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The Growers Solution

LATE FALL 2010

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VOLUME 23 ISSUE 5

Soil Fertility and Soil Microbiology

By Jim Halbeisen

In the Late Fall 2009 edition of *The Growers Solution* we explained the contradiction about soil tests being primarily chemical extraction while agricultural soils are largely a living biological media. Here we will emphasize the point that mineral absorption by plants is not only a chemical phenomenon, but also is greatly influenced by the microbiological factors in the soil.

In our earlier *Solution* article we referred to the mineral nutrition and plant physiology reference book *Mineral Nutrition of Higher Plants* by Horst Marschner. In his book Marschner discusses the chemical release of minerals to the growing plant by such factors as pH, cation-exchange capacity, redox potential, and soil water content. Any input to the soil, whether it be environmental or man made, influencing any of these factors has an effect on the growing crop. The chemical reactions are

pretty straight forward, such as the addition of fertilizer causing certain favorable responses from the plant, which, of course, are those the chemical companies emphasize in their educational literature intended to lead producers to focus only on fertilizer additions as being all important.

However, as Marshner says, there are other factors influencing mineral nutrient concentration in soil solutions, such as the quantity of soil organic matter and microbial activity. We at Growers Chemical Corporation agree and believe they maybe should be considered even more important.

Conditions in the rhizosphere, the soil-root interface or boundary, differ in many respects from those in the so-called "bulk soil," that soil some distance from the root. In Marshner's text he says, "Although the chemical properties of the bulk soil are very important for root growth and mineral nutrient availability, the conditions in the rhizosphere and the extent to which roots can modify these conditions play a very decisive role in mineral nutrient uptake in general and in micro nutrient uptake in particular."

In the rhizosphere the microbiological population is influenced directly by the plant secreting organic substances, predominately sugars and organic acids, which can be used as feed by the microbes. In turn, the microbiological population can help feed the plant mineral nutrients present in the soil. This mutually beneficial relationship of the plants feeding the soil microbiology and soil microbiology feeding the plants is called symbiosis.

In the first case, certain microorganisms such as bacteria and actinomycetes temporarily "tie

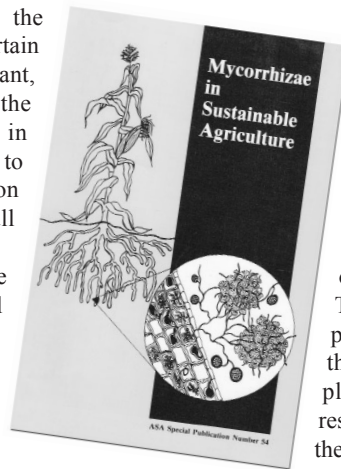
up" or hold nutrients in their living cells with these nutrients later being released for plant use when the microbes die. In the second case, special symbiotic fungi such as arbuscular mycorrhizal fungi can live on or in the roots of plants. These fungi work with the plants by greatly expanding the area from which the plant can gather soil resources and actually feed the minerals directly to the plant root. It also has been

noted, in the reference material *Soil Biological Fertility* by Lynette K. Abbott and Daniel V. Murphy, that mycorrhizal fungi can act in the same manner as other microbes. "Because AM (arbuscular mycorrhizal) fungi are often among the largest consumers of net primary production, they immobilize a tremendous quantity of nutrients, and the rate at which their tissues decompose will impact nutrient availability, because the benefits plants gain from mycorrhizas are often unrelated to root colonization and spore densities."

As we examine the roots of plants in the soil, we find an environment around the root filled with living entities working in unity with the crop to feed themselves as well as the crop. This biological life consumes the minerals and dies making those minerals available to the crop. Or else these same entities penetrate the crop's root and increase the area from which the crop can pull minerals for its own use.

There are several literature sources discussing these rhizosphere reactions and the fact they can occur out in the bulk soil position, as well,

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On The Road Again

LATE FALL 2010

Growers Mineral Solutions is scheduled to set up and staff booths at the following upcoming farm shows and conventions this winter. It's a great time to stop in and review your plant food and animal nutrition needs, hear about new developments at Growers or just chat with the folks who make it all happen — your friends and neighbors.

