



# Vitazyme Studies Showing Improved Fertilizer Efficiency — 1995-2020

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# Vitazyme Studies Showing Improved Fertilizer Efficiency — 1995-2020

## Barley

**2012. V. V. Plotnikov, National Academy of Agricultural Sciences, Vinnytsia, Ukraine, cv. winter barley.**

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

**2013. V.V. Plotnikov Research, Scientific, Innovation, and Technology Center of the Institute of Forages and Agriculture of Podillya NAAS, National Academy of Agricultural Sciences, Ukraine, cv. winter barley.**

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

2. At middle and high nutrition backgrounds of spring barley plants (N30-60P20-40K30-60) and Vitazyme application, the grain yield increase was 0.91-0.96 tonne/ha, or 24-27%.

3. Vitazyme use when growing spring barley on the plot without fertilizers provided a profit of 1052 UAH/ha; with (N30-60P20-40K30-60) the profit was 1307-1392 UAH/ha, respectively.

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

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

## Bermudagrass

**2012. James Rogers, Ph.D., The Noble Foundation, Headquarters Units I and III Farms, and Pasture Demonstration Farm, Ardmore, Oklahoma, cv. common bermudagrass.**

**Conclusions:** In this replicated three-year study in Oklahoma of the effect of Vitazyme on the yield and nutritional value of bermudagrass, at three locations, no significant increases in these parameters occurred with Vitazyme at any of the three nitrogen levels. However, Vitazyme boosted the yield by 8% at the 50 lb/acre N rate, and by 14% at the 100 lb/acre N rate. The product also appeared to improve calcium and potassium levels of the forage at these two nitrogen rates, but the other elements and nutritional parameters were not affected. Vitazyme holds promise as a potential enhancer of bermudagrass yield and quality in dryland range settings in Oklahoma.

## Corn

**1995. Bert Schou, Ph.D., Agricultural Custom Research and Education Services (ACRES), Cedar Falls, Iowa, cv. Kruger 9506.**

**Conclusion:** In a replicated small plot study, both the high (120 lb/acre) and low (80 lb/acre) nitrogen rates produced highly significant yield increases with Vitazyme. These increases occurred in spite of periods of very hot and dry weather during the growing season, especially June 15 to 25, July 10 to 14, July 24 to 31, and August 23 to 28. As a result of these weather extremes, the average corn yields for 1995 in eastern Iowa were significantly reduced compared to most years. The increase with Vitazyme for the low nitrogen rate was 10% (7.7

bu/acre), and for the high nitrogen rate it was 11% (8.7 bu/acre).

**1996. Waymand Lipsey, Agri-Research, Burlington Iowa, at Agri-Research Farm, Danville, Iowa, cv. Querna 7670.**

**Conclusions:** Corn grain yield was significantly improved with Vitazyme at both the high nitrogen level (120 lb/acre) and the low nitrogen level (80 lb/acre), by 10.4 and 27.6 bu/acre, respectively. These increases were 7% and 22% above the untreated control nitrogen levels. The lower nitrogen rate is thus shown to be more responsive than the higher rate, a usual observation when the yield is nearing the maximum potential for a particular set of growing conditions.

**1997. Ivan Anderson, Ph.D., Iowa State University, Ames, Iowa, at Boone, Iowa, cv. Pioneer 3489.**

**Conclusions:** At 0 and 50 lb/acre of nitrogen, Vitazyme applied at one leaf and six leaves improved the corn yield by 5% and 2%, respectively, over the same fertilizer nitrogen levels without Vitazyme.

**1999. Charles A. Mullins, Ph.D., and Allen R. Straw, The University of Tennessee Plateau Experiment Station, Crossville, Tennessee, cv. Silver King sweet corn.**

**Conclusions:** Vitazyme caused several favorable effects in this sweet corn study:

Marketable and cull ears:

- The largest yield was produced by a moderate N level (80 lb/acre) plus Vitazyme, which was 1.1 tons/acre (+29%) more than its control.
- At the low N level (40 lb/acre), Vitazyme increased sweet corn yield by 0.4 ton per acre. [These results confirm the normal effect of Vitazyme to increase nitrogen availability to a crop when N is somewhat limiting (as 40 and 80 lb N/acre), while Vitazyme may cause nitrogen excess at high N levels (160 lb/acre), thus limiting the yield response somewhat.]
- Ear weight was greatest with 80 lb N/acre, especially with Vitazyme (9.3 oz/ear). The high N rate gave the smallest ear size.
- The fewest cull ears were produced at the 80 lb/acre rate, both with and without Vitazyme.

Growth parameters:

- The tallest plants were raised with 80 lb N/acre plus Vitazyme.
- The thickest stalks were produced by the 160 lb N/acre rate, with or without Vitazyme.
- The most plants per plot were produced by the 80 lb N/acre rate plus Vitazyme.

This site was very fertile and did not reveal nitrogen and Vitazyme effects as well as would a less fertile site. Nonetheless, Vitazyme produced good responses in the study, especially at 80 lb/acre.

**2001. Dennis Parrett and Richard Preston, Cecilia Farm Service, Inc., Cecelia, Kentucky, cv. Novartis 6367.**

**Conclusions:** In this corn study in Kentucky, Vitazyme proved to be highly beneficial to corn production in terms of yield increase and income increase. Especially noteworthy was the increase in yield of 48% over the control with high nitrogen sidedressed, versus a 35% yield increase for the same nitrogen addition without Vitazyme. This 13.8 bu/acre increase in yield provided an extra \$39.79/acre income, showing its high profitability in farming programs.

**2003. Bert Schou, Ph.D. Agricultural Custom Research and Educational Services (ACRES), Cedar Falls, Iowa, cv. Pioneer 34H31 non-GMO.**

**Conclusions:** In this Iowa study, Vitazyme produced statistically equal yield increases with 80 lb/acre of N compared to 160 lb/acre of N, while both Vitazyme treatments boosted grain yield by 5 to 7% above the untreated control. There was no benefit to applying additional Vitazyme above the standard 13 oz/acre rate. The highest return on investment was for the extra 80 lb/acre of N of Treatment 4, but this return was followed closely by two 13 oz/acre applications of Vitazyme (Treatment 2). In terms of the return on investment ratio, Vitazyme applied at the standard rate did the best (2.6:1).

