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

2014 Crop Results

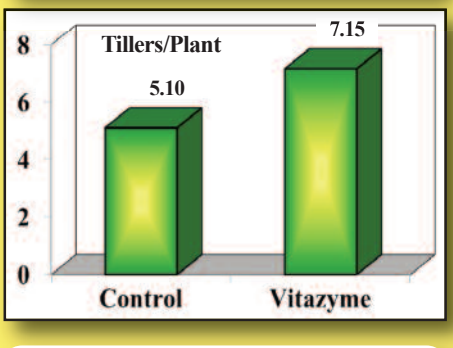
Vitazyme on Winter Wheat

Researcher: Jacob Hesseltine, Vital Grow Distribution LLC, Waterville, Washington
Farmer: Brandt Farms
Location: Waterville, Washington
Variety: Eltan
Planting date: August 22, 2013
Seeding rate: 36 lb/acre
Seedbed preparation: conventional
Previous crop: winter wheat and summer fallow
Soil type: volcanic ash mixed with sand and clay
Experimental design: A 120-acre field of winter wheat was divided into two parts, one being about 40 acres which received Vitazyme once in the spring. The purpose of the study was to determine the effects of this product on wheat growth and yield.

1. Control **2. Vitazyme**

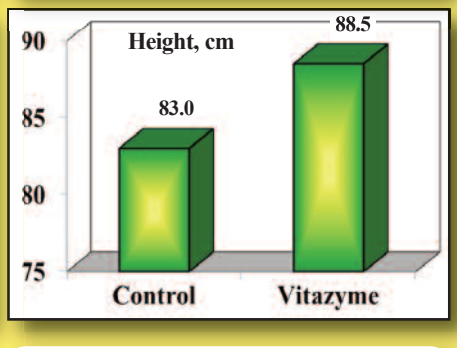
Fertilization: 65 lb/acre of a mixed fertilizer
Vitazyme application: 13 oz/acre sprayed in late April along with a herbicide. A Summers Ultimate NT 90-foot boom sprayer was used.
Growing season weather: a dry year overall
Plant mapping results: On August 1, four days before harvest, 20 random and average plants from both treatments were dug and evaluated for several parameters.

Tillers Per Plant



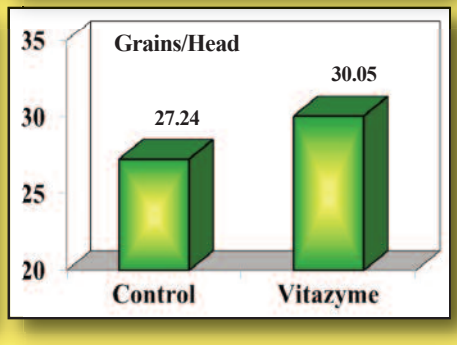
Increase in tillers per plant with Vitazyme: 40%

Plant Height



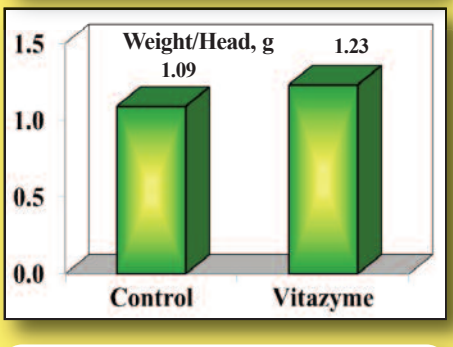
Increase in plant height with Vitazyme: 7%

Grains Per Head



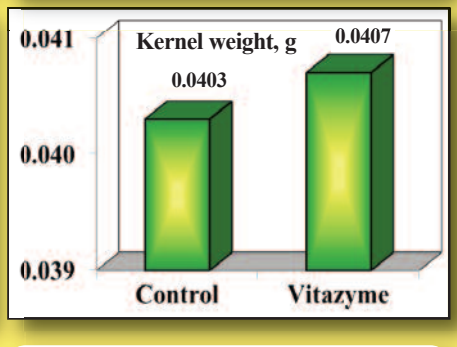
Increase in grains per head with Vitazyme: 10%

Grain Weight Per Head



Increase in grain weight per head with Vitazyme: 13%

Kernel Weight



Increase in kernel weight with Vitazyme: 1%

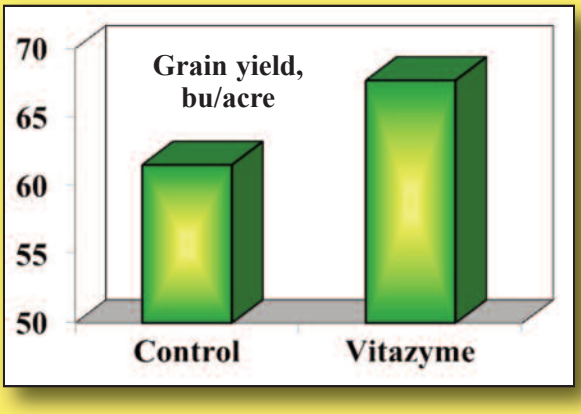
All five measured parameters were improved with Vitazyme application, in particular tillers per plant. Head size and grain weight per head were also notably increased.

