



**Technical
Information**

FOSFITAL EXTRA

Properties and benefits

GENERATION 4

LA CALIDAD DE LA EXPERIENCIA

FOSFITAL EXTRA is a biostimulant based on **Potassium Phosphite** with a dual function on crops: on the one side, it acts as a nutrient, and on the other, it acts through two distinct ways as a **stimulant of self-defense mechanisms of plants** against fungal pathogens and, also, acts directly on its metabolism to combat it (**fungistatic effect**), due to the presence of phosphorous as **PHOSPHITE ion**.



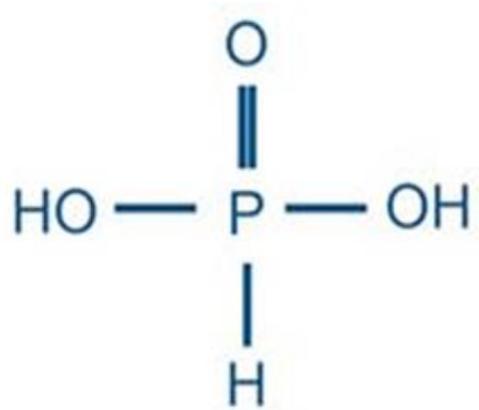
FOSFITAL EXTRA has the **REACH** registration of the EU which regulates the registration, evaluation, authorisation and restriction of chemical substances and preparations, with an overall objective to protect human health and the environment protection.

FOSFITAL EXTRA is formulated in special stainless steel reactors, equipped with a double jacket and connected to a closed cooling system using "chillers", through which water flows to an adequate temperature to temper the exothermic reaction that occurs during its production, giving the formula greater stability.

During its production process, an adequate temperature, pH, speed and shaking time, as well as the order of addition of raw materials are fundamental to guarantee a high quality of the final product and high efficiency in the field.



What are phosphites?



Phosphite

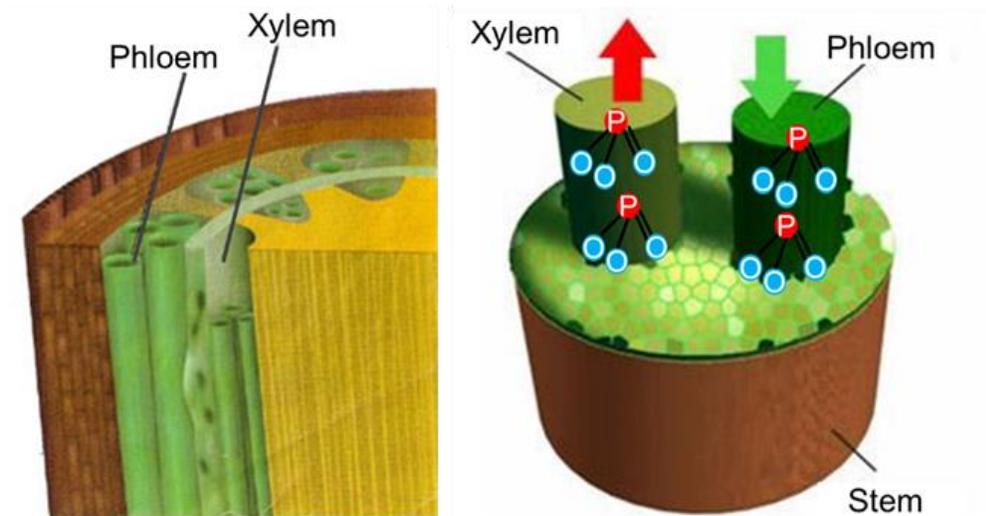
Phosphorus (P) is one of the essential elements required by all living organisms. It is very reactive-rapidly combining with other elements such as O and hydrogen (H). When it is not fully oxidized, H occupies the place of one O atom, the resulting molecule is called **phosphite** (or phosphonate) and is represented chemically as PO_3^{-3} .

The phosphite ion can present ionic bonds (sharing electrons) with the hydrogen ions (H^+) forming the phosphorous acid (H_3PO_3) or forming salts through the union with other cations (K, Ca, Mg, etc.).

