

Alder Canker

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The last two aerial detection surveys have mapped alder canker over widespread areas of southcentral and interior Alaska. Canker disease is most severe in thin-leaf alder (*Alnus tenuifolia*) stands (Figure 33), but it is also found on Siberian or green alder (*Alnus fruticosa*) and Sitka alder (*Alnus sinuata*). The primary causal fungus on *Alnus tenuifolia* has previously been identified as *Valsa melanodiscus*, and its virulence has been verified in field inoculation trials in Alaska. The fruiting bodies of *V. melanodiscus* are usually abundant in the dying bark overlying the cankers. The cankers have a distinctive appearance compared to cankers on other tree species, as they are very long (often the full length of the stem) and narrow, with no noticeable host callusing or healing activity.



Figure 33. Alder canker (*Valsa melanodiscus*) on thin-leaf alder.

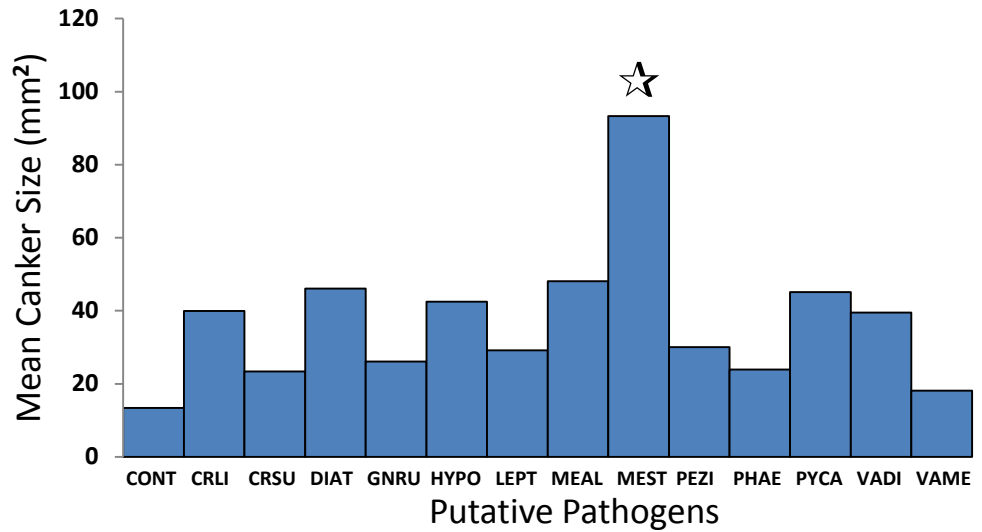
Our research on all three alder species has shown that many other fungi often occur on canker tissue as well as on dying and dead stems. Some of these fungi are nearly indistinguishable from *V. melanodiscus*, and canker morphologies are not always consistent. Detailed historic records that document the occurrence of various pathogenic fungi on alders in Alaska are lacking, and most records are the product of a single study at Glacier Bay. In order to establish a comprehensive list of pathogenic and opportunistic fungi on alder in southcentral and interior Alaska, we began an effort to collect, identify, and isolate fungi associated with canker disease, and dying and dead stems.

Using isolations of fungi from the three species of alder, we established inoculation trials to determine whether some of the fungi were capable of causing alder canker. Two plots were installed in each of two alder stands, where multiple species of alder coexisted under the same site conditions (microclimate and soil type). A plot containing *A. tenuifolia* and *A. fruticosa* was established in Fairbanks, and a plot containing *A. tenuifolia* and *A. sinuata* was established near Denali State Park. Alder species in these plots were inoculated to test the potential pathogenicity of thirteen fungi isolated from cankers, and to compare disease symptom development to a control inoculation without fungi. In temperate regions, canker fungi often exhibit greater virulence when host plants are entering and leaving dormancy. Previous studies had demonstrated that *V. melanodiscus* was more virulent on *Alnus tenuifolia* when inoculations were done in the spring. Therefore, this inoculation trial was planned for the fall in order to compare pathogen virulence under conditions that might favor increased virulence of the other, less-well-known fungi.

