



## **A Newsletter For The Clients Of Agri-Technologies, Inc.**

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### **Gypsum- Valuable Product to Agriculture W. Scott Weathington**

Many years ago, most of us recall gypsum being used only as a pegging treatment in peanuts. When plasti-culture was started on farms in the eastern US, we soon recognized the benefits from applying gypsum in other production situations. Gypsum has become such an essential part of our production program that we are now using it on virtually all irrigated crops. It would not surprise me to see gypsum become a standard treatment in tobacco production as well as no-till cotton production in the near future.

There are two natural forms of gypsum: anhydrite ( $\text{CaSO}_4$ ) and dihydrate ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ). Chemically, the only difference between them is that the dihydrate contains two molecules of crystallized water. Both of these materials go into the soil solution immediately after rain or irrigation and the time taken for the smaller particles to get into solution can actually be measured in seconds, which is a great contrast to the soil reaction time of limestone. There are many forms of gypsum. As a result, it is important to test a source before using it to determine quality and if there are contaminants that can influence crop production and/or quality. By-product gypsum, for example, can contain large amounts of other chemicals including citric acid, which can lower soil pH. Some sources contain large amounts of moisture, which adds to freight cost and impacts the amount of calcium sulfate you actually get in a ton. One form of by-product gypsum that is very similar to natural gypsum is associated with phosphate production. This material is an excellent and economical material but is sometimes difficult to spread and contains a fair amount of moisture. My experience with this material indicates that you can improve the physical properties by storing it for a year under plastic before application.

### ***Major Benefits of Gypsum***

- Economical source of calcium and sulfur with no effect on pH.
- Improves soil structure and reduces compaction.
- Flocculates sand, silt, and clay particles and promotes more rapid humus production. This, in turn, improves water and air movement and promotes root aeration.
- Improved water penetration and irrigation efficiency.
- Displaces salts like sodium and in some cases magnesium to reclaim high salt soils and improve the balance between calcium and magnesium. As a rule of thumb there should be 16 times more calcium in a soil than sodium. Sodium should never occupy more than 15% of the CEC.
- Reduces permeability problems resulting from the use of high bicarbonate irrigation water.
- Enhances water use efficiency by 25 to 100 percent allowing the grower to achieve the same results with less water.
- Improves soil aeration and promotes better root growth.
- Reduces run-off, erosion, and soil crusting by forming larger and more stable soil aggregates.
- Reduces acidity in the subsoil by displacing aluminum deep in the soil profile subsequently promoting deeper rooting.
- Promotes accumulation of organic matter more rapidly.

### ***Injecting Gypsum in Drip Irrigation Systems***

Supplying calcium needs and preventing or solving soil permeability and salt problems can be achieved by injecting gypsum. High quality bulk and bagged gypsum is now available. The product we have worked with is called Aqua-Cal from US Gypsum. This material can be injected in drip irrigation systems as well as applied through pivot or sprinkler irrigation systems.

There are two forms of gypsum, dihydrate and anhydrite. The dihydrate form dissolves readily in water. Normally 90% of the gypsum will be dissolved in an agitated water solution within the first minute of agitation, however it will take 5-7 minutes to dissolve the remaining 10%. It is important to note that when injecting gypsum you must maintain the agitation while the injection is taking place. Another important factor is to remember to inject the gypsum before the filtration system.

It has been suggested that it is best to keep the rate of gypsum below 1000 ppm in the solution. Based on my calculations, this is a very high rate. We have injected rates of 100-200 ppm with success. A normal injection rate would be about 20 lbs. of Aqua-Cal per 1000 gals. of water.

If you plan to inject gypsum, note that a frequent or continuous injection is more beneficial when treating a salt problem or a permeability problem whereas weekly or bi-weekly injections would be adequate to supply calcium or address minor salt accumulation.

## Growth Regulators in Cotton

In the past few years, a number of new growth regulators have been brought to the market. Cotton farmers now have a wide range of growth regulators to choose from. Prices have varied widely from a low of \$30 to a high of \$90 per gallon. Last year prices ranged from \$45 to \$70 per gallon.