**2003. Unknown researcher, Department of Agriculture, Ondo State, Nigeria, at Iju/itaogbolu, Akure North Local Government Area, Ondo State, Nigeria., unknown cv.**

**Conclusions:** In this replicated Nigerian corn study Vitazyme has been shown to increase plant growth and yield parameters (grain, ear number, ear length, and ear weight) significantly above the control. Vitazyme also increased yield parameters significantly, especially at the lower fertilizer levels (0 and 100 kg/ha NPK), where the Vitazyme +100 kg/ha NPK yield exceeded the 200 kg/ha NPK yield by 10.0 g/m<sup>2</sup>. At 100 kg/ha NPK, Vitazyme significantly boosted yield by 83.3 g/m<sup>2</sup> above the same fertility level without Vitazyme. In this highly weathered tropical soil of Ondo State of Nigeria, Vitazyme is seen as a powerful motivator of higher yield potential for corn and an improver of nitrogen use efficiency.

**2004. Ron Heiniger, Ph.D. North Carolina State University, Clarkton, North Carolina, cv. DKC69-71 RRH62.**

**Conclusions:** In this North Carolina State University replicated corn study, Vitazyme increased corn grain yields at all N levels except at 56 lb/acre N. The average overall yield was increased by Vitazyme by 9%, which was significant at P=0.05. Resistance to both Northern Corn Leaf Blight and Grey leaf Spot were also significantly (P=0.05) increased over several N levels, and was significantly greater for Vitazyme over all N levels for Grey Leaf Spot, and nearly so for NCLB. This product shows excellent promise in promoting higher yields with greater disease resistance under North Carolina conditions.

**2004. Ron Heiniger, Ph.D., North Carolina State University, Elizabeth City, North Carolina, cv. DKC69-71 RRH62**

**Conclusions:** This corn study in North Carolina revealed that Vitazyme increased grain yield significantly, by an average of 18.7 bu/acre (+15%) over all plots ... and especially at the 0 N level, where yield was improved by 44.5 bu/acre (+82%) above the control. Both Northern Corn Leaf Blight and Grey Leaf Spot were also significantly reduced by Vitazyme at all N levels, the average reduction being 39% for NCLB and 12% for GLS. These data show that Vitazyme apparently improves plant immunity to common corn pathogens, and concurrently boosts the yield potential of the crop, especially when N is limiting. The optimum N application in this study was 112 lb/acre; corn yields increased only slightly with Vitazyme with higher N rates, although without Vitazyme the yields fell somewhat.

**2006. George Nelson, Ph.D., University of Minnesota West Central Research Farm, Morris, Minnesota, cv. DK 47-10Bt/RR.**

**Conclusions:** Vitazyme increased corn grain yields at all but the highest nitrogen level in this west central Minnesota study. Because of high variability among plot yield values, few significant differences emerged. The reason for this variability is likely due to differences in soil moisture variability across the test area during the very hot and dry summer, although it is possible that differences in the pattern of available nitrogen could also have played a part. As a result of the drought conditions, yields were substantially reduced from normal levels in average years. It is apparent that Vitazyme produced yield increases, though not significant at P=0.10, at the 68, 118, and 168 /acre total nitrogen levels. The yield increases dropped as the nitrogen levels increased, reflecting the approach towards maximum yield potential during this drought year. The 218 lb/acre treatment showed a yield reduction with Vitazyme, most likely because Vitazyme increased available nitrogen to levels beyond the optimum portion of the response curve. Soil tests were not conducted during the growing season to confirm or deny this rationale. There were no benefits gained from using Vitazyme Cold Start in this study, likely because the soil was not unduly cold (>50°F) at planting time.

**2007. Curt VanNice, Blue Grass, Iowa, cv. LG Seeds, 2545 VT3.**

**Conclusions:** In this Iowa field corn study, despite excessive wetness early and late in the season, the yields were increased 2.0 to 2.4%, and bushel weights were increased up to 1.5 lb/bushel with Vitazyme, although bushel weights were rather low due to stalk rot and other diseases. Vitazyme may have had a positive effect

on grain drydown rates. Yield effects were consistent, giving about a 5.0 bu/acre increase at all three nitrogen levels. These increases were very profitable: at \$4.00/bushel, then this 5 bu/acre improvement would lead to a gross increase of \$20.00/acre.

**2007. Fred Vaughn and Greg Wilson, Vaughn Agricultural Research Services, Branchton, Ontario, Canada, cv. Pioneer 38P03.**

**Conclusions:** In this southern Ontario, Canada, study of Vitazyme on corn at two nitrogen levels, Vitazyme was shown to significantly increase grain yield, by 16% above the respective control (no Vitazyme) levels. Moreover, the yield of the Vitazyme + 60 kg/ha N rate was statistically equal to the 120 kg/ha N rate without Vitazyme, demonstrating the ability of the product to improve the utilization of nitrogen. Two applications of 1 l/ha, at planting and again at the eight-leaf stage, brought about this yield improvement. The yield increases gave significant income increases: \$74.40/acre at 60 kg/ha nitrogen, and \$90.00/acre at 120 kg/ha nitrogen.

