Sysstem™ Series

AGRO·K®

SYSSTEM® SERIES

Sysstem™-Cal
Sysstem™-ZN
Sysstem™-MG
Sysstem™-ZMag
Sysstem™-MN
Sysstem™-K
Sysstem™-MolyZ
Sysstem-Ready™
Sysstem-SeaCal™
Sysstem-Pecan™
Sysstem-Advance SR™
Sysstem-VT™

SYSTEMIC FOLIAR NUTRITION

Agro-K has a variety of secondary and micronutrient phosphite-based fertilizers built to suit the nutrient needs of all growers – horticultural and row crops. These innovative products are unique to the foliar industry and are designed to assist growers in maximizing yield and quality – no matter what crop they grow.

All nutrients in Agro-K's Sysstem-Series product line are linked to a phosphite for rapid absorption and movement within the plant. The nutrients are plant-available upon uptake giving growers the ability to rapidly affect nutrient status within their crop. All of Agro-K's Sysstem-Series line, including Sysstem-Cal, are compatible with one another giving growers the ability to effectively manage nutrients while minimizing spraying trips.

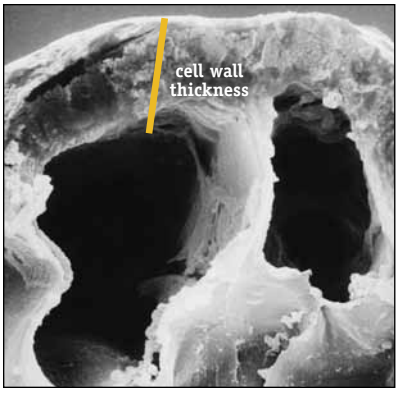
Maximizing a plant's nutrient status throughout the growing season is vital to a grower's bottom line. Deficiencies of one or more nutrients during peak demand timings such as bloom, fruit set, cell division and bulking can negatively affect fruit quality (size, color, firmness, shelf life, etc.) and yield; and not just in the current growing season, but future crops as well. Proper management and balancing of plant nutrient levels can improve fruit quality and overall plant health.

Science-Driven Nutrition℠

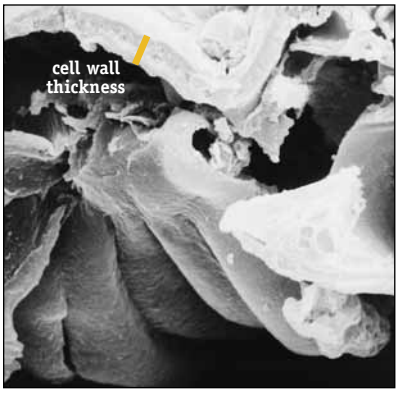
Calcium is probably the most important element in maximizing fruit quality. Plants low in calcium will produce fruit with thinner cell walls and poor cell wall integrity. This can lead to splitting during sizing and/or faster internal breakdown post-harvest and poor shelf life. Achieving adequate or optimal levels of calcium in fruit is critical to maximizing crop quality and grower pack-out and for maintaining overall plant health.

Plant demand for calcium is highest during the early season from bloom through early fruit development when most cell division and elongation happens. It is during this period that most calcium is incorporated into the cell wall structure. Appropriately timed applications of Sysstem-Cal, as part of a complete calcium nutrition program, can result in thicker cell walls of both the leaf and fruit tissue helping growers maximize quality and minimize fruit problems related to calcium deficiencies, such as bitter pit in apples, cork in pears, blossom end rot in tomatoes, internal gel breakdown in stone fruit and brown rot in potatoes.

Evidence of Sysstem-Cal's effectiveness for improving cell wall integrity can be seen in apple trial work conducted in Idaho and New York. Bitter pit is caused by low calcium levels and/or low N/Ca or K/Ca ratios. Applying Sysstem-Cal foliar during peak demand can help minimize this issue. One other important factor worth noting is that foliar potassium applied between bloom and the end of fruit cell division can antagonize calcium uptake and incorporation into cell walls. This is detrimental to fruit quality and storage life and care should be exercised to minimize foliar potassium applications during this development window.



