Pest & Crop

June 29, 2001 - No. 15

In This Issue

Due to an error beyond our control, Issue No. 14 did not have the new publication E-218 attached. You will find it attached with this newsletter. We are sorry for any inconvenience this may have caused.

Insects, Mites, and Nematodes

Japanese Beetle, To Treat or Not - (*John Obermeyer, Rich Edwards, and Larry Bledsoe*) -

- Beetle damage usually looks worse than it is
- Corn and soybean damage particulars and treatment guidelines are given
- Controlling adults to prevent grub damage is impractical
- Don't use "bag-a-bug" type traps

As reported in previous issues of the *Pest&Crop*, Japanese beetle are emerging throughout the state. A rash of phone calls from Posey County (extreme SW Indiana) indicates that they could be one of Indiana's Japanese beetle hotspots this year. Adults will continue to emerge from the soil for several weeks, causing concern to producers and homeowners alike. The one important thing to remember when it comes to Japanese beetles – their presence and damage usually looks worse than it is.

Field Corn: Japanese beetles feed on corn leaves, tassels, and silks. Generally ignore leaf and tassel damage since it is usually not economic. If beetles are present and feeding on corn silks, an insecticide should be applied only if on average the silks are being cut off to less than 1/2 inch before 50% pollination has taken place. This rarely happens on a field-wide basis. Don't be overly excited by this pest's tendency to clump (or party!) on a few ears within an area and eat the silks down to the husks. With sufficient soil moisture, silks will grow from 1/2 to 1 inch per day during the one to two weeks of pollen shed. Silks only need to be peeking out of the husk

to receive pollen (refer to Bob Nielsen's articles in this week's "Agronomy Tips"). Besides, beetles are often attracted to silks that have already completed the fertilization process even though they are still somewhat yellow. Check for pollen shed and silk feeding in several areas of the field, Japanese beetles tend to be present only in the outer rows of the field. Don't be influenced by what you think you may see from windshield surveys! Get out into fields to determine beetle activity.

Beginning of pollen shed

Pollen shed nearly completed

Soybean: Soybean plants have the amazing ability to withstand considerable damage (defoliation) before yield is impacted. The impact of defoliation is greatest during flowering and pod fill because of the importance of leaf area to photosynthesis, and ultimately to yield. Therefore, nearly 50% soybean defoliation before bloom or 25% defoliation from bloom to pod fill can be tolerated before yields are economically affected. This defoliation must occur for the whole plant, not just the upper canopy. The beetles often congregate in areas of a field where they are first attracted to weeds such as smartweed. Typically if economic damage occurs, it is only in these areas. Therefore, spot treatments where possible should be considered. Don't be overly alarmed by these bright, iridescent beetles that feed on the top canopy of the soybean plants. Consider that as they feed their defoliation allows for better sunlight penetration into the lower plant canopy!

Grubs: Japanese beetles developed from grubs feeding on organic matter and/or the roots of plants last fall and this spring. Therefore it seems logical that killing adult beetles this year should prevent grub damage in 2002. However it simply doesn't work that way. Researchers' attempts to draw in beetles to encourage them to lay eggs for subsequent grub damage in research plots have generally failed. Entomologists for years have been trying to understand this fickeled creature. Basically, the adults feed, mate, and lay eggs when and where they want to. The grubs are just as unpredictable. Research attempts to correlate grub presence to crop damage have usually shown insignificant differences. Damage does occur, but we are just not usually able to predict when or assess how much. Besides, each beetle mates and lays eggs several times during its oviposition period. To prevent egg laying in a field, one would need to treat multiple times during July and August.

Some producers have purchased Japanese beetle traps and have placed them where beetles have congregated. The "bag-a-bug" type trap can utilize both a pheromone and a floral scent to attract both sexes of the beetle. However, these traps are NOT recommended for beetle management because they attract more beetles than they control, resulting in localized plant damage.

Should controls be needed, refer to publications E-219, *Corn Insect Control Recommendations – 2001*, or E-77, *Soybean Insect Control Recommendations – 2001* for labeled products. These and other field crop related publications can be viewed electronically at <http://www.entm.purdue.edu/entomology/ext/targets/e-series/fieldcro.htm>.

