

GROWER FIELD GUIDE, June 2000

The subject of sprayer tank pH comes up frequently, especially when a material does not produce the results expected. Some materials require a relatively narrow range of pH, others can tolerate a broader range. The purpose of this discussion is not to determine what range an individual material should be adjusted to, but the potential for degrading the material by the sequence commonly used to fill sprayer tanks. Unless methods have changed since I actually drove a sprayer, as soon as the water was deep enough in the tank to circulate, the nutrients, insecticides and adjuvants begin to be added. When materials that can change the pH of the tank are added to a partially filled tank, their effect will be exaggerated until they are near the final dilution. If there is also an insecticide in the mix that happens to be sensitive to an extreme pH range, chemical damage could happen without you realizing the cause because by the time the tank is full and you might test the pH, it would be in the target range. The moral of the story is to adjust the pH to the appropriate range and add the sensitive materials last when the tank is nearly full.

What seems to be another misunderstanding is the relationship of half-life in the sprayer tank and effective residue on the tree. pH and the resulting hydrolysis occurs only in solution. The adjustment of the spray tank pH is to avoid rapid decomposition of material during the time you are spraying. Once the residue has dried on the tree, pH no longer exists, hydrolysis stops. I don't believe there is a practical difference in effective residue on the foliage between a material with a tank half-life of more than 24 hours and several days. While we don't have data on all of the materials we use, a general pH of 5.0 to 6.5 is recommended UNLESS the manufactures label states otherwise.

This is a good place to note that Imidan is very pH sensitive. Be sure to adjust the pH to a range of 4.0 – 6.0. We have some free test kits available. It is not necessary to check every tank, only when you change mixtures OR water sources. You should check at the start of every cover. The pH of irrigation water may change with the season, especially if you are using surface water. If you are using more than one water source to spray with be sure to check each of them.

Usually by late June I'm beginning to have discussions with growers and other fieldmen about the inability to control cherry mildew, or Psylla, mealybug, etc. My first question will always be "How good is your coverage." When I ask this question I commonly get the answer that it's either 200 or 400 gallons per acre.

Gallonage per acre and coverage are not necessarily related. Coverage is more directly related to the ability of the fan on your sprayer to replace the air in tree canopy with air coming through the nozzle section of your sprayer carrying the material into the tree. The smaller your fan, the lower your horsepower, the higher the wind speed, the slower you have to drive to get complete coverage in the center of the tree canopy. Remember that most insect and disease problems originate or spread from the center and upper portions of the tree where coverage will naturally be the poorest. One spray cover that requires 50% more time to do right will be less costly than two sprays done as quickly as possible but don't completely control the problem.

If you really want to know if your coverage is as good as you think it is, put 50lbs. of Surround in one of your spray tanks. Spray that on your biggest, densest trees. That will tell real quick what your coverage really is.

Surfactant confusion?

I get called frequently by growers, sometimes fieldmen asking if one surfactant (spreader/wetting agent) can be substituted for another. The general answer is yes. Most surfactants recommended are non-ionic, 80% or more active ingredients. The manufacturer has to tell you this somewhere on the label. I have not seen any performance difference in the orchard when I have substituted different brands of non-ionic materials of similar strength.

Why do brands change so frequently? Price and availability. We buy only a few pallets at a time to keep our costs down. When we reorder, sometimes that brand is not available immediately, or the price has changed. So we substitute another brand of equal quality. Sometimes our suppliers will offer a special price for reasons of their own. If it is attractive and we are satisfied with the quality of the product we will change brands to keep our prices down.

I know it's confusing for you, it's confusing for use too. But we are willing to do it to keep your costs down. Just remember, if it's non-ionic, 80% or better active, you can safely substitute to use up supplies on hand.

Some materials such as Retain, require a silicone based surfactant. The manufacturer will not warranty the performance if another class of surfactant is used. If a silicone surfactant has been recommended to you, don't substitute a non-ionic surfactant without talking to your fieldman.

I have freely copied and adapted information from various Research and Extension personnel and publications plus the experiences of the Fieldstaff at Northwest Wholesale for the information presented in this Grower Field Guide. Any errors in presenting that information are entirely mine, please notify me of any errors so that they will not be repeated.

All material usage information supplied in this bulletin is believed to be in compliance with current labels. It is the responsibility of the grower to insure that use of any material is in compliance with the label on the product in his possession! All material rates in this bulletin are based on dilute applications at 400 gallons per acre unless otherwise noted.

All of the monitoring aids mentioned in this bulletin and research information on most of the insects and diseases mentioned are available through any Northwest Wholesale warehouse.

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Container Recycling

Your response to Northwest Wholesales' decision to be a collection point for empty plastic chemical containers has been impressive. Last year at this time we had collected less than 500 containers at Wenatchee and Cashmere. This year I am estimating that we have collected nearly 3000 containers.

Keep'em comin'. Properly rinsed of course! There is a poster on display with pictures and detailed instructions on container cleaning at all participating locations.

If you're generating lots of empty jugs and need to store them briefly, here's an easy way to do it. After you've rinsed them and remove all of the excess labeling (plastic sleeve and booklets, etc;) put them upside down in an old apple bin. They will drain clean and stay dry and clean even if you have to leave them in the orchard under the sprinklers for awhile. No second rinsing or draining needed with this method. Just load the bin and bring'em in.

