EXPERIENCES IN METALOSATE FOLIAR APPLICATIONS ON CROPS IN THE SAN JOAQUIN VALLEY

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I do technical services for mid Valley Agricultural Services located in Linden, and Escalon, California. Linden and Escalon are located at the north end of the San Joaquin valley. My job is to provide technical support to the sale staff for any questions or problems that arise. The questions can be interpretation of soil or tissue tests, or anything connected with agriculture. The area has a wide variety of annual and perennial crops. The crops are listed below:

Alfalfa	Asparagus	Barley	Bok Choy	Broccoli	Cabbage
Corn, grain	Corn, silage	Eggplant	Fava Beans	Green beans	Kidney beans
Oats	Onions	Peppers	Potatoes	Tomatoes, fresh	Tomatoes, Cannery
Squash	Sudan grass	Sugar Beets	Watermelons	Wheat	Winter forage
Almonds	Apples	Apricots	Blue Berries	Cherries	Chestnuts
Grapes	Nectarines	Peaches	Pears	Plums	Walnuts

The soils on the east side of the valley are derived from granitic outwash from the Sierra Mountains. The soils range from coarse sands to heavy, “adobe” clay. The soils on the west side of the valley are derived from primarily high calcareous sedimentary rock. The soils on the west side of the valley are loams and clay loams. There are some sandy loams along the major rivers.

The minor elements most likely to be deficient on the east side soils are zinc and boron. That situation occurs in many crops such as almonds, grapes, peaches, and walnuts and apples. Sweet cherries are an example of a crop that needs a lot of manganese.

The range of crops and soils makes for very interesting questions. All to often the answers are not readily available and a “best guess” must suffice for an answer. Any new ideas or products are examined to see if they can help our growers be more efficient and more profitable.

I was first introduced to the Albion amino acid chelated mineral nutrients by the books published by Albion Laboratories. I was impressed by the effort to inform users of the products with actual research data. The published data was based on research around the world with literature citations. Such documentation is not usual at the field level. By field level I mean at the retail/grower/user level. Usually the literature at the field level is a summation of university tests or supplier trials with little explanation of the conditions of the tests.

Subsequent to reading some of the Albion published literature, Kevin Dickinson and Ludwig Voet called on Mid Valley Ag Services. Working with Pete Bulthuis, we decided to try some of the Albion products in situations where we had not corrected the problems with other products. I will describe some of those situations and the results we observed. The situations will be identified by the grower’s name and the crop. They are: ‘Marchesotti’ Onions, ‘Cowan’ Cherries, ‘Aoyama’ Cherries, ‘Walker Tract’ and ‘Sambado’ Cherries.

MARCHESOTTI ONIONS: CROP YEAR 1996-1997

The soil in this field was a mixture of darker soil with a pH of 6.8 and a lighter colored soil with a pH of 7.8. The preplant fertility program was 700 pounds of 12-12-12 broadcast and disked in. The 40-inch beds were formed and 5 rows of onions were planted on top of the beds in November 1996. The onions in the higher pH soil emerged and grew poorly. They had a greenish yellow color with very slow leaf development.

I tried some hand sprayer applications with various nutrients. There was no response to the nutrient combinations I applied. After conversation with the Albion representative a combination of Metalosate products were applied with Nutriphite and a fungicide. The application was made when most of the onions had 4 to 6 leaves. The combination of products is listed below.

Ridomil M772	at 2 Lb. Per Acre
Nu-Film P	at 2 Oz. Per Acre
Iron Metalosate	at 32 Oz. Per Acre
Manganese Metalosate	at 32 Oz. Per Acre
NutriPhite	at 24 Oz. Per Acre

This combination was applied by air in fifteen gallons of water on March 12, 1997. Within five to seven days the plants were greener and had a vigorous look.

The southern 50 acres of this field were treated again on with the following combination of products:

Iron Metalosate	at 16 Oz. Per Acre
Manganese Metalosate	at 16 Oz. Per Acre
NutriPhite	at 16 Oz. Per Acre

This combination was applied by ground in thirty gallons of water on March 21 on the southern 50 acres of the 95-acre field. The southern 50 acres had the majority of the high pH soil in the field. The plants in the whole field turned dark green within two weeks and remained dark green for the rest of the season.

The grower had never been able to product satisfactory growth in these high pH spots before. He was very satisfied with the results.

COWAN CHERRIES: 1997 CROP YEAR

Towards the end of March 1997 the new growth of the cherries showed nutrient deficiency symptoms. The visual symptoms looked somewhat like zinc deficiency. The new growth was a pale yellow green with almost a white tint. The leaves were smaller than normal also. No one in our company had seen symptoms like this on cherries before. A soil test indicated a soil pH of 7.3, a cation exchange capacity (C.E.C.) of 31.6 and a calcium to magnesium ratio of 1.6. The potassium value was 97 ppm, which was very low for a soil of this C.E.C. We walked the field with the Albion representative and took tissue samples. The T.E.A.M. nutrient index values for the Cowan tissue sample is given in Table 1.

