26th ANNUAL MARCH MESSAGE
TO MASSACHUSETTS TREE FRUIT GROWERS (2004)

By
Ronald Prokopy, Department of Entomology, University of Massachusetts, Amherst
and
Jon Clements, Department of Plant and Soil Sciences, University of Massachusetts, Amherst

Introduction

Since its inception, the intent of the March Message has been to summarize new information and offer thoughts related to the management of insect and mite pests of tree fruit in Massachusetts. The information is compiled from a wide variety of sources but mainly from results of work conducted by colleagues in northeastern states and Michigan plus our own work.

Thanks to Arthur Tuttle of UMass and Art Agnello of Cornell (Geneva) for providing information on newly-labeled pesticides and Isabel Jacome for typing the Message.

GENERAL IPM TOPICS

PROBLEM PESTS: 2003 ACTIVITY AND NEW FINDINGS

IPM MANUALS, SUPPLIES AND SERVICES

CHANGES IN ORCHARD CHEMICALS FOR 2004

Since the 2003 March Message and since publication of the 2003-2004 New England Apple Pest Management Guide, 4 new pesticides have been labeled for use in orchards. Some others have undergone label modification. Here's a summary of how things stand as of February 17, 2004.

A. NEWLY REGISTERED COMPOUNDS

Calypso (thiacloprid) is manufactured by Bayer. It is a new neonicotinoid insecticide (related to Provado and Assail) that offers locally systemic activity. It is labeled for use on apples and pears. Perhaps more than any other recently labeled insecticide, it comes closest to matching Guthion and Imidan in spectrum of activity against orchard pests.

The label recommends use against aphids, leafminers, leafhoppers, mirid bugs (like tarnished plant bug and stink bug), European apple sawfly, plum curculio, apple maggot, codling moth, oriental fruit moth, pear psylla and pear midge. Starting with the 2001 March Message, we have annually presented data in the March Message on the performance of Calypso relative to other orchard pesticides evaluated in eastern and midwestern states. Combined results indicate that Calypso does indeed perform generally well against all of the above pests included on the label, though perhaps a bit short of the performance of Guthion or Imidan.

Calypso is relatively non-toxic to bees, in contrast to Provado and Assail, which are rather highly toxic. It is comparatively safe on predators and parasitoids.

No more than 16 fluid ounces (0.5 lb a.i.) per acre per year are allowed, which translates roughly into 4-8 applications per year, depending on dose per application. Pre-harvest interval is a lengthy 30 days, which could pose problems for apple maggot control. But re-entry interval is only 12 hours, a major advantage over Guthion.

Deliver (*Bacillus thuringiensis*, subspecies *kurstaki*) is a new addition to the current array of Bt products labeled for orchard use, such as Agree, Biobit, Condor, Crymax, Dipel, Javelin and Xentari. It has the same spectrum of activity as other Bt products, mainly against early larval stages of fruitworms and leafrollers.

Warrior (lambda-cyhalothrin) is manufactured by Syngenta. It is a new synthetic pyrethroid labeled for use on apples, pears, peaches, nectarines, plums, cherries and apricots. Like most other synthetic pyrethroids, it has activity against a broad spectrum of orchard pests but is supposed to be less harmful to beneficials on account of the novel type of formulation used. Unlike Danitol, it is not known to suppress pest mites.

Zeal (etoxazole) is manufactured by Valent. It is a new miticide labeled for use on apples, pears and non-bearing stone fruit trees. Zeal is predominantly an ovicide/larvicide and may not be

effective against older nymphs or adults. It will not control rust mites. Only 1 application per season is allowed, with a 28-day pre-harvest interval.

B. LABEL CHANGES.

Actara. Actara is currently labeled for use against certain orchard pests of pome and stone fruit in a few states. Previously, it was labeled for use in New England orchards, but some problems and concerns caused temporary label withdrawal. It should be labeled again for use in New England orchards sometime during the 2004 growing season.

Assail (Cerexagri) has a supplemental label in 2004 that adds numerous pests to the label, including Oriental Fruit Moth, European Apple Sawfly, Japanese Beetle, Apple Maggot, Plum Curculio, and San Jose Scale.

Dimethoate has been voluntarily withdrawn by the registrant for use on apples.

Guthion can no longer be used on plums. Through 2005, it can still be used on apples, pears, peaches and nectarines. It will now be sold only as Guthion Solupak 50%WP.

Formulations of azinphosmethyl other than Guthion Solupak (e.g., Guthion 50WP) that are presently on hand in orchards can be used under the label specified for that product. Such azinphosmethyl is not subject to the restrictions that apply to Guthion Solupak.

On apples, maximum allowed annual use is 8 pounds of Guthion Solupak per acre. At 8 oz/100 gal (or 24 oz/acre), this translates into about 5 allowable applications per year on mature M.7 trees (more applications if rates are reduced below 8 oz/100 or if trees are smaller than mature M.7). On pears, maximum allowed annual use is 3 applications totaling up to 6 pounds of Guthion Solupak per acre. On peaches and nectarines, maximum allowed annual use is 2 applications totaling 2.25 pounds of Guthion Solupak per acre.

For apples and pears, the pre-harvest interval is 14 days, unless the last application is greater than 2 pounds per acre, in which case allow 21 days before harvest. For pick-your-own blocks, the new pre-harvest interval is 30 days. The new re-entry interval is 14 days, but is reduced to 7 days for fireblight pruning (provided workers are thoroughly protected). Re-entry for mowing apparently is OK within a few hours after droplets have dried, provided there is no contact with treated foliage. There are also much tighter restrictions on drift of Guthion to nearby off-target sites, especially streams, ponds and neighboring properties.

Imidan can be used on all major pome and stone fruit crops through at least 2006. As yet, we are aware of no new label changes that apply to Imidan for 2004.

Pyramite is gradually being discontinued by its manufacturer (BASF) and replaced, with the same active ingredient and use patterns (but a different formulation) by **Nexter**.

APPLE IPM STUDIES IN MASSACHUSETTS IN 2003

In 2003, we conducted IPM studies in 95 blocks (468 plots) of apple trees in commercial orchards in Massachusetts plus 4 blocks (16 plots) in commercial orchards in Vermont and New Hampshire. It proved to be an excellent year for orchard research. Here are some of our findings.

PLUM CURCULIO (PC)

For 2003, we had 2 major goals in our research on PC: (1) To assess the value of all-row vs. perimeter-row sprays for PC control, and (2) to refine the use of odor-baited trap trees as a method for determining where and when to apply perimeter-row sprays for PC control.

To assess the value of all-row vs. perimeter-row sprays, 1-acre plots of apple trees bordering woods received insecticide applied either to all rows for all sprays, to only perimeter rows (1 and 2) for all sprays, or to all rows for the first spray and then to only perimeter rows (1 and 2) for succeeding sprays. In addition, to assist in interpreting results of this insecticide application test, we placed Circle traps (screen wrapped around tree trunks) on trees in successive rows from the block perimeter to the interior to capture PCs that may have immigrated into interior rows of blocks before petal fall. We also placed emergence cages (screened pyramids) beneath perimeter row trees and in woods to see if PCs might be overwintering in orchards. Results showed the following:

- Applying petal fall as well as first and second cover sprays against PC only to perimeter rows 1 and 2 did not provide effective control.
- Applying a petal fall spray to all rows (perimeter and interior) followed by first and second cover sprays only to perimeter rows 1 and 2 was just an effective as applying all sprays to all rows.
- Data from PC captures by Circle traps showed that substantial numbers of PCs are present on interior rows before petal fall (they could have immigrated into interior rows after leaving overwintering sites in woods during pink and bloom or they could have overwintered beneath interior -row trees or both).
- Data from PC captures by emergence traps showed that some PCs do indeed overwinter beneath apple trees in orchards.
- Together, our findings from 2003 indicate that (1) a spray against PC applied to all rows of trees in an orchard is needed at (or within a few days after) petal fall to control PCs that have moved into or overwintered beneath interior-row trees, and (2) following the petal fall spray, insecticide needs to be applied only to perimeter-row trees to achieve effective control of PC for the remainder of the season. Whether or not perimeter row 2, in addition to perimeter row 1, needs to receive such spray remains to be determined.

