Sunflowers *with Vitazyme Bio application*

Researcher: V.V. Plotnikov
Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York
Location: LLC "Obriy", Vinnytsia District, Vinnytsia Region, Strointsi Village, Ukraine: central Ukraine (440-590 mm of rain per year)
Variety: NK Kondi ***Planting date:*** May 5, 2021 ***Planting rate:*** 60,000 seeds/ha ***Previous crop:*** winter Wheat
Tillage: disking to 6-8 cm, deep harrowing to 22-24 cm, cultivation in two tracks to 5-6 cm
Soil type: gray podzol (1.7% organic matter)
Experimental design: A sunflower 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 sunflower seed yield.

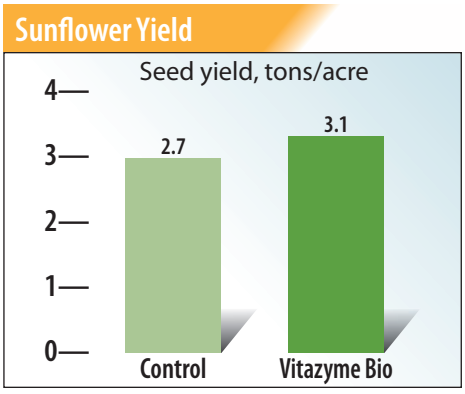
Sunflowers grown in the Vinnytsia region of central Ukraine show a markedly darker color of Vitazyme Bio treated plants in the lower portion of the photo. Treated plants were larger with bigger heads, and yielded 15% more.

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

Fertilization: 34 kg/ha of N during pre-plant tillage, and 2-24-24 kg/ha of N-P_2O_5-K_2O at planting
Vitazyme application: 1 liter/ha sprayed on the leaves and soil on June 5, 2021, at the 6-leaf stage. Vitazyme Bio is the same as Organic Vitazyme marketed in different parts of the world.
Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
Control	2.7	—
Vitazyme Bio	3.1	0.4 (+15%)

Increase in seed yield with Vitazyme: 15%



Vitazyme Bio improved sunflower yield by 15% above the untreated control.

Income results: A yield increase of 0.4 ton/ha resulted in an income increase of $277/ha.
Conclusions: In this Ukrainian field-scale sunflower trial, where Vitazyme Bio was applied at 1 liter/ha on the leaves and soil at the 6-leaf stage, the yield was increased by 0.4 ton/ha (15%) above the control, netting the farmer an additional $277/ha of income. This product is shown to be highly effective for improving sunflower yield and income in Ukraine.

Sunflower plants dug from the two treatments illustrate the effect of Vitazyme Bio to improve total plant biomass, root mass, leaf area, and head size.

Sunflowers *with Vitazyme application—Effectiveness in Reducing Herbicide Stress*

Researcher: V. V. Plotnikov
Research organizations:
Plant Designs International, Rochester, New York;
Agro Expert International, Kaharlyk, Ukraine,
and the Cherksy Experimental Station of Bioresources
Location: Drabiv District, Cherkasy Region,
Drabovo-Bariatynske Village, Ukraine; central Ukraine
(440 to 590 mm of rain per-year)
Variety: NK Neoma
Planting date: April 21, 2020
Planting rate: 55,000 seeds/ha
Previous crop: winter wheat
Tillage: disking to 6-8 cm, harrowing to 22-24 cm,
cultivation to 5-6 cm
Soil type: typical Chernozem (3.9% organic matter)
Experimental design: A sunflower 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 sunflower seeds.

Sunflower responses to Vitazyme in Ukraine continue to be excellent, as for the 2020 trial in central Ukraine, where the yield was improved by 12.

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

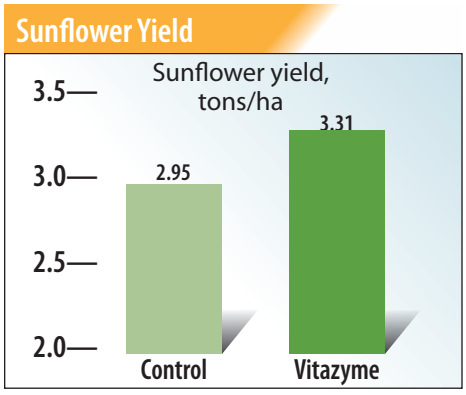
Fertilization: 46 kg/ha of N during pre-plant cultivation, and 4-15-20 kg/ha of N-P_2O_5-K_2O per ha at planting
Vitazyme application: 1.0 liter/ha sprayed at the 6-leaf staage on May 24, 2020.
Herbicide application: In 2019, a herbicide with the active compound amidosul Furon 250 had been applied to winter wheat, and the carryover effect seriously affected the sunflower crop. To ameliorate this stress, Vitazyme was applied on May 24 at 1 liter/ha.

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
Control	2.95	—
Vitazyme*	3.31	0.36 (+12%)

*Applied to relieve herbicide stress.

Increase in sunflower yield with Vitazyme: 12%



Income results: This increase in yield of 0.36 ton/ha produced an income increase of $181/ha.

Conclusion: A field-scale trial in Ukraine compared an untreated control with Vitazyme applied at 1.0 liter/ha over the canopy at the six-leaf stage. This application was designed to relieve herbicide stress. This single application produced a marked yield increase of 12% (0.36) tons/ha over the untreated control, showing the great-efficacy of this biostimulant to increase sunflower yields in Ukraine in spite of herbicide damage.

Sunflowers *with Vitazyme application*

Notice the enhanced head size and development with the Vitazyme program in this Ukraine trial. The yield has been sustantially improved and very profitably.

Supple heads that are well-filled are the hallmark of Vitazyme use with Suflowers, which is a major oilseed crop in Ukraine. In this trial yield was increased by 9%.

Researcher: V. V. Plotnikov
Research organizations: Plant Designs International, Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: Cherkasy Experiment Station of Bioresources, Drabiv District, Cherkasy Region, Drabovo-Bariatynske Village; Central Ukraine (440-590 mm of precipitation per year)
Variety: CI Diamantis
Planting date: April 19, 2019
Planting rate: 50,000 seeds/ha
Previous crop: winter wheat
Soil type: typical Chernozem (humus = 3.9%)
Field preparation: disking to 6-8 cm, plowing to 22-24 cm, cultivating in two tracks to 5-6 cm
Experimental design: A sunflower field was divided into conventionally treated and Vitazyme treated portions to evaluate the effects of Vitazyme on the yield of the crop.

