

T E C H N I C A L B U L L E T I N

Agromil[®]-S

Non Hormonal Organic Stimulant

(to Improve and to Increase the Quality and the Vigor of the Germination of Seeds and Vegetative Propagulum)

Composition

Each 100g of Agromil[®]-S contain:

Complex of: Citrus Bioflavonoids (vit. P), Citrus Phytoalexins, Ascorbic Acid and Ascorbates (vit. C), Citrus Fatty Acids, Citrus Sugars and Glycerides.....	40,00g
Stabilizer and inert carrier	100,00g

Physical and chemical specifications

- Chemical formula: Agromil[®]-S is a very complex organic compound and doesn't have a single chemical formula. Agromil[®]-S works by internal Natural Synergism of its compounds, mainly Citrus Bioflavonoids (vit. P), Citrus Phytoalexins and Ascorbic Acid (vit. C).

- Appearance and aspect: Dry fine powder (80 to 120 mesh).
- Organoleptic characteristics:
 - Taste: Biter (as Citrus Bioflavonoids), acid and adstringent.
 - Odour: Agreeable (as ferment citrus).
 - Color: Cream coloured.
 - Density (g/ml at 25°C): 0,570 (+/- 5%).
 - PH (10% dilution at 25°C): 2,90 (+/- 10%).
- Acidity (*quantity of product (mg) neutralized by 1 ml of NaOH-1N*): 2300 (+/- 10 %).
- Corrosivity: At 2000 ppm it is similar as potable water.
- Sinergistic Association between Ascorbic Acid (vit. C) and Citrus Bioflavonoids: 32000 ppm (+/- 10%).
- pH for use in mixtures: Better with pH lower than 7.0, but it maintain its efficacy until pH 9.0.
- Expiration date: Three (3) years after manufacturing.
- Storage: Keep it in right closed drums, in a cool place and distant from toxic products.
- Stability:
 - Stable at normal temperatures of use (4°C to 40°C), but over 120°C its stability goes down.
 - Incompatible with anionic and highly alkaline products. Very stable at light, but avoid the direct sun rays.

Chemical structure of main Agromil®-S compounds

The main chemical compounds, are:

- Polyphenols;
- Citrus Bioflavonoids (Vit. P);
- Naringin: Citrus grapefruit origin (Citrus paradisi);
- Hesperidin: Citrus sweet orange (Citrus sinensis);
- Tangeretin: Citrus tangerin and bergamot origin (Citrus reticulata e Citrus aurantium);
- Quercetin: Rinds of Citrus and other fruits origin;
- Rutin: Citrus and others vegetables origin;
- Citrus Phytoalexins (Furocoumarins);
- Psoralen: Citrus bergamot and tangerin origin;
- Bergapten: Citrus bergamot and tangerin origin;
- Methoxsalen: Citrus bergamot and tangerin origin;
- Ascorbic Acid and Ascorbate (vit. C).

Figure 1: Single Bioflavonoids “Quercetin” (C₁₅H₁₀O₇)

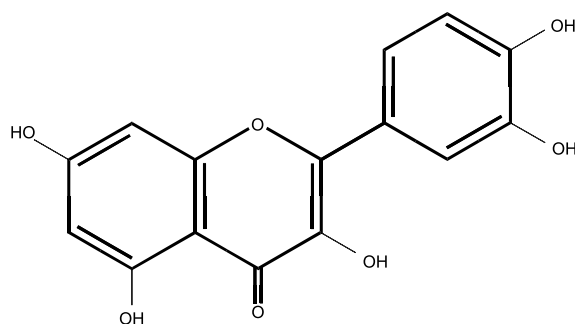


Figure 2: Glycoside Bioflavonoids “Naringin” (C₂₇H₃₂O₁₄)

