

Growing Healthy Crops and Healthy Profits

December 6-8, 2005
Grand Rapids, Michigan



Tree Fruit

Tuesday morning 9:00 am

Moderator: Mike Wittenbach, MSHS President- Elect

9:00 a.m. Grower Innovation Panel

Jim Bardenhagen, Leelanau Co. MSU Extension
Banding Manure in Orchards, Jim Koan, Al-Mar Orchards, Flushing, MI
Narrow Row Weed Sprayer, Paul Friday, Paul Friday Farms, Coloma
Mechanical Positioning of Grape Vines, Tom Zabadal, SWMREC, MSU Extension

9:30 a.m. Pear Culture, Growing Pears Our Way

John Wells, Hood River, OR

10:00 a.m. Fireblight Management Strategies for 2006

George Sundin, Plant Pathology Dept., MSU

10:20 a.m. Trac Software for Easier Spray Record Keeping and Reporting

Juliet Carroll, New York State IPM Program, Cornell Univ.

10:40 a.m. Orchard Weed Management

Leslie Huffman, Ontario Ministry of Ag and Food, Ontario, Canada

"Pear Culture, Growing Pears Our Way."

John M Wells, 2155 Wells Drive
Hood River, Oregon 97031

The Hood River Valley is located in north central Oregon, between the Columbia River and Mt. Hood. This area is referred to as the Mid-Columbia region of pear production in the Pacific Northwest. The valley's orchards range in elevation from 83' at the river, up to 2300' at the last orchard in the upper valley. Only seven miles wide and extending about 20 miles, the valley is surrounded by foothills that are 4000' in elevation.

Fruit growing in the Hood River Valley started in 1855. Commercial orchards were being planted by 1876 with Yellow Newtown Pippin and Spitzenburg apple orchards. Our family has been farming in Hood River County since 1891, and we still farm fields that great grandfather purchased in 1901. A severe freeze in 1919 killed most apple plantings and Anjou pear orchards survived. Anjou, Bartlett and Bosc pears were replanted in these old apple fields and have remained the major crops in our valley since. Hood River County tree fruits account for 95% of the 52 million dollar farmgate and pears now account for 73% of the total. Of 14,500 acres of tree fruits grown in Hood River County, about 11,600 acres are planted to pears. Roughly 80% of the pears, including most of the winter pears and one-third of the Bartlett pears produced, go to the fresh market. The remaining Bartlett pears go primarily to the canneries. The Mid-Columbia Region grows about 40% of nearly 15 million boxes of winter pears produced in the Pacific Northwest. The majority of the production is Anjou pear. Bartlett, Bosc, Comice, Red Anjou, and Forelle are used to pollinate Anjou. Other minor pear tonnages include Seckel, Starkcrimson, Asian, Cascade, Packams Triumph, and Concorde. The trend in tree replanting has been predominately pear, but in recent years with late maturing, rain resistant cherry varieties and quicker returns with dwarfing rootstocks, cherry and apple plantings were over 50% of the total trees planted in 2002.

Integrated Pest Management-Best Management Practices.

Since 1994 our family farm has relied on Pheromone Mating Disruption in pear and apple fields. We place isomate C+ at the rate of 150-225 wires per acre in the Delayed Dormant stage, before buds become large, and preferably before Pre-Pink when you can easily damage the expanding bud. Next we place traps to monitor the emergence 'biofix' and start our degree day (DD) clocks. I have used Avatel HarvestGuard clocks to accumulate DDs for over 15 years and compare my local site information to other sites in the valley on the internet. In 2004, we installed a weather station that collects the information and sends it to the internet. On the internet, I can now view real time weather and modeling information at our field site through the IPPC and IFPnet websites. Our county now has 19 weather stations that can be accessed through the internet. The additional HarvestGuard DD clocks are placed along the 'trap line' of 50 traps that monitor Codling Moth (CM) and Oblique-Banded Leaf Roller (OBLR) and recorded manually. From the weather station modeling, DD clocks and the trap counts, the CM and OBLR sprays are more appropriately timed. After 3-4 seasons, we began to replace general insecticides with insect growth regulators (IGRs). No Azinphosmethyl has been used for CM in recent years in our pear or apple blocks. Secondary pests, like Pear Pyslla and Spider Mites have reduced in

populations below the economic thresholds. Soft spray programs do work in pear and apple fields, and I would encourage orchardists to use Mating Disruption and IGRs, to produce clean fruit and provide a safer work environment for your applicators and employees.

