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NECTRIELLA (KUTILAKESA) PIRONII, A PATHOGEN OF FIG PLANTS[1,2]

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Abstract. **The fungus,** Nectriella (Kutilakesa) pironii **Alfieri & Samuels, causes stem galls and cankers of fig (**Ficus carica **L.) plants. Six cultivars were found to be susceptible to the pathogen.**

Nectriella pironii has been recently described (3) along with its imperfect state *Kutilakesa pironii* Alfieri (1) and reported as a wound pathogen on a number of woody and other ornamental plants (4, 5). The generic name *Kutilakesa* Subram. is reported as a synonym of *Sarcopodium* Ehrenb. ex Schlecht. by Sutton (7).

In 1982, *N. pironii* was isolated from a naturally infected fig plant (*Ficus carica* L. 'Spanish Brown' = ? 'Fico di Spagna' or ? 'Noire de'Espagne') in Gainesville, Florida (6). The fungus was recovered from stem cankers of a relatively young fig plant (1.2 m tall) in close proximity, ca. 2 m, to a *K. pironii*-infected Texas sage plant, *Leucophyllum frutescens* (Berl.) Johnston. Both the perfect state and *Kutilakesa* imperfect state were present on corky callus tissues of the cankers. This appears to be the first report of *K. pironii* occurring on fig.

Because figs are an edible crop of world importance, the purpose of this study was to determine pathogenicity of the fungus on 6 of the more popular cultivars of fig.

Materials and Methods

Six fig cultivars were tested for comparative susceptibility to *Kutilakesa pironii*. They were 'Celeste' = 'Malta', 'Conadria' a selection from 'Adriatic', 'Green Ischia' = 'Verte', 'Kadota', 'Lemon' = 'Blanche', and 'Osborn Prolific' (6). Plants were derived from cuttings, were 14 months old, fairly uniform in stem diameter, and ca. 46 cm in height at the time of inoculation. The inoculum was grown on potato dextrose agar (PDA) (prepared from 200 g of boiled fresh Irish potatoes supplemented with 20 g dextrose, 1 g KH_2PO_4, and 18 g Difco agar, made up to 1 liter with deionized water) for 3 weeks at room temperature 25 ± 2°C) under continuous light (fluorescent light, General Electric F40LW-RS-WMII at approximately 1000 lux).

All cultivars were inoculated via an oblique stem incision approximately 2-3 mm deep and 5-7 mm long made with a sterile scalpel. Two plants per cultivar were inoculated with 10 incisions per plant (5 incisions on the stem up to the first leaf and 5 stem incisions at the leaf axils) with a like number of plants serving as controls. Incisions were inoculated by inserting a 2-mm diameter PDA plug bearing sporodochia of the fungus into the incision. On plants serving as controls, a PDA plug (2-mm diameter) without the fungus was inserted into the incision.

Inoculation without wounding was accomplished by placing a PDA plug (2-mm diameter) bearing sporodochia of the fungus at the leaf axil. Two plants per cultivar were inoculated with 5 sites per plant.

All plants were enclosed in plastic bags which served as moist chambers and placed on a greenhouse bench; ambient temperatures were 30 ± 6°C during day time and 17 ± 5°C at night. The plastic bags were removed after 4 days and observations were made at 3-week intervals for 12 weeks. Gall formation was measured as proliferated, callused tissue at inoculation sites and was substantiated with subsequent re-isolation of the causal pathogen at the end of 12 weeks.

Results and Discussion

All 6 cultivars of fig were susceptible to *Kutilakesa pironii*. Symptom reaction was expressed in the form of galls and cankers from which the pathogen was re-isolated in every instance. The cultivar reaction to incision inoculation of the 6 cultivars of fig showed that all produced galls except 'Conadria', which reacted with the formation of cankers (Table 1). Some differences in host susceptibility were observed with respect to stem gall proliferation (Table 2). 'Kadota' and 'Lemon' produced larger galls.

The fungus was not able to penetrate and infect stem

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Table 1. Reactions of 6 cultivars of fig (*Ficus carica*) to stem wound inoculations with *Kutilakesa pironii* after 12 wk.

Cultivar	Symptom reaction	No. infected/ no. inoculated
Celeste	Galls	14/20
Conadria	Cankers	14/20
Green Ischia	Galls	12/20
Kadota	Galls	14/20
Lemon	Galls	15/20
Osborn Prolific	Galls	14/20

Table 2. Tissue proliferation (height in mm) from the stem surface of 6 cultivars of fig (*Ficus carica*) 12 wk following stem wound inoculation with *Kutilakesa pironii*.

