



Pistachio Early Season Disease Management Guidelines

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Wet weather during pistachio shoot emergence and bloom has growers and PCA's questioning the need for fungicide applications against Botrytis and Botryosphaeria.

The following discussion about management of these two important diseases is based on UC research by Dr. Themis Michailides, with whom I recently reviewed his latest findings. The decision to treat now is based upon the following:

1. Past Disease Pressure. Botrytis has obviously been low for growers in the southern San Joaquin Valley, since we have been in a low rainfall pattern during the past three years. Botryosphaeria (Bot) has been light to moderate in the south, but is present in significant quantities in some orchards, as evidenced by the damage it caused in 2009 following the significant rain infection event in May. Practically speaking, most growers have little idea as to how much Bot disease pressure they are under, because they have not taken the monitoring methods (winter strike removal and Bud Mon assessment prior to leaf out) developed by Themis seriously, and thus wait to get hammered economically before they wake up to the problem. At that point, it becomes difficult to control Bot without spending lots of money, especially if one thinks it can be managed by repeated fungicide sprays. However, those of us in the research and education side of agriculture realize all too well that most farmers prefer to get smacked in the head with a crop disaster than subscribe to a little preventative disease management. It is the way of Man.
2. Understanding the Biology of the Disease. Botrytis can be thought of as an opportunist. This fungus hangs out on the bud scales and surrounding wood during the winter. During wet springs, the spores germinate and are splashed onto the emerging green tissue. Botrytis likes the male pistachios better than the females, especially the old male cultivars 02-16 and 02-18, which have tighter clusters of pollen and higher sugar content. In persistent wet weather, the fungus infects the male flowers and the tender shoots of male and female trees, forming a tuft of buff-colored spores around the base of the emerging shoot. The shoots then wilt, become a dark green, and resemble a shepherd's hook. Infected shoots are NOT hard, but flaccid to the touch. Botrytis also penetrates the shoots and flowers, and causes a canker to develop in the wood tissue. You can find it by cutting into the wood at the base of the flower or shoot. Rain continuing into the fruit set period can cause infections to the rachis tissue and subsequent loss of part or all of the cluster. The degree to which a given orchard suffers all the above awful symptoms again depends on how much of a problem you have had in the past, how much rain you experience during bloom, and what male cultivars are present in the orchard. Honestly, the

appearance of Botrytis looks worse than the effects it has on production. I am NOT saying, “don’t treat for it”, but don’t hang yourself in the barn if you decide not to treat and you find out later you should have. Botrytis makes ranch managers and PCA’s understandably uncomfortable, since the wilted shoots become focal points for those seeking to find fault.

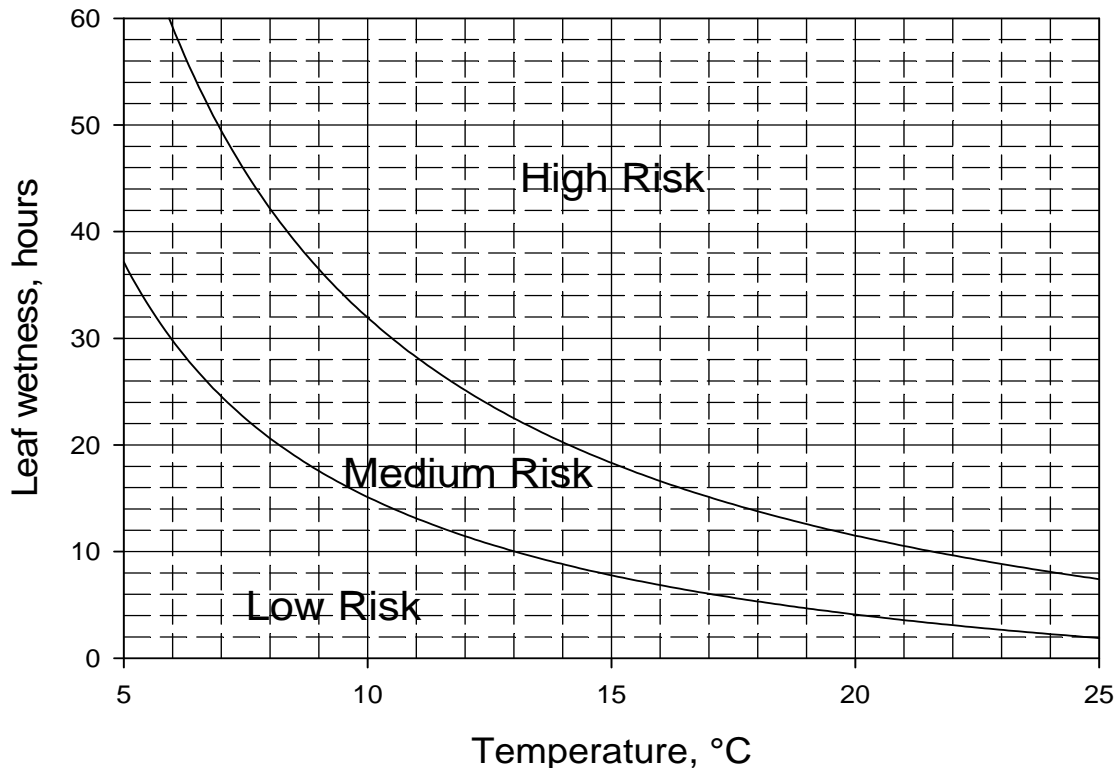
Botryosphaeria is another matter. For reasons mentioned above, Bot is on the rise again in the south, and those cankers we keep telling you to get rid of during the winter are now capable of spitting out infecting pycnidia for SIX YEARS! Yep! Count’em! SIX! Now that I have your attention, here is what is going to happen to those pycnidia. Themis has developed a model to predict the conditions favoring spore dispersal. It shows that all temperatures DURING THE RAIN, the amount of rainfall occurring during any event, and the time interval **between** rain events are very important. Here is how it works; if a given rain is 4 mm (.16 inches) or greater, and the temperature is at least 52⁰F, you begin accumulating hours of leaf wetness. Leaf wetness is a parameter which is actually measured by some weather stations, but unfortunately the CIMIS stations do not presently have this capacity, and will not in the near future due to budget constraints. Those of you wishing actual leaf wetness data could obtain it through private weather stations which are relatively common in the south valley. The rest of us, for now, must rely on our intuition to estimate how long after a rain event the leaves remain moist. Obviously, if it rains at night, the hours are high, providing the threshold 52⁰F is met. If it rains early the morning, and then the sun comes out and the wind blows, leaves may only be wet for an hour or two. You can see from Themis’ figure 1 below that it takes about 14 hours of accumulated leaf wetness at 52⁰ F (11⁰C) to begin thinking about needing to treat for Bot. **DO NOT** forget about past disease pressure in making this decision!

