

also in cherry, plum and apricot. These symptoms are quite evident in summer but are difficult to detect later in the season. The first and most important symptom is the phloeem necrosis. Very many trees are affected. It was supposed that a virus disease was concerned, however experiments showed that this disease is not graft transmissible; the disease could be cured by heavy manuring.

MULDER: Is it sure that the diseases in France and Italy are identic? Has Dr SOUTY already carried out experiments on fertilisation?

Answer: It is not sure that the diseases in France and Italy are the same. In France manuring has no influence.

CIFERRI: Does a tree with phloeem necrosis show this symptom every year afterwards?

Answer: No. The necrosis may be induced by frost.

CIFERRI: Will a new tree, planted after roguing an affected one, stay healthy?

Answer: Yes, the disease does not infect via the soil healthy trees planted on the site where affected ones were rogued.

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VIRUS SYMPTOMS ON ALMOND LEAVES IN SOUTHERN ITALY

BY

GIOVANNI SCARAMUZZI

Laboratorio Crittogamico, Pavia, Italy

Under the general name of 'mosaic' in 1943 a virus disease of almond (*Prunus amygdalus*) in Puglia region (Southern Italy) has been reported.

Up til now no further attention has been given to the disease, although almond trees represent, together with olive trees, grapevines and citrus, the main fruit crop of the same region. Presumably peculiar local conditions together with the fact that only rarely affected trees die, are at the base of this negligence.

The remarkable frequency of the symptoms of the disease on almond trees (in some districts we could calculate even a 40 percent of infected trees in the field) induced us to investigate the problem with more attention.

Not all almond varieties show the same degree of symptoms; some of them are heavily infected, but some others seem to be sufficiently tolerant and are symptomless.

In these first two years, our investigations were particularly directed towards collecting different symptoms on leaves of different almond varieties, which are extremely numerous in the Puglia region (about 300, the greater part of which still unknown.)

The ascertained variability in symptoms on each almond variety makes us presume that there may be a different reaction of each of them to the virus infection and, at the same time, that symptoms are made complex by the presence of many virus strains, so that a gradient in symptoms may be produced.

Moreover, it is to bear in mind that the symptoms are the ones collected only in a few almond districts of the region, but without any doubt their number will

still increase by extending the investigations to the other almond varieties in other districts of the same region.

It is in our program also to investigate the relations between virus infection and yield, as we could already ascertain that yield is particularly influenced in some varieties and in relation to only some symptoms. In some cases symptoms of the disease appear also on fruits (malformations, yellow patches, reduction in size, etc.). We hope to do more research regarding this point of view in the next future. On the other side, even if trees do not die, in most cases affected trees assume a diseased appearance in comparison with normal ones, presumably because of the reduction of chlorophyll in the leaves and of the fact that generally diseased leaves soon fall down and foliage is renewed in the same spring. It is easy to suppose that this can more or less and indirectly influence the yield of the infected trees. Variability in symptoms and the high number of cultivated varieties of almond makes this valuation extremely difficult.

The importance of these virus diseases of almond is to be considered also in relation to the actual and almost uncontrolled commerce of nursery plants which represents an important means of diffusion of these diseases. In this connection, we want to emphasize that on 110 nursery plants purchased three years ago from the Puglia region, 106 appeared next year infected and showed symptoms of the diseases.

SYMPTOMS

A slight stunting of the infected trees occurs after some years. Diseased trees have (particularly in early spring) a rosetted appearance due to the crowding of leaves on twigs with shortened internodes. Each of the leaf symptoms here reported were collected on a single tree on which it seems to be characteristic. Sometimes different symptoms appear on the same tree.

Probably it is possible to classify them schematically as follows:

1. Affected trees show a variable amount of foliage with yellow blotches in the leaf blade. The leaf shape is often abnormal. The yellow blotches become necrotic in a second stage. The first symptoms appear on the first formed leaves, when they are a few centimeters long as chlorotic pale green blotches, which then turn yellow and persist on the leaves throughout the season.
2. Vein and veinlet yellowing; frequently symptoms 1) appear on the same plants together with this symptom.
3. Affected trees show variable amounts of foliage with white blotches on the leaf blade. These blotches may become necrotic later. It is a not widely diffused symptom.
White spots limited only along the margins of the leaf blade may be considered as a more peculiar aspect of the same complex of symptoms.
4. Vein and veinlet whitening; like the symptoms described in 2), but white. Frequently on the same plant together with symptoms 3).
5. Line pattern; patterns on leaves usually consist of lines, bands, and oak-leaf patterns. The characteristic symptom is a fine, irregular and yellow or yellow-green band on each half lamina, usually forming a symmetrical pattern. Part of the yellow band tissue eventually becomes necrotic and either splits or drops out. 'Line pattern' occurs often on the same trees showing symptoms 1) and 3).