Characteristics of phosphites

- ✓ The **phosphite ion** is **very active** in plant because it is **unstable** and tends to react with everything.
- ✓ It is **highly water soluble** and can be **quickly absorbed** through a plant's leaves, and roots.
- ✓ The phosphite has double circulation (**systemic**) because it moves through the xylem and phloem. For the above, its application can be to any organ of the plant (leaves, stem or root), facilitating the nutrient elements distribution to which it is chemically bound.

Its systemic property allows it to arrive the roots for the control of diseases caused by soil fungi as well as to foliar fungi.



The phosphite ion is systemic, easily absorbed and translocated through xylem and phloem to all areas of plant.

The use of **Potassium Phosphate** is an interesting tool due to the important characteristics of **phosphite ion**, being able to produce a rapid stimulation of different metabolic processes in plants, causing the following effects:

- ✓ **Triple fungal activity**
- ✓ **Vehicle** of the important nutrient element: **potassium (K)**
- ✓ **Metabolic activator in post-stress states**

✓ **Triple fungal activity**

The ***Oomycetes*** (*Phytophthora*, *Pythium*, *Peronospora*, *Plasmopara*, etc.) cause two types of diseases:

- **The gummosis of crops**
- **The brown or watery rot of fruits**

➤ **The gummosis of crops**

The propagules of pathogen present in soil can directly infect roots and base of crop.

Symptoms of these diseases are only visible after several months from infection, showing lack of vigour and generalized decay. First symptoms in trunk and main branches are not visible externally, because they consist in a darkening of phloem and cambium. As infection progress, **affected areas begin to crack and emit gummy exudations.** In addition, it will make **small fruits and leaves, and their leaves turn yellow.**



➤ **The brown or watery rot of fruits**

The splashes caused by rain disseminate the pathogen propagules from the ground to fruits.

Symptoms of brown rot can appear directly in the field after 3-7 days from infection. They are characterized by **soft brown rot**, which progresses until affect fruit whole. A lot of fruits with these symptoms usually falls to the ground. When the fruits are collected with still recent infection, it usually develops later in the store.



✓ Triple fungal activity

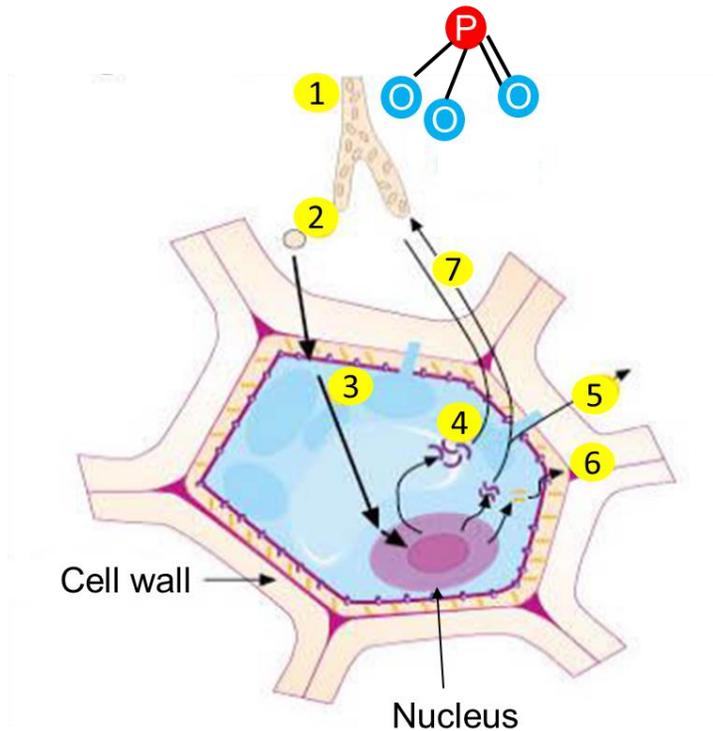
The triple fungicidal effect of the phosphite ion is because it has:

- Indirect action on the metabolism of Systemic Acquired Resistance **(activator of plant defenses)**
- Direct action on fungal walls and cell membranes
- Direct action on fungal metabolism **(fungistatic effect)**

➤ **Indirect action on the metabolism of Systemic Acquired Resistance**
(activator of plant defenses)

Phosphite acts as an **external elicitor agent** stimulating the synthesis of enzymes such as Phospho-Amino-Lyase (PAL) and the pathway of the shikimic acid, in such a way that **defenses are promoted in plants, presenting these different changes**. These changes in plants can be of structural type (thickening of the wall, conductive vessels, abscission layers, callus formation, etc.), or a biochemical type (formation of phytoalexins, peroxidases, hydrolytic enzymes of the walls of fungus such as chitinases and gluconases, phenolic polymers, aromatic compounds, phytotoxins, etc.).

