Chlorosis In Arizona

Many Crops Are Affected in Most Sections of the State

By W. T. McGeorge

Most of the soils in the irrigated valleys of Arizona are calcareous — that is, they contain carbonate of lime in widely variable amounts. If the amount is excessive, the leaves of many plants growing in soils of this type are not able to maintain a healthy green color. This yellowing of the leaves of plants growing in calcareous soils is called chlorosis and when it is due to an excess of lime in the soil it is called lime-induced chlorosis.

In Arizona, chlorosis appears on a number of crops such as citrus, peaches, apples, pears, grapes, strawberries, bush berries, and field crops such as sorghum, peanuts, pinto beans, and some grasses. A light attack of chlorosis does not usually cause serious injury. Severe attacks may lead to failure to blossom and die back in orchard crops.

Lime Is Cause

While the excess of lime in the soil is a major cause of chlorosis, the direct cause in most cases in Arizona is a deficiency of iron, manganese, or zinc — especially iron.

All crops require a small amount of these elements as plant food. Chlorosis develops when the plant is not able to supply its normal requirements from these high-lime soils by normal uptake through the roots. Also when some crops are growing in high-lime soils they are not able to properly utilize iron even when an ample amount has been taken up into the root system.

The problem in Arizona has been found to be one in which it is largely a matter of helping the crops utilize the iron, manganese, and zinc within the plant itself. In most cases iron is the one that needs the most help.

For some years the Department of Agricultural Chemistry and Soils has been studying the chlorosis problem in Arizona. Soils from many sections of the state have been subjected to chemical tests. These analyses have not shown any evidence of a deficiency in the soil.

Turning next to the plants we found that when growing in our highly calcareous soils, a very large percentage of the iron taken up by the plant is precipitated in the roots and never reaches the leaves. Going still further we found that even in the leaves a large percentage of the iron is present in an inactive form and has thus become useless to the leaf. In arriving at this conclusion we have analyzed several hundred samples of soils, roots, and leaves.

Since iron is instrumental in the formation of the green coloring matter in leaves — chlorophyll, that is — they turn yellow when the iron becomes inactive. One function of chlorophyll in leaves is to convert the sun's rays into energy for growth. Chlorophyll is sometimes referred to as the power plant. Thus when plants are chlorotic they operate on a low energy efficiency. The more severe the chlorosis the lower the efficiency and the ability of the crop to produce.

Research on a problem of this nature, even though it may produce the reasons why, is of little value to the farmer unless it brings forth a cure. In this connection there are two procedures which are effective. One is to treat the soil in such a way as to offset the effect of the excess lime. The other is to treat the plant — that is, the above ground part of the plant.

The first procedure is the more logical way to proceed, as the root is the normal channel of food supply to the plant. Our research has shown that chlorosis can be cured when a sulfur-manure mixture containing iron is banded in the root zone. Sulfur is an acidifying agent and will correct the bad effect of lime.

This procedure has given good results with field crops and young trees but is not considered very satisfactory for old trees. The reason for this is that the acidity developed from sul-

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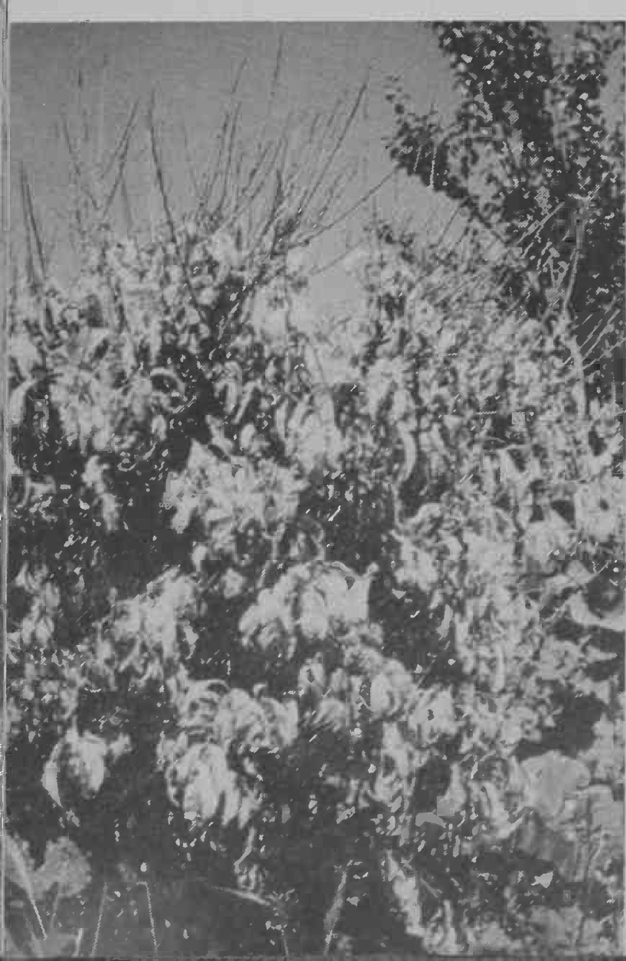
The tree on the left is a control tree. The tree on the right was plugged with iron citrate powder in July. Photographs were taken in October. The orchard is located at St. David in Cochise County.



