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Life of the Soil, A pH Primer

by Joanna Kenyon

Of the many variables that influence the growth of your fabulous vegetables, soil health is one of the most important. But it can also be more than a little intimidating. With irrigation, we can touch the ground or look for the familiar signs of wilting. With soil, the indicators of poor health are less tangible. Lack of nutrients can look like certain diseases or pests. A vegetable's failure to grow robustly could also be attributed to lack of sun, a seed variety unsuited to the area or something else entirely.

So... how can we know when our soil is ideal for our various plants?

Well, to address this question, let's consider some of the main purposes of soil. On a basic level, soil is the medium out of which our plants grow. The roots of our plants will burrow down into the soil and seek the elements beyond sunlight that they need to grow and thrive—especially water and mineral nutrients.

Water

Certain types of soil will hold water better for the roots to find, gather and pass upwards to help with various different processes. Water helps plants move nutrition and sugars around, regulate heat and pass unwanted gasses and molecules out of its system. Water also provides a solution for most nutrients to dissolve into, so they become accessible to the plants.

Certain soils such as clays—which are finer types of particles that cling more tightly to each other—retain water to a high degree. In fact, clays can hold too much water, encouraging root rot and over concentration of certain minerals. Clay can make it harder for roots to burrow through in search of their nutrients.

Other soils such as sands—which are coarser types of particles that have wider spaces between them—can allow water to flow too quickly through, before plants have a chance to collect the water or nutrients they need. In these types of soils, valuable nutrients can wash away quickly, leaving plants needy and underdeveloped.

Nutrients

Just as humans have a variety of dietary needs, so too do our plants. Each nutrient helps plants perform certain functions. Nitrogen, phosphorus and potassium are three elements, for instance, that most plants want in fairly large concentrations.

Nutrient deficiencies are actually quite common, and can vary in effect from discoloration of leaves to failure of vegetables to grow very large. In my own garden, for instance, I rarely get discoloration in the leaves of most vegetables (except broccoli), but many of my vegetables fail to grow to the sizes that I would like (like my poor garlic this year). This is very likely due to missing nutrients.

Nutrient deficiencies can be harder to diagnose, however, in part because they affect so many of the other factors that help or hinder plants. Lack of some nutrients can make it hard for plants to move and regulate water, for instance, and thus mimic a shortage of water. Other nutrients might help plants fight off certain diseases, so their shortage could just mean that your plants are more prone to get sick.

TOOLS & TECHNIQUES

pH & How it is Complex, Confusing & Affects Everything

pH stands for “potenz Hydrogen,” or the ability of the soil to hold hydrogen. When a soil has a low ability to hold hydrogen, it has a low pH and is **acidic**—like lemons and other citrus. When a soil has a high ability to hold hydrogen, it has a high pH and is **alkaline**, also sometimes called “sweet.” The scale that measures pH goes from 1 (very acidic) to 10 (very alkaline) and even one degree makes a huge difference.

One of the more confusing aspects of pH is why a soil’s ability to hold hydrogen makes a difference to a plant. Well, in shorthand, pH affects a plant’s ability to gain nutrition from the soil. When the soil is too acidic OR too alkaline, certain minerals become inaccessible to plants. They might be there in the soil, but the plants can’t get at them because they are not able to dissolve properly into liquid form.

This isn’t just a problem on one end of the scale, but on both the acidic and the alkaline side of the scale. Examples of nutrients that become less available to plants when the soil is **too acidic** are nitrogen, phosphorus, potassium, sulfur, calcium and magnesium. Examples of nutrients that become less available to plants when the soil is **too alkaline** are iron, manganese, copper, zinc (metals) as well as some of the same nutrients that are affected by high acidity.

Okay, so back to that first part – about how different plants have different dietary needs. Well, because pH affects which nutrients are available, some plants prefer the soil a wee bit **more acidic**—such as blueberries, potatoes, hydrangeas, azaleas and rhododendrons, among others. Most of these like a pH range between 4.5 and 6. On the other hand, some plants prefer soil that is **more alkaline**—such as beets, honeysuckle, plums and sweet cherries. Most of these like a pH range between 6.5 and 8.

