



Sunflowers *a Nitrogen Rate Study*

Researcher: Kernel personnel

Research organization: Kernel Company, Ukraine [Kernel is the largest producer of sunflower oil in Ukraine, and exports oils and grains worldwide, and provides storage for grains and seeds.]

Location of trial: Uman District, Cherkasy Region, Chorna Kamiianka Village, Ukraine

Variety: SiExperto **Planting date:** unknown

Planting rate: unknown **Previous crop:** unknown

Experimental design: A sunflower field in 2023 was divided into several treatments to evaluate the effect of Vitazyme on the application of four different nitrogen fertilizer rates with sunflowers. Sunflower yield was evaluated for each treatment.

Fertilization: nitrogen applied at the rates given in the table to right.

Vitazyme application: Vitazyme applied at 1 liter/ha sprayed on the leaves and soil at the 10-leaf stage (BBCH 30) on June 23, 2023.

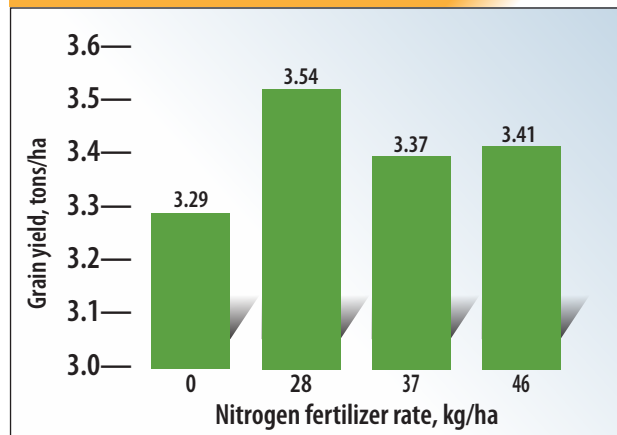
Treatment	Fertilizer rate kg of N/ha	Vitazyme liter/ha
1	0	1
2	28	1
3	37	0
4	37	1
5	46	1

Yield results:

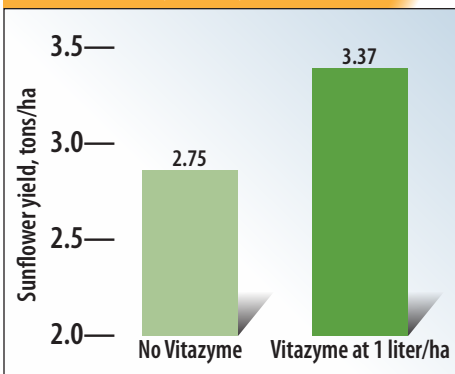
Treatment	Grain yield tons/ha	Yield change* tons/ha
1. No N + Vitazyme	3.29	—
2. 28 kg/ha N + Vitazyme	3.54	+0.25 (+8%)
3. 37 kg/ha N	2.75	-0.54 (-16%)
4. 37 kg/ha N + Vitazyme	3.37	+0.08 (+2%)
5. 46 kg/ha N + Vitazyme	3.41	+0.12 (+4%)

*Yield of Treatments 2, 3, 4, and 5 compared to the no-nitrogen Treatment.

Sunflower Yield As Affected by N-Rate and Vitazyme



Sunflower Yield at 37 kg/ha of N As Affected by Vitazyme



Yield increase with Vitazyme at the same N level: 0.62 ton/ha (+23%)

Conclusions: This sunflower field trial in the Cherkasy Region of Ukraine, using four different nitrogen fertilizer rates, with Vitazyme applied at 1 liter/ha at the 10-leaf stage to all but one treatment, revealed that the product in every case increased sunflower seed yield considerably. Without Vitazyme, even with 37 kg/ha of N applied, the yield was only 2.75 tons/ha, whereas all of the Vitazyme treatments greatly exceeded this no-Vitazyme but fertilized treatment by up to 0.79 ton/ha (Treatment 2 versus Treatment 3). The yields of the higher N rates, of 37 and 46 kg/ha of N, did not exceed the yield of the lower N rate of 28 kg/ha for some unknown reason, but all of the Vitazyme treatment yields were similar — including the unfertilized Treatment 1 — varying by only 0.25 tons/ha. These results show the great effectiveness of Vitazyme treatment in enhancing sunflower yield in Ukraine, even in the absence of N fertilizer.



Sunflowers with Vitazyme application

Researcher: Dumitru Manole, Ph.D. **Research organization:** S.C. Sport Agra, Ltd., Romania

Trial location: Amzacea Village, Constanta County, Romania **Variety:** Corteva P64LE25

Planting date: March 25, 2022 **Planting rate:** 6.5 seeds/m² (65,000 seeds/ha) **Previous crop:** corn

Field preparation: disking to 15-20 cm the fall of 2021; harrowing the spring of 2022

Experimental design: A sunflower field of 49.45 ha was used to apply two treatments: Vitazyme and Dr. Green Energy to plots totaling 1.44 ha. The purpose of the trial was to determine the effect of these two materials on the yield of sunflower seeds.

① Vitazyme ② Dr. Green Energy + Dr. Green Rape

Fertilization: At planting time (March 25), 250 kg/ha of 18-46-0% N-P₂O₅-K₂O; after emergence (April 25), 150 kg/ha of 34.5-0-0 N-P₂O₅-K₂O.

