Spring Barley *with Vitazyme Cold Start application*

Researcher: V. V. Plotnikov
Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York
Location: PE Meleshkin, Kozyatyn District, Vinnytsia Region, Zhurbyntsi Village, Ukraine; central Ukraine (440-590 mm of rain per year)
Variety: Sebastian, F 2
Planting date: April 7, 2023
Planting rate: 4 million seeds/ha
Previous crop: soybeans
Tillage: disking to 8-10 cm, plowing to 20-22 cm, harrowing, pre-planting cultivation to 3-4 cm
Soil type: podzolic black soil (3.9% organic matter)
Experimental design: A spring barley field was divided into an untreated control area and a Vitazyme Cold Start treated area, to evaluate the effect of this biostimulant on the yield of barley grain.

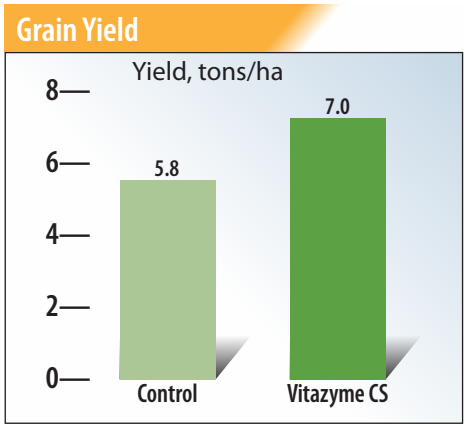
1 ***Untreated control*** **2** ***Vitazyme Cold Start***

Fertilization: 30 kg of N per row at planting
Vitazyme Cold Start application: 1 liter/ha sprayed on the leaves and soil on May 6, at BBCH 13
Income results: The 21% yield increase in barley yield resulted in an income increase of $149/ha.

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Control	5.8	—
2. Vitazyme Cold Start	7.0	1.2 (+21%)

Increase in barley grain yield with Vitazyme Cold Start: 21%



The greater head size and plant development on the right can be noted in this Vitazyme Cold Start spring barley trial. The treated barley yielded 21% more than the untreated control side of the field.

Conclusions: A field-scale spring barley trial in central Ukraine, using a single 1 liter/ha spray application of Vitazyme Cold Start at BBCH 13, resulted in an excellent 1.2 ton/ha yield increase (+21%), which increased net farm income by $149/ha. This result reveals the great value of this program for barley production in central Ukraine.

Barley (Spring) *with Vitazyme application*

Researcher: V. V. Plotnikov ***Research organizations:*** Plant Designs International, Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: LLC "APK Nastashka", Rokytne District, Kyiv Region, Nastashka Village, Ukraine; central Ukraine (440 to 590 mm of rain per year)
Variety: Britni ***Planting date:*** April 8, 2020 ***Planting rate:*** 4 million seeds/ha
Previous crop: corn ***Tillage:*** disking to 10-20 cm, plowing to 20-22 cm, cultivation to 3-4 cm
Soil type: podzolic Chernozem (3.3% organic matter)
Experimental design: A spring barley field was divided into a Vitazyme treated area, and the remainder of the field was left untreated, in order to evaluate the effect of Vitazyme on barley grain yield.

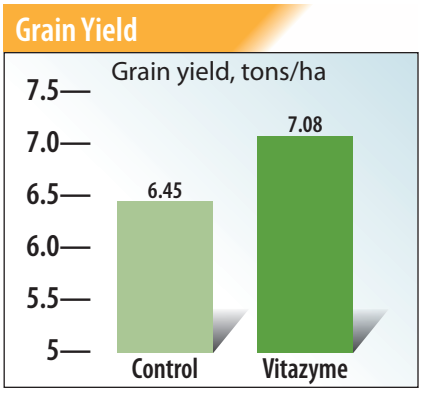
❶ ***Control*** ❷ ***Vitazyme***

Fertilization: 49 kg/ha of N and 24 kg/ha of S before planting plus 5-16-22 kg/ha of N-P_2O_5-K_2O at planting
Vitazyme application: 1.0 liter/ton of barley seed was applied on April 6, 2020, two days before planting.

