PURDUE UNIVERSITY
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A Newsletter for Commercial and Advanced Amateur fruit growers.

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Crop Conditions

(Peter M Hirst, hirst@purdue.edu, (765) 494-1323)

Blackberry – pre-harvest

Apple fruit at 25 mm diameter

Grape fruit set

Red raspberry – harvest beginning

How likely will drought develop or worsen in Indiana?

(Beth Hall, hall556@purdue.edu)

The news of the disastrous drought and extreme heat in the western United States (US) have local folks wondering if Indiana might be next. The latest release of the US Drought Monitor map (Figure 1) shows the exceptional drought in the western states as well as the expansion of extreme and exceptional drought in the north-central U.S. Currently, the lower Midwest states (that includes Indiana) seem to have been moderately spared and shorter-term forecasts and climate outlooks are suggesting relatively regular rainfall relief over the next several weeks. It is still early in the growing (and warm) season, so a drought in Indiana is not out of the question. However, the rest of June appears to be likely to receive above-normal precipitation. Combine this chance with the likelihood of above-normal evapotranspiration rates, Indiana is unlikely to gain too much ground in replenishing groundwater or surface water supplies. Figure 2 shows the additional precipitation needed (in inches) to bring the Palmer Drought Index to within normal ranges for this time of the year. With the exception of southeastern Indiana, the rest of the state needs anywhere from a little bit of rain (i.e., a trace) to as much as 9 inches (northern counties). That is a lot of rain needed for northern Indiana – particularly for an area of the state that already has below-normal groundwater levels and irrigates the most.

The 3-month climate outlook (representing July through September) is slightly favoring above-normal temperatures over that period as well as slightly favoring above-normal precipitation (Figure 3). Because the outlooks are only "slightly" confident, assume there is a bit of uncertainty on how the season will actually turn out, let alone how the timing of these conditions will occur. For example, the precipitation climate outlooks could prove to be accurate by the end of September when looking at the 3-month precipitation total. However, most all of that rain could have fallen in early July, leaving the rest of the 3-month period predominantly dry and therefore contributing to drought conditions.

While modified growing degree day (MGDD) accumulations (Figure 4) continue to increase (what happens throughout the warm season), it is interesting how they still seem to be lagging the climatological average in the southern half of the state. The magnitude of how much behind those accumulations are seem rather insignificant compared to the seasonal totals thus far, but still noticeable on departure maps (Figure 5). Northern county MGDD accumulations are slightly above the 1991-2020 climatological average, however, lagging compared to the 2017 and 2018 seasons (Figure 6). Warm temperatures are expected over the next several days which may help increase those accumulations closer to normal, however the nature of modified growing degree days is that any daily maximum temperature above 86°F is modified down to the 86°F value. Therefore, warm days exceeding this maximum threshold do not increase MGDD accumulations at a faster rate.

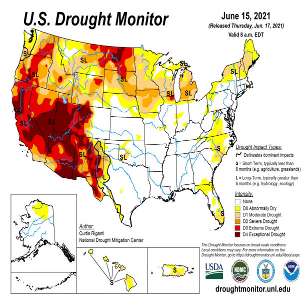

Figure 1. US Drought Monitor map released 17 June 2021 representing conditions as of 15 June 2021.

Figure 2. Modeled estimates of how much precipitation (inches) would be needed (by climate division) to return the Palmer Drought Index to normal ranges.

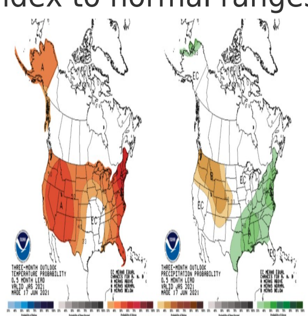

Figure 3. Climate outlooks for the July-August-September period for temperature (left map) and precipitation (right map). These are produced by the national Climate Prediction Center and illustrate confidence of favoring above- or below-normal conditions.

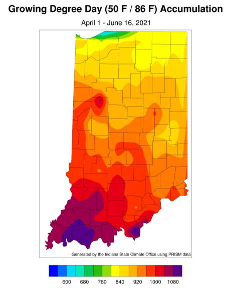

Figure 4. Modified growing degree day accumulations from April 1 to June 16, 2021.

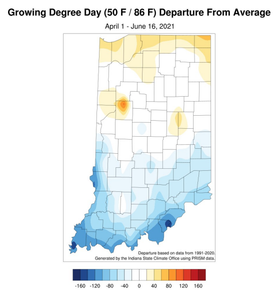

Figure 5. Modified growing degree-day departures as of 17 June 2021 compared to the 1991-2020 climatological average.

