

prevent infection by this fungus or any wound pathogen that might be present.

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## FRUIT ROT OF FIG CAUSED BY PHYTOPHTHORA PALMIVORA<sup>1,2</sup>

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**Abstract.** A rot of green, immature fruit of fig (*Ficus carica* L.) was found to occur under natural conditions in Florida. The fungus, *Phytophthora palmivora*, was consistently isolated from the diseased fruit, and inoculations on detached, immature figs reproduced the symptoms.

In July 1982 and June 1983, rot of green, immature fruits of fig (*Ficus carica* 'Green Ischia' = 'Verte') (2) was observed in Gainesville, Florida. The infected fruit were limited to within 60 cm of the surface of the soil. There was no apparent foliage infection.

The purpose of this study was to isolate and identify the causal agent and to determine its pathogenicity on detached, immature fruit.

### Materials and Methods

**Isolation of the pathogen.** The fungus which sporulated on the surface of infected figs was transferred directly to a selective medium for pythiaceae fungi (5) since it appeared to be a member of this group. The plates were incubated at room temperature (25 ± 2°C) for 72 hr and observed for colony development. Cultures were maintained on potato dextrose agar (PDA) at room temperature. The PDA was prepared as described by El-Gholl, et al. (4).

**Sporulation of the pathogen.** Cultures for zoospore production were obtained by inoculating 15 ml of V-8 broth in Petri plates and incubating at room temperature for 2 days. V-8 broth was prepared as described by El-Gholl, et al. (4). The V-8 broth cultures were rinsed 2 times and resuspended in 10 ml of sterile tap water. The cultures were then incubated under continuous fluorescent light (General Electric F40LW-RS-WMII at approximately 1000 lux) for 48 hr. Zoospore release was triggered by treating the sporangia in the culture with chilled (10°C) deionized water. Zoospores were filtered through 16 layers of cheesecloth to remove sporangia. The number of zoospores was then determined using a standard hemacytometer.

**Inoculation with the pathogen.** Immature figs of uni-

form size were harvested one day before inoculations. Treatments consisted of wounded and nonwounded fruit, using 10 figs/treatment. Two wounds were made on the lateral side of each fruit with a flamed ring of fine insect pins. One drop of a zoospore suspension containing 3 x 10<sup>5</sup> zoospores per ml (1.4 x 10<sup>4</sup> zoospores per drop) was put directly onto each wound. Two drops were also placed on the lateral side of each nonwounded fruit. Fungal mats (3 mm in diameter) bearing sporangia were also used for inoculation on wounded and nonwounded figs. With figs serving as controls, only deionized water was used with a like number of drops. All fruit were kept 4 days in moist chambers at room temperature.

### Results and Discussion

The fungus isolated from naturally infected figs was identified as *Phytophthora palmivora* (Butl.) Butl. (2). This isolate was tested on detached, immature figs, and the fruit was found to be highly susceptible (Table 1). Within 4 days, symptoms of brown fruit discoloration became evident in all inoculated treatments, with fungal sporulation evident as a white fluffy growth on the surface of infected figs (Figs. 1 and 2). This fungus was identical to that obtained from naturally infected figs (Figs. 3 and 4). *Phytophthora palmivora* was also able to penetrate and infect immature figs in the absence of wounds (Fig. 1).

Table 1. Infection of detached, immature 'Green Ischia' figs by *Phytophthora palmivora* after 5 days at room temperature.

	Condition of fruit	No. infected/ no. inoculated
	Control	Wounded Nonwounded
Inoculated with zoospores	Wounded Nonwounded	9/10 9/10
Inoculated with fungal mats bearing sporangia	Wounded Nonwounded	10/10 10/10

*Phytophthora* fruit rot of fig is new to the United States, but the pathogen is endemic. The disease was noted in Taiwan and India (7). The same disease was reported on 'White Adriatic' [= 'Verdone' (3)] in New South Wales (1). In Japan, it was shown to be the cause of a white powdery rot of fig fruits and was found to infect leaves,

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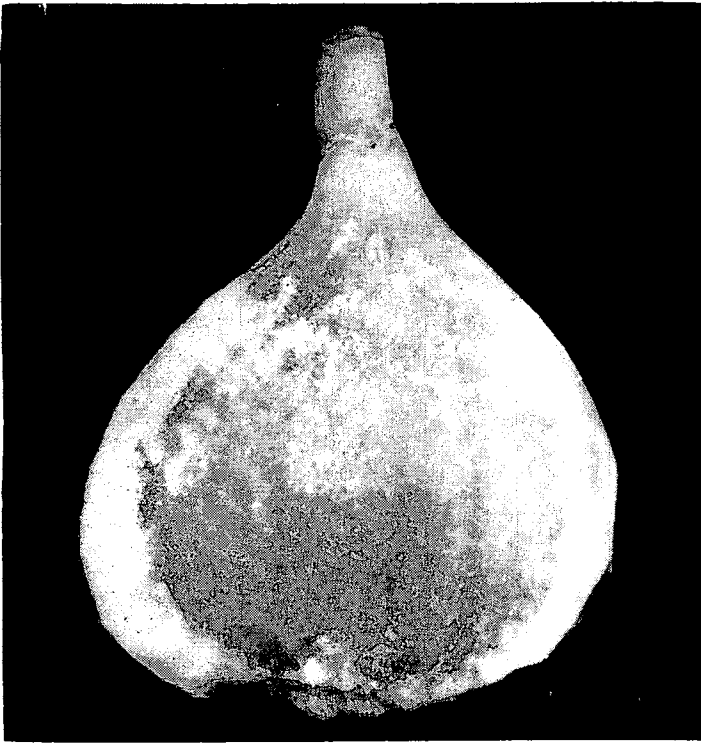


Fig. 1. Infection of a detached nonwounded 'Green Ischia' fig by zoospores of *Phytophthora palmivora* under laboratory conditions after 4 days at room temperature.