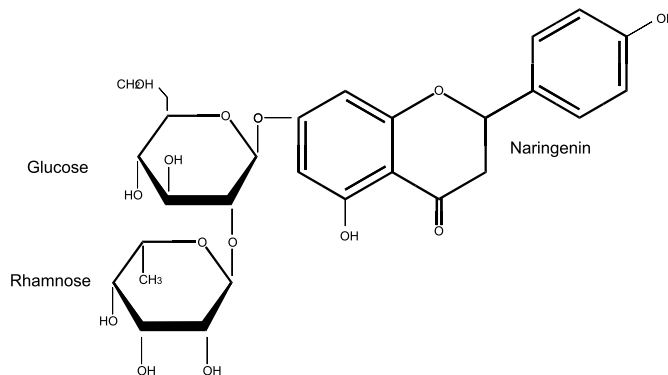


Figure 3: Ascorbic Acid (C₆H₈O₆)

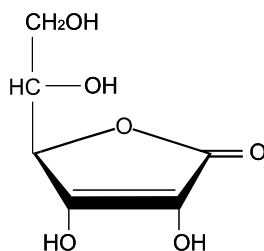
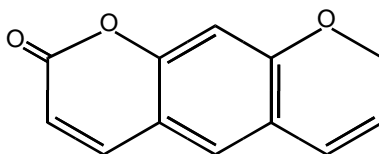


Figure 4: Phytoalexin “Psoralen” (C₁₁H₈O₇)



Quinabra's technology

The active compounds of Agromil®-S are thoroughly distributed by the vegetable kingdom:

- The Ascorbates and the Ascorbic Acid are essential constituent of the vegetable, mainly in growing tissues (Chinoy, 1984).
- The Bioflavonoids are present in many superior vegetable and they possess many essential functions (Wollenweber and Dietz, 1981) (Harborne, 1988) (Pietra, 2000). Nowadays it has already been recognized more than 8000 different Bioflavonoids molecules from vegetables (Pietra, 2000).
- Phytoalexins are substances of low molecular weight, formed in vegetable tissues in response to an infection. They are substances with microbicide characteristic (Kuc and Rush, 1985).

The technology developed by Quinabra gathers in the technical Agromil-S product those three groups of substances (Bioflavonoids: Ascorbic Acid, Ascorbates and Phytoalexins), which are natural constituent of the vegetables and they possess chemical and physiologic characteristics of agronomic interest to obtain productivity in the agriculture at a viable cost and with low environmental impact.

Ascorbic Acid and Ascorbates (vit. C) in the agriculture

- Chemical characteristics of Ascorbates and Ascorbic Acid

Chemically, the Ascorbates and Ascorbic Acid are reducers agents. They contribute to avoid the excessive oxidation, linking to free radicals and free metals of the system (Chinoy, 1984).

The free forms of Ascorbic Acid and Ascorbates are very unstable and ephemeral. Some substances are capable to form complex with the Ascorbic Acid and Ascorbates, preventing its fast oxidation and stabilizing its action in the system. The Bioflavonoids and some amino acids stand out among those substances (Chinoy, 1984) (The Merck Index 12nd edition, Bioflavonoids)

- Metabolic origin of the Ascorbic Acid and Ascorbates

The Ascorbic Acid and Ascorbates have its origin starting from simple sugars. They are present in great amounts in the mitochondrias and in the chloroplasts (Chinoy, 1984)

- Physiologic characteristics of Ascorbic Acid and Ascorbates (Chinoy, 1984)

There is a direct correlation among growth rate, growth of the tissues and content of Ascorbic Acid. The seeds in germination, produce a great amount of Ascorbic Acid, and during the phases of intense growth it can happen a decrease on its content, rising soon after, demonstrating like this its active participation in the germination process.

The Ascorbates and the Ascorbic Acid are very important in the vegetable metabolism. The presence of Ascorbates and the Ascorbic Acid in the system improves the efficiency of the cellular breathing and photosynthesis, turning the cells organelles more resistant and able to work in high temperatures or in conditions of lack of water.

That is observed by the numerous papers that exist at different countries, and in different cultures reporting the stimulating effect in the germination, about the exogenous addition of Ascorbic Acid being also demonstrated a better resistance to the saline conditions of the soil.

That action in the germination can also be explained by the action of the Ascorbic Acid as co-enzyme, mobilizing hormones by the stimulus of enzymes. This action results in a fast transformation of nutrients of seed endosperm. In leguminosae the addition of Ascorbic Acid increases the number and the weight of root nodules.