To refine the use of odor-baited trap trees as a method for determining which perimeter rows ought to receive first/second cover spray and when to apply such spray, we conducted 6 separate experiments using attractive pheromone (GA= grandisoic acid) plus attractive fruit odor (BEN= benzaldehyde) as odor bait.

Effectiveness of odor bait was determined by counting the proportion of sampled fruit on an odor-baited trap tree that had fresh PC egglaying scars. The more effective the odor bait, the greater the proportion of infested fruit. Results showed the following:

- 1 dispenser of GA (releasing about 1 mg/day) plus 4 dispensers of BEN (releasing about 40 mg/day) was just as effective a combination as any combination with greater amounts of GA+BEN and was more effective than combinations with lesser amounts.
- The amount of fresh PC injury on perimeter-row trap trees baited with 1 GA + 4 BEN averaged about 8-fold greater than the amount on unbaited perimeter-row trees 31-33 meters distant from the trap trees, indicating that an odor-baited trap tree can aggregate PC injury over a distance at least as great as 31-33 meters.
- Perimeter-row trap trees baited with 1 GA + 4 BEN at corners of orchards blocks are no more and no less effective than ones midway between corner trees.
- The odor combination of 1 GA + 4 BEN draws PCs to an odor-baited tree in general and not to the particular part of the tree where the odor in placed.
- Sampling for fruit freshly injured by PC can be done with confidence by examining fruit from to chest to head height in the outer part of the canopy of medium (M.26) and small (M.9) trees, but for large (M.7) trees sampling may require examining fruit in the upper half of the canopy (at least early in the season).
- Sampling 50 fruit on a trap tree baited with 1 GA + 4 BEN twice per week beginning 7 days after the petal fall spray against PC and applying a perimeter-row spray only if (but as soon as) 1 fresh injury out of 50 fruit sampled is seen should ensure that cover sprays against PC are not wasted and that block-wide injury will not reach 1% (= the average amount of PC injury at harvest over the past decade in Massachusetts orchards).
- Together, our 2003 findings suggest that growers can save a lot of time sampling for fresh PC injury and can apply perimeter-row spray against PC with confidence and effectiveness if sampling is confined to perimeter-row trap trees baited with 1 GA + 4 BEN. For 2004, we hope to determine how many odor-baited trap trees might be needed in a typical orchard. Neither GA nor BEN is available yet for purchase by growers, but any grower interested in trying out an odor-baited tree approach to monitoring PC should contact Ron Prokopy at 413-545-1057.

APPLE MAGGOT (AMF)

For AMF, our ultimate goal is to develop a simple and inexpensive trapping system that will provide excellent control (without need of any insecticide spray) under a wide range of orchard architectures and conditions. Toward this end, in 2003 we evaluated a new approach to assigning distances between odor-baited sphere traps hung on perimeter trees in 1-acre plots in 12 Massachusetts commercial orchards. Previously, we assigned distances between perimeter spheres largely on an arbitrary basis. Our new approach employed an index that incorporates a value for the state of each of 4 variables: tree size, quality of pruning, cultivar composition and nature of border habitat, as follows:

Value	Tree size	Quality of pruning	Cultivar susceptibility	Bordering habitat
1	Large (M.7)	Poor	High (e.g., Gala)	Woods
2	Medium (M.26)	Fair	Moderate (e.g., Cortland)	Hedgerow
3	Small (M.9)	Good	Low (e.g., McIntosh)	Open

If the sum of the 4 values characterizing a perimeter were 4 (worst-case scenario) then spheres were placed 5 meters apart on perimeter trees. If the sum were 12 (best-case scenario), then the distance between perimeter spheres was 17 meters (the farthest distance apart in 2003). If the sum were 5-11, distance between spheres was adjusted accordingly. Each sphere was coated with sticky and baited with a 5-component blend (Geneva blend) of attractive odor. Effectiveness of this new system for deploying spheres was compared with that of 2-3 sprays against AMF in an adjacent plot in each orchard. Effectiveness was measured by counting AMF on unbaited monitoring traps on the interior of each plot and by sampling fruit in each plot at harvest for AMF injury. Results showed the following:

- Compared with the number of spheres deployed under the arbitrary system used for assigning distances between spheres in these same blocks in 2001 and 2002, only 64% as many spheres were used under the new index system of 2003.
- Control of AMF by odor-baited spheres in the test plots was as just as good in 2003 as in 2001 and 2002 and just as good in 2003 as that by 2-3 insecticide sprays.
- Together, these results suggest that our new index system for assigning distances between odor-baited spheres on perimeter trees will save money (about one-third) and be effective in providing AMF control.
- Interestingly, after 4 consecutive years of withholding insecticide after mid-June in sphere-trapped plots, injury to fruit by leafrollers and internal lepidoptera (codling moth and lesser appleworm) was no greater in baited sphere plots than in grower-sprayed plots. This suggests that these moth pests may not build to damaging populations in the absence of insecticide spray against AMF in July and August.

In 2003, we looked further into optimal within-tree positioning of odor-baited spheres for capturing AMF. In an orchard dedicated to Johnny Appleseed in Leominster, we hung sticky spheres baited with odor (Geneva blend) in various parts of canopies of Jersey Mac and Golden Delicious trees. Results showed the following:

- Spheres in the outer half of the canopy captured twice as many AMF as spheres in the inner half.
- Spheres with all foliage and fruit at the side and below cleared to 10-20 inches captured more than twice as many AMF as spheres having foliage and fruit cleared to 1-3 inches or 30-40 inches.
- Future recommended within-tree position for odor-baited sphere traps will be placement in outer half of tree canopy with all foliage and fruit at side and below removed to at least 10 inches and preferably 20 inches and as much foliage and fruit as possible beyond that distance.

In 2003, we also evaluated our latest version of pesticide-treated spheres (PTS) as a substitute for sticky spheres for AMF control. Our newest version of a PTS consists of a 200 gram (= 7 ounce) hardened disc made of Entrust (= spinosad as insecticide) plus sugar (as fly feeding stimulant) plus paraffin wax (as binder) atop a red plastic sphere. Under high humidity, morning dew or rainfall, sugar and spinosad seep from the disc onto the sphere surface and together are ingested by alighting AMF, which then die. Testing of this new-version PTS in 2003 was conducted in 1/2-acre plots in each of 6 commercial orchards, with each plot surrounded by odor-baited spheres 6-8 meters apart. Results showed the following:

- Odor-baited spheres topped by discs containing spinosad, sugar and paraffin were slightly more effective in preventing AMF entry into plots and in preventing injury to fruit than were previous-version PTS (spheres coated with latex paint containing imidacloprid and topped by discs of sugar and paraffin) and than were 2-3 grower-applied insecticide sprays against AMF.
- Discs atop PTS were able to supply sufficient sugar and spinosad to sphere surfaces for the entire 3-month AMF season, without needing replacement.
- Entrust (spinosad) is a very safe compound --so safe that it was recently labeled for use in organic orchards.
- Dow (= manufacturer of Entrust), Pest Management Innovations of West Virginia (= manufacturer of the discs), EPA (= regulatory agency) and Umass (= holder of the pending patent on these new-version PTS) are excited about the future of spinosad-capped PTS as an inexpensive and effective substitute for sticky spheres for AMF control. An official EPA label is expected for the 2005 growing season.

