SYMPOSIUM ON FRUIT TREE VIRUS DISEASES

Wädenswil and Lausanne June 21-25 1954

Abstracts of the lectures.

Introduction

Virus diseases on fruit trees are widely spread in Europe since quite a long time, however the true character of these diseases has not been recognized. I suspect that the "rheinische Kirschbaumsterben", studied at the turn of the century by Aderhold, Goethe, Ruhland and Sorauer, is nothing else than our Pfeffinger disease whose damages have been accentuated by frost during these years. As long as the european fruit tree culture was not carried out intensively, these diseases were not of such an economic importance as they are now in the extended american monocultures.

Atanasoff (1935) and Christoff (1938) in Bulgaria and Arnaud (1936) in France firstly proved experimentally the occurrence of stone fruit viruses in Europe. This work was continued only during the last years. Compared with the work done in America we are in Europe only in its beginning.

For our symposium two main problems must be taken into consideration:

1) It must be examined if the european virus diseases are identic with those in America. It seems possible that some differences in the symptom expression may depend on the different varieties used in the two continents. We have to test therefore our european viruses on american varieties. This work needs a close collaboration between the european specialists. The results are comparable only if they are achieved exactly under analogous conditions. Our american colleagues can refer in this respect to their famous Handbook no 10, a proof of an excellent team-work.

2) The natural spreading of most of our virus diseases on fruit trees does not suffice to spread over large countries or even continents. These diseases are propagated mainly by means of infected rootstocks and scions. A consequent nursery improvement and a careful inspection of mother trees will be the main task for an efficacious control of virus diseases on fruit trees. The same standardized test methods should be applied in all countries. In this respect too american authors have done a pioneer-work in developing several indexing methods and we still hope that the cucumber test or a simple chemical method will come from West.

The solution of all these problems will be favorized by an international cooperation and by a close contact of the workers in this field. We should be pleased if this symposium could contribute a little toward this aim.

Wädenswil, June 7, 1954. S.Blumer

L.C. Cochran

VIRUS DISEASES WHICH CAUSE THE MOST DAMAGE TO PEACH TREES IN THE UNITED STATES

Until 1930 only four viruses were known to affect and damage peach in the United States. These were all located in the eastern part of the United States. Peach yellows first became known about 1750 and before its cause was determined and control methods were developed, it destroyed peach culture in many regions of northeastern United States. Today it is rare and is considered a minor disease. Little peach and red suture, first seen about 1890, are apparently caused by strains of the peach yellows virus. They produce lesser tree symptoms and are harder to recognize, hence are not removed as promptly as yellows. In some areas, particularly in Michigan, they continue to recur and cause damage. Peach rosette is a spectacular disease and, because of its characteristic severe rosetting effect followed by quick death, can be readily recognized and controlled by prompt removal.

The phony disease of peach, which occurs in the southeastern section, is probably the most serious virus disease of peach in the United States. It was seen as early as 1885, but its cause was not known until 1929. It does not kill trees, in fact, it causes them to appear more healthy than normal in its early stages, but by the second year reduces the fruit in quantity and in size to non-commercial grades. The disease is spread by large, long-lived, long-ranged, leaf hoppers and has an incubation period of 2 to 4 years, in the interim of which it can be spread from incubation stage trees, therefore it is not as effectively rogued as peach yellows. Over 2,500,000 diseased trees have been removed and nearly 100,000 new cases occur annually.

Peach mosaic, discovered in 1930, occurs in southwestern United States. Similar to phony, peach mosaic does not kill trees but renders them commercially unproductive. The symptoms are chiefly leaf mottling, dwarfing of trees, bumpy fruit, and reduced yield. In intensively farmed areas, peach mosaic can be reduced to less than one per cent of the orchard trees by roguing diseased trees. The limiting factors of control of peach mosaic are little-damaged, tolerant peach varieties which act as reservoirs and wild hosts.

X-disease, discovered in Connecticut and now occurring in all the New England States and northern Central States, is primarily a disease of the native chokecherry, which it eventually kills and from which it moves on to peaches and sweet and sour cherries. It is effectively controlled by removal of chokecherries from the immediate vicinity of orchards. Western X-disease, so termed because it occurred in western United States apart from X-disease and appeared to differ from it, is a serious disease of peaches and cherries in western United States. It differs from X-disease chiefly in the fact that spread appears to occur independent of chokecherry and moves from tree to tree in the orchard. Roguing appears to be the only control, but may be complicated by the occurrence of natural hosts. There appear to be a number of forms of the causal virus, causing variable expression of the disease in peach and cherries.