Sysstem-Cal™ treated banana leaf shows significantly thicker cell wall. Magnification 4,410X



Control banana leaf has thinner cell wall. Magnification 4,410X

Agrasstance Trial N. Rose, NY 2010 Variety: Macintosh	Bitter Pit Incidence	
	% @ Harvest	% 75 DA Storage
Control	0.4	1.7
Sysstem-Cal	0.3	0.6

University of ID Dr. Essie Fallahi Caldwell ID 2008 Variety: Braeburn	Bitter Pit Incidence	
	% @ Harvest	% 75 DA Storage
Control	7.24a	14.07a
Sysstem-Cal	0.67b	1.86b

Almond Trial

Treatment	In-Hull Harvest Field Wgts. lbs/acre	Meat Wgts. lbs./acre	Meat Wgts. Diff./acre
2002 - Sysstem-Cal @ 1qt./ac.	10,533	2,528	239
Control 2002	9,537	2,289	
2003 - Sysstem-Cal @ 1qt./ac.	6,769	1,625	130
Control 2003	6,230	1,495	

Trial conducted by Dr. Phil Grau, Grau Consulting, Fresno, CA

Zinc plays many important roles within the plant, the most important of which are vascular function and leaf and root development. Peak demand timing for zinc is early season when root and leaf development are occurring. Maximizing leaf and root development will not happen if the plant is short of zinc during this time. Zinc, by aiding in vascular function and health also aids calcium transport because calcium moves via transpiration. Due to the phosphite formulation, Sysstem-ZN is both phloem and xylem mobile – maximizing the transportability and benefits of the nutrient.

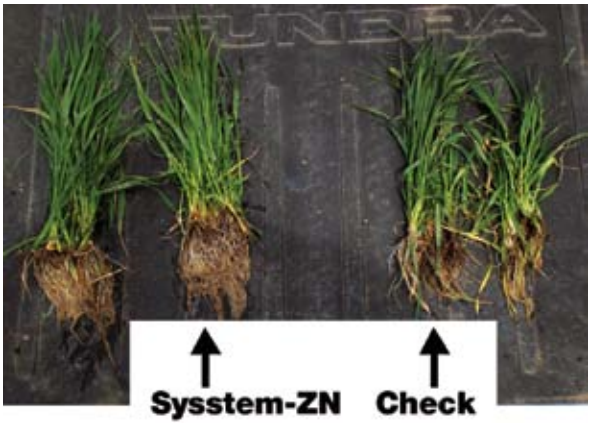
Basic Zinc Sulfate treatment - uneven bud break

Sysstem-ZN™ treatment - uniform and accelerated bud break

Basic Zinc Sulfate treatment

Sysstem-ZN™ treatment - significantly larger fully developed leaves

Observations:
The Sysstem-ZN™ treated trees broke bud more evenly and all buds (from the base to the tip of the branch) broke at the same time as compared to the basic zinc treated trees, which broke bud progressively and outwardly from the trunk to the branch tip. Sysstem-ZN™ treated trees leafed out faster and overall leaf size was significantly larger by 30 -40% as compared to the basic zinc treated trees. Overall the Sysstem-ZN™ treated trees appeared very healthy throughout the growing season.



Sysstem-ZN applied on wheat early season tank mixed with the broad leaf herbicide application can help maximize root development and establishment. Encouraging early rooting promotes better nutrient and moisture uptake leading to better yield and higher test weight.

Manganese is important in root health and nodulation. Sysstem-Ready – a foliar zinc/manganese combination, due to the phosphite formulation is also phloem and xylem mobile maximizing nutrient mobility and availability to the roots resulting in increased nodulation, root and leaf development and ultimately higher yields.

Tuber Mineral Analysis

Dr. Jeff Miller - University of Idaho - 2006					
Nutrient:	Control	Grower's Standard Potassium Phosphite	Sysstem-ZN™ (1) 3qts/ac	(2) 5qts/ac	Sysstem-ZN™(2) vs Control
Zinc	0.35	0.34	0.51	0.43	22.90%
Calcium	9.12	7.94	9.52	11.41	25.00%
Phosphorus	68.6	73.74	73.26	74.33	8.30%
N/Ca Ratio*	39.72	46.83	39.83	32.7	-17.70%

**N/Ca Ratio (Lower number is better)*
Sysstem-ZN™(1) = 3 qts x 3 apps, at standard timings
Sysstem-ZN™(2) = 5 qts x 3 apps, at standard timings
Potassium Phosphite = 5 qts x 3 apps, at standard timings

Used at proper peak demand timings, the Sysstem® Series products can improve crop nutrient levels. In the trial above, Sysstem-ZN™ increased zinc, phosphorus and most importantly calcium levels in the tubers compared to the control and a standard potassium phosphite material. Applications of foliar potassium during cell division will directly antagonize calcium uptake (as shown in this trial) and once cell division is complete calcium cannot be moved into the cell walls. By linking zinc to a phosphite, Sysstem-ZN™ increases root mass and root function which increases calcium uptake from the soil during cell division leading to increased calcium levels. In addition, the N/Ca ratio in the Sysstem-ZN™ tubers was lower. A low N/Ca ratio can be directly correlated to improved tuber quality and storage life. Conversely, the conventional potassium phosphite application raised the N/Ca ratio relative to both the Sysstem-ZN™ treatment and the control due to potassium antagonizing calcium uptake during cell division.

