flat limb. The yield may be good but it is impossible to grow a well shaped tree. So the growers will eradicate such trees even if the yield may not be influenced so much (THIEM).

In New Zealand flat limb causes serious losses in the Gravenstein variety as branches showing severe symptoms stop growing and the fruits become small and rough (ATKINSON).

T. Pl.ziekten 62 (1956): 46–49

ROUGH SKIN OF APPLES [1])

BY

W. VAN KATWIJK

Plantenziektenkundige Dienst, Wageningen, Netherlands

In contrast to the situation in stone fruits of which already a large number of virus symptoms is known, in apples and pears only few virus diseases have been found. In Holland some of these virus diseases occur.

Symptoms of unknown cause on the fruits of apple trees of the varieties Belle de Boskoop and Glorie van Holland in scattered orchards were found in the Netherlands several years ago. These symptoms which are generally well defined concern a roughening of small or larger parts of the skin of the fruits and cause serious losses.

Rough corky brown patches develop on the skin of the fruits. Sometimes these patches are small and have a somewhat circular shape. In other cases rough brown rings or elongated stripes can be seen, whilst the fruits of heavily infected trees often show a roughening of large parts of the skin. It has been observed that in some cases the rough brown patches are cracked and the fruits may show a slight deformation due to local growth retardation. The patches develop both in the green and coloured parts of the skin.

The symptoms mentioned occur first on the fruits of one or some branches of an infected tree, but gradually they appear also on the fruits of other branches and finally they can be found over the entire crown. The number of affected fruits of a tree increases rather rapidly within a few years.

Fruitgrowers have observed that the number of infected trees in orchards also increases during a period of several years. For that purpose one fruitgrower kept apart the apples of each Boskooptree in his orchard during picking time and sorted them out on rough skin symptoms. From these observations it has become likely that there is also a spread of the disease from tree to tree. However it is not yet known whether this spread takes place in a natural or artificial way.

This disease, which in the Netherlands is called 'ruwschilligheid', meaning 'rough skin', causes heavy losses. The growth of the fruits of infected trees is retarded and in consequence these fruits remain smaller. Affected fruits can be sorted only in the lowest commercial grades and have only little market value.

The rough skin symptoms can already be found soon after the first development of the fruits. In our country the disease is only found in older trees.

As was said before mainly the apple varieties Belle de Boskoop and Glorie

[1]) Photos of the symptoms have been published in Tijdschr. o. Plantenz. 61: 4–6 (1955).

van Holland develop rough skin symptoms in the Netherlands, but the disease was also found occasionally in some other varieties as Dijkmans Zoet, Golden Delicious and Notaris.

In order to investigate the rough skin problem an inquiry was set up in 1951 among fruitgrowers in various parts of the country. From this inquiry it became clear that the disease occurred in trees on all kinds of soil, on various rootstocks and under different food conditions. Only the bad water conditions of the soils showed correlation. A second possibility was that the symptoms might be of virus nature. Thus in 1952 experiments were set up in the experimental garden of the Plant Protection Service at Wageningen. Five out of ten healthy young Boskoop trees – red type – were grafted, each with four to five grafts of Boskoop trees – green type – showing rough skin symptoms. The other five trees remained ungrafted for comparison.

In 1954 fruits developed on the branches of both the indicators and the grafts. After examination in September some fruits just below the grafts on the branches of the indicators turned out to show rather clear rough skin symptoms. The other apples of the indicators were still symptomless. It should be stated here that the apples of the grafts showed the symptoms very clearly. On the non-grafted trees not a single apple with rough skin symptoms was found. Evidently the rough skin symptoms are grafttransmissable and must be caused by a virus.

One month afterwards, in October 1954, a fruitgrower who grafted some grafts from diseased trees on a healthy Boskoop tree, came to the same conclusion.

In other countries similar symptoms have been found. In Germany a disease called 'Stilettenkrankheit', is known. The symptoms agree with the rough skin type, which shows small cracks in the rough patches. In Switzerland rough skin symptoms in Boskoop-apples locally cause considerable losses in the quality of the fruit. FISHER reports on this matter.

According to personal information from BLUMER and BOVEY rough skin symptoms are found in southern Switzerland. They also detected rough skin apples on the market at Avignon, France. Furthermore similar symptoms occur in Denmark and in Sweden, where RAMSFJELL detected a slight cracking of the fruits, which he calls star-cracking.

MULDER, at Wageningen, observed trees of the variety Glorie van Holland with rough skin symptoms on the apples. He found a slight local clearing of small parts of the veins in only a few leaves near the tops of some shoots. Since he found similar leaf symptoms on the leaves of Boskoop trees grafted with rough skin diseased Glorie van Holland he suggests that they may be associated with the rough skin virus disease. However this supposition has not yet been proved definitely. As a matter of fact such vein clearing symptoms should facilitate the detection of infected trees in summer, when rough skin symptoms on the apples are not always very clear.

In general however one can see the first roughening already shortly after the first development of the fruits. Later in the season some patches may crack. These symptoms differ from those observed in New Zealand and Canada, called respectively green crinkle and false sting.