**2010. Bert Schou, Ph.D., Agricultural Custom Research and Education Services (ACRES), Cedar Falls, Iowa, cv. Pioneer 36W66 (non-GMO).**

**Conclusion:** This non-GMO replicated corn trial from eastern Iowa proved that Vitazyme A and Vitazyme B formulations both substantially and statistically increased grain yield, by 15.6 bu/acre (10%) and 13.0 bu/acre (8%), respectively. Both of these treatments, applied at planting and at the V8 stage at 13 oz/acre, also increased the ash level of the grain. The increases were 0.56 and 0.23 percentage points, respectively, great increases in the minerals essential for plant growth. Thus, the growth and health-imparting values of these treatments should be apparent. All other treatments also increased crop yield by 4 to 7%, and grain ash in these treatments was raised by 0.11 to 0.19 percentage point. Of special interest in the fact that a 50% nitrogen application, along with two Vitazyme A applications, improved yield by 10.8 bu/acre over the 100% nitrogen control without Vitazyme. This result shows the nitrogen utilization improvement usually noted with Vitazyme.

**2013. Sara Berg and Ron Gelderman, Ph.D., Department of Agronomy and Soils, South Dakota State University, Brookings, South Dakota, at South Dakota State University Research Farm, Aurora, South Dakota, cv. DeKalb 45-51.**

**Conclusions:** A small plot corn study in east central South Dakota revealed that Vitazyme and fish — Vitazyme applied at planting and at V8, and fish applied at planting, V8, and silking — significantly increased corn yield at all nitrogen fertilizer levels, by up to 8.7% at the 0% N level. The Vitazyme plus fish treatment at 100% N gave the highest yield of all ten treatments (164.2 bu/acre). Vitazyme increased plant population at the three highest nitrogen levels, and fish and fish plus Vitazyme also increased population at 100% N. Grain quality parameters were affected by nitrogen levels to some degree, the contents of protein, copper, iron, manganese, and sulfur increasing and the contents of potassium, zinc, phosphorus, and magnesium decreasing with increasing nitrogen fertilizer. This study reveals the usefulness of Vitazyme and fish, and especially the two combined, to increase corn yields under rainfed conditions in eastern South Dakota.

**2013. Timothy Veldkamp, SGS Ag Research, Aurora, South Dakota, cv. 4055 Roundup Ready.**

**Conclusions:** This corn trial with Vitazyme at two nitrogen levels, near Brookings, South Dakota, revealed that Vitazyme significantly improved corn yield at the 50% N level. This yield was only 2.1 bu/acre less than the 100% N treatment without Vitazyme, and not significantly different from it. This reveals the improved nitrogen efficiency often noted with the use of this product. The 100% N level gave a 2% (2.9 bu/acre) yield increase for Vitazyme; the two were statistically the same. Grain moisture was not affected by the treatments, but there appeared to be a slight improvement in grain bushel weight with Vitazyme. These results show the excellent value of this program for corn growers in the northern Corn Belt.

**2015. Researchers: David Clay, Ph.D., and Craig Reicks, Research Assistant II, South Dakota State University, Department of Plant Science, Brookings, South Dakota, at Aurora, South Dakota, cv. NK N41Y-**

### **3000 GT (98-day hybrid)**

**Conclusions:** A corn trial in eastern South Dakota, designed to evaluate the effects of Vitazyme seed and foliar treatments on grain yield, and nitrogen and water use efficiency at three nitrogen levels, was impaired by a poor plant population for the seed treated plots. Thus, in most cases only the foliar treatment treated at V6 was evaluated. In spite of this limitation, Vitazyme improved grain yield significantly at the 125 lb/acre nitrogen rate (+6%), increased nitrogen efficiency by 17%, and reduced the yield loss due to water stress by 9.2 bu/acre; the control yield loss at 125 lb/acre was 14.2 bu/acre. The 0 and 75 lb/acre nitrogen rates did not show significant yield or nitrogen and water use responses, for unknown reasons. Moreover, nitrogen balance was improved at all fertility levels, especially at the 125 lb/acre nitrogen application rate. Since this highest of the three rates is similar to a typical farmer nitrogen application rate, the value of Vitazyme use for improved nitrogen and water use efficiency is displayed in this study, the result being a 9.1 bu/acre yield increase. A seed treatment along with the foliar application would likely have triggered significant responses for all parameters at all three nitrogen application rates.

### **2016. Dr. David Clay and Graig Reicks, Department of Plant Sciences, South Dakota State University, Brookings, South Dakota, at the South Dakota State University Field Research Facility, Aurora, South Dakota, cv. DKC 49-72 (99-day hybrid).**

**Conclusions:** A small plot, replicated corn trial near Brookings, South Dakota, using 12 treatments with a Vitazyme seed treatment, a foliar treatment, or both, at three nitrogen levels (0, 75, and 125 lb of N/acre), revealed a pronounced yield response at the reduced nitrogen level (75 lb/acre) for the seed treatment. The corn yield jumped by 11%, from 197 to 218 bu/acre, a highly significant increase that equalled the seed treatment yield at the high nitrogen level (125 lb/acre). This high yield was about the same as the yield obtained at 125 lb/acre of nitrogen without Vitazyme on the seeds. Calculations of nitrogen use efficiency using 15N computations revealed that, at the reduced 75 lb/acre nitrogen rate, the efficiency of nitrogen movement into the grain was greatly enhanced with the Vitazyme seed treatment, increasing from 40.3% to 58.0%. This increase occurred at the reduced nitrogen rate only, revealing that when more fertility stress existed the brassinosteroids and other active agents in Vitazyme caused more nutrients to be translocated into the grain out of the total fertilizer added, compared to the untreated corn at the same 75 lb/acre nitrogen rate.

