

The SNGPG asks....What is Humus or Humic Acid?

The term "humus" dates back to the time of the Romans, when it was frequently used to designate the soil as a whole. It was later applied to the organic matter of soils and composts, or to different fractions of this organic matter; as well as, to complexes formed from a variety of natural organic substances. Humus compounds are complex natural organic compounds that are formed in soils from plant residues, by a process of "humification". Humus materials are complex aggregate of brown to dark colored amorphous substances, which have originated during the decomposition of plant and animal residues by microorganisms, under aerobic and anaerobic conditions, in soils, composts, peat bogs, and water basins. Chemically, humus consists of certain constituents of the original plant material resistant to further decomposition; of substances undergoing decomposition; of complexes resulting from decomposition, either by processes of hydrolysis or by oxidation and reduction; and of various compounds synthesized by microorganisms.

"Humic acid" is the commercial term often used to refer to the combined humic and fulvic acid content found in these naturally occurring deposits. Humic acid is known to be among the most bio-chemically active materials found in soil.

Why Use Humic Acid?

Today, there is a recognized and increasing use of humic acids for their beneficial impact on the growth and cultivation of Giant Pumpkins, Squash, Long Gourds, Giant Tomatoes and Watermelons and particularly in organically-deficient soils. Humic acid is not a fertilizer as it does not directly provide nutrients to plants, but is a compliment to fertilizer. Benefits include:

- Addition of organic matter to organically-deficient soils
- Increase root vitality
- Improved nutrient uptake
- Increased chlorophyll synthesis
- Better seed germination
- Increased fertilizer retention
- Stimulate beneficial microbial activity

Healthier plants and improved yields

How Does Humic Acid Improve Soil?

When applied to clay soils, humic acid can help break up compacted soils, allowing for enhanced water penetration and better root zone growth and development. When applied to sandy soils, humic acid adds essential organic material necessary for water retention thus improving root growth and enhancing the sandy soil's ability to retain and not leach out vital plant nutrients.

How Does Humic Acid Improve Plant Growth?

As mentioned above, one way plant growth is improved is through the structural improvement of both clay and sandy soil allowing for better root growth development.

Plant growth is also improved by the ability of the plant to uptake and receive more nutrients. Humic acid is especially beneficial in freeing up nutrients in the soil so that they are made available to the plant as needed. For instance if an aluminum molecule is binded with a phosphorus one, humic acid detaches them making the phosphorus available for the plant. Humic acid is also especially important because of its ability to chelate micronutrients increasing their bio-availability.

How Does Humic Acid Effect Microbial Activity and What is its Role?

The activities of beneficial soil microbes are crucial for the sustainability of any soil and plant growth. Humic acid stimulates microbial activity by providing the indigenous microbes with a carbon source for food, thus encouraging their growth and activity. Soil microbes are responsible for solubilizing vital nutrients such as phosphorus that can then be absorbed by the humic acid and in turn made available to the plant. Additionally, microbes are responsible for the continued development of humus in the soil as it continues to break down not fully decomposed organic matter. This in-situ production of humus continues to naturally add to the humic acid base and its benefits.

Humic Acid's Role in Fertilization

Humic acid is technically not a fertilizer, although in some walks people do consider it that. Humic acid is an effective agent to use as a complement to synthetic or organic fertilizers. In many instances, regular humic acid use will reduce the need for fertilization due to the soil's and plant's ability to make better use of it. In some occurrences, fertilization can be eliminated entirely if sufficient organic material is present and the soil can become self sustaining through microbial processes and humus production.

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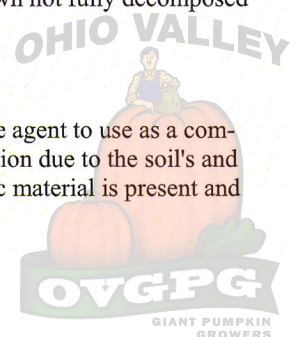
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A Soil Study of Atlantic Giant Pumpkins

by Don Chambers

Don Chambers contacted 392 growers over 7 years to prepare this report!

dec@stratuswave.net

Introduction

Soil is the basis and foundation of all plant growth. Focusing on soil preparation for the Giant Pumpkin plant is first in setting the stage for the sport/hobby of Pumpkin growth. A soil study focusing on pumpkins grown over 1200 lbs. and separated into 100 lb. increments up to the most recent World Record Pumpkin is conducted in this study. Balancing soil available uptake to the plants and soil balance is the goal of this study. These results are available here for further study and knowledge regarding soil test results and why we obtain them. These records are available for anyone wanting to do further studies on this subject. It is time to share the results and have others make their own conclusions and hypotheses based on this available information. Thus far it doesn't appear that a soil test to this extent has been performed on just AGs alone. Sound scientific study is the key to breaking the One-Ton barrier and beyond. The purpose of this study is to discover what soil stats separate record pumpkins from non-record status.

