

# Vitazyme User's Guide

## *An Introduction to the Nature of Vitazyme, How It Works, and the Appropriate Use of This Highly Effective Crop and Soil Biostimulant*

### 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 contain 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 B-vitamins, triacontanol, glycosides, and porphyrins.

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. Besides, 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.

The product 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.

## HOW VITAZYME WORKS

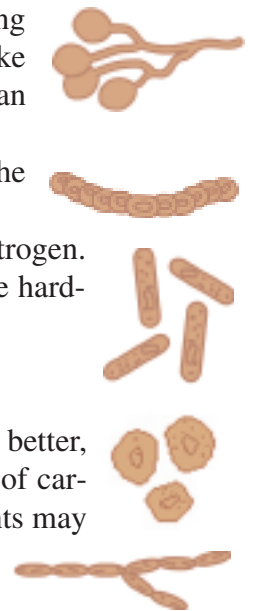
All plants that grow in soils develop an intimate relationship between the roots and the organisms that populate the root zone. The teeming billions of bacteria, fungi, algae, cyanobacteria, protozoa, and other organisms that grow along the root surfaces — the rhizosphere — are much more plentiful than 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.

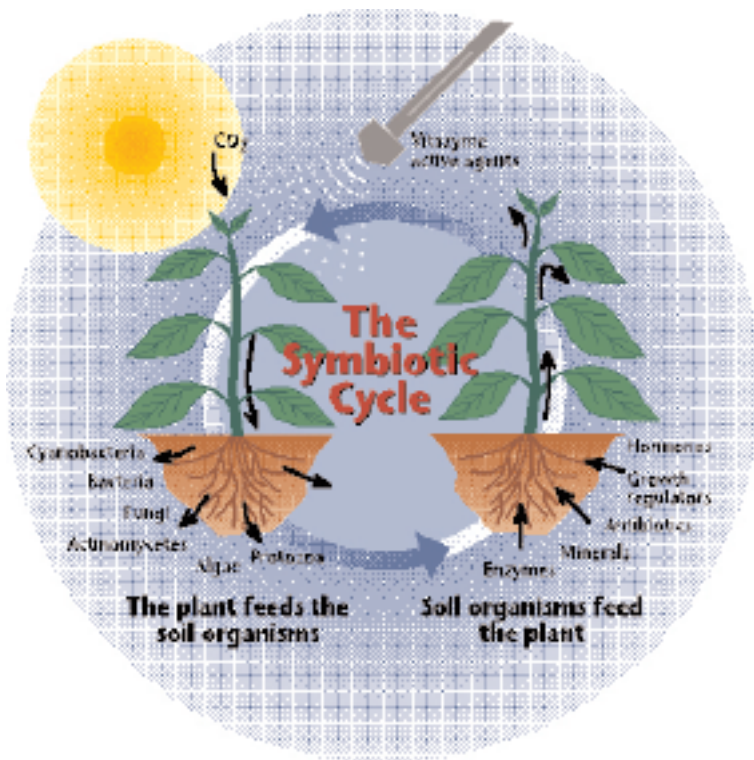
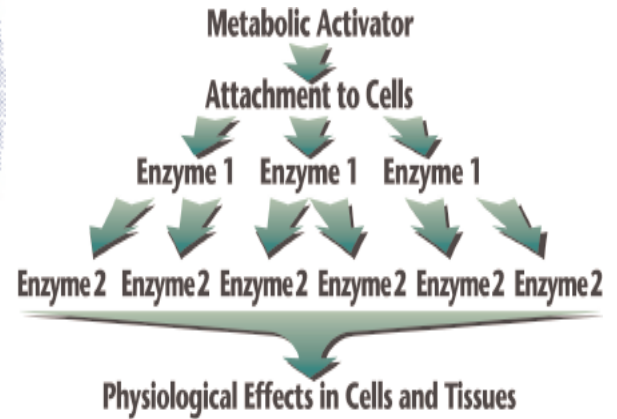
Vitazyme contains “metabolic triggers” that stimulate the plant to photosynthesize better, fixing more sunlight energy in the form of carbon compounds to increase the transfer of carbohydrates, proteins, and other growth substances into the root zone. These active agents may enter the plant through either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

