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Update on Pest Management
and Crop Development

F R U I T J O U R N A L

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A MITE CHILLY

EASTER EGG
HUNT
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❖❖ The European red mite (ERM), *Panonychus ulmi* (Koch), is the most important mite species attacking deciduous fruit orchards of North America, being the only species in NY that can maintain itself at high populations in commercial orchards, and is one of the few mites in the state that overwinters as a fertilized egg. The egg is dark red, has a ridged surface, and is a slightly flattened or onion shape in form including a short "stalk" arising from the egg's center. The winter eggs are frequently deposited in groups on roughened areas of the bark – especially around the bases of buds and fruit spurs – and may be so numerous as to give, to the unaided eye, a reddish cast to infested areas.

Winter egg deposition occurs over a relatively long period during the summer. This form passes the winter in a state of diapause, or arrested development, which carries the population through the cold winter period that is unfavorable for growth. When the weather returns to conditions in which the mite can resume active life, diapausing eggs are stimulated to hatch. Some winter eggs may be laid in July, but most are deposited from mid- to late August. Environmental factors inducing winter egg production include: diminishing food supply (or food quality), lowered temperature, and decreasing photoperiod (daylength). Of these, photoperiod and temperature are the most important factors. Food availability becomes a factor

if it is depleted or restricted, as can happen when populations reach high levels early in the season, and the quality of the foliage on which they occur suffers because of excessive feeding. This drop in food quality can condition the females to produce winter eggs somewhat before the temperature and daylength alone would cause the mites to enter diapause. Such situations have been observed to take place as early as mid-July. If injury to foliage is not severe early in the season, populations often build up significantly in late August and early September. Many of these late-appearing females deposit their eggs in the calyx and stem ends of apple fruits, in addition to the wood surface.

The survival of the winter ERM egg has been addressed by a few researchers in the past, and some facts are known fairly well, but others have yet to be formally documented. First of all, the outer shell of winter egg is structurally similar to that of ERM eggs laid in the summer, except that

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the summer egg is vulnerable to desiccation up to six hours after deposition, but the winter egg is able to survive desiccating conditions as soon as it is deposited. Both types of egg are laid on the substrate, and then a layer of cement (for attachment) and a layer of wax (for waterproofing) is secreted over it; however, the winter egg is held in the mite until a developmental stage at which it is already waterproofed, before being laid and receiving these additional coverings.

The eggs must go through a period of chilling in order to resume their development and proceed to hatch; it is estimated that hatching occurs 3-4 weeks after the breaking of diapause. Studies have found that the fully developed mite embryo (= larval stage) is stimulated to break the eggshell by light; in one trial, 86% of the eggs being studied hatched during daylight. Researchers have found that winter eggs in diapause never hatch if temperatures remain between 64–77°F, but diapause can be broken by chilling the eggs (at 34–48°F) for 100 to 200 days. Less time is required at lower chilling temperatures.

Every year, the winter weather pattern in NY produces questions about the effect on ERM eggs, in terms of their ability to either tolerate exceptionally cold temperatures, or to take advantage of unusually mild weather. The fact is that there is always some winter mortality of ERM eggs, that it can be quite variable (ranging from perhaps 15% to nearly 60% in severe cases), and that it is dependent on many different factors, such as orchard micro-habitat and air drainage, amount of snow cover, and genetic characteristics of local populations, in addition to simple raw temperature readings. One study conducted in NY after the extremely cold winter of 1956–57 showed that ERM hatch was cut drastically (to 1–20% of normal) in western NY after a 3–5-day period in the -23 to -28°F range, but that hatch reduction was not uniformly this severe in the Lake Champlain growing region following the same temperature pattern. These results suggest that the eggs in that district may have been conditioned to withstand lower winter temperatures than in warmer parts of the state. The long-term average winter minimum in Peru is approximately -22°F, whereas in the Geneva area it ranges from -10 to -15°F.