Several other virus diseases affect peach in western United States. Some of these are wart, Muir dwarf, yellow bud mosaic, necrotic leaf spot, willow twig, ring spot, asteroid spot, etc. Of these, yellow bud mosaic is the most serious. While it is still restricted to relatively small areas, it eventually kills trees and control is complicated by its occurrence in other Prunus hosts. Peach wart produces no symptoms on affected trees except on the fruit, which it completely ruins. It apparently does not spread or spreads very slowly under western orchard conditions and can be

controlled by diseased-tree removal and elimination from nursery stock. Muir dwarf, similar to phony, causes trees to become dense and dark green in color and reduces fruit set, but appears to be restricted to the Muir variety. This variety was used chiefly for drying and is being replaced. Ring spot appears to be primarily a cherry disease, the causal virus being seed transmissible in Mahaleb and Mazzard seedlings, but causes serious damage to some varieties of peaches, such as Rio Oso Gem, Rochester, etc. Willow twig appears to cause bare unfruitful twigs, particularly on the J.H.Hale variety, but is limited in distribution. Asteroid spot is prevalent in southwestern United States, particularly in Texas, and although it causes considerable leaf spotting and some leaf drop, does not cause serious crop reduction. Peach stunt, a condition which may be caused by more than one distinct virus, occurs sporadically in several widely separated areas and is giving some concern.

M.F.Welsh

STONE FRUIT VIRUS DISEASES IN BRITISH COLUMBIA AND NEIGHBOURING PARTS OF THE UNITED STATES.

Fourteen virus diseases are recognized and named in British Columbia stone fruits. These are: little cherry, small bitter cherry, Lambert mottle, mottle leaf, twisted leaf, rasp leaf, rugose mosaic and ring spots in sweet cherry; sour cherry yellows and reversion in sour cherry; western X-disease and wart in peach; ring pox in apricot; dwarf in prune. Because the relationships of causal viruses are imperfectly understood it is uncertain whether the exact number of diseases is less than fourteen or much larger.

The most serious disease is the little cherry disease of sweet cherry. This disease was observed first in 1933 in a single orchard. During the ensuing fifteen years it spread through all trees of almost all orchards of the Kootenay fruit-growing region, a total of approximately 40,000 trees. It has not spread into other parts of British Columbia or into the United States. Attempts to introduce the disease into other commercial stone fruits have been unsuccessful.

The most serious of the other diseases in sweet cherry are Lambert mottle and twisted leaf. These diseases are still present in only a few widely separated orchards, but their rate of spread is sufficiently rapid to cause alarm. There is considerable variation in the symptom expression of both diseases.

The most serious disease in peach is western X-disease, which occurs in about 5% of the trees in several districts.

In the Okanagan Valley a disease of sweet cherry was discovered in 1940 with symptoms closely resembling those of little cherry. However, this disease spreads very slowly through infected trees, and the rate of orchard spread is so slow that it is not considered an economic problem. It has been named small bitter cherry. Transmission to peach causes symptoms of western X-disease.

In the neighbouring United States fruit districts western X-disease in peach occurs more frequently and is more serious. A disease occurs in cherry that causes symptoms similar to those of little cherry and small bitter cherry, and that spreads at a rate that is intermediate between these two diseases. This disease, which produces western X-disease symptoms when transferred to peach, is known as western X little cherry. It is believed to be identical with small bitter cherry. Four leaf hopper vectors have been found by workers in Washington.

All the other diseases that occur in British Columbia occur also in neighbouring United States districts. Two additional diseases of the Lambert mottle type, and known as rusty mottle and mild rusty mottle, occur in Washington and Oregon.

Ring spots are known to be present, usually as latent viruses, in most sweet cherry trees growing in the northwest states and British Columbia. Sour cherry yellows and prune dwarf are also believed to be present as latent viruses in many sweet cherry trees.

C.A.R. Meyneke

THE SPREADING OF A CHERRY VIRUS DISEASE IN THE NETHERLANDS

In the cherry culture in a certain part of the Netherlands one of the most common virus diseases is the "Eckelrader-virus disease". Mulder described it earlier. Similarity with the in Switzerland well known "Pfeffingerkrankheit" is great. A vector is not known untill now. Together with several symptoms in the leaves unfruitfulness is a result of the disease.

The impression existed that the disease was spreading fast. It was thought that it could become a threat for the cherry culture in that district.

