

Research Report

Susceptibility of Mesquite Species to Powdery Mildew in Arizona

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Abstract

*Mesquite (*Prosopis* sp.) is a popular tree in landscapes in Arizona because of its drought tolerance and attractive growth habit. Powdery mildew has been observed from late summer until early spring on mesquite leaves. It has been identified as *Pleochaeta polychaeta* based on morphological descriptions and comparison to herbarium specimens. Surveys were conducted in fall 2008 through winter 2009 at two locations in southern Arizona to determine the susceptibility of different mesquite species to powdery mildew. Twelve mesquite trees representing two species were sampled at Texas Canyon near Willcox, AZ, and 177 trees representing eight species were sampled at the University of Arizona campus in Tucson, AZ. The North American mesquite species *P. glandulosa* var. *glandulosa* and *P. velutina* were infected with powdery mildew at the University of Arizona campus and *P. velutina* at the Texas Canyon site. No powdery mildew was observed on *P. alba*, *P. cinerea*, *P. nigra*, *P. chilensis*, *P. pubescens* and *P. chilensis* x *flexuosa*. The powdery mildew affects the aesthetic value of severely infected trees but seems to have little effect on long term tree health.*

Introduction

Both native and introduced mesquite species (*Prosopis* sp.) are important members of urban landscapes and natural habitats in Arizona. Velvet mesquite (*Prosopis velutina*) is native to Arizona, but many other mesquite species and hybrids are used in urban landscapes including western honey mesquite (*P. glandulosa* var. *glandulosa*) native to other parts of the U.S. and *P. nigra*, *P. alba* and *P. chilensis* that are native to South America. Mesquites are deciduous trees that lose their leaves in cold temperature and drought conditions. Premature shedding is caused by infections from powdery mildew. Disease is sporadic, and severity varies from year to year. Disease is found at very low levels in most years. The most recent severe outbreak that affected trees throughout the Tucson, AZ area occurred in 2000 on *Prosopis velutina* and *P. glandulosa* var. *glandulosa*. Variation of infections of mesquite was observed in both native and landscape habitats in Arizona, but there were no records of species susceptibility. A survey was initiated to determine susceptibility of different mesquite species to powdery mildew and confirm the identity of the pathogen.

Materials and Methods

Survey for powdery mildew susceptibility. In fall 2008 and early spring 2009, 177 mesquite trees belonging to eight species - *Prosopis glandulosa* var. *glandulosa*, *P. velutina*, *P. alba*, *P. chilensis*, *P. nigra*, *P. cinerea*, *P. pubescens* and *P. chilensis* x *flexuosa* were surveyed at the University of Arizona in Tucson, Arizona. Since the University of Arizona has planted *Prosopis* sp. from around the world on the Tucson campus, this was an ideal location for the survey due to the large number of *Prosopis* species in one location. All the trees on the campus were irrigated resulting in higher humidity than in most desert areas and creating a uniform environment conducive to powdery mildew development. Trees were identified to species using a GIS map of the campus that identifies each tree by genus and species (<http://codd.art.snr.arizona.edu/arboretum/viewer.htm>). In addition, seven *P. velutina* and five *P. chilensis* were evaluated in fall 2008 in Texas Canyon at a landscaped interstate highway rest area near Willcox, AZ. All the trees were irrigated, and the distance between the trees was approximately 15 m.

Leaves from all mesquite trees on campus and at the rest area were inspected in October-November 2008 and again in February-March 2009. Small branches with leaves were cut off from both lower branches of the trees at about 2 m height and with a pull pruner from about 2 to 4.5 m height. Leaves with powdery mildew signs and/or symptoms were sampled and stored at 4°C. The leaves were evaluated for the presence of powdery mildew using a dissecting microscope.

Identification of powdery mildew species. Powdery mildew fruiting bodies, asci, chasmothecia appendages and conidia collected from infected mesquite leaves were measured using a compound microscope. Identification was based on the description in Braun's monograph of the Erysiphales (Braun, 1987). To confirm the identification, the mesquite powdery mildew was compared to specimens of the same species from the U.S. National Fungus Collections in Beltsville, MD (<http://www.ars.usda.gov/is/np/systematics/usfungu.htm>).

Results and Discussion

Leaves of *P. velutina* had patches of mycelium of the powdery mildew fungus on the upper leaf surface and occasionally on the lower surface. Leaves of *P. glandulosa* var. *glandulosa* were often completely covered with mycelium (Fig. 1a). Leaves turned yellow and necrotic at infection sites (Fig. 1b and insert). Production of conidiophores with conidia and chasmothecia was often abundant (Fig. 2). The powdery mildew on *P. velutina* was equally distributed throughout the canopy. No difference between infections of younger vs older leaves was seen. On *P. glandulosa*, the young, softer leaves were the first to show powdery mildew symptoms throughout the canopy, but as the growing season continued, the older leaves also became infected.