Bearing this in mind, it still should be noted that an evaluation of winter ERM egg numbers is used for management purposes in some apple growing regions. One representative procedure was developed by Dick Rogers in Nova Scotia during the early 1990s, and is still used routinely with success by growers in that area. The technique involves examining 10 spurs from each of 3–10 trees per block to determine egg abundance. The "spur" sample unit is defined to be the equivalent of about 3 cm (slightly >1 inch) of wood around a spur or bud from at least 2-yr old wood that is <2 cm (0.8 inch) in diameter. Spurs are examined on the trees to avoid time-consuming collection and laboratory analysis. A scoring of the abundance of eggs on this unit of spur wood is based on a scale from 0-4, as follows:

SCORE	NUMBER OF EGGS
0	0
1	1–10
2	11–50
3	51–100
4	>100

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The scores for all the spurs in a sample are tallied, and an average score is calculated by dividing the total tally by the number of spurs examined. Three levels of intervention are envisioned as being possible outcomes of the sampling process. Therefore, three arbitrary thresholds were established that could be related to the scoring system used. These are shown below:

THRESHOLD	RECOMMENDATION
0	No treatment
0.1	Superior oil "concentrate" (a product not available in the US) at 0.5% at tight cluster
1.0	Superior oil (e.g., Damoil, Omni Supreme) at 1-2% at tight cluster
2.0	Prebloom oil plus early season miticide (e.g., Apollo, Savey, Zeal)

This method appears to be reliable in Nova Scotia, provided the persons sampling have some training and experience, and mite counts in June suggest that egg scores may even be a fairly good predictor of post-bloom mite numbers. However, it should be mentioned that this type of sampling method has not been verified under NY conditions, and that differences in mite populations, weather patterns, and mite control products (history and labeling restrictions) could very well necessitate considerable modifications of the above guidelines. Nevertheless, egg scores might be useful as a relative index of potential mite numbers in any block, although the overriding influence of spring weather conditions should never be dismissed as an ultimate factor in the development of early summer ERM populations.



EXAMPLE ERM EGG POPULATION

0% of spurs w/ eggs

10% of spurs w/ 1–10 eggs

100% of spurs w/ 1-10 eggs

100% of spurs w/ 11-50 eggs

In general, it can be an advisable practice to survey the spur wood in blocks with a history of moderate to severe mite problems, particularly after seasons when mites were not so abundant, because under such conditions high populations can build up and lay high numbers of eggs in September (after the grower has stopped thinking about them). A severely cold winter can reduce the viability of the eggs that are present in the spring, but favorable developmental weather early in the season can easily compensate for a small founding egg population, whereas a cold, wet and extended April and May can serve as effectively to retard mite development as would a good early season spray program. ❖❖

GLOWING EMBERS?

PREBLOOM
SIGNS OF FIRE
BLIGHT?
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❖❖ About a year ago, when apple trees in Vermont were at the silver tip bud stage, Terry Bradshaw, the apple specialist at the University of Vermont, circulated some photos of trees with oozing trunks (Figs. 1–2) and asked if the ooze could be evidence of fire blight. The affected trees were reported to have been free of visible fire blight at the end of the previous season, although some fire blight had been noted in that block earlier during the previous summer. The oozing trees showed vertical cracks that could have been indicative of winter damage (Fig. 1), but older literature suggests that fire blight may also cause cracks in trunks. Several veteran pathologists, myself included, expressed doubts that bacterial ooze from fire blight would be evident so early in the season. However, Terry sent samples to Dr. Kerik Cox at the Geneva Experiment Station and folks in Dr. Cox's lab verified that *Erwinia amylovora* was present in the ooze. Terry's observations in VT showed that young trees can develop trunk blight if bacteria resident in symptomless wood are triggered to become pathogenic and, perhaps more importantly, that affected trees can produce ooze very early in the season.



