Apple Branch Canker Disease

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Apple branch canker is caused by several fungal pathogens including *Diplodia bulgarica*, *D. seriata*, *D. mutila*, and *Neonectria major.* Common symptoms are brown lesions on branches and branch dieback. Wood tissue underneath these lesions appears reddish-brown and water-soaked. Lesions are elliptical and sunken, sometimes forming a callus in older wood. Over time, lesions grow into cankers, causing a series of concentric calluses and sunken bark layers.

Once the pathogen causes the canker, they produce their overwintering fruiting bodies (pycnidia and perithecia) on dead branches and become a source of inoculum. Most of the canker pathogens disseminate their spores during precipitation (rain, dew, fog, etc.) which usually coincides with dormant pruning. Once the fungal spores land on exposed plant tissue, such as fresh leaf scars, pruning wounds, and broken branches they can colonize and cause disease. Fruits can also be infected, causing bull's-eye-rot at the lenticels and eye rot on the calyx end.

Branch canker diseases can be significant in regions with high rainfall, including coastal regions. Apple branch canker diseases in California are prevalent in the Sebastopol area of Sonoma County and worsened by high fall rains.

Photos of apple branch canker in an apple orchard near Sebastopol, California (photos taken by Ellie Andrews).

Management Recommendations:

→ Prune and remove disease material and reduce pathogen spread. Cankers kill branches and serve as sources of inoculum.

- Scout for dark lesions and cankers on branches regularly.
- Prune out cankers and any visible diseased tissue in the early summer. At this time of the year, symptoms are easy to see, and the spread of the fungus is least likely due to dry weather.
- Remove dead branches a few inches below the canker tissue during dormant pruning.
- Sanitize pruning tools with either 70% isopropyl alcohol or 70% ethanol between each cut or tree. Alternatively, a 5% bleach solution can be used for sanitizing pruners, but it may cause degradation on pruning tools.
- Ensure pruning cuts are flush against the remaining branch.
- Apply three-cut method to promote faster sealing (callusing) on large primary branches. https://ucanr.edu/sites/eskalenlab/files/380090.pdf
- Remove pruning debris from the orchard immediately to prevent spore dissemination of pathogens from infected branches. Diseased wood can be burned.
- Use pruning wound protectants to prevent new infections.

→ Pruning wound protection options.

- Organic protectant fungicide options: Bordeaux mixture, other fixed copper materials.
- Biological products

→ Annual applications of protectant fungicides for European canker caused by *Nectria galligena*. We do not have evidence yet that copper would work on other canker pathogens such as *Diplodia spp*.

- Applications of Bordeaux or approved fixed copper materials are generally acceptable in organic systems. However, not all copper compounds are approved for use in certified organic production so check individual products. All ingredients must be certified by the organic grower's certifying agent.
- Be sure to read the label thoroughly and apply the appropriate rate for your chosen product. Be sure to follow all label precautions including Pre-Harvest Interval (PHI) and Re-Entry Interval (REI).
- The first application can be made in early fall before rain commences. If the disease is serious, you could consider applying a second application when most of the leaves have fallen.
- See this resource about Bordeaux Mixture from UC IPM for more info.

→ Promote strong plant health throughout the season.

- Use appropriate water and nutrient applications to promote optimal plant functioning.
- Use drip irrigation (rather than sprinklers) which can help increase plant water use efficiency and reduce canopy humidity.

Areas for Future Scientific Research

- Biofungicides such as *Trichoderma*-based products show good efficacy on grapevine trunk disease pathogens. However, more trials are needed with common apple canker pathogens.
- More trials are needed to evaluate whether annual copper-based fungicide applications could effectively control branch canker pathogens besides European canker caused by *Nectria galligena*.

References and Related Resources

UC IPM: European Canker
UC IPM: Apple
UC IPM: General Properties of Fungicides Used in Apples
Pacific Northwest Pest Management Handbook: Apple (Malus spp.)-Nectria Canker (European Canker)