http://ipm.osu.edu/fruit/index.html

THE OHIO STATE UNIVERSITY Newsletter Extension

Fruit ICM News

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In This Issue:

Calendar

June 19-20: Farm Market Tour; Pickaway, Ross, and Pike counties, sponsored by Direct Marketing Assoc. of Ohio and OSU Extension. Contact John Ellerman at the Centers at Piketon (800) 297-2072.

June 30: Ohio Fruit Growers Society Summer Tour and Meeting, Patterson Fruit Farm, Chesterland. For more information, contact John Wargowsky at (614) 249-2424, or e-mail at jwargows@ofbf.org.

Actara Insecticide Note

Source: Celeste Welty, OSU Extension Entomologist

Registration of Actara 25WG insecticide was mentioned a few weeks ago. The label is now available with further details. Actara acts by contact and by ingestion. It is a non-restricted use product made by Syngenta. The re-entry interval is 12 hours. Actara can be used pre-bloom or post-bloom on apples and pears. On both crops there is a limit of 8 oz/A per season and 1 application pre-bloom. The preharvest interval is 35 days if used at a rate above 2.75 oz/A, or 14 days if used at a rate of 2.75 oz/A or lower.

On apple, post-bloom target pests are leafhoppers at a rate of 2 to 2.75 oz/A, and apple aphid, leafminers, plum curculio at a rate of 4.5 to 5.5 oz/A. Pre-bloom target pests are apple aphid, rosy apple aphid, leafminers, mullein bug at a rate of 4.5 oz/A.

On pear, post-bloom target pests are pear psylla at a rate of 5.5 oz/A and aphids, plum curculio, Comstock mealybug at a rate of 4.5 to 5.5 oz/A. Pre-bloom target pests are pear psylla at a rate of 5.5 oz/A and apple aphid at a rate of 4.5 to 5.5 oz/A.

C. Wayne Ellett Plant & Pest Diagnostic Clinic

Source: http://www.ag.ohio-state.edu/~plantdoc/cweppdc/cweppdc.html

The C. Wayne Ellett Plant and Pest Diagnostic Clinic (CWEPPDC) is located at the The Ohio State University in Columbus, Ohio. It is one of a few diagnostic facilities in the United States which integrates expertise from plant pathology, entomology, agronomy, horticulture, and natural resources into a comprehensive program of plant disease and pest identification. Services available through the Clinic include plant disease diagnosis, insect and mite identification, plant and weed identification, and nematode extractions. If you access the above web site, you will find sample forms and diagnostic fees.

The accuracy of any diagnosis depends upon the information supplied, the sample or specimen material selected, and the condition in which the sample or specimen arrives. When submitting a sample, please follow these packing and delivery suggestions:

1. Select specimens fresh from the field; carefully shake off dew or excess water before packing.
2. Press non-woody plants or leaves on small branches between paper and place them between two pieces of stiff cardboard. Do not tape samples onto the paper or cardboard. Place the sample in a padded envelope.
3. Fruits and vegetables should be wrapped individually in dry newspaper and shipped in a suitable box.
4. Soft, succulent plants that are packed in airtight plastic frequently decay before their arrival. Package these plants so they may "breathe."
5. Turf specimens should be wrapped securely in several layers of newspaper or aluminum foil. Pack firmly in a box to avoid contamination of the leaves with soil particles.
6. For mailing, use strong containers like corrugated boxes or mailing tubes that will not crush in transit.
7. Fill empty spaces in mailing cartons with crushed or shredded paper to protect the specimen
8. Use overnight mail services or mail packages early in the week to avoid weekend layovers at the post office.
9. Careful packaging and quick delivery of the specimens is essential.

Send all samples to:

C. Wayne Ellett Plant and Pest Diagnostic Clinic
110 Kottman Hall
2021 Coffey Road
Columbus, Ohio 43210
(614) 292-5006
Fax: (614)292-4455

E-Mail: ppdc@postoffice.ag.ohio-state.edu

New Nutrition, Food Safety Institute To Be Developed At OSU

By: Candace Pollock, Associate Editor, OARDC Research Services; Sources: Tammy Bray, Associate Dean of the College of Human Ecology, OSU, and Ahmed Yousef, Department of Food Science and Technology, OSU

Ohio State University researchers are joining forces to create a one-of-a-kind research institute addressing nutrition and food safety from the farm to the plate. More than thirty-five researchers from the colleges of Food, Agricultural, and Environmental Sciences, Human Ecology, Veterinary Medicine, and Medicine and Public Health are integrating agriculture, food systems, nutrition and medicine into the Ohio Bionutrition and Food Safety Research Institute.

