



Inside

Crop Conditions
Weather Outlook
Critical Temperatures
Apple Scab
Brown Rot of Stone Fruits
Apple Diseases
Training Young Trees
Topworking Apple Trees and
Bench Grafting New Trees
Coming Meetings

FFF 96-03
March 26, 1996

Crop Conditions

March continues to bring a little of spring and a lot of winter to Indiana. Heavy snow fell over much of the state on March 19-20 with amounts exceeding 15 inches in several areas. High winds caused drifting despite the fact that the snow was wet and heavy. The heavy snow caused some cane breakage on brambles and blueberries. Temperatures were below normal following the snow storm with possible damage to peaches and brambles from lows in the upper teens and low 20s. Another wave of cold air is expected to move across the state during the last week of March. The cooler temperatures are delaying fruit crop development, which may help plants avoid damage from below normal temperatures. Growers in Southwest Indiana report that they still have potential for a full crop of peaches. In southern Indiana peaches are at early bud swell (calyx red), apples are at silver tip to green tip, and brambles have 1/2 to 3/4 inch shoots. Grapes are still dormant. All fruit crops are dormant across the rest of the state.

Weather Outlook: Over the past several years we have included 6 to 10 day forecasts and 30 day outlooks as a regular part of Facts for Fancy Fruit. Last year we began including Growing Degree Day information for use in IPM programs. All of this information was provide to us by the Midwest Ag Weather Center at Purdue. Unfortunately, the center was closed in September, 1995. We are working with other departments on campus to find ways to make weather information available for this and other newsletters, but at this time, we do not have all the details worked out. We hope to be able to provide GDD information for multiple sites in the state in the near future. However, we will not be able to provide an agricultural weather outlook as we have done in the past. Growers will need to find that information elsewhere. The National Weather Service broadcasts weather information on radio stations across the state which often includes notes of interest to agriculture. The internet also contains several weather related sites that can be accessed. We'll bring

you more about these matters as the season progresses.

Critical Temperatures: Early spring can cause fruit growers alot of sleepless nights. There is a threat of frost or freeze damage anytime after plants have broken dormancy and buds begin to grow. Though there's not anything that can be done to control the weather, there are several things growers can do to lessen the risks of frost damage in orchards and vineyards.

The level of cold that fruit buds can take varies by species and stage of growth. The tables below give the critical temperatures for various fruit crops. These temperatures are approximate, since they were determined under controlled conditions and many environmental factors can influence the actual critical temperatures. Also, the buds on a given plant are not all in the same stage at a given time, with some more advanced than others. However these data do give you a good concept of the temperatures at which to expect injury. Note the footnotes, especially as they relate to different cultivars.

**Critical Temperatures for Flower Buds:
Apples***

Bud Development Stage ^a	1	2	3	4	5	6	7	8	9
Ave. Temp. for 10% Kill	15°F	18	23	27	28	28	28	28	28
Ave. Temp. for 90% Kill	2	10	15	21	24	25	25	25	25

*For Red Delicious. Golden Delicious and Winesap approximately 1 degree hardier; Rome Beauty, 2 degrees hardier; except after petal fall, when all varieties are equally tender.

^aBud development stages are: 1=Silver Tip, 2=Green Tip, 3=Half-Inch Green, 4=Tight Cluster, 5=First Pink, 6=Full Pink, 7=First Bloom, 8=Full Bloom, 9=Post Bloom.

Peaches*

Bud Development Stage ^a	1	2	3	4	5	6	7
Ave. Temp. for 10% Kill	10°F	21	23	25	26	27	28
Ave. Temp. for 90% Kill	1	5	9	15	21	24	25

*For Elberta.

^a1=First Swelling, 2=Calyx Green, 3=Calyx Red, 4=First Pink, 5=First Bloom, 6=Full Bloom, 7=Post Bloom.

(From Washington State University Extension Information.)

Grapes*

Bud Development Stage ^a	1	2	3	4	5	6
Ave. Temp for 10% kill	Varies	13°F	21	25	27	28
Ave. Temp for 90% kill	Varies	-3	10	16	21	22

*For Concord

^a1=Dormant, 2=First swell, 3=Full swell, 4=Bud break, 5=1st leaf, 6=2nd leaf.

Strawberries

Bud Development Stage	Buds Emerge	Buds Closed	Flower Open	Small Green Fruit
Ave. Temp for 90% kill	10°F	22-27°F	30°F	28°F

Duration of temperature for damage can be 20 minutes to 2 hours, depending on wind, humidity, and cultivar.