Pesticide contamination in the Hood River watershed basin was surveyed in 2001-2002 by Oregon's Department of Environmental Quality. Their samples indicated that both Chlorpyrifos and Azinphosmethyl were present at small but identifiable levels. This level was not enough to kill salmon larvae, but interferes with their olfactory navigation. With long worker re-entry time, and concerns of surface water contamination, we discontinued the usage of both of these pesticides. The Hood River Grower Shipper Association received funding to identify the 'sensitive areas' and produced a guide book called "Best Management Practices" that provides growers with practices to reduce contaminating our waters. This guide book is available on the internet at the Hood River Grower Shipper Associations website.

Field Improvements-Irrigation-Fertilizer-Spring Heating Systems

Increasing the premium quality 'targeted' fruit to sell per acre, with the lowest input costs per bin, has kept the best growers farming. Implementing new irrigation systems and technologies help reduce input costs. We must use every method we can to reduce labor inputs, and make employees more efficient. Many improvements have been made in supplying irrigation to our trees. The amount of water lost has become increasingly important with new regulations on stream flow, water temperature, and pesticide contamination. Sprinkler hand line costs have increased enough recently to force the orchardist to install a permanent system. Secondly, the distance between trees has decreased and has made it impossible to move pipe through the tree rows. Solid set impact sprinklers installed 20 years ago are now more expensive to install than newer products like a 1" tube with microsprinklers. These new irrigation systems have reduced the total volume of water applied per acre from as much as 24" per season (4" x 6 sets) to 17" per season (2.5" x 7 sets). Smaller amounts of water can be applied, more frequently, with a better distribution than older impact sprinklers, all at a lower cost. The orchardist now has the option to apply fertilizer through these newer irrigation systems. This has many benefits, for example, better tree growth with less fertilizer applied and improved flexibility in timing the application of fertilizers.

The Hood River Valley has been relying on frost fans more than the old diesel heating systems for spring frost control. The valley now has over 200 fans working on a cold spring morning compared to less than 25 fans 30 years ago. Supplemental heat surrounds the fans if temperatures drop below critical. If purchasing a new heating system, consider propane heaters. Propane starts easier and by increasing the pressure, can produce more heat without re-entering the field. It is unlikely that diesel heating systems will survive much longer due to environmental risks and rising fuel costs.

Trends in Pear Horticulture-Planting Densities

Sixty years ago both pear and apple were planted at 20' x 40' or 30' x 30' on seedling roots, and with 48-54 trees per acre(t/ac), these trees were expected to reach a height of 20-24'. This size of tree could produce over 1000 pounds of fruit, but the ladder work was unsafe and cost prohibitive. Forty years ago, Green Anjou and Bartlett pears were planted on seedling rootstocks at 25' x 25' and 20' x 20', about 70- 110 t/ac, and trained with open centers to a height of 16'. During the 1970's, Old Home x Farmingdale (OHxF) clonal rootstocks became a dominant pear rootstock in the Pacific Northwest. Growers were beginning to plant 12' x 18' distances (202 t/ac), training the trees to a 12' central leader. Average production per acre over the past 25 years, has increased from 11 to 14 tons per acre for Barletts and from 13 to 17 tons per acre for Anjous. There are still just a few growers that consistently produce 22 tons per acre in their new plantings.

Through time, producing more tonnage per acre has allowed progressive growers to be competitive. The dwarfing rootstocks of apple have allowed higher density plantings than we achieve with pear rootstocks. Cold-winter regions, like the Pacific Northwest are unfavorable for quince rootstock plantings and few plantings with pear on quince are planted north of Medford, Oregon. Several rootstocks for pear like OHxF 51, OHxF 40, Pyrodwarf, and Pyro 2 are being evaluated, but the majority of pears are still being planted on OHxF 87, OHxF97 and Bartlett seedling. Due to the cultivar size, pear growers may plant Bartlett, Bosc and Comice at higher densities per acre than with Anjou and Forelle. Slender Bosc trees are being planted vertically at 8' x 16' (340 t/ac), whereas larger Anjou trees are at 10-12' between trees and 16-18' between rows (202-272 t/ac).

Pruning in Higher Density Plantings

Pear trees should be pruned at planting to 28-32", regardless of the planting density. This promotes more wide angled lateral branches. Positioning the limb can be done with toothpicks and spreaders, or by pulling down limbs with hop clips or string secured to the trunk with a screw. Young branches should be positioned so the leading tip is higher than the rest of the branch. Tying limbs below horizontal increases fruiting, but vertical shoots will arise near the trunk and at each node position along the limb. Reduce tip pruning to encourage fruiting. The following year, the flattened limbs will need to be tied up, to carry the fruit weight. The growing point of tied pear limbs will return quickly to vertical, much quicker than apple limbs will.