Fortunately, most vegetables, fruits and ornamentals prefer an **in-between range**, which is roughly between 6.3 (slightly acidic) and 7.5 (slightly alkaline). Also fortunate is the fact that plants are capable of modulating pH internally—and although it does mean less energy goes into production and growth, it can take a little edge off the pH stress to know that your plants do self-care.

Don’t worry or fret if this is overwhelming. Here are some steps for maintaining good soil and pH health:

Use Compost.

One of the best pieces of advice I’ve come across is the observations that: “Organic gardeners don’t feed the plants. They feed the soil and let the *soil* feed the plants” (Spiegelman, 2010, p.28). Applying compost is one of the best ways to feed your soil. It’s more important for regular practice than applying commercial fertilizers, for two reasons: one of which is that it’s very important to know that you are applying the right fertilizer, as it can be easy to over-fertilize with the wrong nutrient (this is an argument for soil testing, however, which is the next recommendation). And the second reason is that compost helps keep your pH at a neutral range by providing more sites for hydrogen and nutrient cations to latch onto.

Consider Soil Testing.

Perhaps it’s not something the home gardener wants to do every year, but if you’re starting or enlarging your garden, soil testing might be something for you to do at first, and then every 3-5 years after. Over-the-counter soil tests can be inaccurate, and don’t come with splendid advice to help you interpret your results. Instead, you might consider one of the local commercial soil testing companies; they should include both very specific breakdowns of some of the most important aspects of your soil, as well as some short recommendations for how to amend your soil. Here is a list of local soil testing companies, along with related recommendations:

<http://www.whatcomcd.org/nutrient-testing>

TOOLS & TECHNIQUES

Rotate Your Crops.

You can use the fact that plants have different nutrient needs to your advantage by alternating the plants you grow in each site over the years. This also helps deter pests and diseases that are plant specific. A general 4-year crop rotation recommendation is:

leaf (lettuce, chard, kale, etc) --->

root (beet, carrots, potatoes, etc) --->

flower (calendula, rye, clover, field peas, etc) --->

fruit (snap peas, cucumber, peppers, squash, tomatoes, etc) ---> **leaf**

Cover Crop.

Cover cropping is one of the most effective ways to enhance the health of the soil. Add a legume mix cover crop to your rotation schedule and you are golden. It is often called “green manure” because when it is incorporated into your soil it adds nutrients and organic matter. If grown in the winter in the Pacific Northwest cover crops also protect the soil from nutrient run off and compaction caused by heavy rain.

Visit this website for further reading: <http://extension.wsu.edu/snohomish/covercrops/>

Tend Towards a Neutral pH.

Increasing the compost of your soil on a regular basis, as well as adding some clay soil to any highly sandy soils, ought to help keep your pH in a good range for your veggies. In the very wet Pacific Northwest, where the rains often pour through our soils, our pH tends to become more acidic over time. (On a side note, this is part of why we have so many blueberries in Whatcom County!) So if your soil likewise tends to drain water rapidly, you might consider liming in late fall to – over time – increase the pH of your soil. Alkaline soils tend to be more rare in Whatcom, but there are some amendments available for the alkaline-loving plants.

Pay Attention to Your Soil Over Time.

In one of the best dreams of my life, I had miraculously become soil—and was noticing my mineral content, the worms burrowing, the water as it passed slowly through, the roots that grew down and to the sides. I felt so relaxed and yet busy in the dream. Healthy soil is teeming with life. We can pay attention to how well the worms stick around (a good sign), how well the soil retains moisture (also a good sign... up to a point) and how well the soil holds and nurtures our plants. Cultivating an awareness of soil, just as we cultivate an awareness of watering needs, will help us be more intuitive about just what our soils need to best feed our plants.

References and Resources

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VEGGIE of the MONTH



Arugula

by Kylie Lewis

This herbaceous green is strong in flavor, uniquely sharp and delicious. Arugula has a robust taste that is peppery and nutty. It is versatile and can be used in salad or braising mixes, pasta dishes and as a gourmet topping for homemade pizzas and tacos. A bowl of fresh arugula with a drizzle of olive oil, a squeeze of lemon and a sprinkle of salt and

pepper is a real delight. The simplest things in the world are among the best.