Weed control: herbicides

Vitazyme application: 1.3 liters/ha sprayed on the leaves and soil on May 5

Dr. Green Energy + Dr. Green Rape application: Dr. Green Energy (100 g N; 400 g K₂O) and Dr. Green Rape (245 g SO₃, 5g MgO, 100 g B, 2 g Cu, 25 g Fe, 50 g Mn, 0.5 g Mo, 20 g Zn) were applied to a plot on May 5 at 1 kg/ha and 2 kg/ha, respectively.

Fungicide application: On April 27, Pictor fungicide, comprised of 200 g/liter Boscalid and 200 g/liter Dimoxystrobin, was sprayed at 0.5 liter/ha over the sunflowers.

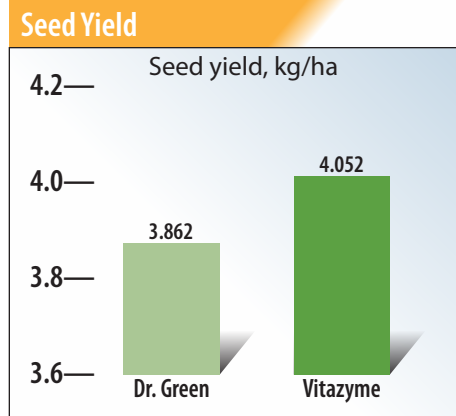
Date of emergence: April 8 to 10

Harvest date: August 15, 2022

Yield results:

Treatment	Seed yield kg/ha	Yield change kg/ha
1. Vitazyme foliar	4.052	—
2. Dr. Green Energy + Dr. Green Rape	3.862	0.190 (+5%)

*Increase in seed yield
with Vitazyme: 5%*



Conclusions: This sunflower trial in Romania, which compared Vitazyme biostimulant with a mineral fertilizer, was not a strict comparison of similar products; it was a comparison of a biostimulant with a mineral fertilizer. Even so, Vitazyme outperformed the Dr. Green Energy + Dr. Green Rape by 0.190 kg/ha, a 5% yield increase. This result shows that Vitazyme improves the uptake of available soil nutrients which the mineral application did not equal.

Sunflowers with Organic Vitazyme application

Researchers: Bence Kiraly, Natalia Simon, and Jenó Simon

Research organization: Syntech Research Group, 6636 Martely, hrsz.; 013818, Hungary; Vital Earth Resources, Inc., Gladewater, Texas, USA

Location: Hodmezovasarhely-Erzsebet, Csongrad-Csanad, Hungary

Variety: Duet CL (*Helianthus annuus*) **Planting date:** May 4, 2022 **Row spacing:** 75 cm

In-row spacing: 21.8 cm **Plant depth:** 5 cm **Planting rate:** 61,000 seeds/ha

Soil traits: clay loam chernozem; good fertility **Tillage:** conventional

Experimental design: A small-plot with sunflowers was established, with plots that were 3 x 10 meters (30 m²), using six replications. Four treatments were applied in a randomized complete block design to determine the effect of Organic Vitazyme and Terra-Sorb Foliar on the yield and other parameters of sunflowers.

Treatment	Rate	Stage of growth	Date of treatment
1. Control	0	—	—
2. Terra-aSorb Foliar	1 liter/ 100 kg seed	Seed treatment	May 4
3. Organic Vitazyme	1 liter/ha	Seed treatment	May 4
4. Organic Vitazyme	2 liters/ha	Seed treatment	May 4

Fertilization: unknown

Organic Vitazyme application: See the treatments above. Organic Vitazyme was applied as concentrated product on the seeds to achieve the desired 1 or 2 liter/ha rates.

Terra-Sorb Foliar application: Terra-Sorb Foliar is a formulation of mostly free amino acids that, when sprayed on leaves, will increase chlorophyll and photosynthesis, improve fruit set, and promote plant recovery during times of stress. It was applied at 1 liter/100 kg of seed.

Herbicide applications: Wing-P at 3.5 liters/ha on May 6; Pulsar 40 SL at 1.2 liters/ha on May 24; Mospilan 20 SG at 0.15 kg/ha on June 19.

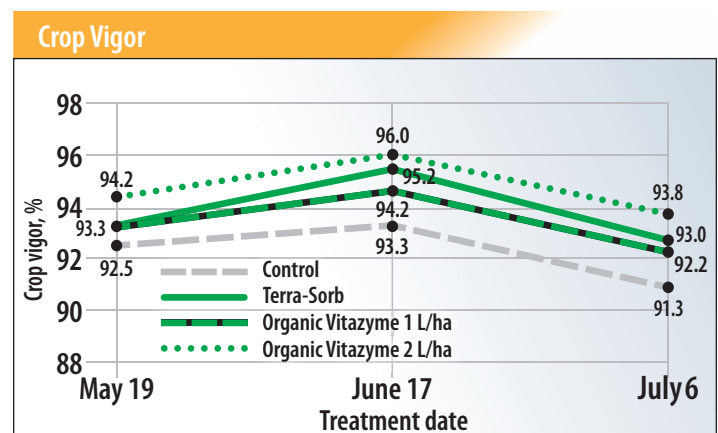
Growing season weather: normal

Phytotoxicity results: Neither Organic Vitazyme nor Terra-Sorb were phytotoxic to the sunflower plants.

