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Grapevine death caused by *Nattrassia toruloidea*

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Mortalité des plantes de vigne causée par *Nattrassia toruloidea*

Résumé: Une grave mortalité s'est verifiée en Sicile sur divers cépages de *Vitis vinifera* L. greffés sur le porte-greffe 140 R. (*V. berlandieri* PLANCHON × *V. rupestris* SCHEELE).

Les ceps montraient des taches chlorotiques et des nécroses sur les feuilles qui successivement tombaient. De conséquence les sarments desséchaient à partir de l'apex et les tissus ligneux sous l'écorce brunissaient.

2 ou 3 ans après l'apparition des symptômes sur les feuilles la maladie provoque la mort de toute la plante.

Dans chaque cas le champignon *Nattrassia toruloidea* a été isolé du bois altéré.

Le champignon a été de nouveau isolé dans les ceps inoculés artificiellement; cela confirmerait que *N. toruloidea* est l'agent pathogène spécifique de la mortalité des plantes de vigne. La température idéale pour *N. toruloidea* est de 30—35 °C; cela explique sa présence principalement dans les pays d'Afrique et d'Asie caractérisés par un climat chaud et sa découverte en Sicile.

Key words: fungus, pathogen, variety of vine, rootstock, leaf, wood, necrosis, toxicity, etiology, symptomatology, Italy.

Introduction

We have recently observed widespread death of grapevines (*Vitis vinifera* L.) in vineyards in the eastern and central provinces of Sicily. The affected plants were of varying ages, with diverse tillage systems and from different cultivars grafted onto rootstock hybrid 140 R. (*V. berlandieri* PLANCHON × *V. rupestris* SCHEELE).

We carried out observations and studies in order to detect the agent responsible for the disease.

Observation and isolation of the pathogenic agent

Information from the various vine-growing areas indicated that the disease has been present for a decade but has become more widespread and developed more rapidly only in the last few years.

Our observations over the 2-year period 1989—90 revealed evident symptoms on both leaves and wood. The first leaf symptoms appeared on the lower leaves in July and consisted of small, chlorotic interveinal spots which were very numerous, isolated or coalescent. These spots were scattered over the epiphyll, irregular in shape and had a central necrotic area which was surrounded by a yellow rim as summer heightened. As the disease evolved, chlorotic marks and necrosis appeared on all the leaves of the infected vines and the leaves fell early (Fig. 1). By the end of summer the shoots were defoliated, began to dry from the apex and carried unripe bunches of grapes. Concomitant growth of rootstock suckers, whose leaves often presented the same symptomatology, occurred (Fig. 2). The entire grapevine died 2 or 3 years after onset of the first leaf symptoms.

