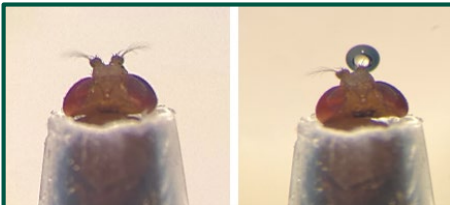


Sweet non-nutritive sugars as a human-safe control for *Drosophila suzukii*

Briana Price



Spotted-wing drosophila male (top) & female (bottom) on erythritol sprayed blueberry leaf



Spotted-wing drosophila with amputated antennae & hemolymph droplet during hemolymph extraction

Drosophila suzukii (Matsumura) (Diptera: Drosophilidae), commonly referred to as spotted-wing drosophila (SWD), is a problematic pest for small fruits. This species has an advantageous serrated female ovipositor (a tube-like organism used for laying eggs) which allows SWD to lay eggs into ripening fruit. Rotational insecticide applications are predominately used to control SWD populations, although there is a desire for human-safe, environmentally friendly management tools.

Non-nutritional sugar, erythritol, is known to kill SWD by not being metabolizable and raising osmotic pressure in the fly hemolymph (a fluid equivalent to blood). Flies like to feed on erythritol, more so when combined with a sweet additive, like sucrose. But, providing sucrose provides flies with a nutritional source for energy. Sucralose, the main ingredient in Splenda® has potential to be used as a non-nutritional additive to entice feeding like sucrose does. For my master's thesis, I've researched feeding preference and mortality by erythritol and sucralose formulations as well as how sucralose effects SWD physiology.

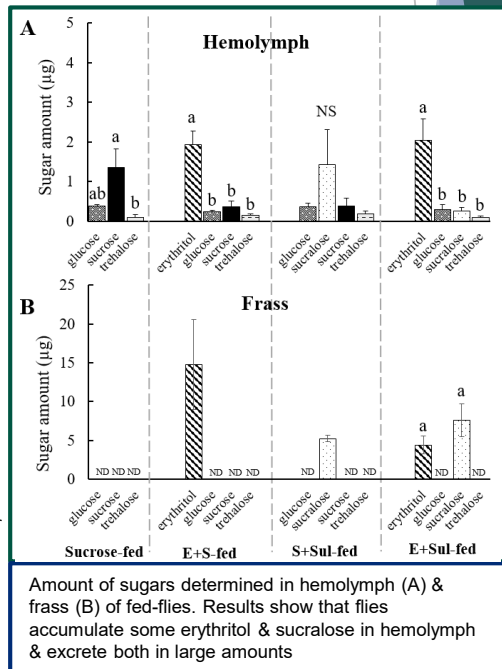
Through mortality tests, we showed that erythritol+sucralose (100% non-nutritional) kills flies faster than erythritol+sucrose

(sucrose is nutritional); this is most likely due to the flies starving because they are not provided with a nutritional carbohydrate. In choice feeding preference tests between erythritol alone versus erythritol+sucralose together, flies preferred to feed on the formulation containing sucralose. This helped support the idea of it being used as an enticing additive.

We also tested if sucralose can be metabolized by flies by using gas chromatography to measure sugar content in hemolymph and frass of flies fed these sugars. We found that flies cannot metabolize sucralose into usable carbohydrates, some sucralose is accumulated in the hemolymph because of heightened pressure and a large amount is excreted instead of used for energy.

This work helps us confirm that sucralose is both attractive and non-nutritional to *D. suzukii*, thus it is a good candidate for replacing sucrose in an erythritol formulation. Field efficacy trials are also underway to further develop this as a practical management tool for growers.

Any questions or suggestions, please contact Man-Yeon Choi (mychoi@usda.gov), Research Entomologist, Jana Lee (jana.lee@usda.gov), Research Entomologist, or Briana Price Choi Lab Technician (briana.price@usda.gov) with the USDA-ARS HCRU.



Amount of sugars determined in hemolymph (A) & frass (B) of fed-flies. Results show that flies accumulate some erythritol & sucralose in hemolymph & excrete both in large amounts