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Control	6.45	—
2. Vitazyme	7.08	0.63 (+10%)

Increase in grain yield with Vitazyme: 10 %



Income results: The extra 0.63 ton/acre produced extra income of $158/ha.
Conclusions: This field-scale barley study in Ukraine, where Vitazyme at 1 liter/ton of seed was planted in a portion of the field, revealed a 10% yield increase with Vitazyme. This increase resulted in a net income increase of $158/ha, showing the great efficacy of this program for barley growers in Ukraine.

Spring Barley *with Vitazyme application*

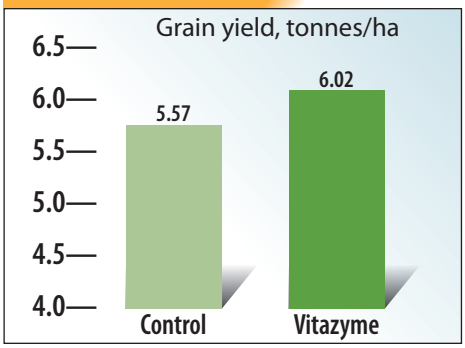
Researcher: V.V. Plotnikov
Research organization: Plant Designs, Inc., Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: Kolyvailo Farm, Vinnytsia District, Vinnytsia Region, Miziakivski Village, Ukraine
Variety: Nezabudka, third generation
Planting date: April 12, 2018
Previous crop: corn
Soil type: dark-brown podzolic (humus=2.0%)
Planting rate: 4 million seeds/ha
Field preparation: disking to 6-8 cm, plowing to 20-22 cm, cultivation to 4-5 cm
Experimental design: A barley field was treated in part with Vitazyme, to compare with the untreated portion of the field and evaluate the effect on yield and profitability.

1 ***Control*** **2** ***Vitazyme***

Fertilization: 77-23-4 kg/ha N-Ca-Mg before planting; 10-26-26 N-P_2O_5-K_2O at planting
Vitazyme application: 1 liter/ha sprayed on April 10.
Yield results: (See bar graph to the right)
Income results: The extra 0.45 tonnes/ha produced $114/ha more income.
Conclusions: This Ukraine spring barley trial, using one 1 liter/ha Vitazyme application, revealed that the yield increased by 8% (0.45 tonnes/ha), a substantial improvement that produced $114/ha more income. This program is proven to be an excellent practice for barley production in Ukraine.

Treatment	Yield	Yield change
	tonnes/ha	tonnes/ha
1. Control	5.57	—
2. Vitazyme	6.02	0.45 (+8%)

Grain Yield



Increase in grain yield with Vitazyme: 8%

Barley *with Vitazyme application*

Researchers: Martin Baltazar and Lucero Fernandez
Farm: Novasem
Research organization: Quimica Lucava
Location: Sayula, Jalisco, Mexico
Variety: Emerald
Planting date: January 14, 2015
Experimental design: A barley field was divided into a 1.5/ hectare Vitazyme treated area, and the remainder of the field served as a control. The purpose of the trial was to discover the effect of Vitazyme on barley yield and profitability.

Barley is being given the second Vitazyme application in a Mexican trial in Jalisco. A pronounced 24% yield response resulted.

1 ***Control*** **2** ***Vitazyme***

Fertilization: Unknown
Vitazyme application: (1) 0.25 liter/ha on the seeds at planting (January 14, 2015) ; (2) 1 liter/ha sprayed on the leaves and soil 37 days after planting (February 20, 2015).
Harvest date: April 29, 2015
Yield results:

Treatment	Sample yield	Yield	Yield change
	kg/0.175 ha	kg/ha	kg/ha
Control	510	2,914	—
Vitazyme	630	3,600	686(+24%)

Increase in barley yield with Vitazyme: 24%

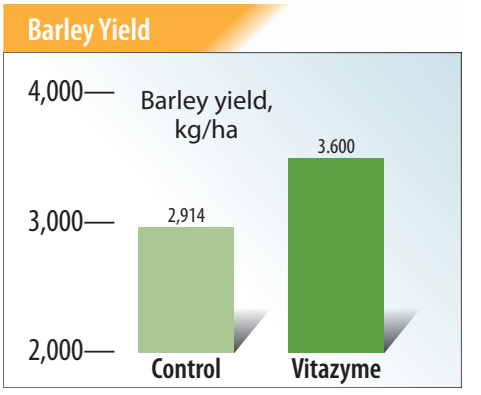
Income results:

Treatment	Yield	Yield change	Gross income[1]	Income change	Vitazyme cost[2]	Profit	Cost : Benefit
	kg/ha	kg/ha	USD/ha	USD/ha	USD/ha	USD/ha	
Control	2,914	—	874.2	—	—	—	—
Vitazyme	3,600	686	1,080.0	205.8	48.28	157.52	3.26

[1]Barley price = 0.30 USD/kg ; [2]Vitazyme cost (for 1.25 liters/ha) + relevant labor for 1 ha.

