VEGETABLE CROPS HOTLINE

A newsletter for commercial vegetable growers prepared by the Purdue University Cooperative Extension Service

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ANGULAR LEAF SPOT - *(Dan Egel)* - The disease angular leaf spot (ALS) of watermelon has been observed by several watermelon growers in SW Indiana in the last week. Although not a serious disease, ALS can be confused with other more serious diseases.

Symptoms of ALS are extremely variable. Usually the lesions are chocolate brown and irregular in size and shape. Often, the edge or margin of the lesion has a water soaked appearance. Seed leaves or true leaves may be affected. Muskmelon is rarely affected by ALS (see Figures 1 and 2).

Figure 1. Upper surface of a watermelon leaf showing angular leaf spot. Picture by D. Egel

Cool, wet weather favors the appearance of ALS. Once transplants go to the field and the weather warms up, the disease will disappear. I have never observed ALS in the field past the first 7 to 10 days following transplanting. Seedlings can be killed or badly disfigured by ALS before the weather warms up and the disease disappears.

If ALS-like symptoms are observed, be sure to have an accurate diagnosis made on your crop. The other important bacterial disease that occurs on watermelon is bacterial fruit blotch. The two diseases cannot be differentiated by symptoms alone: a lab test must be carried out.

Figure 2. Under surface of a leaf showing angular leaf spot symptoms. Picture by D. Egel

Once ALS is diagnosed, the disease can be managed by the use of copper hydroxide bacteriacides. Resist the urge to use other unnecessary pesticides. Applications of a copper hydroxide bacteriacide once a week is sufficient. Always read and follow label directions when using any pesticide.

THE ESSENTIAL ELEMENTS - *(Chris Gunter)* - It has been know since ancient times that certain materials applied to growing plants have beneficial effects. However, it wasn't until the 1800's that scientists began verifying which elements are essential for plant growth and development (Jones, 1998). These elements are frequently called nutrients or nutrient elements. In 1939 Arnon and Stout, two plant physiologists working at the University of California, established three criteria which must be met in order for an element to be essential for plant growth:

- Omission of the element in question must result in abnormal growth, failure to complete the life cycle, or premature death of the plant.
- The element must be specific and not replaceable by another.
- The element must exert its effect directly on plant growth or metabolism, and not some indirect effect such as reducing the uptake of another element.

There are 16 recognized essential elements for plant growth and they are: Carbon (C), Hydrogen (H), Oxygen (O), Nitrogen (N), Phosphorous (P), Potassium (K), Calcium (Ca), Magnesium (Mg), Sulfur (S), Chlorine (Cl), Boron (B), Iron (Fe), Manganese (Mn), Zinc (Zn), Copper (Cu), Molybdenum (Mo). The broad function of these elements are given in Table 1. With the exception of C, H, and O, which are taken up as gasses from the atmosphere, these elements are absorbed by plants as ions or chelates (a metal ion in combination with a molecule) in the soil solution.

Table 1. A list of essential elements and their broad function in plant growth and development.

Essential Element	General Function in the Plant
C, H, O, N, S	Major components of protein
P, B	Energy transfer reactions and carbohydrate (sugar) movement
K, Mg, Ca, Cl	Numerous functions including specific components of proteins and maintaining ionic balance
Cu, Fe, Mn, Mo, Zn	Enable energy transport and catalysts for enzymes

In addition to these essential elements, there may be other elements that are essential for growth and development in plants. These elements may be necessary in such low amounts that it is difficult to establish if they are essential. We give this group of elements the name beneficial. An example of an element in that category would be Nickel (Ni). Recent studies have shown that Ni is likely to be classified as essential in the future.

Look for upcoming articles, which will describe specific essential elements and their role in plant growth.

References:

Arnon, A.I. and P.R. Stout. 1939. The essentiality of certain elements in minute quantity for plants with special reference to copper. Plant Physiology 141:371-375.

Jones, J.B., Jr. 1998. Plant Nutrition Manual. CRC Press, New York, NY. p. 4-12.

Mengel, K. and E.A. Kirby. 1987. Principles of Plant Nutrition. Fourth Edition. International Potash Institute, Berne, Switzerland.

Preliminary Data on the Scouting Period of Striped Cucumber Beetles - (*Frankie Lam*) - Most insects have an optimal range of temperatures for activity, growth, and development. The optimal range of temperatures is different for each insect species. For most insect pests, the optimal temperature for activity is still unknown to growers and entomologists.

The striped cucumber beetle is an active insect pest. During daytime the adult beetles fly among cucurbit plants and feed on the leaves and stems. The beetle is a vector of bacterial wilt. Once a plant is infected with the bacterium, nothing can be done to save the plant. The best strategy to manage the disease is to manage the beetle during the early season. Thus, determining the number of beetles in the field accurately is important for the management of the pests. In addition, knowing the most active period for the beetle during the day is essential in making the decision for when to scout. You should plan to scout when the beetle is active.

