Southeastern Regional Peach Newsletter

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Editors Note

All too often, I admittedly tend to be one of those "glass half empty" people. However, at this point, I think I am feeling something akin to optimism as I review the depth and breadth of information contained in this newsletter. The spirit of cooperation within this industry is growing, and it has to make one feel that we are involved in an endeavor which is greater than the sum of the parts. Much of the information contained in this newsletter comes from cooperative efforts – involving producers, researchers, extension personnel, and industry representatives. Research and extension personnel receive incredible support from the peach industry, both monetarily and in cooperative research ventures. As such, on behalf of the research and extension community, let me express my thanks to producers and industry leaders for the support which helps to generate this information.

This months newsletter contains extensive information on scale control, packing house preparation, copper usage for bacterial spot control, and glyphosate selection – very practical and timely information. I hope this peach season is prosperous for all of us.

Phillip M. Brannen
Editor

Focal Points – New Information for the Peach Industry

Suggested Spray Schedule for Maximum Resistance Management of Brown Rot. As mentioned in the last newsletter, DMI-resistant *Monilinia fructicola*, causal agent of brown rot, strains have been detected in Georgia. The geographic extent of the resistance is not known, but it is suggested that producers take a conservative approach relative to resistance management. With only two classes of chemistry available for control of preharvest brown rot, the DMIs and strobilurins, we have a critical need to extend the use of these fungicides as long as possible. If utilized as indicated, the following chart allows for good control of brown rot, while optimizing resistance management with the current arsenal of fungicides at our disposal. It is suggested that the entire industry may want to consider such a management program; since resistant strains have been found in Georgia, there is no reason to assume that other locations will not observe resistance as well. Of interest, Dr. Katie Stevenson (University of Georgia) has also recently confirmed DMI resistance development in pecan scab populations in Georgia.

Suggested Spray Schedule for Maximum Brown Rot Resistance Management

Phenology (Growth) Stage	Dry Periods	Wet Periods
10% Bloom	----	Topsin M[a] + Captan; or Rovral; or Vangard
50-75% Bloom	Bravo	Bravo
Petal Fall/Shuck Split	Bravo	Bravo
Cover Sprays	Sulfur	Captan
First Preharvest Spray	Captan	Abound or Topsin M[a] + Captan
Second Preharvest Spray	Pristine	Pristine
Third Preharvest Spray	Orbit or Elite or Indar	Orbit or Elite or Indar

[a]Do not use more than one application per year of Topsin M, since resistance develops rapidly with the benzimidazole fungicide class.

Scholar application information. Sukas Wartanessian is the director of research and development for the Decco products managed by Cerexagri, Inc. He recently shared information with us relative to recommendations for his products and optimized Scholar application. Though we continue to investigate the optimum use of this important product, this information is of value to the industry, since it is the best information we have to date. The basic information derived from conversations and brochures from Sukas can be found in the bullet points below. Additional detailed information can be found by linking to two fact sheets from Decco ("2003 Stone Fruit For California" and "Stone Fruit Fungicide Application").

Post-Harvest Disease Control

- Scholar is the best option.
- Controls brown rot, Rhizopus rot, Botrytis rot and Gilbertella rot.
- High volume application: rate is 8-16 oz. in 25-100 gallons of an appropriate water, wax/oil emulsion, or aqueous dilution of a wax/oil emulsion, applied to 200,000 lbs. of fruit.
- Low volume: rate is 8-16 oz. in 7-25 gallons of an appropriate water, wax/oil emulsion, or aqueous dilution of a wax/oil emulsion, applied to 200,000 lbs. of fruit.
- Dip application: 8-16 oz. in 100 gallons of an appropriate water, wax/oil emulsion, or aqueous dilution of a wax/oil emulsion.