Dec. 7-9 Tue-Thur	Great Lakes Fruit & Veg Expo Grand Rapids, MI
Jan. 4-6, 2011 Tue-Thur	Keystone Farm Show York, PA
Jan. 7-8 Fri-Sat	Georgia Fruit and Vegetable Savannah, GA
Jan. 11-13 Tue-Thur	New Jersey Veg. Mktg. Conf. Atlantic City, NJ
Jan. 17-20 Mon-Thur	Delaware Ag Week. Harrington, DE
Jan. 18-19 Tue-Wed	Ohio Produce Growers Congress Sandusky, OH
Jan. 18-20 Tue-Thur	Fort Wayne Farm Show Fort Wayne, IN
Jan. 18-20 Tue-Thur	Virginia Farm Show Fishersville, VA
Jan. 26-27 Wed - Thur	Empire State Fruit & Veg. Expo Syracuse, NY
Feb. 1-3 Tue-Thur	Mid Atlantic Fruit & Vegetable Hershey, PA
Feb. 2-4 Wed-Fri	Southern Farm Show Raleigh, NC
Feb. 4 Fri.	Northern Indiana Grazing Conf. Howe, IN
Feb. 8-9 Tue-Wed	Alexandria Area Ag Show Alexandria, MN
Feb. 8-10 Tue-Thur	Canadian International Farm Equip Toronto, Ontario
Feb. 16-19 Wed-Sat	National Farm Machinery Show Louisville, KY
Feb. 22-24 Tue-Thur	Central Minnesota Farm Show St. Cloud, MN
Feb. 23-24 Wed-Thur	Ontario Fruit & Veg. Conv. St. Catharines, Ontario
Feb. 24-26 Thur-Sat	NYS Farm Show Syracuse, NY

Hope To See You!

Yield Checking Gives Answers

By Jim Johns

A little more than 55 years ago Growers was formed to produce a plant food, now called Growers Mineral Solutions, and a soil program, called the Growers Program. The ultimate goal was that farm customers should profit.

One of the founders, V. A. Tiedjens, Ph.D., Agricultural Chemistry, had spent most of his, by then, lengthy career at the university level and various state extensions, continuously frustrated by the influence agribusiness had over the direction agriculture was being taken. From his experimentations he knew dry and bulk liquid fertilizers were very inefficient and costly for the farmer. He had found a better way, but none of his extension and university colleagues would listen to him. A private business firm wanting to get into the farm fertilizer business professed to like his ideas, but he soon found the owners really didn't care whether the product worked or not. "Forget all the experimenting, just get out and sell the fertilizer."

Others at the firm did believe in his ideas, especially the young Sales Manager, J.P. Henry. The two soon departed, together formed Growers Chemical Corporation and, in the process, took most of the original firm's sales personnel with them.

Doc, Joe and their small sales force all agreed, the product must work and be profitable for the customers, and farmers needed to see it happen on their own ground, out in their own fields. And most important, they needed to compare, by way of comparison plots, different fertility methods. Growers recommendations in the field compared with any of the others' recommendations in the same field with the same variables — seed variety, planting dates, row widths, etc. Although some plots were weighed over scales, this led to a lot of tedious hand checking in the field, but the results were impressive and convincing. Growers did then, and does now, consistently win profit-per-acre-wise over all others about 90% of the time, and the results from the beginning were, and continue to be, win or lose, printed in the Growers Results Book each year.

Although somewhat out of date with today's relatively much higher yields, Growers also recognizes, with a framed certificate, customers raising 100 bushels of corn per acre using GMS as their only fertility — manure can be used, but no other N. P. & K.



Dr. Tiedjens yield checking a customer's field.

Early results in for the 2010 season have Harold Kennell's ongoing County Extension Comparison Plots in Illinois, alternating corn one year, soybeans the next, showing Growers, over the 20 years, averaging \$26.00 more profit per acre than the County's Conventional plot. This year the Growers soybeans received a big boost from a 50 tpa high calcium lime application from four years ago — 76.8 bu/ac over Conventional's 45.8 bu/ac.

Also in early from perennial Growers 100 Bushel Club winners, David and Theresa Kashak from northwest Pennsylvania, is their 321 bu/ac. yield, a likely all time high yield for Growers. David said he got out a year old bag of non-GMO seed, found the germination pretty good, but, to play it safe, he double planted it, ending up with 55,000 plants per acre. The 5 + acre plot received the same 5 gallons per acre GMS in the row and 6 gpa GMS with 8 ½ oz. NA foliar spray as the rest of his corn which averaged, with 33,000 ppa, a little over 200 bu/ac. Fertilizer cost, \$120.00/ac. David said you could see right to the row where the deer and raccoons were enjoying the inside rows of GMO corn and bypassing the outside rows of non-GMO corn.

