

NEWS & VIEWS

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Dr. A.E. (Al) Ludwick,
Western Director
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Searching for Answers in '98

EACH year the Potash & Phosphate Institute (PPI) and the Foundation for Agronomic Research (FAR) help support research projects across North America. These projects involve crop production in the field...systems research to develop best management practices (BMPs).

PPI will be assisting with 16 FAR-supported research projects in the western U.S. in 1998. Following is a listing of each project. Please understand that they are still in progress and that the timing of release of detailed results is strictly up to the researcher.

Arizona



Alfalfa Response to Forms of Phosphorus in the Irrigated Southwest

Project Leader: *Dr. Michael J. Ottman, Plant Sciences Department, University of Arizona, Tucson, AZ 85721. (520-621-1583).*

This project was initiated in the fall of 1996 to evaluate the relative benefits of different phosphorus (P) sources (liquid and dry) and best management practices (BMPs) for alfalfa production in the irrigated desert climate of Arizona. First year data indicate that both 10-34-0 and 11-52-0 can be effectively topdressed to produce high yield alfalfa. The topdressed 11-52-0 produced somewhat higher yields and seemed to move deeper into the soil than did the water-run 10-34-0 in this initial season. Adequately fertilized treatments with either source produced over 11 tons/A. High quality alfalfa hay is important to support a large dairy industry in the far west. Phosphorus could play an increasingly important role in maintaining both hay yield and quality.



Response of Valencia Oranges to Potassium Fertilizer on a Sandy Soil

Project Leader: *Dr. Charles A. Sanchez, Department of Soil, Water and Environmental Sciences, Yuma Agricultural Research Center, The University of Arizona, Yuma, AZ 85364. (520-782-3836).*

This project is in its initial year, and first harvest will be taken in April 1998. The purpose is to evaluate the effectiveness of different sources of potassium (K) fertilizer applied either directly to the soil, to the foliage or in combination for orange production in the sandy growing region of western Arizona. This is a major citrus growing area, and there is little research information supporting present fertilizer practices on these typically nutrient depleted soils. Fruit will be harvested and graded using standard market criteria.

California



Boron Nutrition of Nut Crops

Project Leader: *Dr. Patrick Brown, Department of Pomology, University of California, Davis, CA 95616. (530-752-0929).*

In 1994, a study was initiated to determine the effect of boron (B) nutrition on flowering, fruit set, and yield of almond. It followed a similar (and very successful) study with pistachio. Spraying B at a rate of 1 to 2 lb Solubor/100 gal on B-deficient almond trees significantly increased fruit set and yields in 1995 and 1996. Of special note is the fact that often almond trees responded positively to supplemental B sprays without showing visible B deficiency symptoms. Results suggest an optimal application is to mix 3 lb Solubor with compatible insecticides and fungicides to reduce application costs and to spray



Agronomic market development information provided by:

**Dr. A.E. (Al) Ludwick, Western Director,
Potash & Phosphate Institute (PPI)
P.O. Box 970, Bodega Bay, CA 94923-0970
Phone: (707) 875-2163
E-mail: aludwick@ppi-far.com**

postharvest. Field research was initiated with walnuts in 1997. Foliar B treatments dramatically increased walnut set and retention, reduced or totally eliminated pistillate flower abortion (PFA) and increased ultimate nut yield. Boron is fundamentally essential for the flowering process and since 80 percent of all agricultural products develop from the flowering part of plants, the implications of this research are very wide ranging.



Establishing Updated Guidelines for Cotton Nutrition

Project leader: *Dr. Bill Weir, University of California Cooperative Extension Service, 2145 Wardrobe Ave., Merced, CA 95340. (209-385-7403).*

The 1996 and 1997 studies have emphasized in-season K application to supplement a well managed preplant program (previously studied) aimed at producing high yields. Initial results substantiated that foliar K (4.5 K₂O lb/A) applied twice at one to three weeks after first bloom produced the greatest yield increases compared to that applied earlier or later in the season. Studies in 1997 showed that additional yield may be obtained by increasing rates of K₂O up to 13.5 lb/A, also applied twice. Foliar applications of K should be recommended on potentially high yielding fields regardless of soil test or previous fertilizer applications. This project further documents the widespread K deficiency of cotton in the San Joaquin Valley and the substantial benefit of both soil and foliar K applications.



Potassium Nutrition of Processing Tomatoes in the Sacramento Valley

Project Leader: *Dr. Tim Hartz, Department of Vegetable Crops, University of California, Davis, CA 95616. (530-752-1738).*

Preliminary survey information gathered prior to the beginning of this study indicated that K deficiency of processing tomatoes may be relatively widespread in California. Initiated in 1995, this project is studying the effect of sidedress, foliar, and water-run K applications on processing tomato yield, fruit quality and severity of premature decline of tomato vines. Survey results in 1996 suggested that soil cation balance, specifically the relative amounts of extractable K and magnesium (Mg), are correlated to the incidence of yellow eye and white core, important factors for peeled and diced products. Applying gypsum or K decreased color disorders in a field with moderate cation imbalance. The combination of materials was especially effective. However, in fields of severe cation

imbalance, a positive response is less probable. It was also observed that maximizing peeled fruit quality requires a higher level of K nutrition than is required for maximum yield, percent soluble solids, or comminuted color. This research is developing parameters for growers to use in deciding which fields will benefit most from K fertilization.



