# 24th ANNUAL MARCH MESSAGE
# TO MASSACHUSETTS TREE FRUIT GROWERS (2002)

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## 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 our own work.

## GENERAL IPM TOPICS AND OPINION



## PROBLEM PESTS: THEIR 2001 ACTIVITY AND NEW FINDINGS



## IPM MANUALS, SUPPLIES AND SERVICES

## CHANGES IN ORCHARD CHEMICALS FOR 2002

As has been the case in previous years, some new types of pesticides have been labeled for use in orchards for the 2002 growing season. Some others may soon receive a label for the 2002 season. Still others have undergone some label modifications. Here's a summary of how things stand as of February 15, 2002.

### A. NEWLY REGISTERED COMPOUNDS

**Acramite** (bifenazate) is a new acaricide that received full federal registration for use on apples, pears, peaches, nectarines and plums as of early February, 2002. It is formulated as 50 WS (water soluble bags) and manufactured by Uniroyal. It is effective for control of European red mites and two- spotted spider mites, but is not effective in controlling apple rust mites or pear rust mites. It is relatively safe on beneficial predatory mites.

Re-entry interval is 12 hours, and it can be used up to 7 days before harvest. However, only 1 application per year is allowed on tree fruit. It is especially effective against motile stages of pest mites and somewhat less effective against eggs. Its value may be greatest as a summer rescue material, especially one that can be applied relatively close to harvest.

**Actara** (thiamethoxam) is a new broad-spectrum insecticide (manufactured by Syngenta) that recently received full federal registration for use on apples and pears but not for use on stone fruit. Thiamethoxam is a second-generation neonicotinoid insecticide, somewhat similar to imidaclopid, a first-generation neonicotinoid. It is more water-soluble than imidacloprid, which partly accounts for its exceptionally high level of translaminar movement into plant tissue. Because of its local systemic activity within a tree, it has a relatively long residual activity of at least two weeks against many sucking and chewing insects, and at the same time it is comparatively safe on beneficials.

Like imidacloprid, its half-life on the surface of foliage is short, less than a day, and rain can wash it off of foliage if spray deposit doesn't dry before it starts raining. The interval between application and harvest is 14-35 days, depending on rate of application. It is labeled for use against aphids, leafhoppers, leafminers, plum curculio, European apple sawfly and pear psylla. Like imidacloprid, it is very toxic to any bees that receive a direct hit from spray and shouldn't be used if flowering ground cover plants are abundant when spraying occurs. Information on the performance of Actara vs. other insecticides against apple pests can be found in the "Problem Pest" section of the 2001 and 2002 March Messages.

**Azadirect** (azadirachtin) is a new pesticide manufactured by Gowan that acts as a repellant, antifeedant and growth regulator against several kinds of tree fruit insects and pest mites. It was recently labeled for use on all pome and stone fruit, and can be used in organic fruit production. The active ingredient azadirachtin is extracted from seeds of neem trees grown primarily in Asia. Repellent and anti-feedant activity is primarily against adult moths or their larvae, whereas growth suppressing and toxic effects are

more widespread and include aphids, leafhoppers and leafminers as well as moth larvae. Maximum effectiveness requires a minimum of 2-3 applications at intervals of 7-10 days. It can be used right up to the day of harvest. Expense and high frequency of needed applications may limit its value for use in conventional orchards.

**Valero** (cinnamaldehyde) is a new acaricide (manufactured by Mycotech) that was labeled in the spring of 2001 for use on apples, pears, peaches, nectarines and plums against pest mites and aphids. Effectiveness depends on direct contact of pests with spray droplets and residual activity is very short (no more than one day). It remains to be seen how effective this new acaricide might be as a summer rescue material against a high population of pest mites.

**B. LABEL CHANGES**

**Guthion and Imidan.** In November of 2001, the EPA proposed changing the labels of azinphosmethyl and phosmet to make them more restrictive than previous labels.

These are the proposed changes. A final decision should be forthcoming soon, now that the period for comment has ended as of January 28, 2002. See also below sections on the Food Quality Protection Act for further information.

Use of azinphosmethyl on apples and pears will be allowed to continue for another four years. The total amount allowed per year is reduced to 3.5 pounds of active ingredients per acre. Re-entry time is extended to 14 days, apparently for all activities. Preharvest interval is extended to 30 days for pick-your-own operations, but for other operations it apparently remains at 14 days if no more than one pound of active ingredient per acre is used. Additional requirements include closed transfer systems for mixing and loading, along with enclosed cabs or maximum personal protective gear for applicators. For stone fruit, use of azinphosmethyl is scheduled to be phased out after four years.

Use of phosmet will be allowed for the next five years on pome and stone fruit but it will no longer be allowed for use in household fruit spray products. Re-entry time has been extended to three days. Preharvest interval remains at seven days. These changes apply to product manufactured after June 30, 2002. Existing product may be used with the existing label.

**Spintor**. The label for Spintor has recently been extended for use on pears against leafminer, leafroller, codling moth and oriental fruit moth but not yet against pear psylla.

**FOOD QUALITY PROTECTION ACT: AN ORGANOPHOSPHATE UPDATE BY NEFCON**

As the six-year anniversary of the Food Quality Protection Act (FQPA) approaches, EPA continues to focus on the regulation of the organophosphate (OP) compounds. The protocols for tolerance reassessment and re-registration mandated by the FQPA were previously not described and

the methodology by which they are ultimately evaluated will be used to review the other classes of compounds in the future. Therefore, EPA has proceeded cautiously, opened the procedure to public review and provided for stakeholder input at each step of the six-phase review process.

All seven of the active ingredients most commonly used in commercial tree fruit production are currently in the final phase of the risk assessment process. This procedure allows for the development of risk management recommendations by the Agency and ultimately results in the publishing of the Re-registration Eligibility Document, or RED, which describes the conditions under which continued use of the product may occur. The following is a summary of EPA's findings and actions as of February 18, 2002.

**Azinphos methyl.** Initial label amendments for azinphos methyl (Guthion) that affected tree fruit production were voluntarily put in place by the registrants prior to the 1999 growing season primarily in response to EPA's concerns regarding dietary risk to children. Further discussions between the registrants, EPA and the stakeholder community directed at reducing the risk to agricultural workers and the environment have continued since the release of the revised risk assessment in the summer of 2000.

The results of these discussions were made available for public comment on November 28, 2001 in the form of an Interim Re-registration Eligibility Document (IRED). This document proposes the cancellation of 28 crop uses (including nectarines), a four-year phase out of 7 crop uses (including peaches) and a four-year, time-limited registration for 8 crop uses (including apples, pears and sweet cherries). Some highlights of the proposed label changes concerning **apple** production are as follows:

- limit of 3.5 lbs ai/acre per season east of the Mississippi, 4.0 lbs ai/acre west of the Mississippi
- increase REI to 14 days for all activities
- require enclosed cabs **or** maximum personal protective equipment (PPE) for applicators
- require closed mixing systems **or** water soluble bags and closed transfer systems for mixing/loading
- add 25-foot buffer zones for permanent surface water
- add spray drift language
- prohibit PYO usage **or** restrict application to early season **or** establish 30 day PHI for PYO operations

The public comment period for this document ended on January 28, 2002. EPA has 60 days from that point to finalize its decision concerning azinphos methyl. Questions concerning which label amendments will ultimately be required, the timeframe for implementing these changes and the disposition of product already in the distribution system remain unanswered at this time. However, the registrant is optimistic that no label changes will take effect for the upcoming growing season.

