Winter Wheat *with Vitazyme application*

Researcher: V. V. Plotnikov
Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York
Location: F G "Kolivaylo," Vinnytsia District, Vinnytsia Region, Mizyakivsky Khutory Village, Ukraine; central Ukraine (440-590 mm of rain per year) ***Variety:*** Patras, F3 ***Planting date:*** October 15, 2023
Planting rate: 6 million seeds/ha ***Previous crop:*** sunflowers
Tillage: Disking in two tracks to 20-22 cm, rolling, planting to 3 cm using a Horsh Pronto Seeder
Soil type: gray podzolic (2.0% organic matter)
Experimental design: A wheat field was divided into an untreated control area and a Vitazyme seed treated area to determine the effect of this product on grain yield and quality.

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

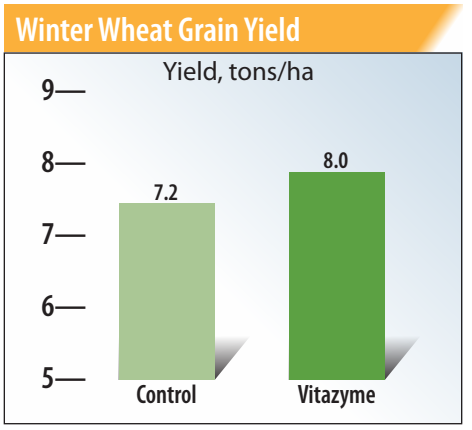
Fertilization: 130 kg/ha of nitrogen applied broadcast in the spring
Vitazyme application: 1 liter/ton of seed, applied October 14, 2023

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

Grain yield results:

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

Grain yield increase with Vitazyme: 11%



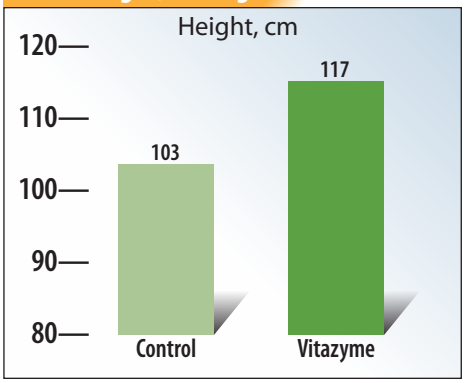
The 1 liter/ton of seed treatment yielded a very good return of 11%, or 0.8 ton/ha..

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

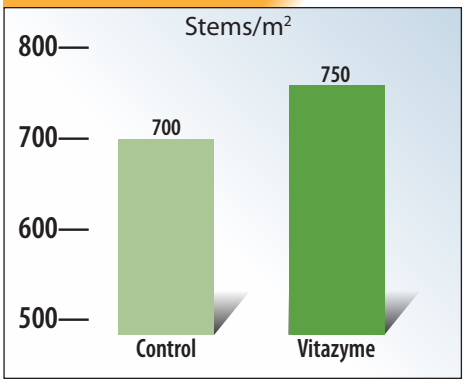
After spring green-up the Vitazyme treated wheat shows remarkably better chlorophyll development and early leaf growth compared to the control.

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

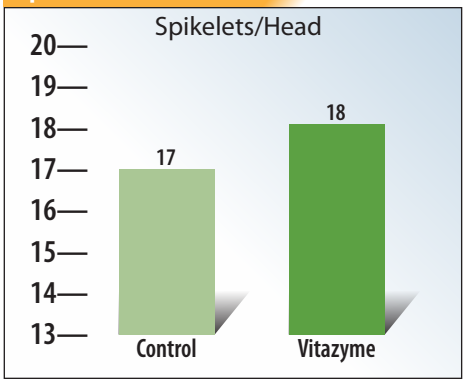
Plant Height, Average



Productive Stems

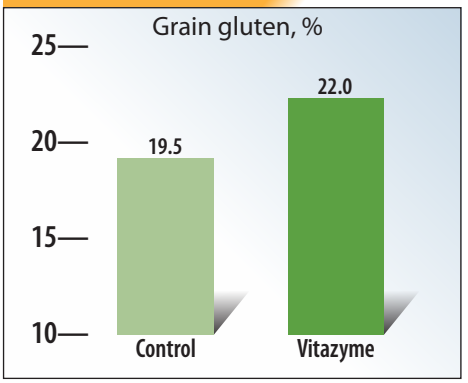


Spikelets Per Head



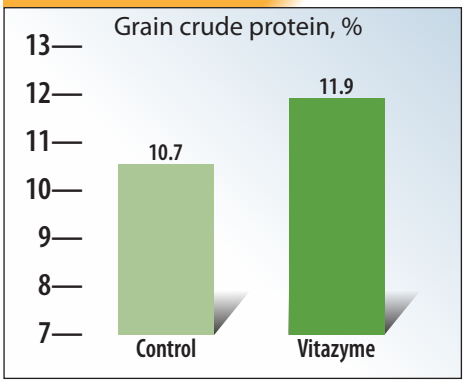
Grain quality results:

Grain Gluten



Increase in grain gluten with Vitazyme: 2.5 percentage points

Grain Crude Protein



Increase in crude protein with Vitazyme: 1.2 percentage points

Improvements in plant growth with Vitazyme

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

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

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

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

Winter Wheat *with Vitazyme Bio application*

Researcher: V. V. Plotnikov
Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York
Location: Kolyvailo Farm, Vinnytsia District, Vinnytsia Region, Mizyakovski Khutory Village, Ukraine; central Ukraine (440-590 mm of rain per year)
Variety: Patricks, F 3 ***Planting date:*** October 15, 2022
Planting rate: 6 million seeds/ha
Previous crop: sunflowers ***Tillage:*** disking to 20-22 cm
Planting depth: 3 cm (Horsch Maestro Seeder)
Soil type: gray podzolic (2.0% organic matter)
Experimental design: A winter wheat field was divided into an untreated control as well as a Vitazyme Bio treatment on the seeds to determine the effect of the product on grain yield and quality.

1 ***Untreated control*** **2** ***Vitazyme Bio***

Fertilization: 100 kg/ha of N applied in the spring
Vitazyme Bio application: 1 liter/ton of seed applied on October 12, 2023, three days before planting
Growth results: In the spring of 2023, prolonged cold stress caused yellowing of the leaf tips for the control treatment by early May, but not with Vitazyme Bio. The leaves of the treated plants also contained more chlorophyll.

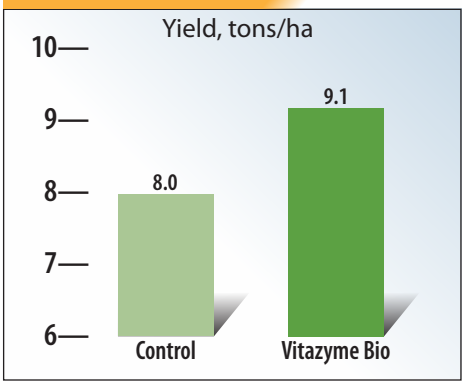
The springtime growth of winter wheat in this Ukraine trial is obviously superior with Vitazyme. A 14% yield increase resulted from this improvement in biomass with Vitazyme Bio.

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Control	8.0	—
2. Vitazyme Bio	9.1	1.1 (+14%)

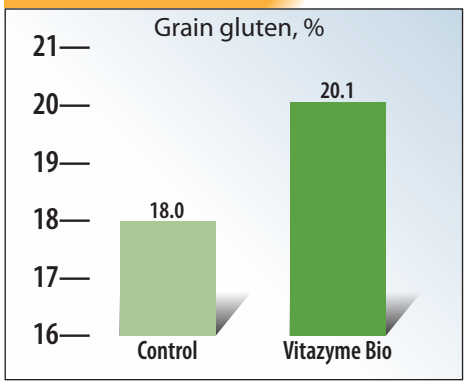
Increase in grain yield with Vitazyme Bio: 14%

Grain Yield



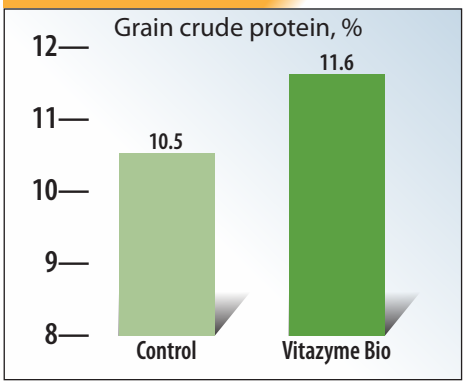
Quality results:

Grain Gluten



Increase in grain gluten with Vitazyme Bio: 2.1 percentage points

Grain Crude Protein



Increase in grain crude protein with Vitazyme Bio: 1.1 percentage points

Income results: A yield increase of 14% resulted in a net profit increase of $175/ha.

Conclusions: A winter wheat field-scale study in Ukraine, using Vitazyme Bio (the organic version of Vitazyme) as a seed treatment at 1 liter/ton of seed, resulted in a yield increase of 14%, and excellent grain quality increases: 2.1 and 1.1 percentage-point increases for grain gluten and grain crude protein, respectively. This yield increase of 2.1 tons/ha boosted income by $175/ha. The product reduced cold stress during the spring regrowth period by eliminating leaf tip burn. These results show the great value of Vitazyme Bio as a winter wheat treatment in Ukraine.

Winter Wheat *with Vitazyme Cold Start application*

Note how much greater is the head density and height of the Vitazyme Cold Start treated winter wheat as compared to the other photo of the untreated wheat. The difference in yield was 21%.

The untreated winter wheat in this Ukraine trial is shown here, with typical head density for the 2023 crop.

Researcher: V. V. Plotnikov
Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York
Location: Kolyvailo Farm, Vinnytsia District, Vinnytsia Region, Mizyakovski Khutory Village, Ukraine; central Ukraine (440-590 mm of rain per year)
Variety: Patricks, F 3 ***Planting date:*** November 3, 2022 ***Planting rate:*** 6 million seeds/ha
Previous crop: sunflowers ***Tillage:*** disking to 20-22 cm ***Planting depth:*** 3 cm (Horsch Maestro Seeder)
Soil type: gray podzolic (1.5% organic matter)
Experimental design: A winter wheat field was divided into an untreated control area and a Vitazyme Cold Start seed treated area. The objective of the study was to determine the effect of the product on the yield, quality, and profitability of the winter wheat.

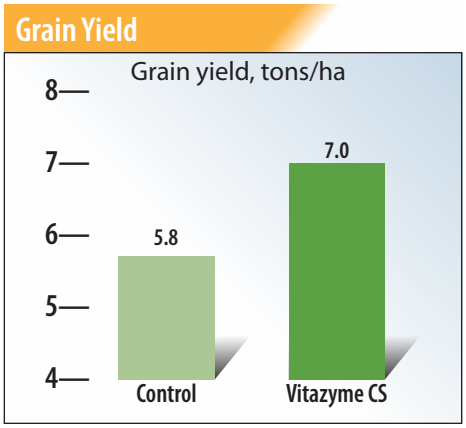
❶ *Untreated control* ❷ *Vitazyme Cold Start*

Fertilization: 100 kg/ha of N top-dressed in the spring
Vitazyme Cold Start application: 1 liter/ton of seed applied on October 31, 2023, three days before planting
Growth results: Due to prolonged cold temperatures in the spring, leaves of the untreated control plants by early May had developed yellow tips. However, the Vitazyme Cold Start treated plants experienced no such yellowing, and were also darker green with more chlorophyll.

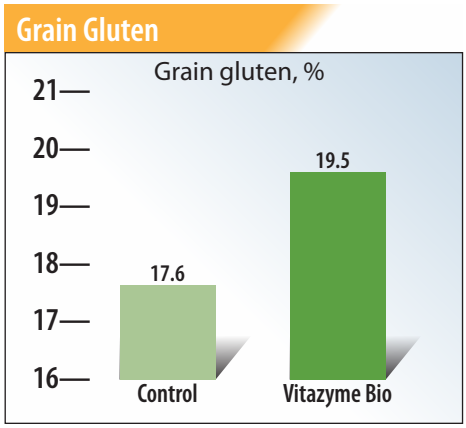
Yield results:

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

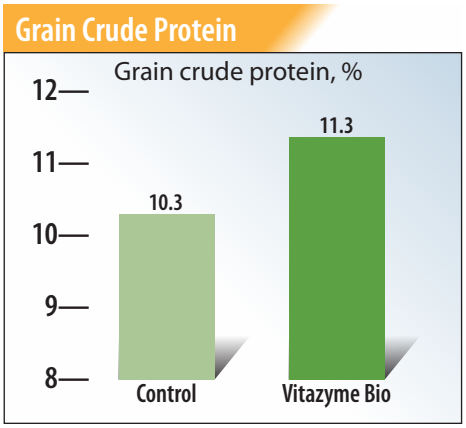
Increase in grain yield with Vitazyme Cold Start: 21%



Quality results:



Increase in grain gluten with Vitazyme Cold Start 1.8 percentage points



Increase in grain crude protein with Vitazyme Cold Start 1.0 percentage point

Income results: As a result of a 21% yield increase, Vtazyme Cold Start boosted farm income by $191/ha.

Conclusions: This field-scale winter wheat study in Ukraine, which evaluated the effect of Vitazyme Cold Start as a seed treatment (1 liter/ton of seed), revealed that yield was increased by 21% (1.2 tons/ha), while at the same time grain gluten and crude protein were elevated over the untreated control by 1.8 and 1.0 percentage-points, respectively. The yield increase netted the farmer $191/ha more income. These excellent results with Vitazyme Cold Start were preceded by reduced spring cold stress and greater leaf chlorophyll. Using this biostimulant for winter wheat production in Ukraine is shown to be highly effective in terms of yield, grain quality, and profitability.

Winter Wheat *with Vitazyme Cold Start application*

Researcher: V. V. Plotnikov
Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York
Location: P E Meleshkin, Kozyatyn District, Vinnytsia Region, Zhurbyntsi Village, Ukraine; central Ukraine (440-590 mm of rain per year)
Variety: Jersey, F 2
Planting date: September 10, 2022
Planting rate: 5 million seeds/ha
Previous crop: spring barley
Tillage: disking to 8-10 cm, plowing to 20-23 cm, pre-planting cultivation to 3-4 cm
Soil type: podzolic black soil (3.9% organic matter)
Experimental design: A winter wheat field was divided into an untreated control area and a Vitazyme Cold Start seed and foliar treated area, with the objective being to evaluate the effect of this product on grain yield and quality, and net crop income.

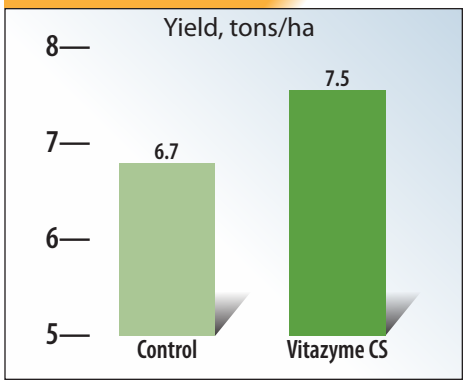
❶ *Untreated control* ❷ *Vitazyme Cold Start*

Fertilization: 45 kg of N as a spring top-dressing
Vitazyme Cold Start application: 1 liter/ton of seed applied on September 8, 2023, two days before planting; 0.5 liter/ha sprayed on the leaves and soil at BBCH 37, on May 16, 2023

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Control	6.7	—
2. Vitazyme Cold Start	7.5	0.8 (+12%)

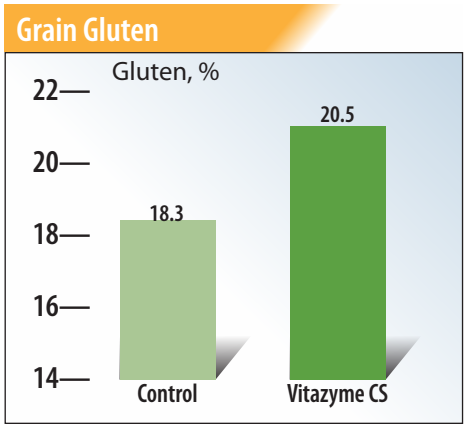
Grain Yield



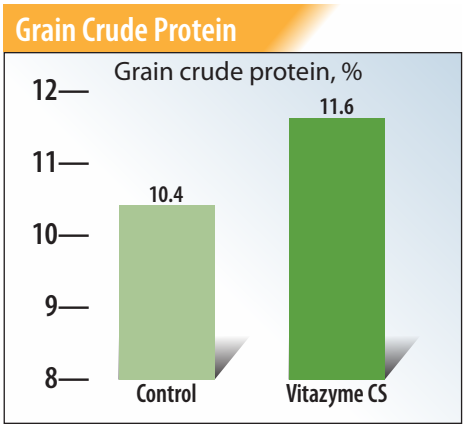
Increase in grain yield with Vitazyme Cold Start: 12%

The early spring growth of this winter wheat crop is excellent after Vitazyme Cold Start treatment of the seeds at fall planting. A very fine 12% yield increase was achieved.

Quality results:



Increase in grain gluten with Vitazyme Cold Start 2.2 percentage points



Increase in grain crude protein with Vitazyme Cold Start 1.2 percentage point

Income results: The Vitazyme Cold Start seed treatment plus spring foliar application produced a yield increase of 0.8 ton/ha (12%), netting the farmer $114/ha more income.

Conclusions: A field-scale Ukrainian winter wheat study, with Vitazyme Cold Start applied at 1 liter/ton of seed plus 0.5 liter sprayed at BBCH 37, proved that the product improved grain yield by 12% above the untreated control area of the field. Grain quality was also improved, by 2.2 percentage-points for gluten and 1.2 percentage-points for crude protein. Net farm income was also increased, by $114/ha. These results prove that Vitazyme Cold Start can significantly enhance the yield, quality, and income of winter wheat grown in central Ukraine.