Bioflavonoids (vit. P) in the agriculture

- Chemical characteristics of Bioflavonoids

Bioflavonoids are compounds with low molecular weight a higher antioxidation power. They act into the vegetable avoiding the oxidation of enzymes, allowing like this a perfect action of the metabolism. In the presence of the Ascorbic Acid its action is more evident due to the occurrence of a synergism among those two substances (Ascorbic Acid x Bioflavonoids) (Merck Index 12nd edition) (Chinoy, J. J., 1978) (Pietra, 2000).

Bioflavonoids are present in the vegetable under several chemical forms:

- Free forms: Ex.: Quercetin. Figura 1;
- Glucoside forms: Ex.: Naringin. Figure 2.

Under the chemical point of view, the free forms are more active. However in the vegetable, the Bioflavonoids are present in mixtures, coexisting chemically both active forms and forms with smaller chemical activity, but that can be altered in its proportion, depending on the physiologic event in subject.

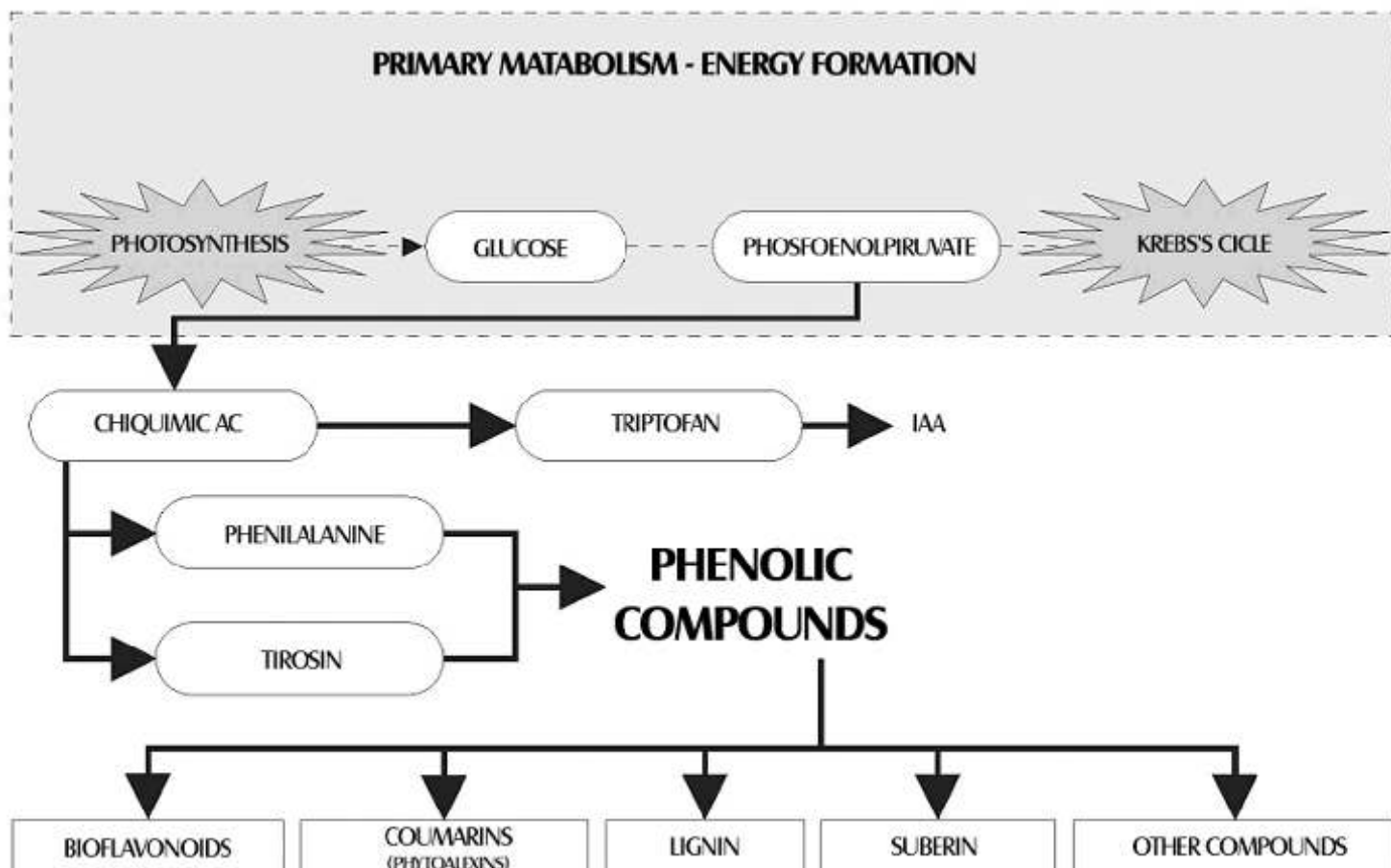
It is demonstrated some beneficial effects of the use of a mixture of Bioflavonoids in the vegetable, increasing the physiologic action in comparison to the use of a single one. (Zuanazzi, J. A. S., et al. 1988).