Cultivar	Control		Inoculated		
	(min)	(max)	(min)	Avg.	(max)
Celeste	0	1.0	1.0	1.6	3.0
Conadria	0	1.0	0	—	1.0
Green Ischia	0	0	1.0	2.5	4.0
Kadota	0	1.0	2.0	3.6	6.0
Lemon	0	0	2.0	4.0	9.0
Osborn Prolific	0	0	1.0	2.5	5.0

tissues of any cultivar in the absence of wounds under conditions of this study.

Fig. 1 and 2 show symptom reactions of *F. carica* to wound inoculations with *K. pironii*.

Kutilakesa pironii has a wide host range (2) and is essentially a wound pathogen of woody plants and woody portions of herbaceous plants. It has thus far only been

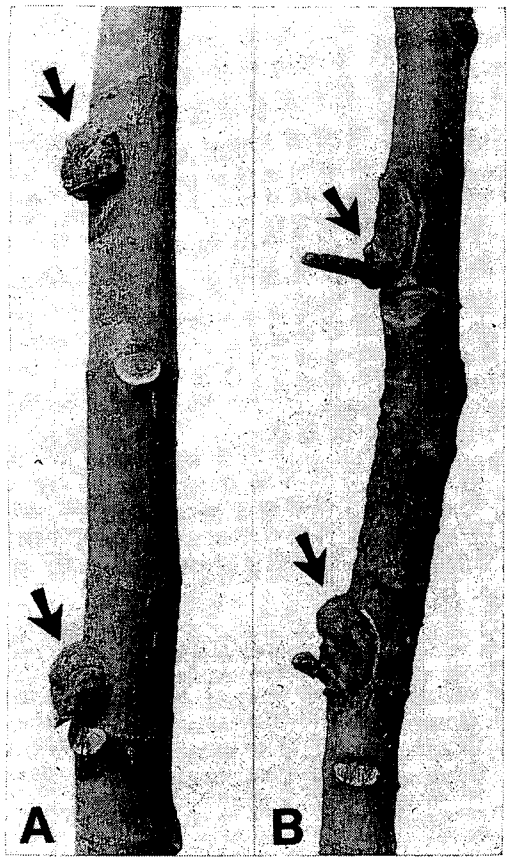

Fig. 1. Stem galls at inoculation sites. A) On *Ficus carica* 'Kadota' (ca. 1X). B) On *Ficus carica* 'Lemon' (ca. 0.8X) caused by *Kutilakesa pironii*.

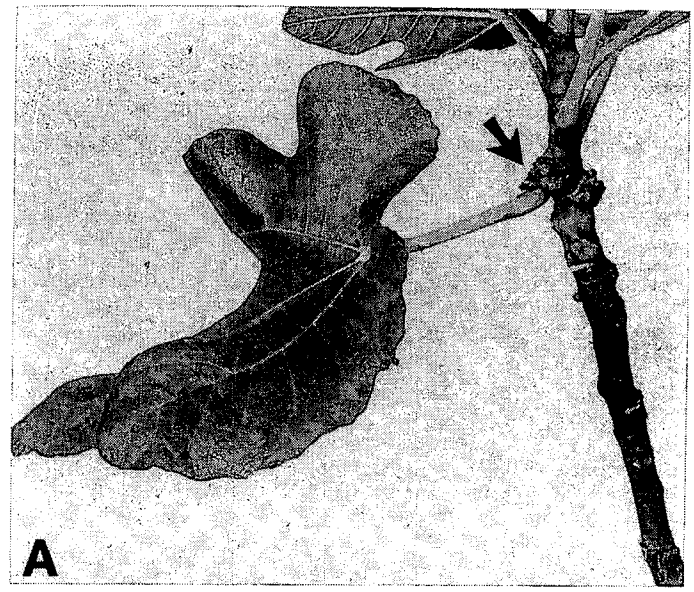

Fig. 2. *Ficus carica* 'Lemon' infected by *Kutilakesa pironii*. A) A stem gall at the leaf axil (ca. 0.3X). B) Closeup of three stem galls at leaf axils after leaves have abscised (ca. 2.3X).

reported in Florida in the Western Hemisphere which suggests that this fungus tends to be adapted to latitudes with relatively mild climates. Further, this pathogen has the potential of becoming a serious problem throughout a wide range of crops (4, 5), particularly where wounding or injuries, natural or man-made, are common-place such as in ornamental horticulture wherein vegetative propagation is a normal and common practice. In such instances, the application of an appropriate and effective fungicide prior to pruning or taking cuttings would be most desirable to

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[1,2]

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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 pythiaceous 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 uniform 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 3×10^5 zoospores per ml (1.4×10^4 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	0/10
	Nonwounded	0/10
Inoculated with zoospores	Wounded	9/10
	Nonwounded	9/10
Inoculated with fungal mats bearing sporangia	Wounded	10/10
	Nonwounded	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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