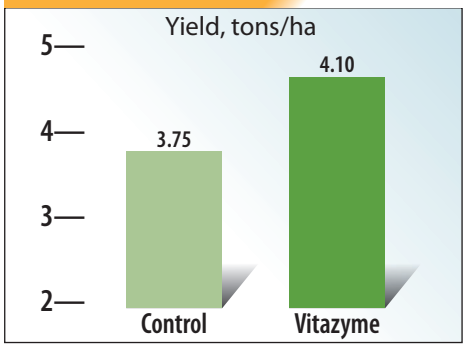
1 ***Control*** **2** ***Vitazyme***

Fertilization: 46 kg/ha of N cultivated in before planting; 4-10-20 kg/ha of $N\text{-}P_2O_5\text{-}K_2O$ applied during planting
Vitazyme application: 0.5 liter/ha sprayed on the leaves and soil at the eight-leaf stage on May 30.

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
Control	3.75	—
Vitazyme	4.10	0.35 (+9%)

Sunflower Yield



Increase in seed yield with Vitazyme: 9%

Income results: The extra 0.35 ton/ha gave an addition $95/ha income.
Conclusion: Sunflowers grown in a Vitazyme trial in central Ukraine, using 0.5 liter/ha sprayed at the eight-leaf stage, gave an additional 0.35 ton/ha yield (9%), that provided $95/ha more income. This program is thus shown to be highly effective in increasing the yield and income for sunflower growers, even when used at lower than normal rates.

Sunflowers *with Vitazyme application*

Researcher: V. V. Plotnikov
Research organizations:
Plant Designs International, Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: LLC "Herron Invest", Yarmolynci District, Khmel'nytskii Oblast, Tarasivka Village, Ukraine; Western Ukraine (550-750 mm at precipitation per year)
Variety: P62 LL 109 ***Planting date:*** April 4, 2019
Planting rate: 62,000 seeds/ha ***Previous crop:*** winter wheat
Soil type: Podzolic Chernozem (humus = 3.3%)
Field preparation: disking to 6-8 cm, plowing to 22-24 cm, cultivating in two tracks to 5-6 cm
Experimental design: A sunflower field was divided into normally treated and Vitazyme treated portions to evaluate the effects of Vitazyme on the yield of the sunflower seeds.

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

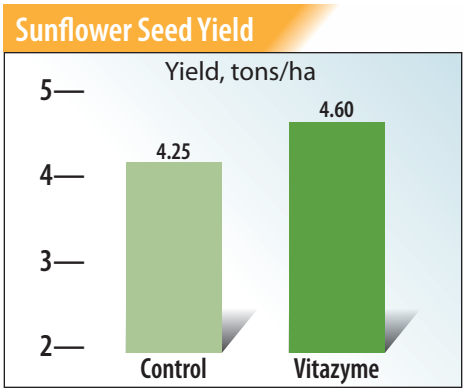
Fertilization: 80-0-30 kg/ha of N-P_2O_5-K_2O applied during plowing; 12-52-0 kg/ha of N-P_2O_5-K_2O applied during planting
Vitazyme application: 1.0 liter/ha sprayed on the leaves and soil at the eight-leaf stage on May 15.

Enhanced overall plant metabolism producing larger stalks, larger leaves and heads, and greater photosynthetic capacity from Vitazyme application has produced the plants shown in this trial.

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
Control	4.25	—
Vitazyme	4.60	0.35 (+8%)

Increase in seed yield with Vitazyme: 8%



Income results: An extra 0.35 tons/ha gave an additional $84/ha income.
Conclusion: This Ukrainian study on sunflowers, using 1 liter/ha of Vitazyme sprayed on the crop at the eight-leaf stage, resulted in an excellent 0.35 ton/ha seed increase (8%). This yield increase resulted in $84/ha extra income, showing the considerable value of this program for sunflowers in Ukraine.

Sunflowers *with Vitazyme application*

Researcher: V.V. Plotnikov
Research organization: State Enterprise "Scientific Innovation and Technology Center of the Institute of Feeding and Agriculture of Podilla of the National Academy of Agrarian Sciences of Ukraine"
Location: Vinnytsia District, Vinnytsia Region, Agronomichne Village, Ukraine
Variety: Sumiko
Planting date: April 30, 2018
Previous crop: spring wheat
Soil type: brown podzolic (humus = 2.2%)
Planting rate: 55,000 seeds/ha
Field preparation: disking to 6-8 cm, plowing to 22-24 cm, cultivation to 5-6 cm
Experimental design: A sunflower field was divided into a Vitazyme treated area, leaving the rest of the field untreated to determine the effect of this product on the yield of sunflower seeds.

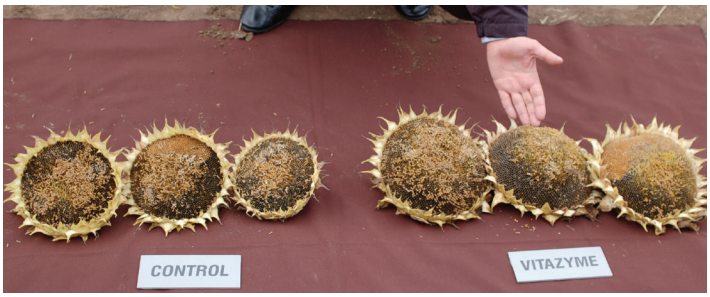
1 ***Control*** **2** ***Vitazyme***

Fertilization: unknown
Vitazyme application: (1) 0.5 liter/ha sprayed on the leaves and soil at the 8-leaf stage on June 8; (2) 0.5 liter/ha sprayed on the leaves at "basket formation"
Yield results:

Treatment	Yield	Yield change
	tonnes/ha	tonnes/ha
1. Control	2.33	—
2. Vitazyme	2.77	0.44 (+19%)

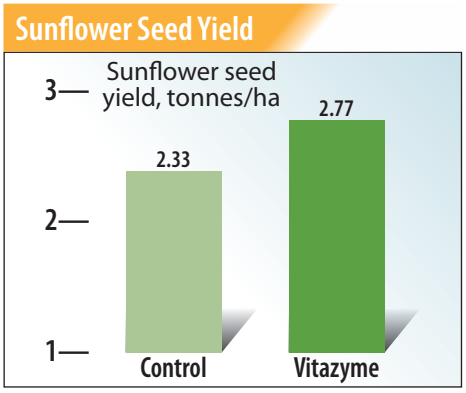
Increase in sunflower yield with Vitazyme: 19%

Income results: The extra yield of 0.44 tonne/ha resulted in $150/ha more income.



Notice the larger heads and higher yield for the Vitazyme treated plants. Birds have eaten many of the seeds in some heads.