- Metabolic origin of bioflavonoids

Bioflavonoids are a chemical compounds derived from the secondary metabolism of the cellular breathing.

A simplified outline of its production in the vegetable metabolism can be observed below:

Figure 5: Simplified outline of Phenolic Compounds production in the vegetable metabolism. (Lydon and Duke, 1989), (Dixon and Paiva, 1995), Hahlbrock and Scheel, 1989), (Phillips, 1992).



Functions and physiologic characteristics of Bioflavonoids

Bioflavonoids possess several functions into metabolism of the vegetable. They are chemical constituent of the sustain tissues of the plants and they can alter the palatability of those tissues, mainly for insects. The contents of Bioflavonoids into the vegetable can be negatively influenced by the presence of chemical molecules (Agrochemicals) in the system (Lydon and Duke, 1989).

Bioflavonoids and its derived are active constituent of the cellular walls, aiding in the chemical and physical resistance against infections. Its presence in the system alters the cellular permeability beneficially, decreasing the exudation (Dixion and Paiva, 1995) (Ayers et al., 1988) (Hahlbrock and Scheel, 1989) (Peters and Verna, 1990).

Bioflavonoids and its derived act as chemical defense against pathogens and also as stimulating substances for the establishment and growth of beneficial microorganisms (fixing nitrogen bacteria, mycorrhiza and assymbiotics associations). Those stimulus increase the competitive advantages of these microorganisms turning suppressive the radicular environment to arise up of the diseases (Hahlbrock and Scheel, 1989) (Dakora and Phillips, 1996) (Hungary, 1994) (Peters and Verna, 1990) (Baptista, 1993) (Cardoso et. Al., 1992) (Ramos, 1996) (Dakora, 1995) (Lameta and Jay, 1987).

It is known that the Bioflavonoids interplay with the hormonal balance of the vegetable. Auxins and Bioflavonoids are produced intensely in the growth zones of vegetable.

Bioflavonoids inhibits action of the Auxin-oxidase enzyme, prolonging the effect of this hormone in the growth and cellular elongation (Jacobs and Rubery, 1988) (Mathesius et al., 1998) (Chinoy, 1978) (Mihailovic et al., 1994).

Besides those functions, Bioflavonoids are important biochemical agents for the germination of the pollen grain (millstone; Nogel; and Taylor, 1992) (Van gives Meer et al., 1992) (Vogt et al., 1994). Bioflavonoids also serves as a natural protecting agent against the excess of brightness and U.V. rays over the vegetable (beggs et al., 1987) (Hahlbrock, 1981).

Interaction between Ascorbic Acid X Bioflavonoids (Chinoy, 1984) (The Merck Index - 12nd edition)

The Ascorbic Acid possesses a very big chemical and structural affinity with Bioflavonoids.

Into the cellular tissues and into the cells those two substances (Ascorbic Acid x Bioflavonoids) coexist and they control several reactions. For example, the reduction of metals and the Free Radicals Scavenger Properties.

Those two substances possess an important paper in the controlling of the tissues hormonal levels, allowing the growth and the differentiation of cells and of cells organelles.