Tammy Bray, associate dean of the College of Human Ecology and project coordinator, said the purpose is to bring together researchers from several areas of discipline to work toward a similar goal. "Our objective is to have people working collaboratively in cutting edge areas to come up with innovative projects and ideas. We want researchers to think outside the box, away from the traditional means of doing science."

The institute represents one of eight focus areas recognized recently by the university and approved by President William Kirwan to help build OSU's reputation on a national and international level. "This is a great chance for us to establish what we've been trying to accomplish for many years," said Ahmed Yousef of the Department of Food Science and Technology, and the coordinator of the food safety team. "This gives us an opportunity to be a leading food safety center while building close ties with nutrition experts."

Yousef said the link between bionutrition and food safety is indirect but crucial to overall human health. "If whatever process you created to make food safe doesn't provide people with any nutritional value, then you are not providing the consumers any service," he said. Bray added that most people don't realize that bionutrition and food safety are interwined at the microbiological level. "How does nutrition affect microorganisms in the large intestine? What does the intestine do to absorb those nutrients, and how do we know that it's good for us?" asked Bray.

The answers to such questions have their origin in agriculture, where studies of probiotics in animals are helping to make foods safer and more nutritious. Probiotics are naturally occurring beneficial microorganisms that live in the intestinal tract of animals and humans and maintain health by fighting illness and disease and by inhibiting the growth of pathogenic bacteria. One such probiotic currently being studied is conjugated linoleic acid, or CLA, a fatty acid found in ruminants that is a potent cancer fighter. OSU animal science researchers are studying ways to increase CLA in dairy and meat products.

"I think that this research institute and what we'll be contributing to it is very important as more people move away from farming and rural areas," said Jeff Firkins, an OSU animal science researcher. "Surveys have shown that people are not very knowledgeable about food issues. We see our role as educating the public and providing them with the kind of information they need to distinguish between what is fact and what may be mere perception."

The study of probiotics, prebiotics (foods or nutrients utilized by bacteria that can be added to a diet to increase the chances of those bacteria thriving in the intestine), and neutraceuticals are seen as opportunities to provide natural ways to improve human health. "Our intent at OSU is to better understand what sort of naturally-occurring ingredients found in foods or fermented food products can be used to promote health and well-being," said Mark Morrison, an OSU animal science researcher.

In addition to research in probiotics and prebiotics, the institute will also house research projects on pathogenic organisms, such as Salmonella, Escherichia coli, Listeria and Campylobacter. Said Yousef, "This research institute is different than any other that has been created. It broadens the perspective of food safety from on the farm to the home, while most food safety centers only focus on what happens to pathogens while food is being processed."

Processing and health problems associated with pathogenic organisms cost the food industry $8.5 billion a year. Roughly 20 percent of the population suffers from pathogen-related illnesses with about 5,000 deaths occurring each year. "Everyone deserves a nutritious, safe, and inexpensive supply of food. To ensure that, we need to work together across college boundaries and make high-impact discoveries for a common cause," said Morrison.

The Ohio Bionutrition and Food Safety Research Institute is in its early stages of development. Participating colleges have requested funding to build the institute, which will be housed in Vivian Hall on the College of Food, Agricultural, and Environmental Sciences campus. Ohio State has provided $200,000 toward the institute and its research activities. The University of Cincinnati's College of Medicine, Case Western Reserve University's College of Medicine, Ross Products Division, Abbott Laboratories, Procter & Gamble, and M&M Mars International Inc. are also involved in the project.

Sooty Blotch and Flyspeck

Source: Bill Turechek & Dave Rosenberger, Plant Pathology, Cornell University; Scaffolds, Vol. 10, No. 12

Sooty blotch and flyspeck are two of the most important summer diseases of apple in New York. The diseases do not result in direct losses in yield, but rather cause a reduction in fruit quality, which can lead to economic loss due to downgrading in fresh market fruit. Losses can exceed 25%, especially in much warmer climates such as those encountered in southeastern NY. Until recently, sooty blotch was thought to be caused by the fungus *Gloeodes pomigena*. However, recent studies have shown that sooty blotch is a disease complex caused by at least 3 different fungi: *Peltaster fruticola*, *Leptodontium elatius*, and *Geastrumia polystigmatis*. All three fungi are not necessarily present in all sooty blotch lesions. Flyspeck is caused by the fungus *Schizothyrium pomi* (= *Zygophiala jamaicensis*).

