

THE RADIO WARNING SERVICE FOR APPLE AND PEAR SCAB IN THE NETHERLANDS IN 1961 AND 1962¹

De radio-waarschuwingsdienst voor appel- en pereschurft in Nederland in 1961 en 1962

DOOR

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INTRODUCTION

A radio scab warning service in the Netherlands was started by the Plant Protection Service (P.D.) in 1948. Initially there was close collaboration with the Royal Dutch Meteorological Institute (K.N.M.I.), whilst lately a number of fruitgrowers have made yearly observations. Later in 1956 the Horticultural Extension Service (R.T.V.D.) took part in this complex organisation. Since the beginning there have been gradual changes in the type of basic observations, the instruments used, the organisation of the service and the character of the warnings, influenced to a large extent by increased knowledge about the biology of the fungus, the development of new types of spray compounds with principally other ways of combating the scab fungus, increased knowledge of the growers, higher demands of the market for fruit quality and the availability of better and faster working spray-equipment.

In the following chapters a short description is given of the present state of the service and the principles on which it is based. The biology of the scab fungus and the principles of control are supposed to be known. A more thorough description of the state of the service in 1957 has been given by MEIJNEKE (1957).

THE OBSERVATIONS

To obtain a good control of apple and pear scab it is necessary to follow the development of the trees, the development of the fungus and the weather conditions. Yearly observations of these three factors are made shortly before and during the period of possible ascospore release.

The development of the trees is followed each spring from bud swelling until the end of blossoming by a number of fruitgrowers spread over the country. They report on stages of development of the main apple and pear varieties by means of preprinted and addressed post-cards, which are filled in and sent to the P.D., as soon as a new stage has been reached. These data are plotted on a map. For discussion of the backgrounds see MEIJNEKE (1957): 266–267.

The development of the fungus in spring is followed at the Plant Protection Service situated at Wageningen in the centre of the country. This is done by observing in the laboratory the ripening of perithecia and ascospores in overwintered leaves. In this way the times of perithecia maturity are fixed and the beginning and end of ascospore release noted. For a description of the methods see MEIJNEKE (1957): 264–266.

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Weather conditions are only observed during the period of ascospore release. Only those conditions which can give rise to infection are of importance. Periods of leaf wetness and the mean temperature during these times are registered by instruments at a number of observation posts spread over the country. From these data, infection periods are determined at each observation post according to the instructions of MILLS in MILLS & LAPLANTE (1954), revised by ROOSJE (1959). The particulars are centralized at the P.D. immediately after each infection period.

THE INSTRUMENTS

Registration of leafwet periods is done by specially developed leafwetness recorders. Since 1960 all observation posts have used a "DE WIT leafwetness recorder" developed by POST (1959a) after an idea of SCHNELLE (1959). These instruments are placed between the trees with the centre of the recording chart at a height of 1.50 m. Records of the temperature are taken at 19 posts by a thermograph, placed in a weather screen at a height of 1.50 m. The thermographs have a one week rotation. These thermographs are controlled at each post by a stamped and verified thermometer, which is also placed in the weather screen, together with a SIX maximum-minimum thermometer.

At 57 other stations a continuous record of the temperature is not kept but necessary temperature data are obtained by the use of a stamped and verified dry bulb thermometer and a SIX maximum-minimum thermometer, both placed in a small weather screen.

THE ORGANISATION OF THE SERVICE

The organisation is a pyramidal one. The Main Central Post (M.C.P.) is located at the P.D. It receives the data from 15 Regional Central Posts (R.C.P.'s), which gather the data from Primary and Secondary Observation Posts in their region, 19 respectively 57 in number in 1961. The Regional Central Posts are manned by officers of the Horticultural Extension Service, and in a few cases by officers of the Plant Protection Service, the Primary Observation Posts mainly by heads of experimental orchards and in a few cases by fruit growers, the Secondary Observation Posts by fruitgrowers, who co-operate on a voluntary basis.

Infection periods are reported as soon as possible by telephone. Secondary and Primary Observation Posts report to their Regional Central Post and this one to the M.C.P. Moreover the data are noted by each observer on special record sheets. Completed sheets are sent in weekly by the Primary Observation Posts but only when infection periods have occurred by the Secondary Observation Posts. The data on the sheets are used by the K.N.M.I. to check the instruments, especially the thermographs and thermometers. When an apparatus gives inaccurate readings it is repaired or replaced immediately by the M.C.P.

Infection periods reported to the M.C.P. before 11.30 a.m. are broadcast at 12.30 p.m., those reported before 22.- p.m. are broadcast the next morning at 5.45 and 6.40 a.m.

The decision to phone lies initially at the Primary and Secondary Observation

Posts. The Regional Central Post has the task of verifying the data as far as possible and eventually decides whether to ask for information from those observation posts that did not report at a certain time.

The M.C.P. plots the data received from the telephone-calls. During and after plotting "gaps" in the data become visible. Moreover the boundaries of the infected region have to be determined. This post then decides whether to phone in order to fill in the data from the missing stations or the "frontier stations".

