INTRODUCING
THE NATURE OF VITAZYME,
HOW IT WORKS,
AND THE APPROPRIATE USE
OF THIS HIGHLY EFFECTIVE
CROP AND SOIL BIOSTIMULANT

User's Guide

the VITAZYME® program

VitalEarth RESOURCES

the VITAZYME® program

INTRODUCTION

Vitazyme represents a breakthrough to higher, more profitable crop yields having greater nutritional value. It encourages a "sustainable" approach to agriculture. Farmers today are searching for ways to reduce off-farm inputs while maintaining or increasing their yields – a difficult order in today's world. Standard chemical approaches have helped spur the "green revolution," but have created potential toxicity problems for farmers as well as consumers. Commercial fertilizer applications have at times contributed to ground and surface water contamination as well as soil compaction. In addition, most of these inputs are expensive and have driven many farmers to reconsider their approach. Vitazyme will help solve these difficult environmental and production problems for the farmer.

WHAT IS VITAZYME

Vitazyme is an all-natural liquid "biostimulant" for soil organisms and plants that contains certain biological activators, which are by-products of a proprietary fermentation process. These active agents include vitamins, enzymes, and other powerful but gentle growth stimulators such as brassinosteroids, B-vitamins, triacontanol, and others.

Vitazyme, used within the context of a common-sense management system, will help the farmer overcome many of his production problems. While not a "magic bullet," it helps the entire system work better – greasing the wheels of his cropping system. The material is nontoxic and environmentally safe. Vitazyme enables the farmer to...

- INCREASE CROP YIELDS AND PROFITS
- IMPROVE CROP QUALITY
- REDUCE FERTILIZER NITROGEN INPUTS AND IMPROVE ITS UTILIZATION
- HASTEN GERMINATION AND MATURITY
- IMPROVE SOIL STRUCTURE AND INFILTRATION

Agriculture in the future must emphasize the use of biological systems — not strictly chemical approaches — to achieve long-term soil productivity.

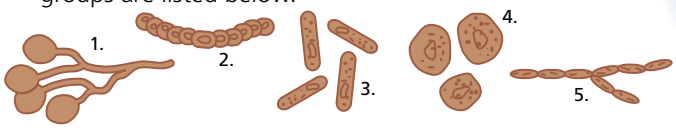
Vitazyme promotes soil life by conforming with natural laws, by encouraging natural predators to control insect and nematode pests, by promoting more intensive biological nitrogen fixation, and by stimulating natural rhizosphere organisms to produce needed plant growth factors.

INCREASE CROP YIELDS

HOW VITAZYME WORKS

All plants that grow in soils develop an intimate relationship between the roots and the organisms that populate the root zone. The teeming billions of bacteria, fungi, algae, cyanobacteria, protozoa, and other organisms that grow along the root surfaces — the rhizosphere — are much more plentiful than in the bulk of the soil. This is because roots feed the organisms with dead root epidermal cells as well as compounds exuded from the roots themselves. The plant may inject up to 25% or more of its energy, fixed in the leaves as carbohydrates, amino acids, and other compounds, into the root zone to feed these organisms... for a very good purpose.

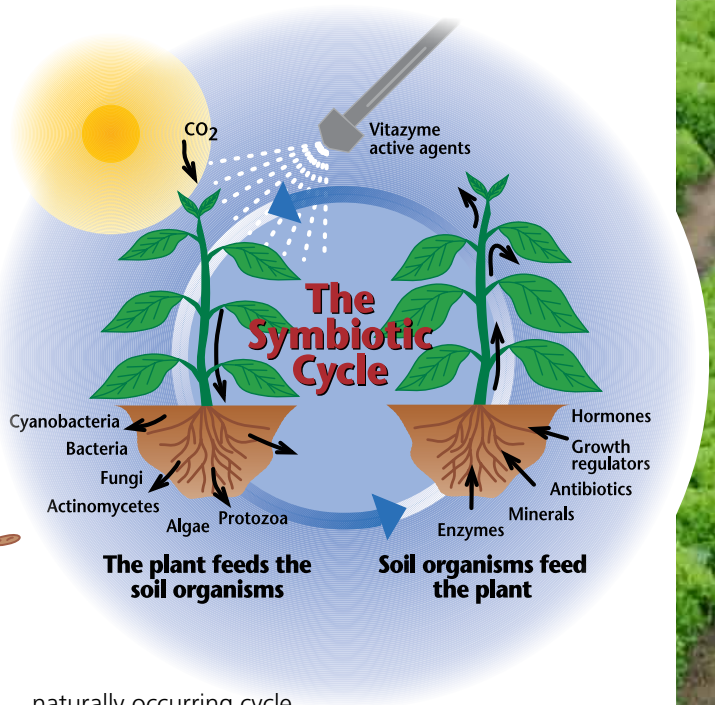
The microorganisms which feed on these exuded carbon compounds along the root surfaces benefit the plant in many ways, a beautiful symbiotic relationship. The plant feeds the bacteria, fungi, algae, and other microbial species in the rhizosphere, which in turn secrete enzymes, organic acids, antibiotics, growth regulators, hormones, and other substances that are absorbed by the roots and transported to the leaves. The acids help dissolve essential minerals, and reduced iron releases anionic elements. A few important microbe groups are listed below.



1. Mycorrhizae, especially vesicular-arbuscular (VAM) types, form "arbuscules" within root cortical cells and extend thread-like hyphae into the soil, increasing the root-feeding surface by ten times or more. They are a major means for uptake of phosphorus, copper, zinc, and other less mobile elements. They also can extract water under much drier conditions than can plant roots.
2. Cyanobacteria fix carbon (they photosynthesize), and also fix nitrogen from the air for plant use.
3. Azotobacter species live on exudates and other carbon sources while fixing nitrogen.
4. Phosphate-dissolving bacteria excrete acids that dissolve minerals and release hard-to-get phosphorous.
5. Actinomycetes generate a variety of pathogen-fighting antibiotics.

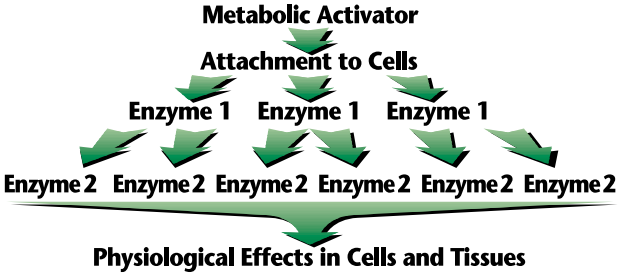
Vitazyme contains metabolic triggers that stimulate the plant to photosynthesize better, fixing more sunlight energy in the form of carbon compounds to increase the transfer of carbohydrates, proteins, and other growth substances into the root zone. These active agents may enter the plant through either the leaves or the roots.