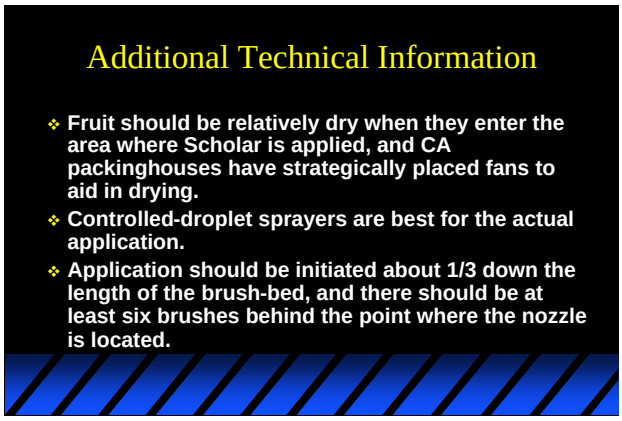
Additional Technical Information

- Suggested water:wax ratio is 3:1.
- 25 gallons per 200,000 lb fruit.
- With more diluted wax (or higher volumes), there is too much loss from the fruit (doesn't stick) and it is hard to get satisfactory fludioxonil residues.

Sukas Wartanessian PhD
Director, R&D
DECCO, Cerexagri Inc.

Additional Technical Information

- The waxing brushes should be horse hair or 50:50 horse hair-nylon.
- Agitation (60-120 rpm) is critical.
- The wax-Scholar mix is stable for weeks or even months.
- Fungicide residues tend to be higher in undiluted wax and lower when diluted wax or water are used as the carriers.
- Excess water on the fruit, carried into the applicator, will cause dilution of the fungicide mixture.



Entomology Update

Scale Management in Peaches

David Jenkins and Dan Horton,
University of Georgia

The most insidious insects peach growers are likely to encounter are the white peach scale and the San Jose scale (Figs. 1 and 2). These immobile insects can rapidly decrease the vigor of your trees, ultimately resulting in their untimely death. In addition, they can infest fruit, reducing its sale value (Fig. 3). Successful scale management relies heavily on knowledge of the beast's life history: Actions taken at the wrong time are not only costly but ineffective. With this in mind we will briefly describe the life histories of these two insect pests and then outline strategies that exploit these life histories to the grower's advantage.

Fig. 1. A heavy white peach scale infestation on a peach limb.

Fig. 2. A heavy infestation of San Jose scale on a peach limb.

Fig. 3. San Jose scale infesting peach fruit.

Life History

White Peach Scale: Adult female white peach scale survive in a dormant state through the winter. Most of these females were fertilized in the fall and so they are just waiting for it to warm up so they can begin laying their eggs. She begins by laying female eggs only and then switches to laying only male eggs. Crawlers, little mite-like juveniles, hatch from the eggs and are able to disperse. Females tend to disperse further from the mother while males tend to settle down closer to the mother. It is important to consider, though, that crawlers can also be dispersed by the wind or animals and can easily spread from orchard to orchard. The crawler is the only mobile stage (except for the adult male) and is the stage that is most susceptible to insecticides. When the crawlers find a suitable place to settle down they insert

their straw-like mouthparts into the vascular tissue of the tree and begin to feed. They also begin to secrete a waxy coating that will protect them from most insecticides. Females will stay put the rest of their lives but males will eventually emerge as winged insects that fly off in search of females to mate with. In the Southeastern US there are four to six generations per year.

San Jose Scale: (Fig. 4) Males and females of the San Jose scale overwinter as partially developed dormant adults. They resume development when sap flow begins and become adults at about the time the trees begin to bloom. The females are round and the males are oblong. As in the white peach scale, San Jose scale males will emerge as winged insects that seek out immobile females to mate with. Unlike white peach scale, this species dispenses with the process of laying eggs: The female gives birth to crawlers that are immediately able to disperse about the tree and the orchard! Once again, the crawler stage is the most susceptible to most of the insecticides used by peach growers during the summer, so in-season treatments target this stage specifically. There are four to six generations per year in the Southeastern US.