Therefore a survey has been carried out in parts of the district during the years 1950 up to 1953. The purpose of this survey was to get an idea of the state of affairs and - by surveying the same part during several years - to get facts about the spreading in the course of time.

As a result a list of varieties, in which the disease can be found is drawn up. Till 1952 the virus was only found in sweet cherries. In 1952 it has been found for the first time in two scur cherry-varieties, of which one is the main cherry variety in the Netherlands and the other is the main Dutch rootstock for cherries. However, the disease has never been found in nurseries, but only in older orchards.

As a further result the survey had a stimulating effect on the pulling up of diseased trees, since the surveyors marked the trees.

A third result is that the Netherlands General Inspection Board for Arboriculture (N.A.K.-B) in future will not take any grafting material of cherries out of this district.

As to the spreading of the disease in the course of time, nearly a doubling of the number of diseased trees was determined in two years.

W. Kotte

OBSERVATIONS ON FRUIT TREE VIROSES IN THE SOUTHWESTERN GERMANY

The researches on the Pfeffinger disease carried out in Switzerland led our attention to this trouble in the germanswiss frontier districts. We observed this disease since 1947. Their occurrence being limited in Southwestern Germany it occasioned so far no great economic importance.

Another disease of cherry trees with symptoms like the Pfeffinger disease was found during these last years in the Netherlands too and of which similar observations were made in some other German regions. The cause for the occurrence of this virosis is completely unsolved hitherto. It seems not probable that only the importation of scions from other countries, e.g. from U.S.A. might be responsible. By no means one could admit a sudden spreading of eventual insect vectors. The presumption that this disease could have a spontaneous origin in different localities is obvious, but no proof has been furnished till now.

On apple trees, especially on older trees of the variety Boscoop, we found for the last years the apple mosaic. According to our observations this disease progresses very slowly, nevertheless considerable damages occur on diseased trees.

On plums we find occasionally the line pattern virus an apparently rather harmless trouble. Such trees observed during several years show no severe diminution of vitality.

The virus diseases on raspberries and strawberries are of much greater importance in our countries. Nurseries are already infected and the considerable trade with new varieties contributes to the increase of the danger. Attention is drawn to the attack by the raspberry leaf and bud mite (Eriophyes gracilis Nal.), not uncommon in our countries, the damage of which looks very like a virus disease. The mite cannot be detected with the optical means of the practician and an error in the diagnosis may bring a nursery undeservedly into discredit. Some pictures will illustrate the attack by mites and the mites itselves.

VIRUS AND VIRUSLIKE DISORDERS ON FRUIT TREES IN WESTERN GERMANY

Field observations effectuated since some years in orchards of southwestern Germany aim at a better knowledge of the distribution and the economic importance of degeneration diseases in fruit trees. These diseases may be classified into the reversible nutrition troubles and the irreversible virus disease and viruslike disorders. The purpose of this work consists in a symptomatology of degeneration diseases on fruit trees. These troubles are much more frequent in Southwestern Germany as assumed till now. The symptoms show considerable variations depending the variety and the atmospheric conditions. In sweet cherries seem to occur different degrees of symptoms leading from the ordinary symptoms on the leaves to the stunting and rosetting effect. In other cases leaf symptoms develop into a reduction of growth with a general weakening of the trees, increased susceptibility against other secundary influences and finally to the collapse of the tree (death of sweet cherries on the Bergstrasse). There are other cases where the growth of the trees seems to be normal although deformations of leaves and fruits, (Nussloch, Heidelberg), or partial monstrosities of flowers (Strehles Kirsche) are present.

In the top of fruit trees the following disorders are found: Local deformations of branches and twigs, brittle wood, soft wood with gummosis, rough bark in connection with stunted growth (pears), local swellings of branches (apple and pear), different kinds of witches brooms and canker formation on cherries. A special branching of sour cherry (Königin Hortense) is interpreted as a latent witche's broom.

Most of these troubles occur in nurseries too. To avoid losses all plants with anomalous growth most be eliminated. In cherry nurseries must be removed plants with chlorotic, curled, silvery, small and misshaped leaves. With these preventionary mesures a sanitation of orchards could be obtained. The spreading of virus diseases and "viroid" troubles do progress slowly only.

With the aid of pictures and dried material some instructive and doubtful cases will be illustrated and discussed.

NURSERY STOCK IMPROVEMENT AND METHODS OF CERTIFICATION OF NURSERY STOCK AND PROPAGATING MATERIALS FOR FREEDOM FROM VIRUS DISEASES.