Growing arugula from seed is easy. Direct-sow arugula into your garden beds by broadcasting the seeds generously into your garden bed. Then cover with a ¼ inch of soil and water thoroughly. Keep evenly moist during germination. This crop thrives in the cooler seasons and does best in early spring and fall. Arugula can be grown throughout the summer but is known to bolt. In the Pacific Northwest, sow seeds from early March to June and again from late August to mid-October. Row cover can help to extend the growing season into the winter. How much to plant? If you sow 1/2 a square foot every three weeks in the cooler seasons you will have plenty.

From seed to harvest is about three weeks. In the garden, that's about as close as you can come to instant gratification. It will grow as fast as you can pick it, harvest the leaves when they are young and tender, approximately 4-6 inches in length. Don't pull out the entire plant, but take a few leaves from each to prolong your harvest. For a continuous supply, sow every three weeks. Leaves allowed to mature for too long will become bitter in taste. For gardeners who are short on space, try growing arugula in a container. Now that you know how to grow arugula from seed, give it a try. You'll be glad that you did.

Arugula is truly one of my favorite plants to grow and to eat. This crop has many uses beyond salads. I love adding arugula to pasta dishes; it wilts in the heat of the pasta and pairs nicely with sauce ingredients like garlic, tomatoes and creamy cheeses. You can also use arugula in vegetable and bean soups: chop it roughly, stir it in at the last minute and keep the pot on the heat until the arugula wilts, just a minute or two. I encourage you to eat the delicate, pale blossoms that come in yellow or white. These flowers lend a nutty and spicy note to salads and beautifully garnish soups. Experiment, have fun and eat your greens!

Arugula Pesto Recipe

Ingredients:

- 1/2 cup walnut or pine nut
- 1 garlic clove, minced
- 2 cups packed arugula leaves
- 1/2 cup freshly grated Parmesan cheese
- pinch of salt
- 1 cup extra-virgin olive oil

Method:

In a food processor or blender, blend all the ingredients together until smooth and enjoy with pasta or on pizzas.



TOOLS & TECHNIQUES

Home Compost

by Kylie Lewis

Backyard composting is a fabulous way to give back to the earth and keep your garden healthy. Finished compost is a free soil amendment and fertilizer. It is mild and won't burn plants like chemical fertilizers. By adding compost you'll improve the overall texture of your soil, enabling it to retain and drain water better. Compost is also a great way to deal with organic waste from our gardens and kitchens, which reduces landfill. These are just some of the numerous benefits of composting for your garden and the environment.

Many different styles exist on the market, but you can easily make your own compost bin. It can be as simple as a 3-by-3 foot bottomless box made with wood, recycled pallets or wire fencing. If you don't have a lot of space you can also use a trash can with holes drilled in the bottom and around the can for ventilation. Drill many holes, all over the can, and use bungee cords to secure the lid. A power drill can be helpful for accomplishing the build component of composting. You can even make a free-standing compost pile. With some further research you can find the right style for your needs.

A simple compost recipe is equal parts green and brown material. The green consists of lawn clippings, kitchen scraps and plant trimmings. The green provides nitrogen and moisture to your pile. The brown is carbonaceous materials such as dry leaves, straw and coffee grounds. If the materials you add are chopped they will break down faster. You can also add some healthy garden soil or composted manure (such as cow or horse) to introduce valuable soil organisms and kick start the decomposition process. Do not include pet waste or disease plant material in your compost. Avoid composting meat because it attracts wildlife, stinks as it decays and can take a long time to break down. Layer your ingredients in your compost pile and dampen the pile with a hose. It should be moist like a wrung out sponge. Nature will do the rest but you can accelerate the process by periodically turning the pile with a fork. Oxygen fuels decomposition.

After you have one pile going you can build another or keep adding to your existing pile. Add pulled weeds, garden trimmings and kitchen scraps to your pile. Try to maintain equal parts green and brown. These layers will eventually break down and become beautiful, usable compost. The fall is a great time to start a compost pile because you readily have green and brown materials available. In winter, brown parts can be hard to find so store away a bag of fall leaves or a bail of straw to add when contributing your kitchen scraps. Moisture control is important. Since we get heavy rainfall here in the Pacific Northwest, it is advisable to keep your compost piles covered. In the spring, if your compost looks and smells like dark soil, liberally apply it to your garden beds.

