

Current outlook

Weather influence on end of dormancy and bud break

Orchards along the Illinois and Wisconsin border are reporting their first signs of bud break on early varieties such as Ida Red. Most orchards in southern Wisconsin should be experiencing bud break on many cultivars this week and should expect development to move steadily, increasing the risk of a possible scab infection next week. Orchards in central Wisconsin and Minnesota and north to the Twin Cities are still at silver tip and have not shown significant signs of bud swell.

This year's winter dormancy was marked by no extended periods of extreme cold or warm temperatures. Temperatures in the -15°F to -20°F in mid-January were enough to kill powdery mildew inoculum, but not enough to generate concerns over severe winter injury to the trees. Temperatures are forecast to fluctuate over the next ten days, marked by lows in the teens on April 6 and highs in the 70s on the 12 and 13th of April. Overall, daily high temperatures should fluctuate between the low 50s and the 70s for the next ten days. Look for warm nights in the upper 40s and 50s paired with high temperatures in the 70s as conditions driving tree growth.

Degree day accumulations have begun to pick up and while important to tracking and monitoring insect growth and development, they are not the greatest predictor of when spring will arrive. Soil moisture and soil temperature are also relevant, among other factors to determine when spring fully arrives. The recent spring rains and forecast for more rain, combined with recent warm temperatures positions crop development to begin as soon as there are consistently warm temperatures. In southern Wisconsin, the NEWA station at the West Madison Agricultural Research stations accumulated 116 DD base 50°F, compared to the 12 DD base 50°F that had accumulated by this time in 2025. Looking at lower temperature thresholds associated with plant growth, a base of 41°F is often used. This year 159 DD base 41°F have been accumulated, whereas last year we had 109 DD base 41°F.

The important take away regarding any effort to look ahead and predict what might happen this spring is to develop several scenarios which address how the weather will impact crop management and early sprays. At this point, it is safe to say it is not going to be a late spring. The more relevant question to ask is, "Will we have a long or short pre-bloom period, and will it be a wet or dry spring? The later the bud break, the less likely there will be an extended pre-bloom period, and this may compress the windows for early sprays and situations may arise where an orchard goes from tight cluster to bloom in just a few days. If anything, the short-term forecast is calling for a wet spring, which may make it difficult to time copper and oil sprays, and will position orchards for rapid growth as warm weather presents itself.

In the paragraphs below we outline the different strategies to support your copper and oil applications at green tip and tackle early scab management. In the near-term growers need to be aware the freeze on April 6 will prohibit oil applications through the 8th. After April 8th most growers should be able to avoid freeze concerns for the next week and need to look for an appropriate weather window to apply copper, oil or their first EBDC fungicide.

Traditional timing of copper

Copper is traditionally applied at silver-tip to avoid the damage it can do to green tissue if applied at later growth stages. Experience has shown the damage potential increases when higher rates are used and/or when tank-mixing with oil. Freeze events just prior to and after copper and oil applications exacerbate this risk and many labels for dormant oil advise against applying 24 to 48 hours before and after the freeze event. If an orchard has significant fire blight inoculum, copper remains an important application which can reduce the population of *E. Erwinia* bacteria. If copper is needed but will be applied to trees beyond silver-tip, reduce the rate and amount of oil, as described below.