Dr. Jeff Miller – Miller Research - 2007				
Nutrient:	Control	Sysstem-ZN™ (1) 3qts/ac	(2) 3qts/ac	Sysstem-ZN™(2) vs Control
Zinc	0.19	0.21	0.22	15.80%
Calcium	13.22	14.27	15.65	18.40%
Phosphorus	42.17	46.75	54.06	28.20%
N/Ca Ratio*	26	26.33	21.86	-15.90%

**N/Ca Ratio (Lower number is better)*
Sysstem-ZN™(1) = 3 qts x 3 apps, starting at standard timings
Sysstem-ZN™(2) = 3 qts x 4 apps, starting at pre-dime + std. timings

Phosphorus

Phosphorus is a macronutrient and important in fruit development, fruit quality and root growth. Unfortunately, phosphorus is relatively immobile in the soil. Therefore, for roots to take up more phosphorus, they must grow to the phosphorus. Each nutrient (Calcium, Zinc, Magnesium, Manganese and Potassium) in Agro-K's Sysstem Series line is bound to a phosphite. Phosphorus in the phosphite form is not directly available to plants, but phosphite based nutrients have been demonstrated in field trials to promote root development (flushing). When this flushing happens new root hairs are formed and are able to take up more phosphorus from their surrounding area. Comparisons of roots (mass, diameters and overall functional numbers) on plants foliar treated with Sysstem-Cal™ shows improvements in all areas relative to untreated plants.

Banana Root Data Collected by the Dept. of Primary Industries (DPI) in N. Qld. Australia	Average of 19 N. Qld. Banana farms	N. Qld. Farm on Agro-K program
Roots w/ diameter > 5mm (g/l soil)	2.21	4.03
Roots w/ diam. > 1mm < 5mm (g/l soil)	2.24	2.07
Roots w/ diameter < 1mm (g/l soil)	1.87	2.49
Total Root Mass (g/l soil)	6.32	8.58

Magnesium plays many important roles. It is the central molecule in chlorophyll and therefore has a direct role in photosynthesis and a plant's ability to generate energy. Magnesium is also needed for effective phosphorus transportation and in how the plant pumps nutrients through the vascular sysstem. Deficiencies in magnesium limit energy functions, nutrient mobility and root activity. Because chlorophyll is formed early season, peak demand timing for magnesium is also early season when leaf development is happening and chlorophyll is being formed. Sysstem-MG is a rapidly penetrating form of magnesium and due to the phosphite formulation is both phloem and xylem mobile.