Critical Soil Phosphorus Levels for Alfalfa Production in Northeastern California

Project Leader: *Dr. Dan Marcum, University of California Cooperative Extension, P.O. Box 9, McArthur, CA 96056. (530-336-5784).*

Phosphorus is the second most limiting nutrient for alfalfa production in northeastern California, following only sulfur (S). This research is re-evaluating the presently established critical levels for interpretation of the bicarbonate P soil test for alfalfa grown in this region and the method of soil sampling to accurately evaluate P variability within fields. In the spring of 1997, soil samples were taken on a 60 x 60 ft. grid over a 25 acre field. The field averaged 18.5 parts per million (ppm), but ranged from 6 to 38 ppm in an apparent random fashion. Twenty harvest locations were selected within the field to test yield response to 300 lb P₂O₅/A. Preliminary spatial analysis of soil sample data indicated that 15 to 20 individual samples are needed to reduce variation in soil test results to a level where the soil bicarbonate P is useful in predicting the need for fertilizer P. Reliable soil test procedures lend credibility to fertilizer recommendations, especially when the recommended rates are high.



Determining Potassium Fertility Needs of Peppers and Celery

Project Leader: *Richard Smith, University of California Cooperative Extension Service, 649-A San Benito St., Hollister, CA 95023. (408-637-5346).*

This project was initiated in the spring of 1997 for vegetables growing on the central coast of California to evaluate K nutritional needs and diagnostic techniques for high yield and quality produce. Peppers and celery were studied this first year. A survey of 12 commercial pepper fields in the Hollister-Gilroy area revealed that 10 were capable of significant fixation of soil K. Pepper tissue K was also low in 10 of the crops. A similar survey of 15 celery fields in the Salinas Valley indicated that all but one field were adequately fertilized with K. Fresh sap K levels in celery tissue were highly correlated with standard laboratory measurements. Additional research, including fertilizer trials, will be conducted to more thoroughly

understand the K nutritional situation of this important vegetable growing region.



**Potassium Nutrition of Pistachio:
Development of Fertilizer
Recommendations and
Diagnostic Procedures**

Project Leader: *Dr. Patrick Brown, Department of Pomology, University of California, Davis, CA 95616. (530-752-0929).*

This project was initiated in 1996 to evaluate the benefits of K fertilization on the yield and quality of pistachio trees growing in three orchards in the Central Valley of California. Nut yield in the initial year significantly increased with K fertilization in the Madera orchard that tested lowest in available soil K and tended to increase in the other two. In terms of quality, there were higher percent split nuts and 100-nut weights due to K application and lower percent blank and stained nuts. In 1997, K fertilization increased yield and improved quality at each location evaluated. The most effective treatment was 240 lb K_2O/A as potassium sulfate (K_2SO_4) applied via micro sprinklers. These data are generally applicable to other nut crops in the Central Valley so they will also impact crops such as almonds and walnuts.

Idaho



**Chloride's Roles in Maximizing
Wheat Performance
(Multi-Regional Project)**

Project leader: *Dr. Brad Brown, University of Idaho SW Idaho Research & Extension Center, 29603 U of I Lane, Parma, ID 83660. (208-722-6701).*

This project was initiated in the fall of 1997 as part of a multi-regional project begun several years earlier. An irrigated winter wheat trial involving 15 varieties (mostly soft white, some hard red) were planted on a location with a history of leaf spotting (physiologic leaf spot). Each plot is split—with and without chloride (Cl) fertilization. The experiment will be harvested in mid-1998. Further documentation of Cl deficiency in small grains will open up a major market for KCl fertilizers in the western U.S.



Montana



Chloride Nutrition Web Site

Project Leader: *Dr. Richard Engel, Department of Plant, Soil and Environmental Sciences, Montana State University, Bozeman, MT 59717. (406-994-5295).*

This is a non-conventional research project involving the summarization of Cl research, literature, and field photos that will be available through PPI's web site. Project was completed in early 1998. Chloride management is a relatively new aspect of crop production, and this web site will update researchers, Extension personnel, industry representatives, and farmers.

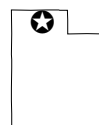


**Effect of Boron Fertilization on
Alfalfa Production**

Project Leader: *Dr. Grant Jackson, Montana State University Western Triangle Research Center, P.O. Box 1474, Conrad, MT 59425. (406-278-7707).*

In a new project initiated in 1997 in northwestern Montana, three rates of B fertilization are being evaluated across three rates of P for irrigated alfalfa production. First year yields (3 cuttings) averaged above 6 tons/A, but there was no response to P or B. This research will be continued an additional two years to document potential long-term benefits to B and P fertilization for intensively managed irrigated alfalfa.