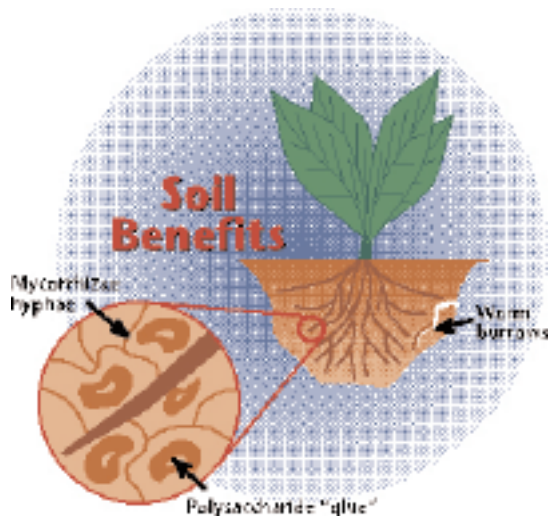


activator. In short, Vitazyme enables the plant to better express its genetic potential by reducing the stresses that repress that expression.

## Enzyme Cascade Effect



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.
- 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 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. Follow the crop recommendations given below.

Vitazyme is very easy and safe to use as well.

- 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 made.
- Soil moisture is needed to activate Vitazyme.

### APPLICATION RATES

**Seeds, Cuttings, Bulbs, and Transplants.** For faster emergence and rooting, dilute at a rate of 1 oz/19 oz of water (a 5% solution) and mist all exposed areas. Allow seeds to dry prior to planting.

**Direct Seed Row Application.** Dilute at a rate of 1 oz/99 oz of water (a 1% solution) and spray onto the seeds prior to covering.

**Liquid Planter Attachment.** Apply 13 oz/acre (1 liter/ha) concentrated around the seed.

**Soil Conditioning (for all temperate field and forage crops).** Apply 13 oz/acre (1 liter/ha) after harvest and before ground freezing.

### CROP RECOMMENDATIONS

**FOR ALL CROPS:**

**LEGUMES: 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. Nitrogen will normally not need to be applied to legumes such as soybeans, kidney beans, field beans, lima beans, alfalfa, and clover except as a starter.

**2. Apply Vitazyme, if possible, to the seeds at or 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. Alternatively — and oftentimes more easily — apply the product directly in the seed row at planting.

**3. Apply Vitazyme to the crop as indicated below.**

**4. 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.

**NON-LEGUMES: 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, but treat nitrogen separately (see point 2).

**2. Reduce nitrogen fertilizer applications to 50 to 80% of amounts required for an optimum yield potential.** Vitazyme will allow plants to make more efficient use of available nitrogen. Reduce amounts each time nitrogen is normally applied. Obtain a score for each of the following items:

	Soil Organic Matter			Previous Crop		Compaction		Soil NO <sub>2</sub> -N Test			
	Low (<1.5%)	Medium (1.5-3%)		Non-legume	Legume	Much	Little	Low	Medium	High	
	1	2	3	1	3	1	3	2	4	6	
Total additive score: Apply this percent of optimum N:	15	14	13	12	11	10	9	8	7	6	5
	← 50-60% →				← 60-70% →			← 70-80% →			

**3. Apply Vitazyme, if possible, to the seeds at or before planting.** Use the recommendations given for

legumes above.

**4. Apply Vitazyme to the crop as indicated below.**

**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.

## **BERRIES — BLUEBERRIES, RASPBERRIES, BLACKBERRIES, DEWBERRIES, ETC.:**

**BERRY FIELD TREATMENTS: Apply Vitazyme. Best:** Apply 1 liter/ha (13 oz/acre) to the soil over the root zone near bud break, and again at 1 liter/ha (13 oz/acre) over both the leaves and soil any time from blossom up to one-third of maximum fruit diameter.

**Good:** Apply 2 liters/ha (26 oz/acre) to the foliage and soil over the root zone at either bud break or early blossom.

**NURSERY TREATMENTS: Treat new cuttings for rooting, or root prunings, with either a 4% Vital Earth Root Activator or a 5% Vitazyme solution.** Soak the portions of the branches or roots to be rooted for 30 to 60 minutes before planting. Then treat the media around the roots with either a 2% solution of Root Activator or a 2% solution of Vitazyme.

**Treat the roots at any transplanting in the nursery, or in the final field transplanting, with an application of either a 2% Vital Earth Root Activator or a 2% Vitazyme solution.** Apply only enough to wet the roots.

## **CEREAL GRAINS – WHEAT, OATS, BARLEY, RYE, TRITICALE:**

**1. Apply Vitazyme, if possible, to the seeds at or 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. Alternatively, apply the product directly in the seed row at planting (see point 2).