Winter Wheat *with Vitazyme Bio (Organic Vitazyme) application*

Researchers: Vadim V. Plotnikov
Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York
Location: SLLC "Dnipro," Vinnytsia District, Vinnytsia Region, Monchyn Village, Ukraine; central Ukraine (440-590 mm of rain per year)
Variety: Bonanza, F2
Planting date: October 20, 2021
Planting rate: 4 million seeds/ha
Previous crop: sunflowers
Tillage: disking to 20-22 cm, cultivation in two tracks to 3-4 cm
Soil type: podzolized chernozem (3.5% organic matter)
Experimental design: A winter wheat field was divided into a Vitazyme Bio treated portion, while the remainder of the field was left untreated. The purpose of the trial was to evaluate the effect of Vitazyme Bio on winter wheat yield and quality, as well as added income.

❶ Control ❷ Bio on the seeds at planting

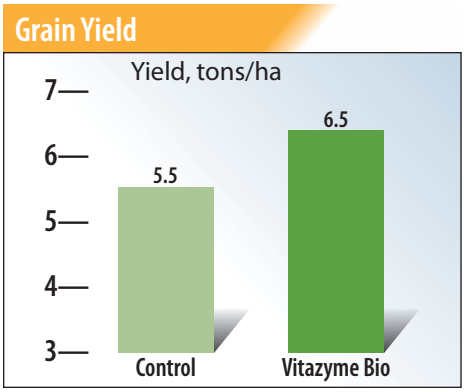
Fertilization: 50 kg/ha of nitrogen disked in before fall planting; 140 kg/ha of N broadcast over the leaves in the spring.
Vitazyme Bio application:
1.0. liter/ton of seed at planting

Note the denser plant stand, bigger heads, and taller stems of the Vitazyme Bio treated wheat compared to the untreated wheat in the other photo.

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Control	5.5	—
2. Vitazyme Bio	6.5	1.0 (+18%)

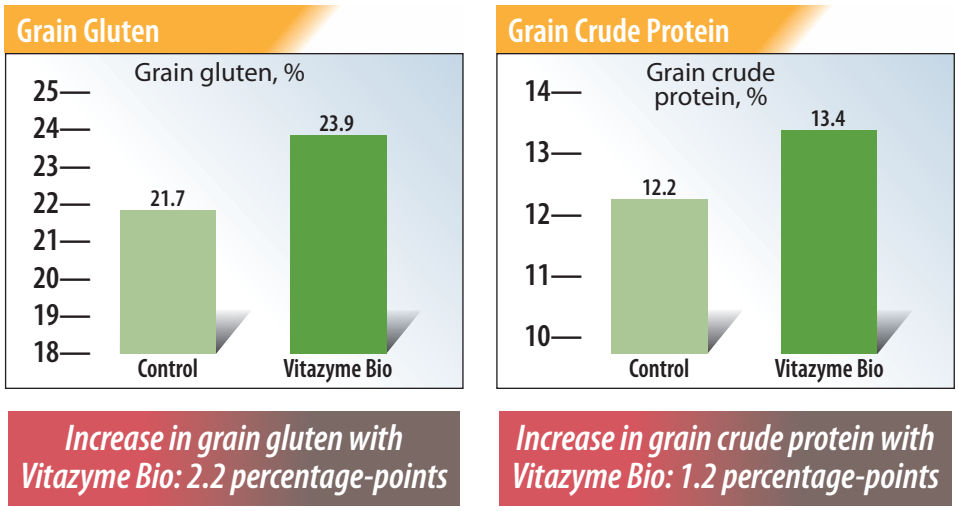
Yield increase with Vitazyme Bio: 18%



The untreated wheat in this trial was shorter with fewer heads than the Vitazyme Bio treated wheat in the accompanying photo.

The Vitazyme Bio treated wheat on the left side of the road is clearly better developed and yielding more than the untreated wheat on the right.

Grain quality results:



Increase in grain gluten with Vitazyme Bio: 2.2 percentage-points

Increase in grain crude protein with Vitazyme Bio: 1.2 percentage-points

Income results: The additional 1.0 ton/ha yield netted an income increase of $185/ha for the farmer.

Conclusions: This winter wheat field trial in Ukraine, which compared a seed treatment with Vitazyme Bio to no seed treatment — all other management factors being the same — showed that Vitazyme Bio increased the total grain yield by 1.0 ton/ha (+18%), while at the same time improving grain quality: grain gluten was elevated by 2.2 percentage points, while grain crude protein was raised by 1.2 percentage points. As shown from similar excellent yield and quality responses with Vitazyme Bio on winter wheat for several years in Ukraine, this program when applied to seeds produces consistent and reliable crop improvements for the farmer.

Winter Wheat *with Vitazyme Cold Start application*

Researchers: Vadim 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: Oriyka, F3
Planting date: October 15, 2021
Planting rate: 5.5 million seeds/ha
Previous crop: soybeans

This wheat field trial reveals denser heads and taller plants with the Vitazyme Cold Start treatment on the right, compared to the untreated wheat on the left.

Tillage: disking to 8-10 cm, plowing to 20-22 cm, pre-planting cultivation to 3-4 cm
Soil type: podzolized chernozem (3.9% organic matter)
Experimental design: A winter wheat field was divided into a Vitazym Cold Start treated portion, while the remainder of the field was left untreated. The purpose of the trial was to evaluate the effect of Vitazyme Cold Start on winter wheat yield and quality, as well as added income, when used to all alleviate weakened plants in the spring due to fertility and water stress.

❶ *Control* ❷ *Vitazyme Cold Start in the spring*

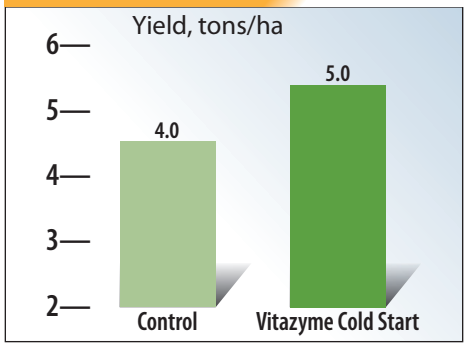
Fertilization: 8-8-8 kg/ha of N-P_2O_5-K_20) in-furrow at planting; 50 kg/ha of N broadcast foliar in the spring
Vitazyme Cold Start application: 1 liter/ha sprayed on the leaves at the BBCH 31 (boot) stage on May 16, 2022. Vitazyme Cold Start is a version of Vitazyme that performs better than the standard Vitazyme under cold and wet springtime conditions.

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Control	4.0	—
2. Vitazyme Cold Start	5.0	1.0 (+25%)

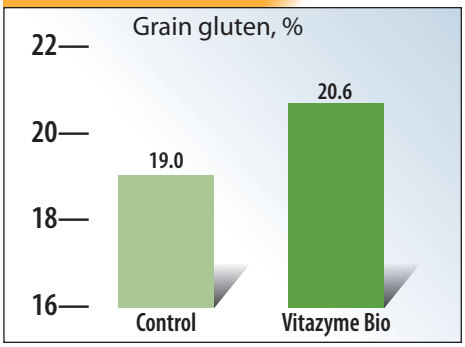
Yield increase with Vitazyme Cold Start: 25%

Grain Yield



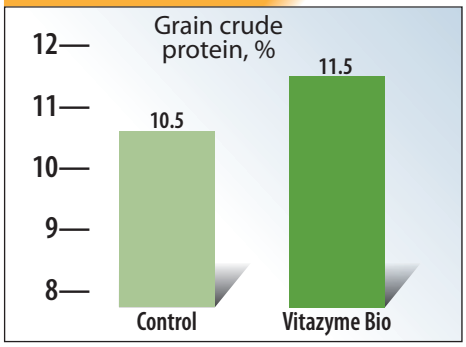
Grain quality results:

Grain Gluten



Increase in grain gluten with Cold Start:1.6 percentage-points

Grain Crude Protein



Increase in grain crude protein with Vitazyme Cold Start: 1.0 percentage-point

Income results: The additional 1.0 ton/ha yield and improved grain quality increased the net income for the crop by $160/ha.
Conclusions: A split-field winter wheat field trial in Ukraine, utilizing 1 liter/ha of Vitazyme Cold Start sprayed on the leaves in the spring to help overcome fertilizer and drought stress, produced a very fine yield increase of 25%, while at the same time increasing grain gluten (+1.6% percentage points) and grain crude protein (+1.0 percentage point). These improvements in winter wheat production help confirm the results of Vitazyme Cold Start on winter wheat for several years, that it is an excellent, very profitable addition to farmers' management programs in Ukraine.

Winter Wheat *with Vitazyme Bio (Organic Vitazyme) application*

Researchers: Vadim V. Plotnikov
Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York
Location: LLC "Svitanok-SM," Berezivsky District, Odessa Region, Stari Mayaki Village, Ukraine; southern Ukraine (270-350 mm of rain per year)
Variety: Skarbnytsya F3
Planting date: October 5, 2021
Planting rate: 4.3 million seeds/ha
Previous crop: sunflowers
Tillage: disking to 10-12 cm, direct seeding to 3 cm with a Potinger planter
Soil type: typical chernozem (3.5% organic matter)
Experimental design: A winter wheat field was divided into a Vitazyme Bio seed-treated portion, while the remainder of the field was treated with another product, Raikat Start. The purpose of the trial was to compare the effect of Vitazyme Bio and Raikat Start on the seeds on winter wheat yield.

Immature heads obtained from the plants later in the season show much improved and more mature head and seed development with Vitazyme Bio than for the untreated heads on the left.

Note the much better leaf and root development with the Vitazyme Bio treatment on the right.

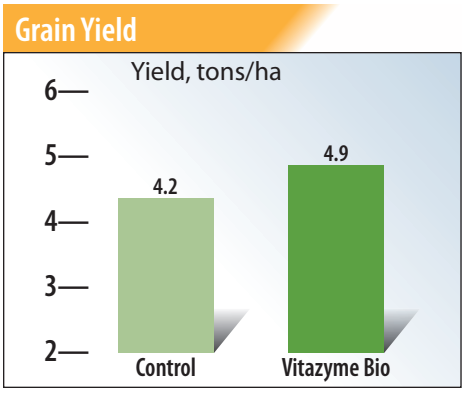
1 ***Raikat Start*** **2** ***Vitazyme Bio***

Fertilization: 6-30-0% N -P_2O_5-K_2O in-furrow at planting, and 63 kg/ha of N and 24 kg/ha of S broadcast later after planting
Vitazyme Bio application: 1.0. liter/ton of seed treated on September 9, 2021, 6 days before planting
Raikat Start application: 0.75 liter/ton of seed. This product is a combination of macro and micro-elements, amino acids, polysaccharides, and cytokinins designed to aid in seed germination, plant growth and stress tolerance, and disease resistance.

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Reikat Start	4.2	—
2. Vitazyme Bio	4.9	0.7 (+17%)

Yield increase with Vitazyme Bio: 17%



Income results: The seed application of Vitazyme Bio produced 0.7 ton/ha more yield than Raikat Start, which is valued at $125/ha.

Conclusions: A field-scale comparative study in Ukraine was performed with Vitazyme Bio and Raikat Start as seed treatments. Rates of application were 1.0 and 0.75 liter/ha for the two products, respectively. Yield results showed that Vitazyme Bio outyielded the Raikat Start by 0.7 ton/ha, that netted the farmer $125/ha more income. In this study, Vitazyme Bio has been shown to be the superior seed treatment of the two for winter wheat in Ukraine.

Wheat (Winter) *with Vitazyme Bio application*

Researcher: V.V Plotnikov.
Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York
Location: PE "AF Dzvony", Lviv District, Lviv Region, Bolotnya Village Ukraine: western Ukraine (550-750 mm of rain per year)
Variety: Reform, F1 ***Planting date:*** September 25, 2020 ***Planting rate:*** 3.5 million seeds/ha
Previous crop: winter canola ***Tillage:*** disking to 10-12 cm, deep cultivation to 28 cm, pre-plant cultivation to 3-4 cm
Soil type: dark-gray podzolic (2.2% organic matter)
Experimental design: A winter wheat field was divided into a Vitazyme Bio treated portion, with an untreated portion left as a control, to evaluate the effect of this product on grain yield and quality

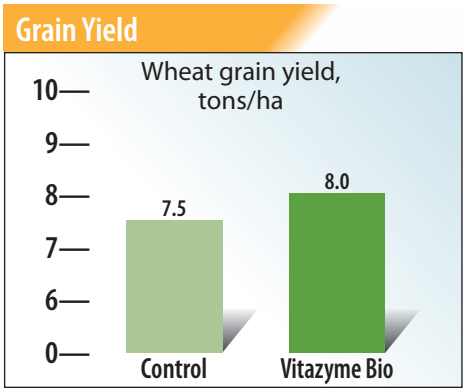
1 ***Control*** **2** ***Vitazyme Bio in the spring***

Fertilization: 16-27-7 % of N-$P_2 0_5$-$K_2 0$ in-furrow at planting; 200 kg/ha N broadcast in the spring
Vitazyme Bio application: 0.6 liter/ha in the spring at crop stage BBCH 31.
Vitazyme Bio is the same as Organic Vitazyme in other market areas.
Yield results:

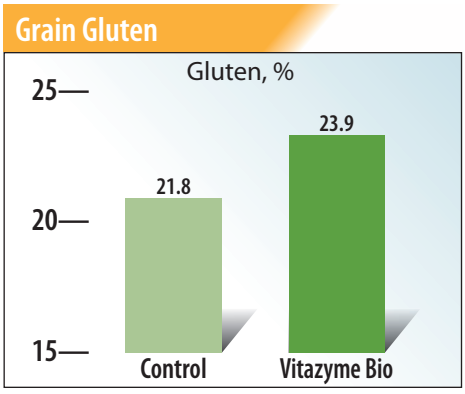
Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Control	7.5	—
2. Vitazyme Bio	8.0	0.5 (+7%)

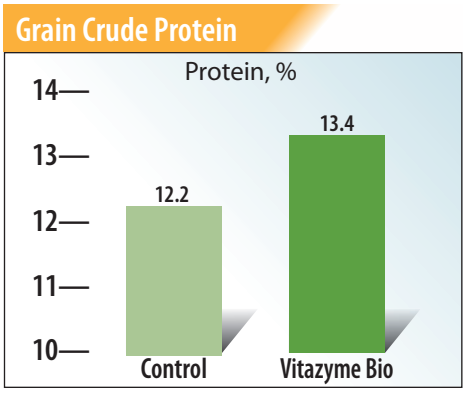
Increase in grain yield with Vitazyme: 7%

The spring 0.7 liter/ha spring application increased grain yield by 0.5 ton/ha (7%).



Grain quality results:





Increase in grain gluten with Vitazyme Bio: 2.1%-points

Increase in grain crude protein with Vitazyme Bio: 1.2 %-points

Income results: The added 0.5 ton/ha yield produced a net income increase of $167/ha.
Conclusions: This field-scale Ukrainian winter wheat trial showed that Vitazyme Bio, sprayed on the leaves in the spring, produced a yield increase of 0.5 ton/ha (7%), while increasing both grain gluten and grain crude protein by 2.1 and 1.2 %-points, respectively. These positive impacts on winter wheat show that applying Vitazyme Bio is a very profitable practice in western Ukraine, increasing net income by $167/ha.

Wheat (Winter) *with Vitazyme application*

Researcher: V.V Plotnikov.
Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York
Location: PE "AF Dzvony", Lviv District, Lviv Region, Bolotnya Village, Ukraine: western Ukraine (550-750 mm of rain per year)
Variety: Producent, F1 ***Planting date:*** October 25, 2020 ***Planting rate:*** 4 million seeds/ha
Previous crop: soybeans ***Tillage:*** disking to 10-12 cm, deep cultivation to 26-28 cm, pre-planting cultivation to 3-4 cm
Soil type: dark-gray podzolic (2.2% organic matter)
Experimental design: A winter wheat field was divided into a Vitazyme treated portion, with an untreated portion left as a control, to evaluate the effect of this product as a seed treatment on grain yield and quality.

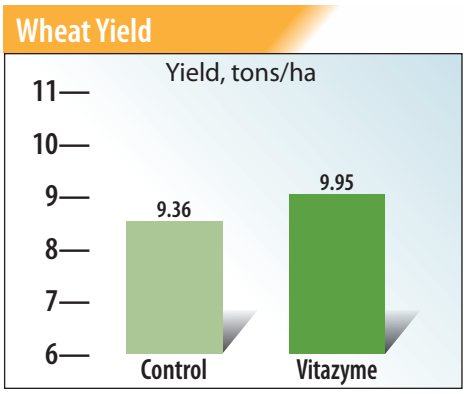
1 ***Control*** **2** ***Vitazyme on the seeds***

Fertilization: 16-27-7 kg/ha of N-$P_2 0_5$-$K_2 0$ with the seeds at planting; 200 kg/ha of N in the spring
Vitazyme application: 0.7 liter/ha as a seed treatment at planting
Yield results:

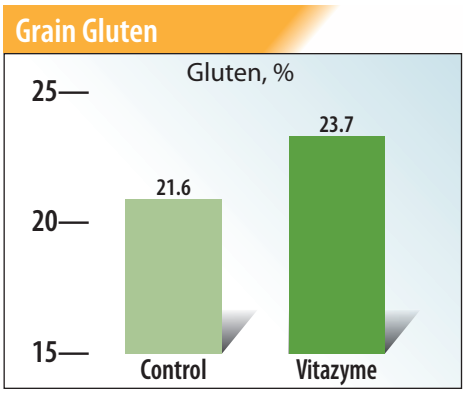
Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Control	9.36	—
2. Vitazyme	9.95	0.59 (+6%)

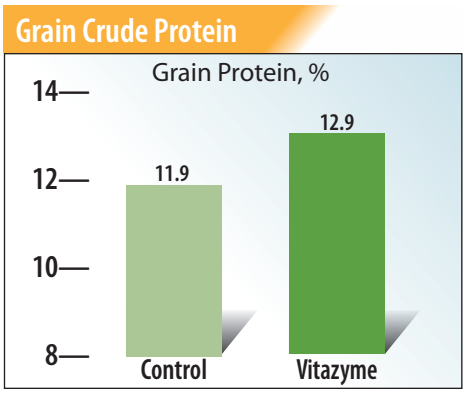
Increase in grain yield with Vitazyme: 6%

The 0.7 liter/ha seed treatment increased grain yield by 0.59 ton/ha.