**Phosmet.** EPA released its revised risk assessment for phosmet (Imidan) at a technical briefing in February 2000. This document indicated that dietary risk was not an issue for this compound and that exposure to handlers could be managed satisfactorily with increased PPE and engineering controls.

An IRED for phosmet was made public simultaneously with that of azinphos methyl (AZM) in the fall of 2001. Similar to AZM, EPA's present concerns center around risks to agricultural workers and ecological risks. Proposed agricultural use changes that affect tree fruit producers fall into two categories: 1) continued registration with new labeling requirements for 33 crop uses (including sweet and tart cherries) and 2) a five-year, time-limited registration for 9 crop uses (including apples, apricots, nectarines, peaches, pears and plum/prunes). Some highlights of the proposed label changes concerning **apple** production are as follows:

- increase REI to 3 days
- require enclosed cabs **or** maximum PPE for applicators
- require water soluble bags and closed transfer systems
- add spray drift language
- prohibit application during bloom period

The registrant has reached an agreement with EPA that allows for all product currently in the distribution system or in possession at the farm level to be used under the current label until all inventories have been depleted. All product sold by the registrant after June 30, 2002 will reflect the changes mandated by the final registration decision (RED) scheduled to be released later this year.

**Diazinon.** In December of 2000, EPA released its revised risk assessment for this active ingredient. EPA concluded this active ingredient posed significant risk to birdlife as currently labeled and was a common contaminant found in surface water. Risk mitigation measures center largely on phasing out, over the next three years, most residential uses of products containing diazinon (Spectracide) whether applied for structural or lawn-care purposes.

Although agricultural uses contributed little in this regard, risk to agricultural workers who apply these products or harvest treated crops was of concern. When the IRED is made public, it is expected that EPA will proposed the cancellation of about 30% of the current agricultural uses and require "Restricted Use" classification for the remaining uses so that applications will be limited to trained, certified applicators. Discussions with the registrant and other stakeholders are ongoing.

**Malathion.** The revised risk assessment for malathion was presented at a technical briefing in November, 2000. Malathion is a lower priority for regulatory action since it is used on less than 10% of the nation's apple acreage. EPA's analysis suggested that dietary risk, drinking water risk and ecological risks were of little or no concern. However, risks to mixers/loaders/applicators and risk to workers entering treated areas for post-application activities were cited. Although the IRED has yet to be posted, additional personal protective equipment (PPE) for handlers and longer restricted entry intervals (up to 6 days) are expected to be included.

**Methyl parathion (Penncap-M).** EPA has previously announced acceptance of the registrant's voluntary cancellation of many of the significant food crop uses for this material including apples, peaches, pears, nectarines, cherries and plums in order to address the Agency's concern of dietary risk to children. The final decision document is expected later this year.

**Chlorpyrifos (Lorsban).** EPA severely restricted the use of this material on apples, tomatoes and grapes shortly after the release of the revised risk assessment in August of 2000, again, due to dietary risk issues. Post-bloom use on apples has been prohibited since December 31, 2000. An Interim Re-registration Eligibility Document (IRED) was published in the Federal Register on November 14, 2001 for which the public comment period ended in mid January. A final decision is expected later this year.

The first step of the review process mandated by the FQPA is drawing to a close for the organphosphate compounds. EPA will soon conclude the evaluation of these active ingredients on an individual basis. This initial evaluation contains a risk assessment that considers all potential routes of exposure including dietary, drinking water, residential and occupational means.

The second phase, cumulative assessment of the risk posed by OPs as a class of compounds, has already been initiated. EPA and USDA convened an advisory panel, the Committee to Advise on Reassessment and Transition (CARAT) to assist in this process in February 2000. Dr. Robin Spitko of New England Fruit Consultants is a member of this committee and has been monitoring the proceedings for the tree fruit industry in the Northeast.

Further information can be found at http://www.epa.gov/pesticides/.

## FOOD QUALITY PROTECTION ACT: CUMULATIVE RISK ASSESSMENT AND CONSEQUENCES AS REPORTED BY NEFCON

**The Process.** The primary focus of EPA's Office of Pesticide Programs activities over the past year has been the development of a cumulative risk assessment for the organophosphate pesticides (OPCRA). This risk assessment is the most complicated, comprehensive attempt to measure cumulative exposure to a particular group of pesticides that has ever been undertaken.

The OPCRA final document exceeds 5,000 pages in length. The methodologies developed by EPA to collect and analyze the data are extremely sophisticated and complex, and have also been a source of much controversy in the agricultural stakeholder community. EPA is relying heavily on the advice of the FIFRA Science Advisory Panel, a panel of expert scientists, especially those in statistical modeling and toxicology, for validation of the methods used. These methodologies have been developed over the past five years, and represent a significant advance in EPA's abilities to evaluate pesticides in a comprehensive manner. It must be emphasized that the current risk assessment, which was released in January, 2002 for public and scientific comment, is a ***preliminary*** assessment; the Agency expects a large number of comments to be submitted until the comment period closes on March

8, 2002.

A cumulative risk assessment is the process of combining exposure (the amount of pesticide to which an individual is exposed) and hazard (the health effects a pesticide could cause) from all substances that share a common mechanism of toxicity. In assessing hazard associated with the organophosphate pesticides, EPA analyzed their common method of toxicity, inhibition of acetylcholinesterase, as the means for assessing risk.

The goal of the organophosphate cumulative risk assessment (OPCRA) is to measure the probability of exposure to more than one organophosphate pesticide and to assess the effects of this combined exposure. The assessment incorporates possible OP exposures from structural, recreational and drinking water, as well as from OP residues in consumed food. Each component of the risk assessment uses the best available data: data from surveys of what people eat and drink, of their activities involving pesticide use around the home and workplace, and monitoring studies of pesticide residues in these environments.

**What to Expect.** A comprehensive assessment of the organophosphates may raise concerns with growers about further restrictions on materials available for crop production. However, the results of the OPCRA may not have much effect on current OP use. Much work has been done previously on the individual organophosphates to reduce their risks as they go through the FQPA-mandated tolerance reassessment process.

The risks for the individual OPs will be factored into the cumulative equation at these lower levels. Most structural and home garden uses have already been cancelled or significantly curtailed; routes of exposure through drinking water have already been determined to be negligible.

It must be noted again that the recently released OP cumulative risk assessment is preliminary; EPA is continuing to seek input from the scientific community and stakeholders and is aware that revisions and refinements will be necessary. Determining cumulative exposure is a huge task and this is the first time EPA has attempted develop a comprehensive profile of human exposure to a group of chemicals with common modes of toxicity. It will be an evolving process that will take years to refine.

Following the comment period closure of March 8, 2002, EPA will consider submitted comments and plans to issue a revised risk assessment in the summer of 2002.

