

SOIL ORGANIC MATTER

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George has presented to you some questions; I'm going to take a slightly different approach. I'm going to make some statements and let you challenge them. This will accomplish the same thing.

Jack asked me to address my comments to organic matter, cover crops, and tillage. When I thought of these three things, I came to the conclusion that they really all revolve around organic matter. In essence then, this is what I'll talk about. I'll discuss what they have to do with tillage as we go along.

Since we seem to be taking a historical approach this morning, organic matter was once the heart and soul of the soil. In fact, it was known as the food of the soil, or the food of the plants that grew in the soil. Then the inorganic chemists came along and said, "Well, you are really just a bunch of blind idiots. Really what you are doing when you put this organic matter in the soil is that you are providing the nitrogen, the phosphorus, the potash, the calcium, the magnesium, etc. that the plants need. All you have to do, really, is to apply these in mineral form and it is a lot cheaper and a lot less bulky, and you will get the same results." Some swung completely to the other end then, and we've really had some rather disastrous results. So, it depends on how it is thrown back; most of us have an appreciation of the fact that organic matter is important to our soil. We might want to raise the question of "why" and so I thought that with the assistance of a few slides, I'd discuss some of these points.

1. Nursery soil organic matter sources

There are primarily three things: cover crops, fresh organic residues, and composts.

(a) Cover crops: This is green manures, or green crops. It's growing some crop on the land hoping to provide some organic matter.

(b) Fresh organic residues: This is bringing organic matter to the area that did not grow there.

(c) Composts: Bringing organic matter to the nursery, composting it, and then applying it to the soil.

In a few cases and under certain situations, some people grow cover crops and then compost it before putting it back into the soil. This is where organic matter comes from--now, where does it go?

2. Nursery soil organic matter losses

We lose organic matter to three different routes.

(a) Oxidation: A nursery soil that is tilled, opened, and exposed by just the natural biological activity in the soil is going to break down the organic matter. It is a constant decomposition. This is not bad. The organisms that do this decomposition, a great number of them, benefit us from other ways and so we want this biological activity in the soil.

(b) Erosion: Wind or water erosion cause loss of organic matter. Although we try to avoid this as much as possible, the nursery soil is opened and exposed and we do get some of this.

(c) Removal with seedlings: There is a considerable quantity of the organic matter (that we work so hard to put back into the soil) that we turn right around and haul off attached to the roots of the seedlings. I'll show you a couple of slides on this and show you how it works.

3. Physical and chemical advantages of organic matter in nursery soil

(a) Improved aggregation in the structures of the soil; this is important to the tillage aspects.

(b) Tillage: One expects this to fall right along in this line.

(c) Penetration of water into the soil and moisture retention: This goes across the board to almost all soil types--makes no difference if its a sandy or clay soil. With good

structure, as far as wind and water are concerned, we reduce erosion. If we have good tilth, we reduce lifting damage. There's nothing worse than to work throughout the season to grow a good crop of seedlings and then tear the roots up getting them out of the soil.

(d) Organic matter as the reservoir of nitrogen and phosphorus: Practically all the nitrogen that we have in the soil will be taking the place of mineral fertilizer as we add it in the form of organic material (protein). As much as three-fourths of our phosphorus often times will be in the organic matter. The organic matter serves to hold nutrients against leaching and here I'm speaking of the physical cation exchange properties of the organic matter. If you have a very coarse sand, you know that the potassium and other calamines will leach unless you get a good amount of organic matter in the soil to hold them.

(e) The last thing I have listed is the buffering action of the soil: A soil that is low in organic matter, unless it is really loaded with clay, which in turn makes a very poor nursery soil, has a low buffering capacity. This means that whatever cultural operations you undertake will, quite likely, change the pH of the soil and the soil that is buffed-up will be protected against this. Also, in this way the organic matter will tend to absorb and take out of circulation some of the overdoses of pesticides that we occasionally have.

4. Biological influences of organic matter in nursery soil

We said that the organic matter served as a reservoir for the nitrogen and phosphorus, but if it stays in the reservoir it's not going to do the seedlings much good. We must have biological activity in the soil, breaking down this organic matter and mineralizing the nitrogen and phosphorus, so that the seedlings can get it. Also, this organic matter serves as a food source for non-synthetic fixing organisms in the soil.

(a) I have listed here the increase in the phosphorus and potash availability to provide organic matter to the saprophytic organics in the soil. They, in turn, attack the primary minerals in the soil and release the potassium and phosphorus. There are at least two lines in the country right now working on this very problem with seedlings. It turns out to be that a considerable amount of phosphorus and potash can be liberated if sufficient material (organic matter) is present for the organisms.

(b) Pathogen suppression: This is a difficult bound, as Jim knows much more than I. There have been well documented cases where proper organic matter in sufficient quantities will result in growth of antagonistic organisms in the soil, which will suppress certain of our root pathogens.