Hypothesis #1: Potassium is needed in higher quantities and base percent ratio than originally suspected.

3% is often recommended for vegetables but Giant Pumpkins show consistent 8-9% average needed to grow to their potential.

Materials and Methods

A collection of soil test samples were obtained from most record growers over the period of 7 years. The study was conducted by e-mail, snail mail and soil test results completed by top growers. The results were obtained and meticulously charted over the last 7 years. Top questions were also posed re. soil and answered by Top Growers which was included in the study. The numbers available were studied and conclusions made with the assistance of top growers findings through experience and also their comments taken into consideration.

The results and amendments are posted earlier in this volume for consideration. All growers were attempted to be contacted at least three times asking for the results and also posted needing results at least once a year on BP.com general discussion, which is the utmost contact source for Giant Pumpkin growers around the world.

Contribution stats:

Total available complete tests available - 221 pumpkins

Total - 392 pumpkins/tests

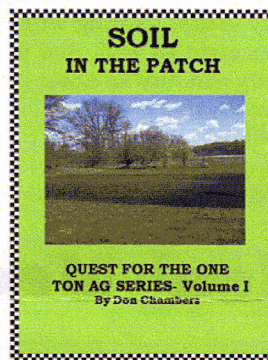
Just pH results submitted- 14 pumpkins/tests

Inability to contact after 3 attempts by e-mail and BP.com -171 pumpkins

No tests done for several years - 4 growers

No soil test available or could not find - 10 growers

No soil test done - 13 growers



Contact Don at the email shown above to order a copy of his new book.

Findings of Soil Study:

Result: Findings available show that the hypothesis is correct and highly significant. This is not to say that record pumpkins can't be grown with Potassium variations of base percent but just show that the majority of record pumpkins require more Potassium than originally suspected and very near the 9 % range theorized by the study.

Base Percent Saturation of K%-Mg%-Ca% is averaged and balanced near an easy to remember ratio of **9-20-67** ratio rounded off. (Note that Potassium % is higher than originally suspected, Calcium % is lower than suspected to be needed). These three balance with Nitrogen and it is helpful to keep them balanced, as one goes up, one goes down etc.

Potassium is needed in higher available quantity than other pumpkins and vegetables. I.e. Recommended for vegetables is 3% but these giants average at 8-9% (closer to 9% available Potassium] needed. Ron & Dick Wallace have been on to this and with timing of these applications as mentioned in newsletters.

Ranges show that the AG plant is quite tolerant to large variations of different nutrients/minerals and to low and high fluctuations. The plants do better with balanced soil but not an overabundance just dumped on the patch.

Organic Matter [OM] is averaged out at about **9%**. Anything above this not broken down can possibly be linked to Blossom-End Splits [BES], excess ammonium and less available Calcium uptake d/t excess Ammonium nitrogen in competition. Also see writings by Russ Landry "Trip Down Calcium Highway" [Excerpts in the volume under Calcium in Soil Chemistry section]. Note that a consistent average of 10% occurs until the last three World records where OM is 3-7.9%. This means that organic material is broken down sufficiently but a loamy-sandy soil is key. Humates are ready to act and available for growth.

pH a few years ago averaged almost spot on 6.8, updates point to a new pH average of nearly 6.9-7.0. Closer to this pH has shown bigger pumpkins. pH is very important for

uptake of what available minerals are possible. The neutral pH seems to be friendly to a balance of what the plant assimilates. Much higher than pH 7 and Zinc is not taken up correctly, lower than 6.8 and certain other nutrients aren't available.

Nitrogen is best applied by a slower release more organic means such as fish fertilizer or blood meal rather than high percent synthetic means. Timing is very important and recognizing the time frame of N breakdown to time-frame of needs for plant vs. Fruit growth. These organic ferts are best applied about two weeks prior to transplant around a 15 ft. Area of the transplant from back end (transplant area of plot to 15 ft. towards main vine growth and 7½ on either side. A reading of about 30-35 ppm is about average and efficient.

Sulphur has quite the range for growth **0.8-639** ppm. Sulphur helps break down proteins and help + ions of nutrients/minerals to become available. It is underestimated as a need. S is sufficient at 15-25 ppm but better the closer it gets to 50. Pumpkins can tolerate a good bit.

Zinc can be tolerated to at least 74 ppm but 5-10 ppm is sufficient for disease resistance and immunity of the plant. An underestimated mineral.

Manganese is best kept between 25-26 ppm as it is balanced here. Higher or lower can effect pumpkin growth as it competes with other minerals if used at too high of levels. There is a myth that Mn higher than 11 can inhibit growth but this does not

prove to be true.

