

PEST MANAGEMENT OF ALFALFA  
IN THE LOWER DESERT VALLEYS OF CALIF

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As a practicing pest control advisor, my idea of pest management of alfalfa involves an in depth knowledge of all the management principles in the growing of quality alfalfa. To the extent that the PCA can manage or assist the grower in his management of these principles will determine the value of the PCA service to the grower. In my own case, we are responsible to the grower for insect and disease control, plant nutrition, weed control, and advice and council on soils, irrigation, etc.

Our goal is to achieve maximum quality and yield at the lowest unit cost of production through a crop management program. The phrase "crop management" is more indicative of our program than "pest management". To achieve our goal it is essential that we obtain production figures from the grower.

Insects, diseases, weed control, fertilization, and many other principles of alfalfa production in the lower desert areas of California and Arizona have been covered in various publications and past symposiums. Much additional information will be added in this symposium; therefore, it is not my intent to dwell on these subjects except in specific areas, where the practical application of principles and the data from field trials might be of value in enlarging our body of knowledge and engendering additional questions.

ALFALFA CALENDAR OF EVENTS

Figure 1. is an attempt to summarize in graphic form the growth periods of the alfalfa plant and some of the major pest management problems associated with production at various months of the year. This data has been compiled from publications by Vern Marble, Donald C. Erwin, Wm. F. Lehman, Don R. Howell, and my own observations and experience.

It is evident from the chart, that the PCA, really functioning in the pest management of alfalfa, has a twelve month per year job and if he is not in the field frequently each month, will eventually get himself into trouble with the grower. The insects and diseases that seldom occur are the ones to watch out for. The major problems can be planned for and usually counted on to occur; however, this summer, armyworms and alfalfa caterpillars were not a problem in the Palo Verde Valley for the first time in many years. In their place, Anthracnose and treehoppers caused considerable damage in Sept. and Oct; seldom occurring examples, not expected and not discovered until much alfalfa was hurt.

PLANT DISEASES, BLUE APHIDS, SOILS, AND PLANT NUTRITION

To become knowledgeable in the identification and prevention or control of plant diseases, other than by chemical means, seems to result in a natural transition into the study of soils and the environment and their effects on plant nutrition as is expressed in the symptoms of deficiencies and excesses in the plant. Having explored this area of plant science, it is a logical step to inquire into all of the aspects of crop growth and nutrition which will help one to better assure a healthy plant and top yields. At this point we found ourselves in the soil and plant analysis business.

Land selection and irrigation, probably the two most important principles in high alfalfa production, are mostly outside the pest control advisors realm of operation in the lower desert valleys at this time, except as plant pathology problems occur that necessitates the altering of irrigation methods. As we have become involved in extensive soil testing, as

the basis for a plant nutrition program, we are finally realizing what a great value the USDA soil maps are as a guide in knowing where to sample in order to locate and analyze the many varied soils in a given field, a common characteristic of nearly all fields in this area. With this soil analysis data, in addition to the plant nutrition information, we can anticipate for the grower, soils and irrigation problems which will have a decided effect on plant diseases and stand longevity.

Our soils and plant analysis monitoring program has corroborated much existing information and taught us a few new things:

1. The soils in the Palo Verde Valley are saline and not sodic. The PH is generally in the range of 7.4 to 8.2. The E.C. is generally 1.2 to 3.5 on the better soils and 10 to extremes of 80+ on poor soils. Applications of soil sulfur, sulfuric acid, calcium polysulfides, etc., have no effect in reducing the salt in these soils; although, considerable amounts of these amendments are continually being used. Limestone, or calcium carbonate, is present in tremendous quantities. To quote L. K. Stromberg, "To avoid any misconception, it cannot be emphasized too strongly that soil salinity cannot be reduced by adding soil amendments or other methods. Only copious amounts of water passing through the soil will remove excessive salts."

2. Certain soils become phosphate deficient much more rapidly than others. We have taken hundreds of soil and thousands of plant samples throughout the Palo Verde Valley in the past two years for chemical analysis in the laboratory. Unfortunately, only recently have we begun to classify the soil samples as to specific soil types, e.g., Rositas fine sand, Holtville clay, etc. By periodically monitoring the soil and plants we are finding that certain fields will become phosphate deficient in just a few months after an application of 110-150 lbs/Acre of P<sub>2</sub>O<sub>5</sub>; whereas, other fields, with the same rate of fertilizer, show adequate levels in the plants for an entire year, even though the residual soil phosphate before fertilization may be about comparable in the respective fields.