Balanced Nutrition

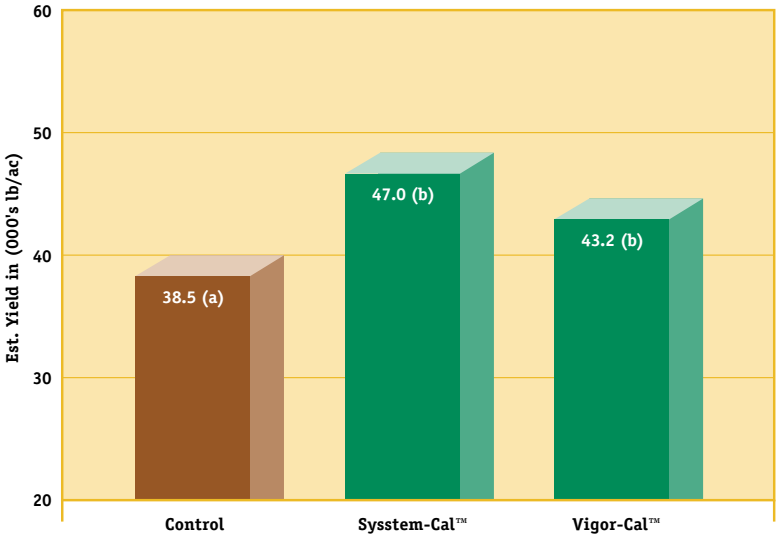
Perennial Crops

Balancing a plant's nutritional status is critical to developing high crop quality and maintaining steady long-term production. Most conventional phosphite-based products on the market are manufactured with a potassium and/or ammonium salt. Unfortunately the bulk of phosphite use on tree and vine crops happens early season when applying additional nitrogen and potassium at the wrong physiological times can negatively affect crop quality and plant health. Because much of Agro-K's Sysstem Series line is manufactured with secondary and micronutrients that are better suited for early season nutritional requirements, the Sysstem product line can have a positive influence on yield, crop quality and plant health. The beginning of potassium peak demand starts at fruit maturation. Applying potassium starting at the beginning of maturation can enhance fruit size, color and sugar. Sysstem-K™ is designed to supply plant-available potassium while also enhancing root development for improved nutrient uptake from the soil.

Sysstem-Cal™ and Sysstem-ZN™ are ideal for early season needs to improve calcium and zinc levels. Sysstem-MG™ and Sysstem-MN™ can be utilized as needed based on tissue analysis or historic records of deficiencies in magnesium or manganese. Many tree fruit, nut and vine growers also apply zinc post harvest to ensure appropriate zinc levels in next year's buds; Sysstem-ZN™ is perfect for post-harvest applications. Sysstem-ZN™ and Agro-K's other Sysstem™ products are all appropriate for post harvest applications. As perennial crops naturally begin to translocate photosynthates to their roots for winter storage Sysstem™ products support and enhance this process by supplying plant-available nutrients in a highly systemic form.

Estimated Total Marketable Strawberry Yield/Hectare

Doug Gubler, Ken Dell, of California Davis, Dept. of Plant Pathology
Montery Bay Academy, Watsonville, CA, 2001

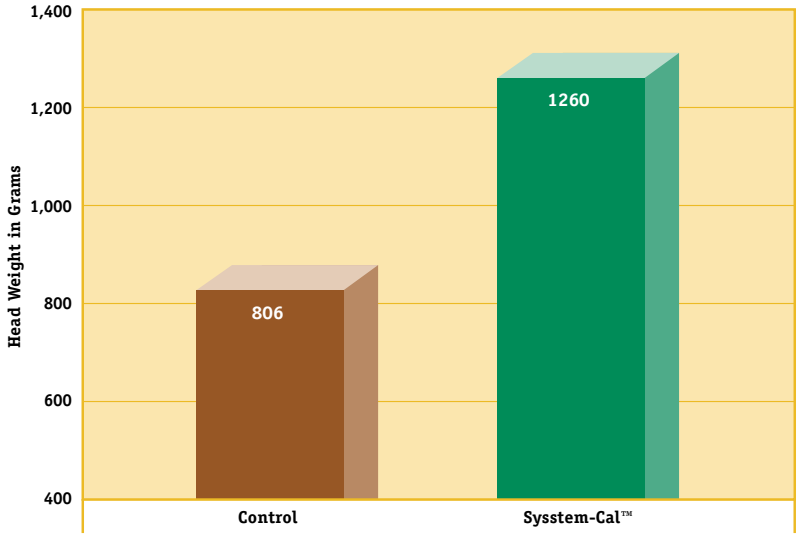


Annual Crops

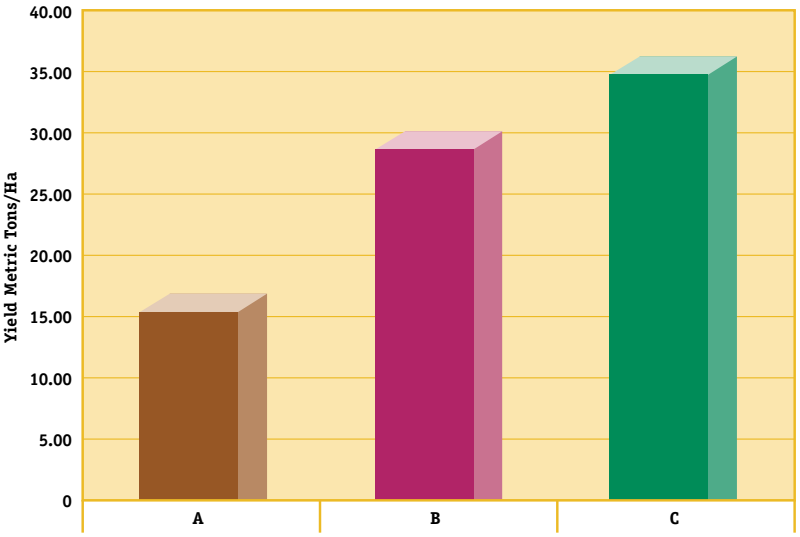
When dealing with annual crops, balancing a plant's nutritional status is just as critical to enhancing crop quality as it is with perennial crops, but it is also important in maximizing fruit size, harvest market-timing and the number of quality pickings. Annual crops that suffer from deficiencies can mature slower and produce fewer and smaller lower quality fruit. Agro-K's Sysstem Series is ideally suited for foliar application and can easily be integrated to grower's conventional spray programs.

