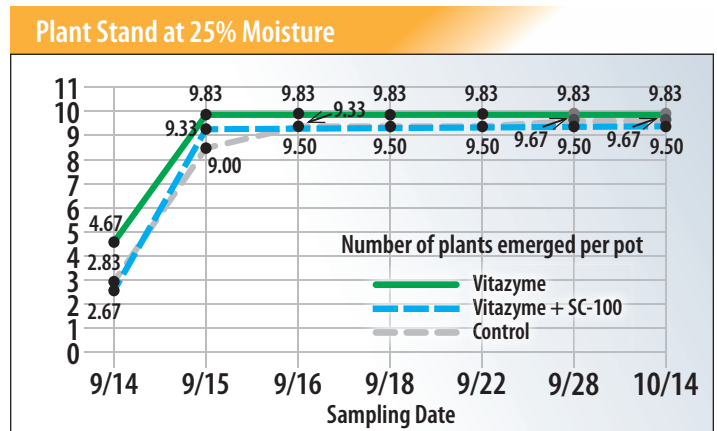
Plant Stand at 75% Moisture:



Plant Stand at 50% Moisture:



Plant Stand at 25% Moisture:

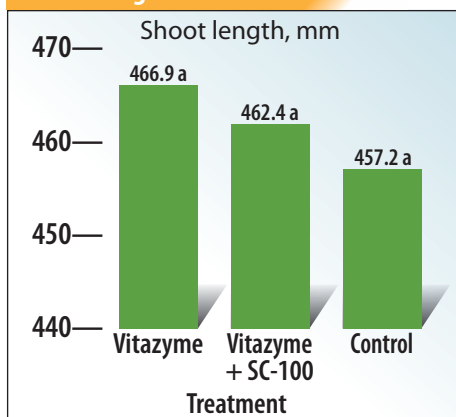


Shoot and root length results:

SHOOT AND ROOT LENGTH

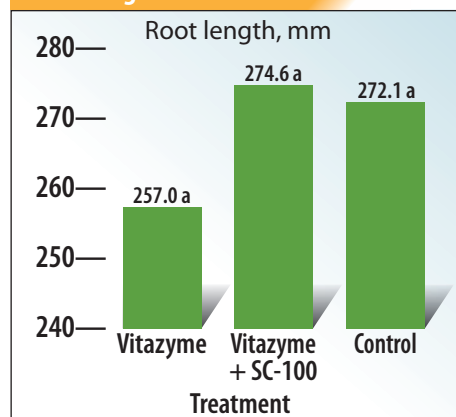
Results for Three Treatments Over All Moisture Levels

Shoot Length¹



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

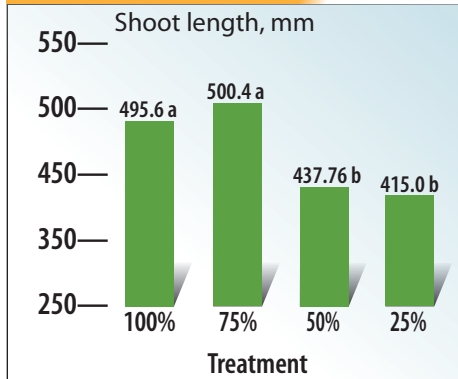
Root Length¹



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

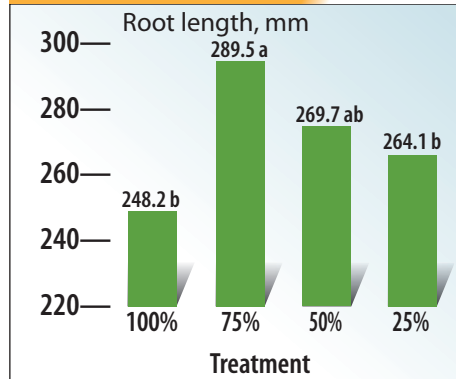
Results for Moisture Levels Over All Three Treatments

Shoot Length¹



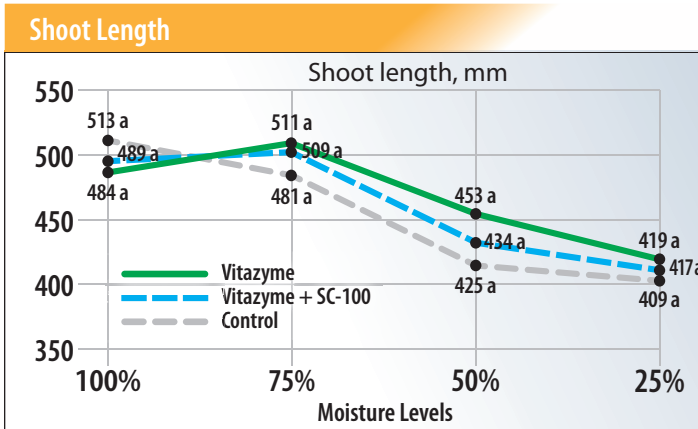
¹Means followed by the same letter are not significantly different at P = 0.05.

Root Length¹



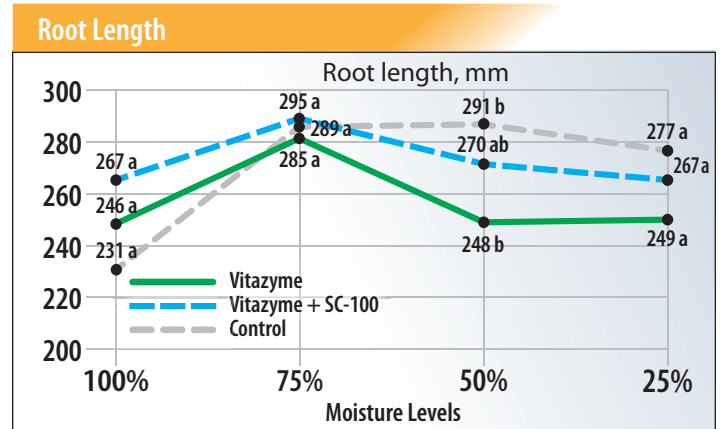
¹Means followed by the same letter are not significantly different at P = 0.05.

Shoot Length for Three Treatments at All Four Moisture Levels¹



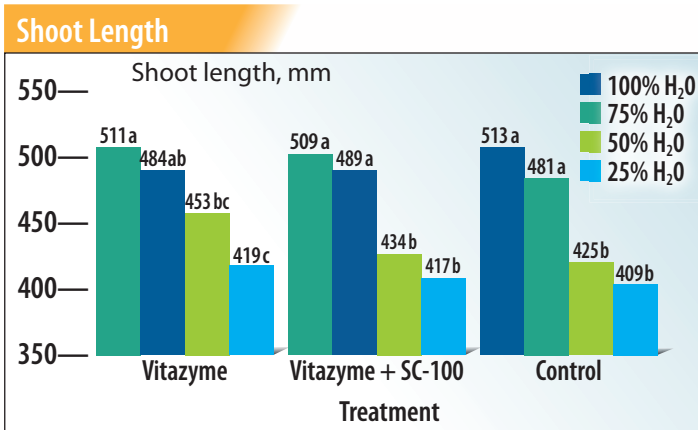
¹Means followed by the same letter are not significantly different at P = 0.05 at each moisture level.

Root Length for Three Treatments at All Four Moisture Levels¹



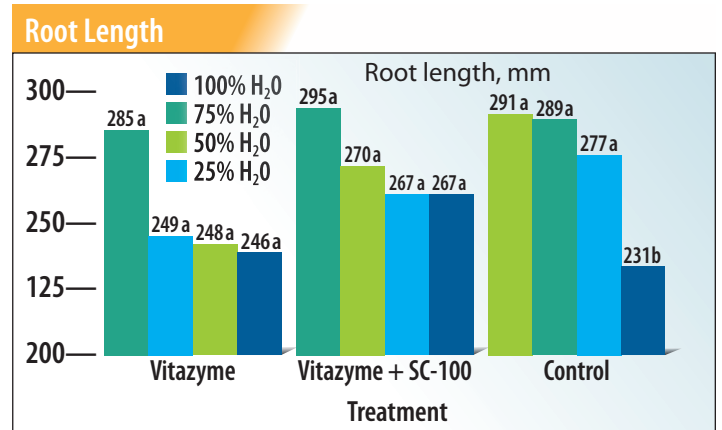
¹Means followed by the same letter are not significantly different at P = 0.05 at each moisture level.

Shoot Length for All Four Moisture Levels for Three Treatments¹



¹Means followed by the same letter are not significantly different at P = 0.05 for each treatment.

Root Length for All Four Moisture Levels for Three Treatments¹

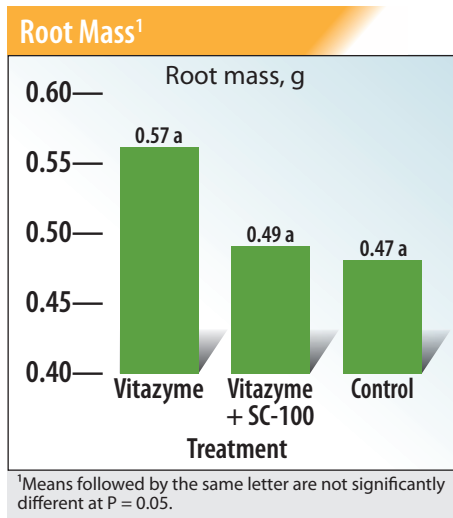
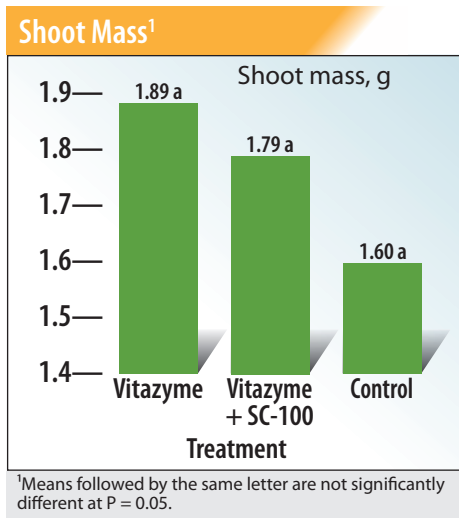


¹Means followed by the same letter are not significantly different at P = 0.05 for each treatment.

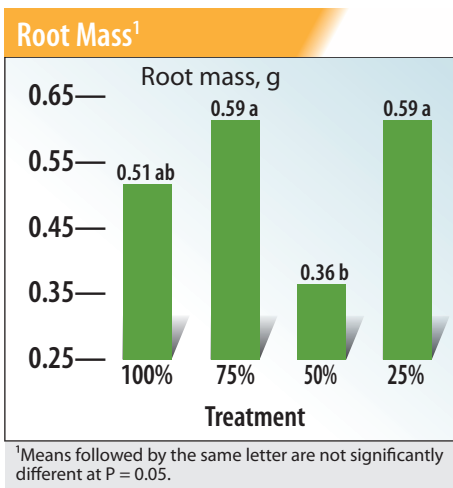
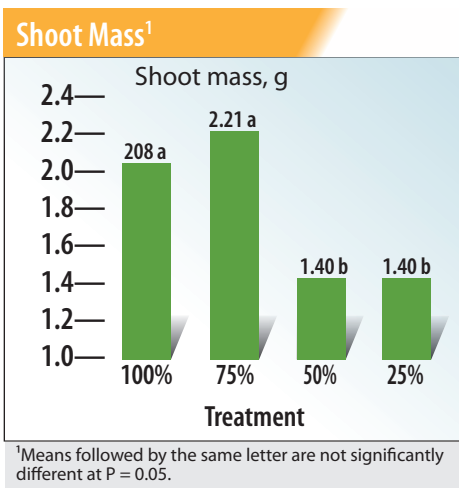
Shoot and root mass results:

SHOOT AND ROOT MASS

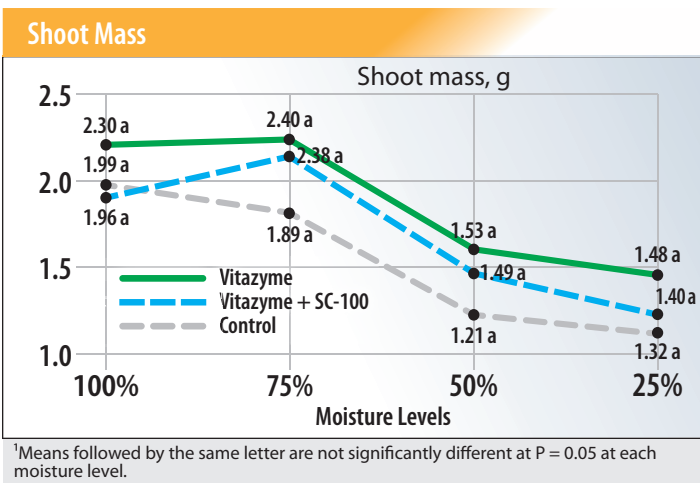
Results for Three Treatments Over All Moisture Levels¹



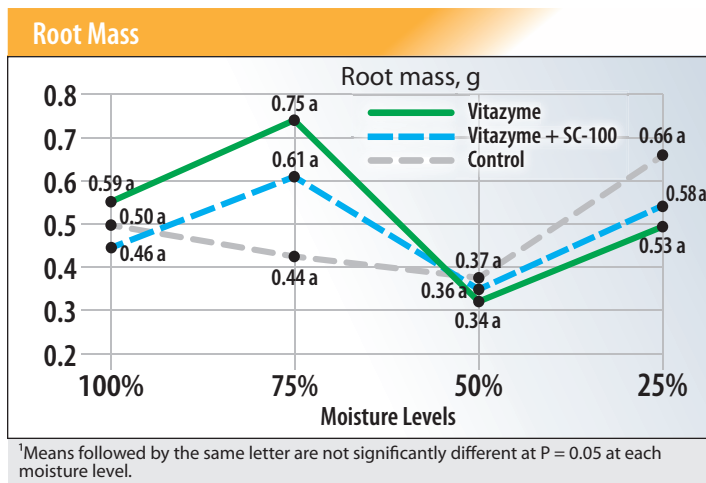
Results for Moisture Levels Over All Three Treatment



Shoot Mass for Three Treatments at All Four Moisture Levels¹

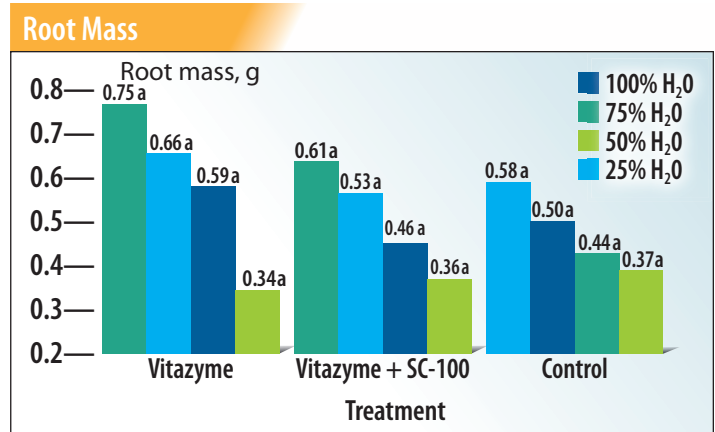
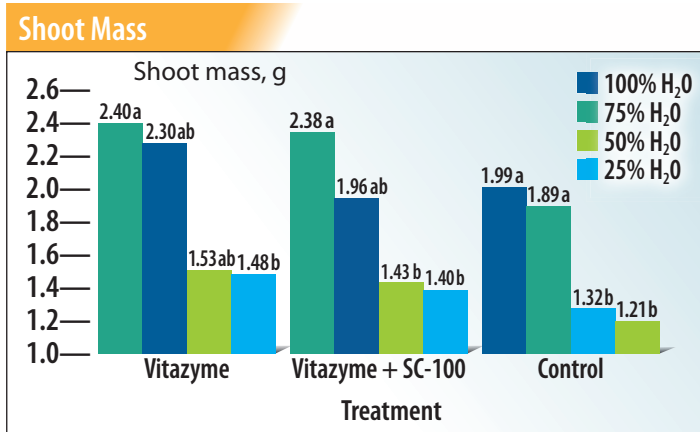


Root Mass for Three Treatments at All Four Moisture Levels¹



Shoot Mass for All Four Moisture Levels for Three Treatments¹

Root Mass for All Four Moisture Levels for Three Treatments¹



¹Means followed by the same letter are not significantly different at P = 0.05 for each treatment.

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Conclusions:

Seedling emergence: There were no clear patterns of seedling emergence in this study for the three treatments, and no statistics run to determine significant differences. There was a tendency for slightly better emergence of the Vitazyme and Vitazyme + SC-100 treatments at the 50% and 25% moisture levels the first days of the trial.

Shoot and root length: Over all moisture levels, the Vitazyme and Vitazyme + SC-100 treatments gave slightly longer shoots than the control, and Vitazyme + SC-100 gave the longest roots. The differences were not significant, Shoot length was greatest for the Vitazyme and Vitazyme + SC-100 treatments at 75%, 50%, and 25% moisture levels, but root lengths were the reverse, Vitazyme having significantly shorter roots at 50% moisture. The Vitazyme + SC-100, and Vitazyme tended to support greater shoot and root length at the 75% moisture level.

Shoot and root mass: Over all moisture levels, both Vitazyme and Vitazyme + SC-100 produced a greater mass of shoots and roots, though nonsignificantly, than did the control. Both Vitazyme and Vitazyme + SC-100 increased shoot and root mass above the control at 75% moisture; this also held for 50% and 25% moisture for shoot mass. Both Vitazyme and Vitazyme + SC-100 increased shoot mass above the control at all moisture levels except in one instance. Vitazyme improved root mass at all moisture levels except the 50% level.

It is suggested that the potting mix and initial watering, even at the low moisture levels of 25% and 50%, may have reduced potential responses of the corn for both Vitazyme and Vitazyme + SC-100 due to the excessive moisture at the beginning of the study, thus reducing the ability of the SC-100 to fully express its hygroscopic properties.



Wheat with Vitazyme application

Researcher: David Gray

Research organization: David Gray's Agro Advantage, O'Connor, Western Australia

Location: Dumbleyung, Western Australia **Variety:** Mace

Planting date: April 24, 2018 **Planting rate:** 60 kg/ha

Previous crop: barley **Soil type:** medium clay loam

Planting method: Stilleto knife point with press wheels

Row spacing: 9 inches **Plot size:** 4 x 40 meters

Experimental design: A barley experiment, using two replicates of four treatments and 4 x 40 meter plots, was established to evaluate the effects of Vitazyme and MicroPlus, alone and in combination, on the growth, yield, and quality of wheat.

① Control ② Vitazyme

③ MicroPlus ④ Vitazyme + MicroPlus

Fertilization: Preplanting: 80 kg/ha Agstar Extra, and 60 liter/ha Flexi-N. Post-planting: 50 liters/ha Flexi-N

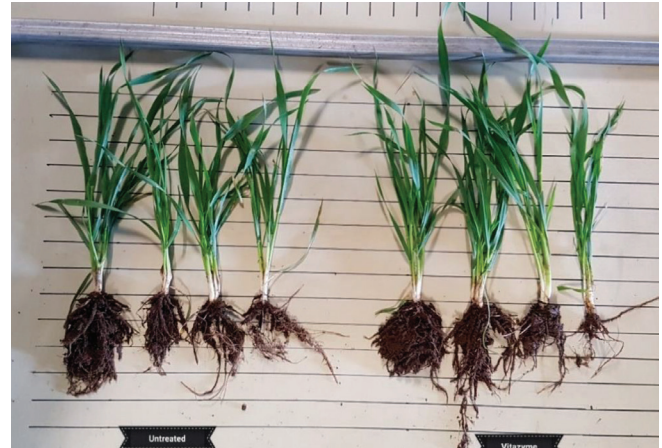
Vitazyme application: 10% fulvic acid was added to the Vitazyme; applied at 2.5 liters/tonne of seed

MicroPlus application: MicroPlus is a formulation of 14 beneficial bacteria and fungi, including mycorrhizal fungi; applied at 3 kg/tonne of seed

Herbicide application: Preemergent herbicides: 2 liters/ha Weedmaster Argo, 2.5 liters/ha trifluralin. Postemergent herbicide: 750 ml/ha Howitzer

Fungicide application: Preemergent fungicide: 200 ml/ha flutriafol

Growth results: On July 26, 2017, visual assessments of plants dug from the various plots showed the following. Note the accompanying photos.



Vitazyme application alone, at 2.5 liters per tonne of seed, plus fulvic acid (right side) gave an excellent boost to both leaf and root mass, and the grain yield increased by 7%.

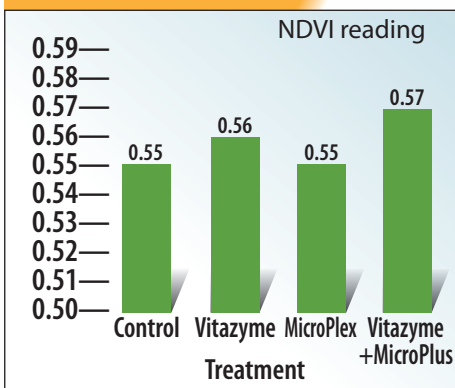


When MicroPlus was added to the Vitazyme, there was a yield increase in root and leaf growth, but yield did not reveal a synergism.

Treatment	Leaf mass	Root mass
1. Control	n.a.	n.a.
2. Vitazyme	+	+
3. MicroPlus	o	o
4. Vita+MicroPlus	+	+

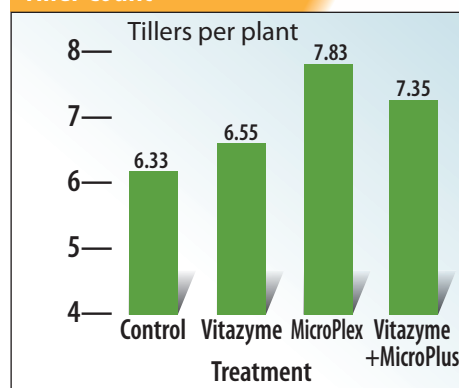
Both Vitazyme alone and with MicroPlus gave excellent growth responses to the leaves and roots.

NDVI Index at First Node¹



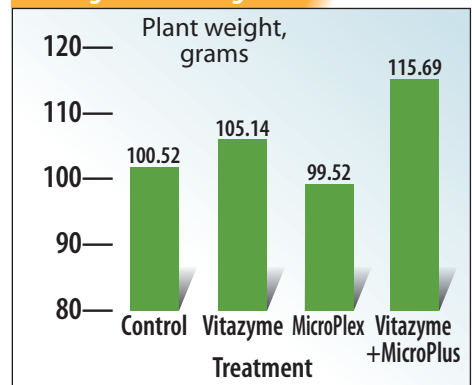
¹NDVI = Normalized Difference Vegetation Index. This is a graphical index that analyzes remote sensing measurements, taken from a satellite or other aerial device. It is a measurement of the near infrared (NIR) and red electromagnetic frequencies to calculate the total reflectance of leaves as related to the amount of chlorophyll.

Tiller Count¹



¹The average of 20 plants per plot, or 40 total plants.

Average Plant Weight¹

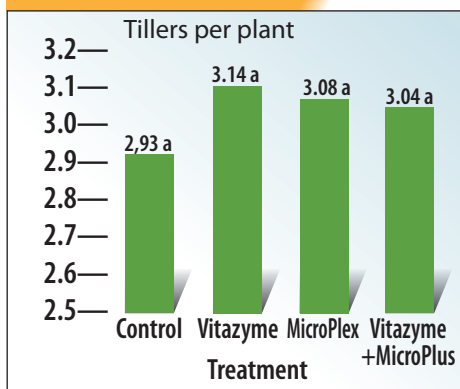


¹The average of 10 plants per treatment.

Increase in plant weight with Vitazyme: 5%

Increase in plant weight with Vitazyme + MicroPlus: 15%

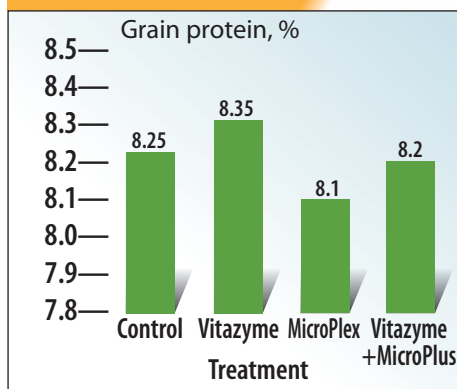
Harvested Yield¹



¹Means followed by the same letter are not significantly different at P = 0.05. There was considerable variation in plot yield due to growing conditions and soil variations.

*Increase in grain yield
with Vitazyme : 7%*

Grain Protein



Conclusions: A wheat trial in Western Australia, utilizing two plots per treatment, revealed that Vitazyme alone produced the highest grain yield, 7% greater than the control yield. This yield was also the highest in protein of all treatments, being 0.1% greater than the control. NDVI indexes showed the greatest leaf density for the combined Vitazyme and MicroPlus treatment, as evidenced in the photos as well. MicroPlus alone gave the greatest number of tillers per plant. Because of variations among plots caused by uneven germination and soil variations, as well as there being only two replications, significant yield differences were not detected among the four treatment. However, the indications from superior responses to Vitazyme for root mass and leaf area, HDVI indexes, plant weight, grain yield, and grain protein reveal a reasonable confidence to farmers that this product is a valuable input for wheat farmers in Australia.

Wheat *with Vitazyme application*

Researcher: Martin Garcia and Lucero Fernandez

Farmer: Ruben Garcia

Research organization: Agro Garna and Quimica Lucava

Location: San Gabriel, Penjamo, Guanajuato, Mexico

Variety: Cortazar

Planting date: January 2, 2015

Experimental design: Two hectares of a wheat field were treated with Vitazyme and compared to an adjoining untreated control. The purpose of the trial was to evaluate the ability of Vitazyme to affect yield and income of this crop.

