

A chemical structure diagram consisting of a central pink line that branches out to connect four hexagonal rings. The rings are colored cyan, green, blue, and cyan from top to bottom. Each ring is connected to the central line via a small white circle and a red line. The word "QUELANT" is written in large, bold, black, sans-serif letters, with a registered trademark symbol (®) to its upper right. Below "QUELANT", the words "Nutritional Technology" are written in a smaller, italicized, black, sans-serif font.

QUELANT[®]

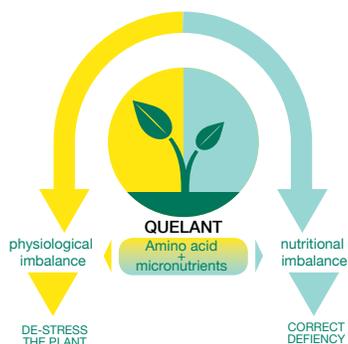
Nutritional Technology

An advanced nutritional program to combat
nutrient deficiency and physiological stress
(amino acids + essential nutrients)



WHAT IS DEFICIENCY STRESS?

Deficiency stress is triggered by a nutritional imbalance that effects a plant’s physiological activity. This stress limits the potential for the plant to grow and thrive in its environment. Macro-Sorb’s Quelant® products (amino acids + essential nutrients) are formulated to play a dual role in reducing this stress. First, they “de-stress” or balance the plant by providing free amino acids, enabling the plant to easily assimilate nutrients. Secondly, they provide readily available mineral nutrients to the plant’s consumption points in order to correct deficiencies.



A stressed plant, regardless of the type of stress, does not assimilate or transport nutrients as efficiently as a plant not subjected to stress. In addition, the nutritional deficiency makes the plant much more sensitive and vulnerable to other types of stress: cold, frost, salinity, drought, pathogen attacks, etc.

DUAL ROLE OF AMINO ACIDS IN PLANT STRESS

The amino acids contained in Macro-Sorb’s Quelant products (free amino acids obtained through Enzymatic Hydrolysis) play a dual role against deficiency stress:

- ✓ Stimulate the recovery of physiological balance so the plant can start to assimilate the nutrients it requires.
- ✓ Complex the essential nutrients so they reach the consumption points quickly, efficiently, and safely.

CONCEPT OF BIOAVAILABILITY

When evaluating the effectiveness of a nutrient chelate or complexing agent for plant health, it is most appropriate to speak of bioavailability.

Bioavailability can be defined as the amount of applied nutrients that can actually be used by an organism. In the case of plants, it would rely on the ability of the plant to absorb and use the applied nutrients.

Bioavailability can be influenced by:



With the application of Quelant products we are able to increase the tolerance to biotic and abiotic stresses by using a complexing agent (a complete range of essential free amino acids obtained through Enzymatic Hydrolysis) that facilitates increases in bioavailability.

NUTRIENT AVAILABILITY AND PLANT STRESS

If a plant is subjected to biotic or abiotic stress, it will not efficiently assimilate nutrients, regardless of the amount available to it.

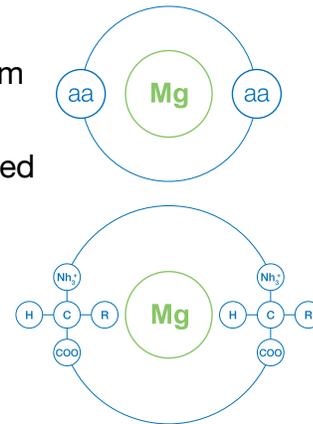
COMPLEXING ROLE OF AMINO ACIDS

Plants possess natural mechanisms to meet the demand for nutrients to support cellular metabolism. The primary mechanism for binding and mobilizing these nutrients is complexing.

Amino acids and low molecular weight peptides retain complexed nutrients in a safe and bioavailable form.

The use of amino acids as complexing agents facilitates:

- ✓ Better absorption
- ✓ Excellent solubility
- ✓ Increased mobility
- ✓ Lower reactivity



QUELANT® vs CHELATES

A chelate acts to sequester the element. In general, they are synthetic molecules that are effective at the time of application, but are less useful during internal transport (mobility within the plant itself), as plants do not recognize these molecules as belonging to a biological system.

A complex of organic molecules proves far more effective in aiding nutrients to reach their place of consumption. The amino acids contained in Macro-Sorb's Quelant products are the same as those naturally used by the plant as an internal complexing agent. Once the nutrient reaches the consumption point, the amino acids can be incorporated directly into the plant's cellular metabolism.

