

## Virus diseases of the grapevine in a Sicilian herbarium of the past century<sup>1)</sup>

by

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### Rebvirosen in einem sizilianischen Herbarium aus dem letzten Jahrhundert

**Zusammenfassung.** — Getrocknete Exemplare von Reben, die zwischen 1880 und 1886 in Sizilien für ein von Dr. FRANCESCO MINÀ PALUMBO, einem Arzt aus Castelbuono (Palermo), begründetes Herbarium gesammelt worden waren, zeigten verschiedene morphologische und farbliche Modifikationen. Die noch sichtbaren Symptome an den Herbarexemplaren erlauben zusammen mit den erläuternden Originalnotizen eine Diagnose auf Befehl durch Reisisgkrankheit, Gelbmosaik und Blattrollkrankheit.

### Introduction

Studies on virus diseases of the grapevine in Italy were initiated by the turn of the century, when a spreading decline of this crop in Sicily, following the introduction of American rootstocks, caused much concern to the growers. The disease, locally called "roncet" or "arricciamiento" and later identified with "fanleaf" (HEWITT 1950), was particularly severe in rootstock nurseries.

Although most reports on "roncet" appeared during the first years of this century (BACCARINI 1902, BRIOSI 1902, RUGGERI 1902), the disorder had been noticed years before (RUGGERI 1895). Conceivably, it had occurred in commercial vineyards for quite a long time. "Roncet" was blamed for deformations of leaves and canes, reduced growth, and poor yield, but not for colour alterations of the foliage other than pale-green or chlorotic mottling (PANTANELLI 1911). Yet, vines with striking chromatic disorders of the leaves (chrome-yellow or reddish discolourations), suggesting the occurrence of other virus diseases in addition to "roncet", were likely present in Sicilian vineyards. Direct evidence of this has now been found in a herbarium containing pathological grape specimens ranging from fungus to virus diseases to pest injuries.

The herbarium was established in 1830 as a collection of Sicilian flora (DI MARTINO *et al.* 1972) by Dr. FRANCESCO MINÀ PALUMBO (1814—1899), a physician of Castelbuono (Palermo) who, owing to his keen interest in botany, gained reputation as one of the outstanding scientists of his time (SACCARDO 1895). The pathological specimens were collected between 1880 and 1886. They are accompanied by explanatory notes with short descriptions of the symptoms and, whenever known, by the name of the causal agent.

Looking through the herbarium, several leaf samples were encountered, which showed symptoms reminiscent of those characterizing different virus-induced disorders. These findings are briefly illustrated and commented upon in the present paper.

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## Diseases

## Fanleaf

Although leaves with varying amounts of deformity, likely induced by virus infections, are found throughout the herbarium, two specimens in particular comprise remarkable examples of foliar malformations.

One of the specimens has the following label (Fig. 1 and 2):

"Ampelopatie. Filloclorosi. Vitigni bianchi e neri. Vigneto di tre anni. Terreno siliceo ferruginoso, a sottosuolo permeabile. Giugno 1880."

"Grapevine diseases. Yellowing of the leaves. White and black-berried vines. Three-year-old vineyard. Siliceous ferruginous soil, with pervious subsoil. June 1880".

It contains leaves of vines obviously belonging to different cultivars, exhibiting modifications of the shape which appear indistinguishable from the symptoms characterizing the fanleaf disease of the grapevine (HEWITT 1950, 1954, VUITTENEZ 1970). Asymmetric blades, abnormally toothed margins, wide open petiolar sinuses, and irregular marginal sinuses are clearly observable in the dried specimens (Fig. 1 and 2). It is evident that the leaves suffered also from colour changes which likely attracted the collector's attention primarily. These might have consisted in a sort of generalized yellowing, possibly differing from the intense chrome-yellow discoloration caused by yellow mosaic virus. However, whether or not the leaves also showed light-green or chlorotic mottlings cannot be ascertained. No specific mention of this

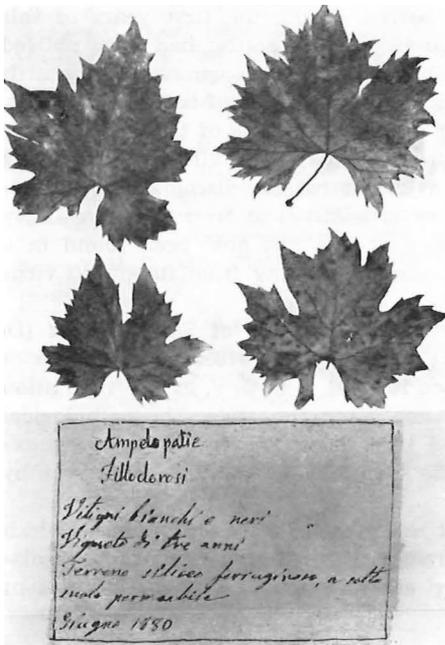


Fig. 1



Fig. 2

Fig. 1 and 2: Leaves showing various kinds of malformations, like those induced by distorting strains of grapevine fanleaf virus.