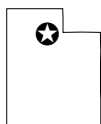
Utah



**Phosphorus and Potassium Soil Test
Relationships and Nutrition for Irrigated
Alfalfa Production in Utah**

Project leader: *Dr. Richard T. Koenig, Department of Plants, Soils and Biometeorology, Utah State University, Logan, UT 84322-4822. (801-797-2278).*

During the initial year of this project (1996) there were significant yield responses by alfalfa at all three field locations to applications of both P and K fertilizer. In 1997 two additional sites were added, and they also produced significant yield responses. Results suggest that the current Utah State University P and K fertilizer recommendations are too low and that both the soil test critical levels and the corresponding rates of P and K fertilization should be raised. The research will be conducted for two additional years and should result in appreciably higher rates of both P and K fertilizer recommendations.



Fertilizer Requirements of Long-Term Sustainability of High Yielding Crops

Project leader: Dr. Richard T. Koenig, Department of Plants, Soils and Biometeorology, Utah State University, Logan, UT 84322-4822. (801-797-2278).

The purpose of the "Utah Centennial Plots" is to evaluate the long-term sustainability and effects on soil properties of organic, inorganic, and combined organic and inorganic fertilizer programs on two crop rotations: alfalfa-wheat and alfalfa-corn-wheat. The study was initiated in the fall of 1996 with alfalfa and wheat as the first crops in the rotation. Alfalfa hay yields during the establishment year were slightly higher with inorganic fertilizer and inorganic fertilizer combined with manure, compared to manure as the sole nutritional source. Wheat yield was significantly higher with inorganic nitrogen (N) fertilizer than with manure applied at an equivalent rate of mineralized N. This program will ultimately define high yield sustainability for these two rotations relative to inorganic vs. organic inputs.

Washington



Influence of Tillage and Phosphorus Rate in Placement on Corn and Bean Yields

Project leader: Dr. Shiou Kuo, Puyallup Research & Extension Center, Washington State University, Puyallup, WA 98371-4998. (253-445-4500).

This project was initiated in 1996 in western Washington to study maximum yields of corn and beans as related to P nutrition in conventional and ridge tillage systems. Silage yields of corn were not affected by P application in the first two years. However, yields and P uptake were higher in the second year for the ridge tillage system. Ridge tillage allows repeated banding of P in the same P-enriched zone, which accounts for the higher P availability and plant uptake. This rotation study will require a few years to establish sufficient differences between tillage systems and P distribution in the soil before the important relationships will become clear. Minimum tillage is expanding in the U.S. and data are needed relative to determining most effective fertilization strategy.



Jonagold Apple Fertility Studies in Western Washington

Project Leader: Mr. Gary Moulton, Mt. Vernon Research & Extension Unit, 1468 Memorial Hwy., Mt. Vernon, WA 98273-9788. (360-4246121).

A study on K and Mg nutrition of high yielding Jonagold apples grown under drip irrigation was initiated

in 1996. This study involves semi-dwarf trees in high plant populations. There were no significant differences during the first two years in yield or quality measurements of the fruit (starch, soluble solids, or fruit pressure) at the off-station location. Only starch conversion was increased in the Mt. Vernon station in 1996 by K fertilization. Little response was initially expected, as the beginning soil fertility was very good. However, available soil K and Mg have dropped substantially in the wetted drip-irrigated zone, and the fertilizer treatments should produce significant benefit over the no fertilizer control in subsequent years. Late-season nutrition is of special concern, and it appears that drip fertigation may need foliar supplementation to maintain K in a proper balance with N. This study will provide valuable information for fertilization under intensive production conditions of apples and similar tree crops.



Evaluating Potassium Sources and Time of Application for Potato Production in the Columbia Basin

Project leader: Dr. Joan R. Davenport, Washington State University Irrigated Agriculture Research and Extension Center, 24106 N. Bunn Rd., Prosser, WA 99350-9687. (509-786-2226).

This study was initiated in 1997 to evaluate K sources, forms (liquid vs. dry), and time of application on yield and quality of potato production under center pivot irrigation. Overall, the fertilizer treatments did not significantly impact yield or the percentage of the crop in the US#1 classification. Specific gravity, however, was impacted by treatment in that it was higher than the control treatment when K₂SO₄ was applied as a granular (100 percent preplant) or liquid treatment with 3 in-season applications or when liquid KCl was applied 100 percent preplant. Also, the incidence of black leg disease was reduced by K fertilization. This study will continue to focus on K management for potatoes, especially as related to tuber quality, which is a primary concern in the Pacific Northwest.

Summary

We at PPI/FAR are pleased to be part of research and education programs that advance the cause of efficient production agriculture. ■