

The Oldest Soil Test

Long before soil labs, people learned about soil by looking at where plants grew healthy, by feeling it, smelling it and even tasting it. They used what they learned to grow better food.

You can do the same today. With a jar, a little water and a few minutes, 11 simple tests show you what your soil needs, so anyone can get better results.

"The more ways we collect data, the more data we collect, and the better our decisions are... in the soil and in life." — Dr. Dirt

Scan for more of Dr. Dirt's books
plantsandpeople.earth/dr-dirt-books.html
Natural Healing for Plants and People



Soil Tests Anyone Can Do at Home

11 experiments for kids and their grown-ups

Jar · Ribbon · Slake · Can Soak · Wire Flag
Worms · Smell · Fizz · Bug Funnel · Rot · Red Cabbage

✂ cut

The Tea Bag Rot Test

How hungry is your soil life?

10 minutes, then wait 2 to 3 months

YOU WILL NEED

- Two tea bags (green tea in a mesh bag lasts best), or a new pair of 100% cotton underwear
- A trowel and two marker sticks
- A kitchen scale, if you have one

1. Weigh each tea bag, or take a photo of the underwear.
2. Bury each about 3 inches (8 cm) deep in a different spot: a garden bed and a lawn or a bare spot. Mark each with a stick.
3. Wait 2 to 3 months.
4. Dig them up, brush off the soil, let them dry, then weigh or look.

What It Means

No ribbon, falls apart
Sandy soil.

Under 1 inch (2.5 cm)
A loam: a good mix.

1 to 2 inches (2.5 to 5 cm)
A clay loam.

Over 2 inches (5 cm)
Clay.

TRY BOTH
Do the Jar Test too. Your fingers and the jar should tell the same story.

Wonder: *Which word fits your soil best: gritty, silky or sticky?*

My result:

FOR GROWN-UPS

Before You Start

People have always tested soil. Long before labs, farmers looked for the places where plants grew healthy and strong. They crumbled the soil in their hands, smelled it, and some even tasted it to tell sweet soil from sour. Over 2,000 years ago, Roman farm writers told how to dig a hole and fill it back in to see how loose the soil was. Families used what they learned to grow more food.

There are many ways to collect data. Dr. Dirt says: the more ways we collect data, the more data we collect, and the better our decisions are... in the soil and in life.

Compare two spots. Every test works best side by side: a spot where plants thrive and one where they struggle.

No wrong answers. Every result tells a story about the life under your feet.

SAFETY

Grown-ups handle hot water, sharp can edges, the lamp and the shovel. Never taste soil; we have safer tests now. Wear gloves if you have cuts, and wash hands after. Before digging deep, make sure no pipes or wires run underneath.

Write it down. Each test has space for your result, and there's a report card on page 25.

WHAT NEXT?

Help Your Soil Come Alive

1. **Keep it covered** with mulch or plants. Bare soil crusts, washes away and gets too hot.
2. **Keep roots growing** all year. Living roots feed the soil life.
3. **Feed it** compost and old leaves, a little at a time.
4. **Dig less,** and stay off wet soil, so the crumbs and fungus threads stay whole.
5. **Water gently** and test again in a few months. Watch your results change!

Draw something you found

✂ cut

TEST 3 OF 11

The Slake Test

Is your soil glued together by life?

10 minutes (dry the clumps the day before)

YOU WILL NEED

- Two clumps of soil about the size of a grape: one from a garden bed or under mulch, one from a bare path
- Two clear glasses of water
- Two forks, or two pieces of window screen

1. Let both clumps dry on a plate for a day.
2. Set each clump on a fork (or screen) and lower it gently into its glass, just under the water.
3. Watch for 5 minutes. Don't touch!
4. Then lift each one gently up and down a few times.

THE BUG FUNNEL

What It Means

Springtails
Tiny jumpers.

Mites
Tiny and round, with 8 legs.

Pill bugs, millipedes and beetles
The shredders.