We hope to determine which particular soil types tend to tie up phosphate at an accelerated rate, and whether location in the valley will be a factor for each soil type, i.e., irrespective of location, will the same type soil generally react the same? We would also like to recommend this project to the University.

3. Types of soil and plant analysis tests most beneficial in the lower desert areas. Most of our soil analysis in the Palo Verde Valley is now limited to determining E.C. or electrical conductance (salt content), SP or saturation percent (water holding capacity of the soil), NO<sub>3</sub>-N (nitrate nitrogen), and PO<sub>4</sub>-P (phosphate). Occasionally we will check exchangeable K (potassium) in sandy soils. Sulfur, potassium, calcium, magnesium, and zinc are plentiful here. Boron is sometimes excessive in very salty, heavy, clay soils.

Plant analysis has been narrowed down to determinations for nitrogen (NO<sub>3</sub>-N and total N) and phosphate (PO<sub>4</sub>-P).

4. Soil testing and plant analysis must be used together in order to make a correct diagnosis concerning a phosphate deficiency and recommendation. In general, 10 to 12 ppm of soil P (HCO<sub>3</sub>-P) is adequate for alfalfa and will show as high a level of P in the plant as alfalfa growing in soil with two or three times more P. Applying fertilizer to soil with 10-15ppm of P seldom increases the P in the plant nor the crop yield. See Fig. 2. This statement applies only to alfalfa grown in the late spring, summer, and fall. We have found that some fields with 10-12 ppm of soil P and a plant content of 1500-2000 ppm of P in October will be deficient, or nearly so, in February or March. Soil testing must be used with plant analysis in order to make a correct diagnosis.

In the early spring, first cutting alfalfa sampled just prior to cutting with a mid-stem content of 800-1100 ppm of P will often times be deficient in P and be expressing visual P deficiency symptoms of small, dark, dull, blue-green leaves and stunted growth. The soil, where such plants are growing, will always contain less than 10 ppm of P unless the symptoms are an expression of a root disease.

Phytophthora megasperma root infection will cause an abrupt drop in the level of P in the mid-stem tissue. In a plant analysis monitoring program it is essential that a drop in plant tissue P to a low or deficient level be carefully investigated before applying additional P. This is an important reason for knowing the soil P level. To date, we have never found disease free plants growing in soil with 10-12 ppm of P, or more, that have not had adequate amounts of P in the mid-stem tissue.

Crown rot will usually have a much more severe effect on a plant if it is growing in a low P soil. Plants can show quite an advanced crown and root necrosis due to crown rot, as well as reduced height and vigor, when growing in deficient P soil. Upon fertilizing with P, normally within thirty days, most of the external symptoms will disappear and normal growth resumes.

In some soils, the soil P will drop to deficient levels (1-5ppm) and the plant tissue will still show an adequate amount of P, perhaps as high as 1200-1600 ppm. This may continue for a few weeks before dropping down, usually gradually, and at other times quite rapidly, to deficient levels in the plant. We attribute this to the fact that our soil sampling program in alfalfa is usually restricted to the top eighteen inches of soil. Soil analysis has shown that most of the P in the desert soils is in this upper zone; however there is P below this zone and a deep rooted plant, such as alfalfa, can often obtain sufficient P at deeper depths for some time. Nevertheless, it has been our experience, that in most cases, when finding alfalfa growing in soils testing low or deficient in P to also find low or deficient P levels in the plant tissue. The degree of correlation is remarkably good. In such cases, 40-50 units of P<sub>2</sub>O<sub>5</sub>, applied to the crop will show a correction of the deficiency in the plant tissue within three to four weeks.

5. Blue aphids feeding on alfalfa plants do not lower the P level in the plant tissue. Whereas root diseases can affect the uptake of P in the plant, even though adequate P is present in the soil, the feeding by blue aphids on alfalfa does not appear to affect the content of P in the mid-stem tissue. See Fig. 2. A light infestation of aphids was present about 5/10. By 5/20, when cut, the population was moderate to heavy, in some spots, and soon died out after being cut. Nevertheless, the yields on two cuttings of hay were greatly reduced. The blue aphid should not be allowed to build up to any extent at anytime. The loss of four or five bales per acre on today's market amounts to fifteen or twenty dollars per acre.

#### SUMMARY

The roll of the qualified pest management or crop management consultant is an exciting challenge personally. With proper training and experience he can be of great worth to the farmer in bringing a higher level of expertise directly to the grower on a day to day basis, than has ever been known in the history of agriculture.

