GROWERTALKS

Pest Management

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Does Dew Do It?

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Western flower thrips (*Frankliniella occidentalis*) is the most destructive insect pest of greenhouses throughout the U.S. and Europe (of course you all knew this). The primary means of dealing with western flower thrips is still the use of insecticides. However, solely relying on insecticides to "control" western flower thrips may lead to populations developing resistance, a situation that has already occurred in Florida. In fact, in August of 2008, Dow AgroSciences, the manufacturer of spinosad (Conserve) voluntarily suspended the sale and use of all spinosad-related insecticides in two counties in Florida (Broward and Palm Beach County) due to positive identification that western flower thrips populations had developed resistance to insecticides containing spinosad as the active ingredient. As such, the advent of alternative approaches to deal with western flower thrips is mandatory.

Greenhouse producers for years have inquired about and/or suggested that mixing a sugar such as white or brown sugar, or a soft drink (e.g. Mountain Dew) with a contact insecticide (in the spray solution) enhances efficacy of the spray application against the western flower thrips. It appears that thrips may have a "sweet tooth." In fact, it has been stated that molasses and brown sugar will act as a surfactant or attract thrips from flowers and encourage them to consume or come in contact with insecticides.

White sugar is pure sucrose derived from either tropical sugar cane or sugar beets. In contrast, there are two types of brown sugar: sticky and free flowing. Both types are obtained by adding syrup such as molasses to purified or refined sugar. However, based on this information, it's difficult to comprehend how and why plant-feeding insects such as western flower thrips would be attracted to any type of sugar, particularly if it doesn't provide any essential nutrients (proteins and amino acids) for development and reproduction. Furthermore, there have been minimal quantitative studies designed to verify the actual benefits of using sugar or soft drinks with contact insecticides to enhance efficacy against western flower thrips. As such, this year, our laboratory conducted a number of experiments to determine if sugar-based compounds actually improve control of western flower thrips.

In addition to white and brown sugars and sugar-laden soft drinks such as Mountain Dew, there are several commercially available insecticidal products based on certain sugar components. These are SucraShield (active ingredient: sucrose octanoate esters) and SorbiShield (active ingredient: sorbitol octanoate). Both products are labeled for thrips "control" and are contact insecticides that either desiccate (by dissolving holes in the insects' cuticle or skin) or suffocate insects. The active ingredient is an extract from the leaf hairs of wild

tobacco plants. (It's interesting to note that the restricted entry interval (REI) for SucraShield is 48 hours yet it's permitted for use in organic production systems.) This article presents initial research results from our study, which was designed to determine if SucraShield, and adding Mountain Dew to certain insecticides is an effective means of dealing with western flower thrips.

Materials and methods

Experiments 1 and 2: Yellow cut transvaal daisy (Gerbera jamesonii) flowers were obtained from a wholesale broker. No pesticides had been applied to the cut flowers before harvest, so the possibility of any pesticide residues negatively affecting western flower thrips survival was minimal. Flower stems were excised 5 to 7 in. below the base of the flowers and placed into 22-mm low-background borosilicate-glass vials containing tap water. One transvaal daisy cut flower was placed into each glass vial. The glass vials were inserted into plastic containers (250-ml) with sand to keep the vials upright. One container or cut flower was equal to one replicate. All the plastic containers were positioned in a polyvinyl chloride (PVC)-pipe open frame on a wire-mesh bench (16 x 5 ft.) with the designated treatment containers arranged in a completely randomized design. A black-knit shade cloth was positioned over the PVC frame to protect the cut flowers from direct sunlight and preserve their longevity. Each cut flower was artificially infested with approximately 15 adult western flower thrips obtained from a laboratory-reared colony in the Department of Entomology at Kansas State University.

All flowers were sprayed until runoff with the appropriate treatments using a 32-oz. plastic spray bottle with 16 oz. of water and approximately 0.6 oz (or 18.0 ml) of spray solution. This spray volume thoroughly saturated the flower surface and allowed the spray solution to penetrate into the disk portion of the flowers. The glass vials were refilled regularly with tap water to ensure lasting quality of the cut flowers. The temperature inside the greenhouse during the experiments was 70 to 75F (21 to 24C) with a relative humidity between 60 and 70%. There were a total of 10 treatments in the first experiment and 12 treatments in the second experiment with five replications per treatment. The treatments and rates are presented in Table 1.

Seven days after application of the treatments, flowers were harvested, placed into plastic petri dishes with lids, and then emasculated under laboratory conditions. We counted the number of live and dead western flower thrips adults. Percent mortality for each treatment was calculated by dividing the number of dead western flower thrips adults by the total number recovered per flower (=replicate). Percent mortality values (after transformation) were subject to an analysis of variance (ANOVA) with treatment as the main effect. Treatment means were separated using a Fisher's protected least significant difference (LSD) test at $P \le 0.05$. All data presented are non-transformed.

Results and discussion

The addition of Mountain Dew, which contains 31 g of sugar (as high fructose corn syrup) per 20 fl. oz., at the



Figure 1. Percent mortality of western flower thrips (WFT), *Frankineella occidentalis*, for all treatments seven days after application for Experiment 1. There were five replications per treatment. Designations: MO-Mountain Devi and UTC-untreated theck. Bars with column letters are not significantly different from each other at P-OS.



rate of 12 fl. oz./50 gal. failed to enhance the efficacy of any of

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Figure 2. Recent mortality of western flower thrips (WF1). Annichoistis occidentals for all treatments seven days after application for Experiment 2. There are the registations per beatment. Designations: UC-unstantist device fram with occurrent liters are not significantly different from each other al P-0.05. the treatments in the first experiment (Figure 1). However, it's difficult to actually assess if mixing Mountain Dew had any real affect since the individual

treatments by themselves provided nearly 100% control of the western flower thrips. Furthermore, since azadirachtin (Ornazin) is an insect growth regulator, the addition of Mountain Dew may not have exhibited the same benefits as compared to mixing Mountain Dew with a contact insecticide. It should be noted that we used a "virgin" colony of western flower thrips. In other words, the laboratory colony had never been exposed to any insecticide applications so the level of efficacy (based on percent mortality) may be an over-estimation of the actual control possible by the treatments in a typical greenhouse where western flower thrip populations have been continuously exposed to insecticide applications. None of the SucraShield treatments, at the low and high labeled rates, in either experiment were effective in "controlling" western flower thrips with percent mortality <60% (Figures 1 and 2). The addition of sugar to spray solutions has been problematic in some cases. Several greenhouse producers, for instance, have actually experienced situations in which black sooty mold fungi started "growing" on the sugar-based spray solution.

We will continue evaluating how mixtures of sugars with contact insecticides and sugar-based compounds perform in "controlling" western flower thrips and other insect pests. However, we need to ask the question: Why would a plant-feeding insect such as western flower thrips be attracted to sugar? So, for the time being, purchase some Mountain Dew to quench your thirst.