

# An Overview of Drippy Blight: An Emergent Insect Associated Disease of Red Oaks

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## GENERAL OVERVIEW

Drippy blight is a recently recognized insect-associated disease that seriously affects several kinds of red oak (e.g., *Quercus rubra*, *Q. palustris*). This condition is caused by the combined activity of the **pin oak kermes scale** *Allokermes galliformis* (Riley), and the **bacterium** *Lonsdalea quercina* (Figure 1). Currently, the disease is localized in Colorado<sup>1</sup>, but similar diseases involving this bacterium are known to occur in five countries on three continents. In the United States, the most similar disease affects the acorns of live oaks in California<sup>2</sup>.

## SYMPTOMS OF DRIPPY BLIGHT DISEASED TREES:

Symptoms on Northern red oak and pin oak include stunted growth, witches' brooms, and branch dieback; in severe cases it contributes to entire tree decline. Additionally, flagging and tip dieback are common and fallen branch tips to litter the ground around the canopy throughout the spring and summer (Figure 1).



Figure 1. Signs and symptoms of drippy blight disease. (A) A symptomatic pin oak showing witch's brooms and dieback as a result of drippy blight disease. (B) Northern red oak branches exhibiting flagging and dieback from drippy blight disease. (C) An adult kermes scale insect (*Allokermes galliformis*, indicated by an arrow) next to bacterial exudates (*Lonsdalea quercina*, indicated by a star). (D) Dead (shriveled) and live (round) kermes scales surrounded by bacterial cankers.

## CAUSAL AGENTS OF DRIPPY BLIGHT DISEASED TREES:

### THE PIN OAK KERMES ALLOKERMES GALLIFORMIS:

Female pin oak kermes are sessile gall mimics, and both immature and mature stages of the scale insect feed on twigs and branches (Figure 3), and can cause severe damage. They overwinter in protected areas on small branches and primarily move to new growth upon bud break in the spring. Once they are settled and feeding, their mouthparts extend into the cortex where their sucking damage kills cells in the proximity of the feeding site (Figure 2). The pin oak kermes is a native insect, but this is the first report of the pin oak kermes causing significant economic damage and of a commensal association with a plant pathogenic bacterium.