These Ukrainian sunflowers produced significantly better when treated with Vitazyme twice during the growing season.



Conclusions: A sunflower field trial in Ukraine produced a 19% yield increase from two 0.5 liter/ha Vitazyme applications, at the 8-leaf and "basket formation" stages. With an income increase of $150/ha, this program is seen to be highly effective for sunflower growers in Ukraine.

Sunflowers *with Vitazyme application*

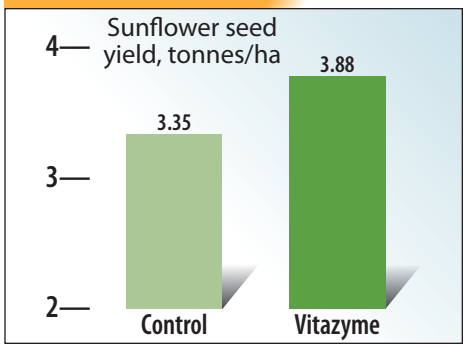
Researcher: V.V. Plotnikov
Research organization: Plant Designs, Inc., Rochester, New York, and Agro Expert International, Kaharlyk, Ukraine
Location: Onufriivka District, Kirovograd Region, Vyshnivtsi Village, LTD Zlagoda, Ukraine
Variety: NK Kondi ***Planting date:*** May 1, 2018 ***Previous crop:*** winter wheat
Soil type: dark brown podzolic (humus = 2.6%) ***Planting rate:*** 50,000 seeds/ha
Field preparation: disking to 6-8 cm, plowing to 22-24 cm, cultivation to 4-5 cm
Experimental design: A sunflower field was divided into a Vitazyme treated area and an untreated control area to determine the effect of this product, in two applications, on yield and profitability.

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

Fertilization: 44-26-26 kg/ha N-P_2O_5-K_2O at plowing; 34 kg/ha N at pre-planting cultivation
Vitazyme application: (1) 0.5 liter/ha sprayed on the leaves and soil at the 8-leaf stage on June 10; (2) 0.5 liter/ha sprayed on the leaves at "basket formation" on June 21
Yield results: (See bar graph to the right)
Income results: The added yield of 16% (0.53 tonnes/ha) gained $185/ha more income.
Conclusions: Two 0.5 liter/ha applications of Vitazyme in this Ukrainian sunflower study provided for an excellent seed yield increase at 0.53 tonne/ha (+16%), while returning the farmer an additional $185/ha of income, showing the great value of this program for sunflower growers in Ukraine.

Treatment	Yield	Yield change
	tonnes/ha	tonnes/ha
1. Control	3.35	—
2. Vitazyme	3.88	0.53 (+16%)

Sunflower Seed Yield



Increase in seed yield with Vitazyme: 16%

Sunflowers *with Vitazyme application*

Researcher: Vadim Plotnikov
Research organization: PJSC "Kurland", Ukraine, Plant Designs, New York, USA, and Agro Expert International, Ukraine
Location: Zhmerynka District, Vinnytsia Region, Tarasivka Village, Ukraine
Variety: NK Roki
Seeding rate: 50,000 seeds/ha
Planting date: May11, 2017
Previous crop: wheat
Soil type: brown podzolic; humus=2.0%
Seedbed preparation: disking to 6-8 cm, plowing to 22-24 cm, harrowing to 5-6 cm
Experimental design: A sunflower field was divided into Vitazyme treated and untreated control areas to determine the efficacy of the product in promoting yield increases.

❶ ***Control*** ❷ ***Vitazyme***

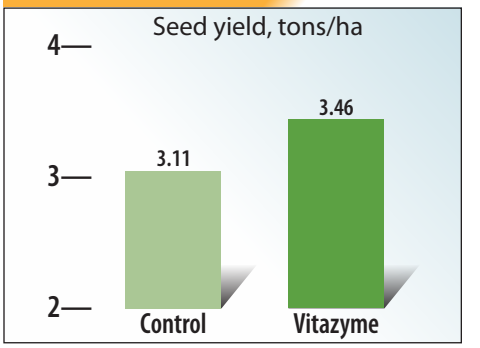
Fertilization: 20-20-12 kg/ha N-$P_2 0_5$-$K_2 0$ broadcast before plowing, and 32/ kg/ha of N in-furrow at planting
Vitazyme application: 1 liter/ha sprayed on the leaves and soil at the 10-leaf stage on June 25, 2017
Growing season weather: dry
Yield results:

Treatment	Seed yield	Yield change
	tons/ha	ton/ha
1. Control	3.11	—
2. Vitazyme	3.46	0.35 (+11%)

Increase in sunflower seed yield with Vitazyme: 11%

Income increase: At a price of $362.86/ton of sunflower seeds, the added 0.35 ton/ha gave an additional $127/ha income.

Sunflower Seed Yield



Conclusions: A sunflower trial in a field in Ukraine in 2017, using a single 1 liter/ha application of Vitazyme at the 10-leaf stage, showed an 11% yield increase (0.35 ton/ha) despite very dry conditions during the growing season. This increase resulted in $127/ha greater returns to the farmer, revealing the excellent efficacy of this product for sunflower growers in Ukraine.

Sunflowers *with Vitazyme application*

The head size has been dramatically improved in this central Ukraine sunflower study. Yield increases over 20% are common.

Vitazyme treated sunflowers in Ukraine display a much improved and vigorous root system, which translates into higher yields.

Researcher: Vadim Plotnikov
Research organization: State Enterprise "Drabivske", Plant Designs, New York, USA, and Agro Expert International, Ukraine
Location: Drabiv District, Cherkasy Region, Drabovo-Baryatinske Village, Ukraine
Variety: NK Neoma
Seeding rate: 50,000 seeds/ha
Planting date: April 26, 2017
Previous crop: wheat
Soil type: typical Chernozem; humus=3.9%
Soil preparation: disking to 6-8 cm, plowing to 22-24 cm, harrowing, to 5-6 cm
Experimental design: A sunflower field was divided into Vitazyme treated and untreated control areas to determine the efficacy of this product in promoting yield increases.

