

NITROGEN USE

Excessive use of nitrogen by North American farms is made evident by the terms “nutrient management,” “hypoxia,” “dead zone,” and “total maximum daily load” (TMDL) which arise during discussions about environmental regulations. Also, these excessive applications of nitrogen can lead to high levels of nitrogen in the plant tissue which may affect the quality of the plant tissue and its susceptibility to infections and degradation. It is important that farmers not use nitrogen in excess so as to protect the quality of the crop and the environment.

GMS believes that if soil calcium levels are sufficient, native soil nitrogen and the nitrogen applications are utilized more efficiently by the crop. Therefore, adequate soil calcium helps lower the need for using excessive levels of added nitrogen.



THE FARMERS SOLUTION

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Your local Growers Representative is:

THE GROWERS PROGRAM

& VEGETABLES & FRUITS



* All of the images in this brochure show Growers grown produce.

Since 1955, Growers Mineral Solutions has helped farmers increase their profit by raising high quality crops with lower overall costs. This is accomplished by creating a superior rooting media, and stimulating plants with smaller amounts of balanced nutrition (GMS) at stress points during the plant's life. This is a farming philosophy known as “The Growers Program.”

Milan  Ohio

GROWERS MINERAL

THE FARMERS SOLUTION

THE GROWERS PROGRAM

The three main elements of The Growers Program are:

CALCIUM—A check of calcium levels in the soil and recommendations for additional applications (if necessary)

GMS—Use of Growers Mineral Solutions at planting, during maximum growth, and reproduction. GMS was originally developed for use in hydroponic production. In these situations, the plant's total mineral nutrition had to be provided.

RESULTS—Yield check to verify profitability.

MANAGEMENT TOOL

The unique feature of the Growers Program is that Growers Mineral Solutions can be used as a very effective management tool. Under periods of stress (too wet or dry), GMS can provide extra nutrition for plant survival. Under favorable conditions, GMS can help maximize yield and/or take advantage of varying market conditions. We recommend feeding vegetable and fruit plants with GMS as maximum stress periods.

SEED TREATMENT, TRANSPLANTING, or PLANTING/GERMINATION—directly on the seeds or small plant roots (in cold, wet soils especially).
FOLIAR SPRAY—during active growth or stress periods to replenish energy in the plant.

This basic approach can have many different variations depending on the soil type, the yield potential, and the farm's past history.



GMS has a balance of minerals that is a unique combination to the field of agriculture. This balance was achieved by Dr. V.A. Tiedjens through years of research using trial and error techniques while using observation to evaluate quantity and quality production. When applied correctly, GMS provides vital nutrients to the plant in a balance and in a form that is immediately available without concern for the pinpoint rainfall which is needed to dissolve dry fertility inputs. Since GMS is registered as a phosphorus feed source, federal and state inspections are required to ensure purity and safety of the GMS product.

When GMS and the element calcium are used together for crop production as in the Growers Program, the nutrient balance of the plant gives that crop the qualities which are important for the fruit and vegetable industry. Fruit and vegetable producers who have implemented the Growers Program see improvement in sugar production, flavor, longer shelf life, and less need for pesticides.

The bottom line is that the Growers Program improves fruit and vegetable quality.



SEED TREATMENT

Seed treating is an ideal way to getting a small amount of nutrition where it is able to give the young seedlings a push in the early stages of growth. When treating soft coated seeds, use 2 to 4 ounces of GMS per bushel of seed whereas with hard coated seeds, use 6 to 8 ounces of GMS per bushel.

IN THE ROW SOIL APPLICATION

GMS is directed into the seed trench before the soil is closed in around the seed by flowing GMS through a drop tube or pipe extension located about 2 inches behind the seed drop. The amount of GMS applied in the seed trench depends on the hardness of the seed coat, the soil's moisture content, the soil's texture, and the soil's temperature.