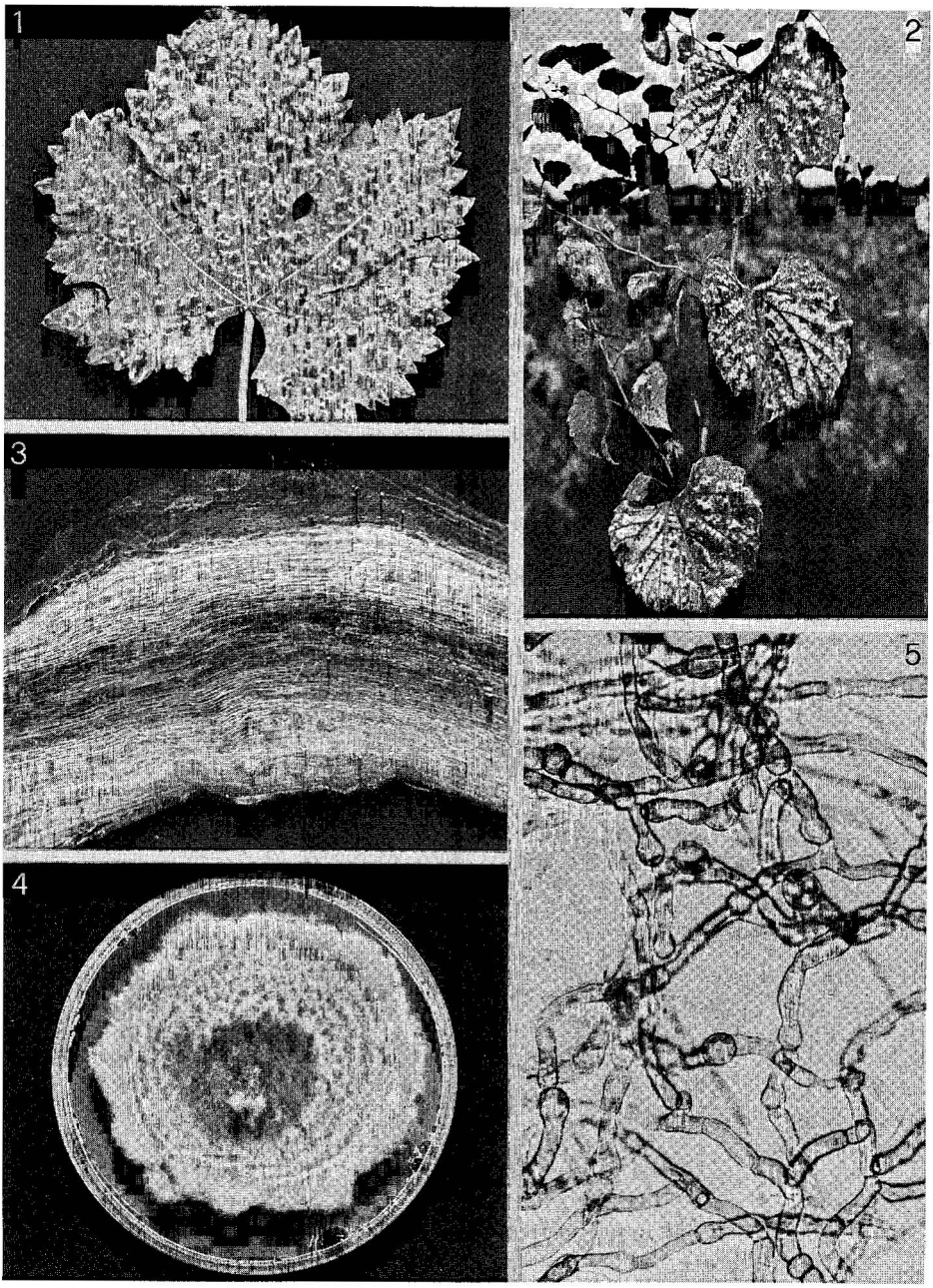

Fig. 1: Necrotic spots between the veins on grapevine leaf caused by the toxins of the fungus *Nattrassia toruloidea* associated with the disease. — Fig. 2: Symptoms on the rootstock 140 R. — Fig. 3: Discolored xylem in the trunk of a grapevine infected with *N. toruloidea*. — Fig. 4: Colony of the isolate of *N. toruloidea* on PDA artificial substrate. — Fig. 5: Hyphae of *N. toruloidea* with chains of arthrospores present.

By removing the bark from the wood of both rootstock and *Vitis vinifera* of the infected grapevines, black colour changes were observed (Fig. 3). No fungal bodies were detected on any of the infected vine organs.

A fungus colony present in the infected wood has been constantly isolated on PDA artificial substrate. This colony had the following characteristics: generally rounded with irregular outlines; soft, felty white mycelium which soon turned greyish-green and then black; irregularly branched hyphae forming separate chains of uni and bicellular cylindrical or globoidal arthrospores (Figs. 4 and 5).