Crop vigor results:

Treatment	Rate	Assessment date*		
		May 19	June 17	July 6
	L/ha	%	%	%
1. Control	0	92.5 a	93.3 b	91.3 a
2. Terra-Sorb	1	93.3 a	95.2 ab	93.0 a
3. Organic Vita	1	93.3 a	94.2 ab	92.2 a
4. Organic Vita	2	94.2 a	96.0 a	93.8 a
LSD (P=0.10)		2.1	1.8	4.1
CV		2.26	1.88	4.37
Treatment F		0.6098	0.0945	0.7380

*Crop vigor assessment by the Student-Newman-Keuls method; means followed by the same letter are not significantly different at P=0.10.



While crop vigor on both May 19 and July 6 did not vary significantly among the three treatments, Organic Vitazyme at 2 liters/ha was significantly more vigorous than the other two treatments, and all treatments exceeded the control for all three dates.

Crop emergence results: There were no significant differences in crop emergence for all four treatments, although all three treatments slightly exceeded the control.

Crop height results:

Treatment	Rate	Assessment date*	
		May 19	July 6
	L/ha	cm	cm
1. Control	0	6.7 b	109.1 a
2. Terra-Sorb	1	6.9 ab	111.7 a
3. Organic Vita	1	6.8 ab	109.6 a
4. Organic Vita	2	7.0 a	112.1 a
LSD (P=0.10)		0.2	4.2
CV		3.19	3.77
Treatment F		0.1349	0.5281

*Crop height assessment by the Student-Newman-Keuls method; means followed by the same letter are not significantly different at P=0.10.

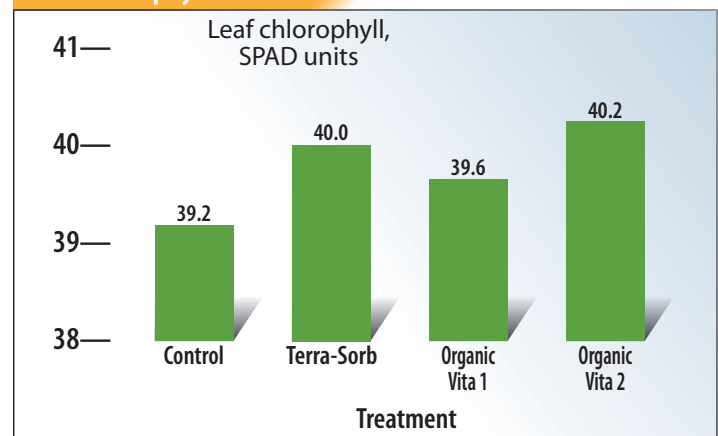
Organic Vitazyme at 2 liters/ha on the seeds significantly increased plant height shortly after emergence. However, the treatments did not differ significantly once the plants grew larger.

Chlorophyll results: The leaves were measured on 20 plants/plot on June 17.

Treatment	Rate	Leaf chlorophyll*
	L/ha	SPAD units
1. Control	0	39.2 c
2. Terra-Sorb	1	40.0 ab
3. Organic Vita	1	39.6 bc
4. Organic Vita	2	40.2 a
LSD (P=0.10)		0.5
CV		1.29
Treatment F		0.0166

*; Means followed by the same letter are not significantly different at P=0.10 according to the Student-Newman-Keuls Test.

Leaf Chlorophyll



All treatments significantly exceeded the control, but Organic Vitazyme at 2 liters/ha gave the greatest leaf chlorophyll increase, at 1.0 SPAD unit greater than the control.

Heat diameter results: There was a slight increase in head diameter with all of the treatments, which was 0.9 cm for Organic Vitazyme at 2 liters/ha. This represented an 8% increase (12.0 cm vs. 11.1).

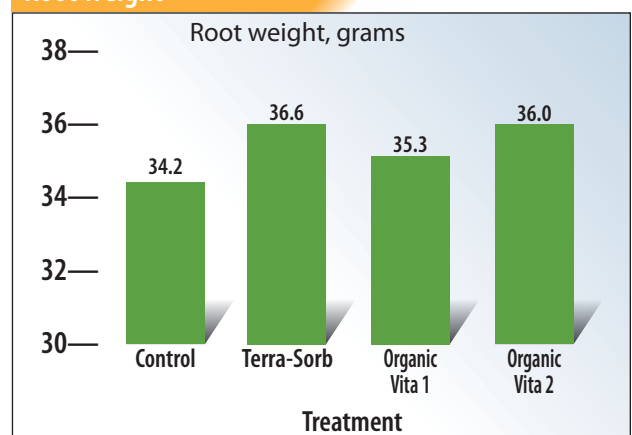
Seed yield results: The plants were harvested on September 13. All yield values were not significantly greater than the control.

Root weight results: There were no significant differences in root weight among the four treatments, although the three treatments gave heavier weights than the control. Sampling was made on 20 representative roots per plot, on September 13.

Oil content results: No significant differences were detected among the treatments.

1,000-grain weight results: There were no significant differences in 1,000-grain weight for the four treatments. However, the three treatments produced seeds that were slightly heavier than the control.