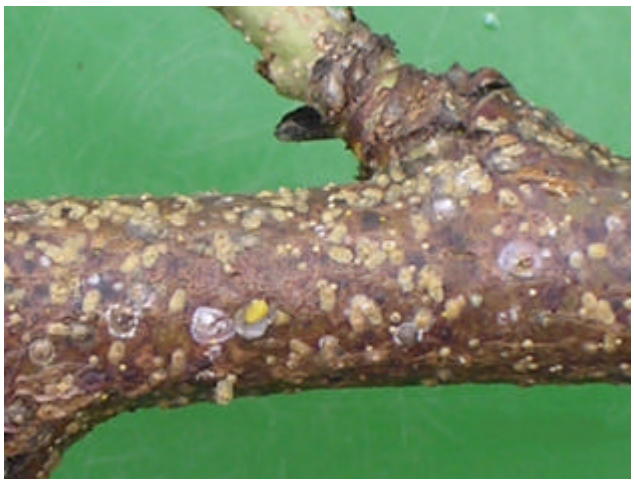


Fig. 4. San Jose scale on a peach branch. A cover has been lifted off of one to reveal the female.

Control Measures

Dormant Oils: The backbone of every grower's scale management strategy should be an application of dormant oil in the winter and most growers should try to get in two applications. Unlike most insecticides, dormant oils are effective against the adult and pre-adult stages of both scale species. They work by coating the scale with a layer of oil that smothers them. Furthermore, dormant oils are applied in the winter when there is no foliage to reduce the amount of oil reaching its target, the scale. Under the most optimal of conditions, a thorough application of dormant oil should result in over 90% mortality of scale in your orchards. Optimal is certainly the objective, but how can growers, but what is a thorough application? Typically, dormant oils should be applied at 1-2% and a 500 gallon tank should cover 4 acres. Reducing the tractor speed greatly improves coverage and is more effective than increasing the percentage of oil used in the application. Remember; your

objective is to coat the scale with a layer of oil that will smother them. Use of the yellow water-sensitive cards is a good way to take the mystery out of whether coverage is what you want.

Some caveats about using dormant oils: To be most effective and to prevent horticultural damage to your trees, dormant oils should be applied when the temperature is going to be between 28°F and 80 ^{o}F within the next 24 hours. Conditions that "soften" the tree's dormancy, warmer temperatures followed by sudden drops call for more caution. One way to keep spraying is to adjust oil concentration from 2% down to 1.5%. And its wise to back off when If the temperature is going to drop much below 28°F (say, 22 ^{o}F) within the next three days of your application you should probably postpone application until the temperature warms. Also, dormant oils should have done their job within 48 hours of the application, so if it rains after that there is no harm done.

After-Application Scouting: Oil cannot cover every nook and cranny on every tree. Some scale insects will be hidden in fissures in the bark, or may be nestled safely under buds. Examine oil-treated blocks about a week after the dormant oil was applied. Look at twigs from problematic blocks under a hand lens you can estimate how effective your campaign against scale was. When you peel back the cover of the scale with a needle or a pocketknife you should see a black, dried-up specimen if you have been successful. If you see yellow or orange specimens (Fig. 4) then you should apply a second dormant oil if you haven't already done so, or adopt the measures listed below. Remember to look under the buds!

Esteem® at Pink: Some blocks in your orchard may be more worrisome in terms of scale infestation. In these blocks you may want to consider using Esteem®, an insect growth regulator that has proven very effective against scale when applied at the pink stage of the tree.

In-Season Applications: This really is your last ditch effort in scale management and should be used only if you think you are in danger of having scale-infested fruit. An in-season tank-mix Imidan® or AZM plus Esteem® timed to coincide with initiation of the crawler stage will be very effective. Unfortunately, applications at other times are no better than your standard in-season sprays alone! To time crawlers you will have to be vigilant, monitoring scale populations in your orchard every week. Using a hand lens and a pocketknife you can lift the cover off of a number of scales in your orchard and look for eggs or crawlers. You may want to invest in an inexpensive microscope to look at scale samples under.