Plant viruses are of especially great economic importance in fruit and nut trees, grapevines and other woody perennial plants not only because they can cause destructive systemic diseases in these hosts, but also because they can persist in the tissues and in all vegetative progeny of such plants so that the losses which result are not limited to the current season during which infection takes place. The viruses continue in these hosts and their vegetative progeny as long as the infected line is perpetuated. Since these viruses cannot, themselves, be seen by inspection methods, and since they can be present in some plants without any symptoms or visible evidence of the plants being infected, many infected plants which are symptomless carriers can act as reservoirs of virus infection and by the means for spreading the virus undetected from one place to another. Also, in other cases, plants may be infected and show only mild to moderate injury, either because of the mildness of the virus or because of the tolerance or resistance of the plants to the virus. For all of these reasons, it is extremely important that nursery stock and sources of propagating material be free of dangerous viruses. We now know that in our woody plants, and especially in our stone fruits, we have many more viruses than we once thought, and from time to time we are finding that unhealthy conditions of plants not previously diagnosed correctly are in fact caused by viruses.

The problem of improving the quality of our nursery stock and sources of propagating material and of developing a program for the certification that nursery stocks are virus-free has many ramifications. It is truly complex, and involves human and economic, as well as biological factors. Its solution requires education and explanation to the orchardists and the nurserymen of the economic advantages and ways to accomplish the objective, as well as the scientific methods for doing it. Although nurserymen desire to establish virus-free scion, budwood and rootstock source plantings, they often find that there is an initial increased cost to introducing and integrating new procedures. Our nursery trade has grown up on the practice of allowing for the minimum of expenditures on the securing of propagative materials. Sudden departure from this practice may have a temporary effect upon profits during a transition period from old to new methods, but eventually, and if properly maintained, propagative sources stocked with virus-free trees should be a highly profitable investment, both from the point of view of the nurseryman who wants to sell trees and scions and rootstock seeds or cuttings, and from the point of view of the orchardist and vineyardist who wants to plant virus-free stock. Many nurserymen and orchardists are now recognizing the economic importance of virus diseases and see the need for a program of producing nursery stocks which can be certified as virus-free. To the nurseryman this is important in meeting competition in marketing his products, and to the orchardist it is important in keeping diseases out of his plantings.

In the establishment of virus-free sources of propagating material there are several steps. First of all there must be sufficient research and accumulation of information concerning the diseases and the viruses which cause them to give us a scientific working basis. This part is accomplished by the research virologist. This research must include the development of suitable and practical methods for detecting, identifying and evaluating the viruses that affect nursery stock, together with methods of avoiding them. Detection and diagnosis are of paramount importance. With these tools we can proceed to the next step of making visual examination of the scion, budwood and rootstock source trees from which nurserymen obtain their propagating material. Usually these source trees are in commercial orchards and are growing, more or less, in the presence of virus diseases which may be infecting these

source trees themselves or other trees in the same planting or in the community. However, in the beginning of a program nurserymen must obtain budwood from such trees until other trees are provided. In our program we have examined these plantings and marked those trees which show disease so that the nurseryman could avoid them and take his budwood from the other trees which appeared to be healthy. Although visual inspection is the first step and serves to eliminate many diseased trees, there are some diseases which cannot be detected unless the trees have fruit at inspection time or unless the inspection otherwise is made in proper season. For instance, peach wart could not be recognized unless there were fruit on the trees because it does not affect other parts of the tree than the fruit. Other diseases, such as peach mosaic and peach yellow bud mosaic, express themselves best early in the growing season, while others, such as X disease and yellow leaf roll of peach, express themselves best late in the season. Still others may be seen in certain varieties of a fruit tree, but not in other varieties even though present because some varieties are tolerant or symptomless carriers of the viruses. These factors make visual inspection alone unreliable. It should be supplemented by transmission or index tests of the propagative source trees on a series of varieties which includes those susceptible to a list of diseases which might be present. If such a test fails to reveal the presence of viruses, then we conclude that our source trees are virus-free within our knowledge of how the virus can be detected. We do need new diagnostic tests, including those which can be made in the field and in the laboratory, and which can be made more rapidly than transmission tests which sometimes require many months. We feel extremely fortunate in the United States that our movement there for improvement of nursery stock and for producing it free of virus diseases, and the research toward this end, is organized on an interregional or national basis. There is frequent and extensive consultation and collaboration between the various research workers on stone fruit viruses in the different states, and rather extensive travel and field trips from one part of the country to another, with good collaboration and cooperation on the part of the individual investigators and those workers who are endeavoring to place in practical operation the results obtained in the research.