➤ **Direct action on fungal walls and cell membranes**



- 1 The pathogen is affected by the phosphite ion.
- 2 Suppressors decrease or do not occur.
- 3 The cell recognizes the infection.
- 4 The phosphite acts on the pathogen resulting in the production of external elicitors that stimulate the defense of plants.
- 5 The defensive organs send "signals of alarm" to cells that have not yet been attacked.
- 6 Structural wall proteins are encoded to produce structures that reinforce the cell walls.
- 7 Enzymes are encoded that degrade the fungus wall.

Action of the phosphite ion in fungi and plant cell.

➤ **Direct action on fungal metabolism (fungistatic effect)**

The **phosphite ion** competes with phosphorus in different metabolic pathways catalyzed by phosphorylating enzymes, for example, in the phosphorylation of AMP and ADP to ATP. In this way, the **processes involved in energy transfer of the fungus suffer a considerable delay and may even be blocked**. The effect on fungus could be compared to a state of total absence of available phosphorus in plant to meet the needs of the fungus. The phosphite ion can suspend fungal growth and development, or the germination of their spores (**fungistatic action**).

✓ Vehicle of nutrient element: Potassium (K)

Potassium is a primary macronutrient that plays an important role as plant functions regulator.

This element affects the plant shape, size, color and taste and other measures attributed to the product quality, for several reasons:

- ✓ Key nutrient in **plant-water relationship**
- ✓ Resistance to **stress** conditions
- ✓ Involved on **cellular elongation**
- ✓ **Enzyme activation** involved on:
 - Photosynthesis
 - Transport of photosynthate
 - Protein synthesis
- ✓ Involved in **quality** of fruits



✓ Metabolic activator in post-stress states

Because the **phosphite ion** acts on both pathways (phloem and xylem), **it enriches the descending saps providing extra energy to overcome stress situations**. For example, the leaves close the stomata in situations of stress. When they receive potassium by xylem it causes its opening, resuming the vegetative activity.

Summary

Element	Guaranteed concentrations
Phosphorus (P ₂ O ₅)	30.00% w/w = 42.00% w/v
Potassium (K ₂ O)	20.20% w/w = 28.0% w/v

*** Obtained from Potassium Phosphite**

Density: 1,4 ± 0,02 * gr/cc

pH (20°C): 4 ± 0,5 *

Use and dose

Crops	Dosage		Momento de aplicación
	Root application	Foliar application	
Fruit vegetables	2 – 4 l/ha	2 – 3 l/ha	Every 15 – 20 days since transplant.
Leaf vegetables	2 – 4 l/ha	2 – 3 l/ha	Every 15 – 20 days since transplant.
Citrus and subtropical crops	2 – 4 l/ha	2 – 4 l/ha	2 – 3 applications: spring sprouting and fattening.
Fruit trees, olive trees and vines	2 – 4 l/ha	2 – 4 l/ha	2 – 3 applications: spring sprouting and fattening.
Extensive and ornamental	2 – 4 l/ha	1 – 1,5 l/ha	2 – 3 applications.

NOTE: It is compatible with most of the available fertilizers and phytosanitary products, even though it is advisable to perform a previous test. Do not mix with mineral oils, sulphur or products containing copper. In the latter case, after the application of a copper compound, wait at least 15 days before application.

Benefits of FOSFITAL EXTRA



1. Has **fungistatic action**
2. Promotes the **natural defenses** of plants
3. **Strengthens the stem and roots**, increasing its resistance to pathogens
4. **Prevents fungal diseases** of Oomycetes
5. Important **source of Potassium**