The Vital Earth News

Agricultural Edition

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Where Have All the Bees Gone?

Without Enough Pollinators Our Crops Are in Trouble!

By Paul W. Syltie, Ph.D.

A strange plague has gripped the country and many areas of the world: honey bee colonies are suddenly disappearing. This disappearance has approached apocalyptic proportions as an estimated quarter of America's 2.4 million bee colonies have disappeared, simply failed to return to their hives.[1] This means about 40 billion bees have died in less than a year ... and without a proven cause in sight.

What is happening is nothing short of total mystery. Although the stricken colony appears to be normal — larvae continue developing and the queen lays her eggs — the workers suddenly (or gradually, scientists aren't sure which) fail to return to the hive. Before long the hive is left with only a few mature bees caring for the developing brood, the immature bees, and the queens. The normal 40,000 to 80,000 bees in the healthy hive have dwindled to only a few thousand. This scenario has been dubbed Colony Collapse Disorder (CCD.[2]

As if that desertion is not strange enough, nearby bees, wax moths, other insects, or animals that would soon raid a deserted hive will not touch CCD hives for some time. Eventually they will; what are the scavengers waiting for?

Why So Serious a Problem?

With at least 22 states reporting these unusual colony deaths, with some commercial beekeepers losing more than half of their bees, and 60 to 70% losses common on both the East and West Coasts[3], the losses are anything but minor. Even in England, Japan, Brazil, and other countries CCD has been reported.

The matter of bee losses might not be so serious an issue except that the beekeeping industry underpins agriculture in the United States by a value of at least $15 billion. As a USDA-ARS researcher said, "If you can imagine eating a bowl of oatmeal every day with no fruit on it, that's what it would be like [without honeybee pollination]."[4] About a third of U.S. crops require insect pollination, including almonds, broccoli, peaches, soy-

Honey bees pollinate more than 90 food, fiber, and seed crops, including the fruits, vegetables, and nuts that are the cornerstones of a balanced and healthy diet.

See Are Pesticides and GMOs, page 2

This Is Your 20th Anniversary Copy!

Welcome to the 20th issue of *The Vital Earth News — Agricultural Edition*. It is our hope at Vital Earth Resources that this edition will be a real joy to read and an encouragement to think about topics of genuine importance for modern agriculture.

Summer 2005 issue

Farming is not an easy occupation in this modern age. It never has been easy. Each year brings with it unique sets of problems, but the basic principles of crop production never change ... and never will change. Plants are plants, and they have their needs.

Summer 2000 issue

It is our sincere hope that the information you receive through this source will be timely and thought-provoking, an asset well worth your time to explore. We will attempt to make the next issues interesting and exciting, and address problems of concern to you. Please feel free to contact us with topics that may interest you for future editions, and we will include them if we can.

In the meantime, have an excellent year farming!

Summer 2004 issue

Are Pesticides and GMOs to Blame?

Continued from page 1

beans, apples, pears, cherries, raspberries, blackberries, cranberries, strawberries, and many more.[5]

Other types of bees or insects can pollinate some crops, but not on a commercial scale as can honey bees. Some species of bumblebees have been useful for some crops, but their use can hardly be seen on the radar screen as yet.

In the sensationalism that the press has kindled since CCD was first identified, Albert Einstein was even attributed to have stated, "If the bee disappeared from off the surface of the globe, then men would only have four years of life left."[6] Yet, his purported quote might not be too far-fetched, so integral is the honeybee to agricultural productivity and environmental integrity.

Possible Causes of CCD

Scientists have struggled to understand the causes of bee colony collapse, but so far have been unable to pinpoint the cause. Possible culprits:

1. Weakened immune systems of the bees may be afflicted by a disease analogous to AIDS in humans, wherein a pathogen is able to multiply because the organism's natural immunity is compromised. For instance, military researchers at Edgewood chemical Biological Center claim to have narrowed the likely cause of CCD to a virus, a micro-parasite, or both.[7] Other researchers have isolated various fungi in the bees of CCD hives.