Increased profit with Vitazyme: 157.52 USD/ha
Cost : Benefit with Vitazyme: 3.26

Conclusion: A barley trial in Mexico, with Vitazyme applied to the seeds at planting and to the leaves and soil 37 days later, resulted in an excellent 24% grain yield increase. This increase gave 157.52 USD/ha more income, and a cost : benefit of 3.26, showing the excellent utility of the program for barley growers in Mexico.



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2014 Crop Results

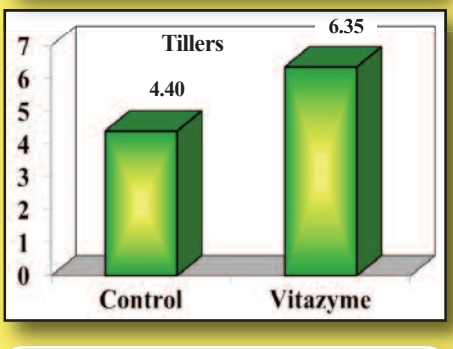
Vitazyme on Spring Barley

Researcher: Jacob Hesseltine, Vital Grow Distribution LLC, Waterville, Washington
Farmer: Tom Stahl *Location*: Waterville, Washington *Variety*: Gallatin (2-row)
Planting rate: 54 lb/acre *Soil type*: clay with volcanic ash
Seedbed preparation: undercutter to loosen soil; anhydrous applicator at 12-inch spacings (4-inches deep)
Previous crop: winter peas (died back from frost)
Planting date: April 30 to May 1, 2014, with an HZ Deep Furrow Drill, rows spaced 16 inches
Experimental design: Two 80-acre fields, separated by a dirt road, were selected for a spring barley study. The east field was treated once with Vitazyme, and the west field served as the untreated control. The objective was to evaluate the effect of this product on barley yield.

1. Control **2. Vitazyme**

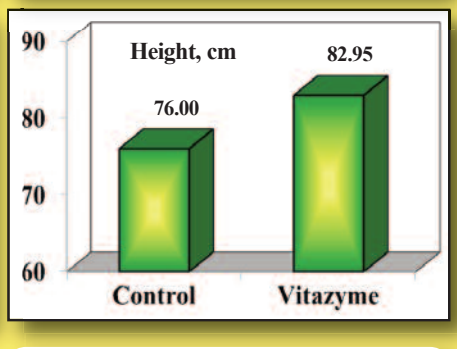
Fertilization: On April 29, 10 lb/acre of sulfur and 30 lb/acre of anhydrous ammonia were applied.
Vitazyme application: 13 oz/acre on June 24, along with Barrage (2, 4-D) at 16 oz/acre and Brox-m (bromoxomil) at 8 oz/acre; a Summers tow behind a spray rig
Crop season weather: mixed for spring grains; good July rains but moisture aided dwarf bunt development, and August 12, 13, and 15 had heavy rains
Growth results: Twenty plants were dug from each treatment on August 12, and evaluated for five parameters.

Tillers Per Plant



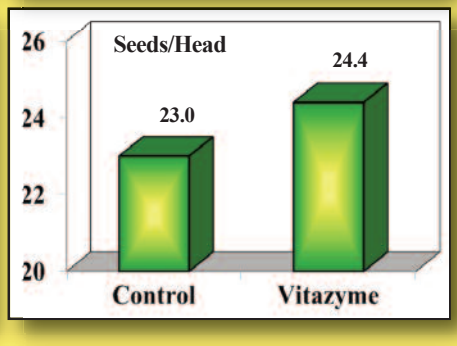
Increase in tillers per plant with Vitazyme: 44%

