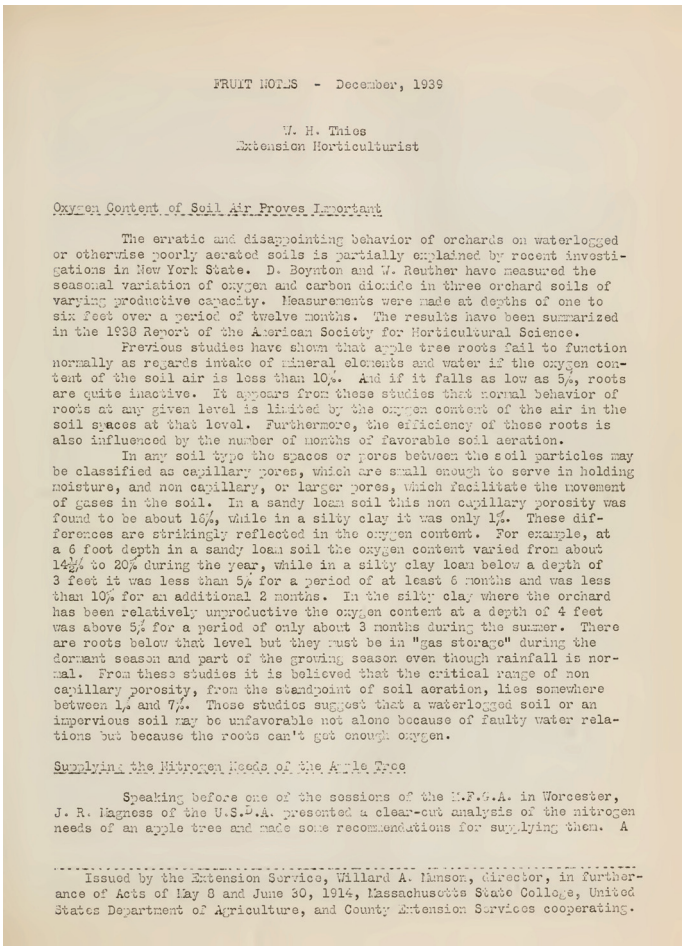
Hormones and the Dropping of Fruit

Laurence Southwick
Department of Pomology, Massachusetts State College

There is considerable popular interest in hormones at the present time with a tendency on the part of many to believe that Utopia for agriculture can be reached via the mysterious hormone route. This belief is based on the tremendous progress made in the past few years concerning the nature of hormones and their manifestly universal presence and importance wherever life exists.

Plant growth substances, variously called growth hormones, growth regulators, growth enzymes, phytohormones and auxins, are definitely known to occur in plants in very minute quantities. In fact, they are essential for normal cell enlargement and recently have been shown to influence fruiting processes. Further, it has been found that the substances which are essential for the growth of plant parts above the ground often inhibit root growth. The mechanism by which hormones "activate" growth is not well understood at the present time.



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W. H. Tries
Extension Horticulturist

Oxygen Content of Soil Air Proves Important

The erratic and disappointing behavior of orchards on waterlogged or otherwise poorly aerated soils is partially explained by recent investigations in New York State. D. Boynton and W. Reuther have measured the seasonal variation of oxygen and carbon dioxide in three orchard soils of varying productive capacity. Measurements were made at depths of one to six feet over a period of twelve months. The results have been summarized in the 1938 Report of the American Society for Horticultural Science.

Previous studies have shown that apple tree roots fail to function normally as regards intake of mineral elements and water if the oxygen content of the soil air is less than 10%. And if it falls as low as 5%, roots are quite inactive. It appears from these studies that normal behavior of roots at any given level is limited by the oxygen content of the air in the soil spaces at that level. Furthermore, the efficiency of these roots is also influenced by the number of months of favorable soil aeration.

In any soil type the spaces or pores between the soil particles may be classified as capillary pores, which are small enough to serve in holding moisture, and non capillary, or larger pores, which facilitate the movement of gases in the soil. In a sandy loam soil this non capillary porosity was found to be about 16%, while in a silty clay it was only 1%. These differences are strikingly reflected in the oxygen content. For example, at a 6 foot depth in a sandy loam soil the oxygen content varied from about 14% to 20% during the year, while in a silty clay loam below a depth of 3 feet it was less than 5% for a period of at least 6 months and was less than 10% for an additional 2 months. In the silty clay where the orchard has been relatively unproductive the oxygen content at a depth of 4 feet was above 5% for a period of only about 3 months during the summer. There are roots below that level but they must be in "gas storage" during the dormant season and part of the growing season even though rainfall is normal. From these studies it is believed that the critical range of non capillary porosity, from the standpoint of soil aeration, lies somewhere between 1% and 7%. These studies suggest that a waterlogged soil or an impervious soil may be unfavorable not alone because of faulty water relations but because the roots can't get enough oxygen.

Supplying the Nitrogen Needs of the Apple Tree

Speaking before one of the sessions of the M.F.G.A. in Worcester, J. R. Magness of the U.S.D.A. presented a clear-cut analysis of the nitrogen needs of an apple tree and made some recommendations for supplying them. A

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But what has this to do with the dropping of fruit? Many fruit growers have heard of investigations regarding the use of hormones to prevent pre-harvest dropping. Scientists at the U.S. Horticultural Station at Beltsville, Maryland, have found that many plant substances have the faculty of delaying normal abscission (dropping) of various plant organs including flowers, stems, petioles and even maturing apples. Recently, with several varieties, very low concentrations of growth substances applied as late sprays noticeably lessened the fruit drop. Other limited tests suggest the same result. We conducted similar tests this fall in two of our McIntosh blocks in Amherst. In one case, the results seemed favorable but, in the other, they were inconclusive. It is just possible that we used too weak a concentration (0.0005%) and perhaps the material used (naphthalene acetamide) was applied a little late. However, on the basis of the results to date, we believe this new method should be following with not more than a moderate enthusiasm by most growers until more is known concerning its possibilities.

Probably additional data on this subject will be forthcoming during the next few months. Further, next season, we plan to carry on more extended experiments here at Massachusetts State College. If growers wish to try out hormone spraying on a small scale, a good plan to follow is to select trees of the same age, with similar vigor and crop and leave alternate trees in the same row, for example, as check (untreated) trees. Otherwise, comparisons of any value will be difficult to make. (Additional information on these new materials will appear in the next issue of *Fruit Notes*.)