Diseases Caused by Fungi and Fungus-Like Organisms

First Report of *Biscogniauxia mediterranea* on *Quercus emoryi* in Southern Arizona

S. A. Wright,¹ B. M. Lalande,^{1,2} N. Wilhelmi,³ and J. E. Stewart^{1,†}

¹ Department of Agricultural Biology, Colorado State University, Fort Collins, CO

² United States Forest Service, Forest Health Protection Region 2, Gunnison, CO

³ United States Forest Service, Forest Health Protection Region 3, Flagstaff, AZ

Funding: Funding was provided by Colorado State University, Department of Agricultural Biology (Undergraduate Research Fellowship) and U.S. Forest Service, Forest Health Protection, Region 3; Emerging Pest Program. Plant Dis. 106:1305, 2022; published online as <https://doi.org/10.1094/PDIS-09-21-1933-PDN>. Accepted for publication 28 September 2021.

In 2019, a decline of *Quercus emoryi* (Emory oak) was observed on the Coronado National Forest located in southeastern Arizona. Symptoms associated with oak mortality included crown dieback and large cankers revealing charcoal-like stromal growth. Trunks and root collars showed girdling, and many affected trees also displayed evidence of gold-spotted oak borer activity. Initial surveys in stands identified clusters of severe infections. Samples with black perithecia and stromal tissue were collected from symptomatic hosts. Morphological characterization of the fungus was completed on fresh perithecial tissue. Stromata were pulvinate and black, showing embedded perithecial bumps, with ostioles visible from the surface of the stroma. Asci were short stipitate and cylindrical with visible oil drops, 6.6 to 9.4 (mean: 8.8) by 139.8 to 179.9 μm (mean: 166.4). Ascospores were smooth ovoid, brown to dark brown, with narrowed and round ends, 6.9 to 9.1 (mean: 7.7) by 13.8 to 25.9 μm (mean: 16.5). Colonies grown on half-strength potato dextrose agar (1/2 PDA) (Korhonen and Hintikka 1980) at 25°C for 14 days were whitish-gray when viewed from the top, and darkened embedded spheres were visible from the bottom. Single-spored cultures were isolated by dissecting the hymenium and placing in distilled water. The suspension was streaked onto 1/2 PDA plates and incubated for 12 h, and pure cultures were grown on 1/2 PDA. DNA was isolated from a mycelial scrape and extracted

using a 10% Chelex solution (Safaei et al. 2017). The internal transcribed spacer (ITS) region was amplified with the ITS1/ITS4 primer pair (White et al. 1990) and PCR products were sequenced at Eurofins Scientific (Lewisville, KY). Isolates (BSS1, BSS2, BSS3, and BSS4) were compared with other *Biscogniauxia mediterranea* sequences in the NCBI database (MG098274 and EF026134) and had 100% sequence identity. Pathogenicity assays were conducted using 8-year-old Emory oak trees in a greenhouse. The oak trees were drought stressed and watered at 50% pot capacity for 2 months prior to inoculation. Each tree received approximately 2,400 ml of water every 2 weeks for the remainder of the experiment. Eight trees were wounded three times with a 5-mm corer. A 5-mm plug of mycelium of isolate BSS2 was used to inoculate wounds. Four trees were used as controls and inoculated with 1/2 PDA plugs. Wounded and inoculated areas were assessed after 3 months. All eight trees exhibited dark necrotic tissue in the vascular cambium and lesions ranged from 11.4 to 25.8 mm in length and were 3.9 to 13.3 mm wide. The controls exhibited no fungal sign, lesions, or necrotic tissues. The pathogen *B. mediterranea* was recovered from 13 of the 24 total inoculations and its identity was confirmed with ITS sequencing. Mortality and dieback caused by *Biscogniauxia* spp. are commonly associated with drought-stressed trees, with increasingly hot and dry conditions routinely noted as inciting factors (Desprez-Loustau et al. 2006). Emory oak is among the dominant tree species in much of the Madrean oak woodlands of the southwestern United States and Mexico and provides vital ecological and cultural services. As southwestern states continue to experience hotter and drier conditions, it is likely Emory oak will become increasingly susceptible to dieback and mortality due to this *Biscogniauxia* sp. (Souther et al. 2021).

References:

- Desprez-Loustau, M., et al. 2006. Ann. For. Sci. 63:597.
Korhonen, K., and Hintikka, V. 1980. Karstenia 20:19.
Safaei, D., et al. 2017. Mycol. Iran. 4:121.
Souther, S., et al. 2021. For. Ecol. Manage. 483:118900.
White, T. J., et al. 1990. Page 315 in: PCR Protocols: A Guide to Methods and Applications. Academic Press, San Diego, CA.

The author(s) declare no conflict of interest.

e-Xtra

Keywords: fungi, tree fruits, forest, disease management, pathogen detection

[†]Indicates the corresponding author.

J. E. Stewart; Jane.Stewart@colostate.edu