ALBION®
Metalosate® Plant Nutrition News
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What Exactly are the Metalosate® Products?

The Metalosate products are patented chelated minerals specifically designed for application on plants. They are unique because the minerals are chelated with amino acids. Since amino acids are the basic building blocks of protein, they are natural molecules found in all living things.

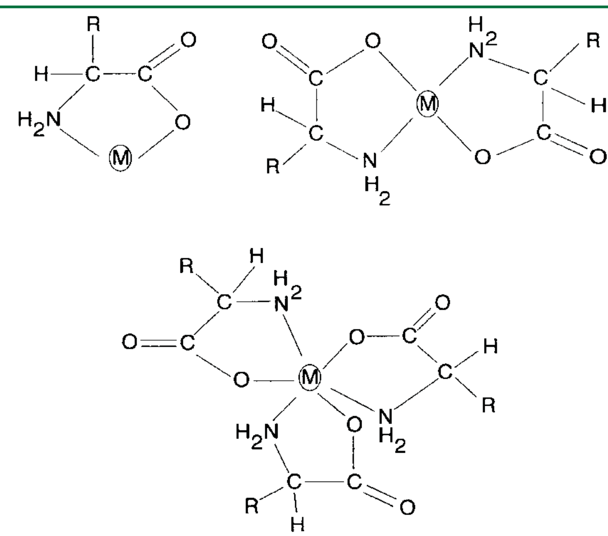
Chelation is the process of attaching a specific organic molecule called a ligand to a mineral ion at two or more sites to form a ring structure. Chelates can be either synthetic or natural. EDTA, DTPA, EDDHA and similar molecules are examples of synthetic chelating agents. Hemoglobin and chlorophyll are examples of natural chelates. Albion's amino acid chelates are chemically very similar to naturally occurring chelates found in plants, animals and humans.[1]

The advantage of using natural chelated forms of minerals is that the amino acid ligands surround and protect the minerals from adverse interactions. These interactions can take place in a solution, in the soil or on the surface of the leaf. They often render non-chelated minerals unavailable to the plant. Because Albion uses natural amino acids to chelate the minerals, they are rapidly absorbed, translocated and metabolized by plants, animals and humans.[1]

Figure 1 shows three examples of molecular structures of Albion's amino acid chelates. One, two or three amino acids are attached to the metal in two or more places. The structure of these molecules minimizes the interaction of the mineral with the surrounding environment. They are very small molecules so they are absorbed and translocated within the plant similarly to other small nitrogen containing molecules. The cells also contain the necessary mechanisms to take the amino acid chelate molecule apart and gain access to the mineral within.[3]

Figure 2 is a diagram of the cross section of a leaf. Note the cuticle, upper and lower epidermis, stomata with guard cells, vascular bundle and the other internal structures of the leaf. The concept that foliar absorption of minerals must take place through the stomata is not entirely correct. Researchers at Albion have observed absorption of the Metalosate chelates across all the surfaces of the leaf, including the upper surface where few stomata exist. Even the small amount that may get through the stomata must also cross the cuticle that lines the internal surfaces of the leaf. This means that, if the mineral is to reach the cells, absorption must take place across the cuticle of the leaf.[3]

Solubility in water is essential for absorption by plants. This is true of the systemic chemicals as well as nutrients. The material must be soluble to pass through the surfaces and into the cells of the plant.[4] Insoluble mineral salts, including all oxides, most hydroxides, carbonates and phosphates, and some sulfates cannot be absorbed by the plant.



(M) = Metal Atom

Figure 1. Chelate examples formed between soluble metals and amino acids.

When a foliar application of these forms of minerals is made, they simply coat the external surfaces of the plant with the unavailable mineral. All of the Metalosate products are completely soluble in water and consequently are available for absorption by the plants.

Figure 3 shows a greatly magnified cross section of the cuticle and outer cell walls of a leaf. The leaves of most plants have a thick waxy surface. Waxes are made up of fatty acids, which by their nature have a negative charge. When a metal salt is dissolved in water, the metal dissociates in the solution to form a cation, which is a positively charged mineral element. When this solution is applied to the waxy surface of the leaf, the positively charged element is attracted to and held on the negatively charged surface. This means that the waxy cuticle serves as a barrier against the absorption of ionic minerals.[3]

Just outside of the plasmalemma, or cell membrane, is the cell wall. The cell wall is made up of cellulose, hemicellulose and other fibrous materials. The primary cell wall is saturated with pectin, which holds the fibers together and strengthens the structure. It is here where the presence of calcium is very important. Calcium associates with the pectin making the cell wall more solid. However, if one applies any other cation, such as Mg, Fe, Mn, Zn or Cu, any of these mineral ions can also become attached to the pectin. As a result, the primary cell wall also acts as a barrier against the absorption of the free metal ions.[3]