① Control ② Vitazyme

Fertilization: unknown

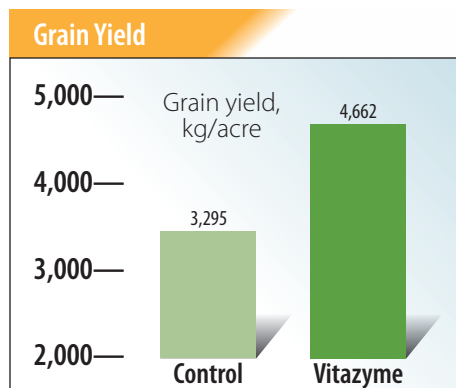
Vitazyme application: (1) 0.25 liter/ha applied to the seeds at planting on January 2, 2015; (2) 1 liter/ha applied to the leaves and soil on February 25, 2015, 54 days after planting

Harvest date: May 11, 2015

Yield results:

Treatment	Yield	Yield change
	kg/ha	kg/ha
Control	3,295	—
Vitazyme	4,662	1,367 (+41%)

Increase in grain yield with Vitazyme: 41%



Income results:

Treatment	Yield	Gross income ¹	Added income	Added cost ²	Net profit	Cost : Vitazyme
	kg/ha	USD/ha	USD/ha	USD/ha	USD/ha	
Control	3,295	635.94	—	—	—	—
Vitazyme	4,662	899.77	263.83	48.28	215.55	4.46

¹Wheat price = 0.193 USD/kg; ²cost of two Vitazyme applications (1.25 liters/ha) and relevant costs.

Increase in income with Vitazyme: 215.55 USD/ha

Increase in Cost : Benefit with Vitazyme: 4.46

Conclusions: A wheat study in Mexico, comparing two Vitazyme applications with an untreated control, revealed that this product greatly increased yield, by 41%. This increase gave a profit enhancement of 215.55 USD/ha, with a cost : benefit of 4.46, showing the program's excellent benefits for wheat growers in Mexico.

Winter Wheat *with Vitazyme application*



Untreated winter wheat at Jordan Farms is shown to be much shorter and less dense in growth than the treated wheat in the accompanying photo.



Vitazyme treated soft white winter wheat (at tillering) is much thicker and taller than the untreated control, and yielded 6% more grain.

Researchers: Jacob Hesseltine and Heba Khalid

Research organization: Vital Grow Distribution LLC, Waterville, Washington

Farmer: Jordan Farms

Location: Waterville, Washington

Variety: Eltan soft white winter wheat

Planting date: August 25, 2014

Seeding rate: 45 lb/acre

Seedbed preparation: subsoiling, harrowing, disking, plowing cultivation, weeding

Previous crop: fallow

Soil type: clayey

Experimental design: Two adjoining and nearly identical fields, each having 155 acres with uniform past management history, were selected to compare the yield and quality of winter wheat as affected by Vitazyme. One field received Vitazyme and the other served as an untreated control.

1 Control 2 Vitazyme

Fertilization: 60 lb/acre of nitrogen in July of 2014

Vitazyme application: 12.4 oz/acre sprayed on the leaves and soil with a 90-foot boom sprayer the last part of April, along with Olympus Flex Broadleaf Herbicide, at the 3 to 5-tiller stage

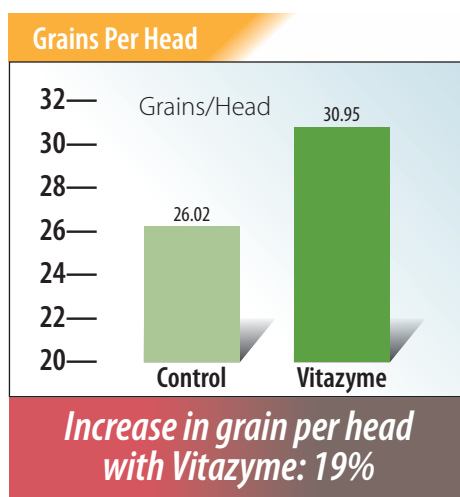
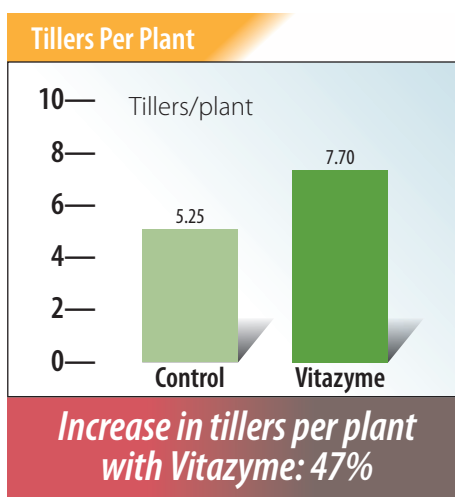
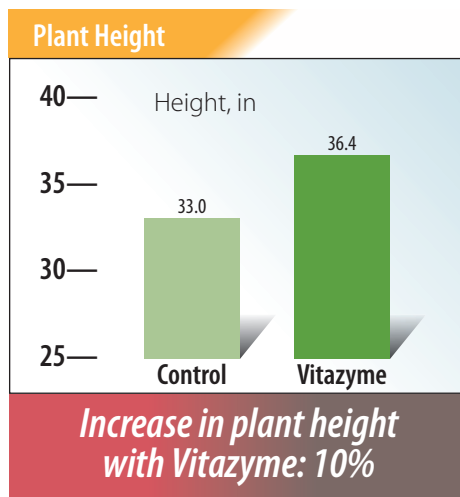
Growing season weather: good growing conditions with little winter

snow, and only 6 inches of precipitation from January to harvest; extreme heat in June and July to affect plant development.

Growth observations: The growers noted visible differences in growth during the growing season, with greater plant mass and more stems in the Vitazyme treatment, plus more stems and thicker stubble noted in the treated field after harvest.

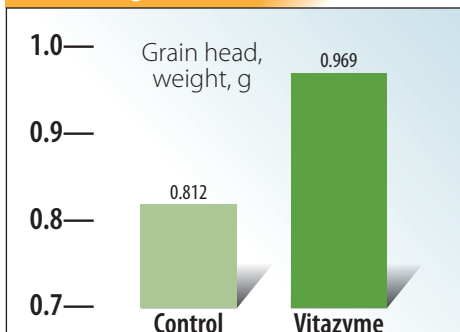
Harvest dates: July 22 and 23, 2015

Plant parameter results: On July 12, 20 typical plants from each field were harvested, and parameters were measured for each one and averaged.



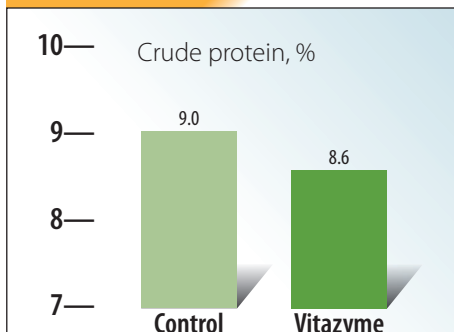
Winter Wheat *with Vitazyme application cont.*

Grain Weight Per Head



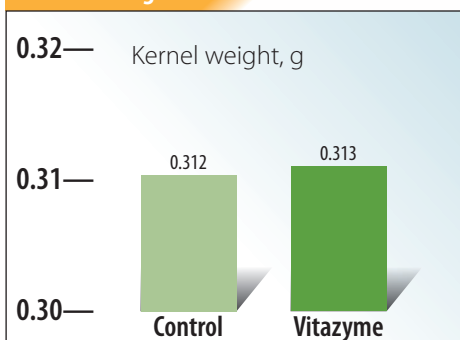
Increase in grain weight/head with Vitazyme: 19%

Grain Protein



Decrease in crude protein with Vitazyme: (-) 0.4%-points

Kernel Weight



Increase in kernel weight with Vitazyme: 0%

Test weight was marginally increased with Vitazyme, while grain protein decreased a bit, which is quite acceptable because low protein is needed for supreme quality of baker's flour. Less than 12% is considered premium quality.

Yield results:

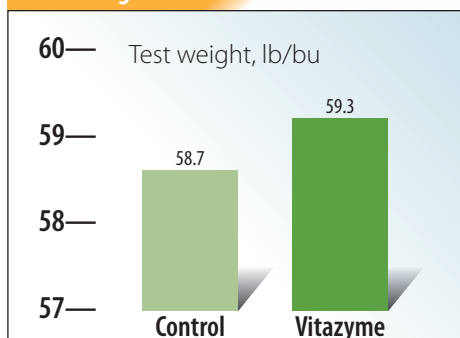
Treatment	Yield bu/acre	Yield change bu/acre
Control	41.08	—
Vitazyme	43.37	2.29 (+6%)

Conclusions: A soft white winter wheat trial in Washington, comparing two 155-acre fields, one treated with a single 12.4 oz/acre Vitazyme application at 3 to 5 tillers, showed excellent improvements in plant and grain parameters (tillers per plant, height, grains per head, grain weight per head, and grain test weight. Weight per grain did not change, and crude protein of the grain decreased slightly (0.4 percentage points). **Differences in growth were noticeable between the two fields during the season, and stubble density was noticeably greater in the Vitazyme field.** Lower summer temperatures and greater rainfall would certainly have improved the response to Vitazyme, but a 6% yield increase was very acceptable. These results illustrate the effectiveness of this program for soft white winter wheat growers in Washington, especially during a dry and heat-stressed year.

All plant parameters but kernel weight increased with Vitazyme. Kernel weight is difficult to change.

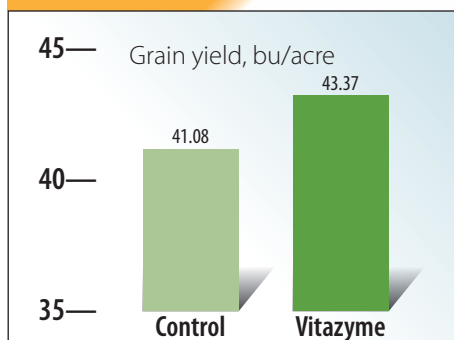
Grain quality results: At harvest, the grain from each field was weighed and sampled separately.

Test Weight



Increase in test weight with Vitazyme: 1%

Grain Yield



Increase in grain yield with Vitazyme: 6%

Winter Wheat *with Vitazyme application*

Researcher: Jacob Hesselstine

Research organization: Vital Grow Distribution LLC, Waterville, Washington

Farmer: Jordan Farms

Location: Withrow, Washington

Variety: Eltan soft white winter wheat

Planting date: August 27, 2014

Seeding rate: 40 lb/acre

Previous crop: fallow

Soil type: sandy loam

Seedbed preparation: subsoiling, harrowing, disking, plowing cultivation, weeding

Experimental design: Two adjoining fields that had equal cropping history were used to evaluate the effect of Vitazyme on wheat yield and protein level. One field of 160 acres was treated, and the other was left untreated as a control.

1 Control 2 Vitazyme

Fertilization: 60 lb/acre of nitrogen in July of 2014

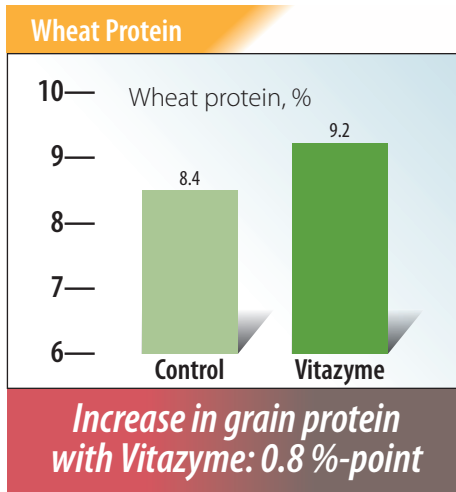
Vitazyme application: 12 oz/acre sprayed on the leaves and soil with a 90-foot boom sprayer the spring of 2015, along with Olympus Flex broadleaf herbicide; plants were in the tillering stage (3 to 5 inches tall)

Growing season weather: good planting conditions in 2014, with very little snow cover through the winter; only six inches of precipitation from

January, 2015, through harvest; extreme heat in June and July, which induced early maturity but less than optimal yields

Harvest dates: July 15 (control field) and July 17 (Vitazyme field)

Protein results:

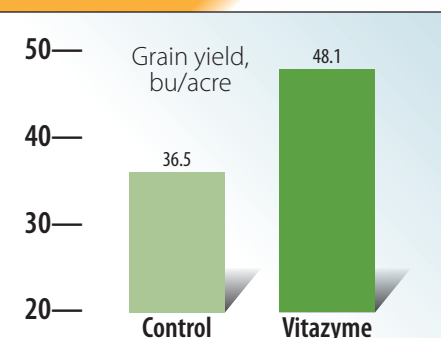


Test weight results: Both treatments produced grain that weighted about 58 lb/bu.

Yield results:

Treatment	Yield bu/acre	Yield change bu/acre
Control	36.5	—
Vitazyme	48.1	11.6 (+32%)

Grain Yield



Increase in grain yield with Vitazyme: 32%

Conclusions: A soft white winter wheat study in Washington, comparing a field receiving a single 12 oz/acre Vitazyme application at tillering compared to an untreated control field, showed that this product markedly improved grain yield—by 32%—while increasing protein by 0.8 percentage-point. This small protein increase did not detract from the baking quality of the flour, since bakeries need less than 12% protein for premium quality, and both fields produced grain having considerably less protein than this. Vitazyme is shown to be an excellent addition to soft white wheat programs in Washington, promoting both high yields and excellent quality.

Vital Earth Resources

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

2014 Crop Results

Vitazyme on Wheat

Researcher: Eddie Pearson

Farmer: C.J. Parker

Location: Lonoke, Arkansas

Variety: bearded wheat

Experimental design: Three fields of wheat — 17, 16, and 16 acres — were treated once with Vitazyme at spring green-up to determine the effect of the product on wheat growth characteristics and yield. An adjoining untreated field served as a control.

1. Control

2. Vitazyme

Fertilization: unknown

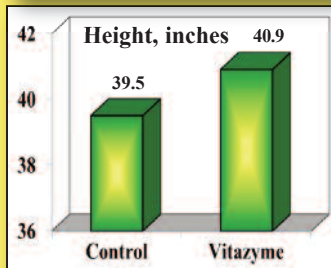
Vitazyme application: 13 oz/acre on the leaves and soil on March 7, 2013

Growing season weather: favorable

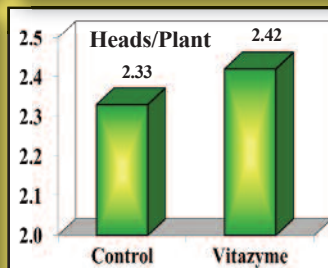
Harvest date: mid-June

Plant characteristics at harvest: Twelve representative plants, having a similar plant density, from each treatment were selected and measured for several parameters.

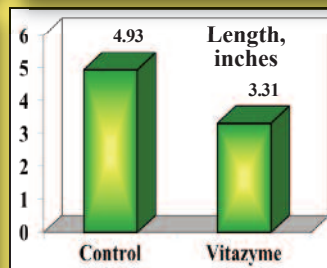
Plant Height



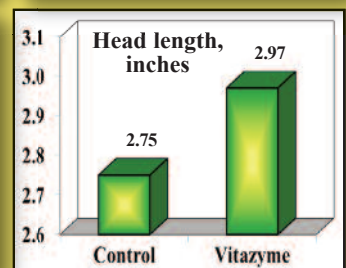
Heads Per Plant



Flag Leaf to Head



Head Length

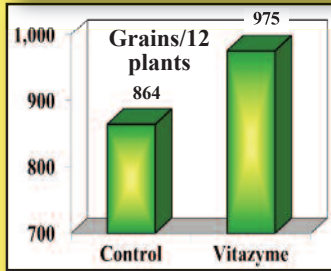
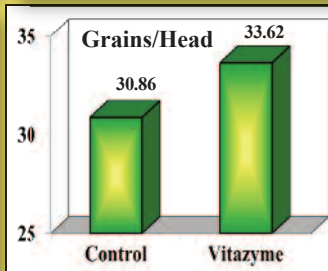
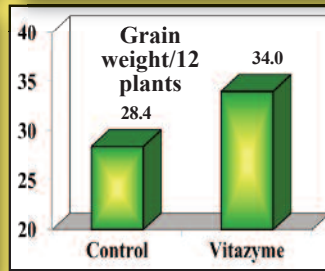
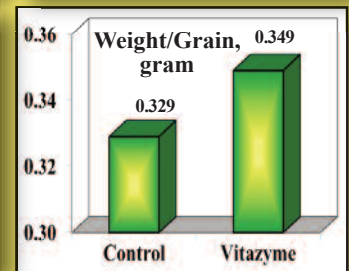


Increase in plant height with Vitazyme: 4%

Increase in heads per plant with Vitazyme: 4%

Decrease in stem length from flag leaf to head with Vitazyme: 33%

Increase in head length with Vitazyme: 8%

Grains Per 12 Plants**Grains Per Head****Grain Weight****Weight Per Grain**

Increase in grains/12 plants with Vitazyme: 13%

Increase in grains/head with Vitazyme: 9%

Increase in grain weight/12 plants with Vitazyme: 20%

Increase in weight/grain with Vitazyme: 6%

Yield results: Accurate yield measurements were possible for only portions of the three Vitazyme treated fields, and these results are given below. The control field yield was not determined.

Treatment	Harvested area	Gross yield	Area yield
	acres	bu	bu/acre
Field 1	16.0	1,252	78.3
Field 2	11.3	1,069	94.6
Field 3	11.4	1,013	88.9
Total	38.7	3,334	86.1

Conclusions: A wheat study in Arkansas revealed that Vitazyme, applied once in March, produced excellent growth and yield responses. The treated plants exceeded the control plants in all categories, giving 20% greater weight of grain per plant, and 6% heavier grain. The fields yielded up to 94.6 bu/acre, the average for the three fields being 86.1 by/acre, even with some irregular low areas of field 1 producing less and reducing the yield. The Vitazyme program is shown to be an excellent management tool for wheat farmers in Arkansas.

Vital Earth Resources

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

2014 Crop Results

Vitazyme on Wheat

Researcher: Juan Cruz Castaneda Vega, Quimica Lucava, S.A., Jalisco, Colima and Nayarit, Mexico

Farmer: Mr. Alejandro Location: Zapotlan del Rey, Jalisco, Mexico

Variety: unknown

Planting date: unknown

Experimental design: A wheat field was divided into a Vitazyme treated area of 1 hectare, and the rest of the field served as a control to evaluate the effect of the product on wheat growth and yield.

1. Control

2. Vitazyme

Fertilization: unknown

Vitazyme application: 1 liter/ha (13 oz/acre) sprayed by a tractor-mounted boom sprayer just before tillering, on December 5, 2013. An output of 300 liters/ha was made. The product was applied together with a fungicide, and with an adjuvant similar to "Break Thru" (1 ml/liter of spray).

Crop growth observations: The researcher noted the following with Vitazyme treatment:

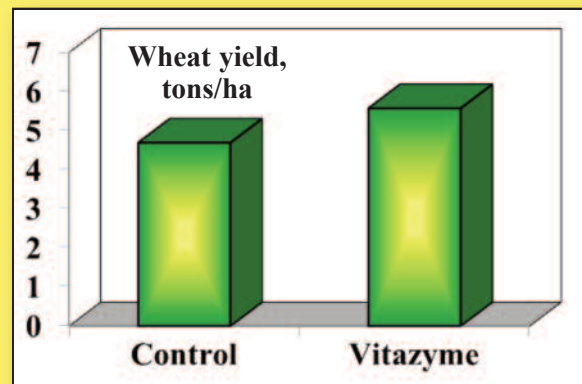
1. A healthier crop, with no striped (yellow) rust
2. An even crop
3. Greater root and leaf growth

Harvest date: April 24, 2014

Yield results: The treated hectare and an adjoining untreated hectare of wheat were harvested and weighed.

Treatment	Grain yield tons/ha	Yield change tons/ha
Control	4.69	—
Vitazyme	5.57	0.88 (+19%)

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



Conclusions: This Vitazyme wheat study in Jalisco, Mexico, revealed that a single 1 liter/ha application, applied in the late fall before tillering, greatly enhanced leaf and root development, and produced uniformity across the field. A yield increase of 19% was produced. The farmer realized, at harvest, that crop responses to soil differences were minimized across the treated hectare. He was convinced that Vitazyme did a fine job of increasing crop yield under difficult cropping conditions.

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

2013 Crop Results

Vitazyme on Wheat

Researcher: Ricardo Cabrera

Trial location: Capitan Miranda, Paraguay

Planting date: March 7, 2013

Experimental design: A wheat experiment was designed for an area having 18 rows (3.06 m) that were 18 meters long for each of eight treatments, The area was 55 m² for each treatment, or 440.6 m² for the entire study. The purpose of the experiment was to determine the yield and growth characteristics of wheat as affected by Vitazyme alone at three rates, Vitazyme plus other treatments, and other treatments alone.

Research organization: DVA, Paraguay

Variety: Itapua 75

Row spacing: 0.17 m (6.6 inches)

Treatment	Seed treatment ¹	Treatment at 30 days after emergence ²	Treatment at flag leaf emergence ³
Control	0	0	0
Complezal Semillon	200 ml	200 ml	1 L
Ascofol Zn	200 ml	200 ml	1 L
ComSem + Vitazyme	200 ml + 150 ml	200 ml + 0.5 L	2 L + 0.5 L
Ascofol + Vitazyme	100 ml + 150 ml	200 ml + 0.5 L	2 L + 0.5 L
Vitazyme 1 (low)	100 ml	0.5 L	0.5 L
Vitazyme 2 (medium)	150 ml	1.0 L	1.0 L
Vitazyme 3 (high)	200 ml	1.5 L	1.5 L

¹Seeds were treated with a seed treater to the seed surface at the indicated rates, before planting.

²Sprayed on the leaves and soil at 30 days after plant emergence.

³Sprayed on the leaves and soil at flag leaf emergence.

Fertilization: 200 kg/ha of 18-46-0 N-P₂O₅-K₂O before planting

Vitazyme application: See the above chart.

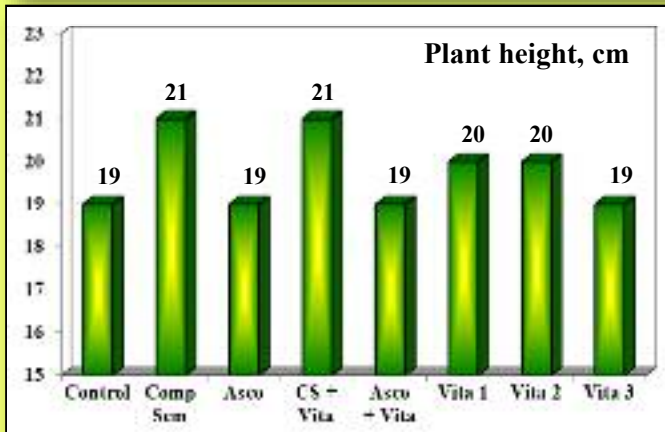
Complezal Semillon: a foliar fertilizer, applied as shown in the chart above

Ascofol Zn: a solution of seaweed (*Ascophyllum nodosum*) and certain nutrient elements, especially zinc (possibly 0.6%), applied as shown in the chart above

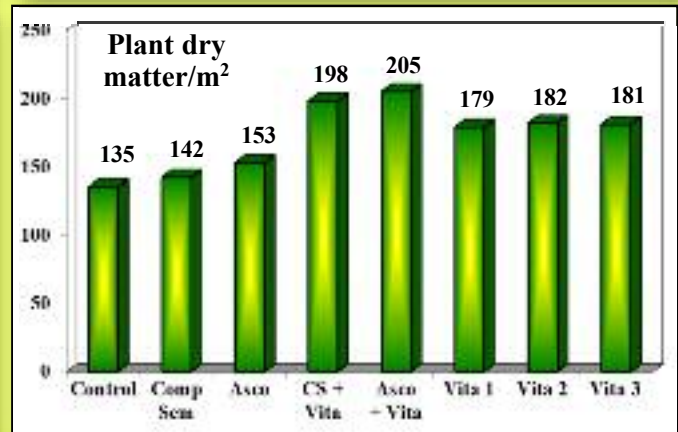
Seed treatment results at 15 days:

Plant Parameters 15 Days After Emergence

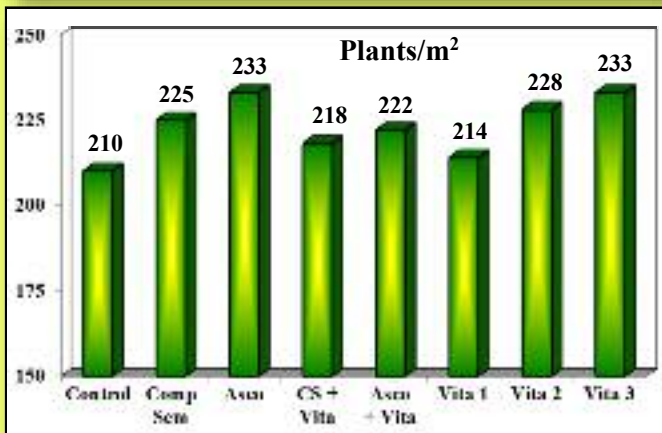
Plant Height



Dry Matter Per Meter²



Plant Number Per Meter²



At 15 days after planting, the seed treatments all increased the plant number (surviving seedlings) and the dry matter per unit area. Plant height was affected erratically by the several treatments.