Iron (Fe) is underrated as a mineral and is especially important with Nitrogen at the needed stage of growth. Larry & Gerri Checkon were on target with the Ironite supplement and how iron can aid absorption and assist Nitrogen for early leaf and vine growth. Plants can tolerate quite a range here as well as some other minerals. The range reveals 2.5-281 ppm. It is ideal near 46-47 ppm.

Copper is not needed in large quantity and if it's at the recommended range, leave it alone.

The study shows that Giant pumpkins can tolerate more but is best between 2-2.3 ppm.

Boron can be toxic but also is needed to assist Calcium uptake into the plant. Keep it within the recommended range of 1-1.5. None of the minerals or factors studied show a completely direct positive or negative correlation although some of the most significant factors or correlations have been discussed in this study.

Discussion

Biases in this study are:

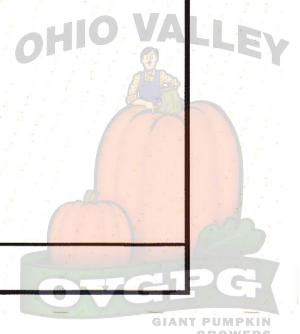
- 1) That all soil tests were not available, taken or given.
- 2) Modes were not extrapolated since some pumpkins were grown in the same plots with same values.
- 3) Spring to Fall testing was conducted and may be subject to change due to weather conditions. Some chemicals such as Nitrogen will leach out of soil with a lot of rain.
- 4) Amendments added at different times but all growers took samples before amendments were added.

Atlantic Giant Pumpkins is found to tolerate quite a wide range of different mineral values as you can observe by looking at the test results. The largest of the large seem to have more of a balance needed to fare well. The minerals tend to balance each other in the soil. The closer you can get to balancing the recommended ranges the chances are the better you will grow. Balance here means to use some type of guide rather than simply throw large quantities of ferts and amendments all over the patch. This study will hopefully provide a substantial guide to growing the next World Record.

The present study is just dealing with amounts and percentages. Soil types and all other recommendations need to be taken into serious account as well. Soil is just one of the most important foundations of pumpkin growing. Be careful not to just apply an arbitrary amount of amendment but to always follow recommendations to change any soil values. Soil manipulation may take more than one season to fully correct. Hopefully others can make needed deductions and/or continue with this study. Please feel free to use the information in this study in a scientific manner for further study. Other studies may also find this information to be an important link to that other particular study. The information above is freely available to assist or complement in any of those particular present or future studies and the Commonwealth of all growers.

Ideal-Median Ranges per Study

Soil Component	Ideal Range
Organic Matter (OM)	8-9%
Nitrogen (N)	30-35 ppm
Phosphorus (P)	160-170 ppm
Potassium (K)	540-550 ppm
Magnesium (Mg)	310-320 ppm
Calcium (Ca)	2540-2550 ppm
pH	6.9-7.0
CEC (Cation Exchange Capacity)	16-17%
Potassium Base Saturation (K%)	8-9%
Magnesium Base Saturation (Mg%)	20-21%
Calcium Base Saturation (Ca%)	66-67%
Sulfur (S)	49-50 ppm
Zinc (Z)	9-10 ppm
Manganese (Mn)	25-26 ppm
Iron (Fe)	46-47 ppm
Copper (Cu)	2-2.3 ppm
Boron (B)	1-1.4 ppm



Mycorrhizal Fungi Dormancy

by Bryan Langley

An interesting fact fell into my lap one day while researching Mycorrhizae. On www.plantmanagementnetwork.org, a website brought together by The American Society of Agronomy, American Phytopathological Society, and Crop Science Society of America, there was an article titled "Arbuscular Mycorrhiza Inoculum to Support Sustainable Cropping Systems". In this article It covers Mycorrhizae's role with plants and also propagation methods.

This is where this quote jumped out at me, "A technical problem usually encountered with AMF is that spores can easily fall into dormancy and germination rates decrease dramatically (16). A cold-temperature treatment can be used to break dormancy (23,39)."

So I looked up the references cited. Reference 16 was associated with *Gigaspora gigantea*, not frequently used by us and reference 29 was associated with *Glomus etunicatum* another not used frequently by us, however reference 23 was associated with *Glomus intraradices*! Ding Ding Ding we have a winner! *Glomus intraradices* is the most widely used mycorrhizal fungi in the agricultural world because it is highly symbiotic. Even with a lot of products that have mixed species in them, usually 50% of the mix is *Glomus intraradices* and the rest is divided up among the remaining species. It also happens to be the main species in the products we use.