**2. Apply Vitazyme to the soil and/or foliage.** Use one of the following schedules.

**SPRING CEREALS: Best:** Apply 1 liter/ha (13 oz/acre) of Vitazyme directly on the seeds at planting. Using an injector to direct the solution on the seeds is an excellent method. Then spray 0.5 to 1 liter/ha (7 to 13 oz/acre) to the leaves and soil at some time from tillering up to the late boot stage.

**Second best:** Spray Vitazyme on the soil at 1 liter/ha (13 oz/acre) after planting but before emergence, and on the leaves and soil at 0.5 to 1 liter/ha (7 to 13 oz/acre) some time from tillering up to the late boot stage.

**Good:** Treat the seeds at planting, or spray Vitazyme on the leaves and soil at 1.5 liters/ha at any time from the 5-leaf stage up to the early tillering stage.

**WINTER CEREALS: Best:** Spray 1 liter/ha (13 oz/acre) of Vitazyme on the soil after fall planting (or inject it directly on the seeds) before emergence. In the spring at greenup, spray 0.5 to 1 liter/ha (7 to 13 oz/acre) on the leaves and soil, and the same amount again at mid-tillering.

**Second best:** Spray 1 liter/ha (13 oz/acre) of Vitazyme on the leaves and soil after emergence but before the first hard freeze. At spring greenup or as late as mid-tillering apply 0.75 to 1 liter/ha (10 to 13 oz/acre) to the leaves and soil.

**Good:** Treat the seeds at planting, or spray 1 to 1.5 liters/ha (13 to 20 oz/acre) of Vitazyme to the leaves and soil in the spring any time from greenup to the boot stage.

## **CITRUS:**

**NURSERIES: Treat the seedlings on a regular basis.** They can be treated in any way that will bring 13 oz/acre (1 liter /ha) of the active agents into the root zone every 30 to 45 days. Use one of the following means: sprinkler irrigation, drip irrigation, or soil drench. A good time to treat potted seedlings is when

transferring them to a larger pot size.

**ORCHARDS:** **1. Treat the roots at transplanting** using a 0.5% Vitazyme root dip (for bare root stock), or a soil drench over the root zone for each tree of about 0.5 oz in one to two gallons of water, depending on the size of the tree.

**2. Apply Vitazyme to the soil and foliage** at 20 oz/acre (1.5 liters/ha) using one of the following schedules:

**Seasonal blossoming:** Apply Vitazyme at leaf flush, and approximately midway through fruit development.

**Continuous blossoming:** Apply Vitazyme every 60 to 90 days during active production.

Application can be made with an orchard or backpack sprayer on the soil and leaves, or by sprinkler or drip irrigation.

## **COFFEE:**

**NURSERIES:** Treat the seeds, if possible, with a 5% Vitazyme solution at planting. Then spray a 1% Vitazyme solution over the seedlings and young plants every 30 to 45 days after emergence until transplanting.

**PRODUCING PLANTATIONS: Best:** Apply Vitazyme to the soil and leaf canopy about the time of maximum bloom at 1.5 liters/ha (20 oz/acre). Then repeat this application to the soil and leaves midway to bean maturation, and again after bean harvest before the period of dormancy.

**Good:** Apply Vitazyme to the soil and leaf canopy at maximum bloom at 20 oz/acre, and again midway to bean maturation.

## **CORN AND SORGHUM:** Apply Vitazyme, if possible, to the seeds at or 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. Alternatively, apply the product directly in the seed row at planting.

**Apply Vitazyme to the soil and/or foliage.** Use one of the following schedules.

**Best:** Apply Vitazyme directly on the seeds at planting at 1 liter/ha (13 oz/acre) using a planter attachment. At knee to waist height, spray 1 l/ha (13 oz/acre) Vitazyme over the plants and soil.

**Second best:** Spray Vitazyme on the soil after planting, but before emergence, at 1 liter/ha (13 oz/acre). At knee to waist height, spray 1 l/ha (13 oz/acre) Vitazyme over the plants and soil.

**Good:** Treat the seeds at planting, or spray 1.5 liters/ha over the plants and soil at knee to waist high.

**COTTON:** Apply Vitazyme, if possible, to the seeds at or 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. Alternatively, apply the product directly in the seed row at planting (see point 2).

