# A Powdery Mildew of Chilli Caused by Oidiopsis sp.

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ABSTRACT

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Powdery mildew of chilli *(Capsicum annuum)* was present in Lee, Collier, and Hendry Counties of southwest Florida in December 1971, and the causal agent was *Oidiopsis* sp. Chlorotic and necrotic spots of the leaves, branch die-back, and dwarfing were the main symptoms, which were followed by pod drop. The pathogen was not observed in any other plant parts. Most nonpungent pepper plants were resistant to the disease. This is the first report of the occurrence of the disease on chilli on the North American continent.

*Additional key words:* obligate parasite, manganese deficiency.

ABSTRACTO

El mildiú de chili *(Capsicum annuum)* fúé encontrado por primera vez en los condados de Lee, Hendry, y Collier en el suroeste de Florida en 1971. El mildiú es causado por una especie de *Oidiopsis*. Los síntomas principales de la enfermedad son manchas cloróticas y necróticas de las hojas, defoliación, sequía de ramas y caída de frutos. El organismo patogenó nó se encontró en otras partes de las plantas. Pimiento es resistente a la enfermedad. Este es el primer reporte de esta enfermedad del chili en el continente Americano del Norte.

*Palabras adicionales:* parasito obligado, deficiencia de manganeso.

Peppers *(Capsicum annuum* L.) have been cultivated on a commercial scale in various parts of Florida since 1950. Annual cropped area has varied from 2,000 to 4,000 hectares. The production of hot chilli peppers is limited to small plots and backyard gardens and is not commercially significant. The appearance of powdery mildew on chilli pepper caused by an unidentified species of *Oidiopsis* poses a potential threat to the pepper industry. In other parts of the world [Africa (6), Asia (4), and the Middle East (7)] species of *Oidiopsis* cause severe diseases of cultivars of chilli pepper and tomato, as well as many other crops. *Oidiopsis* has been reported on the American continent only on hyacinth bean (*Dolichos lablab* L.) in Nicaragua by Litzenberger and Stevenson (5), on tomato *(Lycopersicon esculentum* L.) in the Dominican Republic by Castellani (3), and on chilli in Cuba (M. B. Ellis, *personal communication*). The disease reported here first was observed in Lee County in December of 1971, and by 1972 it was found in most chilli plots in the other two adjacent counties of Hendry and Collier.

The disease has received very little attention owing to the lack of commercial chilli production in southwest Florida. Eventually the potential danger from the disease prompted investigations to determine its importance on pepper. In preliminary studies at the Agricultural Research Center–Immokalee, it was determined that the only susceptible nonpungent pepper cultivar was Agronomico and that all other nonpungent cultivars were resistant. The pungent cultivar Jalapeno was susceptible, and all of the other chilli cultivars were susceptible in varying degrees. This is the first report of the occurrence of powdery mildew (caused by *Oidiopsis* sp.) on chilli pepper in the United States and on the North American continent.



## MATERIALS AND METHODS

**Field studies.**—Chilli, pungent and nonpungent pepper cultivars, and a pepper breeding line were planted in randomized and replicated plots in the spring of 1972 for symptom observation. Symptom severity was classified according to the Brown, Barratt, and Horsfall system (2) in individual plants to determine ranges of susceptibility within each cultivar and the breeding line tested. Natural infection occurred late in the season with enough severity to indicate degrees of resistance.

**Pathogenicity studies.**—Plants of three chilli-type peppers, one pungent pepper, five nonpungent pepper cultivars, and a nonpungent pepper breeding line were grown and tested for their reaction to *Oidiopsis*. Inoculum was collected from three different sources within a thirty-mile radius of Immokalee in the surrounding counties of Lee, Hendry, and Collier. Plants were grown individually in 7-cm diameter (3-inch) plastic pots containing a mixture of peat, perlite, and soil (1:1:5, v/v). The chilli cultivars were Pasilla, Ancho, and Mulato; the pungent cultivar was Jalapeno; and the nonpungent cultivars were Yolo Y, Early Cal Wonder, Yolo W. Burpee, Avelar, and Agronomico. The breeding

line was Florida 23-1-7. Plants were covered with plastic bags for twelve hours after inoculation and were uncovered for the remainder of the experiment. Inoculum was prepared by making distilled water suspensions of the three sources of conidia. Three plants of each type of chilli, and the pungent and nonpungent peppers were inoculated in the experiment. Disease ratings were made as in the field studies (2).