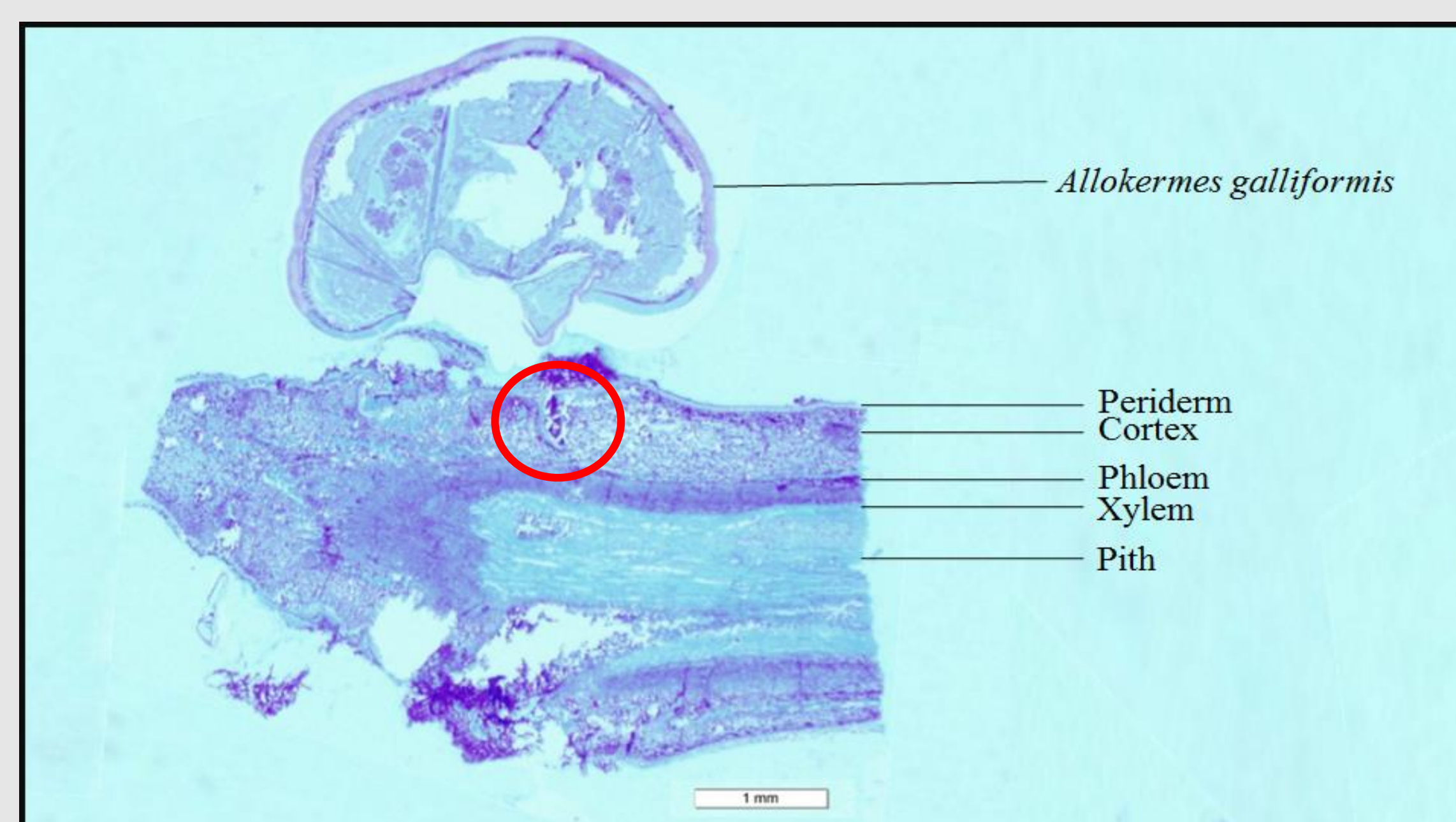


Figure 2. Histological section of a female pin oak kermes feeding on red oak, the damaged cells are circled.

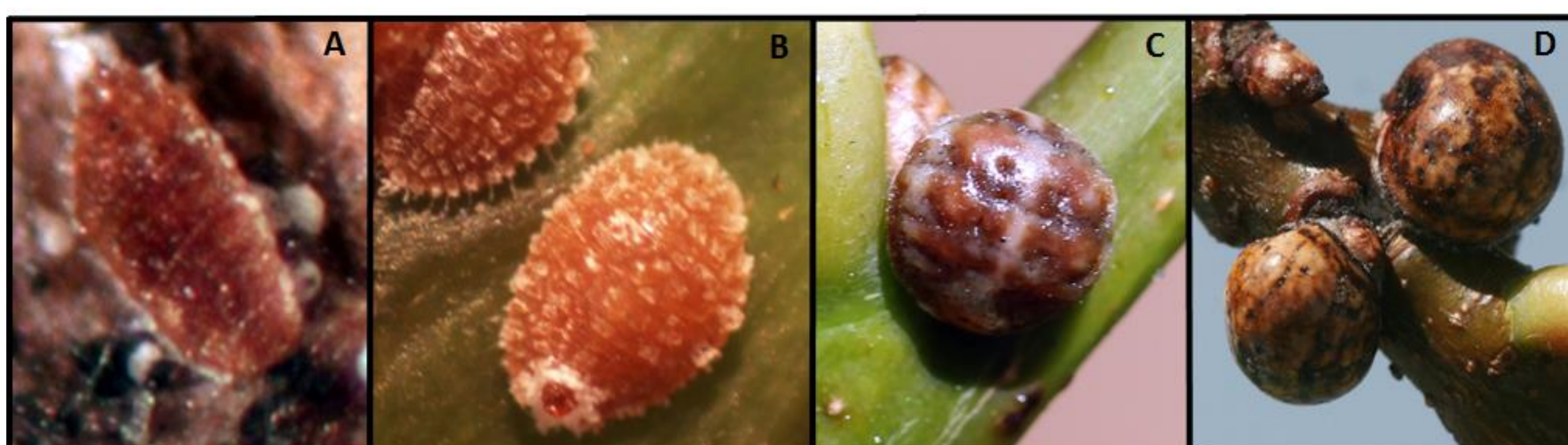


Figure 3. Life stages of female pin oak kermes. (A) first instar, (B) second instar, (C) third instar, and (D) post-reproductive adult.