The company encourages customers, usually by way of their Growers Sales Representatives, to send in the results of their test plots, crop yields and costs, comparison plots, with and without other N. P. & Ks, etc., to be recorded into the annual Growers Results Book. Yield Check Forms are available at the Growers Office or by way of the Growers Web site, www.growersmineral.com/pdf/yieldreport.pdf. The book goes to press shortly after the first of the year, so there is still time to send in 2010 results. ■

The Growers Program and Soil Microbiology

By Jim Halbeisen

In this issue's accompanying article, "Soil Fertility and Soil Microbiology," we discuss the science of how the biological life in soil enhances mineral nutrient availability to plants. For years Growers Chemical Corporation has advocated the availability of soil mineral nutrients, whether native, added by fertilizer or manure, can be improved significantly if the soil's life forces are given the opportunity to function properly. The premise of the Growers Program, as developed by Dr. V. A. Tiedjens, is that 96% of all plant tissue is carbon, hydrogen and oxygen, all of which come naturally from the sun, air and water. When adequate oxygen is introduced into the soil by way of the mineral element calcium, oxidation takes place. Growing plants and soil microbiological life can then function most efficiently, making available tied-up soil elements, which results in soils needing lesser amounts of applied nutrition to grow economically successful crops.

The biggest enemies to proper fertilizer usage are the timing of application and its distance from the plant. Because GMS is nutritionally balanced and its salt and heavy metal content are very low, it can overcome the enemies of efficiency. GMS can be placed close to, or on, the growing plant, when needed, during times of environmental and growing stresses.

How do The Growers Program, involving high calcium lime additions, and Growers Mineral Solutions (GMS) improve and interact with the microbiological forces in soil?

GMS: Soil microbiology are actually small plants. GMS's quality ingredients, making it safe to be fed to livestock and/or be safely applied directly to plant foliage, also allows GMS to beneficially feed soil microbes. When GMS is applied as a starter, transplant solution, or seed treatment, and the crop does not need it at the time, the excess nutrition will remain in the soil profile, where it can be, and is, consumed by the microbes. Soil microbiology has a short life span, however, so when it dies after having consumed the nutrition, there is practically no delay before it becomes available to the crop. Leaching losses from heavy rains coming soon after planting are minimized, because, if the crop has not utilized the nutrition right away, it can access it later, as needed, from the microbes which have consumed it.

In contrast, other more common fertilizer materials, containing toxic and cheaper grades of nitrogen, phosphorus, and potassium only, no trace or minor elements, having high salt levels and often containing heavy metals, are toxic to soil microbes and harmful to their growth and will eventually limit their populations. This explains how some less costly fertility products work initially, but, in time, their usage rates need to be increased,

making them economically not competitive.

Calcium: Most agronomists recommend limestone applications mainly to neutralize soil acidity. But lately some agronomists are suggesting low pH soils inhibit the growth of the soil microbiology. That soil life is hindered by low pH is correct, however, soil microbiological growth improvement is also tied to calcium levels in the soil. Calcium is needed in the microbes diet, and calcium also opens, or loosens, soils allowing the entry of oxygen needed for it to breathe.

Dr. V. A. Tiedjens long contended the main benefit coming from high calcium limestone applications was not for pH adjustment, but to flocculate the soil colloids. Many scientific soil references confirm his position. By flocculating, the soil becomes more porous, and more oxygen is introduced, which encourages more beneficial soil microbiological growth. In addition, soil microbes consume calcium as a feed source, helping to increase their populations.

The final result, or intent, of the Growers Program is to feed the crop and soil life directly with GMS and adequate calcium, but to also have the improved soil microbiological life help feed the crop, thus reducing the need for costly fertility inputs. ■

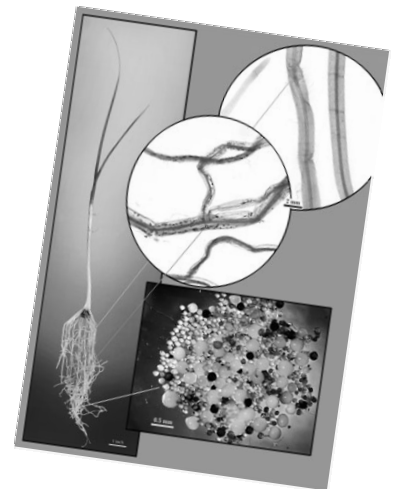
Soil Fertility and Soil Microbiology

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resulting in more nutrition for the growing crop. For example, as stated in *A Textbook of General Botany*, "Certain bacteria living independently in the soil are able, as are those living in root nodules, to fix the nitrogen of the air. (Remember, 79% of the earth's atmosphere is N gas.) One genus of these soil bacteria (*Azotobacter*) is of great importance, its members being capable in the course of a year

of fixing from 15 to 40 pounds of atmospheric nitrogen per acre."

