

Simple Soil Tests - Improving Soil Health Workshop Transcript

my name is Glenn ravenberg and I own and CEO of soilworks. Big deal, what's that mean to you? We're the manufacturer of the extractor and also of the compost. But one of the things that I'd like to spend a short period of time talking about is what do microbes, like what do good microbes like versus bad microbes because there's beneficial and there's also pathogenic bacteria.

There's pathogenic fungus or fungi and there's also beneficial. They like different things. We're going to talk about that because some soil isn't ready for microbial inoculation.

And what I mean by that is what we're going to cover in the next short period of time. Before I start I need to tell each and every one of you I'm considered a disruptive speaker. I have been blackballed and taken off many speaking docket because I give information on how to solve problems. What do I mean by that?

When the university Academia Professor stands up and says a weed is just a plant growing out of place I don't buy that. I don't buy it at all. Or when they look at your soil test they go oh boy, you're scared to buy more fertilizer because all these minerals are unavailable, or they're tied up.

Or you're talking to the Academia about your pH of your soil. They said well you got a seven and a half pH, you're just gonna have to deal with it. Bull, I'm a believer of creation and we were given opposable thumbs and the ability to reason. I love what Jay has done with our extractor and to give you a quick little secret, he's not here, he hasn't even seen the beginning of the good stuff that happens as the soil becomes more balanced.

Anybody ever been to a soil seminar they say well you need to balance your soil but they don't tell you what that means. Or what it is or how to do it so without further ado we're going to try to attack this this is very informal... if you have a question shoot your arm up. If you're nervous about asking a question, write it down and we'll cover it later.

I'm going to have some opinions and I'm going to have some facts that a lot of you are going to disagree with. That's okay, I'm going to say some things to you that you're going to think, I don't know this bald guy from South Dakota. I don't know if he knows much. And then there's going to be some things I'm going to say and it's like, now we know he is absolutely certifiably crazy.

So if I may ask for one request, all of you sit back, open up your mind to the possibilities of something that may be different than what you're used to. We're going to take you on a journey of success in the soil. We're going to take you on a journey with success in the plant.

And with that, if I can see your hands, how many physicists, microbiologists, meteorologists, um chemists do we have in the room? Oh crap I was kind of hoping for a couple. We're gonna jump

in and out of a lot of different Sciences. These chemists, these agricultural chemists that say chemistry will explain everything about agriculture. They're foolish; it takes many Sciences to understand life.

And when we talk about life the name of our company Soilworks isn't just a name, we actually have been working since long before the turn of the century to figure out how to make soil work.

It worked before we were all here. These plants that were growing in the Garden of Eden surrounding it. I never heard the minister talk about a fertilizer plant or a chemical manufacturer by the Garden of Eden. These plants have all been here a long time so we're going to do the orange sheet that we handed out. I'm going to work very hard to absolutely dump a truckload of information on you in a very short period of time. And at the end of our short period of time if you don't think you've gotten any good information, come see me and I will refund the money that it cost you to get into the meeting today.

This orange sheet we put together for a group in California. There's an Acres USA conference that was in Sacramento at UC Davis and they asked us to give a talk on healthy soil and healthy plants. And then we had a field tour in one of our customers uh Orchards. So the information here, it applies to California, Kansas, Caledonia, Kazakhstan, Connecticut. Because all plants like the same things.

The Definition of Healthy Soil

We have a lot of different backgrounds in our room but we all need air. We all need food, some of us aren't quite as good looking as others but hopefully we can all get along so we're going to start with healthy, the definition of healthy soil.

Your definition may be higher or different than my definition of healthy. The definition of healthy that I like is without disease or impairment, period. So when we look at our Fields and when I say I'm a farmer, third generation on our family farm in South Dakota. And what was uh chemical free, just because Dad didn't believe in chemicals, we've now turned into organic.

And boy have we learned a whole lot about farming trying to grow crops organically.

What is healthy soil?

Soil that can penetrate water, allow water in.

Soil that will grow food. Soil that doesn't want to grow weeds. Even though we're told it's just a plant growing out of place. Soils that don't have disease.

Soils that don't grow armyworms, root worms, cutworms, wireworms. Soils that grow good healthy worms and good healthy bacteria and good healthy fungus.

To give you an idea my parents tried really really hard to raise us, my brother and sister and I. Well they didn't teach me how to swear, spit or steal but we all learn because in an environment bad things happen.

It's life we can't control the price of Commodities, we can't control the weather. It's either too wet, too dry, too windy, too calm, too whatever. That's just farming, let's control things we can.

And that's in the soil so if you do a soil test. Hopefully you're doing a zero to six inch top six inch probe. Your core, your samples, you mix them up in a bucket and you send them off to the lab. The lab takes an acid, blasts those off, different degrees of acids to see what's in that soil.

So when you look at soil as a composition of what it is, 45% of the soil if you just write it right in your worksheet, *soil minerals by 45 percent*, that's what makes up 45% of your soil. Five percent of your soil should be, according to the experts, organic matter.

Now with the minerals that show up on your soil test we're just going to go over the top five. There's a lot of talk about the trace minerals. The copper, iron, zinc, and manganese that get tied up with glyphosate, they are important.

But in most Fields we've got bigger fish to fry. And there's more important and a better return on investment for money than some of those trace minerals.

Calcium

Number one mineral and I'm just going to give you a little bit of background. The first mineral that normally shows up on your soil test is calcium. And in my mind being from South Dakota and fairly simple, I think calcium is kind of the mother of all the other minerals. Because when calcium is equally distributed throughout an environment, no matter what it is, everything works well.

Now, no judgment, no back and forth. If you are in a no-till situation, calcium is one of the heaviest minerals in the soil and naturally migrates down with moisture. What do I mean by that? We see a lot of problems showing up in all types of farming. We're based in South Dakota, we work in 38 States across the U.S, we're across all of Canada, and 17 foreign countries. We see a lot of good and we see a lot of bad.

What do I mean by that? In a lot of orchards it's a no-till situation, they will do a zero to six (No-Till Farming expression) and say huh we have 3,500 pounds of calcium we have all kinds of calcium. If you do an inch by inch in a zero to six in most no-till situations, and no-till does work. But the top inch has virtually no calcium. Because water and time has migrated that down. Second inch, virtually no calcium. Third inch virtually no calcium.

Fourth inch, yeah we're seeing some calcium.
Fifth inch, yeah we're seeing some calcium. T
The sixth inch, yeah there it is.

But it migrates down with moisture. What's my point? Every microbe that you want in your soil has a skeletal structure. Endo or external, insider or outside it has to have calcium for physical structure and physical integrity. If there isn't available calcium in the top inch and you spray whatever compost down, if there's no calcium there you're not going to be impressed.

And to be honest, another secret, we don't want a call from anybody to say, yeah we use your extractor, we're not impressed. We bought your bio five and we didn't see squat. It's happened to every one of us. So what I'm going to try to do is to show you what we have found the hard way, how to prepare an environment for microbes.