Grain quality results:





Increase in grain gluten with Vitazyme: 2.1%-points

Increase in grain crude protein with Vitazyme: 1.0 %-points

Income results: The 0.59 ton/ha yield increase resulted in $210/ha more net income.
Conclusions: A winter wheat split-field trial in western Ukraine, using a 0.7 liter/ha seed treatment, resulted in a 0.59 ton/ha (6%) yield increase, along with improvements in grain gluten (2.1 %-points) and grain crude protein (1.0 %-points (1.0 %-points). In addition, net income was increased by $210/ha by this yield and quality increase, proving the effectiveness of Vitazyme as a positive crop supplement in Ukraine.

Wheat (Winter) *with Vitazyme application*

The improvement in plant biomass and head number and size with Vitazyme is apparent in this photo.

V.V. Plotnikov explains the virtues of the Vitazyme program to the farmer at the Grain Company Hors Farm in central Ukraine. Note the excellent wheat crop.

Researcher: V.V Plotnikov.
Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York
Location: LLC "Grain Company Hors", Zolotonosha District, Cherkasy Region, Pogreby Village Ukraine; central Ukraine (440-590 mm of rain per year)
Variety: Mattus, F1 ***Planting date:*** October 15, 2020 ***Planting rate:*** 5.5 million seeds/ha
Previous crop: sunflowers ***Tillage:*** disking in two tracks to 12-14 cm, pre-sowing cultivation to 3-4 cm
Soil type: chernozen (4.0% organic matter)
Experimental design: A winter wheat field was divided into a Vitazyme treated portion, with an untreated portion left as a control, to evaluate the effect of this product on grain yield, especially as related to cold air temperatures early in the spring season.

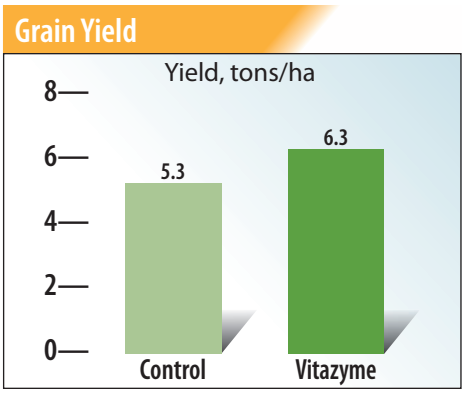
1 ***Control*** **2** ***Vitazyme in the spring***

Fertilization: at fall planting on October 15, 2020, 9-9-9 kg/ha N-P_2O_5-K_2O in the row with the seeds; 115 kg/ha of nitrogen in the spring
Vitazyme application: 1 liter/ha sprayed on the leaves and soil on April 4, 2021, at BBCH 21 (early tillering), during a period of very cold air and soil temperatures.
Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Control	5.3	—
2. Vitazyme	6.3	1.0 (+19%)

Increase in grain yield with Vitazyme: 19%

As a stress reliever of cold temperatures, Vitazyme applied during this cold period in April increased the yield by 19% above the control treatment.



Income results: By improving grain yield by 1.0 ton/ha, a 1 liter/ha Vitazyme application increased income by $336/ha.
Conclusions: A Ukrainian winter wheat split-field study, which compared a 1 liter/ha Vitazyme treatment with an untreated control, revealed that this spring application at early tillering (BBCH 21) increased grain yield by 1.0 ton/ha (19%). Such a response is especially significant because it shows how the stress-relieving effects of the brassinosteroids have a marked effect in recovering crop growth and development during cold periods. Thus, Vitazyme is shown to be well suited to central Ukraine, where cold weather in April can hinder wheat development. The extra 1.0 ton/ha with Vitazyme netted $336/ha more income.

Wheat (Winter) *with Vitazyme and Vitazyme Cold Start application*

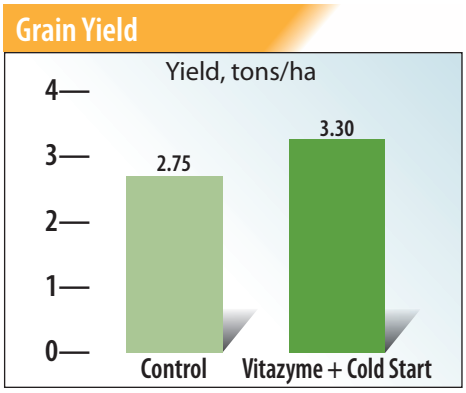
Researcher: V.V Plotnikov.
Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York
Location: LLC "VKAF Maiaky", Odessa District, Odessa Region, Maiaky Village, Ukraine; southern Ukraine (270-350 mm of rain per year)
Variety: Lira Odessa, F3 ***Planting date:*** September 9, 2020 ***Planting rate:*** 3.5 million seeds/ha
Previous crop: chickpeas ***Tillage:*** disking to 6-8 cm, disking to 10-12 cm, tillage to 3.5 cm with a Petinger aggregate
Soil type: Chernozen (4.1% organic matter)
Experimental design: A winter wheat field was divided into a treated portion, with an untreated portion left as a control, to evaluate the effect of both Vitazyme and Vitazyme Cold Start, applied as a seed treatment, on wheat yield and grain quality.
Fertilization: 21-24 kg/ha of N-S at pre-plant disking; 10-20-10 kg/ha of N-$P_2 0_5$-$K_2 0$ during planting; 80 kg/ha of N on March 24, 2021, at BBCH 22 stage (KAS urea- ammonia solution or liquid N)

❶ *Control* ❷ *Vitazyme + Vitazyme Cold Start on the seeds*

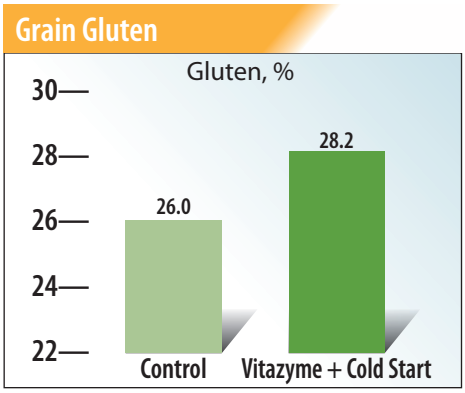
Vitazyme application: A seed treatment of 0.5 liter/ha Vitazyme + 0.3 liter/ha Vitazyme Cold Start
Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Control	2.75	—
2. Vitazyme	3.30	0.55 (+20%)

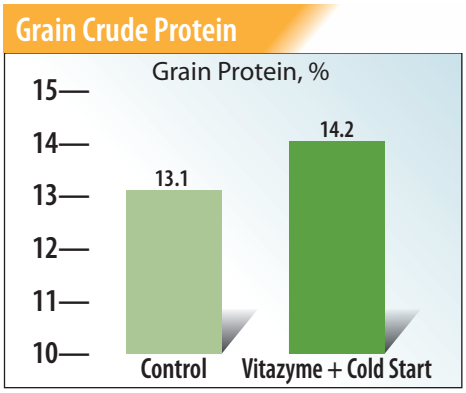
Increase in grain yield with Vitazyme: 20%



Grain quality results:



Increase in grain gluten with Vitazyme + Cold Start: 2.2%-points



Increase in grain crude protein with Vitazyme + Cold Start: 1.1%-points

Income results: The 0.55 ton/acre grain yield increase, and superior protein content from Vitazyme + Vitazyme Cold Start, gave an increased income of $191/ha.
Conclusions: A split-field winter wheat trial in southern Ukraine, using Vitazyme at 0.5 liter/ha + Vitazyme Cold Start at 0.3 liter/ha on the seeds at planting, provided substantial improvements in yield (+20%), grain gluten (+2.2%-points), and grain crude protein (+1.1 %-points). Net income was also improved by $191/ha compared to the untreated control. As shown in studies conducted during previous years in southern Ukraine, these products are highly effective in improving winter wheat yield and quality.

Wheat (Winter) *with Vitazyme application*

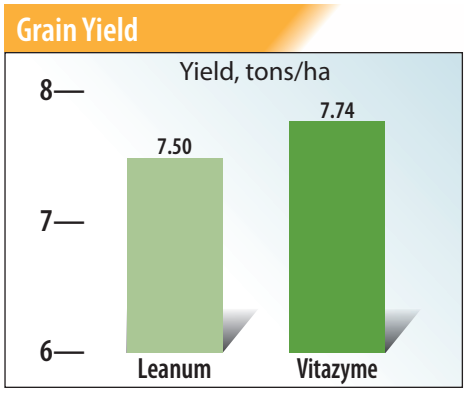
Researcher: V.V. Plotnikov
Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York
Location: LLC "Step-2000", Uman District, Cherkasy Region, Stepkivka Village, Ukraine; central Ukraine (440-590 mm of rain per year)
Variety: Bodycek, F1 ***Planting date:*** October 10, 2020 ***Planting rate:*** 4.2 million seeds/ha ***Previous crop:*** sunflowers
Tillage: vertical tillage with an aggregate SalFord RTS, to 15 cm, pre-sowing cultivation to 3-4 cm
Soil type: Chernozem (3.5% organic matter)
Experimental design: A winter wheat field was divided into a Vitazyme treated portion, with a competitor product Leanum as a control, to compare the effectiveness of the two products as seed treatment to increase grain yield.
Fertilization: at fall planting on October 10, 2020, 20-25-15-9 kg/ha N-N-$P_2 0_5$-$K_2 0$-S in the row with the seeds; 119 kg/ha of nitrogen and 24 kg/ha of S in the spring

1 ***Leanum seed treatment*** **2** ***Vitazyme seed treatment***

Vitazyme application: 1 liter/ha on the seeds before planting
Leanum application: applied at the recommended rate on the seeds before planting

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Leanum	7.50	—
2. Vitazyme	7.74	0.24 (+3%)



Increase in grain yield with Vitazyme: 3%

The Vitazyme seed treatment caused a 3% greater yield increase than did the Leanum product.

Income results: The extra 0.24 ton/ha grain yield with Vitazyme produced $82/ha more income than did the Leanum seed treatment.
Conclusions: A split-field trial with winter wheat in Ukraine compared the effectiveness of Vitazyme, at 1 liter/ha on seeds, with a competitor product (Leanum), also applied to the seeds. Vitazyme increased the yield by 0.24 ton/ha (3%) more than did Leanum, showing that Vitazyme is the superior product for winter wheat yield enhancement. That 3% yield difference netted the farmer $82/ha more income.

Wheat (Winter) *with Vitazyme application*

Researcher: Bruce Kirksey, Ph. D.
Research organization: Agricenter International, Memphis, Tennessee
Location: Memphis, Tennessee
Variety: Turbo (Triticum aestivum)
Planting date: October 18, 2019
Planting depth: 0.75 inch
Row spacing: 7.5 inches
Rows per plot: 9
Population: 1.5 million seeds/acre
Planting method: seed drill
Tillage method: conventional
Planting conditions: friable soil, good moisture
Soil type: Falaya silt loam
Fertility level: good
Soil drainage: good
Soil values: pH = 6.1, organic matter = 1.8%, C.E.C. = 7.8 meq/100 g.
Experimental design: A small-plot randomized complete block experimental design experiment was established for winter wheat, each plot being 30 x 6 feet (180 ft^2). Four treatments with four replications were used (16 plots), to determine the effects of Vitazyme, Bio Seed, and Caramba fungicide on wheat yield.

Treatment	Caramba	Vitazyme	Bio Seed
1.	14 oz/acre	—	—
2.	14 oz/acre	13 oz/acre	100g/acre
3.	—	13 oz/acre	100g/acre
4.	—	—	—

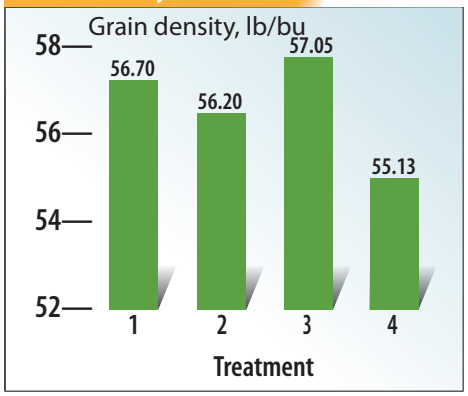
Fertilization: unknown
Caramba application: 14 oz/acre to Treatments 1 and 2 on April 6, 2020. Caramba is a Fusarium head blight suppressor containing metconazole, made by BASF.
Vitazyme application: 13 oz/acre to Treatments 2 and 3 on April 6, 2020
Bio Seed application: 100 g/acre to Treatments 2 and 3 on April 6, 2020. Bio Seed is a mixture of bacteria and fungi that are beneficial to seed germination and plant development.
Harvest date: July 7, 2020, using an Almaco Plot Combine, on a 5 x 30-foot strip for each plot

Test weight results: The density of the grain for each treatment was determined with the plot combine.

Treatment	Grain density[1]	Density change
	lb/bu	lb/bu
1. Caramba	56.70 ab	1.57 (+2.8%)
2. Caramba + Vita + Bio Seed	56.20 b	1.07 (+1.9%)
3. Vitazyme + Bio Seed	57.05 a	1.92 (+3.5%)
4. Control	55.13 c	—

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

Grain Density



Increase in grain density

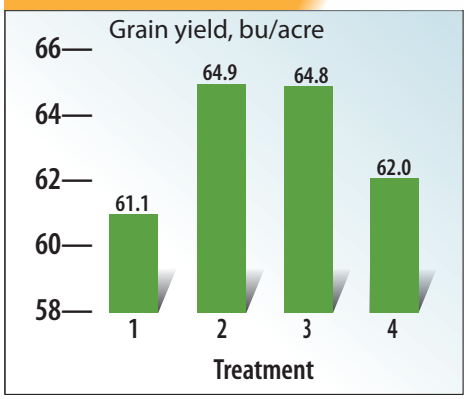
Caramba 2.8%
Caramba + Vitazyme + Bio Seed 1.9%
Vitazyme + Bio Seed 3.5%

Grain moisture results: There were no significant differences in grain moisture among the four treatments.
Yield results:

Treatment	Grain yield[1]	Yield change
	bu/acre	bu/acre
1. Caramba	61.1 b	(-) 0.9 (-1.5%)
2. Caramba + Vita + Bio Seed	64.9 a	2.9 (+4.7%)
3. Vitazyme + Bio Seed	64.8 a	2.8 (+4.5%)
4. Control	62.0 b	—

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

Grain Yield



Increase in grain yield

Caramba + Vitazyme + Bio Seed 4.7%
Vitazyme + Bio Seed 4.5%

Conclusions: In this small-plot winter wheat study at Memphis, Tennessee, with generally good growing conditions throughout the season, Vitazyme and Bio Seed teamed up to produce consistent and significant yield increases, approaching 3 bu/acre. Caramba fungicide, however, by itself reduced the yield slightly, and did not produce a synergism when combined with Vitazyme and Bio Seed; Caramba added to this combination significantly reduced the test weight. These results show a good benefit for winter wheat production by using Vitazyme and Bio Seed in combination when applied in the spring.

Wheat (Winter) *with Vitazyme application*

Researcher: V. V. Plotnikov
Research organizations: Plant Designs International, Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: PE "AF Dzvony", Peremyshl District, Lviv Region, Bolotnya Village, Ukraine; western Ukraine (550-750 mm of rain per year)
Variety: Arctis, F3
Planting date: October 15, 2019
Planting rate: 6 million seeds/ha
Previous crop: soybeans
Tillage: disking to 6-8 cm, deep cultivation to 28 cm, pre-sowing cultivation to 3-4 cm
Soil type: dark-gray podzolic (2.2% organic matter)
Experimental design: A winter wheat field was selected to apply a springtime Vitazyme spray to a portion of the field, while leaving the rest of the field as an untreated control area, to determine the effect of this product on grain yield and quality.

The rooting of winter wheat in Ukraine is shown here to be excellent and vigorous despite drought conditions. Under stress such as drought, the product enables the crop to be more productive.

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

Fertilization: 10-26-26 kg/ha of N-P_2O_5-K_2O at planting; 220-7-9 kg/ha of N-Mg-S in the spring
Vitazyme application: 0.7 liter/ha sprayed in the leaves at stem elongation, on May 21, 2020

Yield results:

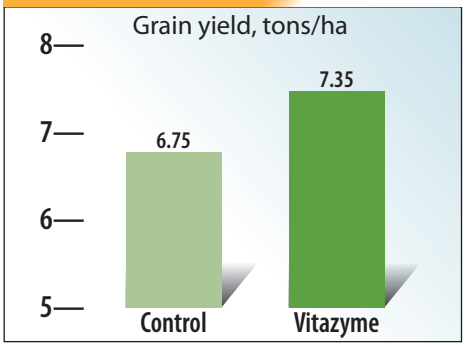
Treatment	Yield	Yield change
	tons/ha	tons/ha
Control	6.75	—
Vitazyme	7.35	0.60 (+9%)

Income results: The single 0.7 liter/ha application resulted in a net income increase of $161/ha.

Gluten and protein results:

Treatment	Gluten	Gluten change	Protein	Protein change
	%	%	%	%
1. Control	21.4	—	11.6	—
2. Vitazyme	23.5	2.1 (+10%)	12.8	1.2 (+10%)

Winter Wheat Yield

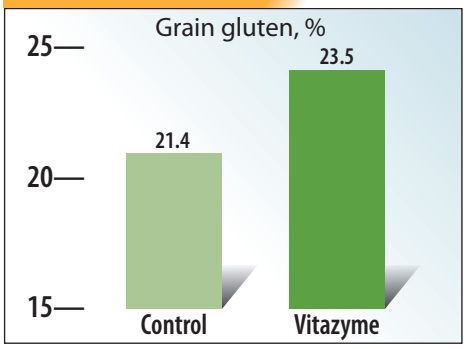


Increase in grain yield with Vitazyme: 9%

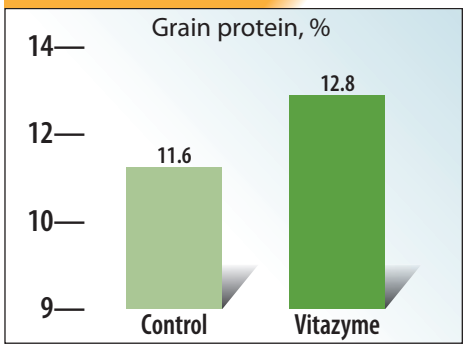
Increase in grain gluten with Vitazyme: 10%

Increase in grain crude protein with Vitazyme: 10%

Grain Gluten



Grain Protein



Conclusion: This field-scale winter wheat trial in western Ukraine compared an untreated control with Vitazyme applied foliar in the spring, at 0.7 liter/ha. This single application resulted in a 9% yield increase, and excellent grain gluten and crude protein increases of 10% each, which resulted in a net income increase of $161/ha. Such positive results show the efficacy of this program to improve the yield, quality, and profitability for wheat growers in western Ukraine.