**Apply Vitazyme to the soil and/or foliage.** Use one of the following schedules.

**Best:** Apply 1 liter/ha (13 oz/acre) of Vitazyme directly on the seeds at planting. Using an injector to direct the solution on the seeds is an excellent method. Then spray 1 liter/ha (13 oz/acre) to the leaves and soil at early bloom.

**Second best:** Spray Vitazyme on the soil at 1 liter/ha (13 oz/acre) after planting but before emergence, and on the leaves and soil at 1 liter/ha (13 oz/acre) at early bloom.

**Good:** Treat the seeds at planting, or spray Vitazyme on the leaves and soil at 1.5 liters/ha at any time from the 5-leaf stage up to early bloom, early bloom being the best time.

## **FISH AND SHRIMP:**

**FOR FISH AND SHRIMP PONDS, WHICH ARE FIRST DRAINED:** After drainage of the pond, and the soil has become dry enough to walk or drive on, spray 20 oz/acre (1.5 liters/ha) 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 WHICH HAVE 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 6 gallons/acre-foot (60 liters/ha-30 cm) 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 below.

**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 1 ounce/100 lb (60 ml/100 kg) 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.

## **FLOWERS:**

**ANNUALS:** **Apply Vitazyme, if possible, to the seeds before planting.** Treat the seeds with a dilute Vitazyme solution, such as a dip or a spray of a 5% solution. If the seeds are small and/or light, it is best to first plant them and apply a 0.5 to 1.0% solution directly on the seeds in the row. Strive to achieve a 1 to 1.5 liters/ha (13 to 20 oz/acre) overall rate.

**Apply Vitazyme to the soil and/or foliage.** Use one of the following schedules.

**Best:** Apply 1 to 1.5 liters/ha (13 to 20 oz/acre), or a 1% solution to the dripping point, directly on the seeds at planting, using a sprayer or watering can. Apply 1 liter/ha (13 oz/acre), or a 1% solution to the dripping point, on the leaves and soil midway to bloom, and again at first bloom.

**Second Best:** Apply 1 to 1.5 liters/ha (13 to 20 oz/acre), or a 1% solution to the dripping point, directly on the seeds at planting, using a sprayer or watering can. Apply one more application at 1 liter/ha (13 oz/acre) midway to first bloom or at first bloom.

**Good:** Apply 1 to 1.5 liters/ha (13 to 20 oz/acre), or a 1% solution to the dripping point, at planting as above, or 1 to 1.5 liters/ha (13 oz/acre) midway to bloom.

**PERENNIALS:** **Apply Vitazyme to the transplant roots, bulbs, or corms** using enough of a 0.5 to 1% solution to contact roots and bulb or corm surfaces when planted. Alternatively, the roots, bulbs, or corms may be dipped in a 5% Vitazyme solution before planting.

**Apply Vitazyme to the soil and/or foliage.** Use one of the following schedules.

**Best:** For new plantings, treat first as above, and then apply 1 to 1.5 liters/ha (13 to 20 oz/acre) to the soil and/or foliage midway to bloom, and again at early bloom. For established plantings, apply 1 to 1.5 liters/ha (13 to 20 oz/acre) at the first signs of greenup in the spring, and again midway to bloom and at early bloom.

**Second best:** Treat new plantings with the first application at planting, as described above. Then, midway to blossom, apply 1 to 1.5 liters/ha (13 to 20 oz/acre) to the soil and/or foliage.

**Good:** Apply Vitazyme either as indicated above at planting, or midway to blossom at 1 to 1.5 liters/ha (13 to 20 oz/acre) to the soil and/or foliage.

## **GRAPES:**

**VINEYARD TREATMENTS:** Apply Vitazyme using a schedule as follows:

**Best:** Apply 1 liter/ha (13 oz/acre) to the soil over the root zone, or in the soil via an injector system, near bud break, and again at 1 liter/ha (13 oz/acre) over both the leaves and soil at blossom. A third application at the same rate should be made when the grapes are BB-size, and another application can be made at veraison. An application two weeks before harvest will help increase grape sugar.

**Good:** Apply 2 liters/ha (26 oz/acre) to the foliage and soil over the root zone at early blossom. At least two more applications during the season, each at 1 liter/ha (13 oz/acre) at the times indicated above, should be made.

