

Video Transcript

Elementary Lesson 3: Plant Soil Interactions

- Speaker 1: In order to understand how nutrients are transferred, to a plant, you must first understand the interaction, between the plants, and the soil.
- Speaker 1: Plants remove water, and nutrients, through the root system. Some nutrients move into the root self, from the soil, by diffusion, and others by an energy requiring process, called active transport.
- Speaker 1: The plants vascular system can be similar to the human circulatory system. Do you know what the difference is, between the xylem and the phloem?
- Speaker 1: Plants transfer water from the roots, to the rest of the plant, through the xylem. Plants transport food, from the leaves, to the rest of the plant, using the phloem. The xylem goes up, and the phloem goes down.
- Speaker 1: I mentioned earlier, that the plants vascular system, can be compared to our circulatory system. Can you name one similarity, and one difference, between the two?
- Speaker 1: You know, we may not have a xylem, and a phloem, but we have veins, and arteries. Veins go to the lungs, to get oxygen, then the oxygen leaves the lungs, through the arteries, to supply our entire body with oxygen.
- Speaker 1: In order to understand how our plants are fed, we must understand the process of removing the nutrients from the soil, up into the plant, through the different vascular systems.
- Speaker 1: In the Nutrients for Life, curriculum, there's an opportunity for you to germinate some seeds, and we went ahead, and germinated some seeds, in some plastic cups. What I want you to see, from this experiment, are the root hairs. They are responsible for bringing the nutrients, and the water, up to the plant.
- Speaker 1: First, we're going to take a look at this clear cup, right here. As you can see, very closely, you can see that the seed has swollen, and a little tiny root, has come out. That root is called, the radical.
- Speaker 1: What I want, all you guys, to do, is open up your paper towel, and pull out one of those germinated seeds. Slowly, pull those out. Very good. Be careful not to break anything. They're kind of intertwined. There you go Caleb.
- Speaker 1: What do you see, there on your seed?
- Speaker 2: Dead skin.
- Speaker 1: That dead skin, very good, is the seed coat. That's what protected the seed, when it was in the soil. What else do you see?
- Speaker 3: Roots.

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- Speaker 1: You see roots. Do you see more than one root, Caleb?
- Speaker 3: Yep.
- Speaker 1: You see multiple roots. Those roots are in the soil, to pull the nutrients, and the water, up. Do you see little green things? These little green things, are called the cotyledon. Then, from the cotyledon, come the first true leaves.
- Speaker 1: Now that you've seen how easy it is, to germinate a seed, I would encourage you, as a class, to get some seeds, and start the germination process. You can see how a tiny seed, grows into a big plant, with the right nutrients, water, and sunlight. You'll be able to hold, your own germinated seed, and look at the different parts, and compare them with your classmates.
- Speaker 1: Bob, thanks for meeting us, in the backyard today. We're going to go into the classroom, and explain to the kids, some things that you know, about gardening, but they may not know.
- Speaker 1: Mr. [Nyer 00:03:52], can you explain to me, and to the students out here, how plants take up nutrients, from the soil?
- Bob: Well sure. Let's take this out of the container, and take a look at it. We've got all these roots, out here. They're growing around, in that pot, but if it was in the soil, they would be searching, and going further out. They would be going down, and they would be going out.
- Bob: Most plants, whether it's a tree, or a flower, or anything, the roots are usually, going to be going out twice the spread, of the plant. They are going a long way out, for getting they're moisture, and the nutrients, for growth.
- Bob: On this plant here, that we're talking about soils and fertilizer, this plant has been growing in a potting soil mix, and when we get these potting soil mixes, we will see these ... See that white stuff on there?
- Speaker 1: Yeah, what is that?
- Bob: That's perlite.
- Speaker 1: Perlite.
- Bob: Some people have the idea, "Oh that fertilizer." No, its volcanic rock, that they heat up, really hot, and it puffs up.
- Speaker 1: What is that in there?
- Bob: It's for drainage.

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- Speaker 1: Okay.
- Bob: So it doesn't pack down, and the other thing in here, is just compost and perlite, is all this was growing in, but that's not a whole lot of fertilizer. It doesn't have the phosphorous, and the potassium, and the nitrogen doesn't hold well, in this. Not as well as it would, in a garden soil. An outside soil, so we have to fertilize them occasionally.
- Bob: This plant, needs fertilizer, bad. When you see something that's ...
- Speaker 1: I see it's yellow.
- Bob: It's yellow, and puny.
- Speaker 1: Mr. [Nyer 00:05:22], can you explain how plants take up nutrients, from the soil?
- Bob: We'll try. Let's get a sample, here.
- Bob: This looks kind of crispy, and dry, but this was a fruit tree. A bare root tree, and this is how we often plant them. Notice, first of all, I want to point out, when we're planting a bare root tree, and this is a fine way to buy them, at the garden centers, in the spring, notice the roots are about a foot, foot and a half wide, and for every inch of trunk diameter, we want at least, that amount of root. For every inch, you want a foot of root area, in order to take up, enough water, and fertilizer, so the plant can grow. Sometimes people don't get enough, and then they don't have success.
- Bob: The nutrients, in the soil ... The ones that are macro-nutrients, that we need the most of, nitrogen, phosphate, and sometimes it's just P, for phosphorous, but it's phosphate, and they'll also bring in, potassium, and we apply that, through pot ash, but nitrogen, phosphorous, potassium, those three, are our major elements, that help plants to grow.
- Bob: If they are deficient in our soil, our plants aren't going to grow well.
- Speaker 1: Okay, Bob, some interesting words, that we've heard about, are phloem, and xylem. What do they have to do with plants?
- Bob: Those two things, together, make up what we call the cambium, of the plant, and that's the true, living part, of the trunk.
- Speaker 1: Bob, I'm always confused about the xylem, and phloem, which one goes up, and which one comes down?
- Bob: I have trouble with that too, the xylem goes up, phloem flows down. Again, xylem takes up your moisture, and nutrients, from the soil, and the phloem, the foods that have been manufactured, through sunlight, and photosynthesis, will go back down, for storage, throughout the plant.

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- Bob: Whenever we've cut across a trunk, or a stem, of a woody plant, you'll see those growth rings. The circles, every year, and what do those circles mean?
- Speaker 1: I always said it was the age. How old they are.
- Bob: Yes, and for every time, you see a ring, that was one year, of growth.
- Speaker 1: Right.
- Bob: Clear out, at the very edge, right underneath the bark, is what we call the cambium, and we have the xylem, and phloem, right inside that. It moves out, every year, so as I'm pulling up this cherry tree, here, right underneath the bark, of this, is the cambium, and on this, since that's the only living part, the center part of it, is just for structure.
- Speaker 1: Okay.
- Bob: The only living part, is right underneath. On this tiny little tree, all I'd have to do, is get a knife, and whittle of this bark, all the way around, and the tree will die, because that cambium, has that xylem, and phloem, in there.
- Bob: The xylem, furthest in, takes nutrients, and moisture, from the soil, up all the way through the tree, clear out to the leaves.
- Bob: I say tree, shrub, flowers.