Wheat (Winter) *with Vitazyme application—Use of the Vitazyme Cold Start Variant*

Researcher: V. V. Plotnikov
Research organization: Plant Designs International, Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: LLC "VKAF Maiaky, Biliaiivka District, Odessa Region, Maiaky Village, Ukraine; southern Ukraine (270-350 mm of rain per year)
Variety: SN Kombin
Planting date: September 30, 2019
Planting rate: 3.5 million seeds/ha
Previous crop: chick peas
Tillage: disking to 6-8 cm, plowing to 20-22 cm
Soil type: typical Chernozem (4.1% organic matter)
Experimental design: A winter wheat field was divided into an untreated, and a Vitazyme (on the seeds) and Vitazyme Cold Start treated area to evaluate the effectiveness of this plant growth stimulator to improve the yield of grain.

This winter wheat crop shows excellent rooting and overall plant development under very dry southern Ukraine conditions, with Vitazyme applied to the seeds before planting.

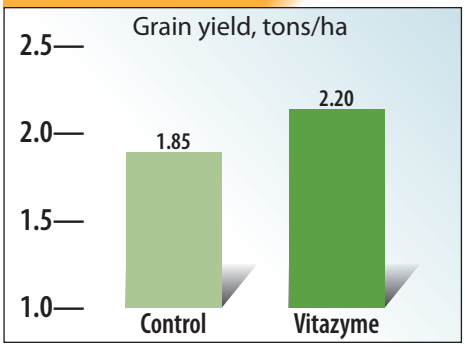
1 *Control* **2 *Vitazyme on the seeds & Cold Start in the spring***

Fertilization: 21 kg/ha of N and 24 kg/ha of S during pre-plant cultivation in 2019; 10-20-10 kg/ha N-P_2O_5-K_2O at planting; 80 kg/ha of N in the spring (liquid urea +NH3 with Vitazyme Cold Start).
Vitazyme application: 0.5 liter/ton of seed of Vitazyme at planting; 0.3 liter/ha of Vitazyme Cold Start sprayed at early tillering, along with nitrogen, on March 4, 2020
Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Control	1.85	—
2. Vitazyme on seeds + Vitazyme Cold Start	2.20	0.35 (+19%)

Increase in grain yield with Vitazyme + Vitazyme Cold Start: 19 %

Winter Wheat Yield

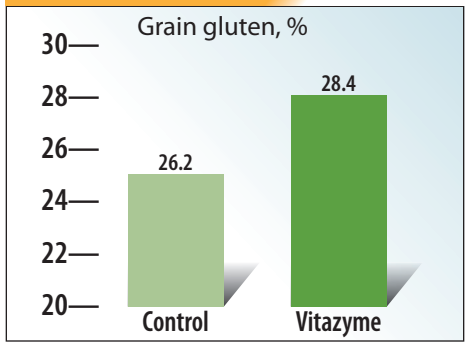


Grain gluten and protein results:

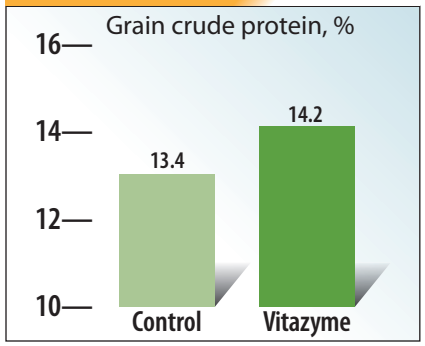
Treatment	Gluten	Gluten change	Protein	Protein change
	%	%	%	%
1. Control	26.2	—	13.4	—
2. Vitazyme on seeds + Vitazyme Cold Start	28.4	2.2 (+8%)	14.2	0.8 (+6%)

Increase in grain gluten with Vitazyme: 8%
Increase in grain protein with Vitazyme: 6%

Grain Gluten



Grain Crude Protein



Income results: The extra 1.02 tons/ha of yield, plus improvements in grain quality, boosted net income in this trial by $94/ha..
Conclusions: A winter wheat trial in southern Ukraine during a very dry summer revealed that a Vitazyme seed treatment at 0.5 liter/ton of seed, coupled with a spring foliar spray at 0.3 liter/ha, caused a very respectable yield increase of 0.35 ton/ha, while at the same time increasing the grain gluten and grain crude protein by 8% and 6%, respectively. These results show how this simple biostimulant program will boost wheat yield and quality in spite of very dry growing season conditions.

Winter Wheat *With a Vitazyme Cold Start Application*

Researcher: V. V. Plotnikov
Research organizations: Plant Designs International, Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: "Kolyvailo" Farm, Vinnytsia District, Vinnytsia Region, Miziakivs'ki Khutory Village, Ukraine; Central Ukraine (440-590 mm of precipitation per year)
Variety: Coloniia, F1 generation ***Planting date:*** October 10, 2018
Planting rate: 6 million seeds/ha ***Previous crop:*** sunflowers
Soil type: gray-brown podzolic (humus = 2.0%)
Field preparation: disking to 6-8 cm, cultivation in two tracks to 4-5 cm
Experimental design: A winter wheat field was divided into normally treated and Vitazyme treated portions to evaluate the effects of Vitazyme Cold Start on the yield and quality of the grain.

1 ***Control*** **2** ***Vitazyme Cold Start***

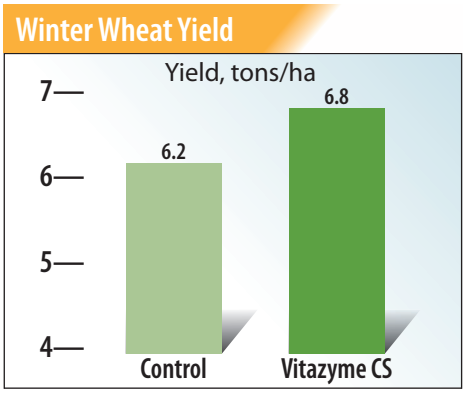
Fertilization: 30-30-30 kg/ha of N-P_2O_5-K_2O applied during fall disking; 184 kg/ha of N applied in the spring
Vitazyme Cold Start application: Two days before planting, on October 8, 2018, the wheat seeds were treated with Vitazyme Cold Start to give 0.7 liter/ha.

Note the superior stem, leaf, and head development for the Vitazyme treated wheat on the right compared to the untreated control om the left.

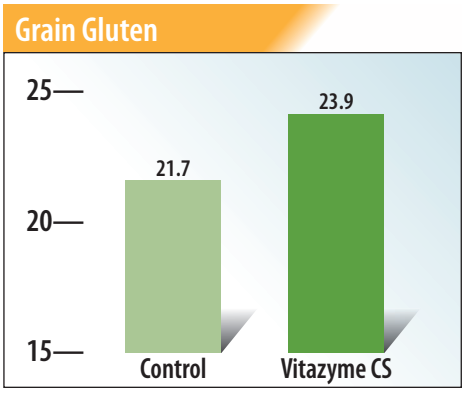
Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
Control	6.2	—
Vitazyme Cold Start	6.8	0.6 (+10%)

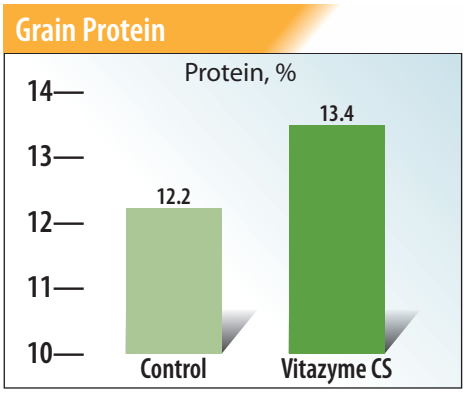
Increase in yield with Vitazyme Cold Start: 10%



Quality results:



Increase in grain gluten with Vitazyme Cold Start: 2.2 %-points



Increase in grain protein with Vitazyme Cold Start: 1.2 %-points

Income results: The added 0,6 ton/ha yield netted an extra $111/ha income.
Conclusion: This Ukraine winter wheat study, using a Vitazyme Cold Start seed treatment to give 0.7 liter/ha actual product, revealed that the yield was increased by 10%, while grain gluten was improved by 2.2 %-points and protein by 1.2 %-points. Added income from the program was $111/ha, showing the great value of this product, for winter wheat production in Ukraine.

Winter Wheat *with Vitazyme application*

Researcher: V. V. Plotnikov
Research organizations: Plant Designs International, Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: LLC Mriia Farming Ternopil, Pidvolochysk District, Ternopil Region, Skalit City, Ukraine; Western Ukraine (550-750 mm of precipitation per year)
Variety: Mulan, F3 generation
Planting date: November 4, 2018
Planting rate: 6 million seeds/ha
Previous crop: spring rape
Soil type: dark-gray podzolic (humus = 3.5%)
Field preparation: disking to 10-12 cm, deep cultivation with a heavy cultivator to 20-22 cm
Experimental design: A winter wheat field was divided into normally treated and Vitazyme treated portions to evaluate the effects of Vitazyme on the yield and quality of the grain.

A more abundant root mass shown here on the right is the result of the activity of Vitazyme's brassinsteroids, resulting in greater nutrient uptake and higher yields.

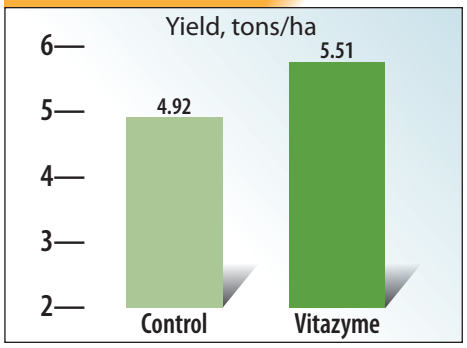
1 ***Control*** **2** ***Vitazyme***

Fertilization: 10-26-26 kg/ha of N-P_2O_5-K_2O applied during fall planting; 150 kg/ha of N applied in the spring
Vitazyme application: Five days before planting, on October 31, 2018, the wheat seeds were treated with Vitazyme to give 1.0 liter/ha.

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
Control	4.92	—
Vitazyme	5.51	0.59 (+12%)

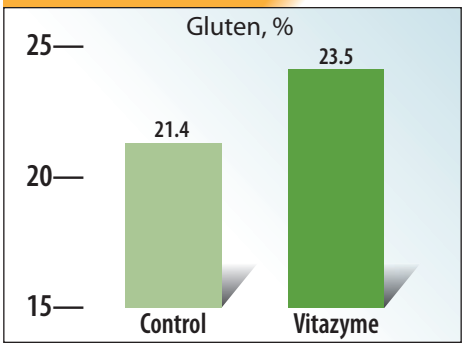
Winter Wheat Yield



Increase in yield with Vitazyme: 12%

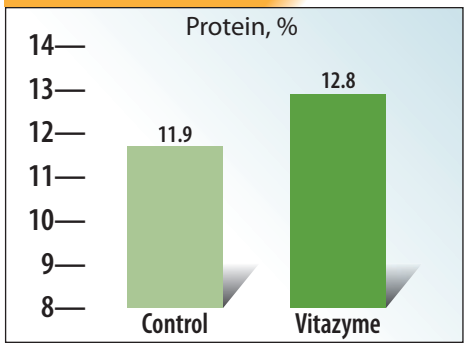
Quality results:

Grain Gluten



Increase in grain gluten with Vitazyme: 2.1 %-points

Grain Protein



Increase in grain protein with Vitazyme: 0.9 %-points

Income results: The added 0.59 ton/ha yield netted an extra $107/ha income.
Conclusion: A Ukraine winter wheat study, using a Vitazyme seed treatment to give 1.0 liter/ha actual product, revealed that the yield was increased by 12%, while grain gluten was improved by 2.1 %-points and protein by 0.9 %-point. Added income from the program was $107/ha, showing the great value of this product for winter wheat production in Ukraine.

Winter Wheat *with Vitazyme application*

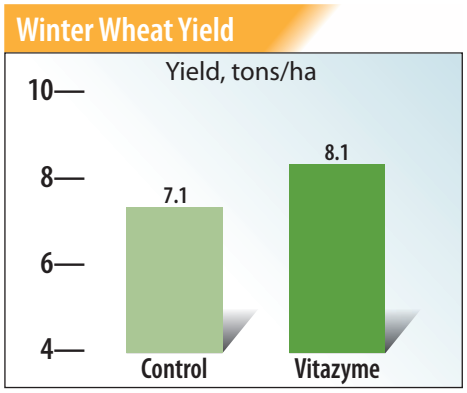
Researcher: V. V. Plotnikov
Research organizations: Plant Designs International, Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: LLC "Zakhid Agro", Vyzhnytsia District, Chemivisi Region, Vashkivtsi Village, Ukraine; Western Ukraine (550-750 mm of precipitation per year)
Variety: Tobak, F1 generation ***Planting date:*** September 20, 2018 ***Planting rate:*** 5 million seeds/ha
Previous crop: spring rape ***Soil type:*** dark-gray podzolic (humus = 3.0%)
Field preparation: disking to 6-8 cm, plowing to 20-22 cm, cultivating to 5-6 cm
Experimental design: A winter wheat field was divided into conventionally treated and Vitazyme treated portions to evaluate the effects of Vitazyme on the yield and quality of the grain.

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

Fertilization: 8-24-24 kg/ha of N-P_2O_5-K_2O applied during fall planting; 120 kg/ha of N applied in the spring
Vitazyme application: 1.0 liter/ha sprayed on the leaves and soil at the tillering stage, on March 30, 2019.

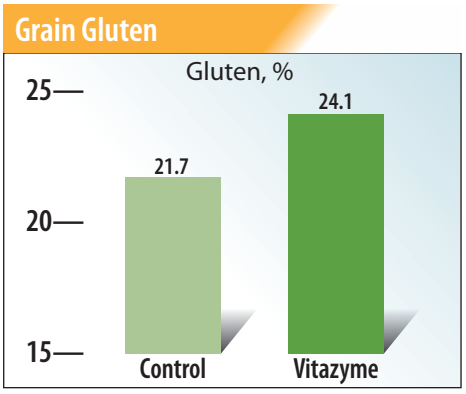
Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
Control	7.1	—
Vitazyme	8.1	1.0 (+14%)

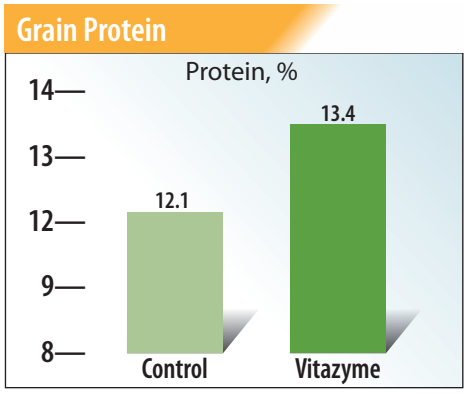


Increase in yield with Vitazyme: 14%

Quality results:



Increase in grain gluten with Vitazyme: 2.4 %-points



Increase in grain protein with Vitazyme: 1.3 %-points

Income results: The added 1.0 ton/ha yield netted an extra $169/ha income.
Conclusion: This Ukraine winter wheat study, using a Vitazyme soil and foliar spray of 1.0 liter/ha at the tillering stage, revealed that the yield was increased by 14%, while grain gluten was improved by 2.4 %-points and protein by 1.3 %-points. Added income from the program was $169/ha, showing the great value of Vitazyme to complement winter wheat production in Ukraine.

Winter Wheat *with Vitazyme application*

Researcher: V. V. Plotnikov
Research organizations: Plant Designs International, Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: "Blagodiinyi Soiuz Radomyshi", Radomyshi District, Zhytomyr Region, Maia Racha Village, Ukraine; Northern Ukraine (550-620 mm at precipitation per year)
Variety: Coloniia, F1 generation
Planting date: November 7, 2018
Planting rate: 6 million seeds/ha
Previous crop: sunflowers
Soil type: gray podzolic (humus = 1.7%)
Field preparation: disking to 6-8 cm, plowing to 20-22 cm, cultivation in two tracks to 4-5 cm
Experimental design: A winter wheat field was divided into two parts, a normally treated and a Vitazyme treated portion to evaluate the effects of Vitazyme on the yield and quality of the grain.

With greater root development and overall plant metabolism from Vitazyme application (plants on the right), a 22% yield improvement was obtained, as well as higer grain gluten and protein.