Many annual crops, like tomatoes, peppers and cucumbers, flower and set fruit continuously. Fruit quality tends to degrade with each picking, but this can be minimized with the Sysstem product line. These crops need a continuous supply of calcium and other nutrients throughout the season to ensure that fruit firmness and quality is maintained at every picking. Integrating Sysstem-Cal™, Sysstem-ZN™ and other Agro-K products into regular spray programs will help maximize plant growth and fruit set while also ensuring nutrient status is maintained throughout the season. The plant can then support a heavy crop load and deliver top quality fruit from the first picking to the last.

Head Lettuce Trial
Dr. May - UC Davis (retired), Watsonville, CA, 2002



Tomato Production



A. Untreated Control
B. Standard Foliar Nutrient Treatment + Standard Sticker applied every 3-5 days.
C. Standard Foliar Nutrient Treatment + Sysstem-Cal @ 3L/HA every 14 days

Lettuce Storage Trial	Days Post Harvest		
	7 days	14 days	21 days
Sysstem Cal™ + Vigor Cal™	G	G	Y/D
Control	G	Y	Y/SD

G = Good Condition
Y = Yellowing Observed
D = Slight Decay
SD = Significant Decay

BIOLOGICALS

Activates the soil's existing microbe base, releases soil-bound nutrients, enhances root zone environment

- Bio-Mulch
- Bio-Max
- BioMax Dual Action +

Seaweed based soil stimulant to increase crop quality and yield

- Symbooster 10X
- K-Booster

Foliar seaweed and micronutrient sprays to enhance crop quality and mitigate plant stress

- Symspray 20X

Seaweed and micronutrient based seed coating to speed emergence, seedling development and increase yield

- Super Symcoat

Seed piece coating to improve tuber set

- Symcoat (potatoes)

PHOSPHITES

Sysstemic phosphite based foliar sprays designed to balance nutrient status leading to enhanced crop quality and overall plant health.

- Sysstem-Cal
- Sysstem-SeaCal
- Sysstem-ZN
- Sysstem-MG
- Sysstem-MN
- Sysstem-K
- Sysstem-ZMag
- Sysstem-Moly Z
- Sysstem Ready
- Sysstem-Pecan
- Sysstem-Advance SR
- Sysstem-VT

DEXTRO-LAC BASED NUTRIENTS

Unique process that complexes the nutrient cation to a sugar molecule for rapid uptake and maximum availability

- Calcium DL
- Cal-Mag DL
- Copper DL
- Iron DL
- Magnesium DL
- Manganese DL
- Micro-Mix DL
- KDL®
- Potassium Finishing Solution
- Zinc DL
- Zinc Plus+4 DL

VIGOR ENHANCED NUTRIENTS

Value-added processing builds on the Dextro-Lac base to further enhance product efficacy

- Vigor-Cal
- Vigor-Cal w/Boron
- Vigor-Cal-Bor-Moly
- Vigor-Copper
- Vigor-SeaCal

MACRONUTRIENTS (N-P-K)

Built with 100% food grade, low salt index materials, including ortho phosphoric acid

- 3-18-18
- 9-18-9
- 9-24-3
- 0-18-25 + 1% Boron

A lignosulfonate multi-trace mineral solution for soil use

- Multipurpose Micronutrients

SPECIALITY PRODUCTS

Effectively controls a wide variety of insects and powdery mildew on contact

- Super Insecticidal Soap

Soybean oil emulsifier/adjuvant that works as a spreader, sticker and drift retardant. Also encapsulates pesticides to minimize odor and volatilization

- SprayTech Oil

Hydrophilic based polymer that reduces evapo-transpiration helping to minimize transplant stress, sunscald, frost damage and winter kill.

- Hytech Polymer

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