Product	Composition % w/w												
	N	P	K	Ca	Mg	B	S	Fe	Mn	Cu	Mo	Zn	
Quelant-K <i>low pH</i>	1		25										
Quelant-Ca	5			5.7		0.2							
Quelant-Minors	2				0.5	0.02	2	3	1	0.01	0.0007	1	
Quelant Amino-Green	18	3	1										

Macro-Sorb's Quelant products are formulated with a full range of essential amino acids from Enzymatic Hydrolysis and variable quantities of essential nutrients.

QUELANT-K[®] low pH

HIGH CONCENTRATION POTASSIUM

Potassium is known as the stress nutrient and is important for plant functions such as photosynthesis and respiration, carbohydrate transport, osmotic (water) regulation within cells and stomata regulation. Required at levels similar to nitrogen, potassium is also known to protect turf from stresses related to drought, heat, cold, traffic, and salinity.

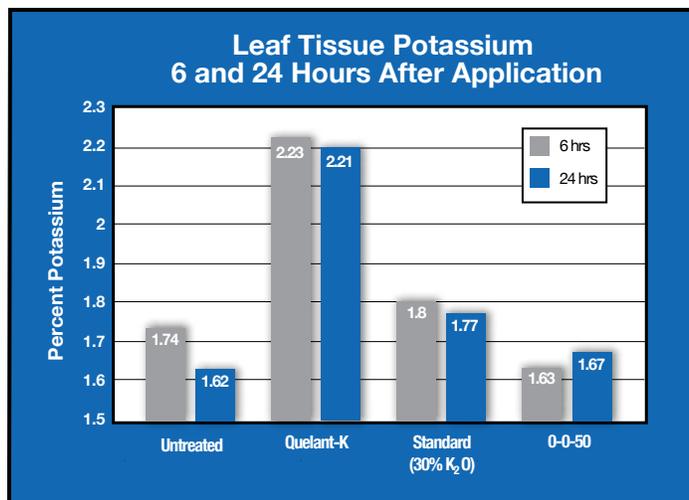
Quelant-K delivers a high concentration of readily available potassium in a formulation that is near pH neutral. Free amino acids incorporated into the formulation aid in prompt potassium uptake and utilization in the plant.



- ✓ Synergy between potassium and Macro-Sorb’s pharmaceutical-grade amino acids improves the absorption, translocation and activity of potassium within the plant
- ✓ Neutral pH and low conductivity enhances tank mix compatibility with other fertilizers and agrichemicals, even when using hard waters

RATE OF APPLICATION

Apply 1.5–2.0 oz. per 1,000 sq. ft. every 14–21 days throughout the growing season. During summer and fall, spray more frequently to improve stress tolerance and enhance synthesis of carbohydrates and proteins.



Leaf Tissue Potassium 6 and 24 hours after treatment applications. Each product was calculated to deliver 1.2 lbs K₂O per acre.

QUELANT[®]-Ca

EFFICIENT DELIVERY OF SUPPLEMENTAL CALCIUM

Calcium is used in the synthesis of new cell walls and membranes, and acts as a messenger for various plant responses to environmental and hormonal signals. Plants with low levels of calcium can also be more susceptible to fungal diseases and environmental stresses.

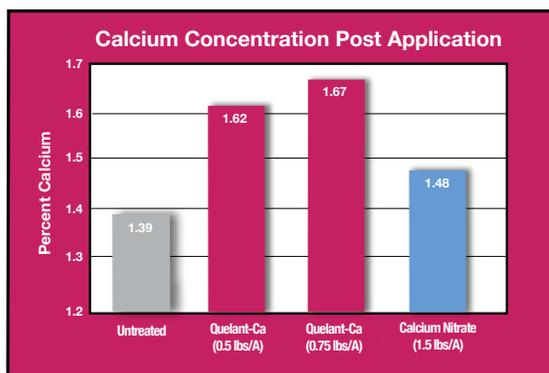
Quelant-Ca is formulated with a balanced proportion of calcium, boron, and free amino acids to aid in prompt absorption into the plant. Calcium can reduce boron availability in the soil and plant, leading to boron deficiency symptoms. Quelant-Ca is formulated with added boron to eliminate such symptoms.