**NURSERY TREATMENTS:** **Treat new cuttings for rooting with either a 4% Vital Earth Root Activator or a 5% Vitazyme solution.** Soak the portions of the branches to be rooted for 30 to 60 minutes before planting. Then treat the media around the roots with either a 2% solution of Root Activator or a 2% solution of Vitazyme.

**Treat the roots of any transplants in the nursery, or in the final vineyard transplanting, with an application of either a 2% Vital Earth Root Activator or a 2% Vitazyme solution.** Apply only enough to wet the roots.

## **GRASSES:**

**HAY AND FORAGES: NEW PLANTINGS: Seeds.** Apply Vitazyme to the seeds at or 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.

**RHIZOMES:** Spray a 1% 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.

**PASTURES:** Spray Vitazyme over the grass at spring greenup at 1 liter/ha (13 oz/acre). Apply Vitazyme again at the same rate every 2 to 3 months during active growth.

**HAY (LEGUME, GRASS, OR MIXED):** Spray Vitazyme at 1 liter/ha (13 oz/acre) to the crop at spring greenup, and after each cutting at 0.5 to 1 liter/ha (7 to 13 oz/acre).

**TURF GRASS: NEW PLANTINGS: Seeds.** Apply Vitazyme to the seeds at planting. Treat the seeds with a dilute Vitazyme solution after spreading the seeds on the soil. Spray a 1.1 to 2 liters/ha (15 to 25 oz/acre) rate (about 0.5 oz/1,000 ft<sup>2</sup>) 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 distribution. Repeat the Vitazyme application at 1 to 1.5 liters/ha (13 to 20 oz/acre) every two months during active growth.

**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 (20 oz/acre). Repeat a Vitazyme application at 1 to 1.5 liters/ha (13 to 20 oz/acre) over the grass every two months during active growth.

**ESTABLISHED TURF:** Use one of the following schedules.

**Temperate zones:** Spray Vitazyme over the grass at spring greenup at 1 to 1.5 liters/ha (13 to 20 oz/acre), and then reapply Vitazyme at the same rate every 2 months during active growth.

**Tropical zones:** Spray Vitazyme at 1 to 1.5 liters/ha (13 to 20 oz/acre) every two months throughout the year. Do not neglect judicious fertility management for infertile tropical soils, with nitrogen reduc-

tions as stipulated above.

## **PEANUTS:**

**Apply Vitazyme, if possible, to the seeds at or 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 on a seeding attachment. It is best to dry the seeds well before planting to avoid bridging in the planter. Alternatively — and oftentimes more easily — apply the product directly in the seed row at planting.

**Apply Vitazyme to the soil and/or foliage.** Use one of the following schedules.

**Best:** Apply 1 liter/ha (13 oz/acre) of Vitazyme directly on the seeds at planting. Using an injector to direct the solution on the seeds is an excellent method. Then spray 1 liter/ha (13 oz/acre) to the leaves and soil when the plants are beginning to peg.

**Second best:** Spray Vitazyme on the soil at 1 liter/ha (13 oz/acre) after planting but before emergence, and on the leaves and soil at 1 liter/ha (13 oz/acre) at pegging.

**Good:** Treat the seeds at planting, or spray Vitazyme on the leaves and soil at 1.5 liter/ha at any time from the 5-leaf stage up to pegging, pegging being the best time.

**POTATOES: 1. Apply Vitazyme, if possible, to the seed pieces at or before planting.** Treat the seeds with a dilute Vitazyme solution, such as 1 liter of a 5% solution for every 50 kg of seed pieces.

**2. Apply Vitazyme to the soil and/or foliage.** Use one of the following schedules.

**Best:** Apply 1 liter/ha (13 oz/acre) of Vitazyme directly on the seed pieces at planting. Then spray 1 liter/ha (13 oz/acre) to the leaves and soil at tuber initiation, and again two weeks before the foliage is killed.

**Second best:** Spray Vitazyme on the soil at 1 liter/ha (13 oz/acre) after planting but before emergence, and on the leaves and soil at 1 liter/ha (13 oz/acre) at tuber initiation.

**Good:** Treat the seeds, or spray Vitazyme on the leaves and soil at 1.5 liter/ha at tuber initiation.

## **RICE:**

**LOWLAND PADDY RICE: In all cases either spray or dip the roots of transplants in a dilute (0.5 to 1%) Vitazyme solution.**

**Best:** Spray 1 liter/ha (13 oz/acre) of Vitazyme on the soil of the drained paddy or field about 5 to 10 days before planting. Allow several days for the product to begin working in the soil before flooding. Then spray 1 liter/ha (13 oz/acre) over the foliage at about early flowering.