Return Bloom

Post bloom thinning conditions were mixed again this year, the weather just didn't cooperate. Growers that were aggressive and didn't wait for that perfect day but applied petal fall sprays at petal fall and 10 mm sprays at 10 – 12 mm even under marginal conditions generally have good result. I think we may be trying too hard to avoid marginal conditions and frequently miss opportunities that are costly to recover.

You may thin your fruit adequately well past the 10 to 15 mm size without assuring a bloom for the following year. If less than half of the spurs bloomed this year, return bloom is not a concern. However on trees that had good bloom and thinned late i.e. larger than 10 mm size, return bloom can be increased with one or more applications of **Ethephon** (Ethrel) beginning 45 to 50 days after full bloom. Cell division is over by this time; fruit shape will not be affected.

Wet the trees to an easy drip, 200 gallons per acre is probably adequate in most orchards, less volume may be used on smaller trees. Application under slow drying conditions will increase the absorption of the Ethephon. Use the lower rate of Ethephon if temperatures are expected to exceed 85° in the three days following application. Do not use on low vigor trees, small fruit and no growth will be the result. On very high vigor young trees you want to bring into bearing and varieties that are chronically bi-annual bearing, a second application should be made 10 to 15 days later.

Bitterpit

Frequency and duration of your calcium spray program is more important than the amount applied with any single spray, start your program with the first codling moth cover and include some calcium in every spray where it is compatible. If you plan on using summer oil applications this year, do not mix calcium chloride at more than 3 lbs. per 100 gallons of water to avoid potential injury.

MIRACAL^{sp}, a non-salt containing soluble formulation may be combined with a wide range of other materials at higher rates than Calcium Chloride. It will not increase sunburn in hot weather, as Calcium Chloride has been known to do.

Calcium Management

It has been recognized for more than 50 years that calcium is an important element for reducing fruit disorders and improving fruit quality of apples and pears. To better understand calcium behavior the following points must be considered.

- Calcium soil reserves are usually adequate, but will not be readily available in low soil pH values (soil balance).
- Calcium moves into the tree passively with water movement only on new roots, directly behind the growing tip before the bark suberizes (active root growth needed).
- Calcium moves in the tree with water to the actively transpiring leaves bypassing the less actively growing fruit (nutrient sink).
- Calcium concentration in the fruit drops as the fruit enlarges (dilution).
- Calcium may move out of the fruit to the growing tips under stress conditions (removal).
- Calcium can't compete with excess Potassium or Magnesium in the tree (antagonism).
- Calcium applied foliar will be absorbed into the fruit just below the peel, it will not move through to the other side of the fruit (coverage).
- Calcium applied foliar throughout the season has been proven more effective in reducing bitter pit and cork spot than either early or late season applications alone (frequency).
- Calcium Chloride moves through the apple cuticle faster than any other formulations of calcium that were tested (efficiency). (*MIRACALsp is being tested against Calcium Chloride in apples and pears this year.*)

Considering the points of calcium behavior above, how do you manage your orchard for the best long-term benefits from calcium?

- Maintain a soil pH of 6 - 7.5, test your good soils about every three years, and test any soils under a corrective program every year.
- Promote early season root growth by letting your soil warm up as soon as possible in the spring. Do not irrigate until the shallow rooted cover crops are showing distress, then only irrigate long enough to rewet the soil profile, do not waterlog the root zone with long irrigation sets, especially on heavy soils.
- Don't promote vigorous shoot growth on bearing trees. Highly vegetative trees have an excessive number of growing points that will always win any competition with the fruit for calcium.
- Maintain adequate soil moisture during hot weather. Soft vegetative growth stressed by heat will draw moisture from wherever it can get it, including the fruit. Some calcium will go with the moisture, it won't come back.
- Do not apply Potassium or Magnesium fertilizers unless soil or tissue samples indicate a need. Both materials compete with calcium for a place at the dinner table and will always win the competition.
- Calibrate your sprayer to insure uniform coverage of the fruit throughout the tree. Removing vigorous growth from the center of the tree early to mid-summer will aid spray coverage for both calcium and pesticides. Remove some of the competition for calcium by growing points and help improve the finish on red coloring varieties of fruit.
- Begin adding calcium with the first codling moth cover spray and continue as close to harvest as possible.

COLOR, RED COLOR, AND MORE RED COLOR.

It's kind of like the weather. Every grower talks about it, but not very many know how just what to do about it.

For forty years I've listened as growers and industry organizations talked about apple color. Generally red color — which strain was darker, brighter — or had more of it. And how poor the fruit flavor was compared to the parent variety. But that darker, brighter, redder strain was what those same growers planned to plant — as soon as they could get the trees!

Nothing has changed. Two major criteria still determine how the grower will be paid — color and size. We could have a long discussion about what ought to be, but that wouldn't change anything, at least for this harvest. The most valuable Red Delicious will still be 90% or more red color and between 80 and 100 box size.

Would you spend \$1.00 to develop more red color on your fruit if you could get more than \$5.00 back? Later in this article I will show you just how much money a relatively small color increase could be worth to you.

I make the assumption you have pruned properly. That your fruit will be exposed to lots of light in August and September when color is developing. That your nitrogen fertilizing program was early and light — no excessive nitrogen lingering into the fall and delaying color development. And that you are not going to allow mites or leafminer — or anything else — damage the leaves and detract from color development.