### **2017. Dr. David Clay and Graig Reicks, Department of Plant Sciences, South Dakota State University, Brookings, South Dakota, at the South Dakota State University Field Research Facility, Aurora, South Dakota, cv. DKC 49-72 (99-day hybrid).**

**Conclusions:** A replicated small plot corn study conducted by South Dakota State University in 2016, near Aurora, South Dakota, using N<sup>15</sup> and C<sup>13</sup> analytical methods, revealed that Vitazyme on the seeds greatly improved the efficiency of both water and nitrogen use. This was shown in particular by the changes in efficiency at 75 lb/acre (40% N reduction) of nitrogen application: treated seeds reduced water stress yield loss by 79%, while nitrogen stress yield loss was reduced by 72%. Grain use efficiency (the percent of applied fertilizer actually going into the grain) at 75 lb/acre of N fertilizer for the Vitazyme treated seed was 58%, while the untreated seed efficiency was 40.3%. These effects of the Vitazyme seed treatment translated into virtually the same yield for Vitazyme on the seeds at 75 lb/acre of N (218 bu/acre) as for untreated seeds at 125 lb/acre of N (220 bu/acre). At 75 lb/acre of N, the treated seeds yielded 23 bu/acre more than the untreated seeds. Even with depressed corn prices of around \$4.00/bu, the benefit:cost ratio of the Vitazyme seed treatment with reduced N application would be 15.1:1. Grain nitrogen was also significantly increased by Vitazyme on the seeds. The Vitazyme foliar treatment did not yield significantly positive results in this trial. Reasons for this lack of foliar response are not known, since a trial in 2014 did produce a significant yield increase of 9 bu/acre.

### **2018. David Clay Ph. D., and Graig Reicks, Department of Plant Sciences, South Dakota State University, Brookings, South Dakota, South Dakota State University, Field Research Facility, Aurora, South Dakota, cv. unknown.**

**Conclusions:** The results of this Vitazyme study on corn at South Dakota State University were quite different

than with previous years' studies, when the yields were promoted by Vitazyme applications at all nitrogen levels. It is apparent that severe leaching and/or denitrification of nitrogen occurred during this extremely wet year, in fact the wettest on record. Note that the growing season rainfall was 30.43 inches, far above the average rainfall for that period by 61%. This excessive rainfall surely caused significant nitrate leaching and denitrification. There was apparently not enough N for Vitazyme to work with at these two N rates after excessive leaching and denitrification had occurred. On the other hand, at the highest N rate of 120 lb/acre there was enough N remaining after losses to allow Vitazyme to improve N efficiency, as has been observed with N<sup>15</sup> studies at South Dakota State University during previous studies. These results illustrate the unpredictability of the weather to influence corn productivity, in South Dakota or anywhere. Nitrogen losses caused lower than average corn yields throughout the Brookings area in 2019, as well as in many areas of the Corn Belt affected by heavy precipitation. Nitrogen leaching and denitrification, as well as late planting from the excessive rains, contributed greatly to yield declines in 2019, and for many acres the inability to plant a crop. The results also demonstrate Vitazyme's ability to assist the crop in making better use of nitrogen that yet remains in the root zone due to high rainfall.

**2020. Graig Reicks and David Clay, PhD., South Dakota State University, Department of Plant Sciences, Brookings, South Dakota, South Dakota State University Experimental Farm, Aurora, South Dakota, cv. unknown.**

**Conclusions:** A small-plot corn study at South Dakota State University, using four replications with four equal increments of nitrogen (urea) and variations of Vitazyme application, revealed that the Vitazyme foliar treatment at 13 oz/acre, applied at the V6 stage, significantly boosted yield by 14 bu/acre (8%) above the untreated control. Moreover, all Vitazyme treatments boosted corn yield above the untreated controls by an average of 2, 6, and 5% for the seed, foliar, and seed + foliar treatments, respectively. Nitrogen levels boosted yield by 20% to 36% over the no nitrogen treatments. This study was affected by a mistake in applying an N- Fixx coating to the plots at two different rates, but changes in the replication arrangement and estimates for plots made possible a statistical analysis. As stated by Graig Reicks, "Even at the 40 lb N/acre rate, a Vitazyme treatment (either seed or foliar) increased yields to as high as corn grown with 120 lb N/acre." These results show the good efficacy of Vitazyme use to enhance corn yields and improve nitrogen efficiency.

## Cotton

**2007. Josh Bynum and Tom Cothren, Ph.D., Texas A&M University, Department of Soil and Crop Sciences, College Station, Texas, cv. Delta and Pine 164 Bollgard II/RR Flex.**

**Conclusions:** This Texas small-plot replicated cotton trial with Vitazyme showed that the product significantly boosted cotton growth and yield parameters above the untreated controls, at all but the 30 lb/acre N rate. The yield was somewhat less with Vitazyme at the 30 lb/acre N rate, presumably because the growth and nodes provided by Vitazyme could not be filled by an inadequate nitrogen supply. NAWF (nodes above white flower), a reliable indicator of final lint yield, was significantly greater than the control with Vitazyme at the higher nitrogen rates, and the final yields bore this out. The lint yield increases for the 60, 90, and 120 lb/acre nitrogen rates were 20, 7, and 9% respectively. Of considerable interest is the fact that, at the 50% nitrogen rate (60 lb/acre), Vitazyme produced nearly an identical yield as did the 100% nitrogen rate (120 lb/acre) with Vitazyme. Moreover, the lint yield with Vitazyme at the 50% nitrogen rate exceeded the lint yield without Vitazyme at the 100% nitrogen rate by 89.3 lb, or 9%. This yield increase despite a reduced nitrogen application shows the capability of Vitazyme within the soil-plant system to promote improved utilization of nitrogen. This replicated cotton study at Texas A&M university revealed that Vitazyme significantly impacted all growth and yield parameters in a positive direction. Over all nitrogen levels, these parameters produced the following significant effects at P=0.05:

Height at early bloom .....	6%
Nodes per plant at early bloom .....	3%
Height at 28 days after early bloom .....	5%

Nodes per plant at 28 days after early bloom .....	6%
Nodes above white flower at 28 days after early bloom .....	5%
Lint yield .....	6%

Fiber length was significantly enhanced by both Vitazyme (2%) and nitrogen (up to 4%), while fiber strength was improved by up to 9% by nitrogen. Vitazyme with the 120 lb/acre nitrogen rate, however, produced the single greatest fiber strength value of any treatment.