Plant Height



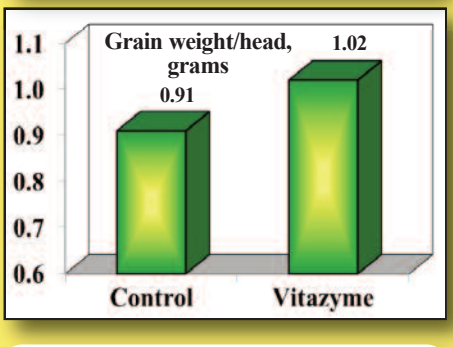
Increase in plant height with Vitazyme: 9%

Seeds Per Head



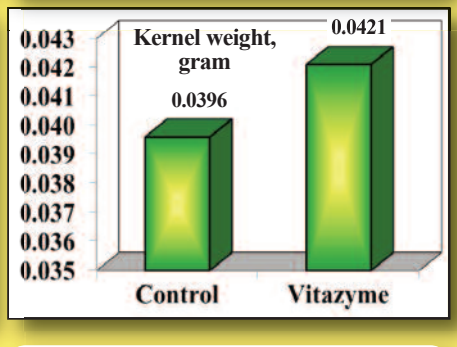
Increase in seeds per head with Vitazyme: 6%

Grain Weight Per Head



Increase in grain weight per head with Vitazyme: 12%

Kernel Weight



Increase in kernel weight with Vitazyme: 6%

Conclusions: A spring two-row barley trial in central Washington produced excellent improvements in yield traits attributable to Vitazyme. Increases were noted in tillers per plant (44%), plant height (9%), seeds per head (6%), grain weight per head (12%), and kernel weight (6%). All of these increases indicated a substantial improvement in yield, that was unfortunately not able to be quantified through direct measurement, These results display the great utility of using Vitazyme for spring barley production in Washington.

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2013 Crop Results

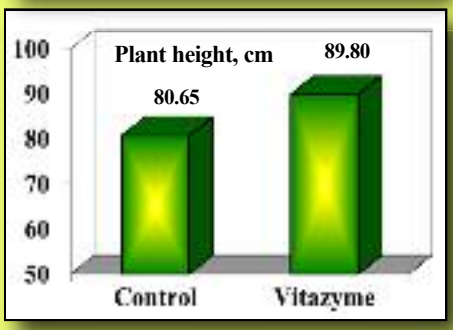
Vitazyme on Spring Barley

Researcher: Jacob Hesseltine *Farmer*: Tom Stahl *Location*: Waterville, Washington
Variety: Gallatin spring wheat *Previous crop*: summer fallow *Soil type*: volcanic ash
Planting date: May 7 to 10, 2013 *Planting rate*: 54 lb/acre *Tillage*: minimum
Experimental design: A 229-acre field of spring barley was selected for this trial, the outer perimeter treated with Vitazyme to evaluate the effect of this production plant characteristics.

1. Control **2. Vitazyme**

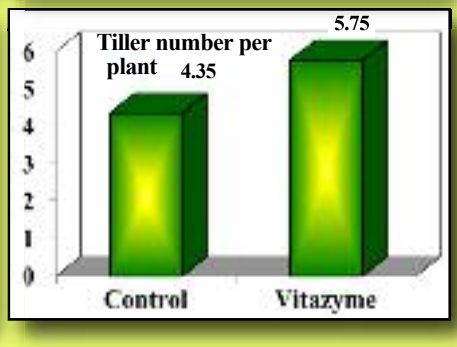
Fertilization: 40 lb/acre of N applied as anhydrous ammonia; 5 lb/acre of S
Vitazyme application: 13 oz/acre (1 liter/ha) sprayed on the leaves and soil on June 10 along with 16 oz/acre of Bromoxynil and 8 oz/acre of Barrage. A 90-foot sprayer made two passes around the field, leaving the center portion untreated with Vitazyme.
Weather for 2013: Excessive late season rain, unfavorable for crop production
Pre-harvest evaluation: On August 9, 20 typical plants from each treatment were dug to evaluate several parameters. Values for the 20 plants were averaged.
Pre-harvest evaluation: Before harvest, 20 typical plants from each treatment were dug and evaluated for five parameters. Values for the 20 plants were averaged.