Root weight



Conclusion: This sunflower small-plot experiment in Hungry, comparing Organic Vitazyme at 1 and 2 liters/ha on the seeds and Terra-Sorb Foliar on the seeds, revealed that all three treatments produced small improvements in most-parameters measured, including crop vigor, crop emergence, crop height, leaf chlorophyll content, head diameter, seed yield, root weight, oil content, and 1,000-grain weight. In a few cases these increases were significant, especially for Organic Vitazyme at 2 liters/ha for crop vigor, crop height, and leaf chlorophyll. This treatment produced the best overall results in this study, followed by Terra-Sorb and Organic Vitazyme at 1 liter/ha.



Researchers: Vadim V. Plotnikov

Research organization: Agro Expert International, Kaharlyk, Ukraine, and Plant Designs International, Rochester, New York

Location: LLC "Sunvit," Berezivsky District, Odessa Region, Viktorivka Village, Ukraine; southern Ukraine (270-350 mm of rain per year)

Variety: LG5542KL

Planting date: May 2, 2021

Planting rate: 50,000 seeds/ha

Previous crop: winter wheat

Tillage: disking to 6-8 cm, plowing to 22-24 cm, harrowing, cultivation in two tracks to 5-6 cm

Soil type: podzolized chernozem (3.5% organic matter)

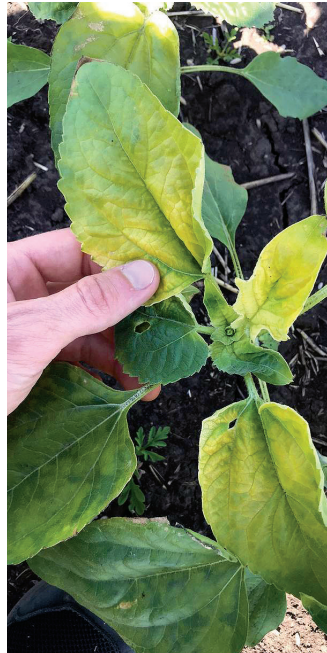
Experimental design: A sunflower field with serious herbicide stress was treated on 31 hectares with Vitazyme Bio to attempt to relieve the stress. One hectare was left untreated to serve as a control. The effects of the product on plant recovery and yield was measured to evaluate the effect of Vitazyme Bio on yield as affected by herbicide stress reduction.

1 Control 2 Vitazyme Bio

Fertilization: 6-12-12-4 kg/ha of N-P₂O₅-K₂O-S in-furrow at planting

Vitazyme Bio application: 1 liter/ha sprayed on the leaves of 31 hectares on June 8, at BBCH 18 (8-leaf stage)

Herbicide application: The sprayer was contaminated with a herbicide containing



Note the serious necrosis of the leaves of a sunflower plant mistakenly sprayed with a toxic herbicide.



The superior top growth of the Vitazyme Bio treated plants is reflected by a much greater root mass, that complements this increased leaf mass. The yield with the product was 28% greater than with the untreated plants.



These sunflowers have recovered by some weeks after Vitazyme Bio application to the right side of this photo. Note the superior growth compared to the untreated side.

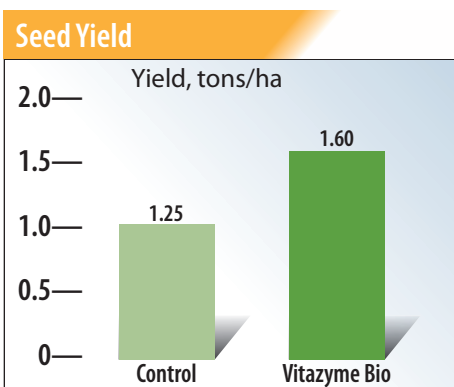
Prosulfuron and MCPA, which had been used to spray weeds in flax. The sprayer was then filled with Eurolightning herbicide (a.i. Imazamox at 33 g/liter and Imazapyr at 15 g/liter), and the field was sprayed on May 30 at 1 liter/ha. The crop was at BBCH 14 (four leaves). Strong herbicide damage ensued, causing much leaf necrosis, but the growing point was still alive on June 6.

These sunflowers have recovered by some weeks after Vitazyme Bio application to the right side of this photo. Note the superior growth compared to the untreated side.

Yield results:

Treatment	Yield tons/ha	Yield change tons/ha
1. Control	1.25	—
2. Vitazyme Bio	1.60	0.35 (+28%)

*Yield increase
with Vitazyme Bio: 28%*



Growth results: Height measurements of the plants for both treatments were made late in the growth cycle, and gave the following results:

Vitazyme Bio plant height 1.2 m
Untreated plant height variable, from 0.4 to 0.8 m or less

Income results: As a result of Vitazyme Bio application to the severely herbicide stressed sunflowers, the yield increase of 0.35 ton/ha (+28%) from Vitazyme Bio gave an income increase of \$104/ha.

Conclusions: A sunflower field of 32 hectares was sprayed in error with a herbicide that was contaminated with another herbicide that had been used on a flax field, and which was toxic to the sunflowers. Considerable leaf necrosis was noted within a week, and the farmer then sprayed 1 liter/ha of Vitazyme Bio over all but one hectare to attempt to relieve plant stress and recover the crop. The result was a fine recovery of the crop, and an increase in yield of 0.35 ton/ha (28%) from Vitazyme Bio, giving an income increase of \$104/ha. These results indicate that the stress reduction properties of the brassinosteroids in Vitazyme Bio are highly effective in recovering herbicide damaged sunflower crops in Ukraine.



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, Strointsy 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.