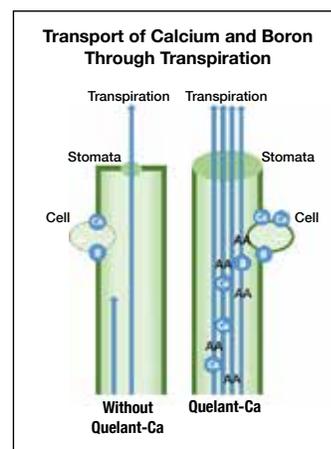
- ✓ Formulated with a specific complex of Macro-Sorb's amino acids to enhance foliar absorption and translocation of calcium
- ✓ Readily available calcium is easily absorbed by leaves and roots, even during times of biotic and abiotic stress
- ✓ Fortified with boron to maximize calcium utilization
- ✓ Excellent tank mix compatibility with other fertilizers and agrichemicals

RATE OF APPLICATION

Apply 1–2 oz. per 1,000 sq. ft. every 7–14 days or 3 oz. per 1,000 sq. ft. when needed to correct calcium deficiency. Increase rate and irrigation water when treating unfavorable soil conditions, but do not exceed 8 oz. per 1,000 sq. ft. per application.



Plant calcium concentrations following applications of Quelant-Ca at two rates (0.5 and 0.75 lbs calcium/Acre) and calcium nitrate (1.5 lbs calcium/Acre). Notice how the amino acid complexed calcium found in Quelant-Ca can be applied at lower rates, while increasing plant calcium levels beyond that of a higher rate of basic calcium nitrate.



QUELANT[®]-Minors

MINOR NUTRIENTS, MAJOR PERFORMANCE

Plants require a wide range of mineral nutrients to survive and grow. Quelant-Minors provides iron, magnesium, sulfur, manganese, zinc, boron, copper, and molybdenum. These nutrients are responsible for chlorophyll production and photosynthesis, protein synthesis, respiration, enzymes and membrane production, and varying chemical reactions.

Quelant-Minors is formulated to deliver a balanced complement of secondary nutrients and micronutrients directly to the plant foliage where it can be readily absorbed and moved to its consumption points. These nutrients are combined with Macro-Sorb's amino acid technology to promote rapid correction and maintenance of nutrient levels.



- ✓ Balanced secondary nutrients and micronutrients combined with Macro-Sorb's L-amino acid technology to improve absorption, translocation, and activity within the plant
- ✓ Corrects and prevents micronutrient deficiencies in turfgrass and other plants
- ✓ Low proportion of nitrogen will not stimulate unwanted growth

RATE OF APPLICATION

Apply 1-1.5 oz. per 1,000 sq. ft. every 14-28 days throughout the growing season.
Use 2.0 oz. per 1000 sq. ft. every 7-14 days prior to special events.

Increase in photosynthetic pigments with Quelant-Minors

Treatments	Chlorophyll a	Chlorophyll b	Chlorophyll a+b	Total carotenes
Untreated (control)	11.41	4.59	16.00	4.59
Quelant-Minors	13.17	4.97	18.14	4.97
Standard	13.10	3.57	16.67	3.57

In this trial, the content of photosynthetic pigments (chlorophyll and carotene) in leaves of *Poa pratensis* (Kentucky bluegrass) was measured and compared to an industry standard product and to an untreated control (values referenced in mg/L of acetone extract, according to *Amon-Mckinney* method). Quelant-Minors increased the contents of the 3 photosynthetic pigments and was also superior to the standard used.

QUELANT® Amino-GREEN®

PRIMARY NUTRITION, ADVANCED TECHNOLOGY

Amino-Green combines primary nutrition with our industry leading amino acid technology to deliver fast-acting, essential nutrition. Nitrogen, the most important nutrient for turfgrass growth, is directly responsible for shoot and root growth, leaf density, and turfgrass color. Using Amino-Green allows you to bring the performance benefits of Macro-Sorb's amino acids to your base fertility program.



- ✓ Provides readily available N, P, K, and biologically active L-amino acids
- ✓ The unique properties of Macro-Sorb's L-amino acids enhance the foliar absorption of these essential nutrients
- ✓ Contains 18% nitrogen, a major component of nucleic acids, amino acids, proteins, chlorophyll and enzymes within a plant
- ✓ Formulated for efficient foliar absorption and immediate use by the plant
- ✓ Perfect foundation product for your fertility spray program

RATE OF APPLICATION

Apply 3–4 oz. per 1,000 sq. ft. every 14 days.
 In cases of nitrogen deficiency, apply 5–6 oz. per 1000 sq. ft.

Lbs Nitrogen/ 1000 ft	0.05	0.075	0.10	0.15	0.20
Fl. Oz. Amino Green/ 1000 ft	3.5	5.3	7.1	10.6	14.2



BENEFITS OF QUELANT NUTRITIONAL TECHNOLOGY

✓ Higher Bioavailability

✓ Rapid Mobility and Assimilation

✓ All Free Amino Acids Present

✓ Wide Range of Stability

✓ High Application Safety

Distributed By:



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