ASSOCIATION OF ENDOTHIA PARASITICA WITH MITES ISOLATED FROM CANKERS ON AMERICAN CHESTNUT TREES

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ABSTRACT.--Cankers *from American chestnut stump sprouts in Virginia plus two large, surviving American chestnut trees in Virginia and West Virginia were examined for the presence of mites (Acarina). All canker samples examined contained mites, with many in the families Oribatidae. Belbidae and Parasitidae. Further identification is in progress. One hundred and sixty-two mites from the stump sprouts growing in eight areas of Virginia were plated on acidified potato dextrose agar in an attempt to isolate Endothia parasitica from them. The blight fungus was recovered from 56 (34.6 percent) of the 162 mites and from at least one mite in all eight areas. These results suggest that mites may disseminate E. parasitica (including, possibly, hypovirulent strains) when they move from bark tissues into the soil and other trees.*

Introduction

It is possible that a carrier may be important in the dissemination of hypovirulent strains of *Endothia parasitica* in North America. This study attempted to provide insight into the possibility that mites may act as carriers of *E. parasitica.* Our objectives were to determine if mites (members of the order Acarina) could be found in association with cankers of American chestnut *(Castanets dentata)* and if *E. parasitica* could be isolated from any mites found.

Methods

Endothia parasitica cankers from five American chestnut stump sprouts in the Johns Creek area of the Jefferson National Forest, Virginia, plus two large, surviving American chestnut trees in Virginia and West Virginia were excised and examined to determine if mites occur commonly on cankers. Also, decayed bark material, which was obtained from the bases or crotches of American chestnut trees, was examined. Cankers (often an attempt was made to excise the entire canker) were obtained from trees with a hammer and a

chisel. All cankers from a given area were collected in a single plastic bag. Canker materials were stored under refrigeration until examined under the dissecting scope. Decayed bark material from the base or crotches of the two large, surviving American chestnut trees and five stump sprouts was placed in a Berlese funnel, equipped with 40-watt incandescent light bulbs, for 72 hours. Mites were collected in a jar of ethanol at the base of the funnel.

All canker surfaces were found to contain mites as did all decayed bark material samples. Five to 10 mites from each canker or bark material sample were mounted as slides for identification. Initially, attempts were made to identify, at least to family, the more commonly found mites.

Canker materials were excised from 5 to 15 diseased American chestnut stump sprouts from each of 8 areas in Virginia to determine if mites could carry *E. parasitica* propagules in or on their bodies. All mites found on these diseased tissues were transferred, aseptically, to acidified, potato-dextrose agar (APDA). An effort was made to keep the mites alive during transfer. A total of 162 mites were plated. Fifty-six or 34.6 percent produced *E. parasitica* on APDA. One to 12 mites at each location were associated with *E. parasitica.* Seven of the most commonly encountered, but apparently different mites, were identified to family. The three families were Belbidae, Oribatidae and Parasitidae, suggesting that a search for a suitable carrier might begin with members of these families.

Discussion

There are several characteristics regarding mites which would be beneficial should they be found to be carriers. Many species commonly found in association with forest litter and plant material in general are fungus feeders: this is especially true of the orbatids. If a monophagus species which feeds on *E. parasitica* could be found, it would be especially beneficial in a carrier capacity, from the standpoint of its need to search for suitable food sources such as *E. parasitica* and presumably cankers on American chestnut. Thus, mites may be important in local spread of *E. parasitica* from canker to canker on a single tree or among cankers on neighboring trees.

Another characteristic of mites which may be particularly beneficial in a carrier relationship is the intimate contact in which mites live in association with the bark surface, In the course of this study, mites were most often found in moist fissures and natural cracks in the bark surface, placing them in areas where infection is most likely to occur. The small size of these Arthropods allows them easy access to suitable infection courts. It should be noted that many insect species (orders Coleoptera, Lepidoptera) which have been associated with chestnut blight cankers go through several life stages or what is known as complex metamorphosis. One of the evolutionary advantages of such species is that not all developmental stages are found in the same habitat or require the same food source. This is good for survival purposes in that different stages of the same species do not compete for the same food, but a disadvantage in terms of carrier efficiency in that the potential carrier is only in contact with the desired host for part of its life. Mites undergo simple metamorphosis and in most cases nymphal stages and adults share the same habitat and food source, placing them in contact with the desired host for much of their life cycle.

A third and perhaps more important aspect regarding mites as potential carriers is that they may produce several generations per year, unlike many insect species which have been associated with cankers caused by *E. parasitica* on American chestnut. Mites continue to multiply throughout the growing season.

Probably the most limiting factor regarding mites as potential carriers is their mobility. This may be a serious restriction to widespread rapid dissemination of hypovirulent strains, although their movement may exceed the rate of spread of hypovirulent strains of approximately 1 meter per year which Grente and Berthelay-Sauret (1978) reported in Europe. Mites may also be windblown or carried on animals, birds, or beetles which come in contact with them, facilitating greater movement.

We do not know the type of propagule that was being carried by the mites we plated. This may be an important consideration for we know that the most debilitated hypovirulent strains of *E. parasitica* sporulate poorly. At this point, we cannot say if mites carry hypovirulent *E. parasitica* for we did not carry out pathogenicity tests on any of the strains recovered from the mites we plated. However, the possibility that mites are carriers of hypovirulent strains appears to warrant further investigation based on these data which have indicated that mites are capable of carrying *E. parasitica* in some form.

Literature Cited

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