Other Fruits: Blueberries are more tolerant of spring frosts than most other fruit crops. Open flowers are not usually injured unless temperatures reach the low to mid 20's. Unopened flowers are less susceptible to frost/freeze injury. Brambles are also relatively tolerant of spring frosts and freezes, partly because the flower buds are not exposed until a few weeks after budbreak. However, early shoot growth on brambles can be damaged by temperatures in the low to mid 20's. Colder temperatures can cause severe cane injury. ID-168, the Indiana Commercial Tree Fruit Spray Guide contains a chart that describes the floral development stage and critical temperatures for several tree fruit crops not listed above.

Another factor that can influence the temperatures within the planting, and subsequent damage, is orchard or vineyard floor management. Bare soil beneath the plants and a closely mown row middle may result in temperatures 6 to 8° higher than in a planting with weedy rows and a thick row middle during radiative frost events. Similarly, settled and firm soil holds more heat than tilled soil, and moist soil holds more heat than dry soil. Sandy soils tend to warm sooner, but loose heat quicker than heavier soils. The ideal orchard floor would be bare, firm, moist soil. The worst situation would be tall, dense cover crop and trashy rows that restrict air drainage. Evaluate your floor management practices to determine if improvements can be made. A

difference of 2 to 3° could be the difference between 10% bud mortality and 50% bud mortality.

Overhead irrigation is one measure growers can use to prevent frost damage. It is used commonly on strawberries, but can also be used with other small fruits, and to a limited extent, tree fruits. Overhead irrigation can prevent temperatures from dropping below 30°F even though the air temperatures may drop to 25°F or colder. The principle behind this method is that as water freezes, heat is released. As long as an adequate layer of freezing water covers the buds, the temperature will remain at or near the freezing point. It is important to remember that a layer of freezing water must be present at all times. Ice without the continued application of water will not protect the flowers from freezing temperatures. This means that the rate of application of water must be carefully monitored. The rate at which water freezes is dependent on several environmental factors, including air temperature, humidity, and wind speed. Generally, the lower the air and dew point temperatures, and/or higher the wind speed, the greater the rate of freezing. Application rates are generally low, about 1/10th of an inch per hour, but may have to be increased depending on the minimum temperature reached and wind speed. The correct rate of irrigation can be determined from the following table.

Air temperature at canopy level (°F)	<u>Wind speed (mph)</u>		
	0-1	2-4	5-8
<hr/>			
At 50% relative humidity	inches per hour		
27	0.10	0.20	0.30
24	0.10	0.30	0.35
20	0.15	0.35	0.45
<hr/>			
At 75% relative humidity			
27	0.05	0.10	0.20
24	0.10	0.20	0.30
20	0.10	0.25	0.40
<hr/>			

The question of when to start the irrigation is difficult to answer. The simplest and safest method is to start irrigation when the temperature in the lowest part of the planting at canopy level reaches 34-32°F and continue irrigation until ice begins to melt after sunrise. Irrigation can be very effective for frost protection, but it can also create problems. On tree fruits and bush crops such as brambles and blueberries, a heavy ice load can break limbs and cause more damage than the possible loss of fruit buds.

Apple Scab: Apple scab infection was above normal last year, you should therefore expect an above normal amount of primary scab spores this spring. The most important time of year for scab control is from green tip to petal fall. If you don't control scab during this period it's an uphill struggle the remainder of the season. Be sure sprayers are properly calibrated; thoroughly read the label of all pesticides you will be applying; use sufficient water to provide good coverage; choose calm, good drying conditions for spraying; prune trees so they have an open canopy allowing for good spray penetration; and maintain a tight schedule if wet weather persists during the primary scab period.

NOTE: Those growers who plan to use the New York IPM 4-spray program for control of primary scab, remember...use only clean blocks (basically no scab the previous year) and make sure you have good to excellent coverage. See ID-168, "1996 Indiana Commercial Tree Fruit Spray Guide", page 11, for further information on the 4-spray program.

Brown Rot Of Stone Fruits: Pink is when sprays should begin for control of brown rot. The proper use of fungicides with some systemic activity protects flowers and fruit, reduces the amount of sporulation formed on the infected tissue, and reduces sources of overwintering inoculum. An excellent new fungicide that has been added to our arsenal of brown rot fungicides is Indar 75 WSP. It is a sterol-inhibiting (SI) fungicide and therefore

has similar properties to Nova and Orbit, the other two SI fungicides labeled for control of brown rot. Indar is labeled for brown rot blossom blight and fruit rot on apricot, cherries, nectarines and peaches. It is also labeled for control of cherry leaf spot and peach scab. See ID-168, "1996 Indiana Commercial Tree Fruit Spray Guide", for further information.