Table 1.
Albion Laboratories T.E.A.M. nutrient index values for Cowan tissue samples

Sample	N	P	K	S	Ca	Mg	B	Zn	Fe	Mn	Cu
1-97	+105	+40	-53-	+15	-64	-46	+22	-19	+65	-58	-8

The tissue test results indicated calcium, manganese, potassium, and magnesium were the most limiting elements. The following combination of products were applied:

Potassium Metalosate	at 3 Pt. Per Acre
Manganese Metalosate	at 2 Pt. Per Acre
Zinc Metalosate	at 2 Pt. Per Acre

This application was applied on April 18, 1997 by ground in 250 gallons of water per acre. The symptoms disappeared in about two weeks of the application. No other indications of minor nutrient deficiency were seen for the rest of the year. An application of calcium nitrate was broadcast and irrigated in with the solid set sprinklers as calcium was not applied in the foliar application. Through out the growing season a gypsum machine was used to apply gypsum or potassium sulfate through the sprinklers. Because of the low potassium in the tissue and the soil I have suggested to Mr. Cowan's field man to be sure to apply plenty of potassium in the irrigation water and to use potassium in foliar sprays. The majority of soils in our area have a low potassium release rate. Adding potassium in the irrigation water or using foliar applications has been an efficient way to add potassium to plants on these soils.

AOYAMA CHERRIES

The following example is a field with chronic problems. The field has areas where the trees show classic manganese deficiency symptoms throughout much of the summer. There are areas where limbs and scaffolds have died or are dying. Bacterial Canker seems to be the major disease problem. During bloom it is easy to find blossoms with shortened pedicels. The crop is usually light but in cherries that means large fruit and the grower gets a premium. The return on this block of cherries has been acceptable because of the large cherries. The questions is can this block have improved health, larger crops, and maintain fruit size?

A water analysis of the irrigation well shows a pH of 7.8 with slightly over 2.75 meq/liter of calcium and magnesium respectively and 4.25 meq/liter of bicarbonates. The Ec_w was 0.57 with 416 ppm TDS and an adjusted SAR of 0.43. A soil analysis shows a pH of 7.4, a C.E.C. of 17.8,and a calcium to magnesium ratio of 2.3. Potassium was measured at 161 ppm, which on this soil is a medium rating.

The field did have some gypsum applied in the water through a gypsum machine late in 1996 and throughout 1997.

Applications of Albion Metalosate were made in the 1996 and 1997 crop year to correct what appeared to be a manganese deficiency. However the symptoms would appear again in four weeks or so. Tissue samples taken in July 1997 finally made the point that potassium was the major nutritional problems. Table 2 shows the T.E.A.M. Analysis Report values for Aoyama taken about July 17, 1997.

Table 2.
Albion Laboratories T.E.A.M. Nutrient Index Values for Aoyama Tissue Samples, 28 July 97

Sample	N	P	K	S	Ca	Mg	B	Zn	Fe	Mn	Cu
Green leaves	-18	-24	-56	-34	-26	-17	+15	-50	Excessive	+14	-5
Yellow/green leaves	-15	-17	-31	-22	-28	-15	+53	-23	Excessive	+40	+58
Potassium Deficient	-25	-14	-58	-25	-26	-12	+27	+2	Excessive	+108	+24

The T.E.A.M. nutrient index values indicated in all three samples that potassium was the most limiting nutrient. In all cases but one the minor nutrients were present in sufficient quantities. In October 1997, one ton per acre of potassium sulfate was applied in a band on both sides of the tree row. Potassium will be part of the foliar spray program throughout the coming year. Tissue samples will be taken twice this year, during the spring and summer, to evaluate the effectiveness of the potassium applications and the nutrient balance of the tissue.

THE T.E.A.M. ANALYSIS AND NUTRIENT INDEX VALUES

The T.E.A.M. nutrient index values used by Albion Laboratories has given me a new insight into how to interpret tissue sample results. The lowest value is not necessarily the most critical. Often it is the lack of two or three nutrients that are the cause of the visible symptoms. In some cases it has identified the need for additional calcium where I wouldn't have expected a need for calcium. In other cases such as Aoyama where the soil test indicated a moderate amount of potassium in the soil it highlighted a real potassium deficiency in a field with major disease problems. The Albion Laboratories T.E.A.M. nutrient index values are a powerful diagnostic tool when combined with a soil test and visual inspection of the field. I now send plant tissue to Albion when I believe the problem is out of the ordinary.