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European Corn Borer, Time to Wait and See - (*John Obermeyer, Rich Edwards, and Larry Bledsoe*) -

- Overall, first brood damage is low
- Extended spring moth flights may further stretch second brood
- High value corn will be at highest risk to late season damage

Surveys throughout the state, black light catches of moths, and pest managers' sampling reports all indicate that European corn borer has had little economic impact on this year's corn, at least thus far. Low overwintering populations and bizarre spring weather obviously didn't favor this pest.

It's somewhat unusual for the first generation moth flight and subsequent larval damage to extend beyond the spring as much as it has. During the two weeks of cool and wet weather in late May and early June, corn borer moths were relatively inactive. This left a pre and post-cool period of moth activity. Those moths emerging and active later seemed to have had an attraction for later planted corn, which goes against typical first brood moth behavior. Corn borer surveys now reveal damage in the range from fresh whorl feeding to larvae boring into stalks. Once in the stalk, the borer is protected from predators, parasites, and insecticides. Mid-vein leaf feeding indicates that stalk tunneling is soon to begin; frass accumulation in leaf axils signals that borers are entering stalks.

Typically, second brood activity is more drawn out making timely treatments to corn difficult. This year the flight will likely be further stretched out. This may challenge managers of high valued crops such as seed and sweet corn. Stay tuned for updates on this pest.

European corn borer entering stalk

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European Corn Borer Survey - June 25, 2001 (Ron Blackwell)

County (Fields) Sampled	Extended Leaf Height (in.)	% of Plants/Field w/ Damage	Avg. # Larvae/ Damaged Plant
Carroll	44.4	20%	1.6
Carroll	46.8	50%	0.9
LaPorte	57.0	12%	2.0
LaPorte	46.1	15%	2.5
Porter	45.8	18%	2.3
Porter	45.7	31%	1.4
Porter	50.5	31%	1.8
White	58.4	13%	0.2
White	53.3	12%	0.3

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Potato Leafhopper Populations Increasing - (*John Obermeyer, Rich Edwards, and Larry Bledsoe)* -

- Re-growth is most at risk to feeding damage
- Damage is already done once "hopper burn" is noticed

Populations of potato leafhopper in alfalfa fields and black light traps have been rising throughout the state. Undoubtedly, the warmer and drier weather has contributed to this increase, as the leafhoppers thrive in these conditions.

Producers are encouraged to inspect new growth soon after cutting for potato leafhopper; this is when alfalfa is most susceptible to feeding, leading to reduced yields and protein. Remember, once the yellowing or "hopper burn" is seen, the damage has already been done. Refer to *Pest&Crop* #12, for sampling and management guidelines. For recommended insecticides, see E-220, *Alfalfa Insect Control Recommendations – 2001*. This and other field crop related publications can be viewed electronically at <http://www.entm.purdue.edu/entomology/ext/targets/e-series/fieldcro.htm>.

Potato leafhopper adult and nymph

A Homeless Insect Story - (*John Obermeyer, Rich Edwards, and Larry Bledsoe*) -

- Some insects feed on weeds
- "Hairy" fields invite innocuous insects
- Hungry insects must feed on something

Just when we think things couldn't get any weirder, we receive calls from Jasper and Knox Counties concerning "catalpa-like" worms in soybean fields. It's another classic case of insects left without a food source after herbicide application. We've had several of these situations this year, the most notable being variegated cutworm and burrower bugs.

Sphinx moth caterpillars, or better known as hornworms, have been found where purslane has been killed following Roundup application. The hornworms were quite happy feeding on the weed until it died, then the caterpillars began to scurry about trying to find an alternate food source. The worms were not observed feeding on soybean foliage, but we recommended checking the fields in a few days since the worms were so numerous. You never know what a desperate insect will eat. Happy scouting and watch out!