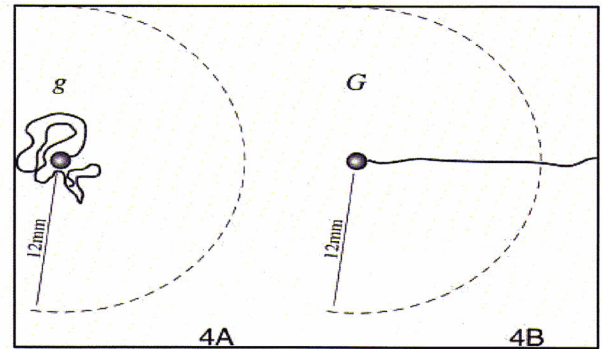
The title of reference 23 is "Breaking Dormancy in Spores of the arbuscular mycorrhizal fungus *Glomus intraradices*: A critical-cold storage period". This study was conducted by Christine Juge, Julie Samson, Claudia Bastien, Horst Vierheilig, Andrew Coughlan, and Yves Piche. In this study it goes into detail how spores of *Glomus intraradices* can become dormant. The definition they used for dormancy was "one that fails to germinate although it is exposed to physical and chemical conditions that support germination and hyphal growth of apparently identical, but non dormant spores of the same species"

The spores they used in the test were 2-3 months old. They used a temperature of 4C (39.2F). The spores were stored for 6 different time frames: 0,3,7,14,90 and 120 days. The germination results were as follows:

Days stored at 4C (39.2F)	Germination rate
0	50%
3	50%
7	70%
14	~85%
90	~90%
120	~85%

So as you can see the *Glomus intraradices* spores that were subject to greater than 2 weeks of cold temperatures had a much higher germination rate. The spores at 0 days and 3 days had 50% germination rate. You have to ask yourself what germination rate would you want?

Another thing noted in the study was the effect the cold storage had on the hyphal tube growth of the germinated spores. The spores that were at 0,3 and 7 days cold storage had hyphal tubes that spiraled around the spore and didn't get very far from the point of origin, the 14,90 and 120 days cold storage had long straight hyphal growth. The following image shows the pattern difference.



This table shows the % of spiral to straight growth hyphal tubes in correlation with days of cold storage

Days of cold Storage	% spiral growth(g)	% straight growth (G)
0	~90	~10
3	~75	~25
7	100	0
14	~50	~50
90	~10	~90
120	~40	~60

So based on the information from this study, cold stratification (storage) not only will increase the amount of spores that germinate but also influences the hyphal growth. So armed with this information I contacted three major Mycorrhizal companies (RTI, Mycorrhizal Applications, and Fungi Perfecti) for their opinions on this matter. The response was surprising. Not one company cold stratifies their inoculums. One told me that this study was purely academic, another didn't even bother to really read over it and thought I was talking about deep freeze storage, and a third admitted to producing dormant spores but knew nothing of the study, however once he read the study he agreed with it.

Mycorrhizal symbiosis is a by chance association, the mycorrhizae needs to get a signal from the root exudes in order to make the symbiotic attachment. Add on top of that chance symbiosis, a reduced spore germination of 50%, and it can seem like the odds are weighing against us. Once a spore has made the association it takes off growing at a rapid rate. Fueled by the plant it has one thing in mind; find food for my host so I can still eat. However it takes 25-30 days on average for the first spores created by that one germed spore to become fully grown and ready to do the same task. So for 25-30 days that mycorrhizae is actually a detriment to the plant, but the tables turn swiftly. Following that time frame the exponential growth of the mycorrhizal colony is staggering. So put that into our hobby time frame wise. We start seedlings in inoculated pots usually in mid April so by mid May the first associated spores have now produced fully functioning ready to go spores which now in turn start producing more spores and so on. Reducing the germination rate cuts in to this exponential growth. So you need to sit back and decide. Don't take my word for it, look up the references, call the companies, and email a scientist or two. In the end do what you think is best but I know what I'm gonna do. My Mycorrhizae will be put in a refrigerator at least 2 weeks before the season starts, because I'm not happy with 50% and neither should you be.

References:

- 1) Breaking dormancy in spores of the arbuscular mycorrhizal fungus *Glomus intraradices*: a critical cold-storage period. -Christine Juge • Julie Samson, Claudia Bastien, Horst Vierheilig, Andrew Coughlan, Yves Piché
- 2) STUDY ON LIFE CYCLE OF ARBUSCULAR MYCORRHIZAL FUNGUS *GLOMUS INTRARADICES* USING *IN VITRO* CULTURING TECHNIQUE -A. Eskandari, Y. R. Danesh
- 3) <http://www.plantmanagementnetwork.org/pub/cm/review/2004/amfungi/>

MOSAIC VIRUS

by Matthew DeBacco

Mosaic Virus is a general term, as there are many plant viruses that create mosaic symptoms but may not be caused by the same virus. Specifically, I will be focusing on Cucumber Mosaic (CMV), Watermelon Mosaic II (WMV-II), and Zucchini Yellow Mosaic (ZYMV), as these are common, with ZYMV being specifically diagnosed as the reason for the loss of my giant pumpkin plants in 2012.

The Problem:

What makes viruses unique is that they are a piece of nucleic acid (like DNA or RNA) wrapped in a protein shell. Basically, this is a nonliving particle, so it is hard to kill something that is not living in the first place.