Harvest date: August 5, 2014

Yield results: Multiple 1.3-acre strips, one combine width, were harvested in each treatment, and the combine monitor yield values were averaged.

Treatment	Grain yield	Yield change
	bu/acre	bu/acre
Control	61.53	—
Vitazyme	67.69	6.16 (+10%)

Increase in grain yield with Vitazyme: 10%



Conclusions: A field scale winter wheat trial in central Washington revealed that Vitazyme, applied in late April at 13 oz/acre with a herbicide, stimulated all measured plant parameters, and boosted yield by 10%. This increase resulted in about $37.00/acre more income, with a cost of Vitazyme of only about $6.00/acre, a $31.00 net return, or a cost;benefit ratio of 6.2:1. Tillering was greatly improved (40%) by this single application, but plant height, grains per head, and grain weight per head were also elevated. The farmer noticed shortly after the Vitazyme treatment that the wheat grew back quicker in the tractor and sprayer tracks than in the untreated control areas. This program for wheat growers is highly recommended to enhance yields and profits in Washington.

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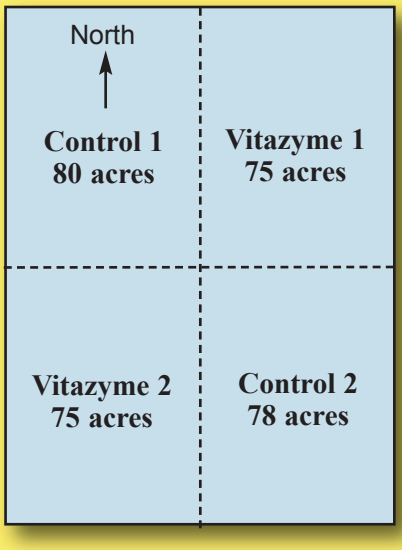
2014 Crop Results

Vitazyme on Winter Wheat



Researchers: Dale Whaley, Washington State University Douglas County Extension Service, and Jacob Hesseltine, Vital Grow Distribution LLC, Waterville, Washington
Farmer: Jordan Farms
Variety: Eltan
Planting date: August 28, 2013
Planting rate: 50 lb/acre
Tillage: conventional
Previous crop: winter wheat and fallow
Soil type: clayey
Weed control: herbicides
Experimental design: Two quarter sections of land planted to winter wheat were each divided approximately in half, with one portion treated with Vitazyme to evaluate the effect of this product on crop yield, as well as oncertain parameters. The product was applied once fairly late in the growing season.

1. Control **2. Vitazyme**

Fertilization: 55 lb/acre of anhydrous ammonia
Vitazyme application: 13 oz/acre in late May. A Flex Coil boom sprayer was used.
Growing season weather: excessive rain during fall planting, and record-low rainfall in 2014
Harvest date: August 4 and 5, 2014. Samples of plants were collected July 29, six days before harvest.
Plant mapping results: Twenty typical plants from each of the four acres were dug by both researchers, and results are averaged for all 20 plants.

Improvements in Plant Traits with Vitazyme

Tillers/Plant	33%
Plant height	12%
Grains/Head	21%
Grain weight/Head	41%
Kernel weight	12%
Test weight	0%

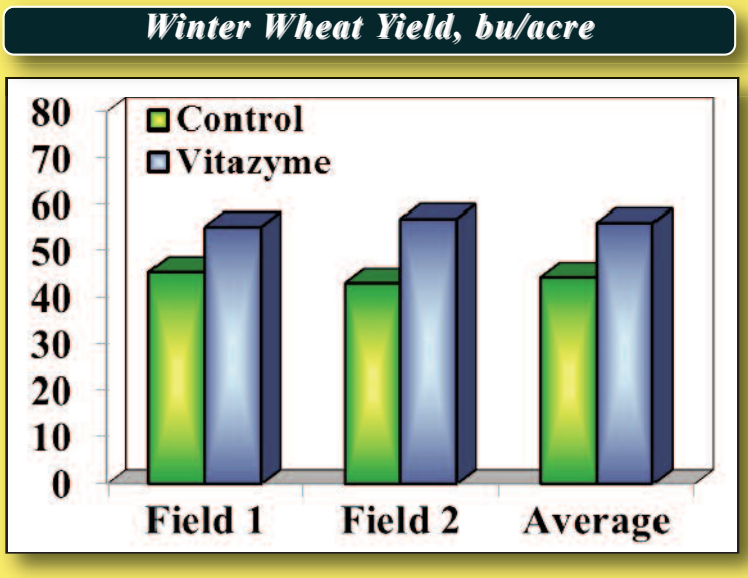
Parameter		Control	Vitazyme	Change
Tillers per plant	Field 1	4.85	6.40	
	Field 2	4.35	5.85	
	Mean	4.60	6.13	1.53 (+33%)
Plant height, cm	Field 1	74.15	80.10	
	Field 2	76.4	89.3	
	Mean	75.3	84.7	9.4 (+12%)
Grains per head	Field 1	29.2	33.7	
	Field 2	24.2	30.6	
	Mean	26.7	32.2	5.5 (+21%)
Grain weight per head, g	Field 1	1.04	1.46	
	Field 2	0.79	1.14	
	Mean	0.92	1.30	0.38 (+41%)
Kernel weight, g	Field 1	0.0356	0.0395	
	Field 2	0.0327	0.0371	
	Mean	0.0342	0.0383	0.0041 (+12%)
Test weight, lb/bu	Field 1	60.8	61.0	
	Field 2	61.0	60.8	
	Mean	60.9	60.9	0

All plant characteristics improved with Vitazyme application, on both fields and in every case. Especially noteworthy are the increases in tillers/plant (33%), grains/head (21%), and grain weight/head (41%). An increase in kernel weight of 12% is also noteworthy.