If you haven't applied calcium for some time, or if you haven't done any tillage for some time unfortunately your top soil will be short of available calcium.

How do we know that? Because we've tested the soil and we've tested the plant. Now when they say that calcium is unavailable, it's migrated down and is probably now in an anaerobic Zone.

What do I mean by anaerobic Zone? We'll get to that in just a little bit, lack of air. The calcium has to be present in every cubic inch of soil to have life.

People that have sleep apnea, if you need a CPAP, those people are short of calcium. How do I know this? In order to go into REM sleep the human body has to relax 600 muscles. To relax those 600 muscles you go into REM sleep and you actually get rest. Calcium is the deficiency in the human body that causes sleep problems.

If soil is tight and stressed, lumpy, clumpy, cloudy, hard pan, plow pan, crusted, it doesn't have mother calcium there to relax it. To make it pliable to accept water. And I apologize, I give a lot of different talks and sometimes they're one day, two day or three day seminars.

And here we're saying okay let's try to put this into an hour. It's like okay we'll see what we can do. So I'm going to try to give you the most pertinent information that will make you wonder if they actually know this stuff. I only speak of things we have proven ourselves and done with our own work. So I'm going to hop through these minerals quite quickly because we've got a lot of good stuff to cover because I made a lot of big promises up front.

Phosphorus

So calcium is the queen, calcium is a mother. Every mother has to have a father, and that father is phosphorus.

Phosphorus doesn't leach down or up; it will move laterally back and forth. And phosphorus is a mineral that facilitates everything to and through the plant. It's a conveyor of minerals, it's a catalyst of nutrients and it's the number one mineral for reproduction. And yes there is reproduction in the soil, and yes there is reproduction in the plant.

If these beneficial microbes don't have good available phosphorus they can't reproduce. Point being you pay for an extractor, you buy microbes, you buy compost, you grow your fantastic Johnson Su, whatever way you go you put it out. And you go, huh I wonder if Jay's full of crap because I didn't see anything that Jay did.

He's done some things right, you guys have done some things right. I know this for fact because if you weren't successful you wouldn't still be in business. And if you weren't intelligent you wouldn't be looking for something that may be better.

So looking at your phosphorus, phosphorus has to be hooked to oxygen to get to the plant. What do I mean by that? If you look at your soil test you'll have Total P, you'll have P1, you'll have P2.

What form of phosphorus can they only form to get to the plant? P₂O₅ Phosphorus pentoxide Every phosphorus has to have a handful of oxygen to get to the plant if the oxygen isn't there in the soil. For the phosphorus to pick up it's going to turn into a union of laborers, I don't work without oxygen that's not my job. These conditions are horrible. I'm not moving.

Source of Oxygen

Now does anybody have an idea where we could find some available oxygen for the soil. Say that again. Right above us, okay now that is a dollar answer. Why did I just give him a buck? Thank you for that because knowledge is power. And make no mistake, the more you know the better off you're going to be.

So while you're in control of things he said right above us and right in us.

The Beneficial microbes breathe just like we do. They breathe in air they exhale carbon dioxide CO₂. And there's also some nitrogen in the air. Anybody remember or anybody know how much nitrogen is in the air. Be loud be proud, all right sorry that was a pretty that was a little bit tougher and there's a \$10, okay.

I bet I'm gonna get more answers now and there is a limited supply here. **78% of every breath we take is nitrogen.**

Why are we buying any of it, it's crazy?

And how can we get this nitrogen from the air down to the soil?

And into the soil? but we're still talking about phosphorus.

And this will answer one of the questions many times when your fertilizer guy will say well you got a lot of phosphorus in your soil but it's all tied up. Or it's unavailable guess what that P₂ may

be lacking O₂. If you're short of oxygen nothing else matters. You could have on your favourite t-shirt, you can have on a brand new pair of socks you could have just had a fantastic meal prepared by the lovely ladies in the kitchen. You run out of air, you're done this is what's happening in American soils.



Penetrometer

Some people say, well I've got some compacted soils. It's like okay. Define compaction. Well it's hard. What does that mean. Well it's like a brick. It's like can you put a number to that. I said well what do you mean? It's like, well the better you can identify something more accurately you have the ability to fix it. This isn't a weapon of torture this is what they call a soil penetrometer and there's a visual, visible gauge on top. And as you pick the appropriate tip, dirt and sand, you push down, and if you're in clay you push down until you get 150 psi.

And that's yeah you are already ahead of me thank you, right below that graph is what PSI does soil need for proper respiration? A hundred and fifty pounds per square inch.

If you have more pressure than 150 the heavy sinking high pressure front that is designed to push air into the soil bounces. You lose oxygen that was free, you lose nitrogen that was free, and you also lose 400 and some parts per million of CO₂.

Carbon Credits

Speaking of CO₂, anybody interested in the carbon credits. Ever looked into it? Okay I can guarantee you, if you follow some of the things we talk about I guarantee each and every one of you will be recipients of large carbon credits.

Guarantee it, did you get that on tape Tony? Great, guaranteed. It may not come from where you think. It's gonna come from reduced nitrogen bill, reduced chemical bill, increasing quality, increase in quantity and increase in nutrition.

150 psi is the maximum pressure that a high pressure front can push and penetrate through. You know you have compactions in your soil because when you look back at the graph we've got 45 percent soil minerals we've got five percent soil organic matter.

What's the other 50 percent? What's the other half Water and Air. Yeah here's another 10 bucks nice work, thank you. Air and water equally make up the other half of the healthy soil.

Now why do we have this there? If you do your soil test and you find out you got good calcium that you've got good phosphorus and you look at all the minerals you get all the minerals absolutely perfect you're going to get a 45 percent on your test being crop because soil minerals only make up 45 percent of the soil. 150 psi will give you, and thanks for that great answer, will give you 25% air 25% water. If you don't have 25 percent air in the soil you will not hold water. You have to have the air space, you have to have the vacancy, you have to have the soil's ability to absorb it. We all saw the picture that Jay showed earlier. Neighbors field, standing water, his field is sticking his finger in the dirt. That's Mother Nature

Once you have ballpark 150 psi, now don't lose your mind if you're checking and it's 152 or 144. This is like Horseshoes and Hand Grenades you get points for being close. Get in the ballpark and you'll win.

As you push down when you step when you hit 150 psi reach down and mark the top of the soil if you only have this depth you have very small lungs in your soil. Now here's a question that has no dollar fixed to it because I think I'm going to get a lot of answers.

Does the soil actually breathe?

How often does it breathe? Okay now one of the disruptive parts. The agronomists will say the soil does not breathe, it's the microbes within the soil and it's the roots within the soil to breathe. But the soil actually doesn't breathe okay? There is respiration. Do we have any airline pilots? Anybody that's going through pilot training understands a high pressure front is heavier and they

have to compensate to bring more lift because that's heavy sinking air that's designed to push air into the soil to give you free nitrogen to give you free Carbon to give you free oxygen.

