An Epiphytotic of *Leveillula taurica* on Tomatoes in Utah

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ABSTRACT

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The *Oidium* state of *Leveillula taurica* was identified in 1980 on fresh market and processing tomatoes and chili peppers in Utah. Perithecia of *Leveillula* were found on dry tomato foliage in a Nevada greenhouse in the spring of 1981. At least 100 ha was involved throughout the major tomato-growing areas. The primary outbreaks occurred on transplanted tomatoes shipped into Utah from Nevada and Florida. Secondary outbreaks were common late in the year on all tomato varieties grown throughout the state.

Additional key words: *Oidiopsis taurica* (Lév.) Salm., *Oidium taurica* Link 1824

An epiphytotic of powdery mildew caused by *Leveillula taurica* (Lév.) Arn. occurred on fresh market and processing tomatoes (*Lycopersicon esculentum* Mill.) in Utah during the 1980 growing season. This species of the powdery mildew fungus on tomato was first reported in North America in 1978 in the Imperial Valley of California (4). A subsequent report in 1979 in the Central Valley of California suggests that the pathogen is spreading (1). This disease has not caused significant economic losses to the tomato industry in the United States, although it is a common and destructive pathogen of tomato, pepper, eggplant, alfalfa, and many other plants in the Mediterranean region, Asia, and Africa (6).

The disease was observed and the *Oidium* Link 1824 state identified on 6 August 1980 in Box Elder, Weber, Salt Lake, and Utah counties on the Wasatch front in Utah. Symptoms were well developed, indicating that the first infections probably occurred at least 2 wk earlier. The first serious outbreaks were observed in commercial plantings of fresh market tomatoes. The disease was found in all 22 fields inspected in early August. We estimated that yield losses in commercial tomato fields ranged from 10 to 90%. The affected area was difficult to determine because it included many fields of small growers, but at least 100 ha was involved. The powdery mildew fungus was not detected in home gardens until late August or early September. Yield losses in most home gardens were negligible because each plant had only a few lesions.

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EXTENT OF DAMAGE

The tomato varieties most commonly affected were Campbell DX 52-12 and 1327 and Del Monte 71-24. The most severe symptoms were observed on 71-24. We noted symptoms on many other varieties, including Beefsteak, Bigset, Fireball, Floramerica, Jetstar, Rocket, Roza, and Tropic. No varieties were free of infection.

Symptoms consisted of bright yellow spots on the upper leaf surface as described by Palti (5), but they differed in that *Oidium* sporulation was very sparse on the undersurface. Infected spots eventually turned brown; affected leaves dried up but persisted on the plant.

Many of the brown lesions had concentric rings similar to, but less conspicuous than, the rings caused by early blight of tomato. The symptoms connoted by the name "powdery mildew" do not develop in Utah because environmental conditions prevent macroscopically visible sporulation. However, many conidia were seen on Tropic tomatoes grown in greenhouses in Utah and Nevada.

In many fields, plants were so severely affected that only a tuft of three or four small leaves remained alive at the terminals. Fruit on these plants did not grow to normal size, and much was sunburned because of lack of foliage. Most plants started to recover by late September as the daily mean temperature decreased. However, recovery was so late in the year that plants did not regain productivity before frost.

The severity of mildew damage to tomatoes grown under sprinkler irrigation was significantly less than to those plants irrigated by furrow, as reported previously (7). Water sprays also restrict development of several other species of powdery mildew fungi (9). Tomatoes grown in a home yard and irrigated by sprinklers had only a few lesions per plant, whereas adjacent plantings using the same source of transplants but irrigated by furrow lost 90% of their foliage.

Chili pepper plants, *Capsicum annuum* L. (variety unknown), were also infected by *L. taurica*. The symptoms were as previously described (5) but differed from those on tomato. In pepper, a brown discoloration coincided with the chlorotic areas of the leaf and foliage was subsequently lost, but the brown discoloration did not develop on tomato leaves and leaves did not dehisce. Infections were only observed on chili peppers growing in plantings next to or very near infected tomato plants. We believe that this is the first report of *L. taurica* on pepper in the United States.

ELECTRON MICROSCOPY

Tomato leaf specimens were prepared for scanning electron microscopy by fixing in Karnovsky's fixative (2), followed by critical point drying. Specimens were sputter-coated in a Polaron E500 with gold-palladium and observed on an AMR 1000 scanning electron microscope (Burlington, MA).

The conidia and perithecia were typical of *L. taurica* (6). Conidiophores emerged in groups of one to five through stomata and branched two and (rarely) three times. Conidia were usually borne singly but occasionally in chains of two to three. The terminal conidia were pyriform with the distal end tapering to a point and the basal end rounded. Subterminal spores were nearly cylindric without the pointed end. Immature conidia were also rounded on both ends. Mycelium was not observed on the surface of the leaf (Fig. 1).

A few perithecia were found in March 1981 on dry tomato foliage in a southern Nevada greenhouse. Plants in this greenhouse had been severely infected with the *Oidium* state in August 1980. The asci and ascospores were characteristic of previous descriptions (6). This is the first report of perithecia of this pathogen in North America.

DISCUSSION

Although this disease was identified in Utah in 1980, it may have been present at least as early as 1978. We did not observe it directly, but pictures of symptoms and descriptions by tomato growers indicate that the powdery mildew fungus was the cause of severe losses in previous years. Some growers describe similar losses in 1976; however, it cannot be verified that these symptoms were caused by *L. taurica*.