Root growth and exudation are both enhanced. This enhancement activates the metabolism of the teeming population of rhizosphere organisms to a higher level, triggering a greater synthesis of growth-benefiting compounds and a faster release of minerals for plant uptake. The plant-microbial symbiosis is stimulated. This entire process may be summarized as **The Symbiotic Cycle**, which is shown below. Vitazyme accelerates this



naturally occurring cycle.

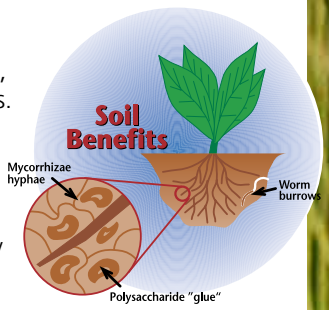
Very small amounts of these metabolic triggers in Vitazyme are needed to greatly improve plant and rhizosphere microbe response. This is because of the **Enzyme Cascade Effect.** Successive tiers of enzymes are activated in plant and microbial tissues to yield a large physiological response from very little applied activator.



In short, Vitazyme enables the plant to better express its genetic potential by reducing the stresses that repress that expression.

HASTEN GERMINATION & MATURITY

Besides improving the growth of plants, Vitazyme also benefits soil characteristics. Soil structure may markedly improve over time because of:



- INCREASED ROOT GROWTH, and thus more root channels.
- GREATER POLYSACCHARIDE PRODUCTION by microbes to glue clay platelets together. Only 0.2% more polysaccharide can markedly improve structure.
- IMPROVED MYCORRHIZAL ACTIVITY, creating sac-like structures and glomalin.
- GREATER EARTHWORM ACTIVITY, their burrows creating channels for air and water. Improvements in structure mean more cleavage planes to promote the ready exchange of air and water. Water infiltration is increased, and runoff and erosion are consequently decreased. Compaction is reduced so roots can freely explore the soil for nutrients and water, increasing yields.

HOW TO USE VITAZYME

VITAZYME IS VERY EASY AND SAFE TO USE.

- Vitazyme may be tank-mixed with fertilizers and pesticides.
- Vitazyme does not need to be tilled into the soil after application.
- The dilution rate is not critical as long as the proper application rate is used.

Vitazyme should be used within the context of a complete crop management system, never by itself. Vitazyme will optimize the existing program by enabling the plant to utilize soil fertility and water more efficiently while reducing costs and increasing productivity. Soil moisture is needed to activate Vitazyme. Follow the crop recommendations given below.

GENERAL APPLICATIONS

Seeds, cuttings, rhizomes, bulbs, etc. Treating the seeds or other planted parts is perhaps the single best use of this product. Be sure to allow the seeds to dry enough to avoid bridging in planters. For better rooting and quicker emergence, do one of the following:

1. For small areas, mist or wet the seeds or cuttings with a 5% solution (1 part in 19 parts of water). One liter of a 5% solution per 50 kg of seed (1 quart/100 lb) is excellent.
2. Apply 0.5 liter of concentrated product on the seeds to be planted on 1 hectare (or 7 oz for 1 acre), using a sprayer or seed treater.
3. Apply 1 liter (32 oz) of concentrated product per metric ton of seed with a sprayer or seed treater.
4. For larger field applications using an in-furrow drop tube,

apply 1 liter/ha (13 oz/acre) on or near the seeds at planting.

5. For potato and other seed piece plantings, dip or spray the pieces to achieve 0.5 liter/ha (7 oz/acre) of the area planted.

Transplants, Dip the root ball, or drench the soil of the transplants, in a 0.25 to 1% solution at planting. For transplant trays, dip the roots of the seedlings in a 1% Vitazyme solution briefly until air is released, or alternatively, after planting, drench the roots of the transplants with a 0.25% solution. Dip or spray bare roots with a 5% solution (1 part in 19 parts of water). For machine or hand field transplanting, place enough water in the drench water to give a 1 liter/ha (13 oz/acre) application.

After-seeding application. Spray seeds or plant parts with a 0.5 to 1% solution (0.5 or 1 part in 99 parts of water) in the row before covering. Strive to achieve a 1 liter/ha (13 oz/acre) rate.

After-seeding applications. Make one to three applications to the crop during the growing season, the number and rate depending on the crop, its days to maturity, and value. Usual rates are 1 to 1.5 liters/ha (13 to 20 oz/acre), with 20 to 60 days between applications. These applications are given in the Individual Crop Recommendations which follow.

Soil conditioning and residue breakdown. Apply 1 liter/ha (13 oz/acre) over the stalks or stubble after harvest but before freezing, or to the soil at any time.

GENERAL RECOMMENDATIONS FOR ALL CROPS

Vitazyme is best used in the context of a comprehensive soil fertility program.

1. Test the soil, if possible, and discover any deficiencies or imbalances. Collect at least 10 subsamples from each uniform soil area (each sample from an area no larger than about 10 ha, or 25 acres), combine them, and send them to a reputable soil testing laboratory. Fertilize as required according to expert consultation, and note point 3 below for nitrogen applications.

2. Apply Vitazyme, if possible, to the seeds at or before planting. Treat the seeds with Vitazyme as indicated in General Applications by mixing the seeds and solution together in a seed treater, on a tarp, or in a seeding attachment. It is best to dry the seeds well before planting to avoid bridging in the planter. Alternatively, apply the product directly in the seed row by drop tube at planting.

3. Nitrogen fertilizer may be reduced each time it is applied if the current N application rate is high, especially if the soil test shows high available N, the soil has good structure, and the microbial activity is excellent. If there is a consideration to reduce nitrogen applications, be sure to review the short discussion at the end of this guide for details. If fertilizer N applications are below optimum, do not reduce N applications.

4. Apply Vitazyme to the crop as indicated in this User's Guide.

5. Integrate other sound, sustainable management practices into the total program such as soil conservation practices, minimum tillage, crop rotations with legumes, and the use of proper varieties.

