

Mating Disruption/SIR

Isomate C+, Checkmate and CIDeTRAK

Larry J. Gut and J. F. Brunner

Washington State University Tree Fruit Research and Extension Center, Wenatchee, WA

Keywords: codling moth, Isomate, Checkmate, CIDeTRAK, apple

Three mating disruption (MD) products were evaluated for their ability to control codling moth (CD) in apple. Two registered products, Isomate C+ (Pacific Biocontrol, Inc.) and Checkmate-CM (Consep, Inc.), and an experimental product, CIDeTRAK (Trécé, Inc.), were evaluated using different rates and numbers of applications. The experimental design consisted of large unreplicated blocks either with pheromone plus insecticides as needed or insecticides only. Tests were conducted in five northcentral Washington locations.

Capture of males in pheromone traps and levels of fruit injury were used to evaluate the effectiveness of CM control in test orchards. Pherocon 1CP traps (Trécé, Inc.) baited with standard lures (red septa containing 1 mg of codlemone) were placed in conventional orchards at a density of 1 trap per 2.5 acres. Traps baited with the standard lure and traps baited with a high load lure (red septa containing 10 mg of codlemone) were used in pheromone treated orchards. The two kinds of traps were uniformly distributed in orchards at a density of 1 trap per 1.25 acres. Traps were placed at mid-canopy in conventional orchards but positioned in the upper third of the canopy in pheromone treated orchards. The number of male moths captured was recorded weekly and trap bottoms were replaced after a cumulative catch of 30 moths, more often if dirty. Lures were replaced every three weeks during the first generation CM flight and biweekly during the second generation flight. CM injury to fruit at the end of the first generation and at harvest was evaluated by nondestructively examining 1,000 apples in each test block. An equal number of apples from high (above 7 feet) and low (below 7 feet) in the canopy was inspected on 50 trees in each block.

The effectiveness of Isomate C+, Checkmate and CIDeTRAK was directly compared at five sites (LB, CH, BU, TW, and AZ). Isomate C+ was applied at the manufacturer's suggested rate of 400 dispensers per acre (d/a) and at a reduced rate of 200 d/a, while Checkmate and CIDeTRAK were applied only at the 200 d/a rate (Table 1). The Isomate C+ codling moth control system consists of a polyethylene tube dispenser loaded with 203 mg of active ingredient (63:31:6 blend of codlemone, 1-dodecanol, and 1-tetradecanol). The Checkmate system is a membrane dispenser loaded with 180 mg of codlemone only and the CIDeTRAK system is a laminate dispenser loaded with 235 mg of codlemone.

First and second generation capture of males in pheromone traps and levels of fruit injury in pheromone and conventionally treated orchards are summarized in Table 1. Isomate C+ was the only pheromone product that provided consistent CM control with minimal intervention with insecticides. Damage levels in orchards treated with Isomate C+ at 400 or 200 d/a generally were equivalent to those recorded in adjacent conventional orchards. An average of 3.6 OPs was targeted against CM in conventional orchards, while an average of only 0.2 supplemental OPs

was applied in Isomate C+ treated orchards. The poorest control using this product, 0.5% fruit injury at harvest, occurred at the site with the highest CM pressure, AZ. In the conventional orchard at this site, a seasonal total of 53.6 moths/trap was captured in pheromone traps and four OP sprays were required to control CM (Table 1).

The efficacy of Checkmate and CIDE TRAK varied considerably from site to site. At site LB where initial CM pressure was very low, moth captures in traps and fruit injury were low in all pheromone treated orchards (Table 1). Relatively high moth captures in both standard and high load pheromone traps were recorded in Checkmate treated orchards at sites BU and TW. At the former site, failure to apply supplemental insecticides during the first CM generation resulted in 2.1% CM fruit injury during that period. Most of the damage occurred in about a 2-acre section along the southern border. This corresponded to an area serviced by the only pair of traps that captured more than one moth in the first flight (7 moths in the 1 mg and 8 moths in the 10 mg trap). The second application of pheromone did not prevent moth captures in pheromone traps throughout the orchard and three OP sprays were applied during the second generation. Supplementing the Checkmate with insecticides was probably the major factor limiting CM injury to 0.9%, all of which was detected within the "hot-spot" that had developed during the first generation. Checkmate alone did not provide adequate CM control at site TW. In a manner similar to that observed at site BU, first generation fruit infestation occurred primarily along the border where a pair of traps indicated a potential problem (3 moths in the 1 mg and 5 moths in the 10 mg trap). Only the edge was treated with insecticide and 0.7% fruit injury was recorded at the end of the first generation. Second generation moth captures were high in both the standard (12.5/trap) and high load trap (8.7/trap), and traps throughout the block were capturing CM. This high CM capture triggered an OP treatment at the beginning of second generation egg hatch to the entire orchard and two additional border treatments at about 14 day intervals. Despite these supplemental sprays 0.9% fruit injury was recorded at harvest with heavier damage along the border but some infested fruit was found in the center of the block.