At any planting density, prune the tree to allow sunlight and spray to reach each limb. If you decide on a central leader or spindle form, few side branches are allowed to grow large. In a tight Anjou pear planting of 5' x 16' (545 t/ac) vertical trellis, remove whole limbs between trees, and form a palmate perpendicular to the row, allowing for continuous branch replacement.

To plant at higher densities (like 778-1815 t/ac), the tree must be tipped at planting to a 65-85 degree angle to reduce tree growth. V-trellis systems in pear are planted at 2-4' between trees and 12-14' between rows. At densities this high, an axe form is common, eliminating nearly all the side branches, and allowing only small caliper side twigs to carry the fruit. Nearly all of the pruning is on the inside of the V-trellis, and burl knots form where this repeated pruning occurs at the same location.

Establishing New Orchard Systems

Higher density tree plantings must have support to carry the crop load. We cannot wait for the tree to support the early crop load we need to return the capital investments. Reducing the initial costs of establishing your planting will help reduce the time for the return of your investment. The number of trees per acre and the irrigation system must be established the first year. Some growers are delaying the trellis and fertigation systems until year two or later. Although this reduces initial costs, the trellis should be completed by the second summer. Placing the wire at all the desired positions can be accomplished with less labor compared to returning with the same equipment to place wire a second time. Our first vertical trellis system had a t-bar with 2 wires at 3', and single wires at 5', 8', 11'. The t-bar at 3' interfered with work and now we use a 4-wire system with single wires at 3', 5', 8', and 11'. When I left trellis wire in 40-50' spans over three years, the wires moved, changing the distance between wires and not using all 3 upper wires together for support. If the trellis structure is finished before the tree is tied, it provides rigid support for the trees and is much easier to tie the tree as it grows into the trellis. We've included a 7' bamboo stick above each tree, clipped at all three wires to help support the distance between those wires. If the wires are held together with bamboo, the trellis is much stronger. We've tried string, instead of bamboo, but this adds no rigidity to the trellis, each wire must support itself. By placing the bamboo stick a few inches over the top wire, we can still connect the tree to the bottom of the bamboo by the second summer.

A trellis system offers the grower a chance to manage each task with simple instructions which hopefully increases the efficiency of the field crews. For example, the piece of bamboo that is above our top wire is for pheromone isomate C+ placement. When spreading pheromone wires in an old orchard, the crew is 'hunting' for a position to tie the pheromone, in the trellis systems they tie a pheromone wire every 15' at the bamboo site, and application time per acre is much quicker. Much of our field work becomes more efficient when each task is similar in each tree. The more uniform we structure each tree, the more uniform the task becomes. Pruning, tying limbs, thinning, and picking all become simple tasks that allow the field crews to move through more acreage per day. When using a ladder to tie limbs, the cost per acre can escalate if you do not move the field crew through an acre quickly. There are always more limbs to tie than you can afford to tie. With a platform trailer, decide the cost per acre you're willing to pay, calculate the speed of the trailer and drag it through the acre. Even if you have not tied all the limbs you wanted to, the input cost was predetermined per acre.

Summary

Orchard systems must be competitive and produce high quality fruit of targeted sizes in quantities that return the investment quickly. An orchard design that has pear tree densities around 300-800 trees/acre may produce adequate return per acre competitively. The efficiency of the orchard design will reduce labor costs, and still attract a return labor force. Uniform trees on a trellis system simplify management by creating repetitive tasks. Many orchard tasks can be accomplished with specially designed platform trailers to enter a vertical or V-type trellis. Plan your competitive orchard system for the future to reduce labor and other input costs per bin, and increase the return on your investment.

Fire Blight Management Strategies for 2006

George W. Sundin
Department of Plant Pathology, Michigan State University, E. Lansing, MI 48824
email: sundin@msu.edu

Introduction

Fire blight is the most serious disease currently limiting apple production in Michigan (#3 in U.S. total production), and is such a severe problem on pear in the eastern United States that the production acreage of this crop is quite small. This disease is particularly difficult to manage, and the situation is exacerbated by three major problems: (i) most of the popular apple cultivars selected by growers are either rated as susceptible or highly susceptible to fire blight; (ii) many of the popular dwarfing rootstocks utilized in Michigan are also highly susceptible to fire blight; and (iii) there are few chemical control options registered for fire blight management. The fire blight pathogen *Erwinia amylovora* is capable of infecting blossoms, fruits, vegetative shoots, woody tissues, and rootstock crowns. There are several distinct phases of the disease including blossom blight, shoot blight, and rootstock blight. The diversity of host tissues, combined with the limited number of management tools available to control the disease, has made it difficult to stop or slow the progress of fire blight epidemics. The continued threat of fire blight to the pome fruit industry is evident from recent epidemics that have occurred worldwide.