Is there anything else you can do to get the best color possible for the strain that you are growing?

I think there is. Allow me to tell you about some spray programs that I know have been used over the years to increase red color. And the one I think gives you the best of both approaches.

ETHREL

The first material that I personally remember was Rotonate in the late '50s. This was manufactured from material removed from the carbon filters of CA rooms. When it was applied about two weeks before harvest it did in fact increase color. Unfortunately the fruit colored because it was ripening and storage life was shortened. We now apply the same chemical (ethrel/ethephon) to accelerate sugar levels for early harvest.

POTASSIUM

In the mid '80s preharvest sprays of potassium were reputed to help in developing red color. My personal experience with this approach was inconsistency. Some years maybe yes, some years no.

To overcome this variability, growers have increased rates or made more applications. There is still a lot of variability from year to year. There have been instances of potassium treated fruit not holding well in storage because of accelerated ripening. It is also well established by researchers that an excess of potassium will suppress the trees ability to utilize calcium and magnesium, resulting in more fruit disorders such as bitterpit.

COPPER

While developing foliar nutrients for the Leffingwell Company in the early '70s, Dr. McNall noticed that the application of copper influenced the development of color on a wide range of fruits and vegetables.

By the early '90s private consultants in the Yakima area were using foliar applications of soluble copper solutions for color development with measurable results. They have related to Rick Wright, the northwest representative for NUTRIENT TECHNOLOGIES since 1991, that color response has not been consistent for them at tissue levels below 8 ppm, they prefer leaf copper levels of 12 ppm or higher.

CASCADE ANALYTICAL's area wide, long-term data base of tissue analysis shows the copper levels in the Columbia Basin and North Central Washington to be between 7 and 8 ppm. At least 4 ppm below the threshold considered necessary for consistent color development by the private consultants in Yakima who have been using this program for nearly 10 years.

Soluble copper is well known for its ability to mark fruit. One manufacturer of a foliar soluble copper recently removed the product from the market because they feared it would be used for color enhancement and mark fruit. Another manufacturer changed the label to prohibit use after bloom for the same reason.

TECH-FLO COPOCAL

In response to the demand for a safe foliar source of copper, Dr. McNall, owner and founder of NUTRIENT TECHNOLOGIES, formulated *Tech-Flo COPOCAL* and introduced it into the market in 1995. This wettable powder suspension is completely safe when applied at a neutral pH. Dr. McNall has included calcium and phosphate to make the copper safer for the fruit finish without reducing its efficiency.

Tissue analysis has shown that 1 gallon per acre of *Tech-Flo COPOCAL* will increase the copper levels by 3 or 4 ppm. Generally three ½gallon applications of *Tech-Flo COPOCAL* are required to raise the copper above 12 ppm and get consistent response. If copper levels are known to be extremely low more applications may be needed.

In 1994 and 1995 Rick Wright arranged large scale trials with packing houses in the Columbia Basin and in Pateros. Both trials had positive results, increasing the WA EX grade by 44% and 31% respectively as compared with an untreated check.

TECH-SPRAY HI-K

Most of the reports of fruit softening by the application of potassium sulfate have been anecdotal or from blocks treated without a check for comparison. To get a direct comparison, in 1995 Rick Wright arranged for a Yakima packinghouse to segregate fruit from a grower who was using both materials.

KTS was applied to one part of the block, *Tech-spray Hi-K* to the other in equal quantities. There was a single application of 1 gallon per acre approximately 30 days prior to harvest. All other operations on the two blocks were identical. The fruit was placed in long term storage, packed in June of 1996.

Pressure recorded at packing averaged 13 lbs. for the KTS treated fruit, 15 lbs. for the *Tech-spray Hi-K* block. The KTS block graded 47.6% top grade WA EX, the Tech-spray treated block graded 51.9% WA EX. — 9% better color AND better condition!

Rick relates that the grower told him at harvest the Tech-spray fruit “looks to have a little nicer color.” Field observations at this range of improvement are not reliable. The success or failure of any fruit improvement program can’t be firmly established until the fruit has been packed.

TECH-FLO COPOCAL and TECH-SPRAY HI-K

My first experience using copper and potassium in combination for color development was in Mattawa. Two adjacent blocks of Red Chief were used. They were harvested over a two-day period in the first week of September. Both the grower and I were unable to see a color difference in the field, but the pack out revealed a 13% increase in WA EX grade fruit. This fruit was harvested at minimum brix for early market without the use of Ethrel, pressures were not recorded.

I have since recommended this program to many other growers. Very few were willing to leave a check block or row, all were satisfied they had improved their fruit color and continued to use the program in following years.

Rick Wright has observed several trials on Red Delicious since then that have averaged 34% increase in WA EX. Trials on varieties such as Gala, Braeburn, Jonagold and Pink Lady in Australia have also increased the packout of the top graded fruit, usually 15% to 20%.

Copper and potassium have both demonstrated an ability to increase red color development. Dr McNall combined these elements into one program in 1996 with *Tech-Flo COPOCAL* and *Tech-Spray Hi-K* to provide more consistent results than when either is used alone.