2. Tied closely to point 1, pesticides applied to field and orchard crops., Foraging worker bees that contact various insecticides will develop suppressed immune systems, if they are not killed outright in the field. Weakness in immunity leads to disease syndromes of various sorts: bacterial, fungal, or viral. Especially linked has been the chemical imidacloprid, sold under the trade name Gaucho. This chemical has been banned in France due to its effects on bee colonies.[8] In France it was discovered that bees became disoriented by the chemical and failed to return to their hives. Pesticide use has increased 50-fold since 1950 and could conceivably account for CCD.[9]

3. Stressful beekeeping practices, also closely tied with point 1. Honey bee colonies are oftentimes transported for hundreds or thousands of miles on bumpy trucks, like from North Dakota to California, so summertime nectar collection in the North can be supplemented by pollination of almonds, oranges, and other blossoming fruit trees in California

Chemicals sprayed into the atmosphere have been shown to contain barium and microorganisms, both of which can be toxic to bees.

Applications of pesticides to all types of crops (2.5 million tons a year) has had a major effect on the ecosphere, and may be responsible for CCD.

in the winter. Many beekeepers also utilize plastic foundation comb that is slightly larger than natural comb, which create worker bees that are half again larger than normal. On top of that, bees are usually fed fructose or other sugars during the off-season; refined sugars are surely not beneficial in the long run for bees. In most cases, pesticides are applied in the hive to suppress mites, and antibiotics are fed as well. These and other stresses can encourage pathogens.

4. GMO (genetically-modified) plants. These plants produce unnatural gene sequences incorporated from sources like soil organisms or even mice, to give them attributes like glyphosate resistance, or the ability to inhibit or kill corn borers and rootworms. The pollen or nectar that bees collect from these plants may contain toxic compounds that, when taken to the hive, compromise bee health or disorient them.

5. Cell phone use. There is evidence that cell phone radiation will disorient bees, as proven by bees becoming confused in their flying habits when a cell phone is placed near the hive.[10] The proliferation of cell phone towers and cell phones throughout the country could possibly disorient foraging bees.

6. Climate change. Bees are fine-tuned organisms, and any disruption in weather patterns can alter their behavior. Rising temperatures, erratic and dramatic changes in temperature, or other weather upsets may disturb their habits.

7. Chemtrail spraying. The top-secret practice of chemical spraying across much of the United States and in other countries may be introducing chemical substances into bees and the flowers they visit, which in turn could disorient them, or reduce their immunity. These aerial sprayings have been found to contain barium, bromine, and an array of microorganisms and fibers, some of which are pathogenic.

The Solution

A most telling fact behind all of these reports of massive bee losses to CCD, and the possible causes, is the prosperity of organic beekeepers this past year. While 40 billion commercially kept bees died, organic colonies thrived. According to Sharon Labchuck, an organic beekeeper from Prince Edward Island,

"... no one in the organic beekeeping world, including commercial beekeepers, is reporting colony collapse on this list [of about 1,000 such beekeepers]. The problem with the big commercial crops is that they put pesticides in their hives to fumigate for varroa mites, and they feed antibiotics to the bees. They also haul the hives by truck all over the place to make more money with pollination services, which stresses the colonies".[12]

The answer seems simple enough: keep pesticides, refined sugars, artificial comb, and other unnatural things away from the bees. Let them forage in areas

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Milk, a Great Food in the Raw State

by Ron Schmid, ND

[An excerpt from The Untold Story of Milk*, available through Acres USA (800-355-5313).]*

Over thirty years ago, I moved to Martha's Vineyard, ill but with a stubborn belief that I could find my own solution to my severe intestinal problems. I started buying raw milk at Fred Fisher's dairy farm in West Tisbury, drinking some fresh and using the rest to make yogurt or "clabbered milk." My intestinal problems mysteriously cleared up. Several years later I went on to medical school and became a naturopathic physician.