Another important component of the decision to treat for Bot now is the amount of leaf area present at the time of the rain events. As of April 13, some orchards on the Eastside are only at early leaf out (terminal leaves still pointed and not expanded), with about 50% female bloom. Reports from Westside growers indicate more developed canopies, but less disease pressure from rainfall and holdover inoculum. Hence, Botrytis is presently more of a concern than Bot in many orchards, since there is very little green tissue present for the Bot pycnidiospores to land on. This hypothesis may NOT be true for pistachio growers in the North, where Bot inoculum is very high, and ANY green tissue may be at risk of infection. Remember also that the Bot battle is not won or lost on what you do NOW. Themis’ research still shows that for most south valley orchards with Bot, a two-spray program in June and July is most effective for Bot as well as Alternaria. However, growers having neglected to monitor their Bot levels must pay attention to rains later in the spring, such as the one we had in May last year, which proved to be a significant Bot infection event. Note in figure 1 that only eight hours of leaf wetness at 77⁰F is a high risk event.

Remember that we are presently discussing INFECTION events, NOT SYMPTOM events. In the spring, the Bot pycnidiospores infect the leaves and nut clusters, but the infections do not express themselves until hot weather arrives. This is why the June-July

treatment window has proven to be most effective. Fungicides applied at that time control the development of the infected tissue.

Figure 1. Potential infection events must be initiated by rain (total rain during event must exceed 4 mm or else disregard, but don't wait until 4 mm accumulated to start counting leaf wetness). Leaf wetness periods interrupted by less than 12 hours should be added together to obtain a single potential infection event.



- Understanding the Fungicides Registered for Disease Management. Again, the choice of fungicide applied now depends on what disease is most prevalent in your orchard. If you have not already done so, go to the following website link, download pages 38-39, have them plasticized, and USE them to select the material best suited to your problem: <http://www.ipm.ucdavis.edu/PDF/PMG/fungicideefficacytiming.pdf>. If Botrytis is your main disease, then Adament, Elevate, Quash, Pristine, and Switch are good choices. Topsin still works well in many orchards if it has not been sprayed repeatedly, and resistance has occurred. If Bot is your main concern, then Abound, Cabrio, Gem, Quash, Pristine, Scala, and Tebuzol have proven most effective in Themis' screening work. Note that there are some hot materials on the way, such as Luna Sensation, Ph-D, and Quilt Xcel, whose California registration is pending. Fungicides are most effective when applied PRIOR to a wet period, but Themis indicates that many of today's materials still provide effective Bot control up to five days after a rain. Pristine is one of the most effective post-rain materials, but exercising this option regularly is really poor management relative to other diseases such as Alternaria. Remember that Bot is VERY

LOW in resistance development, and Alternaria is VERY HIGH. Themis has shown Alternaria resistance within two years of repeated Pristine treatment. So, those of you treating during this wet weather need to study the chart you now have plasticized and in your hand to determine how best to minimize your rate of Alternaria resistance development. Note that it is NOT a matter of IF Alternaria resistance will occur in your orchard, but rather WHEN. If you have a dense canopy, poor infiltration, or delays in harvest, paying attention to Alternaria resistance management will save your crop someday soon. Reliance upon another wave of super fungicides to save your tail is NOT resistance management, it's foolishness! If you mix materials, make sure they have different modes of action, such as Quash mixed with Gem for the roundhouse punch. Themis says 10-14 treatment intervals for today's powerful fungicides are sufficient in wet weather and moderate disease pressure. Under drier conditions, one month is adequate.

4. Finally....I only wish I could get you guys to fill out your Good Agricultural Practices survey as easily as I can stir you to spray! Demonstrating good industry stewardship is the lifeblood of our industry! DO IT! Happy Farming!