Plant Height*

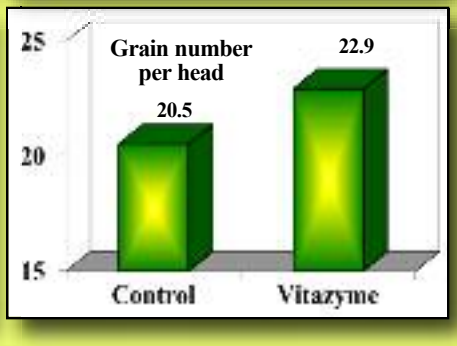


*Measured from soil level to tip of tallest tiller.

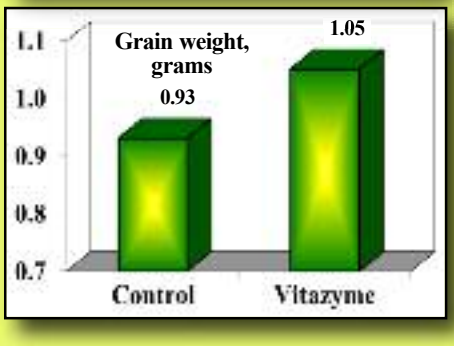
Productive Tillers/Plant



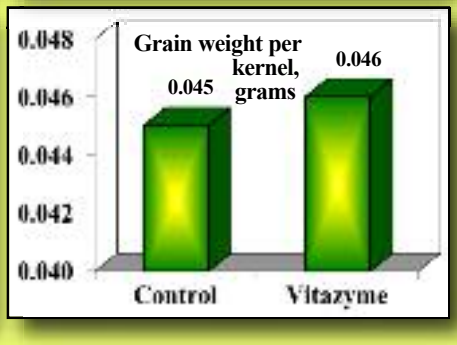
Grains Per Head



Grain Weight Per Head



Grain Weight Per Kernel



Yield results: none

Conclusions: This central Washington spring barley trial revealed that Vitazyme improved all plant and grain parameters, especially productive tillers per head (+32%), but grains per head (+12%) and grain weight per head as well (+13%); kernel weight was slightly increased. These data show that the yield was certainly enhanced with Vitazyme even though yield values were not obtained.

Increases with Vitazyme:

Plant height	11%
Productive tillers/plant	32%
Grains per head	12%
Grain weight/head	13%
Grain weight/kernel	2%

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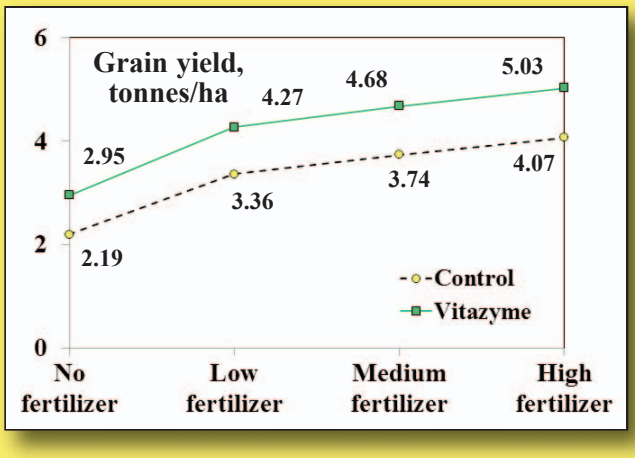
2013 Crop Results

Vitazyme on Spring Barley

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*: Nabat *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*: buckwheat *Planting date*: April 19, 2013
Soil preparation: disking, plowing, harrowing *Planting rate*: 4 million seeds/ha
Experimental design: A small plot spring barley experiment was set up with four replications, to show the effectiveness of Vitazyme as a modifier of yield, protein, and disease incidence. Four levels of fertility were employed.

