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DISEASE NOTES

First Report of the Armillaria Root Disease Pathogen, *Armillaria sinapina*, on Subalpine Fir (*Abies lasiocarpa*) and Quaking Aspen (*Populus tremuloides*) in Colorado

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In July 2014, mycelial fans (isolates CO104F, CO106F, and CO108F) of *Armillaria* sp. were collected from forest trees in Colorado. These isolates were all identified as *A. sinapina* based on a somatic pairing test against 18 tester isolates representing six North American *Armillaria* spp. and nucleotide sequences of the translation elongation factor 1α (*tef-1α*; GenBank Accession Nos. KT327065, KT327066, and KT327067). Based on nine replications of somatic incompatibility tests, all isolates showed high intraspecific compatibility (colorless antagonism) with three *A. sinapina* tester isolates (average 77%), but low compatibility with closely related *Armillaria* spp. (average 0 to 26%). Sequences of *tef-1α* for all isolates showed an identity of 99% to *A. sinapina* (GenBank accession Nos. JF313114, JF313131, JF313132, JQ898316, and JQ898315). Isolates CO104F and CO106F were collected from root collars of standing, freshly dead subalpine firs (*Abies lasiocarpa*) in forests near Nederland, Colorado (39°59′44.6″ N, 105°38′05.0″ W, elevation 3,091 m; 39°57′11.7″ N, 105°35′55.8″ W, elevation 2,759 m). Mortality of subalpine fir was interspersed (small patches of 3 to 10 trees) throughout a stand predominantly consisting of mature Engelmann spruce (*Picea engelmannii*) and subalpine fir. Basal resinosis of infected trees indicated pathogenicity by *A. sinapina*. Additionally, isolate CO106F was collected from mycelial bark fans, which were intercalated through multiple bark layers—an additional sign of disease that is not observed in saprophytic interactions. Armillaria root disease was frequently associated with trees that had been attacked by western balsam bark beetle (*Dryocoetes confuses*). Isolate CO108F was collected from recently dead quaking aspen (*Populus tremuloides*) near Colorado City, Colorado (37°56′50.1″ N, 104°59′43.3″ W, elevation 2,693 m), where many windthrown aspen trees exhibited decayed roots/butts with mycelial fans and visible zone lines, which are signs/symptoms of Armillaria root disease. Previous surveys in Colorado have reported *A. solidipes* (as *A. ostoyae*) on *Picea* spp. and *Pseudotsuga menziesii* (Lindsey 1999; Worrall et al. 2004), but *A. sinapina* has never been previously confirmed in this state. *A. sinapina* has been reported on hardwoods in the northeastern United States, but it is commonly found on conifers of northwestern North America (Banik et al. 1996). Although *A. sinapina* is frequently considered a weak pathogen, previous studies have demonstrated its pathogenicity on conifers of British Columbia (Cleary et al. 2012; Dettman and van der Kamp 2001). Trees that are maladapted due to climate change could become more susceptible to Armillaria root disease caused by *A. sinapina* (Cleary et al. 2012). More thorough surveys are needed to document the distribution and ecological impacts of *A. sinapina* in relation to climate change.

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