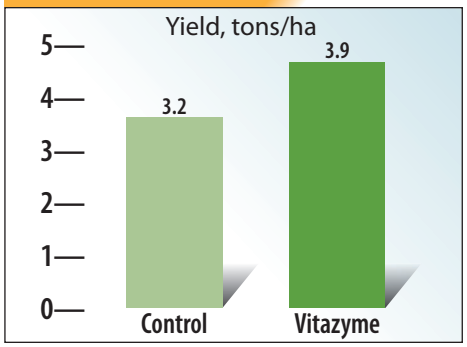
① *Control* ② *Vitazyme*

Fertilization: 10-26-26 kg/ha of N-P_2O_5-K_2O applied during fall disking; 62 kg/ha of N applied in the spring
Vitazyme application: Two days before planting, on November 5, 2018, the wheat seeds were treated with Vitazyme to give 1.0 liter/ha

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
Control	3.2	—
Vitazyme	3.9	0.7 (+22%)

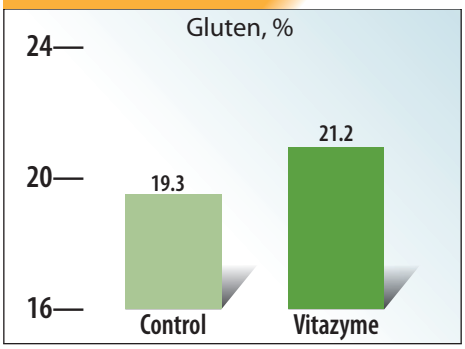
Winter Wheat Yield



Increase in yield with Vitazyme: 22%

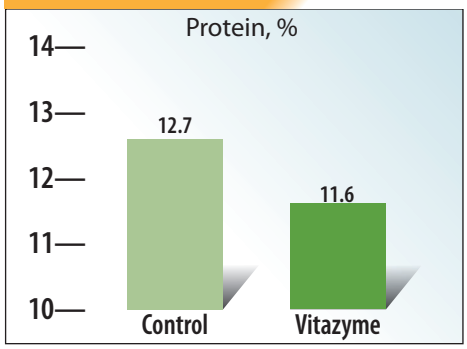
Quality results:

Grain Gluten



Increase in grain gluten with Vitazyme: 1.9 %-points

Grain Protein



Increase in grain protein with Vitazyme: 0.9 %-points

Income results: The added 0.7 ton/ha yield netted an extra $128/ha income.
Conclusion: This Ukraine winter wheat study, using a Vitazyme seed treatment to give 1.0 liter/ha actual product, showed that the yield was increased by an excellent 22%, while grain gluten was improved by 1.9 %-points and protein by 0.9 %-point. Added income from the program was $128/ha, showing the great supplemental value this product adds to winter wheat production in Ukraine.

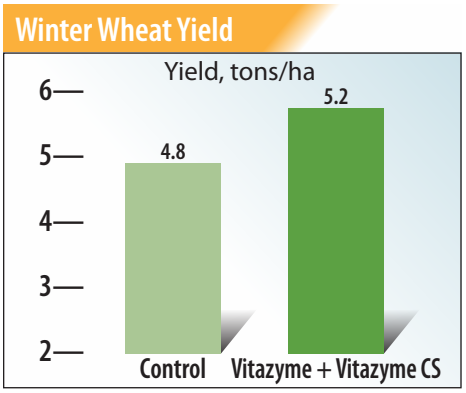
Winter Wheat *With a Vitazyme Cold Start Application*

Researcher: V. V. Plotnikov
Research organizations: Plant Designs International, Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: LLC "VKAF Maiaky", Biliaiivka District, Odessa Region, Maiaky Village, Southern Ukraine (270-350 mm at precipitation per year)
Variety: Lira Odeska, F1 generation ***Planting date:*** September 22, 2018 ***Planting rate:*** 4 million seeds/ha
Previous crop: chick peas ***Soil type:*** Typical Chernozem (humus = 4.1%)
Field preparation: disking to 6-8 cm, disking a second time to 14-16 cm
Experimental design: A winter wheat field was divided into conventionally treated and Vitazyme treated portions to evaluate the effects of Vitazyme + Vitazyme Cold Start on the yield and quality of the grain.

1 *Control* 2 *Vitazyme + Vitazyme Cold Start*

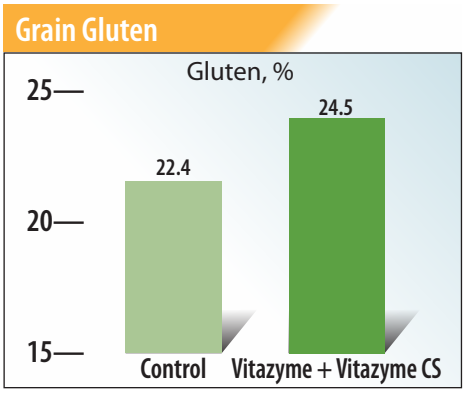
Fertilization: 21 kg/ha of N and 24 kg/ha of S during disking; 10-20-12 kg/ha of N-P_2O_5-K_20 at planting; 80 kg/ha of N as a KAS urea-ammonia mixture in the spring, with Vitazyme Cold Start
Vitazyme and Cold Start application: 0.5 liter/ha of Vitazyme on the seeds before planting; 0,3 liter/ha Vitazyme Cold Start sprayed on the leaves and soil at early tillering on February 17, 2019
Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
Control	4.8	—
Vitazyme + Vitazyme Cold Start	5.2	0.4 (+8%)

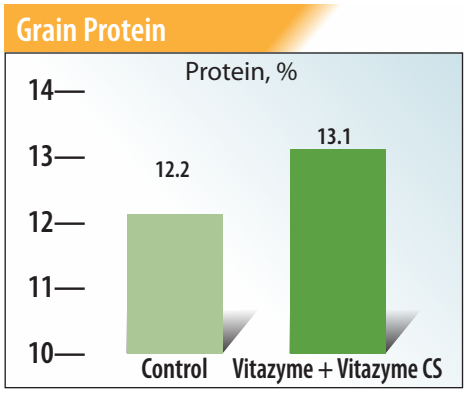


Increase in yield with Vitazyme + Vitazyme Cold Start: 8%

Quality results:



Increase in grain gluten with Vitazyme + Vitazyme Cold Start: 2.1 %-points



Increase in grain protein with Vitazyme + Vitazyme Cold Start: 0.9 %-points

Income results: The added 0.4 ton/ha yield netted an extra $67/ha income.
Conclusion: This Ukraine winter wheat study, using Vitazyme on the seeds plus Vitazyme Cold Start in the spring at early tillering, produced a yield increase of 8%, while grain gluten was improved by 2.1%-points and protein by 0.9%-point. Added income from the program was $67/ha, giving respectable yield and income increases when both products are used together.

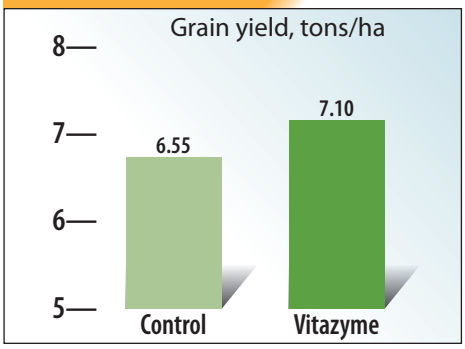
Winter Wheat *with Vitazyme application*

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 Hutory Village, Ukraine
Variety: Midas, third generation ***Planting date:*** October 10, 2017 ***Previous crop:*** sunflowers
Soil type: gray podzolic (humus = 2.0%) ***Planting rate:*** 6 million seeds/ha
Field preparation: disking to 6-8 cm, plowing to 20-22 cm, cultivation to 4-5 cm
Experimental design: A winter wheat field was divided into Vitazyme treated and untreated areas to determine the effect of this product on the yield, quality, and profitability of the crop.

❶ ***Control*** ❷ ***Vitazyme***

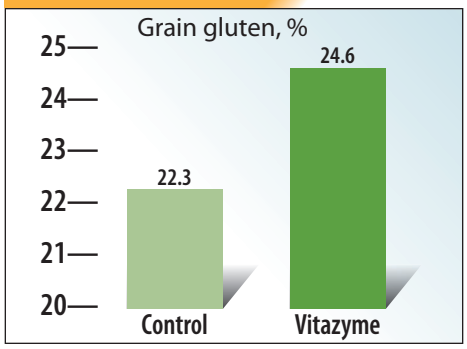
Fertilization: 15-40-40 kg/ha of N-$P_2 0_5$-$K_2 0$ at fall sowing; 186-48 kg/ha of N-S in the spring
Vitazyme application: 1 liter/ha on October 8, 2017, sprayed over the soil
Yield and grain quality results: The harvest date is unknown.

Grain Yield



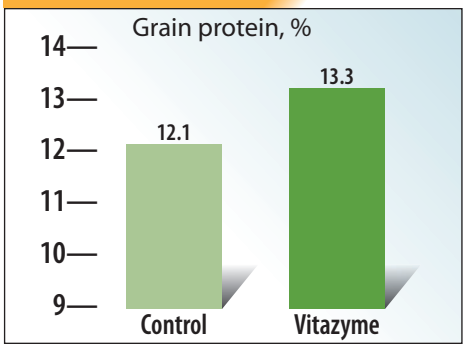
Increase in grain yield with Vitazyme: 8%

Grain Gluten



Increase in grain gluten with Vitazyme: 2.3 %-points

Grain Protein



Increase in grain proteins with Vitazyme: 1.2 %-points

In this random plant sampling, Vitazyme is shown to promote rooting and top growth, leading to a higher yield.

Income results: The improvement in yield and grain quality provided an extra $129/ha income for the farmer.

Conclusions: A winter wheat study in central Ukraine, using only one 1 liter/ha application of Vitazyme, showed an 8% increase in grain yield, along with significant increases in grain gluten (2.3 percentage points) and grain protein (1.2 percentage points). These improvements provided $129/ha more income, and proved the considerable efficacy of this product for improving wheat production in central Ukraine.

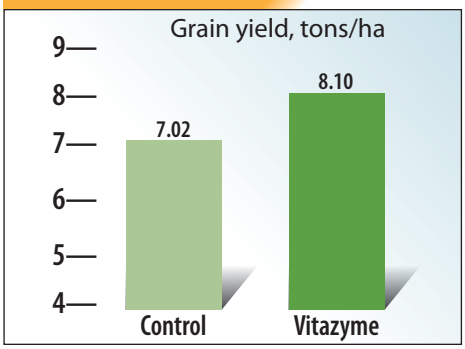
Winter Wheat *with Vitazyme application*

Researcher: V. V. Plotnikov
Research organization: Plant Designs, Inc., Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: Bilgorod-Dnistrovskii District, Odessa Region, Petrivka Village, LTD Spelta, Ukraine
Variety: Midas, elite ***Planting date:*** September 21, 2017 ***Previous crop:*** winter canola
Soil type: typical chernozem (humus = 4.1%) ***Planting rate:*** 5 million seeds/ha
Field preparation: disking to 6-8 cm, disking to 14-16 cm, cultivation to 4-5 cm
Experimental design: A winter wheat field in southern Ukraine was divided into Vitazyme treated and untreated areas, and compared to determine the effect of this product on the yield, quality, and profitability of the biostimulant.

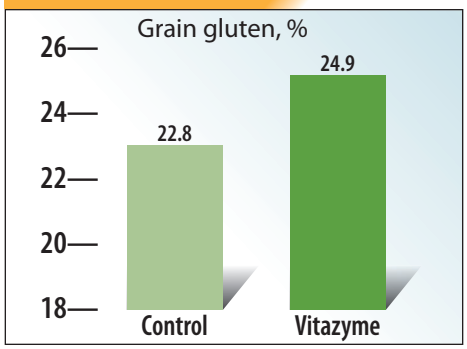
❶ ***Control*** ❷ ***Vitazyme***

Fertilization: 18-18-18 kg/ha of N-P_2O_5-S at disking; 20 kg/ha at planting; 170-36 kg/ha N-S in the spring
Vitazyme application: (1) 0.5 liter/ha sprayed on the leaves and soil at the 3-leaf stage on October 26, 2017; (2) 0.5 liter/ha sprayed on the leaves and soil at tillering on April 16, 2018
Yield and quality results:

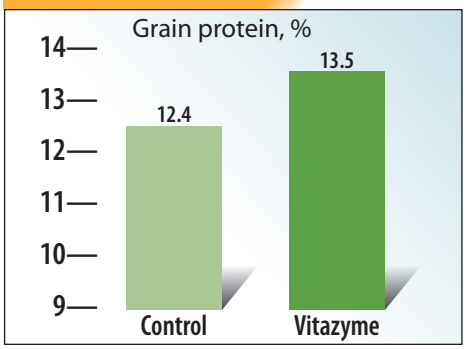
Grain Yield



Grain Gluten



Grain Protein



A Vitazyme seed treatment for wheat (left-hand plants) stimulates germination and seedling development, an effect that compounds during the growing season as can be seen here.

Increase with Vitazyme

Grain yield ..... 15 %
Grain gluten..... 2.1 %-points
Grain crude protein ..... 1.1 %-points

Income results: An increase in yield of 2.1 tonnes/ha, coupled with an improvement in crude protein and gluten, resulted in $243/ha more income.

Conclusions: This southern Ukraine winter wheat trial, using two 0.5 liter/ha Vitazyme applications, resulted in an excellent 15% yield increase, along with good increases in gluten and crude protein, with a 1.1 percentage point improvement for protein. These increases produced $243/ha more income for the farmer and reveal the great efficacy of this program for wheat farmers in Ukraine.

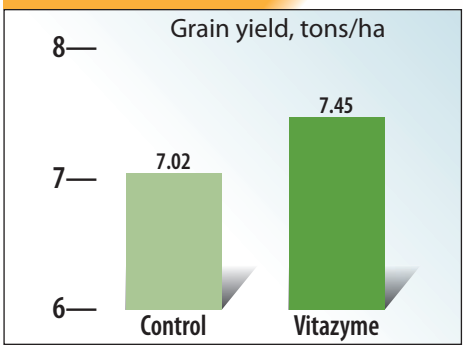
Winter Wheat *with Vitazyme application*

Researcher: V. V. Plotnikov
Research organization: Plant Designs, Inc., Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: Bilgorod-Dnistrovskii District, Odessa Region, Petrivka Village, LTD Spelta, Ukraine
Variety: Balaton, elite ***Planting date:*** September 21, 2017 ***Previous crop:*** winter canola
Soil type: typical chernozem (humus = 4.1%) ***Planting rate:*** 5 million seeds/ha
Field preparation: disking to 6-8 cm, disking to 14-16 cm, cultivation to 4-5 cm
Experimental design: A winter wheat field in southern Ukraine was divided into Vitazyme treated and untreated areas to evaluate the effect of this product on the yield and quality, as well as profitability, for winter wheat.

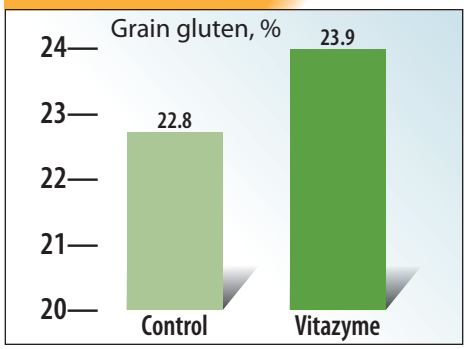
❶ ***Control*** ❷ ***Vitazyme***

Fertilization: 18-18-18 kg/ha of N-P_2O_5-S at disking; 20 kg/ha P_2O_5 at planting; 170-36 kg/ha N-S in the spring
Vitazyme application: 0.5 liter/ha sprayed on the leaves and soil in the fall of October 26, 2017
Income results: The improvement of grain yield and quality resulted in $95/ha added income.
Yield and quality results:

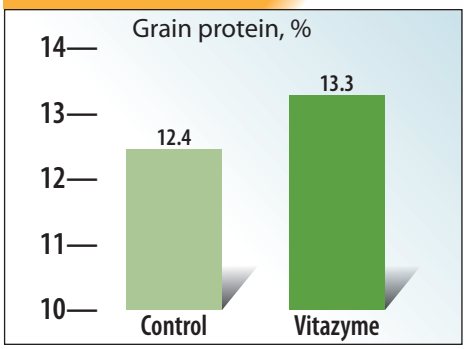
Grain Yield



Grain Gluten



Grain Protein



Increase with Vitazyme	
Grain yield	*6 %*
Grain gluten	*1.1 %-points*
Grain crude protein	*0.9 %-point*

Conclusions: This winter wheat trial in southern Ukraine, using a single spring application of Vitazyme at only 0.5 liter/ha, resulted in a respectable yield increase of 6%, while boosting grain gluten and crude protein by 1.1 and 0.9 percentage points, respectively. These results show the excellent utility of this program for Ukrainian wheat growers.

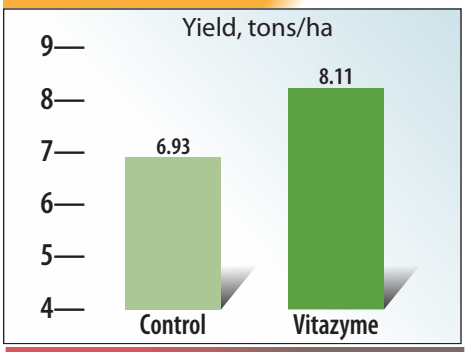
Winter Wheat *with Vitazyme application*

Researcher: Vadim Plotnikov
Research organization: "Dashkivtsi", Ukraine, Plant Designs, New York, USA, and Agro Expert International, Ukraine
Location: Lityn District, Vinnytsia Region, Dashkivtsi Village, Ukraine
Variety: Mulan (generation 2)
Seeding rate: 6 million seeds/ha
Planting date: October 3, 2016
Previous crop: soybeans
Soil type: gray-brown podzolic; humus=2.0%
Soil preparation: disking to 20-22 cm, cultivation to 14-15 cm, pre-sowing cultivation to 5-6 cm
Experimental design: A winter wheat field was divided into a Vitazyme treated area and a untreated control area to determine the effect of this product on grain yield and protein content.

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

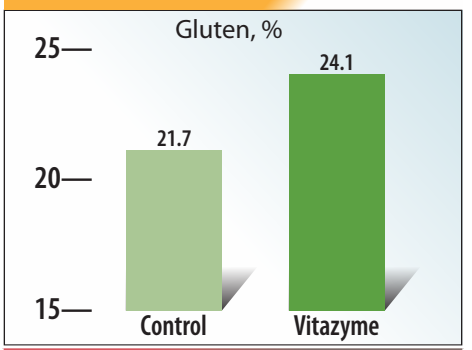
Fertilization: 51-52-52-36 kg/ha of N-P_2O_5-K_2O -S broadcast during fall cultivation; 150 kg/ha of N applied in the spring
Vitazyme application: 1 liter/ha sprayed on the leaves and soil on May 3, 2017
Growing season weather: dry
Yield and quality results:
Income results: At a price of about $190.68/ton, the added income from the extra 17% grain produced is $225.
Conclusions: A winter wheat field-scale trial in central Ukraine, using 1 liter/ha foliar applied in the spring, produced an excellent 1.18 ton/ha (17%) yield increase compared to the untreated control. Moreover, grain quality improved, with 24 percentage points more gluten and 1.3 percentage points more crude protein. As a result, the return to the farmer for this one liter application was an impressive $225/ha, showing the great efficacy of this program for wheat farmers in Unkraine.