Together, our 2003 research on AMF points the way to use of a minimum number of spinosad-capped PTS that can be deployed in a fashion tailored to the specific architecture of a targeted block to achieve AMF control that is both inexpensive and effective. This approach to AMF control will be evaluated extensively in every New England state and New York in 2004.

MITES

In 2000, *Typhlodromus pyri* (TP) mite predators were released at the centers of 2 of the 4 plots that comprised a block of apple trees in each of 12 commercial orchards. By 2001, TP had spread to most parts of all 4 plots. We continued to sample leaves in perimeter and interior rows of each plot in 2002 and 2003 with the intent of determining the size of the TP population relative to the population size of another principal mite predator, *Amblyseius fallacis* (AF), and the ability of both these predators to suppress European red mites (ERM). Sampled leaves were sent to cooperator Jan Nyrop at Geneva, New York for identification and counting of predators and prey mites. Results for 2003 showed the following:

- Even after 4 years of tree growth since seedlings were established in borders areas adjacent to perimeter rows of apple trees, hazel trees supported very few TP or AM. Based on research in Europe, we had thought that encouraging the abundance and growth of hazel trees in border areas would give rise to high populations of AF and TP on these trees and thereby provide a source of predators for inoculating adjacent orchard trees. Unfortunately, this did not turn out to be the case.

- In 2003, as in 2002, TP averaged about 10 times more abundant than AF across all 12 orchard blocks. It seems that once TP have become established as predators, they dominate AF. Only in blocks where ERM were moderately to very abundant were any AF found.
- In 7 of the 12 blocks, TP were able to maintain ERM at very low levels each year, including 2003. In 5 of the 12 blocks, however, TP either did not build to substantial levels or declined in abundance from 2002 to 2003. In 3 of these 5 blocks, ERM rose to potentially injurious levels in 2002 or 2003. We don't know for sure, but it could be that the prolonged cold temperature of the winter of 2002-03 killed many of the TP in certain orchards, damaging their numbers to the point where they could no longer suppress ERM effectively.
- After studying populations of released TP along with resident AF and ERM in 12 orchard blocks from 2000 to 2003, our overall conclusion is that released TP can be relied upon to provide effective suppression of ERM year after year in most circumstances. However, in a few cases, neither TP nor AF provided completely effective long-term biocontrol of ERM.

LEAFMINERS

In 2003, we continued in-depth sampling of the same 12 orchard blocks sampled from 2001-2002 for density and species composition of leafminers. Our purpose has been to acquire information that might help us to understand the causes underlying a shift in species composition from apple blotch leafminers (ABLM) to spotted tentiform leafminers (STLM) in some orchards and the possible consequences of this shift for LM management.

In 2003, as in the past, we sampled 400 leaves per block (100 each in rows 1, 3, 5 and 7) in June and repeated this in August and November so as to cover the first, second and third generations of LM. Each mine was carefully examined under a microscope for identification of LM and percent parasitism. Results showed the following:

- In 7 of the 12 blocks, ABLM was the dominant species in 2003, whereas STLM was dominant in the other 5 blocks in 2003. In 11 of the 12 blocks, the species that dominated in 2003 also dominated in 2001 and 2002.
- The average density of mines increased about 18-fold from first to third generation in 2003. The increase was 17-fold in 2001 and 19-fold in 2002. This shows a remarkable level of consistency across years in degree of LM increase form first to third generation.
- The established threshold for potential injury caused by LM is 200 mines per 100 leaves in the second generation. Only 1 of the 12 blocks reached even 50 second-generation mines per 100 leaves in 2003. Thus, all 12 blocks in 2003 were well below any danger of damage by LM.
- From 2001 to 2003, 6 of the 12 blocks received no insecticide whatsoever against LM. Each year, ABLM dominated in 3 of these 6 blocks, whereas STLM dominated in the other 3 blocks. During 2001-2003, 6 of the 12 blocks did receive insecticide targeted against LM at least once. Each year, ABLM dominated in 4 of these 6 blocks, STLM in 2 of the blocks. Across all 3 years, percent parasitism averaged 26% in the 6 blocks that received no insecticide against LM and 25% in the 6 blocks that did. In none of the 12 blocks did LM come close to approaching a potentially damaging population in any of the 3 years.

- Unfortunately, combined findings from 2001, 2002 and 2003 do not paint a very clear picture of factors that drive species composition, parasitism, mine densities and need for insecticide use against LM. Further study is needed to sort out the causes underlying the dynamics of LM populations in commercial orchards.

PROBLEM PESTS: THEIR 2003 ACTIVITY AND NEW FINDINGS

TARNISHED PLANT BUG (TPB)

2003 Activity. TPB captures by white rectangle traps and TPB-injured fruit in harvest surveys in Massachusetts in 2003 were below levels seen in 2001 and 2002 and close to levels seen from 1995-2000. The same was true in other New England states.

Several factors could be responsible for the rather large fluctuations across years in amount of injury to apples caused by TPB. These include degree of parasitism, weather during the previous autumn when TPB nymphs are developing into overwintering adults, and weather from tight cluster through bloom (when developing buds are most susceptible to the injury that shows up at harvest as dimples and scars). Truth is, we don't really know which factor might be the most important.

New findings. New findings on TPB involve trials of pesticides in providing control in 2003. The information below comes from Dick Straub and Peter Jentsch in the Hudson Valley (HV) as well as Harvey Reissig and David Combs in Western New York (WNY). Treatments were applied at pink and petal fall.

		% TPB DAMAGED FRUIT AT HARVEST	
	Approx. rate/100 gal	**HV**	**WNY**
Calypso 480SC	1.0 oz	0.8	2.1
Calypso 480SC	1.3 oz	1.1	-
Assail 70WP	1.1 oz	0.1	-
Imidan 70WP	21 oz	0.1	-
Untreated	-	3.8	1.6

Results suggest that Assail performed as well as Imidan and better than Calypso in controlling TPB.

EUROPEAN APPLE SAWFLY (EAS)

2003 Activity. In Massachusetts, other New England states and Quebec, EAS trap captures and fruit injury were at or below normal levels in 2003.

New findings. New findings on EAS involve trials of pesticide in 2003 for providing EAS control. The information below comes from Glen Morin of New England Fruit Consultants

(NEFCON), Dick Straub and Peter Jentsch of the Hudson Valley (HV) as well as Harvey Reissig and David Combs of Western New York (WNY) and Henry Hogmire of West Virginia (WV). Treatments were applied at petal fall and first cover.

		% EAS damaged fruit at harvest			
	Approx. rate/100 gal	**NEFCON**	**HV**	**WNY**	**WV**
Actara 25 WG	1.7 oz	3.3	-	-	-
Assail 70 WP	1.1-1.6 oz	-	0.0	0.0	0.5
Avaunt 30 WG	2.0 oz	-	0.0	-	-
Calypso 480 SC	1.3 oz	0.5	-	-	-
Clutch 50 WDG	1.0 oz	-	-	0.0	-
Diamond 7.5 WG	8.8 oz	-	-	0.2	-
Imidan 70 WP	21 oz	-	0.0	-	0.0
Guthion 50 WS	8-12 oz	1.8	0.3	0.0	0.2
Untreated	-	8.3	4.2	0.2	3.5

Combined results suggest that Assail, Avaunt, Calypso, Clutch, Imidan and Guthion all gave very good to excellent control of EAS, whereas Actara and Diamond were little or no better than untreated control.