Management of Fire Blight in Michigan

Effective management of fire blight is limited in many cases by the susceptibility of scion and rootstock. Where possible, varieties with decreased susceptibility should be planted. For example, varieties such as 'Gala', 'Ginger Gold', and 'Jonathan' are highly susceptible to fire blight infection whereas other varieties such as 'Golden Delicious' are less susceptible to the disease. We've seen many situations of side-by-side plantings where one variety is decimated with fire blight strikes and the adjacent more tolerant variety is not. Also, rootstock choice is critical to the survival of young trees in that varieties grown on susceptible rootstocks such as M.26 are at risk of developing rootstock blight. Rootstock blight typically occurs through internal movement of the pathogen following scion infection through the tree to the rootstock. This infection will kill the tree. Trees are at high risk for rootstock blight for about the first ten years; over time, this risk is decreased, but we have seen rootstock blight on older trees grown on susceptible rootstocks. There are resistant rootstocks available, for example, the Geneva series (such as G.16) and Budagovsky 9 has performed well showing field resistance. Scions planted on resistant rootstocks can still be infected with fire blight, however, these trees will not be killed by rootstock blight.

The blossom blight phase of fire blight is the only phase where the organism is surface associated and reachable with spray materials. The antibiotic streptomycin is the most effective control compound available for limiting blossom populations of the fire blight bacterium. Reducing blossom populations and thereby reducing fire blight inoculum is critical to the control of the blossom blight phase of the disease and also in reducing disease pressure for the shoot blight phase of the disease. Unfortunately, due to the reliance of the apple industry on streptomycin for fire blight control, streptomycin resistance has developed in populations of the

fire blight pathogen *Erwinia amylovora* in Southwest Michigan in the mid-1990's, and we detected a wide distribution of streptomycin-resistant *E. amylovora* in the Fruit Ridge area north of Grand Rapids in 2004.

Other materials available for blossom blight control include another antibiotic, oxytetracycline. This antibiotic is less effective than streptomycin because its activity is bacteriostatic and not bactericidal, meaning the oxytetracycline inhibits growth of the pathogen, but does not kill the pathogen. The biological control material Serenade MAX appears to work like an antibiotic and has shown some ability to reduce blossom blight in trials conducted in Michigan. Serenade is best used in conjunction with antibiotics and growers should not rely on this material solely for control. BlightBan A506 is a biological control bacterium that inhibits blossom blight through early colonization of blossoms. BlightBan A506 must be applied early, usually with a first spray at 10% bloom and another at about 70% bloom. Unfortunately, we have not observed effective control of blossom blight as yet in trials incorporating BlightBan A506.

Copper compounds are excellent materials for fire blight control because the pathogen is highly susceptible to copper. The difficulty with copper, of course, is the effect of copper on fruit russetting. A dormant copper application, or one put on at about 1/4 inch green tip, is effective in reducing fire blight inoculum emerging from cankers. Copper can also be used for control in nonbearing trees.

Shoot Blight Management with Prohexadione-calcium

Shoot blight is an important phase of fire blight in Michigan and can occur even in years such as 2005 where little blossom blight occurred. This is because of late-appearing inoculum emerging from fire blight cankers. Trauma conditions, caused by high winds and hail, also play an important role in the occurrence of shoot blight. Prohexadione-calcium, marketed as Apogee, is a growth inhibitor that has excellent activity in reducing shoot blight infection. This is an important material in a grower's toolbox for shoot blight control. The activity of prohexadione-calcium as a shoot blight inhibitor seems to be directly related to its activity in limiting growth. Actively-growing apple shoots are highly susceptible to fire blight infection, whereas shoots that are inhibited in growth by prohexadione-calcium can be infected, but become highly resistant to spread of the pathogen. The optimal timing for a prohexadione-calcium application is petal fall of the king bloom, as it takes 10-14 days for the material to exert its effects. The other important aspect of this control material is that it is not affected by the streptomycin resistance status of the pathogen.

Fire Blight Materials in the Pipeline

I will also be discussing our research results with several potential new materials for blossom blight control. One of these, the antibiotic gentamicin, has shown promising results for a few years now in Michigan and around the country. Other materials include additional formulations of bacterial biological control agents, including different types of bacteria, a material that activates the apple disease defense system, and an existing fungicide that has now been shown to also possess antibacterial properties.

