

RECENT TRENDS IN PLANT DISEASE CONTROL

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The purpose of this study was to discover whether there have been any significant changes in emphasis on the type of disease control studied and recommended by plant pathologists throughout the world during recent years.

The figures are derived solely from the Review of Applied Mycology, which thoroughly covers the field of plant diseases and their control and is held in high regard by all plant pathologists. This, of course, involves the possibility of error due to the changing interests of the abstractors, a supposition which seems exceedingly unlikely since the abstracts are made by professional abstractors and are of a very high order of excellence. The period covered is 1922 to 1938, inclusive, though Volume 1 (1922) of the Review of Applied Mycology is very small and was omitted from some of the computations.

The method was simply to count the references to control methods without attempting to weight them. A book or article which discussed a single method exhaustively counted only one. On the other hand, an article which, without any special basis for such recommendations, suggested 4 or 5 different methods, was given one count for each method. In other words, we were studying interests and opinions, not results. Curves were plotted based on 3 or 5 year moving averages to bring out trends and from these the following conclusions were drawn.

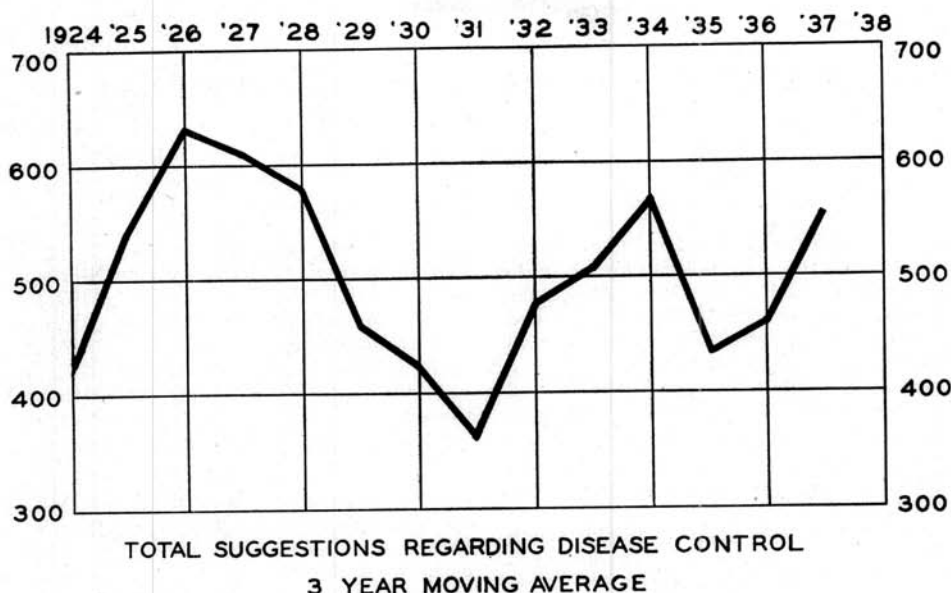
Considering, first of all, the total number of references to disease control, it was evident that following a slight increase in the already large number of such references, approximately 550 each year, with which the period opened, there was a sharp drop beginning about 1926 and culminating in 1931 followed by a second increase and a smaller drop in 1935-36. In spite of possible errors due to the method, I am inclined to believe that at least the first big decline indicates a natural loss of interest in the control of plant disease

associated with a marked surplus in agricultural products in most, if not all, of the countries in which plant pathology is actively studied; and that the increase soon after 1930 is also significant since it is at least contemporaneous with some business recovery, and some control of the volume of agricultural production in many countries.

The most significant single fact which appears from this study is that throughout the period spraying and dusting taken together make up approximately one-third of the total number of suggested control measures. While there is, of course, some fluctuation from year to year, these two closely related methods have retained against all competition their supremacy in the mind and work of plant pathologists, a development in striking contrast to the prediction made by Erwin F. Smith in 1902 (*Science* 15:601-612) "In my judgment, the treatment of diseases by spraying with copper fungicides has reached its climax and is now on the wane."

Next in importance and closely related to the foregoing, comes seed treatment which shows some decline in popularity from its high point of nearly 20 per cent about 1926 to a low of about 13 per cent in 1933, followed by an increase due very probably to the development of new and very effective chemical compounds for this use. Recommendations for the selection and breeding of resistant varieties as a means of disease control have been somewhat more numerous proportionately during the last ten years than they were at the beginning of the period under discussion. They still make up only a little over 10 per cent of the total suggestions for disease control.

Interest in local sanitation, including eradication, as a means of disease control, has been relatively less during the last half of the period under survey than earlier, the number of recommendations



declining from 12-13 per cent to 6-7 per cent.

Control, or rather the avoidance of plant disease by seed certification, and the use of clean seed and planting stock, showed almost continuous decline from 1924 to 1931 with a very slight rise since that time. The actual number of such recommendations, however, never reached 5 per cent of the total. Heat treatments which are, of course, always a very small proportion (less than 2 per cent) of the total, reached the height of their popularity about 1930-31 and have since fallen off appreciably.

It may be argued that some or all of these cases in which we find fewer recommendations of a given type, are due to the fact that the control methods that have been worked out are well known to growers and are applied so generally that there is no need of further recommendations. This, however, is not true in the case of spraying, the best known and most widely used of all control methods.

A definite and continuous recent change appears in those recommendations which deal with the addition of small amounts of essential chemical elements to correct what are now well known as soil deficiency diseases. The earlier recommenda-

tions, of which there were very few, usually comprised merely a suggestion that better fertility would be beneficial. Beginning about 1928-29 there was a decided increase in the number of such recommendations and by 1935 ten per cent of all suggestions for disease control dealt with this phase. At the same time they became decidedly more specific. During recent years, instead of general recommendations of higher fertility, there appear specific recommendations for the correction of some particular deficiency. This, of course, directly reflects an increase in our knowledge regarding the importance of the so-called "minor" elements. In this development, the different elements have shown some competition among themselves. The most popular at present is boron. The curve for recommendations of boron shows a steady upswing beginning in 1930 and apparently the end is not yet.

Except for this single item there is little to indicate very marked changes in basic principles of disease control during this period, which may be taken to indicate the inherent conservatism of plant pathologists or the difficulty of improving greatly on the basic methods, many of which were discovered over a century ago.