Fire blight

- **Timing of copper:** Copper is traditionally applied between silver tip and green tip to target fire blight bacteria that overwintered in cankers on the tree. At this early growth stage and with cool temperatures, bacterial colonies in fire blight cankers are not actively growing. Two pounds of actual metallic copper should be applied at this time to persist until early pink through bloom, to inhibit bacterial growth when the fire blight cankers become active. The goal of the early copper application is to minimize phytotoxicity to green tissue and flower parts while maximizing the deposition of copper on the cankers. When copper is applied to these cankers, it will inhibit bacterial growth that becomes active during warmer temperatures before and during bloom and reduce the risk of bacteria spreading to open flowers. The risk of applying too much copper, is if excess copper is present at petal fall it can cause fruit damage and russetting. When the standard fixed copper products on the market are used, assume three inches of rain is necessary between the application of copper and fruit-set to minimize the risk of russetting.
- **Tree phenology impact on timing copper and oil:** It is not uncommon to see uneven tree phenology across an orchard, within a cultivar or within a single tree. For example, often the terminal buds of shoots open prior to lateral buds, and vegetative buds can precede or lag behind developing fruit buds. Consequently, for the purposes of determining whether it is safe to apply copper or oil products, vegetative buds may not best represent your average development. Rather, when assessing the potential for copper or oil phytotoxicity the phenology focus should be on assessing growth of fruiting buds.
- **Spot spraying copper in problem blocks:** If fire blight was a problem in a block or cultivar last year, it is important to apply 2lb. of actual copper per acre to achieve affective control of fire blight bacteria. If you find yourself at ½" green or tight cluster, reduce to 1lb of actual copper. During bloom extra vigilance will be necessary to ensure streptomycin applications are timed properly. If possible, prioritize pruning these blocks pre-bud break.
- **Note:** Other copper products such as Cueva and copper sulphate are not good replacements for fixed copper applications at silvertip/green tip as they either contain

lower initial quantities of copper or have higher solubility, resulting in insufficient copper residues in cankers. However, these products being less phytotoxic than fixed coppers may be safely applied to green tissue and thus offer some utility in preventing shoot blight post bloom. There will be further discussion on blossom blight vs. shoot blight as we approach bloom.

Copper application rates and formulation considerations

- **Application rates:** Between silvertip and bud break, use one to two pounds of metallic copper per acre and apply with a high volume of water, e.g., 75 – 125 GPA, depending on tree size. A 0.25% concentration of oil can be used to improve the distribution of the copper within bark and cankers. To reduce risk of bud damage, do not apply oil when temperatures have been, or are forecasted to be, below 32°F within 48 hours of the applications.
- **Copper formulations:** There are many copper-containing products that can be used for fire blight at bud-break. Formulations may contain copper hydroxide, copper sulfate, copper oxychloride, etc. All these formulations function the same way. They supply copper ions, i.e., metallic copper, and it is these copper ions that inhibit bacterial or fungal growth. The hydroxyl or sulphate portion of the molecule does not. When choosing a copper product for fire blight, it is important to compare the amount of metallic copper contained in the different products. This is often represented on the package either as a percentage of dry metallic copper by weight or as pounds per liquid volume.

Another important factor in choosing copper is its longevity, which is dependent on the particle size of the copper salts in the formulated products. The smaller the particle size, the more resistant it is to being dislodged by rain, and theoretically the better the copper will be distributed throughout fire blight cankers. Remember to track rainfall totals from the application date. If three plus inches of rain has accumulated by bloom, it's likely the copper will be gone, and you will need to be more aggressive in controlling bacteria compared to a drier spring.

Minimize copper injury

Once copper products are dry, they are no longer phytotoxic. If there is still sufficient copper residue remaining at petal fall, this can be redistributed by rainfall on to the developing fruitlets and cause russeting. For the standard copper products on the market, it is thought approximately three to four inches of rain between application and fruit-set mitigates this risk.

Tips to mitigate risk of phytotoxicity and russeting from copper applications between ¼ to ½" green tip.

- Apply when drying conditions are good (low humidity). The longer the copper stays wet and is put on green tissue the potential for more damage of phytotoxicity increases (russeting).

- Do not apply copper with oil within 24-48 hours of a freeze event. Ideally, locate the weather station or thermometer in or at the same level as the tree canopy and/or on the lower end of the canopy. If no NEWA max/min thermometer tied to the tree.
- Eliminate the oil from the application if at risk of a freeze event.
- Reduce the rate of copper per acre (but not the total gallons of water per acre) No less than 1 lb. of actual copper per acre.
- If copper must be applied near a freeze event, low rates of oil may still be used as a spreader. Where trees have been in the ground more than one or two years, the oil can be as critical as the water volume, but applying a 1% oil is not critical. A common Extension recommendation is to apply 1 quart per 100 gallons (0.25%), as this concentration is sufficient as a spreader.