## Lettuce

**2005. Agricola Nieto SPR deRL, at the Javier Gonzalez Ranch, Labradores parcel 48, Mexico, cv. Cleopatra.**

**Conclusions:** Vitazyme greatly increased income with lettuce for this production field in Mexico, by increasing yield by 23% despite a 40% nitrogen fertilizer reduction. This yield increase led to an income increase of 8,921.28 pesos per hectare. This study reveals how Vitazyme’s active agents are able to improve the efficiency of nitrogen use through reducing losses from denitrification, leaching, and other means, while enabling a more vigorous rhizosphere microflora to generate more of its own fixed nitrogen, and make better use of applied and native nitrogen.

**2010. Adoracion Torres-Guy Institution: Soils and Agro-Ecosystem Division, Agricultural Systems Cluster, College of Agriculture, U.P. Los Banos, Los Banos, Lagune, The Philippines, cv. Grand Rapids.**

**Conclusions:** According to the official report on the Philippine lettuce study, “The different treatments influenced significantly the plant height, number and width of leaves, weight of plant, and yield of lettuce at harvest. The recommended rate of Vitazyme increased significantly the number of leaves, but the increment was higher with the conventional fertilizer. All treatments increased all parameters significantly over the control. The performance of Vitazyme in combination with 50% of the recommended rate of conventional fertilizer was significantly better than the performance of either Vitazyme alone or 50% of the recommended rate of conventional fertilizer, indicating a positive interaction between Vitazyme and 50% of the recommended rate of conventional fertilizer. A much better positive interaction was noted between Vitazyme alone and the recommended rate of conventional fertilizer. However, for economic reasons it would be better to recommend to the farmers a combination of the recommended rate of Vitazyme with 50% the recommended rate of conventional fertilizer. This approach will definitely result in much higher cost savings. The new product, Vitazyme, may qualify for provisional registration by the Fertilizer and Pesticide Authority as long as it is applied together with conventional fertilizer at 50% of the recommended rate.” Note the improvement in nitrogen utilization with Vitazyme.

- No added fertilizer plus Vitazyme yielded 3.93 tons/ha (28%) more than no fertilizer alone.
- With 50% added fertilizer, Vitazyme increased the yield by 4.12 tons/ha (62%) more than 50% fertilizer alone.
- With 100% added fertilizer, Vitazyme increased lettuce yield by 3.79 tons/ha (46%) more than 100% fertilizer alone.

Note also that Vitazyme with no fertilizer added exceeded the 50% fertilizer rate without Vitazyme by 0.32 tons/ha (5%), while the 50% fertilizer rate plus Vitazyme exceeded the 100% fertilizer rate without Vitazyme by 2.64 tons/ha (32%), showing a great nitrogen efficiency improvement with this product.

## Rice

**2004. Researchers unknown, Institute for Rice Research, Province of Havana, an the experiment station, south of Jibaro, Province of Sancti Spiritus, Cuba, cv. Perla de Cuba [“Cuban Pearl”], a short cycle type, and at Havana Province, and cv. 4499, a medium cycle variety at Sancti Spiritus**

**Conclusions:** The Cuban research team said the following:

1. The biostimulant Vitazyme increased the agricultural yield of rice cultivation.
2. The 100% and 75% nitrogen variants, plus the application of Vitazyme during active tillering or the beginning of the panicle stages, were the most effective to increase the agricultural yield, with economic effects of \$128.62 and \$94.38 per hectare respectively.



All Vitazyme treatments in this rice trial exceeded the respective controls highly significantly, at the 100% fertilizer level by 36% and at the 75% fertilizer level by 24 to 52%. Moreover, all of the 75% fertilizer + Vitazyme treatment yields exceeded the 100% fertilizer treatment (Treatment 2) yield; while the single application (Treatments 6, 7, and 8) increases were not significantly greater, the double application (Treatment 5) was, by a full 1.16 tons/acre, or 25%. These results dramatically show the effect of Vitazyme's active agents to stimulate improved nitrogen and mineral utilization and natural soil nitrogen fixation, thus reducing the farmer's reliance on expensive fertilizer inputs. These yield improvements were influenced primarily by a great increase (34 to 56%) in panicle density per unit area, a reflection of the number of tillers (stems) produced per plant. Kernels per panicle were also increased, from 1 to 16%, whereas effects on unproductive tillers and panicle length were somewhat variable.

**2006. Researchers unknown, Arroz de Riego, near Guayaquil, Ecuador, cv. unknown.**

**Conclusions:** Few details are available on this study, although two levels of fertilizer nitrogen, 100% and 75%, were applied with Vitazyme to investigate the effect on yield and crop profitability. Treatments:

1. 100% nitrogen only
2. 75% nitrogen + Vitazyme
3. 100% nitrogen + Vitazyme

Yield was increased substantially above the 100% nitrogen control for both the 75% and 100% nitrogen treatments with Vitazyme. However, actual yield numbers were not available. Income increases above the control were substantial.

Income increase with Vitazyme + 100% nitrogen: \$128.62/ha

Income increase with Vitazyme + 75% nitrogen: \$94.38/ha

Despite a reduction in nitrogen fertilizer by 25%, Vitazyme boosted income above the control nearly as much as did the 100% nitrogen treatment. Both treatments proved that Vitazyme, applied at planting and at head initiation, is a highly effective yield and income enhancer in Ecuador.

**2007. Le Nhu Kieu, Viet Nam, cv. unknown.**

**Conclusions:** On several "infertile" large area tests, Vitazyme gave excellent responses for rice with only 50% of the usual nitrogen. Despite this major reduction in nitrogen application (by 50%), the Vitazyme treatments produced an average of 4% more yield. This increased utilization of nitrogen with Vitazyme is typical of the response gained on other crops besides rice, enabling the farmer to obtain equal or greater yields while reducing costly nitrogen applications by 20 to 50%. On fertile alluvial soil large rice plots, the yield of rice treated with Vitazyme + 50% of the high nitrogen level increased significantly ( $P=0.05$ ). This increase was 4% above the untreated control. Because such an excellent yield response was gained while reducing nitrogen fertilizer, the obvious benefits for farmers and the entire nation are readily apparent. Great savings in fertilizer cost and increases in grain sales provide the most ideal combination for Viet Nam to prosper in the age of modern agriculture.