#### LITERATURE CITED

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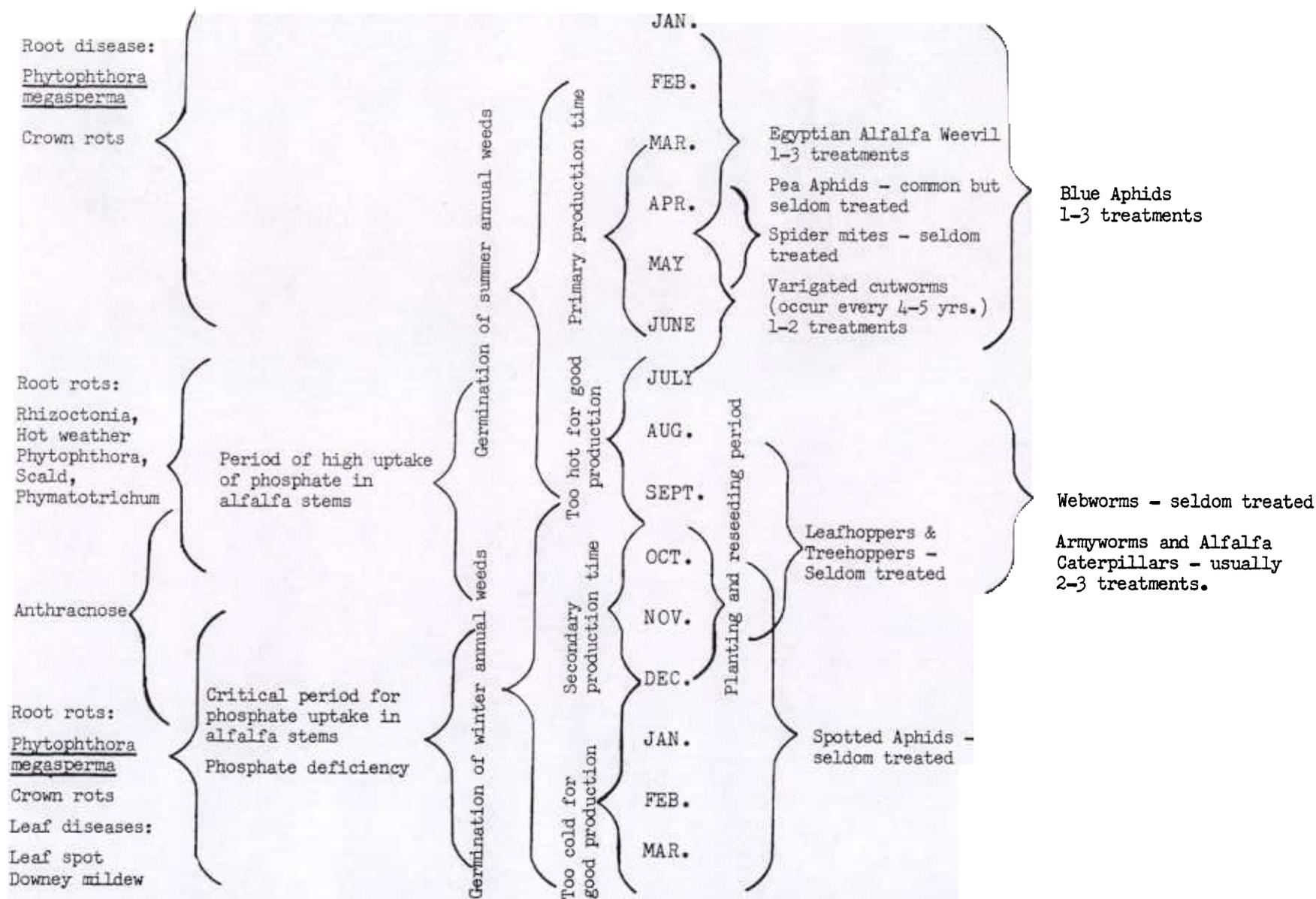
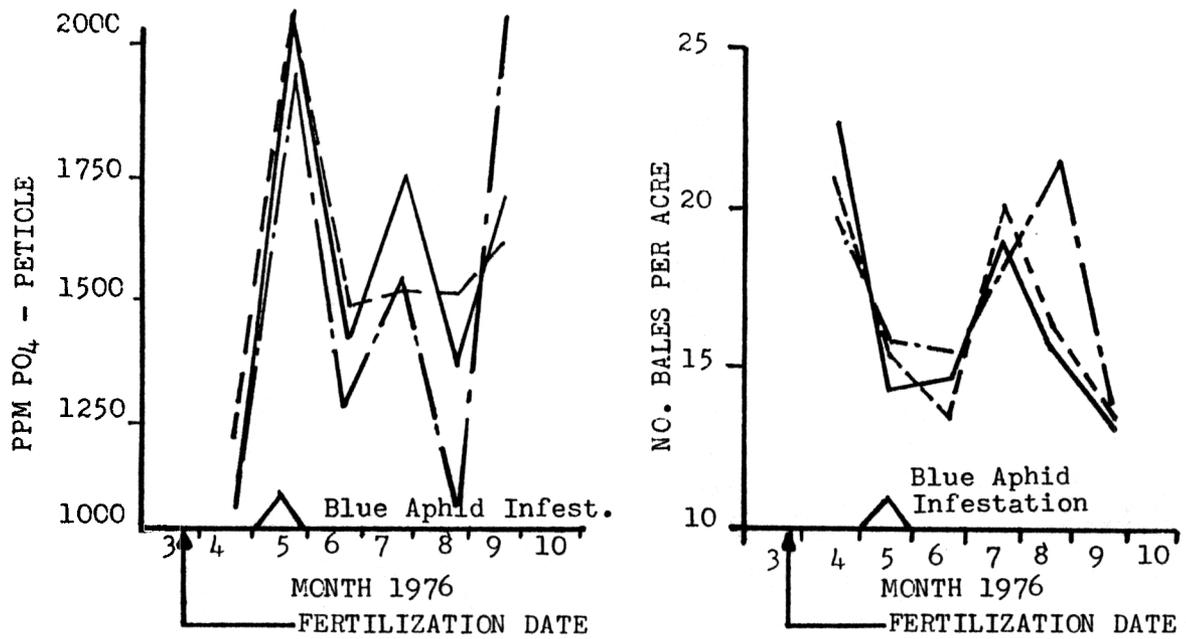