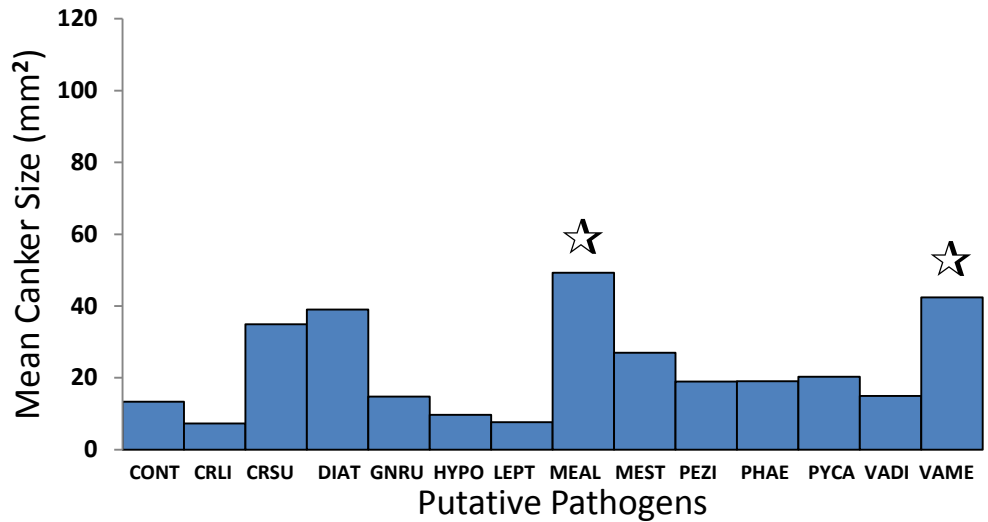
Symptom development (canker size) for each fungus was measured 14 months following the fall 2010 inoculation (Figure 34). Analysis of variance showed highly significant differences in mean canker size among the fungal pathogens in each plot. The inoculation trials demonstrated that the most virulent of the 13 fungi tested on Sitka alder was *Melanconis stilbostoma*, which was not highly virulent on the other alder species. On Siberian and thin-leaf alders, *Valsa melanodiscus* and *Melanconis alni* showed similar, high levels of virulence. On other tree hosts, *Melanconis* species are sometimes secondary colonizers of cankers; for example, it readily fruits and is isolated from Butternut (white walnut) cankers caused by *Sirococcus clavigignenti-juglandacearum*. Therefore, it was a significant discovery that two species of *Melanconis* were pathogens on alder in Alaska, rather than secondary colonizers of cankered tissue. *Cryptosporrella suffusa*, considered a likely suspect by some scientists, was not virulent on any of the alder species. *Valsa melanodiscus* and *Valsa diatrypoides* were not as virulent on alder species as we had expected based on other inoculation trials, and it is possible that the season of inoculation impacted our results. To better understand the alder canker pathogens in Alaska, we plan to repeat the fall inoculation trial, in addition to a spring inoculation trial, with the *Valsa*, *Melanconis* and *Cryptosporrella* species in 2012.

New host index records of wood decay fungi on alders in Alaska for 2011 include *Phellinus alni*, and the unexpected occurrence of *Fomes fomentarius*, *Fomitopsis pinicola*, and *Inonotus obliquus*. The latter three fungi are usually restricted to other tree species. New records of fungi associated with cankers include *Cryptosporrella alni-sinuatae*, *Annulohyphoxylon multifforme*, *Plagiostoma* sp., *Cytospora ribis*, *Daldinia loculata*, *Nectria cinnabarina*, *Physalospora scripa*, *Coniochaeta* sp., and several collections of *Entoleuca mammata*. The latter fungus is a well-known pathogen of poplars and causes Hypoxylon canker of aspen, and was unexpected on alder species. Herbarium specimens for documentation of these fungi on alder in Alaska have been prepared for official annotation. Further work is in progress to determine whether some of our collections of fungi from alder in Alaska are fungi known from alder species in Europe. ■

***Alnus sinuata* at Lower Troublesome Creek, Alaska**



***Alnus fruticosa* at Fairbanks, Alaska**



***Alnus tenuifolia* at Fairbanks, Alaska**

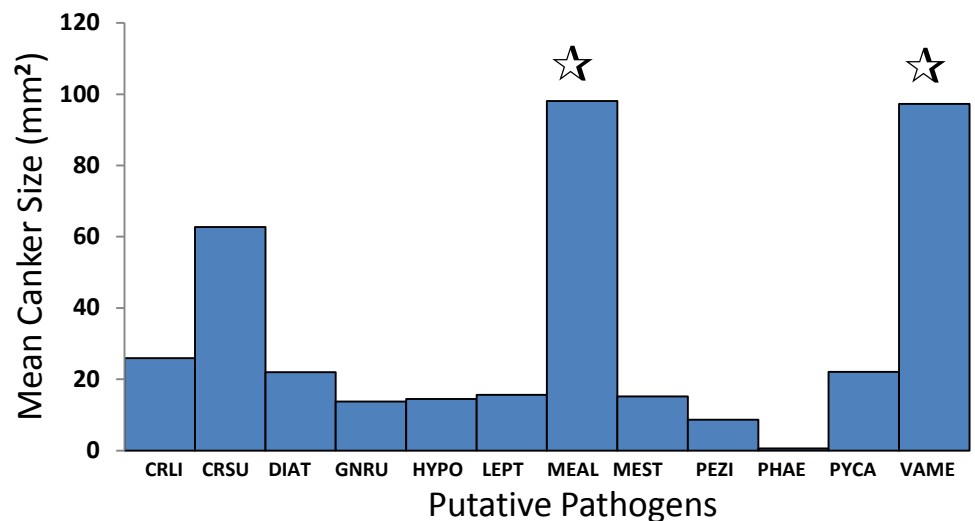


Figure 34. Disease response on three alder species to inoculations with the fungal pathogens. CONT= control (no pathogen) CRLI= *Cryptosphaera ligniae* CRSU= *Cryptosporella suffusa* DIAT= *Diatrype spilocea* GNRU= *Gnomonia rubi-ideaei* HYPO= *Hypoxyton fuscum* LEPT= *Leptographium piriforme* MEAL= *Melanconis alni* MEST= *Melanconis stilbostoma* PEZI= *Pezicula* sp. PHAE= *Phaeomollisia/Phialocephala fortinii* PYRE= *Pyrenochaeta cava* VADI= *Valsa diatrypoides* VAME= *Valsa melanodiscus* Stars indicate species that differed significantly from controls.