**2009. Researcher unknown, Cianjur, West Java, Indonesia, Cigeulis, cv. a local variety.**

**Conclusions:** In this Indonesian rice study, using normal (100%) fertilizer, with and without Vitazyme, and 50% fertilizer with Vitazyme, all three treatments were statistically equal in yield, and all significantly exceeded the "farm practice" treatment. This result proved that Vitazyme applied twice, along with a 50% reduction in fertilizer, produced a yield equal to the 100% fertilizer treatment without fertilizer. This result is highly important for Indonesian rice farmers, who need to minimize fertilizer inputs due to high costs. Vitazyme applied with 100% fertilizer also greatly improved seed number per panicle of rice at harvest, being 46% above the farm practice and 28% greater than the 100% fertilizer treatment; this great seed per panicle increase was not observed with the 50% fertilizer plus Vitazyme treatment.

## Shallots

**2009. Researchers unknown, Kemukten Brebes, Central Java, Indonesia, cv. unknown.**

**Conclusions:** This shallot study in Indonesia showed how Vitazyme will improve both the yield and quality of this important food crop. The smell, taste, and crispness of the bulbs were enhanced by the treatment, and the yield was improved by 15% for the full fertilizer + Vitazyme treatment, and by 7% for the 50% fertilizer + Vitazyme treatment. These data show that this product can increase yield despite a 50% reduction in fertilizer application, an important point when saving on fertilizer costs has become so prominent nowadays.

## Sugar Beets

**2009. O.V. Kornijchuk, V.V. Plotnikov, and agronomic scientists, Vinnytsia State Agricultural Experiment Station, Ukraine Academy of Agrarian Sciences, Vinnytsia, Ukraine, Snizhana, cv. Snizhana.**

**Conclusions:** This Ukrainian sugar study revealed that, at every fertilizer level, Vitazyme increased the sugar production, first by increasing the beet yield, and then the sugar percentage at each level. Besides, the added income for each fertilizer level was substantial. These results prove that Vitazyme is a highly viable sugar beet amendment for Ukrainian agriculture.

1. No fertilizer	40.0 tons/ha
2. No fertilizer + Vitazyme	45.5 tons/ha (+14%)
3. 50% fertilizer	50.5 tons/ha
4. 50% fertilizer + Vitazyme	61.0 tons/ha (+21%)
5. 75% fertilizer	55.0 tons/ha
6. 75% fertilizer + Vitazyme	67.5 tons/ha (+22%)
7. 100% fertilizer	70.0 tons/ha
8. 100% fertilizer + Vitazyme	80.5 tons/ha (+15%)

**2010. V. V. Plotnikov, National Academy of Agrarian Sciences, Vinnytsia State, Agricultural Research Station, Vinnytsia, Ukraine, cv. Karmelita.**

**Conclusion:** This sugar study in Ukraine, using four fertilizer levels and one Vitazyme regime (1 liter/ha applied twice to the leaves and soil), showed that beet and sugar yields were markedly and uniformly improved at all fertilizer levels. Besides, the sugar content of the beets was increased by 0.5 percentage point or more, the increase decreasing slightly as the fertilizer rate increased. The Vitazyme program is shown to be an excellent practice to incorporate into sugar beet production in Ukraine.

1. No fertilizer, no Vitazyme	31.5 tons/ha
2. No fertilizer + Vitazyme	39.7 tons/ha (+26%)
3. Low fertilizer, no Vitazyme	48.7 tons/ha
4. Low fertilizer + Vitazyme	61.2 tons/ha (+26%)
5. Medium fertilizer, no Vitazyme	51.9 tons/ha
6. Medium fertilizer + Vitazyme	64.1 tons/ha (+24%)
7. High fertilizer, no Vitazyme	55.6 tons/ha
8. High fertilizer, + Vitazyme	70.3 tons/ha (+25%)

**2011. Researcher unknown, National Academy of Agrarian Sciences, Vinnytsia State Agricultural Research Station, Vinnytsia, Ukraine, cv. Leonora.**

**Conclusion:** This sugar study in Ukraine, using four fertilizer levels and one Vitazyme regime (1 liter/ha applied twice to the leaves and soil), showed that beet and sugar yields were markedly and uniformly improved at all fertilizer levels. Besides, the sugar content of the beets was increased by 0.6 percentage point or more, the increase decreasing slightly as the fertilizer rate increased. The Vitazyme program is shown to be an excellent practice to incorporate into sugar beet production in Ukraine.

1. No fertilizer, no Vitazyme	32.3 tons/ha
2. No fertilizer + Vitazyme	39.5 tons/ha (+22%)

3. Low fertilizer, no Vitazyme	46.5 tons/ha
4. Low fertilizer + Vitazyme	56.5 tons/ha (+22%)
5. Medium fertilizer, no Vitazyme	50.4 tons/ha
6. Medium fertilizer + Vita zyme	61.1 tons/ha (+21%)
7. High fertilizer, no Vitazyme	54.1 tons/ha
8. High fertilizer + Vitazyme	65.3 tons/ha (+21%)

## Sugar Cane

### 2004. Dr. Isel Creach, Santiago de Cuba, Cuba , cv. C89-147 ratoon.

**Conclusions:** In this Cuban sugar cane trial, Vitazyme applied three times during the growing season substantially and significantly improved the growth, cane yield, and sugar yield versus both the no N control and the 100% N control. The sugar yield was improved by a highly significant 35% above the 100% N level with Vitazyme applied at the same N level. Only 50% N + Vitazyme also increased yield above the 100% N, by 23%, showing how effective both Vitazyme + standard fertilization, and Vitazyme along with reduced fertilizer, are in promoting more profitable sugar production in Cuba on haplustert or calcaric-eutric vertisol soils, for a ratoon sugar cane crop.