We have been stressing the idea that nurserymen should establish virus-free mother plantings to be used primarily for propagating sources, and a number of our nurseries now have such plantings or are in the process of developing them. One of the most important factors to be considered in looking for a suitable site for a virus-free planting is that of isolation. An unpredictable hazard is the future loss of isolation due to commercial plantings made nearby subsequent to establishment of the mother planting and frequently stimulated by the apparent healthy growth of the scion, budwood and rootstock source trees. Other factors to be considered are proximity to wild plant species which could serve as virus hosts, climatic conditions, soil fertility, irrigation facilities in arid areas, and accessibility.

Scion and budwood source trees, in addition to being virus-free, must be developed from vigorous and productive clones and from stock that is true to variety name. Such a program, therefore, requires a close cooperation with horticulturists and plant breeders. One cannot stress too strongly the importance of taking all precautions to see that new varieties, when developed and prepared for introduction, are maintained virus-free. There have been instances where the plant breeder, after developing a healthy seedling of a new variety, has topworked scions or buds of it onto a rootstock, and particularly onto an older tree, and then found too late that the rootstock or the older tree was infected with a virus. This can be disastrous to the new variety, even when the mistake is discovered in time to prevent distribution of the variety to new localities as nursery stock. If a new variety is worthy of perpetuation, it is of prime importance that it be free of virus diseases at the onset of its development, and to assure this it is essential that virus-free understocks be used. As a precaution, the original seedling should always be retained in its pure state until vegetatively propagated progeny is known to be established in a safe place on virus-free understock.

As a final thought, and of particular importance to nurserymen, it should be said that we have found, particularly in the case of certain viruses such as peach ring spot, that when budwood is taken from virus-free sources known to be vigorous and is budded upon compatible and virus-free rootstocks, which also have been selected for their vigor, a high budwood survival is obtained in the nursery row, and uniform stock of premium quality is the end product. This is of especial importance to the nurseryman in increasing his stand of trees in the nursery row and the total yield of trees in return for his time and expense in growing them.

THE MOST IMPORTANT VIRUS AND VIRUS-LIKE DISEASES IN ITALY.

APPLE - "Witches broom": on young trees in nursery and on old tree in the field. It seems to be a virus disease because it has been already transmitted by grafting. Diffused in the area of Verona, in Alto-Adige, and recently in the area of Ferrara.

" - "Die-back": in the area of Trento and Bolzano and in the Aosta Valley. Both of unknown ethiology.

PEACH - "Rosetting willow-leaves": it has been prooved to be a virus disease and it has been transmitted by grafting. It is diffused, but localized in the area of Savona.

" - "peach wart": it has been observed in Piemonte region, but it seems not largely diffused. Of relative importance.

" - "peach calico": (described as peach mosaic) diffused in Emily region, but apparently not important.

" - "phloem-necrosis": one of the most important phytopathological problems in the Veneto region of these last ten years. Sperimentally it has been prooved to be a potassium and phosphorus deficiency, in connection with organic matter deficiency. The symptoms appear also on 1-2 years old trees in nursery and are similar or to those described under the name of "false little peach".

" - "non infectious peach rosette": in the area of Alba (Piemonte), only in soils having precedently a mixed forest of deciduous trees. Caused by a toxic substance existing in the soil, but now disappeared after a few years of culture. The same symptomatology was found also on Alder trees.

ALMOND - "calico": diffused in the most part of South Italy where Almond is cultivated, but relativly not important under an economical point of view.

CHERRY - "die-back": still of uncertain ethiology, but it seems to be a nutrient deficiency disease. Very diffused in the area of Verona and in some areas of central Italy.

APRICOT and PRUNE - "die-back": almost the same symptoms of Cherry. It seems to be of the same nature.

OLIVE - "phloem-necrosis": very diffused in different areas of northern and central Italy and due to boron-deficiency.

" - "witches broom": of uncertain ethiology. It has been affirmed to be of virosic nature.

" - "sickle leaf" (and other leaf malformations): of uncertain, but probably of multiple ethiology.

FIG - "Mosaic": universally diffused in Italy and apparently a very important disease.

VINE - "infective degeneration" (commonly known as "court-noué"): an old very serious disease on american stocks. Probably caused by a series of mild viruses of european vines, some of which causing transient symptomatology and immunity against virulent viruses.

PERSIMMON - "black nerved leaves": of unknown ethiology.

THE PROLIFERATION DISEASE ON APPLES.