The Symptoms:

The leaves will develop a mottled look exhibiting blotches of lighter green color and more normal-looking colorations. It can look very similar to a magnesium deficiency. See write up by Bryan Langley in this Newsletter. Typically, the newer growth will be the

first to show these signs; this is an area where cellular replication is occurring at the highest rate, and rapidly dividing cells is exactly what the virus needs. Viruses simply redirect cells to manufacture more virus particles and not normal plant tissue. As the infection worsens, the leaves can also become misshapen along with the color changes.

In my infected field I noticed the secondaries that were terminated and had no new growth occurring were resistant to showing the mottled coloration. I believe this is simply due to the fact that, overall, the rate of cell division is low in mature leaves.

Another sign of a very high virus concentration in the plant is the immature (pre-pollination) pumpkins will have green colorations in a random pattern. If the pumpkin has been recently pollinated (within about 7-10 days), the pumpkin may continue to still grow and retain the common early shine, but it will develop irregular bumps with potentially no change in coloration. If the pumpkin is over 20 days old then it may not develop evidence of being infected other than reduced growth rate due to the plant having lower efficiency. If your plant gets infected after 50 days there may be no evidence of problems other than some of the leaves getting the mottled coloration to them.

What this leads me to believe is that after day 20, our pumpkins no longer have cell division occurring, meaning that from day 20 on, it is just cell expansion that is responsible for the increase in pumpkin size. Again, this is only a theory based on my



observation of the lack of change in mature leaves that are not actively dividing.

The Vector:

How does something nonliving find my plant? The initial point of infection typically occurs through an insect vector. In most cases, this is an aphid with *Myzus persicae* (Green Peach Aphid), and *Aphis gossypii* (Melon and Cotton Aphid) being of particular concern for ZYMV.

Now, in my patch I did not see any aphids prior or post infection, however, I have learned of a special case of “night-time runner aphids”. These aphids hatch and can run through a field at night looking for their ideal host, biting random plants along the way, transmitting the virus, and leaving the area without being detected even with consistent scouting.

Another vector can be you, the grower/caretaker. Some viruses have a very high rate of mechanical transmission. This can mean leaves from two adjacent plants touch one another and transfer the virus.

Tools and equipment can also act in the same way, so removal of a plant and disinfection of the tools used in the patch should occur as an attempt at local eradication.

Method of control:

If insects are the vector, then insecticides seem to be the logical method of control, but this is NOT the solution. An infected insect only has to pierce the plant to spread the virus, so transmission can literally occur within a few seconds. A much more effective method of control is regulating weed species because they act as reservoirs for the virus, which can infect the plant without showing

symptoms. Weed species to target are Pokeweed (*Phytolacca americana*), as it can be an alternative host for many plant viruses, as well as *Trifolium repens* (white clover), *Stellaria media* (Chickweed), and

Tripleurospermum maritimum (Mayweed). In particular with Pokeweed, I suggest you even offer to rid your neighbor’s property of this weed, as it is easy to spot and can potentially save your season. **Use Google.com to see a photo of these weeds.**

General recommendations:

If you suspect you have a virus, I suggest you consider getting a virus screen (www.agdia.com) to determine the exact virus (or viruses) you have. Each has their own specific conditions; some are of greater concern than others. If a virus is confirmed, it is best to remove the material from the patch.



Inducing Magnesium Deficiencies

by Bryan Langley

Its fruit growth time and many growers are trying to push their pumpkins to its maximum potential. A common method is to switch to a higher potassium fertilizer. And stories be

told..... many growers have easily over done it and stopped a fruits growth. But what is the reason for the big stop, and can it be averted? I use TKO and Silguard for their Protective properties, and also a boost of Potassium. This year, my magnesium level was slightly lower than prime, at the beginning of the season. I had a fruit doing 37 pounds one day, then it slowly dropped down to 21 a day over the course of a week.

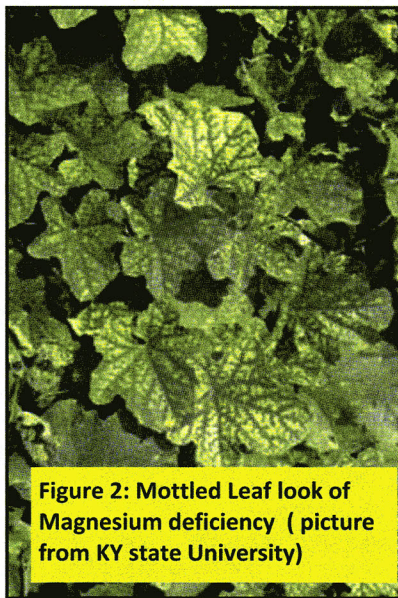


Figure 2: Mottled Leaf look of Magnesium deficiency (picture from KY state University)

At the same time I saw some discoloration on the leaves near the fruit. Very similar to what downy mildew looks like, but no fungal spores underneath the leaves. I did some research and found some pics of magnesium deficiency that looked identical to what I saw. There are many other things it could be too, but based on what it said this seemed the most likely.