There are many methods of composting. You could spend years learning about the subject but don't let that intimidate you. The simple steps outlined here will get you started. Regardless of what method you use, all plant matter will eventually break down and become soil again.

For further reading, check out the following article online:

Washington State Universities publication: **Backyard Composting**
<http://cru.cahe.wsu.edu/CEPublications/eb1784e/eb1784e.pdf>

VEGGIE of the MONTH

One Potato, Two Potatoes...

by Shannon Allegra Fox

This spring I cleared a blackberry patch and planted a potatoes in the rich soil. Sown in the crisp early spring were 5 varieties. I delighted each time I looked at the thriving plants, and I took great joy in seeing the pretty lil' tater blossoms. Potatoes get a bad rap for not being the most nutritious; however, they have lots of potassium, vitamins C and B, copper, iron and protein.



How to Harvest?

I kept a hawk eye on the local potato farmers every move for the last 4 months. It's finally time to harvest! First, let the plant's leaves die back, then cut them off and dig the potatoes up with your pitchfork or shovel. Just be careful not to dig into the potatoes themselves (this will inevitably happen - just eat those first since they will not store well). You can also use a hand trowel and be on your hands and knees. It may take a little longer but it's just another excuse to get down and dirty! Kids and adults love digging them up, since every tater is a buried treasure!

Simple Storage

1. Inspect all potatoes for soft spots, sprouts and mold. Only perfect potatoes are suitable for long-term storage.
2. Place the potatoes in a cardboard box, paper bag or mesh bag to ensure good ventilation.
3. Store in a cool, dry and dark place (50-60° is the ideal temperature range).
4. Check on your potatoes regularly, and remove any that are soft, shriveled or sprouted.

Planting Guidelines

Plant potatoes in early spring, from mid-March to April. Plant organic seed potatoes, which can be found at a garden nursery, seed catalog or local farmer's market. The term "seed potato" can be a little misleading. Although potatoes do set seed, they do not grow true to seed. To get the variety of potato you want, you need to grow part of the actual potato, which is called vegetative propagation. These pieces of potato are referred to as seed potatoes.

When it's time to plant a healthy potato crop, you must properly prepare the soil before planting. Potatoes thrive in a loose, well-drained, slightly acidic soil (pH 5 - 6).



VEGGIE of the MONTH

Selecting Seed Potatoes

Because potatoes are grown with vegetative propagation, any diseases from the prior year will be carried over. That's why it is so important to use disease free seed potatoes and that means certified seed potatoes, rather than supermarket potatoes. Any potatoes that have soft spots, cracks or bruises or signs of rotting should be discarded. Start with the healthiest, strongest seed potatoes, to avoid problems and guarantee a good harvest.

If you've ever kept your potatoes in the cabinet too long, you've probably seen them sprout.

So What Exactly Do You Plant?

Leave small potatoes whole, cut medium sized potatoes in half and cut large ones into quarters. An "eye" is a bud that grows into a new plant.



So you see, even a novice like me can grow a potato garden in a square foot plot, upright in a hay bale, in creative salvaged materials like a washing machine colander (you can often find these at Appliance Depot) or in two 20 foot rows.

Try growing different varieties for color, flavor and size. Planting a variety also means cultural diversity in the garden and helps with disease resistance.

Taters are a fun addition to the garden and can easily be grown in or outside of your raised bed.

Washington State University has a great fact sheet entitled Growing Potatoes in the Home Garden.

<http://cru.cahe.wsu.edu/CEPublications/FS165E/FS165E.pdf>

VEGGIE of the MONTH

Roasted Root Medley Recipe

Serves 4

Ingredients

- 1 carrot
- 1 parsnip
- 1 beet
- 1 potato or sweet potato
- 1 yam
- 1 orange (or orange juice)
- 1-2 tablespoons extra virgin olive oil
- salt
- garlic cloves
- herbs of choice (try rosemary, thyme, parsley)

Add in rutabaga, turnip, celery, fennel, and/or onions.
Omit any of the veggies listed above that you don't like.
Cater the dish to your particular taste.