As that passes through you have a low pressure front that brings air up and that's normally after a rain and you walk outside. Oh you smell that nice good earthy smell Mother Nature just exhaled. If you're at 150 psi ballpark you're gonna get that the minerals that used to be unavailable or tied up will become available. And will become untied as long as you get air to them.

The goal for your aerobic Zone

How deep do your roots want to go in the crop that you're growing? The deeper you get your aerobic Zone the further the high pressure front gets pushed in, the more microbial activity you have the healthier your soil is. Healthy being without disease or impairment.

Let's just start off with six inches you may be surprised if you go out there. Now these are less than 300 bucks. You don't have to buy one, tell your neighbor you saw this great tool and if they buy it you'll show them how to use it. For another option if you've got a Banana Spade or a sand shovel go out and you can still do this in last year's crop and dig down and see where the roots are growing and what they're doing.

If you do this penetrometer in the spring that is going to be the softest most mellow relaxed soil of the season. As you get into November, December and January and that Sun starts beating down and cooking that soil, it gets Tighter and Tighter and Tighter.

Soil has personality and anybody that Farms understands that some of it's good, some of it's bad. Livestock have personalities too. Soil should not be overly soft, gooey and sticky when it's wet and turn to a dirty rotten Rock when it's dry.

Nothing should change his personality that much. What one thing could possibly keep the soil more mellow? Calcium. Mother isn't there, she may not be available, she may be down in the basement. Okay so we have calcium and phosphorus that are Mom and Dad. Phosphorus is a facilitator and it's one of the largest users of oxygen to get to the plant.

How do we know this? When you do a tissue test, a petiole test or a sap test the numbers that they give you on phosphorus is always always always P205.

If you don't have oxygen to hook to the phosphorus you're screwed. Nothing happens and your fertilizer guy is right. And he wants to be right because they want to sell you more phosphorus. It's their job, it's the American way. You should try to use what you've already purchased or what's there.

The other thing of which Jay has already found out, say Jay thank you by the way you gave such great information you guys are kind of a tough act to follow you're putting a lot of pressure on me here.

But the phosphorus, every one of you has more phosphorus in your soil than what you see or what's shown. As you increase the viability of your soil, allow air to come in, all of a sudden. microbes are starting to mine phosphorus and you're going to get phosphorus to show up that you never knew you had. Point being, start creating an environment to get the indigenous microbes that you already have in your soil and get them going. To see what you've got create the environment to grow good things

Potassium

Okay so we've got calcium and phosphorus, mom and dad. Now we're going to start with the kids. Potassium. Potassium is a water loving mineral. Potassium is one of the number one minerals, when it's in excess, that grows weeds.

Potassium is normally one of the largest excesses in any type of manure, especially ruminant animals, dairy, or feedlot. Potassium is the one mineral that will increase faster in a no-till situation than any other mineral that you're going to find.

Why? Potassium's got the nickname potash. The reason they call it potash is if you have a stove you throw coal or wood or grass or burn anything. Almost every other mineral every other element will oxidize with the heat and go up the chimney and leave you what's left. When the fire is done take that potash out and throw it on a certain part of your yard. You will grow weeds. Big strong ugly nasty weeds and the higher the potassium gets the nastier your weeds are going to get.

There are people that say, oh we've got super Weeds now. No, you got super screwed up soil. Fix the problem. What's the problem? There's residue that isn't being digested.

Now please don't take note of this on a serious note but as a funny note. None of you guys are no-till farmers none of you are true no-till farmers because if you were truly a no-till farmer when you got your food you wouldn't unbutton your shirt. You would have flopped the food on your belly and you would have waited for it to osmotically absorb through your skin. I didn't see anybody do that.

The quick way of digesting. Put it into the soil, into your body, into the animal is digestion in every sense of the word. What's that mean, possibly and I know this is going to be a dirty word with some of you, possibly some intelligent tillage.

What's that mean? In South Dakota we were very, very, dry this year, probably almost as dry as what you guys are. Dry enough to the point that some of the younger kids don't remember

seeing rain up there. But from July on we got no moisture. We go to do fall tillage, and to give you an idea when I say tillage, normally 15 to 18 inches of rain per year is enough for the growing season to start moving and leaching minerals to the soil.

We normally get that, we didn't get it this year. We got dirty rotten nasty, horrible dry soil. We were scared to do any tillage at all. Just like anybody else we didn't want it to blow.

We've got a piece, we have a piece of equipment called an airway I'm not promoting Airway I'm promoting vertical aeration and on our main ground we could twist those anywhere from six to ten degrees and all we were doing was poking holes. And why were we poking holes? Because we had compaction, we had over 300 pounds per square inch of compaction. And we know air isn't going to get into the soil if we're over 150.

So we used a vertical aeration piece of equipment and we poked holes seven inches deep every seven inches. It isn't as aggressive as tillage that we normally like to do and here's going to be a dirty word in our world. We find that every four or five years a moldboard plow absolutely makes sense and makes money.

But we get enough rain to leech minerals. If you don't get enough rain probably not the best situation. But as you look at the potassium and I've talked to several of you guys, a lot of it and I've heard several guys say yeah we're no tilling we're getting a lot of potassium.

What happens is any residue left on top of the soil, the infrared, the ultraviolet rays from the sunshine next summer are going to hit it and break it down and oxidize it. There is probably 40 to 150 to 160 to one a large ratio of carbon to nitrogen in that residue that is going to leave you.

The chemical companies want us to do this. The fertilizer companies want us to do this because that assures them business, next year and the year after and the year after that.

So with potassium. Potassium hangs onto moisture. Here's the other thing. If you have an excess of potassium on top you're going to get a watery, washy, plant. Because when a plant is looking for Mama looking for calcium, if it can't find it, it's like oh crap. I hear some potassium it's real close. It's right side by side on the periodic table we'll grab potassium. Potassium's job is to hang onto moisture like a gatorated hydrates, it hangs onto water.

We know that this is true because if you've ever been running a weed eater or a weed trimmer, you're trimming grass and trimming grass and all of a sudden you hit a broadleaf weed and you get sprayed with water.

Weeds love potassium. Potassium grabs moisture. Moisture lowers the sugar content or the brix of the plant and all of a sudden now you are susceptible to disease.

Intelligent incorporation of some of the residue. Please take a look at it as a possible option.

That's potassium, likes to grow weeds when it's in excess.

Magnesium

The next mineral could be my brother. If people were named minerals my brother would have been named magnesium because he had to sit right between Mom and Dad in church. Because he just couldn't contain himself and he couldn't quit screwing around. And he had to have calcium and phosphorus, one on each side of him just to keep him under control.