Trac Software Makes Spray Record-Keeping and Reporting Easier

Juliet E. Carroll and Judy A. Nedrow, NYS IPM Program, Cornell University, NYSAES, Geneva, NY 14456, jec3@cornell.edu, 315-787-2430.

Abstract:

Trac[®] software (copyright 2003-2005 Cornell University), an Excel-based record-keeping and reporting software program, enables fruit farmers to easily maintain and report accurate crop protection records that are, 1) vital to their market edge, when increasingly competitive global markets demand detailed pesticide records and product traceability, and 2) critical to their integrated pest management practices, especially when faced with pest or disease control failures and severe outbreaks. In 2005, Trac software was upgraded for apple and grape and new Trac software was created for all other fruit crops commonly grown in New York. Trac Software support materials were created including a Software Manual, a Frequently Asked Questions website, and a training workshop module.

Introduction:

Issue - Fruit farmers face increasing need to produce crop protection and production records on demand. The Environmental Protection Agency Worker Protection Standard (EPA-WPS), processors, marketers, etc, require pesticide records and each has a different reporting form, required either by law or to market the crop. This necessitates that farmers fill out several different forms when marketing their crop, making record-keeping an unnecessarily burdensome task. In an expanding and increasingly competitive global market, farmers with the ability to produce detailed crop production records, including pesticide spray records, will have a competitive edge. As more consumers actively seek products with eco-labels, those grown without pesticides, those produced in an environmentally sound manner, or those produced under sustainable practices, the onus will be on the farmer, processor, and marketer to show auditors that such practices were indeed used. Furthermore, accurate crop protection and production records are critically important to the farmer, particularly when pest or disease control failures or severe outbreaks occur. Computerized records would allow farmers to easily search and judge pest management practices in light of such pest control failures or severe pest pressure.

Response - The apple farmers requested that record-keeping software be developed to generate the various pesticide spray record forms required by processors, buyers, and brokers, to aid in their record-keeping and market access requirements. The grape juice processors requested that similar software be developed for their grape farmers. Funds were secured from several sources to support software development in Microsoft Excel, a common spreadsheet program. In 2003, TracApple software was released for beta testing and in 2004 TracGrape software was released. A software license agreement was prepared and the software was copyrighted by Cornell University. Canandaigua Wine distributed 165 copies of the software to grape farmers they have contracts with. Each year the software is revised with pesticide registration updates and software improvements. In 2005, TracPear, TracBerry, TracStoneFruit, and TracCherry were released. Farmers using Trac software enter their data once and it automatically fills out the report forms of all the major fruit processors and buyers in the Northeast. Very simply, the user fills in the blanks on data entry worksheets. Trac software has drop-down lists for pesticides and pests, saving time and preventing typographical errors. The software also generates drop-down lists specific to the user's farm business.

When a pesticide trade name is selected from the drop down list the program automatically fills in the EPA registration number, restricted entry interval, pre-harvest interval, and calculates the earliest harvest date.

Objectives:

1. Upgrade TracApple and TracGrape and develop Trac software for other fruit crops.
2. Publish, online and in print, supporting information for Trac Software.
3. Conduct Trac workshops, presentations and exhibits.
4. Initiate steps to develop Trac software for vegetable crops.

Procedures:

1. Upgrade TracApple and TracGrape and develop Trac software for other fruit crops.

Following the release of the beta test version of TracApple 2003 software, grower input on its improvement was solicited at meetings, exhibits, and an email survey. It became clear that growers found the Excel-based software easy to use. Some of the comments from the 2003 survey follow:

"It was a big improvement over the other software I bought in the past."

"We would like to use it in 2004 and are going to order the 2004 program."

"We just got started with it, had some computer problems, but intend to use (it) more fully this year - want to get (the) 2004 version set to go."

TracApple 2004 was upgraded and released in February 2004 with the following new features:

- A. New reports automatically generated from entered data:
 - a. EPA Worker Protection Standard Central Posting form.
 - b. EUREPGAP-compliant pesticide usages report form.
 - c. Knouse Foods processor form.
- B. Improved SprayData worksheet:
 - a. Earliest harvestable date calculated automatically.
 - b. Chemical costs calculated automatically for each spray applied.
 - c. Easier spray rate calculations.
 - d. Weather tracking columns.
- C. Improved ChemTable worksheet:
 - a. Accessible and easily viewed for quick reference.
 - b. Space for additional, user-defined chemicals.
 - c. Columns to record unit costs of chemicals to enable cost calculations.
- D. Improved BloomHarvest worksheet includes a harvest Tracking Number column.
- E. A new FertData worksheet generates a EUREPGAP-compliant fertilization record.