Yield results: The farmer noticed a definite differences in color and height of the crop when he combined the fields.

Treatment	Field 1[a]			Field 2[b]			Total Area	
	Total yield	Area yield	Yield change	Total yield	Area yield	Yield change	Average yield	Yield change
	bu	bu/acre	bu/acre	bu	bu/acre	bu/acre	bu/acre	bu/acre
Control	3,640	45.50	—	3,356	43.03	—	44.28	—
Vitazyme	4,143	55.24	9.74 (+21%)	4,274	56.99	13.96 (+32%)	56.11	11.83 (+27%)

[a]Control = 80 acres; Vitazyme = 75 acres. [b]Control = 78 acres; Vitazyme = 75 acres.



Increase in wheat yield with Vitazyme: 27%

Conclusions: A winter wheat trial in Washington involving two contiguous split-acre parcels, with Vitazyme applied once in late May, revealed that the product improved nearly all measured plant parameters at harvest, including tillers per plant (33%), plant height (12%), grains per head (21%), grain weight per head (41%), and kernel weight (12%). Test weight was not affected. Yield was improved by an impressive 27% for both split fields, a difference that the farmer could clearly see while harvesting. All of the crop sold as Number 1 Wheat. These results show the great value of utilizing Vitazyme to enhance winter wheat programs in central Washington.

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2014 Crop Results

Vitazyme on Winter Wheat

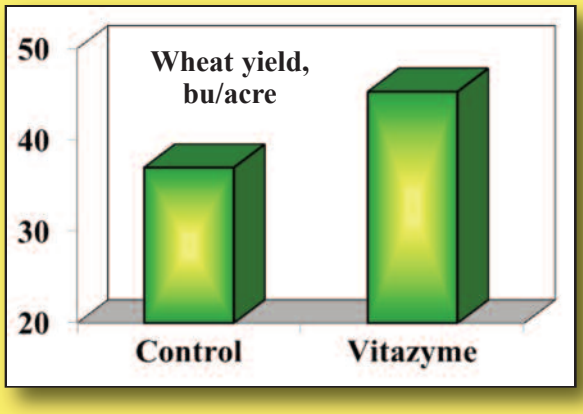
Researcher: Jacob Hesseltine, Vital Grow Distribution LLC, Waterville, Washington
Farmer: Jordan Farms *Location*: Withrow, Washington *Variety*: Eltan
Planting date: September 10, 2013 *Planting rate*: 43 lb/acre *Soil type*: sandy loam
Seedbed preparation: conventional (harrowing, plowing, and cultivation)
Previous crop: winter wheat and summer fallow
Experimental design: A field of winter wheat totalling 193 acres was divided into a Vitazyme treated area (105 acres) and an untreated control area (88 acres), with one application, to determine the effect of the product on wheat yield.

1. Control **2. Vitazyme**

Fertilization: 45 lb/acre of anhydrous ammonia
Vitazyme application: 13 oz/acre sprayed on May 20 along with Olympus Flex broadleaf and grass killer, using a flex-coil boom sprayer
Weather for 2014: Rain delayed planting, and rainfall during the growing season was at a record low.
Harvest date: July 23 to 28, delayed by rain
Yield results:

Treatment	Wheat yield	Yield change
	bu/acre	bu/acre
Control	37.0	—
Vitazyme	45.4	8.4 (+23%)

Increase in wheat yield with Vitazyme: 23%



Grain test weight results: The control treatment gave 62.3 lb/acre test weight, while the Vitazyme treatment gave 62.4 lb/bu, nearly identical. Both treatments produced No. 1 wheat since the test weight exceeded 60 lb/bu.
Income results: Wheat was selling for $6.12/bu at the time of harvest. A Vitazyme price of $60.00/gal is used for the calculations; 13 oz/acre would cost $6.00.

Treatment	Wheat yield	Wheat income	Income change
	bu/acre	$/acre	$/acre
Control	37.0	226.44	—
Vitazyme	45.4	277.85	51.41

Income increase with Vitazyme: $51.41/acre

Cost:Benefit ratio with Vitazyme: 8.57:1

Conclusions: A winter wheat large-field study in central Washington revealed that one 13 oz/acre application of Vitazyme, applied with a herbicide, improved the yield by 8.4 bu/acre, a 23% increase. Using the current wheat price, that increase gave $51.41/acre more income, representing an 8.57:1 cost:benefit ratio for the $6.00/acre product investment. Such a great improvement in yield and income for a small investment, while requiring no extra trip across the field, reveals the excellent value of Vitazyme for wheat growers in the Pacific Northwest.