In the years since, I've recommended raw milk and the foods you can make from it to most of my patients. I send them to Debra Tyler's local farm in rural Connecticut because she feeds her Jerseys only grass and hay, and I've found that makes for the best milk. I've never known one of my patients to have a problem with raw milk, though I've read accounts of many people who have.

Over 95 percent of America's dairy farmers drink their raw milk. I've asked a number of them why, and the answers range from, "Tastes better" to "Makes me feel good" to "Don't like store-bought food." Maybe they're on to something.

Did you know that raw milk and its products shaped the cultures that founded western civilization? The earliest human artifacts include vessels containing residues of milk. Where people have gone, the ox and his kind have followed. Rome was built on ground blessed by libations of milk. In America, the arrival of a shipload of cows saved the Jamestown colony from starvation. Cows went west with the settlers, hitched behind wagons pulled by their brothers the oxen, feeding families and calves alike. The bovine tribes have been our best animal friends for a long, long time.

Those contented cows fed on green pastures, and when that began to change in the 1800s our relationship with bovines began to deteriorate. The decline began with distillery dairies and continued as

cities grew. In those dairies, confined, diseased and abused cows were fed the acid waste products of whiskey making. The milk they produced often led to disease; the solution proposed was pasteurization.

In recent years, we've seen the growth of modern confinement dairies where cows never leave their stalls. Though conditions generally are not as bad as those of the distillery dairies, many of these cows are sick with mastitis and other chronic conditions. These facilities now produce something like 70 percent of our milk in the United States.

Many people want an alternative to modern commercial milk, and hundreds of thousands of Americans — perhaps millions — are drinking organic milk today. A growing number are going to great lengths to obtain raw milk from healthy cows, and many more have grown curious about raw milk and want more information. Accurate information about raw milk can be hard to come by; advocates and detractors often appear at loggerheads and both sides are prone to erroneous and unsubstantiated claims.

The primary factor polarizing the climate, however, is the fact that many of the medical and public officials who denigrate raw milk are tied to a system that demands compulsory pasteurization of all milk. As a result, with the exception of a few states, raw milk is available for purchase only at relatively few farms, if at all. In 15 states all sales are outlawed; in Canada, it is against the law for a farmer to even give raw milk away (the penalty for breaking that law can be a $250,000 fine and three years in jail)....

The very best milk comes from healthy animals that spend most of their time outdoors on fresh pasture eating lots of grass, supplemented seasonally by high quality hay, green chop, root vegetables, and perhaps a little grain. Compared to milk from confinement cows fed mostly grains as well as various types of waste products like leftover bakery goods and citrus peel, such milk is rich in a variety of nutrients. In fact, "summer milk", as it used to be called, is a completely different food from the milk generally available today. ❐

Where Is Family Farming Headed?

A Brief Grass Roots Look At American Agriculture

By Paul W. Syltie, Ph.D.

Take a look at where family farming has gone in a matter of just 50 years ... from being the backbone of American agriculture to a marginalized relic. Forced to change due to economic and social pressures, the owner-operated farm has been under continuous assault for decades, and is becoming increasingly rare.

"Where Is the Family Farm Headed" has been written as a three-page article, available from Vital Earth Resources.

Request your copy as a pdf version, or as a printed article by writing us here at Vital Earth. You may also contact the author directly at pwsyltie@yahoo.com.

The days of the one-room schoolhouse, 160-acre farms, closely integrated communities based around the farm economy, and supportive family and friends living close by remind us of a culture that believed in high moral standards and a bright future for the country. Are we seeing signs of a return to this by-gone culture? Read the article and find out! ❐

15-Minute Soils Course

Lesson 25:

Phosphorus (P): the Plant's Energy Master

We have examined nitrogen and potassium to some depth in these lessons. Now let us look at phosphorus (P), the energy storage powerhouse of all living things.

While P (as P_2O_5) comprises only 0.05% of typical soils, plants concentrate it to about 0.33% in their tissues. Although its level is less than for nitrogen and potassium, its presence is critical for living systems. P is involved with all aspects of plant function (below).