Adding calcium and phosphate helps prevent the fruit softening frequently associated with the pre harvest use of potassium for color development. In eight years of working with growers and packing warehouses using *Tech-Spray Hi-K* for color development, Rick Wright states that he has never seen a reduction in fruit quality in either pressure or physiological disorders such as bitterpit. In many cases the treated fruit was firmer than the untreated at harvest as well as when removed from storage.

Here’s the payoff!

Using the packouts from the 1994 and 1995 trials that Rick Wright provided me, I calculated the increased value using the Grower’s Clearing House annual price summary for the 1998 – 1999 shipping season. I wanted to see what the difference would be in a low priced year.

One trial packed out at 49% combined WA & US Ex treated verses 34% combined for the untreated. Even at this very low packout, the treated fruit calculated at \$111.86 more per acre than the untreated fruit based on 45 bins per acre. (This is the same yield used in last month’s pool valuation article.) The material cost for the program I will describe later is only \$77.28 per acre, resulting in a net return of \$34.58 per acre.

I doubt this orchard exists today. I included it to illustrate the point that treating even very marginal fruit can increase value.

The second trial is a more realistic portrayal of Red Delicious blocks that are still producing. This block packed out 93% combined WA & US Ex on the treated portion versus 86% on the untreated portion. The per acre value increase in this trial is \$653.14. Again based on 45 bins per acre and 1998-99 Clearing House Summary prices.

For every \$1.00 spent on material, there would have been \$8.45 increased value!

Here's the basic program as it has been used:

Tech-Flo COPOCAL @ 2 qts. per acre

Tech-Spray Hi-K @ 2 qts. per acre

Calcium Chloride @ 8 lbs. per acre

The first application is made at 65 to 75 days after full bloom. Second and third applications are made at 18 to 25 day intervals. These materials may be combined with most pesticides that are not acidic. Do not combine with sulfur.

TECH-GRO MIRACAL_{sp}

Calcium chloride may contribute to sunburn and other fruit finish damage because of its salt content. Dr. McNall has developed a non-salt based calcium product **TECH-GRO MIRACAL_{sp}** that will not contribute to sunburn or other fruit finish damage. Rick Wright is now recommending this material in place of the Calcium Chloride. Replacing the Calcium Chloride with **TECH-GRO MIRACAL_{sp}** in the two examples above would not have been profitable in the marginal first example, but would have returned \$5.30 for every \$1.00 spent for material in the second trial. I can't calculate the value of reduced cullage from sunburn and finish damage until we have some actual trials with this material. Any volunteers?

So there it is. Ya gotta have all the fruit color you can get. Ya gotta have fruit that you know will store well. Ya gotta reduce the risk of sunburn cullage from sudden or prolonged summer heat.

Use the NUTRIENT TECHNOLOGIES COPOCAL/Hi-K program. It works on all of your coloring varieties as well as Red Delicious. Call your fieldman or get a copy of the program at any Northwest Wholesale warehouse.

The only safe **and** cost effective program I know of.

First Generation Codling Moth

As of May 18th, most areas were predicted to begin the first generation codling moth control Memorial Day weekend and into the first week of June. While slightly earlier than last year, this is still later than normal, any spraying that was done by the calendar at three weeks after bloom missed the mark by nearly a week, maybe more. Monitor the temperatures in your area and use the model for proper timing. Control of the first generation is important to avoid problems and higher costs later in the summer.

The second cover and third covers must take into account a higher possibility of needing control of aphid and possible leafroller (**see post bloom leafroller section**). Leafminer should be considered separately if possible (**see leafminer section**). Spider mite populations should be monitored, most orchards are well controlled by predatory mites, but surprises should be avoided whenever possible. (**see spider mites**)

Aphid control is **Provado** @ 3 - 5 oz. per acre with 2 - 4 oz. of **Silwet** per 100 gallons, the higher rate of Silwet normally lets you use the lower rate of Provado.

If you are not familiar with most of the predator insects in your orchard, **PNW 343, Beneficial Organisms Associated with Northwest Crops** has good color pictures of some the critters you need to know. It's available at cost at your NWW warehouse.

Post bloom Leafroller

The same cool weather that made chemical thinning difficult probably resulted in poor control of Leafroller if you relied on BT only. **Success** has proven to be an effective alternative. **Confirm** was introduced this spring as another alternative, I'll be interested to hear how it performed.

Now (early June) is a very good time to assess how good your early season controls were and how much control you may need during the rest of the year. Remember the female Leafroller does not fly very far from where she emerges so low pressure populations are usually very spotty, you must look at several locations in the orchard to determine what surviving populations you have.

If you had damage last year at harvest, that is the place to look first! Less than the best control of the overwintering generation (you could still find an occasional larva or pupa) means that you will probably need to start monitoring the first summer generation about the time of your second cover codling moth spray sometime in late June. If you achieved very good control (you can see where they were but can't find any live ones) your potential for damage is probably closer to the second generation of codling moth in July.

Unfortunately there is no reliable method of trapping to monitor for either population levels or emergence timing for small (20 - 30 acre) locations. Unlike the female Leafroller the male will move long distances in response to a pheromone lure, the catch in your trap could be from any one of your neighbors. Keep looking for the first larva to begin showing up on the back of terminal leaves in the upper center of the trees.