The harder the seed coat, the wetter the soil, and the colder the soil temperature, the more GMS can be used. For example, on clay soil very early planted sweet corn could use up to 5 gallons per acre of GMS on the seed, whereas on sandy soil, later planted pumpkins should receive closer to 1 gallon per acre. Generally, clay soil needs more GMS than sandy soil; harder coated seeds need more GMS than softer coated seeds; wetter soils can use more GMS than drier soils; and colder soils need more GMS than warmer soils.

WATER CONSIDERATIONS

Anytime GMS is placed directly on the seed, any water added to the solution in equal volumes to the GMS helps to lessen the osmotic influence of the GMS. If the volume of GMS used for the soil moisture content, soil temperature, soil texture, soil organic matter volume, and added water is still too high, the producer may need to put the GMS in the 2 by 2 position. This situation may occur in Southern soils below the Mason Dixon line. In this case, consult with the GMS sales representative.

TRICKLE IRRIGATION

Normally apply GMS at 1 gallon per acre per week during the season. This would be starting close to the first blossom set and continuing on until 6 to 10 gallons of GMS per acre has been applied for the season. As the soil texture becomes higher in clay and organic matter content, more GMS may need to be applied. Also, always inject GMS at the end of the pumping cycle to keep the nutrients as close to the roots as possible.

When trickle irrigating, it is important to test water for dissolved solids or hardness. If either reading is high enough to cause chemical reaction with GMS, an acidifier must be added to the water before GMS is injected into the water.

GMS effectiveness is compromised by high dissolved solid water and emitter plugging can occur if water hardness is not addressed by acidification.

TRANSPLANTING SOLUTIONS

Whatever volume of liquid is being applied per acre, always use GMS at the rate of 1 gallon per acre. The water and GMS mixture can be applied directly to the plant roots as the plants are set in the soil.

FOLIAR FEEDING

Anytime GMS is foliar sprayed, if water is used for dilution its quality has a very big impact in the effectiveness of GMS. When diluting GMS with water, consult with the GMS sales representative.

It is important all vegetables and fruits be foliar sprayed consistently by fine mist. Through the years, the most successful vegetable and fruit growers following the Growers Program invariably say the best recommendation they could give others is to spray GMS at 1 gallon per acre every week. This would be starting close to the first blossom set and continuing on until 6 to 10 gallons of GMS have been applied over the season. Some producers will spray 2 gallons per acre every week, but they still apply the 6 to 10 gallons per acre for the season.

Many farmers have found that foliar feeding is a very effective tool during periods of environmental stress such as drought or excess rainfall. In these situations, plant roots often have been injured and cannot take up nutrition properly, but putting nutrients into the plant through foliar absorption can usually help overcome stress problems.

Foliar sprays should be applied in the early morning, late afternoon (evening) or overcast days in the summer. Spring or fall foliar sprays can be made during a higher percentage of daylight hours.

In the very early spring and very late fall, there may be times it would be prudent to wait for warmer temperatures. Plants will not absorb minerals through the foliage during the heat of the day or in bright sunlight. Foliar sprays are generally applied by ground equipment utilizing boom sprayers, mist blowers, and high boy sprayers, while some are made by helicopter or spray planes. Weather, fruit set, and stress have a big influence on the need for foliar feedings.

Monitoring crop conditions at all times is very important. After learning what foliar feeding accomplishes for them, almost every operation develops its own special techniques for foliar spraying with GMS. Therefore, the best recommendation for every producer is "read the crop."

When foliar feeding, it is important to test any water used as a carrier for GMS for dissolved solids or hardness. If GMS is mixed in water that has higher dissolved solid or hardness

levels, there will be a chemical interaction between the GMS and the water. In these cases, acidifiers need to be added to the water to ensure GMS activity and no physical sprayer problems with the mixture.

WATER CONSIDERATIONS

Anytime GMS is foliar sprayed, if water is used for dilution its quality has a very big impact in the effectiveness of GMS. When diluting GMS with water, consult with the GMS sales representative.

