pH in Soil & Food, Teacher Resource

Topics	Coverage
Goals	• Learn what pH is and how it is measured in soil and food • Identify factors that affect soil pH, such as soil acidification, leaching, root crops, fertilizers, acid rain, and oxidative weathering • Investigate the pH levels required for optimal growth of various food plants • Learn how to test soil pH levels using a pH soil meter • Develop skills in recording observations, characteristics, and fixing issues that arise with a plant
What is pH	1. pH measures the acidity or alkalinity in soil 2. pH controls the nutrient chemical form and reactions in soil
Why do we need to measure pH in soil?	The pH in the soil controls the nutrient chemical form as well as controls their reactions. ultra acidic (<3.5), extremely acidic (3.5–4.4), very strongly acid (4.5–5.0), strongly acidic (5.1–5.5), moderately acidic (5.6–6.0), slightly acidic (6.1–6.5), neutral (6.6–7.3), slightly alkaline (7.4–7.8), moderately alkaline (7.9–8.4), strongly alkaline (8.5–9.0) and very strongly alkaline (>9.0)
What controls pH in soil?	**Soil acidification**: the acidity of the soil decreases over time The rate at which the acidity decreases depends on: **Rainfall**: when it rains, water mixes with the air and creates something called "carbonic acid". This can make the soil more acidic, which is bad for plants. **Root crops**: when plants like potatoes, carrots, and beets grow, they release hydrogen ions into the soil. This also makes the soil more acidic. **Fertilizers**: sometimes people put special things called "ammonium fertilizers" on the soil to help plants grow. But this can also make the soil more acidic. **Acid rain**: sometimes rain can have things in it that make it more acidic, like pollution from factories or cars. When this happens, the rain can make the soil more acidic too.

	Oxidative weathering: this is when oxygen mixes with other things in the soil and makes something called an "oxide". This can also affect the pH of the soil. So, these are the things that can affect soil and make it harder for plants to grow. It's important to understand these factors so that we can take care of our soil and help our plants grow strong and healthy!
What pH do foods need?	● 6.0-7.5 ○ Asparagus: 6.0-8.0 ○ Lemon: 6.0-7.5 ○ Orange: 6.0-7.5 ○ Brussels sprout: 6.0-7.5 ○ Kale: 6.0-7.5 ○ Spinach: 6.0-7.5 ● 6.0-7.0 ○ Peach: 6.0-7.0 ○ Broccoli: 6.0-7.0 ○ Lettuce: 6.0-7.0 ○ Radish: 6.0-7.0 ● 5.0-7.5 ○ Celery: 5.8-7.0 ○ Garlic: 5.5-8.0 ○ Pumpkin: 5.5-7.5 ○ Tomato: 5.5-7.5 ● 5.0-7.0 ○ Raspberry: 5.5-7.0 ○ Carrot: 5.5-7.0 ○ Cucumber: 5.5-7.0 ○ Apple: 5.0-6.5 ● Below 5.0 ○ Miracle Fruit: 4.5-5.8 ○ Potato: 4.8-6.5 ○ Blueberry: 4.0-6.0
How to test pH in soil:	The soil of the Miracle Fruit Plant should always be between 4.5 and 5.8. Failure to do so may result in a wilted, brown, sad plant. Water with filtered water or rain water only
When to check pH level:	● When you see brown and/or crispy leaves ● We recommend purchasing a soil pH tester from your local hardware store to get accurate reading

How to raise or lower pH:	■ To raise pH levels, sprinkle coffee grounds on top of the soil ■ To lower pH levels, add sphagnum peat moss to the soil

Materials:

1. Plant pot, 6 inches wide
2. Soil, if not purchased with the plant
3. Miracle Fruit Plant
4. pH Soil Meter
5. Coffee Grounds
6. Sphagnum Moss

Assignment: Students will partner up and take turns recording observations, characteristics, and fixing any issues that arise with the miracle berry tree. Each student should have a record of this table and should be gone over every week as a recap for those who were not in charge that week.

It is up to you, the teacher, if you are going to water the plant or the students.

Week	Observations	Quantitative Characteristics	Did I/We Do Anything?
Week 1	Plant looks healthy, 3 leaves	pH reading of 5.5	N/A
Week 2	Plant seems to be yellowing, could be from overwatering	pH reading of 4.0	Sprinkled coffee grounds on the top to help increase pH
Week 3	Plant has sprouted a new leaf making 4 total	pH reading of 5.0	N/A
Week 4	The leaves are turning red	pH reading of 5.3	Moved the plant to a place where there was filtered light. Will continue to watch
Weeks 5-6	No new red leaves	pH of 5.0	Added a little of coffee grounds again to raise pH
Weeks 7-8	The leaves now look pale, not as vibrant as before	pH of 6.0	Added sphagnum moss to the soil in hopes it comes down

**While these are examples, there are some common issues listed in the observation section. If your plant is having any issues besides pH, you can find how to treat them via our website