Here's what I found.

1) From www.eplantscience.com , “Increased potassium fertilization or availability, relative to magnesium, will inhibit magnesium absorption and accumulation and vice versa”.

2) “On soils marginal in crop available magnesium, deficiency can be induced by highsoil potassium levels or high rates of applied potassium.” (Iowa State University, Dept of Agronomy).

3) “Magnesium deficiency can be readily induced on many soils by excessive dressings of potassic fertilizers, especially sulfate of potash” ([The Diagnosis of Mineral Deficiencies in Plants by Visual Symptoms](#), by Thomas Wallace, M.C., D.Sc., A.I.C, University of Bristol Agricultural and horticulture Research Station, Long Ashton, Bristol)

So armed with this info I decided to apply foliar Magnesium by use of Epsom salts. I diluted 2 tablespoons per gallon and spray the plant on 2 consecutive nights. On the 3rd and 4th days gains were back to 29 and 30 lbs. To dilute the Epsom salts, use warm water in a cup

and mix until crystals are gone, then put in sprayer and fill with water. The point not to be missed here, is to be aware of what you are spraying or drenching with, and what effect it has on other nutrients. It is very easy to throw things out of whack and slow or even stop your growth.

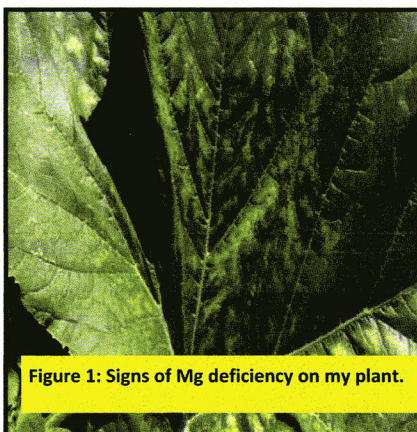


Figure 1: Signs of Mg deficiency on my plant.



They are the scourge of many a Pumpkin Grower. They are amongst the smallest of the non subterranean pests that we battle each summer. Thousands of them may be feasting on your plants all summer and you won't even know it until the end of August, after the life of your plants has been literally sucked dry. There are many species of them and most just love Cucurbita Maxima leaves.

APHID

Steve Connolly

Aphids may be green, yellow, brown, red or black depending on their species. All are small pear shaped insects with long legs and antennae. Generally adult aphids are wingless, but most species also occur in winged forms, especially when populations are high or during the spring or fall. The ability to produce winged individuals provides the pest with a way to disperse to other Giant Pumpkin plants when the quality of the food source deteriorates. Although they may be found singly, Aphids often feed in dense groups on the underside of your plants leaves. Aphids have many generations during the Pumpkin growing season, and where there are not harsh winters they can reproduce asexually with adult females giving birth to live females (often as many as 12 per day) without mating. Young aphids are called nymphs. They molt, shedding their skins about four times before becoming adults. Up here in New England, the species we battle will mate, and produce eggs in the fall and early winter, which provides them a more hardy stage to survive harsh weather. When the weather is warm many species of aphids can develop from newborn nymph to reproducing adult in 7 to 8 days. So you must be vigilant. Because each adult aphid can produce up to 80 offspring in a matter of a week, aphid populations can increase with great speed.

Large populations can cause curling, yellowing, and distortions of leaves. They can also produce large quantities of a sticky exudates known as honeydew, which often turns, the underside of your leaves black with the growth of a sooty mold fungus. Some aphid species inject a toxin into the leaves of your plants which further distorts growth.

Aphids may transmit viruses from one pumpkin plant to another. The virus causes molting, yellowing or curling of leaves. Although losses can be great, they are difficult to prevent through the control of aphids, because it only takes this bug a few minutes to transmit the

virus to your plant, while it takes much longer to kill the aphid with an insecticide. Although aphids and the viruses they transmit seldom kill your pumpkin plant, the damage they inflict can severely limit the growth potential of your fruit. Which means a smaller pumpkin for the

Weigh-off.

MONITORING & CONTROL

Check your plants regularly for aphids—at least twice weekly when the plants are growing rapidly. Most aphid species prefer the underside of leaves so turn them over to check them. Also check for evidence of natural enemies such as lady bugs, lacewings and even tiny wasps. Among the most important natural enemies are these small parasitic wasps that lay their eggs inside the aphid. When the egg hatches, it eats it from the inside out, leaving nothing but a mummified skin of the aphid. Some growers plant Queen Ann's Lace plants around their patch since the flower of these plants attract these wasps. Some spray high velocity water on the underside of the leaves which blows them off, and on the ground they die.