In-season cover spray applications with our standard OP materials are only modestly effectiveness and will only maintain scale populations at current levels, not reduce them. It is useful in combating scale infestations on fruit but is of limited value otherwise. The foliage prevents much of the pesticide from reaching its target and the pesticide is only effective against the crawler stage. As always, be aware of your pre-harvest intervals and your re-entry intervals when applying in-season pesticides.

Summary

Scale infestations can be a frustrating problem but persevering at a sound management program will pay off in the end. Apply your dormant oil in the winter, making sure you get good coverage. Scout your blocks to ensure that you have killed all of your scale. In problematic blocks follow up with an application of Esteem® at pink. If things are still out of hand and you are certain that your fruit will be infested, be patient and apply Esteem® or Imidan® when you or your county extension agent has determined crawlers are present.

Acknowledgments

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Weed Science Updates

Mirror mirror on the wall, show me the best Glyphosate formulation of them all

Wayne Mitchem,
North Carolina State University

Glyphosate has been around for a long time and is probably the most widely used herbicide in the world. That being said, you would think there would be little confusion on glyphosate or glyphosate products. Unfortunately, this is not the case. Commonly when a product's patent ends something far better is in the market place and being widely used. That is not case with glyphosate because of the development of glyphosate tolerant crops. Growers of cotton, soybean, and corn can use glyhosate over the top of genetically modified varietiesis. I recently saw an estimate that 75% of the soybean acreage in the United States receives at least one application of glyphostate. That acreage alone is in the millions and does not include glyphosate tolerant cotton or corn acreage. Every major chemical manufacturer or chemical formulator wants to have a portion of that acreage treated with "their" glyphosate product. The beneficiary of all the competition has been the growers. Last summer I know of glyphosate formulations selling for less than $18 per gallon, which equates to $4.50 per acre for a 1 qt per acre application. This is a cheap price for weed control.

Each year I get questions from growers regarding glyhosate formulations. There are a number of formulations being marketed to growers. In fact, Monsanto is marketing 9 glyphosate formulations themselves. Some with surfactant, some without, some more concentrate than others, which creates confusion in the market place for the consumer (you the grower). Below are four commonly asked questions regarding glyphosate formulations along with answers.

1. Are generic glyphosate formulations as effective as name brand glyphosate products like the Roundup formulations?

Each year there is discussion regarding the effectiveness of one glyphosate formulation over another. The bottom line is glyphosate is glyphosate. I am not aware of any one formulation providing superior weed control over other formulations. There has been evidence that some Roundup Ready Crops are more sensitive to one specific glyphosate formulation than others but for our purposes in fruit crops this is not a concern because contact with the crop must be avoided. We do not have Roundup Ready Fruit Trees.

Data in Table 1 indicates that weeds respond similarly to most glyphosate formulations. Even morningglory control, which can be difficult to achieve with glyphosate, ranged from 92 to 94 % 18 days after application. All glyphosate products provided 100% control of johnsongrass and Palmer amaranth 18 days after application.

Table 1. **Weed Response to Equivalent Rates of 7 Glyphosate Formulations.**

Herbicide Treatment		**% Control - 18 Days After Application***		
Glyphosate Formulation	**Rate****	**Morningglory Species**	**Johnsongrass**	**Palmer Amaranth**
Roundup UltraMax	19.5 oz A^{-1}	94	100	100
Roundup WeatherMax	16 oz A^{-1}	92	100	100
Glyfos Induce	24 oz A^{-1} 0.5 % v/v	92	100	100
GlyStar Induce	24 oz A^{-1} 0.5 % v/v	93	100	100
GlyphoMax Induce	24 oz A^{-1} 0.5 % v/v	92	100	100
Touchdown IQ	24 oz A^{-1}	93	100	100
Clearout 41 Plus	24 oz A^{-1}	93	100	100

***Data courtesy of Dr. A. C. York, Crop Science Dept., N.C. State Universtiy, Raleigh, NC.*

2. Are some glyphosate formulations more rainfast than other formulations?

Pesticide labels are held up to be legally binding directions for growers to follow when using a product and provide guidance for expectation of product performance under certain conditions. In order to try to best answer the question I spent some time reviewing 15 or so glyphosate labels from various manufacturers. It became apparent that the answer depends on whether the formulation in question has a surfactant included in the formulated product.