Pentia was used by some growers for the first time in 2003. It contains mepiquat pentaborate instead of mepiquat chloride. Pentia, which is priced in the \$70 range, is supposed to get into the plant faster and provide better height control, promote earliness, and result in higher yield. Tests indicate 0 - 200 lbs/acre increase in yield using this product. Studies indicate a 25 percent increase in mepiquate uptake using Pentia. One study resulted in 19 percent more 1<sup>st</sup> and 2<sup>nd</sup> position bolls where Pentia was used.

There are a few considerations in determining the most economical product. For example, if a grower uses a total of 24 oz. of Pentia on the crop at \$72 per gallon, the cost per acre would be \$13.50. If Mepex were used at a cost of \$48 dollars per gallon, the cost per acre would be \$9.00. Yields would need to average at least 7 lbs./acre more in a 75 cent cotton market to pay for the higher priced product. You could spray the cheaper product earlier or use a higher rate to possibly get the same results.

Growers should try Pentia in 2004 and compare to the traditional materials (Mepex and Pix) to determine if the new product is worth the additional money. Last year, we observed both products working well in some fields while in others nothing controlled the excess growth.

## *Cercospora*

*Cercospora* is the genus of fungi typically known to cause disease across a wide variety of plants including Brassica crops, carrots, and soybeans. *Cercospora*, depending upon the species (host specificity) of fungi, infects crop plants to produce diseases such as Cercospora Blight, Cercospora Leaf Spot, White Spot, and Frogeye Leaf Spot. This type of fungi is primarily known to inflict foliar disease but can also affect other plant parts, which is the case with soybeans.

Of the plant diseases that affect crops, most are fungi. *Cercospora* is one of many fungi known to be a plant pathogen since it lacks chlorophyll and cannot carry out photosynthesis. It, therefore, must invade other organisms in order to obtain sustenance and nutrients. Being a fungus, *Cercospora* is well adapted and can survive in soil, water, and air. Its survivability is achieved by reproduction and dispersion by means of spores (conidia) to available host plants. The spores produced can be dispersed by wind, splashing or flowing water, and the activities of people and animals. *Cercospora* is also able to over-winter as most other fungi on or in living or dead plants, seeds, soil, and weed hosts. *Cercospora* is an invasive type of fungi, which can lead to yield loss when it becomes established within a crop. Yield loss occurs due to foliar damage to the crop which leads to reduced seed quality and yield in soybeans and undesirable leaf and fruit quality in vegetable crops.

The primary inoculum for the *Cercospora* fungus typically is from infected seed (on or in the seed), infected crop debris, or host weed plants. The first lesions, which are leaf spots, vary in color from pale green to white and generally are bordered by brown tissue. The leaf spots, which range in size from 1-5 mm, can be circular to angular spots, which become visible after 8-12 days. The main components that drive the disease cycle include available moisture and weather conditions such as high humidity and 75-81° F temperatures. Under favorable conditions, profuse sporulation will result from the initial lesions. The spores (conidia) then infect other plants generally by invading through the stomata and epidermal cells of leaf tissue. Leaf blighting occurs when lesions are numerous enough to cover 30 % of the leaf area. With adequate moisture, the infection of *Cercospora* will progress in plants by the continuous formation of new lesions and production of conidia for sporulation until ultimately all foliar tissue becomes infected.

Control measures for *Cercospora* vary by crop and include crop rotation, destruction of crop debris, eradication of weed hosts, and fungicide treatment. Crop rotation is effective in controlling this disease in soybeans. A two or three year rotation with unrelated crops in conjunction with deep plowing to destroy crop residue is usually effective. In vegetable crops, eradication of weeds and other plant hosts along with long rotations are advised for combating *Cercospora*. High quality, pathogen free, seed is of utmost importance in controlling *Cercospora*. Fungicide treatments can be made to seed and/or shortly after emergence and establishment to achieve good disease control in vegetables. In soybeans, a foliar fungicide can be applied during the early reproductive growth stages of the crop to control the disease.

## **Foliar Potassium Nitrate on Cotton**

### **What Researchers Say? What Our Test Plots Reveal?**

For years, some university researchers have been saying that a foliar application of potassium nitrate could increase cotton yields by as much as 60-80 pounds of lint per acre. Researchers in the southeast have supported the application of potassium nitrate on fast fruiting varieties at first bloom. Generally, 17 lbs./acre of potassium nitrate is recommended, beginning at first bloom and continuing through boll set.

