Progress report for CDFA contract number 06-0225

Project Title: "The pit membrane barrier to *X. fastidiosa* movement in grapevines: Biochemical and physiological analysis"

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Time period covered by the report: December, 2008 through February, 2009

Objectives and Progress:

Introduction: This project focuses on the pit membrane (PM), the primary plant cell wall meshwork that separates one vessel from its neighbors and serves as a filter to assure that particles (e.g., bacterial cells) are not moved throughout the plant in the plant's water-conducting system. Research prior to the initiation of this project in 2006 had suggested that grapevine PMs provided an important barrier to the systemic movement of *X. fastidiosa* (*Xf*) cells in the xylem system and, therefore, suggested that PM integrity was a key to successful vine defense against Pierce's Disease (PD) development. Earlier reports for this project have supported the idea of an important PM role in a grapevine's PD defense and this information is a central tenet to current projects led by Lindow and Chatterjee (2008), Lindow et al. (2008) and Labavitch et al. (2008) that involve genetic manipulations of grapevine rootstocks to limit the spread of *Xf* in scions. A few questions that are related to factors affecting *Xf* spread in grapevines remained at the end of the project's original funding period.

Objectives: This project is now in a no-cost extension phase. The two objectives listed are restated from the original project. They are pieces of the original 2006 project's goals.

Objective 1. To repeat our 2005 observations of a late Spring, dramatic increase in the porosity of grapevine pit membranes in uninfected vines.

Objective 2. To determine whether an infected grapevine's production of and response to ethylene impacts its reaction to *Xf* and its relative PD susceptibility or resistance.

In the previous reporting period we reported that we had determined that a relatively new, sprayable formulation of the ethylene receptor blocking compound 1-methylcyclopropene (1-MCP) could inhibit a grapevine response (tylose formation in pruned stems) to its own ethylene. Thus, 1-MCP will be used to test Objective 2. However, we have no additional progress to report at this time. The studies identified in the 2 objectives will begin in Spring, 2009.

Intellectual Property:

No new intellectual property will be developed by this work. It is conceivable that the manipulation of the grapevine's ethylene response sensitivity will have a beneficial impact on

its response to *Xf* introduction. Thus our results could shape studies "grapevine manipulation" efforts that eventually lead to the development of intellectual property.

Appropriate References:

Labavitch JM, ALT Powell, AB Bennett, D King and R Booth (2008) Optimizing grape rootstock production and export of inhibitors of *Xylella fastidiosa* polygalacturonase activity. Proceedings of the 2008 Pierce's Disease Research Symposium. pp 214-219.

Lindow S and S Chatterjee (2008) Control of Pierce's Disease by methods involving pathogen confusion. Proceedings of the 2008 Pierce's Disease Research Symposium. pp 180-186.

Lindow S, D Trauner and E Beaulieu (2008) Exploiting pathogen signal molecules for control of Pierce's Disease. Proceedings of the 2008 Pierce's Disease Research Symposium. pp 187-192.

The Relationship of the Potential Results from this Project and Solutions to the PD Problem in CA:

The ability of pit membranes to withstand the impacts of *Xf* and its cell wall-degrading enzymes and prevent the systemic spread of the pathogen appears to be a key to grapevine resistance to PD. Several studies based on this idea are already underway. Whether the continuing work in this project identifies additional opportunities for grapevine protection is not certain at this time.