Lots of kinds
A busy soil food web, turning leaves into food for the microbes.

SAFETY

The lamp gets hot: a grown-up sets it up, and never leave it on alone. Don't touch centipedes; they can pinch. Let the critters go where you found them.

Wonder: *How many different kinds did you find?*

My result:

WRITE IT DOWN

My Soil Report Card

Test	Spot 1	Spot 2
Jar Test		
Ribbon Test		
Slake Test		
Can Soak Test		
Wire Flag Test		
Earthworm Count		
Smell Test		
Vinegar Fizz Test		
Bug Funnel		
Tea Bag Rot Test		
Red Cabbage pH Test		

Spot 1 is: _____

Spot 2 is: _____

GATHER FIRST

Things You'll Need

Most of it is already in your kitchen. Each test lists just what it uses.

FROM THE KITCHEN

- ☐ A clear jar with a lid
- ☐ Clear glasses or cups
- ☐ Spoons and two forks
- ☐ Dish soap
- ☐ White vinegar
- ☐ Lemon juice and baking soda
- ☐ A red cabbage
- ☐ A strainer and coffee filters
- ☐ Two tea bags (green tea in mesh)
- ☐ Paper towels
- ☐ Distilled water or rainwater
- ☐ A kitchen scale (if you have one)

TOOLS

- ☐ A ruler, a marker and a timer
- ☐ A shovel and a trowel
- ☐ A tarp or an old sheet
- ☐ A metal can, both ends cut off
- ☐ A small board and a hammer
- ☐ A wire survey flag
- ☐ A funnel or a cut-off bottle top
- ☐ Window screen
- ☐ A desk lamp
- ☐ A magnifying glass
- ☐ Two marker sticks

FROM OUTSIDE

- ☐ Soil from a garden bed
- ☐ Soil from a bare path
- ☐ Leaf litter or crumbly compost

✂ cut

TEST 9 OF 11

The Bug Funnel

Meet the tiny critters that shred leaves into soil.

15 minutes to set up, then 2 to 4 hours

YOU WILL NEED

- A funnel (or the top of a plastic bottle, cut off and flipped)
- A jar and a damp paper towel
- A piece of window screen
- A handful of leaf litter or crumbly compost
- A desk lamp and a magnifying glass

1. Put the damp paper towel in the bottom of the jar.
2. Set the funnel in the jar and lay the screen inside the funnel.
3. Put the leaf litter on the screen.
4. Shine the lamp about 6 inches (15 cm) above it. The critters crawl away from the light and warmth, down into the jar.
5. After 2 to 4 hours, look in the jar with the magnifying glass. Count and draw what you find.

THE SLAKE TEST

What It Means

Holds together

Roots, fungus threads and the sticky stuff soil life makes glue the crumbs. Rain soaks in instead of washing soil away.

Falls into a muddy cloud

Not much glue. This soil needs living roots, mulch, compost and less digging.

Little bubbles

Air coming out of the spaces in the soil. That's normal.

Wonder: *Which clump held together longer? What was growing where it came from?*

My result: _____

TEST 1 OF 11

The Jar Test

What is your soil made of: sand, silt or clay?

5 minutes, then wait 1 to 2 days

YOU WILL NEED

- A clear jar with a lid (tall and straight-sided is best)
- About 1 cup of soil from your garden
- Water
- 1 teaspoon of dish soap (it helps the bits come apart)
- A marker and a ruler

1. Pick out rocks, sticks and roots.
2. Fill the jar one-third full of soil. Add water until it is two-thirds full, then the soap.
3. Put the lid on tight and shake hard for 3 minutes.
4. Set it down where it won't be bumped. After 1 minute, mark the top of the bottom layer: that's **sand**.
5. After 2 hours, mark the next layer: that's **silt**.
6. When the water clears (1 to 2 days), mark the top layer: that's **clay**.

THE RED CABBAGE PH TEST

What It Means

Pink
Acid (sour), like lemon juice.