The speed of the system depends to a large extent on the speed of the telephone-traffic. This is fully automatic almost throughout the country. Moreover the M.C.P. has a special "secret" telephone-number for this scab-warning service in order to overcome the hazard of the normal telephone-lines of the M.C.P. being blocked by other calls.

The M.C.P. is responsible for the wording of the warnings; the K.N.M.I., however, for eventual meteorological aspects in the warnings. The text is phoned by the M.C.P. to the K.N.M.I. for incorporation in their special weather talk, during which telephone-call the text is checked meteorologically. The warnings contain the regions, sometimes the stations, where infection periods took place as well as the hour of commencement per region or station, depending upon the situation (infection caused by rain front passage or by showers).

Only in the first warnings are remarks made concerning the state of development of the fruit trees. These remarks contain data about the susceptibility of the trees in different regions of the country.

THE WARNINGS

Warnings are issued when:

- a.* the ascospores are almost mature;
- b.* ascospores are expected to be released following rain;
- c.* ascospore release has begun in the open;
- d.* infection periods have occurred somewhere in the country;
- e.* ascospore discharge has ceased.

The warnings are incorporated in the daily weather talks given by the K.N.M.I. especially for agriculturists and horticulturists. During the growing season these talks are given three times a day at 5.45, 6.40 a.m. and at 12.30 p.m. on weekdays and once only on Sunday at 6.40 a.m.

The warnings at 12.30 p.m. are very short because of the brief time available for the weathertalk (2 min.), in which also warnings about pests for other crops have to be incorporated. More time is available at 5.45 and 6.40 a.m. (about 10 min.), hence the warnings can then be somewhat more extensive.

THE MEANING AND USE OF THE WARNINGS

The scab warning service is meant to help the grower by giving him some of the facts he should know before deciding whether to spray. The action he eventually takes is left entirely to his discretion, thus the wording of the warnings is informative, not authoritative. Comments about the necessary sprays or compounds to use are generally not included.

This system assumes that the growers have been fully instructed in the interpretation of the warnings. Information about the warning service and the possible interpretations are provided in their technical weekly's, in meetings during the winter and again shortly before ascospore release starts. This instruction is given mainly by the R.T.V.D.

The warnings, or perhaps better, the messages, receive different interpretations by the fruit growers depending on whether they spray protectively or curatively. Warnings *a* and *b* (see former chapter) are of importance to all fruit growers and have the function of a "be on your guard"-sign. Nature does not always give time for the second pre-warning (warning *b*).

Those who wish to control scab by protective measures have to apply the first spray after the second, eventually after the first prewarning. Where the danger of early infection by conidia from wood scab exists, spraying should begin immediately after the trees develop susceptible parts. Usually this is shortly before or after the first pre-warning. In the Netherlands it is seldom necessary to do this because of the lack of wood infection. It is only in some pear orchards or with apple-varieties like Cox's Orange Pippin that danger exists, but then only in badly managed orchards.

The warning issued under *c* (ascospore release has begun in the open) indicates that every grower can expect an infection to take place. Those spraying protectively should either have sprayed or should spray immediately, assuming that the trees have susceptible areas. In the Netherlands this is not always the case in every part of the country. Where the trees have no susceptible areas spraying can be postponed. Trees are susceptible at or shortly before the green tip stage. For those spraying curatively this warning is a "be on your guard"-sign.

Warnings of infection periods are of different value to the two groups of fruit growers. For the protectively spraying group they raise the question of whether the last spray was carried out too late to be sure of a complete effect. Then they have the opportunity to correct their spray programme in two ways:

- a.* to apply immediately a curative spray of for example either organic mercury, dodine or cepyram;
- b.* to apply as soon as possible and at short intervals two or more sprays having only a protectant action. This should stop further infection, and localize established infections.

Knowledge of infection periods enables growers to analyse at a later date the effect of their spray-programme and the effect of the compounds used. If necessary a change in their schedule can be made next year. Knowledge of infection periods is indispensable for the grower who wants to spray curatively; however, curative spraying can be used in the Netherlands only until blossoming or at the utmost until the end of ascospore-release in order to avoid spray damage. The choice of compounds is limited as those which possess curative action all have phytotoxic effects on certain varieties under certain circumstances, when sprayed at a normal concentration, as is done in the Netherlands. This is one reason why curative spraying is not practised generally. Where it is followed its use is limited at the latest to the end of ascospore discharge, hence the reason why warnings cease at that time.

In conclusion it can be said that the date for the completion of ascospore

release is an arbitrary one as the number of ascospores released diminishes only very gradually during June and the first half of July. However, those released in July lose their importance compared with conidia as a source of inoculum. Only when the orchard is very isolated and could be kept completely free of infection till July small numbers of ascospores released in July may still have some importance.