1. No nitrogen	82.99 tons/ha cane	9.13 tons/ha sugar
2. 100% nitrogen	87.70 tons/ha cane	9.65 tons/ha sugar
3. 50% nitrogen + Vitazyme	106.66 tons/ha cane	11.73 tons/ha sugar
4. 100% nitrogen + Vitazyme)	112.89 tons/ha cane	12.42 tons/ha sugar

### 2004. Eng. Fidel Hernandez, Espana Rep. Estate, Mantanzas Province, Cuba, cv. Matanzas C323-68 ratoon.

**Conclusions:** The total cane yield was increased about the same (13 to 14%) by Vitazyme at either 100% or 75% fertilizer. This fact demonstrates that Vitazyme will enhance yields as well under reduced fertilizer regimes as under full fertilizer regimes: the 75% fertilizer treatment + Vitazyme applied five times gave about the same increase as did the 100% fertilizer treatment + Vitazyme applied three times. The sugar yield increase was about 10% for both of the Vitazyme treatments. These increases show that Vitazyme is an excellent supplement for sugar cane production in Cuba in red Eustrustox or Ferralson soils, especially since it reveals the potential to achieve high yields while reducing fertilizer use.

1. No nitrogen	54.27 tons/ha	9.87 tons/ha
2. 100% fertilizer + 3 Vitazyme applications	62.09 tons/ha (+14%)	10.89 tons/ha (+10%)
3. 75% fertilizer + 5 Vitazyme applications	61.38 tons/ha (+13%)	10.81 tons/ha (+10%)

## Sweet Potatoes

### 2003. Dr. C. Olegario Muniz, T.M. Benjamin Gonzalez, and T.M. Miguel Mullins, Republic of Cuba, Ministry of Agriculture, Soils Institute, Central Registry of Fertilizers, at Experimental Station “La Renee”, Quivican, Havana Province, Cuba, cv. CEMSA 78-354.

**Conclusions:** According to the researchers, “It is proposed that Vitazyme, which is a biostimulant synthesized from vegetable matter, intensifies the activity of the soil-plant system, which makes possible an increase in photosynthesis so that more carbon becomes affixed to the texture of the plant. Besides the noted Vitazyme economic residual effect, the beneficial residual effect of Vitazyme upon the physical and biological properties of the soil must be included, even though it was not evaluated in this trial.”

“(a) The application of the biostimulant Vitazyme plus 75% dosage of the recommended chemical fertilizer for this type of soil and cultivation allows for a significant and economical increase of the agriculture yield of sweet potatoes in comparison with the application of a 100% dosage. Nevertheless, with the application of Vitazyme similar yield results are achieved as the control treatment with only 50% chemical fertilizing.

(b) The combined use of the biostimulant Vitazyme, plus a dosage of 50 to 100% of the recommended chemical fertilizer, did not affect the quality (percentage of dry matter and starch) of the sweet potato.”

1. 100% fertilizer	27.20
2. 100% fertilizer + Vitazyme	34.00 tons/ha (+25%)
3. 75% fertilizer + Vitazyme	32.33 tons/ha (+19%)
4. 50% fertilizer. + Vitazyme	26.73 tons/ha (-2%)

## Tobacco

**2017. Yaona Mtonga, agronomist, J.B. Mumba, senior technical officer, Neil A. Mphembera, soil chemist, and C. E. D. Mainjeni, plant pathologist, Farmers Organization Limited, Malawi, at Kandiya Research Station, Lilongwe District, and Kabwafu Research Station, Northern Malawi, cv. unknown.**

**Conclusions:** A tobacco study in Malawi, at two research sites, using replicated small plots revealed that Vitazyme applied at planting as a seedling dip, and two foliar/soil spray applications, greatly and significantly improved tobacco yield and quality at the same fertilizer level, but especially at the 75% fertilizer rate. Yield was increased by 25% at the 75% fertilizer rate, 15% at the 100% fertilizer rate, and 9% at the 50% fertilizer rate. Moreover, root volume, plant height, stem diameter, and areas of lower, middle, and upper leaves were significantly increased with 2.7 liters/ha of Vitazyme during the growth period. Leaf quality and color evaluations also favored Vitazyme applications, especially at the 75% fertilizer rate, where the highest leaf quality was increased by 26% over the 75% fertilizer control. The orange leaf color was increased significantly by Vitazyme at this same 75% fertility level, by 52%. The income evaluation revealed that Vitazyme, at all three fertility levels, greatly improved returns on investment, by 21.9, 54/6, and 12.2 times at the 100%, 75%, and 50% fertilizer levels, respectively. These results show the great benefit of using Vitazyme for tobacco culture in Malawi.

## Wheat, Winter

**2009. O.V. Kornijchuk, V.V. Plotnikov, and other agronomic scientists, Vinnytsia State Agricultural Experiment Station, Ukraine Academy of Agrarian Sciences, Vinnytsia, Ukraine, cv. Liona super elite V.**

**Conclusions:** This winter wheat study in Ukraine, using Vitazyme at four fertility levels with and without Vitazyme, revealed that this product gave a remarkable yield increase of 12 to 13% above the untreated control for each treatment comparison. This yield increase with Vitazyme was similar to the increase in yield with fertilizer: a 12 to 13% increase at each fertility increment. Quality analyses revealed that grain weight, 1,000 grain weight, gluten, and crude protein all increased with Vitazyme, and disease incidence and spread were reduced as well. Stem density, grain number per load, and weight per head were all improved with Vitazyme, as was income: by 120 hrn/ha (no fertilizer) to 507 hrn/ha (100% fertilizer). These data clearly show that Vitazyme works together with fertilizer elements to improve wheat yield in a significant way, and that this program is highly effective for improving the productivity and income of wheat growers in Ukraine.