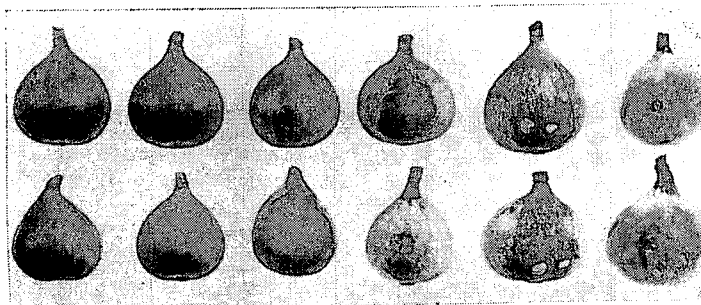


Fig. 2. Fruit infection of 'Green Ischia' fig by *Phytophthora palmivora* under laboratory conditions after 5 days at room temperature. Left to right: control nonwounded, control wounded, zoospore inoculation of nonwounded fruit, zoospore inoculation of wounded fruit, inoculation by mycelial mats bearing sporangia on nonwounded fruit, and inoculation by mats on wounded fruit.

young buds and in some instances, young stems of 'White Genoa' (3) and 'California Black' (3, 6, 7). The disease is common in the lower part of the tree, but frequently is found on higher fruits and limbs (7). The first severe epidemic affecting fig orchards was in the summer of 1935 in the Kurashiki region of Japan and was most prevalent on 'White Genoa'. Under laboratory conditions, the same fungus was shown to affect other fruits such as apple, Japanese pear, persimmon, eggplant, tomato, and tubers of potato (7).

In fig-growing areas of the world, it appears that *P. palmivora* has the potential to infect susceptible cultivars of fig under favorable conditions, and in view of its host range, is considered a serious pathogen of important crops.

Our *P. palmivora* culture, isolated from naturally in-

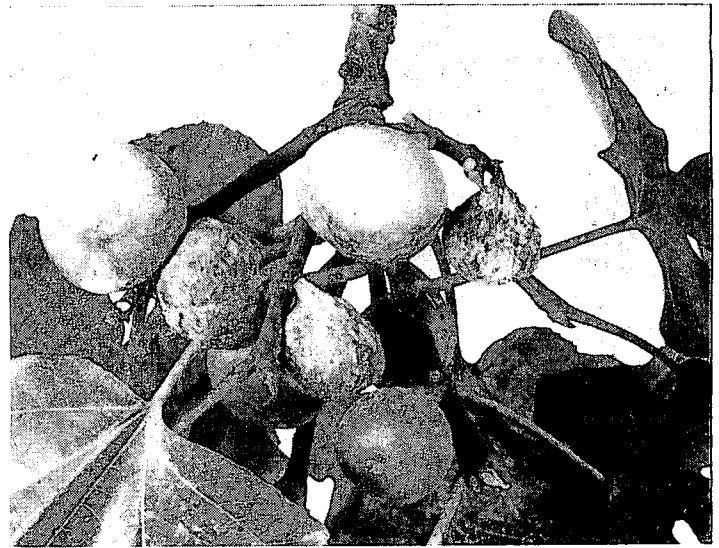


Fig. 3. Fruit of 'Green Ischia' fig infected by *Phytophthora palmivora* under natural conditions.

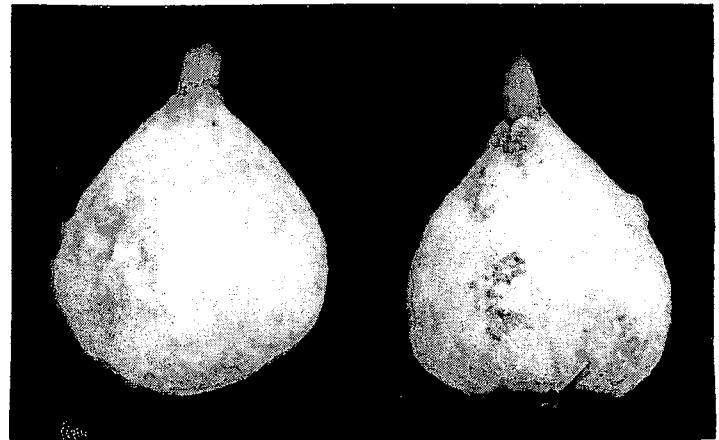


Fig. 4. Fruit of two 'Green Ischia' figs naturally infected by *Phytophthora palmivora*.

fecting figs was deposited with the American Type Culture Collection, 12301 Parklawn Drive, Rockville, Maryland 20852 as ATCC 56328, and in the Florida Type Culture Collection, 1911 S.W. 34th Street, Gainesville, Florida 32608 as FTCC 998.

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