THE INFLUENCE OF SPRAY APPLICATION METHOD ON THE EFFICACY OF A MICROENCAPSULATED SPRAYABLE CODLING MOTH PHEROMONE

Alan L. Knight (ARS, USDA, Wapato, WA) and Tom Larson (Consep Inc, Bend, OR).

Keywords: *Cydia pomonella*, apple, sex pheromone

Development of microencapsulated formulations of sex pheromones that can be applied through standard orchard spraying technology holds promise. However, until recently products containing the major sex pheromone component for codling moth have been short-lived and only marginally effective. One approach to improve the effectiveness of these products for codling moth is to target a greater percentage of the active ingredient into the upper portion of the canopy. Increased efficacy in product deposition has the potential to reduce the cost of this approach and improve its efficiency. Studies were conducted to examine the deposition patterns of a typical air blast application versus a new, low volume "over-the-top" application. The level of disruption with these two approaches was compared and also contrasted with an application made directly on the ground. This treatment was included to measure whether the pheromone not deposited in the canopy is wasted.

This study was conducted in a 30-year-old Red Delicious orchard near Naches, WA. All treatments were made on 10 July, 2000. Three replicated 1.0 acre plots of each treatment were randomized within the orchard and separated by at least 50 m. The four treatments consisted of: 1) an untreated check, 2) a proprietary pheromone formulation at a rate of 100 gallons of water per acre with a small air blast sprayer, 3) the same formulation sprayed with a modified herbicide sprayer that delivered the same rate of active ingredient in 5 gal of water per acre, and 4) the pheromone formulation sprayed on the ground with a herbicide sprayer at 5 gal per acre. Capsules treated with a fluorescent pigment were added to the spray tank with the two canopy treatments. Fifty leaves from the top and bottom of each plot were collected and examined under a blacklight. Within each plot five female-baited traps and one trap either baited with a Consep Inc. 1x or 10x Biolure.

Results

The pheromone formulation sprayed on the ground had some activity during the first 4 days of the test but showed no activity after 7 days. Levels of disruption were marginally higher in the 'over-the-top' than the air blast application treatment through 22 days (Table 1). These results were consistent with the density of capsules deposited in the canopy. Capsule density was nearly 50% greater with the 'over-the-top' vs the air blast application: 3.04 versus 2.03 capsules per leaf (Table 2). Capsule density was generally greater on the bottom than the upper surfaces of leaves. Capsule densities were greater in the top than the bottom of trees with the 'over-the-top' application method. Capsule density was more uniform in the canopy with the air blast method.

Table 1. Comparison of spray application method with a micro-encapsulated formulation of codling moth sex pheromone. The study was conducted on July 12, 2000, Naches, WA.

Days after Application	Treatment	Mean (SE) moth catch per trap type 1x Biolure	10x Biolure	F-baited
4	'Over the top'	0.33 (0.33)	2.33 (0.33)	0.07 (0.07
	Air blast	1.67 (0.88)	2.67 (1.67)	0.27 (0.12)
	Ground	5.00 (2.89)	5.67 (2.96)	0.47 (0.17)
	Check	11.00 (3.22)	16.00 (3.79)	1.27 (0.72)
8	'Over the top'	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
	Air blast	0.00 (0.00)	0.67 (0.33)	0.00 (0.00)
	Ground	2.67 (1.45)	2.33 (0.27)	0.27 (0.15)
	Check	3.33 (1.77)	3.67 (2.03)	0.13 (0.13)
15	'Over the top'	0.67 (0.21)	1.50 (0.72)	0.27 (0.10)
	Air blast	2.50 (0.56)	6.17 (3.45)	0.90 (0.56)
	Ground	30.00 (16.95)	21.67 (5.30)	1.07 (0.33)
	Check	28.33 (4.92)	27.33 (4.39)	1.30 (0.37)
22	'Over the top'	3.33 (1.05)	10.00 (2.65)	0.03 (0.03)
	Air blast	4.17 (1.35)	15.17 (3.93)	0.57 (0.37)
	Ground	26.00 (3.97)	29.67 (3.88)	0.13 (0.06)
	Control	16.33 (3.35)	36.33 (4.72)	0.37 (0.14)
29	'Over the top'	3.67 (0.96)	10.33 (2.94)	1.60 (0.31)
	Air blast	3.00 (1.44)	3.33 (1.17)	2.83 (0.50)
	Ground	47.67 (9.62)	50.00 (3.04)	5.53 (1.03)
	Control	23.50 (4.52)	30.33 (7.33)	3.00 (0.54)

Table 2. Mean density (SE) of fluorescent capsules in apple plots treated with either an air blast or a low-volume 'over-the-top' spray application of a codling moth pheromone formulation.

Treatment	Canopy Height – Leaf Surface High-Top	High-Bottom	Low-Top	Low-Bottom
Airblast	0.36 (0.09)	1.52 (0.32)	0.36 (0.11)	1.82 (0.28)
'Over-the-top'	1.62 (0.35)	3.44 (1.32)	0.86 (0.22)	0.12 (0.06)