**Cultural studies.**—Leaves from the three chilli sources were brought to the laboratory for cultural studies. Conidia were washed from the leaves with sterile distilled water and seeded in plates with the following standard media: potato-dextrose agar, nutrient agar, Czapek's, V-8 juice, peptone agar, and lima bean agar. Two lots of each type of medium were seeded for conidial germination; one for growth in total darkness and the other illuminated with fluorescent lighting that provided a light intensity of 16,140-21,520 lux for an 18-hour day-length.

## RESULTS

**Field studies.**—Symptoms of powdery mildew in the field first appeared when leaves lost their light green juvenile color and began to harden. One or two white tufts of mycelium developed on the underside of the leaves (Fig. 1-A). As the leaves grew, the number of white tufts increased and coalesced, giving the upper side of the leaf a light greenish-yellow chlorosis (Fig. 1-A). In mature leaves the chlorosis generally was restricted to tissue between the large veins, causing the leaf to have a somewhat netted appearance as with plants with manganese deficiency. As the powdery mildew infection progressed, the center of the light greenish-yellow area became dark brown and dropped off. Leaves generally abscised by the time the brown areas became enlarged, causing the plants to be nearly defoliated. Mycelial tufts were observed mostly on the lower surface of the leaves, rarely on the upper surface, and on the denuded stems. Conidia formation was restricted to the lower surface of the leaves. White tuft formation was observed only on the tissue of the current year. No symptoms were observed on any other plant structures, including flowers and fruit.

Powdery mildew has caused partial defoliation of chilli plants in backyard gardens since December of 1971. Home owners have made few, if any, attempts to control diseases with fungicides, because it was believed that the problem was caused by a lack of manganese or by green peach aphids [*Myzus persicae* (Sulzer)] and was not by a fungal pathogen.

Powdery mildew has been more severe in shaded areas, whether humid or dry. In home gardens, symptoms were observed on both short and long types of Serrano chilli, as well as on the pungent cultivar Jalapeno. It never has been seen on any of the other types of pepper, either in home gardens or in large production fields.

Results of field studies on susceptibility indicate that there were highly significant differences ($P = 0.01$) in a Duncan's multiple range test among the cultivars screened in the spring of 1972 (Table 1). In these tests, most of the nonpungent pepper cultivars were not infected by powdery mildew, whereas all of the chilli cultivars showed degrees of susceptibility. The nonpungent cultivar Avelar appeared to be resistant in both greenhouse and field tests, but the nonpungent Agronomico and pungent Jalapeno cultivars were highly