Since 1946 there are known to the Horticulture Extension Service in Zeeland on the Bosooop variety some cases of abnormal growth reminding one of witches'broom.

In 1949 this abnormality was studied in detail. Grafting experiments carried out in 1950 showed two years later that this disease must be caused by a virus.

Symptoms:

1) A considerable number of buds which normally remain dormant begin to push. This vegetative growth causes reduced blossoming and an intensive ramification on the fruit bearing branches. The top of the tree takes thereby a bunchy appearance.

At the end of Summer much side branches arise from the suckers so that finally the numerous twigs at the top of the shoot reduce the growth of the original growing point.

2) The leaves of such a tree are to a large extent provided with two stipules much bigger than usual. They have developed into very small and stalked leaves.

3) Diseased trees bear only few and small fruits.

A disturbance in the growing substances seems to stimulate the growth of the buds and stipules.

In the Netherlands we only found this disease in old orchards, but never in nurseries. That does not mean that the disease does not occur on young trees. It might be possible that the symptoms only appear on older trees while the virus is present from the very first.

To clarify this question, we infected three year old trees and obtained symptoms after two years. Probably the disease has been eliminated from the nursery by the consequent use of healthy material. It seems possible too, that the disease was introduced earlier from France with diseased rootstocks. At present, in the Netherlands, the EM-rootstocks are preferred for vegetative propagations and so the disease will probably have lost any practical importance in ten years.

Mulder, D.

A VIRUS DISEASE ON SOUR CHERRY IN THE NETHERLANDS.

Since 1948 symptoms of dieback on sour cherries were found which are confined on a rather short period after blossoming. This disease can be distinguished from the bacterial wilt by the local yellowing and necroses on the leaves.

In 1950, scions from trees with the Eckelrader disease (= Pfeffinger disease ?) were grafted on sour cherries. In the second season these sour cherries showed an acute dieback with similar symptoms as described above. It seems that one component of the Eckelrader disease also causes the virus symptoms on sour cherries (Meikers variety). Regarding the first symptoms of the Eckelrader-virus complex on sweet cherries, it is probable, that this component must be the necrotic ring spot virus. Here we firstly find band- and ring-like yellow spots. In the second year most of these spots do not reappear and a diminution of leaf surface with enations on the lower side takes place. These symptoms resemble at rasp leaf.

It seems therefore, that the Eckelrader disease is caused at least by two different viruses, the necrotic ring spot virus and the rasp leaf virus.

In 1953 a sour cherry tree was observed among different cherry varieties in an experiment plantation of the Institute voor Veredeling von Tuinbouwgewassen, which showed very severe symptoms of dieback combined with necrotic and red spots on the leaves. The shoots of the rootstock of this tree showed no symptoms.

This disease was transmitted by sap-inoculation on young cucumbers. Here a rosetting and the death of growing points was produced as described by Moore, Boyle and Keitt for the yellows and necrotic ring spot virus on cucumber. Yellows not being observed up till now in the Netherlands, it seems probable that in both cases the virus of necrotic ring spot has been transmitted on cucumbers.

At the Institute voor Veredeling van Tuinbouwgewassen a method for embryo cultures of cherries has been developed. During this work aberrations on seedlings have been observed, which must be considered as primary symptoms of necrotic ring spot. This would be the first case of virus transmission by seeds of fruit trees in the Netherlands. The back-inoculation on other cherries by grafting has been carried out but without a visible success till now.

K. Heinze

STONE FRUIT VIROSES IN GERMANY AND EXPERIMENTS ON THEIR TRANSMISSION.

Pictures of the Pfeffinger disease from different localities, ring spot on cherry, line pattern on plum and the Dahlem peach virosis are demonstrated. The symptoms vary in a wide range according the varieties used and their origin.

It is proved that the Dahlem peach mosaic can be transmitted by aphids. Experiments with Myzodes persicae and Hyalopterus amygdali were successful.

The entire complex of the Pfeffinger Disease is not transmissible by aphids. The leaves only showed in these trials some mottling and necroses but no cnations.

On fruit trees were found 25 species of Typhlocybidae; further species of 8 genera of other families of leaf-hoppers. The latter are occasional visitors of fruit trees and do not cause sucking-injuries like the Typhlocybidae.

Transmission experiments with leafhoppers failed until now. If transmission by leafhoppers really occurs it is suspected that occasional visitors serve as vectors.