In May of 2004, TracGrape 2004 was released in collaboration with the major grape juice processors in New York. It was based on the TracApple 2004 version improvements listed above. The processor report forms specific to the grape industry were included in TracGrape (Canandaigua Wine, Cliffstar Corporation, Westfield Maid, Carriage House Co. Inc., Growers Cooperative Grape Juice Co., Meier's Wine Cellars Inc., and Mogen David Wine Co.) Canandaigua Wine distributed 165 copies of the CD to their growers. Cliffstar Corporation sent letters to their growers announcing the availability of TracGrape software.

The major focus of our effort in 2004 was in the development of 2005 Trac Software for all other fruit crops commonly grown in New York. Along with this effort, **TracApple** and **TracGrape** were upgraded for 2005. **TracPear** was developed and released on the TracApple 2005 CD. **TracBerry** was developed and covers strawberry, raspberry, blackberry, blueberry, currant and gooseberry. TracBerry is distributed on its own CD. **TracCherry** (sweet & tart cherry) and **TracStoneFruit** (peach, nectarine, apricot and plum) were included on the TracStoneFruit CD.

The most challenging part of developing these Software programs is in maintaining and updating the chemical information for each crop. This effort is supported by the Pest Management Guidelines (Agnello 2005, Pritts and Bushway 2005, Weigle and Muza 2005) and by faculty and staff involved in contributing

to these publications. Trac software is disclosed for copyright via the Cornell Research Foundation and is protected by a software license agreement developed in conjunction with Cornell University Council. Language regarding the use of pesticides and the use of the software as it relates to pesticides is cleared through the Pesticide Management Education Program. Availability of Trac software is announced through Extension newsletters, trade magazines, Extension-sponsored grower meetings, the New York Fruit & Vegetable Expo, and via email to all Trac software recipients.

2. Write and publish supporting information for Trac Software.

A convenient Trac software tri-fold brochure with order form details information about the software and its cost. Information describing Trac software was published online at www.nysipm.cornell.edu/trac/. The web pages contain detailed information about each Trac Software program, an order form, the “Getting Started” instructions, tips for using Excel and Trac, and a complete Trac Software Manual. The Manual is also included as a pdf file on the CDs of the 2005 versions of Trac Software.

Based on records of technical support inquiries on Trac Software, a set of Frequently Asked Questions (FAQs) and answers was written and published online. Twenty-seven questions with comprehensive answers about Trac Software were written, covering everything from the basics of copying and pasting information to filtering and sorting data in Excel to generate customized reports specific to any farm business.

3. Conduct Trac workshops, presentations and exhibits.

In 2004, eight presentations, four exhibits, and one workshop on Trac Software were conducted across New York and in Ontario, Canada. In addition, a grant from the New York Farm Viability Institute was secured to develop a computer-training module for apple growers in conjunction with Finger Lakes Community College, Canandaigua, NY and KM Davies apple storage, Williamson, NY. Under this grant, four hands-on TracApple training sessions were conducted, reaching approximately 40 apple growers.

4. Initiate steps to develop Trac software for vegetable crops.

As part of the AIC project, we explored the potential for developing Trac Software for vegetables. Two grants were submitted in conjunction with Birds Eye and SYSCO to secure funds. Although neither of these grants was secured, we are confident that Trac Software for vegetable crops will be developed in the future.

Results and discussion:

Impact – Trac has effectively streamlined the burdensome task of record-keeping and reporting for apple and grape farmers. In 2004, 126 copies of TracApple and 307 copies of TracGrape were distributed to interested farmers in New York and also in 17 other states and two Canadian provinces. Apple growers using TracApple were able to generate their yearly pesticide records within 24 hours of the exhaustive Eurepgap certification audits and sail through this portion of the audit. One grape juice processor reported saving up to 25 percent in the time it takes them to process their grape growers’ records when those records are generated with TracGrape. Development of TracGrape in conjunction with Canandaigua Wine enabled them to devise a report form for their grower contracts. Growers using the software state that it is easy to use and manipulate their crop production and crop protection data in Trac. Trac software costs \$20 to purchase, compared to other farm-related software that costs much more and is more complicated to learn, Trac software provides a simple answer to bringing more farmers into the computer age and digitizing New York’s agricultural industry. Growers that are able to easily access computer records of pesticide and fertilizer applications and compare practices from year to year, tracking costs and harvests, will be better able to manage their farm businesses, make more informed IPM decisions, all of which will provide a solid foundation for farm sustainability.

References:

Agnello, A.M. (ed.). 2005. Pest Management Guidelines for Commercial Tree Fruit Production. Cornell Cooperative Extension, Ithaca. 232 pp.