Magnesium is the mineral that is also electrically active, but if your magnesium is in excess and what I mean by that on your soil test, if you have more than 15 percent base saturation of magnesium you have too much and you'll have sticky slimy greasy when it's wet soil and you'll have hard as a rock dry hard when it dries off. Magnesium is a greedy mineral and it electrically hangs on to nitrogen. The higher the Magnesium is in your soil the more nitrogen it will tie up.

You've seen some Fields where you put the same amount of nitrogen across the whole field and you're looking at it like... ah that part of the field looks like it's low in nitrogen got the same amount.

I guarantee you have more magnesium in that area tying it up. If there's a problem child in the house and this particular house is the soil, Mama's usually the first one to fix the problem.

When you apply available calcium to the soil it will see the magnesium and go oh, you need to come here and it's motherly love that's going to hug the Magnesium. The nitrogen gets kicked off. Ah there's more free nitrogen.

And then the magnesium and you need to shut, you're going to be good, and what's going to form is a natural compound called dolomite. Calcium magnesium. In our world when we can flip that soil with a moldboard plow every four or five years because we get more rain, that calcium that has migrated down flips back over and it migrates down and starts grabbing onto the Magnesium calming it down.

You will notice that the higher the magnesium in the soil the higher the surface tension is with a penetrometer. It's the tightest, nastiest, most potentially horrible soil on the planet. But it has the most nutrients of any soil on the planet. And when you get Mom in charge and calcium comes in and says you guys need to relax right now and just chill, all of a sudden these nutrients become available, they're not tied up.

Now along with this every mineral has an electrical value. Now we're going to get deep deep deep deep into physics here. Stick with me I'll go slow. The charges of the polarity, it's either a positive or a negative. With me so far. Okay these charges have different degrees of strength.

You not only have to balance some minerals on a volumetric level but also on an electrical value. And that's where this measures the electricity or the attraction. Magnesium is kind of like a teenager in love. For that first love they're hanging on each other there. You almost have to pry them apart.

What keeps teenagers in love apart? Putting Mom right in the middle of them cools everything down. So if you have tight soil, high compaction you probably have a Calcium deficiency Magnesium is the X, when it's in excess it ties up nitrogen. That's the mineral that makes your soil tight and that's one of the minerals that can be easily relaxed to allow air and water into your soil.

Sulphur

The third electrolyte mineral is sulphur. Sulphur is like the quiet shy child that at family events all of a sudden you're sitting at the table and it's like where'd sulphur go. It's like oh they leached away here half an hour ago. Nobody even noticed that sulphur can leach up, sulphur can leach down.

Just like nitrogen sulphur is very, very important because it carries and holds electrical charges. The heck am I talking about here? If you don't have enough sulphur in your soil you don't have enough battery. And what I mean by that is in everybody's vehicle there's a battery. And the fluid that's in there is sulphuric acid a derivative of sulphur or sulfate. You need 30 to 40 parts per million of sulphur or sulfate in your soil to carry and hold the electrical charge that each and every beneficial microbe creates.

What do I mean by that? Every microbe is electrical.

Now thought... your heart

Everybody's got one, a lot of people try to act on I don't have a heart, you got a heart.

What makes your heart run?

An electrical stimulus is generated by the sinus node (also called the sinoatrial node, or SA node). This is a small mass of specialized tissue located in the right upper chamber (atria) of the heart. The sinus node generates an electrical stimulus regularly, 60 to 100 times per minute under normal conditions.

Rich dang it that's a 20. [Laughter] stop answering questions

It's electrical our heartbeat is electrical and it beats 80,000 to 100,000 times a day. Heartbeat, air and romance are sometimes combined. None of them are more important unless you're not getting one of them.

If your heart stops now all of a sudden it's important. If you can't breathe too much pressure, air is important. If you're not getting romance, that's your own problem. We're not going there today.

EC Meter

But with this the electricity of our heart, these microbes and almost each and every beneficial aerobic air breathing CO₂ exhaling microbe in the soil carries a half of a volt of electricity and this half of a volt of electricity is what pushes and pulls the minerals to and through the soil.



We can measure this we don't guess we measure. This is a very common handheld EC Meter, electrical conductivity meter. Most people will grab this, they'll jab in the soil and take one look and say okay.

Say let's take just a little bit more time and look at the electricity. The probes that this reads are the electricity of the two shiny points.

So let's say my fingers are the top of the soil. You stick it in just a little bit till you see a number. If you have a high salt or high sodium area in your soil, sodium is molecule light and will come to the top. And if you're getting kosher or foxtail or

tickle grass growing you have a sodium or saline or salt problem.

And if this number is over a 1.0, do not put any microbes down on there because it's going to fry them. They don't have a chance. It doesn't matter how much love you put into growing them, composting them, extracting them, you just throw them in, you burned them. They can't handle that much electricity. The microbe electrical route that they enjoy for an environment is between a 0.3 and a 0.9, zero point three and zero point nine. These microbes have to have all the minerals. The calcium phosphorus, potassium, magnesium, and sulphur and many others for their structure, but they also have to have the right electrical environment.

Now anybody that has irrigation water, you can also use this to check your irrigation water, rain water, deionized water, distilled water, RO water, any water that's been treated and snow melt should show up as a 0.00 there should be no electricity in pure water.

This is water I brought from home 0.52. 0.52 not very good water. What's that mean? There's too much electricity grabbing on to other stuff. This electricity is carrying minerals.

Water is meant to carry oxygen and nutrients from the soil. We don't know what minerals this water is carrying. The old timers and I'm becoming one of them very quickly, and say boy half an inch of rain is worth an inch and a half of irrigation water. That's because rain water or snow has a zero conductivity.

As you look at your soil if you have a sodic or saline area and you see a high number over 1.0, there's too much tension. There's too much electricity and what I mean by that is you've heard the adage a little salt in the wound burns. It's what it's going to do to the microbes. How do you get rid of that tightness and that excess electricity and salt and sodium? Available calcium.

Calcium is a direct or indirect fix to almost everything.

So go to the other part of the field and as you push down, if this number stays at a point three, point three, point three, point three, point three, point three as you go down, the more consistent that number is through this profile the more biological controlled that environment is.

These microbes have microscopic jobs. They have microscopic zones and they have microscopic job descriptions and environments they like. The more consistent the electricity is top to bottom, the better and longer life the microbes that are already there will have of any microbes that you can put out will have.

We covered a lot of ground. I don't know how well I'm doing. Questions, comments or concerns? Yes sir. This is micro Siemens or millimoles and it used to be in ergs. Ergs energy released per gram per second but they're changing it to a decimal point so that 0.3.4.5 that's what your first energy should be in planting or first emergence.

And then reproduction takes more energy should be a 0.6.7.8 or 0.9 it takes. I was reading it number 19. depending on what scale you have measured with if they're measuring ergs where microsiemens or millimoles you just move the decimal place two or three points so 900 would be a 0.9 makes sense?

49:30 on video

Thank you. Questions comments concerns so let's say I take that out and I go out and I you know let's say a guy Grace is corn stocks and he you know was hoping they had that much damage but he puts them down and he's not correct who will because he was grazing his Milo stocks what's the first step if he wants to loosen up his soils and may possibly go backward corn after his Milo stocks what what's the next step.