Labels for glyphosate products (regardless of manufacturer) that DO NOT have a surfactant included with the formulated product are reasonably clear on rainfastness. If rainfall does

not occur within 6 hours of application the product should perform as expected. If glyphosate has been applied more than 2 hours before rainfall but not 6 hours, effectiveness may be reduced. In situations where rainfall has occurred within 2 hours of application effectiveness may be reduced enough that the weeds will have to be treated again.

The rainfast interval for glyphosate products with surfactant included is addressed vaguely on the label. Regardless of manufacturer, all the labels I read had a statement similar to the example given below.

*"Heavy rainfall soon after application may wash this product off the foliage and a repeat application may be required for adequate control"***.**

- Roundup WeatherMax , January 28, 2004

So to answer the above question one must know the definition of "soon". I suspect the rainfast interval to be at least 2 hours given statements on glyphosate product labels that do not contain surfactant, however that is an assumption.

3. If a surfactant is included in the glyhosate formulation is it beneficial to add additional surfactant or ammonium sulfate?

This came up several years ago when glyphosate formulations including surfactant begin to be marketed. We looked at several rates Roundup Ultra with and without surfactant or ammonium sulfate. Our results indicated that if low rates (Roundup Ultra at 1 pt/A) were applied to weeds marginal in size it was beneficial to add additional surfactant or ammonium sulfate for controlling some species (common ragweed and morningglory). When full rates were applied (1qt/acre or Roundup Ultra) there was no benefit to adding additional surfactant.

However there are situations you might consider adding ammonium sulfate or a surfactant. If the glyphosate is being applied to weeds under stress a spray additive may improve glyphosate uptake.

4. I have been told that generic glyphosate formulations do not include fruit uses on their label. Is that true?

Of the four questions this one is the most surprising. Some marketers of glyphosate products are indicating to growers that less expensive, generic glyphosate formulations do not have fruit uses included on the label. There may be an exception, but of the formulations I looked at today all included uses for fruit crops on their labels. In the event an exception exists read the label to verify the use for a particular crop.

Horticulture Update

Preparing the Packinghouse for the 2004 Peach Season

Kathy Taylor
University of Georgia

The Southeastern peach industry is known for the high quality of its fresh peaches. As the 2004 peach season approaches, it is time to ready the packinghouse for output of the best peach product. There are several areas in the packing facility that should be considered.

Hydrocooler. Consider running food safe detergent at 0.5% with appropriate defoamer (according to label) addition through the hydrocooler in preparation for the season. Cleaning the cooler in this way will remove contaminants that build up throughout the season and can cause fruit inking. If you elect to do this, be sure to do it at least two times. The first cleaning will dislodge these materials, but the second will more thoroughly remove them from the hydrocooler. Using pressure washing will improve your results.