① Control ② Vitazyme Bio

Fertilization: 34 kg/ha of N during pre-plant tillage, and 2-24-24 kg/ha of N-P₂O₅-K₂O at planting

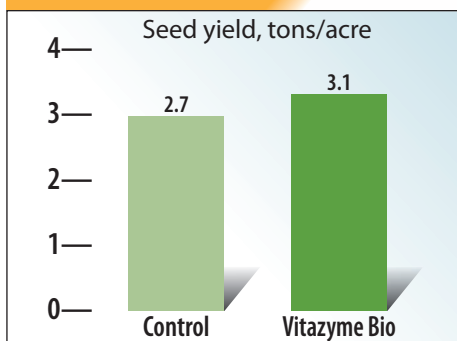
Vitazyme application: 1 liter/ha sprayed on the leaves and soil on June 5, 2021, at the 6-leaf stage. Vitazyme Bio is the same as Organic Vitazyme marketed in different parts of the world.

Yield results:

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

Increase in seed yield with Vitazyme: 15%

Sunflower 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.

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.



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.



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 Cherkasy 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-P₂O₅-K₂O per ha at planting

Vitazyme application: 1.0 liter/ha sprayed at the 6-leaf stage on May 24, 2020.

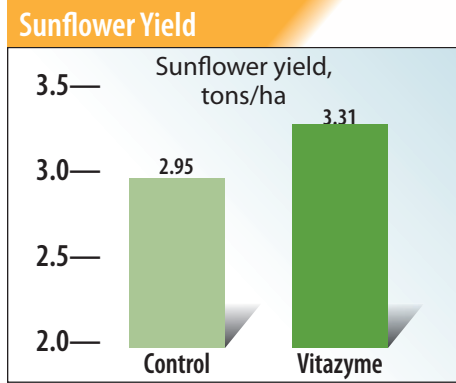
Herbicide application: In 2019, a herbicide with the active compound amidosul Furon 250 had been applied to winter wheat, and the carryover effect seriously affected the sunflower crop. To ameliorate this stress, Vitazyme was applied on May 24 at 1 liter/ha.

Yield results:

Treatment	Yield tons/ha	Yield change 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 substantially improved and very profitably.

Supple heads that are well-filled are the hallmark of Vitazyme use with Sunflowers, 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.

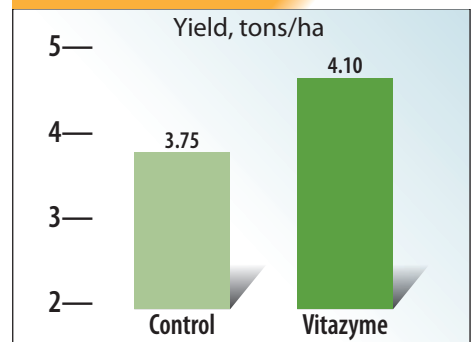
① Control ② Vitazyme

Fertilization: 46 kg/ha of N cultivated in before planting; 4-10-20 kg/ha of N-P₂O₅-K₂O 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 tons/ha	Yield change 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-P₂O₅-K₂O applied during plowing; 12-52-0 kg/ha of N-P₂O₅-K₂O applied during planting

Vitazyme application: 1.0 liter/ha sprayed on the leaves and soil at the eight-leaf stage on May 15.

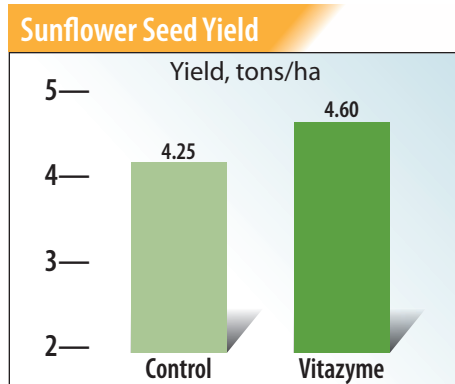


Enhanced overall plant metabolism producing larger stalks, larger leaves and heads, and greater photosynthetic capacity from Vitazyme application has produced the plants shown in this trial.

Yield results:

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

Increase in sunflower yield with Vitazyme: 19%

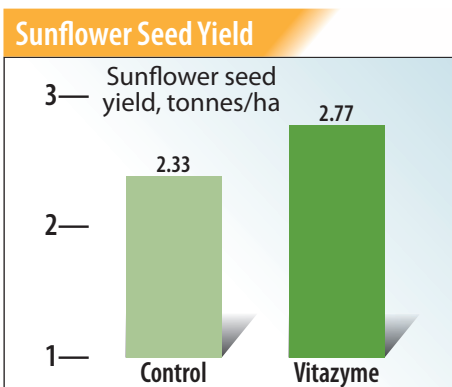
Income results: The extra yield of 0.44 tonne/ha resulted in \$150/ha more income.



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-P₂O₅-K₂O 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

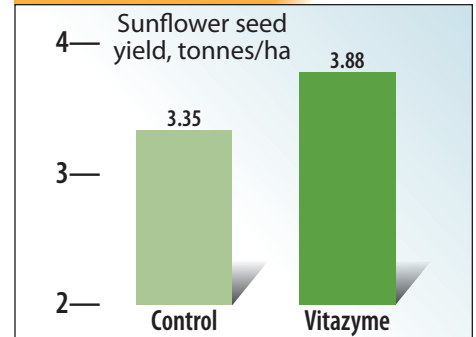
Yield results: (See bar graph to the right)

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 tonnes/ha	Yield change 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: May 11, 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.