Apple Diseases: Tight cluster to pink is a time for maximum disease control efforts. During this period primary scab spores often reach their peak; powdery mildew infection is occurring on new growth; cedar apple rust is discharging spores with each rain; and fire blight is building, ready to be carried to opening apple and pear blossoms. It's not a pretty picture!

1. *Apple scab:* As noted above, the potential for severe scab infection is high. The amount of scab is directly dependent on the frequency of spring rainfall. If we have a wet April, scab pressure will be high, if it turns dry, scab pressure will be low, spray accordingly.

2. *Rust:* The pink stage of apple growth generally coincides with the time rust spores begin to infect apple foliage and fruit. If rust is a chronic problem consider the use of a sterol-inhibiting fungicide such as Nova, Funginex (triforine), Bayleton or Rubigan.

3. *Powdery mildew:* If mildew has been a chronic problem in certain blocks (Jonathan, Rome, Ida Red) the above mentioned sterol-inhibiting fungicides are excellent in helping to control mildew.

4. *Fire Blight:* Cool spring temperatures help prevent a rapid increase in the fire blight population; warm spring temperatures can cause very sudden, dramatic increases in the fire blight population. Here's hoping for a cool spring.

Training Young trees: Have you finished training those young apple and pear trees? Adequate training of the central leader during the first three years will get the trees off to a good start and help to minimize headaches

later. Training of trees, without pruning, will help to promote spur formation and fruiting early in the life of the tree. Good early training will reduce the amount of corrective pruning necessary later. The more dwarfing the rootstock, and the closer the tree spacing, the more young trees should be trained without cutting. This will maximize early production which will assist in further dwarfing the trees. On young trees, excess laterals can be left to produce fruit for a year or so, then should be pruned out to provide for adequate light interception.

Clothespins are effective in producing good crotch angles, and spreaders are effective in limb positioning to obtain the correct crotch and limb angles. Also effective are rubber bands and any number of other limb positioning aids available through nursery and supply houses.

The angle to which limbs are spread should be roughly 45-60 degrees from the vertical. If limbs are not spread far enough or not spread at all, vegetative growth is promoted, fruiting is delayed and tree size is not controlled. If limbs are spread too far the trees may never reach the size required to fill their allotted space in the row, and will usually produce excess vertical shoot growth that will have to be pruned out later. Use your judgment to decide how far to spread laterals.

Trees on dwarfing rootstocks from M.7 on down may have to be supported during these formative years. Trees on smaller rootstocks should probably be supported for the life of the tree. Incidentally the graft union and "standability" of trees on Bud.9 rootstock has been the best of all of the dwarfing rootstocks tested here at Purdue. Even these however should be supported until established and perhaps beyond when they are bearing heavily.

Topworking apple trees and bench grafting new trees: The best time for grafting is about the time that growth starts but temperatures are still cool. Grafting in the time from tight

cluster to bloom results in a high success rate if grafting technique is acceptable and the plant material is in good condition. Scion wood must be dormant. Chip budding at this same time can be very successful. Frank Street and Army Armstrong used to topwork peaches at about that time, with dormant scion wood and had excellent success. Of course, their technique was excellent.

Coming Meetings:

April 2 — Southeast Indiana Fruit Growers Meeting. 7:00 p.m. Dearborn County Farm Bureau building, Aurora. Contact: John Ewart (812) 926-1189.

April 4 — Eastern Indiana Fruit Growers meeting. 7:00 p.m. Minnestrista Cultural Center. Contact: Harold Brown, Muncie (317) 747-7732.

April 4 — Fruit tree pruning demonstration for homeowners. 2 p.m. Buckley Homestead Co. Park, Lowell (Lake Co.) Contact Mark Kepler, Crown Point (219) 755-3240

Department of Horticulture
Purdue University
1165 Horticulture Bldg.
West Lafayette, IN 47907-1165

Bruce Bordelon
1165 Dept. of Horticulture
Purdue University
West Lafayette, IN 47907-1165
317/494-1298
e-mail: bb@hort.purdue.edu

Paul Pecknold
1155 Dept. of Botany & Plant Path.
Purdue University
West Lafayette, IN 47907-1155
317/494-4628
e-mail: Pecknold@btpny.purdue.edu

Dick Hayden
1165 Dept. of Horticulture
Purdue University
West Lafayette, IN 47907-1165
317/494-1298
e-mail: Dick_Hayden@hort.purdue.edu

Rick Foster
1158 Dept. of Entomology
Purdue University
West Lafayette, IN 47907-1158
317/494-9572
e-mail: Rick_Foster@entm.purdue.edu

Disclaimer: Reference to products in this publication is not an endorsement to the exclusion of others which may be similar. Any person using products listed in this newsletter assumes full responsibility for their use in accordance with current label directions of the manufacturer.