Symptoms
Sooty blotch appears as various shades of olive-green on the surface of the fruit. Colonies range in shape from nearly circular with distinct margins to rather large, amorphous blotches with diffuse margins. The variation in shapes and color can be attributed to the interaction between the different fungi causing the disease and environmental conditions, specifically temperature and relative humidity.

Flyspeck appears as distinct groupings of shiny, black fungal bodies (called thyriothecia) on the surface of the fruit. The number of thyriothecia associated with a single infection ranges from a few to over fifty. Although flyspeck thyriothecia appear to exist individually, close examination reveals mycelium connecting the individual structures.

For both flyspeck and sooty blotch, the causal fungi grow only within the wax cuticle of the fruit and are quite superficial. Rubbing the fruit with a cloth will often be enough to "clean-up" an apple that is only lightly affected.

Disease Cycle

The specific details of the life cycle of the sooty blotch fungi *P. fruticola*, *L. elatius*, and *G. polystigmatis* are not specifically known because they have only recently been identified as the cause of sooty blotch. However, the disease cycle is assumed to be similar to that described for *Gloeodes pomigena*. The fungi overwinter on infected twigs on apple and on its numerous wild hosts. Conidia are formed in late spring and early summer and are dispersed to developing fruit by wind and splashing rain. Fruit infection typically occurs from late-April to mid-May in the southeastern United States and in June in the northern and northeastern United States. The first symptoms are generally apparent 20-25 days after infection, but can be visible in 8-12 days under optimal conditions.

In Pennsylvania, it was found that the development of sooty blotch was highly correlated with the amount of rainfall received in July, and to a lesser degree in August and September. In laboratory studies, conidia of *P. fruticola* germinated between 12-24C and between 12-32C for *L. elatius* at a relative humidity of 95%. The optimum temperatures for fungal development were between 12-24C and 16-28C for *P. fruticola* and *L. elatius*, respectively. The production of conidia of both fungi was greatest when the relative humidity exceeded 97%.

Flyspeck overwinters as thyriothecia on apple twigs, culled apple fruit, and on numerous wild hosts. Ascospores mature and are discharged shortly after bloom and initiate infection (Williamson & Sutton, 2000). The time of discharge varies from region to region and in relation to environmental factors. Symptoms are visible 10-12 days after infection under optimal conditions, but may not occur for 1 month under less than ideal conditions. Initial infections will give rise to conidia, which initiate secondary infection throughout the remainder of the season.

Numerous observations in the field have shown that warm and wet or humid conditions are needed for the development of disease. Laboratory studies have shown that conidia can germinate within the range of 8-24C, colony development occurs over the range 5-28C, and spore production readily occurs between 12-24C (Ocamb-Basu et al., 1988a; Williamson & Sutton, 2000). All three processes require that the relative humidity exceed 96%. The development of asci was initiated at temperatures between 4-6C and ascospore maturation occurred at various temperatures between 9 and 21C. Again, both processes require a high relative humidity.

Disease Management

Control of sooty blotch and flyspeck truly requires an integrated approach. Perhaps the single most important practice for reducing the damage caused by these diseases (outside of the use of fungicides) is to ensure that pruning is adequate to promote rapid drying of fruit surfaces. It was shown that the incidence of sooty blotch and flyspeck could be reduced by an average of 30% by "severe pruning" (Latham & Hollingsworth, 1973). In a later study, dormant pruning in a non-sprayed orchard reduced the incidence and severity of sooty blotch in 2 out of the 3 years, but the results were inconsistent with respect to flyspeck (Ocamb-Basu et al., 1988b).

In a 2-year study conducted in Massachusetts, Cooley et al. (1997) showed that summer pruning could reduce the incidence of flyspeck by nearly 50% in an unsprayed orchard. In the same study, they indicated that the number of fruit downgraded from USDA Extra Fancy was reduced when summer pruning was done in commercial orchards. They concluded that summer pruning helped to decrease the incidence of flyspeck by reducing the number of hours of relative humidity >95% and allowing increased penetration of pesticides to the upper two-thirds of the canopy when applications were made with an airblast sprayer.