Mike Manning, Jasper Co., CES

Hornworm feeding on purslane

Mike Manning, Jasper Co., CES

Homeless hornworms

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Black Light Trap Catch Report
(Ron Blackwell)

County/Cooperator	6/12/01 - 6/18/01							6/19/01 - 6/25/01						
	VC	BCW	ECB	GC	CEW	FAW	AW	VC	BCW	ECB	GC	CEW	FAW	AW
Clinton/Blackwell	67	16	26	0	0	0	4232	6	4	0	0	0	0	14
Dubois/SIPAC	68	34	0	5	0	0	1144	99	16	0	4	0	0	113
Jennings/SEPAC	26	8	4	1	0	0	412	120	12	1	2	0	0	34
LaPorte/Pinney Ag Center	5	0	161	0	0	0	223	14	3	68	1	0	0	76
Lawrence/Feldun Ag Center	90	32	13	1	0	0	2504	75	8	0	0	0	0	91
Randolph/Davis Ag Center	10	10	62	0	0	0	948	54	14	26	7	0	0	117
Tippecanoe/TPAC	84	16	170	0	0	0	1070							
Tippecanoe/P. J. Boeve			41											
Whitley/NEPAC	18	16	238	0	0	0	940	31	7	78	8	0	0	124

BCW = Black Cutworm ECB = European Corn Borer GC = Green Cloverworm CEW = Corn Earworm
AW = Armyworm FAW = Fall Armyworm VC = Variegated Cutworm

Weeds

The Mighty Marestail – (*Glenn R.W. Nice, Thomas Bauman, Case Medlin*) -

What does it look like?

Chances are you have seen this annual weed before. Known in Indiana as marestail (*Conyza Canadensis*) it is otherwise known as horseweed, hogweed, or butterweed. It can be seen through out open fields and waste areas in the spring and summer. The seedling has oval smooth cotyledons. Young leaves are stocked to start with forming a rosette, and then as the main stem starts to elongate leaves become attached directly to the stem (figure 1). Mature leaves are simple and linear. The edge of the leave can be toothed or entire. Leaves and stems are generally hairy. The leaves are alternately placed on the main stem and can be quite crowded looking somewhat like a bushy tail, hence the name marestail. The leaves can be 1 to 4" long and up to 3/4" wide. The main stem can be simple having no branches or have branches.

What do the flowers and seeds look like?

Many small flowers are arranged in an elongated panicle (figure 2). The flowers are 1/32 to 1/16" long and are white to lavender. The seed is an achene (small dried fruit with one seed) approximately 1/32" long with several white bristles at the top.

How do I control it?

As a burndown in soybean and corn, glyphosate (Roundup Ultra, Touchdown) + 2, 4-D (several) at 0.5 + 0.25 lb ai / A can be used to control marestail. In the case of corn, atrazine + 2, 4-D or dicamba can be used at labeled rates. In soybean, chlorimuron (Classic) POST at 0.1 to 0.2 oz ai / A. In the case of Roundup Ready soybean, glyphosate POST at 0.5 to 0.75 lb ai / A. If possible, spray mares tail before it reaches 6" tall. Remember to read the labels for specific restrictions.

Fig .1. Elongated adult

Fig. 2. Mares tail florescent

Agronomy Tips

Sex in the Corn Field: Tassel Emergence & Pollen Shed - (*Bob Nielsen*) -

- Corn produces both male and female flowers on the same plant
- The tassel contains the male flowers of the corn plant

Early planted corn in the southern areas of Indiana is beginning to move into the critical flowering stages of pollen shed and silk emergence. Corn throughout the rest of the state will similarly enter the critical pollination period during the next three weeks. Success or failure during this period of the corn plant's life will greatly influence the potential yield at harvest time.

As important as this process is to the determination of grain yield, it is surprising how little some folks know about the whole thing. Rather than leaving you to learn about such things "in the streets", I've developed this article and the accompanying one on silking that describe the ins and outs of sex in the corn field.