Bioflavonoids are known as the most important protectors of the oxidation of the Ascorbic Acid (Chinoy, 1984) (the Merck Index - 12nd edition).

Chemical natural defense of plant

- Pre-formed chemical barriers:

The plants produce an enormous range of Secondary Metabolites, which some of them show microbiocide activity. Some of those compounds are into the plants and, existing in healthy plants, in its activity form. Other, they happen as inactive precursors, which they are activated in response to a damaged tissue, or to a pathogen attack (Osborn, 1996).

Van Etten et al. (1994), proposed the term Phitoanticipines to distinguish these pre-formed microbiocidal compounds pre-formed then Phytoalexins which are synthesized from remote precursors in response by attack of pathogens.

A great number of constituent compounds of the plants possesses microbiocidal activity. Among these compounds there are free Phenolics groups and the Glucosides groups (Osborn, 1996).

Some Bioflavonoids and yours derived (isoflavonóides) are toxic for the pathogen. Those compound can cause permanent lesions in the membranes systems of the pathogens (Dakora, 1995).

- Post-formed chemical barriers (Phytoalexins)

Phytoalexins are microbiocidal compounds of low molecular weight, that accumulate in plants as a result of an infection or stress.

Phytoalexins are natural chemical compounds used by the plants as Natural Protectors (Natural Agricultural Defensive) against its natural enemies.

The speed of the accumulation of Phytoalexins is associated with the resistance of the plants to diseases caused by fungus and bacterias. Phytoalexins are just a component of the mechanism of the plants resistance to diseases (Kuc, 1995).

Compounds with Phytoalexins activity belong to several chemical groups, including Bioflavonoids, Isoflavonoids and Furocoumarins. Most of Phytoalexins are lipophilic molecules. This property allows to them to cross the plasma membrane to an internal site of action in the pathogen (Smith, 1996). The phenolic groups gives a significant contribution for the toxicity of Bioflavonoids and its derived and for the Furocoumarins (against the natural enemies of plants) (Van etten, 1976) (Arnoldi et al., 1986).

Phytoalexins are considered as “Vegetal Natural Antibiotics”, that are produced by them selves, and this production is induced by Biotic or Abiotic Elicitors.

Phytoalexins can protect at high level of efficacy the plants against plague and diseases, but all the time the defense reaction needs to start-up early, in order to prevent/avoid the pathogens invasion over the vegetal tissues (Bailey & Mansfield, 1982 Deffume, 2000).

Now days many Phytoalexins are well know, in some cultivated plants, with activity “in vitro” against Fungi, Bacteria and Nematodes, but don't against viruses and insects (Bailey & Mansfield, 1982).

Agronomic characteristics and mode of action of Agromil®-S

Agromil®-S is a complex product. It contains several types of Bioflavonoids, chemically associated to the Ascorbic Acid. It still possesses traces of Citric Phytoalexins (Furocoumarines).

- Agromil®-S has Antioxidant Action scavenging free radicals, and acting as cyto-protector in situations in which the oxidant radicals are harmful to the vegetable cells.
- Agromil®-S helps a better radicular absorption of nutrients, promoting beneficial alterations in the permeability of the tissues of roots.
- The Antioxidant action of Agromil®-S protects the seeds that are germinating against the harmful action of Alelopathic substances; proximity with the fertilizers; residues of undesirable agrochemicals, etc.
- The Antioxidant action of Agromil®-S protects the embryo in germination against to deterioration (peroxidation) of lipids (oils), inhibiting the enzymatic activity as well as the non enzymatic, avoiding the degradation of cells and strengthening its walls, mainly in hostile situations (Ex.: proximity of fertilizers and agrochemicals) and critical situations of temperature and/or humidity.
- Agromil®-S promotes a chemical alteration in the Rhizosphere, favoring the establishment of benefic microorganims, stimulating the root nodulation in leguminosae and the establishment of assymbiotic and mycorrhizal associations, helping to maintenance of an Suppressive Environment in theRhizosphere to avoid the Growth of Pathogens.
- Agromil®-S has a regulating action on the vegetable hormones responsible for the growth and ramification of the root, stimulating the root increment.
- Agromil®-S links to the cellular walls of the plants, suppling a larger physical resistance, due to the alteration of the chemical characteristics of the plants (natural polyphenols), reducing the palatability for insects and protecting against the pathogens action.
- The Agromil®-S's compounds, mainly Bioflavonoids and the Ascorbic Acid work in synergism, protecting together against the self-oxidation, increasing the Bio-availability of both. This quality allows that Agromil®-S has excellent effectiveness in any soil types and in the presence of organic matter.