R. Gallay

THE INFECTIOUS DEGENERATION OF THE VINE IN THE FRENCH PART OF SWITZERLAND

Since a few years, several cases of infectious degeneration of the vine, apparently due to viruses, have been found in this part of Switzerland. The symptoms of this disease may vary to a considerable extent, according to the variety, the place and the weather conditions, and also according to the type of virus or viruses present. The most frequent symptoms are:

A) Leaf abnormalities: crinkle, asymetry, malformation, mosaic, veinbanding, vein-clearing, leafrolling, "high-light" chlorosis.

B) Stem abnormalities: short internodes, irregular internodes (court-noué), double-nodes, forks, fasciations.

C) Flower abnormalities: millerandage and "coulure". (Dropping off)

D) Abnormal roots on cuttings.

Some of these symptoms can also be observed in vineyards usually considered as healthy and cropping normally, suggesting that the viruses responsible for the degeneration are only more severe strains or particular combinations of viruses occuring communly in vineyards.

The most important outbreaks of this disease have been observed in St-Prex and St-Saphorin, near Lausanne, the most severe of both being that of St-Prex. An experiment was started in 1949 in order to see if the disease was perpetuated in the wood taken on infected vines, and to determine the part played by the soil. Degenerated Chasselas taken in both places mentioned above was grafted on healthy rootstocks 3309 (Riparia x Rupestris) and 5C (Riparia x Berlandieri), together with healthy Chasselas as control. These vines were planted in St-Prex and St-Saphorin in contaminated soil, and in Pully, at the experimental Station, in a soil where no degenerated vines had been so far noticed. Results show that the disease persists in the grafting wood taken on infected vines, and that the degeneration is not due to the soil, although environmental conditions may influence the symptom expression. Reduction of yield in degenerated vines may be as much as 90%, mainly due to the dropping off (coulure and millerandage), and to the fact that degenerated vines bear less grapes than healthy ones.

Other experiments have been made in order to show whether the infectious degeneration is graft-transmissible, i.e. if its infectious agent can pass through the graft union. Healthy material from various european varieties was grafted on diseased rootstocks (3309, Rouge de la Loire), by the usual methods, by inarching graft or by inserting a piece of diseased shoot into a sound shoot. Evidence so far available indicates that some symptoms characteristic of this disease have been transmitted (vein-clearing, mosaic, "high-light" chlorosis) but not all of them. However, healthy scions grafted in 1948 on degenerated 3309 and planted in Pully are still cropping normally and have shown so far no symptoms of degeneration.

No evidence of a transmission by Phylloxera has yet been obtained in laboratory trials. Other possible vectors have not yet been tested.

Some evidence of mechanical transmission has been obtained recently (leaf rolling, vein-clearing, "high-light" chlorosis) but this awaits confirmation.

Some of the symptoms mentioned above occur on very young seedlings of Chasselas grown from seeds of degenerated or healthy vines, and are probably seed transmitted (crinkle, vein-clearing).

Dr.Wurgler has recently developed a useful test for detecting the infectious degeneration, based on the fact that cuttings of degenerated vines produce less and larger roots than those of healthy vines.

Dr.Bovey has devised a method by which the court-noué can be estimated accurately by a mathematical formula. The "indice de court-noué" is calculated from the length of successive internodes of a shoot. The distribution of the "indices de court-noué" among healthy vines and diseased ones has been studied.

Heat-therapy has been tried by Bovey on both hardwood cuttings, in winter, and on potted plants. No result has yet been obtained with hardwood cuttings. Heat treatment of potted plants during the growth period had two opposite results: in some cases, an apparent cure was followed by the reappearance of symptoms more severe than before, in other cases it seemed that at least some components of the disease have been inactivated. Work on these lines is still in progress.

VIRUS DISEASES AND SELECTION OF STRAWBERRY IN VALAIS (SWITZERLAND)

Since a few years, strawberry culture has become more and more difficult in the canton of Valais, the most important strawberry-growing district of Switzerland (about 1000 ha). Although this decline is probably due to various causes (root fungi, spring yellows, lack of selection, pests) virus diseases are thought to be the most important factor of the degeneration of the commonly cultivated variety, Madame Moutot. Crinkle and yellow-edge (yellows or xanthosis) are quite commonly observed, but there are other types (or strains ?) of viruses not yet described, belonging to the group 1 of Prentice. One of them causes intense proliferation of buds in Fragaria vesca, another produces vein-clearing in both vesca and the variety Madame Moutot. There are also strains causing chlorosis in vesca.