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

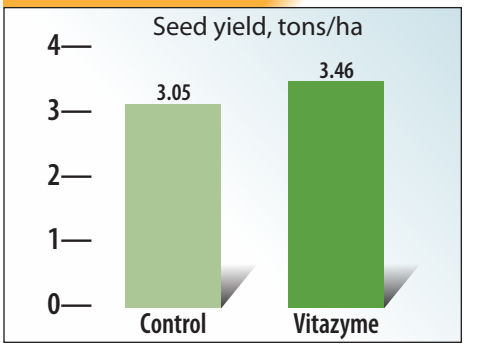
Fertilization: 120 kg/ha of nitrogen broadcast before planting, and10-26-26 kg/ha of N-P_20_5-K_20 in-furrow starter at planting
Vitazyme application: 0.5 liter/ha sprayed on the leaves and soil at the 8 to10-leaf stage on June 10, 2017
Growing season weather: dry
Yield results:

Treatment	Seed yield	Yield change
	tons/ha	ton/ha
1. Control	3.05	—
2. Vitazyme	3.46	0.41 (+13%)

Increase in sunflower seed yield with Vitazyme: 13%

Income increase: At a price of $397.56/ton of sunflower seeds, the added 0.41 ton/ha gave an additional $163/ha income.

Sunflower Seed Yield



Conclusions: This Vitazyme full-scale field trial with sunflowers in the Ukraine, utilizing just one foliar/soil application of 0.5 liter/ha at the 8 to 10-leaf stage, provided an excellent 0.41 ton/acre (13%) seed yield increase, which gained the farmer $163/ha more income. These results show how useful this program is for sunflower growers in Ukraine.

Sunflowers *with Vitazyme application*

Researcher: V. V. Plotnikov
Research institution: Agro Expert International, Vinnytsya, Ukraine
Location: L. L. C. Zelen'ky, Zelen'ky Village, Myronivs'kyi District, Kyiv Region, Ukraine
Variety: NK Condi
Planting date: May 5, 2016
Seeding rate: 50,000 seeds/ha
Soil type: podzolized
Soil type: podzolized Chernozem (3.3% organic matter)
Cultivation: disking to 6-8 cm, plowing to 20-22 cm, harrowing, and two cultivations to 4-5 cm
Rainfall: 500-550 mm
Experimental design: A sunflower field was divided into a Vitazyme treated and untreated area, with the objective of determining the effect of this product on the yield of the seeds.

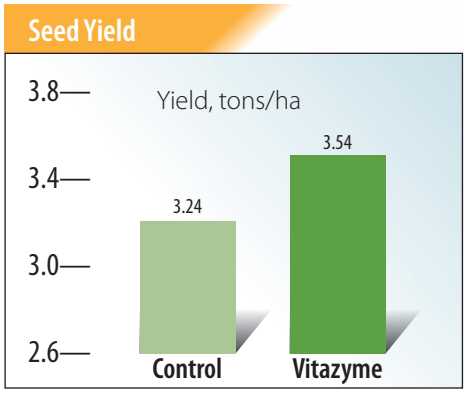
1 ***Control*** **2** ***Vitazyme***

Fertilization: at planting, 16-16-16 kg/ha of N-P_2O_5-K_2O in-row
Vitazyme application: 1.0 liter/ha on the leaves and soil at the 8–leaf stage, on June 17, 2016
Yield results:

Treatment	Seed yield	Yield change
	tons/ha	tons/ha
Control	3.24	—
Vitazyme	3.54	0.30 (+9%)

Increase in seed yield with Vitazyme: 9%

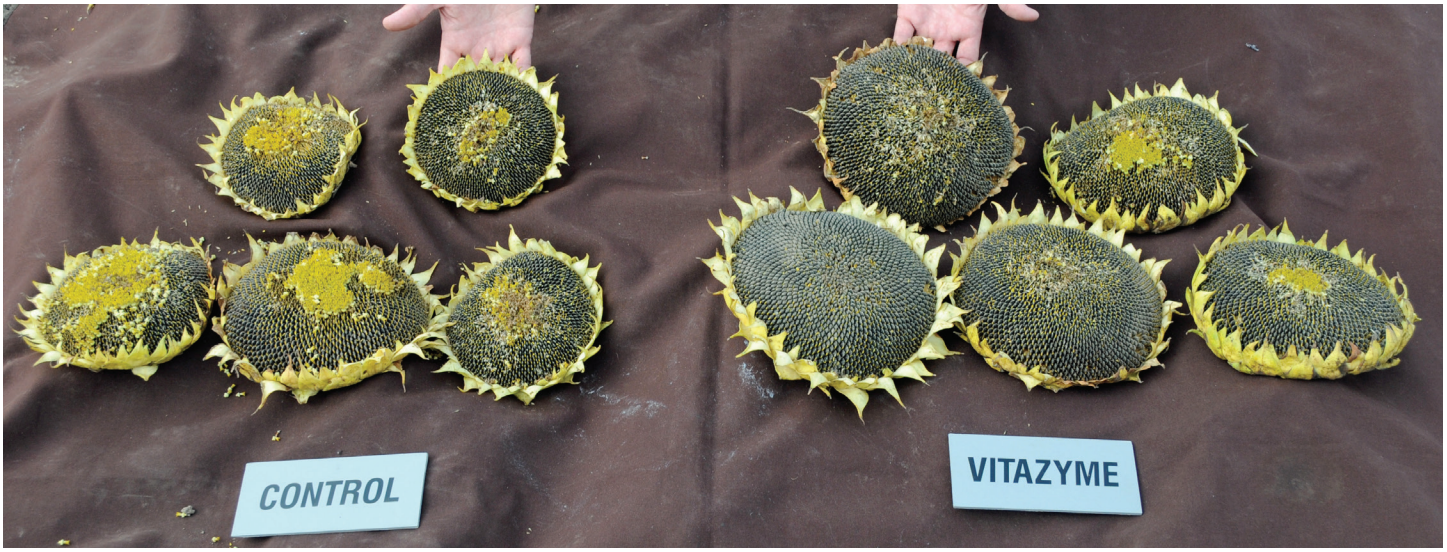
Sunflowers treated with Vitazyme in Ukraine have consistently produced superior yields of both tonnage and oil content.



Income results: Vitazyme increased net profit by 104 USD/ha.
Conclusions: This Vitazyme soil and foliar trial in Ukraine showed that only 1 liter/ha produced a 9% yield increase. Profits were substantially increased by 104 USD/ha, revealing the value of this product for sunflower production in Ukraine.

VitalEarth 2015 Crop Results

Sunflowers *A Summary of Three Field Trials in Ukraine*

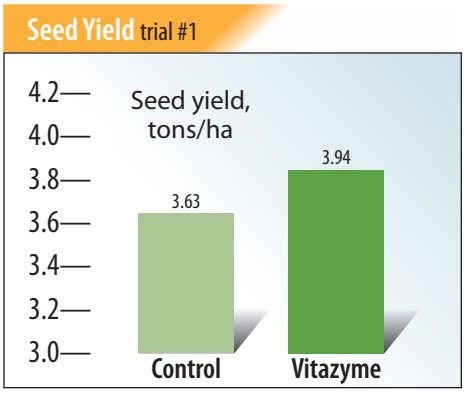


Sunflower response to Vitazyme has been uniformly excellent over the many years it has been trialed in several countries, including Ukraine where this trial took place.