Both green crinkle and false sting are characterized by rather severe cracking of the fruits, whilst only later in the season some slight roughening in these

cracks may appear. We never found such severe deformation of the apples as shown for green crinkle by ATKINSON this morning. I therefore have the opinion that rough skin and green crinkle or false sting are not identical. Some symptoms of the ring spot virus disease mentioned from New Zealand resemble those of our rough skin. We did not yet find however those concentric rings.

Summarizing we can conclude that the rough skin virus disease of apples gives serious problems when growing certain apple varieties in the Netherlands as well as abroad. In the Netherlands the disease has not yet been found in young trees in modern orchards owing to careful selection of the mother trees, which are used for propagation by means of grafts.

LITERATURE

FISCHER, H., – 1955, Ungewöhnliche Berostungen und Rissbildungen bei Boskoop, Glockenapfel und anderen Apfelsorten, eine Viruskrankheit? Schweiz. Zeitschr. f. Obst- und Weinbau 64 (7): 125–131.

KATWIJK, W. VAN, – 1952. Ronde bruine vlekjes op appels. De Fruitteelt 42 (28): 544–545.

KATWIJK, W. VAN, – 1955. Ruwschilligheid bij appels, een virusziekte. Tijdschr. over Plantenz. 61: 4–6.

MULDER, D., – 1955. Ruwschillige vruchten en een bladsymptoom bij appel. Tijdschr. over Plantenz. 61: 11–15.

VLASVELD, W. P. N., – 1952. Wat is er met die appels aan de hand. De Fruitteelt 42 (34): 642–643.

DISCUSSION

POSNETTE: In England there has been found a disease similar to rough skin. This disease is called 'star crack'. The variety Cox's Orange Pippin is the most commonly affected in England. Has this variety been found affected in the Netherlands too? In other varieties the symptoms may vary. Rough skin with only little star cracking has been found in the varieties James Grieve, Boskoop and Bramley's Seedling in England. Furthermore it has been observed that infected trees start flowering about three weeks later than healthy trees. Is this phenomena known from Holland too?

Answer: In the Netherlands only the varieties Belle de Boskoop and Glorie van Holland have been found severely affected. In Cox's this disease has never been found up to now. There are not yet any details available on the beginning of the flowering time of diseased trees in Holland.

SCARAMUZZI: What is the difference between the ringspot disease in New Zealand and the rough skin in the Netherlands?

Answer: Many of the symptoms of rough skin resemble very much those of ring spot, but we never found these concentric rings and also no serious deformations. In future these diseases probably may show to be caused by the same virus or by strains of the same virus. Further experiments with uniform indicators must be set up to detect whether there is a connection between these two diseases.

The deformation has only been found in a few cases (POSNETTE).

The deformation is typical for the green crinkle, not for the ringspot (ATKINSON).

ATKINSON: Is there any dieback associated with the rough skin in the Netherlands?

Answer: No, in the Netherlands dieback symptoms were never found in the affected varieties.

In England dieback has only been found in the Cox's variety showing star crack. Other varieties infected do not show dieback (POSNETTE).

CIFERRI: Symptoms of rough skin and of green crinkle have not been found in the same varieties. Is it known if green crinkle on unripe fruits probably evolves to rough skin in ripe ones?

Answer: This is not likely. Green crinkle shows early in the season, infected fruits often being severely distorted. Ring spot and rough skin show later in the year and do not cause distortion (ATKINSON).

STANCOVIC: Is there something known about the influence of ecological conditions on the development of rough skin?

Answer: Rough skin symptoms have been found every year under often quite different conditions. Only this year few clear symptoms can be found, probably as a result of the warm and dry summer.

T. Pl.ziekten 62 (1956): 49–50

THE LEAF ROLL VIRUS DISEASE OF SWEET CHERRY

BY

A. F. POSNETTE

East Malling Research Station, England

The presence of leaf roll disease (POSNETTE, 1955) in three orchards in Kent has been confirmed by graft transmission; this is at present the only means of clearly distinguishing the disease from those caused by other lethal pathogens, such as *Armillaria mellea* and *Pseudomonas mors-prunorum.*

SYMPTOMS ON DIFFERENT HOSTS

Upward rolling of leaves has been a constant symptom on all varieties inoculated, including Bing, Early Rivers, Hedelfingen, Schrecken Bigarreau and F12/1. A severe bark necrosis and gumming at the point of inoculation have been characteristic reactions of F12/1; this results in the death of the stem above the inoculation point and strong suckering from below it. Swellings develop on the two-year-old and older stems of F12/1, apparently caused by the breakdown of the medullary rays to form gum-filled pockets. Leafing and flowering of F12/1 and Early Rivers are delayed in the spring. Flower pedicels are short, many being only half the length of those on healthy trees.

Mature orchard trees of Early Rivers may be killed within 3 years of the first appearance of symptoms. (These symptoms were illustrated by lantern slides).

When inoculated in the glasshouse in May or June, young seedlings of peach and apricot were severely stunted, and died in the following year. Myrobalan seedlings developed leaf rolling but were not otherwise severely affected.