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2013 Crop Results

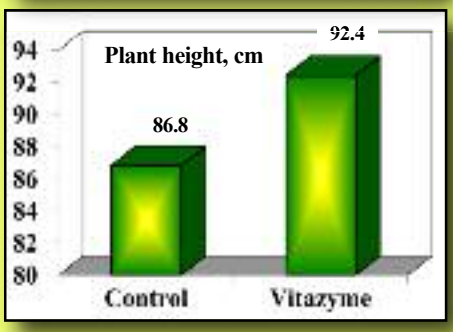
Vitazyme on Winter Wheat

Researcher: Jacob Hesseltine *Farmer*: Garth Hinderer *Location*: Waterville, Washington
Variety: Eltan soft white winter wheat *Previous crop*: fallow *Planting date*: mid August, 2012
Planting rate: 60 lb/acre *Tillage*: plowing, harrowing, cultivation
Experimental design: A 39.54-acre field was separated into two portions: 21.82 acres for Vitazyme application and 17.72 acres for an untreated control. Vitazyme was spring applied by air, to evaluate the effects of the product on winter wheat.

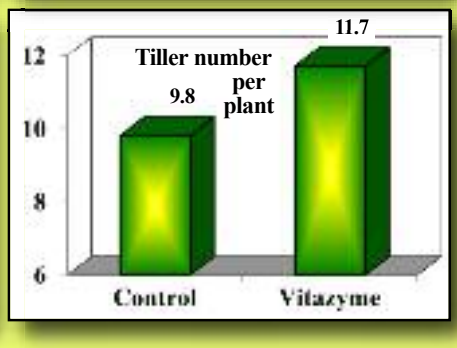
1. Control **2. Vitazyme**

Fertilization: 50 lb/acre of N and 10 lb/acre of S applied in the spring
Vitazyme application: 11.7 oz/acre (0.9 liter/ha) applied by air on the 21.82 acres on May 20
Weather for 2013: Good, but with considerable late season rain that interfered with harvest
Harvest date: August 20 and 21, 2013
Pre-harvest evaluation: On August 8, 20 plants from both the Vitazyme and control areas were dug to evaluate plant parameters. Values are averages for the 20 plants.

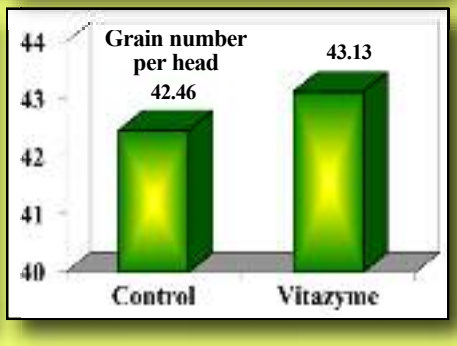
Plant Height*



Productive Tillers/Plant

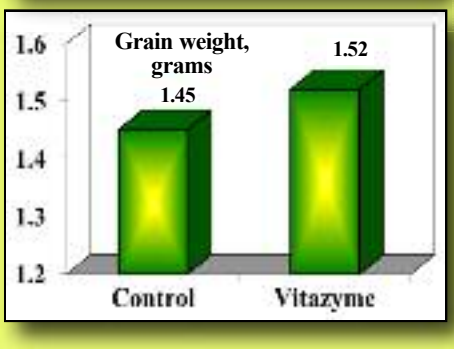


Grains Per Head

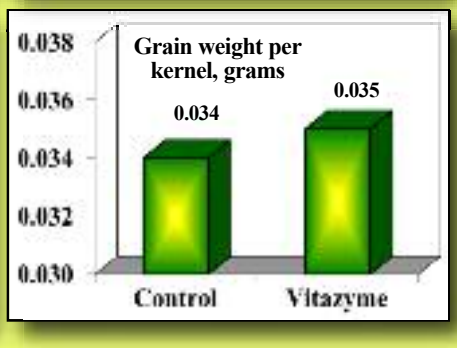


*Measured from soil level to tip of tallest tiller.

Grain Weight Per Head



Grain Weight Per Kernel



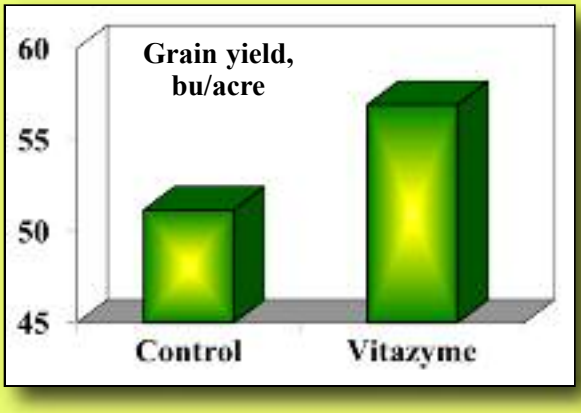
Increases with Vitazyme:

Plant height 7%
Productive tillers/plant 19%
Grains per head 2%
Grain weight/head 5%
Grain weight/kernel 3%

Yield results: A severe wind and rain storm on August 10 damaged the crop, the Vitazyme treatment more so than the control due to taller plants and heavier heads.