Increase in Dry Matter at 15 Days

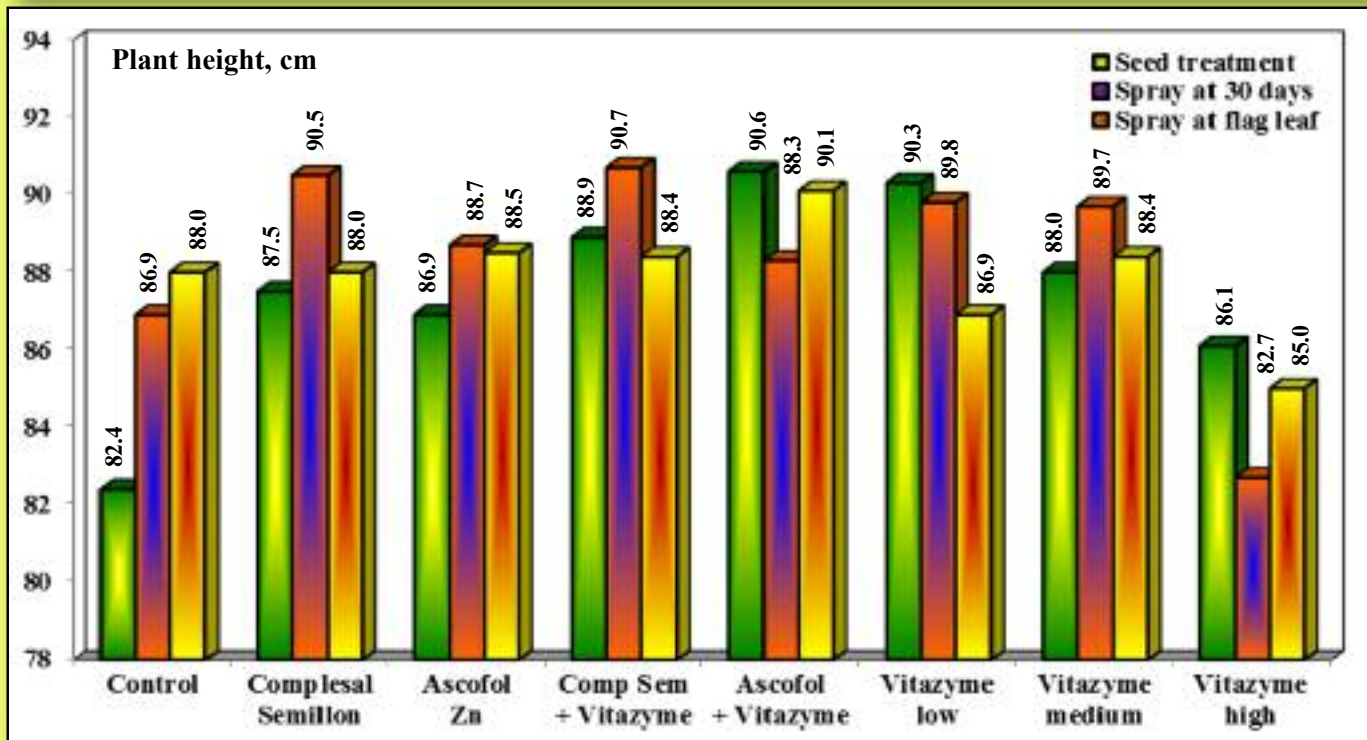
- | | |
|------------------------|------|
| 2. Complezal Semillon | +5% |
| 3. Ascofol Zn | +13% |
| 4. Comp Sem + Vitazyme | +47% |
| 5. Ascofol + Vitazyme | +52% |
| 6. Vitazyme low | +33% |
| 7. Vitazyme medium | +35% |
| 8. Vitazyme high | +34% |

Increase in Plants at 15 Days

- | | |
|------------------------|------|
| 2. Complezal Semillon | +7% |
| 3. Ascofol Zn | +11% |
| 4. Comp Sem + Vitazyme | +4% |
| 5. Ascofol + Vitazyme | +6% |
| 6. Vitazyme low | +2% |
| 7. Vitazyme medium | +9% |
| 8. Vitazyme high | +11% |

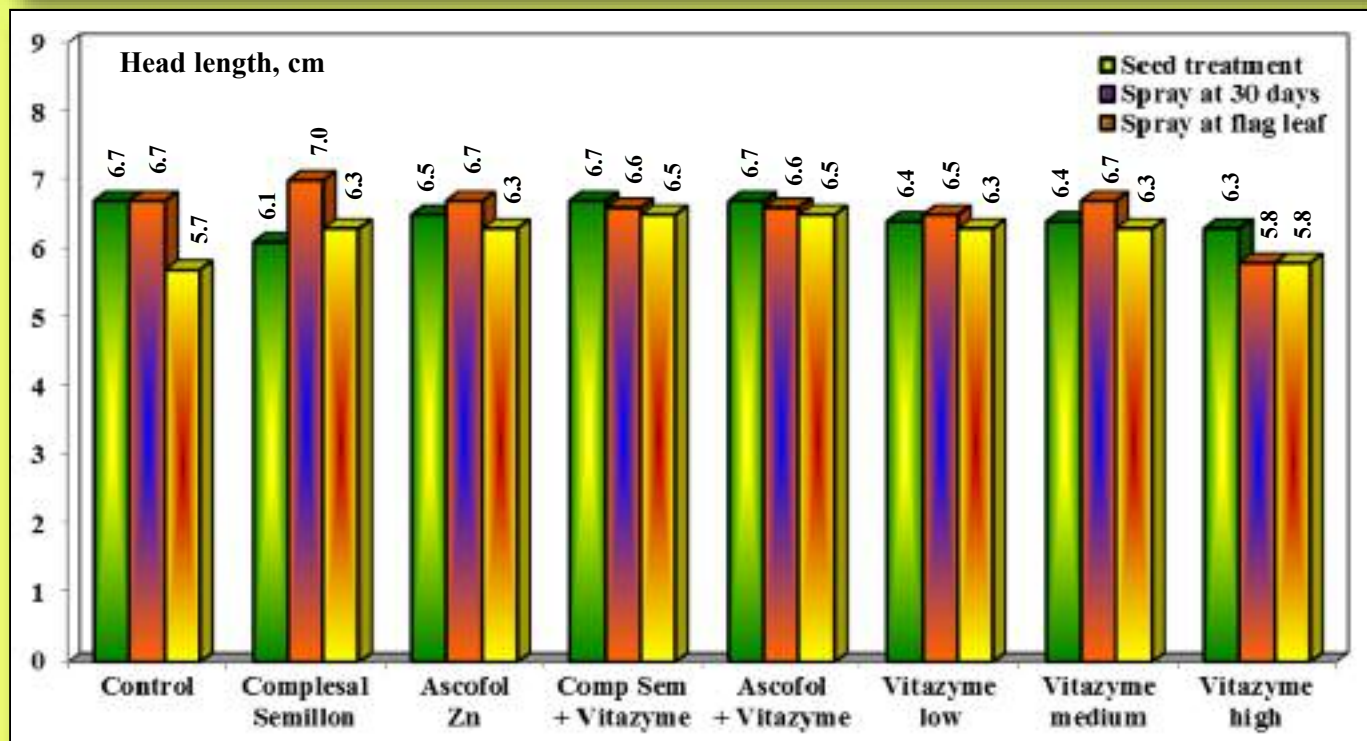
Harvest and yield results:

Plant Height At Harvest



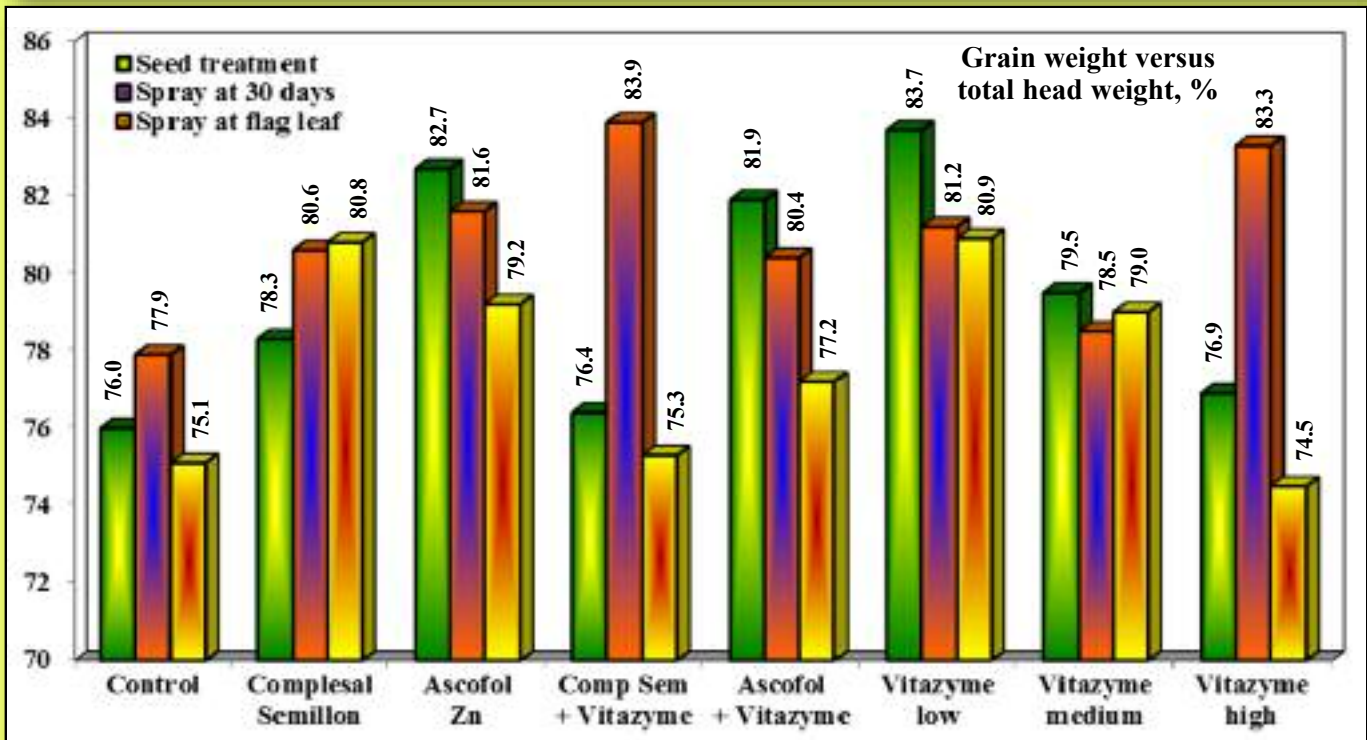
There was considerable variability in plant height, though most treatments exceeded the height of the control for all three application regimes. In general, the foliar application at 30 days increased plant height the most for the Complestal Semillon, Ascofol Zn, Complestal Semillon + Vitazyme, and Vitazyme at the medium level. Vitazyme seed treatment and the other treatments all exceeded the control in height by a lot.

Head Length



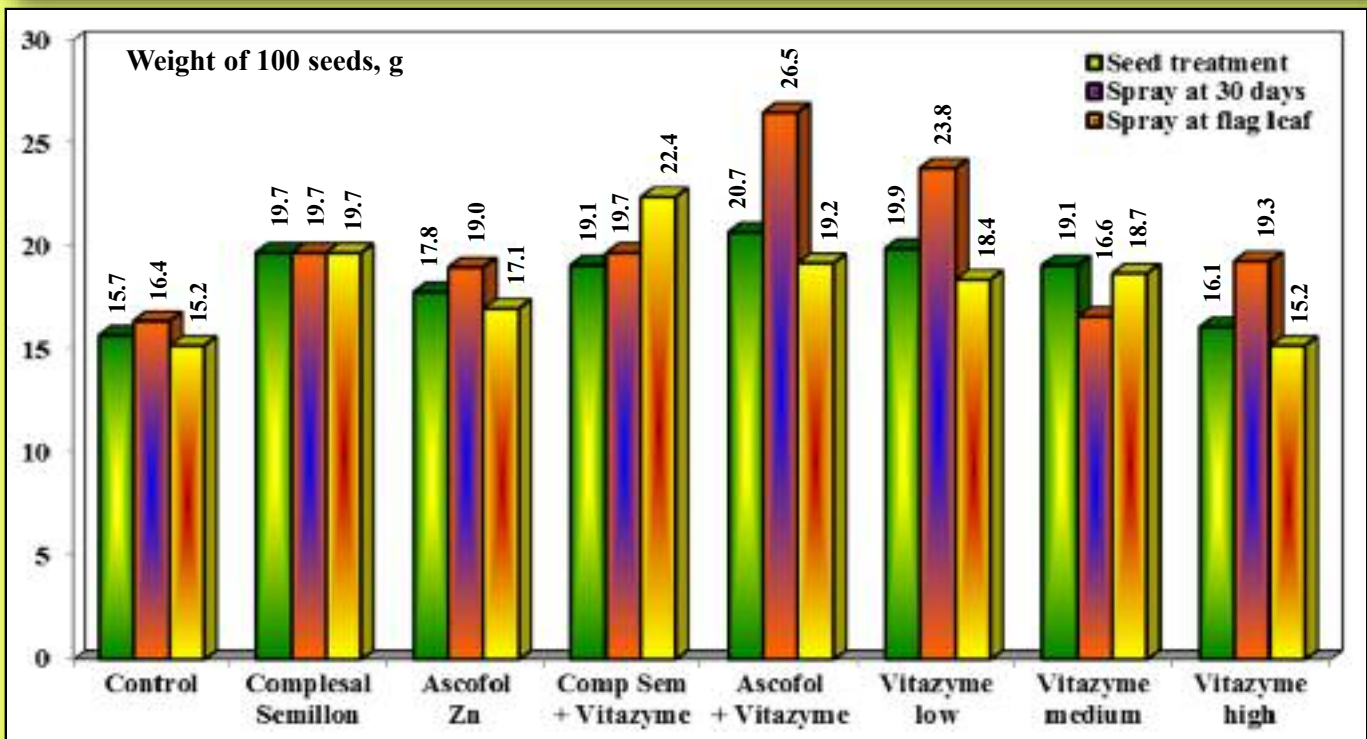
Head length did not vary significantly among the eight treatments, although the highest rate of Vitazyme tended to produce the shortest heads.

Percent Grain in Heads



Numbers did not vary dramatically, but the highest values were for Vitazyme + Complelal Semillon and the high Vitazyme applications at 30 days after emergence.

Weight of 100 Seeds

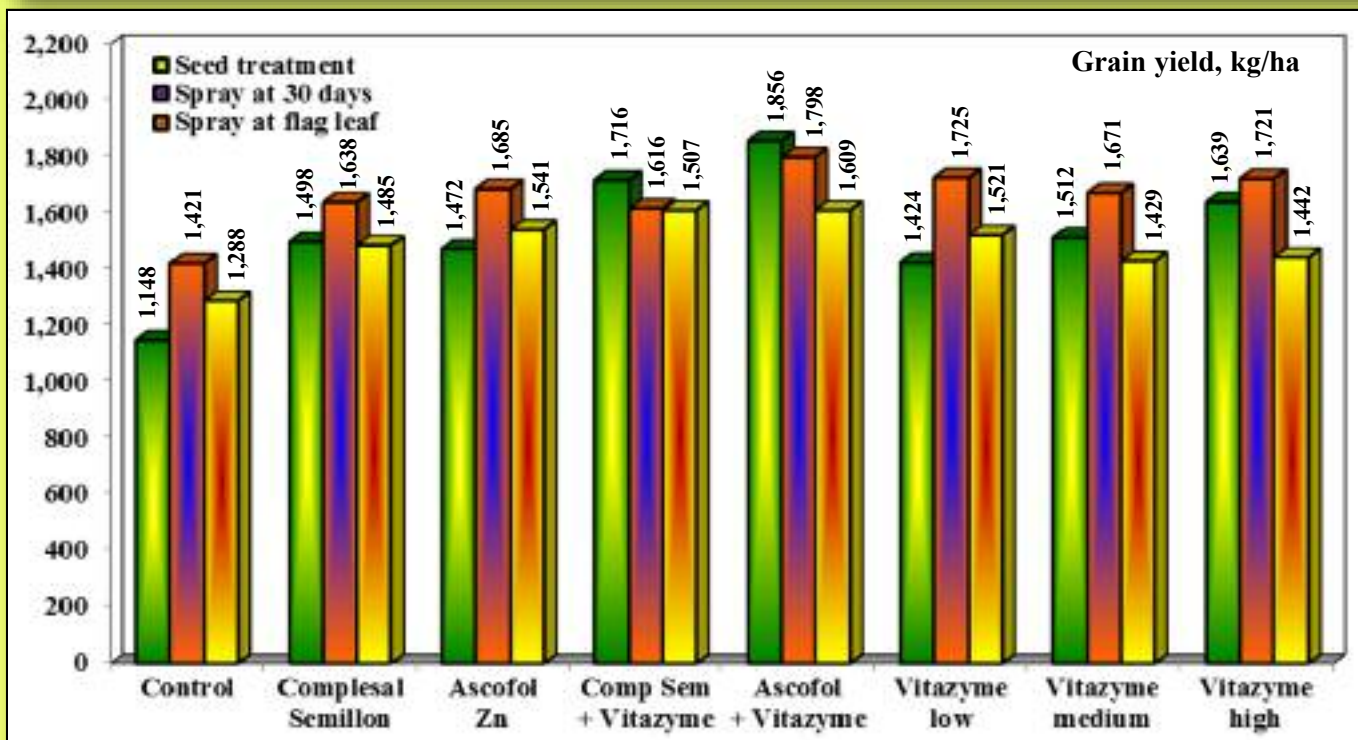


In nearly every application regime the Vitazyme, with or without additives, improved seed weight, sometimes dramatically. The greatest increase was 62% with Vitazyme + Ascofol Zn.

Increase in 100 Seed Weight With Vitazyme

	<u>Seed treatment</u>	<u>Foliar 30 days</u>	<u>Foliar flag leaf</u>
2. Complestal Semillon	25%	20%	30%
3. Ascofol Zn	13%	16%	13%
4. Comp Sem + Vita	22%	20%	47%
5. Ascofol + Vita	32%	62%	26%
6. Vitazyme low	27%	45%	21%
7. Vitazyme medium	22%	1%	23%
8. Vitazyme high	3%	18%	0%

Grain Yield

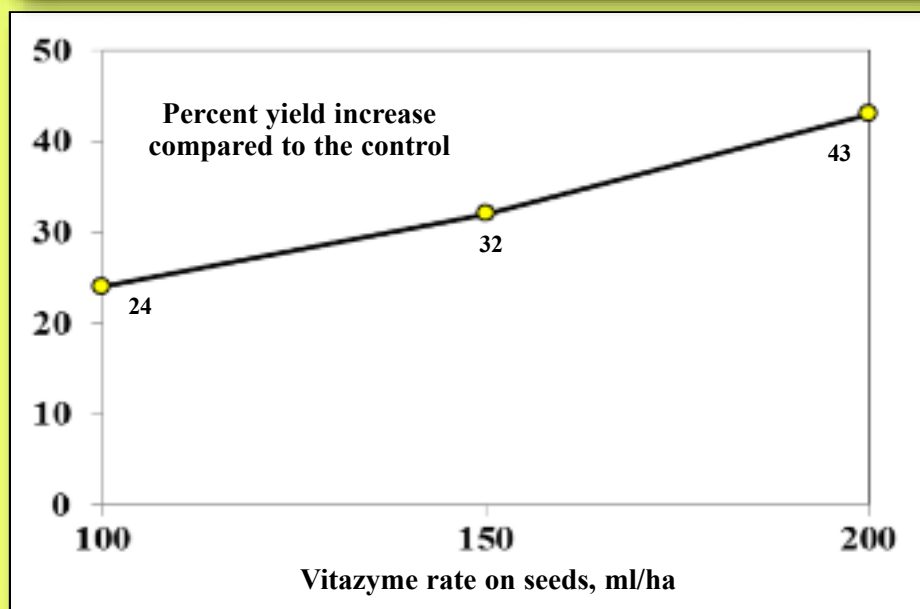


Every Vitazyme and product treatment increased the grain yield above the control. The smallest increase was 7%, and the highest was 62%, for the Ascofol Zn + Vitazyme seed treatment. The combination gave the highest yield for all three applications. Vitazyme seed treatment responses increased as the application level increased.

Increase in Grain Yield With Vitazyme

	<u>Seed treatment</u>	<u>Foliar 30 days</u>	<u>Foliar flag leaf</u>
2. Complesal Semillon	30%	15%	15%
3. Ascofol Zn	29%	19%	20%
4. Comp Sem + Vita	49%	7%	17%
5. Ascofol + Vita	62%	27%	25%
6. Vitazyme low	24%	21%	18%
7. Vitazyme medium	32%	18%	11%
8. Vitazyme high	43%	21%	12%

Wheat Grain Response to Vitazyme Seed Application



The grain response to the medium and high Vitazyme rates was 11 to 12%, while the low rate gave an 18% yield increase; yield responses for these two rates were much higher (18 to 21%) when applied 30 days after emergence.

Conclusions: According to the researcher, “According to what was observed in the field, in the first year’s work, it was able to notice the good compatibility of Vitazyme with other products. Vitazyme by itself and in mixtures do not present any phytotoxicity effect, and according to the comparative bar graphs the most suitable moments of application would be in a seed treatment and in a foliar spray 30 days after emergence.”

Vital Earth Resources

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

2013 Crop Results

Vitazyme and Kelpek on Winter Wheat

Researcher: V.V. Plotnikov

Research organization: Scientific, Innovation, and Technology Center of the Institute of Forages and Agriculture of Podillya NAAS

Location: National Academy of Agricultural Sciences, Ukraine

Variety: Tsarivna

Soil type: ash gray soil (humus = 2.2%, hydrolyzed-N = 8.4 mg/100 g of soil, P = 15.8 mg/100 kg of soil, exchangeable K = 12.4 mg/100 g of soil, pH = 5.5)

Previous crop: soybeans

Planting date: October 7, 2012

Soil preparation: disking, plowing, cultivating

Planting rate: 6 million seeds/ha

Experimental design: A replicated trial (four reps), with 0.1 ha plots, was established to evaluate the effectiveness of Vitazyme and Kelpek, applied at tillering, in affecting the yield and profitability of winter wheat.

1. Control

2. Kelpek

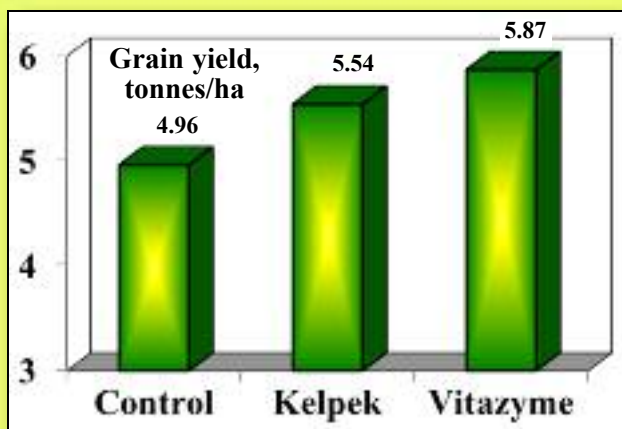
3. Vitazyme

Fertilization: fall, 0-30-45 kg/ha N-P₂O₅-K₂O plowed in; spring, 80 kg/ha N

Vitazyme application: 1 liter/ha sprayed on the leaves at tillering (April 25, 2013).

Kelpek application: 2 liters/ha sprayed on the leaves at tillering (April 25, 2013).

Yield results:



Increase in yield with ...

Kelpek 12%

Vitazyme 18%

Income results: Profit with Kelpek = 807 UAH/ha

Profit with Vitazyme = 1,511 UAH/ha

Conclusions: According to the Ukrainian researchers,

1. Vitazyme use at a rate of 1.0 L/ha at the tillering stage of winter wheat provided the increase of grain yields at the level of 0.91 tonne/ha, or 18%. When using a competitive product Kelpek at a rate of 2 L/ha at the tillering stage of winter wheat, the grain yield increase was 0.58 tonne/ha or 12%, and was 0.33 tonne/ha less than when using Vitazyme.

2. When using Vitazyme at a rate of 1.0 L/ha for winter wheat plants, the profit is 1,511 UAH/ha, which is 704 UAH/ha more than when Kelpek was applied at a rate of 2 L/ha.

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2013 Crop Results

Vitazyme on Winter Wheat

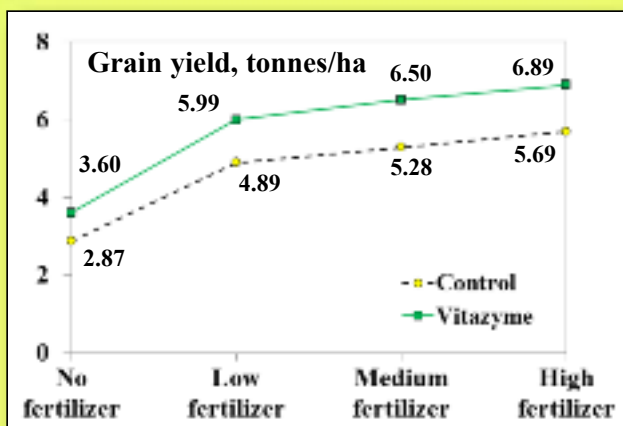
Researcher: V.V. Plotnikov Research organization: Scientific, Innovation, and Technology Center of the Institute of Forages and Agriculture of Podillya NAAS Location: National Academy of Agricultural Sciences, Ukraine
Variety: Tsarivna Soil type: ash gray soil (humus = 2.2%, hydrolyzed-N = 8.4 mg/100 g of soil, P = 15.8 mg/100 kg of soil, exchangeable K = 12.4 mg/100 g of soil, pH = 5.5)
Soil preparation: disking, plowing, cultivating Previous crop: peas Planting date: October 3, 2012
Experimental design: A plot study with four replicates was set up with four fertility levels, to determine the effect of Vitazyme at each fertility level on grain yield, quality, yield parameters, and fungal diseases. Planting rate: 6 million seeds/ha

Treatment	Nitrogen	Phosphorus	Potassium
	kg/ha	kg/ha	kg/ha
1. Control	0	0	0
2. Control + Vita	0	0	0
3. Low fertility	60	30	45
4. Low fert + Vita	60	30	45
5. Medium fertility	90	40	60
6. Medium fert + Vita	90	40	60
7. High fertility	120	50	75
8. High fert + Vita	120	50	75

Fertilization: See the treatment table above. Phosphorus and potassium amendments were applied in the fall, and nitrogen was applied in the spring.