On some 5-year-old trees of 'Catuccia' 'Fragiulio' and 'Rachele' varieties, which showed only symptoms 1) in 1953, next year these symptoms appear only in the early spring, while later in the season 'line pattern' was mixed with them; in 1955, at last, only a line pattern was visible on the same trees.

6. 'Ring-spot'; symptoms consist of yellow or yellow-green rings, spots and line patterns. Very often on the same leaves mixed with line pattern.
7. A mosaic mottling; small yellow or yellow-green flecks on the leaf blade. There is a gradient of mosaic mottling. Leaves may assume irregular shapes.
8. Irregular mottling, with chlorotic, yellow-green and brown spots (sometimes also with yellow-green streaks), usually accompanied by distortion and reduction in size of the leaf blade. Leaves may be also misshapen and the leaf blade generally wavy or undulating. Both mottling and distortion of leaves are more or less pronounced.
9. A rusty mottle; yellow-brown or rusty spots, irregularly diffused on the leaf blade. This symptom occurs only on very few plants.
10. Pale green or yellowish patches, which soon change to bright yellow or creamy-white on any part of the leaf. These patches may also become necrotic. No specific pattern is formed. Found only on very few plants.
11. Sometimes we find a mixture of some of the symptoms reported above. Some leaves show symptoms recalling the ones described in the literature on almond leaves for 'yellow bud mosaic'; some of them recall also the symptoms reported on almond leaves experimentally infected with 'peach mosaic'. It is probably a mixture of different strains of a virus on the same tree. This mixture of symptoms occurs quite often.

EXPERIMENTAL TRANSMISSION

The first attempts to transmit the disease experimentally in Italy, were carried out in 1943; presumably they concern the symptoms 1), with the transmission of the same symptoms on healthy almond trees.

In our trials we tried transmission by grafting, using almond trees showing symptoms 1), but which only showed them together with 'line pattern' symptoms. Grafts were performed in 1953 on apricot (*P. armeniaca*), on plum (*P. domestica*), on sweet cherry (*P. avium*) and on peach (*P. persica*) trees. Next year the following symptoms developed on leaves near the grafting point:

- a) on apricot: line pattern and some ring-spots; the symptoms recall the ones reported in the literature as due to 'peach mosaic' experimentally transmitted on apricot.
- b. on plum: line pattern, or yellow-brown mosaic mottling.
- c. on peach: line pattern and irregular mottling.
- d. on cherry: no symptoms as grafts failed.

The incubation period seems to be 6-7 months. In only two years symptoms appear on all the branches of a 5-year-old plant.

Monosteira unicastata is probably to be considered as one of the insect vectors of this group of virus diseases, according to the observations that infected trees are, in the majority of cases, heavily infested.

In conclusion, the problem is just delineated and the program of work is

wide and complex. It is evident that different strains of a virus or of several viruses are present on the infected plants. It is possible also that most part of the symptoms described may belong to the 'line pattern' group of virus symptoms. This can be more accurately ascertained using indicator plants. In any case, at present, we are allowed to presume that almond trees have actually, in Italy, the highest percentage of virus infection of all stone fruit trees.

Generally, all symptoms described may disappear with the rise of temperature, so that in August the affected trees are symptomless.

May be also we can reach a classification of almond varieties according to the relative severity of their different symptoms.

Not yet investigated are the relations between leaf symptoms and the variability in leaf shape and size and leaf malformations, among which is also a certain number of bifid leaves that may be directly connected with virus infection.

From a practical point of view, there is a good possibility to reach the solution of the problem by selecting resistant varieties or only distributing the ones already cultivated in our almond growing regions that appear to have a remarkable resistance to virus infection.

DISCUSSION

POSNETTE: Have all those symptoms been transmitted?

Answer: Only some of them, as I emphasized in my lecture. Till now it was most important to know what symptoms and how many of them are present in Italy.

POSNETTE: Has the variegation been transmitted by grafting?

Answer: No, that variegation could not be transmitted up til now.

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THE PRESENT ASPECT OF FRUIT TREE VIRUS DISEASES IN SWITZERLAND

BY

S. BLUMER

Versuchsanstalt für Obst-, Wein- und Gartenbau, Wädenswil, Switzerland

At the moment we know in Switzerland about a dozen virus diseases of fruit trees. Some of them are of considerable economic importance especially some virus diseases of apples.

Flat limb is very frequent in the varieties Gravenstein and Schneiderapfel. Besides, this disease occurs occasionally in the varieties Ontario, Glockenapfel and Tobiäslar. The yield of diseased trees may be very satisfactory at least during the first years. It is assumed that this fact is due to some difficulties in the downward movement of organic compounds.

The proliferation disease seems to be very frequent in nurseries but occurs also on fullgrown trees. The identification of this disease in the nursery is very difficult, because the prior growth of axillary buds may be caused by other factors