A research study is being conducted at the Southwest Purdue Agricultural Center to determine the most active period for the striped cucumber beetle during the day. A muskmelon field was sampled every two hours from eight o'clock in the morning to four o'clock in the late afternoon. Different rows in the field were scouted randomly in different hours so that a row would not sample twice in a sampling date. During each sampling time, 60 plants were sampled randomly. The total number of beetles for each sampling hour was recorded and is presented in Table 1. Based on the preliminary data from this May, it seems that the beetles are less active in the early morning. The best time to scout the field for cucumber beetles seems to be after ten in the morning. However, this is preliminary data from the early season and the beetles might not behave the same during the hot summer. I hope that by the end of this research study I can suggest a scouting time, when the beetles are most active in muskmelon, for different parts of the season.

Table 1. Total numbers of beetles on sixty plants in every two-hour counts during the day in May 2003.

	Beetles per 60 Plants				
Date	**8 AM**	**10 AM**	**12 PM**	**2 PM**	**4 PM**
May 7	68	98	105	96	57
May 13	19	55	66	71	65
May 15	56	74	75	95	81
May 20	49	77	62	62	73
May 22	79	91	112	107	78

Using Growing Degree Days to Estimate Harvest Dates - *(Liz Maynard)* - By early June most warm season crops will be in the ground even in the northern part of the state. But planting won't be over for producers planning for late season harvests of fruiting crops. It seems every year there is a question or two about how late a crop can be planted. Without having actually planted a crop later than usual and learned from experience, how can we answer the question?

One way is to look at historical temperature records, specifically growing degree day (gdd) accumulations. Gdd are units combining measurements of temperature and time that are widely used to predict plant growth. Because crop growth is highly dependent on temperature when water and nutrients are adequate, crop development often parallels growing degree day accumulation. In May, when temperatures are cool, gdd accumulate slowly and crops grow is slowly. In July, when it's hot, gdd accumulate rapidly and crops grow faster.

Table 1. May-September 1971-2000 Growing Degree Day Normals for Regions in Indiana

Region	May	June	July	August	September
Northwest	336	572	710	644	413
North Central	343	574	706	640	409
Northeast	329	562	693	626	394
West Central	384	622	754	685	453
Central	366	605	737	674	440
East Central	344	576	704	642	418
Southwest	448	689	808	765	529
South Central	412	640	776	725	487
Southeast	417	648	779	735	498

Source: Indiana Climate Page - Data Archive - Normals http://shadow.agry.purdue.edu/sc.norma-geog.html

Thirty-year normal monthly totals for growing degree days in Indiana are shown in Table 1. These are growing degree days for corn, using a base temperature of 50°F and a maximum of 86°F. Note that July has the most gdd, August is next, ahead of June, and May has less than 1/2 the total of July except in the southern regions. Gdd accumulation for NW Indiana beginning May 1 is shown in a graph format in Figure 1. If a corn

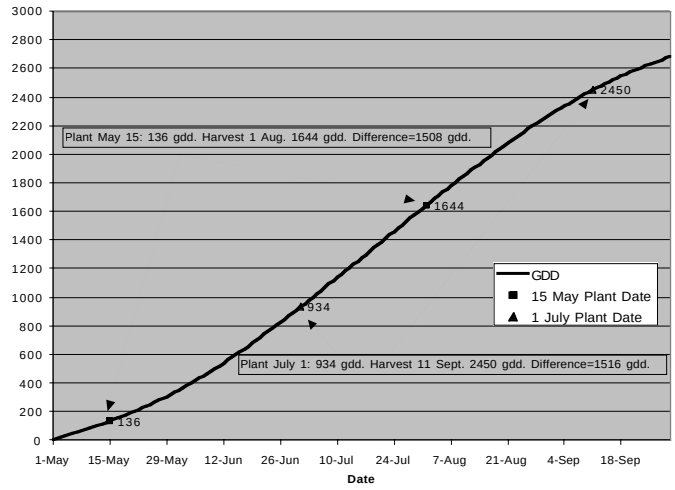

Figure 1. Growing Degree Day Accumulation, Base 50°F, May-Sept., 1971-2000 Normals for NW Indiana

variety planted May 15 typically matured around Aug. 1, that would correspond to about 1510 gdd. The same variety planted July 1 would be expected to mature about 1510 gdd later, around Sept. 11, based on the 30-year normals.