I'm going to answer a question with a question that's if that's okay. We have problem soil we all do, nobody's special it's just the way it is.

We're the ambulance crew. Stick with me here for a second. We go to the scene of the accident or the problem. What's the first thing an EMT checks for? Are they breathing, thank you. So before you do this, check your air, check your respiration. Because if you've got a heartbeat and you're not breathing the future doesn't look that good. So you got to have both, this is the heartbeat, the electrical heartbeat that is designed to come from microbes and this is the respiration that calcium will provide by relaxing the soil.

Now I need to jump back a little bit, wait hang on Jaden did I answer your question?

I mean aside from calcium is there like I mean one thing we try to do is like if we have some compaction area that we're trying to fix we like to use sorghum sudan grasses you know a high amount of sorghum Sudan grass and pearl millets to try to break up the radishes at the break but that's contraction issues. Then you're suggesting applying GSR the calcium product that you guys have. What are other solutions to breaking up the compaction of those two things?

Other options to alter Compaction

Okay other options to fight compaction. We're going to switch gears here a little bit. And please don't look at the front of this book it's kind of been through a war but the name of this book is When Weeds Talk and over the years we've been highlighting weeds that we have naturally eradicated by balancing the soil.

By balancing the pH, by getting air into the soil. If you want to get air into the soil quick we make a calcium for that. If you're not in a hurry you can plant things. What do I mean by that? When you walk, if you get your neighbor to buy a penetrometer, go in one of his pastures and look for some thistles or some musk vessels or Kenneth thistles or big ugly nasty heavy tap rooted weeds.

And what you'll do is you'll be going along in all sudden it's like hmm the ground that these thistles are growing in is a lot harder than where they're not. A weed is not a plant growing out of place it's got a big heavy Tap Root and a Tap Root of a Canada thistler musk thistle can push through up to and over 800 PSI of pressure to break open that hard pan to get down to where the calcium is migrated and to bring it back up.

And then when that root and plant dies it distributes a little bit of calcium to soften and relax the soil. So if you've got hard pan and plow pan do what you have to do but plant some plants that have a good hit, good heavy Tap Root. Now it's been a few years since I've been down here in Kansas.

I know you guys don't have a problem but do any of your neighbors possibly have some yellow mustard growing in their fields from time to time. If you've got neighbors that are growing it I get it yellow mustard is a weed that enjoys salt and sodium just like kosher. The yellow mustard will grow in a lower salt and sodium than what a kosher will. And if you watch those salt and sodium

areas which was yellow mustard, as it gets heavier yellow mustard you're going to now get kosher growing.

And as that kosher gets bigger and if the salt gets higher the kosher and the yellow mustard won't grow, but now you'll get tickle grasser or wild barley or foxtail depending on on the area that you call it and that all can be monitored with this (holds up EC meter) and in our country the low ground that used to be the best ground is now dead. The chemical Farmers have killed it with the conventional salts and sodium from the fertilizers and the chemicals.

And if you go into those areas they always work those areas and that's like you're working the wrong area because I've given guys this penetrometer I say now these dead areas as you guys keep working that is the softest most mellow part of your field. And they go oh you think you know so much. I said be careful I said you'll tip over so they're ready to push down and they push down they go down to their Knuckles. They think after a couple steps like what happened. I said sodium is all positively charged. It's like polarities repel. Its like putting six big dudes into a small closet. There's going to be some pushing and shoving, somebody's going to probably get popped. Dudes don't want to hang on to each other that close, there's repulsion.

It's all about electricity. If you have the wrong electricity microbes won't stand a chance. If you have the wrong electricity the minerals won't structure, that answer your question?
okay any other questions comments

Carbon

We got to keep on going otherwise I'm going to run out of time here.

If we go over to the right side of the page composition of a healthy plant, these numbers if you've never seen them before are quite new, they're quite fresh. I pulled them out of a book that was published in 1859.

The professors and scientists and agronomists have known this information for a long time. Now the composition that we have here is the composition of a healthy plant. Healthy being without disease, without impairment, no army worms, root worms, cut worms, wireworms. No Leaf Hoppers, no aphids, no fungal diseases. This plant has enough immunity to fight that off.

This can be corn, this can be canola, this can be cantaloupe. All sun-loving plants react to this. So what would you suppose 47% is, the biggest number there. What is that 47% makeup?

Who said that? yeah just did you see it there nice.

oh there's another \$20. I gotta quit asking questions, thank you for that.

Carbon makes up 47%, hear this, of the dry matter. Now anybody that does rations with livestock you always look at dry matter, moisture is a variable. Most plants while they're growing in the field will be anywhere from 70 to 90% water. Waters are variable, let's throw that out and look at dry matter.

So let's just say on average most plants are 80 percent water. We're now looking at 20% of the plant as dry matter. 47% of that dry matter is carbon. Other than the sneaky guy over here 43 is the Nick hey I see you looking, 43% is the next inclusion and is oxygen.

Okay help me out here with the math 47% and 43% we're at 90%. What was your carbon and oxygen bill last year for your inputs?

Yeah, the next inclusion is four percent. Four percent is hydrogen. There's something that you've probably never heard of in an Agronomy or a soil or microbiological meeting, hydrogen.

Why would we talk about hydrogen? If you remember anything about chemistry, a plant lays its leaves out to gather sunlight, water and minerals which is making sugar photosynthesis.

The chemical formulation for sugar is carbon hydrogen and oxygen. $C_6H_{12}O_6$ is sugar. Carbon hydrogen and oxygen make up 94% of the plant. Why in the wide wide world are we forced into buying so much nitrogen? Because the plant can't breathe. The soil can't breathe and the minerals aren't balanced.

And nobody in the Agronomy world and in the industrial synthetic fertilizer chemical World wants us to figure it out. Make no mistake it's big business we all know what we spend a year on inputs. So 47% carbon, 43% oxygen, 4% hydrogen. Nitrogen, here comes the big one. 3% is the only amount that a plant wants if it has enough carbon and oxygen.

Here's something they won't tell you in an agronomic School when a plant is looking for carbon and oxygen and if it can't find it you're like oh crap. All right we'll take some nitration. If a plant is looking for calcium and can't find it it will grab potassium. It's a dirty trick to a plant looking for carbon and here's some nitrogen. It's just like if I'd say hey who likes a big fat steak dinner? Everybody raises their hands and I say dinner's on me. We go to the steakhouse and here comes your plates and everybody gets a hot dog or a corn dog.

It's like well I I asked you if you want if you like steak I didn't tell you I was gonna buy it for you. These plants are getting pissed and there's an old commercial that says don't mess with Mother Nature she will win. Or it's not nice to fool Mother Nature.