INDIVIDUAL CROP APPLICATIONS

The following recommendations are considered optimal for most growers, but many variations are possible. Vitazyme is effective when applied at any time during the crop's life cycle. It is possible to reduce the application rate and increase the number of applications, such as 0.5 liter/ha four times versus the normal 1 liter/ha twice for many crops. An additional application to many crops 15 to 30 days before harvest, if the final prescribed application leaves 45 or more days to harvest, will oftentimes give additional, highly profitable benefits. Reduced application frequency and/or amount of product can still give profitable results. Vitazyme can successfully replace other biostimulants currently being used, as well as growth regulators, rooting enhancers, growth hormones, and so forth. The product can be mixed with fertilizers and plant protection products.

ALFALFA, CLOVER, TREFOIL, ETC.

New plantings. Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray 1 liter/ha (13 oz/acre) 30 to 45 days after planting, and after each cutting.

Established stands. Spray 1 liter/ha (13 oz/acre) at spring green up, and after each cutting, including the last cutting to help harden in the crop. Rhizobium inoculant can be applied directly with Vitazyme to stimulate nodulation and improve nitrogen fixation.

BANANAS, PLANTAINS.

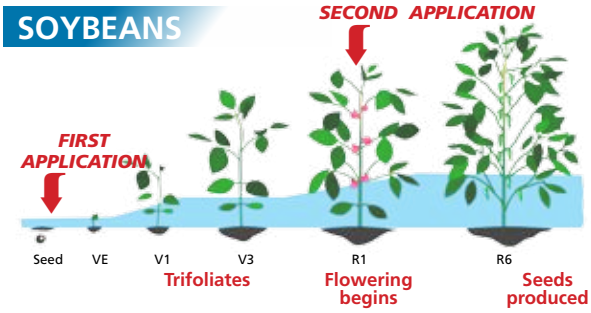
Nurseries. Drench the corm, and the soil around the corm, with a 0.5 to 1% Vitazyme solution; corms may also be soaked in a 1% Vitazyme solution for 2 to 6 hours before planting. Then spray a 1% solution on the new plants and pots or liners every 14 to 21 days.

New plantings. Spray or dip the roots using a 5% Vitazyme solution, or drench the soil around the plants with a dilute solution to deliver about 10 ml (0.4 oz) of Vitazyme per plant; the dilution rate is not critical. Spray the leaves and soil over the roots with 1 liter/ha (13 oz/acre) 45 days after planting, and every 60 days thereafter.

Producing plantations. Spray 1 liter/ha (13 oz/acre) on the plants and soil every 60 days. For hand sprayers, concentrate the spray over the plant and root zone.

BEANS (SOYBEANS, FIELD BEANS, BUSH BEANS, FAVA BEANS, COWPEAS, ETC.).

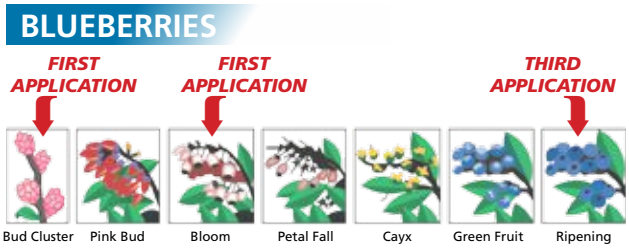
Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil at early bloom (R1). Alternatively, the second application can be split into 0.5 liter/ha (7 oz/acre) at the third trifoliate (V3) and at early bloom (R1).



BERRIES (BLUEBERRIES, BLACKBERRIES, RASPBERRIES, DEWBERRIES, ETC.).

New plantings. Spray or dip the roots using a 5% Vitazyme solution, or drench the roots after planting with a dilute Vitazyme solution, to give about 1 liter/ha (13 oz/are) total application. Dip bare rooted stock in a 5% solution. At 30 days after planting, spray leaves and soil with 1 liter/ha (13 oz/acre), or for small plantings with a 1% solution. Reapply 1 liter/ha (13 oz/acre) every 45 to 60 days during active growth.

Established plants. At spring bud break, spray the plants and soil with 1 liter/ha (13 oz/acre), and again at blossoming. Apply once again to the leaves and soil at 1 liter/ha (13 oz/acre) 45 to 60 days after the blossom application.



CANOLA, MUSTARD.

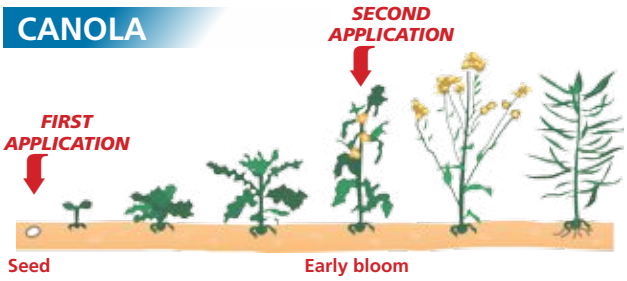
Spring Canola. Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil at early bloom. If no at-

IMPROVE SOIL STRUCTURE

SOYBEANS

planting application is made, apply 1 liter/ha (13 oz/acre) as soon as possible after emergence, followed by the bloom application.

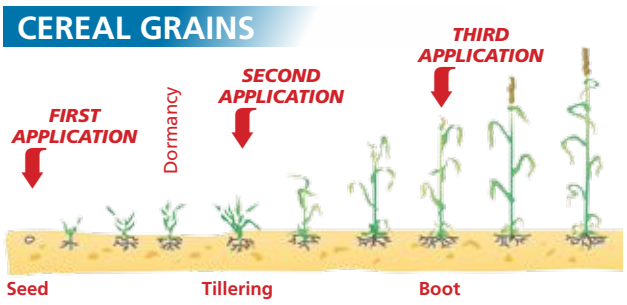
Winter Canola. Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). After winter dormancy, spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil at green-up, and 0.5 liter/ha (7 oz/acre) at early bloom.



CEREAL GRAINS (WHEAT, BARLEY, OATS, RYE, SPELT, ETC.).

Winter Cereals. Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray 1 liter/ha (13 oz/acre) on the leaves and soil at spring green-up with 1 liter/ha (13 oz/acre), with another optional application at the boot stage with 0.5 liter/ha (7 oz/acre).

Spring Cereals. Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray 1 liter/ha (13 oz/acre) on the leaves and soil sometime between late tillering and late boot stage.



CITRUS FRUIT (ORANGES, GRAPEFRUIT, LEMONS, TANGERINES, ETC.).

Nurseries. At planting, drench the soil of the pot or liner with a 1% Vitazyme solution, or else spray or dip the bare roots with a 5% solution. Then spray a 0.5 to 1% solution on the small trees and soil every 14 to 21 days.

