Artal 125 years

SMART AGRICULTURE | 1895-2020

Technical Information

HUMIC & FULVIC ACIDS

Their functions on plants

GENERATION 4

LA CALIDAD DE LA EXPERIENCIA

What they are

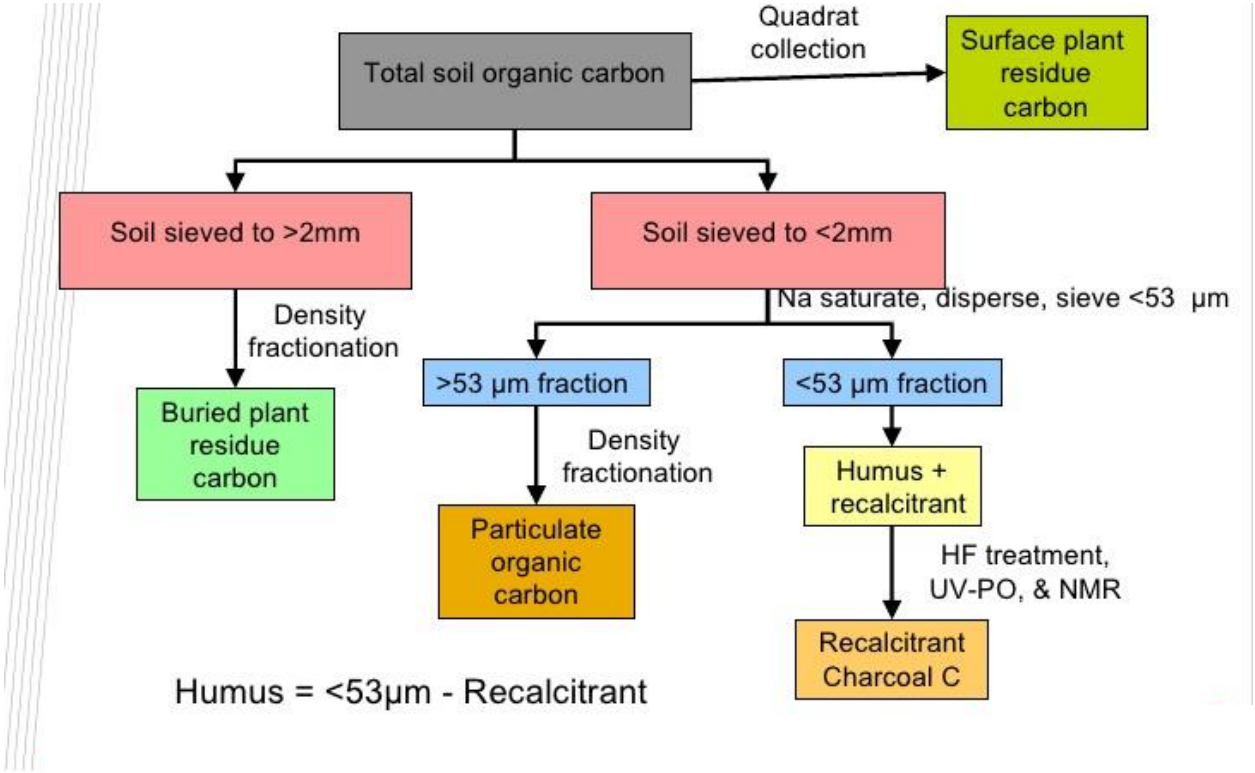
Humic and fulvic acids are a group of heterogeneous molecules present in soils, being the active part of organic matter.

Humic acids are composed by a mixture of complex carbon molecules that are formed by decomposition and oxidation of organic matter.

Humic acids

Fulvic acids

What are they



Humic substances represent up to 80% of the TOC (Total Organic Carbon) of the soil.

They are organic compounds dissolved in natural waters and are formed by the microbial degradation of dead plant matter, such as lignin and carbon, a process similar to "humification".

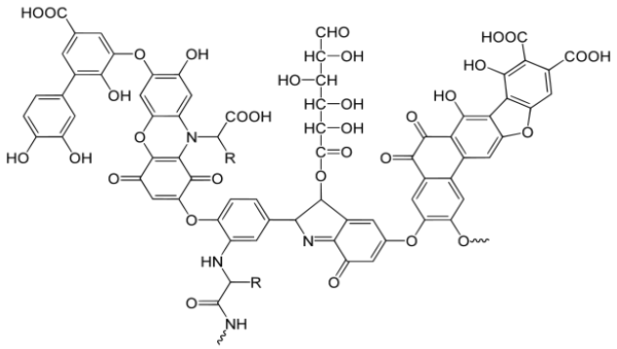
They are chemically defined as weak acidic electrolytes with carboxylic groups, phenolic-OH and other active groups.

They have a black-brown appearance, with a mycelial-like structure and a molecular weight between 500 Da (fulvic acids) and 100,000 Da (humic acids).

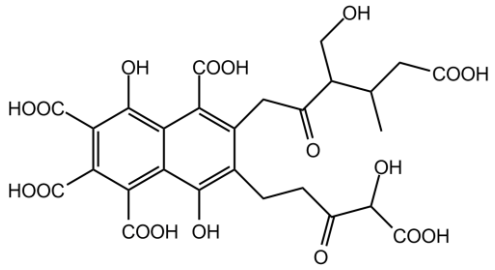
Humic & Fulvic acids

Differencies

When we refer to humic acids, we also include fulvic acids in this concept, although they are not the same compounds.



Humic Acids

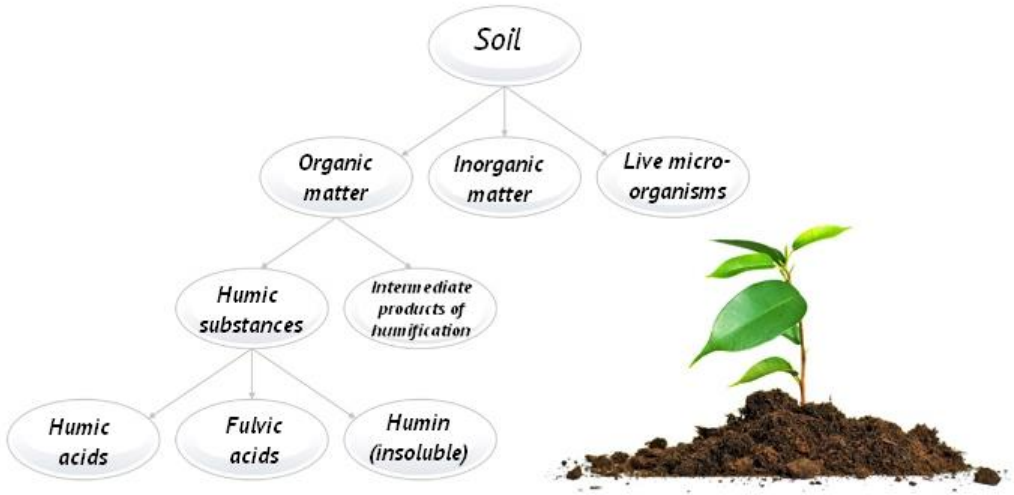


Fulvic Acids

The two groups of molecules differ in terms of carbon and oxygen content, degree of polymerization, molecular weight, color, and acidity, among others.

Humic & Fulvic acids

Differencies



Humic acids have:

- Higher molecular weight than fulvic (100,000 Da humic and 500 Da fulvic).
- Greater cation exchange capacity.
- Greater water retention capacity.
- A slower action in the plant compared to fulvic acids (which are faster).
- Greater persistence in the soil and in the plant compared to fulvic acids.

Humic & Fulvic acids

Extraction

The origin of this class of compounds is diverse (peat, plant remains, etc.) but most of the humic acids on the market are obtained from Leonardite, a substance that is chosen for a better quality and is characterized by having very advantageous agronomic properties :

- humidified plant substance

- very rich in organic matter

- it is in an intermediate state of transformation between peat and lignite.