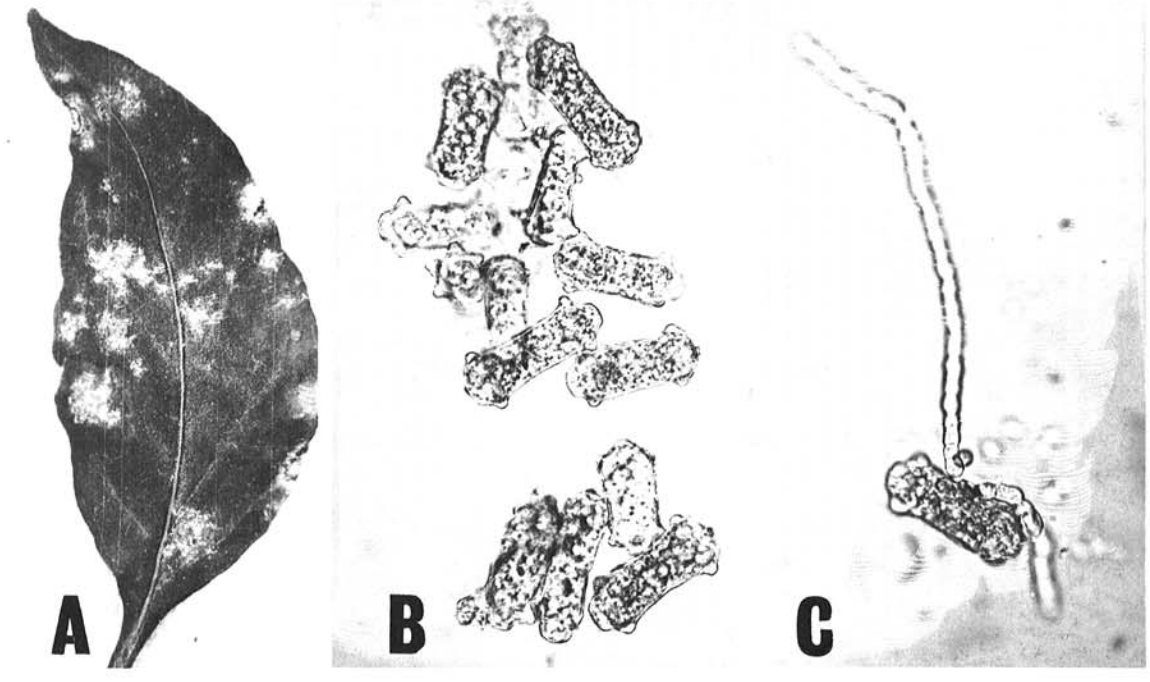


**Fig. 1-(A-C).** Symptoms on a chilli leaf and conidia produced by *Oidiopsis* species. **A)** White tufts of mycelium and conidia on lower side of leaves; **B)** group of conidia with rough surface; and **C)** germinating conidium.

TABLE 1. Degrees of susceptibility of chilli, pungent, and nonpungent pepper cultivars to natural infection and inoculation with powdery mildew (*Oidiopsis* sp.)

| Pepper types and cultivars | Disease severity (%)[a] | |
|---|---|---|
| | Natural infection | Greenhouse inoculation |
| Chilli types | | |
| Pasilla | 2.79 y[b] | 4.2 y |
| Ancho | 2.32 y | 3.2 y |
| Mulato | 1.38 y | 1.7 y |
| Pungent type | | |
| Jalapeno | 31.85 yz | 36.7 z |
| Nonpungent types | | |
| Agronomico | 44.04 z | 27.5 yz |
| Avelar | 3.73 y | 2.5 y |
| Early Cal Wonder | 0.00 y | 0.0 y |
| Yolo-Y | 0.00 y | 0.0 y |
| Yolo W. Burpee | 0.00 y | 0.0 y |
| 23-1-7 | 0.00 y | 0.0 y |

[a]Percent disease estimated by the Brown, Barratt, and Horsfall system.

[b]Column values followed by the same letter are not significantly different ($P = 0.01$) according to Duncan's new multiple range test.

susceptible in both greenhouse and field tests.

**Pathogenicity.**—The disease symptoms (leaf discoloration, chlorosis, and necrotic spots followed by partial defoliation, stem die-back and stunting) observed on inoculated plants were as severe as those observed on plants in the field. Little is known about the etiology of this powdery mildew pathogen.

There were no differences in pathogenicity among the three sources of inoculum. Consequently, the data for the three sources of inoculum were combined in Table 1. Greenhouse inoculation experiments were not repeated because of the similarity between the results obtained and those from natural field infection.