The preliminary OPCRA may be accessed at http://www.epa.gov/pesticides/cumulative/.

**COMMENTS ON "SURROUND"**

Surround is a new insecticide, first labeled for use on fruit trees in 2000. It consists of particles of kaolin clay, the same kind of clay used in making porcelain pottery. The manufacturer of Surround (Engelhard Corporation) has developed a process that breaks up the clay into uniformly small-size, same-shape particles that are all about two microns in size (very tiny). If unprocessed kaolin clay particles were to be sprayed on trees, they would cause a great deal of phytotoxcity. But the tiny uniform particles of Surround do not cause phytotoxicity. Nor do they plug the stomates (breathing pores of leaves). Rather, they actually reflect a lot of light toward the center of trees, which is favorable for enhancing fruit size. Surround is especially effective in preventing sunburn of fruit, which is rarely a problem in New England but is a major problem on the West Coast.

Through 1999, particles of refined kaolin clay had to be mixed with a solvent (methyl alcohol) to aid solubility in water. But the formulation known as Surround contains an adjuvant that facilitates good tank mixing as long as there is continuous agitation.

Surround usually does not kill insects or mites. Rather, it acts as a deterrent by interfering with the chemical sensors present on the feet of adult insects. Because it is not a toxicant, disrupted insects may remain in fruit trees and attack any plant tissue not covered by Surround. It may be especially problematic to maintain complete coverage of newly developing leaves and rapidly growing fruit. Maintaining coverage in the face of frequent rainfall is challenging in itself, but doing so in the face of rapid tissue growth can be even more of a challenge.

Surround has been evaluated in 2000 and 2001 against a wide variety of apple and pear pests, mainly by Mike Glenn and Gary Puterka in West Virginia, Alan Knight in Washington, Harvey Reissig and Art Agnello in New York and ourselves in Massachusetts. Provided coverage is very thorough and continuous across weeks or months, it can do a good job of controlling pear psylla, leafrollers, leafhoppers, stink bugs and apple maggot.

The excellent control of apple maggot using four to five summer sprays two weeks apart may be due in large part to turning the fruit white and therefore making the spherical shape of fruit (so important in fly detection of fruit) much less apparent to foraging flies. Surround is moderately effective against plum curculio, codling moth and oriental fruit moth, and not very effective against San Jose scale, rosy aphids, mites and leafminers. In fact, populations of these latter pests may actually increase more in the presence than absence of Surround because of negative effects of Surround on certain beneficial natural enemies of these pests.

A major advantage of Surround is that it can be used in organic fruit production and provides acceptable to good control of many fruit pests using 10 - 12 sprays per year. Also, as mentioned, it does a great job of protection against sunburn.

Major questions or shortcomings include its rather high cost (about $32 an acre per

application), the need for many applications to maintain continuous coverage, the often times rather ineffective degree of coverage provided by air blast and shoulder-mounted sprayers compared with the much better coverage provided by hand gun applications, the white residue (hard to remove) on fruit at harvest if there are summer applications, and the potential wear on spray equipment.

As with any approach to pest control, each grower must weigh the positives against the negatives and make an appropriate decision.

## ADVANCED-LEVEL IPM STUDIES IN MASSACHUSETTS IN 2001

In 2001, we conducted advanced-level IPM studies in 24 commercial orchards in Massachusetts. These studies focused on:

- development of monitoring traps for plum curculio
- influence of cultivar arrangement and border area composition on performance of sticky spheres for controlling apple maggot
- development of pesticide-treated spheres as a substitute for sticky spheres in controlling apple maggot
- spread of released *Typhlodromus pyri* mite predators
- species composition of leafminer pests and extent of parasitism as affected by cultivar arrangement and border area composition
- comparison of perimeter - row sprays versus whole-orchard sprays in controlling plum curculio, apple maggot and leafrollers.

Results of these studies will not be given here but are printed in nine articles in the just-published 2001 issue of *Fruit Notes of New England* (Vol. 66) and in several articles in the first and second issues of the 2002 volume of *Fruit Notes* (to appear in March and May).

## PROBLEM PESTS: THEIR 2001 ACTIVITY, AND NEW FINDINGS

### TARNISHED PLANT BUG (TPB)

**2001 Activity.** For the first time in 8 years, TPB rose up and attacked apples in a way that was typical of the high populations of the 1980s. To illustrate, TPB fruit injury at harvest in 2001 in 12 monitored orchards in Massachusetts averaged 5.8% compared to just 2.0% in 12 monitored orchards from 1997-2000. Captures of TPB on white rectangle monitoring traps also were much higher in 2001 than in recent years. This same pattern of high TPB trap captures and injury was true for other New England states, eastern New York and Quebec.

Why did TPB erupt in 2001? After several consecutive years of gradual TPB decline, we suggested in the 2001 March Message that the combination of decreasing acreage of alfalfa (the major host plant supporting TPB buildup) and increasing effects of egg parasitoids released in 1994 were taking their toll on TPB. We can only speculate that the sudden rise in 2001 may have been due to (1) lots of snow cover that protected overwintering adults from mortality and (2) a very dry April that may have affected flower bud development of ground cover plants and stimulated most TPB to seek out buds on fruit trees as an alternative.

**New Findings.** Unexpectedly, extraordinarily large numbers of immigrating TPB adults were captured on vertical sticky clear Plexiglas traps placed next to woods or hedgerows for monitoring immigrating plum curculios. In 2002, we plan to see how well TPB captures on these border-type sticky panels correlate with captures on in-orchard white rectangles and with fruit injury. Perhaps they are a better indicator of the extent of TPB threat than current white rectangles.

Other new findings on TPB involve trials of pesticide efficacy in providing control. The information below comes from Peter Jentsch and Dick Straub of the Hudson Valley (HV) and Henry Hogmire and associates of West Virginia (WV). Treatments were applied at pink and petal fall.

| | **Approx.** | **% TPB damaged fruit at harvest** | | |
|---|---|---|---|---|
| | **rate/100 gal** | **HV-1** | **HV-2** | **WV** |
| Actara 25 WG | 1.8 oz | 3.5 | 3.6 | 0.8 |
| Asana 0.6 EC | 2.0 oz | 1.9 | 0.4 | 0.2 |
| Calypso 4 SC | 0.5 oz | 3.0 | 1.7 | 0.7 |
| Guthion 50 WP | 10.0 oz | 3.5 | 0.6 | - |
| Lorsban 4 EC | 13.0 oz | - | - | 1.2 |
| Warrior 1 CS | 1.1 oz | 3.3 | 2.3 | - |
| Untreated | - | 8.0 | 14.0 | 1.0 |

Combined results suggest that Asana provided better control of TPB than any of the other materials tested, with Actara, Calypso and Warrior providing control equal to or only slightly less effective than Guthion. In year 2000 trials reported in the 2001 March Message, Actara and Calypso again were about equal in providing TPB control.

**EUROPEAN APPLE SAWFLY (EAS)**

**2001 Activity.** Trap captures and fruit injury were about average in Massachusetts and other New England states in 2001.

**New Findings.** There were no new findings of significance on EAS in 2001, except perhaps that EAS continues its gradual spread westward and is becoming a problem now in Ontario.