It is very time consuming to search for newly hatched Leafroller larva in the center of the tree. My method is to walk slowly along the row looking at the upper terminals against a bright sky. Any thin spot in the leaf caused by the feeding of the young larva will be very easy to see, down to match head size. You need to carry a pole pruner or some other means of getting some of the terminals down where you can examine them, there are other conditions and insects that will tatter or make holes in the terminal leaves. A Leafroller larva will have a shelter of webbing built against one of the major veins of the leaf before it is large enough to roll the leaf. When you find these it is time to begin your control program.

San Jose Scale

This pest is usually first noticed at harvest in isolated locations by the red spotting on the fruit or at pruning when the overwintering scales are noticed on the bark of the tree. The crawler stage may be spread to other trees by the wind, being carried on the feet of birds, on orchard equipment or even on the clothing of workers.

The best approach to orchard protection is to prevent scales from becoming established. This can be done by treating the orchard annually before bloom (delayed dormant oil & Lorsban) when buds are beginning to open and good spray coverage of the tree can be achieved easily. Summer sprays directed at the crawler stage help protect the fruit but usually do not control infestations. For this reason they are a supplement to the early season sprays, not a substitute.

It is difficult to sample for population density or potential for fruit infestation. If damage was noticed the previous harvest or reported on the cull analysis from the warehouse you should consider summer control until damage is no longer found. The crawlers of the first generation time closely with the second codling moth cover in mid to late June. Without PennCap, application timing this year will be important. If you have an uncontrolled site that you can relate your orchard to, monitor that site on a regular basis. Double sided tape wrapped around a few branches will capture the first crawler. Dan McCarthy is monitoring one or more sites this way in Okanogan County. I will ask Dan to inform use when he first catches crawlers.

Tim Smith is running a San Jose Scale model this year based on "moderate lower elevation site". This model projects about 5% crawler emergence by the first week of June, all over by the last week of June. You can use this to anticipate when you might need to control. Be sure to allow for the general differences between your site and either the model or Dan's catch sites.

We don't have a dual-purpose (codling moth and scale) material such as PennCap this season. **Esteem** has performed well for San Jose Scale control in California and test plots in Washington. Apply **Esteem** at 13 to 16 oz. per acre when the crawlers first emerge. Use oil up to 1% to improve control.

Spider Mites

Only a minority of the apple orchards in North Central Washington have to control for spider mites in any given year, sometimes we forget to watch for the critters until the damage begins to show in July and early August.

By June you should be able to find some European red mite scattered throughout the tree. Look on the older leaves. If you easily find leaves with several adults, many eggs and very few or no predators, monitor on a weekly basis until you decide who is going to win, the good guys or the bad guys.

The twospotted mite and the McDaniel mite populations will start in the center of the tree as they move up from the orchard floor and then out onto the branches as the population develops. Just a few predators will control a relatively large population of these mites, but if you find more than just a few adult mites per leaf you should also monitor them on a weekly basis.

There are two major predators of spider mites in the orchard, the most common is the **Western predatory mite** (*Typhlodromus occidentalis*). It feeds on spider mites and rust mites. The egg is oval, transparent when laid turning translucent white after a couple of days. When populations are low early in the season most eggs are laid singly on the back of the leaf along the mid vein. The oval eggs are easy to distinguish from the eggs of the McDaniel or twospotted mites, which are round, smaller and laid randomly on the exposed areas of the leaf. When twospotted or McDaniel populations are high, predator eggs will be laid among the mite eggs and in the webbing. The body of the mature predator mite is broad at the rear and tapers toward the head. They are opaque white unless they have feed recently then they take on the color of the prey. They avoid direct sunlight and will be found on the back of the leaves, usually sheltered against the mid rib of the leaf.

The other major predator of mites is *Zetzellia mali*. It feeds mostly on rust mite and European red mite. It may not be able to control high populations of mites but will maintain control of low populations if not disturbed by toxic pesticides. The eggs are round, lemon yellow and smaller than spider mite eggs. The adult is lemon yellow to reddish and slow moving. It is almost oval but more pointed at the rear and slightly smaller than a spider mite.

There are no absolute numbers for deciding at what levels to spray for mite control, experience is the best guide. Weather, time of year, tree vigor etc., are all factors to consider. If you can see that the predator mite population is building, enduring a slight bronzing of the foliage should not affect the crop, especially with a light crop, and should result in establishing or reestablishing fully integrated mite control.

Leafminer

(a reminder from May)

This is a mostly cosmetic, sometimes pest. This year you have it, next year you don't. The first generation is usually unnoticed unless populations are very high. Most of the eggs are laid on the primary leaves, the rapid expansion of the foliage covers these before the mines become visible from the top of the leaf. The second generation will be more visible as the female prefers to lay eggs on the young expanding leaves of the growing shoots. By the time this generation has reached the late tissue feeding stage (the mines are tenting up), parasitism should be fairly easy to find. You can tolerate 4 - 6 mines per affected leaf at this stage if you can find either parasite larva or pupa or dead leafminer pupa in 25% or more of the mines and will not be using a material that will destroy the parasite population. Full control with a single spray is difficult after the second generation because of the overlapping of generations and the resulting mix of all development stages later in the season. If you have some predators available and target your sprays to preserve them you won't need full direct control.