All trials were organized by V.V. Plotnikov, Ph.D, to determine the yield and profit-improving potential of Vitazyme. Fields were divided into Vitazyme and control areas.

1. Conducted by Agricultural Cooperative "Agrobusiness" at Kaharlystkyi District, Kyiv Region, Horohove Village, Ukraine, on a podzolized chernozem (3.1% organic matter).

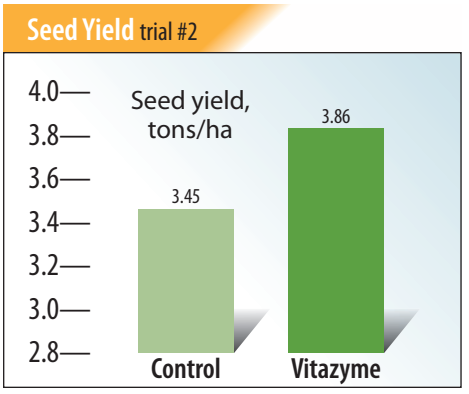
Variety: NK Brio hybrid
Seeding rate: 50,000 seeds/ha
Planting date: April 25, 2015
Previous crop: winter wheat
Cultivation methods: disking to 8 cm, plowing to 22 cm, cultivation to 6 cm
Fertilization: 45 kg/ha N, pre-plant incorporated; 15 kg/ha N, 15 kg/ha $P_2 0_5$, 15 kg/ha $K_2 0$ in-furrow at planting
Vitazyme application: 1 liter/ha sprayed on the leaves and soil at the 8-leaf stage on May 31, 2015
Results: *(See bar chart to the right)*



Yield increase with Vitazyme: 0.31 tons/ha(+9%)
Profit increase with Vitazyme: 2,114 UAH/ha

2. Conducted by JLLC "Palmira Vidhodivlya" at Zolotonosha District, Cherkasy Region, Voznesens'ke Village, Ukraine, on a chernozem soil (3.5% organic matter).

Variety: NK Kondi hybrid
Seeding rate: 50,000 seeds/ha
Planting date: April 21, 2015
Previous crop: winter wheat
Cultivation methods: disking to 8 cm, plowing to 22 cm, cultivation to 6 cm
Fertilization: 45 kg/ha, pre-plant incorporated; 15 kg/ha N, 15 kg/ha $P_2 0_5$, 15 kg/ha $K_2 0$ in-furrow at planting
Vitazyme application: 1 liter/ha sprayed on the leaves and soil at the 6-leaf stage on, May 22, 2015
Results: *(See bar chart to the right)*

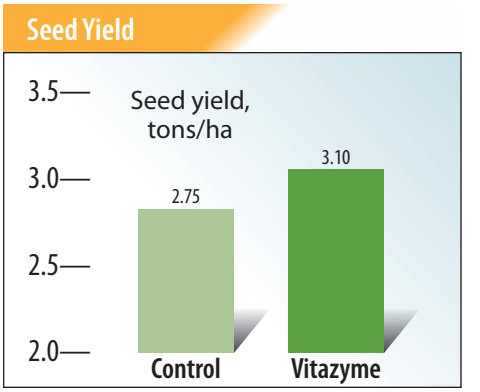


Yield increase with Vitazyme: 0.41 ton/ha(+12%)
Profit increase with Vitazyme: 2,954 UAH/ha

Sunflowers *A Summary of Three Field Trials in Ukraine cont.*

3. Conducted by CMTC "Nadiya Ukrayiny", at Kiliys'kyi District, Odesa Region, Kiliya Town, Ukraine, on a calcareous chernozem (2.5% organic matter).

Variety: LH55.43 KL hybrid
Seeding rate: 50,000 seeds/ha
Planting date: April 9, 2015
Previous crop: winter wheat
Cultivation methods: disking to 8 cm, plowing to 24 cm, cultivation to 6 cm
Fertilization: 35 kg/ha N, pre-plant incorporated; 16 kg/ha N, 16 kg/ha P_20_5, 16 kg/ha K_20 in-furrow at planting
Vitazyme application: 1 liter/ha sprayed on the leaves and soil at the 6-leaf stage on May 5, 2015
Results: *(See bar chart to the right)*



Yield increase with Vitazyme: 0.35 ton/ha(+13%)
Profit increase with Vitazyme: 2,450 UAH/ha

Location	Yield increase	Profit increase
	%	UAH/ha
Central Ukraine (500-550 mm ppt)		
"Agrobusiness" — Horohove	9	2,114
"Palmira Vidhadivlya" — Voznesens'ke	12	2,954
Southern Ukraine (300-350 mm ppt.)		
"Nadiya Ukrayiny" — Kiliya	13	2,450
Mean	11.3	2,506

Conclusion: All three of these sunflower trials produced excellent yield increase from a single 1 liter/ha foliar Vitazyme application at the 6 to 8 leaf stage. The average increase was 11.3%, and the average profit increase was 2,506 UAH/ha for all three trials. This program is shown to be an excellent addition to sunflower production programs in Ukraine.

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

2014 Crop Results

Vitazyme on Sunflowers

Researcher: unknown *Research organization*: Kernel Company, LLC, Ukraine
Location: Man'kivs'ky District, Cherkasy Region, Viktorivka Village, Ukraine *Variety*: NK Dolbi
Planting rate: 50,000/ha *Planting date*: May 19, 2014
Previous crop: winter wheat *Soil type*: Chernozem, with 3.7% organic matter
Seedbed preparation: disk-plowing to 6-8 cm, plowing to 22 - 24 cm, harrowing, two cultivations to 5-6 cm
Experimental design: A sunflower field was divided into a Vitazyme treated area and an untreated control, to discover the effects of the product on seed yield and profitability. All plant protection and fertilization regimes were identical for both treatments.