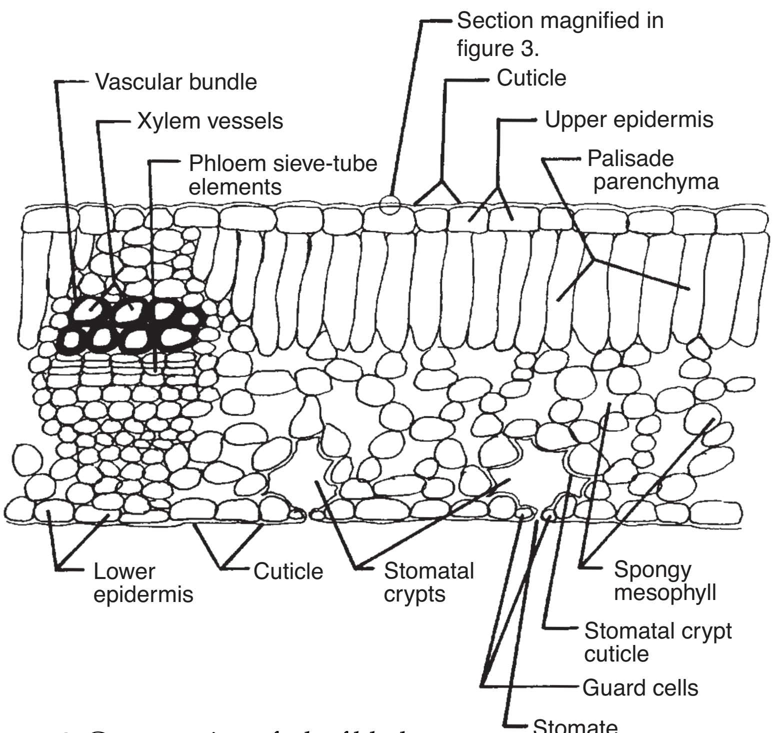


Figure 2. Cross-section of a leaf blade.

Minerals completely chelated with amino acids are neutral in charge. They are neither attracted to nor repulsed from the negatively charged surfaces of the leaf. Consequently, they freely pass through these barriers. When the amino acid chelates reach the cell membrane, they are recognized by the mechanisms of absorption as a source of organic nitrogen. As a result, the entire amino acid chelate is taken into the cell very rapidly and efficiently.[3]

Cell membranes do not have the ability to absorb synthetic chelates, such as EDTA, DTPA, EDDHA and others. For the mineral to be absorbed into the cell, these chelates must release the mineral. This

During the late 1950s, Albion Laboratories became involved in manufacturing vitamin and mineral supplements for animals. At that time, Dr. Harvey Ashmead, the founder of Albion, observed that the animals were not absorbing the mineral supplements at rates corresponding to the doses he administered. He determined, for example, that as little as 4% of iron in an inorganic salt form was actually being absorbed by the digestive systems of many animals.[2]

The researchers at Albion learned that animals needed to chelate or complex the minerals with organic molecules within their digestive system before they could be absorbed into the bloodstream. This lead to the discovery that minerals complexed with proteins could be absorbed by the animals at a much greater rate than inorganic minerals. With further research, Dr. Ashmead and his colleagues developed the amino acid chelate. Today, Albion's amino acid chelated iron can be absorbed at a rate of more than 90% by animals in need of the nutrient.[2]

