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ASIAN CHESTNUT GALL WASP ON CONNECTICUT CHESTNUT TREES

A new pest is threatening chestnut trees in Connecticut. Asian Chestnut Gall Wasp (*Dryocosmus kuriphilus*) was accidentally brought into the U.S. to an orchard of Chinese chestnut trees (*Castanea mollissima*) in Georgia in 1974. The grower brought cuttings of Japanese chestnuts (*C. crenata*) from Japan without an import permit from USDA-APHIS-PPQ, grafted them in his orchard, and the insect emerged (4, 5).



Fig. 1. Asian chestnut gall wasp, *Dryocosmus kuriphilus*, on a Chinese chestnut. Photo by Jerry Payne.

D. kuriphilus has one generation a year. In the early summer, the wasp lays its eggs in chestnut buds, they hatch after about

40 days and larval growth is very slow through the autumn and winter. In the spring before chestnut buds normally begin to break, the larvae begin to mature and convert the bud into a gall (Fig. 1). Galls develop in 7-14 days and often contain portions of developing leaves, stems, petioles, and flowers. The larvae feed for 20-30 days within the galls before pupating. Adult wasps, 1/8" long, begin emerging from the galls during late May through early June, and emergence is complete in about three weeks. Only female wasps have been found, and they lay three to five eggs in a cluster inside each bud. More than one wasp may oviposit in the same bud, and some buds may have up to 25 eggs. After adult emergence, the gall dries, becomes wood-like, and remains attached to the tree for several years. Any leaves or flowers attached to the gall die, severely impacting the health of the tree and drastically reducing nut production. There are currently no pesticides that control this insect.

In 1963, gall wasp was reported to threaten the chestnut industry of Japan and Korea. Since its introduction into Georgia, it has nearly eliminated the Chinese chestnut industry in that state (Fig. 2).



Fig. 2. Asian chestnut gall wasp galls on a Chinese chestnut tree.

In 1993, we found galls on American chestnut trees (*C. dentata*) along the Appalachian Trail at the southern end of the native range of this tree, and the pest rapidly made its way north (Fig. 3) (1, 3, 7).



Fig. 3. Asian chestnut gall wasp galls on an American chestnut tree.

The wasp can spread by movement of infested twigs or shoots (growers sharing cuttings of their trees with others), or by flight of the adults.

Jerry Payne (personal communication) had observed that chinquapins (chestnuts with a single nut in each bur instead of three) were rarely infested in Georgia, so we made crosses of American chestnuts (two seedlings from the same mother tree) with two hybrids that were

Ozark chinquapin (*C. ozarkensis*) crossed with Chinese chestnut. We knew that the American trees and the Chinese trees would be very susceptible to infestation by gall wasp, and that the American chestnut and Ozark chinquapin would be susceptible to chestnut blight disease (caused by *Cryphonectria parasitica*). The offspring of this cross would have some resistance to blight, allowing them to survive longer than susceptible trees, and if the resistance to wasp infestation was easily inherited, some of the offspring would express some level of resistance and give us clues about whether we could breed trees to resist this pest. In 1995, we planted 93 trees in North Carolina in an area where gall wasp was already endemic. In 2009, 36 of them were still alive, 31 of which had no galls (Fig. 4) (2). One of those trees has little blight, and, if it isn't killed by bears climbing it for the nuts, we hope to propagate it for future tests.



Fig. 4. Hybrid chestnut planting in Bent Creek, NC, where gall wasp is endemic. Most trees have several chestnut blight cankers (arrows).

These results encouraged us to plan more crosses with chinquapins, but we needed to know which trees had the most resistance to wasp infestation. In 2011, we found *D. kuriphilus* galls on our chestnuts at Lockwood Farm in Hamden (Fig. 5).

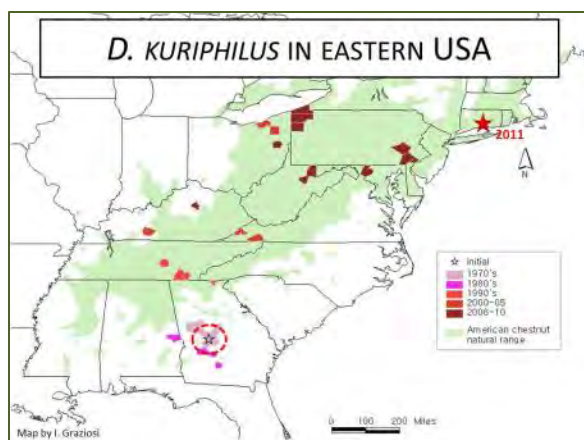


Fig. 5. Map of the presence of Asian chestnut gall wasp (*Dryocosmus kuriphilus*) on chestnut trees, prepared by Ignazio Graziosi at the University of Kentucky. The light green area is the natural range of American chestnut trees.

By the next year, chestnuts all over Lockwood Farm and at the Chestnut Plantation at Sleeping Giant had galls (Fig. 6).



Fig. 6. Asian chestnut gall wasp galls on one of our hybrid chestnuts at Lockwood Farm in Hamden.

Since we have all of the species of *Castanea* growing in these two places, we were able to assess resistance to wasp infestation among the species. We found that the Ozark chinquapins were rarely galled, and started using them in crosses to put wasp resistance into commercial chestnut cultivars and our advanced-hybrid timber chestnut trees. Allegheny chinquapins (*C. pumila*) and Chinese chinquapins (*C. henryi*) also seem to resist infestation, and will be used in future crosses.

Work at the University of Kentucky on the insect has resulted in new information about two parasites, one from China and one native to the U.S. We hope that these may offer some control (6). Lynne Rieske-Kinney found larvae of one of these parasites in galls that we sent to her from our Connecticut plantings, and we will be working closely with her to maximize their presence.

Chestnut trees grow slowly, and we may not be able to judge resistance to gall wasp in young trees. We plan to make many crosses of all combinations and plant the offspring out at Lockwood Farm. We want to know how resistance to gall wasp is inherited, and we want to produce trees for the chestnut industry and for our forest plantings that will not be severely damaged by this new pest.

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