Grain Yield



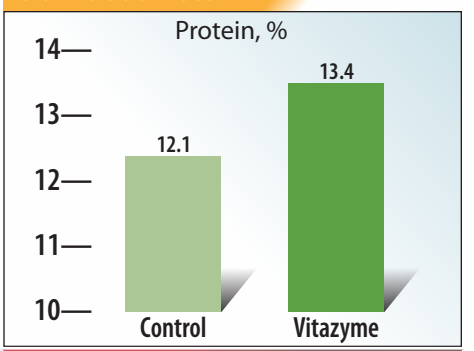
Increase in grain yield with Vitazyme: 17%

Grain Gluten



Increase in grain gluten with Vitazyme: 2.4 percentage points

Grain Crude Protein



Increase in grain crude protein with Vitazyme: 1.3 percentage points

Winter Wheat *with Vitazyme application*

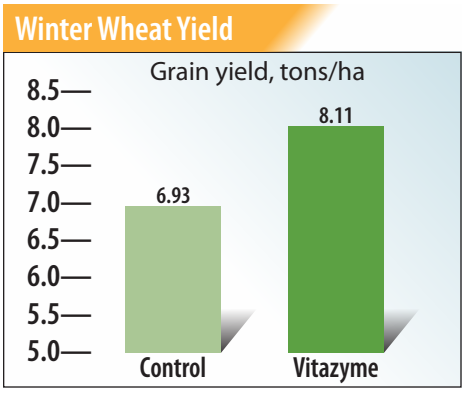
Researcher: Vadim Plotnikov
Research organization: LLC "Dashkivtsi"
Location: Litinsky District, Vinnitsia Region, Dashkivtsi Village
Variety: Mulan (generation 2)
Seeding rate: 6 million seeds/ha
Planting date: October 3, 2016
Previous crop: soybeans
Soil type: ashy gray, humus=2.0%
Seedbed preparation: disking to 20-22 cm, cultivation to 14-15 cm, and a pre-planting cultivation to 5-6 cm
Experimental design: A field of winter wheat was divided into an untreated control area and a Vitazyme treated portion to evaluate the effect of this treatment on the yield and quality of grain.

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

Fertilization: (1) A pre-plant application of 51-52-52-36 kg/ha of N-P_2O_5-K_2O-S, (2) 150 kg/ha of N broadcast in the spring.
Vitazyme application: 1 liter/ha foliar sprayed on May 3, 2017
Growing season weather: dry
Yield results:

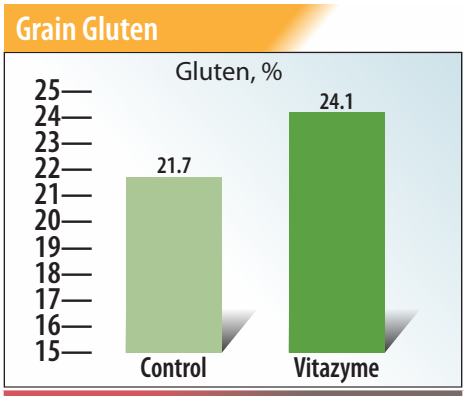
Treatment	Grain yield	Yield change
	tons/ha	ton/ha
1. Control	6.93	—
2. Vitazyme	8.11	1.18 (+17%)

Yield increase of winter wheat with Vitazyme: 17%

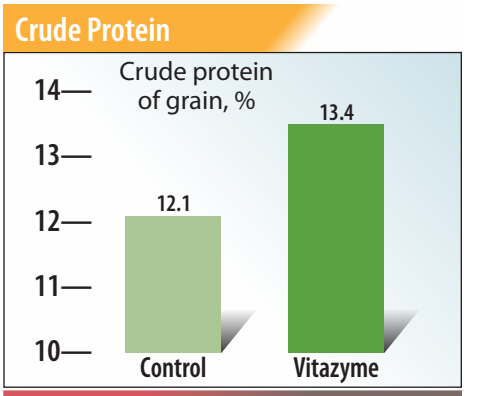


Vitazyme applied to winter wheat in Ukraine produced an excellent yield response of 17%, while increasing grain protein as well.

Grain quality results:



Grain gluten increase in winter wheat with Vitazyme: 2.4% percentage points



Grain protein increase in winter wheat with Vitazyme: 1.3% percentage points

Income results: The yield improvement in this wheat study caused an income increase of $225/ha.
Conclusions: This winter wheat study in Ukraine, using only one application of 1 liter/ha on May 3, produced an excellent yield increase of 17%, while in addition improving the gluten and crude protein by 2.4 and 1.3 percentage points, respectively. Besides, these improvements led to an income increase of $225/ha, proving how effective this program is for wheat growers in Ukraine.

Winter Wheat *with Vitazyme application*

Researcher: Vadim Plotnikov
Research organization: "Oskar" Farm, Ukraine, Plant Designs, New York, USA, and Agro Expert International, Ukraine
Location: Velyka Mikhailivka District, Odessa Region, Kardamychevo Village, Ukraine
Variety: Cubus (generation 3)
Seeding rate: 4.5 million seeds/ha
Planting date: September 21, 2016
Previous crop: sunflowers
Soil type: typical Chernozem; humus=4.3%
Soil preparation: disking to 6-8 cm, harrowing to 4-5 cm
Experimental design: A winter wheat field was divided into Vitazyme treated and untreated control areas to determine the efficacy of this product in promoting yield and grain quality increases.

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

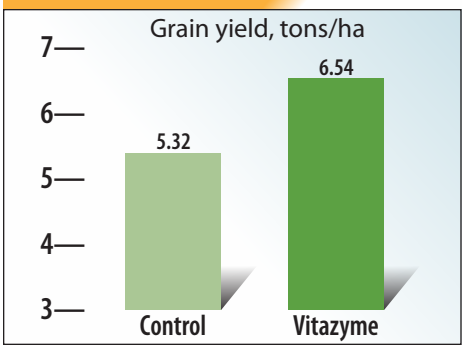
Fertilization: 10-26-26 kg/ha of N-P_2O_5-K_2O starter at fall planting, and 65-35 kg/ha of N-S broadcast in the spring.
Vitazyme application: 0.5 liter/ha sprayed on the leaves and soil in the fall (October 26, 2016), and 0.8 liter/ha sprayed on the leaves in the spring (April 10, 2017)
Growing season weather: dry
Yield and grain quality results:

Treatment	Grain yield	Yield change
	tons/ha	ton/ha
1. Control	5.32	—
2. Vitazyme	6.54	1.22 (+23%)

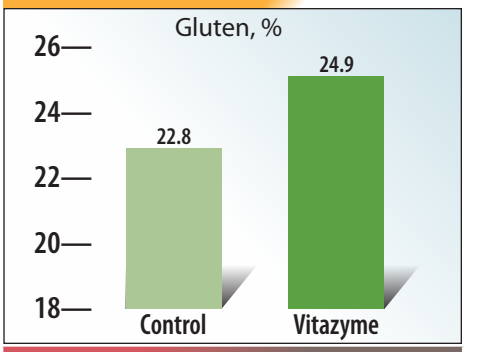
Increase in grain yield with Vitazyme: 34%

Young wheat plants from Ukraine reveal much better early growth when treated with Vitazyme on the seeds. The usual rate applied is 1 liter/ton of seed.

Winter Wheat Yield

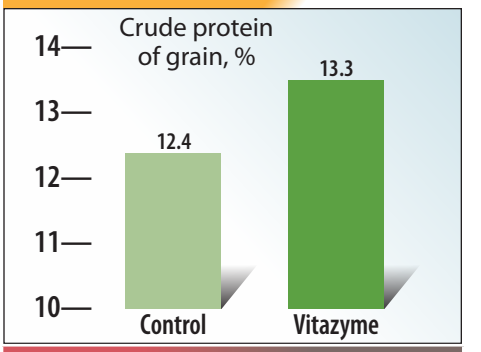


Grain Gluten



Increase in grain gluten with Vitazyme: 2.1 percentage points

Grain Crude Protein



Increase in grain gluten with Vitazyme: 0.9 percentage point

Income results: At a price of $190.98/ton for winter wheat, the added 1.22 tons/ha gave an additional $233/ha income.
Conclusions: A southern Ukranian full-field study using Vitazyme plant and soil supplement, at 0.5 and 0.8 liter/ha in the fall and spring, respectively, resulted in an excellent yield gain of 1.22 tons/ha (23%) compared to the untreated control. Grain gluten also increased (2.1 percentage points), as did crude protein (0.9 percentage point). Farmer income rose by $233/ha, showing the great utility of this program for Ukrainian wheat farmers.

Winter Wheat *with Vitazyme application*

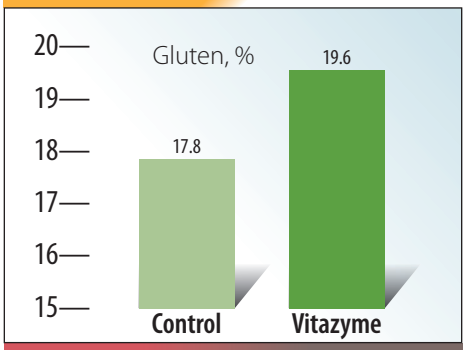
Researcher: V. V. Plotnikov
Research institution: Agro Expert International, Vinnytsya, Ukraine
Location: Farming Enterprise Kolyvailo, Miziakivs'ki Hutory Village, Vinnytsya Region, Ukraine
Variety: Acteur
Planting date: October 2, 2015
Seeding rate: 6 million/ha
Soil type: gray podzolic (2.0% organic matter)
Cultivation: disking to 6-8 cm, plowing to 20-22 cm, and two cultivations to 4-5 cm
Rainfall: 500-550 mm
Experimental design: A winter wheat field was divided into a Vitazyme treated and untreated area, with the objective of determining the effect of this product on the yield and quality of the grain.

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

Fertilization: at planting, 30-30-30 kg/ha of N-P_2O_5-K_2O in-row; in the spring, 120 kg/ha of N
Vitazyme application: 1.0 liter/ha on the seeds before planting, on September 30, 2015

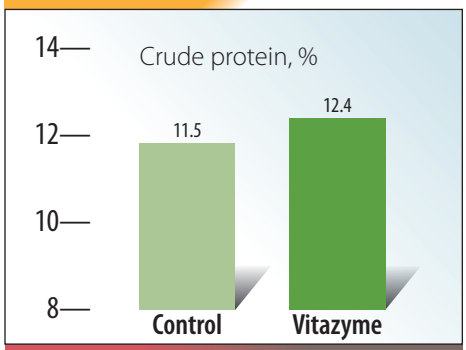
Quality results:

Grain Gluten



Increase in grain gluten: 1.8%-points

Crude Protein



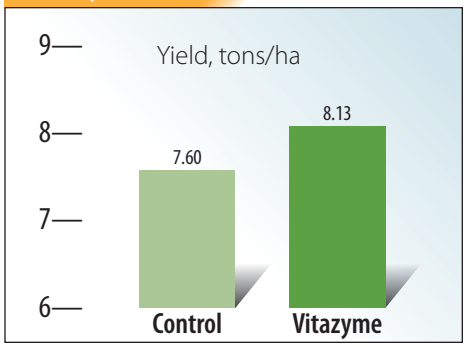
Increase in crude protein: 0.9%-point

Yield results:

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

Increase in grain yield with Vitazyme: 7%

Grain yield



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

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

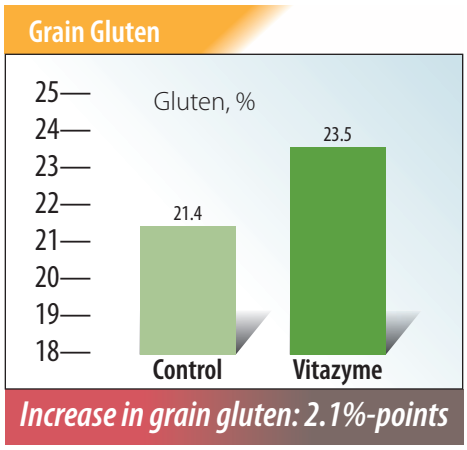
Winter Wheat *with Vitazyme application*

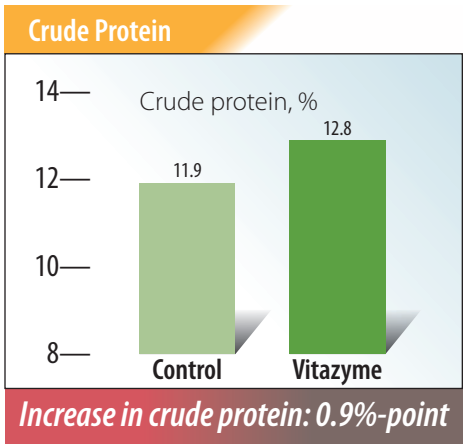
Researcher: V. V. Plotnikov
Research institution: Agro Expert International, Vinnytsya, Ukraine
Location: Private Agricultural Enterprise Polianka, Polianka Village, Harbuzyn District, Mykolayiv Region, Ukraine.
Variety: Zolotokolosa, first reproduction
Planting date: September 25, 2015
Seeding rate: 5.5 million/ha
Previous crop: peas
Soil type: gray podzolic (3.2% organic matter)
Cultivation: disking to 6-8 cm, plowing to 20-22 cm, and one cultivation to 4-5 cm
Rainfall: 300-350 mm
Experimental design: A winter wheat field was divided into a Vitazyme treated and untreated area, with the objective of determining the effect of this product on the yield and quality of the grain.

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

Fertilization: at planting, 16-16-16 kg/ha of N-P_2O_5-K_2O in-row; in the spring, 120 kg/ha of N
Vitazyme application: 1.0 liter/ton on the seeds before planting, on September 21, 2015

Quality results:

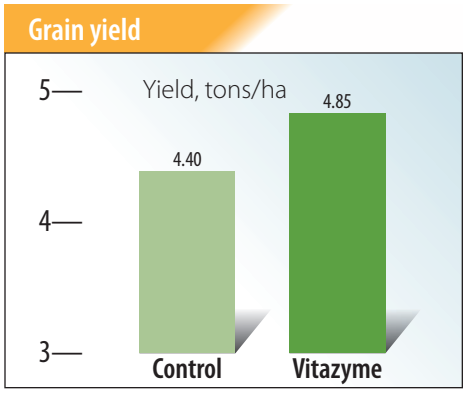




Yield results:

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

Increase in grain yield with Vitazyme: 10%



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

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

Winter Wheat *with Vitazyme application*

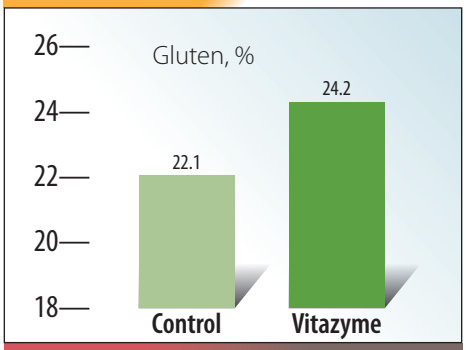
Researcher: V. V. Plotnikov
Research institution: Agro Expert International, Vinnytsya, Ukraine
Location: Agricultural L. L. C. Rozkishna, Novosilka Village, Holovanivs'kyl District, Kirovohrad Region, Ukraine.
Variety: Zolotokolosa, first reproduction
Planting date: September 28, 2015
Seeding rate: 5.5 million/ha
Previous crop: soybeans
Soil type: podzolic Chernozem (3.1% organic matter)
Cultivation: plowing to 20-22 cm, and two cultivations to 4-5 cm
Rainfall: 500-550 mm
Experimental design: A winter wheat field was divided into a Vitazyme treated and untreated area, with the objective of determining the effect of this product on the yield and quality of the grain.

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

Fertilization: at planting, 15-15-15 kg/ha of N-P_2O_5-K_2O in-row; in the spring, 105 kg/ha of N
Vitazyme application: 1.0 liter/ton on the seeds before planting, on September 23, 2015

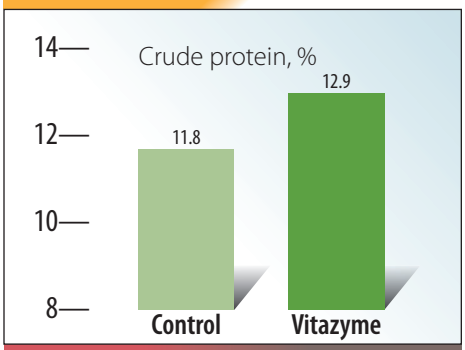
Quality results:

Grain Gluten



Increase in grain gluten: 2.1%-points

Crude Protein



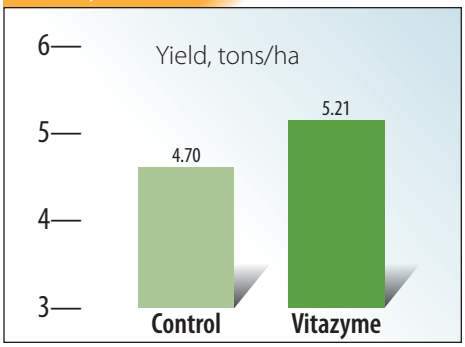
Increase in crude protein: 1.1%-point

Yield results:

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

Increase in grain yield with Vitazyme: 11%

Grain yield



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

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

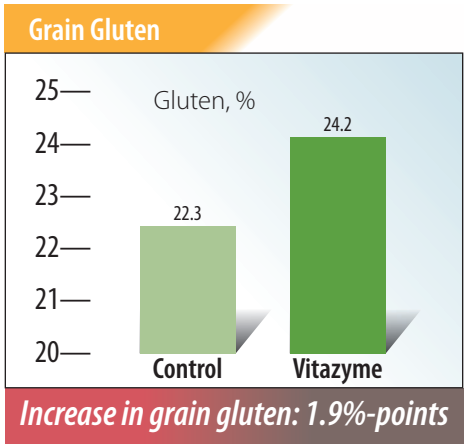
Winter Wheat *with Vitazyme application*

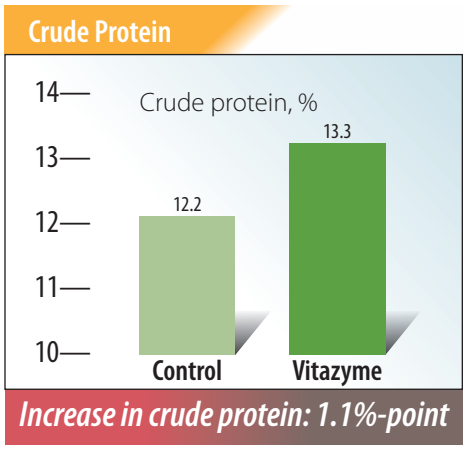
Researcher: V. V. Plotnikov
Research institution: Agro Expert International, Vinnytsya, Ukraine
Location: Private Enterprise Urozhay, Volodymyrivka Village, Domanivs'Kyi District, Mykolayiv Region, Ukraine.
Variety: Pylypivka, selected grain
Planting date: September 30, 2015
Seeding rate: 5.5 million/ha
Previous crop: sunflowers
Soil type: podzolic Chernozem (3.3% organic matter)
Cultivation: disking to 6-8 cm, plowing to 20-22 cm, and one cultivation to 4-5 cm
Rainfall: 300-350 mm
Experimental design: A winter wheat field was divided into a Vitazyme treated and untreated area, with the objective of determining the effect of this product on the yield and quality of the grain.