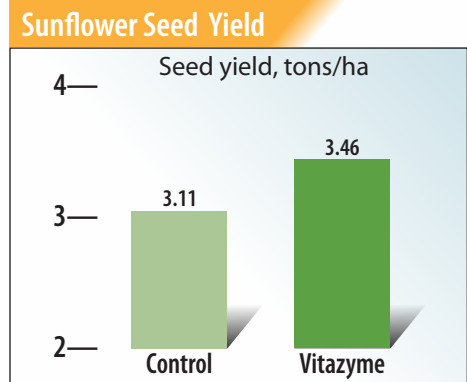
① Control ② Vitazyme

Fertilization: 20-20-12 kg/ha N-P₂O₅-K₂O 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 tons/ha	Yield change 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.



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.

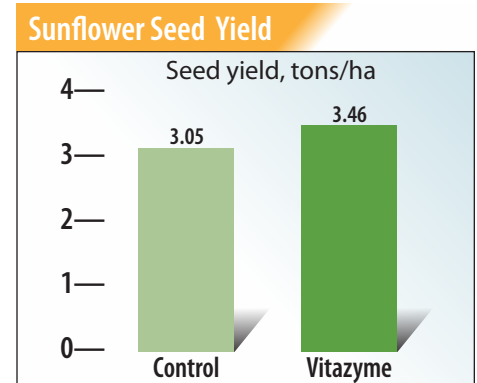
Researcher: Vadim Plotnikov
Research organization: State Enterprise "Drabivske", Plant Designs, New York, USA, and Agro Expert International, Ukraine
Location: Drabiv District, Cherkasy Region, Drabovo-Baryatinske Village, Ukraine
Variety: NK Neoma
Seeding rate: 50,000 seeds/ha
Planting date: April 26, 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.

Fertilization: 120 kg/ha of nitrogen broadcast before planting, and 10-26-26 kg/ha of N-P₂O₅-K₂O in-furrow starter at planting
Vitazyme application: 0.5 liter/ha sprayed on the leaves and soil at the 8 to 10-leaf stage on June 10, 2017
Growing season weather: dry
Yield results:

Treatment	Seed yield tons/ha	Yield change 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.



1 Control 2 Vitazyme

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, Myroniv'skyi 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-P₂O₅-K₂O in-row
Vitazyme application: 1.0 liter/ha on the leaves and soil at the 8-leaf stage, on June 17, 2016

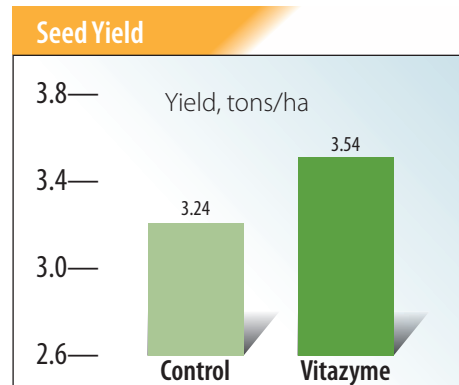
Yield results:

Treatment	Seed yield tons/ha	Yield change 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.

Sunflowers *A Summary of Three Field Trials in Ukraine*



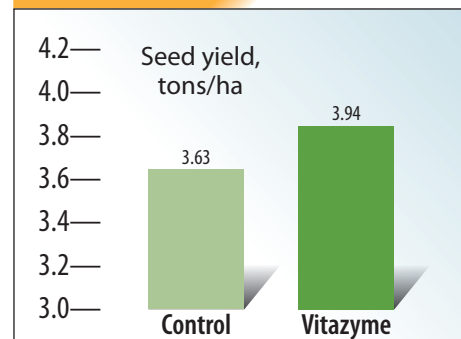
Sunflower response to Vitazyme has been uniformly excellent over the many years it has been trialed in several countries, including Ukraine where this trial took place.

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 Kaharlytskyi 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 P₂O₅, 15 kg/ha K₂O 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)

Seed Yield trial #1

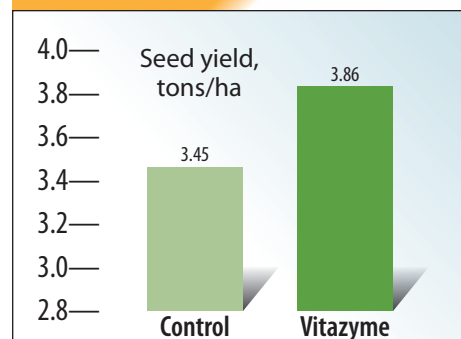


Yield increase with Vitazyme: 0.31 tons/ha(+9%)
Profit increase with Vitazyme: 2,114 UAH/ha

2. Conducted by JLLC "Palmira Vidhodyvlya" 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 P₂O₅, 15 kg/ha K₂O 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)

Seed Yield trial #2



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 CMTС "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