Blätter mit verschiedenartigen Mißbildungen, wie sie durch deformationsauslösende Stämme des Fanleaf-Virus verursacht werden.

is made in the label and the present colouring of the samples (a light-brown hue with occasional darker spots) does not give any helpful hint to this account.

Another specimen:

"Foglie di vite con peli aracnoidei, raccolte in vigneto vecchio. Settembre 1886".

"Grape leaves with arachnoid hairs, collected in an old vineyard. September 1886"

consists of leaves that, in addition to a very hairy lower surface as stated in the tag, show mishapen outlines and various irregularities of the blades. Their colour is uniformly dark-green with no indications of pre-existing chromatic changes. Again, these abnormalities are strongly reminiscent of those induced by distorting strains of grape fanleaf virus.

### Yellow mosaic

Samples with obvious discolourations of the leaves, closely recalling the symptoms of grape yellow mosaic (HEWITT 1945, DIAS 1970) are present in two different specimens.

One of these, tagged as follows:

"Malattie della vite. Itterizia-Filloclorosi. Vitigno nero. Vigneto giovine. Giugno 1886"

"Grapevine diseases. Jaundice-Yellowing of the leaves. Black-berried variety. Young vineyard. June 1886"



Fig. 3

Fig. 3: Light colouring of leaves collected in late spring from vines affected by yellow mosaic. The arrow points to a leaf from the same herbarium with "normal" colouring.

Fig. 4: Leaves with variegations induced by grapevine yellow mosaic virus.

Abb. 3: Aufhellung bei Blättern von Reben, die im späten Frühjahr gesammelt worden waren, mit Symptomen von Gelbmosaik. Der Pfeil zeigt auf ein Blatt desselben Herbariums mit „normaler Farbe“.

Abb. 4: Blätter mit Schekung infolge von Gelbmosaikbefall.



Fig. 4

includes a couple of small shoots and several detached leaves whose present yellowish colouring, much paler than the dark-brown or dark-green hue of "normal" leaves from the same herbarium (Fig. 3, arrow), is highly suggestive of an original chrome-yellow condition. Some of the leaves show interveinal islands or bands of greenish tissue, as though the blades were not uniformly discoloured. Conspicuous deformations of the leaf shape are also visible.

The other specimen (Fig. 4) is labelled:

"Ampelopatie. Foglie con macchie bianche, molto differenti da quelle affette da clorosi primaverile questa forma è incominciata sul finir di settembre, e primi di ottobre. Molto rara, vigneto di due anni. Ottobre 1886".

"Grapevine diseases. Leaves with white spots, very different from those affected with spring yellowing this form initiated at the end of September and beginning of October. Very rare, two-year-old vineyard. October 1886".

In this sample, many whitish or light-brown spots of different shape and size occur on the leaves, conferring upon them a variegated appearance. Such discolourations are randomly scattered, so that they may involve the primary veins and/or narrow



Fig. 5

Fig. 5: Reddening in leaves of leafroll-affected vines. Reddish discolourations are visible in a few (leaf 2, arrows) or several (leaf 1 and 4, arrows) areas or on the whole leaf surface (leaf 3).

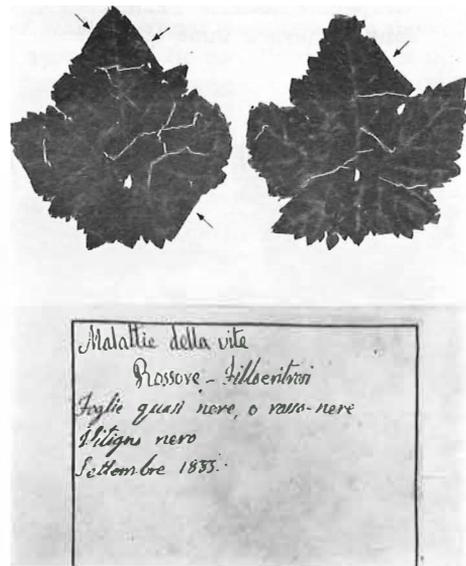


Fig. 6

Fig. 6: Intense reddening and rolling of the leaf margins (arrows) in leaves of vines affected by leafroll virus. Note the cracks on the leaf surface and the light colouring of the veins.

Abb. 5: Rotfärbung an Blättern von blattrollkranken Reben. Rötliche Verfärbungen sind an einigen (Blatt 2, Pfeile) oder mehreren Stellen (Blatt 1 und 4, Pfeile) oder auf der ganzen Blattspreite sichtbar (Blatt 3).

Abb. 6: Intensive Rotfärbung und Einrollung der Blattränder (Pfeile) an Blättern von blattrollkranken Reben. Zu beachten sind die Risse der Blattspreite und die Aufhellung der Blattadern.

strips of adjacent tissue, or may extend to large sectors of the leaf blade, sharply contrasting with the dark-green colour of the rest of the blade. Foliar malformations are absent or very mild.