New plantings. Spray or dip the roots using a 5% Vitazyme solution, or drench the soil around the small trees with a dilute solution to deliver about 10 ml (0.4 oz) of Vitazyme per tree; the dilution rate is not critical. Spray the leaves and soil over the roots with 1 liter/ha (13 oz/acre) 45 days after planting, and every 60 days thereafter. Drip or sprinkler application also works well.

Producing orchards. Make four 1.3 liter/ha (16 oz/acre) applications during the season: (1) pre-bloom foliar, (2) petal fall foliar, (3) three months later on the soil, and (4) four months later on the soil. Applications 3 and 4 to the soil may be either by drip or sprinkler irrigation.

COCOA.

Nurseries. Soak the seeds before planting in a 5% Vitazyme solution for 12 hours. Then drench the soil of the pot or liner at planting with a 1% Vitazyme solution. Spray young plants with a 0.5 to 1% solution every 14 to 21 days.

New plantings. Spray or dip the roots using a 5% Vitazyme solution, or drench the soil around the small trees with a dilute solution to deliver about 10 ml (0.4 oz) of Vitazyme per tree; the dilution rate is not critical. Spray the leaves and soil over the roots with 1 liter/ha (13 oz/acre) 45 days after planting, and every 60 days thereafter. Drip or sprinkler application also works well if available.

Producing plantations. Spray or irrigate Vitazyme at 1 liter/ha (13 oz/acre) on the leaves and/or soil every 60 days.

COFFEE.

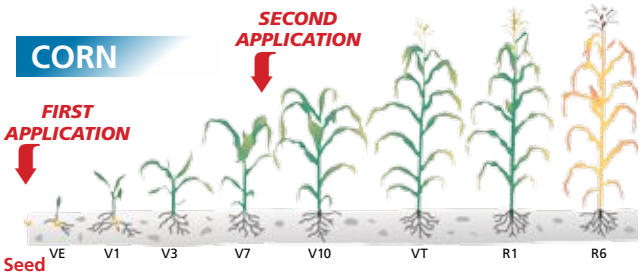
Nurseries. Soak the seeds before planting in a 5% Vitazyme solution for 12 hours. Soak cuttings and grafts in a 5% solution for 30 minutes before planting. Then drench the soil of the pot or liner at planting with a 1% Vitazyme solution. Spray young plants with a 0.5 to 1% solution every 14 to 21 days.

New plantings. Spray or dip the roots using a 5% Vitazyme solution, or drench the soil around the small trees with a dilute solution to deliver about 10 ml (0.4 oz) of Vitazyme per tree; the dilution rate is not critical. Spray the leaves and soil over the roots with 1 liter/ha (13 oz/acre) 45 days after planting, and every 60 days thereafter. Drip or sprinkler application also works well.

Producing plantations. Spray 1 liter/ha (13 oz/acre) on the leaves and soil at bloom. Then spray 1 liter/ha (13 oz/acre) to the leaves and soil at 6, 12, and 20 weeks after blossom.

CORN.

Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil at the 8 to 10-leaf stage (*see stage growth illustration on page 8*).



COTTON.

Treat the seeds at planting (see General Applications), or the soil at planting with 1 liter/ha (13 oz/acre). Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil at early bloom, and again 21 to 28 days later.

FISH AND SHRIMP.

For Ponds That Are First Drained. After drainage of the pond, when the soil has become dry enough to walk or drive on, spray 1.5 liters/ha (20 oz/acre) over the soil surface to establish a strong microorganism population in the soil. Allow the soil to remain unflooded for at least seven days, and then reflood before adding the fish or shrimp. This method is especially effective for tilapia and shrimp species, or with any fish that consumes small organisms that are enhanced by the soil treatment.

For Ponds Having Little Water Exchange. If the fish or shrimp pond is self-contained, and has little water exchange with outside sources (which would quickly dilute any added Vitazyme), add enough product to maintain a 60 liters/ha-30 cm (6 gal/acre-foot) concentration. This will provide direct stimulation of the fish or shrimp. Additional product should be applied again every 30 to 60 days to maintain proper levels of active agents in the pond. Application can be made by adding the Vitazyme at several locations in the pond from a boat. Water application is not recommended for ponds that have significant water exchange; instead, use the direct feeding method in these cases.

For Direct Feeding of Fish. For certain species of fish, such as catfish or members of the sunfish family, the feed can be treated before feeding irrespective of whether there is much water exchange in the pond. The mix should be about 60 ml/100 kg (1 oz/100 lb) of feed, and can be premixed during feed preparation or sprayed on the feed pellets after preparation. Premixing is preferred so that there will be less loss of active agents from Vitazyme between the time that the feed hits the water and the fish consume it.

FLAX.

Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil at early bloom.

COTTON

FLOWERS.

Annuals. Treat the seeds at planting (see General Applications), or else the soil at planting with a 1% Vitazyme solution. A watering can or sprayer can be used on the seeds before row covering. Spray a 1% solution to the dripping point for small areas, or 1 liter/ha (13 oz/acre) for larger field areas at planting, and again at early bloom, and every 30 days during active blossoming. For smaller areas spray a 1% solution to the dripping point.

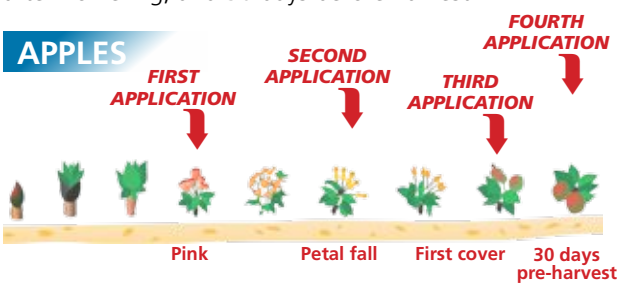
Perennials. Treat the seeds, roots, bulbs, or other planted parts at planting with a 5% solution. For transplants, drench the roots at planting with a 1% Vitazyme solution. Then spray the leaves with a 1% solution to the dripping point for small areas. For larger field areas, spray 1 liter/ha (13 oz/acre) at planting and every 30 days during active growth.

FRUITS, TEMPERATE (APPLES, PEARS, PEACHES, APRICOTS, NECTARINES, PLUMS, CHERRIES, KIWI FRUIT, ETC.).

Nurseries. Drench the soil of new plantings in pots or liners with a 1% Vitazyme solution, or else spray or dip the bare roots with a 5% solution. Then spray a 0.5 to 1% solution on the small trees and soil every 14 to 21 days. For field grown trees, apply 1 liter/ha (13 oz/acre) every 30 days.

New plantings. Spray or dip the roots using a 5% Vitazyme solution, or drench the soil around the small trees with a dilute solution to deliver about 10 ml (0.4 oz) of Vitazyme per tree; the dilution rate is not critical. Spray the leaves and soil over the roots with 1 liter/ha (13 oz/acre) 45 days after planting, and every 60 days thereafter. Drip or sprinkler application also works well.

Producing orchards. Air-blast spray 1.3 liters/ha (16 oz/acre) of Vitazyme on the trees, and soil beneath the trees, four times: at pink, petal fall (30 days after petal fall), first cover, and 30 days before harvest. Even better results may be obtained with the petal fall application at 0.7 liter/ha (8 oz/acre) of Vitazyme, and then the same rate applied every 7 to 10 days until 30 days before harvest. For kiwi fruit, apply 1.3 liters/ha (16 oz/acre) 14 days before bud burst, 10 days before flowering, 14 days after flowering, and 30 days before harvest.



FRUITS, TROPICAL (MANGOES, AVOCADOS, GUAVAS, PAPAYA, JACK FRUIT, ETC.).

Nurseries. Drench the soil of new plantings in pots or liners with a 1% Vitazyme solution, or else spray or dip the bare roots with a 5% solution. Then spray a 0.5 to 1% solution on the small trees and soil every 14 to 21 days.

New plantings. Spray or dip the roots using a 5% Vitazyme solution, or drench the soil around the small trees with a dilute solution to deliver about 10 ml (0.4 oz) of Vitazyme per tree; the dilution rate is not critical. Spray the leaves and soil over the roots with 1 liter/ha (13 oz/acre) 45 days after planting, and every 60 days thereafter. Drip or sprinkler application also works well.

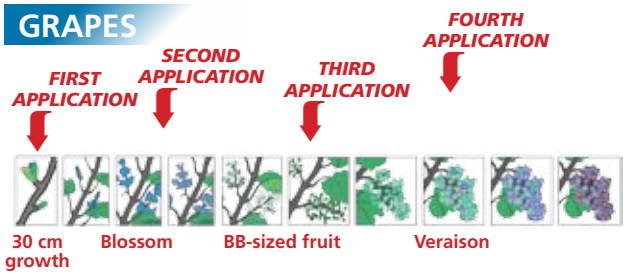
Producing orchards. Spray 1.3 liters/ha (16 oz/acre) every 60 days, concentrating the spray over the plant and root zone.

GRAPES.

Nurseries. Drench the soil of new plants in pots or liners with a 1% Vitazyme solution, or else spray or dip the bare roots with a 5% solution. Then spray a 0.5 to 1% solution on the small plants and soil every 14 to 21 days.

New plantings. Spray or dip the roots using a 5% Vitazyme solution, or drench the soil around the small plants with a dilute solution to deliver 5 ml (0.2 oz) of Vitazyme per plant; the dilution rate is not critical. Spray the leaves and soil over the roots with 1 liter/ha (13 oz/acre) 45 days after planting, and every 60 days thereafter. Drip or sprinkler irrigation also works well.

Producing vineyards. Spray 1 liter/ha (13 oz/acre) on the leaves and soil at 30 cm (12-inch) first vine growth, and on the leaves at blossom, again at BB-sized fruit, and at veraison. If the time from veraison to harvest is greater than 45 days, an additional application 20 to 30 days before harvest is recommended.



GRASSES, HAY AND FORAGES.

New plantings, seeds. Apply Vitazyme to the seeds at or before planting (see General Applications); be sure the seeds are dry and segregated before planting. Treat the seeds with a dilute Vitazyme solution, such as 1 liter of a 5% solution for every 50 kg of seed. Mix the seeds

and solution together thoroughly in a seed or cement mixer, on a tarp, or in a seeding attachment. It is best to dry the seeds well before planting to avoid bridging in the planter. Rhizodium inoculum can be applied directly with Vitazyme to provide an excellent synergism between the two materials.

New plantings, rhizomes. Spray a 5% Vitazyme solution on the rhizomes of bermudagrass and similar grasses prior to planting, or dip the rhizomes in the solution briefly. If neither treatment is possible, spray the newly planted field with 1 liter/ha (13 oz/acre) of Vitazyme.

Legumes, grasses, or mixed species. Spray Vitazyme at 1 liter/ha (13 oz/acre) to the crop at spring greenup, and after each cutting at 1 liter/ha (13 oz/acre).

Pastures. Spray Vitazyme over the grass at spring green-up at 1 liter/ha (13 oz/acre). Apply Vitazyme again at the same rate every 60 days during active growth.

GRASSES, TURF.

New plantings, seeds. Apply Vitazyme to the seeds at planting (see General Applications). Spray 1 liter/ha (13 oz/acre, about 0.5 oz/1,000 ft²) directly on the seeds and soil. It is also possible to spray a 5% Vitazyme solution on the seeds before planting; make sure that all seeds are coated. Dry the seeds thoroughly before planting to insure proper seed distribution. Repeat the Vitazyme application at 1 liter/ha (13 oz/acre) every 45 to 60 days during active growth.

New plantings, sod. Spray a 1% Vitazyme solution on the soil surface just before laying the sod. About two weeks after laying the sod, spray Vitazyme again over the sod surface at 1.5 liters/ha (10 oz/acre). Repeat a Vitazyme application at 1 liter/ha (13 oz/acre) over the grass every 45 to 60 days.

Established turf. Temperate zones: Spray Vitazyme over the grass at spring green-up at 1 liter/ha (13 oz/acre), and then reapply Vitazyme at the same rate every 45 to 60 days during active growth. Tropical zones: Spray Vitazyme at 1 liter/ha (13 oz/acre) every 45 to 60 days throughout the year. Do not neglect judicious fertility management for infertile tropical soils.

Hydroseeding. Add Vitazyme to the hydroseeder tank to achieve a 1 liter/ha (13 oz/acre, or 0.5 oz/1,000 ft²) rate.

GREENHOUSE CROPS.

Foliar and soil applications. For hydroponic applications, see HYDROPONICS. Apply Vitazyme at 1 liter/ha (13 oz/acre, or 0.3 oz/1000 ft²) every 14 to 21 days to leaf and soil surfaces with a sprayer or mist system. Alternatively, apply 0.5 liter/ha (0.15 oz/acre) every 7 days. 0.3 oz = 8 ml. 0.15 oz = 4 ml.

Drip and sprinkler applications. Add Vitazyme to the system to give a 1 liter/ha (13 oz/acre, or 0.3 oz/1,000

ft²) application every 14 to 21 days, or 6 oz/acre (0.15 oz/1,000 ft²) every week.

HYDROPONICS.

Spray the leaves of the plants with Vitazyme at 1 liter/ha (13 oz/acre, or 0.3 oz/1,000 ft²) every 7 to 14 days during active growth. Be sure good leaf contact is made by using a fine droplet size or mist-type applicator, or an air-blast sprayer. For general applications when the area cannot easily be ascertained, apply a 1% solution (1 oz/gal or 10 ml/liter) to the leaf dripping point.

Note: Vitazyme added directly to the hydroponic water may not give consistent results.

MILLET.

Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil at early heading.

NUTS, TEMPERATE (PECANS, WALNUTS, HAZELNUTS, ETC.).

Nurseries. Drench the soil of new plantings in pots or liners with a 1% Vitazyme solution, or else spray or dip the bare roots with a 5% solution. Then spray a 0.5 to 1% solution on the small trees and soil every 14 to 21 days.

New plantings. Spray or dip the roots using a 5% Vitazyme solution, or drench the soil around the small trees with a dilute solution to deliver about 10 ml (0.4 oz) of Vitazyme per tree; the dilution rate is not critical. Spray the leaves and soil over the roots with 1 liter/ha (13 oz/acre) 45 days after planting, and every 60 days thereafter. Drip or sprinkler application also works well.

Producing orchards. Air-blast spray 1.3 liters/ha (16 oz/acre) of Vitazyme on the trees, and soil beneath the trees, three times: at full leafing, after the nuts have set, and half ways through nut development.

NUTS, TROPICAL (BRAZIL NUTS, PISTACHIOS, ALMONDS, ETC.).

Nurseries. Drench the soil of new plantings in pots or liners with a 1% Vitazyme solution, or else spray or dip the bare roots with a 5% solution. Then spray a 0.5 to 1% solution on the small trees and soil every 14 to 21 days.

New plantings. Spray or dip the roots using a 5% Vitazyme solution, or drench the soil around the small trees with a dilute solution to deliver about 10 ml (0.4 oz) of Vitazyme per tree; the dilution rate is not critical. Spray the leaves and soil over the roots with 1 liter/ha (13 oz/acre) 45 days after planting, and every 60 days thereafter. Drip or sprinkler application also works well.

Producing groves. Spray or irrigate 1.3 liters/ha (16 oz/acre) of Vitazyme on the trees and/or soil three times: at bloom, again at 30 days after bloom, and half way to nut maturity.

OIL PALM.

Nurseries. Drench the soil of new plantings in pots or liners with a 1% Vitazyme solution, or else spray or dip the bare roots with a 5% solution. Then spray a 0.5 to 1% solution on the small trees and soil every 14 to 21 days.

New plantings. Spray or dip the roots using a 5% Vitazyme solution, or drench the soil around the small trees with a dilute solution to deliver about 10 ml (0.4 oz) of Vitazyme per tree; the dilution rate is not critical. Spray the leaves and soil over the roots with 1 liter/ha (13 oz/acre) 45 days after planting, and every 60 days

thereafter. Drip or sprinkler application also works well.

Producing plantations. Apply 1.3 liters/ha (16 oz/acre) Vitazyme on the leaves and soil of the grove every 60 days, by airblast sprayer or irrigation. If neither of these application methods are possible, spray the soil over the root zone at the above rate.

OLIVES.

Follow the guidelines for FRUITS, TEMPERATE.

PEANUTS.

Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil at pegging.

PEAS.

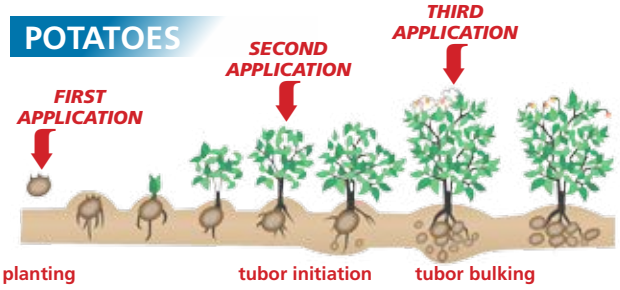
Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil at early bloom.

PINEAPPLE.

For mature, continually producing fields, spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil every 60 days.

POTATOES.

Treat the seed pieces, or seed pieces and soil, at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil at tuber initiation, and again at tuber bulking. An additional 1 liter/ha (13 oz/acre) before harvest is recommended for long-season varieties for additional tuber bulking.



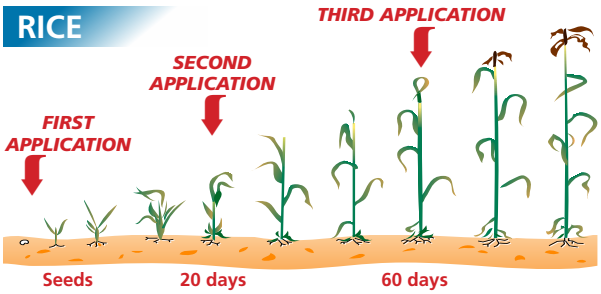
POTATOES, SWEET.

Treat the sweet potato slips at planting with a dip in a 5% solution, or with a soil drench of a 0.5 to 1% solution for a 1 liter/ha (13 oz/acre) total application. Then spray the leaves and soil at 30 and 60 days after planting at 1 liter/ha (13 oz/acre).

RICE.

Upland rice. Follow the guidelines for CEREAL GRAINS.

Paddy rice. Treat the seeds before planting by soaking in a 5% Vitazyme solution, or by applying 0.5 liter/ha (7 oz/acre) of concentrated product to the seeds with a sprayer or seed treater. For transplants, dip the roots in a 5% Vitazyme solution before planting. Then foliar apply Vitazyme at 1 liter/ha (13 oz/acre) at 20 days and 60 days after planting.



RUBBER.