Our goal was to conduct a similar research study that would duplicate the work of researchers in the Southeast. Through the help of a client from Minturn, South Carolina, we established seven research plots. Four of the plots were ultra narrow row and three plots were on 38-inch row conventional cotton. Each of the seven plots was divided into three sections, an untreated plot

<b>Foliar Potash Test</b>			
<b>UNR</b>			
<b>Treated Field</b>	<b>lbs./ac.</b>	<b>Untreated Field</b>	<b>lbs./ac.</b>
Back Gin South	939	Back Gin South	851
Back Gin North	1017	Back Gin North	763
Block Room 8 South	792	Block Room 8 South	880
Block Toom 8 North	734	Block Toom 8 North	807
Front of Gin South	924	Front of Gin South	675
Front of Gin North	1027	Front of Gin North	719
Above H20 East	1320	Above H20 East	1115
Above H20 West	1159	Above H20 West	1399
<b>Average</b>	<b>989</b>	<b>Average</b>	<b>901</b>
<b>Difference 88 lbs./ac.</b>			
<b>38" Row Cotton</b>			
<b>Treated Field</b>	<b>lbs./ac.</b>	<b>Untreated Field</b>	<b>lbs./ac.</b>
Minturn Rd North	1482	Minturn Rd North	1254
Minturn Rd South	1042	Minturn Rd South	1179
Moody House East	1237	Moody House East	1490
Moody House West	1265	Moody House West	1017
Hamer Graham West	903	Hamer Graham West	896
Hamer Graham East	1199	Hamer Graham East	992
<b>Average</b>	<b>1188</b>	<b>Average</b>	<b>1138</b>
<b>Difference 50 lbs./ac.</b>			

with a treated zone on each side. We made our first application of liquid potassium nitrate (3.5-0-12) at first bloom at a rate of 3 gal/acre and repeated the treatment approximately three weeks later.

Upon visual inspection it was very difficult to distinguish any advantages of foliar applications of potassium nitrate. When defoliation was complete and the bolls were fully opened, we picked and weighed 10-foot sections of both treated and untreated areas. Results were similar to those of previous studies. Five of the eight UNR treated areas out-yielded the matching untreated plots. Averaged over all the plots, the UNR cotton yielded 88 lbs./acre (before ginning) more cotton where the foliar potassium nitrate was applied. Four of the six conventional, 38-inch row, cotton plots out-yielded the untreated plots. Averaged over all plots, the treated cotton yielded an additional 50 lbs. of seed cotton per acre.

## **Is Poncho the New Seed Treatment for You?**

There are several seed treatment products on the market for corn. Gustafson has introduced two new products (Poncho 250 and Poncho 1250) that may be of interest. Poncho is a chloro-nicotinyl (CNI) neonicotinoid seed treatment insecticide for use on corn. The main difference in the two products is that Poncho 1250 has 1.25 mg of active ingredient as compared to 0.25 mg for Poncho 250. Both products are said to be more effective than other CNI formulations on insects including wireworm, cutworm, billbug and corn rootworm.

There are several benefits of the two new products. Both are water-soluble and are attracted to plant lipids, which is ideal for maximum plant absorption. They both have contact and systematic activity. In addition, they can be combined with fungicides on seed and there are no known interactions with herbicides. One important element of both chemicals is that commercial seed companies can apply them to the seed.

The main difference between the two products is the active ingredient concentration. Poncho 250 provides 0.25mg ai per seed while Poncho 1250 provides 1.25 mg ai per seed. Poncho 250 provides early season protection against cutworms, wireworms, white grubs, seed corn maggots, flea beetles, chinch bugs and other early season pests. Poncho 1250 provides a broader spectrum of insect control. Poncho 1250 provides rootworm control comparable to traditional soil-applied insecticides while also controlling billbugs.

In comparisons, Poncho 250 and 1250 work equally as well as the best competitor, Counter where nematode pressure is low. Counter would be a better choice if there is high nematode pressure with or without billbugs. Poncho 250 will work fine if there is low nematode and billbug pressure. If billbugs are a problem and there is low nematode pressure, Poncho 1250 will work fine. The 1250 will also work well in a corn behind corn rotation where there is low nematode pressure.