Fig. 1 Alfalfa calendar of events, Lower Desert Areas of Southern California



LEGEND: — U10B-CHECK No fertilizer  
 - - - U10C-TREBLE 200 lbs/Acre  
 - . - U10D-11-48-0 100 lbs/Acre

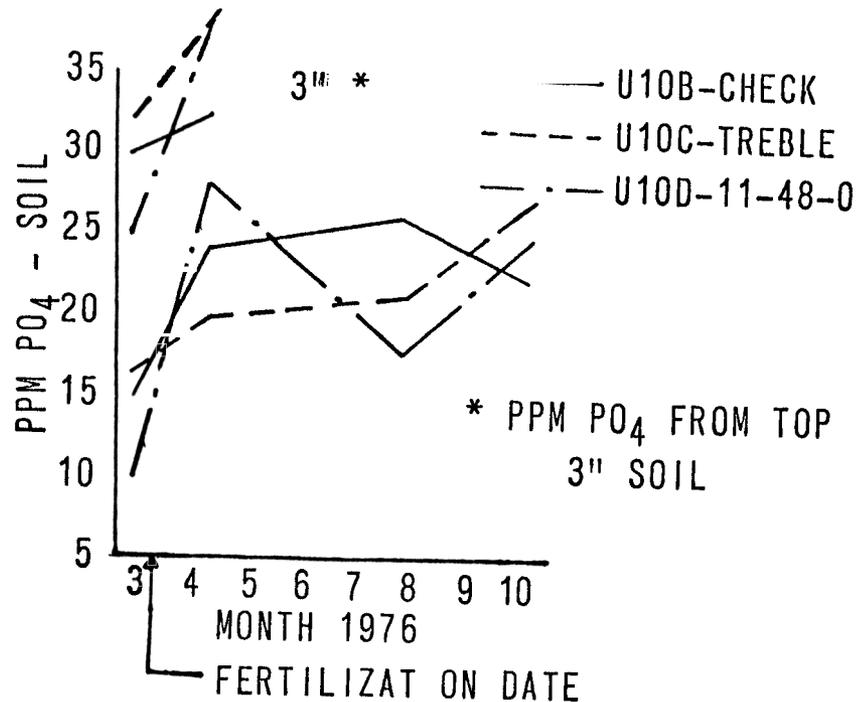


FIGURE 2. An example of an alfalfa plant and soil monitoring program and the effect that various fertilizer rates had on the soil P level, plant tissue P level, and yield throughout the season. Note the fluctuation of P in the plant tissue throughout the season; although, the soil P was fairly constant and at adequate levels.