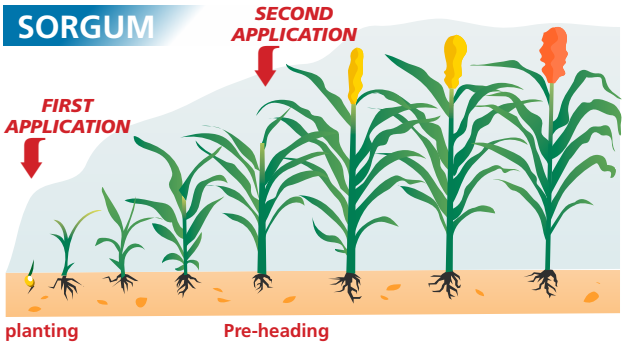
Nurseries. Drench the soil of new plantings in pots or liners with a 1% Vitazyme solution, or else spray or dip the bare roots with a 5% solution. Then spray a 0.5 to 1% solution on the small trees and soil every 14 to 21 days.

New plantings. Drench the soil around the small trees with a dilute solution to deliver about 10 ml (0.4 oz) of Vitazyme per tree; the dilution rate is not critical. Spray the leaves and soil over the roots with 1 liter/ha (13 oz/acre) 45 days after planting, and every 60 days thereafter. Drip or sprinkler application also works well.

Producing plantations. Apply 1.3 liters/ha (16 oz/acre) Vitazyme on the leaves and soil of the grove every 60 days by airblast sprayer or irrigation, or over the root zone by backpack sprayer.

SORGHUM.

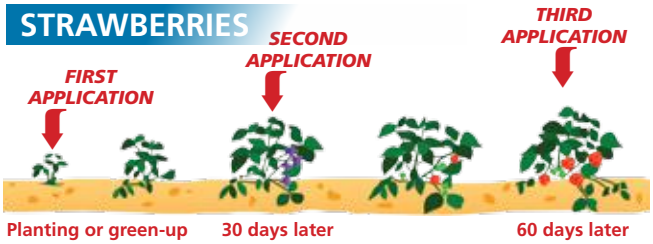
Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil before head emergence.



STRAWBERRIES.

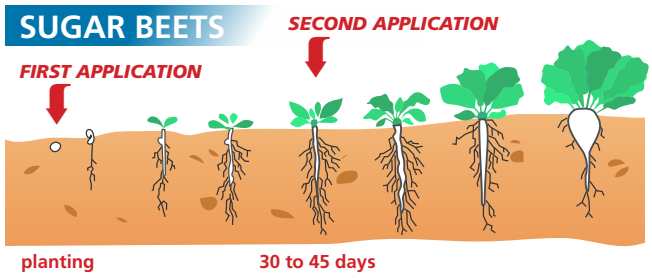
New plantings. Dip the roots in a 5% Vitazyme solution, or drench the new plants after planting with a 1% solution, or a field rate equivalent to 1 liter/ha (13 oz/acre).

Producing fields. Spray or irrigate the plants and soil with Vitazyme at 1 liter/ha (13 oz/acre) at spring green-up or 30 days after planting, and every 30 days thereafter during active production.



SUGAR BEETS.

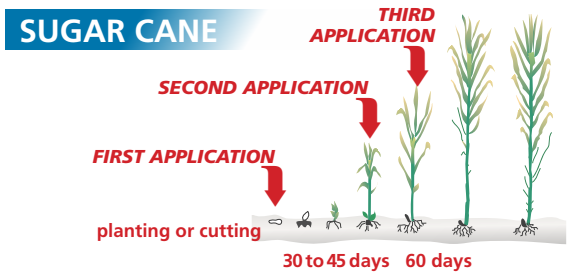
Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil 30 to 45 days after planting.



SUGAR CANE.

New plantings. Spray or dip the seed pieces in a 5% Vitazyme solution, or else apply 1 liter/ha (13 oz/acre) of Vitazyme in the seed row with the planter. Using 1.5 liters/ha (20 oz/acre), spray the leaves and soil at 30 to 45 days after planting, and again at 60 days after planting.

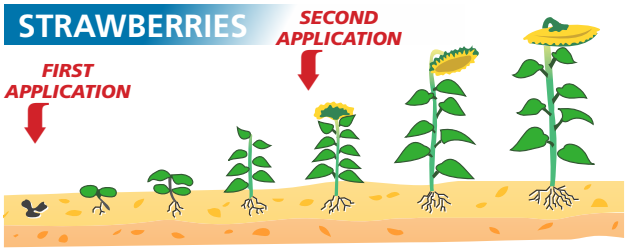
Ratoon cane. After cutting, spray or irrigate 1 liter/ha (13 oz/acre) of Vitazyme on the cane field. Follow this with 1.5 liters/ha (20 oz/acre), sprayed on the leaves and soil at 30 to 45 days after harvest, and again at 60 days after harvest.



HY ROOT CROPS

SUNFLOWERS.

Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray or irrigate 1 liter/ha (13 oz/acre) over the leaves and soil at early head formation.



TREES (TIMBER, ORNAMENTAL, ETC.).

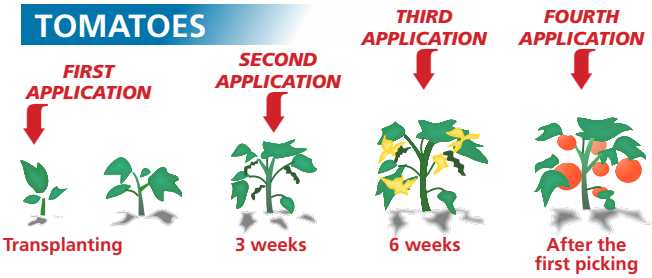
Nurseries. Drench the soil of new plantings in pots or liners with a 1% Vitazyme solution, or else spray or dip the bare roots with a 5% solution. Then spray a 0.5 to 1% solution on the small trees and soil every 14 to 21 days.

New plantings. Spray or dip the roots using a 5% Vitazyme solution, or drench the soil around the small trees with a dilute solution to deliver about 10 ml (0.4 oz) of Vitazyme per tree; the dilution rate is not critical. Spray the leaves and soil over the roots with 1 liter/ha (13 oz/acre) 45 days after planting, and every 60 days thereafter. Drip or sprinkler application also works well.

Established trees. Spray or irrigate Vitazyme at 1.3 liters/ha (16 oz/acre) to the leaves and/or soil at spring green-up in temperate regions, and again every 60 to 90 days during active growth.

VEGETABLES.