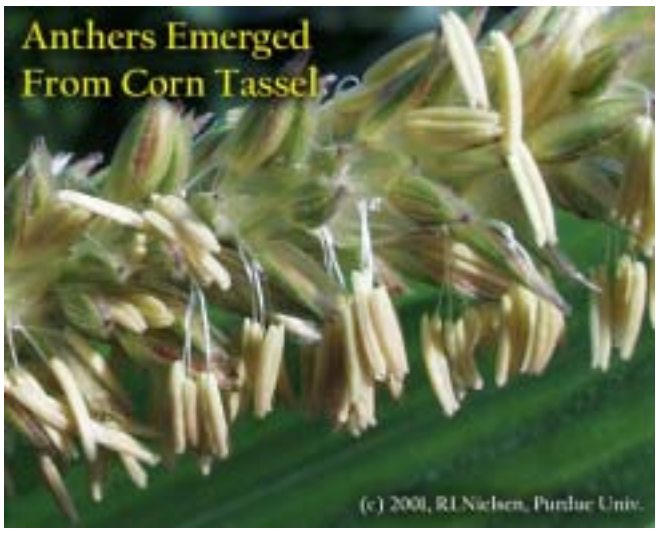
Remember that corn has both male flowers and female flowers on the same plant (a flowering habit called monoecious for you trivia fans.) Interestingly, both flowers are initially bisexual (aka 'perfect'), but during the course of development the female components (gynoecia) of the male flowers and the male com-

ponents (stamens) of the female flowers abort, resulting in tassel (male) and ear (female) development.

Technically, growth stage VT occurs when the last branch of the tassel emerges from the whorl (Ritchie et al., 1993). Portions of the tassel may be visible before the maximum leaf stage (final visible leaf collar) has occurred. Plant height is nearly at its maximum at growth stage VT. Pollen shed may begin before the tassel has completely emerged from the whorl.

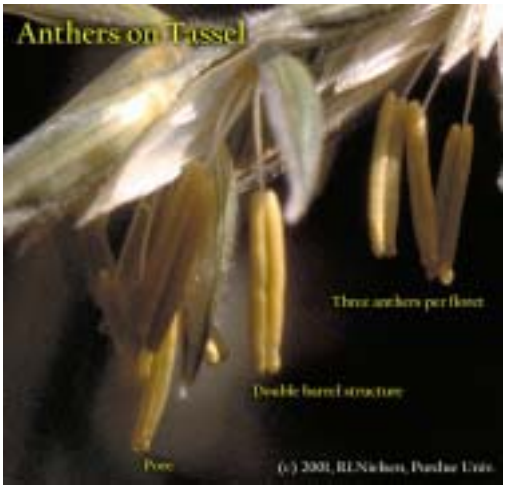
The corn plant is most vulnerable to hail damage at growth stage VT since all of its leaves have emerged. Complete (100%) leaf loss at growth stage VT will usually result in complete (100%) yield loss by harvest. Even if pollination is successful, the ear shoots will usually die because few leaves remain to produce the necessary carbohydrates (by photosynthesis) to complete grain fill.

Between 500 to 1000 spikelets form on each tassel. Each spikelet contains two florets. Each floret contains three anthers. The anthers are those 'thingamajigs' that hang from the tassel during pollination. Under a magnifying lens, anthers look somewhat like the double barrel of a shotgun.



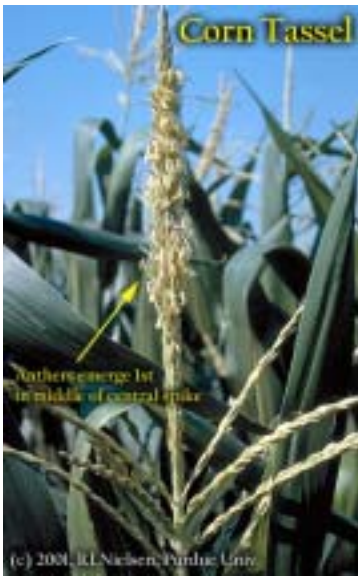
As these florets mature, anthers emerge from the glumes and pollen is dispersed through pores that open at the tips of the anthers. Pollen shed usually begins in the mid-portion of the central tassel spike and then progresses upward, downward and outward over time. Anthers typically emerge from the upper flower first, while those from lower flower typically emerge later the same day or on following days. Spent anthers eventually drop from the tassel and are sometimes mistaken for the pollen itself when observed on the leaves or ground.

The yellow 'dust-like' pollen that falls from a tassel represents millions of individual, nearly microscopic, spherical, yellowish- or whitish translucent pollen grains.



Each pollen grain contains the male genetic material necessary for fertilizing the ovary of one potential kernel.

The outer membrane of a pollen grain is very thin. Once dispersed into the atmosphere, pollen grains remain viable for only a few minutes before they desiccate. Yet, with only a 15 mph wind, pollen grains can travel as far as 1/2 mile within those couple of minutes.