PLUM CURCULIO (PC)

2003 Activity. In Massachusetts, PC damage was somewhat greater in 2003 than in 2002 but below that of 2000 and 2001. Very cool weather during May and much of June resulted in prolonged egglaying through mid to late June. Growers with insufficient spray residue to carry them through lots of rainy periods in June were hit the hardest. Similar conditions and PC activity occurred in other New England states.

New findings. We now have 4 consecutive years of data on captures of immigrating PC adults on odor-baited traps placed at edges of woods, where PCs overwinter. For each of these 4 years (2000-2003), more than 60% of all PCs immigrated by petal fall, with the remainder strung out over 5-6 weeks after petal fall. As indicated earlier (in the section on PC under "Apple IPM Studies"), many of these pre-petal fall immigrants spread into interior trees and justified a whole-orchard spray against PC at or shortly after petal fall. Subsequent sprays against PC can be restricted only to perimeter-row trees without compromising effective control of PC, and can be timed according to information derived from examination of fruit on odor-baited trap trees. See earlier section on PC under Apple IPM Studies for further new findings.

Other new findings on PC come from a study in 2003 by Dick Straub and Peter Jentsch of the Hudson Valley. They asked how well a thinning spray of Sevin XLR alone at petal fall might control PC if followed by Guthion 14 and 28 days after petal fall. Sevin XLR is favored over Sevin 50 WP for 4 reasons: (1) it is less toxic to bees (because its particle size does not resemble pollen, as does 50 WP), (2) it holds up much better under moderate or heavy rainfall (as we had in May and June in 2003), (3) it is relatively rate-insensitive as a thinner (1 or 2 pints

/100 gal work equally well), and (4) it packs more punch against PC than does 50 WP (actually 50 WP is no longer sold). Here are the data from their study.

Treatment	Rate/100 gal	% PC damage 8 days after PF
Sevin XLR	1.0 pint	1.6
Sevin XLR + Guthion 50 WS	1.0 pint 6.0 oz	1.9
Sevin XLR	2.0 pint	4.8
Sevin XLR + Guthion 50 WS	2.0 pint 6.0 oz	4.8
Guthion 50 WS	6.0 oz	5.9
Guthion 50 WS	12.0 oz	7.4
Untreated	-	14.5

Results show that even a low rate of 1 pint of Sevin XLR alone at petal fall gave just as good control of PC during the next 8 days as did 2 pints of Sevin XLR alone and as did a mixture of Sevin XLR with Guthion. In fact, Guthion alone at 6 or 12 oz/100 did not perform as well as Sevin XLR alone at 1 pint/100, possible because Sevin XLR holds up better under rainfall than does Guthion. These results, which need to be verified in 2004, hold out the exciting possibility that Sevin XLR alone at petal fall can give excellent PC control for at least a week and that another kind of insecticide against PC may not be needed until at least a week after petal fall. It also remains to be seen if Sevin 80S (a new formulation to replace Sevin 50WP) performs as well as Sevin XLR against PC, is less phytotoxic than Sevin XLR and is less harmful to some species of mites predators (= strikes against XLR under some conditions).

Several other trials of pesticide effects on PC were conducted in 2003 by Glen Morin of New England Fruit Consultants (NEFCON), Dick Straub and Peter Jentsch of the Hudson Valley (HV), Harvey Reissig and David Combs of Western New York (WNY) and John Wise of Michigan. The information below involves 2 applications of each material against PC (petal fall and first cover).

		% PC damaged fruit at harvest			
	Approx. rate/100 gal	NEFCON	HV	WNY	MI
Actara 25WG	1.5 oz	4.5	-	-	0.0
Assail 70WP	1.1 oz	-	0.6	8.7	0.5
Avaunt 30WG	1.7 oz	-	0.0	-	0.0
Calypso 480SC	1.0 oz	7.8	-	-	0.5
Clutch 50WDG	1.0 oz	-	-	2.4	0.0
Provado 1.6F	2.0 oz	-	-	-	4.0
Warrior ICS	1.7 oz	-	-	-	0.5
Imidan 70WP	21.0 oz	-	0.2	-	-
Guthion 50WP	8.0 oz	2.8	0.2	4.0	0.0
Untreated	-	43.3	4.7	51.0	6.5

Results indicate that compared with Guthion or Imidan (which were equally effective), Actara, Avaunt and Clutch performed nearly as well or better, whereas Assail, Calypso, Provado and Warrior were not as good.

APPLE MAGGOT (AM)

2003 Activity. Overall AM activity in commercial orchards in Massachusetts was about normal in 2003, but frequent and heavy rainfall in July and August raised concerns that insufficient residue after spraying remained to provide continuous and effective control. Indeed, infestation of apples in some orchards was slightly greater than in the past 3 years. AM populations were variable across other parts of the Northeast in 2003.

New findings. Findings from our 2003 research on AM in commercial orchards are described earlier in the section on apple maggot under "Apple IPM Studies". It's worth repeating here that our 2003 findings suggest a modification in the within-tree positioning of red sticky spheres for monitoring AM. We now recommend that each sphere be hung in the outer half of the tree canopy with a least 25 cm (10 inches) and preferably 50 cm (20 inches) of space between the sphere and the nearest fruit and foliage to the side and beneath. There should be as much foliage and fruit as possible beyond 50 cm. Clearing away more space around a sphere than previously recommended allows for growth of foliage and fruit that could, if too close, mask the conspicuousness of the sphere after mid-summer. Results from 2003 show the superiority of the 25-50 cm distance, especially after mid-season.

In the October 2003 issue of the Journal of Economic Entomology, Harvey Reissig of Geneva (New York) published an article summarizing 2 years of field studies (1999 and 2001) on effects of various pesticides on AM under conditions of low vs. high field populations of AM. Results are given in the following table.

	Approx. rate/100 gal	No. applic.	% infested fruit 1999	% infested fruit 2001
Esteem 35WP	1.2 oz	4	4.2	-
Spintor 25C	0.6 oz	8	4.0	28.1
Avaunt 30WG	0.6 oz	4	1.8	40.1
Actara 25WG	1.8 oz	4	4.7	18.0
Calypso 70WG	0.5 oz	4	0.2	2.5
Provado 1.6F	2.2 oz	8	3.7	-
Imidan 70WP	11.0 oz	4	2.8	-
Guthion 50WP	8.0 oz	4	--	0.4
Untreated	-	-	7.5	35.1

Results show that under the fairly low AM pressure of 1999, Calypso and Avaunt performed as well as or better than Imidan in controlling AM. Under the high AM pressure of 2001, only Calypso performed well, though not quite as well as Guthion. Overall, Calypso

provided AM control roughly equal to that of Imidan or Guthion under both low and high AM pressure. The other materials were less reliable or performed poorly.

Several studies of pesticide effects on AM were conducted in 2003 by Glen Morin of New England Fruit Consultants (NEFCON), Dick Straub and Peter Jentsch of the Hudson Valley (HV), Harvey Reissig and David Combs of western New York (WNY) and John Wise of Michigan (MI). Applications were made 3 times during July and August.

		% AM damaged fruit at harvest			
	Approx. rate/100 gal	**NEFCON**	**HV**	**WNY**	**MI**
Assail 70WP	1.1 oz	-	0.7	0.0	0.7
Avaunt 30WG	2.0 oz	7.3	-	-	-
Calypso 480SC	1.0 oz	-	0.4	-	2.1
Clutch 50WDG	1.0 oz	-	-	-	8.7
Provado 1.6F	1.5 oz	-	-	-	5.2
Imidan 70WP	21 oz	-	1.0	-	-
Guthion 50WP	8.0 oz	6.3	-	0.0	2.1
Untreated	-	22.3	3.5	0.4	10.0

Results indicate that Assail, Avaunt and Calypso performed as well or better than Guthion or Imidan, whereas Clutch and Provado were inferior.