## PLUM CURCULIO (PC)

**2001 Activity.** PC damage to apples on perimeter-row trees at harvest in 12 monitored orchards in Massachusetts in 2001 averaged 5.3%, well above the 1.8% average from 1997-1999 but well below the 2000 record level of 12.6% injury in these same orchards. The PC season was a carbon copy of 2000 until mid-June. As determined by our odor-baited traps placed next to woods, the major invasion of immigrant adults occurred during the first week of May when trees were at tight cluster to pink. Several lesser pulses of invasion occurred from mid-May through early June but ended by mid-June, unlike 2000, when invasions continued through late June. Over the past few years, our twice-weekly tracking of the course of PC injury in commercial orchards from petal fall through late June has shown that most injury occurs after May (when residual activity of the last PC spray has begun to wear off). This was true again in 2001, when injury through May was moderate (1.6%) but more than tripled (to 5.3%) during the first 2 weeks of June and leveled off at that point. Elsewhere in the Northeast, PC damage was moderate in 2001.

**New Findings.** Results of our research on PC over recent years, including 2001, allow us to paint a picture of the pattern of movement of PCs from overwintering sites in woods and hedgerows into orchards, and from resting places in ground cover beneath trees into the tree canopy--for feeding and egglaying. This is our current picture.

PCs immigrate from overwintering sites on days when the temperature is high, at least 75°. The higher the temperature, the greater the chance for immigration. Immigration may begin at early tight cluster and peak as early as pink, especially if the soil is dry. Effects of wind and humidity on the extent of immigration are minor compared to the effects of sun and heat. Immigration may continue through late June. Immigrants arrive first at perimeter-row trees and tend to stay there for much of the season if the trees are large, well-foliated and offer good protection. If perimeter-row trees are small with thin canopies, PCs are more apt to move toward interior rows. After arriving, PCs are most prone to enter tree canopies to feed and lay eggs when the barometric pressure begins to drop or is low, especially if accompanied by high humidity or rain. Under these conditions, the higher the temperature above 65°, the greater the chances of fruit damage. As mentioned above, the trend over recent years has been toward spurts of immigrants entering orchards in June, a month or more after petal fall. If insecticide coverage has worn off, such immigrants can cause substantial fruit injury. Perimeter-row sprays applied in June do a good job of preventing injury by late immigrants.

Several trials of pesticide effects on PC were conducted in 2001 by ourselves in 6 commercial orchards in Massachusetts (MA), Peter Jentsch and Dick Straub in the Hudson Valley (HV) and John Wise and associates in Michigan (MI). The information below involves 3 applications of each material against PC (petal fall, first cover and second cover).

| | Approx. rate/100 gal | % PC damaged fruit at harvest MA | HV-1 | HV-2 | MI-1 | MI-2 |
|---|---|---|---|---|---|---|
| Actara 25 WG | 1.5 oz | - | 0.9 | 2.3 | 4.0 | 4.5 |
| Avaunt 30 WG | 1.9 oz | 2.1 | 7.9 | 1.4 | 3.5 | 8.5 |
| Calypso 4 SC | 1.0 oz | - | 1.4 | 0.3 | 2.8 | 5.5 |
| Danitol 2.4 EC | 5.3 oz | - | - | - | 0.0 | - |
| Guthion 50 WP | 8.0 oz | 1.9 | 0.0 | 0.4 | 0.5 | 7.0 |
| Imidan 70 WP | 16.0 oz | - | 2.8 | 1.6 | - | - |
| Provado 1.6 F | 2.7 oz | - | - | - | - | 26.0 |
| Surround WP | 25 lb | - | - | - | - | 21.0 |
| Warrior 1 CS | 0.8 oz | - | 0.7 | 0.9 | 1.5 | - |
| Untreated | - | - | 21.3 | 50.0 | 15.0 | 43.0 |

Combined results suggest that Guthion performed better than any other material in controlling PC, followed by Calypso, Warrior, Actara and Avaunt in descending order. In the lone trial where used, Danitol performed as well as Guthion, whereas Provado and Surround gave only fair to poor control. Results of year 2000 trials reported in the 2001 March Message showed that Actara and Avaunt performed about equally well in controlling PC and slightly better than either Calypso or Guthion, with Provado and Surround again being least effective.

## APPLE MAGGOT (AMF)

**2001 Activity.** In Massachusetts, AMF populations were about average in 2001, causing an average of 0.8% damaged fruit in 12 monitored commercial orchards. Populations and damage were about 5 times greater than in 2000. Trap captures in commercial orchards began in early July, peaked during the first 2 weeks of August, and declined gradually thereafter. Unlike some years, few AMF were present by mid-September. AMF populations varied in other parts of the Northeast, being higher than normal in the Hudson Valley. By far the greatest trouble with AMF of which we are aware occurred in North Carolina, where injury exceeded 15% in some commercial orchards, catching several growers by surprise.

**New Findings.** Several trials of pesticidal effects against AMF were conducted in 2001 by ourselves in 6 commercial orchards in Massachusetts (MA), Peter Jentsch and Dick Straub of the Hudson Valley (HV), Harvey Reissig and associates of western New York (WNY), and John Wise and associates of Michigan (MI). Applications were made every 2 weeks except for these 4 materials applied weekly: Aza-Direct, Spinosad Bait, Spintor and Surround.

| | Approx. rate/100 gal | % AMF damaged fruit at harvest MA | HV | WNY | MI-1 | MI-2 |
|---|---|---|---|---|---|---|
| Actara 25 WG | 1.5 oz | - | - | 18.0 | - | 0.5 |
| Avaunt 30 WG | 1.9 oz | 0.4 | 12.6 | 40.1 | - | - |
| Aza-Direct EC | 11.0 oz | - | - | 42.0 | - | - |
| Baythroid 20 WP | 0.4 oz | - | 13.3 | - | - | - |
| Calypso 480 SC | 2.0 oz | - | 4.6 | 2.5 | - | 0.1 |
| Danitol 2.4 EC | 5.3 oz | - | - | - | - | 1.2 |
| Imidan 70 WP | 16.0 oz | - | 0.7 | - | - | - |
| Guthion 50 WP | 8.0 oz | 0.3 | 0.7 | 0.4 | - | 0.4 |
| Proclaim 5 SG | 1.1 oz | - | 29.6 | - | - | - |
| Provado 1.6 F | 2.7 oz | - | - | - | - | 0.8 |
| Spinosad Bait | 1.1 oz | - | - | 34.3 | 7.0 | - |
| Spintor 2 SC | 2.5 oz | - | 33.4 | 28.1 | - | - |
| Surround WP | 25 lb | - | - | 0.0 | - | 0.3 |
| Warrior 1 CS | 1.1 oz | - | 17.3 | - | - | - |
| Untreated | - | - | 62.4 | 35.1 | 15.0 | 21.8 |

Combined results suggest that Guthion and Imidan performed better than any other materials in controlling AMF. Among other materials tested in more than one location, Calypso performed best, whereas Actara and Avaunt were inconsistent or fair at best, and Spintor and Spinosad Bait were poor (even though applied weekly). Among other materials tested in only a single location, Surround, Provado and Danitol performed best, with Aza-Direct, Baythroid, Proclaim and Warrior giving fair to poor control. Results of year 2000 tests reported in the 2001 March Message showed that Calypso and Surround performed about as well as Guthion in controlling PC. Again, Actara and Avaunt were somewhat inferior.