**The pathogen.**—The generic identity of the pathogen (*Oidiopsis* sp.) was determined by M. B. Ellis, Commonwealth Mycological Institute, Kew, Surrey, England. The conidia of the pathogen are hyaline, single-celled, with a rough surface and apparent globular material (Fig. 1-B). They are cylindrical with semiblunted tip and measure 40 × 13 μm (33-45 × 10-15) (Fig. 1-C). A few of the conidia have pointed ends. The mycelium grows mostly on the lower surface of the leaves and is hyaline. The conidiophores are also hyaline, septate, rough-surfaced, and measure up to 250 μm long and 8 μm broad. The conidia are catenulate and occasionally are produced in catenulate branches. The conidiophores and conidia fit the description of the genus *Oidiopsis* (6) and were identified as such.

The species identification of *Oidiopsis* awaits comparison with the species described in eastern Europe (4) and Israel (7). The necrotic centers of the lesions caused by *Oidiopsis* sp. were invaded by saprophytic fungi (*Alternaria, Stemphylium,* and *Cladosporium* spp.). These fungi have been mistaken in a number of cases as the causal organisms of the powdery mildew spotting.

**Cultural studies.**—The results of seeding conidia of *Oidiopsis* in the various types of media were negative. Although a number of conidia germinated on the various media, conidia germinated as well in sterile distilled water (Fig. 1-C). No growth or mycelial development was observed in any of the media, confirming that *Oidiopsis* is an obligate parasite.

## DISCUSSION

Powdery mildew of chilli pepper was caused by *Oidiopsis* sp. and consistently was associated with chilli leaf spotting throughout Lee, Hendry, and Collier Counties. Home gardens are periodically turned under, destroying the host plants for obligate pathogens such as *Oidiopsis* sp. It was not established whether there are other hosts in the tri-county area that may allow the powdery mildew pathogen to survive until new home garden plantings are established. *Oidiopsis* sp. possibly may survive in volunteer chilli plants or it might overseason in an ornamental or weed host. Such a possibility is probable in view of the large host range of the genus, which includes a large number of weeds (1, 4, 6, 7).

Although the disease is of little economic importance in pepper-growing areas of southwest Florida, its widespread occurrence suggests that breeding investigations should consider the potential danger of the pathogen attacking newer breeding lines with the nonpungent Agronomico genes, since that cultivar proved to be susceptible both in field trials and greenhouse inoculation experiments. The high susceptibility of the pungent cultivar Jalapeno was a significant factor since there are many plantings of it that could increase the prevalence of *Oidiopsis* in the tri-county area. The appearance of *Oidiopsis* for the first time on the North American continent may pose a potential threat to the chilli industries of Louisiana, Arizona, and California.

## LITERATURE CITED

1. BERGER, G. 1938. Contribution a la connaissance de Leveillula taurica Arnaud. Ann. Epiphyt. N.S. 4:21-25.
2. BROWN, I. F., R. W. BARRATT, and J. W. HORSFALL. 1968. Elanco conversion tables for Barratt-Horsfall rating system. Special Report, Eli Lilly and Co., Greenfield, Indiana. 46140.
3. CASTELLANI, E. 1958. Plant diseases of economic importance in the Dominican Republic. FAO (Food Agric. Organ., U.N.) Plant Prot. Bull. 7:31-35.
4. GOLOVIN, P. N. 1956. Monographic survey of the genus Leveillula Arnaud. Trans. Bot. Inst. U.S.S.R., Acad. Sci. Ser. II 10:195-308.
5. LITZENBERGER, S. C., and J. A. STEVENSON. 1957. A preliminary list of Nicaraguan plant diseases. Plant Dis. Rep. Suppl. 243:1-19.
6. NOUR, M. A. 1958. Studies on Leveillula taurica (Lev.) Arn. and powdery mildews. Trans. Br. Mycol. Soc. 41:17-38.
7. PALTI, J. 1959. Oidiopsis diseases of vegetable and legume crops in Israel. Plant Dis. Rep. 43:221-223.