Treatment	Grain yield	Yield change
	bu/acre	bu/acre
Control	51.15	—
Vitazyme	56.92	5.77 (+11%)

Increase in grain yield with Vitazyme: 11%



Conclusions: A soft white winter wheat study in central Washington revealed that Vitazyme improved every plant parameter measured, especially productive tillers per plant (+19%). Grain yield was increased by 11%, and would likely have increased even more had the crop been harvested before a severe storm struck. Also, an application on the seeds, or early in the crop cycle, would likely have improved the yield increase, as would have a full 13 oz/acre application rate. This study shows the excellent effectiveness of foliar applied Vitazyme for wheat production in Washington.

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2012 Crop Results

Vitazyme on Winter Wheat

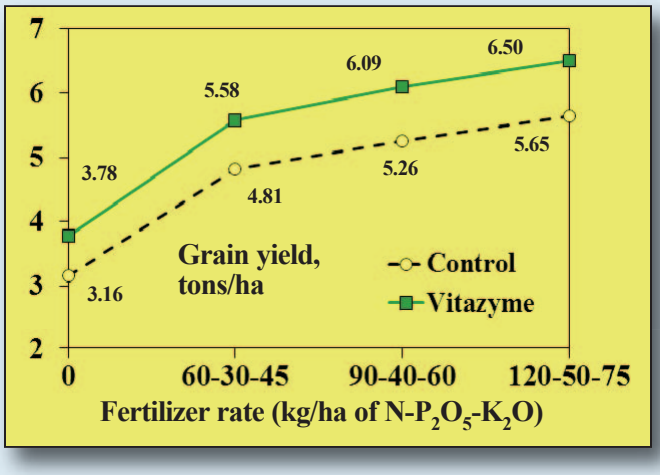
A Fertilizer Rate Study

Researcher: V. Plotnikov *Research organization*: National Academy of Agricultural Sciences
Location: Vinnytsia, Ukraine *Variety*: Carivna *Tillage*: conventional (disking, plowing, and cultivating) *Soil type*: gray podzolic (2.2% organic matter, 8.4 mg/100 g of soil hydrolyzed N, 15.8 mg/100 g of soil P, 12.4 mg/100 g of soil exchangeable K, pH = 5.5)
Planting date: October 7, 2011 *Previous crop*: peas *Planting rate*: 6 million seeds/ha
Experimental design: A replicated plot design wasinitiated with winter wheat, using four fertility levels, to evaluate the effect of Vitazyme on wheat yield, quality, disease incidence, and plant traits at four fertility levels. Four replications were used, and the plots were 0.1 ha in area.

Treatment	Vitazyme	Nitrogen	Phosphate	Potash
	----------	kg/ha	----------	
1	0	0	0	0
2	X	0	0	0
3	0	60	30	45
4	X	60	30	45
5	0	90	40	60
6	X	90	40	60
7	0	120	50	75
8	X	120	50	75

Fertilization: Phosphorus and potassium fertilizers were applied in the fall of 2011 during basic tillage, and nitrogen was applied in the spring.
Vitazyme application: For Treatments 2, 4, 6, and 8, a seed treatment of 1 liter of Vitazyme per ton of seed was applied, and later 0.5 liter/ha were applied to the leaves and soil at the boot stage (leaf tube formation).
Weather for 2012: favorable for crop development

Yield results:



Treatment	Yield increase with Vitazyme*	Income increase with Vitazyme*
	tons/ha	hrn/ha
2	0.62 (+20%)	1,095
4	0.77 (+16%)	1,457
6	0.83 (+16%)	1,581
8	0.85 (+15%)	1,623

*Yields and income are compared at the same fertility level.

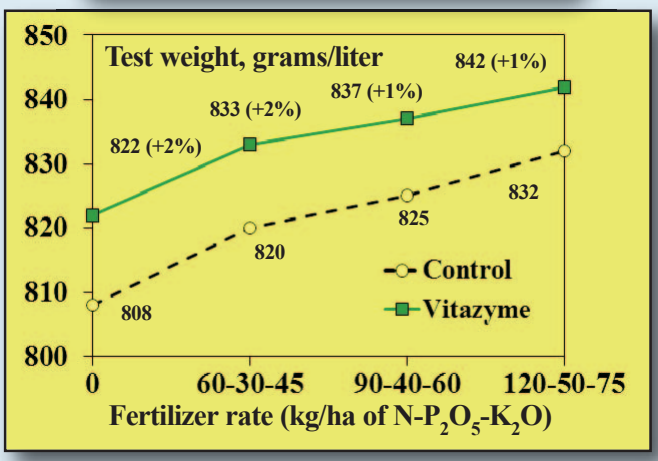
Yield increase with Vitazyme

No fertilizer 20%
Low N-P-K 16%
Medium N-P-K 16%
High N-P-K 15%

Note that at all fertility levels the yield was increased, but especially at the lowest level (20%). When low and medium rates were applied, the yields increased by 16%, and the high fertilizer rate boosted the yield by 15%. These results correspond with other studies over the years which have shown that the highest percentage yield increases are with the lower soil fertility levels. At any fertilizer application level, Vitazyme in this study has been shown to be an excellent, highly profitable addition to the wheat, production system.

