

## Lethal paradox canker continues to emerge in southern San Joaquin Valley orchards

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Plant pathologists seem particularly adept at providing fear-inspiring names to new diseases and maladies, such as “Sudden Oak Death” or “Thousand Cankers Disease”; however, such names appropriately illustrate the manifestation of symptoms and provide a catchy name to enhance memory retention of associated diseases. Following this precedent, lethal paradox canker (LPC) similarly holds true to its name as it continues to cause mortality of California walnuts on the hybrid rootstock.

### Symptoms of LPC

On the tree surface, both LPC (Fig 1A) and *Phytophthora* cause dark, viscous ooze or bleeding. When the bark is peeled away, however, LPC symptoms are distinct from those caused by *Phytophthora*. The cankers associated with LPC tend to be more “rounded” or “lobed” at their margins than those caused by *Phytophthora*, which often have relatively “angular” or “pointed” advancing margins. Also, LPC cankers usually exhibit concentric “growth rings” near advancing edges of the necrotic tissue (Fig 1B). LPC has only once been observed on Northern California black rootstock, which is susceptible to root and crown rots caused by several species of *Phytophthora*. *Phytophthora* species are common inhabitants of aquatic ecosystems and can be introduced to orchards via irrigation with surface (i.e. canal) water. They also can find their way into orchard soils via infested nursery stock, adjacent ornamental plantings, or movement of infested soil. LPC has been observed in orchards that have historically been irrigated with ground water, and are therefore at lower risk of introduction of *Phytophthora*. Early symptoms of LPC may include small bleeds on the rootstock (Fig 1A) and a general canopy decline, but the canker will envelope the rootstock, girdling the tree and causing mortality. In Tulare County, the most recent reports of LPC have been in ‘Tulare’ and ‘Chandler’ blocks, and generally in orchards ranging from approximately 10-15 years old.



Figure 1. A) The initial symptom of lethal paradox canker is bleeding on the rootstock. B) As symptoms progress, the canker girdles the tree, and a black, viscous ooze stains the base of the tree.

### Research Advances.

The cause of LPC is yet unknown. Although it is commonly thought that the disease is caused by a microorganism, a causal agent has not yet been resolved. LPC cankers do not readily or consistently yield culturable microorganisms, so creative approaches are required to investigate the disease’s cause. Working with UCCE Farm Advisors throughout the state, Dr. Greg Browne, USDA-ARS and Dr. Ravi

Bhat, UC Davis, sampled over 50 trees in 6 counties to examine associations between the disease and possible causal agents. Pathogenicity tests have been established with candidate LPC pathogens. In 2013, our UCCE Tulare County research team mapped LPC incidence in four Tulare County orchards and are continuing to monitor the spatial and temporal spread of LPC within affected sites. Visualization of the trajectory of spread may assist in the development of hypotheses of potential causes of LPC. In autumn 2013, observed incidence of LPC increased in surveyed orchards with percent symptomatic trees ranging from 1.3-2.8% and 3.8-4.0% in September and October, respectively. Our research team will continue monitoring disease progress during the 2014 field season and welcome the opportunity to visit new orchards with emerging LPC symptoms.