Packing-line. As with the hydrocooler, contaminants accumulate on the packing-line, particularly on the brushes at the waxer. Research has shown that wax from the brushes accumulates pesticide residues. It is important to remove this source contamination not only at the beginning of the season but regularly throughout the season, if not daily, then weekly. Use a food safe detergent with brushing of the brushes while they are spinning.
One of the best ways to improve fruit quality is to improve transitions that can cause damage on the packing-line. Our laboratory tests demonstrate that drops greater than 3 inches on metal and 6 inches on cardboard can cause injury to peach fruit as will velocity increases greater than 3 meters/s^2. This translates to a need to reduce the velocity and height of some drops, especially the drop of fruit onto and off of the packing line. Slowing the speed of fruit dropping onto the packing-line at the dry dump and into the packing box at the volume filler are two sites where great risk of damage can be mitigated. In addition, sites on the line where the direction of travel changes are locations of high risk for fruit injury. At these locations, use of foam padding to cushion impacts or addition of curtains to slow velocity can give significantly reduce damage risk. In addition, reducing the slope of fruit drops can reduce velocity and reduce damage risk. An audit of your packing-line can establish points where padding or curtains can be added or slope of drop reduced. In Georgia, have your county agent contact my office to arrange an audit.

Cold room. As with the packing-line, careful scrutiny of cold room facilities can improve energy management of the packinghouse, reducing costs of operation and improving storage conditions of fruit. Cold room entry curtains and door seals should be replaced annually and examined periodically during the season to determine if repair or further replacement is needed. An audit of the cooling unit will determine whether it is operating optimally. Cold room audits in Georgia can be arranged through your county agent.

Food Safety. Many packing facilities are now attaining food safety accreditation. Even if you have not developed a program of Good Agricultural and Management Practices it is important to attend to several areas in the packinghouse to safeguard your product and your reputation. Some of the recommendations given above impact not only fruit appeal but also fruit safety.

Many buyers are now asking for a determination of pesticide residues on fruit they purchase. We have found that fruit pesticide loads entering the packing facility are below EPA tolerance maximums when recommended pesticides and their preharvest intervals are observed. After hydrocooling and fuzz removal by brushing the pesticide load on fruit is nearly undetectable with pesticide testing, but reloading of pesticides on fruit is possible if waxing brushes are not cleaned on a regular basis.

In addition, some retailers are asking for assurance that the fruit they purchase are free of human pathogens. Development of a food safety program that includes worker vigilance to support food safe practices such as hand cleaning and the wearing of latex gloves to avoid peel damage from fingernails will help assure produce free of human pathogens. For this program, be sure to equip the packing facility with hand cleaning stations, provide hand-cleaning instructions and be prepared to enforce regular cleansing by employees and visitors. It is important that simple measures are taken to ensure that the facility is free of rodents. Do a "spring cleaning" in the packing facility that removes all items other than approved items necessary to perform the packing process. All other items should be stored in other areas of the farming operation. Maintain good stock rotation practices for fruit boxes and other packaging materials. Use a regular pest management service that manages vermin with approved materials for a food handling facility.

Make an effort to assure that foreign objects do not end up in the pack out. Packing line employees should not have food or drink containers in the inspection or packing areas. They should be asked to limit jewelry to wedding rings and properly secured watches. Traffic and storage areas above the packing-line must have a lip that prevents the fall of foreign items onto the line. Make sure all lighting is covered with protective material that will prevent contamination of fruit or the package below with glass if it shatters.

Plant Pathology Updates

Copper-containing Fungicides/bactericides and their use in Management of Bacterial Spot on Peaches

David Ritchie
North Carolina State University

The bacterial spot pathogen (*Xanthomonas arboricola* pv. *pruni*) is sensitive to copper. There are many factors that affect the efficacy of copper in the control of bacterial plant pathogens. The most important property contributing to the biological activity of copper is its ability to

exist in what is termed the “free” or “ionic” state. In nature, copper almost always is combined with other elements or minerals. When conditions become such that copper exists in the ionic or in the free copper state, it is very reactive. It is this reactive nature that gives copper the ability to kill bacteria. Also, it is this reactiveness that is responsible for phytotoxicity. The amount of copper in the ionic state is greatly influenced by pH of the solution (eg. droplet of water on the leaf). The more acidic (pH below 7.0) the solution the more free copper and the more bactericidal but potentially the more phytotoxicity it becomes. In contrast, the more basic (pH greater than 7.0) the solution the less free copper and less bactericidal but less potential for phytotoxicity. The goal is to achieve a balance between these two extremes.