What Does DHIA Mean to Arizona?

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cow. Also, a study was made by comparing the herds on test for one year against those on test for 5 years or more. The difference was 36 pounds of butterfat per cow year more for the herds on test five years or more. Undoubtedly the increase in production is due to the use of the DHIA records to cull out the low producers, feed the better cows more and the development of a sound breeding program.

High-producing cows convert feed into milk and butterfat more efficiently and profitably than do low-producing cows. More production per pound of feed consumed means lower feed costs and greater returns above feed costs. For example, the average cow in the nation produces 200 pounds of butterfat with an income of $110.00 over feed cost and $.66 to produce a pound of butterfat. Whereas, the average dairy cow in DHIA in the nation produces 350 pounds of butterfat with an income of $223.00 over feed cost and $.47 to produce a pound of butterfat.

The quickest and surest way to improve the inherent producing capacity of a herd is through the use of a series of good herd sires. In one generation the herd sire contributes 50 percent to the genetic make up of the new heifers in the herd. By the fifth generation 97 percent of the genetic makeup of the new heifers in the herd is based on the sires selected. On an average, for every sire that improved the herd there have been two others that either failed to improve the herd or actually reduces practically all the improvement made by the good sire.

In order to get more basic information which will enable the dairymen to make better herd sire selection, the Bureau of Dairy Industry, in cooperation with State Extension Services began collecting individual lactation records in 1935 to "prove" large numbers of association sires. The records are also used in analyzing the breeding progress that is being made in many individual herds, with a view to finding improved strains and families from which desirable breeding stock may be selected.

Arizona herds in Dairy Herd Improvement Associations may be looked upon as a part of a mammoth breeding herd of national importance—one that is being improved constantly and one from which breeding stock is gradually disseminated to improve the thousands of other herds that make up the nation's dairy cattle population.

—W. R. Van Sant is Extension Specialist in Poultry and Dairying.

Southwestern Bee Laboratory

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serious loss of beneficial honey bees if proper precautions are taken. This important problem will receive major attention as a part of the research program of the new Arizona laboratory.

Study Pollination of Melons

Todd and McGregor are now engaged in a study of the role of the honey bee in the pollination and set of melons grown in the Salt River Valley in cooperation with the Arizona Vegetable Growers Association and Orin A. Hills of the U. S. Department of Agriculture, Vegetable Insect Research Laboratory at Phoenix. Pollination and insecticidal factors which may favor an earlier and heavier set of fruit are being investigated. When this study is completed, the results will be of interest to all growers and shippers of melons.

A close, cooperative relationship is being created between the Southwestern Bee Culture Laboratory and the Department of Entomology of the University of Arizona. This will be reflected in cooperative research work and the sharing of laboratory facilities.

Beekeepers to Meet in Arizona

Because of the increased interest in beekeeping in relation to the pollination of agricultural crops in the southwest, the University of Arizona has invited the American Beekeeping Federation to hold its annual conference on pollination on the campus at Tucson during the last week of October 1950. This will be a national meeting with prominent speakers to discuss problems common to the beekeeper, farmer, and seed producer. All interested persons are invited to attend. Further details concerning the program will be released later.

—Laurence A. Carruth is Professor of Entomology and Head of the Department.

Chlorosis in Arizona Affects Many Crops

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fur must hit a certain percentage of the roots. In old trees a large part of the root system has retired to the subsoil where it is difficult to reach them.

Field tests with sulfur-manure mixtures have given excellent response on chlorotic sorghum and pinto beans. In these tests the sulfur-manure mixture was applied at rates of 250 and 500 pounds per acre. In the case of field crops it may be best to delay the treatment until the chlorosis develops, because the fields are usually spotted with green and chlorotic plants and in such cases it is not advisable to go to the expense of treating the entire field.

For old trees where the roots cannot be reached, a cure has been effected by plugging an iron salt into the trunk of the tree. Tests of this nature have been conducted in Santa Cruz, Cochise, Pima, Yavapai, Maricopa, and Graham counties on chlorotic apple, peach, and pear trees and for chlorotic grape vines in Yavapai county. A heavy irrigation immediately preceding or following the injection of the iron salt into the trunk promoted a quicker response. In one case the leaves greened up in 10 days.

It should be mentioned that all yellow leaves are not chlorotic leaves. Yellowing may result from a nitrogen deficiency, nematode injury on the roots, and other causes. In these, the yellow color is usually spread quite uniformly over the leaf. In chlorosis the veins are green and the area between the veins turns yellow to form quite distinctive patterns.

—W. T. McGeorge is Agricultural Chemist.

What Is "Crude Fiber?"

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The present method of feed analysis involving the crude-fiber determination is unsatisfactory. For research purposes this determination has been replaced by a detailed analysis of the various chemical fractions occurring in the feed. However, these analyses are long and expensive so are not suitable for routine use.

The perfection of a suitable method of analysis to replace the crude-fiber determination for commercial and general use is one of the big problems confronting animal nutritionists at the present time.

—B. P. Cardon is Associate Animal Husbandman and Associate Animal Pathologist.