Treatment	Nitrogen	Phosphorus	Potassium
	kg/ha	kg/ha	kg/ha
1. Control	0	0	0
2. Control + Vita	0	0	0
3. Low fertility	30	20	30
4. Low fert + Vita	30	20	30
5. Medium fertility	45	30	45
6. Medium fert + Vita	45	30	45
7. High fertility	60	40	60
8. High fert + Vita	60	40	60

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	35%
Low fertilizer	27%
Medium fertilizer	25%
High fertilizer	24%

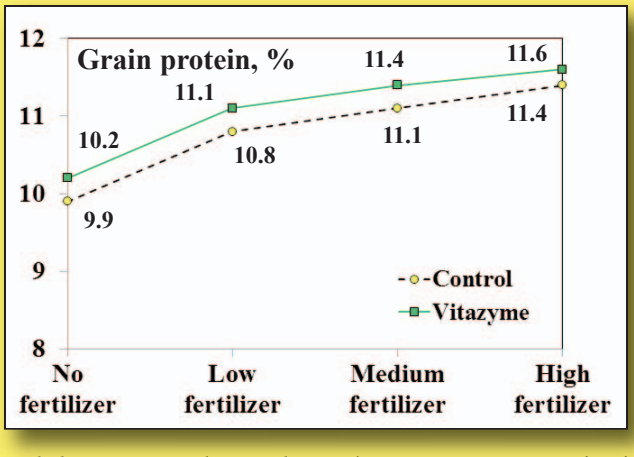
Fertilizer levels improved barley grain yield, and Vitazyme at each level further increased the yield, by 24 to 35%.

Income results:

Vitazyme net income increase	
No fertilizer	1,052 UAH/ha
Low fertilizer	1,307 UAH/ha
Medium fertilizer	1,358 UAH/ha
High fertilizer	1,392 UAH/ha

Net income increased at each fertility level, with Vitazyme improving income the most at the high fertilizer rate.

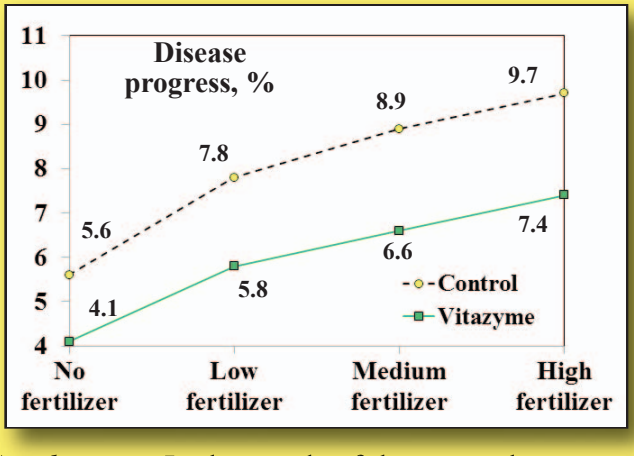
Grain crude protein results:



Crude protein increase with Vitazyme	
No fertilizer	0.3%-point
Low fertilizer	0.3%-point
Medium fertilizer	0.3%-point
High fertilizer	0.2%-point

The increase in grain crude protein followed fertility levels, and Vitazyme nominally increased protein at each level.

Dark brown patch results: There was a 100% incidence of brown patch fungus for all treatments.



All plants were infected with this fungal disease, but the disease progress was greatest with higher fertilizer levels; Vitazyme slowed the progress by 1.5 to 2.3%-points.

Conclusions: In the words of the researchers,

1. In the case of no fertilizers, application of Vitazyme for spring barley of the Nabat variety, at a rate of 1 L/tonne of seed and 1 L/ha at the tillering stage, provided a grain yield increase of 0.76 tonne/ha, or 35%.

2. At middle and high nutrition backgrounds of spring barley plants ($N_{30\text{-}60}P_{20\text{-}40}K_{30\text{-}60}$) and Vitazyme application, the grain yield increase was 0.91-0.96 tonne/ha, or 24-27%.

3. Vitazyme use when growing spring barley on the plot without fertilizers provided a profit of 1052 UAH/ha; with ($N_{30\text{-}60}P_{20\text{-}40}K_{30\text{-}60}$) the profit was 1307-1392 UAH/ha, respectively.

4. Vitazyme use at respective development stages provided a slight increase in raw protein content in spring barley grain, by 0.2-0.3%.