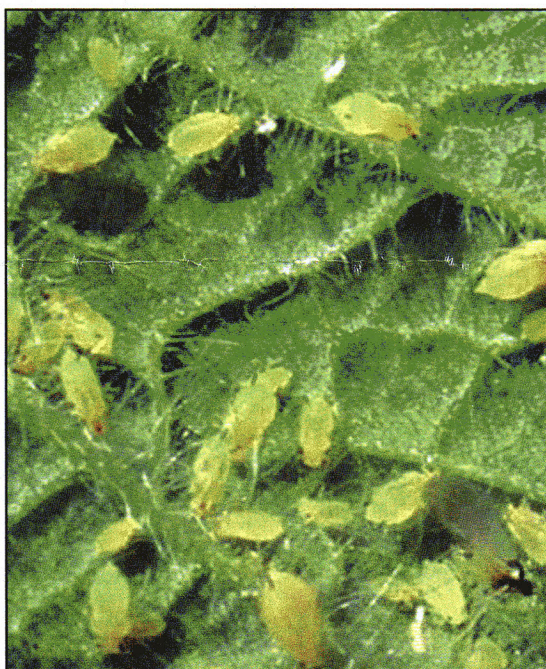
But where aphid populations are localized on a few curled leaves, the best control may be to prune these areas out and dispose of them. Natural enemies can be very important in the control of aphids, especially in gardens not sprayed with broad spectrum pesticides like (carbamates, and pyrethroids) like Neem oil and insecticidal soap) that kill natural enemies species as well as pests. Malathion is a simple pesticide of choice by many growers, but it must be sprayed on the underside of the leaf canopy to be most effective.

We then asked Ron Wallace for some words of advice, as follows: *Could you tell us how you control Aphids. Usually when I start visiting patches in late August, most patches are infested with them, but yours is not. Any words of advice would be much appreciated...*

Answer....I foliar apply merit wsp every 2-weeks from June till mid September. Merit is an aphid killer!

Usually natural enemy populations do not appear in significant numbers until aphids begin to be numerous. In the North East aphids cause their greatest damage in your patch when temperature are warm (65-80F) but not hot. Populations of many species are significantly reduced by summer heat over 90F.

Catch infestations early. Once aphid numbers are high, and they have begun to distort and curl leaves, it is often hard to control them because the curled leaves shelter aphids from insecticides or natural enemies.



APHID leaf damage...You'll get a pumpkin but, its size will be reduced, due to plant breakdown....