Mother Nature will win. If you want to decrease your nitrogen bill, increase your carbon and oxygen in the soil because it makes up 90% of the plant. It's this simple okay. We have three percent left. We've got 47% carbon 43% oxygen 4% hydrogen 3% nitrogen. What's the last 3%? Wait no no I'm gonna say it because I think I'm out of money. The last 3% that makes up a healthy plant is the soil minerals.

So when I say if you get your soil minerals on your soil test sheet exactly perfect you're going to score a 45% or a 50% on your soil test. Guess what percent you're going to score on the plant test?

Three hmm I wonder why there's so many problems in agriculture now we're coming to the meat this is the good stuff here. This is where the rubber hits the road, the most important mineral content of a healthy plant. A healthy plant needs to lay its leaves out, gather sunlight, water, minerals, and make sugar within the plant. There's a transportation system. When that plant makes sugar there's a movement that's called the phloem that grabs that sugar and pushes it down out the root tips called a root exudate that is sugar water and minerals.

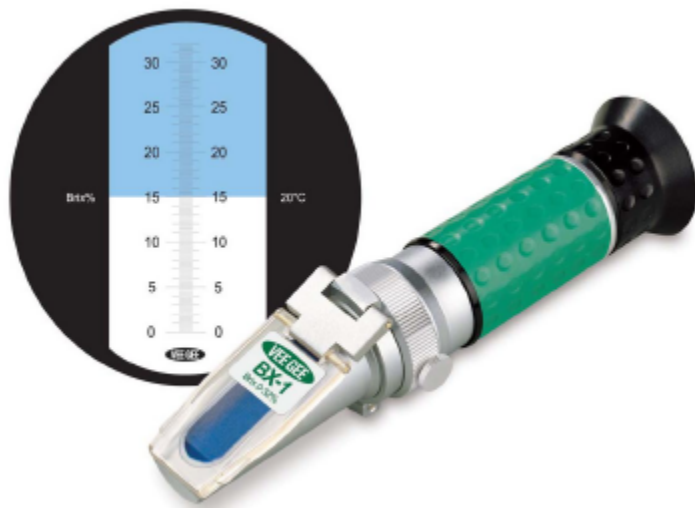
If that plant is producing a fair bit of sugar up to and over half of it can be pushed out the root tips. That's microfood, that's what gets the microbes partying and doing their thing. The xylem is when the microbes break off minerals and there's water there the minerals go up the next day so the plant can make more sugar to send it down to feed the roots.

It's a Wonderful Symphony, that when when it happens it lowers your input costs it increases the nutrition of what you're growing, **it increases your Revenue.**

Two of the things that are most important is you have to have a two percent level in the tissue within the petiole of calcium for that plant to photosynthetically make sugar.

The three tenths of a percent of the point 0.3 has three phosphorus. Mom and Dad have to be there, they have to be present and they have to work to make sugar. If you don't have two percent calcium, if you don't have three tenths of a percent phosphorus you're not going to make sugar.

1hr:04 into video



Refractometer

How do you know you're making sugar? Because we have another tool. This is so much fun. We can test everything with a \$100 piece of equipment called the refractometer. Our Amish customers will call it the refractometer or the sugar meter.

Take any drop of juice that you can squeeze out. Now if this looks like a garlic press anybody, you're exactly right. Put some plant tissue in there,

give it a squeeze, put a couple drops on, close the lid. Point it to the light and the light will refract through this, through the fluid and show you how much sugar is in that sap. Here's the numbers that they don't want us to know.

At eight brix of sugar you now have immunity and protection against detrimental fungus, algae, and mould, phytophthora or rhizoctonia, pythium, fusarium, pick your critter. Rust, all of these fungal diseases are all part of the same scumbag family. They don't like sugar content over eight brix, spelt b-r-i-x and they don't like available calcium and phosphorus in the plant making sugar.

Moving up from eight brix of sugar you now have fungal resistance and immunity. The next big level is ten brix of sugar. This is a good one.

At 10 brix of sugar that's the level that most weeds do not enjoy.

To finish the comment, they say a weed is just a plant growing out of place. A weed enjoys the exact opposite that our food crops do. It wants the exact opposite. What do I mean by that?

Okay we know that calcium and phosphorus is Mom and Dad and our food growing plants want love. And they will appreciate that we know that with a refractometer. And that a healthy plant is made of carbon oxygen and hydrogen is very important to the essence of the plant which is sugar.

At 10 brix of sugar there's a separation. Your weeds will start getting smaller. You're engineering an environment to grow food rather than weeds. So these guys say, oh we've got superweeds, oh we've got chemical resistant weeds. It's like yeah that's our problem but it's not the problem. You have screwed up the soil. They have obnoxiously high levels of potassium, they have low calcium, they have low phosphorus, they have low carbon, they have low oxygen, and they have problems.

Engineer the environment to grow things that make you money.

At 10 brix of sugar weeds are going the wrong or the good way. They're going down, they're not appreciating it. Many times a big tall weed will bow down to you because it's not happy or healthy.

At 10 brix of sugar the next thing that happens is normally, whatever your nitrogen Bill used to be you can cut it in half.

I'm going to say that in a different way. At ten brix of sugar you now have enough carbon, oxygen and hydrogen that the plant only needs 50% of the nitrogen than it used to.

Now we're getting to some fun stuff here, cutting down on the inputs. Please don't cut back drastically on anything until you know where you're at. This is the fuel tank, (holds up refractometer) this is the heartbeat, (holds up EC meter) and this is the respiration (holds up penetrometer). It's like taking the doctor to the soil or vice versa.

10 brix of sugar. Weeds are starting to go backwards, nitrogen is cut in half.

Here's a big one. Your irrigation costs will normally be cut but anywhere from 30 to 50%. I'm going to say that again. At 10 brix of sugar you will be able to reduce your water by 30 to 50%.

Why? Because carbon, oxygen, hydrogen and sugar electrically hang on to water. It will pull it from the air that we know as humidity and it will hang on to it until the plant pulls it or the soil pulls it away, it will absorb into the soil, it will absorb into the plant, it will absorb anywhere that carbon is.

GMO's

Now I'm not a big fan of genetically modified plants. I get why people do it as you work your way and get to health. When you get to 10 brix of sugar you can normally say goodbye to genetic modification because you're never going to get it any higher than probably 11 or 12 brix of sugar.

It's been genetically modified to grow in imbalanced soil and to grow like a weed. It is not food, it is designed to be fuel I don't mean to hurt anybody's feelings or try to offend anybody but it is what it is.

Genetic modified plants will not pick up phosphorus, because it's a terminal seed. You can't take it and replant it.

If you feed GMO corn silage or corn to a female you will have reproductive problems. Before I got into the soil business I was in the animal pharmaceutical and nutritional end. And I did autopsies and we figured out why animals were dying.

The number one reason that people quit feeding genetically modified corn to hog units or to any female Dairy barns or to any any female anything is because their reproduction went to crap.

