Mating Disruption/SIR

Effect of rainfall on encapsulated codling moth pheromone

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Keywords: codling moth, rain, overhead irrigation, microcapsules, pheromone, CM-F, stickers, *Cydia pomonella*

Abstract: Laboratory tests were performed to demonstrate adherence of encapsulated codlemone to apple leaves after exposure to rain. Microcapsule adhesion differences between the top and bottom of apple leaves were also tested. Various commercial stickers were evaluated for improved adhesion of codlemone microcapsules to leaf surfaces during rain. Results indicate that increased rainfall is inversely proportional to microcapsule adherence, more microcapsules adhere to the bottom of leaves when overhead rain is applied and a latex-based product appears to be the most efficient sticker for increasing microcapsule adherence.

Introduction

Codlemone is the female sex pheromone of codling moth (*Cydia pomonella*). Using this pheromone in a microcapsule, Suterra has created a controlled release formulation that disrupts the mating of codling moth. Many orchards are affected by rain and/or overhead irrigation each year. Therefore, it is important to test the adhesion of codling moth flowable (CM-F) when exposed to rain or overhead irrigation and to test commercial "stickers" that may aid the adhesion of CM-F microcapsules to leaves. The results of this test will give Suterra a basic understanding of how the CM-F formulation behaves in rain and may provide a recommendation for sticker usage.

Materials and Methods

Leaves with at least one inch of petiole were collected from Lodi apple trees (8'-10'). After collection, each leaf petiole was placed through the rubber septum of a GC vial filled with water. Aqueous sticker and control solutions were prepared before each test with fluorescent microcapsules plus standard CM-F. The stickers were mixed according to label specifications and, for the purposes of this test, it is assumed that the fluorescent microcapsules perform identically to the CM-F microcapsules. Eight leaves were sprayed with a sticker/CM-F solution and two were sprayed without CM-F for controls. A stainless steel holder was fabricated such that 10 vials containing a leaf could be mounted radially and horizontally. The leaves were attached to the apparatus and set outside in full sun for at least one hour to evaporate the water carrier and allow the sticker to cure. With a black light, the fluorescent microcapsules were counted on each leaf. To simulate rain, the loaded leaf apparatus was set in a 10-gallon white bucket and a sprayer was set up so that a cone-shape of water sprayed directly on the tops of the leaves. Leaves were sprayed for either 15 seconds (0.08 inches), 30 seconds (0.17 inches) or one minute (0.36 inches). The number of beads remaining on each leaf was again counted and the loss of microcapsules was recorded. To test the difference of CM-F microcapsule adhesion

between the top and bottom of leaves, the best performing sticker solution was sprayed on both sides of the leaf and the same methods as above were performed.

Results and Discussion

The percent loss of microcapsules as a function of increased duration of rain is shown in Figure 1. Exposure to 0.08, 0.17, and 0.36 inches of rain corresponds to 57, 69 and 79% CM-F microcapsule loss from leaves, respectively. These data indicate that CM-F microcapsule loss from apple leaves increases with increased rainfall.

The effect of various commercial stickers on CM-F microcapsule adhesion is depicted in Figure 2. Bond, a latex-based formulation, appears to be the most efficient commercial sticker for improving CM-F microcapsule adherence to apple leaves. As shown, exposure to 0.08 inches of rain corresponds to 36% CM-F microcapsule loss, a 37% increase in adherence as compared to control with no sticker.

Figure 3 shows the difference of CM-F microcapsule adhesion between the top and bottom of leaves when overhead rain is applied. As might be expected, 44% more microcapsules adhere to the bottom as compared to the top of leaves.

Overall, results indicate that rain and/or overhead irrigation reduces CM-F microcapsule adhesion to apple leaves. It should be noted that the amount and intensity of water sprayed on these apple leaves was large and corresponds to 22 inches of rain in one hour. Therefore, the conditions under which these tests were performed were quite extreme. The data presented here suggest that there is a cumulative increase in CM-F microcapsule adhesion when Bond is used as a sticker in conjunction with spraying leaves so that the microcapsules are not directly affected by overhead rain or irrigation.