Bioflavonoids (vit. P) and Ascorbic Acid (vit. C) together are part of the Natural Chemical Arsenal of the Plants, and they induce the plants to synthesize its own natural Phytoalexins, improving the Chemical Phytosanitary Treatment.

The plant with right metabolism of phenolics compounds can answer faster to the control of an infectious process; also answering better to the treatments with traditional fungicides.

The higher stability and higher Bio-availability of Agromil®-S extends its action since the initial plantation until the crop, in the case of the annual cultures, or during all the station for the case long cycle cultures.

Indication of use

Agromil®-S is to be used the treatment of seeds and vegetative propagulums. Its use is indicated for the following situations:

- To increase the vigor of the germination / budding;
- To reduce the effects of environment stress in the germination / budding;
- To help the establishment of beneficial microorganisms in the Rhizosphere, turning the ambient suppressive to pathogens, improving the efficiency of the chemical phytosanitary.

Dosages and application

Agromil®-S has powder form, to be applied directly in the seeds before the plantation, mixing looking to the best homogeneous form, being its best application form through fertilizers (mineral and/or organic) usually recommended by the Agricultural Adviser technician.

Calculate the dose to be used of Agromil®-S to obtain in the final formulation 100g of Agromil-S for 100kg of seeds.

The dose of Agromil®-S can charge according the Agriculture Adviser taking the following considerations:

- Size of the material to be treated: as larger the relationship surface/volume of the material to be treated, use higher dosage of Agromil®-S;
- For oleaginous seeds or vegetative propagulums with higher level of oxidation, use higher doses.

For other technical information about dosages, please call the technical department of Quinabra.

Compatibility

- Agromil®-S is compatible with insecticides, fungicides, oils and agricultural adhesives (non-ionics or cationics).
- Do not mix with products that contain high concentrations of metais (free ions).
- We recommended to verify the compatibility of the mixtures in pre-test (to be made by Agricultural Adviser technician).
- Don't use Agromil®-S in seeds to be cultivated in hidroponic green-houses because the incompatibility between organic acids and the nutritive hidroponic solution.

Toxicity of Agromil®-S

- Oral toxicity acute DL50: Higher than 5,00g / kg body weigh of tested animal.
- Test of molecular toxicity: It doesn't cause damage or alterations on protein or cell/DNA (Deoxyribonucleic Acid) from mammals. It isn't mutagenic.
- Skin irritation: It doesn't cause skin irritation at indicated concentrations of use.
- Ocular irritation: It can cause slight irritation, because its lower pH.

Personal protection

In spite of Agromil®-S be a Phytopharmaco of lower of low toxicity, the special cares to application of agrochemicals should be followed by everyone, because there could be allergic or very sensitive people. The use of safety glasses, gloves, bonnets, masks are obligatory.

The solar action on the skin wet with Agromil®-S can produce temporary skinstains.

The accidental contact with the eyes can cause irritation (due to acid pH). In that case washing immediately with plenty water during 5-10 minutes and if necessary go to the doctor taking the product label.

In case of accidental ingestion, don't induce the vomit and drink milk or drinkable water.

Agromil®-S is biodegradable not presenting risk to the environment, to the animals or to the people.

Don't spill the in springs of water, because its acid pH can coagulate the protein of eggs and young fishes.

Keep the product on its original packing, in fresh and dry place, far away from traditional poisonous agrochemicals.