**STINK BUGS (SB)**

**2001 Activity.** No quantitative assessment of SB injury to fruit was made in Massachusetts commercial orchards or other northeastern states in 2001. However, observations continue to indicate that SBs are becoming an increasing problem on apples during summer months, just as they are in other parts of the USA.

**New Findings.** By far the most important new findings come from 2000 and 2001 studies of patterns of SB injury to apples by Mark Brown of the USDA fruit lab in West Virginia.

Brown introduced SBs into cages placed over developing apples to get a precise idea of the kind of injury they cause. He found that maximum damage occurs about a month before harvest, a time when insecticide residue may have begun to wear off on late-ripening cultivars. The main symptom of damage is a slight depression in the fruit surface, perhaps only 1/4-3/8 inch in diameter. Necrosis or

corking lies beneath the depression, but there is no easily visible sign of a puncture. SBs insert their mosquito-like beaks into apples to feed and drink, but it requires 200-fold magnification under a very high power microscope to see the puncture. If damage was recent, the depression will be smaller, and the tissue beneath may appear greenish rather than brown. If apples have yellowish skin, depressions may appear greenish on the outside. If apples have red skin, depressions usually appear dark or deep red on the outside. Sometimes SB injury tends to appear in clusters or groups of depressions on the fruit surface, often near the stem end of the fruit. Apple maggot injury does not show up as the corking of tissue beneath the egglaying puncture. But what we have for years thought to be cork spot may in fact be SB injury, which can also be confused with bitter pit. Thus far, no registered insecticide seems to provide truly good control of SBs on apples.

As mentioned in the 2000 March Message, SB populations in orchards are greatest (a) where mullein (a favored host) is abundant near an orchard, (b) when dry weather causes SB hosts near orchards to dry up in mid-summer and stimulate SB movement into orchards, and (c) on perimeter rows of trees nearest areas of SB buildup in orchard borders.

**FRUIT-FEEDING MOTH PESTS**

**2001 Activity.** Among fruit-injuring moth larvae that feed on apples, harvest samples taken from 12 commercial orchards in Massachusetts in 2001 showed essentially no injury whatsoever by codling moth, oriental fruit moth or lesser appleworm. Leafrollers (LR) and green fruitworms combined to give a somewhat above normal level of 1.2% injury caused by early-season feeding within a month after petal fall. However, late-season LR feeding primarily during August caused an average 4.5% injury to harvested fruit, which is far above the 0.7% average of 1997-2000. At least one Massachusetts grower experienced a dramatic increase in LR abundance since 1999, the year he brought in some trees from a nursery in Michigan that may have been infested with organophosphate-resistant LR.

Almost all of the late-season LR injury appears to have been caused by oblique-banded LR (OBLR). Strains of OBLR resistant to most organophosphate and carbamate insecticides have plagued New York and other more western states for years. Let's hope we are not seeing the first indication of their widespread appearance in Massachusetts.

The Hudson Valley also experienced unusually high OBLR injury in 2001. It was attributed in part to good overwintering conditions for OBLR plus dry weather during summer that slowed terminal growth (the major feeding site of OBLR larvae) and induced larvae to move to fruit to feed. Macouns, Cortlands and other clustering varieties offering larvae good protection when feeding on fruit suffered the most injury, especially where poorly thinned. Quebec also reported above-normal OBLR damage but other New England states did not.

**New Findings.** In regard to monitoring for OBLR, Harry Reissig and Peter Jentsch from New York found that it is very difficult to find overwintering larvae in hibernacula (protective structures found on apple twigs and branches) because the hibernacula are so inconspicuous. They believe that perhaps the

best chance to get some idea of the size of the upcoming OBLR population is to monitor for presence of larvae inside of blossoms at pink, a favored site of OBLR feeding activity. Under dry summer conditions, when lush terminal growth is truncated or sparse, OBLR larvae tend to feed on the undersides of protected leaves without noticeably rolling the leaves. So in dry summers, the monitoring of leaves for OBLR may require extra care if larval presence is to be detected.

Recent information from Dan Waldstein, Harvey Reissig and Jan Nyrop in New York indicates that young OBLR larvae blow in from border-area trees (such as black cherry and choke cherry) and can continually colonize apple trees, especially perimeter rows.

In regard to control of OBLR, Harvey Reissig and Art Agnello from New York recommend using 2-3 sprays against high populations of OBLR. These should be made at times corresponding to periods of first hatch, mid-hatch and 2 weeks after mid-hatch of the first generation of summer larvae. In Massachusetts, first hatch of first summer brood larvae usually begins in late June.

Field trials of pesticidal effects against OBLR in 2001 were conducted by Peter Jentsch and Dick Straub of the Hudson Valley (HV), Harvey Reissig and associates in western New York (WNY) and John Wise and associates in Michigan (MI). The information below is based on 3 applications of each material beginning in late June and at 2 and 4 weeks thereafter.

| | **Approx.** | **% infested leaves or fruit** | | |
|---|---|---|---|---|
| | **rate/100 gal** | **HV** | **WNY** | **MI** |
| Avaunt 30 WG | 2.0 oz | 0.0 | 24.5 | - |
| Calypso 4 SC | 1.0 oz | 1.3 | - | - |
| Confirm 2F | 7.0 oz | - | 16.0 | - |
| Intrepid 2F | 4.0 oz | - | 9.6 | 0.0 |
| Lannate LV | 16.0 oz | - | 9.8 | - |
| Proclaim 5 SG | 1.6 oz | 0.2 | 7.0 | - |
| Spintor 2 SC | 2.0 oz | 0.0 | 6.6 | - |
| Warrior 1 CS | 1.1 oz | 0.0 | 11.9 | - |
| Untreated | - | 1.4 | 18.9 | 2.5 |

Combined results suggest that Spintor and Proclaim are very effective materials for OBLR control, with Intrepid, Lannate and Warrior not far behind. Avaunt, Calypso and Confirm did not provide good control. Thus, for best control of high-population OBLR, a 2-3 application program of Spintor or Proclaim, beginning in late June, should work well.

## BORERS INFESTING BURR KNOTS ON APPLE TREES

**2001 Activity.** As has been the pattern for several consecutive years, dogwood borers reared up again in several Massachusetts apple orchards in 2001. Apple trees may also be under fire from American plum borers, especially blocks that are close to plum or peach trees or close to black cherry

trees in nearby woods. In the Hudson Valley in 2001, about 50% of the surveyed trees that were on M.9 or M.26 rootstock and had burr knots were infested by bark borers. Trees having all-year mouse guards and trees having a lot of vegetation growing against the trunk are the most susceptible. Borers feeding inside of burr knots often later move to feeding on the cambium and may eventually girdle a tree, slowing tree growth or causing tree death.

**New Findings.** Proven solutions to reducing burr knots (and hence borer infestation) include removal of plastic mouse guards from April through harvest, maintaining wire mouse guards free of debris and keeping lower parts of the tree trunks free of weeds.

