INFORMATION LEAFLET

Improving soil and climate protection in communities

HUMUS HELPS WITH SOIL CARE

Humus, that very special, dark, blackish-brown substance, is fundamental to plant growth. Without humus there would be no life. This sounds like an exaggeration but it is not: all life on our planet depends on plants and their ability to grow in healthy, well-functioning soil. Humans and animals are ultimately dependent on plants, and to get healthy soil, you need a high degree of humus in it. Humus is often incorrectly used by gardeners when generally referring to soil. However, humus is the sum of all matter comprising of dead organic material, both plant and animal based, as well as the products of their metabolism, in the soil and on its surface

Earthworms play an essential role in the formation of humus.

HOW IS HUMUS FORMED AND WHAT DO WE NEED IT FOR?

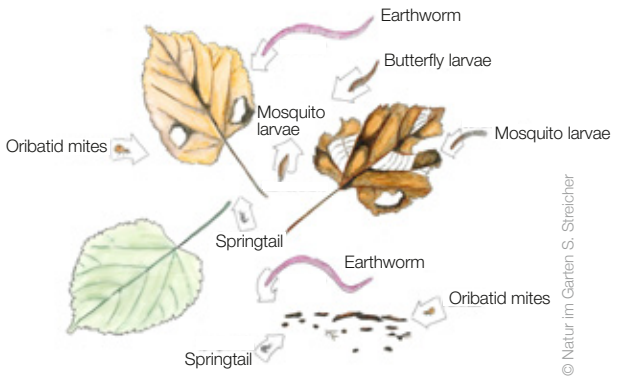
Origin

Step 1: Humus is created by the **disintegration of plant and animal residues –** such as dead roots, leaves, stalks, carcasses, animal droppings and the like.

Step 2: Larger soil creatures, such as earthworms, isopods or centipedes feed on these and carry out the **initial breakdown** of the organic matter.

Step 3: **Soil fungi, unicellular microorganisms and bacteria** take care of the rest.

Ideally, only **inorganic end products** from the initial material remain after this process. These include water, carbon dioxide, nitrates, minerals and trace elements, which are then again available as nutrition within the plants' life-cycle. This type of humus is therefore also referred to as nutrient humus. From a chemical point of view, nutrient humus comprises mainly of carbohydrates (sugars), proteins and also some fats, which can be broken down quickly and easily.



Decomposition of a leaf by various species of soil fauna.

SYM:BIO
EUROPÄISCHE UNION
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A special type – permanent humus

However, not all organic matter disintegrates completely. Even for microorganisms, wood pulp, cellulose or different types of natural wax are "hard to digest" or can only be devoured and decomposed by specialist organisms.

Many of these substances are then chemically transformed to humic substances. These are complex organic compounds that take a very long time to break down, tend to persist in the soil for a long time, and make it look dark. These compounds are also known as **permanent humus.**

There are various reasons why this permanent humus is very important for the fertility of the soil:

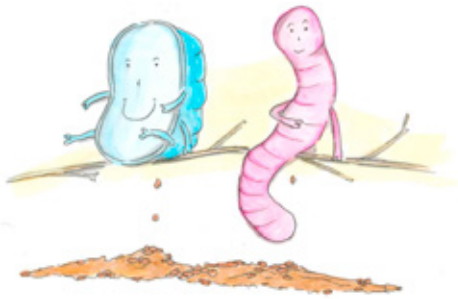
1. Nutrient, water, and carbon storage

Due to having a **very large surface area and specific chemical structure,** humic substances are able to bind water and nutrients to their surface, but also to make them available to plant roots as needed. They are even better than clay minerals at doing so! Plainly speaking, you can imagine permanent humus as being like a storage cupboard where the roots can find and take the nutrients they need, such as nitrogen, phosphorus or potassium, and most importantly, exactly at the time they need them. Besides that, humus-rich soils act as carbon reservoirs: this is because humic matter consists mainly of **carbon atoms.** Quite an interesting detail with regard to the climate change problem, isn't it?