In response to substantial moth captures in pheromone traps, four of the five CIDE TRAK blocks (CH, BU, TW, AZ) received at least two supplemental OP sprays for CM control (Table 1). Moreover, only a 30% reduction in OP sprays occurred in blocks where CIDE TRAK dispensers were used relative to the conventional program. A combination of CIDE TRAK plus three insecticide treatments did provide adequate control at sites BU and AZ. Very high moth captures were recorded in the CIDE TRAK orchard at site CH during the first and second generation. Four OP sprays (two/generation) limited CM injury to 0.3% per generation. Only the CIDE TRAK orchard at site TW incurred a relatively high level of fruit injury. Damage levels of 0.6% and 0.8% were observed at the end of each generation. As in the Checkmate orchard at this site, OPs were not used during the first generation despite capturing a significant number of moths on one border (3 moths in the 1 mg and 5 moths in the 10 mg trap). The majority of first generation damage was found in this area and two supplemental OP sprays during the second generation successfully prevented the infestation from spreading to the center of the block.

Table 1. Comparison of codling moth catch and fruit injury in apple orchards treated with Isomate, Checkmate, or CIDeTRAK pheromone dispensers and/or organophosphate (OP) insecticides, Washington, 1995.

Site	Treatment ¹		Average (maximum) catch/trap per generation ²				% fruit injury each generation		
			Standard lure		High load lure		First	Second	
	Dispenser	Rate (d/a)	OPs	First	Second	First			Second
LB	Isomate	400	0	0.3 (1)	0.0	1.0 (2)	0.0	0.0	0.0
	Isomate	200	0	0.3 (1)	0.5 (2)	0.8 (2)	0.3 (1)	0.0	0.0
	Checkmate	200	0	0.0	0.0	2.3 (5)	0.3 (1)	0.0	0.2
	CIDeTRAK	200	0	0.0	0.0	1.0 (1)	0.0	0.0	0.0
	CT-isomerized	200	0	2.3 (6)	1.0 (2)	3.5 (6)	0.3 (1)	0.0	0.0
	None	0	1	1.0 (3)	0.0			0.0	0.0
CH	Isomate	400	1	1.3 (3)	0.0	5.3 (7)	1.3 (3)	0.1	0.2
	Isomate	200	0	1.3 (3)	0.0	3.5 (6)	0.3 (1)	0.1	0.0
	Checkmate	200	0	0.5 (1)	2.3 (6)	4.3 (7)	4.7 (13)	0.0	0.1
	CIDeTRAK	200	4	15.3 (41)	3.3 (6)	25.7 (31)	25.3 (45)	0.3	0.3
	CT-isomerized	200	4	2.7 (4)	0.7 (2)	10.7 (18)	6.3 (7)	0.2	0.0
	None	0	4	13.3 (17)	14.3 (23)			0.1	0.0
BU	Isomate	400	0	0.0	0.0	3.0 (5)	1.3 (3)	0.0	0.0
	Isomate	200	0	1.5 (2)	0.0	1.8 (4)	0.3 (1)	0.0	0.0
	Checkmate	200	3	2.3 (7)	14.0 (46)	2.8 (8)	12.3 (25)	2.1	0.9
	CIDeTRAK	200	3	2.3 (4)	3.8 (5)	7.7 (7)	5.3 (12)	0.0	0.0
	CT-isomerized	200	2	1.3 (3)	2.3 (3)	5.0 (6)	5.7 (8)	0.0	0.0
	None	0	5	15.8 (26)	6.8 (15)			0.0	0.0
TW	Isomate	400	0	1.3 (3)	0.8 (3)	1.3 (2)	4.5 (11)	0.1	0.0
	Isomate	200	0	1.3 (2)	1.5 (5)	5.0 (15)	5.3 (16)	0.1	0.2
	Checkmate	200	1	2.0 (3)	12.5 (24)	3.0 (5)	8.7 (14)	0.7	0.9
	CIDeTRAK	200	2	1.7 (3)	1.7 (4)	3.0 (5)	10.0 (11)	0.6	0.8
	CT-isomerized	200	1	1.0 (1)	2.0 (2)	3.0 (3)	8.0 (8)	0.3	0.0
	None	0	4	9.3 (19)	20.3 (36)			0.3	0.3
AZ	Isomate	400	1			3.7 (8)	0	0.3	0.5
	CIDeTRAK	200	3	1.0 (2)	8.0 (11)	2.5 (3)	14.5 (22)	0.1	0.2
	CT-isomerized	200	3	5.5 (8)	5.0 (9)	33.5 (37)	26.5 (41)	0.5	0.2
	None	0	4	18.8 (38)	34.8 (53)			0.0	0.0

¹Checkmate pheromone treatments were applied twice.

²Capture of moths in Pherocon 1CP traps baited with lures containing codlemone at a dosage of 10 mg (pheromone treated orchards) or 1 mg (non-pheromone treated orchards). Traps were placed within the mid or upper fruiting canopy of the tree in non-pheromone and pheromone treated orchards, respectively.