Apple Scab

Apple scab is well tuned to the development of apples. The amount of ascospore development in terms of pre-bud break is typically small. During spring rains, mature spores could be released pre-bud break but would require green tissue for an infection to occur. The bulk of ascospore release typically occurs between tight cluster and petal fall. Biological fungicides should be delayed until there is significant leaf surface for absorption and temperatures are consistently warmer.

Recommended approaches to managing apple scab

Unless there are other early season disease considerations, it may be possible to treat cultivars differently based on your history of scab. If you did not have scab or fire blight last year, do not assume your management was perfect and your inoculum is low. If you were not monitoring infection periods for apple scab, do not assume infections occurred. In the absence of infection data, it is difficult to establish the efficacy of the previous management.

- Copper applications at green tip will offer some scab protection for five to seven days and are a good substitute for other fungicides that target scab at green tip. The fungicide mancozeb in the EBDC class of fungicides, e.g., Roper Rainshield, Manzate, etc., is the preferred protectant fungicide to apply between green tip and bloom. Mancozeb is also significantly cheaper than copper and a better choice to manage early season scab. Pre-bloom applications of Captan should be avoided due to extreme phytotoxicity that can occur if Captan and oil overlap or are tank mixed. Delaying Captan applications until bloom (or later) provides maximum pre-bloom flexibility to apply oil multiple times, e.g., as a hedge against scale and mite pests. Relying on mancozeb for early protection also allows oil or other penetrating adjuvants to be used when applying single-site fungicides, for whose activity absorption into the plant tissues is required; this is also the case for certain insecticides applied pre-bloom, such as Esteem (pyriproxyfen).

Where there is a concern for an infection between green tip and tight cluster, the best option is to rely primarily on a protectant spray program and save the most effective single-site fungicides in

tank mixes for use from tight cluster to petal-fall when both scab inoculum levels are peaking and increasing leaf area enables better single-site utility. REMINDER: Always tank-mix a protectant, EBDC or captan, with ANY single-site fungicide. For high-inoculum blocks early season there are other single-site fungicides from the Anilopyrimadine class, i.e., Scala (pyrimethanil), Vanguard (cyprodinil) and Inspire Super (A pre-mix of the DMI fungicide difenoconazole and Vanguard / cyprodinil). This fungicide group does provide better cool weather performance compared to other single-site fungicide groups.

Another option for tank-mixing is the fungicide Syllit (dodine). This product may only be used until pink but would be an option for very high inoculum orchard blocks or cultivars. This fungicide has activity as an anti-sporulant, which has generally meant it can reduce the production of secondary spores (conidia) on newly emergent primary lesions. The label indicates it may have an impact on some of the previous year's ascospores that are still on the ground. John is doubtful but hopeful in a high-inoculum block dodine may offer some benefit. Remember that any anti-sporulant fungicide puts maximum pressure on a fungus to select for resistant genetics; use with forbearance and apply at the highest recommended rate.

Additional notes on mancozeb and disease management:

- The full rate of mancozeb, referred to as the “Pre-bloom schedule” is 6 lb./acre and the half rate or “Extended-spray schedule” is 3 lb./acre and interpreting these two schedules can be confusing. The full rate allows for four six-pound applications where the half rate is seven three-pound applications up to the 77-day pre-harvest Interval (PHI). If the goal is to apply mancozeb past bloom, then it is important to only use 21 pounds maximum for the season and not apply past the 77-day PHI. For emphasis, if you wish to use an EBDC after bloom, NEVER apply more than the 3 lb./A half-rate. This is the case even if the total amount used for the season is well under 21 lb. per acre.
- If there is not a lot of rain, there will be a buildup of ascospores waiting to release during a major rain event. Many minor rain events will release spores more frequently which is ideal.