Copper-containing materials have been used on peaches for many years and its use may be increasing. It should not be forgotten that **peaches can be very sensitive to copper and if improperly used serious phytotoxicity can occur. Be sure that the correct rate of copper is used and that sprayers are correctly calibrated.** Phytotoxicity is more likely to occur when conditions are slow drying (more than 20 minutes) and cool (less than 55F). Injury is usually to leaves resulting in discoloration, shot-hole, and defoliation.

There are numerous copper-containing fungicide/bactericide products and formulations. The amount of “metallic (elemental) copper equivalent” in these products ranges from slightly more than 5% to greater than 50%. Thus the amount of formulated product used per acre can vary greatly. To be able to make standard recommendations for these different formulations, recommended rates per acre are expressed as the amount of metallic (or elemental) copper in the product. This approach works well for most copper formulations but not for some of the “liquid-type” formulations such as Copper-Count-N and Tenn-Cop 5E, which contain less than 10% metallic copper.

In TABLE 2, are listed the trade name, copper formulation, the metallic copper equivalent, manufacturer, and the re-entry time of commonly available copper fungicides/bactericides used on peaches (please be aware that some products may not be labeled for use in all states – always read the product label before using). TABLE 3 lists formulations of copper likely to be used on peaches against bacterial spot <u>from delayed dormant</u> through <u>shuck split.</u> The top row of the table lists the rate/acre (A) of metallic copper. Just below that is stated the tree growth stage for which the rate is recommended. Within each column is listed the formulated rate of product/A containing the corresponding metallic rate for the different products. Product trade names in **BOLD (*)** print are the formulations that have been most extensively tested and used in North Carolina since the early 1990s to develop the recommendations provided here. Other formulations may perform as well, but have not been tested. Rates per acre are calculated to the nearest 0.01 lb then rounded to the nearest 0.1 lb or fluid ounce (fl oz). A variation of approximately 10% in rate/A should not significantly affect the activity but must NOT EXCEED the label rates. An important characteristic of copper is that it is protective and not curative, thus to be effective copper must be present prior to occurrence of conditions for infection (ie, the presence of moisture such as rainfall or dew). This also means that good spray coverage of the tree is essential. The higher rate should be used on highly susceptible varieties or in orchards where bacterial spot has been damaging or weather conditions are very favorable for disease.

TABLE 2.

TRADE NAME	FORMULATION	METALLIC COPPER EQUIVALENT	MANUFACTURER	RE-ENTRY INTERVAL (HR)*
BASICOP	53% elemental copper	53.0%	Griffin, LLC*	24
CHAMP WP	77% copper hydroxide	50.0%	NuFarm Americas, Inc.	24
CHAMP Dry Prill	57.6% copper hydroxide	37.5%	NuFarm Americas, Inc.	24
CHAMP Formula 2	37.5% copper hydroxide	24.4% (3.0 lb/gal)	NuFarm Americas, Inc.	24
C-O-C-S WDG	74.8% copper oxychloride 14.2% basic copper sulfate	50.0%	UAP- Loveland Products	24
COPPER-COUNT-N	Copper ammonium complex	8.0% (0.784 lb/gal)	Mineral Research & Development	12
CUPROFIX DISPERSS	36.9% basic copper sulfate	20.0%	Cerexagri, Inc.	24
KOCIDE 101	77% copper hydroxide	50.0%	Griffin, LLC	24
KOCIDE 2000	53.8% copper hydroxide	35.0%	Griffin, LLC	24
KOCIDE DF	61.4% copper hydroxide	40.0%	Griffin, LLC	24
KOCIDE 4.5 LF	37.5% copper hydroxide	24.4% (3.0 lb/gal)	Griffin, LLC	24
TENN-COP 5E	58.0% copper salts of fatty and rosin acids	5.14%	Griffin, LLC	12

* Griffin was purchased by DuPont in 2003.