From the above, it is apparent mineral element nutrition of crops is much more complicated than the "unit in, unit out" theory followed in soil testing. In fact, the efficiency of fertilizer dollar utilization probably rests more with the microbiological population present in the soil than with how much fertilizer is recommended by the soil testing laboratory. ■



Growers Calendars and Growers Conference Calls

By Staff

For those of you who may be interested, our new 2011 Growers wall calendars, measuring 11 inches wide and hanging down about 18 inches, are available from your Growers Sales Representative.

In the Growers Calendar, each month's second Thursday has a printed reminder for our regularly scheduled telephone Conference Calls.

REGARDING THE GROWERS CONFERENCE CALLS EVERYONE, PLEASE NOTE!

The Conference Call dial-in number and the participant access code number are being changed to accommodate our Canadian people who were having some trouble joining in.

As of December 9, 2010, the second Thursday

in December, everyone's new dial-in number is to be 1-213-289-0500 and everyone's new participant access code number is to be 8262757.

The 2011 Growers Calendar correctly gives the scheduled Conference Call starting times for each month as 9:00 PM EST or EDT except for June, July, and August when it will be 10:00 EDT. ■

Growers MINERAL SOLUTIONS

LATE FALL 2010

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The Enemies of Fertilization and Profitability

By Jim Halbeisen

For years Growers Program critics have insisted using such small amounts of fertilizer would “wear out” the soil. Simple arithmetic, according to their argument, showed removing a certain size crop containing certain amounts of mineral elements, would require those minerals be replaced or the land’s productivity would decline.

Countering this argument, Dr. Victor Tiedjens, originator of the Growers Program, cited scientific literature from J. B. van Helmont (1572-1644) who, with the addition of only distilled water, grew a tree. In the five year growing period the tree gained 164 pounds in weight while the soil lost only 2 ounces of weight. This reference usually appears in early chapters of plant physiology text books at which point beginning students are told 96% of plant tissue is composed of

carbon, hydrogen, and oxygen, or sunlight, air and water.

Recent nutrient management literature continues the early thinking by suggesting 200 bushel corn can remove as much as 49.2 or as little as 24.6 pounds of phosphorus per acre. Dr. Tiedjens and the Growers Program have always argued crops do not need as much elemental minerals as the agricultural establishment contends. Time and distance are the real enemies of fertilizer utilization by crops.

Observing the continued success of many GMS customers throughout North America since 1955, the Growers Program idea of less elemental mineral inputs, should demonstrate the economic possibilities for other farm operations. Because today’s fertilizer prices

increase as energy costs increase, farmers using less total energy (fertilizer) by following the Growers Program should have better chances at improved profits. Using less mineral inputs, more efficiently, will be a buffer against extreme movements in fertility costs.

Recalling similar events in 2008, our recent commodity price increases could again embolden chemical and raw material suppliers to raise their prices significantly. The bottom line, however, if operators can reduce their dependence on large fertilizer applications and use smaller more efficient fertility inputs, while taking advantage of beneficial microbiological factors naturally found in soils, increasing costs of energy will have less effect on their farms’ profitability. ■

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email to: growers@hmcld.net
or visit our Web site: www.growersmineral.com

Pricing Change for 2011

By Staff

Some of you may not have heard, but our raw material suppliers not long ago made it possible for us to lower the 2011 price of GMS close to 20% off our last price change of August 2009.

The other good news, as of now, our traditional 10% for November, 8% for November, 6% for January, 4% for February, and 2% for March Cash In Advance of Delivery discounts can be applied to these new prices.

We hope these new prices and discount

offerings can last throughout the 2011 season, but, who knows? Certainly, Growers doesn’t know what with corn, bean and other commodity prices fluctuating up and down, coupled with our experience the last 2 or 3 years with the raw material suppliers wanting a pretty big share of the farmer’s good fortune whenever farm prices do go up. The best hedge bet for the farmer may be to take advantage of today’s price situation.

Contact your local Growers Sales Representative for the latest pricing and ordering information. ■