<sup>1</sup>Sitz et al. 2018. *Arboriculture & Urban Forestry*, 44(3).

<sup>2</sup>Hildebrand, D.C., and Schroth, M.N. 1967. *Phytopath.* 57, 250-253.

## CAUSAL AGENTS OF DRIPPY BLIGHT DISEASED TREES:

### THE BACTERIUM *LONSDALEA QUERCINA*:

In drippy blight disease, the bacterium enhances the damage ensued by the pin oak kermes. In fact, the bacterium massively oozes and drips from scale feeding sites and other tree wounds in the summer creating a sticky film on surfaces under the canopy (Figure 4). The bacterium actively oozes from June through September. Later in the summer, the bacterial exudates become thicker, dripping ceases, and then maroon overwintering cankers appear on twigs.

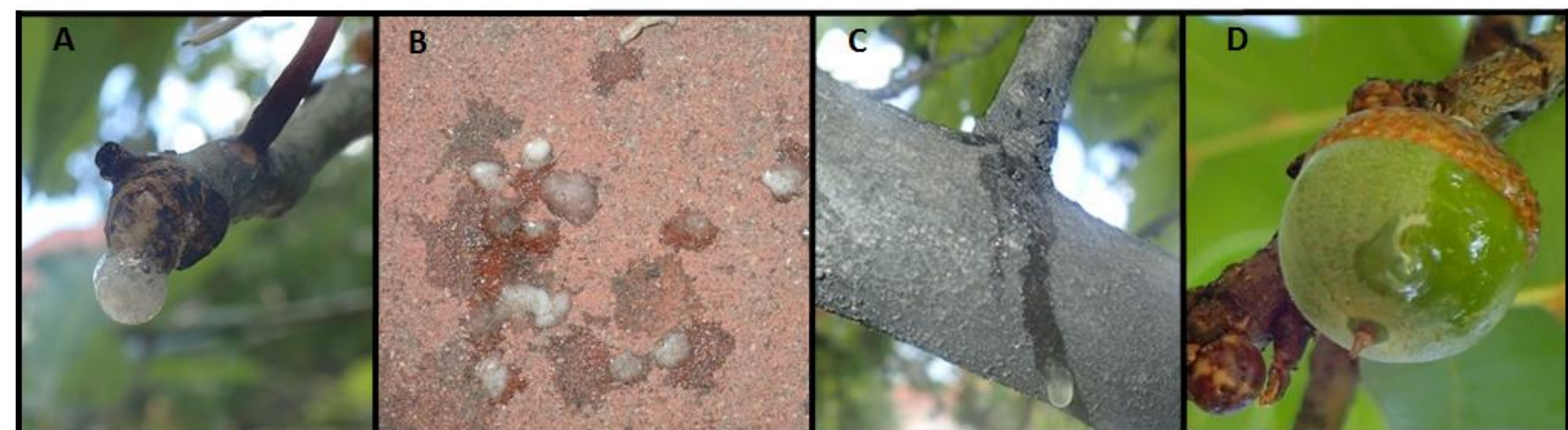


Figure 4. Bacterial exudates produced by *Lonsdalea quercina* infection of red oak. Exudates are present in and around the canopy of diseased trees including at (A) branch abscission sites, (B) sidewalks, (C) branches throughout the canopy, and (D) acorns.