LEAFROLLERS (LR)

2003 Activity. By far, the species of LR that causes the most trouble in Massachusetts apple orchards is the oblique banded leafroller (OBLR). In commercial orchards in MA in 2003, damage by OBLR averaged somewhat less than in 2002 and much less than in 2001. Overall, OBLR damage in 2003 in MA was at a level that was about average for 1995-2000. To our knowledge, only one grower in MA experienced an outbreak of OBLR in some of his orchard blocks in 2003. Two mid-season applications of SpinTor (late June and early July) halted the outbreak. Damage by OBLR was below average in both eastern and western New York but was above normal in Ontario and Quebec, especially in orchards of inadequately thinned fruit, where 3-4 fruit per cluster remained to protect OBLR from insecticide.

New Findings. The MA grower who experienced the most troublesome outbreak of OBLR in his orchard in 2003 observed that outbreak blocks were those that received Apogee. Blocks that did not receive Apogee seemed to have less damage by OBLR. The cause of a possible relationship between use of Apogee and buildup of OBLR is unknown but could be related to a possible tendency of Apogee-treated leaves to be more dense (clumped) in the vicinity of fruit clusters. This could give OBLR larvae feeding on such leaves good protection against insecticide sprays and easy access to nearby fruit.

As discussed in the 2002 issue of the March Message, there has been much recent research attention on assessing the comparative degree of susceptibility vs. tolerance or resistance of OBLR to conventional vs. newer insecticides. That attention continued into 2003, with results again showing a lot of variation among OBLR populations in different parts of the same state and among different states in degree of susceptibility. If there is a common theme to emerge, it would be that Intrepid at petal fall against young first-generation OBLR larvae should give effective control wherever used and that SpinTor in back to back applications in late June and early July against second-generation larvae should also be very effective wherever used. Tolerance or resistance to these 2 materials seems to be almost non-existent as yet.

Much research has been done in the past decade on use of OBLR pheromone for mating disruption as a substitute for insecticide sprays. Results to date have been variable and not nearly as promising as mating disruption for control of codling moth. A 2003 article by Stelinski and coauthors from Michigan State University suggests that the sensory receptors of OBLR moths may be different from those of other moth pests of apple in a way that poses unique (and to date unsolvable) challenges for successful mating disruption.

A field trial of pesticides against OBLR in 2003 was conducted by Harvey Reissig and David Combs in Western New York (WNY). Each pesticide was applied 8 times (petal fall until mid-August).

	Approx. rate/100 gal	**% OBLR damaged fruit at harvest WNY**
Assail 70WP	1.1	5.0
Guthion 50WP	8.0	1.3
Untreated		7.4

Results show that Assail was not at all effective against OBLR and that Guthion was marginally effective at best.

CODLING MOTH (CM) AND OTHER INTERNAL LEPIDOPTERA

2003 Activity. Injury to apple fruit by CM, oriental fruit moth (OFM) and lesser apple worm (LAW) was lower in Massachusetts in 2003 than in 2002 and much lower than in recent years in New York and Ontario. Fortunately, we in MA and other New England states have yet to experience the kind of injury to apples by internal moth larvae that our neighbors to the west have been experiencing for the past several years. The cool and rainy summer weather of 2003 seemed to put a damper on internal lepidopterans throughout the East.

New findings. In the USA as well as worldwide, most of the research on CM, OFM and LAW has centered on use of pheromone for mating disruption. In New York, a large study was initiated in 2002 by Art Agnello and collaborators to control CM, OFM and LAW in commercial orchards using pheromone rather than insecticide. This study was continued in 2003. After 2

consecutive years of use, pheromone was found to provide control of CM, OFM and LAW just as good as that given by insecticide sprays. The challenge ahead lies in simplifying the method used for distributing pheromone so it is cost-competitive with insecticide. Mating disruption poses no harm to beneficial predators and parasitoids (as do most insecticides) and is highly compatible with other advanced-level IPM tactics.

Trials of insecticide effects against internal leps were conducted in 2003 by Harvey Reissig and David Combs in Western New York (WNY) and John Wise of Michigan (MI). Results below are from 4 applications of each material (2 in July and 2 in August) in WNY and 2 in June and 2 in August in MI).

		% fruit infested at harvest	
	Approx. rate/100 gal	**WNY**	**MI**
Assail 70WP	1.1 oz	3.5	4.0
Avaunt 30WG	1.75 oz	22.6	--
Calypso 480SC	1.0 oz	17.3	8.0
Clutch 50 WDG	1.0 oz	--	18.0
Deliver	5.5 oz	35.0	--
Diamond 7.5WG	8.8 oz	12.3	3.0
Esteem 35WP	1.5 oz	44.4	--
Intrepid 2F	5.3 oz	29.7	--
Warrior 1CS	1.0 oz	10.6	--
Imidan 70WP	20 oz	15.7	--
Guthion 50WP	8 oz	16.3	6.0
Untreated	--	59.4	34.0

Results show that Assail, Diamond and Warrior performed better than Imidan or Guthion against the combination of CM, OFM and LAW, that Calypso performed about the same as Imidan or Guthion, and that Avaunt, Clutch, Deliver, Esteem and Intrepid were inferior.

SAN JOSE SCALE (SJS)

2003 Activity. In Massachusetts, very few orchards had any trouble whatsoever with SJS in 2003. The same was true in most other orchards in New England in 2003 except for blocks here and there in Connecticut and Rhode Island. Problem blocks may not be receiving an oil spray early enough (at half inch green) to control SJS before males emerge or may be receiving too little oil on upper interior limbs (where SJS tends to build up first).

New findings. An oil spray at half inch green to suffocate overwintering SJS is the first line of defense, but in situations where SJS continue to build and have become problematic year after year, insecticide applied in back to back sprays in mid and late June can control crawlers that emerge 3-5 weeks after petal fall.

Trials of pre-bloom application of pesticide against SJS (at half inch green) in 2003 were conducted by Harvey Reissig and David Combs of Western New York (WNY).

	Approx. rate/100 gal	% SJS infested fruit at harvest WNY
Spray oil 10E	2.0 %	6.3
Damoil	2.0 %	7.0
Purtec 15E	2.0 %	20.3
Lorsban 4EC	16 oz	22.3
Lorsban 4EC+	16 oz	16.7
Spray oil 10E	2%	
Esteem 35WP+	4 oz	3.0
Spray oil 10E	2%	
Assail 70WP+	1 oz	4.3
Spray oil 10E	2%	
Untreated	--	50.8

Results show that oil alone at half inch green (Spray oil 10E or Damoil but not Purtec oil 15E) gave very good control of SJS. Addition of Esteem or Assail to oil at HIG slightly improved control over oil alone.

Trials of post bloom insecticides against SJS were conducted in 2003 by Dick Straub and Peter Jentsch in the Hudson Valley (HV) and by John Wise in Michigan (MI). Applications were made in twice: mid June and late June.

	Approx. rate/100 gal	% SJS infested fruit at harvest HV	MI
Assail 70WP	1.1 oz	0.0	--
Clutch 50WDG	1.0 oz	--	0.0
Intrepid 2F	2.7 oz	0.1	--
Proclaim	1.6 oz	--	0.0
Warrior 1CS	1.7 oz	--	0.5
Imidan 70WP	21 oz	--	0.0
Untreated		1.2	9.0

Results suggest that all of the materials tested performed well against SJS in two applications made in June.

BORERS INFESTING BURR KNOTS ON APPLE TREES

2003 Activity. In 2003, Dogwood borer (DWB) continued to be a significant threat to new plantings of apple trees on M.26 and M.9 rootstock in Massachusetts and other eastern states. Many of the orchards that we visited in 2003 showed signs of DWB larval damage to burr knot tissue. In some cases, DWB larvae leave burr knot tissue and move to feed on tissue of the inner bark (cambium), where feeding can threaten the life of the tree.