FUTURE OR PLANNED USES FOR THE ALBION METALOSATE PRODUCTS

I believe we should be using the Metalosate products at bloom in our various tree and vine crops. Data from Jim Adaskaveg with UC Riverside demonstrates better disease control when calcium is included in the bloom spray. He demonstrated use of calcium sprays at bloom by themselves would reduce the incidence of bloom diseases. Using calcium Metalosate sprays at bloom should also improve fruit quality as well as reducing the incidence of bloom diseases.

LARGORIO CHERRIES - WALKER TRACT

These examples are presented to show how difficult it is to correct a nutritional deficiency when a problem layer is two feet deep or deeper in the soil profile. All of these fields show a combination of manganese or zinc and lime induced iron chlorosis symptoms. Table 3 gives the Albion Laboratories T.E.A.M. Nutrient Index Values for cherry leaves form Walker Tract.

Table 3.
Albion Laboratories T.E.A.M. Nutrient Index Values for leaves form Walker Trace, 22 April 1997

Sample	N	P	K	S	Ca	Mg	B	Zn	Fe	Mn	Cu
Walker Tract	+36	+15	-34	-19	-50	-26	+5	-34	+90	+44	-26

After the April 1997, tissue test results the grower applied to the young trees the following mixture:

Calcium Metalosate	at 24 Oz. Per 100 Gal.
Zinc Metalosate	at 12 Oz. Per 100 Gal.
Potassium Metalosate	at at 16 Oz. Per 100 Gal.
Magnesium Metalosate	at 8 Oz. Per 100 Gal.
NutrPhite 0-26-28	at 32 Oz. Per 100 Gal.

The grower applied this mixture with a backpack sprayer. The trees turned green for about a month. Then the same symptoms reappeared.

Table 4 give the soil test results for surface and subsoil from Walker Tract.

Table 4.
Soil test results of topsoil and subsoil from Walker Tract, 7 July 97

Sample No.	pH		Hydrogen H+ meq/ 100g	C.E.C meq/ 100 g	Percent Cation Saturation (computed)					EC_E	Soluble salts ppm	O.M %
	Soil pH	Buffer index			% K	% Mg	% Ca	% H	% Na			
Top Soil	6.7			32.5	2.0	26.2	69.4		9.9	2.87	1837	
Sub Soil	7.3			37.5	1.2	20.2	76.9		1.4	0.96	614	

Sample No.	Nitrogen ppm		Phosphorus ppm		K ppm	Ca ppm	Mg ppm	So4 ppm	Zn ppm	Mn ppm	Fe ppm	Cu ppm	B ppm
	NO3	NH4	Weak Bray	NaHC O3-P									
Top Soil	81	5		52.2	252	4660	1096	12	2.7	11.6	13.2	3.5	0.05
Sub Soil	14	3		33	179	5820	928	6	0.4	3.7	10.6	2.3	0.08

The nutrient index values indicates calcium as the most limiting but the tissue sample was taken early in the year and the plant had not accumulated much calcium yet. A tissue sample taken in September of 1996 (not shown) had normal levels of calcium and magnesium. Potassium was low in both samples.

The only element that appears low in the soil test is zinc. These trees are currently irrigated with underground drip. The trees are about four years old. The grower will probably convert the irrigation system to mini-sprinklers in 1998 or 1999.

My guess is this is a combination of lime induced iron chlorosis and zinc deficiency. In 1998 I will suggest a combination of zinc, iron, manganese and potassium Metalosates as an early spring application to alleviate the symptoms temporarily. I believe the long-term solution will be the use of soil sulfur or sulfuric acid applications to lower the soil pH.

The Sambado field is very similar to the Largorio Walker Tract. The leaf symptoms are similar and the leaf tissue results are similar. The remedy would appear to be the same.

The puzzling thing is none of these soils are high in calcium carbonates yet the symptoms seem to be the lime induced iron chlorosis. I wonder if the high calcium to magnesium ratio has a part in setting up the cherries for this nutrient deficiency.

SUPPORT FOR QUESTIONS IN THE FIELD

I have presented two situations where foliar applications of the Albion products gave a quick and satisfactory solution. I then wanted to present crop and soil problems that haven't been solved by one or two applications of foliar nutrients. The data and questions about the problem cherries were presented to illustrate how a crop and soil situation can present problems, which don't yield to usual solutions. They represent only 1% to 3% of the total acreage of a given crop but are irritating to the grower and frustrating to the field man. We have the same problems in apples, walnuts and other crops in the Linden area. This is when a supplier of products with a broader range of experience than is available at the local level can be invaluable if he can help solve the problem. We need answers where the corp, soil, and stage of growth are all considered in solving the problem.