Trials of pesticidal effects on dogwood borer (DWB) were conducted in 2001 by Dave Kain, Dick Straub and Art Agnello in New York (NY) and John Wise and associates in Michigan (MI). Applications were made by a handgun to burr knots of trees on M.26 rootstock. For some treatments, pesticide was mixed with latex paint and sprayed on burr knots.

| | **Approx. rate/100 gal** | **Time of application** | **DWB larvae/10 trees NY** | **MI** |
|---|---|---|---|---|
| Actara 25 WG | 5.5 oz | June 12 | - | 5.0 |
| Avaunt 30 WG | 1.7 oz | Petal fall | 0.4 | - |
| Calypso 4 SC | 4.0 oz | June 12 | - | 5.0 |
| Lorsban 4 EC | 1.5 lb | Half-inch green | 0.1 | - |
| | | Pink | 0.1 | - |
| | | Petal fall | 0.0 | - |
| Lorsban 50 WP | 3.0 lb | June 12 | - | 6.0 |
| Lorsban 4 EC & paint | 1.5 lb | Half-inch green | 0.0 | - |
| Paint alone | - | Half-inch green | 0.5 | - |
| Thiodan | 12.0 oz | Petal fall+ July 18+ August 15 | 0.3 | - |
| Untreated | - | - | 0.8 | 20.0 |

Results from Michigan suggest that Actara, Calypso and Lorsban were equally effective when applied in mid-June, reducing borer populations by about 70%. Results from New York suggest that Lorsban applications at half-inch green, pink or petal fall were equally effective in controlling DWB, that Lorsban plus paint was no more effective than Lorsban alone, and that Actara, paint alone or Thiodan gave less effective control.

## LEAFHOPPERS

**2001 Activity.** Neither white apple leafhoppers (WAL) nor rose leafhoppers (RL) were very abundant through July in Massachusetts, but both species showed considerable buildup in August. By September, adults were bothering pickers in some orchards, though incidence of leafhopper excrement on fruit was fairly low. Potato leafhoppers (PL) were considerably less abundant in 2001 than in several previous years in Massachusetts. Elsewhere, leafhoppers were about average or maybe even slightly below average in abundance.

**New Findings.** Relevant new findings involve insecticide trials conducted in 2001 against LH by Peter Jentsch and Dick Straub in the Hudson Valley (HV) and Harvey Reissig and associates in western New York (WNY).

| | | | No. of LH per 25 leaves** | |
|---|---|---|---|---|
| | | **Approx. rate/100 gal*** | **HV (WAL+RL)** | **WNY (WAL)** |
| (A) | Actara 25 WG | 0.4 oz | - | 0.0 |
| | Avaunt 30 WG | 2.0 oz | 4.3 | - |
| | Calypso 4 SC | 1.0 oz | - | 0.0 |
| | Guthion 50 W | 8.0 oz | - | 8.8 |
| | Warrior 1 CS | 1.1 oz | 0.0 | 0.0 |
| | Untreated | - | 7.1 | 22.7 |
| (B) | Provado 1.6 F | 2.0 oz | 2.9 | - |
| | Provado 1.6 F | 0.5 oz | 2.9 | - |
| | Sevin XLR | 16.0 oz | 12.5 | - |
| | Sevin XLR | 4.0 oz | 23.5 | - |
| | Untreated | - | 77.2 | - |

* Applications for (A) were made 4 times in HV from petal fall through 3rd cover and 10 times in WNY from half-inch green through August. Applications for (B) were made once, on September 18.
** Sampling for (A) was conducted on July 1 in HV and on August 28 in WNY. Sampling for (B) was conducted on September 25.

Results show that for applications made 4 or 10 times during the growing season, Actara, Calypso and Warrior gave excellent control of WAL and RL, whereas Avaunt and Guthion were less effective. For applications made only once (in mid-September) against late-season LH, Provado at both recommended and 1/4 of recommended rate gave excellent control, Sevin at recommended rate gave good control and Sevin at 1/4 recommended rate gave fair control.

Other findings from scattered sources suggest that insecticidal effects of Provado last for about 2 weeks, after which the amount present in the sap of sprayed leaves is too little to exert much toxicity.

Also, leaves that develop after a spray of Provado, such as new terminal growth in May, June and July, are not protected and will support PLH and other LH as they unfold and develop. Hence, they begin to be susceptible to LH 10-14 days after a spray. As reported by Kathleen Leahy of Polaris, Apogee may be just about as effective as Provado in controlling PLH.

**LEAFMINERS (LM)**

**2001 Activity.** In Massachusetts, LM populations were comparatively low throughout the season, as reflected by low captures of adults in May on sticky red trunk traps, low numbers of first-generation larvae and less than average numbers of second and third generation larvae. Indeed, buildup from first to third generation was only about 16-fold in 2001, considerably less than the 36-fold buildup from first to third generation in 2000. Fewer than 20% of Massachusetts growers treated against LM in 2001. Elsewhere in the Northeast, LM likewise were comparatively low in 2001.

**New Findings.** A 2001 report by Jan Nyrop and Alan Lasko in New York State IPM Publication 218 sheds some new light on threshold levels at which LM can be tolerated before leaf photosynthesis is affected. They measured levels of leaf photosynthesis on July 11, August 4 and August 24 on Delicious trees. They found that photosynthesis declined in direct proportion to amount of leaf area removed by LM larvae and that a single mine causes a 2.5% reduction in photosynthesis. This is equivalent to the effect of 125 mite days (for example, 10 mites per leaf for 12.5 days). At 500 mite days (for example, 10 mites per leaf for 50 days), there is a 10% reduction in leaf photosynthesis. This is the threshold level for treatment of mites to avoid reduction of yield or quality of fruit under a moderate crop load. Based on the well-studied effects of mites on tree health, Nyrop and Lasko suggest that apple trees can tolerate up to 4 mines per leaf before photosynthesis is affected to point that influences fruit yield and quality. This level of 4 mines per leaf is about twice our current threshold of 2 second-generation mines per leaf for McIntosh and other cultivars prone to dropping fruit early. Further research is underway in NY to determine the influence of apple cultivar on tolerable levels of LM.

Trials of pesticide effects against LM were conducted in 2001 by Harvey Reissig and associates in western New York (WNY) and John Wise and associates in Michigan (MI). The following is based on 8 post-bloom applications of each material beginning at petal fall.

| | **Approx.** | **Relative level of mines** | | |
|---|---|---|---|---|
| | **rate/100 gal** | **WNY** | **MI-1** | **MI-2U** |
| Actara 25 WG | 0.5 oz | 0.9 | - | - |
| Aza-Direct | 11.0 oz | - | - | 8.0 |
| Calypso 4 SC | 1.0 oz | 0.1 | 0.0 | - |
| Guthion 50 WP | 8.0 oz | 0.7 | 21.0 | - |
| Surround WP | 12.0 lb | - | - | 51.0 |
| Warrior 1 CS | 1.1 oz | 0.3 | 20.0 | - |
| Untreated | - | 2.0 | 41.0 | 52.0 |

Results suggest that Calypso gave excellent LM control and Aza-Direct fair control, whereas Actara, Surround and Warrior were little or no better than Guthion, even after 8 applications. These results were similar to 2000 findings and suggest that Calypso could be an addition to Provado, AgriMek and Spintor as effective insecticides against LM.