New findings. Although it's not a new finding, a very important factor in keeping DWB at bay is keeping the number of burr knots on the rootstock at low levels. Cultural practices that reduce burr knots prevent buildup of DWB. Mounding soil around rootstocks or planting trees a bit deeper than normal can help prevent burr knot proliferation, provided that it does not lead to rooting of the scion. Weed control around the tree trunk can reduce shade and humidity, both of which promote development of burr knots. Avoiding use of tightly wrapped spiral mouse guards will open tree trunks to better airflow and better coverage by insecticide. Finally, DWB larvae require wound sites on bark to establish successfully. Egglaying by DWB females is highly correlated with mechanical wounding of the trunk, perhaps because wounded tissue emits more volatiles attractive to DWB females. Whatever can be done to reduce the chance of wounding tree trunks when mowing will help in protecting against DWB infestation.

Just as with peach tree borers, there is much future potential of controlling DWB in apple orchards with pheromone, either by permeating the atmosphere of the orchard with so much pheromone as to prevent males from finding females or by adding a small amount of insecticide to sites baited with pheromone, thereby killing attracted males. Tracy Leskey of the USDA lab in West Virginia and Chris Berg at VPI in Virginia are leading the effort to develop this new approach.

Trials of insecticides against DWB in 2003 were conducted by John Wise in Michigan (MI). Applications were made once, in late June during peak of DWB flight.

		No. DWB larvae per trunk
	Approx. rate/100 gal	**MI**
Lorsban 4E	3 qt	0.1
Lorsban 50W	3 lb	0.3
Actara 25WG	5.5 oz	1.7
Assail 70WP	3.4 oz	0.5
Calypso 480SC	4.0 oz	1.1
Untreated	--	1.7

Results show that Lorsban remains the best insecticide against DWB, with Assail not quite as good. Calypso and Actara did not provide effective control.

LEAFHOPPERS

2003 Activity. Leafhoppers (white and/or rose) became a problem in July or August in a few Massachusetts orchards in 2003, especially orchards that saw rather limited use of Sevin as a thinner. Potato leafhoppers showed up considerably later than normal (maybe due to the cool, wet summer weather) and were less abundant than normal.

New Findings. Relevant new findings involve insecticide trials conducted in 2003 against LH by Dick Straub and Peter Jentsch of the Hudson Valley (HV). Insecticide was applied once (in July).

	Approx. rate/100 gal	**% reduction in white apple leafhopper (WALH) nymphs 10 days after spraying HV**
Applaud 20 DF	3.8 oz	+22
Fuji Mite 5 % EC	10.7 oz	31
Provado 1.6 F	1.0 oz	93
Thiodan 50 W	16 oz	85
Untreated	-	+ 237

Results show that Provado and Thiodan gave excellent control of WALH nymphs. Fuji Mite provided some suppression and Applaud gave no suppression.

APHIDS

2003 Activity. Except for woolly apple aphids (WAA), aphids were little trouble in Massachusetts apple orchards in 2003. As in recent years, WAA continued to be a problem in July and August in several orchards in Massachusetts, other in New England states and New York. Very few pesticides are effective against WAA, and the most commonly used ones harm natural enemies of WAA.

In the past, Lorsban, Penncap, Thiodan and Diazinon have given pretty good control of WAA. The first 2 can no longer be used during summer on apples, and Thiodan appears to be losing some of its punch in some orchards. That leaves Diazinon as perhaps the best present choice for control of WAA. EPA will allow 2 applications of Diazinon per year on apples. So that's good news, as application of Diazinon is allowed during summer months.

New findings. Relevant new findings involve insecticide trials against rosy aphids (RAA) conducted in 2003 by John Wise of Michigan (MI). Application was made twice: petal fall and first cover.

	Approx. rate/100 gal	% of clusters infested by RAA MI
Avaunt 30 WG	1.7 oz	14.5
Assail 70 WP	1.1 oz	0.0
Actara 25 WG	1.5 oz	0.0
Calypso 480 SC	1.0 oz	0.0
Clutch 50 WDG	1.0 oz	0.0
Warrior 1 CS	1.7 oz	0.0
Guthion 50 WP	8 oz	2.5
Untreated	-	11.2

Results show that Actara, Assail, Calypso, Clutch and Warrior provided excellent control of RAA, whereas Guthion was less effective and Avaunt was ineffective.

LEAFMINERS

2003 Activity. Based on captures of LM adults in April and May on sticky red traps on trunks of apple trees, it looked like some Massachusetts orchards were heading for trouble with LM in 2003. But the threat never materialized, perhaps because the weather during the period of LM egglaying was so cool and wet that most adults never got to lay most of their eggs. Overall, the increase in mines per leaf was 18-fold from first to third generation in 2003 compared with 17 - and 19- fold in 2001 and 2002. Thus, 2003 was an average LM year, after all. The same was true in other New England states and New York, where high adult populations in some orchards during pink and bloom never translated into troublesome numbers of mines during summer, even in the absence of spray against LM.

New Findings. In an earlier section of this Message entitled "Apple IPM Studies", we gave an account of new findings on LM in Massachusetts in 2003. Otherwise, no relevant new information on LM appeared in 2003, not even results of insecticide trials against LM. Apparently LM around the northeast is much less of an annual threat than it used to be. Hence, the diminished attention by researchers.

MITES.

2003 Activity. The generally cool wet weather of the 2003 growing season kept pest mites at low levels in most Massachusetts orchards. In a few blocks, spot treatment against European red mites was needed in August. Other New England states experienced little problem with ERM in 2003. In Rhode Island, yellow mites (which look roughly like two-spotted mites but are yellowish rather than ivory) were abundant in several orchards, but apparently not to the point where they caused too much damage.

New Findings. New findings on pest and predatory mites in Massachusetts are covered in an earlier section under "Apple IPM Studies" New findings from other parts of North America were

very slim in 2003, possibly because mites have generally been less problematic in recent years than in times past.

One finding from our own 2003 studies worth repeating here is the decline in numbers of *Typhlodromus pyri* (TP) predators in several Massachusetts orchards in 2003 compared with 2002. Perhaps the long and cold winter of 2002-03 was responsible. If so, then we could be in for more trouble than normal with pest mites in 2004 if the very cold temperatures of January 2004 take a similar toll on TP survival.

Trials of miticide efficacy were conducted in 2003 by John Wise of Michigan. Each miticide was applied once (just after petal fall in early June).

		Avg. no. motile mites per leaf in late July	
	Approx. rate/100gal	**ERM**	**ARM***
AgriMek 0.15EC+	3.3 oz	9.5	139.1
Sunspray 6E	0.3 gal		
Envidor 240SC	3.0 oz	10.8	71.6
Envidor 240 SC	4.0 oz	15.1	85.1
Mesa .078EC+	6.7 oz	2.5	125.4
Sunspray 6E	0.3 gal		
Untreated		102.3	227.4

***** Apple rust mites

Trials were also conducted in 2003 by Glen Morin of New England Fruit Consultants. Each miticide was applied once (on August 20).

		Avg. no. motile ERM per leaf in early September
	Approx. rate/100 gal	
Acramite 50WS	5.3 oz	2.0
Pyramite 60WS	1.4 oz	0.4
Untreated	-	25.6

In addition, trials were conducted in 2003 on effects of various pesticides on pest and predator mites by John Wise in Michigan. Each material was applied 3 times: June 16, June 30, August 16.

