BIFOX - 20 TECHNICAL DATA SHEET
POWDERED PHOSPHATE ROCK 20% DE P_2O_5

1. PRODUCT DESCRIPTION

The phosphoric or phosphate rock (RF) obtained in the Bahía Inglesa region of Chile and marketed by the company Fosfatos de Caldera in that country is considered one of the most reactive phosphorites in the world.

The best agronomic results from the application of Bifox RF is achieved in acid soils. Thus, in soils with pH less than 6.0 where grain crops are cultivated, a very high relative agronomic efficiency (EAR) to soluble phosphate sources can be expected, while in soils with neutral pH the EAR could vary between 80 and 90%. depending on the content of exchange bases, texture, clay mineralogy, among other factors.

On the other hand, in perennial pastures or improved pastures or natural fields, the EAR can exceed 100% in relation to soluble fertilizers, due to the progressive release of P from RF over the years.

The experimental work carried out in Argentine soils in perennial ryegrass pastures allowed us to validate and confirm the results observed in southern Chilean soils in perennial pastures, annual forage grasses, rapeseed, wheat, among other crops.

2. AGRONOMIC AND ENVIRONMENTAL BENEFITS

Contribution of bioavailable and progressively released phosphorus (P) that allows maximizing the apparent recovery of P over time and minimizing the environmental impact of P losses outside the soil-crop system

- Ideal for recovering the availability of extractable P from soils, taking advantage of its residual effect
- Contribution of Ca available for mineral nutrition of plants
- Improvement of the acidity condition of the soil (i.e. liming effect)
- Low content of heavy metals
- 100% source of mineral origin without chemical treatments (i.e. suitable for organic agriculture)

Table 1 details the physiological functions of phosphorus and calcium in plant physiology and their role in crop productivity and quality.

Table 1. Phosphorus and calcium functions in plant physiology and their implications on crop productivity and quality

Nutrient	Physiological role	Agronomic effect
Phosphorus	• DNA and RNA constituent • Energy storing and transfer • Photosynthesis • Plant respiration	• Root growth and development • Seedlings growth and vigor • Growth of flowers and fruits • Tolerance to abiotic stress (e.g. frost, drought, etc.)

Calcium	• Integrity and permeability of cell wall and plasma membrane • Growth of the pollen tube, flowers and fruits • Growth of root hears and the whole root system • "Secondary messenger" (signal transduction) for hormone biosynthesis and regulation	• Root functioning and growth • Tolerance to abiotic and biotic stress • Firmness and fruit quality • Flower fecundation and fruit production • Hormonal and nutritional balance

2. CHEMICAL AND PHYSICAL PROPERTIES

The Bifox's phosphate rock (PR) is obtained from sedimentary origin and contains francolite (carbonate fluor apatite) as a main mineralogical component. This apatite has high rates of isomorphic substitution of carbonates by phosphate within the crystalline apatite structure, explaining the high reactivity features of the PR. The low particle size also enhances the PR reactivity for crop fertilizing.

Table 2. Bifox-20 main chemical and physical properties

Property	Value
Total P (% de P_2O_5)	20 +/-2
P soluble in neutral 2% ammonium citrate 2% (% de P_2O_5)	5-7
P soluble in citric acid (% de P2O5)	9-10.5%
Potassium (% de K_2O)	0.84
Calcium (% de CaO)	30.0
Magnesium (% de MgO)	0.95
Sulfur (% de S)	1.20
Irion (% de Fe_2O_3)	2.30
Copper (ppm de Cu)	30
Manganese (ppm de Mn)	126
Silicon (% de SiO_2)	32.0

Heavy metals (% As+Cd+Pb+Hg+Cr+Ni+Co+Se)	<0,03%)
Particle size	95% below 0.149 mm (100 Tyler Mesh)
Bulk density (g/cm^3)	1.26
Water content (%)	5%

3. AGRONOMIC RECOMMENDATIONS

3.1. PHOSPHATE FERTILIZATION

Fertilization recommendation of the Bifox´s PR should be assessed by a competent agronomist taking into account key factors like crop specie, soil characteristics, climate, machinery, among others.

Table 3 display general fertilization recommendations for different crops. These recommendations could change depending on the soil fertility condition, grain or forage yield, etc.

Tabla 3. Bifox´s phosphate rock general recommendations for featured crops.

Crops	PR rates	Application moment	Application placement
Annual crops	100-500 kg/ha	-Pre-planting or planting	-Broadcasting with or without incorporation -Banded at planting time, below and to the side of sowing line
Pastures	-Maintenance: 300-800 kg/ha/year -Planting: 200-700 kg/ha -Correction: variable depending on actual soil extractable P content, objective of available P to be reached, etc.	-After grazing or forage remotion -Pre-planting or at planting depending on PR rate and available machinary -Any time within crop rotation convenient from the logistical standpoint	-Broadcasting with or without incorporation -Banded at planting time with the seeds or below and to the side of sowing line
Fruit crops	-Crop establishment: variable depending of crop specie. -Correction: depending of current soil P status and fruit specie. -Maintenance: 40-150 kg/ha/year depending on crop type and productivity.	-At planting -Pre-planting	-At planting time -Broadcasting with or without incorporation -Banded on soil source either over the row line or between rows.

3.2. LIMING EFFECT

Aside from the role of the Bifox´s PR to provide plant-available P for crops, the product has also could ameliorate soil acidity conditions by increasing the soil pH and exchangeable Ca content and mitigating soluble Al at root zone which is toxic for crops. To this end, a 50% of neutralizing value could be considered. The magnitude of the liming effect will depend on several factors like soil type and clay mineralogy, soluble or exchangeable Al, OM content, among others.

4. BIBLIOGRAPHY

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