So at ten brix of sugar you can take a look at being conventional. If you're planting a GMO I get it. You gotta do what you got to do to survive many, many, years farming.

We're not done yet. At 12 or 13 brix of sugar.

And this is just taking plant sap out of the plant squeezing it, looking at it.

At 12 13 14 brix of sugar, here's a fun one, you now have natural insecticidal resistance.

What do I mean by that? I'm up here rattling off a lot of stuff but we bought and paid for a lot of this information. With our research Greenhouse we hired an entomologist on retainer.

Entomologists study insects. Everybody tells us that Sugar kills insects. This is how it does it. Plant feeding insects are born and live without a pancreas. They can't digest sugar at a level of 12 13 14 brix of sugar. That Sugar will ferment, turn into alcohol and kill them. And people say there wasn't a plan in the first six days that things got put together. There definitely was a plan.

Sugar, which consists of carbon hydrogen and oxygen is the essence to everything that saves and makes you money. But if the soil can't breathe due to lack of calcium, you're not going to get there.

Questions on sugar content? okay moving on

Carbon to Nitrogen Ratio

White carbon to nitrogen ratios matter. If you haven't done a carbon to nitrogen ratio on your soil. Please specify and ask for it. It is the most important number on your soil test.

Why? Because carbon makes up 47 percent of the dry matter weight of the plant. It's the essence of success, carbon to nitrogen.

If you ask Academia say uh what are we shooting for for carbon and nitrogen they will lean and they go, oh my God and I've had many University do this, and say oh you probably have eight or ten times more carbon than nitrogen. Making it sound like oh my gosh we are loaded with carbon when you talk to the microbiologists.

They'll say an eight to one carbon nitrogen which is the answer to the first line most soils have. At eight nine or ten to one carbon to nitrogen the microbiologists will say an eight to one will just keep microbes alive.

They will do no work, they will save you no money, they will break down nothing, they're just like people we know or people we've hired. They're there but they're not getting anything done. They're a waste of air and good water.

Next number, okay I'm going deaf and blind **beneficial soil microbes require at least a 16 to 1 minimum carbon nitrogen ratio**

If you don't have a 16 to 1 carbon to nitrogen ratio in your soil, please don't spend a lot of money on putting bugs of any sort down. Because you're going to starve them. 16 to 1 is the minimum level microbes need to do work to be beneficial to making you save your money.

Okay you hear a lot of talk about mycorrhizal fungi. They say don't till your soil don't do anything to the soil because you'll destroy the mycorrhizal fungi in the soil.

If you don't have an 18 to 1 carbon and nitrogen you're not going to destroy any mycorrhizal fungi. They're not there.

And last but not least balanced aerobic compost should be 30 to 1 33 to 1. That is good compost. Now there's a lot of people out there that are piling up shit and mixing it around and calling it compost. If it isn't at least a 16 to 1 carbon to nitrogen getting it free would be expensive. It's not worth it. Now my background is in animal Pharmaceuticals and nothing against the livestock guys, I'm just please Don't Kill the Messenger, this is just the way it is.

If you put out liquid or dehydrated or composted dairy manure, for every thousand gallons of manure you put out you're going to put out 30 to 50 pounds of potassium.

If you're a no-till farmer you already have potassium excess because of the resin that's laying on top. If you can incorporate a little bit of that with some intelligent way you can start breaking that down. Getting the carbon in, they say that you shouldn't disturb the soil because you're going to kill microbes.

With any type of penetration or any type of soil movement you will kill microbes but you may suffocate him if you have more than 150 psi surface tension. If you don't have a 16 to 1 carbon and nitrate you're going to starve the little bastards. What a tough way to die.

Looking at your carbon to nitrogen, the good people that are there holding hands saying we need to save the Earth and we have way too much carbon. You guys can capitalize on that, there's money here for you guys to make.

But that air that surrounds us has to get into the soil, it has to breathe. Everything has to have air that's good. Now the other thing is if you haven't done a carbon to nitrogen and if you haven't checked the sugar content of your plant, please do because if for some electrical lightning shot of nature that these companies want to pay Farmers for sequestering carbon, you want to have your numbers in the past so you can show them what you're doing.

So when they say well you know most people sequester about a ton and that's worth about 23 dollars and you can say no we sequestered four ton because we have a deep aerobic Zone we have carbon to get it going and now 4 times 23 now you're looking at something that's a little bit more viable.

But in order to sequester it, nobody's telling you this, but you have to show them where you used to be. The carbon content of the soil is the most overlooked under spoken and never, least checked in the soil. If you haven't checked the carbon and nitrogen, please please please do.

Now if you're low in carbon, here comes some potential craziness, liquid molasses in the starter, liquid molasses as a foliar, sugar as a foliar.

If you're low in carbon and you need to spray a chemical, here's a twist. One pound of sugar in with your chemical per acre whether it's your fungicide, herbicide, an insecticide, or a pesticide.

Why? because all of these problems which the industry say are THE problem, they're just A problem. A weed isn't a plant growing out of place. so we just say hey this soil is really tighter, it's high salter, it's low phosphorus, it's crappy. I'm here to show you that I'm trying to fix it.

Here comes the spray boom. Oh it's just killed the scout and we wonder why we're going backwards.

Calcium, phosphorus, carbon, oxygen, are the first four things you need to look at to start creating the environment for microbes.

pH

Okay pH was one of the promises that I made. Anybody tell you how to raise or lower the pH in your soil? Anybody have neighbors that have a high pH soil? Is this the English speaking group okay?

You have a high pH. In the world of physics pH is a measurement of resistance. The higher the pH gets the more pressure you have to push to get anything through. We see this if you're in seven and a half, eight, eight and a half. The higher the pH the tighter it, the more resistance in the physicist world.

But let's jump back to chemistry. The chemists say, well pH is a measurement of potential hydrogen.

Okay what in the wide Wide World of Sports does that mean? As the actual pH number goes up the potential becomes greater. In other words as the pH number goes up the actual hydrogen goes down. We need to capture hydrogen, because as you capture hydrogen, that lowers the potential hydrogen that can be held.

Now what on Earth do we know that hangs on to water, that's beneficial, that makes up the majority of the plant. Carbon, Oxygen, Hydrogen, i.e. sugar.

Molasses

Yeah molasses, sugar, leonardite, stubble, anything that can be intelligently incorporated into the soil in a starter, however it is in a strip till, you have to increase the carbon content because carbon holds and controls four to eight times its weight in hydrogen. Hydrogen being a major part of H₂O.

The more carbon you have the less a drought will affect you. To give you an idea we do a lot of work in many parts of the world where the growing season is longer. We have successfully dropped the pH in many many different fields, no-till on Orchards or full tillage. We've dropped them a full point to a point and a half in one fiscal year.

How's this happen, how can it be, adding a little sugar, adding a little molasses. The sugar is going to drop the pH. You tell it to your agronomists and they go oh is that that bald guy from South Dakota. Because we've heard him say that crap before.