	Approx. rate/100 gal	Avg. no motile mites per leaf in late August: ERM	AF*	Avg. no. overwintering ERM eggs per cm^2 of twigs
Asana XL	4.3 oz	38.4	0.04	44.0
Assail 70WP	1.3 oz	1.9	0.47	0.5
Avaunt 30WG	2.0 oz	0.1	0.23	0.6
Calypso 480 SC	1.3 oz	2.6	0.82	2.6
Clutch 50 WDG	1.0 oz	0.3	0.62	0.3
Danitol 2.4EC	5.3 oz	12.0	0.12	27.3
Guthion 50 WP	10 oz	7.8	0.62	7.5
Sevin XLR	32 oz	40.4	0.37	45.2
Untreated	-	0.3	0.27	0.3

***** *Amblyseius fallacis*

Results of the above tests indicate the following.

When applied once just after petal fall, Mesa plus oil gave excellent season-long control of ERM, whereas AgriMek plus oil and Envidor gave good control. All materials suppressed apple rust mites (ARM) to some degree, with Envidor doing it best.

When applied once in late August, both Pyramite and Acramite gave very good control of ERM.

When applied 3 times from mid June until mid August, neither Assail, Avaunt or Clutch caused any flaring of ERM and resulted in very few ERM eggs on twigs going into winter. Calypso was nearly as good as the above three in not flaring ERM, and Guthion caused only slight to moderate flaring. However, Asana, Danitol and Sevin XLR led to substantial or major flaring of ERM, with large numbers of ERM eggs on twigs going into winter after 3 treatments with each material. The bottom line from this very useful study in Michigan is that synthetic pyrethroids and Sevin XLR, if used 3 times from mid-June to mid-August, will likely lead to outbreaks of ERM

PEACH PESTS

2003 Activity. During 2003, we at UMass did not monitor the activity of peach pests. Elsewhere in the East, plant bugs, stink bugs and oriental fruit moth were less problematic than normal, probably due to summer-long availability of lush host plant foliage and consequent relative lack of movement of these pests onto fruit of peach trees to seek moisture and nutrients. In Connecticut, some peach orchards in 2003 experienced semi-outbreaks of European red mite (ERM) possibly as a consequence of substantial use of synthetic pyrethroids in the dry summer of 2002 to control stink bugs.

In some Connecticut PYO peach orchards having lots of ERM, customers are starting to become annoyed or possibly even allergic to ERM.

New findings. Trials of insecticide effects on San Jose Scale on peaches were conducted in 2003 by John Wise of Michigan. All treatments were applied once (on July 11).

	Approx. rate/100 gal	Avg. no. SJS on new shoots
Actara 25WG	1.5 oz	21.3
Applaud 70W	0.7 oz	13.5
Esteem 35 WP	1.7 oz	4.8
Warrior 1 CS	1.7 oz	0.3
Untreated	-	6.8

Results show that Warrior gave excellent control of SJS on peaches whereas Esteem gave just slight control and both Actara and Applaud caused flaring of SJS.

IPM MANUALS, SUPPLIES AND SERVICES

PURCHASE OF 2004 PEST CONTROL GUIDES, IPM PUBLICATIONS, ETC.

For 2004, the weekly (during the growing season) ***Healthy Fruit*** message, the ***March Message***, and the **2003-2004** ***New England Apple Pest Management Guide UPDATE*** will be available for a subscription fee. Subscriptions may be ordered by contacting Doreen York [dyork@pssci.umass.edu], UMass Fruit Program, 205 Bowditch Hall, University of Massachusetts, Amherst, MA 01003-9294. Single copies of the March Message are also available for $5, and may be useful to out-of-state growers as an alternative to the entire Massachusetts subscription.

The 2003-2004 New England Apple Pest Management Guide was mailed to all who subscribed in 2003. With Bill Coli as editor, the guide contains new information up to February of 2003. You will receive an UPDATE to the Guide for 2004 compiled by New England Extension fruit specialists as part of your 2004 subscription. Note that the 2003-2004 Guide is still available through the UMass Extension bookstore for $15 (plus $5 shipping). Send check (specify publication code AG-AP04 and made out to 'University of Massachusetts') to UMass Extension Bookstore, Draper Hall, 40 Campus Center Way, University of Massachusetts, Amherst, MA 01003-9244. (The Guide may also be ordered on-line at http://www.umassextension.org/Merchant2/merchant.mv)

Note: Tree fruit management guides should only be used during the growing season(s) for which they were written. Information obtained from old guides may be outdated and may result in illegal pesticide application, or growers may miss new information about phytotoxicity or effectiveness. We highly recommend that growers discard old pest management guides in favor of the updated versions or other new information.

Management Guide for Low-Input Sustainable Apple Production is also available from the UMass Extension Bookstore. This publication details the techniques of apple production that utilize disease-resistant apple cultivars and IPM procedures. (Order code AG-LISA, $12.00 plus $5 shipping.)

Fruit Notes of New England is a quarterly journal published by the UMass Fruit Program. It contains new research findings on fruit growing in Massachusetts. The subscription price is $15 per year, and checks should be made out to the University of Massachusetts and sent to the UMass Fruit Program, 205 Bowditch Hall, University of Massachusetts, Amherst, MA 01003-9294.

Healthy Fruit is published weekly from early April through harvest, and contains timely information regarding pest management, such as insect and disease phenologies and management options and crop management strategies, such as thinning and fruit maturity. It is provided to all package subscribers via e-mail, first-class mail, or FAX. Subscription requests should be sent to Doreen York [dyork@pssci.umass.edu], UMass Fruit Program, 205 Bowditch Hall, University of Massachusetts, Amherst, MA 01003-9294

2004-2005 Tree Fruit Production Guide. Penn State University. Price $13.00. (Plus $5 shipping.) Make checks payable to Penn State and send with your name, address and the title of the publication you are requesting to Publications Distribution Center, College of Agricultural Sciences, Penn State University, 112 Ag Administration Building, University Park, PA 16802. Penn State's distribution center can also take telephone orders (for credit card purchases) at (814) 865-6713. (Note the complete publication is also available on-line: http://tfpg.cas.psu.edu/)

New York Fact Sheets. Among others, the Cornell Tree Fruit Fact Sheets set includes:

Pear Psylla	Codling Moth
Plum Curculio	Green Fruitworm
Obliquebanded Leafroller	Peachtree Borer
Apple Maggot Fly	Spotted Tentiform Leafminer
European Red Mite	Predatory Mites
Rosy Apple Aphid	San Jose Scale
White Apple Leafhopper	Dogwood Borer
Woolly Apple Aphid	Oriental Fruit Moth
Beneficial Insects	Redbanded Leafroller
Brown Rot	Fire Blight
Powdery Mildew	Cedar Apple Rust
Apple Scab	Sooty Blotch and Flyspeck
European Apple Sawfly	Tarnished Plant Bug
Comstock Mealybug	Phytophagous Mirid Bugs

The New York/Cornell Fact Sheet series features excellent photographs, and a set of 33 can be purchased for $30.35. Individual sheets are also available for $2.00 each. These can be ordered from Cornell University Resource Center-C, 7 Cornell Business & Tech. Park, Ithaca, NY

14850. (Note that all these fact sheets are also available on-line: http://www.nysipm.cornell.edu/catalog/catalog01/ftf.html)

New Hampshire Pest Management Fact Sheets. Cooperative Extension Service, University of New Hampshire, Durham, NH 03824. Free of charge. Fact sheets are available on:

Tarnished Plant Bug	Codling Moth
Redbanded Leafroller	Apple Maggot Fly
Plum Curculio	European Red Mite
Scale Insects	Fire Blight
Apple Scab	

(UNH Fact Sheets are also available on-line: http://ceinfo.unh.edu/frutpubs.htm)

Common Tree Fruit Pests. Published in 1994, a comprehensive guide to identification and control of more than 50 arthropod pests of tree fruits. Written by entomologist Angus Howitt of Michgan State University. Contains many excellent color pictures and straightforward information on most pests encountered in the field. Available for $10.00 from: MSU Bulletin Office, 117 Central Services, Michigan State University, East Lansing, MI 48824-1034. The publication number is NCR-063. Checks should be made out to Michigan State University. **This publication should be in every grower's library!**

Mid-Atlantic Orchard Monitoring Guide. Published in 1995 by the Northeast Regional Agricultural Engineering Service, under the guidance of West Virginia University and with input from fruit researchers throughout the Mid-Atlantic region. Contains thorough and current information on pest and disease biology, monitoring and treatment, as well as nutrition, irrigation and fruit evaluation. Many color photographs. Available for $48.00 from NRAES, Cooperative Extension, P.O. Box 4557, Ithaca, NY 14853-4557. Checks should be made payable to NRAES.