These chromatic changes are very similar to late season manifestations of yellow mosaic.

#### Leafroll

Examples of leaves from leafroll-diseased vines are encountered in at least five different specimens, all of which originate from red-fruited plants. The explanatory tags (labels in Fig. 5 and 6) always contain the word "rossore" (reddening) with evident reference to a reddish discolouration of the leaves, i. e. to a condition which is now known as one of the characterizing symptoms of leafroll in red-berried grape cultivars (GOHEEN *et al.* 1958, GOHEEN 1970).

Two specimens are worth mentioning. Of these the one labelled:

"Ampelopatie. Rossore. In vario stato, in vitigno nero, vigneto di monte. Settembre 1886".

"Grapevine diseases. Reddening. In various stages in black-berried cultivar, vineyard on a hillside. September 1886"

is made up of several leaves of different size, whose prevailing light-brown colour is often broken by dark-reddish spots and bands in the interveinal areas. The extent of the discolouration varies with the sample. As shown in Fig. 5, some leaves exhibit only occasional red blotches (leaf 2, arrows), whereas in other leaves the reddening process is more advanced (leaf 1 and 4) and may involve the whole blade (leaf 3). In no instance the primary veins are discoloured. On the contrary, in many samples they retain a shade of green.

Another specimen with leafroll symptoms is shown in Fig. 6:

"Malattie della vite. Rossore-Filloeritrosi. Foglie quasi nere, o rosso-nere. Vitigno nero. Settembre 1885".

"Grapevine diseases. Reddening-Redleaf. Leaves almost black or red-black. Black-berried cultivar. September 1885".

It contains several large-sized leaves of one variety, exhibiting an intensely dark-red or blackish colour of the blades, except for the primary and secondary veins which are light-brown or greenish. Such leaves are heavy, thicker than normal and very brittle, as demonstrated by their extensively cracked surface (Fig. 6). These peculiar characteristics are a likely consequence of the excessive accumulation of starch in the mesophyll, a well established phenomenon in leafroll-infected vines. There are also clear indications of a pronounced downward rolling of the leaves. In several places, the leaf outline appears blunt as if the edges had been sharply cut (Fig. 6, arrows). Actually, in these areas the leaf margin is bent downward on itself, possibly because its rolled condition at the time of collection prevented a proper flattening of the whole blade when the leaves were mounted in the herbarium.

#### Discussion

Although Dr. MINÀ PALUMBO did not ascertain the etiology of the alterations shown by the grape material he had collected, there is no doubt that he appreciated their pathological nature. Evidence of this is provided by the autographic labelling of the specimens as "Ampelopatie" or "Malattie della vite", both dictions meaning "Diseases of the grapevine".

On the other hand, one could not reasonably expect a proper identification of any of the above diseases considering that the studies, which lead to the establish-

ment of their nature, were not yet initiated when the herbarium specimens were collected. For instance, the first mention of "roncet" (fanleaf) as a specific disease, appeared in the French and Italian literature in 1893 (VIALA 1893) and 1895 (RUGGERI 1895), respectively, i. e. over a decade after collection of the specimens illustrated in Fig. 1 and 2; while one of the oldest records of "fanleaf", is probably the "Gabler" disease of Southern Austria (RATHAY 1883) whose description is again posterior to the herbarium specimens.

It must be acknowledged, however, that the classification of the diseases we have made according to current views, often relies on the accurate information accompanying the herbarium samples. Thus, the recognition of the specimen of Fig. 3, as an example of yellow mosaic, was propitiated both by the suggestive labelling ("jaundice", a disease obviously familiar to a physician) and by the recorded time of collection (June). Two notions: i. e., presence of chrome-yellow colour somewhat resembling an "icterus" and evidence of symptoms in late spring, are characteristic enough of yellow mosaic to speak in favour of the correctness of identification. This specimen may, therefore, represent the earliest record of yellow mosaic, a syndrome first observed in France in 1914 (DIAS 1970) but identified as a specific virus disease in more recent times in California (HEWITT 1945).

As to leafroll, the frequency of collections with symptoms of such disorder in MINÀ PALUMBO's herbarium indicates that this disease was of common occurrence in Sicily over 80 years ago, thus confirming the hypothesis that the causal virus pre-existed the introduction of American rootstocks in Europe. To our knowledge, one of the oldest records of leafroll in Europe, dates back to a French description of 1853 (FABRE 1853).

### Summary

Dried grapevine specimens, collected in Sicily between 1880 and 1886, and showing different morphological and chromatic modifications, were found in a herbarium established in 1830 by Dr. FRANCESCO MINÀ PALUMBO, a physician of Castelbuono (Palermo). On the basis of symptoms still visible on the specimens and of the herbarium's original explanatory notes, the diseased material was identified as being affected by fanleaf, yellow mosaic and leafroll.

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