The characteristics classified the fungus as *Nattrassia toruloidea* (NATTRASS) DYKO and SUTTON (SUTTON and DYKO 1989). After isolation pathogenicity trials were performed by inoculating two 2-year-old grapevines which had been obtained from root cuttings of two Sicilian cultivars (Nerello Mascalese and Frappato di Vittoria) in pots. Inoculations were performed by inserting mycelium discs (3—4 mm in diameter) from a 10-d-old colony obtained on PDA in Petri plates into shoot wounds. The grapevines were then placed in a chamber with constant temperature of 30 °C and humidity of 60 %. 6 weeks after inoculation the grapevines presented cup-shaped apical leaves and chlorotic interveinal spots which spread to the leaf edge and necrotized. Leaves fell from the shoots which died from the apex.

The same fungus obtained from naturally infected grapevines was reisolated in the inoculated grapevine wood.

Discussion and conclusions

Isolation results and experimental reproduction data of the disease indicate that *N. toruloidea* is the specific agent responsible for grapevine death in some vinegrowing areas of Sicily. This fungus was first observed in Egypt in apple trees and classified as *Hendersonula toruloidea* (NATTRASS 1933). A recent review of the different species of *Hendersonula* based on the morphological characteristics of the fungus led to the classification of *H. toruloidea* under the generic name *Nattrassia toruloidea* (SUTTON and DYKO 1989).

This may be the first report of *N. toruloidea* in plants in Europe. However the same fungus has been observed in the United Kingdom where it caused mycosis of feet and toe nails in former residents of the tropics (GENTLES and EVANS 1970). This fungus is generally found in hot humid areas of Africa and Asia and is harmful to diverse fruit and forest trees (GIHA 1975; AL-ZARARI *et al.* 1979; SHAWKAT *et al.* 1979; PANDEY *et al.* 1981; RECKHAUS and ADAMOU 1987).

Decline of grapevines similar to that seen in Sicily has been reported only in Iraq where its widespread diffusion causes severe damage to all the local varieties (NATOUR *et al.* 1967; WANGIKAR *et al.* 1969). The leaf spots observed on the grapevines infected by *N. toruloidea* (Figs. 1 and 2) are characteristic of the disease and may be due to the action of the toxins produced by the fungus (PANDEY *et al.* 1981).

The most suitable temperature range for *Nattrassia toruloidea* growth is 30—35 °C which explains its geographic distribution, its presence in Sicily and spread of infection during the summer period.

Fig. 1: Taches nécrotiques entre les nervures sur feuilles de vigne causées par les toxines du champignon *Nattrassia toruloidea* associé à la maladie. — Fig. 2: Symptômes sur le porte-greffe 140 R. — Fig. 3: Coloration du xylème du tronc de vigne infectée par *N. toruloidea*. — Fig. 4: Isolé de *N. toruloidea* sur substratum artificiel PDA. — Fig. 5: Mycélium de *N. toruloidea* avec présence de chaînes des arthrospores.

Summary

Severe decline has been observed on different grapevine cultivars (*Vitis vinifera* L.) grafted on rootstock hybrid 140 R. (*V. berlandieri* PLANCHON × *V. rupestris* SCHEELE) in various plantations in eastern and central Sicily. The affected grapevines presented chlorotic leaf spots and necrosis. Early leaf cast was followed by drying of the shoots from the apex and darkening of subcortical tissues. The whole grapevine died 2 or 3 years after onset of leaf symptoms.

The fungus *Nattrassia toruloidea* (NATTRASS) DYKO and SUTTON was constantly isolated from the infected wood. Artificial inoculation of the isolate on rooted cuttings of the local cultivars Nerello Mascalese and Frappato di Vittoria reproduced the disease observed in the field.

The fungus was reisolated from the artificially inoculated plants, confirming that *N. toruloidea* is the specific pathogenic agent responsible for the grapevine death observed by us. The most suitable temperature range for growth of this pathogen is 30—35 °C which explains its distribution in hot African and Asian countries, its presence in Sicily and its widespread diffusion during the summer season.

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