

# First Record of *Phytophthora cinnamomi* in Kiwifruit Trees in Egypt

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**Abstract**-This is the first report of widespread infestation of *Phytophthora cinnamomi* in kiwi wood in the Egypt. In February 2011, typical symptoms of crown rot disease was observed on 33% of kiwifruit trees (*Actinidiachinensis*) grown in Egypt.

**Index Terms:** *Phytophthora cinnamomi*, Kiwifruit Trees, Egypt

## I. INTRODUCTION

The **kiwifruit**, often shortened to **kiwi** in many parts of the world, is the edible berry of a cultivar group of the wood vine *Actinidia deliciosa* and hybrids between this and other species in the genus *Actinidia*. The fruit has a soft texture and a unique flavour, and today is a commercial crop in several countries, mainly in Italy, New Zealand, Brazil and Egypt. However, considering the epidemic nature of the damage, it was suspected that some pathogens may be related to the disease. In particular, *Phytophthora* sp. was believed to be the possible cause because the fungus has been reported as the major pathogen causing similar diseases in kiwifruit in New Zealand, California, Chile, and France (Conn *et al.*, 1991; Latorre *et al.*, 1991; Baudry *et al.*, 1991). In this paper, *Phytophthora* root rot of kiwifruit is firstly reported in the country, along with identification and pathogenicity test of the causal pathogen.

## II. MATERIALS AND METHODS

### Isolation of the causal pathogen.

Direct isolation of the causal fungus was carried out in kiwifruit orchards using a water agar and a semi-selective medium for *Phytophthora* (Jee *et al.*, 1997). Small pieces (5 mm<sup>3</sup>) of the infected tissues of the diseases roots or stems were cut by a scalpel after removal of the epidermis and bark. The pieces were placed on the media without surface disinfection and incubated for 4 days at 23°C. Mycelial tips from the pieces were cut and transferred into 10% clarified V8 agar for further studies. The internal transcribed spacer (ITS) region of the rDNA of a single isolate was amplified using the primers ITS1/ITS4 and sequenced.

### III. PATHOGENICITY TEST

For pathogen city test, we poured zoospore suspensions (4×10<sup>5</sup> zoospores per pot) on the soil of ten pots with rooted kiwi cuttings (4 months). Three plants were inoculated per isolate, and the same number of uninoculated plants was used as control checks. The pots with inoculated and uninoculated plants were separately submerged in water 1-2 cm deep from the bottom for 24 hr, and then placed in a greenhouse for 14 days at 24-30°C. Degree of pathogen city to the kiwi plants was graded as

follow: severe=all leaves defoliated and root rot; moderate=one to three leaves defoliated and root rot; weak = only root rot. After 3 months of growth, the seedlings were harvested and *P. cinnamomi* was isolated from seedling.

## IV. RESULTS AND DISCUSSION SYMPTOMS

In February 2011, typical symptoms of crown rot disease was observed on 33% of kiwifruit trees (*Actinidiachinensis*) grown in a commercial farm of Tahreer province, Bohara Governorate in Egypt. Infected plants have root rot, small chlorotic (yellow) leaves and the terminal growth may die back, or be stunted. Crowns of trees with lesions ranged from completely healthy to declining or dead (Fig. 1). Other symptoms include wilt, stem cankers (with sudden death of tree), and decline in yield, decreased fruit size, gum exudation, collar rot.



**Fig. 1.** Symptoms of crown rot disease of kiwifruit trees.

*Phytophthora* sp. was isolated from ten trees in five distinct sites and from four soil samples using selective medium containing hymexazol and identified according to (Hardham, 2003).

## V. IDENTIFICATION

The fungus was characterized using microscopic observations by coraloid hyphal swellings, chlamydospores, lack of oogonia in single culture and production of numerous. Chlamydospores are produced abundantly axenically and from infected tissue. They are borne from hyphae, and globose with thinner walls. Sizes range from 31 to 50 µm in diameter and are either terminal to intercalary in the mycelium. Oogonia are round with a tapered base, smooth, hyaline to yellow, with size ranging from 21 to 58 µm. The fungus produce ovoid sporangia with a nonpapillate, obpyriform with an apical thickening, tapered or rounded at the base, and terminally borne. Average sporangium size was 72 × 45 µm (length × width).

The sporangia produced many zoospores after 2 days flooding with autoclaved pond water on V8 juice agar, followed by internal proliferation. BLAST analysis of the 898-bp segment showed a 99% homology with the sequence of *P. cinnamomi* (GU799638) as follows:

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1
ccacacctaaaaaactttccacgtgaaccgtatcaaccaattagttgggg
gcctgctct
61
ggcgcgcgctgtcgtatgcaaaagtcgacggctgctgctgctggcggg
ccctactactg
121
gcgagcgtttgggtccctctcgggggaactgagctagtagcctctctttaa
accattc
181
tgtaataactgaacatactgtggggacgaaagtctctgctttaaactagat
agcaacttc
241
agcagtgatgtctaggctcgacatcgatgaagaacgctgcgaactgc
gatacgtaatg
301
cgaattgcaggattcagtgatcatcgaattttgaacgatattgcaactcc
gggttag
361
tcctgggagatgcctgtatcagtgctccgtacatcaaaactggctctcttctt
ccgtgt
421
agtcggtgatggaggtgccagacgtgaggtgtcttgcgggcggctctcg
gactggctgt
481
gagtccttgaaatgtactgaactgtactctctttgctcgaaaagcgtgacg
ttgctgg
541
tttgaggagctgcctgtatggccagtcggcgaccggtttgtctgctcgggc
gtttaatgg
601
aggagtgttcgattcgggtatggttgcttcggctgaacaaagcgttatt
ggatgttc
661
ttcctgctgtggcggtagcggatcggtaaccgtagctgtgctaggctggc
gtttgaacc
721
ggcgggtgtgttcgaagtaggggtggcggcttcggctgctgagggtcgat
ccattggga
781
actctgtctctcggcgcactgtgtgctgtggtggcatcctcaa

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VI. PATHOGENICITY

For pathogen city, 75% of plants expressed severe symptoms on roots and stems. Mean root dry weights were reduced by *P. cinnamomi*. Decline of Kiwifruit infected by *P. cinnamomi* was observed. This is the first report of widespread infestation of *P. cinnamomi* in kiwi wood in the Egypt. Similar effects have been reported for Kiwifruit by the same pathogen (*Latorreet al.*, 1991).