DISCUSSION

The purpose of the radio warnings is to provide the grower with a "tool" to help him in his decisions regarding his spray programme. The manner in which he uses this information is for him to decide.

Clearly it is impossible to describe precisely in which regions infection has taken place and where the limits lie. This last item cannot be determined exactly even with a series of wide spread observation posts. POST (1959b), however, has gathered sufficient data about warnings based upon observations by a central observation post to justify a warning service with a relatively small number of such posts.

As listening and remembering are difficult a visual presentation of the collected data would be helpful in increasing the effectiveness of the warnings, thus the use of television for explanation of the map with the plotted data of infection periods is to be recommended, provided that there are enough television sets on fruit farms or in fruit centres and that use can be made of this medium when necessary, i.e. at least once a day during rainy periods.

A further drawback of a centralized warning-system is that where an infection period has been caused by the passage of a rain-front the areas affected can be predicted; however, in the case of rain showers this is more complicated.

All these draw-backs lead to the conclusion that the ideal situation would be for each individual grower to determine the infection periods for his own orchard. The costs of the equipment need not to be an impediment, for it is inexpensive and the saving in the number of sprays applied and the better control would soon justify the expense. It is a matter of educating the fruit-growers in the methods of handling the instruments and determining the infection periods.

Expenditure depends to some extent on the apparatus used. In this respect there is a considerable difference in the leaf-wetness recorders developed in different countries. In the Netherlands the leaf wetness recorder of DE WIT Ltd. is generally used and costs about f 260.—; a good thermograph f 275.—; a control thermometer f 15.—; a weather screen f 100.— These and some other items give a total cost for equipping an observation post of approximately f 675.—.

In Belgium a thermohumectograph as developed by BAZIER, costs about f 750.—, but it has the advantage, that a separate thermograph is not needed and that both readings can be seen on the same chart. Moreover a weather-screen is not needed, but a control thermometer with a special simplified screen is indispensable. The costs of equipping an observation post with the Belgian apparatus would be approximately f 775.— – f 800.—.

In Germany the "Tauwaage" by HILTNER is generally used. This apparatus costs about 450.— DM. With a thermograph, control-thermometer, weather screen, etc. the total costs would be circa f 830.—.

In Great Britain the simplified leaf-wetness recorder developed by The Meteorological Office in collaboration with HIRST is produced commercially by Casella Ltd. This instrument costs circa f 800.—. The total costs of equipping an observation post would be about f 1200.—.

A comparison of the leaf wetness recorder of DE WIT with the thermohumectograph of BAZIER showed that both instruments were adequate; however, there was some evidence that the first apparatus had some advantage over the second in registering the difference between dew or fog and rain.

One has to remember, however, that any apparatus only gives an approximate estimate of the conditions prevailing throughout an orchard. Each instrument only registers a single point observation, whereas there are many thousands of leaves present all under different drying conditions. Moreover the drying conditions early in the spring, when there are only a few small leaves present, differ greatly from those later in the season, when the trees are in full leaf. Only the thermohumectograph can be adjusted to allow for this last factor. But in any case in the beginning a calibration of the instruments by visual observation is necessary in order to determine a mean standard deviation with which the instruments readings can be corrected. Eventually several corrections for different parts of the season have to be made.

In conclusion it may be said that many fruit growers in the Netherlands regard the radio warnings about scab and scab infection periods as an important aid in the control of apple and pear scab, in spite of the draw-backs mentioned in this chapter.

SAMENVATTING

De organisatie van de radio-waarschuwingdienst voor appel- en pereschurft in 1961 en 1962 wordt beschreven. Door een landelijke centrale post (L.C.P.), die in de Plantenziektenkundige Dienst (P.D.) was gevestigd, werden tijdens de periode van ascosporen-uitstotingen van 15 regionale centrale posten (R.C.P.'s) gegevens verzameld over de duur van de bladnatperioden en de temperatuur tijdens deze bladnatperioden. De waarnemingen van de 15 R.C.P.'s waren op hun beurt afkomstig van 19 primaire en 57 secundaire waarnemingsposten, verspreid over het land. De uitrusting en de taak van de verschillende waarnemingsposten worden vermeld.

Door de landelijke centrale post werden vijf soorten berichten uitgegeven. De eerste drie soorten hebben betrekking op het begin van de ascosporen-uitstotingen; het laatste bericht geeft het einde van de ascosporen-uitstotingen aan. Daartussen vinden meldingen van het optreden van infectieperioden ergens in het land plaats. De betekenis van alle typen berichten wordt besproken.

Een vergelijking van de kosten van uitrusting van waarnemingsposten bij gebruik van verschillende bladnat-registrerende apparatuur valt uit ten gunste van de in Nederland ontworpen en gebruikte „DE WIT-bladnatschrijver”.

De radio-waarschuwingdienst voor appel- en pereschurft wordt, ondanks de daaraan verbonden en vermelde bezwaren, door vele fruittelers in Nederland beschouwd als een belangrijke steun bij de bestrijding van appel- en pereschurft.

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