## MANAGEMENT:

Drippy blight disease can lead to tree mortality, yet managing outbreaks is difficult because kermes scale natural enemies are scarce and only anecdotal evidence exists regarding chemical control of the two causal agents. Any treatment that occurs needs to target regions harboring the scales. Mechanical control is difficult because infestations occur throughout the upper canopy and are widespread in regions experiencing disease. Kermes scales are always seen on drippy blight diseased trees, but many additional insects including wasps and bees, are attracted to the bacterial ooze (Figures 5 and 6). They can become contaminated, and likely contribute to spreading the disease.

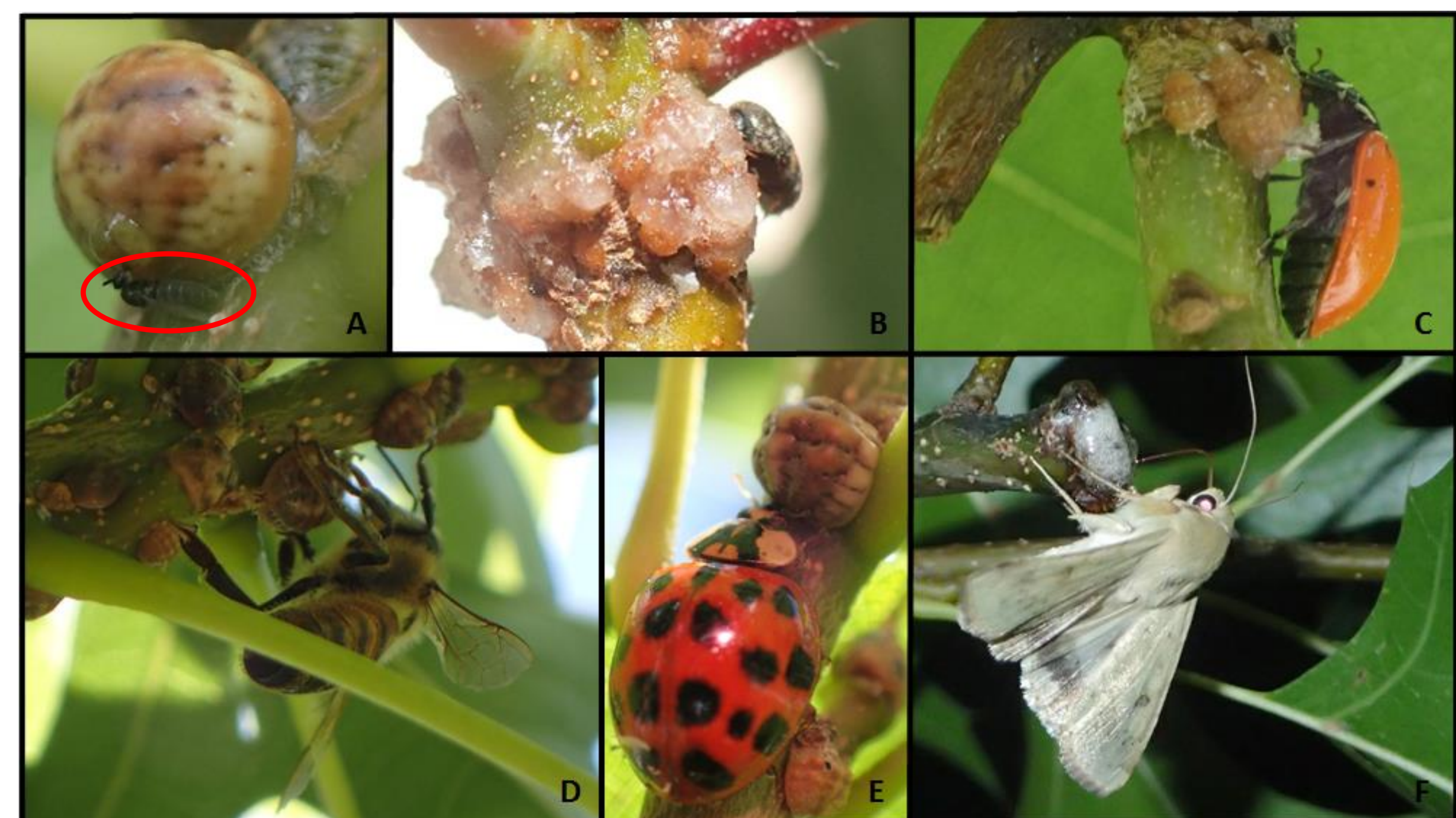


Figure 5. A subset of the insects visiting bacterial exudates include the following orders and families: (A) Diptera: Scatopsidae, (B) Coleoptera: Dermestidae, (C and E) Coleoptera: Coccinellidae, (D) Hymenoptera: Apidae, and (F) Lepidoptera: Noctuidae.