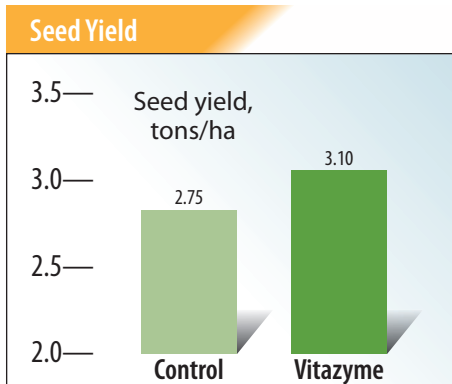
Previous crop: winter wheat

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 P₂O₅, 16 kg/ha K₂O 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

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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

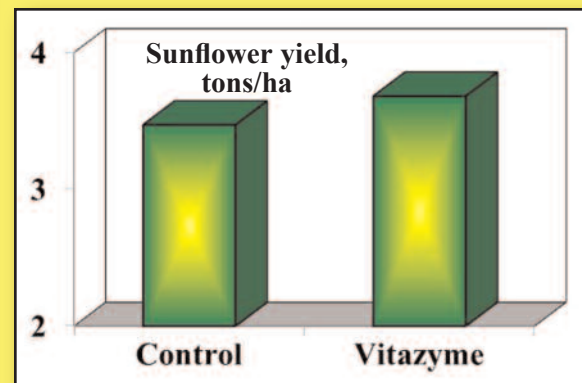
Fertilization: 50 kg/ha of nitrogen broadcast and incorporated before planting, and 10-26-26 kg/ha of N-P₂O₅-K₂O in-furrow at planting.

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

Yield results:

Treatment	Yield tons/ha	Yield change 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

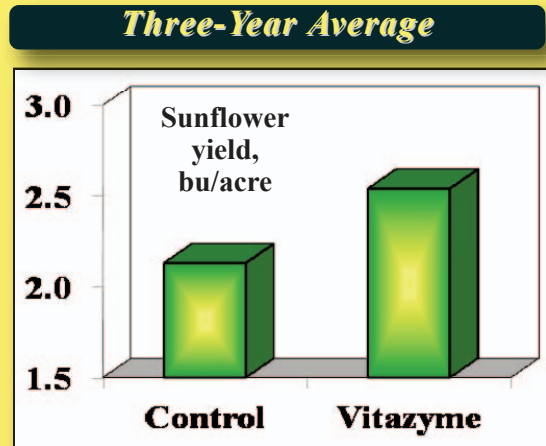
Location: National Academy of Agrarian Sciences, Vinnytsia State Agricultural Research Station, Vinnytsia, Ukraine (Central Forest and Steppe Region)

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

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

¹1 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 m², 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

3. Vitazyme (0.5 L/ha) at head formation (budding)

2. Epin-Extra

4. Vitazyme (1.0 L/ha) at head formation (budding)

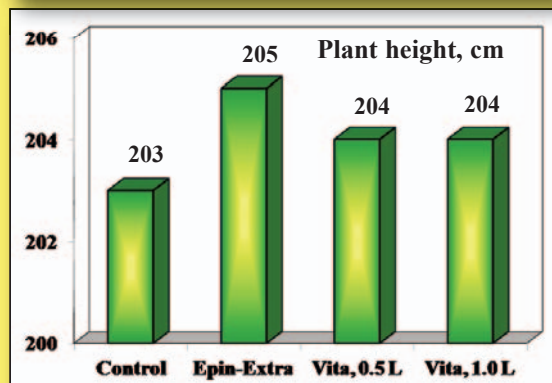
Fertilization: ammonium phosphate plus potassium (16-16-16% N-P₂O₅-K₂O) at 2 centners/ha in rows

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.

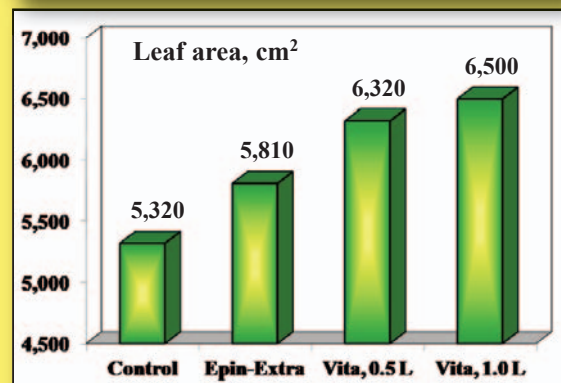
Plant Height



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.

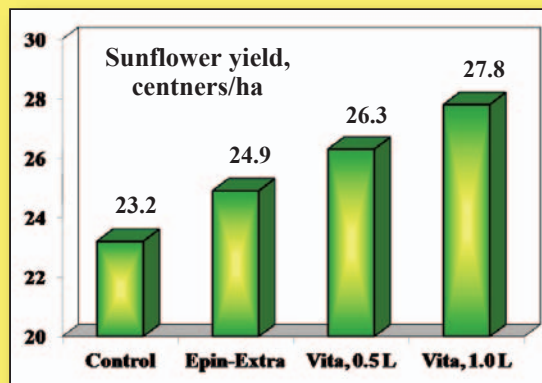
Both Vitazyme treatments substantially increased leaf area, leading to greater photosynthesis and yield potential. Epin-Extra increased leaf area nominally.