QUALITY VS QUANTITY

When dealing with niche markets such as retail fruits and vegetables, quality production is of great importance. Today, most agriculture markets are based on quantity with little attention being given to product quality. Many times in wholesale fruits and vegetables, quality of the product is of little importance because flavoring, preservatives, and artificial coloring are used to enhance the products' appeal. However, when a producer sells directly to his consumer, he must ensure appearance, texture, and flavor if he wants to maintain a profitable operation from repeat business. To enhance these characteristics, the producer must strive for production which consists of quality.

In our opinion, the biggest deterrent to growing quality vegetables and fruits is the quest for quantity. Many times, to achieve this higher quantity production, excessive levels of nutrients are used to try and promote high quantity levels. We realize that plants have a definite need for nutrients, however, we also remember that dry plant tissue is about 95% carbon, hydrogen, and oxygen. Therefore, using excessively high fertility creates an imbalanced nutrient level within the plant tissue which causes the plant tissue various problems which reduce the profitability of the crop by reducing the crop's quality.

Therefore, we feel by using the Growers Program, calcium, and balanced nutrition (GMS), a grower can achieve very competitive production while improving a crop's quality. The quality factors that GMS users realize are improvement with sugar content, better flavor, longer shelf life, and less need for pesticides.

BALANCED NUTRITION & CALCIUM

Since 1955, we have advocated the Growers Program, calcium, and GMS as a way to achieve economically competitive quantity production while achieving superior quality production. The science behind the Growers Program of Dr. Tiedjens is sound, and is reported quite extensively in the plant physiology literature.

The fertilizer industry has published articles suggesting better nutrient uptake by plants when using a properly balanced fertility source. For example, one article suggested that the

plant utilization of nutrients is improved when the nutrients are delivered to the plant in a balance which includes specific ratios of all the essential elements. The plant's uptake of those nutrients was improved when all the essential elements are available in a specific ratio even though the delivered volume of the elements is lower than when the elements are supplied individually in higher concentrations.

Research by agricultural institutions first demonstrated, with the help of radioactive isotopes, the efficiency of foliar applied nutrition and later the positive influences achieved with the use of foliar sprays. Some research suggests that when nutrition is applied to the leaf in the right form, the fertility ions penetrate the leaf and cell walls increasing chlorophyll production and synthesis in the plant. This increase in chlorophyll production does not come from increasing leaf area but rather by a "photon pump priming effect" which is an increase in cellular activity and respiration that increases the uptake by the plant's vascular system in response to the increased water needs by the leaf. This increase in uptake automatically brings more fertility elements into the plant via the vascular system. The need for more moisture and greater gaseous exchange stimulates additional root mass to provide it. Excess carbohydrates produced by the plant due to greater synthesis of sugars by the increased chlorophyll are excreted by the root hairs and stimulate microbial colonies on the roots by providing additional energy sources. The microbial colonies in turn provide auxins and root stimulation compounds to the plant. More root hairs and root tissue further increase the plant's ability to uptake water and fertility. This chain reaction is set off if the correct fertility material is applied to the foliage at the right time to set up this feedback loop. Great efficiencies are to be obtained with foliar feeding because we are stimulating the entire "pumping" mechanism that comprise the leaf's cells.

The calcium side of the quality issue arises from the many important functions of the plant that are tied together with calcium and quality functions. Calcium pectate in the middle lamella of the plant tissue provides cell to cell adhesion which helps protect fruit from softening during ripening or storage. Calcium makes cell wall materials less accessible to enzymes produced by bacteria or fungi that may degrade the fruit. Plant tissue calcium maintains the integrity of the cell plasma membrane along with the structural integrity of the intracellular organelles. Also, a calcium protein complex called calmodulin, which is a small acidic protein with no enzyme activity of its own, is found in all cells which have enclosed organelles. Calmodulin's structure is amazingly similar throughout the plant and animal kingdoms. This calcium protein complex affects many functions, including cell propagation, by influencing cell division (mitosis). Therefore, the consequences of a calcium deficiency can include structural problems for the cell and depletion of calcium storage which is needed for cellular process regulation.