1. No fertilizer	3.31 tons/ha
2. 50% fertilizer	5.57 tons/ha
3. 75% fertilizer	6.08 tons/ha
4. 100% fertilizer	6.49 tons/ha
5. No fertilizer + Vitazyme	3.74 tons/ha (+13%)
6. 50% fertilizer + Vitazyme	6.25 tons/ha (+12%)
7. 75% fertilizer + Vitazyme	6.83 tons/ha (+12%)
8. 100% fertilizer + Vitazyme	7.27 tons/ha (+12%)

**2010. V. V. Plotnikov Location: National Academy of Agrarian Sciences, Vinnytsia State Agricultural Research Station, Vinnytsia, Ukraine, cv. Liona, Super Elite.**

**Conclusion:** Vitazyme in this Ukrainian winter wheat trial significantly improved the yield, profitably, quality, fungal infection, and growth characteristics at four fertilizer levels. The improvements were consistent for all parameters, and are summarized below. The data for this test show clearly that Vitazyme tends to improve crop yield, quality, and structural characteristics the most at the lower fertility levels (zero and 65-30-45 kg/ha N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O), while reducing the development and spread of the head fungal disease septoriosis the most at

higher fertilizer levels (100-45-70) and 130-60-90 kg/ha N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O). These results display the great value of Vitazyme as a highly profitable crop amendment for Ukrainian winter wheat production.

1. No fertilizer	2.83 tons/ha
2. No fertilizer + Vitazyme	3.50 tons/ha (+24%)
3. Low fertilizer	5.17 tons/ha
4. Low fertilizer + Vitazyme	6.15 tons/ha (+19%)
5. Medium fertilizer	5.51 tons/ha
6. Medium fertilizer + Vitazyme	6.57 tons/ha (+18%)
7. High fertilizer	5.83 tons/ha
8. High fertilizer + Vitazyme	6.77 tons/ha (+16%)

## **2012. V. Plotnikov Research organization: National Academy of Agricultural Sciences**

**Location: Vinnytsia, Ukraine, cv. Carivna**

**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.

1. No fertilizer	3.16 tons/ha
2. No fertilizer + Vitazyme	3.78 tons/ha (+20%)
3. Low fertilizer	4.81 tons/ha
4. Low fertilizer + Vitazyme	5.58 tons/ha (+16%)
5. Medium fertilizer	5.26 tons/ha
6. Medium fertilizer + Vitazyme	6.09 tons/ha (+16%)
7. High fertilizer	5.56 tons/ha
8. High fertilizer + Vitazyme	6.50 tons/ha (+15%)

## **2013. V.V. Plotnikov, Scientific, Innovation, and Technology Center of the Institute of Forages and Agriculture of Podillya NAAS, National Academy of Agricultural Sciences, Ukraine, cv. Tsarivna.**

**Conclusions:** In the words of the researchers,

(a) Without fertilizer application, the double use of liquid organic mineral fertilizer Vitazyme for winter wheat seed dressing of Tsarivna variety, at a rate of 1 L/tonne, and for plant treatment at the tillering stage at a rate of 1.0 L/ha, provided compared to the control (without Vitazyme) the grain increase of 0.73% tonnes/ha, or 25%. The plots with mineral fertilization systems after Vitazyme application had yield increases of 1.11-1.22 tons/ha, or 21-23%.

(b) Vitazyme use when growing winter wheat on the experimental plot without fertilizers gave the profit of 1,050 UAH/ha compared to the control, and the plots with NPK doses increased the profit by 1,837-2,044 UAH/ha.

(c) Winter wheat grain of the Tsarivna variety, grown with the use of Vitazyme, had better quality characteristics on every experimental plot compared to the control plot without Vitazyme use. The grain units increased by 22-29 grams/L, 1,000 grain weight by 2.0-2.6 grams, gluten by 2.1-2.3%, and crude protein by 1.1-1.4%.

(d) On every plot of winter wheat of the Tsarivna variety with various NPK doses, and also without fertilizers, with Vitazyme compared to the control, the plants affected by root rot decreased by 22-24%, speckled leaf blotch by 22-25%, and speckled spike blotch by 14-23%.

(e) The yield structure of winter wheat of the Tsarivna variety under various backgrounds of nitrogen-phosphate-potassium fertilizers on every plot applied with Vitazyme was improved. The density of productive heads

was increased by 25-34 units/m<sup>2</sup>, the number of kernels in a head by 1.9-2.4 units, and grain weight from the head by 0.13-0.16 gram.

(f) By using Vitazyme for a seed dressing and applied to winter wheat plants, without fertilizers the grain quality increased from the 6th to the 3rd class, and with 60-30-45 kg/ha %N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O application, the grain quality increased to the 1st class.

1. No fertilizer	2.87 tons/ha
2. No fertilizer + Vitazyme	3.60 tons/ha (+25%)
3. Low fertilizer	4.89 tons/ha
4. Low fertilizer + Vitazyme	5.99 tons/ha (+22%)
5. Medium fertilizer	5.28 tons/ha
6. Medium fertilizer + Vitazyme	6.50 tons/ha (+23%)
7. High fertilizer	5.69 tons/ha
8. High fertilizer + Vitazyme	6.89 tons/ha (+21%)

## A Guide for Calculating Nitrogen Fertilizer Application Rates With Vitazyme

1. Select a number for each of the four categories that describes your cropping condition.
2. Add the four numbers.
3. Find that number in the bottom section, the "Total additive score."
4. The percentage given below that number is the percentage of nitrogen you need to apply of what you would normally apply for optimum yield.

Soil Organic Matter			Previous Crop		Compaction		Soil NO <sub>3</sub> -N Test						
Low(<1.5%)	Medium(1.5-3%)	High(>3%)	Non-legume	Legume	Much	Little	Low	Medium	High				
1	2	3	1	3	1	3	2	4	6				
Total additive score:			15	14	13	12	11	10	9	8	7	6	5
Apply this % of optimum N:			← 60% →			← 70% →			← 80% →				