The tomato-producing area in Utah

(approximately 500 ha) is not a significant part of total U.S. production, but it is an important aspect of the local economy. The main concern is whether this epiphytotic (with yield losses up to 90%) could be repeated in areas such as California, where 5,500 ha of fresh market tomatoes, 89,000 ha of processing tomatoes, and 80 ha of peppers were grown in 1979 (1).

We have noted that *L. taurica* was first reported in the Imperial Valley of California in 1978 (4), as was the first serious outbreak of *Erysiphe polygoni* DC., which caused an epiphytotic on sugar beet in 1974 (3). The subsequent spread of the sugar beet mildew fungus throughout the western United States and Canada was a striking example of dispersal (8), and may raise concern about the potential for *L. taurica* in North America. The host range of the pathogen includes 710 species of plants in 28 different orders (6). Important commercial hosts include tomato, eggplant, pepper, and globe artichoke, but the fungus also infects alfalfa, carrots, onion, and potato.

Primary outbreaks of *L. taurica* in Utah occurred on those hectares planted with tomato transplants imported from Nevada and Florida. Transplants were not inspected because we were not aware of this disease at the time. Secondary outbreaks occurred on locally grown plants, which suggests that the pathogen may be incapable of overwintering in the colder conditions of northern Utah. A temperate environment, therefore, may restrict the movement and significance of the disease in the United States. Palti (6) points out that the fungus overwinters in Mediterranean countries on many weed hosts, providing an important source of inoculum in the spring.

In the United States, the potential for serious economic loss from infection by *L. taurica* warrants close observation and preparation for control.

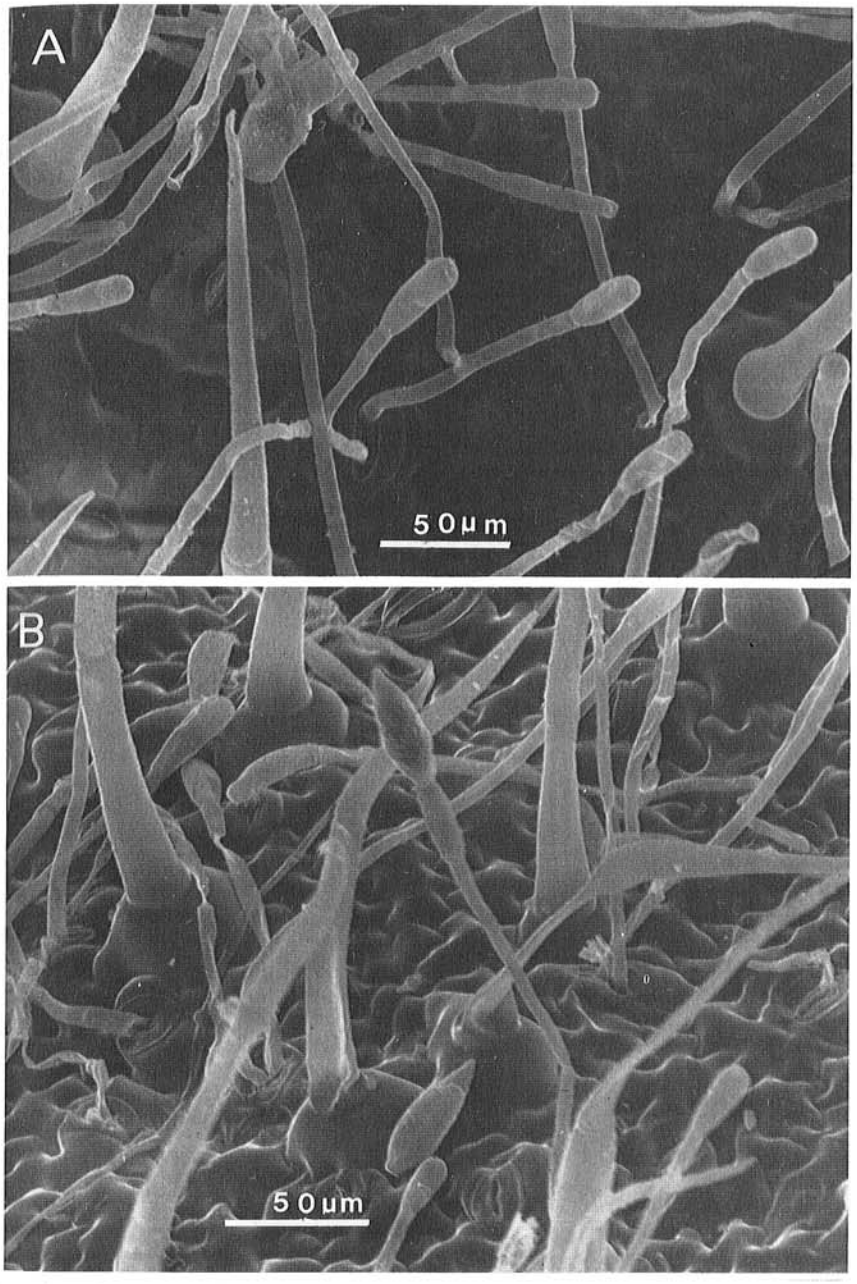

Fig. 1. Scanning electron micrographs of *Leveillula taurica* on tomato foliage. **(A)** Clusters of one to three conidiophores with terminal conidia emerging from stomates. **(B)** Pyriform, mature conidia with the distal end of the conidium tapering to a point.

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