Vitazyme application: (1) a seed treatment of 1 liter/tonne of seed; (2) a foliar spray at tillering of 1 liter/ha

Yield results:



Yield increase with Vitazyme

No fertilizer 25%
Low fertilizer 22%
Medium fertilizer 23%
High fertilizer 21%

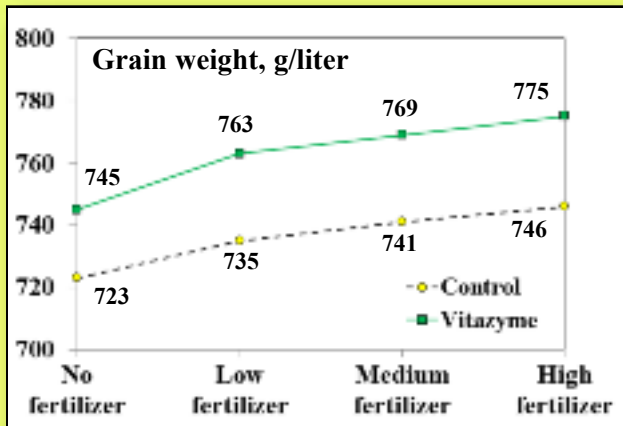
At all fertility levels, Vitazyme increased the grain yield substantially, from 21 to 25%.

Income results: Increases in income from Vitazyme were as follows:

Vitazyme net income increase	
No fertilizer	1,050 UAH/ha
Low fertilizer	1,837 UAH/ha
Medium fertilizer	2,044 UAH/ha
High fertilizer	2,006 UAH/ha

At all fertility levels Vitazyme improved profits, but the highest profit was realized at the medium level, followed closely by the high fertility level.

Grain density results:

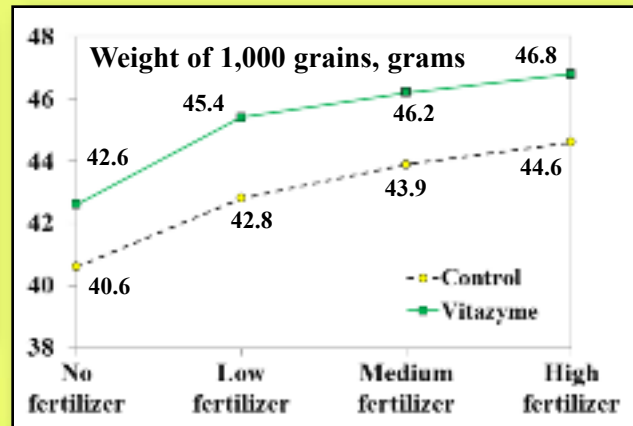


Grain density increase with Vitazyme	
No fertilizer	3.0%
Low fertilizer	3.8%
Medium fertilizer	3.8%
High fertilizer	3.9%

Grain density is quite difficult to change, but Vitazyme consistently improved it by 3 to 4%.

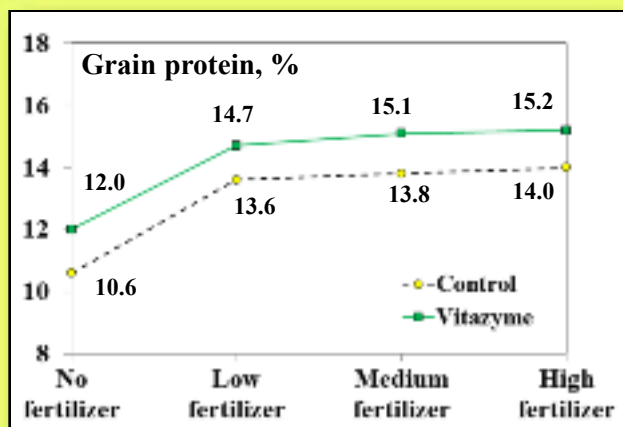
1,000-grain weight results:

1,000-grain weight increase with Vitazyme	
No fertilizer	4.9%
Low fertilizer	6.1%
Medium fertilizer	5.2%
High fertilizer	4.9%



The weight of 1,000 grains increased with the fertility level, and parallels the grain density data above.

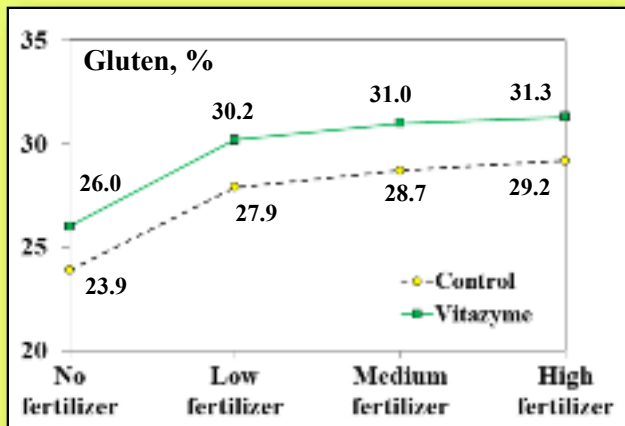
Crude protein results:



Increase in crude protein with Vitazyme	
No fertilizer	1.4%-points
Low fertilizer	1.1%-points
Medium fertilizer	1.3%-points
High fertilizer	1.2%-points

Increasing fertilizer rates uniformly raised grain protein, with Vitazyme consistently increasing the level above the control.

Grain gluten results:



Increase in gluten with Vitazyme

No fertilizer 2.1%-points
Low fertilizer 2.3%-points
Medium fertilizer 2.3%-points
High fertilizer 2.1%-points

Grain gluten rose along with the fertilizer levels, and Vitazyme always exceeded the untreated control.

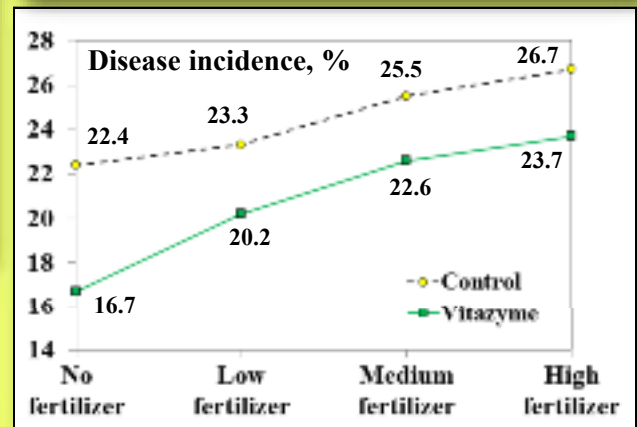
Root rot results:

Reduction in root rot with Vitazyme

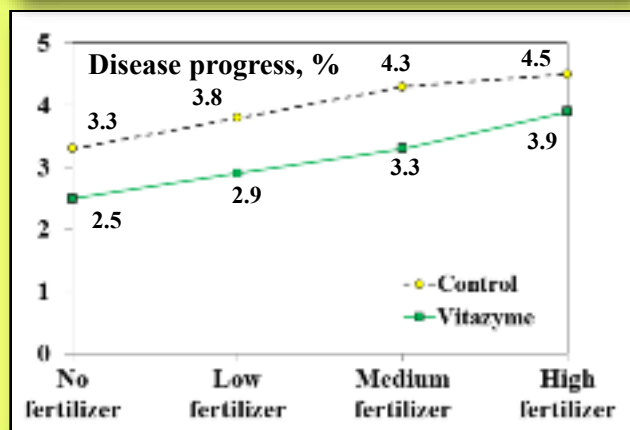
No fertilizer -5.7%-points
Low fertilizer -3.1%-points
Medium fertilizer ... -2.9%-points
High fertilizer -3.0%-points

The incidence of root rot was less in the Vitazyme treated plots, but all incidences of root rot rose with fertilizer levels.

Root Rot Incidence



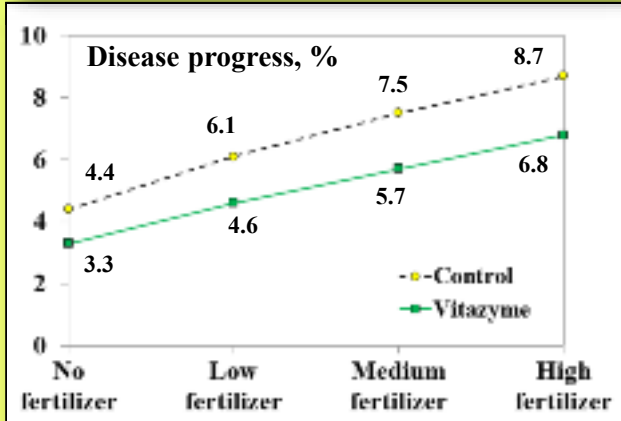
Root Rot Progress



Progress of the root rot complex increased with fertilizer level, but Vitazyme restricted its development at all levels versus the untreated control.

Speckled leaf blotch results: All treatments had 100% incidence of speckled leaf blotch disease, but the progress of the disease was reduced with Vitazyme. Progress increased with fertilizer level.

Leaf Blotch Progress



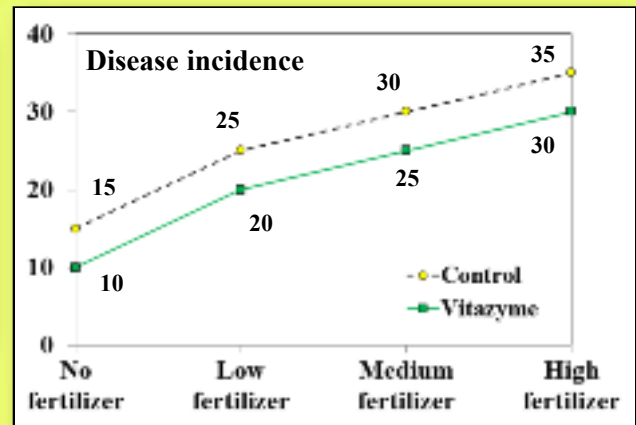
Reduction in speckled leaf blotch disease with Vitazyme

No fertilizer -1.1%-points
 Low fertilizer -1.5%-points
 Medium fertilizer ... -1.8%-points
 High fertilizer -1.9%-points

Speckled spike blotch results:

Reduction in speckled spike blotch disease with Vitazyme

No fertilizer -5%-points
 Low fertilizer -5%-points
 Medium fertilizer -5%-points
 High fertilizer -5%-points



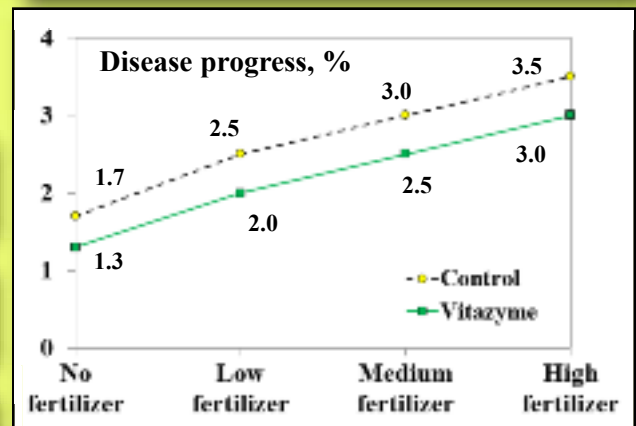
Vitazyme reduced speckled spike blotch fungal disease below the control levels, and all incidences increased with the fertilizer rate. Disease progress paralleled the disease incidence.

Wheat structural elements results:

Increase in head density with Vitazyme: 5 to 6%

Increase in kernels/head with Vitazyme: 9 to 13%

Increase in grain weight/head with Vitazyme: 14 to 18%



Treatment	Head Density		Kernels/Head		Grain/Head	
	Control	Vitazyme	Control	Vitazyme	Control	Vitazyme
	----- heads/m ² -----		----- kernels/head -----		----- grams -----	
No fertilizer	404	429 (+6%)	17.5	19.7 (+13%)	0.71	0.84 (+18%)
Low fertilizer	537	565 (+5%)	21.3	23.3 (+9%)	0.91	1.06 (+16%)
Medium fertilizer	556	586 (+5%)	21.6	24.0 (+11%)	0.95	1.11 (+17%)
High fertilizer	581	615 (+6%)	22.0	23.9 (+9%)	0.98	1.12 (+14%)

All three parameters increased with fertilizer level, and Vitazyme pushed the values in every case above the control values.

Conclusions: In the words of the researchers,

1. Without fertilizer application the double use of liquid organic mineral fertilizer Vitazyme for winter wheat seed dressing of Tsarivna variety, at a rate of 1 L/tonne, and for plant treatment at the tillering stage at a rate of 1.0 L/ha, provided compared to the control (without Vitazyme) the grain increase of 0.73% tonnes/ha, or 25%. The plots with mineral fertilization systems after Vitazyme application had yield increases of 1.11-1.22 tons/ha, or 21-23%.

2. Vitazyme use when growing winter wheat on the experimental plot without fertilizers gave the profit of 1,050 UAH/ha compared to the control, and the plots with NPK doses increased the profit by 1,837-2,044 UAH/ha.

3. Winter wheat grain of Tsarivna variety, grown with the use of Vitazyme, had better quality characteristics on every experimental plot compared to the control plot without Vitazyme use. The grain units increased by 22-29 grams/L, 1,000 grain weight by 2.0-2.6 grams, gluten by 2.1-2.3%, and crude protein by 1.1-1.4%.

4. On every plot of winter wheat of Tsarivna variety with various NPK doses, and also without fertilizers, with Vitazyme compared to the control, the plants affected by root rot decreased by 22-24%, speckled leaf blotch by 22-25% and speckled spike blotch by 14-23%.

5. The yield structure of winter wheat of Tsarivna variety under various backgrounds of nitrogen-phosphate-potassium fertilizers on every plot applied with Vitazyme was improved. The density of productive heads was increased by 25-34 units/m², the number of kernels in a head by 1.9-2.4 units, and grain weight from the head by 0.13-0.16 gram.

6. *By using Vitazyme for a seed dressing and applied to winter wheat plants, without fertilizers the grain quality increased from the 6th to the 3rd class, and with $N_{60}P_{30}K_{45}$ application to the 1st class.*

Vital Earth Resources

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

2012 Crop Results

Vitazyme on Wheat

Seed Treatment Results in the Greenhouse

Researcher: Paul W. Sylie

Location: Vital Earth Resources Research Greenhouse, Gladewater, Texas

Variety: hard red winter

Planting date: March 14, 2012

Pot size: 1 gallon

Soil type: silt loam

Seeding rate: 50 seeds/pot

Experimental design: Wheat seeds were treated on January 1, 2012, and planted on March 14, 2012, 57 days after treatment, to evaluate the effects of Vitazyme seed treatment over time. Four replicates were used in a randomized block design to determine plant growth.

1. Control

2. Vitazyme seed treatment

Fertilization: none

Vitazyme treatment: On January 17, wheat seeds were soaked in a 10% Vitazyme solution for 6 minutes, then dried on paper towels with a fan blowing over them for rapid evaporation. The seeds were stored at room temperature.

Harvest date: April 5, 2012, 21 days after planting

Dry weight results: The plants were washed free of soil and placed in a drying oven at 115° F for 24 hours, then weighed to the nearest 0.01 gram.

Treatment	Dry weight	Weight change
	g	g
Control	5.71 a	—
Vitazyme seed trt.	5.78 a	0.07 (+1%)
Block P	0.1124	
Treatment P	0.6984	
Model P	0.1548	
CV _{0.10}	4.18%	
LSD _{0.10}	0.40 gram	

While Vitazyme produced a small increase of 1%, this increase was not significant.

Conclusions: Wheat seeds planted in the greenhouse 57 days after a seed treatment were stimulated to produce 1% more biomass at 21 days after planting. This was a nonsignificant increase in growth, but an indication that the seed treatment was having a positive effect.

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

2011 Crop Results

Vitazyme on Winter Wheat

Researcher: Unknown

Research coordinator: I.V. Braginets

Research organization: Alfa-Agro, Ukraine

Variety: unknown

Experimental design: A field was divided into a Vitazyme treated and an untreated portion to evaluate the effect of this product on crop yield.

1. Control

2. Vitazyme

Fertilization: farm practice

Vitazyme application: 1 liter/ha sprayed on the leaves and soil after the spring herbicide treatment

Yield results: No yield results are available, but the increase in yield is given.

**Increase in wheat yield with Vitazyme:
0.6 ton/ha (8.9 bu/acre)**

Conclusion: This yield increase was an excellent result of Vitazyme application in this Ukraine study.

Vital Earth Resources

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2011 Crop Results

Vitazyme on Winter Wheat

Researchers: university personnel Research organization: Kubansky State Agrarian University, Department of Plant Physiology Location: Krasnodar, Russia Variety: Graciya

Soil type: leached black soil (organic matter = 3.5 to 4.5%, surface N = 0.16 to 0.18%, mobile P = 17.2 to 35.7 mg/100g, mobile K = 10.2 to 37.0 mg/100 g, total bases = 33.0 to 34.3 mg-ekv/100 g of soil)

Experimental design: A replicated winter wheat trial was set up in Russia to evaluate the effects of Epin-Extra, a standard growth stimulant, and Vitazyme at three rates on the growth, yield, and quality of the crop.

Treatment	Seed treatment	Early boot
1. Control	0	0
2. Epin-Extra	0.2 liter/ton	0.05 liter/ha
3. Vitazyme	0.1 liter/ton	0.1 liter/ha
4. Vitazyme	0.5 liter/ton	0.5 liter/ha
5. Vitazyme	1.0 liter/ton	1.0 liter/ha

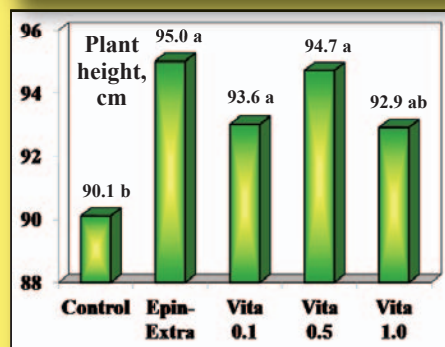
Fertilization: unknown

Vitazyme application: 0.1, 0.5, or 1.0 liter/ton of seed applied before planting; 0.1, 0.5, or 1.0 liter/ha sprayed on the leaves and the soil in the spring at the early boot stage

Epin-Extra: 0.2 liter/ton of seed applied before planting; 0.05 liter/ha sprayed on the leaves and soil in the spring at the early boot stage

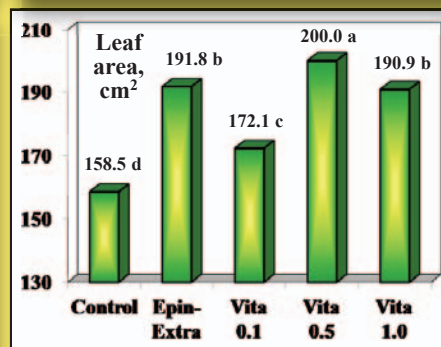
Growth results: Before harvest during growth, the height, leaf area, and weight of the plants were measured.

Plant Height¹



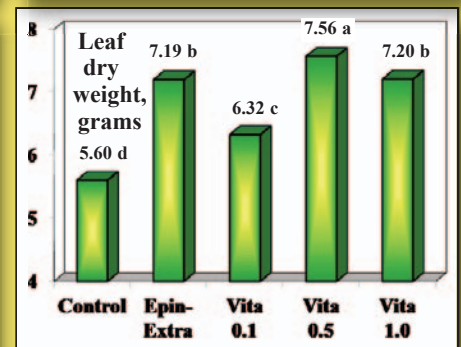
¹HCP_{0.05}=3.2 cm. Means followed by the same letter are not significantly different at P=0.05

Leaf Area¹



¹HCP_{0.05}=6.3 cm². Means followed by the same letter are not significantly different at P=0.05

Dry Weight (Above-Ground)¹



¹HCP_{0.05}=0.21 grams. Means followed by the same letter are not significantly different at P=0.05

Increase in plant height with Epin-Extra and Vitazyme

Epin-Extra	+5%
0.1 liter/ha	+4%
0.5 liter/ha	+5%
1.0 liter/ha	+2%

All products provided height increases that were statistically equal, with all but the 0.5 liter/ha rate being greater than the control.

Increase in leaf area with Epin-Extra and Vitazyme

Epin-Extra	+21%
0.1 liter/ha	+9%
0.5 liter/ha	+26%
1.0 liter/ha	+20%

The four treatments all gave leaf area increases significantly greater than the control, especially Vitazyme at 0.5 liter/ha.

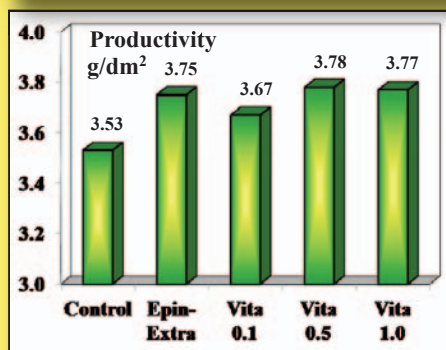
Increase in above-ground dry weight with Epin-Extra and Vitazyme

Epin-Extra	+28%
0.1 liter/ha	+13%
0.5 liter/ha	+35%
1.0 liter/ha	+29%

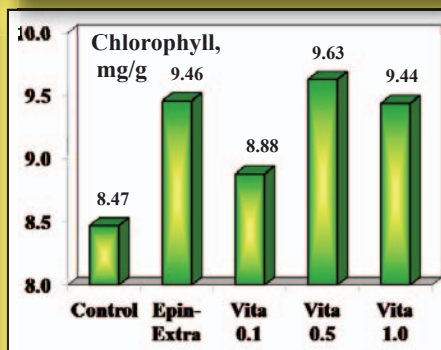
All treatments were significantly greater than the control for dry weight, especially the 0.5 liter/ha Vitazyme treatment.

Leaf productivity, chlorophyll, and carotene results:

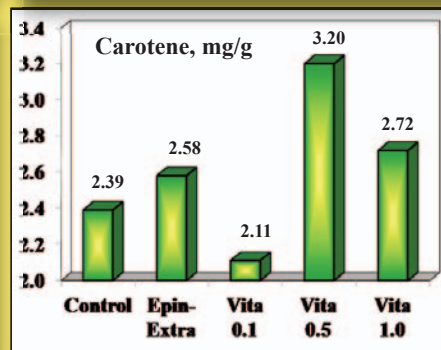
Leaf Productivity



Chlorophyll a + b



Carotene



Increase in leaf productivity with Epin-Extra and Vitazyme

Epin-Extra	+6%
0.1 liter/ha	+4%
0.5 liter/ha	+7%
1.0 liter/ha	+7%

All treatments increased leaf productivity by a similar level, from 4 to 7%

Increase in total leaf chlorophyll with Epin-Extra and Vitazyme

Epin-Extra	+12%
0.1 liter/ha	+5%
0.5 liter/ha	+14%
1.0 liter/ha	+11%

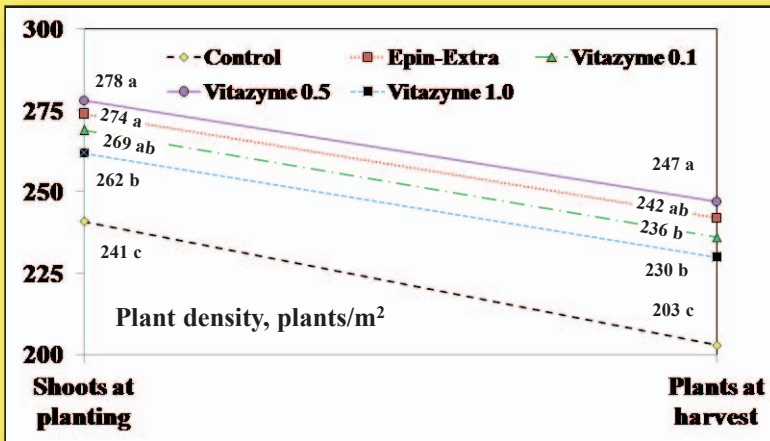
Chlorophyll a + b was increased by all treatments, by up to 14% by the 0.5 liter/ha Vitazyme application.

Change in leaf carotene with Epin-Extra and Vitazyme

Epin-Extra	+8%
0.1 liter/ha	-12%
0.5 liter/ha	+34%
1.0 liter/ha	+14%

Carotene was greatly increased by the 0.5 liter/ha Vitazyme treatment (34%), with the 0.1 liter/ha rate lowering the content.

Crop density and survival results:



HCP_{0.05} = 9.0 plants/m² HCP_{0.05} = 7.9 plants/m²
 Means followed by the same letter are not significantly different at P = 0.05.

Plant Emergence

Epin-Extra	+14%
0.1 liter/ha	+12%
0.5 liter/ha	+15%
1.0 liter/ha	+9%

All treatments significantly increased plant emergence, especially the 0.5 liter/ha Vitazyme treatment.