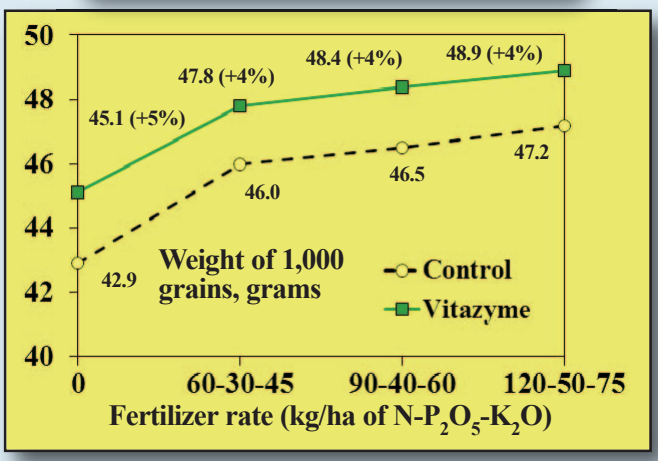
Quality results:

Grain Test Weight



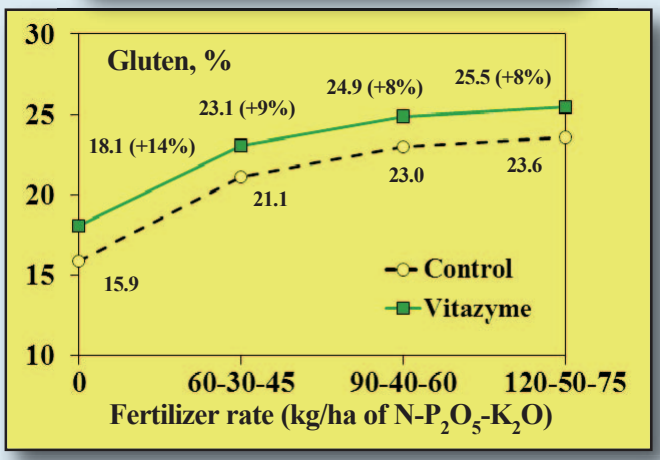
Increase in test weight with Vitazyme at the same fertilizer level: 1 to 2%

Weight of 1,000 Grains



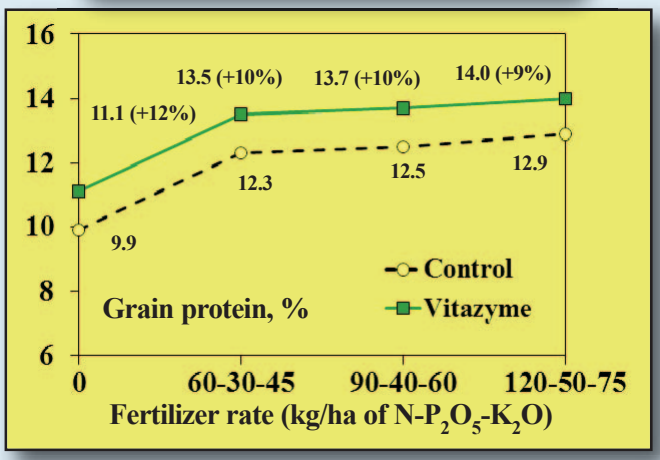
Increase in 1,000-grain weight with Vitazyme at the same fertility level: 4 to 5%

Grain Gluten



Increase in grain gluten with Vitazyme at the same fertilizer level: 8 to 14%

Grain Crude Protein

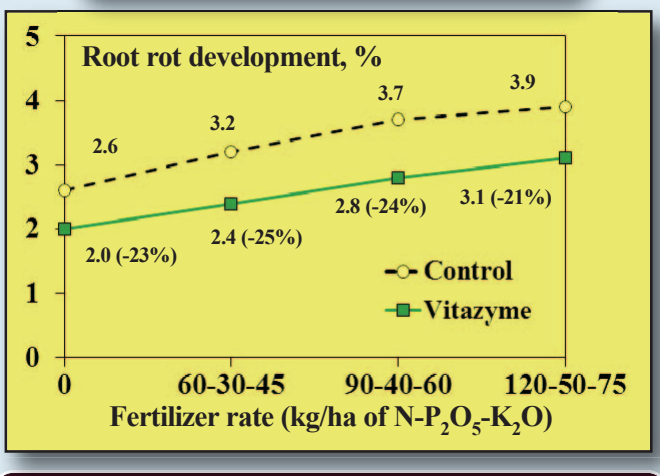


Increase in grain crude protein with Vitazyme at the same fertilizer level: 9 to 12%

All quality parameters responded positively to Vitazyme application – test weight, 1.000-grain weight, gluten, and protein – the higher fertilizer application rates giving somewhat reduced responses. Note that protein increased from 1.1 to 1.2 percentage points for all fertility levels.