Purple
About neutral, like plain water. Most garden plants like slightly acid to neutral soil.

Blue or green
Basic, like baking soda.

GOOD TO KNOW
Colors change gently in soil, so it's a rough guide. For the exact number, Dr. Dirt uses a pH meter.

Wonder: *Predict first: what color will your soil turn?*

My result:

✂ cut

TEST 4 OF 11

The Can Soak Test

How fast does rain sink into your soil?

15 minutes to an hour

YOU WILL NEED

- A metal can with both ends cut off (a grown-up's job; tape the sharp edges)
- A small board and a hammer
- A ruler, a marker and a timer
- A jug of water

1. Inside the can, draw a line 1 inch (2.5 cm) from one end.
2. Set the can on the soil, other end down. Lay the board on top and tap it in about 2 inches (5 cm).
3. Pour water in up to the line and start the timer.
4. Stop the timer when the water is gone and the soil just glistens.
5. Do it again in the same spot. The **second** time is your answer.

THE VINEGAR FIZZ TEST

What It Means

Fizzes or hisses
The soil has lime in it: crushed coral, shell or limestone. It's probably on the basic side (pH above 7). Don't add more lime.

No fizz
No lime. Most Hawai‘i volcanic soils don't fizz.

GOOD TO KNOW
This test finds lime, not the exact pH. Try the Red Cabbage pH Test, or bring a sample to Dr. Dirt's pH meter.

SAFETY
Vinegar stings eyes. Keep it away from faces.

Wonder: *Does soil near the beach fizz more than soil up mauka?*

My result:

TEST 11 OF 11

The Red Cabbage pH Test

Is your soil sour (acid) or basic?

30 minutes

YOU WILL NEED

- Two red cabbage leaves and hot water (a grown-up's job)
- A strainer and coffee filters
- Clear cups and a spoon
- Distilled water or rainwater (tap water can change the color)
- For comparing: lemon juice, plain water, baking soda in water

1. A grown-up chops the leaves, covers them with hot water and lets it sit 10 minutes. Strain out the purple juice.
2. Mix 2 spoonfuls of soil with 4 spoonfuls of distilled water. Stir, then let it settle for 10 minutes.
3. Pour the soil water through a coffee filter into a clear cup.
4. Add a few spoonfuls of cabbage juice. Do the same with the comparing cups.

THE JAR TEST

What It Means

Mostly sand
Water and food drain away fast. Compost helps it hold on.

Mostly silt
Smooth and rich, but it crusts and packs down when left bare.

Lots of clay
Holds water and food, but gets sticky and short of air. Roots and compost open it up.

About even
That's called loam, and most plants love it.

Floating bits
Bits of old leaves and roots: organic matter, food for soil life.

IN HAWAIʻI

Volcanic soils can stay cloudy for days and the layers may look blurry. That's the ash, not a mistake.

Wonder: *Which layer is the thickest in your jar?*

My result:

✂ cut

TEST 8 OF 11

The Vinegar Fizz Test

Is there lime, coral or shell in your soil?

5 minutes

YOU WILL NEED

- A spoonful of dry soil
- A small clear cup
- White vinegar
- A spoon

1. Put a spoonful of soil in the cup.
2. Pour in a few spoonfuls of vinegar.
3. Put your ear close and listen. Watch for bubbles.

THE CAN SOAK TEST

What It Means

Under 10 minutes
Rain soaks in well. Lots of open spaces in the soil.

10 to 60 minutes
Slow. In a big storm, water may run off.

Over an hour
Packed down or crusted. Water runs off and roots run short of air.

COMPARE

Test a garden bed and a path. The difference is what feet and bare ground do to soil.

Wonder: *Where in your yard does water sink in the fastest?*

My result:

TEST 2 OF 11

The Ribbon Test

Feel your soil: is it gritty, silky or sticky?