Extraction and separation

Humic and fulvic acids are soluble in basic medium and therefore this is used to extract them in liquid form by means of an alkaline substance such as classical potassium hydroxide.

Subsequently, they are passed into an acidic medium: humic acids precipitate while fulvic acids remain in the liquid phase.

Humic acids on soil

- They positively influence the fertility of a soil
- They promote microbial activity
- They help to create a soil structure that facilitates water infiltration and helps water retention.
- They act as natural complexing agents contributing to nutrients' release
- They help in the breakdown of toxic substances such as: nicotine, aflatoxins, antibiotics, shallots and most organic pesticides.
- They buffer the pH values of the soil and release carbon dioxide.
- They help stabilize the effects of changes in soil temperature and slow the evaporation rate of water.

Humic acids on soil

Depending on the type of soil, humic acids:

- In clayey soils, they help to improve the structure of the soil, enhancing permeability and increasing aeration at the root level of the plant.
- In sandy soils with low organic matter levels, they help to increase the exchange of macro and micronutrient cations, improve the water retention capacity and avoid the loss of nutrients by leaching.

Humic acids on plants

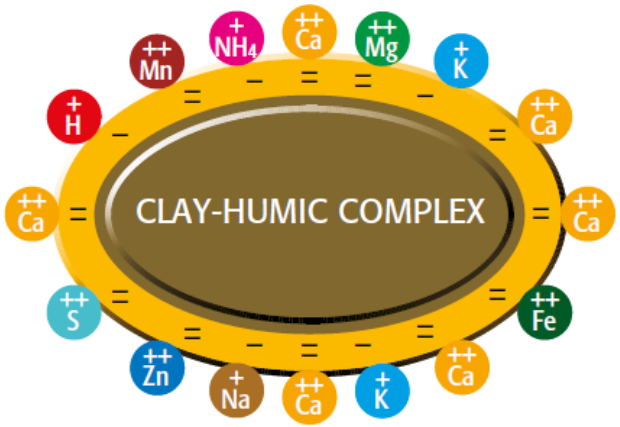
Nutrient absorption

Positive ions, or cations, are attracted to and bind to humic acids.

The humus retains the exchange bases through ion exchange: this binding allows the unblocked nutrients to be more easily adsorbed by the plant.

Root systems are also negatively charged, with a stronger negative charge than humic acid. Therefore, positive ions bind to humic acids, facilitating their absorption by the plant.

Without this essential system, many nutrients would remain locked in the soil and would not be available to the plants they must fertilize.

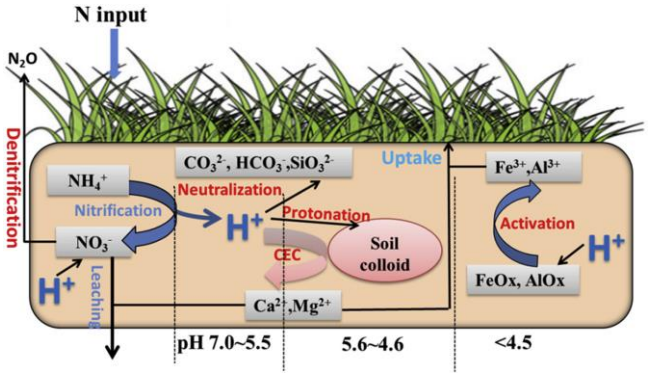


Humic acids on plants

Buffer Effect

Humus has a high buffering power against pH variations by virtue of its property as a weak acid and the presence of exchange bases absorbed on its surface.

- In the presence of acidic molecules ➔ releases exchange bases and absorbs hydrogen ions.
- In the presence of basic molecules ➔ absorbs metal cations and releases hydrogen ions



Levels of toxins

Decrease of toxins levels

Humic acids chelate harmful toxins in the soil, preventing them from entering the plant.