TABLE 3.

	Metallic Copper/A	2.0 – 2.5 lb	1.0 – 2.0 lb	1.0 lb	0.5 lb	0.1 - .25 lb
	Tree Growth Stage	Delayed Dormant to Early Bud-break	Pink Bud	5 -10% Blossoms Open	Petal Fall	Shuck Split/Shuck-off
TRADE NAME	**METALLIC COPPER**	**PRODUCT/A**	**PRODUCT/A**	**PRODUCT /A**	**PRODUCT/ A**	**PRODUCT /A**
BASICOP	53.0%	3.8 – 4.7 lb	1.9 – 3.8 lb	1.9 lb	0.9 lb	0.2 – 0.5 lb/A
CHAMP WP	50.0%	4.0 – 5.0 lb	2.0 – 4.0 lb	2.0 lb	1.0 lb	0.20 – 0.50 lb/A
CHAMP Dry Prill	37.5%	5.3 – 6.7 lb	2.7 – 5.3 lb	2.7 lb	1.3 lb	0.27 – 0.67 lb/A
CHAMP Formula 2	24.4% (3.0 lb/gal)	85.3 – 106.7 fl oz/A	42.7 – 85.3 fl oz/A	42.8 fl oz/A	21.3 fl oz/A	4.3 – 10.7 fl oz/A
C-O-C-S WDG	50.0%	4.0 – 5.0 lb/A	2.0 – 4.0 lb/A	2.0 lb/A	1.0 lb/A	0.20 – 0.50 lb/A
***CUPROFIX DISPERSS**	20.0%	10.0 – 12.5 lb/A	5.0 – 10.0 lb/A	5.0 lb/A	2.5 lb/A	0.5 – 1.3 lb/A
***KOCIDE 101**	50.0%	4.0 – 5.0 lb/A	2.0 – 4.0 lb/A	2.0 lb/A	1.0 lb/A	0.2 – 0.5 lb/A
***KOCIDE 2000**	35.0%	5.7 – 7.1 lb/A	2.9 – 5.7 lb/A	2.9 lb/A	1.4 lb/A	0.3 – 0.7 lb/A
***KOCIDE DF**	40.0%	5.0 – 6.3 lb/A	2.5 – 5.0 lb/A	2.5 lb/A	1.3 lb/A	0.3 – 0.6 lb/A
KOCIDE 4.5 LF	24.4% (3.0 lb/gal)	85.3 – 106.7 fl oz/A	42.7 – 85.3 fl oz/A	42.7 fl oz/A	21.4 fl oz/A	4.3 – 10.7 fl oz/A

Based on current knowledge concerning use of copper to management bacterial spot on peaches, the “low-rate” formulations of copper such as Tenn-Cop 5E are best used post-bloom in cover sprays rather than in the pre-bloom sprays. Rates of Tenn-Cop 5E range from 4 – 8 fl oz/A applied in 100 – 125 gal water/A. Tenn-Cop 5E can be alternated with Mycoshield 17W on a 7-14 day interval depending on frequency of rainfall, which is used at 0.75 – 1.25 lb/A. Also, the label for Tenn-Cop 5E states that it is limited to a maximum of six (6) post-bloom cover sprays.

Application of Early-Season Copper Sprays

2.0-2.5 lb Cu/A

Early Bud-break

1.0-2.0 lb Cu/A

Pink-Bud

1.0 lb Cu/A

Blossoms Opening

NOTE: The rate per acre is expressed as the metallic or elemental copper equivalent, NOT the product rate.

Application of Early-Season Copper Sprays

0.50 lb Cu/A

Petal-fall

0.10-0.25 lb Cu/A (+ Mycoshield 0.75/lb/A?

Shuck-split/Shuck-off

Unacceptable copper phytotoxicity may begin to occur at this stage

NOTE: The rate per acre is expressed as the metallic or elemental copper equivalent, NOT the product rate.

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