However, the primary means of managing sooty blotch and flyspeck is by regularly scheduled applications of fungicides. In northeastern United States, fungicides are applied to apples from mid-June through August primarily to control sooty blotch and flyspeck. Four or five summer fungicide applications may be needed to control these diseases in wet years, whereas only two or three well-timed applications are needed in dry years. Omitting summer fungicide sprays is risky because gaps in fungicide protection during critical periods in summer can result in the sudden appearance of numerous flyspeck infections just before harvest.

Field research conducted in the Hudson Valley over the past 10 years has been used to develop a model for timing apple fungicide sprays during the summer. The model targets flyspeck because fungicide programs that control flyspeck will nearly always control sooty blotch under N.Y. conditions. The concepts used to develop the N.Y. Flyspeck Model are outlined below. Omitting fungicides is always risky because potential losses from disease on fruit can quickly obliterate any savings that accrue from withholding sprays. Nevertheless, the information and concepts used to develop the N.Y. Flyspeck Model may be useful in deciding how to time summer fungicides, even if the ultimate decisions on fungicide timing end up being considerably more conservative than those suggested by the model.

The first step in constructing the N.Y. Flyspeck Model was the development of a table of estimated residual activities for various summer fungicides (Table 1). This table was developed using data from small-plot field trials conducted in the Hudson Valley from 1987-1996. Residual activities shown in the table are shorter during summer than for the last spray before harvest because cooler conditions in the fall slow development of sooty blotch and flyspeck, and also because late infections will fail to develop symptoms before harvest, and therefore are of no concern.

In addition to the residual activity of fungicides shown in Table 1, research has shown that benzimidazole fungicides (Benlate and Topsin M) and strobilurin fungicides (Sovran and Flint) provide post-infection activity against sooty blotch and flyspeck. Their post-infection activity decreases as the time between infection and fungicide application increases. Although there are still some data gaps with Sovran and Flint, tests completed to date suggest that all four of these fungicides have reasonable activity against flyspeck infections that have accumulated fewer than 100 hours of wetting after infections occurred. Working in North Carolina, Brown & Sutton (1995) showed that sooty blotch and flyspeck appear on fruit only after fruit are exposed to 275-300 hours of accumulated wetting following infection. Thus, it appears that Benlate, Topsin M, Sovran, or Flint will provide post-infection control of flyspeck and sooty blotch so long as the infections are less than one-third of the way through the incubation period, with "incubation period" defined as 275-300 hours of accumulated wetting after infection.

By taking advantage of both the residual activity of fungicides and the post-infection activity of Benlate, it may be possible to eliminate one or two summer fungicide sprays after the last scab spray is applied in early to mid-June. The logic is as follows: Assume that the last spray for apple scab (usually first or second cover spray) will provide the residual activity noted in Table 1. If mancozeb is used for the last scab spray, then fruit will be protected for the shorter of either 21 days or through 3.5 inches of accumulated rain following the mancozeb application. After the residual activity from the last scab fungicide spray is exhausted, a "protection gap" of up to 100 hours of leaf wetting (including dew periods) can be tolerated if Benlate, Topsin M, Sovran, or Flint is used later in the season. A leaf wetness recorder will be required to monitor hours of leaf wetting, but data from a regional recording station may suffice for orchards within 10-15 miles of the recording station. During the protection gap, fruit will not be protected by fungicides, so sooty blotch and flyspeck infections may occur on fruit if inoculum is present in the vicinity of the orchard.

At the end of the protection gap, one of the four fungicides with post-infection activity must be applied to eradicate infections. To be conservative and allow for unexpected rains that might intervene before sprays are completed, the post-infection program should be initiated after the accumulated wetting during the protection gap reaches 80 hours. A minimum of two fungicide applications should be used following the protection gap and prior to harvest to ensure complete suppression of incubating flyspeck infections. The two post-infection sprays should be 14-21 days apart and, in dry years, will most likely coincide with insecticide applications timed to control apple maggot. Including Benlate, Topsin M, or Flint in August applications should also control black rot infections that may develop in fruit lenticels as the fruit begin to ripen. Sovran is also effective against black rot, but it has a 30-day to harvest restriction.

In simple terms, following this model will usually result in eliminating fungicide sprays for about 30 days sometime between June 7 and July 25, with timing of the spray gap dependent on when the last June spray is needed for apple scab or cedar apple rust. In dry years, the spray gap might extend for 45 days or more, whereas in wet years, it might only be three weeks.

