

A Quick Start Guide to Soil Biology

For Cut-Flower Growers



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Have you ever wondered why some soils produce healthy plants with little attention needed, while others struggle, even when fertilisers are added?

Welcome to the incredible world of soil biology!

Our Story Starts...

Billions of years ago, the first microbes emerged and started moving around in the rock dust that covered our Earth, processing what they found and very slowly evolving.

It was much, much later that plant life began - around 500 million years ago. Plants have never existed without microbes, and now, microbes struggle to exist without plants. They work in symbiosis with each other, and if one is absent, the other will fail to thrive.

Before We Dig In

We, cut-flower growers, are asking our soil to produce more than it would naturally produce. It may surprise you (it did me!) to hear that what we are doing is classed as **intensive farming**. Because of this, **inputs are necessary**. But, how are you supposed to know what to add, without spending time and money on testing and re-testing? Read on to find out more.

So... What is "Healthy Soil"?

Healthy soil that will grow beautiful, abundant crops ALL BY ITSELF depends on two things:

- Soil structure/organic matter content
- Soil Biology

Many of us assume that plant nutrition is simply a matter of adding various fertilisers. With a healthy soil, nutrients are made available to plants by the very life within it - meaning that *no synthetic fertilisers* will ever be needed, and organic fertilisers could be a rare addition too! Healthy soil is TEEMING with life to help your plants thrive.

Soil Type Matters Less Than You Think

Is your soil type clay, sand, silt or most-coveted loam? Thankfully, it matters less than lots of the gardening advice out there would have you believe, *once adequate organic matter is added in*.

Here's a quick breakdown:

Soil Type	Pros	Cons	What Organic Matter Improves
Clay	Retains nutrients well	Gets waterlogged	Structure, air and water movement
Sand	Light and quick to warm up in Spring	Poor nutrient retention, dry	Gives sites to host biology, nutrient holding capacity, moisture retention
Silt	Smooth texture like flour, holds nutrients better than sand	Compacts easily	Structure and water retention
Loam	Usually balanced	None	Supports biological activity

Do you see it too? Soil type matters less than the amount of organic matter and biological activity within it. Whatever your soil type, adding organic matter is the key to improve (or, in the case of loam, support) it.

Glossary

Compost: bagged or homemade well-rotted plant matter

Cycling nutrients: microbes eating and pooping

Fertiliser: a natural or synthetic substance that supplies nutrients to plants

Microbes: the life in the soil. Bacteria, protozoa, nematodes, fungi

Mulch: something placed on top of the soil to enrich the soil, maintain moisture levels and keep weeds at bay

Nutrition: elements, minerals and compounds in the soil that feed soil biology and plants

Organic matter: compost and plant roots, made up of mostly carbon and some nitrogen

Soil Biology: the life in the soil. Bacteria, protozoa, nematodes, fungi

Who Lives in Living Soil?

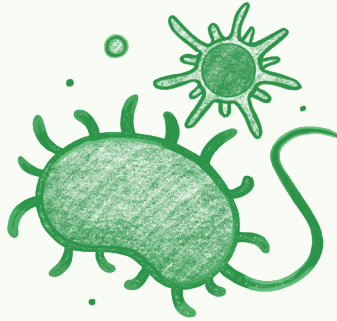
We're getting to the crux of the matter! Here's the line up. These four microbes plus plant matter make up the so-called 'soil food web'. It's a web and not a chain because the microbe-plant relationship is symbiotic, and so are the relationships between microbes.

Plant Roots



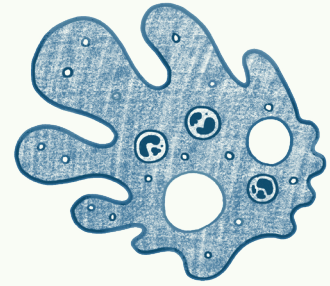
Plant roots reach down through the layers of soil, exuding sugars and proteins which are then eaten by microbes.

Bacteria



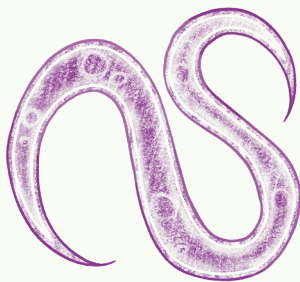
Beneficial bacteria can colonise the roots, and the roots take what they need back. Bacteria LOVE nitrogen, and turn decomposing organic matter into nitrogen in their tiny bodies. They also scavenge for other nutrients in the soil, like phosphorus, potassium and sulfur, and convert them into plant available forms.

Protozoa



The primary 'recyclers' of the soil eco-system. They eat the bacteria and then excrete excess nutrients in a form that can't wash away - heroes. Very sensitive to tillage, pesticides and extreme changes of temperature.