Unlike nutrients, plants do not absorb them and rinse off. This vital process keeps plants healthier in today's increasingly challenging growing environments.

Humic acids on plants

Water retention

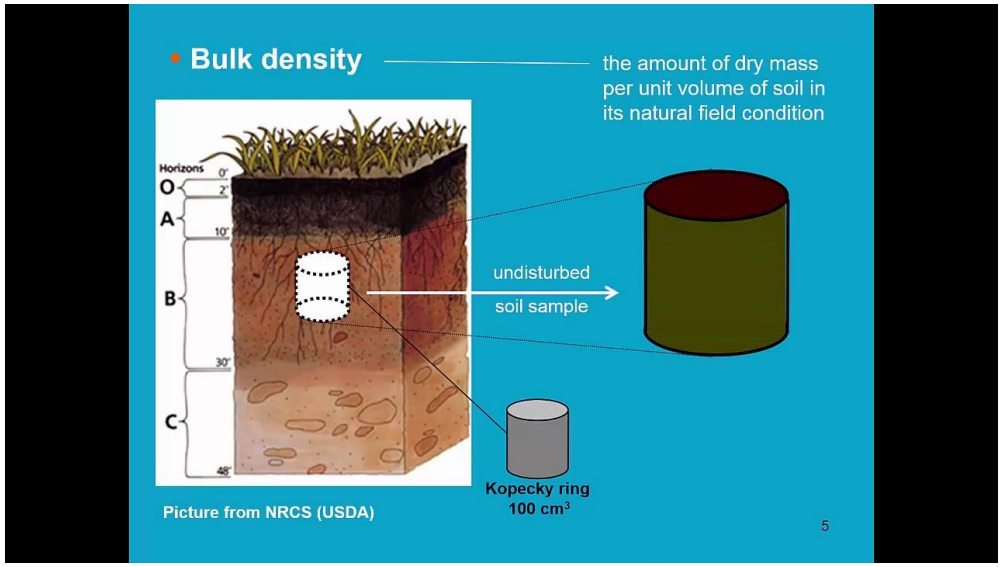
Better water retention

Humic acids have the ability to increase water retention in soils.

Humic acid makes the soil particles not subject to excessive movements and translocations in the soil, allowing the penetration of water

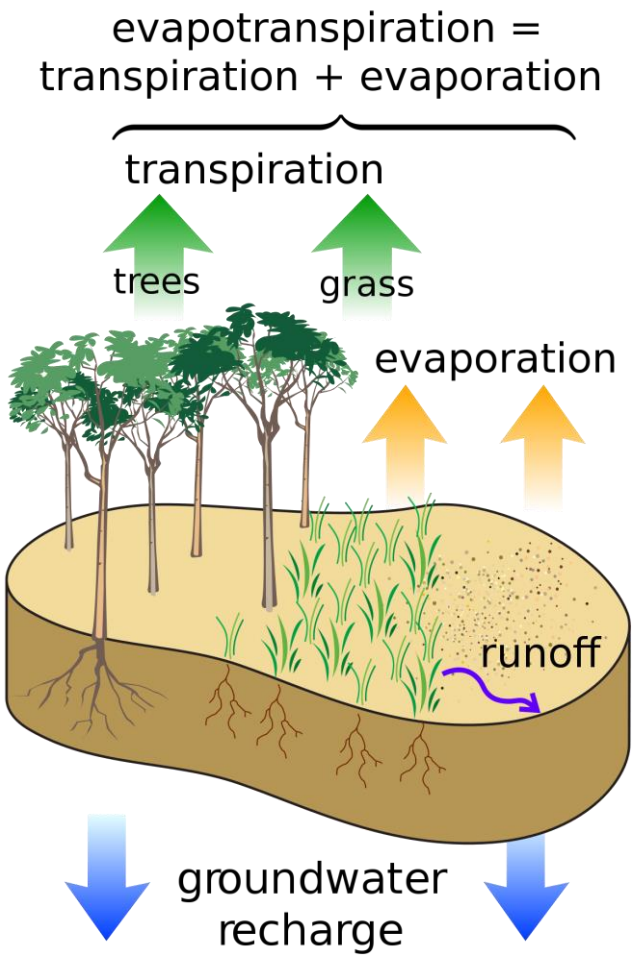
Water retention

Humic acid makes the clay particles not subject to excessive movements and translocations in the soil, allowing the penetration of water.