The powdery mildew found on mesquite in Arizona fits the description of *Pleochaeta polychaeta* (syn. *Uncinula polychaeta*) based on fruiting body and spore measurements (Braun, 1987). Chasmothecia ranged from 240-300 µm in diameter and had numerous, uncinuate appendages that were shorter (0.6-0.7 times) than the chasmothecial diameter. Appendages on the same chasmothecium varied in length. Asci were 70-75 x 25-30 µm, stalked, and contained two ascospores. Conidia were borne singly and ranged in size from 50-60µm x 12.5-18µm. Most conidia were cylindrical, and short germ tubes with lobed apexes formed at one end. A few primary, lanceolate conidia also were observed. Foot cells of the conidiophores were frequently spirally twisted. Characteristics of all collections of powdery mildew on the Arizona mesquites were identical. Identification was confirmed by comparison with herbarium specimens from the U.S. National Fungus Collections of *Pleochaeta polychaeta* from hackberry from New Mexico (BPI 554451) and Texas (BPI 554425). It did not match a specimen from Bolivia (BPI 554468).

P. polychaeta has been reported from Asia (Tai, 1979), Africa (Hirata, 1986), North America (Braun, 1987), and South America (Hirata, 1986) on 18 different hosts. Another powdery mildew, *Pleochaeta prosopidis*, was reported on mesquite in South America (Hirata, 1986) in 1909. There were no specimens of *P. prosopidis* available for comparison.

P. polychaeta is distinctly different from *P. prosopidis* in several characteristics based on the description by Braun (1987). Chasmothecia of *P. prosopidis* are 150-230 µm in diameter and their appendages 0.75-1.5 times the size of the

chasmothecial diameter whereas the diameter of chasmothecia of *P. polychaeta* ranges from 200-320 μm and the appendages are only 0.25-0.75 times the length of the chasmothecial diameter. The chasmothecia of the Arizona mesquite powdery mildew are 240-300 μm and the appendages are 0.6 – 0.7 times the chasmothecial diameter matching the measurements of *P. polychaeta*. The appendages of the powdery mildew from Arizona were uncinatae as described for *P. polychaeta* and never circinate or subhelicoid as were the appendages of *P. prosopidis*. Therefore *P. prosopidis* was ruled out.

Of the eight different species of mesquite trees found on The University of Arizona campus, 95% of the 42 *P. glandulosa* var. *glandulosa* and 96% of the 27 *P. velutina* were infected, but none of the 70 *P. alba*, 33 *P. chilensis* and two *P. pubescens* was infected. Single trees of *P. nigra*, *P. cinerea* native to India and the hybrid *P. chilensis* x *flexuosa* were not infected. Infected *P. glandulosa* and *P. velutina* were found next to non-infected *P. chilensis*, *P. pubescens* and *P. alba* and were within 50 m of *P. nigra* and *P. cinerea*. All seven of the *P. velutina* at the rest area at Texas Canyon, AZ were infected with powdery mildew, and none of the five *P. chilensis* were infected.

P. polychaeta infection of mesquites does not seriously harm or kill the trees, but it does impact their aesthetic value. Leaves appear white when severely infected and often drop prematurely. The close proximity of infected *P. glandulosa* and *P. velutina* to the other mesquite species provided ample opportunity for the conidia of the powdery mildew to be blown onto leaves of non-infected trees. These results indicate that only the North American mesquite species *P. velutina* and *P. glandulosa* var. *glandulosa* are susceptible to *P. polychaeta* and that species from other parts of the world are not susceptible to the *P. polychaeta* that occurs in Arizona.

Literature cited

Braun, U. 1987. A monograph of the Erysiphales (powdery mildews) J. Cramer, Berlin-Stuttgart.

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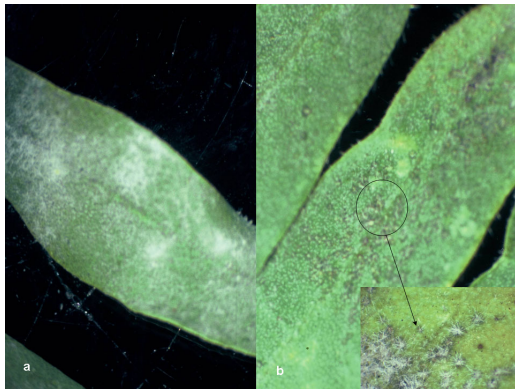


Figure 1 a and b.



Figure 2.