❶ ***Control*** ❷ ***Vitazyme***

Fertilization: at planting, 30-30-30 kg/ha of N-P_2O_5-K_2O in-row; in the spring, 120 kg/ha of N
Vitazyme application: 1.0 liter/ton on the seeds before planting, on September 25, 2015

Quality results:

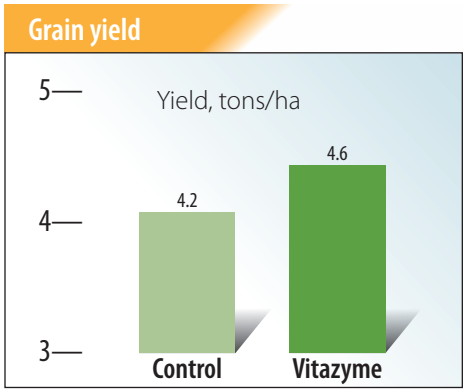




Yield results:

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

Increase in grain yield with Vitazyme: 10%



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

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

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.

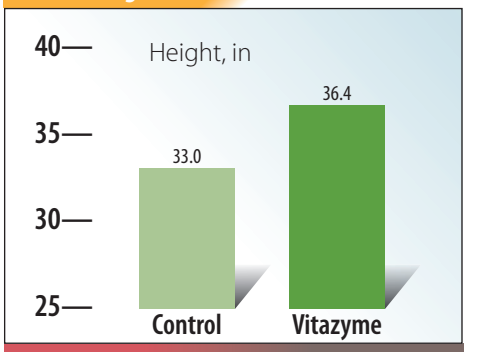
Vitazyme treated soft white winter wheat (at tillering) is much thicker and taller than the untreated control, and yielded 6% more grain.

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***

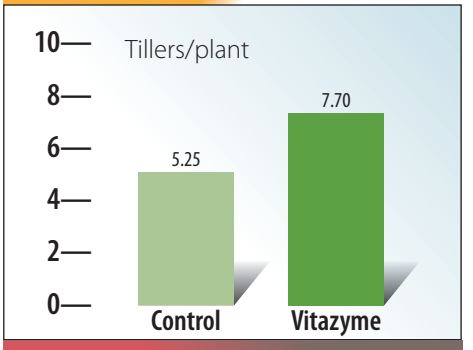
Fertilization: 60 lb/acre of nitrogen in July of 2014
Vitazyme application: 12.4 oz/acre sprayed on the leaves and soil with a 90-foot boom sprayer the last part of April, along with Olympus Flex Broadleaf Herbicide, at the 3 to 5-tiller stage
Growing season weather: good growing conditions with little 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.

Plant Height



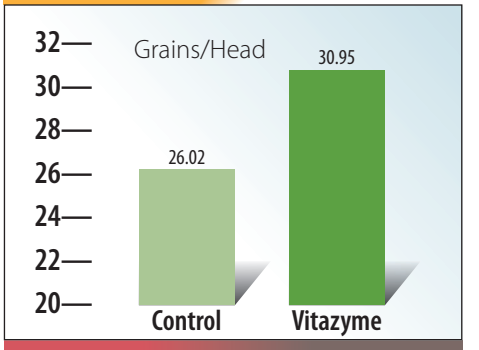
Increase in plant height with Vitazyme: 10%

Tillers Per Plant



Increase in tillers per plant with Vitazyme: 47%

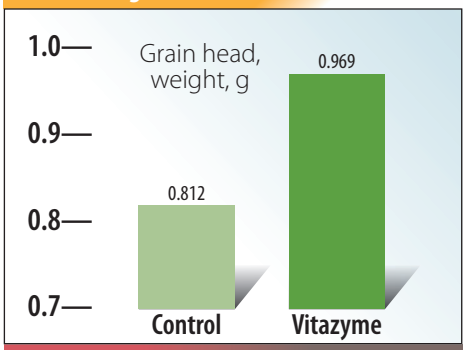
Grains Per Head



Increase in grain per head with Vitazyme: 19%

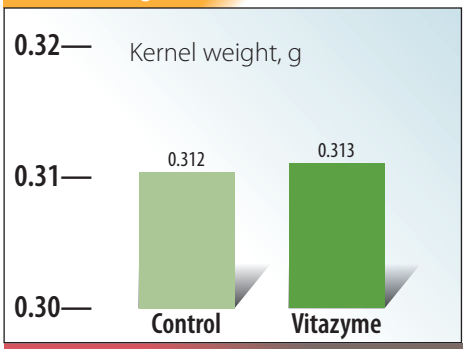
Winter Wheat *with Vitazyme application cont.*

Grain Weight Per Head



Increase in grain weight/head with Vitazyme: 19%

Kernel Weight

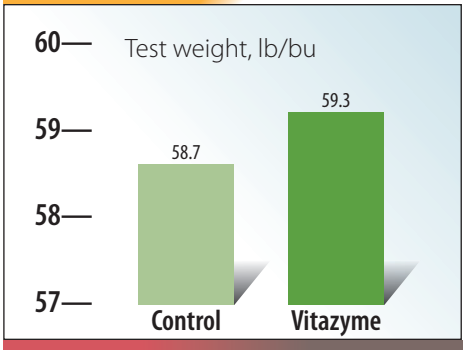


Increase in kernel weight with Vitazyme: 0%

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

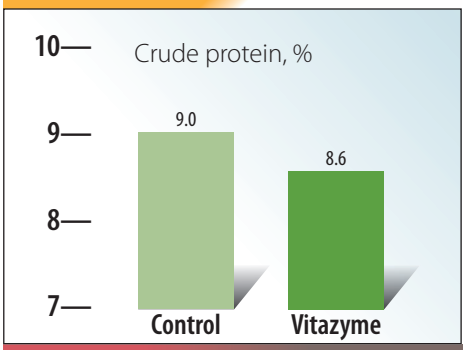
Grain quality results: At harvest, the grain from each field was weighed and sampled separately.

Test Weight



Increase in test weight with Vitazyme: 1%

Grain Protein



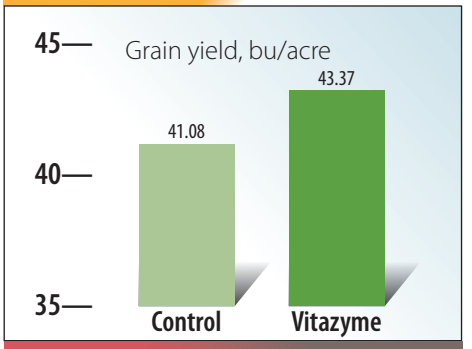
Decrease in crude protein with Vitazyme: (-) 0.4%-points

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

Grain Yield



Increase in grain yield with Vitazyme: 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 sightly (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.

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

2014 Crop Results

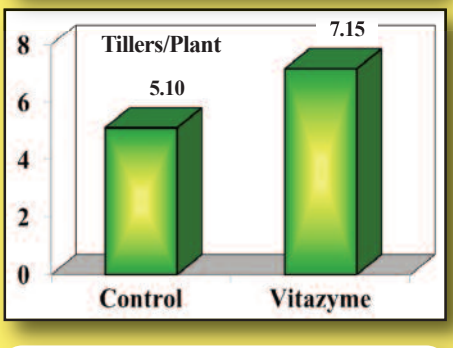
Vitazyme on Winter Wheat

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**

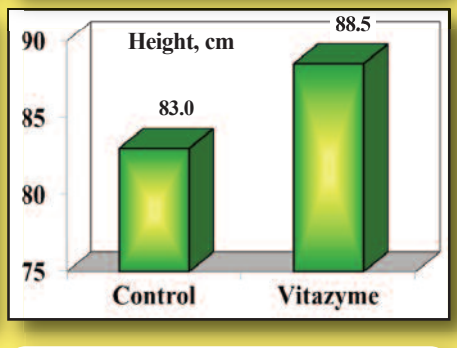
Fertilization: 65 lb/acre of a mixed fertilizer
Vitazyme application: 13 oz/acre sprayed in late April along with a herbicide. A Summers Ultimate NT 90-foot boom sprayer was used.
Growing season weather: a dry year overall
Plant mapping results: On August 1, four days before harvest, 20 random and average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

Tillers Per Plant



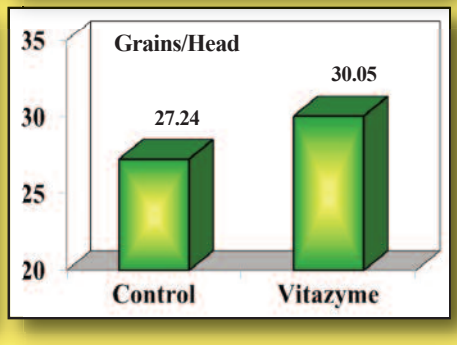
Increase in tillers per plant with Vitazyme: 40%

Plant Height



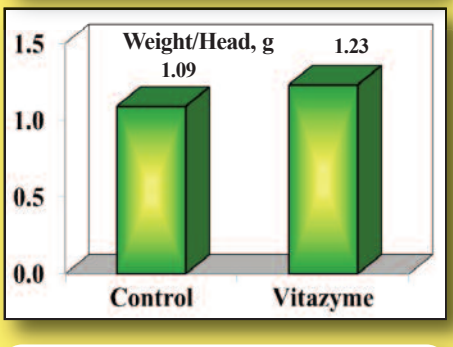
Increase in plant height with Vitazyme: 7%

Grains Per Head



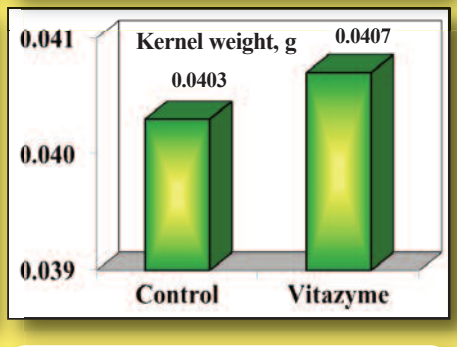
Increase in grains per head with Vitazyme: 10%

Grain Weight Per Head



Increase in grain weight per head with Vitazyme: 13%

Kernel Weight



Increase in kernel weight with Vitazyme: 1%

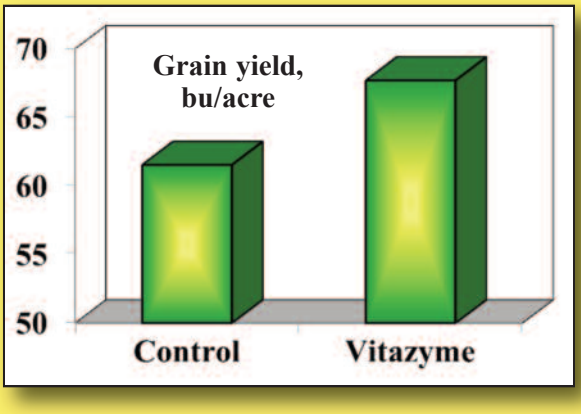
All five measured parameters were improved with Vitazyme application, in particular tillers per plant. Head size and grain weight per head were also notably increased.

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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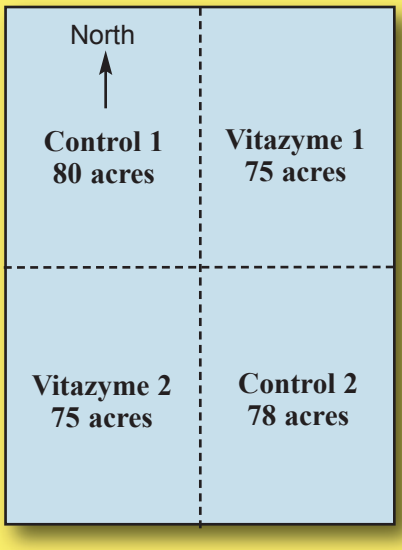
2014 Crop Results

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%

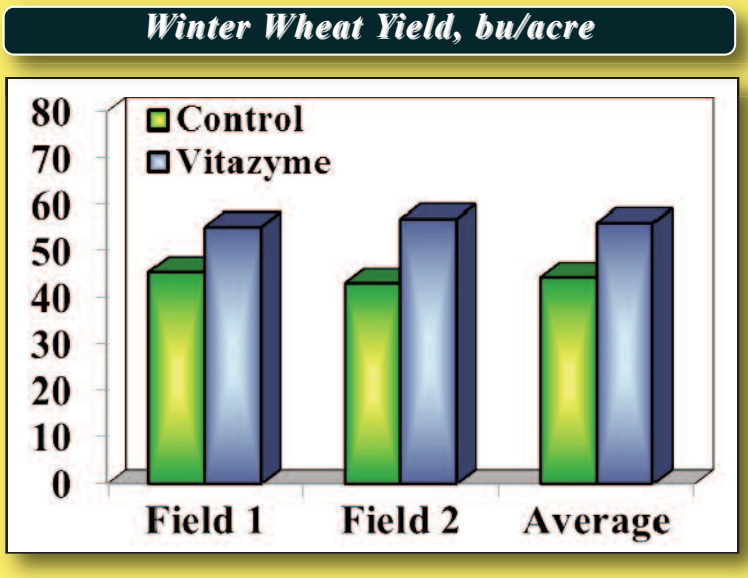
Parameter		Control	Vitazyme	Change
Tillers per plant	Field 1	4.85	6.40	
	Field 2	4.35	5.85	
	Mean	4.60	6.13	1.53 (+33%)
Plant height, cm	Field 1	74.15	80.10	
	Field 2	76.4	89.3	
	Mean	75.3	84.7	9.4 (+12%)
Grains per head	Field 1	29.2	33.7	
	Field 2	24.2	30.6	
	Mean	26.7	32.2	5.5 (+21%)
Grain weight per 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

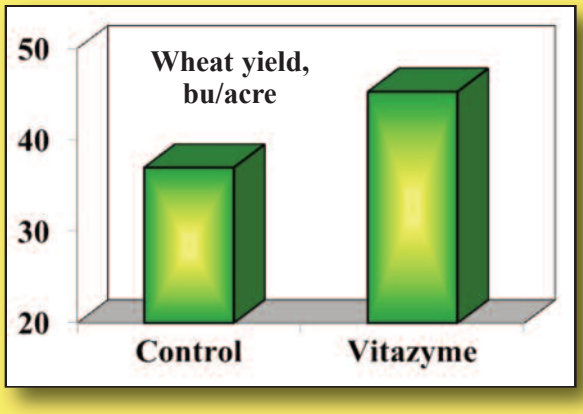
Researcher: Jacob Hesseltine, Vital Grow Distribution LLC, Waterville, Washington
Farmer: Jordan Farms *Location*: Withrow, Washington *Variety*: Eltan
Planting date: September 10, 2013 *Planting rate*: 43 lb/acre *Soil type*: sandy loam
Seedbed preparation: conventional (harrowing, plowing, and cultivation)
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

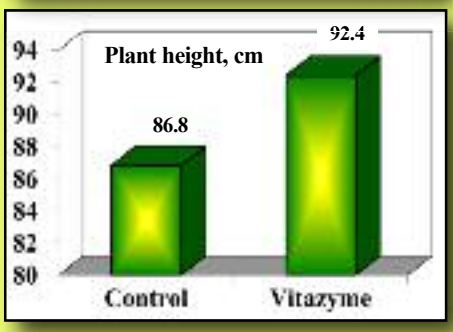
Vitazyme on Winter Wheat

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**

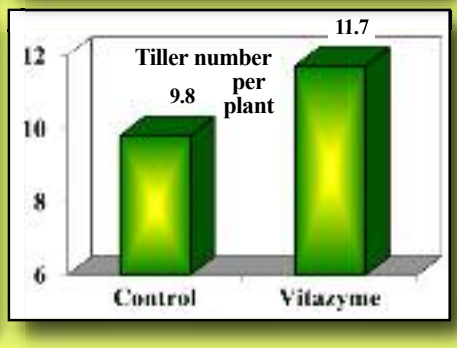
Fertilization: 50 lb/acre of N and 10 lb/acre of S applied in the spring
Vitazyme application: 11.7 oz/acre (0.9 liter/ha) applied by air on the 21.82 acres on May 20
Weather for 2013: Good, but with considerable late season rain that interfered with harvest
Harvest date: August 20 and 21, 2013
Pre-harvest 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*

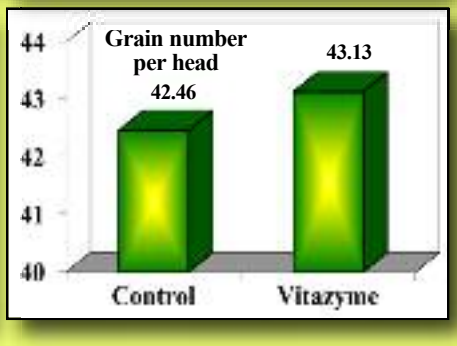


*Measured from soil level to tip of tallest tiller.