Humic acids on plants

Water retention



Humic acid reduces the evaporation of water from soils.

In the presence of water, the cations absorbed by humic acid are partially ionized and move a short distance away from the oxidation sites of humic acid. This event restores part of the positive attractive force of the bound ion.

Microbial growth

Improvements in microbial growth.

They provide a source of carbon that serves as a food source for microbes and, secondly, due to their large size, they provide a source of colonization for microflora.

Humic acids on plants

Soil structure

Better general soil structure.

They have positive and negative charges and a high molecular weight.

This allows humic acids to bind to all soil particles, creating the necessary space for microbes and healthy root growth.

Benefits

They improve nutrient absorption maintaining a balanced nutrition.

They improve the structure of the soil, increasing the buffering power of the soil and optimizing the absorption of N. P. K by plants.

They neutralize acid and alkaline soils, regulating the pH value of soils, with a prominent effect on alkaline and acid soils.

They reduce nitrate losses in groundwater.

They improve the resistance of crops to different sources of stress such as cold, drought, pests, diseases, etc.

Benefits

They stabilize nitrogen levels and improve nitrogen efficiency (as an additive with urea)

They promote the production of healthier and stronger plants.

They buffer the effects of excess elements (particularly sodium), toxic chemicals, and heavy metals.

They promote seed germination in less time.

They offer improvements in soil structure creating a crumb structure for better water and oxygen intake and better root penetration.

Humic & Fulvic acids

Fertiorgan Humus

- ✓ Product based on humic and fulvic acids resulting from the decomposition and transformation process of Leonardite organic matter.
- ✓ The application of this product:
  - Increases the microbial activity of the soil.
  - Increases the cation exchange capacity (CEC)
  - Improves its physicochemical properties.
  - Strengthens the clay-humic complex.

Fertiorgan Humus

Guaranteed contents

Element	Guaranteed contents
Total humic extract	15,00% p/p = 17,25% p/v
Humic acids	8.00% p/p = 9.20% p/v
Fulvic acids	7.00% p/p = 8.05% p/v
Potassium (K_2O) water-soluble	5.00% p/p = 5.75% p/v

Density:	1,15 gr/cc
pH (20°C):	13,2

How to use and dosage

FERTIORGAN HUMUS is recommended for all types of crops.

FERTIORGAN HUMUS can be applied throughout the vegetative cycle, from pre-transplant.

FERTIORGAN HUMUS is especially recommended in low organic matter soils, since it works by improving the properties of the soil and the assimilation of other nutrients that are present in it and that are necessary for the correct nutrition of the crops.

Fertiorgan Humus

How to use and dosage

FERTIORGAN HUMUS can be applied via the roots using any irrigation system. Make several applications throughout the vegetative cycle. General application doses: 2.5-5 l / ha and application until completing 40-60 l / ha and crop cycle.

CROP	ROOT APPLICATION	APPLICACIONS / FRECUENCY
Fruit vegetables	40-60 l/ha	4 - 7 applications from pre-transplant, every 10 - 15 days
Leaf vegetables	25-50 l/ha	4 - 7 applications from pre-transplant, every 10 - 15 days
Citrus and subtropical	40-60 l/ha	In pre-sprouting, pre-flowering and fruit set every 15 days
Fruit trees, olive tree and vineyard	40-60 l/ha	From sprouting, repeat every 15 - 20 days, pre-flowering and setting
Extensive and ornamental	25-30 l/ha	3 - 5 applications from transplant every 15 - 20 days