Fig. 1

Appearance of fire blight ooze from trunks or rootstocks at bud break is probably a rare occurrence. However, considering how much

fire blight was present last year, I suspect that many growers will see additional young trees collapse this spring because of rootstock blight. We know that fire blight bacteria can sometimes travel from blossom or shoot infections down through symptomless branches and trunks until they reach blight susceptible rootstocks, such as M.26 and M.9, where they multiply and cause disease. Trees with rootstock blight often develop red foliage early in the fall, a symptom that is a common indicator of rootstock problems. However, it is likely that some trees that appeared healthy last fall will collapse after growth begins this year, especially if the fire blight infection in the rootstock had not totally killed the roots by the end of last summer. It is also possible that some blocks may develop trunk blight similar to that noted in Vermont last year.



Fig. 2

Ooze like that shown in the Figs. 1 & 2 contains billions of bacterial cells along with sugars that make the ooze attractive to flies. We usually think of fire blight as being disseminated primarily by bees and other pollinators during bloom, but flies that visit oozing trunks or rootstocks may be distributing the (b)ooze that gets the party going when the first flowers open. Although older literature suggests that the flies that are attracted to ooze rarely visit flowers, I suspect that insect dissemination of ooze during the prebloom period may still play a role in launching fire blight epidemics. Of course, we also know that bacteria in ooze will be spread by splashing rain and blowing mist.

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Because of the huge amount of inoculum present on trees with visible ooze, it seems logical to suggest that any trees that develop ooze on the trunks or rootstocks prior to bloom should be removed and destroyed before flowers open. Given the prevalence of blight last year, it may be advisable to carefully monitor young orchards at the tight cluster and early pink bud stages this spring to determine if any trees have visible ooze and need to be removed.

Note, however, that not all "ooze" or external sap flow in spring can be attributed to fire blight. Trees that have been winter damaged in the past may be unable to seal up pruning cuts because no wound healing can occur in the dead or winter-damaged xylem. Such trees may leak sap at fresh pruning cuts (Fig. 3), and the leakage sometimes



Fig. 3

continues for several years (Fig. 4). The sap leaking from pruning cuts is generally more watery and translucent than ooze from fire blight, but leaking sap is quickly colonized by other organisms that may create dark stains below the pruning cut (Fig. 5). Where sap flow has created dark stains below pruning cuts, the bark beneath the stained area will appear green and healthy if bark chips are removed with a pocketknife. I suspect that leakage traceable to pruning cuts is more likely to be indicative of winter injury than of fire blight. However, any leakage that is viscous with a reddish or yellow-brown color may be indicative of fire blight, especially in blocks that had blight last year. An exam-



Fig. 4

ple of fire blight ooze coming from a pruning cut is provided in one final photo from the orchard that Terry Bradshaw observed in Vermont last year (Fig. 6).



Fig. 5



Fig. 6

Acknowledgements: Thanks to Terry Bradshaw, University of Vermont, for reporting his observations and for permission to use his photos (Figures 1, 2, and 6). Thanks to Kerik Cox and folks in his lab for verifying that *Erwinia amylovora* was present in the ooze Terry observed at silver tip last year.



UPCOMING PEST EVENTS

	<u>43°F</u>	<u>50°F</u>
Current DD accumulations (Geneva 1/1–4/6/15):	22	9.0
(Geneva 1/1–4/6/2014):	27	5.6
(Geneva "Normal"):	103	32
(Highland 1/1–4/6/15):	46	16
<u>Coming Events:</u>	<u>Ranges (Normal ±StDev):</u>	
Green fruitworm 1st catch	50–152	11–71
Pear psylla adults active	31–99	8–34
Pear psylla 1st oviposition	40–126	11–53

PEST FOCUS

Highland: 1st **green fruitworm** trap catch.
Pear psylla beginning to lay eggs.

NOTE: Every effort has been made to provide correct, complete and up-to-date pesticide recommendations. Nevertheless, changes in pesticide regulations occur constantly, and human errors are possible. These recommendations are not a substitute for pesticide labelling. Please read the label before applying any pesticide.

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