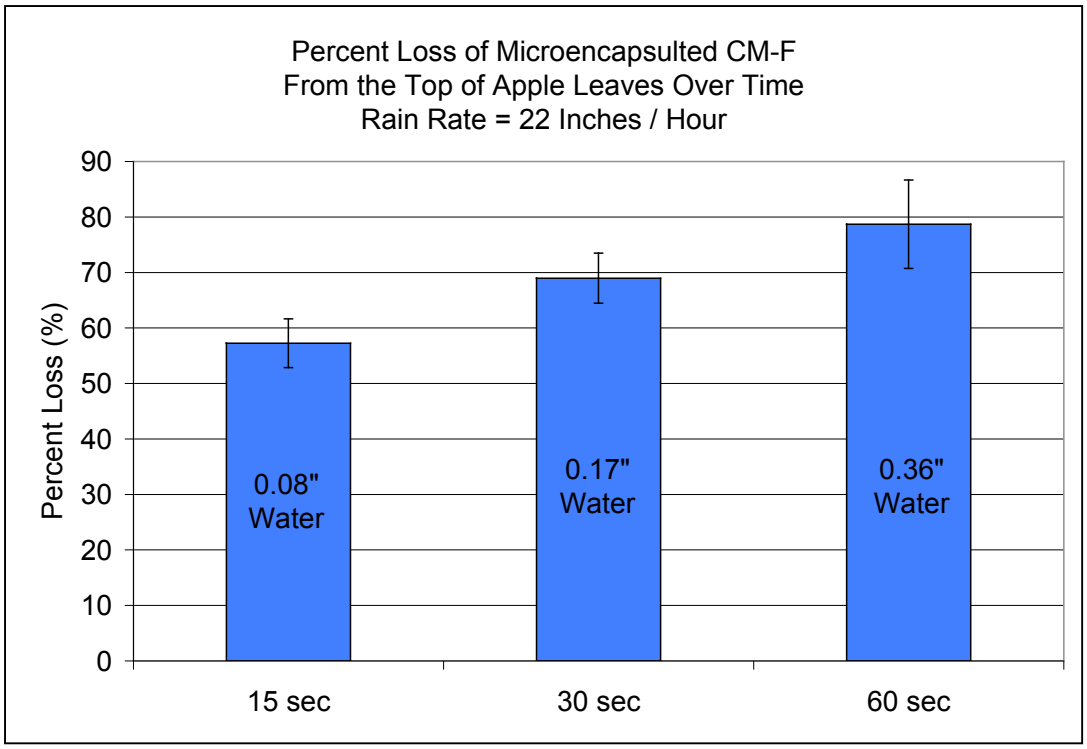

Fig. 1. Percent loss of microcapsules versus increased duration of rain.