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 centners/ha	Yield change 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	

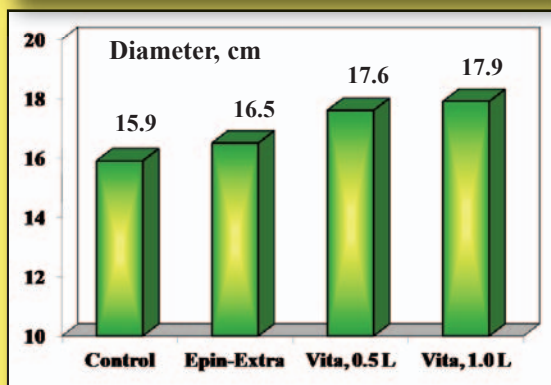


All three treatments increased yield, but Vitazyme at both rates produced a much bigger increase than did Epin-Extra.

Increase in yield with Vitazyme

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

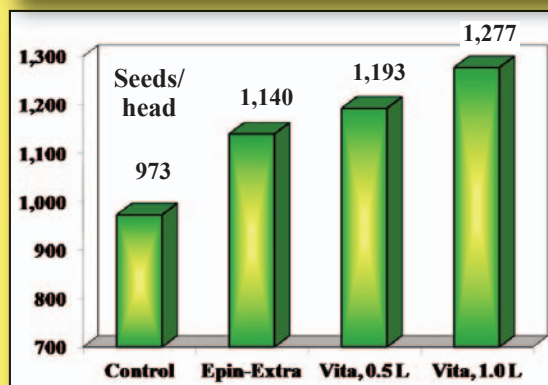
Head Diameter



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.

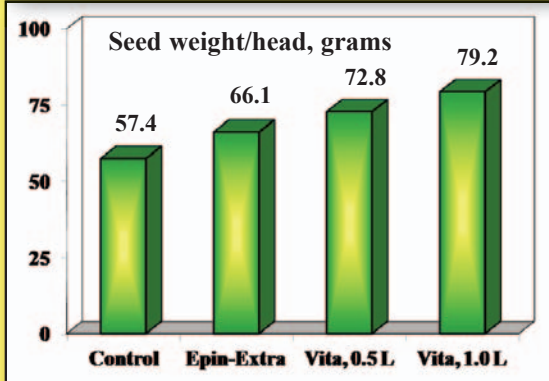
Increase in head diameter with Vitazyme

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%

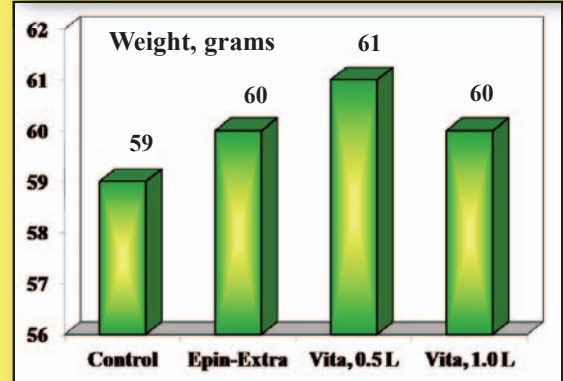
Seed Weight Per Head



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.

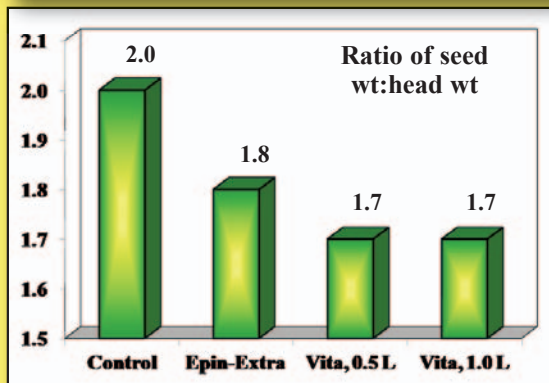
Increase in seed weight with Vitazyme

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.

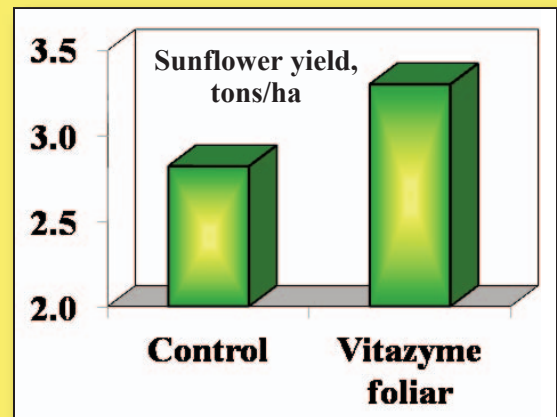
1. Control

2. Vitazyme on leaves

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

Yield results:

Treatment	Yield tons/ha	Yield change 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

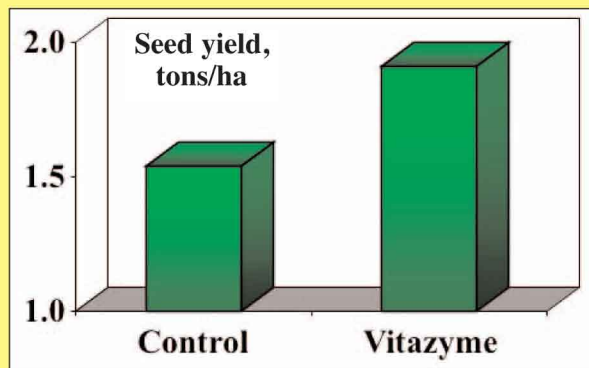
Fertilization: 45 kg/ha N

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 tons/ha	Yield change 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.