

**Weed Hosts of the SFR Strain of
Pseudomonas solanacearum, Causal
Organism of Bacterial Wilt
of Bananas**

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ABSTRACT

Isolations from weed species growing in banana plantations in Honduras and artificial inoculations indicate that 12 of the 64 weed species tested are potential hosts of the SFR strain of *Pseudomonas solanacearum*. *Phytopathology* 61:1314-1315.

Thirty-nine of 307 weed species found in or near banana plantations in Honduras (J. D. Dickson, *personal communication*) are known hosts of *Pseudomonas solanacearum*, and 76 belong to genera containing known susceptible species (1, 2, 4, 6, 10). The relationship of these numerous potential weed hosts to the continued presence and spread of bacterial wilt of bananas (Moko) caused by *P. solanacearum* has not been clearly demonstrated. Buddenhagen (2) isolated the banana (B) strain from two species of wilted Heliconias growing in abandoned plantations which induced wilt in bananas. Sequeira & Averre (10) encountered extensive infections of three Heliconia species in virgin woodland areas in Costa Rica by the B strain. These isolates produced distortion symptoms similar to those found in young banana plantations planted on recently cleared woodland. Isolates of *P. solanacearum* obtained by these investigators from other weed species were not pathogenic to bananas. Sequeira (9) stated that under natural conditions the banana strain has a very limited host range, attacking only species of Heliconia and bananas.

More recently, Belalcazar et al. (1) studied the susceptibility of 33 weeds to races 1, 2, and 3 of *P. solanacearum*, pathogenic to tobacco, banana, and potato, respectively. Five species were susceptible to race 2; 12 species were considered carriers, displaying no external symptoms but showing some internal necrosis of the vascular system from which the bacteria were recovered.

This investigation was undertaken to determine if any weed species in the Honduras banana plantations can maintain populations of the insect-transmitted SFR strain (3) of *P. solanacearum* (with or without symptoms) which could be transmitted to bananas in the "bush-chopping" operation in which all understory vegetation is hand cut with machetes. Machete transmission is probably the most common means of spread from bananas to bananas (8).

Isolations from weed species in banana plantations.—Isolations were made from 41 common weed species

growing within banana plantations in Honduras. Although many of the weeds appeared healthy, or only had one or two necrotic leaves, they often showed internal discoloration of the vascular system. Isolations were made by aseptically placing small pieces of surface-sterilized plant material from various parts of the plant into sterile distilled water and shaking. After 5 min, a droplet of this water was streaked on tetrastazolium medium (7). Colonies of *P. solanacearum* were easily identified on this medium after 48 hr at 31 C. These isolations revealed that 10 of 41 weed species were hosts of the SFR strain (Table 1).

Bacterial suspensions for testing pathogenicity were prepared by suspending two loopfuls from typical colonies in 5 ml of sterile distilled water, and injecting 1 ml of the suspension into the pseudostem of young, potted banana plants (VALERY AAA cultivar). All isolates were pathogenic to bananas.

Greenhouse pathogenicity tests.—To determine if some weed species from which *P. solanacearum* was not isolated might be potential hosts, 43 weed species, which included 20 from which isolations had been previously attempted, were transplanted from the banana plantations to 10-inch pots in the greenhouse. Plants were allowed to recover 1 month prior to inoculation with one or more strains of *P. solanacearum*. Plants were inoculated by pouring 100 ml of a heavy suspension of bacteria on the soil and wounding the roots by inserting a knife into the soil 3 times about 4 cm from the edge of the pot or by puncturing the stem with a fine sterile scalpel and placing a drop of bacterial suspension on the wound. The plants were inoculated with the insect-transmitted SFR strain (3), a mixture of the fast-wilting banana (B) strain (2, 5), or B, SFR, and the tomato (T) strain (5). Distilled water was used for treating the control plants. The greenhouse inoculations revealed that two additional species, *Physalis* sp. and *Solanum torvum*, were susceptible to the SFR strain of *P. solanacearum*. Thirty-two plant species did not develop symptoms, and the organism could not be recovered. The 10 weeds that were hosts in the banana plantations (Table 1) also became diseased, except that *Xanthosomas roseum* did not develop symptoms. However, the organism could be recovered from the plants.

TABLE 1. Natural weed hosts of the SFR strain of *Pseudomonas solanacearum* found in Honduras banana farms

Weed hosts	No. isolations made ^b
<i>Asclepias curassavica</i> L.	10/31
<i>Cecropia peltata</i> L. ^a	2/30
<i>Piper auritum</i> HBK. ^a	14/55
<i>Piper peltatum</i> L.	15/40
<i>Ricinus communis</i> L.	9/57
<i>Solanum hirtum</i> Vahl. ^a	2/2
<i>Solanum nigrum</i> L.	10/46
<i>Solanum umbellatum</i> Mill. ^a	11/35
<i>Solanum verbascifolium</i> L.	8/31
<i>Xanthosomas roseum</i> Schott. ^a	14/59

^a Not previously reported as hosts of *P. solanacearum*.

^b Numerator refers to times SFR was isolated; denominator to number of isolations made.

Stem inoculations of susceptible weeds with strains of P. solanacearum.—The B, SFR, and D (2, 5) strains of race 2 were used individually to stem-inoculate 9 of the 12 susceptible weed species. Control plants were inoculated with sterile distilled water. Symptoms began developing 3-4 weeks after inoculation. Although some variation in susceptibility to the three strains was observed, resistance displayed by any given weed species tested often meant only a delay in symptom development, which in most cases eventually resulted in death of the plant.

Isolations from weed species growing in the field and artificial inoculations indicate that of the 64 weed species tested, 12 are potential hosts of the SFR strain of *P. solanacearum* causing bacterial wilt of bananas. *Cecropia peltata*, *Piper peltatum*, *Solanum hirtum*, *S. umbellatum*, and *Xanthosomas roseum* have not previously been described as hosts of *P. solanacearum*. This is the first time a strain of *P. solanacearum* pathogenic to bananas has been isolated from naturally infected weed species unrelated to Musaceae.

The relatively long period (3-4 weeks) before symptoms were detected after inoculation explains how the organism can survive and be spread in weed species under field conditions. The slow rate of disease development could allow the plant to survive between bush-chopping cycles, and the organism then could be mechanically spread to other susceptible plants. If symptom development was rapid, the plant would die quickly and desiccate, greatly reducing the chances of mechanical spread. This does not eliminate the possibility of spread from weed to weed by other means, such as insects or root transmission. Once the initial infection takes place in the understory vegetation within a banana plantation, it is easy to visualize a chain reac-

tion of mechanical spread in the bush-chopping operation. As infection of the susceptible weed species increases, the possibility of spread to bananas becomes proportionately greater either by mechanical, root, or insect transmission.

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