SMALLOPS
Nanoparticles for sustainability

NANOPARTICLES FOR THE FERTILIZER SECTOR

In Smallops we produce a suspension of nanoparticles (OPS) from olive waste (olive pomance and vegetable water). This suspension is very rich in nutrients such as N, K, humic and fulvic acids, Fe... for its contribution as fertigation, being a sustainable product.

1. WHAT IS THE FERTILIZER OR FERTILIZER?

A **fertilizer** is any type of organic or inorganic substance that contains nutrients in forms assimilable by plants, to maintain or increase the content of these elements in the soil, improve the quality of the substrate at a nutritional level, stimulate the vegetative growth of plants. plants, etc. Natural or ecological examples of compost are found both in the classic manure, mixed with agricultural waste such as forage, or in the guano formed by the excrement of birds (for example, poultry, such as chicken).

Iron is the most abundant nutrient in almost all soils. However, there are frequent iron deficiencies for crops as a consequence of its low solubility in the soil and the high sensitivity of plants to iron chlorosis. The low solubility of iron in the soil is a consequence of the high pH of limestone soils, 8-9, in which the solubility of iron oxides is minimal.

In addition, in these soils, there is a large presence of bicarbonate ion which, on the one hand, makes plants sensitive to chlorosis reduce their ability to absorb iron and, on the other hand, plugs the medium so that the pH cannot go down in the rhizosphere, avoiding points with possible iron solubilization. If iron chlorosis is not treated, it can lead to complete plant defoliation, poor drainage, damaged roots, compacted roots, high alkalinity, and plant nutritional deficiencies.

2. REGULATION (EU) 2019/1009

The new Regulation (EU) 2019/1009 on fertilizers covers a wide range of fertilizer component materials and it is contemplated to broaden the scope of harmonization in order to include recycled and organic materials from different origins, thus contributing to developing the circular economy within the Union.

It is considered one of the key legislative proposals of the action plan for the circular economy, to incentivize in the EU the production of fertilizers from non-imported organic or secondary raw materials. The recovery of secondary raw materials, bio-waste, by-products, derivatives and digestates produced in the EU, is one of the technological challenges contemplated to favor European self-sufficiency, in the scenario of sustainable agriculture.

Another of the objectives of this Regulation is to eliminate trade barriers between member states and allow the exchange and use of harmonized fertilizers, without technical obstacles to free trade.

3. TYPES OF FERTILIZER

There are many options on how to pass the nutrients to the plants. Many gardeners and farmers use a combination of different fertilizers and techniques. The fertilizer can be of a single type or it can also be available as a mixture of different nutrients and trace elements. The key to selecting a fertilizer is understanding what and how many nutrients your plants need.

3.1. BIO-FERTILIZERS

In nature, there are a large number of valuable microorganisms that play a vital role in the development of plants by helping them to reach and absorb nutrients. Their usefulness can be improved with human help by selecting and detecting the most efficient organisms, cultivating them, and adding them back to the soil, either directly or as seed coatings. Cultured microorganisms are also applied with the help of some carrier materials and are therefore known as biofertilizers.

3.2. ORGANIC FERTILIZER

Organic fertilizers are made from a material that occurs naturally and is biodegradable. An organic fertilizer could comprise the following compounds:

- mineral deposits
- Peat
- Compost
- Seaweed
- animal manure

Organic fertilizers are excellent in their terms as they are good for both fields and gardens. As soon as an organic fertilizer is used, it begins to exert its beneficial effects on the soil and on the plants. In addition, these fertilizers improve the health and productivity of the soil in the long term.

3.3. INORGANIC FERTILIZERS

These come in different forms such as liquid, powder, or granules that come in pouch boxes. Inorganic fertilizers consist mainly of concentrated ammonia diluted with water. Commonly, inorganic fertilizers are used to treat industrial fields as they are less expensive and can be effortlessly synthesized on a larger scale. Inorganic fertilizers are less bulky than their organic counterpart and therefore the nutrients can easily be transported to different parts of the plant.

3.4. CHEMICAL NITROGEN FERTILIZER

Such fertilizers are rich in nitrogen content. The nitrogen in the fertilizer turns into ammonia and dissolves when water from rain or any other source wets the area. The nutrients from the fertilizers are then transported through the soil, eventually reaching the root system of the plant. Nitrogen fertilizers are usually available in pellet form or in the form of white pellets that are used before or at planting.

3.5. COMPOUND FERTILIZERS / NPK FERTILIZERS

Compound fertilizers do not always adapt to different types of soils. Therefore, a form of fertilizer is used that consists of more than two minerals or elements in reasonable proportions. These fertilizers easily acclimatize to the different types of soils with which they are mixed. A mixture of different types of fertilizers eliminates various deficiencies in the plant and the soil. These fertilizers require less labor to apply to the soil. The mix consists of three main nutrients which are Nitrogen, Phosphorus and Potassium. Such fertilizers are called complete fertilizers.

4. NEW ORGANIC FERTILIZER FROM VEGETABLE WATER AND OLIVE POMACE

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Below we name the different advantages that OPS provide as fertilizers:

- A **higher growth rate** of plants has been observed thanks to the supplementation of iron and hydrochar.
- Thanks to the OPS the plants would have **greater iron absorption.**
- **Increases the resistance** of the plant with OPS fertilizer against the **stress of environmental changes** (cold, heat, wind, water stress...).
- **Plants do not show phytotoxicity effects** due to the slow and gradual release of iron from OPS.

In conclusion, we obtain a fertilizer of high environmental quality at a lower cost, by obtaining an input for the agri-food industry from an agricultural residue such as vegetable water; since the resulting fertilizer improves the absorption of iron by plants due to its nanometric size and its surface area, so that agricultural production is increased with the same land.

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