1. Control **2. Vitazyme**

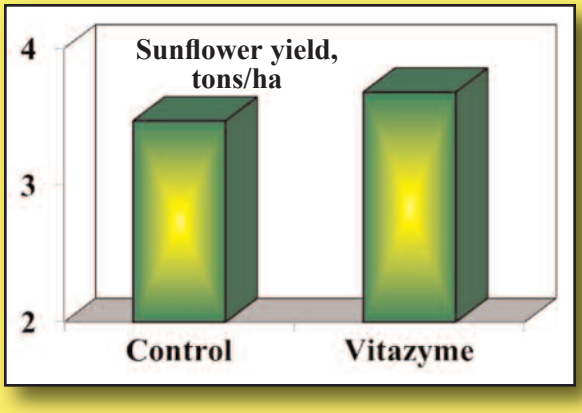
Fertilization: 50 kg/ha of nitrogen broadcast and incorporated before planting, and 10-26-26 kg/ha of N-P_2O_5-K_2O in-furrow at planting.

Vitazyme application: 1 liter/ha sprayed on the leaves and soil at the 6-leaf stage, on June 14

Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
Control	3.47	—
Vitazyme	3.68	0.21 (+6%)

Increase in sunflower yield with Vitazyme: 6%



Income results: Income and expense calculations showed that the 1 liter/ha application increased net income by 956 UAH/ha ($60.71/ha at 1UAH = 0.0635 USD).

Increase in income with Vitazyme: 956 UAH/ha

Conclusions: Sunflowers grown in Ukraine responded excellently to a single 1 liter/ha application of Vitazyme at the 6-leaf stage. The yield was improved by 6%, resulting in an increase in income of 956 UAH/ha ($60.71/ha), showing the excellent utility of utilizing this program on sunflowers in Ukraine.

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2011 Crop Results

Vitazyme on Sunflowers

Researcher: Unknown
Research coordinator: I.V. Braginets
Research organization: Alfa-Agro, Ukraine
Variety: unknown
Experimental design: A field was divided into a Vitazyme treated and an untreated portion to evaluate the effect of this product on crop yield.

1. Control **2. Vitazyme**

Fertilization: farm practice
Vitazyme application: 1 liter/ha sprayed on the leaves and soil at the 10 to 12-leaf stage
Yield results: No yield results are available, but the increase in yield is given.

Increase in sunflower yield with Vitazyme:
0.45 ton/ha (16.7 bu/acre)

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

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Average Values for 2009 to 2011 in Ukraine

Vitazyme on Sunflowers

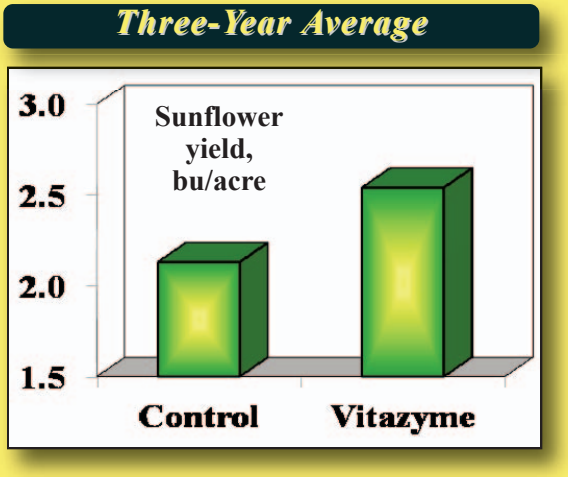
Researcher: V.V. Plotnikov *Location*: National Academy of Agrarian Sciences, Vinnytsia State Agricultural Research Station, Vinnytsia, Ukraine (Central Forest and Steppe Region)

Demonstration plot values averaged over three years, 2009 to 2011:

Treatment	Yield	Yield change
	tons/ha	tons/ha
1. Control	2.13	—
2. Vitazyme at head formation[1]	2.54	0.41 (+19%)

[1]1 liter/ha at head formation.

Three-Year Average Increase With Vitazyme: +19%



Conclusion: Over three years of demonstrations, Vitazyme is shown to be an excellent adjunct to sunflower production in Ukraine.

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2011 Crop Results

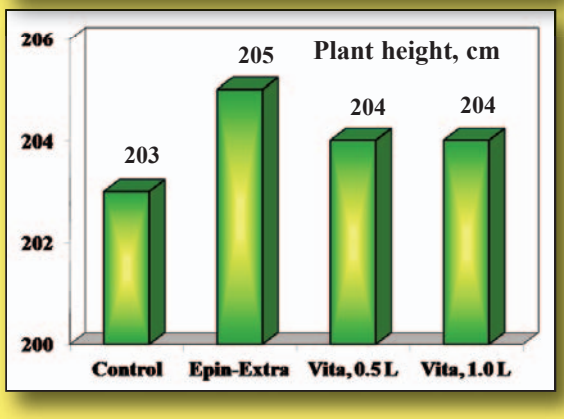
Vitazyme on Sunflowers

Researcher: V.D. Strelkov, Ph.D., and V.V. Morozovsky *Research organization*: State Research Institution, All-Russian Research Institute of Biological Plant Protection, Russian Agricultural Academy
Location: Russia *Variety*: Flagman *Soil type*: Chernozem (Mollisol)
Field preparation: disking and plowing in 2010, and disking in April of 2011
Previous crop: winter wheat *Planting date*: April 28, 2011
Planting rate: 10 kg/ha, adjusted to 40,000 plants/ha
Experimental design: A replicated trial with sunflowers was initiated on a field having plots of 25 m^2, using Vitazyme, a standard treatment (Epin-Extra), and an untreated control. The purpose of the trial was to determine the effect of the products on yield and quality of the crop.

1. Control
2. Epin-Extra
3. Vitazyme (0.5 L/ha) at head formation (budding)
4. Vitazyme (1.0 L/ha) at head formation (budding)

Fertilization: ammonium phosphate plus potassium (16-16-16% N-P_2O_5-K_2O) at 2 centners/ha in rows
Vitazyme application: either 0.5 or 1.0 liter/ha with a backpack sprayer at the beginning of head formation (budding), applied in 250 liters/ha of water on June 15, 2011
Epin-Extra application: applied at 0.004 liter/ton of seed in 10 liters of water, as well as 0.04 liter/ha on the plants at 2 to 3 true leaves, in 250 liters/ha of water with a backpack sprayer, on May 24, 2011
Plant growth results: At the beginning of ripening the height and leaf area of each plot were measured using AAC-100 methods.