Maintaining your garden without peat helps protect the climate!

Garden soil does not need peat. It can do very well without it. Peat mining destroys peat bog landscapes, which are currently becoming rare and endangered. In terms of CO2 content, peat is a **major store of fossil carbon.**

The so-called **clay-humus complexes,** which emerge as a result of synergy with soil organisms, play an important role in the fertility of soil. Organic particles in the digestive tract of earthworms mix with the mineral particles (sand, clay, etc.) and combine to form clay-humus complexes. These complexes are very effective in binding plant nutrients and can make them available to the roots as required.

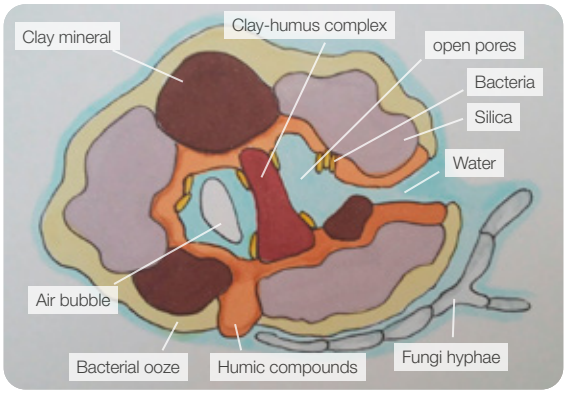


The excretions of the soil fauna help form the important clay-humus complexes.

2. Structure-building and stabilising element

However, permanent humus is not just a nutrient store but upon the activity of the soil organisms it also acts as a structural and stabilizing element in the soil. An ideal soil, which is lumpy and loose to the touch, is the result of microbes and soil organisms doing their work properly and forming compact lumps of soil. We can call this the **living structure** of the soil.

You can imagine it like a brick wall where the mineral parts of the soil (clay, sand, etc.) represent the bricks, while the microbes and the humus are the mortar binding the bricks together. However, unlike bricks, the product of a living soil is not a wall, but a three-dimensional sponge-like structure that is very good at storing water and air. This is a soil that is healthy and fertile, perfect for any gardening activity. This soil is **"ready",** as a farmer would address it, or as a baker would address a perfectly proved bread dough, which is airy and plump, ready to make the perfect loaf of bread. Such lovely crumbly soil has enough stability to withstand erosion and prevent nutrients from leaching out.



Structure of a soil crumb.

So how do you get a humus-rich soil?

Humus can only build-up if the soil organisms have enough plant residues to feed on (such as mulch, compost, organic fertilizers or green manure). Artificially produced fertilizers ("synthetic fertilizer") do not have the capacity to ensure improved fertility of soil. And what is more, synthetic fertilizers harm the useful "workers" making the soil naturally fertile, such as earthworms.

Avoid artificial fertilizers!

Plants absorb large amounts of easily soluble nutrients. As a result, they grow very fast. This may look good, but the downside is that such plants are more **susceptible to pests and diseases.**
In addition to this, heavy rainfall may **wash the nutrients away** from the soil and into groundwater.

1. Organic mulch

There certainly is something we can for the soil organisms: covering any empty free surface in vegetable and flower beds with mulch.

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Mulch protects soil surface.

Mulching means **covering the ground with plant material.** Straw, dried grass clippings, leaves or similar materials are all suitable for this purpose. Special mulching materials, such as hemp or flax hulls are also available from some retailers.

You can find a range of beneficial soil additives on

www.naturimgarten.at/bodenhilfsstoffe-produkte

A layer of dead plant residues **protects the surface of the ground from extreme weather,** such as heavy rains or high heat, which may damage the plump and airy structure of the soil underneath it. Mulched ground contains much more moisture hidden in the tiny cavities between the mulching materials than the uncovered surrounding areas. All of this is really beneficial for many soil organisms. They also welcome organic mulch as a **source of food.** The tiny little helpers working hard underneath the ground also help stabilize the airy structure of the soil with the products of their metabolism, as the aforementioned clay-humus complexes are formed in their intestines.

If you incorporate fibrous mulch into the soil, it would use up nitrogen as it decomposes. To compensate for this loss it is advised to dig some bovine horn shavings in under the layer of mulch. Green mulch, such as lawn clippings or dead weeds, are good **sources of nitrogen,** too.

Find more information about mulching in our information leaflet:

www.naturimgarten.at/infoblatt/mulchen

2. Organic fertilizers

Organic fertilizers can be used to provide a similar effect.

They are available in a wide variety from specialist retailers and are made from animal or vegetable waste products such as **bovine horn flakes, bone meal or pulp from oil seed pressing.** These materials decompose and are absorbed and broken down by soil organisms, which means that the nutrients are released slowly and not all at once. Besides that, there are the soil organisms which produce humus, as we have read before.

It is a very good idea to fertilize your garden with **compost.** Compost is the product of decomposition of vegetable waste, which means it is particularly rich in humus and comes with all the related benefits.

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Earthworms are the most widely known representants of the soil fauna. However, there are also other tiny animal species, such as mites, woodlice, insect larvae and algae, fungi, and bacteria – all of them are involveld in building up the humus layer.

Hints and tips for community green spaces

If there are any areas in your community greenery that are not currently in use but may be used later, it is a good idea to sow them over with green manure plants.

It is a method for temporary, short or long-term greening of the surface using specific plant species. Green manure is also a good way to add extra nutrients to beds that you plan to harvest in the autumn, or those which would lie fallow for more than three weeks. Once grown, green manure plants are cut while still green, and you can either work them into the ground, or use them as mulch. The deteriorating roots of the dead plants leave behind cavities and provide a great source of **food for soil organisms.** This method of soil preparation can be used for both for the kitchen and the ornamental garden, prior to planting vegetables or perennials.

You can find more information about green manure on

www.naturimgarten.at/infoblatt-gruenduengung

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Green manure crops, such as Phacelia, improve soil structure, provide nectar for the bees adn insects, and serve as mulch covering the soil throughout winter.

Humus properties at a glance

- **Nutrient storage, Water reservoir and Carbon storage**
- **Source of food for soil organisms**
- **Produces loose, well-aerated and easily workable soil, and healthy plant growth**
- **Acts against leaching of nutrients and erosion**

Public green areas and near-nature gardens will become “climate-proof”!

Due to the ever-increasing drought in many places and climate change, many communities are confronted with the effects of climate change in the management of their green spaces.

The cross-border Interreg project SYM:BIO (ATCZ234) connects and mobilizes stakeholders in the Czech Republic, Vienna and Lower Austria, and demonstrates the great potential of public green spaces and semi-natural gardens in adaptation to climate change.

You can find more information at

- **www.naturimgarten.at/projekt-sym-bio.html**
- **www.at-cz.eu/at/ibox/pa-4-nachhaltige-netzwerke-und-institutionelle-kooperation/atcz234_symbio**

The aim of the SYM:BIO network is to focus on the environmental function of green spaces and gardens in built-up areas as part of INTERREG V-A Austria-Czech Republic. Together with the project partners Bio Research Austria, Mendel University Brno, ZERA, NÖ ABB and „Natur im Garten“ GmbH, the project areas cover the locations of Vienna, Lower Austria, the Vysočina Region and South Moravia in the Czech Republic. The projects involve theoretical and practical research and the promotion of strategies for adaptation to climate change, as well as methods for management promoting biodiversity and the transformation of public green spaces and gardens to drought-resistant green areas.

At the end of the project period, the experiences and strategies of all the project partners will be combined to produce a SYM:BIO guide for biodiversity promotion and drought-adaptation measures for public green spaces and gardens.

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