**Second best:** Spray 1.5 liters/ha (20 oz/acre) of Vitazyme on the soil of the drained paddy or field about 5 to 10 days before planting. Allow several days for the product to begin working in the soil before flooding.

**Good:** Spray 1 liter/ha (13 oz/acre) over the foliage sometime between the boot stage and early flowering.

**UPLAND FIELD RICE: Best:** Apply 1 liter/ha (13 oz/acre) of Vitazyme directly on the seeds at planting. Using an injector to direct the solution on the seeds is an excellent method. Then spray 1 liter/ha (13 oz/acre) to the leaves and soil at some time from tillering up to the late boot stage.

**Second best:** Spray Vitazyme on the soil at 1 liter/ha (13 oz/acre) after planting but before emergence, and on the leaves and soil at 0.5 liter/ha (7 oz/acre) some time from tillering up to the late boot stage.

**Good:** Treat the seeds, or spray Vitazyme on the leaves and soil at 1.5 liters/ha at any time from the 5-leaf stage up to early flowering.

**RUBBER TREES: Apply Vitazyme.** Spray 1 to 1.5 liters/ha (13 to 20 oz/acre) of Vitazyme over the root zone of the grove, beginning at any time. Follow this application every three months (90 days)

with an identical application. The leaves of the trees may be sprayed as well if desired, using an orchard or aerial sprayer.

It is best to time the Vitazyme applications to precede or follow nitrogen fertilization by 7 to 10 days. In this way the product will not inhibit nitrogen promoting effects. Maximum latex production may be encouraged by timing an application to occur 15 days before tapping the trees.

## **SOYBEANS, FIELD BEANS, PEAS, AND OTHER BEANS:**

**Apply Vitazyme, if possible, to the seeds at or 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 on a seeding attachment. It is best to dry the seeds well before planting to avoid bridging in the planter. Alternatively — and oftentimes more easily — apply the product directly in the seed row at planting.

**Apply Vitazyme to the soil and/or foliage.** Use one of the following schedules.

**Best:** Apply 1 liter/ha (13 oz/acre) of Vitazyme directly on the seeds at planting. Using an injector to direct the solution on the seeds is an excellent method. Then spray 1 liter/ha (13 oz/acre) to the leaves and soil at early bloom.

**Second best:** Spray Vitazyme on the soil at 1 liter/ha (13 oz/acre) after planting but before emergence, and on the leaves and soil at 1 liter/ha (13 oz/acre) at early bloom.

**Good:** Treat the seeds at planting, or spray Vitazyme on the leaves and soil at 1.5 liter/ha at any time from the 5-leaf stage up to early bloom, early bloom being the best time.

## **SUGAR CANE:**

**NEW PLANTINGS:** **Apply Vitazyme, if possible, to the seed pieces at or before planting.** Treat the pieces with a dilute Vitazyme spray or dip (0.5 to 1%) before planting. Alternatively, apply the product directly in the seed row at planting to achieve a 1 liter/ha (13 oz/acre) actual rate.

**Apply Vitazyme to the soil and/or foliage.** Use one of the following schedules.

**Best:** Spray Vitazyme at 1 liter/ha (13 oz/acre) to the soil sometime between 15 and 30 days after planting. Repeat this application over the leaves and soil at 3 months after planting, and again 6 months after planting, or as late as possible when machine traffic is still possible.

**Good:** Treat the seeds, or spray Vitazyme over the leaves and soil at 1 liter/ha (13 oz/acre) about 3 months after planting, and at 1.5 liters/ha (20 oz/acre) about 6 months after planting, or as late as possible when machine traffic is still possible.

**RATOON CANE:** **Apply Vitazyme to the soil and/or foliage.** Use one of the following schedules.

**Best:** Spray Vitazyme at 1 liter/ha (13 oz/acre) to the cut cane field within a few days after harvest. Repeat this application over the leaves and soil about 3 months after harvest, and again 6 months after harvest or as late as possible while machine traffic is still possible.

**Good:** Spray Vitazyme over the leaves and soil at 1 liter/ha (13 oz/acre) as soon as possible after harvest, and at 1.5 liters/ha (20 oz/acre) any time from 3 to 6 months after planting.