Nematodes



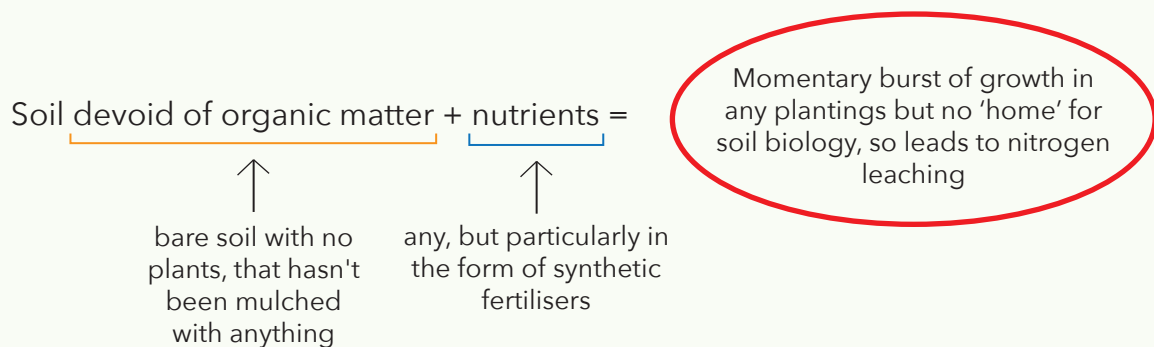
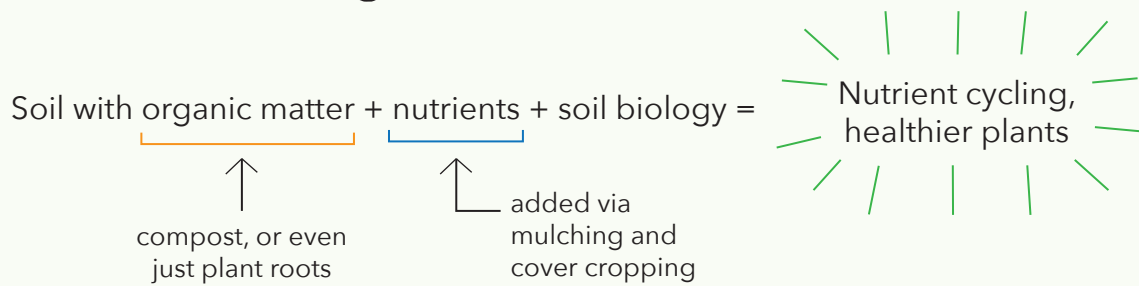
Nematodes eat fungi and bacteria (and each other!). They excrete excess nutrients like the protozoa do, and they also move very quickly and distribute bacteria throughout the soil, distributing bacteria as they go (they can travel up to 12cm away from a resource-rich area in search for food! So cute). Some types can keep pest populations in check.

Fungi



The ultimate decomposers, resource sharers and soil protectors, but they couldn't do any of it without the aforementioned microbes. They create a sticky protein (glomalin) which physically binds the soil together, creating structure. They soak up water like a sponge and can deliver it and other nutrients to plants that need it. Perennials prefer a more fungi-rich soil compared with annuals.

Organic Matter Matters



Bacteria populations explode when synthetic fertilisers are added to soil. Bacteria need to eat lots of carbon vs nitrogen - and synthetic fertiliser is generally purely nitrogen - so they need to find masses of carbon to survive. They then eat up the organic matter content in the soil much more quickly than they would have without the synthetic fertiliser being added, leading to an overall loss of soil life (as organic matter content is needed to host biology).

As well as this, the simple act of all these new bacteria being alive leads to much more CO₂ being exhaled by them all.

If we want to store carbon in the soil instead of releasing it as CO₂, we need undisturbed organic matter in the soil to host the microbes, who can then convert the organic matter into nutrients for our living plants.

Why Nutrient Deficiencies Happen

Many nutrient deficiencies are not caused by a lack of nutrients. A soil may contain plenty of potassium, but if the biology responsible for cycling potassium is absent, plants can still show deficiency symptoms.

Phosphorus and potassium levels are pretty much static in the UK and there is enough in every soil, but having the correct soil biology is needed to unlock it.

A biological deficiency can look exactly like a nutrient deficiency.

Three Ways to Improve Soil Health

When it comes to improving soil health, you can choose to do it simply, which will take time (a year or more), or quickly.

Simple ways to improve soil health:

- 1 - Buy bags of compost and use as a 2-5cm mulch on your beds
- 2 - Grow cover crops and chop them down to build up organic matter (chop and drop as often as possible, think about the behaviour of grazing animals)
- 3 - Make your own compost and add as a mulch once or twice a year

Fast ways to improve soil health:

- 1 - Test your soil to make sure it's actually lacking something
- 2 - Test your input (bought/homemade compost) to make sure it has what you need
- 3 - If nutrition is lacking in the soil apply the Soil Smith's **fermented organic fertiliser** (12 essential plant nutrients and trace minerals), and if biology is lacking apply their highly acclaimed product, **Goop** (jammed full of loads of beneficial soil biology)

The Soil Smiths have kindly given us a discount code to use for their products. They sell a couple of absolutely brilliant pro-soil biology products, they conduct soil tests (both biological and nutritional), and they are always up for a chat if you have any further questions. They work with farmers of all types (arable, flowers, market gardeners) on all scales (1000's of acres down to less than one acre) so they've got plenty of experience to draw from!

Visit www.soilsmiths.co.uk/shop and use code 'flowermag20' for 20% off all products.

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