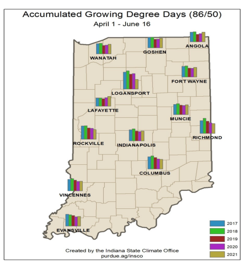

Figure 6. Comparison of 2021 modified growing degree day accumulations from April 1 – June 16 to the past four years.

Grapevine leaf removal

(Miranda Purcell, mrpurcel@purdue.edu)

Now is the time to start thinking about leaf removal in grapevines. Cluster zone leaf removal can lower risk of disease, increase spray penetration and even improve fruit quality. The period immediately after bloom to 3 weeks post-bloom is the most effective time for leaf removal. Leaf pulling after this time can increase the risk of sunburn, especially on the west side of the canopy. Many growers only leaf pull on the east side of the canopy (on north-south rows) to avoid this. The removal of the basal 3-5 leaves in the cluster zone can reduce the risk of bunch rots, especially in tight clustered varieties such as Vignoles, Seyval and Chardonel. Increasing sun makes the berries less susceptible to disease and allows for rapid drying after rain or dew. Leaf removal can also improve fruit quality in aromatic varieties, such as Traminette, and can improve anthocyanin development in red varieties.

In high cordon-trained systems, pulling shoots off the tops of the rows can also help improve sunlight exposure to the leaves at the base of the shoots. These basal nodes will be retained at pruning and will provide next year's crop; increasing sun exposure has been shown to improve bud fruitfulness as well as cane hardiness. Shoot positioning can help achieve these goals as well and may need to be done multiple times throughout the season.

Post-bloom leaf removal in the cluster zone on VSP-trained vines

Frogeye leaf spot

(Janna L Beckerman, jbeckerm@purdue.edu, (765) 494-4628)

Frogeye leaf spot, caused by the fungal pathogen, *Botryosphaeria obtusa*, has been quite prevalent this year, probably due to the combination of potential (and realized) crop loss and our cool, wet spring. This is the same fungus that causes cankers on the tree, along with black rot of apple fruit (Fig. 1).

Frogeye leaf spot gets its name from the concentric pattern of light brown to tan center portions of the leaf spot ringed by a darker margin. Infection is believed to start around petal-fall with small, discolored specks appearing where the fungus has infected and invaded the leaf. As the fungus continues to grow, the specks enlarge, forming small (1/8 to 1/4 inch diameter) spots; these develop a light center surrounded by one or more darker brown rings. Extensive spotting of leaves initially causes chlorosis (Fig. 2) followed by early leaf loss. Both attached and fallen, infected leaves develop black pustules (pycnidia) on the upper leaf surface (Fig. 1). These pycnidia help to distinguish frogeye leaf spots from similar spots caused by spray injury or other pathogens. These leaf spots serve as a warning that the spray program being deployed is not adequately protecting the tree; growers seeing frogeye leafspot should anticipate viewing black rot on fruit, and cankers on branches and stems, later in the growing season.

Other forms of leaf spotting can result when spores of apple scab or juniper rust germinate on more scab and rust resistant apple cultivars (Fig. 3). This is termed a hypersensitive response, and describes the death a few plant cells to protect the many, and results in the leaf compartmentalizing the invading pathogen. The invading rust fungus soon dies due to the host defense response, but the plant cells killed or damaged by the germinating spores leave their mark, and can provide an entry points for other leaf spotting fungi or saprophytes. Some rust infected spots may develop characteristic orange, pinpoint spots to distinguish them from other (scab or powdery mildew) pathogens.

Also be aware that some causes of leaf spotting may be due to captan injury (Fig. 4). Captan by itself rarely causes foliar phytotoxicity on apples, and only rarely does so on fruit. Unfortunately, due to the multitude of pests growers face (often happening at the same time), tank mixes are used; it is the combination of all the products in the tank that results in captan phytotoxicity. Spray oil, and/or adjuvants that are commonly used in the formulation of emulsifiable concentrations (ECs) and suspension concentrates (SC) can solubilize captan and allow it to move through the protective waxes on both fruit and leaf surfaces. This damage isn't just limited to captan: Sulfur and/or liquid-lime sulfur can cause damage when applied ahead of hot weather whereas copper tends to cause phytotoxicity during cooler weather or under acidic tank mix conditions. All can be phytotoxic if mixed with oil sprays or their application in any order overlaps by 10 to 14 days.