In order to improve the quality of the material for planting, a scheme of selection has been started in 1950. 3000 plants taken in the best strawberry-beds in 24 different areas were planted in 1950, and their performances were studied during two years. Part of the offspring of the best 30 plants has been propagated in an area where the strawberry aphis is very scarce, and the other part has been used for a comparative yield trial. Ten clones have been chosen for further propagation, on the following criteria: vigour, resistance to winter-dieback, low virulence of viruses, lack of spring yellows, good yield. None of these clones is virus-free.

All attempts to reconstitute virus-free stocks from strawberry-plants taken in the cultures have failed so far. Of many thousands of plants of the variety Moutot which were examined or tested, none was entirely devoid of virus: those which showed no symptoms were found to be infected with latent virus 1 (mild crinkle). As this virus is a component of the complex disease called yellow-edge, it was desirable to get rid of it.

During the summer 1953, infected strawberry-plants were cured by heat-treatment in an oven or in a little glasshouse electrically heated (10 days at 37°C.). These plants are being propagated in areas where the aphis vector of strawberry viruses is not present. All our selected clones will be heat-treated, and the virus-free * material will be compared to the material of the same clone infected with mild or latent virus.

The most important vector, Pentatrichopus fragaefolii Cock. (= Passerinia fragaefolii Cock.) is common all the year on cultivated strawberries around the lake Leman. In Valais it occurs only from september to january and disapears almost completely at the end of the winter. The level of infestation remains very low during the spring and the summer. Above 800-1000 m this aphis is very scarce and above 1200 m it is practically absent. In the lowest part of Valais, virus transmissions occur from september to november.

The virus-free clones and the clones selected as mentioned above will be multiplied in the parts of Valais which are most remote from the strawberry-growing areas, and where P.fragaefolii is very scarce or entirely absent. Care will be taken to avoid not only viruses, but also spring yellows, mites, eelworms and fungal diseases. It is hoped that these steps will improve the quality of the planting material and increase the yield of strawberry cultures.

* By "virus-free", I mean a plant giving no symptoms on Fragaria vesca when grafted to it.

Symposium für Viruskrankheiten der Obstbäume (20.-25.Juni 1954) in Wädenswil.

Teilnehmer:

Frl.Dr.Gisela Baumann, Biologische Zentralanstalt, Institut für Phytopathologie, Aschersleben (Ost-Deutschland)

Dr.R.Bovey, Stations Fédérales d'Essais Agricoles, Lausanne

Prof.R.Ciferri, Direttore del Laboratorio Crittogamico, Università di Pavia (Italia)

Dr.L.C.Cochran, Principal Pathologist, Citrus Experiment Station, Riverside, California

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Dr.G.Scaramuzzi, Laboratorio Crittogamico, Università, Pavia

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Dr.K.Stoll, Eidg.Versuchsanstalt, Wädenswil

Dr.G.L.Stout, Plant Pathologist, Bureau of Plant Pathology, Department of Agriculture, Sacramento 14, California

Prof.H.Thiem, Uferstrasse 36, Heidelberg

Dr.M.F.Welsh, Plant Pathologist, Dominion Laboratory of Plant Pathology, Science Service Summerland, British Columbia, Canada

Dr.L.Zobrist, Chemische Fabrik Dr.R.Maag A.-G., Dielsdorf, Zürich.

Symposium über Viruskrankheiten an Obstbäumen

Montag, 21.Juni, 14 Uhr, an der Eidg.Versuchsanstalt Wädenswil.

Kurzvorträge - Communications

L.C.Cochran: Virus Diseases which cause the most Damage to Peach Trees in the United States.

M.F.Welsh: Stone Fruit Virus Diseases in British Columbia and neighbouring Parts of the United States.

G.L.Stout: Nursery Stock Improvement and Methods of Certification of Nursery Stock and Propagating Materials for Freedom from Virus Diseases.

R.Ciferri: The most important Virus Diseases of Fruit Trees in Italy.

Mulder D.: Die Proliferationskrankheit an Apfelbäumen.

Mulder D.: Eine Viruskrankheit der Sauerkirschen in Holland.

C.A.R.Meyneke: The Spreading of a Cherry Virus Disease in the Netherlands.

K.Heinze: Gehölzvirosen an Steinobst in Deutschland und Versuche zu ihrer Uebertragung.

W.Kotte: Beobachtungen über Obstbau-Virosen in Südwestdeutschland.

H.Thiem: Virus und virusähnliche Erscheinungen an Obstbäumen in Westdeutschland.

Zur Erleichterung der Diskussion werden den Teilnehmern englische Auszüge der einzelnen Vorträge zugestellt werden.