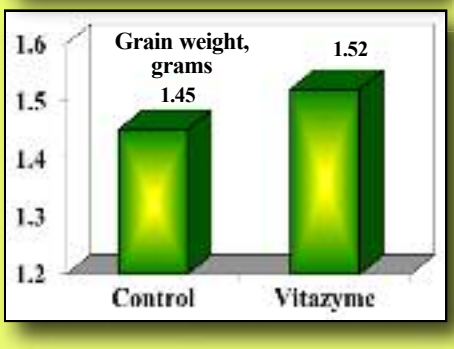
Productive Tillers/Plant



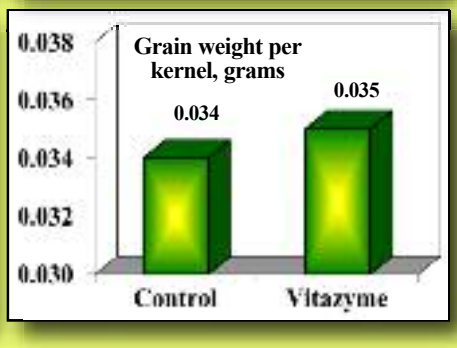
Grains Per Head



Grain Weight Per Head



Grain Weight Per Kernel



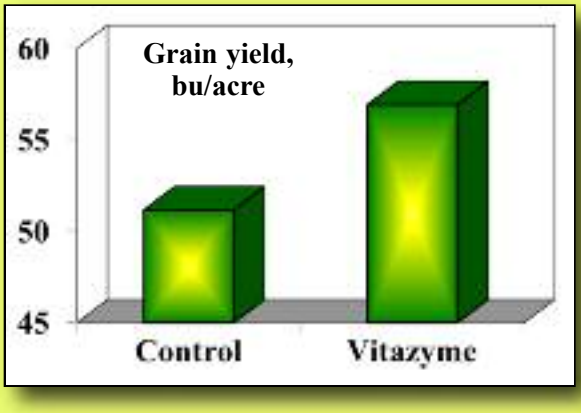
Increases with Vitazyme:

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

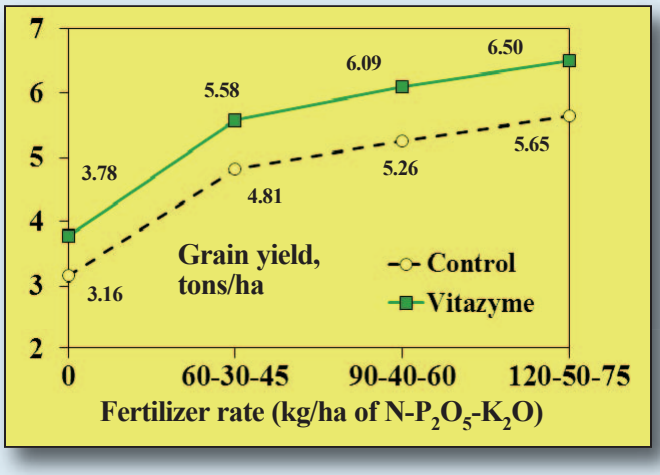
A Fertilizer Rate Study

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.

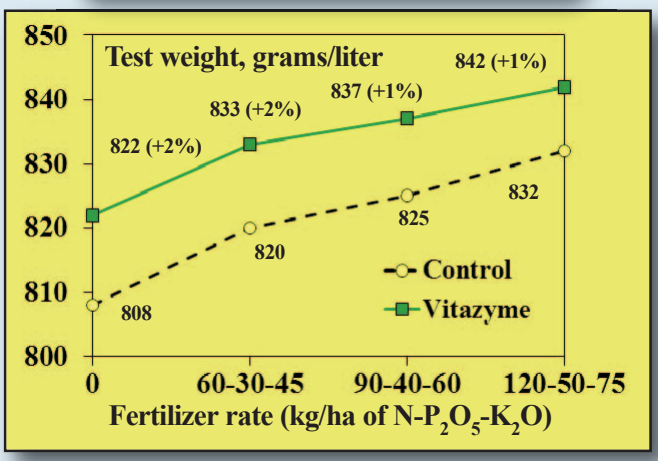
Yield increase with Vitazyme

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.

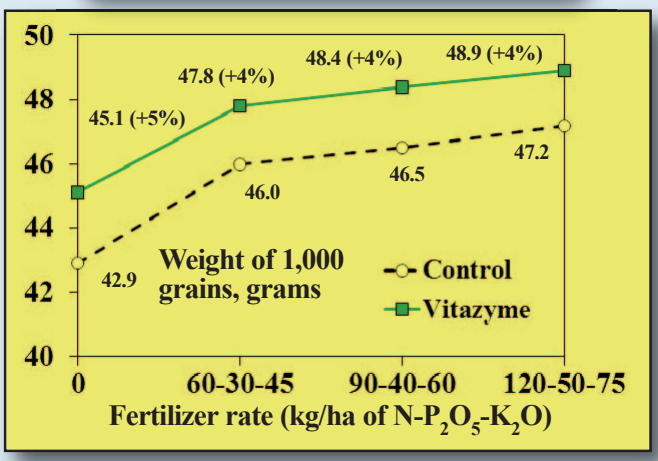
Quality results:

Grain Test Weight



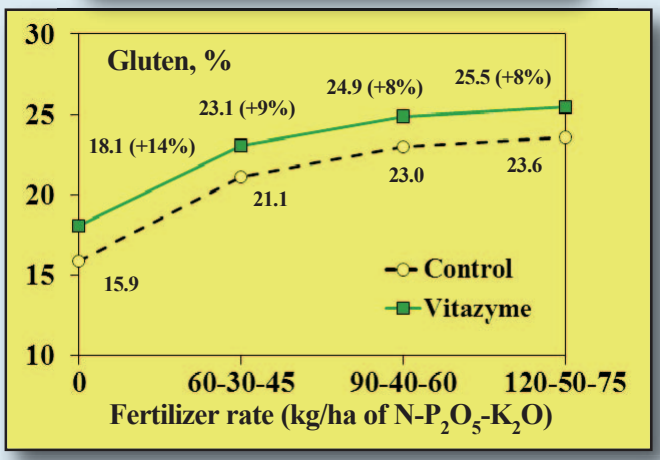
Increase in test weight with Vitazyme at the same fertilizer level: 1 to 2%

Weight of 1,000 Grains



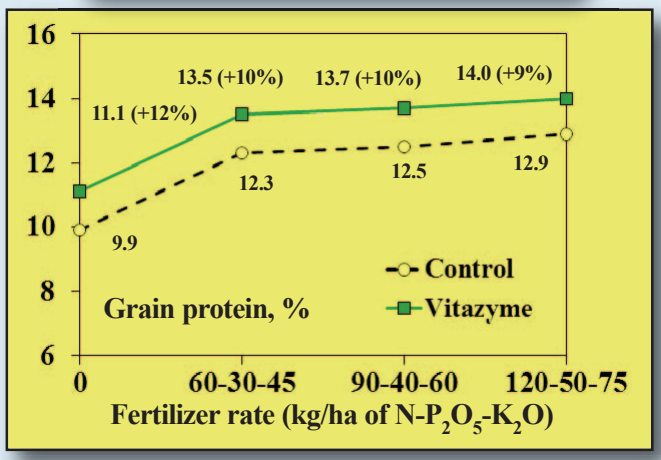
Increase in 1,000-grain weight with Vitazyme at the same fertility level: 4 to 5%

Grain Gluten



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

Grain Crude Protein

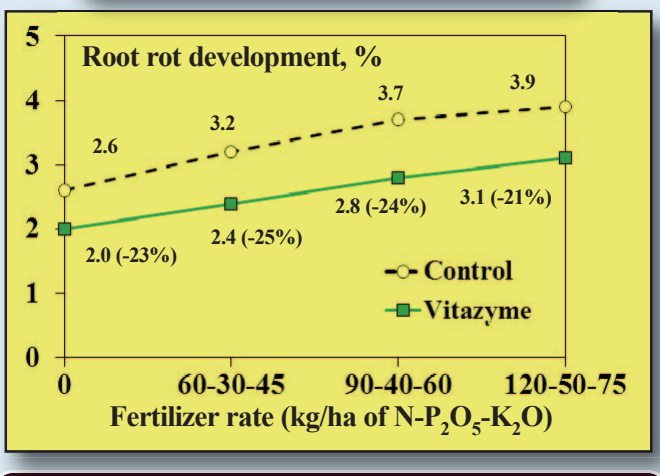


Increase in grain crude protein with Vitazyme at the same fertilizer level: 9 to 12%

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.

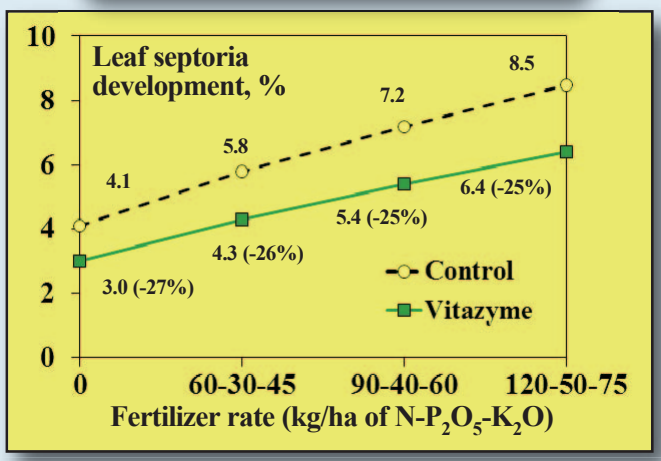
Disease results:

Root Rot Damage



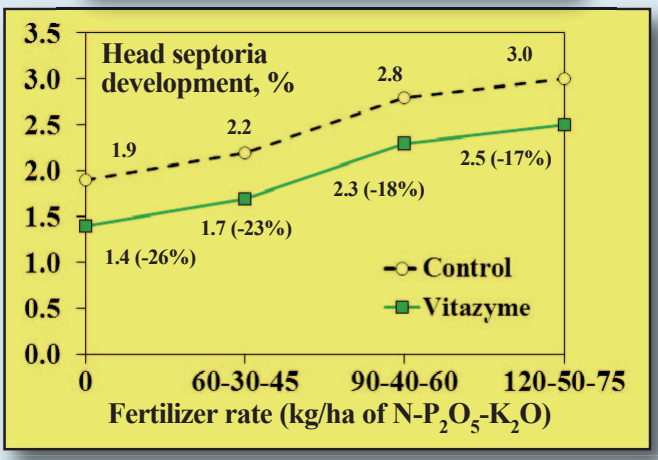
Decrease in root rot development with Vitazyme at the same fertilizer level: 21 to 25%

Leaf Septoria Damage



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

Head Septoria Damage

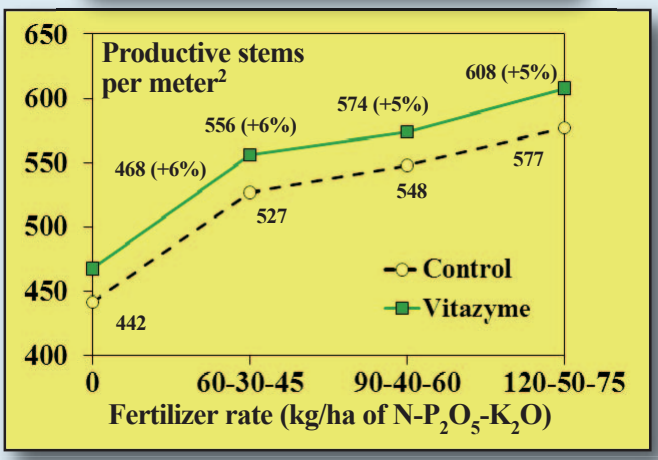


Decrease in head septoria damage with Vitazyme at the same fertilizer level: 17 to 26%

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.

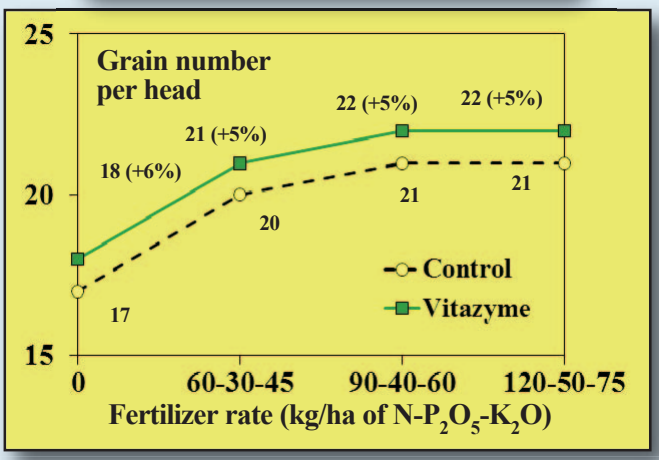
Plant structure results:

Stem Density



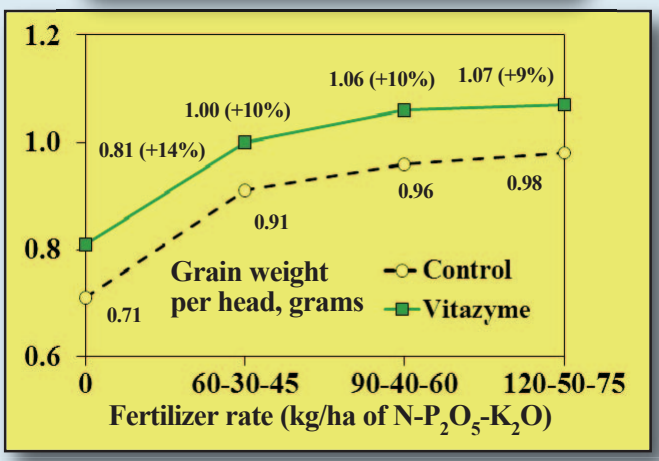
Increase in productive stems with Vitazyme at the same fertilizer level: 5 to 6%

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.

Wheat (Winter) *with Vitazyme application*

Researcher: V. V. Plotnikov
Research organization: Plant Designs International, Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: LLC "Agricor Holding", Novgorod-Siversky District, Chernihiv Region, Popivka Village, Ukraine; northern Ukraine (550-670 mm of rain per year)
Variety: Kubus, F2 ***Planting date:*** September 5, 2019 ***Planting rate:*** 4.5 million seeds/ha ***Previous crop:*** winter barley
Tillage: disking to 6-8 cm, plowing to 20-22 cm, cultivation to 4-5 cm ***Soil type:*** gray podzolic (2.0% organic matter)
Experimental design: A winter wheat field was divided into an untreated and a Vitazyme treated area to evaluate the effectiveness of this plant growth stimulator to improve the yield of grain.

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

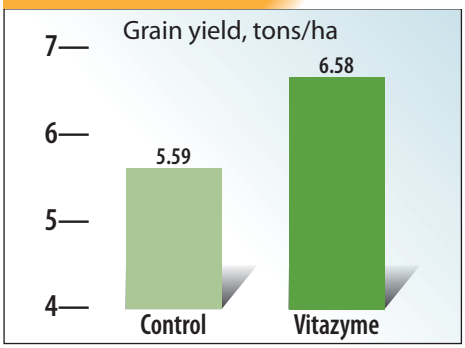
Fertilization: 30-0-40 kg/ha N-P_2O_5-K_2O preplant; 85 kg/ha of N in the spring
Vitazyme application: 1.0 liter/ha sprayed on the leaves on May 3, 2020

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Control	5.59	—
2. Vitazyme	6.58	0.99 (+18%)

Increase in grain yield with Vitazyme: 18 %

Grain Yield

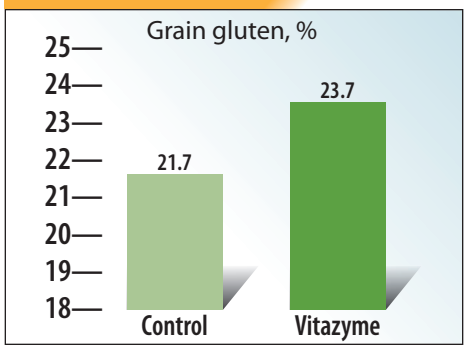


Grain gluten and protein results:

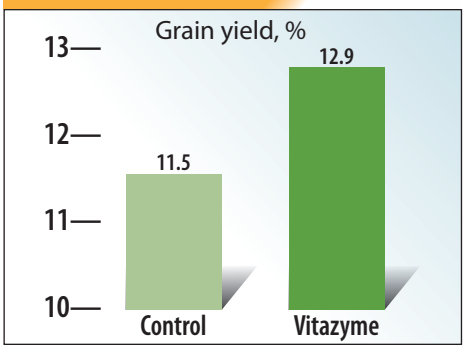
Treatment	Gluten	Gluten change	Protein	Protein change
	%	%	%	%
1. Control	21.7	—	11.5	—
2. Vitazyme	23.7	2.0 (+9%)	12.9	1.4 (+12%)

Increase in grain gluten with Vitazyme: 9%
Increase in grain protein with Vitazyme: 12%

Grain Gluten



Grain Protein



Income results: The 18% improvement in yield, along with increases in grain quality, led to a substantial net income increase of $269/ha.
Conclusions: This field-scale Ukraine trial with winter wheat, comparing a single Vitazyme application with the untreated control, revealed that yield increased by 18%, while both gluten and protein were elevated, by 9 and 12% respectively. Income was likewise increased, by $269/ha. Such a simple and effective, low-cost program for winter wheat makes this product an attractive supplement for farmers in Ukraine.