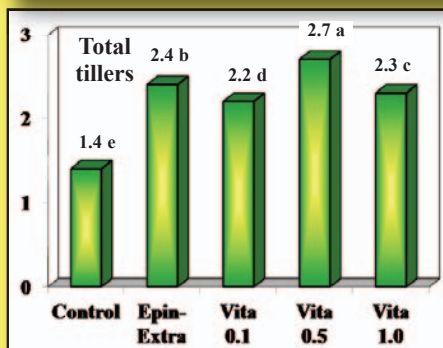
Plant Survival

Epin-Extra	+14%
0.1 liter/ha	+12%
0.5 liter/ha	+15%
1.0 liter/ha	+9%

All treatments gave 88 to 89% survival, compared to 84% for the control treatment.

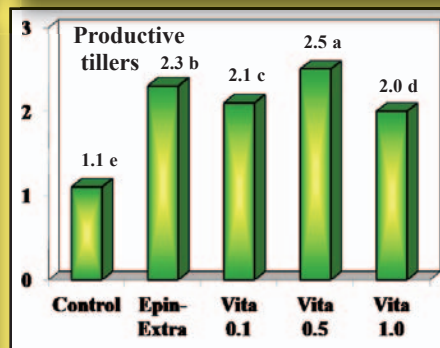
Harvest parameter results:

Total Tillers/Plant



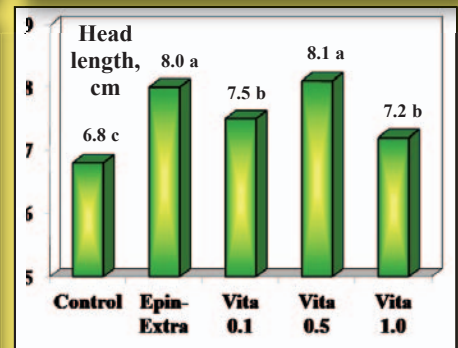
HCP_{0.05} = 0.07 tillers/plant. Means followed by the same letter are not significantly different at P=0.05

Productive Tillers/Plant



HCP_{0.05} = 0.06 tillers/plant. Means followed by the same letter are not significantly different at P=0.05

Head Length



HCP_{0.05} = 0.3 cm. Means followed by the same letter are not significantly different at P=0.05

Increase in tillers/plant with Epin-Extra and Vitazyme

Epin-Extra	+71%
0.1 liter/ha	+57%
0.5 liter/ha	+93%
1.0 liter/ha	+64%

All treatments significantly increased total tillers per plant, especially the 0.5 liter/ha Vitazyme applications, which exceeded all other treatments.

Increase in productive tillers/plant with Epin-Extra and Vitazyme

Epin-Extra	+109%
0.1 liter/ha	+91%
0.5 liter/ha	+127%
1.0 liter/ha	+82%

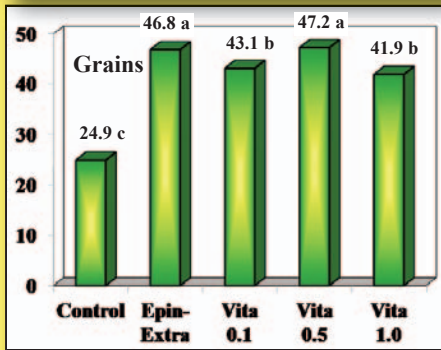
The productive tillers reflected the total tiller values, with Vitazyme at 0.5 liter/ha exceeding all other treatments.

Increase in head length with Epin-Extra and Vitazyme

Epin-Extra	+18%
0.1 liter/ha	+10%
0.5 liter/ha	+19%
1.0 liter/ha	+6%

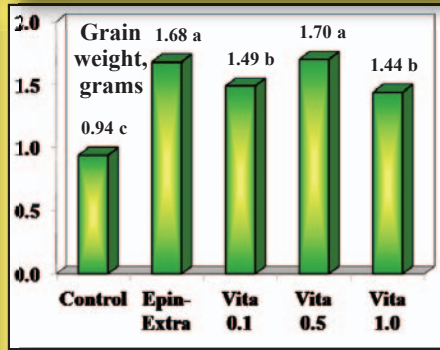
Head length was significantly greater for all applications, especially Vitazyme at 0.5 liter/ha and Epin-Extra.

Grains/Plant



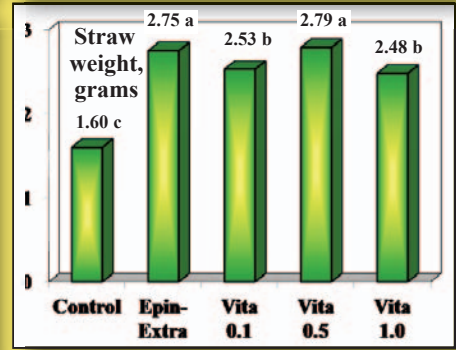
HCP_{0.05}=1.3 grains/stalk. Means followed by the same letter are not significantly different at P=0.05

Grain Weight/Plant



HCP_{0.05}=0.06 grams. Means followed by the same letter are not significantly different at P=0.05

Straw Weight/Plant



HCP_{0.05}=0.08 grams. Means followed by the same letter are not significantly different at P=0.05

Increase in grains/plant with Epin-Extra and Vitazyme

Epin-Extra	+88%
0.1 liter/ha	+73%
0.5 liter/ha	+90%
1.0 liter/ha	+68%

Grains/plant for all treatments significantly increased dramatically for all treatments.

Increase in grain weight/plant with Epin-Extra and Vitazyme

Epin-Extra	+79%
0.1 liter/ha	+59%
0.5 liter/ha	+81%
1.0 liter/ha	+53%

Grain weight/plant greatly increased for all treatments at significant levels, especially for the 0.5 liter/ha Vitazyme rate.

Increase in straw weight/plant with Epin-Extra and Vitazyme

Epin-Extra	+72%
0.1 liter/ha	+58%
0.5 liter/ha	+74%
1.0 liter/ha	+55%

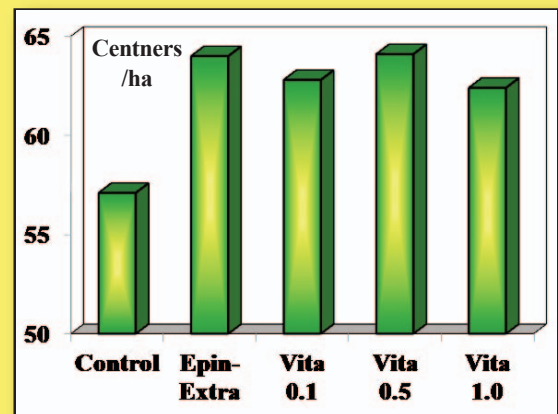
All treatments significantly increased straw weight/plant, especially the 0.5 liter/ha Vitazyme application.

Yield results:

Treatment	Yield centners/ha	Yield increase centners/ha
1. Control	57.1 b	—
2. Epin-Extra	64.0 a	6.9 (+12%)
3. Vitazyme, 0.1 L/ha	62.8 a	5.7 (+10%)
4. Vitazyme, 0.5 L/ha	64.1 a	7.0 (+12%)
5. Vitazyme, 1.0 L/ha	62.4 a	5.3 (+9%)
HCP _{0.05}	2.9 centners/ha	

Increase in yield

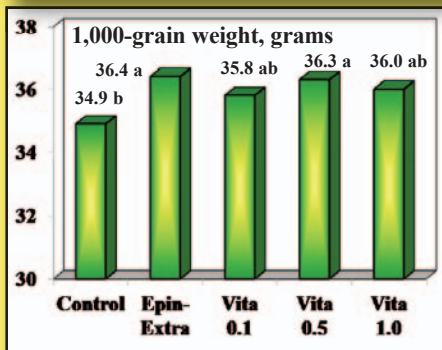
Epin-Extra	+12%
0.1 liter/ha	+10%
0.5 liter/ha	+12%
1.0 liter/ha	+9%



All treatments significantly boosted yield – by 9 to 12% – above the control, the best yield being with Vitazyme at 0.5 liters/ha. All yields except the control were statistically equal.

Grain quality results:

1,000-Grain Weight



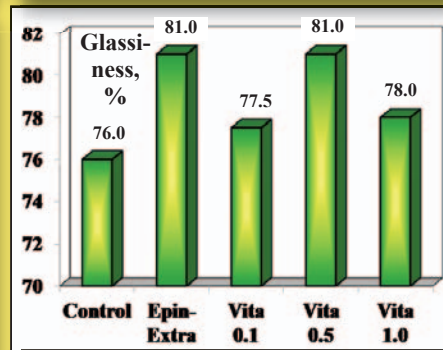
HCP_{0.05}=1.1 grams. Means followed by the same letter are not significantly different at P=0.05

Increase in 1,000-grain weight with Epin-Extra and Vitazyme

Epin-Extra	+4%
0.1 liter/ha	+3%
0.5 liter/ha	+4%
1.0 liter/ha	+3%

Vitazyme at 0.5 liter/ha and Epin-Extra significantly increased 1,000-grain weight above the control.

Glassiness

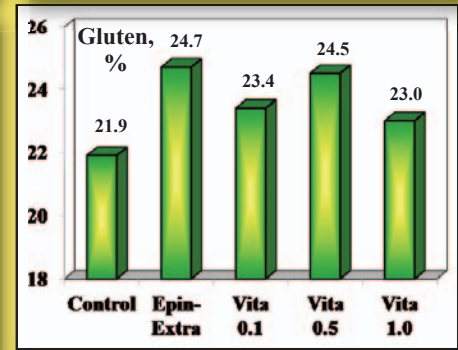


Increase in glassiness with Epin-Extra and Vitazyme

Epin-Extra	+7%
0.1 liter/ha	+2%
0.5 liter/ha	+7%
1.0 liter/ha	+3%

Glassiness was improved by all treatments, but especially by Vitazyme at 0.5 liter/ha and Epin-Extra.

Gluten



Increase in grain gluten with Epin-Extra and Vitazyme

Epin-Extra	+72%
0.1 liter/ha	+58%
0.5 liter/ha	+74%
1.0 liter/ha	+55%

All treatments increased gluten content of the grain, but Epin-Extra + Vitazyme at 0.5 liter/ha increased it most.

Conclusion: An in-depth replicated winter wheat study in Russia revealed that both Vitazyme (at three rates) and Epin-Extra improved seed germination (9 to 15%, Vitazyme at 0.5 liter/ha the highest) and survival through the winter (88 to 89%, Vitazyme at 0.5 liter being best). Plant height, leaf area, and dry weight were improved significantly by both products, the most with 0.5 liter/ha Vitazyme. Leaf chlorophyll and carotene were also increased by both Vitazyme and Epin-Extra, the 0.5 liter/ha Vitazyme rate giving a 34% increase in carotene. Harvest parameters also revealed the superiority of the 0.5 liter/ha Vitazyme rate, as values significantly improved at P=0.05 for all treatments for tillers/plant (57 to 93%), productive tillers/plant (82 to 127%), head length (6 to 19%), grains/plant (68 to 90%), grain weight/plant (53 to 81%), and straw weight/plant (55 to 74%). In each case the 0.5 liter/ha rate of Vitazyme gave the highest values. All treatments significantly improved the yield above the control, and were statistically equal, but 0.5 liter/ha Vitazyme gave the highest yield. Grain quality-weight, glassiness, and gluten content were all improved by the products as well. **In summary, the effectiveness of the treatments were Vitazyme (0.5 liter/ton of seed + 0.5 liter/ha foliar) > Epin-Extra > Vitazyme (1.0 liter/ton of seed + 1.0 liter/ha foliar) > Vitazyme (0.1 liter/ton of seed + 0.1 liter/ha foliar).**

Vital Earth Resources

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

2011 Crop Results

Vitazyme on Winter Wheat

Researchers: R.M. Gafurov, Ph.D., and L.I. Malutova

Research organization: Russian

Agricultural Academy, State Research Institution, Moscow Research Institute of Agriculture "Nemchinovka"

Location: Russia

Variety: Moscow-56

Planting rate: 4,500,000 seeds/ha

Soil type: sod-podzol (organic matter = 2.9%, pH = 5.7, available P = 170 to 190 mg/kg, exchangeable K = 92 to 110 mg/kg)

Experimental design: A wheat experimental area was treated with Epin-Extra, the typical seed and foliar treatment, and two Vitazyme treatments in an effort to evaluate their effects on growth parameters and harvest data. Four replicates were used.

Treatment	Seed treatment	Tillering
1. Control	0	0
2. Epin-Extra	0.2 liter/ton	0.05 liter/ha
3. Vitazyme	0.5 liter/ton	0.5 liter/ha
4. Vitazyme	1.0 liter/ton	1.0 liter/ha

Fertilization: before fall planting, 64 kg/ha of N, 64 kg/ha of P₂O₅, and 64 kg/ha K₂O; at the beginning of regrowth, 36 kg/ha of NH₄NO₃

Vitazyme treatment: either 0.5 or 1.0 liter mixed with one ton of seed before planting on August 25, 2010; 0.5 or 1.0 liter/ha sprayed on the leaves and soil at tillering on May 15, 2011

Epin-Extra application: 0.2 liter/ton of seed before planting on August 25, 2010, and 0.1 liter/ha sprayed on the leaves and soil at tillering on May 15, 2011

Plant emergence results:

Treatment	Emergence date	Enhanced emergence	Plant population (plants/m ²)	Population change (plants/m ²)
1. Control	Sept. 1	—	410	—
2. Epin-Extra	Aug. 30	+2 days	420	+10
3. Vitazyme, 0.5 L/ha	Aug. 30	+ 2 days	425	+15
4. Vitazyme, 1.0 L/ha	Aug. 30	+ 2 days	425	+15

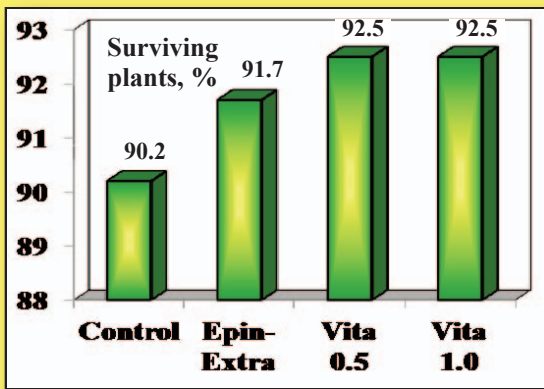
Reduction in time to emergence with Vitazyme

0.5 liter/ha +2 days
1.0 liter/ha +2 days

Increase in plant population with Vitazyme

0.5 liter/ha +15 plants/m²
1.0 liter/ha +15 plants/m²

Overwintering results: After winter, counts were made of surviving plants for each treatment.



Increase in surviving plants with Vitazyme

0.5 liter/ha 2.3 %-points
 1.0 liter/ha 2.3 %-points

Growth results: The following values were determined from a 0.25m² sheave selected from each treatment.

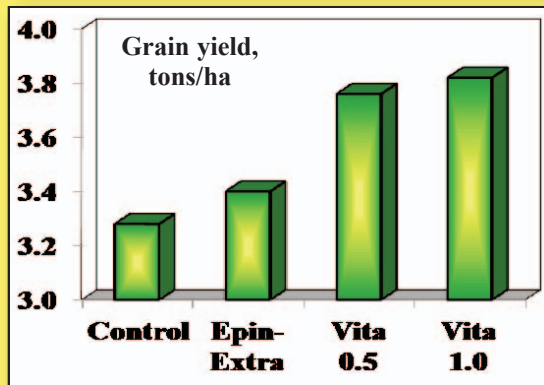
Plant height	Procutive Stalks	Tillering	Head Length																																								
<table border="1"> <thead> <tr> <th>Treatment</th> <th>Plant height, cm</th> </tr> </thead> <tbody> <tr> <td>Control</td> <td>59.7</td> </tr> <tr> <td>Epin-Extra</td> <td>69.2</td> </tr> <tr> <td>Vita 0.5</td> <td>70.0</td> </tr> <tr> <td>Vita 1.0</td> <td>68.5</td> </tr> </tbody> </table>	Treatment	Plant height, cm	Control	59.7	Epin-Extra	69.2	Vita 0.5	70.0	Vita 1.0	68.5	<table border="1"> <thead> <tr> <th>Treatment</th> <th>Stalks/m²</th> </tr> </thead> <tbody> <tr> <td>Control</td> <td>359</td> </tr> <tr> <td>Epin-Extra</td> <td>376</td> </tr> <tr> <td>Vita 0.5</td> <td>382</td> </tr> <tr> <td>Vita 1.0</td> <td>383</td> </tr> </tbody> </table>	Treatment	Stalks/m²	Control	359	Epin-Extra	376	Vita 0.5	382	Vita 1.0	383	<table border="1"> <thead> <tr> <th>Treatment</th> <th>Tillers per plant</th> </tr> </thead> <tbody> <tr> <td>Control</td> <td>1.7</td> </tr> <tr> <td>Epin-Extra</td> <td>2.0</td> </tr> <tr> <td>Vita 0.5</td> <td>2.0</td> </tr> <tr> <td>Vita 1.0</td> <td>2.0</td> </tr> </tbody> </table>	Treatment	Tillers per plant	Control	1.7	Epin-Extra	2.0	Vita 0.5	2.0	Vita 1.0	2.0	<table border="1"> <thead> <tr> <th>Treatment</th> <th>Length, cm</th> </tr> </thead> <tbody> <tr> <td>Control</td> <td>8.0</td> </tr> <tr> <td>Epin-Extra</td> <td>8.6</td> </tr> <tr> <td>Vita 0.5</td> <td>9.0</td> </tr> <tr> <td>Vita 1.0</td> <td>9.0</td> </tr> </tbody> </table>	Treatment	Length, cm	Control	8.0	Epin-Extra	8.6	Vita 0.5	9.0	Vita 1.0	9.0
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<p>Increase in plant height with Vitazyme</p> <p>0.5 liter/ha +17% 1.0 liter/ha +15%</p>	<p>Increase in productive tillers with Vitazyme</p> <p>0.5 liter/ha +6% 1.0 liter/ha +7%</p>	<p>Increase in tillers with Vitazyme</p> <p>0.5 liter/ha +18% 1.0 liter/ha +18%</p>	<p>Increase in head length with Vitazyme</p> <p>0.5 liter/ha +13% 1.0 liter/ha +13%</p>																																								
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<p>Increase in head number with Vitazyme</p> <p>0.5 liter/ha +14% 1.0 liter/ha +14%</p>	<p>Increase in seeds per head with Vitazyme</p> <p>0.5 liter/ha +7% 1.0 liter/ha +7%</p>	<p>Increase in grain weight per head with Vitazyme</p> <p>0.5 liter/ha +20% 1.0 liter/ha +50%</p>	<p>Increase in 1,000-seed weight with Vitazyme</p> <p>0.5 liter/ha +10% 1.0 liter/ha +19%</p>																																								

Vitazyme on the seeds and leaves at both 0.5 and 1.0 liter/ha substantially improved the seed and plant parameters at harvest. Three parameters include productive stalks (+6 to 7%), tillering (+18%), head length (+13%), head number (+14%), seeds per head (+7%), grain weight per head (+20 to 50%), and 1,000 seed weight (+10 to 19%). Epin-Extra increased these parameters as well, but not as greatly as did Vitazyme.

Yield and quality results: The crop was harvested on July 23, 2011, using a Sampo-1500 combine. The moisture of the grain was 13.9%.

Treatment	Yield ¹	Yield change	Protein	Protein change	Gluten	Gluten change
	tons/ha	tons/ha	%	%-points	%	%-points
1. Control	3.28 c	—	18.00	—	33.6	—
2. Epin-Extra	3.40 b	0.12 (+3%)	19.14	+1.14	35.9	+2.3
3. Vitazyme, 0.5 L/ha	3.76 a	0.48 (+15%)	18.43	+0.43	33.8	+0.2
4. Vitazyme, 1.0 L/ha	3.82a	0.54 (+16%)	17.79	-0.21	32.6	-1.0
HCP _{0.05}	0.13					

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



The yield of wheat from both the 0.5 and 1.0 liter/ha rates of Vitazyme gave the highest yield increase (+15 and 16%), while Epin-Extra gave only a minimal 3% yield increase. On the other hand, Epin-Extra provided the highest protein and gluten increases. Vitazyme at 0.5 liter/ha gave small protein and gluten increases, so presents the best overall yield and grain quality treatment.

Conclusion: A replicated winter wheat trial in Russia revealed that Vitazyme, applied on the seeds and also at tillering, substantially improved seedling emergence (by 2 days) and survival, which carried over into overwinter survival as well. Growth parameters showed marked responses to both Vitazyme treatments, such as productive stalks (+6 to 7%), tillering (+18%), head length (+13%), head number (+14%), seeds per head (+7%), grain weight per head (+20 to 50%), and 100-seed weight (+10 to 19%). Yield was improved by 15 to 16%. Epin-Extra improved most parameters, but gave only a 3% yield increase. Protein and gluten were increased the most by Epin-Extra, and the 1.0 liter/ha Vitazyme treatment decreased protein and gluten. The overall best treatment, in terms of yield and quality, was the 0.5 liter/ton Vitazyme seed application plus a 0.5 liter/ha foliar treatment.

Vital Earth Resources

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

2011 Crop Results

Vitazyme on Winter Wheat

Farmer: AGRivision
Systems, Perth, Australia

Researcher: Steven David

Research organization: Organic Farming

Variety: unknown

Location: Goshen, Victoria, Australia

Planting date: June 11, 2010

Experimental design: A replicated (four times) wheat trial in Australia involved three treatments, the farmer practice plus two Vitazyme treatments, to determine the effect of the product on crop growth and yield.

1. Control

2. Vitazyme on the seeds

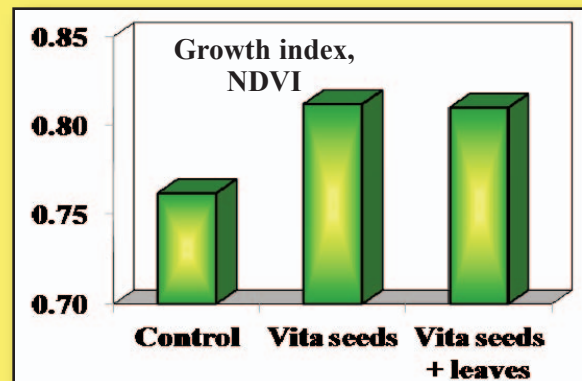
3. Vitazyme on the seeds and leaves

Fertilization: farmer practice

Vitazyme application: (1) 1 liter/tonne of seed for Treatments 2 and 3; (2) 0.5 liter/ha on the leaves at early tillering for Treatment 3

Growth results: Early growth was increased by 6 to 7% as a result of using the Vitazyme treatments.

Treatment	Wheat growth	Growth change
	----- NDVI analysis -----	
Control	0.762	—
Vitazyme on seeds	0.812	0.050 (+7%)
Vitazyme on seeds and leaves	0.810	0.048 (+6%)

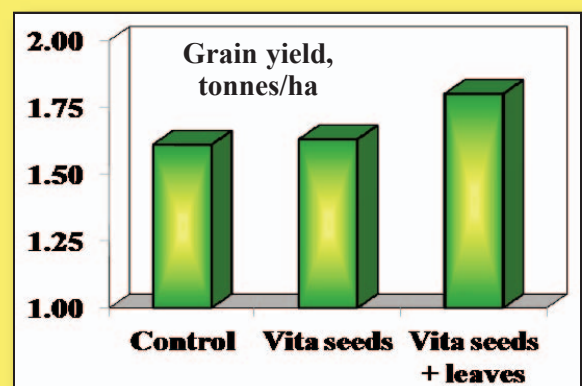


Increase in NDVI growth index with Vitazyme: 6 to 7%

Yield results: The crop was harvested in December of 2010.

Treatment	Grain yield*	Yield change
	tonnes/ha	tonnes/ha
Control	1.61 b	—
Vitazyme on seeds	1.63 b	0.02 (+1%)
Vitazyme on seeds and leaves	1.80 a	0.21 (+12%)

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



Increase in yield with Vitazyme twice: +12%

Conclusion: This replicated wheat study in Australia, using Vitazyme as a seed treatment alone, and as a seed treatment plus a foliar treatment, revealed that the product improved growth substantially early during the growth cycle. Final yield was significantly increased by 12% with the two applications, though the seed treatment alone did not significantly improve yield above the untreated control. These results show the great benefit of Vitazyme as a growth amendment for wheat in Australia.

Using a price of \$300.00/tonne, this program yielded \$60.30/ha additional income to the farmer.

Vital Earth Resources

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(903) 845-2163 FAX: (903) 845-2262

2009 Crop Results

Vitazyme on Wheat, winter

Researcher: O.V. Kornijchuk, V.V. Plotnikov, and agronomic scientists

Organization: Vinnytsia State Agricultural Experiment Station, Ukraine Academy of Agrarian Sciences, Vinnytsia, Ukraine

Variety: Liona, super elite

Sowing rate: 6 million seeds/ha

Location: Ukraine central forest-steppe area near Vinnytsia

Planting date: September 30, 2000

Previous crop: spring vetch

Tillage: plowing and cultivating

Soil type: gray forest steppe soil; in the 0-30 cm layer, 2.2% organic matter, 8.4 mg/100 g of soil “hydrolyzed nitrogen”, 15.8 mg/100g of soil phosphorus, 12.4 mg/100 g of soil exchangeable potassium, and pH=5.5.

Experimental design: A field was divided into four fertility levels, replicated four times, and each regime had either Vitazyme or no Vitazyme. Yields were evaluated in response to Vitazyme.