Here's the science behind it. When microbes have carbon, they have the raw ingredient to breathe in and exhale carbon dioxide CO₂. When you have a whole pile of microbes honeymooning, partying like it was 1999, or a senior year right after finals, they're giving an awful lot of huffing and puffing and CO₂. Here comes the irrigation or the rain.

Here's the science. H₂O and CO₂ make carbonic acid, a very mild soft natural organic acid that slowly drops the pH and massages the potential hydrogen back down to a six four, six five, which is where your phosphorus is more available. Which is where your beneficial microbes love to be. Which is where the availability of all the other nutrients work better, and that's also where this plant sap pH should be a 6.4 as well.

Makes sense, questions.

How much molasses?

Good question what's the carbon and nitrogen content of your soil and I don't mean to be a smart Jack, but here's the thing, don't just take this information and go uh let's try a gallon. It's not gonna do it. It's like peeing on a prairie fire you're not going to get the results you want.

In a corn crop what we're seeing is going to be anywhere from 10 to 50 gallons of molasses per acre per year.

If it's a pivot, spoon feed it little by little anytime you put nutrients out on the soil, or on the crop. Small amounts more often are more beneficial and more economical for you.

The selling companies don't like it because they want to sell big volumes. Not every day can be Thanksgiving where we eat too much, and Grandpa unbuttons his pants. And everybody lays around sleeping afterwards because they ate too much. Small amounts more often.

Molasses is a slow breakdown; it's a longer chain carbohydrate. Put some sugar with it. Two to three gallons at a time of molasses and the Molasses can be 30 to 35 brix of sugar molasses. The intensity is measured in sugar content in brix. So that 33 percent you can pump it with a trash pump. It works very well and it's easy to handle.

The Molasses is a longer chain carbon that's going to be lunch for the microbes tomorrow, next Tuesday, and next Saturday.

Put some white sugar with it. That's a short chain carbohydrate or a short chain carbon that'll feed him right now. What you're doing is you're feeding the indigenous microbes and they will correct the soil.

I'm going to give you a little bit of a review again.

You have to have a large volume of microbes exhaling CO₂. As they exhale CO₂ they have to biometrically push that CO₂ up because CO₂ is one and a half times heavier than air. So if somebody tells you, oh golly don't till your soil because you're going to lose all your carbon. If that carbon's in CO₂ form it won't leave you because it's one and a half times heavier than the air.

There's a reason that these people are telling you not to do what sometimes needs to be done. Because they get to sell you more stuff.

Along with the CO₂ and the water H₂O forming carbonic acid, something else happens. Many strains, hundreds if not thousands of strains of the microbes that you may be growing or buying are lactobacillus bugs which are lactic acid producing. And as these lactic acid producing bugs die off they give off a little more lactic acid that adds to the carbonic acid that keeps lowering the pH.

As these microbes die they start turning into humus. Humus is something you probably haven't seen on your soil test because not many of us have it. Humus comes from decaying microbes. The reason we don't have any is because all the microbes have gone to sleep or have vacated the facility because of the environment that we've created. So the last five things on the sheet. The top five things for soil and plant health and this is in order.

Number one: Calcium

is Mom calcium. If you don't have available calcium in the whole Stratosphere of the profile of your soil, you're not going to get good microbes to reproduce protein work for you.

Number two: Phosphorus

Phosphorus, Mom and Dad, calcium and phosphorus will allow the plant to start making sugar to feed the microbes, so that down the road you don't have to buy any more molasses and sugar.

This isn't a forever thing. As the soil gets going, as Mother Nature gets tuned in, your input costs keep going down. The plants are designed to make sugar. We're just trying to help it along to get things going. So calcium and phosphorus make sugar, that's the power plant, that's the sugar production.

Number three: Carbon

You gotta have carbon in the soil. It's got to be at least 16 to one. If you don't have a sixteen to one don't expect Fantastical results from any microbial pack, it won't happen. You'll throw those microbes out then they'll do the no we're not doing it. There's nothing to eat here, we're gonna starve and then you're going to be disappointed.

Then wherever that microbial pack or extract extractor came from you're gonna have a beef with. Let's alleviate that, so calcium and phosphorus. Carbon's number three.

Number four: Oxygen

The only place you're going to get oxygen from is the atmosphere. Those four things, when they are in alignment, and you have it in the plant, and you have it throughout the soil, and that soil can breathe, then number five you'll see the full extent and the full wonderment of aerobic beneficial soil microbes.

Number five: Aerobic beneficial Soil Microbes

If you get the first four done, you will then see the the benefit of aerobic beneficial soil microbes Whether you extract them, whether you buy them I don't know if you were here earlier Jay I said what you've seen is fantastic on your farm but as you start fine-tuning and changing some things it's just, it's just, this is gonna be so much fun you can't understand it, it's just the beginning.

Covering as much as I did as quick as I did, each one of these topics could have been three hours and I don't think anybody, any of us have the desire to go through that. The reason we brought Tony, or some people refer to him as Anthony, there I'm sure there's a joke there somewhere, to videotape this is as we blew through a lot of information.

You can go back and review it. We have other videos on YouTube that just talk about this or the EC meter or how to adjust the pH. So it's information that can be added to the Fantastic information that Jay has shown you on his extractor. So if there aren't any further questions.

What time of day are you checking the brix. Great question. If you check it in the middle of the afternoon, that's going to be the highest sugar content. If you check it in the early morning that's going to be the lowest sugar content because Boron is a mineral that comes to work at night and pulls sugar down from the plant down to the root tips.

If you see a two brix change from day to night you've got a root problem. There's something working on that route and that plants going oh oh we may have some cut worms. Let's shove some sugar down there if it has it.

If you want to get rid of root worms, cutworms, wireworms, army worms, put some sugar molasses in your starter.

But the highest point is two to three o'clock in the afternoon. The lowest point is the first thing at sunrise in the morning.

If you do have a refractometer and we've had so many guys say oh I've had a refractometer there for 20 years I haven't got anything to move, it's never moved on me, hasn't moved in 20 years in fact.

I said there's four things that you're short of or out of balance. Those four things are on your sheet, available calcium, available phosphorus, carbon, oxygen, and then microbes.

One quick thing on the extractors and I need to be very clear on. We can't get enough Parts quick enough to keep up with the wonderful response Jay has created and with the natural business that we have been doing.

Part of the reason I'm here is to say let's look at your soil because there's no way we can get enough parts to make everybody an extractor or to make 30 extractors. We're fighting to get parts with five or ten at a time.

One time we order it's one thing. The next time we order something else and every stinking time we order the price goes up. So if you've talked to our office they said well the price today is such and such but we don't know what's going to be next week. That's real, so my point with this and this is what we do everywhere, please work on your soil before you bring kids home, meaning microbes so you have the biggest best benefit that you possibly can.

I stopped here as the last 10 minutes is about their GSR calcium product. You can go to the time location on the youtube video and open the read it if you wish.