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Agromil-S[®]

(Vitaminas e Ácidos Orgânicos)
Bio-estimulante Orgânico, Não Hormonal para Germinação
de Sementes e Material Propagativo

Composição Básica do Produto:

Cada 100g de Agromil-S contém:

Complexo de Bioflavonóides Cítricos (MLP), Fitalexinas Cítricas,	
Ácido Ascórbico (Vit.C e Ascorbato), Ácidos Graxos Cítricos e Glicéridos	40,00 g
Estabilizante e Veículo inerte q.s.p.	100,00 g

Indicação e Modo de Ação:

- Agromil-S é um produto técnico: "matéria-prima" para ser usado como aditivo na formulação de produtos para tratamento de sementes e material de propagação vegetativa a fim de estimular uma rápida germinação e emissão de brotações, homogeneizando o "stand", garantindo um maior vigor inicial, colaborando para evitar o estabelecimento de doenças;
- Agromil-S tem ação antioxidante sequestrando radicais livres e atuando como cito-protetor em situações nas quais os radicais oxidantes são prejudiciais às células vegetais;
- Agromil-S tem ação sobre a peroxidação dos lipídeos, inibindo tanto a atividade enzimática como a atividade não enzimática, evitando a degradação dos tecidos celulares e fortalecendo suas paredes celulares;
- Agromil-S tem ação benéfica sobre a rizosfera, atuando como sinalizador químico para o estabelecimento e o crescimento de microrganismos benéficos. Esses microrganismos benéficos auxiliam na promoção direta do crescimento vegetal, induzindo resistência a doenças, auxiliando na mineralização da matéria orgânica e de nutrientes, alterando benéficamente o equilíbrio hormonal no vegetal e atuando no controle biológico através da antibiose direta contra microrganismos patogênicos;
- Os componentes de Agromil-S, principalmente os Bioflavonóides e o Ácido Ascórbico trabalham em sinergismo, protegendo-se mutuamente contra a auto-oxidação, incrementando a biodisponibilidade de ambos. Esta qualidade permite que o Agromil-S tenha excelente eficácia em quaisquer tipos de solo e na presença de matéria orgânica.

Doses:

Calcular a dose a ser usada de Agromil-S para se obter na formulação final 100 g de Agromil-S para 100 kg de sementes.

A dose do Agromil-S pode variar a critério do formulador, ou do responsável técnico levando-se em consideração:

- Tamanho do material a ser tratado: quanto maior a relação superfície / volume do material a ser tratado, maior será a dose do Agromil-S;
- Para sementes oleaginosas ou material propagativo de alto poder de oxidação, usar doses maiores.

Para maiores informações sobre doses, entre em contato com o departamento técnico da Quinabra.

Compatibilidade:

Agromil-S é compatível com inseticidas, fungicidas, óleos e aderentes agrícolas com características catiônicas ou não-iônicas.

Não misturar com produtos que contenham altas concentrações de metais.

Recomendamos verificar a compatibilidade das misturas em pré-teste.

Não usar Agromil-S em sementes destinadas ao ambiente hidropônico, devido a incompatibilidade dos ácidos orgânicos com a solução nutritiva.

Cuidados especiais:

Apesar do Agromil-S ser um fitofármaco de baixíssima toxicidade, devem ser seguidos todos os cuidados de aplicação de Agrotóxicos, pois existem pessoas alérgicas ou muito sensíveis. O uso de óculos de segurança, luvas, bonés, máscaras e botas é obrigatório.

A ação solar sobre a pele molhada com Agromil-S, pode produzir manchas temporárias. Contato acidental com os olhos, pode causar irritação (devido ao pH ácido), nesse caso lavar imediatamente com muita água potável e se necessário, ir ao médico levando este rótulo.

No caso de ingestão, não provocar vômito e beber leite ou água potável. Agromil-S é biodegradável não apresentando risco ao meio ambiente, aos animais ou às pessoas. Não lançar o produto puro em mananciais de água, pois seu pH ácido pode coagular a proteína de ovos e larvas de peixes.

Guardar em sua embalagem original, em lugar fresco e seco, longe de agrotóxicos de uso tradicional.

Lote N°:

Data de Fabricação:

Prazo de Validade: 2 anos após a data de fabricação

Peso Líquido: 20 kg

Fabricante



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