To preserve the most predators, time the spray when a majority of the adult leafminers have emerged (60% or more) and egg laying is beginning. The parasitic *Pnigalio* wasp will be just beginning to emerge and most of them will survive to attack the next generation. There are several materials that may be used to control adults. **Vydate L** at 1 pint per acre, **Malathion Methoxychlor** @ 2 qts. per acre or **Omni, Stylet or Volck Clear oil** at 1%, wetting the trees thoroughly. The oil damages the wings and renders the adult flightless, plus it will suppress any mite or leafhoppers present.

If you need to control mines in the sap feeding stage, use **Success** at 6 oz. per acre with ¼% oil, **Agrimek** @ 10 oz. per acre with 1 gal. of oil per acre, or **Vydate L** at 1 qt. per acre. None of these materials will provide good control of the tissue feeding stage, apply them as early in the egg hatch as possible.

Monitor the leafminer from the back of the leaf. The eggs are very small, nearly transparent and lime green. As they hatch the larva will begin to tunnel in the leaf making a thin white line beginning at the edge of the egg and rapidly expanding into an easily visible white spot. The mine will not be visible from the top of the leaf until the tissue

feeding stage and the leaf begins to tent up. To search for the *Pnigalio* larva you must open the mine. A pair of tweezers works well for this. Just pinch the edge of the mine and peel the loose cover off. The *Pnigalio* larva is white to cream colored and spindle shaped. It feeds on the exterior of the leafminer larva and is easy to see with a hand lens. The pupa begins very light gray and darkens to a shiny black, it is 1/4 to 2/3 of the size of the leafminer larva. If you open flat mines and find discolored or very lethargic leafminer larva, that is a pretty good indication that the *Pnigalio* wasp is active in the orchard.

If you need aphid control at second cover time and would like to increase the chances of predator control of a light to moderate leafminer population, use **Provado** at 2 ounces per 100 gallons with **Silwet** (a silicone surfactant) at 1 ounce per 100 gallons in enough volume to wet the tree to an easy drip. This will suppress a leafminer population by killing most of the sap feeding stages and allowing a high number of the *Pnigalio* wasp to survive.

Grape Mealybug in Apples

Very little research has been done on the second generation of mealybug in apples, I could not find any published articles in my files. The insect biology supplement to the 1992 WSU Spray Guide noted that there may be a complete second generation on apples beginning in early to mid July.

If you have a population in your orchard you probably know about it from previous fruit damage or the presence of the cottony overwintering egg masses. Begin to monitor the suckers originating from spray sheltered areas of the tree in late June and early July to time the emergence of the crawlers and direct the sprays against this stage. It seems that you can only kill what the spray contacts, you will probably need two applications 10 - 14 days apart to control this second generation. The larger, wax covered stages are not controllable.

Sevin, Guthion, Imidan, Lorsban, Diazinon, and Provado plus oil all seem to give adequate control if the material contacts the insect. Rotate materials to delay insect resistance.

APRICOT

Peach Twig Borer (PTB)

The first PTB catch in the Wenatchee area occurred the weekend of May 14th at Baker Flat. If you have monitored for PTB in another area and have a catch date, please call myself or Tim Smith at Cooperative Extension so timing models can be run for your area. We will update you weekly on the progress of the current generation. Check with the counter at your nearest warehouse to see what areas have models being developed, current models are faxed out each Monday afternoon or Tuesday morning. The alternative is to apply **Imidan 70WSB** or **Success** 14 days before you expect to pick the fruit.

Azinphos Methyl is no longer legal to use on Apricots.

Perfection Spot

Perfection Spot is aggravated by rain, past history has a strong bearing on how much protection you may need. **Rally 40WP** @ 5 ounces per acre, or **Orbit** @ 4 ounces per acre both work well on Perfection Spot. Combine either one with **Captan 50WP** @ 5 lbs. per acre for Coryneum Blight or Alternaria.

Weather conditions that favor either apple scab or cherry mildew also are conducive to the development of Perfection Spot, Alternaria (Apricot Freckle) and Coryneum Blight.

CHERRY

Cherry Viruses

It is rare not to find a few trees in a block of cherries that are not doing well. Especially if the trees are more than 20 years old. In most instances these trees are infected with one or more viruses. There are several cherry viruses, some quite dangerous to the future production of the block. Cherry Mottle leaf, Cherry Rasp leaf and Cherry Twisted leaf are the viruses that I see most. The best time to patrol your orchard for virus symptoms is after shuck fall, before there is enough mildew on the leaves to distort them and confuse the identification of a virus. It becomes difficult to identify viruses after harvest except for extreme symptoms.

There are two genetic disorders, Crinkle leaf and Deep Suture, that can be found by noticing abnormally shaped leaves and fruit. These disorders may be pruned out if they don't affect large portions of the tree. In young blocks you might want to top work these trees.

Extension Bulletin 1323, **Field Guide to Sweet Cherry Diseases of Washington** is a good reference to help you identify these disorders plus some others that I haven't mentioned. It may be seen at any Northwest Wholesale warehouse. Copies are available at NWW and Cooperative Extension.

Mildew

Stylet and Omni oil have received a lot of interest as an early season mildew eradicator/protectant. We have been recommending that you do not apply oil past pit hardening to avoid possible fruit damage. If the trees clean are kept free of mildew prior to GA time there should be less need to use other chemicals during the ripening and harvest periods.