5. Vitazyme application on spring barley plantings decreased the dark brown patch affect on leaves by 24-27%.

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2012 Crop Results

Vitazyme on Spring Barley

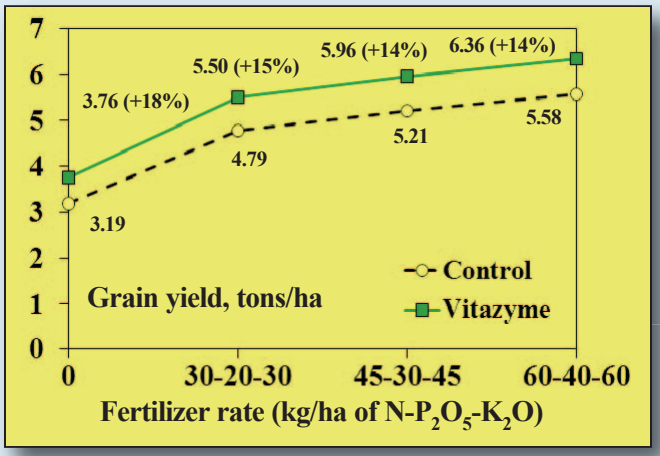
A Fertilizer Rate Study

Researcher: V. Plotnikov *Research organization*: National Academy of Agricultural Sciences
Location: Vinnytsia, Ukraine *Variety*: Nabat super elite *Tillage*: conventional (disking, plowing, and cultivating) *Soil type*: gray podzalic (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: April 24, 2012 *Previous crop*: buckwheat *Planting rate*: 4 million seeds/ha
Experimental design: A replicated plot trial with spring barley, using four replicates, was conducted on 0.1 ha plots to determine the effectiveness of Vitazyme to improve the yield and quality of spring barley. Four fertility levels were used across the treated and control plots.

Treatment	Vitazyme	Nitrogen	Phosphate	Potash
		kg/ha		
1	0	0	0	0
2	X	0	0	0
3	0	30	20	30
4	X	30	20	30
5	0	45	30	45
6	X	45	30	45
7	0	60	40	60
8	X	60	40	60

Fertilization: Phosphorus and potassium fertilizers were applied dry in the fall with fall tillage, and nitrogen was applied in the spring.
Vitazyme application: 1 liter/ton on seeds, and 0.5 liter/ha sprayed on the leaves and soil at tillering
Weather for 2012: favorable for crop development

Yield results:



Treatment	Income increase*
	hrn/ha
2	950
4	1,216
6	1,292
8	1,349

*Comparisons are made with the untreated control at each fertility level.

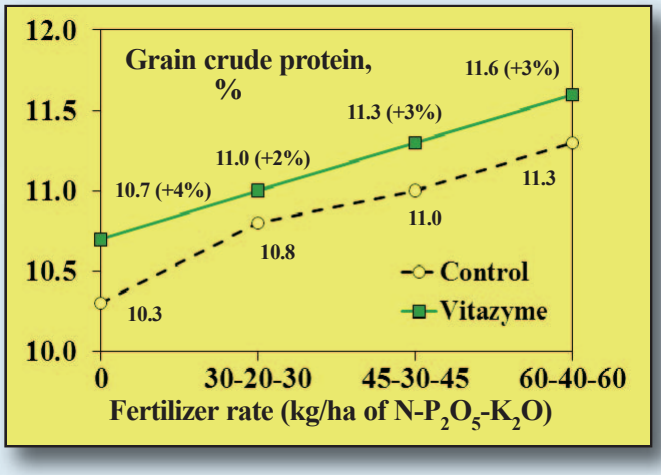
Increase in grain yield with Vitazyme at the same fertilizer level: 14 to 18%

Note the fine yield increases with Vitazyme at each fertility level, from 14 to 18%.

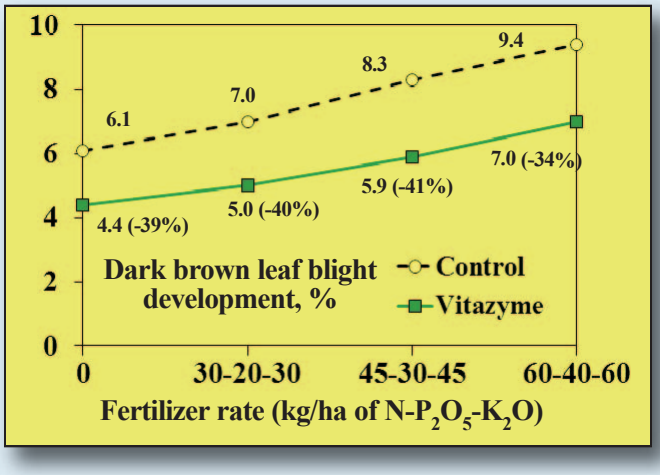
Crude protein results:

Increase in crude protein with Vitazyme at the same fertilizer level: 2 to 4%

All four fertilizer levels showed good protein increases with Vitazyme.