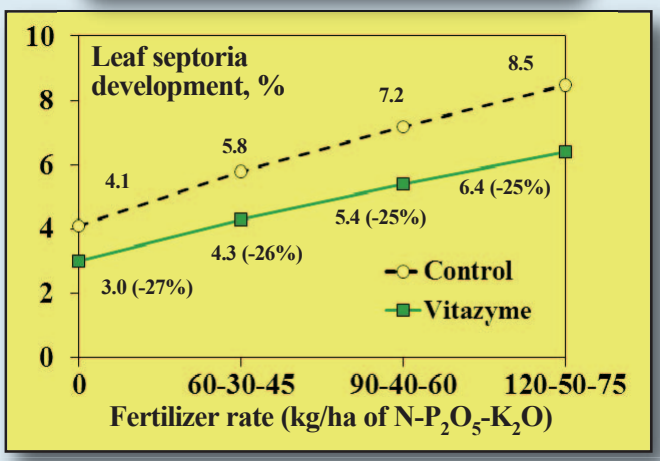
Disease results:

Root Rot Damage



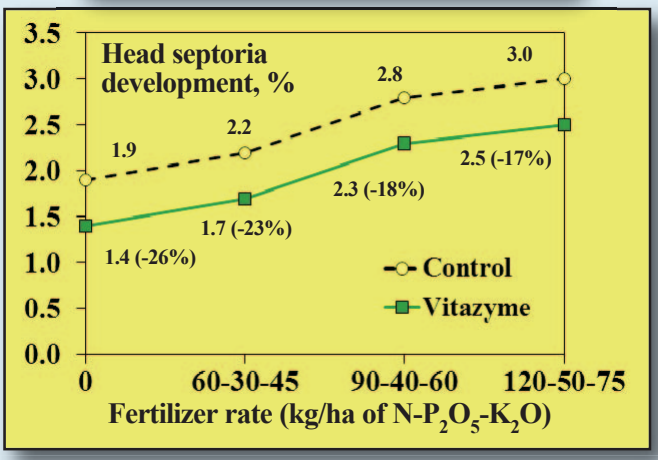
Decrease in root rot development with Vitazyme at the same fertilizer level: 21 to 25%

Leaf Septoria Damage



Decrease in leaf septoria development with Vitazyme at the same fertilizer level: 25 to 27%

Head Septoria Damage

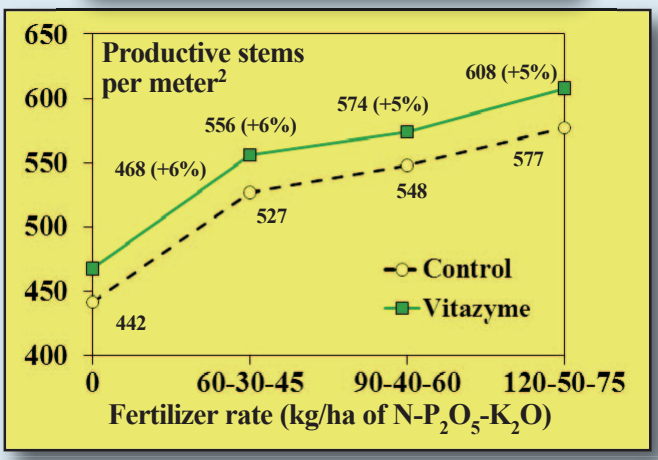


In every case Vitazyme reduced damage of fungi to roots, leaves, and heads, by from 17 to 27%. The greatest protection percentage-wise was found at the lowest fertility levels.

Decrease in head septoria damage with Vitazyme at the same fertilizer level: 17 to 26%

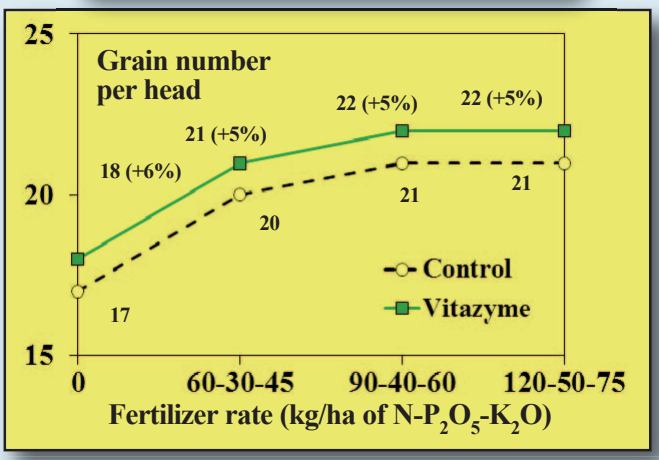
Plant structure results:

Stem Density



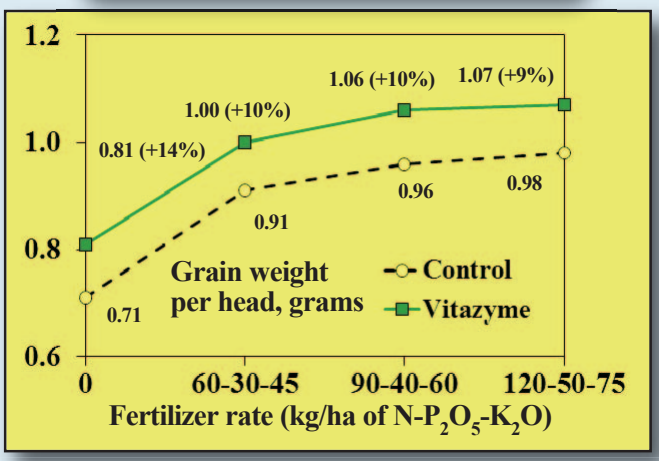
Increase in productive stems with Vitazyme at the same fertilizer level: 5 to 6%

Grains Per Head



Increase in grains per head with Vitazyme at the same fertility level: 5 to 6%

Head Grain Weight



Increase in grain weight per head with Vitazyme at the same fertilizer level: 9 to 14%

Note that all parameters measured – stem density, grains per head, and grain weight per head – were all enhanced by Vitazyme at all fertilizer levels, especially percentage-wise at the lower fertilizer rates.

Conclusions: In this replicated Ukrainian study with Carivna wheat at four fertility levels, Vitazyme proved itself to be a very consistent crop enhancer. The product increased yield by 15 to 20%, the highest percentage increases at the lowest fertilizer levels. Income was also boosted substantially. Grain quality was likewise enhanced: test weight by 1 to 2%, 1,000-grain weight by 4 to 5%, gluten by 8 to 14%, and crude protein by 9 to 12%. Fungal root rot damage was reduced by up to 25%, and both leaf and head septoria development were reduced by 17 to 27%. Plant physical traits showed improvements as well, with productive stem density increasing by 5 to 6%, grains per head by the same amount, and grain weight per head by 9 to 14%. These consistent results show the great value of Vitazyme in improving both the quality and yield of winter wheat in Ukraine.

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2012 Crop Results

Vitazyme on Winter Wheat

Researcher: V. Plotnikov *Research organization*: National Academy of Agricultural Sciences
Location: Vinnytsia, Ukraine *Varieties*: several (see later in this report)
Tillage: conventional (disking, plowing, cultivating) *Previous crop*: corn
Seedbed preparation: plowing, harrowing, and cultivation
Soil type: gray podzolic (2.2% organic matter, 8.4 mg/100 g of soil hydrolyzed N, 15.8 mg/100 g of soil P, 12.4 mg/100 g of soil exchangeable K, pH = 5.5)
Planting date: October 13 and 18, 2011 *Planting rate*: 6 million seeds/ha
Experimental design: Plots of 0.1 ha, with four replicates, were laid out to evaluate the effect of Vitazyme on several winter wheat varieties at the Vinnytsia research station. The purpose of the trial was to evaluate the effect of one Vitazyme application on the yield of grain as compared to the untreated control.

1. Control **2. Vitazyme**

Fertilization: 50 kg/ha dry nitrogen in the spring
Vitazyme application: 0.5 liter/ha on the leaves and soil at the boot stage (leaf tube formation)
Weather for 2012: favorable for all crops
Yield results:

Treatment	Planting date	Grain yield		Yield change	Extra income
		Control	Vitazyme		
		tons/ha	tons/ha	tons/ha	hrn/ha
Carivna	October 13	4.11	4.54	0.43 (+10%)	765
Lisova pisnya	October 13	3.56	3.94	0.38 (+11%)	665
Popelyushka	October 13	3.06	3.74	0.68 (+22%)	1,265
Zymoyarka	October 13	3.29	3.51	0.22 (+7%)	391
Torrild	October 13	3.28	3.60	0.32 (+10%)	545
Skagen	October 13	3.20	3.74	0.54 (+17%)	985
Carivna	October 18	3.44	3.77	0.33 (+10%)	565
Lisova pisnya	October 18	3.23	3.60	0.37 (+11%)	645
Popelyushka	October 18	3.24	3.55	0.31 (+10%)	525
Zymoyarka	October 18	2.92	3.22	0.30 (+10%)	505

All varieties of winter wheat at both planting dates showed excellent yield increases with Vitazyme, ranging from 7 to 22%, with added income of up to 1,265 hrn/ha

Yield increase with Vitazyme

October 13 planting

Carivna	10%
Lisova pisnya	11%
Popelyushka	22%
Zymoyarka	7%
Torrild	10%
Skagen	17%

October 18 planting

Carivna	10%
Lisova pisnya	11%
Popelyushka	10%
Zymoyarka	10%

Conclusions: This winter wheat trial at the National Academy of Sciences in Vinnytsia, Ukraine, revealed that Vitazyme, applied at 0.5 liter/ha at the boot stage, produced excellent yield increases of from 7 to 22% for six varieties, whether applied on October 13 or October 18. Extra income ranged from 291 to 1,265 hrn/ha, proving the excellent value of Vitazyme for winter wheat production in Ukraine.