5 minutes

YOU WILL NEED

- A small handful of soil
- A little water
- A ruler

1. Take a lump of soil the size of a ping-pong ball and pick out any stones.
2. Add water a few drops at a time, squeezing, until it feels like soft putty.
3. Rub a pinch between your fingers. **Gritty** means sand, **silky** (like flour) means silt, **sticky** means clay.
4. Squeeze the ball between your thumb and finger, pushing it up into a flat ribbon.
5. Keep pushing until the ribbon breaks off. Measure how long it got.

THE TEA BAG ROT TEST

What It Means

Lots eaten (big holes, light tea bag)
Busy soil life: bacteria, fungi and worms at work.

Nearly whole
Slow soil life. It may be too dry, packed down or low in food.

GOOD TO KNOW

Soil life eats faster when it's warm and moist. Hawai‘i's warm soil can work fast!

SAFETY

Wash your hands after.

Wonder: *Which spot ate more? Why do you think so?*

My result:

✂ cut

TEST 5 OF 11

The Wire Flag Test

Where does your soil get hard?

10 minutes

YOU WILL NEED

- A wire survey flag (from a hardware store) or a straight piece of stiff wire with tape on the end
- A ruler

1. Test a day after rain or watering. Dry soil always feels hard.
2. Hold the wire straight up near the top.
3. Push it straight down, slow and steady. Don't force it.
4. Stop when it bends or won't go any further. Pinch it at the soil line and pull it out.
5. Measure how deep it went. Try 5 spots: a garden bed, the lawn, a path, under a tree.

THE SMELL TEST

What It Means

Sweet and earthy, like a forest after rain
Soil life is busy. That smell is **geosmin** (jee-OHZ-min), made by tiny thread-like bacteria in airy, healthy soil.

Sour or like rotten eggs
The soil is too wet and short of air. Life that doesn't need air has taken over.

Nothing at all
Dry, or low in life. Wet it and sniff again. Still nothing? It needs organic matter.

FUN FACT

Your nose can smell geosmin in tiny amounts. It's why the air smells so good when rain hits dry ground.

Wonder: *Which handful smelled more alive?*

My result:

✂ cut

TEST 7 OF 11

The Smell Test

What does healthy soil smell like?

5 minutes

YOU WILL NEED

- A handful of soil from a garden bed
- A handful from a bare or soggy spot
- A little water

1. If the soil is dry, sprinkle on a little water.
2. Hold each handful close and take a gentle sniff.
3. Find a word for each smell: sweet, earthy, sour, rotten, or nothing?

THE WIRE FLAG TEST

What It Means

Slides past 12 inches (30 cm)
Loose and open. Roots and worms move easily.

Stops in the top few inches
A hard, packed layer. Roots and worms struggle to get through.

A sudden stop and a clink
Probably a rock. Try a spot nearby.

HELPING HARD SOIL

Stay off wet soil, keep paths in one place, mulch, and grow deep-rooted plants like daikon radish. Roots and worms open it up.

Wonder: *Where in your yard is the soil hardest? Who walks there?*

My result:

✂ cut

TEST 6 OF 11

The Earthworm Count

How many worms live in one shovel of your soil?

20 minutes

YOU WILL NEED

- A shovel
- A tarp or an old sheet
- A ruler

1. Pick a cool morning when the soil is moist.
2. Dig out a block of soil about 1 foot (30 cm) wide, long and deep. Set it on the tarp.
3. Break it apart gently with your hands and count every earthworm.
4. Put the soil and the worms back in the hole.

THE EARTHWORM COUNT

What It Means

10 or more
Great! Plenty of food, air and water for soil life.

5 to 10
Good.

Fewer than 5
The soil may be too dry, packed down, low in organic matter, or dug or sprayed lately.

GOOD TO KNOW
Worms go deep when it's hot or dry. A low count on a dry day may not be the whole story. Try again after rain.

SAFETY
Wash your hands after.

Wonder: *Where do you think the worms go when the soil dries out?*

My result: