Washington State University

Pest Management Transition Project

Tree Fruit Research & Extension Center

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Monitoring codling moth

The number of supplemental controls necessary for summer codling moth (CM) generations will depend largely on the level of control that was achieved during the first generation. A monitoring plan to assess the efficacy of control programs after each CM generation should include: visually examining fruit for signs of CM injury; monitoring trap catch to help determine the size and distribution of emerging populations; and, monitoring phenology models to ensure that sampling and spraying activities are carried out at the appropriate time. Using these tools to assess control programs throughout the season will allow the opportunity to make any adjustments that are necessary to ensure clean fruit at harvest and can also save time and money by eliminating unnecessary spray applications or limiting the size of the area that is treated.

Visual inspections for CM injured fruit can help assess the efficacy of control programs.

Taiwan Protocol Sampling Worksheet

Tree	Above or equal to	Below or equal to	No. Fruit w/Live Larvae	Cum. no.
1	3			
2	3			
3	3			
4	3			
5	3			
6	3			
7	3			
8	3			
9	4			
10	4			
11	4			
12	4			
13	4			
14	4			
15	4			
16	4			
17	4			
18	4			
19	5			
20	5			
21	5	0		
22	5	0		
23	5	0		
24	5	0		
25	5	0		
26	5	0		
27	5	0		
28	6	0		
29	6	0		
30	6	0		
31	6	1		
32	6	1		
33	6	1		
34	6	1		
35	6	1		
36	6	1		
37	6	1		
38	7	1		
39	7	1		
40	7	1		
41	7	2		
42	7	2		
43	7	2		
44	7	2		
45	7	2		
46	7	2		
47	7	2		
48	8	2		
49	8	2		
50	8	3		

A minimum of 21 trees must be sampled before stopping in orchards with low risk of codling moth infestation.

http://entomology.tfrec.wsu.edu/Cullage_Site/Pages/CM_Export.html

Assessing control programs

Visual inspections for CM injured fruit can provide useful information about the efficacy of CM control programs. Visual inspection for CM injury does not have to take a great deal of time. It is more important to look at more trees than spend a lot of time looking at more fruit on a few trees. In most cases, visual inspections can be focused on problem areas or areas with high CM trap catch. If following the on-tree sequential field sampling protocol for export to Taiwan, sampling should be done within two weeks of harvest. Begin tree samples in the area of highest CM pressure, examining 60 half-fruits per tree. A half-fruit is a fruit which an entire half plus the calyx can be seen. Begin at the top of the tree and work down until a total of 60 half-fruits have been examined. The number of trees sampled will depend on the amount of CM injury that is found. A clean orchard block may require sampling as few as 21 trees to complete the evaluation.

Summer codling moth trapping

Pheromone traps are less effective in the summer months. If treatment thresholds based on trap catch are being used, the number should be reduced by half for summer generations. Pheromone lures do not last as long in warm summer months and may need to be replaced more often (do not exceed manufacturers recommendations). If trap capture from first generation was not representative of fruit injury found during visual inspections, changes should be made to improve the monitoring program. False negatives (i.e. no trap capture but fruit injury occurred) can be the result of using too few traps, poor trap maintenance, or inappropriate lure choice. The DA Combo lure (Trece) is a gray septum containing a low pheromone load plus the added component of a plant kairomone (pear ester). The Combo lure has shown to be more attractive (captures more moths) in research trials and can be a good option for use in areas that have a history of false negatives.

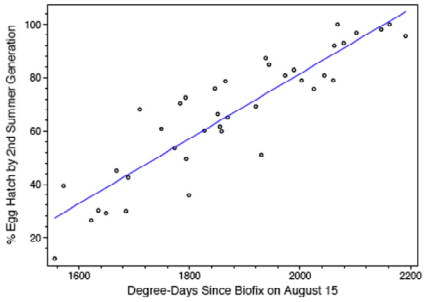
Outside sources of codling moth

Outside sources of CM populations can become problematic during summer generations. When first generation populations are left uncontrolled, as in abandoned or poorly managed orchards, summer populations can grow exponentially. Extra traps should be placed along orchard boarders when outside sources are suspected. Bin piles can be another outside source of CM populations. Bins that are brought into the orchard mid season can harbor CM that have exited stored fruit. Because these CM are transported from outside the orchard (often cold storage buildings), their phenology will not be in synch with the internal orchard population. Extra traps should be placed around bin piles to monitor moth emergence. Border sprays of 4-5 rows around external sources or bin piles may be necessary if these areas are identified as problems. A good monitoring program can help pinpoint these problem areas so that controls to protect fruit can be applied when necessary.

3rd generation codling moth

Most fruit growing regions in Washington State experience at least a partial 3rd CM generation each year. Though a portion of these CM will not complete their lifecycle, the potential impact of this generation should not be underestimated. If left uncontrolled, at least some 3rd generation CM larvae will overwinter and contribute to the CM population that emerges the following spring. Further, 3rd generation CM larvae will be feeding in the orchard just before harvest, which could result in unwanted fruit injury. Dr. Vince Jones, WSU TFREC, has developed a correlation between degree days (DD) from Biofix on 15 August and the percentage of 3rd generation egg hatch that will occur. The formula (shown below) can be used to help predict the potential impact of the 3rd generation so that necessary controls can be planned accordingly. For example, if the DD from Biofix on 15 August is 1900, the percentage of 3rd generation CM egg hatch that is predicted to occur is 67%.

DD from Biofix	% egg hatch of 3rd generation
1600	31
1700	43
1800	55
1900	67
2000	80
2100	92



Predicted 3rd generation egg hatch compared to degree days since biofix on 15 August. (Dr. Vince Jones, WSU TFREC).

% egg hatch of 3rd gen = 0.121837 * DD – 164.0344

*0.121837 * 1900 - 164.0344 = 67%.*

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Pest Management Transition Project
Washington State University
1100 North Western Avenue
Wenatchee, WA 98801