**MITES**

**2001 Activity.** In Massachusetts, overwintering eggs of European red mites (ERM) were comparatively low in abundance, and favorable spraying conditions allowed nearly all growers to apply at least one (and in most cases two) pre-bloom oil sprays. The net result was exceptionally low numbers of first-generation ERM nymphs at Pink. Heavy showers during June and early July helped keep populations low. Few growers needed a summer rescue miticide application. Neither two-spotted nor yellow spider mites flared to cause concern. Elsewhere in the Northeast, ERM were less of a problem than usual, despite the dry mid and late summer weather. However, in Connecticut and Rhode Island, yellow spider mites continued to build to increasingly higher levels in several orchards. These mites look like two-spotted mites but are smaller with yellowish spots. Injury appears similar to two-spotted injury (leaves become pale) but is usually confined to the mid-rib area of leaves. It's not the typical bronzing of ERM injury. Fortunately, yellow spider mites have much lower reproduction capability than two-spotted mites.

**New Findings.** Several studies published in 2001 confirmed some previous suspicions and findings on mites and their predators.

- On the West Coast, Danitol, like other pyrethroids, was found to repel pest mites, causing them to move from locally-infested spots and spread throughout orchards, thereby increasing the probability of an orchard-wide mite problem.
- In California, Pounce and Asana (both pyrethroids) were found to adhere to bark tissue of fruit trees for very long periods (6 months and longer) and even after such a long time since application, caused significant mortality to mite predators walking on bark.
- In New York and Ontario, released *Typhlodromus pyri* predators are continuing to provide excellent long-term biocontrol of pest mites provided that use of unfriendly pesticides such as pyrethroids and EBDC fungicides is nil or minimum.
- In Massachusetts in 2001, *T. pyri* was the dominant mite predator in the 12 commercial orchard blocks where they were released in 2000, and apparently they were a major factor in suppressing pest mites during summer. *Amblyseius follacis* predators were nearly totally absent from these 12 blocks throughout 2001.
- In Utah, foliage infected by powdery mildew was found to infested by pest mites to a greater degree than foliage free of powdery mildew (reasons unknown).

Trials of acaricide effects against mites were conducted by Glen Morin of NEFCON in

Masschusetts (MA), Peter Jentsch and Dick Straub of the Hudson Valley (HV), John Wise and associates in Michigan (MI), and Henry Hogmire in West Virginia (WV). The information below involves different times of application of each material and different intervals between application and sampling, as indicated.

| | | No. motile mites and eggs per leaf | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Aprox. | MA* | | HV** | | | MI*** | | WV**** |
| Pesticide | rate/100 gal | ERM | AF | ERM | TSM | ARM | ERM | ARM | ERM |
| Acramite 50W | 4.0 oz | 3.9 | 0.3 | 6.3 | 0.0 | 16.5 | - | - | 15.3 |
| Acramite 50W | 5.4 oz | 8.8 | 0.3 | 2.1 | 0.1 | 41.7 | - | - | 17.3 |
| Envior 240 SC | 3.5 oz | - | - | 7.7 | 0.2 | 4.4 | - | - | - |
| Fujimite 5% | 11.0 oz | - | - | - | - | - | 0.3 | 51.0 | - |
| Pyramite 60W | 1.5 oz | 9.9 | 0.9 | 6.9 | 0.0 | 5.0 | 0.9 | 149.0 | 2.6 |
| Untreated | - | 26.4 | 1.5 | 4.4 | 0.4 | 12.1 | 10.6 | 127.0 | 18.9 |

* Application July 31, sampling on August 10
** Application July 5, sampling on July 9
*** Application on May 25 and 31, sampling on July 30
**** Application on June 6 and 28, sampling on July 30
ERM = European red mite, TSM = two-spotted mite, ARM = apple rust mite, AF = *Amblyseius fallacis*

Results from Michigan suggest that Fujimite gave substantially better control of ERM and ARM than Pyramite, from Massachusetts and/or the Hudson Valley suggest that Acramite gave somewhat better control of ERM than Pyramite but did not control ARM, and from West Virginia suggest that Pyramite gave much better control of ERM than Acramite. Envior appeared to be ineffective in controlling ERM. The considerable variation in results among states in level of mite control by the various materials may have been due in part to differences in time of application and days elapsed after application before sampling. No consistent pattern of results seems to have emerged from these tests.

**SAN JOSE SCALE (SJS)**

**2001 Activity.** Although SJS was found infrequently in larger commercial orchards in Massachusetts and other parts of the Northeast in 2001, some part-time growers who operate small orchards continue to be plagued by SJS. A few of these growers experienced a great deal of SJS injury in 2001. The cause may lie in a combination of having large trees, inadequate pruning of the interior and upper parts of the canopies, and sprayers that are not adequate to provide good coverage of oil and other pesticides to the interior of the upper canopy, where most SJS infestations originate. For some large commercial orchards, first applications of oil beginning at pink rather than half-inch green (optimal for SJS) may be part of the reason for appearance of SJS on some harvested fruit.

**New Findings.** Two few research sites had enough of a SJS population in 2001 to yield good data on SJS control. A very effective program in the past has been oil alone or oil plus Lorsban at half-inch green to handle a low infestation, and Guthion, Imidan, Lorsban or Provado in mid or late June in a second application to handle a larger problem. Some trials suggest that Esteem also does an excellent job of controlling SJS.

**PEAR PSYLLA**

**2001 Activity.** Except for parts of the Hudson Valley, psylla were either naturally rather low in abundance or were well-controlled in most northeastern orchards in 2001. This was at least the third year in a row that psylla were well below the average populations seen in the mid-1990s.

**New Findings.** Peter Jentsch and Dick Straub of the Hudson Valley (HV) and John Wise and associates in Michigan (MI) evaluated several materials against pear psylla in 2001. Materials were applied at various times as indicated.

| | | | No. nymphs per leaf | |
|---|---|---|---|---|
| | **Approx. dose/100 gal** | **Time of Application** | **HV (June 25)** | **MI (August 14)** |
| Actara 25 WG | 1.8 oz | April 25 | 8.7 | - |
| | | May 7 (PF) | 3.6 | - |
| | | June 16 | 7.1 | - |
| Agrimek 0.15 | 5.0 oz | May 7 (PF) | 4.2 | - |
| Agrimek 0.5 | 5.0 oz | May 17 (1C) | - | 0.0 |
| Calypso 4 SC | 1.5 oz | May 7, 17 | 13.5 | - |
| Provado 1.6F | 6.0 oz | June 16 | 8.1 | - |
| Surround WP | 25 lb | May 17-Aug 14 (1-6C) | - | 3.5 |
| Untreated | - | - | 8.1 | 11.0 |

Results from the Hudson Valley suggest that Actara or Agrimek applied at petal fall did a better job of controlling psylla than Actara applied pre-bloom or in mid-June or Calypso (2 applications) or Provado (applied in mid-June). Results from Michigan suggest that Agrimek applied at first cover provided excellent season-long control, with good control from a season-long program of Surround. Although not evaluated in these tests, Esteem or Pyramite applied at cluster bud and Pyramite or Provado applied at petal fall usually provide excellent psylla control.