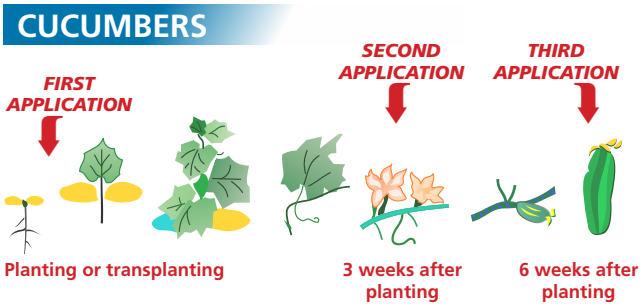
Tomatoes, peppers, and eggplant. Treat the seeds at planting. For trays, dip the roots of seedlings in a 1% Vitazyme solution briefly until the air is released. Alternatively, shortly after transplanting, drench the base of the transplants with a 0.25% Vitazyme solution to achieve 1 liter/ha (13 oz/acre). Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil at 3 weeks, at 6 weeks, and after the first picking.



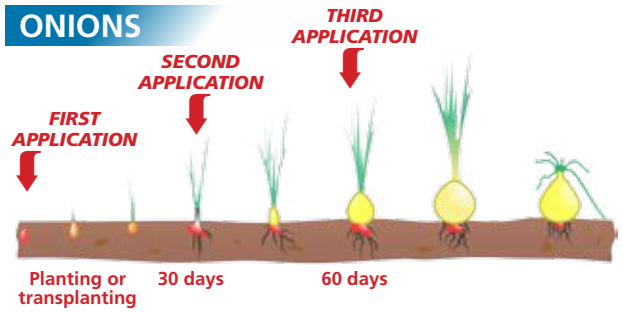
Brassicas (Broccoli, Cabbage, Cauliflower, Brussel Sprouts, Kale, Collards, etc.). Treat the seeds at planting (see General Applications), or the transplants with a soil drench of 1% Vitazyme, or a field rate of 1 liter/ha (13 oz/acre) in the drenching water. Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil half way to maturity, often at 30 days after planting.

Rooted annuals (Carrots, Beets, Rutabagas, Turnips, Parsnips, etc.). Treat the seeds at planting (see General Applications), or else the soil at planting with 1 liter/ha (13 oz/acre). Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil 30 to 45 days after planting. For rapid maturing crops such as radishes, apply a 1% spray or 1 liter/ha (13 oz/acre) to the leaves and soil 14 days after planting.

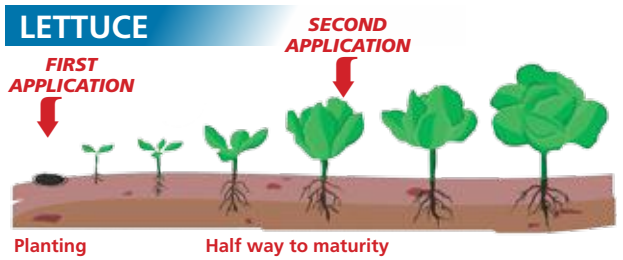
Cucurbits (Cucumbers, Squash, Pumpkins, Watermelons, Muskmelons, Gourds, etc.). Treat the seeds at planting (see General Applications), or the transplants with a soil drench of 1% Vitazyme, or a field rate of 1 liter/ha (13 oz/acre) in the drenching water. Then spray or irrigate 1 liter/ha (13 oz/acre) on the leaves and soil 3 weeks after planting. Another 1 liter/ha (13 oz/acre) spray can be made by air at 6 weeks after planting.



Onions, Leeks, Shallots, etc. Treat the bulbs, plants, or seeds with a 5% Vitazyme dip or spray at planting, or apply 1 liter/ha (13 oz/acre) in the seed row. Then spray or irrigate the leaves and soil with 1 liter/ha (13 oz/acre) at 30 days after planting, and again 60 days after planting.



Leafy annuals (Lettuce, Spinach, Swiss chard, etc.). Treat the seeds with a 5% Vitazyme solution at planting (see General Applications). Then spray or irrigate Vitazyme at 1 liter/ha (13 oz/acre) on the leaves and soil midway through the growth cycle, often 30 days after planting.



Asparagus. Treat the seeds or crowns at planting (see General Applications). Then treat the soil and plants with 1 liter/ha (13 oz/acre) at shoot emergence, at 30 days after shoot emergence, and again after harvest when the ferny leaves have fully expanded.

Tropical root crops (Cassava, Taro Root, Yams, White-Fleshed Sweet Potatoes, etc.).

New plantings: Spray or dip the roots or tubers with a 5% Vitazyme solution, or apply 1 liter/ha in the row at planting; a root drench of 1% Vitazyme may also be used.

Established stands: Apply 1 liter/ha (13 oz/acre) to the leaves and soil every 30 to 45 days during active growth.

NITROGEN FERTILIZER REDUCTIONS

Many research trials conducted with Vitazyme utilizing reduced nitrogen rates have shown that nitrogen efficiency is improved, allowing crops to yield as well at lower nitrogen rates as at higher rates. However, it is imperative that the farmer be careful to assess his own cropping situation to be sure his soil is in good enough condition to allow Vitazyme to adequately improve nitrogen utilization. He can do this by evaluating the organic matter content, previous crop, degree of compaction, and soil nitrate-nitrogen level as shown in the table. Obtain a score for each item from the chart below and add them. If the total is 12 to 15, about 60% of the usual applied nitrogen for a high yield potential needs to be applied. If the score is 8 to 11, then 70% of the nitrogen should be applied. A less favorable environment for soil microbes and root growth, giving a score of 5 to 7, will allow about 80% of the usual nitrogen to be applied for a high yield potential.

It is best to first try this nitrogen reduction with Vitazyme on a portion of the crop to evaluate the effectiveness of the reduction under local environmental conditions. Then, once the reduction is shown to work well, increase the amount of crop treated with the reduced nitrogen program.

Soil Organic Matter			Previous Crop		Compaction		Soil NO_3-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 much N:	← 60% →				← 70% →				← 80% →		

RESULTS TO EXPECT

Vitazyme will boost yields and crop quality of all crops. Note the results in the Vitazyme annual field trial results booklets and on the Website for exact test data. Yield increases of 5 to 30% are common, and oftentimes a reduced nitrogen fertilizer rate of up to 50% will still produce yields equal to the 100% fertilizer rate.

Vitazyme will improve the protein of legumes and grains, and the mineral content of seeds, fruits, leaves, and roots. Digestibility of forages will be increased. Fruit and root color, firmness, and storability will also be enhanced. In addition, soil characteristics such as structural strength, permeability, and bulk density will be improved over time.

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