**TEMPERATE FRUITS AND NUTS:** **Apply Vitazyme at transplanting.** Use one of the following treatments:

**Root dip:** Dip the bare roots in a 1% Vitazyme solution before planting.

**Root drench:** After planting (either bare root or potted trees), drench the root zone with about 1 or 2 gallons of water containing 1 oz of actual Vitazyme.

**APPLES, PEARS, PEACHES, APRICOTS, PLUMS, CHERRIES, ETC.:** Apply Vitazyme to the soil and foliage.

**At bud break.** In the spring, spray 1.5 liters/ha (20 oz/acre) on the soil over the root zone for large trees.

For small trees, reduce the rate to 1 liter/ha (13 oz/acre).

**At about one-third maximum fruit size.** Spray 1.5 liters/ha (20 oz/acre) on the leaves and soil for large trees. For small trees, reduce the rate to 1 liter/ha (13 oz/acre).

**ALMONDS, PISTACHIOS, PECANS, WALNUTS: Apply Vitazyme to the soil and foliage.**

**At bud break.** In the spring, spray 1.5 liters/ha (20 oz/acre) on the soil over the root zone for large trees. For small trees, reduce the rate to 1 liter/ha (13 oz/acre). Inject through irrigation systems if desired.

**At about one-half maximum nut size.** Spray 1.5 liters/ha (20 oz/acre) on the leaves and soil for large trees. For small trees, reduce the rate to 1 liter/ha (13 oz/acre).

## **TREES:**

**CONIFEROUS AND DECIDUOUS SPECIES: Apply Vitazyme, if possible, to the seeds at or before planting.** Follow one of the following treatment plans:

**Best:** Soak the seeds in a 5% Vitazyme solution for about 6 hours before planting. This is especially useful for hard seeds. Hard seeds can be soaked for up to 24 hours. It is best to dry the seeds before planting.

**Good:** Dip the seeds in a 5% Vitazyme solution just before planting. Alternatively, drench the soil of the seeding media with a 0.5 to 1% Vitazyme solution just after planting.

**Apply Vitazyme to the soil and foliage.** Apply 1 liter/ha (13 oz/acre) of Vitazyme directly on the seeds before or at planting (see above). Spray 13 oz/acre — about 0.3 to 0.5 oz per 1,000 square feet — over the leaves and soil at seedling emergence and every 30 days thereafter while the trees remain potted. Then, after planting the trees in a forest or landscape setting, apply Vitazyme at 13 oz/acre over the root zone every 60 to 90 days during active growth. Vitazyme can be applied through a drip or sprinkler irrigation system; use the same rates as already given.

**At transplanting:** Water the transplanted tree thoroughly, and then apply about 1 to 2 gallons of water to each tree containing the following amounts of Vitazyme:

Small tree (<3 ft): 0.2 oz

Medium tree (3 to 6 ft): 0.5 oz

Large tree (6 to 10 ft): 0.7 oz

Very large tree (>10 ft): 1 oz or more, depending on the size

## **TROPICAL FRUITS AND NUTS – BANANA, MANGO, PAPAYA, GUAVA, PINEAPPLE, BRAZIL NUT, AND PISTACHIO:**

**1. Treat the corms or plants at transplanting.** When new corms or plants are planted, apply a soil drench over each site of about 0.5 to 1 oz (14 to 28 ml) of Vitazyme in two gallons (8 liters) of water.

**2. Apply Vitazyme to the soil** over the root zone at 1.5 liters/ha (20 oz/acre) every 45 to 60 days with backpack sprayers. Concentrate the spray over the zone of greatest root development, usually alongside the developing tiller, but all soil surfaces should be treated. Vitazyme may also be applied through drip or spray irrigation systems.

## **VEGETABLES:**

**ROOT CROPS – CARROTS, BEETS, TURNIPS, RUTABAGAS, ETC.: 1. Apply Vitazyme, if possible, to the seeds at or before planting.** Treat the seeds with a dilute Vitazyme solution, such as 1 liter of a 5% solution for every 50 kg of seed; for small lots of seed, a spray with a 5% solution will do. Mix the seeds and solution together thoroughly in a seed 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. Alternatively, apply the product directly in the seed row at planting (see point 2). For small plantings and gardens, one may spray a dilute solution (0.1 to 0.5%)

on the seeds and soil in the row before covering.

**2. Apply Vitazyme to the soil and/or foliage.** Use one of the following schedules.

**Best:** Be sure to treat the seeds (see point 1). Apply 1 liter/ha (13 oz/acre) of Vitazyme to the soil shortly after planting. Then spray 1 liter/ha (13 oz/acre) on the leaves and soil midway through the growing cycle.

**Second best:** Treat the seeds (see point 1). Then spray Vitazyme on the soil and leaves at 1 liter/ha (13 oz/acre) about midway through the growing cycle.

**Good:** If it is impossible to treat the seeds, spray 1 liter/ha (13 oz/acre) of Vitazyme on the soil shortly after planting. Spray the leaves and soil again at 1 liter/ha (13 oz/acre) about midway during the growth cycle. **If only a single application is made, spray 1.5 liters/ha (20 oz/acre) of Vitazyme on the leaves and soil sometime between planting and midway through the growth cycle, preferably within a few days of planting.**

**BRASSICAS – CABBAGE, BROCCOLI, CAULIFLOWER, BRUSSEL SPROUTS:** **1. Apply Vitazyme, if possible, to the seeds at or before planting, and to the transplant roots at transplanting.** Treat the seeds with a dilute Vitazyme solution, such as 1 liter of a 5% solution for every 50 kg of seed; for small lots of seed, a spray with a 5% solution will do. Mix the seeds and solution together thoroughly in a seed 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. Alternatively, apply the product directly in the seed row at planting (see point 2). For transplants, dip the roots in a 1% Vitazyme solution at planting, or spray them with a 5% solution. Alternatively, the transplants can be watered soon after planting with a dilute solution to give an equivalent of 0.5 liter/ha (7 oz/acre).

**2. Apply Vitazyme to the soil and/or foliage.** Use one of the following schedules.

**Best:** Be sure to treat the transplants (see point 1). Apply 1 liter/ha (13 oz/acre) of Vitazyme to the soil and plants shortly after transplanting. Then spray 1 liter/ha (13 oz/acre) on the leaves and soil about midway through the growth cycle.

**Second best:** Treat the transplants (see point 1). Then spray Vitazyme on the soil and leaves at 1 liter/ha (13 oz/acre) about midway through the growth cycle.

**Good:** If no transplant treatment is used, spray 1 liter/ha (13 oz/acre) of Vitazyme on the plants and soil immediately after transplanting. Spray the leaves and soil again at 1 liter/ha (13 oz/acre) about midway through the growth cycle. If only a single application is made, spray 1 to 1.5 liters/ha (13 to 20 oz/acre) of Vitazyme on the leaves and soil sometime between planting and midway through the growth cycle.

**LONG SEASON CROPS – TOMATOES, CUCUMBERS, MELONS, ETC.:** **1. Apply Vitazyme, if possible, to the seeds at or before planting, and to the transplant roots at transplanting.** Treat the seeds with a dilute Vitazyme solution, such as 1 liter of a 5% solution for every 50 kg of seed; for small lots of seed, for small lots of seed, a spray with a 5% solution will do. Mix the seeds and solution together thoroughly in a seed 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. Alternatively, apply the product directly in the seed row at planting (see point 2). For transplants, dip the roots in a 1% Vitazyme solution at planting, or spray them with a 5% solution. Alternatively, the transplants can be watered soon after planting with a dilute solution to give an equivalent of 0.5 liter/ha (7 oz/acre).

**2. Apply Vitazyme to the soil and/or foliage.** Use one of the following schedules.

**Best:** Be sure to treat the transplants (see point 1). Apply 1 liter/ha (13 oz/acre) of Vitazyme to the soil and plants shortly after transplanting. Then spray 1 liter/ha (13 oz/acre) on the leaves and soil at early bloom, and an additional 0.5 liter/ha (7 oz/acre) every 30 days thereafter during active fruiting.

**Second best:** Treat the transplants (see point 1). Spray 1 liter/ha (13 oz/acre) of Vitazyme to the plants and soil within a week after transplanting, and again at early bloom.

**Good:** If no transplant treatment is used, spray 1 liter/ha (13 oz/acre) of Vitazyme on the plants and soil immediately after transplanting. Spray the leaves and soil again at 1 liter/ha (13 oz/acre) at early bloom.

## **RESULTS TO EXPECT**

Vitazyme will boost yields and crop quality of all crops. Note the results in the annual field trial results booklets 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.

Crop quality will be improved such as 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 usually be enhanced as well. In addition, soil characteristics such as structural strength, permeability, and bulk density will be increased when Vitazyme is used over time.