Diseases Caused by Oomycetes

First Report of Dieback Caused by *Phytophthora ramorum* on Golden Chinquapin, *Chrysolepis chrysophylla*, in California

S. Rooney-Latham,^{1,†} C. L. Blomquist,¹ T. Pastalka,² and M. C. Soriano¹

¹ California Department of Food and Agriculture Plant Pest Diagnostics Center (PPDC), Sacramento, CA 95832-1448

² Department of Natural Sciences and Mathematics, Dominican University of California, San Rafael, CA 94901

Plant Dis. 106:2002, 2022; published online as <https://doi.org/10.1094/PDIS-09-21-2044-PDN>. Accepted for publication 30 January 2022.

Golden or giant chinquapin, *Chrysolepis chrysophylla* (Fagaceae), is a slow-growing, evergreen shrub or tree native to the west coast of the United States (Niemiec et al. 1995). In April 2015, several declining chinquapin trees were identified on Bolinas Ridge near Mt. Tamalpais in Marin County, California, a *Phytophthora ramorum* infested region (Rizzo et al. 2002). Affected trees were large overstory trees with dry, olivaceous foliage and thin canopies. Branch dieback was observed but no bole or branch cankers were observed. When the outer bark and epidermis were removed from the branches and water sprouts, dark brown vascular streaking was observed. Discolored xylem tissue (5 mm²) was cultured on corn meal agar selective medium, CMA-PARP (Jeffers and Martin 1986). An organism morphologically resembling *P. ramorum* was isolated from one water sprout piece. DNA from the symptomatic plant tissue and a pure culture were extracted and amplified using oomycete-specific PCR primers PHY.OO.18S.F and PHY.OO.28S.R (Rooney-Latham et al. 2019) and cox2 primers cox2-R and cox2-F (Hudspeth et al. 2000). PCR amplicons were sequenced using the same primers. The sequences obtained from pure cultures, symptomatic branches, and water sprouts were identical, and one was deposited into GenBank. The sequences, MZ234054 (ITS) and MZ265374 (cox2), were a 100% match to the ex-type of *P. ramorum*, MG865581 and EU427470, respectively. Koch's postulates were tested on three small plants (0.5-m tall, 3.8-liter pots). Plants were inoculated with 6-mm plugs taken from the margin of a 7-day-old *P. ramorum* colony growing on V8 juice agar. Plugs were placed on wounded stems, approximately 2 cm above the soil line, and wrapped in Parafilm. An equal number of plants were treated with uncolonized

V8 agar plugs as controls. The potting mix of two additional plants of the same size was infested with 200 ml of a zoospore suspension (10⁵ spores ml⁻¹) that was drenched around the base of the stem. Each base was scored with a razor blade before applying the suspension. Two plants were scored and drenched with sterile water as controls. After 7 days, plug-inoculated plants began to wilt and leaves began to turn grayish green. After 15 days, plants began to collapse and isolations were made from stem cankers and roots onto CMA-PARP. After 12 days, leaves of plants that were soil-drenched with zoospores were a dull green color and after 38 days, dry and brittle. Lesions were seen on the roots and stems when isolations were made at 35 days. *P. ramorum* was consistently isolated from stems of wound-inoculated plants and from roots and stems of soil-inoculated plants. No *P. ramorum* was isolated, nor were symptoms observed, on any control plants. *P. ramorum* causes sudden oak death on many members of the Fagaceae as well as ramorum blight on more than 130 hosts (Cobb et al. 2020). Early studies showed that *P. ramorum* isolates from tanoak could cause cankers on chinquapin logs (Hansen et al. 2005). To our knowledge, this is the first official detection of *P. ramorum* causing disease on *C. chrysophylla* in wildlands. Unlike other Fagaceae hosts of *P. ramorum*, external bole cankers were not seen on infected chinquapin trees. Branch isolation onto PARP media was difficult and detection by PCR from symptomatic vascular tissue was more efficacious. Chinquapin is an important member of diverse conifer and hardwood forest types in the western United States. Losses of chinquapin due to *P. ramorum* would reduce forest diversity and could cause the loss of habitat for many animal species.

References:

- Cobb, R. C., et al. 2020. Earth's Future 8:e2020EF001500.
- Hansen, E. M., et al. 2005. Plant Dis. 89:63.
- Hudspeth, D. S. S., et al. 2000. Mycologia 92:674.
- Jeffers, S. N., and Martin, S. B. 1986. Plant Dis. 70:1038.
- Niemiec, S. S., et al. 1995. Page 51 in: Hardwoods of the Pacific Northwest. Research Contribution 8. Oregon State University, Forest Research Laboratory, Corvallis, OR.
- Rizzo, D. M., et al. 2002. Plant Dis. 86:205.
- Rooney-Latham, S., et al. 2019. Plant Dis. 103:448.

The author(s) declare no conflict of interest.

e-Xtra

Keywords: forest, oomycetes, pathogen detection, trees

[†]Indicates the corresponding author.
S. Rooney-Latham; slatham@cdfa.ca.gov