Three Simple Soil Tests to Determine What Type of Soil You Have

Angelo (admin) 3 years ago

Healthy plants only grow in healthy soils, and if you know what type of soil you're working with, you're better able to improve it to get the best results from your garden.

In this article, we'll discuss what soil is composed of, and show you three easy tests that you can perform at home without any special equipment to determine what type of soil you have.

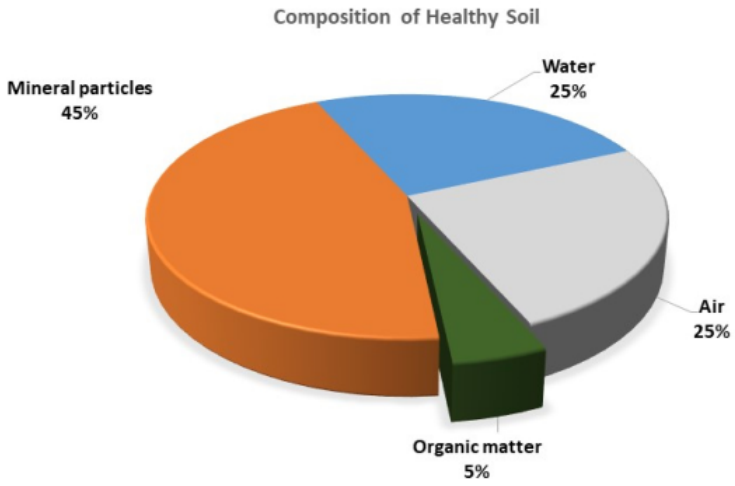
Soil Composition – What's in Soil

When we read about soils, we see many terms used to describe them. A good **friable** soil is a loose soil that plant and tree roots can easily push their way through in search for water and nutrients. A **fertile** soil is a rich soil which contains lots of nutrients to support plant growth. But what makes a **healthy** soil?

Most people thinks of soils as being composed of nothing more than mineral particles, and that is only partially correct.

The composition of healthy soils is as follows:

- Mineral particles – 45%
- Organic matter – 5%
- Water – 25%
- Air – 25%



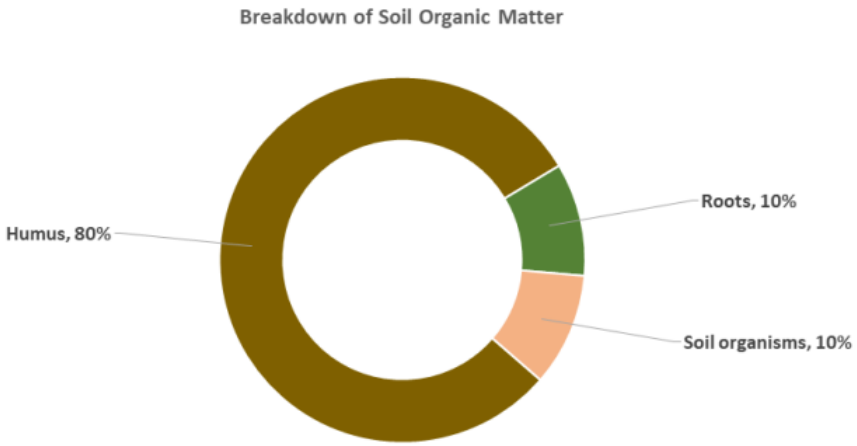
Soil is composed of much more than minerals!

What surprises many gardeners is that healthy soil is 50% air and water! This is because plant roots need both water and oxygen, and with air spaces between soil particles, water can drain through more easily and pull air into the soil as it moves down.

If we look at the solid components of soil, 45% is comprised of various mineral particles, which we'll examine in further detail, and the remaining 5% is **organic matter**.

What makes up this 5% or organic matter in soils?

- Humus – 80%
- Roots of living trees and plants – 10%
- Living soil organisms – 10%



The organic matter portion of soil is part decomposed organic matter that was once living, and part living organisms

Humus is decomposed organic matter, it's plant material that has rotted down to create the rich, black substance in soil which helps hold water and nutrients.

It's no surprise that soil contains the roots of living plants and trees, but they're not the only living part of the soil.

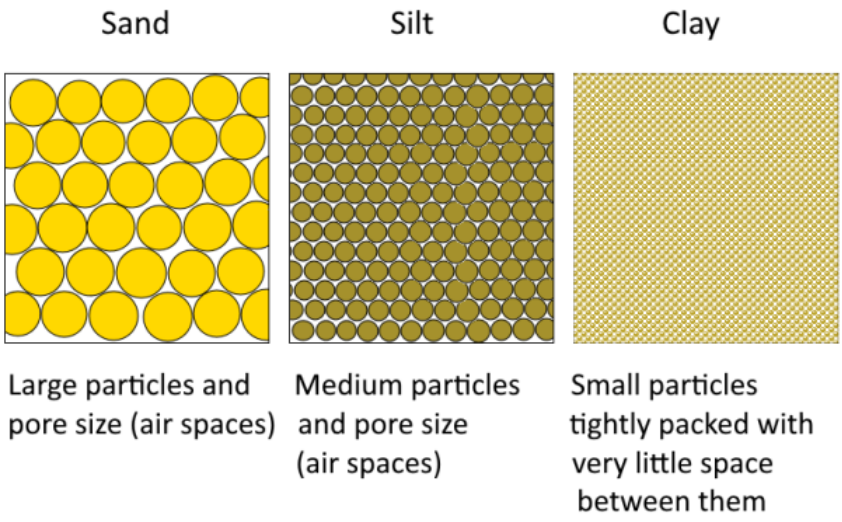
Healthy soil is alive, and it's one of the most complex living ecosystems, which is referred to as the **soil-food web**. The soil-food web is an extensive community of living organisms that live all or part of their lives in the soil, which exist in complex relationship to one another. The function of the soil-food web is to break down organic matter to build soil and make the nutrients available to plants.

It's estimated that there are around 50 billion soil organisms in 1 tablespoon of healthy soil, and to put that into perspective, the whole human population numbers around 7 billion.

Soil Texture and Types of Soils

The mineral component of soils is a mixture of sand, silt and clay in various proportions.

- **Sand** particles are the largest, measuring **0.05 – 2mm** in diameter, are visible to the naked eye, feels gritty to the touch and hold very little water. Sandy soils drain quickly, don't hold water well, but allow good aeration.
- **Silt** particles are medium sized, measuring **0.002 – 0.05mm** in diameter, and silt particles feel very fine like flour or talcum powder when dry, and feel smooth when wet. Silt only holds a moderate amount of water. Silty soils have properties in between those of sand and clay.
- **Clay** particles the smallest particle in the soil, measuring **less than 0.002mm** in diameter, and can only be seen a microscope. The largest clay particle is 25 times smaller than the largest silt particle and 1,000 times smaller than the largest sand particle. Clay feels hard and brittle when dry, and sticky when wet. Clay holds much more water than sand or silt, so clay soils don't drain or aerate as well. In most types of soils, the clay content increases with the soil depth.



The air spaces between soil particles determine how well the soils drain water

From the table below we can also see that sand particles come in various sizes also, defining the various grades of sand available. Only very fine sand particles are close to silt particles in size.

Soil particles in order of increasing size

Clay ..... <0.002 mm
Silt ..... 0.002 – 0.05 mm
Sand ..... 0.05 – 2.0 mm
Very fine sand ..... 0.05 – 0.10 mm

Fine sand ..... 0.10 – 0.25mm
Medium sand ..... 0.25 – 0.5 mm
Coarse sand ..... 0.5 – 1.0 mm
Very coarse sand ... 1.0 – 2.0 mm

The term **soil texture** refers the relative proportions of sand, silt, or clay in a soil.

- Soils with the finest texture are called clay soils
- Soils with the coarsest texture are called sandy soils

One common description soil of soil texture or soil type is that of a **loam**, or **loamy soil**.

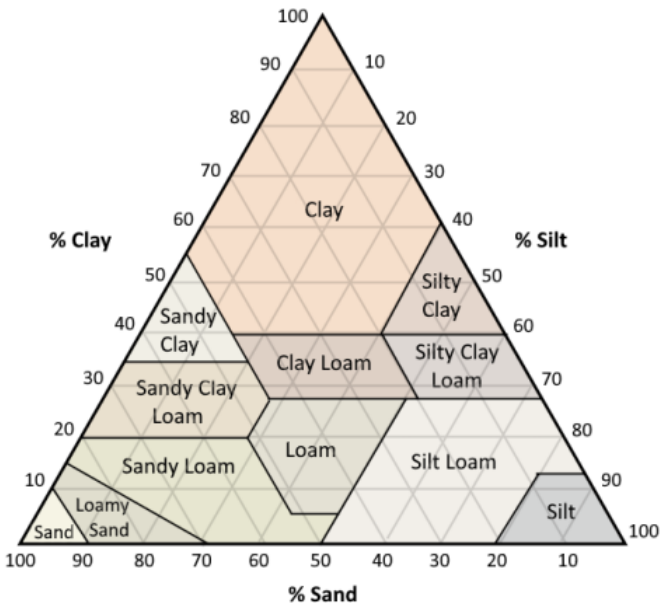
What is Loam?

A loam is a soil which combines sand, silt and clay particles in relatively equal amounts.

The benefit of loamy soils is that they can retain moisture while draining well, allow sufficient air to reach the roots, and retain nutrients, making them ideal for most garden plants.

Soils with a loam texture can contain different proportions of sand, silt and clay to create various soil types, such as sandy loams, silty loams, loamy sand, and clay loams for example. They're names after which proportion is highest in the mixture.

If the percentages of sand, silt, and clay in a soil are determined through testing, we can use the soil textural triangle shown below to determine the which textural class our soil belongs to.



The soil textural triangle describes the relative proportions of sand, silt and clay in various types of soils.

Test 1 – Assessing Soil Using the Soil Sedimentation Test

One way to work out the percentages of sand, silt and clay in a soil sample is by using the soil **sedimentation test**.

It's a simple test, all you need is a tall empty jar, a marker and some water.

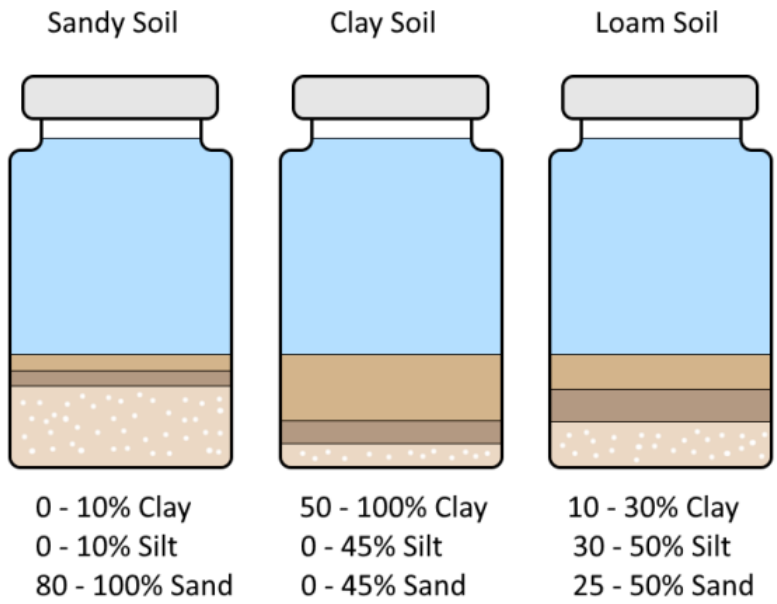
1. Fill jar 1/3 full with dry soil, break up any clumps or clods.
2. Fill the jar with water to about 2.5 cm (1") below rim.

3. Place lid on the jar, shake vigorously to mix the soil and water well.
4. Place the jar on level surface, use marker to mark level of soil sediment on side of the jar at the following times:•After **1-2 minutes** this is the **SAND** layer.

   •After **1 hour** this is the **SILT** layer.

   •After **24 hours** (or until the water is relatively clear, may take several days) this is your **CLAY** layer.Anything left floating is just organic material.

Note, if the water from your water supply is 'hard water', use distilled water or rainwater for this test instead. Hard water is high in dissolved minerals, mainly calcium and magnesium, which will affect the soil in the water.

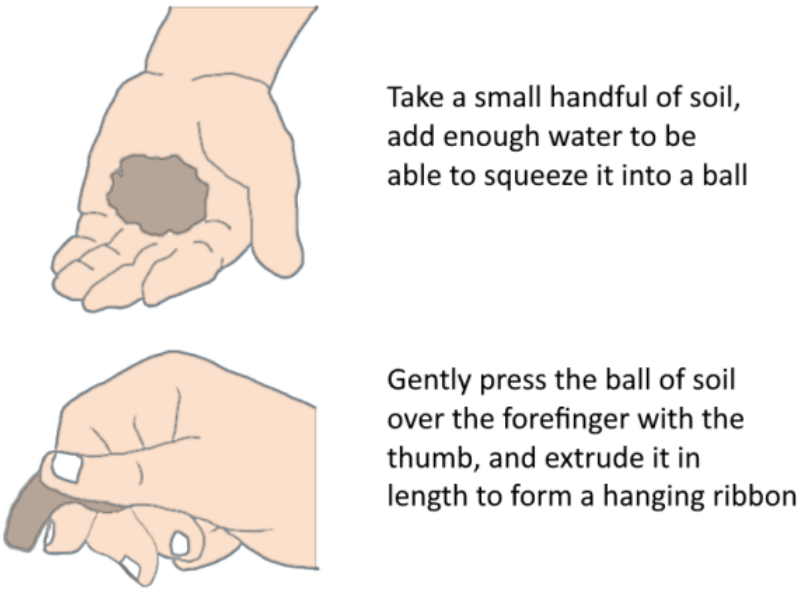


Soil sedimentation test, showing the layering of the various components of the soil, with clay at the top, silt in the middle and sand particles at the bottom of the jar.

Test 2 – Assessing Soil Using the Ribboning Technique

Soil texture can also be estimated by hand using the ribboning technique.

This is a handy test to use when out in the field without any equipment.



Ribboning technique soil test

Estimating soil texture by hand using ribboning technique takes practice to produce consistent results.

1. Take a small handful of soil about the size of a golf ball.
2. Slowly add water a drop at a time while mixing to form a ball of soil that has the consistency of putty. If you can't make a ball, the soil is very sandy.
3. Gently squeeze the ball to determine if it will stay together as a ball or fall apart.
4. Feel the ball with fingers, is it gritty (sand), silky (silt) or plastic/sticky (clay)?
5. Gently press the soil ball over the forefinger with the thumb to extrude it in length and make hanging ribbon. If you can make a short ribbon, soil texture is loamy, a mixture of sand and clay. The longer the ribbon, the more clay is in the soil.
6. After completing the ribbon test, take a pinch of soil from the soil ball and place it in the palm of your hand. Add enough water to break up soil until you have a muddy puddle. Note if there turbidity (cloudiness) in the water. Rub the wet soil in your palm to determine if it feels gritty, smooth, or equally gritty and smooth.

Repeat this test several times to ensure consistent results, and then compare findings and average ribbon length with following list.

- **SAND** – Cannot form ribbon as soil particles will not or very slightly hold together, soil cannot be moulded, single grains stick to fingers, when enough water is added in palm of hand to break up soil the water will turn slightly cloudy or not at all.
- **LOAMY SAND** – Will form ribbon to **5 mm**, soil particles will slightly hold together, when enough water is added in palm of hand to break up soil the water will definitely turn slightly cloudy.
- **CLAYEY SAND** – Will form ribbon **5 – 15 mm**, soil particles will slightly hold together, soil is sticky when wet, many sand grains stick to fingers, soil discolours fingers with clay stain.
- **SANDY LOAM** – Will form ribbon of **15 – 20 mm**, soil particles will just hold together enough to form a soil ball, very sandy to touch, sand grains are visible.
- **LIGHT SANDY CLAY LOAM** – Will form a ribbon of **20 – 25 mm**, soil ball holds together moderately well but is sandy to touch, sand grains are easily visible.
- **LOAM** – Will form ribbon around **25 mm**, soil ball holds together and is spongy, soil feels smooth with no obvious sandiness, may be somewhat greasy as organic matter is usually present.
- **SANDY CLAY LOAM** – Will form ribbon **25 – 40 mm**, soil ball holds together strongly, soil is sandy to touch, sand grains are visible.

- **CLAY LOAM** – Will form ribbon **40 – 50 mm**, soil ball holds together strongly and is plastic (consistency like putty) and smooth to manipulate.
- **SANDY CLAY and LIGHT CLAY** – Will form ribbon **50 – 75 mm**, soil ball is plastic (consistency like putty) with slight resistance to shearing. In sandy clay you can see, feel and hear sand grains, whereas light clay is smooth to touch.
- **LIGHT MEDIUM CLAY** – Will form ribbon **75 – 85 mm**, soil ball is plastic (consistency like putty) and smooth to touch with moderate resistance to ribboning when pressed between thumb and forefinger.
- **MEDIUM CLAY** – Will form ribbon **85 – 100 mm**, soil ball is plastic and handles like plasticine, can be moulded into rods, with moderate resistance to ribboning when pressed between thumb and forefinger.
- **HEAVY CLAY** – Will easily form ribbon **over 100 mm**, soil ball is plastic and smooth, handles like stiff plasticine, can be moulded into rods without fracture; has firm resistance to ribboning when pressed between thumb and forefinger.

Test 3 – Assessing Soil Using the Clay Dispersal Test

If you have a clay soil, and want to break up the clay, should you add gypsum? Use this test to find out.

Gypsum can be used to break up **sodic clay soils** (which contain sodium), but it doesn't work on calcium clays.

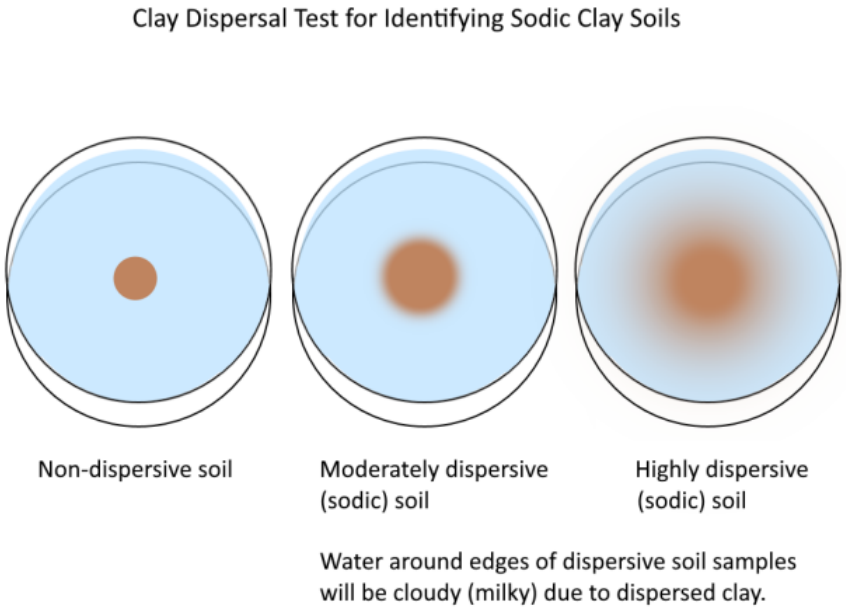
The way to test the degree of how sodic soils are is with a simple **clay dispersal test**.