Treatment	Vitazyme	Nitrogen	Phosphorus	Potassium
			----- kg/ha -----	
1. No Fertilizer	0	0	0	0
2. 50% fertilizer	0	65	30	45
3. 75% fertilizer	0	100	45	70
4. 100% fertilizer	0	130	60	90
5. No fert + Vita	x	0	0	0
6. 50% fert + Vita	x	65	30	45
7. 75% fert + Vita	x	100	45	70
8. 100% fert + Vita	x	130	60	90

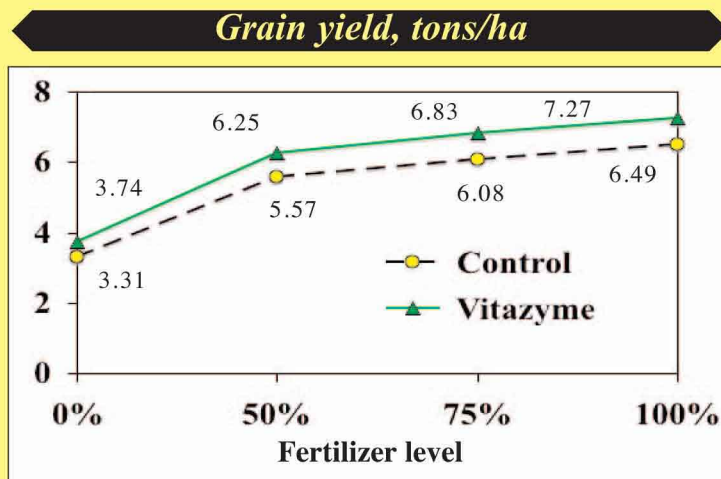
Fertilization: See the amounts applied in the table above.

Vitazyme application: Two spring applications of Vitazyme were made at 1 liter/ha each time, on the leaves and soil.

Yield results:

Treatment	Grain yield	Yield change*
	----- kg/ha -----	
1. No Fertilizer	3.31	—
2. 50% fertilizer	5.57	—
3. 75% fertilizer	6.08	—
4. 100% fertilizer	6.49	—
5. No fert + Vita	3.74	0.43 (+13%)
6. 50% fert + Vita	6.25	0.68 (+12%)
7. 75% fert + Vita	6.83	0.75 (+12%)
8. 100% fert + Vita	7.27	0.78 (+12%)

*Comparisons are made between Vitazyme treated and untreated treatments at the same fertility level. Thus, 1 and 5, 2 and 6, 3 and 7, and 4 and 8 were compared.



Increase in grain yield with fertilizer*

No fertilizer	3.53 tons/ha
50% fertilizer	5.91 tons/ha (+67%)
75% fertilizer	6.46 tons/ha (+83%)
100% fertilizer	6.88 tons/ha (+95%)

Increase in grain yield with Vitazyme

With no fertilizer	13%
With 50% fertilizer	12%
With 75% fertilizer	12%
With 100% fertilizer	12%

*Values are averaged for Vitazyme treated and untreated treatments,

Quality results:

Grain Weight

Fertilization	Control	Vitazyme	Change
	----- grams/liter -----		
None	815	834	19 (+2%)
50%	826	844	18 (+2%)
75%	832	850	18 (+2%)
100%	832	852	20 (+2%)

1,000 Grain Weight

Fertilization	Control	Vitazyme	Change
	----- grams -----		
None	44.5	46.0	1.5 (+3%)
50%	45.0	47.5	2.0 (+4%)
75%	46.0	48.0	2.0 (+4%)
100%	46.0	48.1	2.1 (+5%)

Gluten

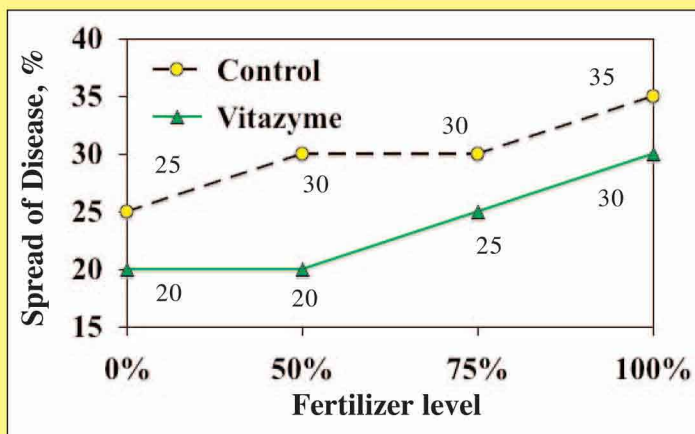
Fertilization	Control	Vitazyme	Change
	----- % gluten -----		
None	14.0	17.6	3.6 (+26%)
50%	23.6	27.6	4.0 (+17%)
75%	24.8	28.8	4.0 (+16%)
100%	27.1	30.0	2.9 (+11%)

Crude Protein

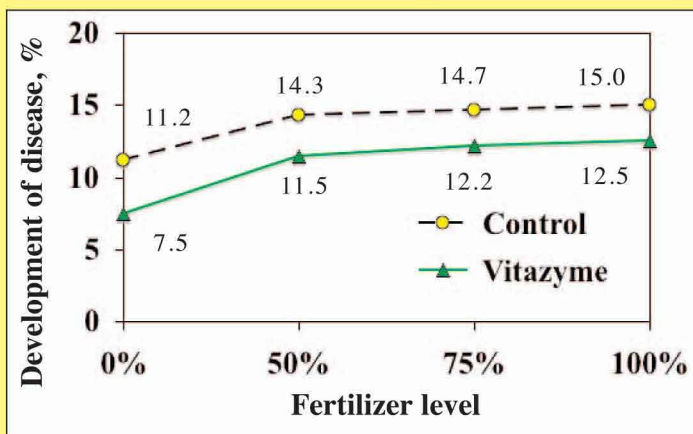
Fertilization	Control	Vitazyme	Change
	----- % protein -----		
None	8.3	9.8	1.5 (+18%)
50%	9.9	11.4	1.5 (+15%)
75%	10.3	11.5	1.2 (+12%)
100%	11.4	12.0	0.6 (+5%)

Disease results: Septoria disease effects

Disease Spread



Disease Development



Grain structure results:

Stem Density

Fertilization	Control	Vitazyme	Change
	----- stems/m ² -----		
None	415	455	40 (+10%)
50%	615	658	43 (+7%)
75%	644	682	38 (+6%)
100%	651	691	40 (+6%)

Grain Number Per Head

Fertilization	Control	Vitazyme	Change
	----- grains/head -----		
None	18	19	1 (+6%)
50%	20	22	2 (+10%)
75%	22	23	1 (+5%)
100%	23	24	1 (+4%)

Grain Weight Per Head

Fertilization	Control	Vitazyme	Change
	----- grams/head -----		
None	0.80	0.87	0.07 (+9%)
50%	0.91	1.04	0.13 (+14%)
75%	1.00	1.10	0.10 (+10%)
100%	1.06	1.15	0.09 (+18%)

Income results:

- **Income increase at 0% fertilizer with Vitazyme: 120 hrn/ha**
- **Income increase at 50% fertilizer with Vitazyme: 410 hrn/ha**
- **Income increase at 75% fertilizer with Vitazyme: 477 hrn/ha**
- **Income increase at 100% fertilizer with Vitazyme: 507 hrn/ha**

Conclusions: This winter wheat study in Ukraine, using Vitazyme at four fertility levels with and without Vitazyme, revealed that this product gave a remarkable yield increase of 12 to 13% above the untreated control for each treatment comparison. This yield increase with Vitazyme was similar to the increase in yield with fertilizer: 12 to 13% increase at each fertility increment. Quality analyses revealed that grain weight, 1,000 grain weight, gluten, and crude protein all increased with Vitazyme, and disease incidence and spread were reduced as well. Stem density, grain number per load, and weight per head were all improved with Vitazyme, as was income: by 120 hrn/ha (no fertilizer) to 507 hrn/ha (100% fertilizer). These data clearly show that Vitazyme works together with fertilizer elements to improve wheat yield in a significant way, and this program is highly effective for improving the productivity and income of wheat growers in Ukraine.

Vital Earth Resources

706 East Broadway, Gladewater, Texas 75647

(903) 845-2163 FAX: (903) 845-2262

2009 Crop Results

Vitazyme on Wheat

Researcher: Nathan Temples

Farm cooperator: Seyer Farms

Location: Oran, Missouri

Variety: Pioneer 25R47

Soil type: sandy loam

Planting rate: 2 bushels/acre

Planting date: October 10, 2009

Row-spacing: 7.5 inches

Irrigation: none

Experimental design: An 80-acre field was divided into two 40-acre portions, one of them treated with Vitazyme and the other with the fungicide Quilt to determine the effect of each on fungal suppression and yield.

1. Quilt fungicide

2. Vitazyme

Fertilization: unknown

Vitazyme application: 20 oz/acre at the flat-leaf stage

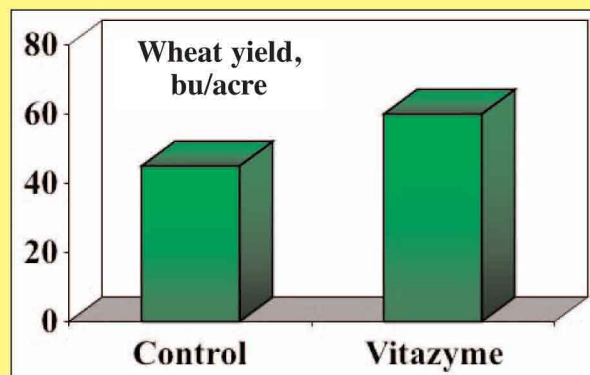
Quilt application: 21 oz/acre

Harvest date: June 20, 2009

Yield results:

Treatment	Yield	Yield change
	-----bu/acre-----	
Quilt	45	—
Vitazyme	60	15 (33%)

Increase in yield with Vitazyme: 33%



Income results:

Treatment	Income ¹	Product cost ²		Net income ³	Income change
	\$/acre	\$/gal	\$/acre	\$/acre	\$/acre
Quilt	225.00	150.00	24.61	200.39	—
Vitazyme	300.00	60.00	9.38	290.62	+90.23

¹Based on \$5.00/bushel; ²Vitazyme cost of \$60.00/gal (\$0.469/oz), and Quilt cost of \$150.00/gal (\$1.172/oz); ³Net income of crop income – product cost.

Income increase with Vitazyme: \$90.23/acre

Return on investment for Vitazyme: \$9.62 per dollar invested

Conclusions: This Missouri wheat vs. fungicide study showed that Vitazyme did a much better job of controlling yield-limiting fungi, and boosting grain yield, than did Quilt fungicide. This income was 33% higher with Vitazyme than with the standard fungicides, and the net return was \$90.23/acre higher, or \$9.62 per dollar invested for Vitazyme.

Vital Earth Resources

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2009 Crop Results

Vitazyme on Wheat, spring

Researcher: O.V. Kornijchuk, V.V. Plotnikov, and agronomic scientists

Organization: Vinnytsia State Agricultural Experiment Station, Ukraine Academy of Agrarian Sciences, Vinnytsia, Ukraine

Location: Ukraine central forest-steppe area near Vinnytsia

Planting rate: 6 million seeds/ha

Previous crop: winter canola

Variety: Pecheryanka, super elite

Tillage: plowing, harrowing, cultivating

Planting date: April 13, 2009

Soil type: gray forest steppe soil; in the 0-30 cm layer, 2.2% organic matter, 8.4 mg/100 g of soil "hydrolyzed nitrogen", 15.8 mg/100g of soil phosphorus, 12.4 mg/100 g of soil exchangeable potassium, and pH=5.5.

Experimental design: A uniform field was divided into Vitazyme treated and untreated plots of 1.0 ha plots, replicated four times, to discover the effect of the product on spring wheat yield and quality factors. Both Vitazyme treatments received product on the seed, and one of these had Vitazyme applied to the leaves as well.

1. Control

2. Vitazyme once

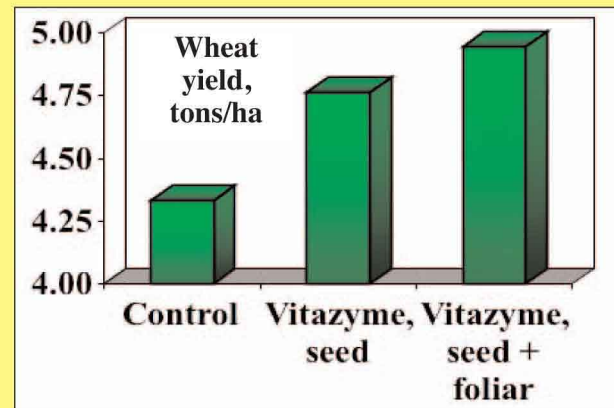
3. Vitazyme twice

Fertilization: 60 kg/ha N, 30 kg/ha P₂O₅, and 60 kg/ha K₂O.

Vitazyme application: Both treatments received a seed treatment at planting, at 1.0 liter/ha, on April 12, 2009. Treatment 3 received an additional 1.0 liter/ha foliar and soil application on June 4, 2009.

Yield results:

Treatment	Wheat yield tons/ha	Yield change tons/ha
1. Control	4.33	—
2. Vitazyme	4.76	0.43 (+10%)
3. Vitazyme, seed + leaves	4.94	0.61 (+14%)



Increase in wheat yield with Vitazyme

Seed treatment 10%
Seed + foliar treatments 14%

Quality results:

Grain Gluten

Treatment	Gluten ----- % gluten -----	Change
Control	25.6	—
Vitazyme	27.6	2.0 (+8%)
Vitazyme, seed + leaves	28.3	2.7 (+11%)

**Increase in gluten with Vitazyme:
8 to 11%**

Crude Protein

Treatment	Protein ----- % protein -----	Change
Control	10.6	—
Vitazyme	11.1	0.5 (+5%)
Vitazyme, seed + leaves	11.6	1.0 (+9%)

**Increase in crude protein with
Vitazyme: 5 to 9%**

Grain Weight Per Liter

Treatment	Weight	Change
	----- grams -----	
Control	740	—
Vitazyme	751	9 (+1%)
Vitazyme, seed + leaves	759	19 (+3%)

Increase in grain weight with Vitazyme: 1 to 3%

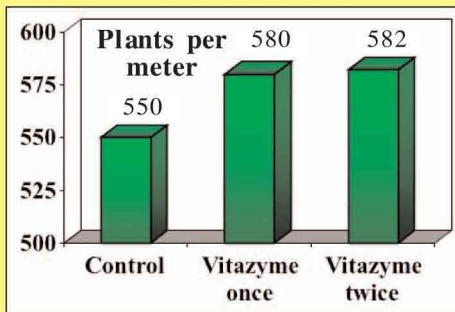
1,000 Grain Weight

Treatment	Weight	Change
	---grams/1,000 grams---	
Control	41.1	—
Vitazyme	42.3	1.2 (+3%)
Vitazyme, seed + leaves	43.5	2.4 (+6%)

Increase in 1,000 grain weight with Vitazyme: 3 to 6%

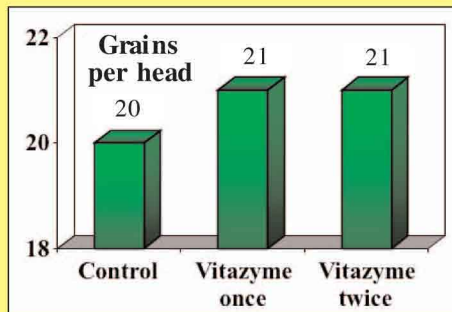
Grain structure results:

Stem Density



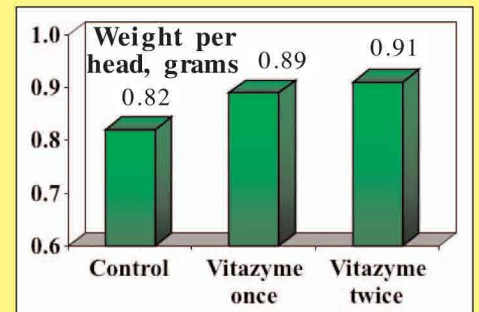
Increase in stem density with Vitazyme: 5 to 6%

Grain Number Per Head



Increase in grains per head with Vitazyme: 5%

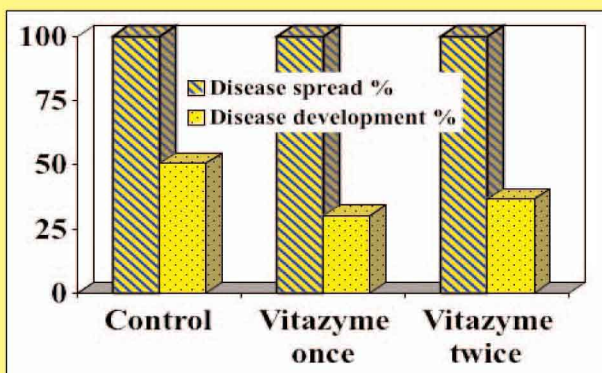
Grain Weight Per Head



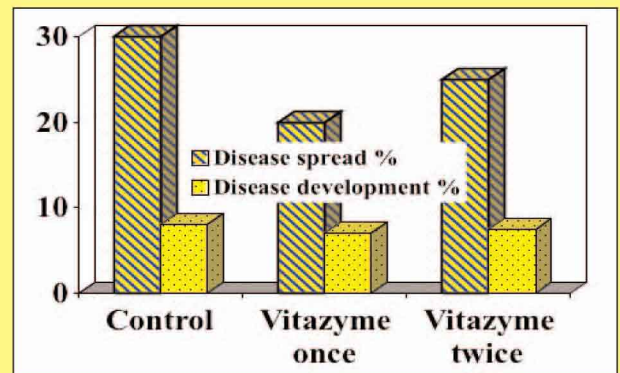
Increase in grain weight per head with Vitazyme: 9 to 11%

Disease results:

Farinaceous Mildew



Septoria Fungus



Income results:

- Income increase with Vitazyme on the seeds: 367 hrn/ha
- Income increase with Vitazyme on the seeds + leaves: 342 hrn/ha

Conclusions: This Ukrainian spring wheat trial proved that Vitazyme on the seeds at planting increased the yield by 10%, whereas an additional 1.0 liter/ha application added 4% more yield. Grain quality was also enhanced with Vitazyme in terms of gluten (+8 to 11%), crude protein (+5 to 9%), grain weight per liter (+1 to 3%), and 1,000 grain weight (+3 to 6%). Stem density, grain number per head, grain weight per head, and disease susceptibility were also increased with Vitazyme.

Vital Earth Resources

706 East Broadway, Gladewater, Texas 75647

(903) 845-2163 FAX: (903) 845-2262

2009 Crop Results

Vitazyme on Wheat, winter

Researcher: unknown

Organization: Ukerzernoprom

Location: Berdichiv area, Ukraine

Variety: Olesa

Soil type: unknown

Planting date: September 7, 2008

Experimental design: A wheat field was divided into Vitazyme treated and untreated areas, with the purpose of evaluating the effect of this product on grain yield.

1. Control

2. Vitazyme on seeds

3. Vitazyme on leaves

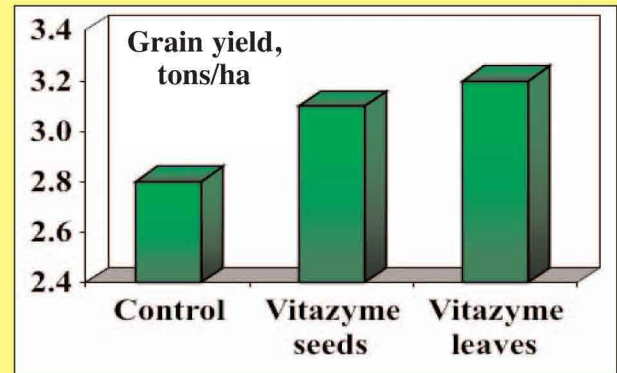
Fertilization: unknown

Vitazyme application: (1) Seeds treated with Vitazyme at 1 liter/ton of seed, on September 7, 2008, for Treatment 2; (2) leaves sprayed with Vitazyme at 1 liter/ha on October 22, 2008, when the plants were a few inches tall.

Yield results:

Treatment	Grain yield tons/ha	Change tons/ha
1. Control	2.8	—
2. Vitazyme, seeds	3.1	0.3 (+11%)
3. Vitazyme, leaves	3.2	0.4 (+14%)

**Increase in wheat yield with
Vitazyme: 11 to 14%**



Conclusions: This Ukraine winter wheat study revealed that Vitazyme, applied to the seeds at 1 liter/ton of seeds, increased grain yield by 11%. A foliar application in the fall increased yield by 14%. These results prove the great utility of this product to improve wheat yields in Ukraine.

Vital Earth Resources

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2009 Crop Results

Vitazyme on Wheat, winter

Researcher: unknown

Organization: Ukerzernoprom

Location: Berdichiv Raion, Zhitomerski Oblast, Ukraine (central forest-steppe area)

Variety: Olecyá

Soil type: gray forest steppe soil; in the 0-30 cm layer, 2.2% organic matter, 8.4 mg/100 g of soil “hydrolyzed nitrogen”, 15.8 mg/100 g of soil phosphorus, 12.4 mg/100 g of soil exchangeable potassium, and pH=5.5.

Planting date: September 7, 2008

Tillage: tilled to 4-5cm

Experimental design: This winter wheat trial was established to evaluate the effect of Vitazyme, as a seed or foliar treatment, to enhance grain yield.

1. Control

2. Vitazyme on seeds

3. Vitazyme on leaves and soil

Fertilization: none

Vitazyme treatment: Treatment 2: 1.0 liter/ha at planting (September 7) with the seeds; Treatment 3: 1.0 liter/ha sprayed on the leaves and soil on October 22, 2008.

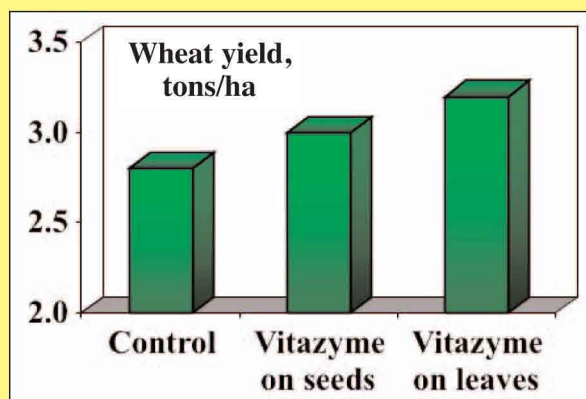
Yield results:

Treatment	Wheat yield tons/ha	Yield change tons/ha
1. Control	2.8	—
2. Vitazyme, on seeds	3.1	0.3 (+11%)
3. Vitazyme, on leaves (fall)	3.2	0.4 (+14%)

Increase in wheat yield with Vitazyme

Fall, on seeds 11%

Fall, on leaves and soil 14%



Conclusions: This Ukraine winter wheat demonstration trial, using Vitazyme without fertilizer additions on the seeds only, or the leaves and soil only, revealed that the seed treatment produced an excellent 11% yield increase. A fall foliar/soil application alone increased the grain yield even more: 14%. Use of Vitazyme on either the seeds, or applied to the foliage, is shown to be an excellent practice for wheat farmers in Ukraine.

Vital Earth Resources

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(903) 845-2163 FAX: (903) 845-2262

2009 Crop Results

Vitazyme on Wheat, winter

Researcher: O.V. Kornijchuk, V.V. Plotnikov, and agronomic scientists

Organization: Vinnytsia State Agricultural Experiment Station, Ukraine Academy of Agrarian Sciences, Vinnytsia, Ukraine

Variety: Bilosnizhka, super elite

Planting rate: 6 million seeds/ha

Location: Ukraine central forest-steppe area near Vinnytsia

Planting date: September 3, 2008

Tillage: plowing and cultivation

Previous crop: winter canola

Soil type: gray forest steppe soil; in the 0-30 cm layer, 2.2% organic matter, 8.4 mg/100 g of soil “hydrolyzed nitrogen”, 15.8 mg/100g of soil phosphorus, 12.4 mg/100 g of soil exchangeable potassium, and pH=5.5.

Experimental design: A uniform field was divided into Vitazyme treated and untreated plots of 1.0 plots, replicated four times, to discover the effect of the product on winter wheat yield.

1. Control

2. Vitazyme twice

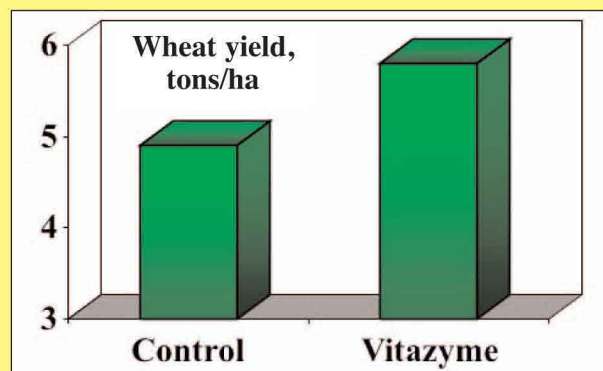
Fertilization: 60 kg/ha N

Vitazyme application: The Vitazyme treatment received a foliar/soil application at 1.0 liter/ha on April 30, 2009, and a second application on May 15, 2009.

Yield results:

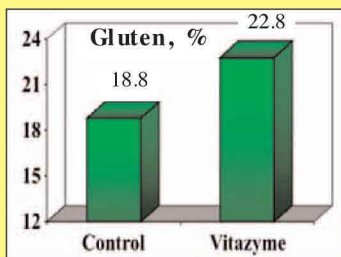
Treatment	Wheat yield tons/ha	Yield change tons/ha
1. Control	4.9	—
2. Vitazyme	5.8	0.9 (+18%)

**Increase in wheat yield with
Vitazyme: 18%**



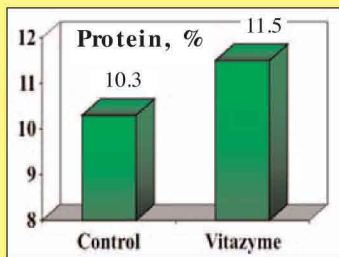
Grain quality results:

Gluten



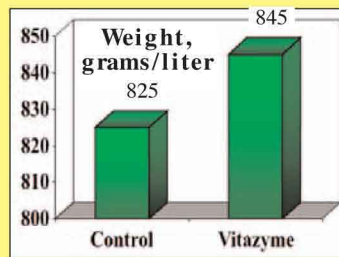
**Increase in gluten
with Vitazyme: 21%**

Crude Protein



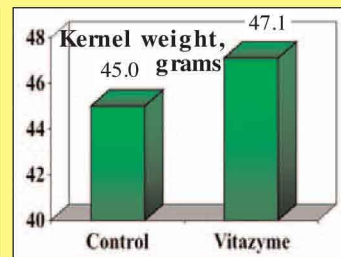
**Increase in crude
protein with
Vitazyme: 12%**

Grain Weight



**Increase in liter
weight with
Vitazyme: 2.4%**

Weight/1,000 Kernels



**Increase in 1,000
kernel weight with
Vitazyme: 5%**

Income results:

Income increase with Vitazyme: 473 hrn/ha

Conclusions: This winter wheat trial at Vinnytsia, Ukraine, revealed that two spring applications of Vitazyme, at 1 liter/ha each time, gave a large yield increase of 18%. The grain was improved in gluten (+21%), protein (+12%), liter weight (+2.4%), and weight per 1,000 kernels (+5%), and the crop income was improved by 473 hrn/ha. Such large yield, quality, and income increases with two simple product applications show that this program is a very good production practice for Ukrainian farmers.

Vital Earth Resources

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

2008 Crop Results

Vitazyme on Wheat

Researcher/Farmer: Blaine Middleton

Variety: TAM 111 hard red winter wheat

Planting date: November 14, 2007

Row width: 9.5 inches

Watering: center-pivot irrigation with electronic treatment

Experimental design: An irrigated circle was divided into treated and untreated sections. A 30-acre area was treated by irrigation water with Vitazyme, while an adjacent untreated 30-acre area of wheat served as the control.

Location: Lamesa, Texas ["West Home" Farm]

Soil type: sandy loam

Planting rate: 75 lb/acre

Planting depth: 2 inches

1. Control

Fertilization: (1) 270 lb/acre of 9-21-21-5% N-P₂O₅-K₂O-S spread dry at planting; (2) 30 gal/acre of 32% N through the center pivot system during March 8 to 15, 2008.

Vitazyme application: (2) 13 oz/acre (1 liter/ha) after emergence, on December 7, 2007; (2) 13 oz/acre at spring greenup, on February 20.

Irrigation, rainfall, and weather: The summer was hotter than normal, and rainfall was very limited, only 2.4 inches of rain. Irrigations: 19 in all, totalling 14.6 inches.

Harvest date: June 4, 2008

Yield results:

Treatment	Total yield, 30 acres		Yield	Change
	lb	bu*	bu/acre	bu/acre
Control	140,020	2,334	77.8	—
Vitazyme	161,860	2,698	89.9	12.1 (+16%)

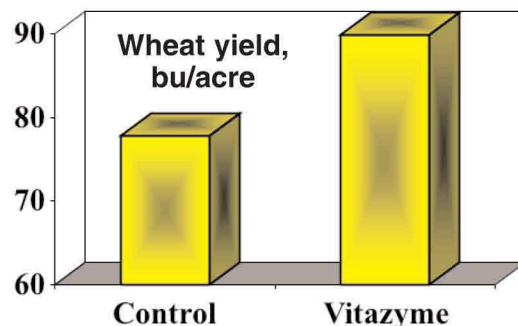
*Based on 60 lb/bu for wheat.

**Increase in wheat yield:
16%**

Income results: A value of \$8.00/bu is used in this table.

Treatment	Yield	Income	Change
	bu/acre	\$/acre	\$/acre
Control	77.8	622.40	—
Vitazyme	89.9	719.20	96.80

**Increase in income with Vitazyme:
\$96.80/acre**



Conclusions: In this hard red winter wheat study in western Texas, Vitazyme applied twice through the irrigation water during a hot, dry summer provided a very large yield increase of 16%. This increase resulted in an income increase of \$96.80/acre, showing the great utility of Vitazyme for wheat production in western Texas. Presumably the product is enabling the crop to make a better use of fertilizer nitrogen, as demonstrated in several other studies

Vital Earth Resources

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

2008 Crop Results

Vitazyme on Winter Wheat

Researchers: O.V. Kornijchuk, V. V. Plotnikov, and agronomic scientists

Organization: Vinnytsia State Agricultural Experiment Station of Forage Institute, Ukraine Academy of Agrarian Sciences, Vinnytsia, Ukraine

Location: Ukraine central forest – steppe area near Vinnytsia

Variety: Podolyanka, Donets'ka 48, and Polis'ka 90

Seeding rate: 6 mil/ha

Soil Type: gray forest steppe soil; in the 0-30 cm layer, 2.2% organic matter, 8.4 mg/100 g of soil “hydrolyzed nitrogen”, 15.8 mg/100 g of soil phosphorus, 12.4 mg/100 g of soil exchangeable potassium, and pH = 5.5.

Planting date: October 1, 2007

Previous crop: spring vetch

Tillage: tilled to 4-5 cm.

Experimental design: A uniform field area was selected to place 1.0 ha plots, replicated four times, over the test area. The objective was to determine if Vitazyme could favorably influence crop yields for this gray forest soil area of Ukraine.

1. Control

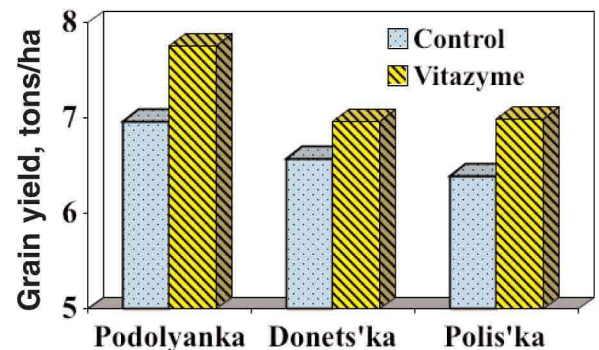
2. Vitazyme applied two times

Fertilization: In the fall of 2007 a broadcast application of 30-60-90 kg/ha N-P₂O₅-K₂O was made. In the spring, 120 kg/ha of nitrogen was applied at two times (50 and 70 kg/ha).

Vitazyme application: 1 liter/ha applied on April 22, and again on May 13, 2008

Harvest date: unknown

Treatment	Grain yield		Yield change	
	tons/ha	tons/ha	tons/ha	%
1. Control				
Podolyanka	6.97	—	—	—
Donets'ka 48	6.58	—	—	—
Polis'ka 90	6.39	—	—	—
2. Vitazyme twice				
Podolyanka	7.76	+0.79		+11
Donets'ka 48	6.97	+0.39		+6
Polis'ka 90	6.99	+0.60		+9



Increase in wheat yield with Vitazyme

Podolyanka **11%**
Donets'ka 48 **6%**
Polis'ka 90 **9%**

Yield results:

Vitazyme increased wheat grain yield by 6 to 11% for the three varieties.

Treatment	Gluten content	Gluten change	Crude protein	Protein change
	%	%-points	%	%-points
1. Control				
Podolyanka	22.5	—	11.5	—
Donets'ka 48	21.9	—	11.5	—
Polis'ka 90	23.4	—	12.0	—
2. Vitazyme twice				
Podolyanka	23.2	+0.7	12.3	+0.8
Donets'ka 48	22.4	+0.5	12.1	+0.6
Polis'ka 90	24.4	+1.0	12.5	+0.5

Increase in gluten with Vitazyme

Podolyanka	0.7%-pts
Donets'ka 48	0.5%-pts
Polis'ka 90	1.0%-pts

Increase in protein with Vitazyme

Podolyanka	0.8%-pts
Donets'ka 48	0.6%-pts
Polis'ka 90	0.5%-pts

Quality results:

Income results: Based on current grain prices, the increase in income from Vitazyme for the three varieties was as follows:

Podolyank	747 hrn/ha
Donets'ka	218 hrn/ha
Polis'ka	507 hrn/ha

Conclusions: Vitazyme applied twice during during the spring growth period resulted in a substantial 6 to 11% increase in yield; Podolyanka variety gave the highest increase, that resulted in a 747 hrn/ha income increase. The quality of the grain was also improved with Vitazyme, the gluten content increasing from 0.5 to 1.0 percentage points, and crude protein from 0.5 to 0.8%. These results prove that this crop treatment is highly effective for improving the yield, quality, and income of winter wheat in Ukraine on these gray forest-steppe soils. Had Vitazyme been applied to the seeds in the fall, or to the newly emerged plants, it is likely that the results would have been even more favorable than with only spring applications.

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(903) 845-2163 FAX: (903) 845-2262

2008 Crop Results

Vitazyme on Wheat

Researcher/Farmer: Blaine Middleton

Variety: TAM 111 hard red winter wheat

Planting date: November 14, 2007

Row width: 9.5 inches

Watering: center-pivot irrigation with electronic treatment

Experimental design: An irrigated circle was divided into treated and untreated sections. A 30-acre area was treated by irrigation water with Vitazyme, while the remaining area under the circle was left untreated. An adjacent 30-acre area of wheat served as the control.

Location: Lamesa, Texas ["East Home" Farm]

Soil type: sandy loam

Planting rate: 75 lb lb/acre

Planting depth: 2 inches

1. Control

Fertilization: (1) 270 lb/acre of 9-21-21-5% N-P₂O₅-K₂O-S spread dry at planting; (2) 30 gal/acre of 32% N through the center pivot system during March 8 to 15, 2008.

Vitazyme application: (2) 13 oz/acre (1 liter/ha) after emergence, on December 7, 2007; (2) 13 oz/acre at spring greenup, on February 20.

Irrigation, rainfall, and weather: The summer was hotter than normal, and rainfall was very limited, only 2.4 inches of rain. Irrigations: 19 in all, totaling 14.3 inches.

Harvest date: June 5, 2005

Yield results:

Treatment	Total yield, 30 acres		Yield	Change
	lb	bu*	bu/acre	bu/acre
Control	124,600	2,077	69.2	—
Vitazyme	161,220	2,687	89.6	20.4 (+29%)

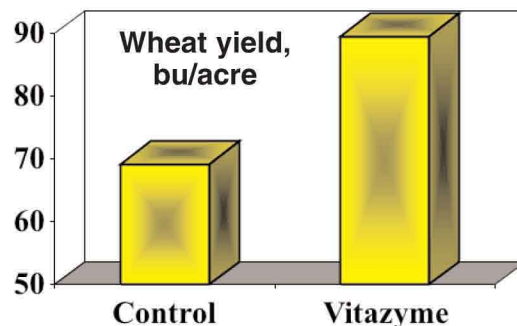
*Based on 60 lb/bu for wheat.

**Increase in wheat yield:
29%**

Income results: A value of \$8.00/bu is used in this table.

Treatment	Yield	Income	Change
	bu/acre	\$/acre	\$/acre
Control	69.2	553.60	—
Vitazyme	89.6	716.80	163.20

**Increase in income with Vitazyme:
\$163.20/acre**



Conclusions: In this hard red winter wheat study in western Texas, Vitazyme applied twice through the irrigation water during a hot, dry summer provided a superb yield increase of 29%. This increase resulted in an income increase of \$163.20/acre, showing the great ability of Vitazyme to assist wheat growers in semi-arid regions. Presumably the product is enabling the crop to make a better use of fertilizer nitrogen, as demonstrated in several other studies.

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

2008 Crop Results

Vitazyme on Wheat

Researcher: Richard Stonewigg

Research Organization: Lachian Kenya Limited

Location: near Nairobi, Kenya

Variety: unknown

Soil type: unknown

Planting date: unknown

Experimental design: An area of winter wheat was divided into small plots, with soil treatments in the main plots and foliar treatments in the sub-plots. The treatments were as follows:

Main Plot Treatments	Sub-Plot
Treatments (soil applications at planting)	(foliar applications)
1. Control	Twin N
2. Control	Impact Ca
3. Vitazyme + Turbo-Seed +Zn	Twin N
4. Vitazyme + Turbo-Seed + Zn	Impact Ca
5. Urea + DAP (Diammonium P)	Twin N
6. Urea + DAP (Diammonium P)	Impact Ca

Fertilization: *Turbo-Seed* is soluble phosphorus + zinc, copper, and magnesium EDTA + humic acid (to help prevent scorching); this was sprayed into the seed row at 15 kg/ha. *Trade Corp Zn* is a zinc formulation, applied to the soil at 100 g/ha. *Diammonium phosphate* (DAP) and *urea* were both applied to the soil at 150 kg/ha each.

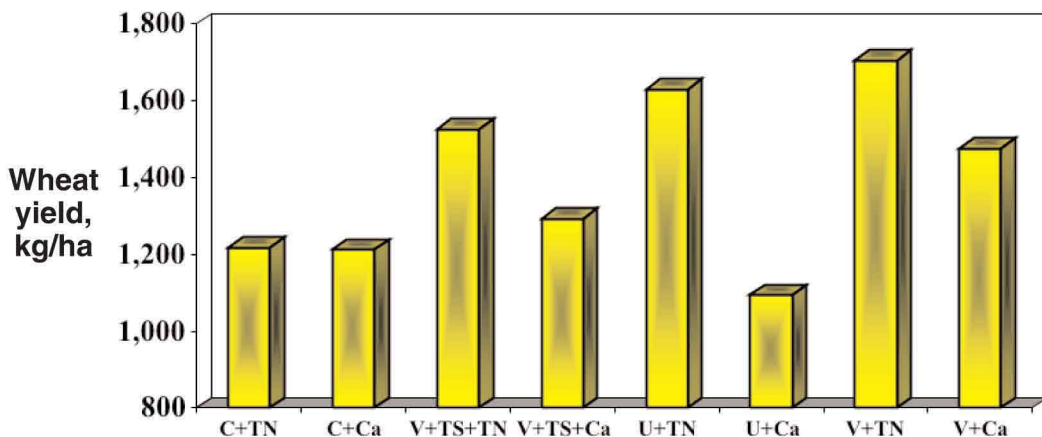
Foliar feeding: *Twin-N* is nitrogen-fixing microbes, applied to the leaves at 1 vial/ha. *Impact Ca* is a calcium + nitrogen formulation sprayed on the leaves at 5 liters/ha.

Vitazyme application: 1 liter/ha sprayed in the seed row at planting

Yield results:

Treatment	Yield	Yield change*
	kg/ha	kg/ha
1. Control + Twin N	1,218	—
2. Control + Impact Ca	1,212	—
3. Vitazyme + Turbo-Seed + Zn + Twin N	1,526	308 (+25%)
4. Vitazyme + Turbo-Seed + Zn + Impact Ca	1,294	82 (+7%)
5. Urea + DAP + Twin N	1,629	417 (+34%)
6. Urea + DAP + Impact Ca	1,094	(-) 118 (-10%)
7. Vitazyme + Twin N	1,704	486 (+40%)
8. Vitazyme + Impact Ca	1,475	263 (+22%)

*Comparisons are made with the appropriate control treatment: Treatments 3, 5, and 7 versus Treatment 1, and Treatments 4, 6, and 8 versus Treatment 2.



Conclusions: In this Kenyan study using various soil and foliar products, all soil applied products stimulated yield, but to different degrees, and with considerable interaction with other products (which effects could not be interpreted due to a lack of replication). The interaction of soil applied products was highest, by far, with Twin N, and the lowest with Impact Ca, giving the following average yields:

Twin N (Treatments 3, 5, and 7): 1,620 kg/ha

Impact Ca (Treatments 4, 6, and 8): 1,288 kg/ha

Increase with Twin N vs. Impact Ca: 322 kg/ha (+26%)

Vitazyme worked very well with Turbo-Seed and zinc to increase the yield by 25% with Twin N, and by 7% with Impact Ca. **The highest average yield, however, was with Vitazyme alone with Twin N or impact Ca**, as shown in the following table.

Average of the Twin-N and Impact Ca treatments for all four main-plot treatments

Treatment	Yield kg/ha	Increase in yield kg/ha
Control	1,215	—
Vitazyme + Turbo-Seed + Zn	1,410	195 (+16%)
Urea + DAP	1,362	147 (+12%)
Vitazyme	1,590	375 (+31%)

Increase in wheat yield with vitazyme only: 31%

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706 East Broadway, Gladewater, Texas 75647

(903) 845-2163 FAX: (903) 845-2262

2007 Crop Results

Vitazyme on Wheat (Winter)

Value of a Seed Application Using 50% Nitrogen

Researcher/Farmer: Jim Dolezal

Varieties: Wesley hard red winter, Antelope hard red white

Row spacing: 10 inches

Planting dates: September 12 to October 3, 2006

Experimental design: A 160-acre block having uniform soils was selected to compare three hard winter wheat varieties — one of them white and two of them red — with all fertility treatments equal, the only difference being that Vitazyme was applied to the seeds of two varieties (hard red wheats) but not to the highest-yielding white wheat variety. Only about 50% of the usual nitrogen rate was applied. Vitazyme was applied in the spring to all areas. The field design and varieties were as follows:

Location: Julesburg, Colorado

Seeding rate: 52 lb/acre

Planting depth: 1.25 inches

Soil type: sandy loam

	Wesley hard red winter wheat 40 acres	Wahoo hard red winter wheat 40 acres	
Antelope hard white winter wheat 80 acres			

Vitazyme	Fertilizer			
	N	P	Seed	Foliar
Field				
Wesley	X	X	X	X
Antelope	X	X	O	X

Fertilization: All areas received 22 lb/acre of P_2O_5 in-furrow at planting, as well as 25 lb/acre of N sprayed foliar in March of 2007. This nitrogen rate was a bit less than 50% of the usual 55 to 58 lb/acre recommended nitrogen rate.

Vitazyme application: All but the Antelope variety received 13 oz/acre of Vitazyme applied through the tubes behind the seed drop tubes. In the spring, Vitazyme at 13 oz/acre was applied over all areas with the foliar sprayed nitrogen.

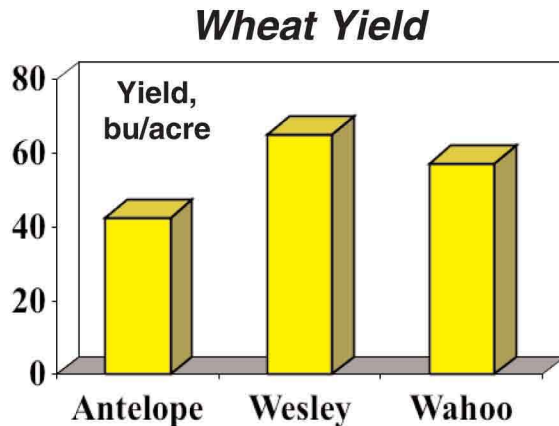
Weather for 2007: good rains, about 17 inches from planting in 2006 to the end of the 2007 growing season

Harvest date: July 10 and 11, 2007

Yield results:

Variety	Vitazyme		Yield bu/acre	Increase vs. Wesley bu/acre
	Seed	Foliar		
Wesley red	X	X	65.1	22.5 (+53%)
Wahoo red	X	X	60	14.6 (+34%)
Antelope white	O	X	42.6	—

Increase in wheat yield with a Vitazyme seed treatment: 34 to 53%



Conclusions: This wheat yield study in northeastern Colorado revealed that with a 50% reduction in nitrogen, yields were still excellent when Vitazyme was applied. However, it was essential that Vitazyme be applied to the seeds at planting to achieve the highest yield potential. The two hard red winter wheat varieties — Wesley and Wahoo — having similar yield potential, yielded from 57.2 to 65.1 bu/acre, while the Antelope hard white wheat, having inherently a greater yield potential than the red wheats, produced only 42.6 bu/acre. Because the Antelope white wheat did not receive a fall at-planting Vitazyme application while both red wheat varieties did, all other fertilizer and spring Vitazyme applications being equal across all areas, it is deduced that **a fall at-planting Vitazyme application of 13 oz/acre is very important to achieve optimum dryland wheat yields.**

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(903) 845-2163 FAX: (903) 845-2262

2003 Crop Results

Vitazyme on Winter Wheat

Researcher: David Schemm

Location: Arrow S Farms, Sharon Springs, Kansas

Variety: Jagger

Planting rate: 120 lb/acre

Soil type: Keith sandy clay loam

Previous crop: corn

Planting date: September 20, 2002

Experimental design: A center pivot covering 120 acres was divided into halves, the north side treated with Vitazyme and the south half left untreated. All other treatments were the same across the pivot area.

1. Control

2. Vitazyme

Fertilization: 18 lb/acre of N as a 28% ammonia solution on about January 20, 2003, when the wheat was all germinated. Total available N: about 60 to 70 lb/acre due to residual N from a failed corn crop in 2002.

Vitazyme application: 13 oz/acre applied with the 28% N solution on January 20

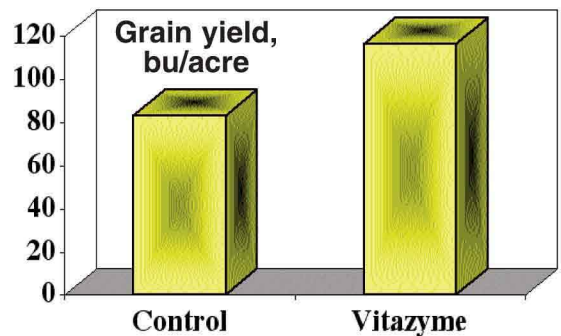
Irrigation: 550 gal/minute well, and 8 inches applied to the crop

Weather: An 8-inch moisture deficit existed for 2002, and by October of 2003 another 4.5-inch deficit had accumulated.

Harvest date: July 20 to 25, 2003

Yield results: The yield of the two 60-acre parcels was estimated closely by bin volume during combining.

Treatment	Grain yield bu/acre	Change bu/acre
Control	83	—
Vitazyme	116	33(+40%)



Increase in grain yield: 40%

Income results: The average price for winter wheat in western Kansas in October of 2003 was \$3.10/bu. At that price, the extra income per acre resulting from Vitazyme applications was 33 bu/acre X \$3.10/bu = \$102.30/acre. Using a cost of \$4.00/13 oz of product the return from Vitazyme was \$25.58 for every dollar invested.

Increased return: \$102.30/acre

Cost:benefit ratio: 25.58:1

Conclusions: The average of this wheat yield was **100 bu/acre** across all 120 acres of the center pivot test area, which was **the highest yield of wheat for the entire county during 2003**. An *average* yield of irrigated wheat is 60 bu/acre for western Kansas, and a *good* irrigated yield is 80 bu/acre.

Vitazyme not only increased the yield of the wheat by 40%, but also **improved the standability of the wheat** due to greater stem strength (more cellulose, callose, and lignin deposition). **The grower estimated that the treated wheat had 20 to 30% more plants standing at harvest than did the untreated control. This benefit resulted in an income increase of \$102.30/acre, with a cost:benefit ratio of about 25:1.**

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2002 Crop Results

Vitazyme and Southeast Mix on Wheat

Researcher: Paul W. Syltie, Ph.D.

Location: Vital Earth Resources Research Greenhouse, Gladewater, Texas

Variety: winter wheat

Soil type: Bowie very fine sandy loam

Planting date: February 22, 2002

Pot type: 1 gallon

Population: about 80 seeds/pot (0.5 tsp)

Experimental design: A complete block design was set up using eight replicates for each of four treatments. The soil was carefully packed into each pot, watered evenly, and then treated with the materials. Plants were watered on demand, and grown in the greenhouse at about 85°F for a high and 60°F for a low temperature.

1. Control

3. Southeast Mix only

2. Vitazyme only

4. Vitazyme + Southeast Mix

Fertilizer application: Each pot received 0.23 gram per pot of $(\text{NH}_4)_2\text{SO}_4$ to equal a 100 lb/acre application, or 21 lb/acre of N and 20 lb/acre of S for a “starter” effect.

Vitazyme application: After planting on February 22, 50 ml of a 0.002% Vitazyme solution was applied to the soil surface of each pot for Treatment 2. This application was equal to the amount of Vitazyme contained in the Southeast Mix of Treatment 4. By mistake, an additional application of Vitazyme was made to Treatment 4 so that the actual amount of active ingredients was twice that of Treatment 2. Field and greenhouse trials, however, have demonstrated that a doubled rate of Vitazyme will not give a plant response that exceeds that of the usual rate.

Southeast Mix application: Regular Southeast Mix granules, a “Sucrate”, were applied to the soil surface of the pots of Treatment 3 at 1 gram per pot; this rate equaled 10 lb/1,000 ft². The Southeast Mix for Treatment 4 had been prepared earlier at the facilities of American Minerals. Two ounces of Vitazyme were mixed with the binder of 50 lb of Southeast Mix during processing, a 0.04 oz/lb rate. At 10 lb/1,000 ft² of Southeast Mix application, this would then give a Vitazyme application rate of about 18 oz/acre. This product was also applied at 1 gram per pot, as for Treatment 3.

Product specifications: **Vitazyme:** a liquid fermentation product of various plant materials, organisms, simple and complex carbohydrates, and other materials to yield a multiple mode of action - multiple active agent metabolic stimulator containing natural growth regulators (triacontanol, etc.), vitamins (B-complex, etc.), enzymes, and other phytoactive substances that are biologically active at very low application rates. Producer: Vital Earth Resources, Gladewater, Texas.

Southeast Mix: a sucrate carboxylate containing a simple carbohydrate binder, together with various minerals (Fe. 18.7%; Mn, 7.8%; Zn, 7.3%; Cu, 3.1%; B, 3.1%), with granules able to quickly break down in water to supply nutrients to plants. Producer: American Minerals, Dunedin, Florida.

Harvest date: April 30, 2002, 67 days after planting.