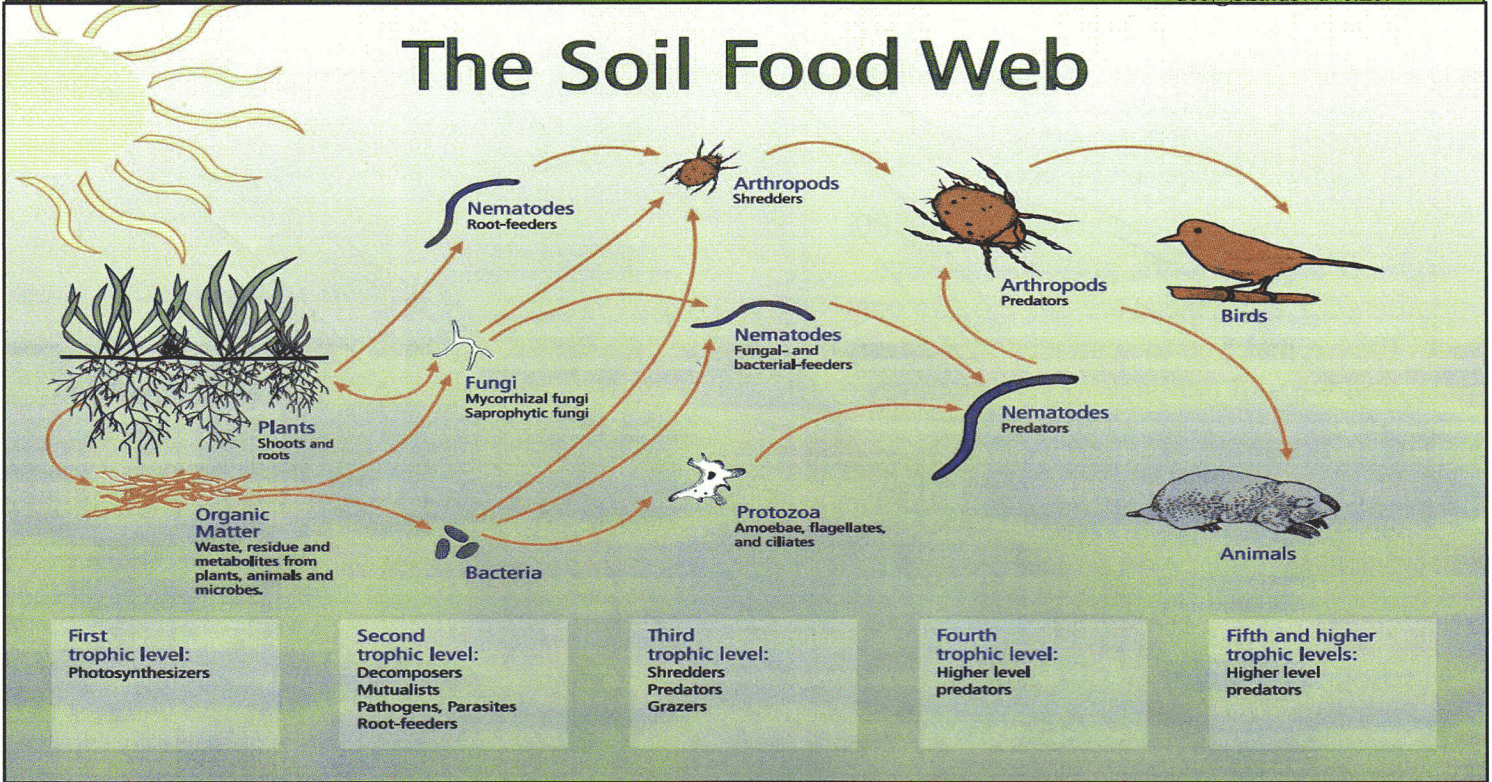


SOIL IN THE PATCH. QUEST FOR THE ONE TON AG

A portion of Chapter 5 about Soil Microorganisms (MOs)... from Don Chambers new 177 page book.

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The Soil Food Web



Viruses

Viruses are extremely tiny organisms which contain genetic information, but which cannot reproduce on their own. To reproduce, they must invade the cells of another organism and use the cells' reproductive machinery. Viruses are parasites of animals, plants and some bacteria—they must use the cells of these other organisms in order to live. Viruses cause mosaic patterns (light green, dark green) in leaves, puckering, leaf distortion, stunting, shortened growth and troubled fruit. It is impossible to diagnose specific viruses based on symptoms. Often two or more viruses are detected in a single plant. Cucurbit viruses generally over-winter in weed hosts. Avoid late season planting and control weeds around fields. Insect control has not proven totally effective. Development of resistance using biotechnology techniques is underway for many species of cucurbits.

Controls:

Control consists of pathogen-free seed and controlling aphids and cucumber beetles. The virus within the seed can be eliminated with hot water or chemical treatments. There are no chemical treatments for these viruses in the patch and control of aphids will not reduce, but may actually increase, transmission of the other cucurbit viruses. There is a need to separate infected plants and destroy them away from cucurbit fields. Eliminate weed hosts. Identify local weeds that serve as host to the pathogen and insects. Eliminate or reduce those weeds.

Major Cucurbit Viruses

Virus	Seed Transmission	Vector	Host Range
Papaya ringspot	no	aphid	only cucurbits
Watermelon Mosaic	no	aphid	wide
Cucumber Mosaic *	yes	aphid	wide
Zucchini Yellow Mosaic	no	aphid	wide
Squash Mosaic*	yes	beetle	limited
Tobacco Ringspot (Xiphinema)	yes	nematode thrips, beetles	wide
Squash leaf curl **	no	whitefly	limited

* Not important on watermelon

** Primarily infects squash and watermelon

Bacteria are members of a large group of microorganisms with a very simple cell structure. Some bacteria manufacture their own food, others live in association with other organisms and some live on organic matter. One of the most important uses of bacteria is as a tool to study inheritance and expression of genetic traits. Bacteria are basically found everywhere.

Bacteria have a symbiotic relationship with plants at the root zone, a part of the soil called the rhizosphere. Most soils are low in available carbon, while soil microbes consist mostly of carbon. As a result, soil microbes are usually in a state of starvation. However, some species of bacteria at the root surfaces extract needed nutrients from the plant, including sugars, amino acids, vitamins, tannin. Sugars provide readily available sources of carbon, while amino acids provide nitrogen. In return the Rhizobacteria provide numerous benefits to the plant including:

- Mineralization of organic nitrogen, sulfur and phosphorous
- Fixation of nitrogen
- Increasing root area
- Causing oxidation-reduction reactions.
- Promoting plant growth
- Producing plant hormones
- Protecting against harmful pathogens
- Enhancing nutrient uptake and use
- Increasing breakdown of synthetic pesticides and other contaminants
- Enhancing drought resistance
- Improving soil aggregation/aeration

Bacteria population numbers and diversity can rapidly increase when calcium is readily available, when soil pH increases towards neutral, and when sugars and amino acids are readily available.

Bacteria can hinder disease-causing MOs (microorganisms) by different methods:

- Direct competition- outgrows the pathogen
- Antibiosis- releases chemicals similar to antibiotics for disease control.

