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First Report of *Geosmithia morbida* and *Pityophthorus juglandis* Causing Thousand Cankers Disease in Butternut

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Butternut or white walnut (*Juglans cinerea* L.) is native to the eastern United States and southeastern Canada. The wood is used for paneling, cabinets, and furniture while the nut kernels are sweet, buttery, and popular in baking and candy-making. It is not commonly grown as a landscape tree.

In November 2011, the Oregon State University Plant Clinic received several branches from a butternut tree growing in Lane Co., OR. The large tree displayed sparse foliage and branch dieback (Fig. 1). The branches had small holes and insect galleries associated with girdling cankers (Fig. 2). Eighteen months later, the tree is still standing and the disease does not appear to have progressed since 2011.

Fig. 1. Sparse foliage and branch dieback of butternut (*Juglans cinerea*) with thousand cankers disease in Lane Co., OR.

Fig. 2. *Geosmithia morbida* canker and walnut twig beetle galleries on butternut branch.

Microscopic examination revealed the presence of larvae and adults of the walnut twig beetle (*Pityophthorus juglandis*) in the galleries (Fig. 3). *Geosmithia morbida*, the cause of thousand cankers disease (TCD), was consistently isolated from necrotic phloem at the canker margins. The ITS region of the rDNA and the β-tubulin and methionine aminopeptidase genes of two single-spore isolates were amplified and sequenced. Both isolates belonged to a multi-locus haplotype group containing *G. morbida* isolates collected from southern California walnut (*J. californica*) and Persian walnut (*J. regia*) in California, and from black walnut (*J. nigra*) in Colorado, Oregon, and Tennessee. Pathogenicity studies were not conducted; however, pathogenicity of

other isolates of *G. morbida* to butternut following artificial inoculation has been demonstrated (4). Butternut readily hybridizes with Japanese walnut (*J. ailantifolia*) and these hybrids, which may closely resemble butternut, have been widely planted. Therefore, the identity of the declining butternut was confirmed using chloroplast-cleaved, amplified polymorphic sequence markers and nuclear microsatellite markers (1).

Fig. 3. Larvae of the walnut twig beetle (*Pityophthorus juglandis*) feeding in the cambium.

G. morbida and *P. juglandis* have previously been reported on black walnut in Oregon as well as in eight other western states and four eastern states (Virginia, Tennessee, North Carolina, and Pennsylvania) (4). The latter four states fall within the native range of butternut. TCD has also been confirmed on Arizona walnut (*J. major*) in Arizona and New Mexico as well as on English walnut (*J. regia*), California black walnut (*J. californica*), and Northern California walnut (*J. hindsii*) in California (3). Butternut is a relatively slow grower and is already seriously impacted in its native range by another canker disease (butternut canker) caused by the fungus *Ophiognomonia clavigignenti-juglandacearum* (2). As a result, it was added to the endangered species list in Canada in 2005. Further damage to butternut by TCD in these regions could be very serious. To our knowledge, this is the first report of natural infection of butternut by *G. morbida* and *P. juglandis*.

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