Managing Frogeye Leaf Spot

Combining cultural and chemical management are critical for controlling of frogeye leaf spot, and a season-long fungicide program is recommended especially on those varieties that are highly susceptible to *B. obtusa* in all its forms (Fig. 5). Earlier in the season, mancozeb provides excellent control. Later on, captan and ziram are recommended during summer covers, supplemented with systemic fungicides like Flint Extra, Luna Sensation, Merivon, Pristine, and some DMI fungicides such as Inspire Super and Cevya are effective against the disease if disease pressures are high or other pathogens require management, as well.

The pathogen overwinters in bark, cankers, and mummies (from infected fruit, or hanger-ons from chemical thinning). Dead shoots and cankered limbs, regardless of the cause, should be removed and destroyed, as *B. obtusa* is an opportunistic pathogen and a fairly effective saprophyte that can colonize and reproduce on this tissue the following spring.

Figure 1. A. Frogeye leaf spot; B. Cankered stem, photo by Patty McManus; C. Erumpent pustules visible from older canker produce spores that cause frogeye leaf spot, black rot and cankering; D. Black rot of fruit.

Figure 2. Frogeye can cause chlorosis and defoliation.

Figure 3. Unsprayed apple showing rust resistant spots, and defense responses to scab and powdery mildew.

Figure 4. Captan injury.

Figure 5. Variety differences in black rot susceptibility.

Figure 5. Variety differences in black rot susceptibility. Dr. Alan Biggs did an excellent evaluation that is available here: https://www.researchgate.net/publication/234007515_Relative_Susceptibility_of_Selected_Apple_Cultivars_to_Fruit_Rot_Caused_by_Botryosphaeria_obtusa

Getting Ready to Plant Strawberries in a Plasticulture System — Planting Materials

(Wenjing Guan, guan40@purdue.edu)

In Indiana, strawberry is traditionally grown as a perennial crop using a matted-row system, in which strawberry bare-root plants (Figure 1) are planted in spring on bare soil. Each year, a large portion of the fruit is harvested from daughter plants that are derived from established runners in the past year. Strawberries can also be grown using a plasticulture system, in which strawberries are grown on plastic-covered beds. Fruit is harvested from the mother plants.

Runners are undesirable in the plasticulture system, and they need to be removed. The main advantage of using a plasticulture system vs. a matted-row system is that it is easier for weed control.

Figure 1. A bare-root strawberry plant.

As mentioned earlier, bare-root plants are used to establish new strawberry patches in the matted-row system, while it is more common to use plugs (Figure 2) in the plasticulture system. Strawberry plugs are usually grown in 50-cell trays. Similar to vegetable transplants, they have active growing roots and leaves. Advantages of using plugs in a plasticulture system compared to using bare-roots is easy establishment and labor-saving. Under conditions of high temperatures and lack of soil moisture, it is very difficult to successfully establish bare-root plants. In addition, bare-root plants have to be planted by hand on plastic-covered beds. While plugs can be planted using a water wheel transplanter that makes planting much more efficient.

Figure 2. A strawberry plug.

In certain situations, however, bare-root plants may still be used in the plasticulture system. This is because plugs are only commercially available for a short period of time in the fall. In northern Indiana, fall planting sometimes could be too late or too high of a risk to get a satisfied yield in the next spring. Bare-root plants are typically available entire spring to early summer. So if growers want to plant strawberries before plugs are commercially available, they may use bare-root plants. The second reason to use bare-root plants in a plasticulture system is because of cultivar limitations. Many of the popular cultivars that are traditionally grown in northern Indiana are only available with bare-root plants. If growers stick to these cultivars, bare-root plants may be the only choice.

Two ways may improve the success of using bare-root plants in a plasticulture system. One is to plant on white plastic mulch. Soil temperature is cooler under white plastic mulch compared to black plastic mulch that makes summer planting of bare-root plants possible. A second approach is to start a strawberry plant in trays with a growing medium, and then plant the tray plants in the field.

Extension Events

(Lori K Jolly-Brown, ljollybr@purdue.edu)

Small Farm Education Field Day July 29th, 2021 at the Purdue Student Farm.

Small Farm Education Field Day Webinar Series August 2, 4, 6, 9, 11, 13, 2021.

REGISTER TODAY: https://www.purdue.edu/hla/sites/studentfarm/events/

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Editor: Peter M Hirst | Department of Horticulture and Landscape Architecture, 625 Agriculture Mall Dr., West Lafayette, IN 47907 | (765) 494-1323