1. Cell division and fat and albumin formation
2. Flowering, fruiting, and seed formation
3. Crop maturation, countering the effects of excess nitrogen
4. Root development, especially lateral and fibrous roots
5. Strength of straw of grains: less lodging
6. Crop quality, especially leaves and roots
7. Resistance to certain diseases

How Phosphorus Works

One of the most important functions of P in plants is to store energy. In photosynthesis, solar radiation is absorbed by pigments such as chlorophyll, which produces ATP (adenosine triphosphate). This ATP, together with NADPH (nicotinamide adenine dinucleotide phosphate), which also is generated by the chloroplast, reduces CO_2 (carbon dioxide) to carbohydrate. From this basic carbohydrate structure all of the other compounds of cells and tissues — proteins, fats, vitamins, and so forth — are generated.

The "Phosphorus Problem"

In agricultural soils there are problems in making P available. Note the table here which shows the amount of nutrient added by fertilizers and removed by crops.

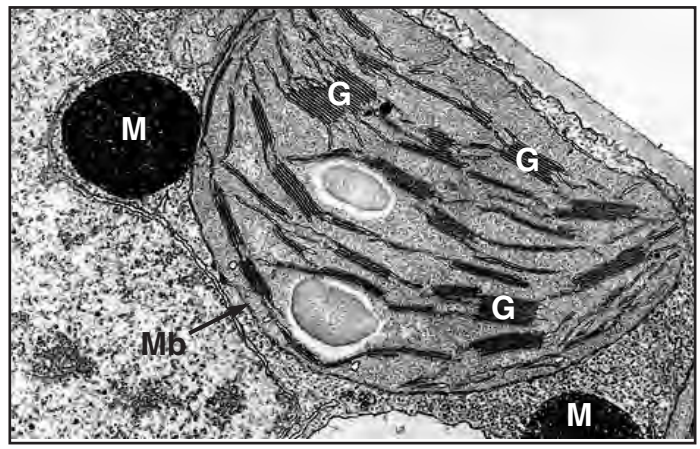
	N	P	K
	thousands of tons, 1965		
Removal by crops	8,838	1,207	4,152
Added in fertilizers	4,580	1,499	2,313
Addition % of removal	52%	124%	56%

It is clear that the efficiency of use of P fertilizers is by far the lowest of the three major nutrients. This is because ...

1. There is only a small amount of P in soils.
2. This soil P is mostly unavailable to plants.
3. Added soluble P is quickly "fixed" by soils and made unavailable.

Why do soils fix P in fertilizers and make it unavailable so quickly? The added P tends to stay where it is placed by becoming chemically bonded to clays and organic matter. About 50 to 70% of soil P is complexed within organic matter. The $Ca(H_2PO_4)_2$ form of P in superphosphate, on reaction with water, produces H_3PO_4 (phosphoric acid), which dissolves iron (Fe), aluminum (Al), and manganese (Mn) in acid soils, and calcium in alkaline soils. The compounds produced are very insoluble and not available to plants. Also, insoluble hydrated oxides of Fe, Al, and Mn are produced with $H_2PO_4^{-1}$. The reaction is as follows:

$$Al(OH)_3 + H_2PO_4^{-1} \longleftrightarrow Al(OH)_2H_2PO_4 + OH^{-1}$$



An electron micrograph of a chloroplast in a leaf cell shows the photosynthetic machinery: grana (G); mitochondria (M); membrane (Mb).

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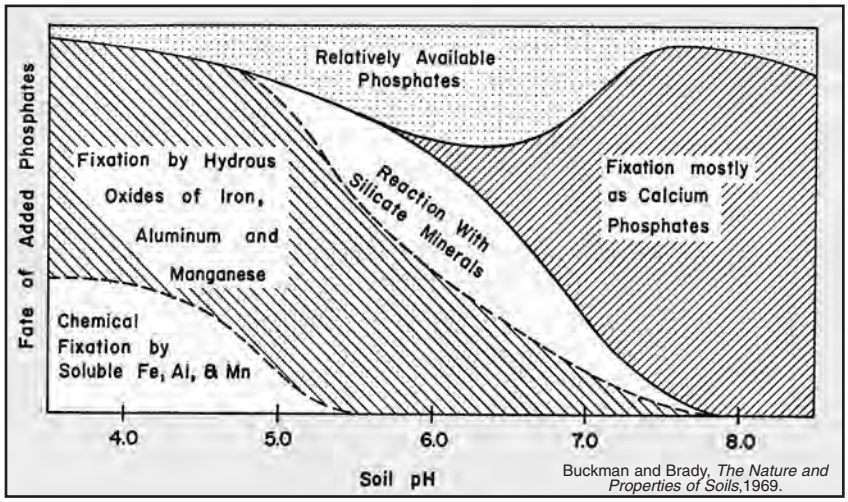
15-Minute Soils Course



Buckman and Brady, *The Nature and Properties of Soils*,1969.

Overcoming the Phosphorus Problem

Plant roots take up P ions within only a few micrometers of their surfaces, so to enhance uptake it is important to have as many fine root hairs as possible within the root zone. Even these fine roots usually do not provide enough surface area to absorb the plant's needs, so nature has provided a more efficient means of P uptake: ***mycorrhizal fungi***. There symbiotic fungi, covered in Lessons 2, 15, and 18, produce "arbuscules" within root cortex cells, where the fungus and root cell exchange nutrients.

An arbuscule of vesicular arbuscular mycorrhizae exchanges nutrients between the plant and fungus, like a placenta in mammals.

The plant gives energy through carbohydrates and other compounds while the fungal mycelia reach into the surrounding soil to scavenge for nutrients, especially the immobile ones like P, Zn, Cu, Fe, and Mn. These are sent back to the roots where they are exchanged at the arbuscules into the root cells.

Plants can sense that they need the mycorrhizae for P uptake. In low P soils (below about 135 ppm by the bicarbonate method) the fungi thrive — and do best at 50 ppm — but above 135 ppm they die off. They also die when 100 mg of P (or more) per kg of soil is added. Roots can even eject the mycorrhizae if soil P is increased enough.

Mycorrhizae are thought to take up P like roots do, but because they create such a massive feeding volume with their countless mycelia extending out beyond the root depletion zone — up to 8 com from the root — they can take up 70 to 90% of the plant's P needs.

Thus, to improve P uptake for plants improve soil structure and aeration and reduce pesticide use so the mycorrhizae can multiply.

See How Much You Learned

1. Phosphorus is just as critical as nitrogen and potassium in plant nutrition. T or F
2. _____ fungi are very important for the uptake of soil P.
3. Phosphorus is involved with energy storage in cells, storing it in _____ and _____.
4. Which of these effects are due to P? a. Stronger straw b. More fibrous roots c. Countering excess nitrogen d. More flowers
5. Calcium phosphates in soils are largely unavailable to plants. T or F
6. Hydrous oxides of __, __, and Mn form in acid soils and are highly unavailable to plants.
7. Which of these is not a part of the "phosphorus problem"? a. P gets rapidly fixed in soils; b. There is not much P in native soils; c. P is easily lost to the air.

Answers: 1. T; 2. mycorrhizal; 3. ATP, NADPH; 4. a, b, c, and d; 5. T; 6. Fe, Al; 7. c.

Making the Most of Commercial N

By Paul W. Syltie, Ph.D.

The effects of commercial fertilizers — especially nitrogen (N) — on soils are oftentimes not well understood. That ignorance in no wise negates the powerful effects they have, however, effects that have been known for decades but often understated. They are often negative, so farmers should find ways to minimize their impact.

Soil Acidification

Nitrogen fertilizer, especially anhydrous ammonia (ANA), has been known for years to solubilize organic matter in the application band, reducing soil humus levels unless aggressive efforts are made to return organic residues. ANA has been used to harden soils in the preparation of military landing strips.

Besides organic matter reduction, ANA and other chemical N sources also replace ions from many exchange sites on clay and organic matter.with hydrogen ions (H^+), kicking off exchangeable calcium, magnesium, potassium, and other ions. This process reduces soil pH, sometimes rather rapidly and especially if the cation exchange capacity is low. The association of Official Agricultural Chemists recognizes that 1.8 lb of pure calcium carbonate is required to neutralize the acidity resulting from the addition of each pound of fertilizer N.

Urea and other N fertilizers are not as aggressive in reducing soil pH as is ANA, likely because these fertilizers do not physically dissolve organic matter in the band upon application. Organic additions of N, such as manure, compost, legumes, and crop residues do not cause a pH reduction due to their complement of calcium and other neutralizing cations, plus the natural buffering effect of organic compounds. These organic materials are much preferred over chemical N sources if available.

1.8 lb of pure calcium carbonate is required to neutralize the acidity resulting from the addition of each pound of fertilizer N.

Earthworms, Mites, and Microbes

All types of N fertilizers can markedly affect soil macro and microfauna. In a study on bluegrass sod in Kentucky, earthworm biomass in the spring was reduced by 80% in response to the high N fertilizer application; in the fall the reduction was 54%. Presumably soil acidification prompted the decreases since calcium is important for earthworm metabolism. Not all studies have shown such worm population reductions with N increases, however. Several species of mites that consume thatch and other organic residues were also reduced in this bluegrass study.

Fertilizers generally increase soil bacterial populations as compared to fungal populations. In general, beneficial fungi are preferred proportionately over bacteria in soil environments, though both groups are important. Tillage operations are oftentimes associated with fertilization, and the fracturing of the soil along with high N applications tends to deplete populations of larger organisms such as protozoa, mites, earthworms, and larger N-fixing algae. These larger organisms are highly important for maintaining soil structure and pathogen control. The mycorrhizal fungi are especially vulnerable to fertilizer and pesticide applications. Their reduction may severely limit the uptake of phosphorus and other immobile elements.

To reduce the risk of drops in soil pH and loss of beneficial soil organisms, it is advisable to incorporate as many organic amendments as possible into the crop management program. Adding N through legumes in a crop rotation is always a good practice. Liming is essential for reversing pH drops with high N applications. Organic materials serve as buffers to pH variations, aid in the release of available nutrients, reduce soil temperature extremes, and help maintain good moisture and air movement for optimum crop yields and profits. ❐

BE SLOW TO CONDEMN

Years ago a 10-year-old boy approached the counter of a soda shop and climbed up on a stool. "What does an ice cream sundae cost?" he asked the waitress.

Fifty cents," she answered.

The youngster reached deep into his pockets and pulled out an assortment of change, counting it carefully as the waitress grew impatient. She had "bigger" customers to wait on.

"Well, how much would just plain ice cream be?" the boy asked.

The waitress responded with noticeable irritation in her voice, "Thirty-five cents."

Again, the boy slowly counted his money. "May I have some plain ice cream in a dish then, please?" He gave the waitress the correct amount, and she brought him the ice cream.

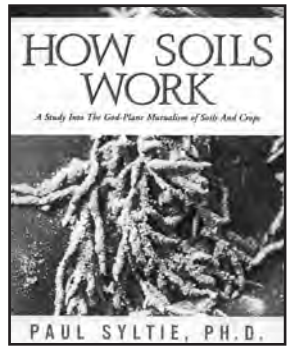
Later, the waitress returned to clear the boy's dish, and when she picked it up she felt a lump in her throat. There on the counter the boy had left two nickels and five pennies. She realized that he had had enough money for the sundae, but sacrificed it so that he could leave her a tip.

The moral: ***Before passing judgement, first treat others with courtesy, dignity and respect.***

Bits and Pieces**, sample issue.**

What Makes Soil Work?

Learn the intriguing facts that enable soils and plant roots to interact and make plants grow. This eye-opening book explains in layman's terms how microbes, minerals, and the environment interact with plant genetics to give us the plants that feed and clothe us. Order from Amazon.com or Virtualbookworm. com.



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where pesticides are not used, and curtail or eliminate transport by truck to far-away places.

Given positive inputs and tender loving care, bees will utilize their God-given talents to even keep away mites. Yet, within a world that promotes heavy pesticide use in fields and encourages bigness and profit-maximization among beekeepers, the urge to add stresses to bees is strong. On the other hand, for beekeepers to survive they may be forced to take a closer look at how they can minimize bee stresses and improve their immune response or watch their colonies disappear into thin air. If the bees disappear, will civilization follow?

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The Future in N Use: Growth Regulators

By Gordon L. Berg

[Editor of *Farm Chemicals*, extracted from his Editorial, October, 1983]

The next big area of nitrogen utilization is linked to plant growth regulators .... As in the early days of nitrogen promotion on corn, there are many skeptics who question higher rates of nitrogen on small grains because of lodging. The answer is plant growth regulators.

Take Union Carbide's Cerone ethephon, for example. We know that lodging can be prevented in small grains using Cerone because European farmers have been using it since 1978. It both reduces the length of internodes and gives plants added straw strength. Cycocel (chlormequat chloride) is another success story.

We at *Farm Chemicals* believe that we're on the edge of a new frontier as North American farmers intensify their management in the same manner as European farmers have for many years. Additional application of nitrogen made possible by use of plant growth regulators has increased yields of wheat as much as 45%. And use of PGRs has also paid off in reduction of time required to harvest and dry small grains. Intensive management is being developed in both old and new growing areas, with states like Virginia predicting 100 bushel/acre wheat yields.

The word is that "fertilizer people are nuts if they don't capitalize on the new technology!" Will you be on the cutting edge of this new frontier? ❒

Whoever would have thought that the words of Gordon Berg would be so prophetic. The natural brassinosteroids, triacontanol, and glycosides in Vitazyme — all of them growth regulators — produced these dramatic effects in cotton (top, Texas A&M, 2006), and corn (bottom, Univ. of Minnesota).

These growth regulators have been shown to improve nitrogen utilization in many crops.

Statement of Purpose

Vital Earth Resources is a for-profit private corporation dedicated to the development, production, and sale of top-quality, ecologically sound horticultural and agricultural products. *The Vital Earth News* is a periodic publication of Vital Earth Resources to inform customers and other interested parties about our products and programs, and to educate our readership on critical issues facing growers today and in the future. If you would like to receive future issues of this newsletter or product information, simply fill out the form on the right and mail it to us.

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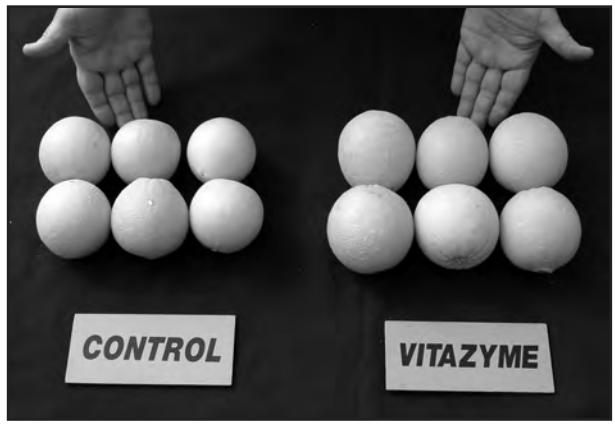
Vitazyme has greatly improved the yield and quality of oranges in California by increasing fruit size, enhancing color, reducing puff and droppage, and reducing frost damage from a severe freeze in January, 2007. Profits have likewise been boosted dramatically, in some blocks by over $1,000 per acre.



Three applications of Vitazyme at 20 oz/acre increased fruit size, color, and quality.

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