Economics are also important in making a decision on a corn insecticide. Poncho 250 is roughly \$18.00/ bag while Poncho 1250 is \$48.00/bag. This is an additional cost on the price of seed per bag. To determine treatment cost per acre, divide the number of seed per bag by the number of seed per acre. Divide the result into the cost of the seed treatment to determine the cost per acre

As you are making decisions concerning seed treatment for the 2004 corn crop, these new products are worth consideration. The Gustafson LLC Seed Center has evaluated the effect of Poncho on germination and reported no significant effect on corn hybrids.

## **Prime Time**

Genetic research is an integral part of modern day agriculture. Farmers and researchers are constantly searching for new ways to enhance yields and inflate net profits. Vast improvements and innovations have laid the groundwork for producers to achieve goals their fathers only dreamed of attaining. One of the most recent technological advances in the seed industry is “priming”. “Seed priming” is a technique of hydrating seeds to a level that allows pre-

germinative metabolism to proceed without completion of germination. At the end of the priming treatment, the seeds can be dried and distributed through the usual channels. Priming is used primarily to break thermodormancy in lettuce and to speed germination of seeds such as pepper, celery, and carrot that are slow to germinate” explains Dr. Kent Bradford, professor in the Department of Vegetable Crops at the University of California.

Priming can be useful in a variety of crops and growing conditions. Priming is beneficial in crops that do not germinate uniformly and crops that germinate slowly. Priming can be done before pelleting seeds that require light for germination. There are many instances where priming can be beneficial. Producing transplants in the greenhouse, where you need to obtain fast, uniform germination, and situations where the soil is too cold or too warm for rapid germination are examples where priming can pay dividends. However, be cautioned that priming will not compensate for poor environmental conditions or cultural practices. Priming cannot help a seed emerge if there is a lack of moisture, the seed is planted too deep, the ground has a tendency to crust over or other adverse climatic factors are present at the time of planting and/or seed emergence.

An exciting technological development that appears to be on the horizon is known as “bio-priming”. Bio-priming is a process where scientists treat the seeds with fungicides or with beneficial micro-organisms during the treatment process to enhance disease protection. Primed seed are certainly worth consideration if the benefits outweigh the added cost of the seed

## **Don't Let Downy Get You Down**

Downy Mildew in Cucurbits is a very common and destructive disease. The fungus *Pseudoperonospora cubensis* causes Downy Mildew in cucurbits. This disease is found annually in our area on virtually all cucurbits.

Observation of leaf symptoms provides the best method for diagnosing downy mildew under most field conditions. On cucurbits, other than watermelon, small yellowish areas occur on the upper leaf surfaces. Later, a more brilliant yellow coloration develops with the internal part of the lesion turning brown. Usually the spots will be angular as they are somewhat restricted by the small leaf veins. When the leaves are wet, a downy white-gray-light blue fungal growth can be seen on the underside of the individual spots. On watermelons, yellow leaf spots may be angular or non-angular, and they will later turn brown to black in color. Often on watermelons an exaggerated upward curl in the leaf will occur.

The disease is spread primarily by spores that grow on the underside of the leaf within the downy growth. Spores are easily dispersed by wind from one leaf to the next. This spore movement occurs most commonly late morning to midday. After the spore has landed on a new leaf, and the leaf is wet, the spore germinates and penetrates the leaf surface. In about four to seven days, new lesions are formed, and new sites are ready to sporulate. As this cycle continues, the disease can reach very high and damaging levels within a field in a very short amount of time.

Downy Mildew is controlled on cucurbits primarily with the use of resistant varieties and a good fungicide spray program. Fungicides are generally recommended on all cucurbits, however, resistant varieties, especially in cucumbers, can reduce the number of sprays that are necessary to achieve control. Foliar fungicides, such as Bravo, or Maneb, can be used on a preventative basis every 7 days. Sprays should begin when vines first begin to run. If downy mildew is already present in the planting, more effective control is achieved by including a systemic fungicide, such as Aliette or Ridomil Gold, in the spray program. However, it is important not to over-apply systemic fungicides as this can lead to the development of fungicide-resistance in the fungal population. An alternating schedule of application in which a systemic + a non-systemic fungicide, such as Ridomil Gold Bravo or Ridomil Gold MZ, are used one week and a non-systemic fungicide is used the following week, is recommended to reduce the risk of development of fungicide-resistance in the fungal population. There are other fungicide choices depending on the production area.