Pritts, M.P. and L.J. Bushway (ed.). 2005. Pest Management Guidelines for Berry Crops. Cornell Cooperative Extension, Ithaca. 84 pp.

Weigle, T.H. and A.J. Muza (ed.). 2005. New York and Pennsylvania Pest Management Guidelines for Grapes: 2005. Cornell Cooperative Extension, Ithaca. 68 pp.



Trac Software Order Form

1. Check the CDs requested.

The price for each CD is \$20

(Make checks payable to Cornell University)

- TracApple[®]
- TracGrape[®]
- TracBerry[®]
- TracStoneFruit[®]

Number of copies ____ x \$20 = _____
(Total Enclosed)

2. Fill out shipping information.

Name:	
Address:	
Address:	
City, State, Zip:	
Email address:	
Phone number:	

3. Send order with payment to:

Trac Software, NYS IPM Program
Cornell University, NYSAES
630 W. North St.
Geneva, NY 14456-0462

More information on ordering Trac:

Phone: (315) 787-2419

Email: mrk25@cornell.edu

www.nysipm.cornell.edu/trac/

Integrated Weed Management in Tree Fruit

Leslie Huffman
Weed Management Specialist (Horticultural Crops)
Ontario Ministry of Agriculture, Food and Rural Affairs
Harrow, Ontario

Most growers would like a herbicide that will eliminate weeds for the season in one application, so they don't have to worry about weeds anymore, and they can focus on all the other activities necessary to produce quality fruit. However, unfortunately it's not that simple.

We know that managing weeds in tree fruit will be a challenge for growers every year. Experience has shown us that one herbicide application rarely gives season-long control, so we need to look at additional ways to increase weed control. Today I would like to highlight 3 topics that will help you with your weed management decisions:

1. Tools to manage weeds
2. Timing to control weeds
3. Impact of using herbicides

1. Tools to Manage Weeds

Herbicides are one of the **tools** we have to control weeds in orchards, and growers often overlook some other effective means of controlling weeds. Most weed management strategies will combine several of these tools, but it is important to be aware of the pros and cons of each of them:

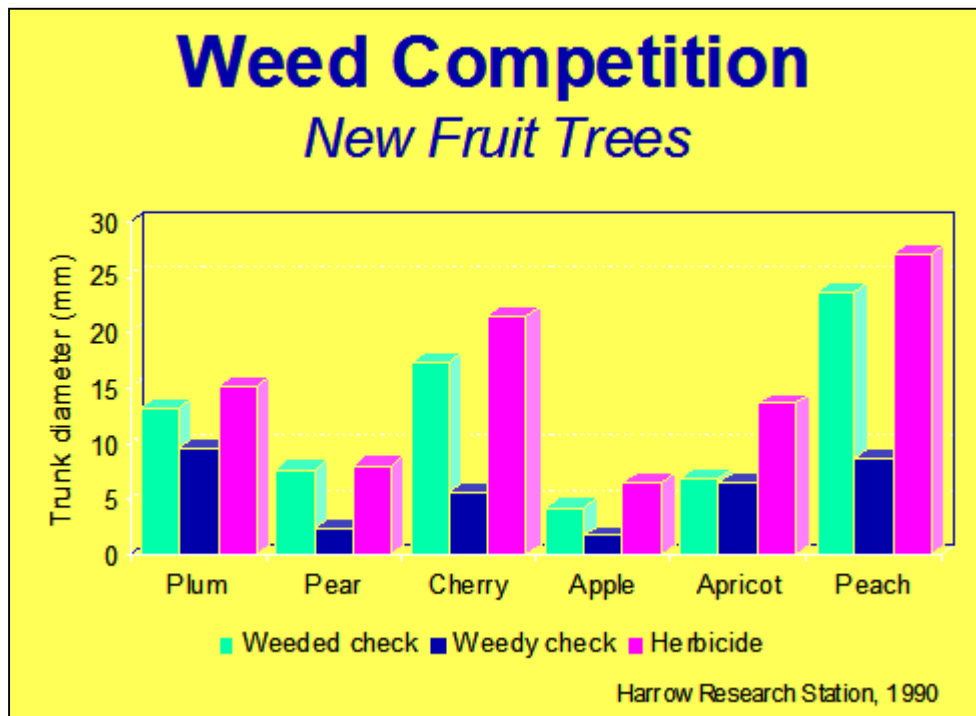
TOOL	ADVANTAGES	DISADVANTAGES
Cultivation	Effective Non-selective Equipment readily available Considered "Green"	May damage soil structure Spreads perennial weeds May damage trees/roots Short term control
Mulching	Effective Non-selective Holds moisture Considered "Green" Long-term control	Availability of mulch Cost of mulch/application Attractive to rodents May affect nutrition Must be free of seeds
Mowing	Rescue treatment Quick suppression Equipment available Considered "Green" Reduce seed spread	Weeds may still compete Quick regrowth Several mowings required May damage young trees