The clay dispersal test is carried out as follows:

1. Collect dry soil aggregates (crumbs of soil) for testing. You can take samples from the various depths of the soil profile if you wish.
2. Carefully place the soil sample into a clear dish of water so as not to mix or agitate the soil. Note that aggregates often slake (crumble) after they are placed in water, but not always, and this is not dispersion.
3. Allow the soil aggregate to sit, and observe the result over time. The water around the edges of the soil aggregate will become cloudy and milky looking if the soil contains a dispersive (sodic) clay. The more sodic a clay is, the more dispersive it will be.

Highly dispersive soil will disperse after about 10-30 minutes, while moderately dispersive soil may take 2 hours to do so.

Note, if the water from your water supply is 'hard water', use distilled water or rainwater for this test instead. Hard water is high in dissolved minerals, mainly calcium and magnesium, which will affect the soil in the water.



Clay dispersal tests provide a visual indicator of how sodic clay soils are by the degree of dispersion in water

Here is a summary of how different clay soils perform in the clay dispersion test:

- **Non-sodic soil** – exchangeable sodium <6%, no dispersion visible after 24 hours, soil aggregates slake (crumble) but do not dispersed (turn milky).
- **Slightly sodic soil** – exchangeable sodium 6–10%, dispersion (milky halo) visible **after 24 hours**, soil aggregates **disperse slightly**.
- **Moderately sodic soil** – exchangeable sodium 6–10%, dispersion (milky halo) visible **after several hours**, soil aggregates **disperse partially**.
- **Highly sodic soil** – exchangeable sodium >15%, dispersion (milky halo) visible in **less than 30 minutes**, soil aggregates **disperse completely**.

How to Improve Soil Quality with Soil Amendment Materials

Once we know exactly what type of soil we are working with, we can add the appropriate soil amendment materials to improve it.

- Sandy soils – improve water retention by adding organic matter (compost), zeolite or bentonite clay.
- Clay soils – improve water drainage by adding organic matter (compost), as well as gypsum (clay-breaker) to sodic clays only.
- All soils – improve **nutrient retention** by adding organic matter (compost), zeolite or biochar. Clay soils and soils high in organic matter retain nutrients better than sandy soils.
- All soils – improve **soil fertility** by adding natural fertilisers such as manures, blood & bone, fish emulsion.

References

1. *NSW Department of Primary Industries – Determining soil texture using the ribboning technique, Primefact 1363 F irst edition, December 2014*
2. *Ritchey, Edwin L.; McGrath, Joshua M.; and Gehring, David, "Determining Soil Texture by Feel" (2015).Agriculture and NaturalResources Publications. 139.*
3. *Agriculture Victoria, Victorian Resources Online – Practical Note: Soil Texture*
4. *Government of Western Australia, Department of Primary Industries and Regional Development – Identifying dispersive (sodic) soils, 2020.*

Share this:

[Beginner's Guide to Vegetable Gardening – Part 2, How to Prepare the Soil](#)
March 25, 2020
Resources

[Why Herbicide Use is Not Compatible with Healthy Soils](#)
February 1, 2023
Soils

[What is Soil Cation Exchange Capacity (CEC)?](#)
July 24, 2022
Resources

Categories: DIY instructions, Resources, Soils

Tags: dispersive clay, loam, sodic clay, soil clay dispersal test, soil ribboning test, soil sedimentation test, soil testing, soil textural triangle

Leave a Comment