## **New Fungicides Help Growers**

There are two new fungicides that have been registered for the 2004 season that will impact a number of crops. Endura and Pristine, from BASF Corp. were recently approved for use on a number of crops. Endura has been labeled for tomato and should be helpful in controlling a number of diseases.

Endura offers a new control of disease including early blight and botrytis. There is a new active ingredient, Boscalid, in Endura. For Botrytis, the formulation rate is 9 to 12.5 oz/ac (6.3 to 8.75 oz active ingredient/ac) The minimum reentry is 0.5 day. It is also recommended to make no more than 2 sequential applications and no more than 2 applications per crop year. For control of early blight, the formulation rate is 2.5 to 3.5 oz/ac (1.75 to 2.45 oz active ingredient/ac,) and the reentry is also 0.5 day. For early blight, it is recommended that no more than 2 sequential applications be made and no more than 6 applications per crop year. Endura offers many new benefits to the grower in controlling disease and in maintaining the effectiveness of previously used methods of control.

Pristine also gives new control to diseases found in a variety of crops. This fungicide is a combination of Boscalid and F500. F500 is the ingredient that is used in Cabrio, another BASF fungicide. Pristine has not received a tomato label to date but it is expected in the future. Pristine offers control of diseases including early and late blight and botrytis.

Endura and Pristine are just two examples of new fungicides being developed to increase disease control in tomatoes. There are others in the works including Tanos, a new fungicide from DuPont. This fungicide will help control bacterial spot on tomatoes. The development of these new fungicides provides different and more effective ways to control disease in a number of crops.

## Diamondback Moth

The diamondback was first found in Illinois in 1854, but spread quickly across the United States and had been found from Florida to the Rocky Mountains by 1883. It has been recorded everywhere cabbage is grown, even as far north as Canada's Northwest Territory. The diamondback feeds on many cruciferous weeds, which gives it the ability to live where cabbage is not grown.

Diamondback moth attacks only plants in the family Cruciferae. Virtually all crucifers are eaten including broccoli, Brussels sprouts, cabbage, Napa cabbage, collards, kale, mustard, radish, turnips, and watercress. Collards will be preferred by ovipositing moths over cabbage. Several weeds are important hosts, especially early in the season before cultivated crops are planted. Yellow rocket, sheperdspurse, pepperweed, and wild mustards are commonly cited as important weed hosts.

Total development time from the egg to the pupal stage averages 25 to 30 days, depending on the weather, the range can vary from 17 to 51 days. In Ontario, diamondback moth is present from May to October, but is most abundant in July and September. In Georgia the diamondback is present year around, but is most abundant in September and October and again in March and April. In the southern states there is continuous breeding, so the number of generations is likely to be between 12-15 per year. In northern regions the number of generations can vary from 3-7.

Diamondback eggs are oval and flattened, and measure 0.26 to 0.44 mm wide. The eggs are yellow or pale green, and are deposited singly or in small groups of 2-8 eggs in depressions on the surface of foliage, or sometime on other plant parts. Females may deposit 250-300 eggs early in the year, but the number decreases in later generations by 90%; average total production is probably 150 eggs.

Diamondback moth has four instars. Throughout development, larvae remain quite small and active. If disturbed, they often wriggle violently, move backward, and spin down from the plant on a string of silk. The larvae are colorless in the first instar but afterwards become green. The body has a few hairs, which are short in length, and most are marked by the presence of small white patches. Initially, the feeding habit of first instar larvae is leaf mining, though they are so small that the mines are difficult to notice. The larvae emerge from their mines at the end of the first instar, molt beneath the leaf, and begin to feed on the lower side of the leaves producing an irregular "windowpane" effect. The diamondback pupates on the underside of the leaf in a loose silk cocoon.

The adult is a small, slender, grayish brown moth with pronounced antennae. It is about 6mm long, and marked with a broad cream or light brown band along the back. The band is sometimes constricted to form one or more light colored diamonds on the back, which is the basis for the common name of the insect. Moths usually mate at dusk, immediately after emergence from the cocoon. Flight and ovposition take place from dusk to midnight. Adult males live about 12- 16 days, and females deposit eggs for about 10 days.

Plant damage is caused by larval feeding. Although the larvae are very small, they can be quite numerous, resulting in complete removal of foliar tissue except for the veins. Diamondback can be very damaging to seedlings, and may disrupt the heading of cabbage. The diamond was never considered a significant pest until the 1950's, when the general abundance began to increase. Although the shift in abundance has been attributed to increased availability of alternate weed hosts or destruction of parasitoids, insecticide resistance was long suspected as the problem. This was confirmed in the 1980's when it was found that the diamondback had developed resistance to pyrethroids. Control of the diamondback is best achieved with the rotation of *Bacillus thuringiensis* and newer chemistries such as Emamectin benzoate, which is the active ingredient in Proclaim.

Rainfall has been identified as a major mortality factor for young larvae, so it is not surprising that crucifer crops with overhead irrigation tend to have fewer larvae than those crops grown in drip irrigation. Overhead irrigation also tends to disrupt oviposition.

## Diagnostic Tools Provide a Foundation for Success

Late winter is a time for planning and a fresh start in crop production. Decisions made now can have profound effects on outcome of a production enterprise. **Soil testing and nematode assay** are basic tools that should be used to plan fertility and nematode control strategy. Rather than guess at the nutritional and pest control requirements, why not take samples and plan the most economic approach to crop production. Wasting money on unnecessary treatments or failing to apply just the right amount of nutrients can mean the difference in success or failure.

A **Soil Test** indicates pH and lime requirement along with nutrient availability. If pH is not in the desired range, crops cannot respond to nutrients that are applied. In addition to addressing needs of the upcoming crop, a soil test indicates trends in fertility that should be managed for long-term success. Many times it takes several years to get a piece of land in optimum production.

There are three classes of nutrients that are required for plant growth. The **major elements nitrogen, phosphorus, and potassium** are required in the greatest quantities and are generally the major components in a fertilizer. The **secondary elements calcium, magnesium, and sulfur** are equally important but generally are not included in a standard fertilizer. The **micronutrients (Iron, Manganese, Zinc, Copper Boron, and Molybdenum)** are required in very small amounts but are equally important in promoting plant growth. They generally serve as catalyst and promote chemical reactions in the plant. Most times it is necessary to develop special fertilizer blends and to apply soil amendments such as lime and/or gypsum to supply just the right amount of nutrients for crop production.

**Waste analysis** provides a prediction of the amount of nutrients supplied in a particular waste product and their availability for the upcoming crop. A waste analysis is absolutely essential to ensure that the proper nutrients are supplied for crop production. They also help avoid excess application and adverse impact on the environment. A waste analysis indicates the availability of essential nutrients for the first crop. It also indicates if potentially harmful levels of some

elements are included in the waste product and helps protect land resources. Soils can actually become sterile from over-application of copper and and/or zinc.

**Plant analysis** provides a mechanism for follow-up and evaluation of crop fertility. It is absolutely essential when using waste products to meet nutrient requirements. It also provides a mechanism to fine-tune crop production and optimize yield and quality. A **plant analysis indicates the status of** the essential elements (**N, P, K, Ca, Mg, S, Fe, Mn, Zn, Cu, B, Mo**) at a given point in the production season. Many times, nutrient shortfalls can be addressed before they become critically limiting. Both crop yield and quality can be protected with a good plant analysis program. It is essential in the production of high quality vegetables.

**Solution or water analysis** can be used to evaluate the usability of an irrigation water source or to confirm that an agricultural enterprise is not adversely affecting ground water quality. Long-term records should be maintained of all ground and surface water sources on a farm to spot any gradual changes that may be taking place. These records also provide a record of stewardship and responsible farming practices. All water sources should be sampled at least annually. This practice is critical for trickle irrigation systems. Seasonal and long-term impact of the water on crop production can be predicted with this information.

It's not too late to implement a comprehensive sampling program on your farm. Call your Agri-Tech consultant and ask them suggest a sampling program that meets your needs and protects the long-term future of your farm. A good sampling program may be the least expensive insurance you can buy.