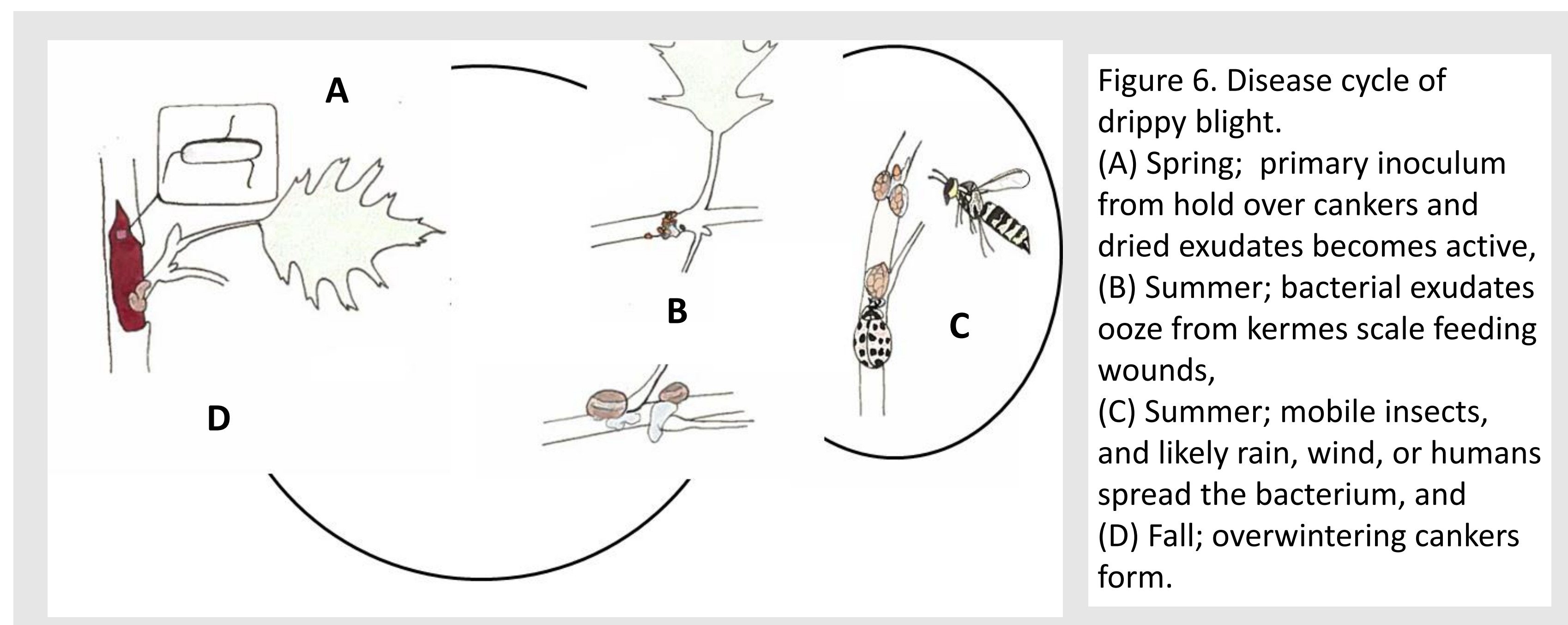


Figure 6. Disease cycle of drippy blight. (A) Spring; primary inoculum from hold over cankers and dried exudates becomes active, (B) Summer; bacterial exudates ooze from kermes scale feeding wounds, (C) Summer; mobile insects, and likely rain, wind, or humans spread the bacterium, and (D) Fall; overwintering cankers form.

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