CAUTION: Omitting fungicide sprays during July is not recommended if tree canopies are dense (as in trees left unpruned last winter) or if fruit are clustered. In orchards with dense canopies or clustered fruit, complete fungicide coverage will almost certainly be impossible during late summer when the canopy reaches maximum density and the clustered fruit prevent fungicide from reaching the center of clusters. In such orchards, Benlate, Topsin M, Sovran, or Flint should be applied during July, when the likelihood of decent coverage is better than it would be in August. Even a very tight fungicide program may fail to control flyspeck during wet seasons in orchards with dense canopies.

Literature cited:

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Control. *Plant Disease* 84, 714-724.

Table 1. Suggested fungicides, rates, and spray intervals for controlling sooty blotch and flyspeck in orchards considered at moderate risk for these diseases.

		June/July		From last spray until harvest	
Fungicides grouped by effectiveness	Rate/100 gals of dilute spray	Spray interval (days)	Maximum rainfall (in.)	Total number of days	Maximum inches of rain allowed before August 30 without respray
Benomyl or Sovran or Mancozeb	3 oz. 1.25 oz. 1 lb	21	3.5	50	4.0
or Ziram/sulfur	1+1 lb				
Topsin-M or Flint or Ziram 76W or Captan 50W	3 oz. 1.0 oz. 1.5 lb 2.0 lb	21	2.5	45	3.0
Ziram 76W	1 lb	21	2.0	45	2.5
Captan 50W	1 lb	14	2.0	30	2.5

Adapted from Agnello, A., Kovach, J., Nyrop, J., Reissig, H., Rosenberger, D., and Wilcox, W. 1999. Timing sprays to control flyspeck. Pages 22-23 in: Apple IPM: A guide for sampling and managing major apple pests in New York State. NY State IPM Program, Geneva, Publ. 207.

Fruit Observations & Trap Reports

Insect Key
AM: apple maggot
CM: codling moth
ESBM: eye-spotted budmoth
LAW: lesser apple worm
LPTB: lesser peachtree borer
OBLR: obliquebanded leafroller
OFM: oriental fruit moth
PTB: peachtree borer
RBLR: redbanded leafroller
SJS: San Jose scale
STLM: spotted tentiform leafminer
TABM: tufted apple budmoth
VLR: variegated leafroller

Waterman Lab, Columbus, Dr. Celeste Welty, OSU Extension Entomologist

Traps used: STLM = Wing trap, SJS = Pherocon V, Codling Moth = mean of 3 MultiPher® traps, Others = MultiPher

Apple: 5/30 to 6/6
- CM: 4.0 (down from 6.3)
- DWB: 0 (unchanged)
- OBLR: 5 (up from 1)
- OFM: 10 (up from 3)
- RBLR: 1 (up from 0)
- SJS: 0 (unchanged)
- STLM: 37 (up from 9)
- TABM: 0 (down from 1)
- VLR: 0 (down from 2)

Note: First few crawlers of San Jose scale detected on black stick tape between 6/4 and 6/6. This week is thus a good time to control scale using diazinon or Esteem.

Peach: 5/30 to 6/6
- LPTB: 0 (unchanged)
- PTB: 0 (down from 1)
- OFM: 11 (up from 10)

Site: East District; Erie & Lorain Counties
Source: Jim Mutchler, IPM Scout
Traps Used: STLM=wing traps, SJS=Pherocon-V, Others=MultiPher®

Apple: 5/30 to 6/5
- CM: 0.6 (up from 0.4)
- RBLR: 0 (down from 37.5)
- SJS: 0 (unchanged)
- STLM: 44.3 (up from 41.5)

Peach: 5/30 to 6/5
- OFM: 0.3 (down from 0.5)
- LPTB: 4.0 (up from 2.0)
- PTB: 0.3 (up from 0)
- RBLR: 0 (unchanged)

Other pests include white apple leafhopper, green apple aphid, rosy apple aphid, lilac borer, green peach aphid

Beneficials include lacewing eggs, larvae, & adults.

Site: West District; Huron, Ottawa, & Sandusky
Source: Gene Horner, IPM Scout
Traps Used: STLM=wing traps, SJS=Pherocon-V, PC = circle traps, Others=MultiPher® traps

Apple: 5/30 to 6/5
- CM: 0.6 (up from 0.4)

RBLR: 0 (unchanged)
SJS: 0.4 (up from 0)

Peach: 5/30 to 6/5
OFM: 0.4 (down from 1.0)
LPTB: 2.0 (up from 1.8)
PTB: 0 (unchanged)
RBLR: 0 (unchanged)

Other pests include green peach aphid, two-spotted spider mite, green apple aphid, rosy apple aphid, lilac borer, tarnished plant bug damage, plum curculio strikes