If the temperature is below 90° and is expected to remain for the following 5 to 7 days, you may tank mix any of the Sterol Inhibitor materials with Kumulus Sulfur or Sulforix. Keep oil and Sulfur or Sulforix 10 to 14 days apart. None of the materials currently being used are systemic. If the foliage has not been directly sprayed it is open season for any new mildew spores that lands on it, thorough coverage is essential!

Continue to protect yourself at infection periods. Once mildew is established on the foliage and fairly easy to find and the weather is 60 to 85 degrees, 10 to 14 day intervals must be maintained into harvest, especially on the Rainier variety.

Abound is a new compound for cherry mildew, but extremely phytotoxic to some varieties of apples. This has resulted in the label for the material requiring a separate sprayer for stone fruit use only. Avoid any drift onto apples. A sprayer used for applying **Abound** must be thoroughly clean prior to selling. It is a 24 to 48 hour procedure. The complete caution and cleaning statement is available at any Northwest Wholesale warehouse, please read it before you decide to use the material.

Cherry Fruit Fly

Emergence of the first fly typically happens about the same time as GA is applied, when the fruit becomes light green to straw colored. The potential number of Cherry Fruit Fly increases as the fruit ripens, peaking during or shortly after Bing harvest. Most markets have a zero tolerance for fruit fly infested fruit so a rigorous prevention program is required. The list of acceptable materials is short.

Diazinon AG500 is not accepted in most export markets, most warehouses request that you do not use it. For local marketing or home use on dark cherries, Diazinon AG500 is acceptable. Rainier or other light skinned cherries may be marked. The preharvest interval (PHI) is 21 days.

Guthion 50WP, Guthion 3F, or Azinphos Methyl must have a 14-day interval between sprays. Guthion 3F has a 7-day PHI, all other forms of azinphos methyl have a 14 day PHI. Guthion 3F is no longer available. Existing supplies should be used up as soon as possible, the shelf life is more limited than wettable powders.

Success is newly registered for cherries this year. Use it @ 4 oz. per acre with complete coverage. It is compatible with any of the commonly used fungicides and GA. This rate will suppress but not eradicate leafroller if they are present in the larval stage. The PHI is 7 days.

Sevin in all forms has a 3-day PHI, carbaryl has a 1 day PHI. Using this material multiple times may increase your risk of post harvest mite infestation. Control of Cherry Fruit Fly is essential to protect the value of the crop, mite problems can be solved later in the season.

Pyrenone is a good fly killer but it does not have any residual control. Initial coverage must be complete. The application rate must be reduced to 80 to 100 gallons per acre to keep the cost reasonable. Harvest may continue without interruption. Consider this material to be the equivalent of an aerial ULV Malathion.

The **Micro Flo Dimethoate 4E** label allows for use both before and after harvest. The PHI is 21 days. Not all countries have a residual tolerance, check with your warehouse before you use it. Sensitive varieties such as Lapins may experience some leaf drop.

Control of Cherry Fruit Fly is based on the life cycle. It requires approximately 7 days to emerge, mature and begin to lay eggs. The ideal control schedule is to apply a material every seven days after the first fly emerges. You don't want to allow any of the flies enough time to mature and begin laying eggs. When infected fruit has been discovered at the packing house it has also usually been determined that the coverage interval has been extended to 10 to 12 days because of poor weather or harvest work. Keep your coverage on time and complete until all of the fruit is harvested, then apply a clean up spray to insure that you start off the next year clean again.

The sequence I am recommending this year begins with the GA spray and Success, 7 days later an Azinphos Methyl, 7 days later another Success, 7 days later Carbaryl. This program will provide excellent Cherry Fruit Fly control unless the interval is stretched out. It should also suppress a leafroller population. None of these materials will leave a residue that would prevent using a Vapor Gard program.

Clean up spray

To reduce the overwintering population of Cherry Fruit Fly apply ½ pint of **Dimethoate 4E** per 100 gallons of water in a dilute spray (trees fully wet and dripping easily) 7 days after final harvest. Combine with 1% oil, (Omni, Stylet or Volck Clear) to prevent mildew from forming overwintering spores. The oil will also suppress spider mites and kill most of the adult leafminers that are in the orchard. Use a minimum of 200 gallons per acre. Concentrate applications will increase the risk of leaf drop. For best results the application must be made before the fruit dehydrates or drops (no more than 2 days of post harvest catch up sleep allowed, sorry about that). I know that there is some concern about leaf drop, I have never seen enough leaf drop to have a material affect on next year's crop. I take the position that the risk of crop reduction is less than the possible loss if the crop is infested with Cherry Fruit Fly!

Vapor Gard

(in case you have forgotten since May)

I have worked with Vapor Gard on cherries for the past several years and personally would not grow a cherry crop without using it. The benefits that I have seen are as follows; increased fruit size (5% to 7%), rain is blown out of the trees easier than untreated trees, rain cracking is reduced under slight to moderate conditions. When rain cracking is severe there is no material difference between treated and untreated. The fruit finish remains bright after application and does not dull in storage. Shelf life of the fruit is increased. I have had one grower tell me that he has less wind marking on his Rainier cherries when he used Vapor Gard in multiple applications. Subjective, but possible.