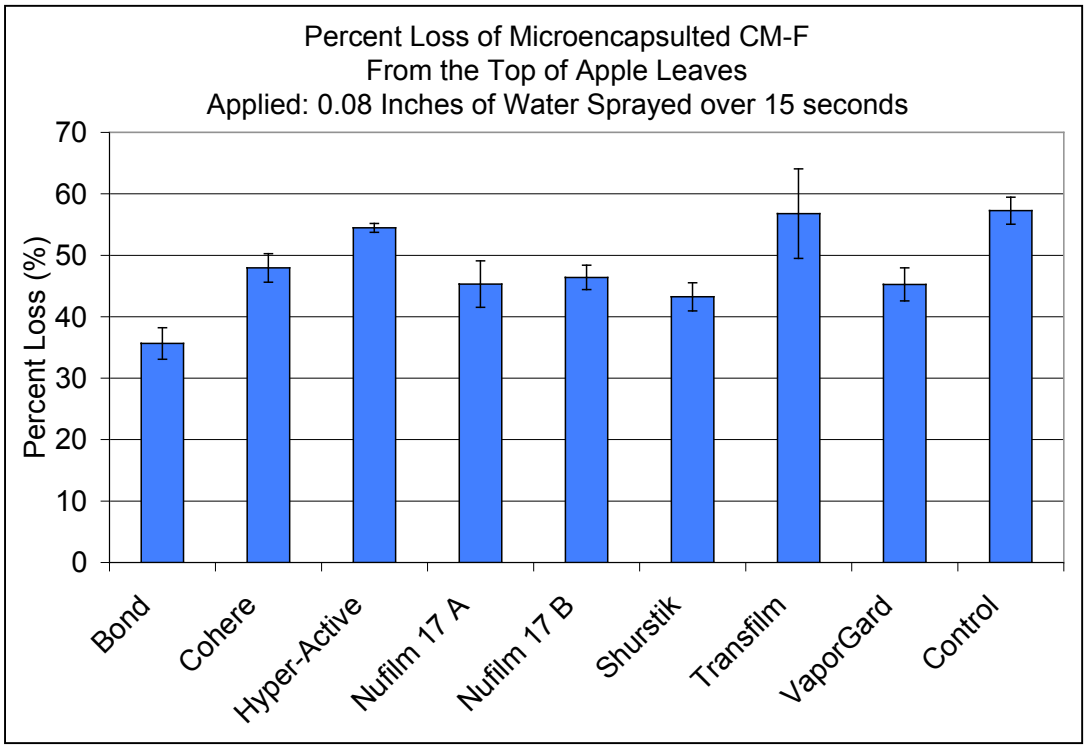

Fig. 2. Percent loss of microcapsules versus type of sticker used.

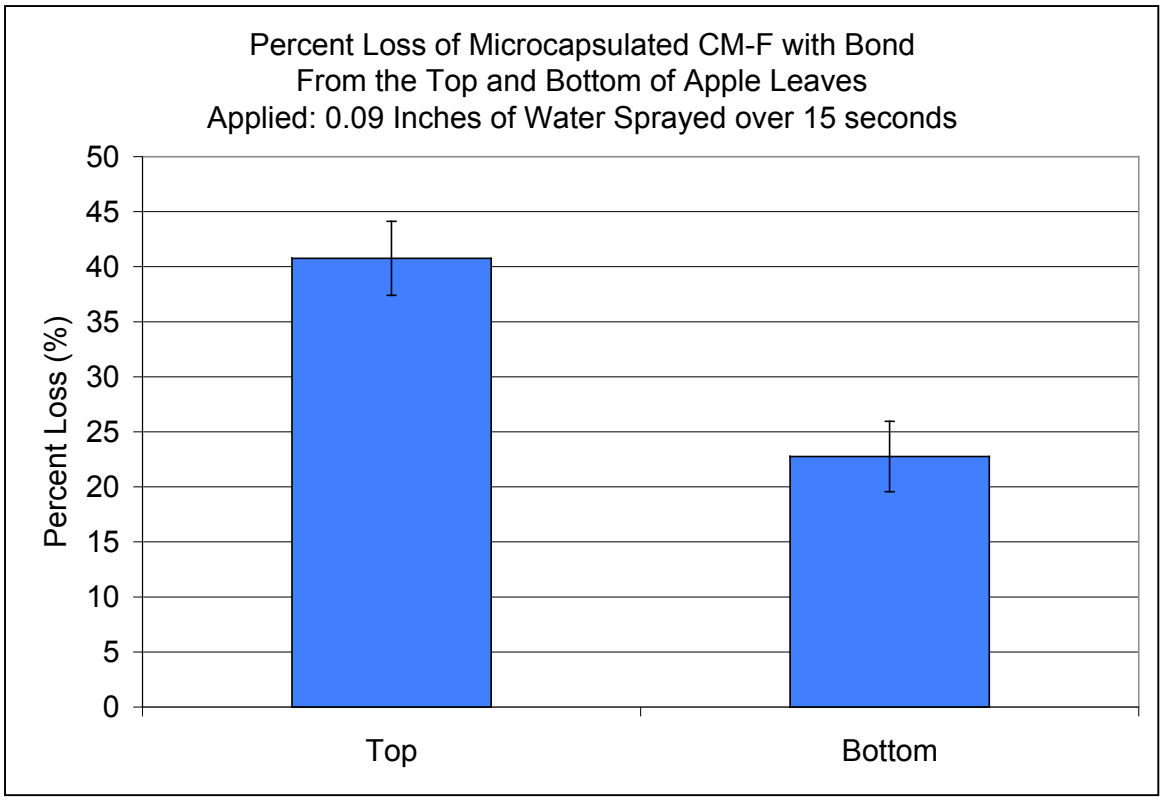

Fig. 3. Percent loss of microcapsules on the top and bottom of leaves.