## PEACH PESTS

**2001 Activity.** During 2001, we in Massachusetts did not monitor the activity of peach pests. But assessments in New York, Ontario and Michigan leave no doubt that damage to peaches by oriental fruit moth (OFM) is on the rise.

**New Findings.** Recent scientific journal articles indicate that OFM larvae (but less so adults) in many Niagra Peninsula peach orchards in Ontario are quite resistant to Guthion , Imidan and Sevin but less so to Lannate. Similarly, research in New Jersey indicates widespread moderate resistance of OFM adults to Guthion in commercial orchards in that state. It seems, therefore, that at least partial resistance of OFM to organophosphate insecticides could become a problem in other parts of the Northeast.

As an alternative to insecticides for OFM control, researchers in Ontario, New York, Pennsylvania and New Jersey have been evaluating the use of mating disruption pheromone (MDP). The basic approach in 2001 involved application of petal fall and early cover-insecticide sprays against plum curculio, which also suppressed OFM to some degree. MDP was then applied for control of the 2nd and 3rd generations. Various approaches to applying MDP were evaluated, including twist-ties attached to tree branches, squirt-bottle application to tree branches, foam spray application to tree limbs, and sprayable microencapsulated formulation. Overall, results showed good to excellent control of 2nd and 3rd generation OFM using MDP. This approach also conserves beneficials, though it does not suppress stink bugs, which can be very troublesome summer pests of peaches. More research on MDP against OFM will be conducted in 2002 to refine its use.

If MDP is not an option for control of organophosphate-resistant OFM, 2001 research by Harve Reissig and associates in New York indicates that 2 spray applications (mid-May and end of May) of Asana or Calypso gave effective season-long OFM control, with Avaunt and Intrepid close behind, followed by Esteem and Imidan, which were not so effective.

## IPM MANUALS, SUPPLIES AND SERVICES

### PURCHASE OF PEST CONTROL GUIDES, IPM MANUALS, ETC.

For 2002, the monthly newsletters; weekly *Healthy Fruit* messages; the *March Message*; the *Peaches, Pears and Plums, A Production Guide*; and the *2000-2001 New England Apple Pest Management Guide* will be available (if needed) for a subscription of $50. Subscriptions may be ordered by sending a check for $50 made out to the University of Massachusetts to the 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. Copies of the following publications may be ordered individually from the UMass Extension Bookstore, Draper Hall, University of Massachusetts, Amherst, MA 01003.

***The 2000-2001 New England Apple Pest Management Guide*** will be mailed to all who subscribe to the $50 package of information and need the guide. The 2000-2001 NEAPMG was edited by Glen Koehler, Alan Eaton, Lorraine Los, Lorraine Berkett, Wes Autio, Jim Dill, Bill Lord, and Elena Garcia. For 2002, the guide itself will not be revised, but there will be a brief update section of 1-2 pages on new pesticides.

***The 1999-2000 Peaches, Pears and Plums, A Production Guide*** includes updated pest biologies and control methods. The Peach, Pear and Plum Guide is edited by the UMass Tree Fruit Team.

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.

**Two fact sheets** are available on biological control of mites and leafminers on apples.

| Costs: | | |
|---|---|---|
| 2000-2001 *New England Apple Pest Management Guide* | | $15.00 |
| 1999-2000 *Peaches, Pears and Plums, A Production Guide* | | $7.50 |
| Opportunities for Increased Use of Biological Control in Massachusetts | | $7.00 |
| ID Code: EXPF 0900 0718 | | |
| Biological Control Fact Sheets: | | |
| Apple Blotch Leafminer | ID Code: IPMA 000L 594A | $2.95 |
| Spider Mites in Apples | ID Code: IPMA 000L 595A | $2.95 |

The costs above include production, handling and mailing expenses. Checks should be made out to the University of Massachusetts and sent together with your order to the UMass Extension Bookstore, Draper Hall, University of Massachusetts, Amherst, MA 01003. Please use the ID code (if provided) to specify the publication you are ordering.

***Fruit Notes of New England*** is a quarterly journal published by the UMass Fruit Program. It contains important new research findings on fruit growing in Massachusetts. The subscription price is $10 per year ($12 US funds for foreign subscriptions), 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 or first-class mail, or just the weekly newsletter can be faxed for an additional $20 fee. Subscription requests, e-mail distribution requests, and fax copy requests should be sent to Doreen

York [dyork@pssci.umass.edu].

***2002 Tree Fruit Production Guide***. Penn State University. Price $13.00. 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 order (for credit card purchases) at (814) 865-4700.

**Updated New York Fact Sheets** Among others, the 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 Fact Sheet series features excellent photographs, and a set of 30 can be purchased for $28.35. Individual sheets are also available for $2.00 each. These can be ordered from Media Services Resource Center-GP, 7 Research Park, Cornell University, Ithaca, NY 14850.

**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 |
| Two Spotted Spider Mite | Aphids |
| Scale Insects | Fire Blight |
| Apple Scab | |

***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 in hardcover ($37.50) or laminated ($30.00) from: Bulletin Office-TFP, Michigan State University, 10B Agricultural Hall, East Lansing, MI 48824-1034. The publication number is NCR-63 (Common Tree Fruit Pests). Checks should be made out to Michigan State University.

***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 $75.00 from Northeast Regional Agricultural Engineering Service, Cooperative Extension, 152 Riley-Robb Hall, Ithaca, NY 14853-5701. Checks should be made payable to NRAES.

## 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 are not usually much of 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 Fruit Worm** – 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** - 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 Delicious 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 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. sugar bushes) can help to determine the potential for thrips immigration.

**3. Tangletrap** (A Tanglefoot Co. product)
Tangletrap (Bird Tanglefoot) is a clear, odorless, non-drying adhesive that is used to coat the reusable red sphere traps. 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, Tangletrap, and magnification equipment for use in sampling are available from:

Gempler's
211 Blue Mounds Road
P.O. Box 270
Mt. Horeb, WI 53572-0270
(800) 382-8473 (Orders)
(800) 332-6744 (Customer Service)

Great Lakes IPM
10220 Church Road
Vestaburg, MI 48891
(517) 268-5693 or
(517) 268-5911

Many pest management supplies are also available from:

OESCO, Inc. (Orchard Equipment)
Rt. 116
Conway, MA 01341
(413) 369-4335

**PEST MANAGEMENT SERVICES AVAILABLE IN 2002 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 Tree Fruit Advisor is available on the World Wide Web, at http://www.umass.edu/umext/programs/agro/tree_fruit/. This site includes Tree Fruit Team contact information; current issues of *Fruit Notes*, the *March Message* and *Healthy Fruit*; and links to other resources, such as Orchard Radar, chemical labels, the NEAPMG, and nutrient management information. Questions about the system 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 2002. Their addresses are:

New England Fruit Consultants (NEFCON)
56 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