There are some serious cautions that must be considered to use Vapor Gard successfully. The Vapor Gard label states that the material must be applied separately. The fruit must be clean when the material is applied. Mildew must be well controlled and the use of heavy residue sprays such as Kumulus Sulfur stopped at least 14 days before any Vapor Gard application. A dirty cherry treated with Vapor Gard can **NOT** be cleaned up at the warehouse. Orbit, Elite, Rubigan, Rally, Guthion 3F, Benlate and Sevin 4F have not caused residue problems in orchards using multiple Vapor Gard applications in the month prior to harvest. Mildew and Cherry Fruit Fly control has not been hampered by the use of Vapor Gard. No detrimental effect on the trees has been observed.

A single application of 1 gallon per acre shortly after the GA application normally results in about a 5% size and tonnage increase.

The most consistently beneficial program I have observed is one gallon per acre applied at the same timing as the GA treatment, followed by another 1/2 gallon either just before or just after each of the ground applied Cherry Fruit Fly sprays. There is no preharvest interval required. Complete and uniform coverage of the fruit and foliage is needed, don't use less than 200 gallons per acre.

If you aren't using a Vapor Gard program but want some rain protection during harvest, apply one gallon 7 to 10 prior to harvest or just before anticipated rain @ 200 gallons per acre. The material cures with about 1 hour of bright daylight and is completely rainfast after that. Vapor Gard will not set up anywhere inside the sprayer that is not exposed to bright daylight but the outside of the machine will be very difficult to clean.

Fruit pitting has become a major concern with the Lapins variety over the past two seasons. Research work done in Canada in 1979 & 1980 with Van cherries shows a reduction of pitting (65 to 84%) using Vapor Gard immediately before harvest. More work should be done locally using multiple and single applications to determine if Lapins will react the same.

Birds

Bird Shield was introduced three years ago, each year we learn more about how to use it. It must be applied at the earliest signs of bird feeding. Once the feeding patterns are established the birds are more difficult to discourage. Coverage should be directed to the tops and outsides of trees that are full sized, similar to the pattern that would be used in blossom thinning of apples. This will cover the portion of the tree where the fruit is most attractive to the birds and allow a shorter period for material breakdown prior to harvest. Young, open trees, especially central leader,

must be sprayed to a light drip only and not over sprayed. **Bird Shield** is applied as a 1% solution, do not tank mix with other products. Allow 7 to 10 days before harvest for the odor and flavor to dissipate. Do not apply while the trees are wet. Repeat the application if heavy rains occur within 24 hours of application.

PEACH/NECTARINE

Green Peach Aphid

If you have a population of Green Peach Aphid post bloom, it is my opinion that you either sprayed too late, (past bud stage 3) or had incomplete coverage. Unlike apples, adult aphids do not migrate onto peaches in the spring or early summer. The population you see now has developed from eggs laid on the tree last fall. As the colonies mature they will leave the trees for alternate hosts. If you have applied a post bloom Asana for control of Green Peach Aphid, be very alert for mite population increases during June and July.

Peach Leaf Curl

Your fall copper applications combined with a dry spring must have done the job. No calls this Spring. Don't forget to do the same again this Fall.

Mildew/Coryneum Blight

The first visible indications of a **Coryneum Blight** infection on the fruit will be a watery looking spot, some with a tendril of ooze curling out of it as the disease progresses. This usually doesn't happen without a few days of wet weather. **Ziram** or **Thiram** are a good protectants, use 5 lbs. per acre applied before the disease is established. Use two **Captan 50WP** applications @ 5 lbs. per acre 10 - 14 days apart if you can see the disease developing on the fruit.

Peach Twig Borer (PTB)

See the Apricot article for information on monitoring Peach Twig Borer. The control timing if you don't use the model on Peach or Nectarine is 7 to 10 days later than on Apricots because there is no need for a pre harvest interval at this time of the year. Success is not labeled for Peach Twig Borer. We don't have any local experience but the material is performing well in California.

PEARS

Depending on temperatures the first generation of Codling moth usually lasts for 6 - 8 weeks. A second cover will be needed 18 - 21 days after first cover, sooner if a good rain fell shortly after application. Second cover is the time to be concerned about the summer generation of Mealybug also. Use **Azinphos Methyl /Guthion 50WP or Imidan 70WSP** at maximum rates. Azinphos/Guthion is the stronger Codling Moth material, but it now has a 14-day PHI. Add a calcium material.

Mites and Pear Psylla should not be a problem if you applied a petal fall Agrimek during those short periods of warm weather following bloom. If you did not apply Agrimek and are still in a wait and monitor mode the chances of foliage damage from insect feeding increases with heat, don't let your guard down. **Pyramite** or **Provado**, plus 3 to 4 qts. of **Volck Clear** oil per acre with either one, (Provado will also provide control of Mealybug) or **Mitac** should be good alternatives for mid summer control of Psylla. **Vendex** or Vendex plus **Apollo** will be needed with Mitac or Provado if mites are a target.

Fire Blight

Secondary bloom on Bartlett begins 2 - 3 weeks after petal fall and continues for up to a month. It will be worth your while to physically remove any open bloom within two to three days after any infection period. As Tim Smith says, that control method is 100 percent effective if done carefully. If you choose to apply Mycoshield, monitor the daily temperatures and compute your risk by using the **CougarBlight** model. Managing your risk in this manner will save you time and money verses 'just in case' spraying. It will also preserve the use of the only currently effective material by slowing resistance development. Copies of the CougarBlight 99F are available at any NWW warehouse.