Fruit Crop Ecology and Management. Published in 2003 and edited by Joy Landis of Michigan State University, this book can assist those growers interested in adopting sustainable orchard practices. The book includes ecological principles and horticultural practices for both tree fruit and small fruit growers. It considers how growers can interact with the environment surrounding the farm, comply with evolving laws and restrictions, and respond to neighbor questions and concerns. The book can be ordered by calling the MSU Bulletin Office at 517-355-0240 and requesting Extension Bulletin E-2759. The price is $ 16.00. (Note this publication is also available on-line: http://web2.msue.msu.edu/bulletins/viewitem.cfm?INVKEY=E2759)

MONITORING AIDS: TYPES AND VENDOR INFORMATION

A variety of pheromone and visual traps is commercially available to growers as pest monitoring aids. We have had considerable experience with the following traps as part of our IPM research and extension efforts over the past years.

1. Pheromone Traps

Leafminers – Pheromone traps for spotted tentiform leafminer (STLM) adults have been used in Massachusetts, but they are of uncertain effectiveness in attracting apple blotch leafminers (ABLM), which is also present in most commercial orchards in Massachusetts.

Codling Moth (CM), Obliquebanded Leafroller (OBLR), Oriental Fruit Moth (OFM), Redbanded Leafroller (RBLR), Variegated Leafroller (VLR), Lesser Appleworm (LAW), Sparganothis Fruitworm – Although traps have been used in the Massachusetts IPM program, these pests have not usually been a problem and so we have rarely used trap-capture data for management decisions. As part of our ongoing extension efforts, we plan to continue to monitor these pests closely, as these pests may have the potential to develop resistance to commonly used organophosphate compounds. Monitoring for these pests will be more important with a very low spray schedule, as shown by recent increases in Oriental fruit moth activity under reduced spray schedules.

Lesser Peachtree Borer, Peachtree Borer, Dogwood Borer – Pheromone traps are available for determining appearance and abundance of adults.

Tufted Apple Bud Moth, Green Fruitworm – Generally these pests have not been a problem in Massachusetts orchards and we have not used pheromone traps for them in our IPM program. Green fruitworm was a major problem in a few western Massachusetts orchards in the early 1980's but numbers have declined in subsequent years**.**

2. Visual Traps

Tarnished Plant Bug (TPB) - We continue to experience good results with the sticky white rectangle traps for TPB. These traps should be set out at silver tip (no later), with pesticide application need and timing based on cumulative captures from silver tip to tight cluster or pink.

Leafminers (LM) - Sticky red visual traps, stapled to tree trunks at silver tip, continue to prove useful in indicating adult emergence and in predicting need for treatment at pre-bloom or at petal fall in orchards dominated by ABLM. Orchards with mixed or unknown LM species composition may gain more reliable data from horizontal LM traps placed in the tree canopies.

European Apple Sawfly (EAS) - EAS adults are highly attracted to sticky white rectangle traps that mimic apple blossoms. Traps should be placed at pink; the need for pesticide application is based on cumulative captures from pink to petal fall.

Apple Maggot Fly (AMF) - Sticky red spheres that mimic ripe apples are an excellent aid in monitoring AMF abundance. They are especially helpful in June and July for determining first arrival of flies in early-variety blocks and in August and September for determining arrival of late season flies immigrating into blocks of Delicious and other late season varieties. Traps should be positioned in late June for early-developing and mid-season varieties and in early July for late-developing varieties. Sticky red spheres baited with synthetic apple volatiles developed

in New York are 4-6 times more effective in capturing AMF than unbaited sticky spheres alone. Traps should be cleaned of insects and debris regularly, preferably once every 2 weeks, as capturing effectiveness will decrease with the accumulation of dead insects. Several variations of sticky red spheres, including lightweight plastic molded traps, are available from the IPM products division of Gempler's and Great Lakes IPM.

Pear Psylla - Sticky yellow traps can be placed 1-2 m from the ground in the south quadrant of the tree to monitor adult activity in spring.

Pear Thrips - Sticky yellow traps should be set three feet high. We use a tomato stake and a metal shelf bracket to mount the trap in the correct position. Traps should be checked at least weekly from ground thaw until fruit bloom. Current recommendations call for a minimum of four traps per ten acre block. Monitoring for thrips populations in nearby overwintering areas (e.g. sugarbushes) can help to determine the potential for thrips immigration.

3. Tangle-Trap (Tanglefoot Company, www.tanglefoot.com) Tangle-Trap Insect Trap Coating is a clear, odorless, non-drying adhesive that is used to coat the reusable red sphere traps. (Note: Tree Tanglefoot is also a non-drying adhesive, but it should not be used with the red sphere traps since it is not clear or odorless.)

4. Bird Control Balloons

'Scare-Eye' bird control balloons have given good to excellent results in reducing bird injury to Cortlands (+ other susceptible varieties). One balloon is effective over a radius of about 20 yards.

Suppliers:

Pheromone traps, synthetic apple volatiles, visual traps, bird repelling balloons, Tangle-Trap, and magnification equipment for use in sampling are available from:

GEMPLER'S
1210 Fourier Dr
Suite 150
Madison, WI 53717
Phone: 1-800-382-8473
Fax: 1-800-551-1128
http://www.gemplers.com

GREAT LAKES IPM
10220 Church Road
Vestaburg, MI 48891-9746
Phone: (989) 268-5693 / (989) 268-5911
Fax:(989) 268-5311
http://www.greatlakesipm.com

Many pest management supplies are also available from:
OESCO, Inc.
P.O. Box 540
Route 116, Conway, MA 01341
Phone: 800-634-5557 or 413-369-4335
Fax: 413-369-4431
http://www.oescoinc.com

PEST MANAGEMENT SERVICES AVAILABLE IN 2004 IN MASSACHUSETTS

In addition to the weekly monitoring and other information provided through University of Massachusetts Extension IPM, growers are strongly urged to monitor their own orchards, or hire private consultants to do so.

The **UMass Fruit Advisor** is available on the World Wide Web, at http://www.umass.edu/fruitadvisor/. This site includes Fruit Team contact information; current issues of *Fruit Notes*, the *March Message* and *Healthy Fruit*; and links to other resources, such as chemical labels, the NEAPMG, and nutrient management information. Questions about the web site should be referred to Wes Autio [autio@pssci.umass.edu].

Two private consulting businesses will continue to offer IPM consulting, scouting, and other services in Massachusetts in 2003. Their addresses are:

New England Fruit Consultants (NEFCON)
66 Taylor Hill Road
Montague, MA 01351
(413) 367-9578
(413) 367-0313 (FAX)

Polaris Orchard Management
364 Wilson Hill Road
Colrain, MA 01340
(413) 624-5104