Growth observations: The plants of Treatment 1 (the untreated control) began to die back towards the end of the growth period. Such a dieback did not occur for any of the other treatments. With up to 80 or more plants per pot there was great nutrient and space competition in each pot, so that performance of the products could be measured under highly stressed conditions.

Height results: On April 30 all of the plant roots were washed clean of soil, and any weeds were removed. An

average height measurement was made for the plants of each pot.

Treatment	Plant height*	Change vs. the control
	----- cm -----	
4. Vitazyme + Southeast Mix	13.9 a	+ 3.0 (+ 28%)
3. Southeast Mix	13.3 ab	+ 2.4 (+ 22%)
2. Vitazyme	12.5 b	+ 1.6 (+ 15%)
1. Control	10.9 c	—

* Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. LSD_{0.10}=1.2 cm.

Both Vitazyme and Southeast Mix significantly increased plant height over the control, by 15 to 22%, but the combined products caused a 28% increase in plant height.

Plant number results: The number of live plants was counted for each pot and subjected to a statistical analysis.

Treatment	Plant number*
3. Southeast Mix	78.3 a
4. Vitazyme + Southeast Mix	77.1 a
2. Vitazyme	76.5 a
1. Control	72.9 a

* Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. LSD_{0.10}=6.2.

Dry weight results: The plants were dried in a drying oven at 115° F for one day, and dry weights were taken to the nearest 0.01 gram. These results showed highly significant differences among treatment means.

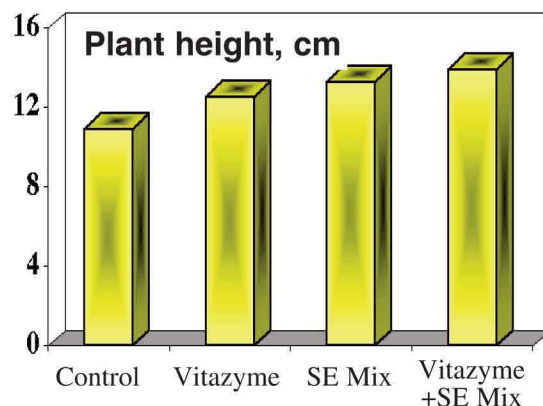
Treatment	Dry weight*	Change vs. the control
	----- grams -----	
4. Vitazyme + Southeast Mix	5.76 a	0.95 (+ 20%)
3. Southeast Mix	5.42 a	0.61 (+ 13%)
2. Vitazyme	5.26 ab	0.45 (+ 9%)
1. Control	4.81 b	—

* Means followed by the same letter are not significantly different at P=0.10, according to the Student-Newman-Keuls Test. LSD_{0.10}=0.52 g.

Increase in dry weight with Vitazyme + SE Mix: 20%

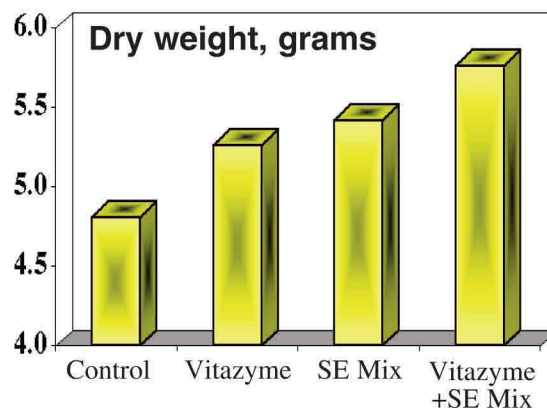
The dry weight of the wheat seedlings was significantly increased above the control by both Southeast Mix alone (+ 13%) and especially by Southeast Mix plus Vitazyme (+ 20%), showing that soil and fertilizer nutrients were being utilized more effectively when Vitazyme was present. Vitazyme alone increased dry weight over the control by 9%, but this increase was not significant at P=0.10.

Weight per plant results: The total dry weight for each pot was divided by the number of plants for each pot to obtain the average weight per plant.



Increase in height with Vitazyme + SE Mix: 28%

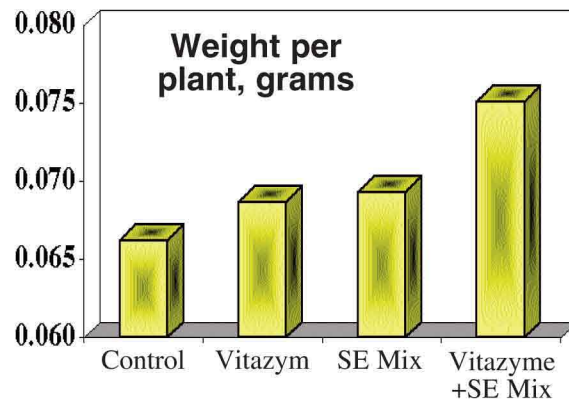
There were no statistical differences among the treatments for plants per pot, but interestingly the Vitazyme and Southeast Mix pots produced the greatest number of surviving plants. Apparently the added nutrients and the biostimulant compounds of the two products helped more wheat seedlings survive. The treated pots exceeded the controls by from 3.6 to 5.4 plants per pot.



Treatment	Weight per plant* ----- grams -----	Change vs. the control
4. Vitazyme + Southeast Mix	0.0751 a	0.0089 (+ 13%)
3. Southeast Mix	0.0693 b	0.0031 (+ 5%)
2. Vitazyme	0.0687 b	0.0025 (+ 4%)
1. Control	0.0662 b	—

* Means followed by the same letter are not significantly different at $P=0.10$, according to the Student-Newman-Keuls Test. $LSD_{010}=0.0057$ g.

**Increase in weight/plant with
Vitazyme + SE Mix: 13%**



Even though Treatments 2, 3, and 4 had the highest plant populations, they also produced the greatest weight per plant, especially Treatment 4 where Vitazyme plus Southeast Mix yielded a 13% greater weight per plant than did the control. This shows that Vitazyme significantly improved nutrient utilization together with Southeast Mix nutrients, with plants that were significantly bigger than with either of the two products alone.

Conclusions: Both Vitazyme and Southeast Mix proved to be effective agents in stimulating wheat growth along with a nominal amount of starter nitrogen and sulfur added at planting, the Vitazyme effect due to biostimulant compounds and the Southeast Mix due to nutrients in the “sucrate” form. These stimulating effects were evident in terms of plant height, dry weight, and weight per plant at harvest. However, the combined Vitazyme and Southeast Mix proved by all means to be the most effective treatment, in all cases producing the greatest height and dry matter accumulation. These results correspond with other studies which demonstrate the ability of Vitazyme phytoactive agents to enhance plant uptake of minerals and nitrogen from either native or applied sources. Note especially the report “Vitazyme and Greenup on Corn”, available through Vital Earth Resources.

Vital Earth Resources

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

2002 Crop Results

Vitazyme on Wheat

Research Farm: Nowlin Farm

Location: Coolidge, Arizona

Variety: a pastry wheat variety

Previous crop: unknown

Soil type: unknown

Planting date: unknown

Experimental design: A large field was divided into two sections: Vitazyme treated with a reduced input of certain fertilizers (101 acres), and full fertilizer without Vitazyme (86 acres).

1. Control + full fertilizer

2. Vitazyme + 50% of some fertilizers

Fertilization: 400 lb/acre N plus other inputs over all areas. At the beginning of grain filling the control area received a foliar application of 4 lb/acre of urea, 14 oz/acre of phosphorus, 36 oz/acre of ViGorator, 1.5 oz/acre of cobalt, 0.75 oz/acre of Xcite, and 0.8 oz/acre of silica. The Vitazyme treated area received Vitazyme (see below) plus 4 lb/acre of urea, 14 oz/acre of phosphorus, 18 oz/acre of ViGorator, 8 oz/acre of sulfur, and 1.5 oz/acre of silica.

Vitazyme application: 13 oz/acre to the foliage at the beginning of grain fill

Harvest results: The last days of May the crop was harvested, and the various loads of grain were weighed from each area. These load weights were tallied for both areas. In addition, the bushel weights and protein levels for the loads were determined and averaged for the two areas.

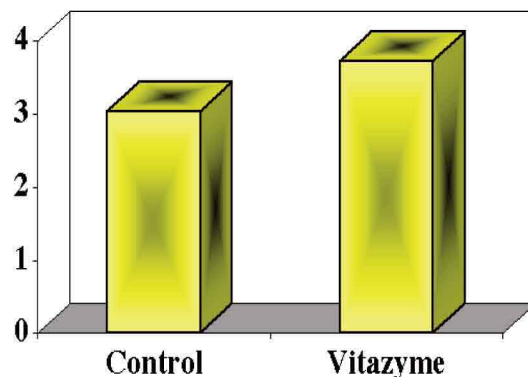
Grain Yield

	<u>Control*</u>	<u>Vitazyme**</u>	<u>Change</u>
	----- tons/acre -----		
Grain yield	3.025	3.715	0.690 (+23%)

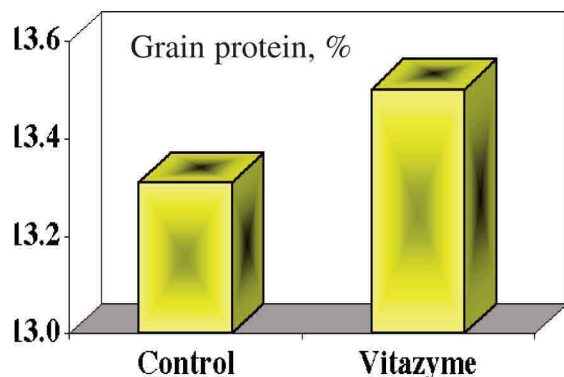
*Eight loads weighed; **12 loads weighed.

Vitazyme with reduced fertility inputs, applied late in the crop cycle, brought about a dramatic 23% increase in wheat yield in this study.

Grain yield, tons/acre



Grain Protein



	<u>Control*</u>	<u>Vitazyme**</u>	<u>Change</u>
	----- percent -----		
Grain protein	13.31	13.50	0.19

*Eight loads measured; **12 loads measured.

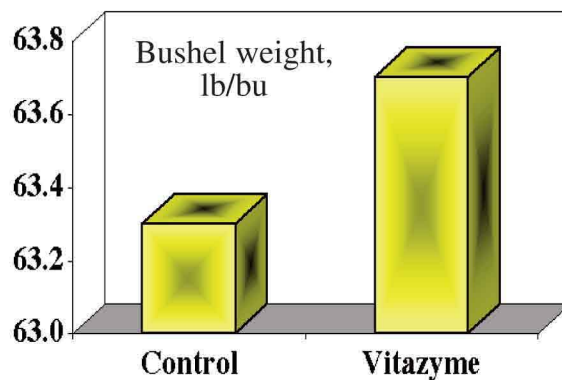
The protein of the grain was boosted by 0.19 percentage point by Vitazyme, despite the fact that some foliar applied fertility inputs were reduced by 50%. The plants were stimulated to make better use of the nitrogen and minerals available to them.

Bushel Weight

	<u>Control*</u>	<u>Vitazyme**</u>	<u>Change</u>
	----- lb/bushel -----		
Bushel weight	63.3	63.7	0.4

*Eight loads measured; **12 loads measured.

The Vitazyme treatment increased the density of the wheat grain by 0.4 lb/bushel, probably due to a higher concentration of minerals within the grain.



Increase in grain yield: 23%

Increase in grain protein: 0.19 percentage point

Increase in bushel weight: 0.4 lb/bu

Income results: Because the wheat was 13.0% protein or above, the grower received a premium price of \$2.00/cwt over the usual price for the wheat. This premium price amounted to \$7.50/cwt.

	<u>Control</u>	<u>Vitazyme</u>	<u>Change</u>
	----- \$/acre -----		
Crop income	453.75	557.25	224.50

**Increase in income:
\$103.50/acre**

Conclusions: Vitazyme together with a reduced rate of certain foliar fertilizers, applied at the beginning of grain filling, brought about an improvement in all parameters measured in this Arizona pastry wheat study. Yield was boosted by 23%, grain protein by 0.19 percentage point, bushel weight by 0.4 lb/bu, and income by \$103.50/acre. These effects resulted from Vitazyme's ability to stimulate rhizosphere microflora, allowing the plant to better utilize native and applied nutrients and to generate more its own nitrogen and growth enhancing compounds in the root zone such as growth regulators, antibiotics, various mineral-dissolving acids, and so forth.

Vital Earth Resources

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2002 Crop Results

Vitazyme on Wheat (Spring)

Researcher: Eltjo van Cingel

Farmer: John Egeland

Location: Fisher, Minnesota

Variety: Knudson hard red spring

Soil type: clay loam

Seeding rate: 90 lb/acre

Planting date: May 14, 2002

Experimental design: A field containing 89 acres was divided into three portions, 34 acres of an untreated control, 32 acres of Vitazyme only, and 23 acres of Vitazyme plus a fertilizer blend.

1. Control

2. Vitazyme

3. Vitazyme + fertilizer blend

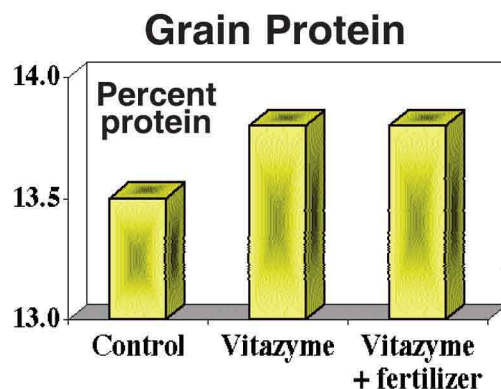
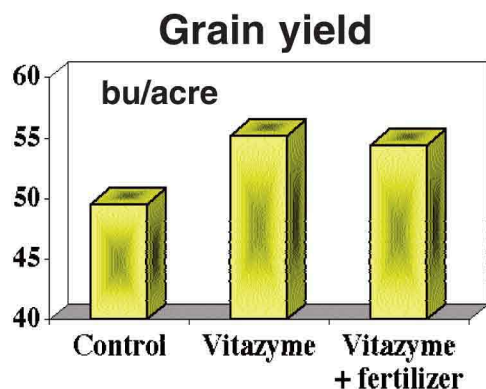
Fertilization: Unknown for Treatments 1 and 2, but Treatment 3 had a special blend of fertilizer applied based upon a soil test and the Albrecht system of soil balancing

Vitazyme treatment: 13 oz/acre on the leaves and soil on June 17 by airplane, with a herbicide, for Treatments 2 and 3

Harvest date: August 21, 2002

Yield results: Actual truck weights were taken to insure an accurate yield calculation for all areas. Yield monitor results were also tabulated, and the highest yield for each treatment is given in one of the columns.

Treatment	Grain yield bu/acre	Change bu/acre	Protein	Highest yield bu/acre	Test weight lb/bu
1. Control	49.5	—	13.5	57	58
2. Vitazyme	55.2	+5.7 (+12%)	13.8	59	58
3. Vitazyme + special blend	54.4	+4.9 (+10%)	13.8	60	57



Increase in Yield (2X): 12%

Increase in grain protein: 0.3 percentage point

Income results: This crop was contracted for \$0.70/bu above the market value, so with a market value of \$4.84/bu the contract price is \$5.54/bu.

Treatment	Grain yield	Grain Value	Change in value
	bu/acre	\$/acre	\$/acre
1. Control	49.5	—	13.5
2. Vitazyme	55.2	305.81	31.58
3. Vitazyme + special blend	54.4	301.38	27.15

**Increase in income:
\$31.58/acre**

**Cost:Benefit ratio:
7.9:1**

Conclusions: Vitazyme applied to the leaves and soil of this hard red spring wheat variety in the Red River Valley significantly increased yield (+12%) and income (\$31.58/acre); yield and return were slightly lower with the special blend of fertilizer. Moreover, the grain protein was enhanced slightly (0.3 percentage point) with both Vitazyme treatments. These results illustrate the rhizosphere stimulating effects of the product's active agents to take up more nutrients, while stimulating photosynthesis to fix more carbon and thus increase yields above the untreated control.

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2002 Crop Results

Vitazyme on Wheat a Testimonial

Researcher: Michael Dustan

Location: southwestern England (Wells, Somerset County)

Variety: feed wheat

Soil type: clayey; high Ca, low Mg, low trace minerals

Planting date: October, 2001

Experimental Design: Four farms had fields that were treated with the Vitazyme program in Somerset County, with control areas left untreated. No total yield data were obtained, but responses were closely estimated on all four farms.

1. Control

2. Vitazyme

Fertilization: Typical applications were 160 to 180 lb N/acre, and 200 to 300 lb/acre of a 0-24-24% N-P₂O₅-K₂O fertilizer.

Vitazyme application: 1 liter/ha (13 oz/acre) at the early flag leaf stage, towards the end of May

Harvest date: August, 2002

Yield and quality results: Average yield increases for the Vitazyme treatments for the four farms were 0.5 to 0.8 metric tonnes/acre.

Yield increases: 0.5 to 0.8 mt/acre

The heads and grains of the Vitazyme treated wheat were larger and plumper than for the untreated control.

Conclusions: Although the Vitazyme was applied very late in the growth cycle, the responses on these four English farms were excellent. Comments of the researcher were as follows:

- **The treated wheat responded immediately to the Vitazyme, results being visible within four days of application.**
- **The treated plants were better looking, bigger, and had less grain shriveling.**
- **It is a very easy-to-use product**
- **All of the farmers are very happy and impressed with Vitazyme.**
- **In one 70-acre block, he expected 1.0 to 1.5 tonnes/acre but after treatment actually harvested over 3.0 tonnes/acre.**

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2000 Crop Results

Vitazyme on Wheat (Winter)

Farmer: Mike Iller

Location: Twin Falls, Idaho

Variety: Stevens soft white winter wheat

Planting date: October 9, 1999

Experimental design: A wheat field of 40 acres was divided into two 20-acre portions having similar soils. One part was treated with Vitazyme and the other part was left untreated for a control. All fertility and management practices were the same for each portion.

1. Control

2. Vitazyme

Fertilization: 10 tons/acre manure, 31 lb/acre N, and 39 lb/acre P₂O₅, the fall of 1999; 46 lb/acre N the spring of 2000

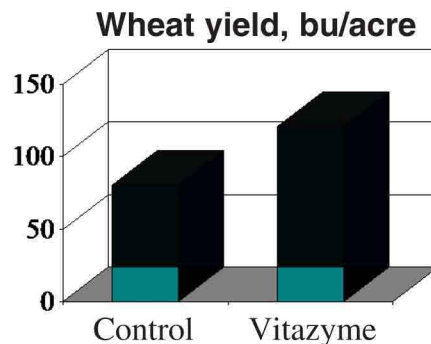
Vitazyme application: 26 oz/acre on the leaves and soil along with 1 pint/acre of 0-30-0

Harvest date: August 29, 2000

Yield results:

	Control	Vitazyme	Change
		bu/acre	
Grain yield	80.47	120.71	40.24 (+50%)

Yield increase: 50%



Income results: A price of \$1.80/bu is estimated

	Control	Vitazyme	Change
		\$/acre	
Gross income	144.85	217.28	(+) 72.43

**Income increase:
\$72.43/acre**

Conclusions: One application that was twice as concentrated as recommended boosted wheat yield in this Idaho study by 50%. This increase amounted to an excellent income enhancement of \$72.43/acre.

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2000 Crop Results

Vitazyme on Winter Forage Barley, Oats, and Wheat

Farmer: Cornelius Van Diest

Location: Newberry Springs, California

Variety: barley, oats, and wheat varieties

Planting date: November 11, 1999

Soil type: light blow sand with high levels of boron in the subsoil

Seeding rate: 150 to 200 lb/acre

Experimental design: A center pivot system was divided into four quadrants. Three (90 acres) were treated with the Vitazyme program and one (30 acres) was left untreated.

1. Control

2. Vitazyme

Fertilization: 18 lb/acre of NH_4NO_3 liquid at the sixth true leaf; 35 lb/acre of NH_4NO_3 liquid two times (sometimes three times) per cutting sequence, giving about 125 lb/acre total of the N fertilizer per crop

Vitazyme treatment: (1) On the seeds at planting at 6.4 oz/acre, with the starter fertilizer; (2) 13 oz/acre sprayed on the leaves and soil twice, after each nitrogen fertilizer application

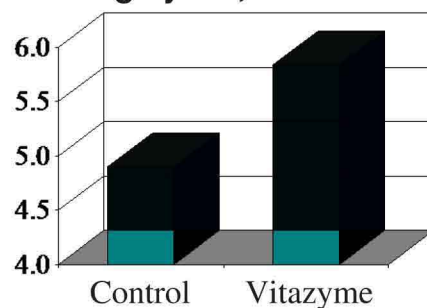
Harvest date: April 11, 2000, for the Vitazyme treatment; April 14, 2000, for the control

Yield results:

	Control*	Vitazyme*	Change
		100 lb bales/acre	
Forage yield	98.0	116.7	18.7
		tons/acre	
Forage yield	4.900	5.833	(+) 0.933 (+19%)

Forage yield increase: 19%

Forage yield, tons/acre



Income results: A value of \$125.00/ton is estimated

	Control	Vitazyme	Change
		\$/acre	
Crop income	612.50	729.13	(+) 116.63

**Income increase:
\$116.63/acre**

Conclusions: This forage trial in the Mojave River drainage basin, with poor desert soils having high yield potential if managed well (12 tons/acre of 20% protein and 60% TDN alfalfa), showed the potential of Vitazyme to substantially increase grass forage yields and income. A 19% yield increase resulted in \$116.63/acre more return, giving a 9:1 return on investment for a Vitazyme seed treatment and two foliar applications.

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1999 Crop Results

Vitazyme on Winter Wheat

Farmer: M. Wheeler

Location: Kent, England

Variety: Equinox (soft wheat)

Soil type: sandy loam

Planting date: October, 1998

Harvest date: August, 1999

Experimental design: A field was divided into two parts, one treated with the "Eco-Ag" System and the other with conventional fertility methods.

1. Control

2. Vitazyme + Eco-Ag products

Fertility treatments: no P₂O₅ or K₂O and reduced nitrogen fertilizer. Nitrogen was applied twice to give 180 kg/ha (161 lb/acre) actual N, which was a 10% reduction in rate.

Vitazyme applications: Four applications of 250 ml/ha (3 oz/acre) each were applied at drilling, early spring, midseason, and flowering to give a 1 liter/ha total. Humic acids were also applied, and fungicide applications were made at reduced levels.

Yield results:

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
Grain, tonnes/acre	4.1	5.1	1(+25%)

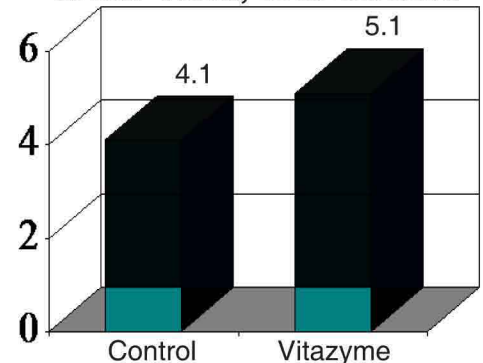
Grain increase: 25%

Income results: Price of wheat = \$111.30/tonne

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
Income	\$456.33/acre	\$567.63/acre	\$111.30/acre

Income increase: \$111.30/acre

Grain Yield, tonnes/acre



Comments: Due to the excellent result, Mr. Wheeler will be using Vitazyme and the Eco-Ag System on all of his land in 2000. He also noticed a benefit to soil structure and available plant nutrients.

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1997 Crop Results

Vitazyme on Wheat

Researcher: Tom Bay

Location: Rushville, New York

Seeding date: October 6, 1996

Variety: Pioneer 2548 winter wheat

Previous crop: native sod

Seeding rate: 2.9 bu/acre

Experimental design: A wheat field was split into two portions, one part of 32 acres receiving Vitazyme and the other part of 43 acres receiving additional nitrogen but no Vitazyme.

1. Control (no Vitazyme)

2. Vitazyme

Fertility treatments: The **control** received 5.4 gal/acre of Nature's 9-18-9 plus 2.6 gal/acre of 0-0-30 (liquid) in the fall at planting, applied directly to the seeds. The **Vitazyme treatment** received only 2.7 gal/acre (50%) of 9-18-9 plus 1.3 gal/acre of 0-0-30 and 0.5 gal/acre of sugar at planting. In the spring, **both treatments** received 60 lb N/acre as a 32% liquid plus 1 lb/acre Solubor.

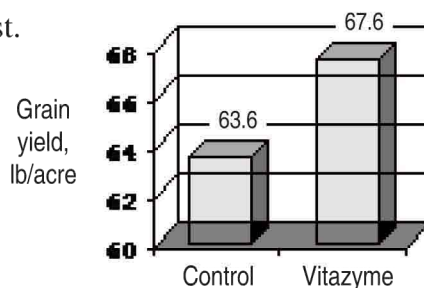
Vitazyme treatment: The Vitazyme treated portion of the field received 13 oz/acre injected with the fertilizer directly on the seed at planting.

Interseeded crop: Red clover was seeded to all areas, so no herbicides were used.

Harvest date: July 20, 1997

Yield results: Both plots had 13% moisture and 60 lb/bu grain at harvest.

<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
63.6 bu/acre	67.6 bu/acre	4.0 bu/acre (+6%)



Yield increase: 6%

Income results: The price of wheat was estimated at \$3.50/bu. The 9-18-9 and 0-0-30 fertilizer mix was worth about \$2.50/gal.

	<u>Control</u>	<u>Vitazyme</u>	<u>Increase</u>
Grain value	\$222.60	\$236.60	\$14.00/acre
Fertilizer savings	—	(4 gal/acre)	\$10.00/acre

Income increase: \$24.00/acre

Comments: Some field variability existed, but the two areas were fairly well matched so the yield comparison should be valid.