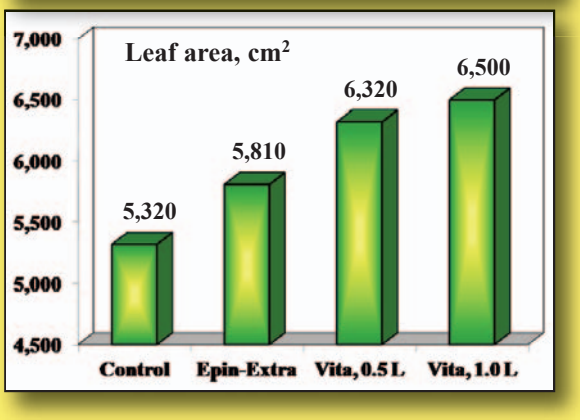
Plant Height



$HCP_{0.05}$=3.25 No Significant differences.

There was little effect of Vitazyme or Epin-Extra on plant height.

Leaf Area



$HCP_{0.05}$=70.3 Significant differences.

Both Vitazyme treatments substantially increased leaf area, leading to greater photosynthesis and yield potential. Epin-Extra increased leaf area nominally.

Increase in leaf area with Vitazyme

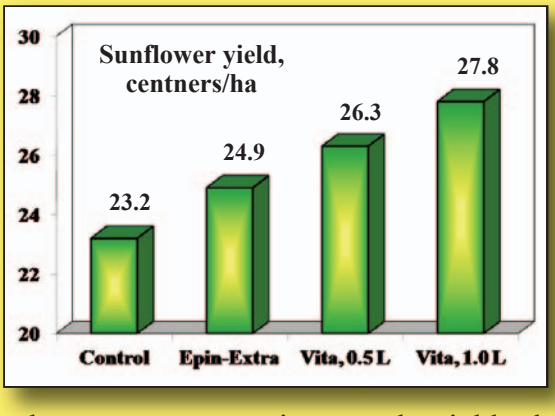
0.5 liter/ha ..... +19%
1.0 liter/ha ..... +22%

Yield results: Harvest was completed on September 23, 2011, using a Xere-125 combine. Yield as well as seed characteristics were evaluated.

Treatment	Yield	Yield change
	centners/ha	centners/ha
1. Control	23.2	—
2. Epin-Extra	24.9	1.7 (+7%)
3. Vitazyme, 0.5 L/ha	26.3	3.1 (+13%)
4. Vitazyme, 1.0 L/ha	27.8	4.6 (+20%)
$HCP_{0.05}$	1.14	

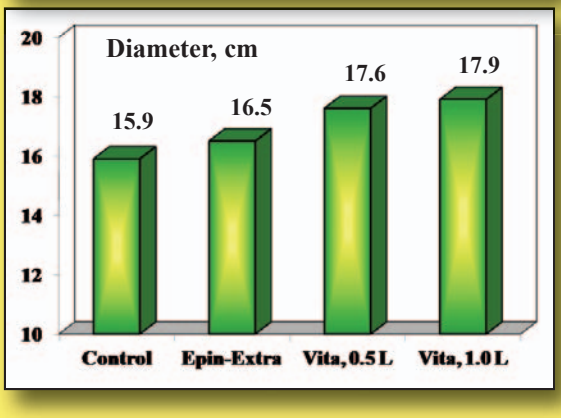
Increase in yield with Vitazyme

0.5 liter/ha ..... +13%
1.0 liter/ha ..... +20%



All three treatments increased yield, but Vitazyme at both rates produced a much bigger increase than did Epin-Exta.

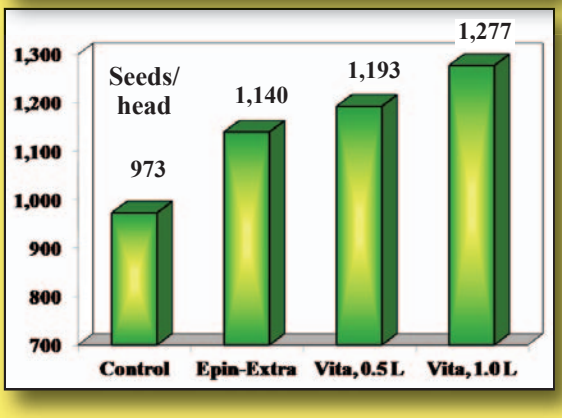
Head Diameter



$HCP_{0.05}$=0.45

All treatments increased head diameter, especially the Vitazyme treatments.

Seeds Per Head



$HCP_{0.05}$=28.5

Seeds per head were markedly increased by all three treatments, but most by Vitazyme.

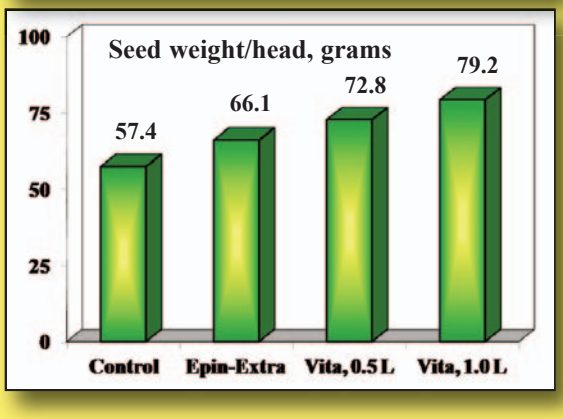
Increase in head diameter with Vitazyme

0.5 liter/ha ..... +11%
1.0 liter/ha ..... +13%

Increase in seeds/head with Vitazyme

0.5 liter/ha ..... +23%
1.0 liter/ha ..... +31%

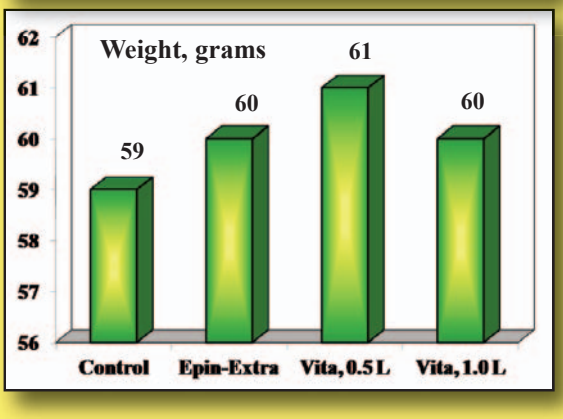
Seed Weight Per Head



$HCP_{0.05}$=3.75

All three treatments increased per head seed weight significantly.

Weight of 1,000 Seeds



$HCP_{0.05}$=0.94

The three treatments all increased the 1,000 seed weight significantly.

