Molecular characterization of Δ9 desaturases from the Sharpshooters, *Homalodisca coagulata* and *Oncometopia nigricans* (Hemiptera: Cicadellidae)

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Introduction

Glassy-winged sharpshooter (GWSS) (*Homalodisca coagulata*) and the Leafhopper, *Oncometopia nigricans* (ON) are important agricultural pest that transmits Pierce's disease of grapes. Pierce's disease is caused by the bacterium, *Xylella fastidiosa*. The bacterium blocks the xylem, the water- and nutrient-conducting vessels of plants. *Xylella fastidiosa* also causes almond leaf scorch, phony peach disease, alfalfa dwarf, oleander leaf scorch, and citrus variegated chlorosis.

What are Fatty Acid Desaturases?

Fatty acid desaturases are enzymes that catalyze the insertion of a double bond at the Δ9 position of fatty acids. A full length cDNA was cloned from the GWSS and the protein characterized in silico.

Unsaturated fatty acids are important constituents of all cell membranes and are required for normal insect growth and pheromone synthesis. Both sequence and structural analyses indicate that the Δ9 desaturases from the GWSS and ON share both sequence, structural, and functional homology.

How can we utilize this gene and information associated with it?

1. **Evolutionary analyses:** Fatty acid 9-desaturases have been found in a variety of organisms. The cloning and characterization of different fatty acid Δ9 desaturase genes will assist in determining evolutionary divergence from one another.

2. **Disruption of Insect Biology:** Aim is to disrupt insect feeding as well as reproduction through disruption of pheromone production.

3. **Pharmacological:** By affecting intramembrane transport membrane permeability Δ9 desaturases play a role in the efficacy of a variety of pharmaceuticals, including cancer chemotherapeutic agents. Insulin can influence intramembrane transport and subsequent absorption of chemotherapeutic agents by activating Δ9 desaturase enzymes, resulting in increases in membrane fluidity and thus drug absorption at physiologic temperatures.

4. **Food:** Another area of application is the alteration of plant lipid biosynthesis for food and industrial uses. In plants, the first step in C-18 fatty acid desaturation is catalyzed by Δ9 desaturase. Cotton has been altered with the Δ9-desaturase gene for use in the food industry to increase the percentage of monounsaturated fatty acids to polyunsaturated Fatty Acids.