EARLY DETECTION OF THIELAVIOSIS TRUNK ROT ON MATURE DATE PALMS \textit{(Phoenix dactylifera)} IMPORTED FROM EGYPT BY TOMOGRAPHY INSTRUMENT

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Abstract

A wide survey was performed during 2006 to 2008 in Sicily to evaluate the presence of Thielaviopsis trunk rot caused by \textit{Thielaviopsis paradoxa} on date palm. Since the pathogen has the potential to devastate palm plantings without showing external symptoms and with high danger of sudden trunk crashes during monitoring period was also evaluated the effectiveness of non destructive diagnosis methods that be able to detect preliminarily de-structured tissues and so to assess the palm stability. In addition, this report demonstrate the high diffusion of the fungus only on mature date palms coming from Egypt.

Key words: \textit{Thielaviopsis paradoxa}, trunk collapse, stability analysis
Parole chiave: \textit{Thielaviopsis paradoxa}, collasso dello stipite, analisi della stabilità

Introduction

\textit{Thielaviopsis paradoxa} De Seyn. (Höhn) is a fungal pathogen able to infect any portion of palm causing a range of symptoms. Diseases caused by \textit{T. paradoxa} have a high destructive potential to palm plantings and include a variety of common names in the literature (i.e. stem bleeding, black scorch, dry basal rot, trunk rot and heart rot) reflecting particular symptomatology on specific palm taxa (Garofalo and McMillan, 2004; Simone, 2004). In Italy this fungus was recently reported on date palm \textit{(Phoenix dactilyfera L.)} as causal agent of “trunk rot” (Polizzi \textit{et al.}, 2006) and on kentia palm \textit{(Howeia forsteriana} Becc.) as responsible of “steem bleeding and trunk rot” (Polizzi \textit{et al.}, 2007). On date palm sudden collapses of trunk portions were observed for the first time in Sicily on palm trees imported from north Africa (Egypt). Since these collapses on itself were noticed on apparently health trees without external symptoms, numerous surveys were performed in southeastern Sicily with the principal aim to ascertain their causal agent. In these areas, indeed, the date palm represents a very important ornamental specie for cultural, social and landscape aspects.

However this study was carried out to investigate at first on the disease incidence, on the provenience of infected palms and, above all, on the value of non destructive techniques in revealing internal decay due to \textit{T. paradoxa} and so predicting very dangerous phenomena of structural instability.

Materials and methods

Mature date palm trees were surveyed in several nurseries, private and public areas such as gardens, palm plantations on avenues, square and streets of Catania and Ragusa provinces. Each site was inspected by monthly to detect symptom referable to \textit{T. paradoxa} such as de-structured tissues and/or trunk collapses. In total more than four hundred palm trees were inspected by macroscopic symptoms. On about the 10\% of examined and apparently asymptomatic palms the analysis by sight was accompanied by sonorous inspection by a gun hammer. Following previous sonorous anomalies the presence of internal decay of asymptomatic palms was assessed by employment of two instrumental techniques. The first was based on drilling resistance of sterile needle on trunk tissues measured and registered by resistograph (IML-RESI B 400). The second technique was performed with Tree Tomography by propagation of sonorous waves detected by Arbotom® Rinntech instrument.
Transverse cross-sections of infected plants were performed to verify the agreement with the de-structured portions revealed by instrumental analysis. From these samples many isolation attempts from tissues adjacent to the rot areas were performed on carrot agar supplemented with 500 μg/L of streptomycin sulphate and acidified (with lactic acid; pH 3.6) potato dextrose agar. Likewise, apparently health date palms were also sectioned to verify the effectiveness of instrumental inspections.

**Results**

Date palm trees with typical trunk rot symptoms were found in the most part of surveyed areas of Catania and Ragusa provinces with a variable disease incidence ranging from 40 to 80% in each site. Comprehensively about two hundred of palms affected by fungus were observed on total of examined plants. Symptoms of thielaviopsis trunk rot were always detected on mature plants (5 to 8 meters) in our investigation and the palm trunk usually collapsed on itself. In many cases, although the canopy appeared normal and healthy the plants died also 2-3 years after transplanting. During monitoring period at least ten palms presented canopy that suddenly falls off the trunk (Fig. 1). Only in some case the canopy died before either the trunk collapse on itself or the canopy suddenly falls off the trunk (Fig. 2). Symptoms were always not detected on lignified and external fibres.

As regards the provenience of palms, it was found that all infected palms have been imported from Egypt and transplanted directly *in situ*.

![Fig. 1 – Trunk collapse of date palm.](image1)

![Fig. 2 – Dyeing canopies of date palms without trunk collapse.](image2)

In most cases of apparently healthy date palms (28 plants) the presence of Thielaviopsis trunk rot was successfully detected by sonorous waves propagation. Transverse cross-sections of plants with any external symptoms confirmed instrumental analysis by Tree Tomography and revealed a brown rot of non-lignified or lightly lignified tissues (Fig. 3).
From these tissues it was consistently yielded on artificial media a fungus with typical endoconidia (3 to 5.5 μm × 7 to 11 μm), endoconidiophores long up to 150 μm, and chlamydospores (7.5 to 13 μm width × 10 to 18 μm length, referable to *T. paradoxa* (Fig. 4).

In addition, tomography has also allowed to detect first symptoms of internal decay of trunk caused by the pathogen (Fig. 5), that was successively isolated on artificial media too. Transverse sections of date palms not showing tomography anomalies (Fig. 6) did not exhibit internal decay.

Fig. 3 – Tree tomography (on the left) corresponding to an affected section of a date palm before trunk collapse (on the right).

Fig. 4 – Conidia (on the left) and chlamydospores (on the right) of *Thielaviopsis paradoxa*.

Fig. 5 – Tree tomography of two date palms without external symptoms revealed first internal decay.

Fig. 6 – Transverse sections of date palms without showing tomography anomalies.
In contrast, instrumental analysis by drilling resistance of sterile needle on trunk tissues was partially effective in revealing internal decay. Indeed, only very decayed tissues were detected with resistograph.

*T. paradoxa* were not detected on other indigenous date palms growing in Sicily. Only occasionally the fungus was associated in a nursery to a dry basal rot of kentia palm (unpublished data).

**Discussion**

The data have clearly shown a high disease diffusion, that was detected only on foreign trade date palms coming from Egypt. This paper demonstrated, for the first time, that Tree Tomography can support the diagnosis and may be used to evaluate the extension and stages of internal decay and, therefore, the palm stability in urban areas. This instrumental analysis, indeed, could allow to preventing danger of crashes, so reducing damage risks to people and things. In any case the high disease diffusion detected on imported date palms suggests to avoid the foreign trade of mature date palms from known infected areas due to symptomless infections caused by this pathogen.

**Literature cited**