What about other crops like peppers, melons or tomatoes? There is not as much information on these crops that there is on corn, but it is possible to make some assumptions and use a similar method. The base temperature for growth should probably be higher than it is for corn. Minimum temperatures for growth of 60°F to 65°F have been published for these crops. If gdd in Table 1 are modified to use the base temperature of 60°F, the normal monthly gdd totals decrease substantially, as shown in Table 2 for NW Indiana. Although the gdd are lower they follow the same general trend, with July being the warmest month followed by August and June. Cumulative gdd for NW Indiana using a base of 60°F are presented in Figure 2. If

Table 2. May-September Monthly 1971-2000 Growing Degree Day Normals for NW Indiana, modified using 60°F base temperature

May	June	July	August	September
42	274	399	337	115

a muskmelon variety transplanted June 1 typically was ready to harvest about August 1, that would correspond to 681 gdd. The same variety transplanted (at the same stage of development) on July 1 would be expected to produce ripe melons by Aug. 26, about 680 gdd later.

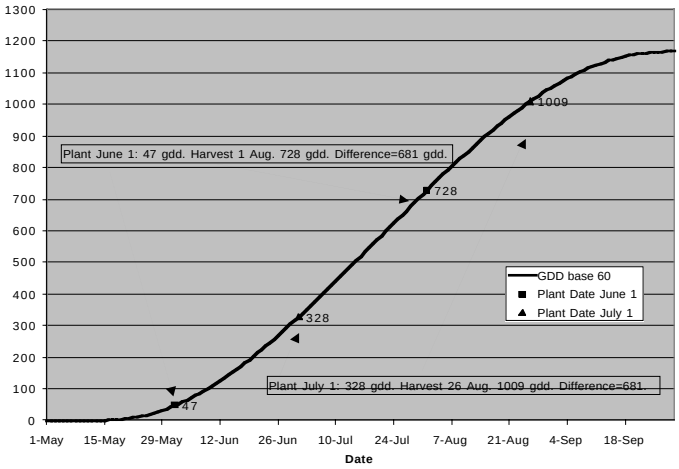

Figure 2. Growing Degree Day Accumulation, Base 60°F, May - Sept., 1971-2000 Normals for NW Indiana

Using growing degree day normals is suggested as a way to estimate when a crop planted on a certain date will be ready to harvest when there is little or no information from experience with that planting date. One does need knowledge or experience of the typical time to maturity for other planting dates. The expected harvest date can then be compared with the average frost date for that area. This system will not work well for crops that have developmental responses to daylength, such as potatoes or onions. Also, if the first fruit-producing flowers do not develop, abort prior to bloom, or fail to set fruit, the growing degree days from planting to harvest will increase and yield will be delayed. This can happen, for instance, when high temperatures interfere with flower development in tomato, pepper and pumpkin.

New Email Groups Available - *(Announcement)* - Two mail groups have been established for Indiana fruit and vegetable growers, winemakers, farm markets, etc. as part of our Indiana Fruit and Vegetable web site. The project is sponsored by the Purdue University Department of Horticulture and Landscape Architecture and is partially funded by a USDA Specialty Crop Block Grant through the Office of the Indiana Commission of Agriculture. The "Fruitveg" group is for all fruit and vegetable growers, farm marketers, etc. in Indiana and

surrounding states. The "Winegrape" mail group is primarily for the Indiana wine industry. Anyone can subscribe to either group.

The mail groups have been established to allow Indiana fruit and vegetable growers, wine grape growers and wineries, and farm marketers to interact with each other electronically. We envision growers and marketers using this forum for free and open exchange of information and ideas. We also feel that the list can be used to coordinate group purchases of equipment and supplies, and as a forum to buy and sell produce and used equipment and supplies. However, we believe that advertising by commercial vendors is not appropriate use of the mail group. While we do not intend to moderate the list, we will keep an eye on the activity. We will not allow personal vendettas, inflammatory comments or other inappropriate use of the list. Any statements made do not represent "official" opinions, and Purdue University takes no responsibility for content.

There are two ways to receive messages from the mail groups, as a list or a digest. If you subscribe to the mailing list, each message that is sent to the list will be forwarded to you as a separate email message. For example, if there are 5 messages sent to the list in one day, you will receive 5 emails from the list that day. Subscribe to the mailing list using this option if you want to receive messages as soon as they are posted. If you subscribe to the mailing list digest, all messages received by the list in one day will be combined into one email message and sent to you periodically. If there are 5 messages sent to the list in one day, you will receive one email containing all 5 messages. Subscribe to the mailing list using the digest option if you prefer to receive fewer separate email messages.

To subscribe to the list, send a message to <majordomo@purdue.edu> with the following command in the body of your email message:

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You will receive a message back from majordomo requiring authentication of your subscription. The process is quick and self-explanatory. If you have any problems, let one of us know and we'll try to help.

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