Leaf blight results:



Reduction in leaf blight with Vitazyme at the same fertilizer level: 34 to 41%

At all fertilizer levels the incidence of dark brown leaf blight was decreased by Vitazyme application.

Conclusions: A spring barley trial in Ukraine, using replicated plots with and without Vitazyme and four fertility levels, proved that Vitazyme increased the yield by 14 to 18% above the control, the highest percentage increase being for the lowest fertility level. Crude protein increased with Vitazyme by 0.2 to 0.3 percentage points at all fertility levels, and dark brown leaf blight development was reduced by from 34 to 41% for all four levels. These results prove that Vitazyme is a powerful tool to improve spring barley yields, protein, and plant health in Ukraine, and should be incorporated into farmers' production programs.

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2011 Crop Results

Vitazyme on Barley

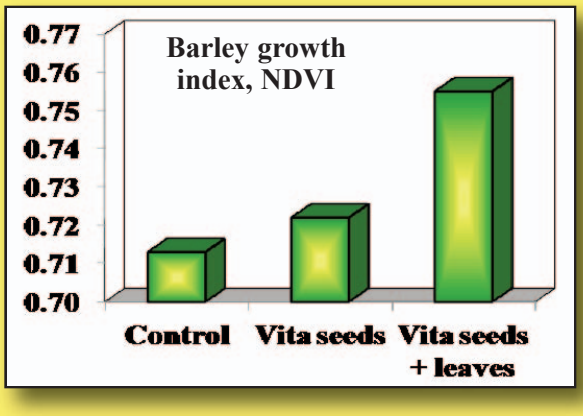
Farmer: AGRivision Systems, Perth, Australia *Researcher*: Steven David *Research organization*: Organic Farming *Location*: Goshen, Victoria, Australia
Variety: unknown *Planting date*: June, 2010 *Soil type*: sandy clay loam
Experimental design: A barley field was divided into three sections – the normal farmer practice, and two Vitazyme programs – to evaluate the effect of this product on barley yield and growth.

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
Growth results: Early barley growth was significantly increased by Vitazyme, as shown below.

Treatment	Barley growth*	Growth change
	---------- NDVI analysis ----------	
Control	0.713 b	—
Vitazyme on seeds	0.722 ab	0.009 (+1%)
Vitazyme on seeds and leaves	0.755 a	0.042 (+6%)

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

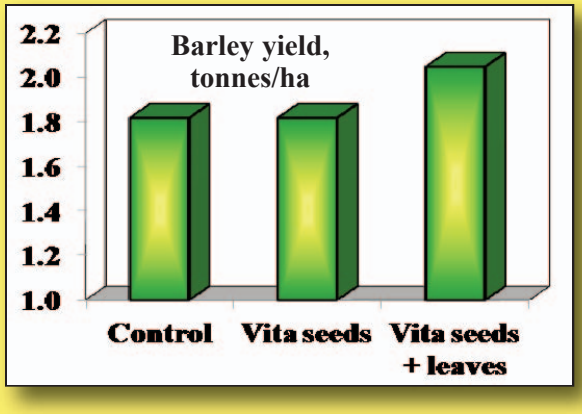


Increase in early growth with Vitazyme twice: +6%

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

Treatment	Grain yield*	Yield change
	tonnes/ha	tonnes/ha
Control	1.82 b	—
Vitazyme on seeds	1.82 b	0
Vitazyme on seeds and leaves	2.05 a	0.23 (+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: In this Australian barley trial, Vitazyme applied on the seeds and again at early tillering significantly increased both early growth (+6%) as well as final grain yield (+12%). The seed treatment alone did not significantly improve plant growth or yield, revealing the importance of a foliar application on barley. This trial success reveals the great value of the Vitazyme program for barley production in Australia.

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2011 Crop Results

Vitazyme on Spring Barley

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

Increase in barley yield with Vitazyme:
0.54 ton/ha (10.0 bu/acre)

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