Method

1. Preheat your oven to 400°.
2. Wash and peel the vegetables.
3. Cut them into 1-2 inch pieces.
4. Place them in a bowl. If you are doing beets, place those separately in another smaller bowl.
5. Juice one orange and whisk in the olive oil.
6. Take one tablespoon of this mixture and drizzle it over the beets and mix to coat.
7. Pour the rest of the mixture over the other vegetables. Toss to coat.



8. If you are doing beets, place the cubed beets in a separate parchment-lined baking sheet. This will ensure that the rest of your veggies won't get stained. *Skip this step if you don't mind the stain of beets on the other veggies.*
9. Place the rest of the cut vegetables in a separate parchment-lined baking sheet.
10. Sprinkle both pans with salt and herbs.
11. Bake for 30 minutes or until tender when stuck with a fork.

Serve immediately.
Bon Appetite!

Eat All the Colors!

by Allie Bishop Pasquier

September is a wonderful time to see many different colors in the garden. When thinking about colors in the garden, many people picture flowers, which have bold colors in order to attract pollinators. But there are many edible plant parts that come in different colors, and we should eat as many colors as we can to get as many vitamins and nutrients as we can! We should make sure that most of the colors we eat come from plants rather than artificial dyes.

Red

What can grow in your garden that is red? Many sweet things are red: raspberries, currants and strawberries might be in your garden right now. Beets, peppers, and tomatoes are also examples of foods that are naturally red. These plant parts are red because they have lycopene, and lycopene is good for our bodies because it may help reduce risk of certain types of cancer. There are also antioxidants in red foods that keep our heart healthy!



red juicy strawberries



pink & purple radishes

Orange

The most famous edible orange plant part is probably the easiest one to remember: oranges! Oranges grow well in climates warmer than Whatcom County, but we can grow other orange foods like carrots. Orange foods are high in vitamin C and folate, which is a B vitamin.



the many colors of heirloom tomatoes



orange calendula edible flower



orange carrots

Yellow

A yellow food that loves summer heat is yellow crookneck squash – you use it just like zucchini, but you get a few different nutrients just by choosing a different color. Orange and yellow fruits and vegetables are colored by plant pigments called carotenoids, which are good for the eyes and the heart.



yellow corn & cauliflower

Green

You might have heard of chlorophyll, a pigment that makes plants green. You can probably think of a few leaves that we eat when trying to think of green plants to add to your diet. Kale, swiss chard, lettuce and spinach are green leaves that contain B vitamins. Think about other green vegetables – broccoli, avocados, cucumbers – there are so many options!



green beans & parsley



cherry bell radishes & savoy cabbage

KID'S CORNER

Blue & Purple

Some of the blue and purple foods that we eat are called “superfoods” because of the powerful antioxidants created by that blue or purple pigment. These antioxidants may help reduce your risk of cancer and heart disease. And studies are showing that blueberries are linked with improved memory function and healthy aging...that’s good news! Other blue foods include blackberries, eggplant and figs.



purple & green kohlrabi



purple/blue borage - edible flower



red/purple beets

It is a good idea to try and eat as many different colors as we can each day.

Here is a recipe to help you get all of the colors into one meal!

Pick one thing from each category, or more than one if you cannot choose!

Rainbow

Something **RED** (apple, strawberry, red bell pepper, beet, radish, tomato...)

Something **ORANGE** (carrot, peach, butternut squash, sweet potato...)

Something **YELLOW** (corn, yellow bell pepper, summer squash...)

Something **GREEN** (spinach, lettuce, arugula, broccoli, celery, asparagus, avocado...)

Something **BLUE/PURPLE** (blueberries, raisins, blackberries...)

Salad

Chop the ingredients up how you like and place them into a bowl. A salad does not need to be lots of greens with a just a little bit of the other stuff – try making it with lots of carrots or corn, for example. If you want lots of greens, go for it!

Make a simple dressing that is delicious with all salads:
3-2-1 dressing!

3 Tablespoons Extra Virgin Olive Oil

2 Tablespoons Balsamic Vinegar

1 teaspoon soy sauce

1 teaspoon maple syrup or honey

Whisk those four ingredients together in a small bowl, and then pour over the salad. Toss everything together and eat! You could eat a rainbow salad every day of the week, and it would be different every time because there are so many wonderful foods of different colors to try!