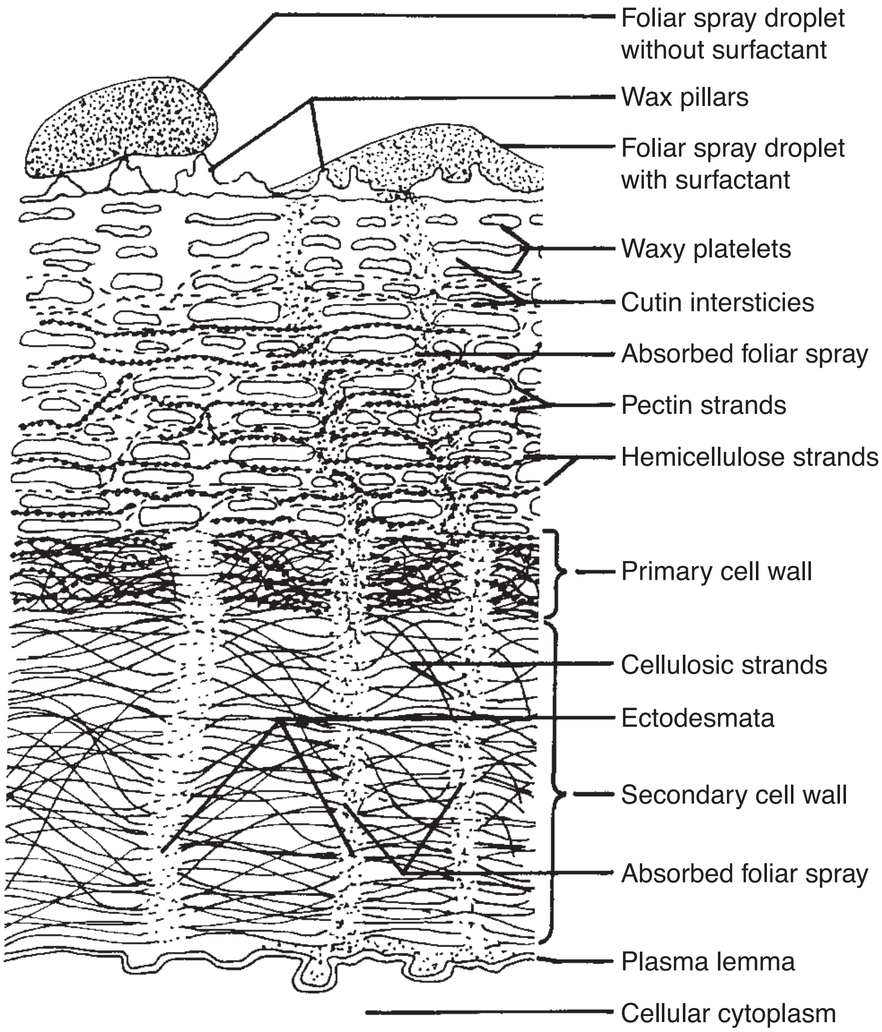


Figure 3. Cross-section of exuded cuticle and outer walls of the upper epidermis.

leaves a vacancy in the chelate molecule displaying charges that must be satisfied. EDTA, for example, has a very high affinity for calcium.[5] As a result, it will scavenge calcium from the surrounding environment, including cell walls and membranes. This can cause the collapse of the cell walls and leakage of the cell contents. This is the reason that the foliar application of high concentrations of EDTA often results in phytotoxicity.

Natural complexing agents, including some claimed to be chelators, such as lignosulfonates, humates, fulvates and others, are actually very large and complex molecules. In addition, many products claiming to be amino acid chelates actually contain long-chain hydrolyzed proteins. Because of their size, the likelihood of any of these molecules actually chelating a mineral is very low. In addition, they would have to be broken down by soil microorganisms into much smaller units to be absorbed into the cells of the plants. Therefore, they do not offer any of the benefits of true amino acid chelates.[6]

Albion's amino acid chelates are very small molecules. Consequently, they readily pass through the plant's barriers against absorption, including the cuticle, the cell walls and cell membranes. Albion's research has indicated that plants can absorb 90% or more of foliar applied Metalosate products within two or three hours.[7]

Because the absorption of the amino acid chelates is so efficient, much lower doses can be applied to achieve measurable responses in the crops. In addition, Metalosate products contain the same amino acid chelated minerals as are in Albion's products for animal and human consumption. This means they are extremely low in toxicity. They are very safe to plants and to the people handling and applying them.

The Metalosate products are available as calcium, magnesium, potassium, zinc, iron, manganese, copper and boron packaged as individual elements. They are also offered as blends of nutrients in products such as Multimineral, Crop-Up® and Zinc Plus.

Albion offers a service that can evaluate the results of plant tissue analysis and diagnose the nutritional status of the crop. This program is known as "Technical Evaluation of Albion's Minerals" or T.E.A.M.® Metalosate applications, according to T.E.A.M. have provided excellent responses in a wide range of crops for many years. For proven results and healthier profits, put them to work for you. ∞

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Albion Advanced Nutrition
101 North Main Street
Clearfield, Utah 84015-2243
USA
www.albion-an.com
Phone: (801) 773-4631
(800) 453-2406
FAX: (801) 773-4633
E-mail: info@albion-an.com

Local Representatives

Kevin Dickinson
(Intermountain US, Africa, Middle East, Europe, UK)
e-mail: kdickinson@albion-an.com
mobile: (801) 540-6035

Jeremy O'Brien
(Washington and Oregon)
e-mail: jobrien@albion-an.com
mobile: (801) 725-4197

Ludwig Voet
(California, Far East)
e-mail: lvoet@albion-an.com
mobile: (801) 726-4004

Todd Edwards
(Southwestern US, Latin America)
e-mail: tedwards@albion-an.com
mobile: (801) 726-7618