

## Mating Disruption/SIR

### EFFECT OF CLAY PARTICLE FILM ON ENCAPSULATED SPRAYABLE CODLING MOTH PHEROMONE RELEASE RATE

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*Keywords:* codling moth, microcapsules, pheromone, sprayable, clay, kaolin, Surround

*Abstract:* A laboratory study was performed to test possible effects of clay particle film (Surround) on the release rate of encapsulated sprayable codling moth (CM) pheromone. Samples of moderate- and slow-releasing CM pheromone microcapsules were tested in conjunction with manufacturer suggested concentrations of Surround. In general, the Surround product reduced the release rate of encapsulated sprayable CM pheromone by 22%.

#### **Introduction**

Surround<sup>®</sup> WP (Engelhard Corp.) is a kaolin clay agricultural product that is sprayed on various crops to protect them primarily from sunburn and heat stress. The Surround product is suspended in water and applied in a sprayable form after which the crops are left with a thin opaque film of clay. Because CM-F (codling moth—flowable) adheres to crop surfaces after applied, there may be an inhibitory effect on the release of pheromone from the microcapsules if the clay product is applied after and hence over CM-F. Therefore, the purpose of this experiment was to test the effect of Surround on the release rate of CM-F pheromone.

#### **Materials and Methods**

Two concentrations of Surround were prepared in de-ionized water, 60 mg/ml and 30 mg/ml, corresponding to manufacturer's recommended use of 100 pounds and 50 pounds per 100 gallons of water, respectively (the manufacturer recommends 100 or 50 pounds of Surround per acre for 6 ft trees). CM-F alone was used for the controls. Four replicate samples were prepared against each blank (either water or Surround) and the experiments were done in triplicate. All data analysis and figures were prepared using Microsoft Excel.

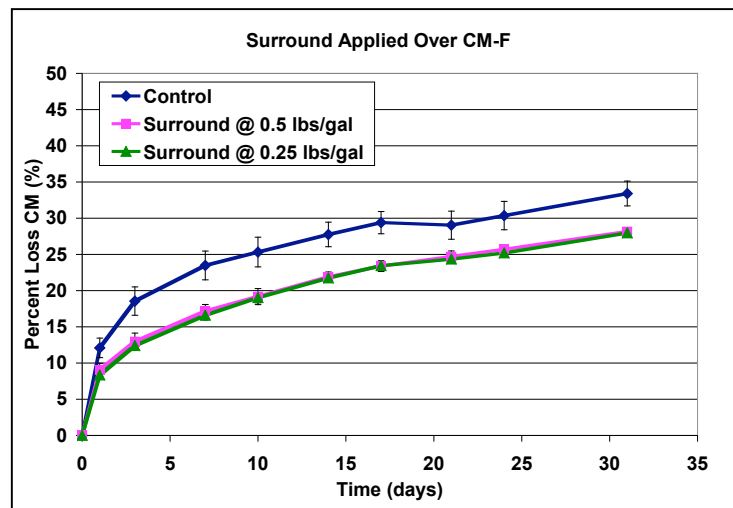
*Surround over CM-F:* Numbered filter disks (1.5 cm diameter) were placed into Petri dishes with tweezers and put in 100°C oven for one hour to remove any water. The disks were removed from the oven and allowed to cool before each disk was weighed. CM-F (3 ml) was added to 20 ml de-ionized water in a cell culture flask. The flask was swirled to mix. The disks were ordered in rows of five and, with a Pipetman, diluted CM-F was applied to the first four disks of each row. The fifth disk in each row served as a blank. The disks were placed in a 40°C environmental chamber and allowed to dry for one hour. These were removed from the oven and allowed to cool before re-weighing each disk. The Surround product was then applied (200 µl) to the samples. Again the samples were dried in the 40°C environmental chamber for one hour to dry. All disks were subsequently placed in foil dishes on chamber trays and weighed

again to get an initial weight. All samples were stored in the environmental chamber and pheromone release was measured by loss in weight over time.

*CM-F over Surround:* Numbered filter disks (1.5 cm diameter) were placed into Petri dishes with tweezers and put in 100°C oven for one hour to remove any water. These were removed from the oven and allowed to cool. The disks were ordered in rows of five and, with a Pipetman, the Surround product was applied (200 µl) to the first four disks of each row. The fifth disk in each row served as a water/Surround blank. The disks were placed in a 40°C environmental chamber and allowed to dry for one hour. These were removed from the oven and allowed to cool before weighing each disk. CM-F (3 ml) was added to 20 ml de-ionized water in a cell culture flask. The flask was swirled to mix and diluted CM-F was added to each disk. Again the samples were dried in the 40°C environmental chamber for one hour to dry and re-weighed to determine the amount of CM-F applied. All disks were subsequently placed in foil dishes on chamber trays and weighed again to get an initial base weight. All samples were stored in the environmental chamber and pheromone release was measured by loss in weight over time.

## Results and Discussion

When Surround is applied over CM-F at two concentrations, the CM pheromone is released at a slower rate than the uncoated controls, as shown in Figure 1. Notably, the inhibition of CM-F pheromone release by the Surround coating is independent of coating concentration. Figure 2 shows the percent of CM pheromone release inhibition over time. The inhibition decreases over time with an average inhibition of about 22%.