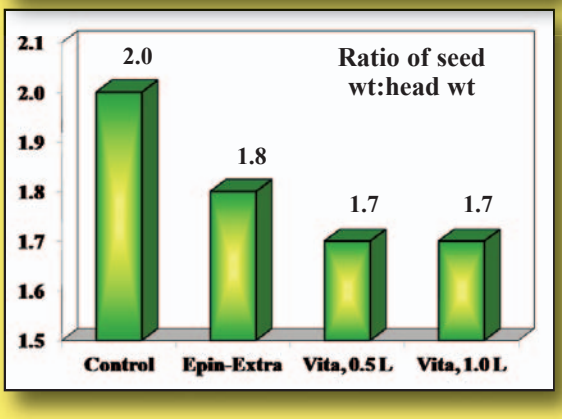
Increase in seed weight with Vitazyme

0.5 liter/ha ..... +27%
1.0 liter/ha ..... +38%

Increase in 1000 seed weight with Vitazyme

0.5 liter/ha ..... +2 grams
1.0 liter/ha ..... +1 gram

Seed Weight Per Head Weight



$HCP_{0.05}$=0.20

Clearly the three treatments produced more seeds per head, so the seed weight to head weight ratios were reduced, especially for the two Vitazyme treatments.

Conclusion: This replicated sunflower study in Russia showed that Vitazyme applied at head formation, using either 0.5 or 1.0 liter/ha, greatly improved leaf area (19 to 22%), as well as final yield (13 to 20%), and harvest characteristics such as head diameter, seeds per head, seed weight per head, 1,000 seed weight, and seed weight per head weight. The 1.0 liter/ha rate was superior to the 0.5 liter/ha rate in most cases. Epin-Extra, a commonly used seed treatment in Russia, produced modest improvements in growth and yield, but they were far inferior to Vitazyme responses. Vitazyme is shown to be an excellent management tool for increasing sunflower yields and growth in Russia.

Increase in seed:head weight ratio with Vitazyme

0.5 liter/ha ..... -27%
1.0 liter/ha ..... -38%

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2011 Crop Results

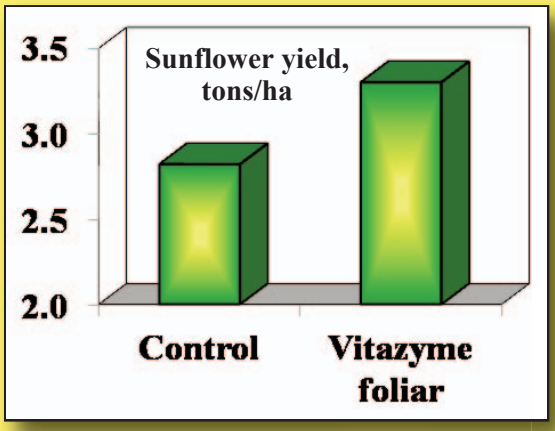
Vitazyme on Sunflowers

Researcher: Unknown *Research organization*: National Academy of Agrarian Sciences, Vinnytsia State Agricultural Research Station *Location*: Vinnytsia, Ukraine (Central Forest and Steppe Region)
Variety: MAS-91A *Planting date*: unknown
Soil type: gray podzolic (organic matter = 2.2%, hydrolyzed N = 8.4 mg/100 g soil, P = 15.8 mg/100g soil, exchangeable K = 12.4 mg/100 g soil, pH = 5.5)
Experimental design: Sunflower plots were prepared and treated with Vitazyme to evaluate the effect of the product on sunflower seed yield and profitability.

1. Control **2. Vitazyme on leaves**

Vitazyme applications: 1 liter/ha on the leaves at head formation on June 16, 2011
Yield results:

Treatment	Yield	Yield change
	tons/ha	tons/ha
Control	2.82	—
Vitazyme foliar	3.30	0.48 (+17%)



Yield increase with a Vitazyme foliar treatment: 17%

Income results: Income increase with a Vitazyme treatment: +1,376 hrn/ha
Conclusion: This replicated sunflower trial in Vinnytsia, Ukraine, in 2011 revealed that Vitazyme improved yield by 17%, while income increased by 1,376 hrn/ha. These results mirror the sunflower data from previous years, and show how effective this program is for Ukrainian agriculture.

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2009 Crop Results

Vitazyme on Sunflowers

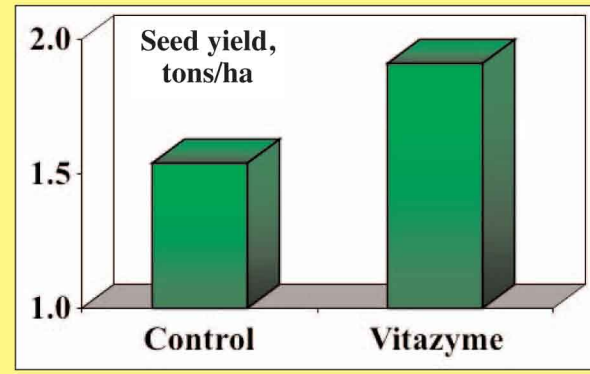
Researcher: O.V. Kornijchuk, V.V. Plotnikov, and agronomic scientists
Organization: Vinnytsia State Agricultural Experiment Station, Ukraine Academy of Agrarian Sciences, Vinnytsia, Ukraine *Location*: Ukraine central forest-steppe area near Vinnytsia
Seeding rate: 5 kg/ha *Planting date*: May 22, 2009 *Variety*: Gelio 06 AK0324
Tillage: plowing, harrowing, and cultivation *Previous crop*: winter wheat
Soil type: gray forest steppe soil; in the 0-30 cm layer, 2.2% organic matter, 8.4 mg/100 g of soil "hydrolyzed nitrogen", 15.8 mg/100g of soil phosphorous, 12.4 mg/100 g of soil exchangeable potassium, and pH=5.5.
Experimental design: A uniform field was divided into plots of 1.0 ha each with two treatments and four replications. The objective of the study was to evaluate the effect of Vitazyme as either a seed application, or a seed plus foliar application on the yield of sunflowers.

1. Control **2. Vitazyme, once foliar**

Fertilization: 45 kg/ha N
Vitazyme application: Treatment 2 received 1.0 liter applied to the leaves and soil on June 25, 2009, at "basket" formation.
Yield results:

Treatment	Seed yield	Yield change
	tons/ha	tons/ha
Control	1.54	—
Vitazyme	1.91	0.37 (+24%)

Increase in seed yield with Vitazyme: 24%



Income results:

Income increase with Vitazyme: 632 hrn/ha

Conclusions: Sunflowers raised with Vitazyme (foliar at 1 liter/ha) in Ukraine produced 24% more seeds, and 632 hrn/ha more income compared to the control treatment. This product has proven itself to greatly improve sunflower production and profits in Ukraine.