Therein lies the concern of the potential for pollen 'drift' from a transgenic corn field to an adjacent non-transgenic corn field and the risk of transgenic 'contamination' of grain intended for non-transgenic sale. The good news is that recent research suggests that the overwhelming majority of a corn field's pollen load is shed in the field itself.

All of the pollen from a single anther may be released in as little as three minutes. All the anthers on an individual tassel may take as long as seven days to finish shedding pollen, although the greatest volume of pollen

is typically shed during the second and third day of anther emergence. Because of natural field variability in plant development, a whole field may take as long as 14 days to complete pollen shed.

Peak pollen shed usually occurs in mid-morning. Some research indicates that pollen shed decreases after temperatures surpass 86°F. A second 'flush' of pollen often occurs in late afternoon or evening as temperatures cool. Pollen shed may occur throughout most of the day under relatively cool, cloudy conditions.

Weather conditions influence pollen shed. If the anthers are wet, the pores will not open and pollen will not be released. Thus, on an average Indiana summer morning following a heavy evening dew, pollen shed will not begin until the dew dries and the anther pores open. Similarly, pollen is not shed during rainy conditions. So, growers need not worry about pollen being washed off the tassel during heavy rainfall. Cool, humid temperatures delay pollen shed, while hot, dry conditions hasten pollen shed.

Extreme heat stress (100°F or greater) can kill corn pollen, but fortunately the plant avoids significant pollen loss by virtue of two developmental characteristics. First of all, corn pollen does not mature or shed all at once. Pollen maturity and shed occur over several days and up to two weeks. Therefore, a day or two of extreme heat usually does not affect the entire pollen supply. More importantly, the majority of daily pollen shed occurs in the morning hours when air temperature is much more moderate.

Some Related References:

Ritchie, S.W., J.J. Hanway, and G.O. Benson. 1993. How a Corn Plant Develops. Iowa State Univ. Sp. Rpt. No. 48. On the Web at <http://maize.agron.iastate.edu/corngrows.html> (last verified 6/18/01).

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Sex in the Corn Field: Silk Emergence - (*Bob Nielsen*)

- Corn produces both male and female flowers on the same plant
- The ear contains the female flowers of the corn plant

As important as the process of pollination is to the determination of grain yield in corn, it is surprising how little some folks know about the details of sex in the corn field. Rather than leaving you to learn about such things "in the streets", I've developed this article and the accompanying one on tassels and anthers that describe the ins and outs of this critical period of the corn plant's life cycle.

Remember that corn has both male flowers and female flowers on the same plant (a flowering habit called monoecious for you trivia fans.) Interestingly, both flowers are initially bisexual (aka 'perfect'), but during the course of development the female components (gynoecia) of the male flowers and the male components (stamens) of the female flowers abort, resulting in tassel (male) and ear (female) development.

The silks that emerge from the ear shoot are the functional stigmas of the female flowers of a corn plant. Every potential kernel (ovule) on an ear develops its own silk. Each silk must be pollinated in order for the ovule to be fertilized and develop into a kernel. Typically, up to 1000 ovules form per ear, even though we typically harvest only 400 to 600 actual kernels per ear.

Technically, growth stage R1 for a given ear is defined when even a single silk strand is visible from the tip of the husk. A field is defined as being at growth stage R1 when silks have emerged on at least 50% of the plants.

Silk Elongation and Emergence

Silks begin to elongate from the ovules about 10 days prior to silk emergence from the husk. Dissection of young developing ears prior to silk emergence from the husk will reveal silk elongation beginning first from the basal ovules of the cob, then proceeding up the ear over time.

In a similar acropetal fashion, silks from the basal (butt) portion of the ear typically emerge first from the husk, while the tip silks generally emerge last. Complete silk emergence from an ear generally occurs within four to eight days after the first silks appear.

As silks first emerge from husk, they lengthen as much as 1 1/2 inches per day for the first day or two, but gradually slow over the next several days. Silk elongation occurs by expansion of existing cells, so elongation rate slows as more and more cells reach maximum size.