**Figure 1**

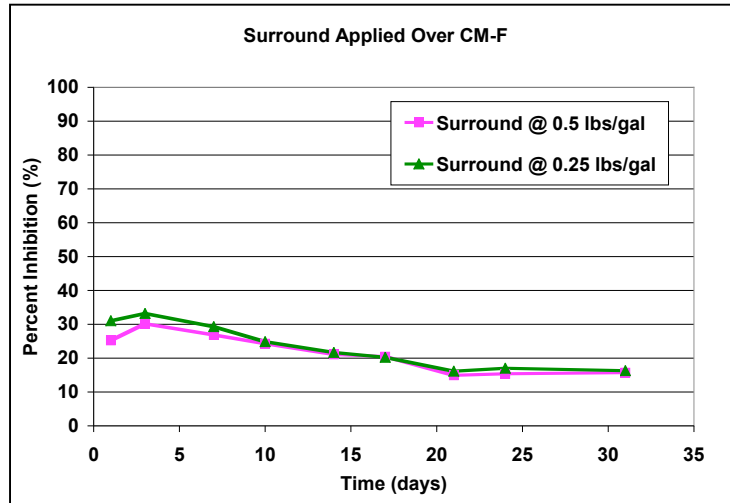


Figure 2

In contrast to the case with the application of Surround over CM-F, when CM-F is applied over Surround there is an even greater inhibition effect, as seen in Figure 3.

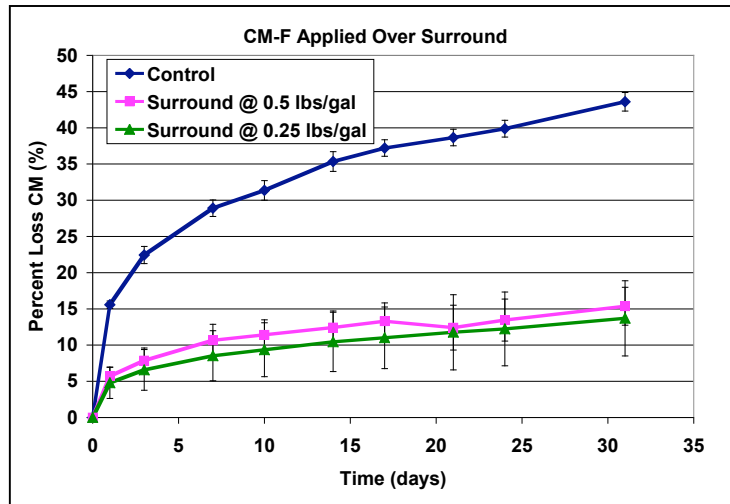
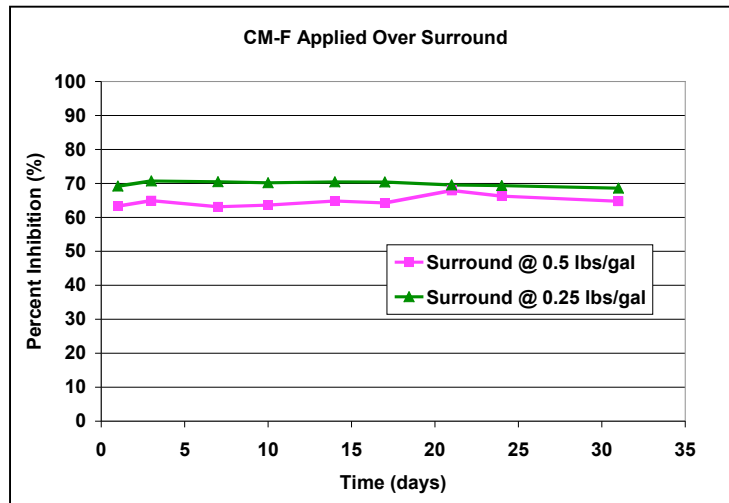


Figure 3

Figure 4 shows that this inhibition is constant over time between about 65-70%. As in the first experiment, the Surround inhibition of CM-F pheromone release is concentration independent over the investigated range.



**Figure 4**

### **Conclusions**

The data suggest that the CM pheromone from the microcapsules applied over Surround has a lower release rate than the microcapsules under the kaolin clay product. While this result initially appears counterintuitive, further investigation of the unexpected result became clear. It was noted that during addition of CM-F over the Surround, the Surround became re-suspended. Therefore, it is possible that during this time, the CM microcapsules became completely coated with the Surround product, thereby increasing the inhibition of the pheromone release. The filter disks were viewed under a microscope and the microcapsules applied over the Surround appeared to look duller than the microcapsules alone, which were highly reflective and transparent in nature. Upon viewing the disks with the Surround over the CM microcapsules, it was clear that there were multiple cracks within the clay-coated surface. This suggests that the reduced release rate of the CM-F pheromone over the Surround is due to coating by Surround and the pheromone from the microcapsules under the Surround is escaping through the cracks in the clay. This mode of action also explains why the inhibition of pheromone release decreased over time for the application of Surround over the CM-F, since the cracks in the clay would increase with continued drying, thereby allowing more pheromone to escape.

Overall, results indicate that Surround reduces the rate of pheromone release from CM microcapsules both as a coating and a support. The average reduction of pheromone release rate with Surround as a coating was about 22%, while the reduction of release after 20 days decreased to about 16%. This inhibitory effect of Surround upon CM-F pheromone release rate should be considered when using the products in conjunction with each other as part of an integrated pest management program for crops.