Flaming	Effective Quick knockdown Equipment available Considered "green" Combine with other passes	Requires fast speed Quick regrowth Risk of trunk damage Cost of propane Safety issues
Herbicides	Effective Easy to apply Can be selective Timely	Require 2% soil organic matter Directed spray equipment Effects on pest complex Cost varies

2. Timing to Control Weeds

Weed researchers are discovering that weeds will only hurt crops if present during specific times. For many horticultural crops, including tree fruit, this time is known as the **Critical Weed-free Period**.

This graph shows the reduction in tree growth from weed competition in newly planted trees. Weeds were present around the trees from May to July only, and caused the reduction in growth shown by the centre bar.



Two things are important to remember about the **Critical Weed-free Period**:

- If the crop is kept weed-free for this time, no yield reduction should occur.
- Weeds emerging after the critical weed-free period will not affect yield.

This trial and other research in orchard weed management indicates the critical weed-free period for fruit trees is likely during these times:

- New trees: May to July
- Bearing trees: budbreak to 30 days after bloom

3. Environmental Impact of Weed Management Herbicides

Whatever you do to control weeds will have an impact on the environment – and most activities will have some good and some bad effects. As seen above, mulching is considered an environmentally friendly way to control weeds, but there are some negative impacts eg. Fuel needed to grind wood chips, leachate from mulch. Mowing can reduce, but not eliminate weeds competition, but uses fuel, produces engine exhaust, etc.

Herbicides also have environmental impacts, and a team of researchers at Cornell, originally led by Dr. Joe Kovachs has tried to assess these impacts. They developed the Environmental Impact Quotient, or EIQs for most fruit pesticides, including herbicides. The entire listing can be found online at <http://www.nysipm.cornell.edu/publications/EIQ.html#table2>

The EIQ measures impact in 10 areas:

- applicator
- picker
- general farm worker
- consumer
- ground water
- fish
- birds
- bees
- beneficial insects
- ecological components

These EIQ ratings have calculated that:

- pesticides used at different rates
- pesticides used different number of application
- % active ingredient varies

To assess the impact of each spray application, calculate the Field Use Rating (EIQ) with this equation:

$$\text{Field Use Rating (EIQ)} = \text{EIQ} \times \% \text{ active ingredient} \times \text{rate} \times \# \text{ of applications}$$

Here are the Field Use Ratings for common orchard herbicides used in Ontario:

Soil-applied Residuals	Postemergents
• Sencor 26.5	• Roundup (annual rate) 26.2
• Dual 28.8	– Roundup (quack) 55.4
• Sinbar 60.5	– Roundup (perennial) 140.0
• Princep 70.7	• Amitrol (low rate) 41.3
• Devrinol 81.0	– Amitrol (high rate) 59.3
• Casoron 126.0	• Gramoxone 77.0
• Lorox 181.0	• Ignite 9.9
	• 2,4-D 53.6

Using these values, you can compare your weed management system:

Eg. Postemergent only programs:

- 3 applications of Roundup: 3 x 26.2 = 78.6 Field Use Rating (EIQ)
- 3 applications of Gramoxone: 3 x 77.0 = 231.0 Field Use Rating (EIQ)
- 3 applications of Ignite (Rely) 3 x 9.9 = 29.7 Field Use Rating (EIQ)

Eg. Postemergent + residual programs:

$$\text{Princep + Roundup (May) + Sencor (July)} = 35.3 + 26.2 + 26.6 = 88.1$$

$$\text{Dual + Princep (May) + Sencor (July)} = 28.8 + 35.3 + 26.6 = 90.7$$

These comparisons show that if you choose soil residual herbicides with low impact (i.e. low EIQ), the environmental impact can be as low as, or even less, than postemergent only programs.

The take home message is to assess each herbicide and its impact separately before deciding to use either soil residual pre-emergent herbicides, or postemergent herbicides.

These three concepts – integrating all Tools of Weed Management, targeting the Critical Weed-Free Period, and assessing the Environmental Impact of herbicides – are important components of a truly integrated weed management (IWM) system. As we continue to learn about weeds in the orchard ecosystem, we can continue to fine-tune our efforts to minimize the impact of weeds on production of quality fruit.