Organic and cultural-scab management at green tip

Organic growers would still want to use copper at silver tip or green tip as it does have some efficacy against apple scab. Reducing the inoculum on the orchard floor within the leaf litter is one of the most effective strategies organic and low-input orchards can do to improve scab management. Flail mowing, machine-raking, sweeping, chopping or mulching are all excellent methods to disrupt overwintering inoculum and has been proven to reduce overwintering scab inoculum by 50%. Conventional growers may consider applying a 5% urea solution to the orchard floor and organic producers may consider lime, which will speed up decomposition of leaf litter.

Biological fungicides can be used by organic and non-organic growers for apple scab and other diseases later in the season. However, many of these products are live cultures and require a minimum amount of leaf surface and warmer temperatures to thrive, they may not be very

effective at green tip and are best saved until there is much more leaf tissue present. If fungicides need to be applied in organic systems, sulfur and lime sulfur are the primary pre-bloom options. Lime sulfur is best applied post-infection as it offers some eradication and too frequent of applications as a protectant can reduce yields, tree, and soil health. Lime sulfur must be applied when it is not too hot and is not compatible with oil. Sulfur alone does not redistribute or adhere very well to tissue and has a short length of efficacy and could be applied as a protectant prior to rain events.

Under our current conditions, organic growers can consider the following:

- Minimize applications of lime sulfur due to phytotoxicity and save for infection periods that anticipate a large ascospore release. Lime sulfur also kills lesions and is another reason to save these applications to later in bloom or post bloom.
- If there is a block with severe scab the last few years, then sulfur may be a good option to apply ahead of the next rain event. But ideally, wait until further along into primary scab season before beginning sulfur applications, at a minimum wait until a very consistent tight cluster through the orchard.

Oil applications for early season mite and San Jose scale management

Oil applied between silver tip and bloom is important to suppress mites and San Jose scale. Dormant oils are easiest to work with when temperatures are at least 60 °F or higher. As temperatures increase, overwintering mite and San Jose scale respiration rates increase, and the oil application will do a better job at suffocating mite eggs and San Jose scale. There is a very wide range of application rates growers like to use. Most growers apply a 1 – 2% oil, but 3 – 5% oil has also been observed. These higher rates may be necessary where scale and mite pressure is most severe. We will discuss mites and scale in greater detail later this spring, but the dormant oil spray is one of the most important opportunities to manage these two pests.

Traditionally, oil was often only applied at dormancy, however over the last decade or more we have seen good results from multiple applications of oil between dormant and pink. Until temperatures rise, there may not be much utility in applying above a 1% oil until temperatures rise above 60F. Oil will not be very effective when applied under these cool conditions. Higher rates of oil will be more effective under warmer conditions and there should be plenty of opportunities between green tip and pink to apply a 2% or 3% oil. When applying oil at silver or green tip under cool conditions, oil applied at 1% will be effective as a spreader/sticker and will not offer much insecticidal activity. If it is not possible to apply a 2% oil before pink, this may lead to higher pressure from mites and scale. During this pre-bloom period, beneficial insects are less active in the trees and impacts from oil should be minimal. Many of our beneficial insects have a wide host range and even if impacted by these early sprays, their populations rebound quite fast.

Esteem (pyriproxyfen) may be applied pre-bloom to improve management of San Jose scale and early leafrollers. San Jose scale is found on the bark and significant green tissue is not needed for

efficacy of an Esteem application. In the past John has recommended ½ inch to tight cluster at a minimum for applying Esteem. Most of the developed tight cluster buds are apical, or at the ends of last year's growth or fruit spurs. These are important buds to protect from scale, however they do not represent a high percentage of all the buds on the tree. Wait until most buds are at tight cluster. There is no rush to apply Esteem this week due to cooler temperatures. Note that Esteem can impact pollinators if applied too close to bloom.