Beneficials include banded thrips, predatory mites, and lady beetles

Northern Ohio Apple Scab & Fire Blight Activity from SkyBit®

	Dates	Level of Disease Activity
Observed	**June 1-6**	Possible **scab** infection & damage
	June 1-6	**Fire blight** active, but no infection
	June 1-6	**Sooty blotch** active, but no infection
Forecast	June 7-15	**Scab** active, but no infection expected
	June 7, 10, 11, 15, 16	**Fire blight** active, but no infection
	June 8, 9	No **fire blight** activity
	June 12-14	Possible **fire blight** infection & damage
	June 7-16	**Sooty blotch** active, but no infection

Degree Day Accumulations for Selected Ohio Sites January 1, 2001 to date indicated

Location	Reported Degree Day Accumulations						Forecasted Degree Day Accumulations 06/13/01	
	May 23		May 30		June 6			
	Base 45° F	Base 50° F	Base 45° F	Base 50° F	Base 45° F	Base 50° F	Base 45° F	Base 50° F
Akron - Canton	623	410	693	445	775	491	925	607
Cincinnati	940	663	1038	726	1154	806	1333	950
Cleveland	632	429	707	469	790	517	942	633

Columbus	867	607	965	670	1079	749	1253	889
Dayton	839	596	930	652	1032	719	1206	858
Mansfield	644	434	716	471	793	514	923	607
Norwalk	649	440	725	480	796	521	947	637
Piketon	915	631	1014	695	1135	781	1290	901
Toledo	656	447	733	490	812	534	974	661
Wooster	666	452	742	496	827	543	955	636
Youngstown	605	397	673	431	753	475	890	577

Phenology

Coming Events	**Range of Degree Day Accumulations**	
	Base 43° F	Base 50° F
Codling moth 1st flight peak	547-1346	307-824
Peachtree borer 1st catch	565-1557	299-988
Obliquebanded leafroller 1st catch	686-1104	392-681
Lesser peachtree borer flight peak	733-2330	392-1526
Spotted tentiform leafminer 2nd flight begins	795-1379	449-880
San Jose scale 1st generation crawlers present	987-1247	569-784
Apple maggot 1st catch	1045-1671	629-1078
Redbanded leafroller 2nd flight begins	1096-2029	656-1381
Codling moth 1st flight subsides	1112-2118	673-1395

Thanks to *Scaffolds Fruit Journal* (Art Agnello)

Preliminary Monthly Climatological Data for Selected Ohio Locations May, 2001

Weather Station Location	Monthly Precip	Normal Monthly Precip	Year-to-Date Precip	Normal Year-to-Date Precip	Average High	Normal High	Average Low	Normal Low	Mean Temp.	Normal Mean
Akron-Canton	4.29	3.73	12.55	14.61	69.1	69.7	49.1	48.2	59.1	59.0
Cincinnati	5.16	4.28	11.18	17.55	75.1	74.0	53.2	51.8	64.1	62.9

Cleveland	3.84	3.49	11.80	13.77	69.5	68.6	50.5	47.3	60.0	57.9
Columbus	7.03	3.93	14.13	14.83	73.3	72.3	53.6	50.1	63.5	61.2
Dayton	4.54	3.88	12.02	15.06	73.2	72.5	53.7	51.0	63.5	61.7
Fremont	3.69	3.60	10.44	12.77	72.6	70.4	49.3	48.2	61.0	59.3
Mansfield	3.77	4.35	12.54	15.29	69.1	69.3	50.0	48.3	59.5	58.8
Norwalk	2.69	3.55	10.03	13.08	70.4	69.4	51.4	47.0	60.9	58.3
Piketon	6.44	4.20	12.40	18.60	75.2	73.6	51.4	49.8	63.3	61.7
Toledo	5.06	2.91	11.43	12.01	71.6	70.5	51.2	46.7	61.4	58.6
Wooster	3.99	4.01	10.21	13.91	70.9	70.6	48.9	46.5	59.9	58.5
Youngstown	2.70	3.52	10.22	13.85	70.4	68.7	47.1	46.2	58.7	57.5

Temperatures in degrees F, Precipitation in inches

Record low set: 31st; Youngstown - 34F Record highs tied: 2nd ,Mansfield - 80F; 3rd, Mansfield 82F, Youngstown 84F

Table Created by Ted W. Gastier, OSU Extension from National Weather Service, OARDC & Local Data

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