Silk elongation stops about 10 days after silk emergence, regardless of whether pollination occurs, due to senescence of the silk tissue. Unusually long silks can be a diagnostic symptom that the ear was not successfully pollinated.

Silks remain receptive to pollen grain germination up to 10 days after silk emergence. After 10 days without being pollinated, silk receptivity decreases rapidly. Natural senescence of silk over time results in collapsed tissue that restricts continued growth of the pollen tube. Silk emergence usually occurs in close synchrony with pollen shed, so that duration of silk receptivity is normally not a concern. Failure of silks to emerge in the first place, however, does not bode well for successful pollination.

Pollination and Fertilization

For those of you serious about semantics, let's review two definitions relevant to sex in the corn field. Pollination is the act of transferring the pollen grains to the silks by wind or insects. Fertilization is the union of the male gametes from the pollen with the female gametes from the ovary. Technically, pollination usually occurs successfully (i.e., the pollen reaches the silks), but unsuccessful fertilization results in poor kernel set on the ears.

Pollen grain germination occurs within minutes after a pollen grain lands on a receptive (moist) silk. A pollen tube, containing the male genetic material, develops and grows inside the silk, and fertilizes the ovary within 24 hours. Pollen grains can land and germinate anywhere along the length of an exposed silk. Many pollen grains can germinate on a receptive silk, but typically only one will successfully fertilize the ovary.

Silk Emergence Failure

Severe Drought Stress. The most common cause of incomplete silk emergence is severe drought stress. Silks have the greatest water content of any corn plant tissue and thus are most sensitive to inadequate moisture levels in plant. Severe moisture deficits will slow silk elongation, causing a delay or failure of silks to emerge from ear shoot. If the delay is long enough, pollen shed may be almost or completely finished before receptive silks are available; resulting in nearly blank or totally blank cobs.

Silking in prolific hybrids (two-eared) is often not delayed as much as in strongly single-eared hybrids. Physiological preference for tassel development under stress is apparently less in prolific hybrids.

Silk Clipping by Insects. Although technically not defined as silk emergence failure, severe silk clipping by insects such as corn rootworm beetle or Japanese beetle nonetheless can interfere with the success of pollination by decreasing or eliminating viable or receptive exposed silk tissue. Fortunately, unless the beetle activity is nonstop for days, continued elongation of silks from the husk will expose undamaged and receptive silk tissue at the rate of about one inch or more per day.

Silkballing. Silkballing is an interesting type of silk emergence failure characterized by the silks simply 'balling up' or 'knotting up' inside the husk leaves. Failure of silk emergence results in incomplete kernel set because some or most of the silks do not receive pollen. Initial diagnostic symptoms of silkballing when walking fields after pollination is complete include:

- Less than normal length of exposed, dried silks (which some may confuse with corn rootworm beetle silk clipping).

- Ear shoots that are not as 'solid' as they ought to be when squeezed.

The definitive diagnostic step is to make a single lengthwise cut, through the husk leaves, from the base of an ear shoot to the tip with a sharp knife and slowly unwrap the husk leaves, taking care not to disturb the arrangement of the silks. By doing this, you will easily observe the 'balled up' silks near the tip of the cob upward to the end of the husk leaves. In fact, a really good (or bad as it were) case of silkballing will look like a glob of spaghetti when you open up the ear shoot. Where silk emergence has been prevented almost entirely, the resistance of the 'balled up' silk mass at the end of the husk results in cobs with slight 'S' shapes and/or a 'shepherd's crook' tip as cob elongation continues after pollination.

The causes of 'silkballing' are neither well understood nor well documented. Cool nights at about the time of silk emergence appear to be the triggering event for 'silkballing'. Some interaction is also involved between the ear's husk coverage (length and tightness), cob length and silk elongation.

Hybrids with unusually tight husks may further worsen the problem. Conditions favoring unusually long husk leaves relative to cob length also likely contribute to the development of the problem. Hybrids themselves may vary in their genetic propensity for sensitivity of silk elongation to cool night temperatures.

Some Related References:

Ritchie, S.W., J.J. Hanway, and G.O. Benson. 1993. How a Corn Plant Develops. Iowa State Univ. Sp. Rpt. No. 48. On the Web at <http://maize.agron.iastate.edu/corngrows.html> (last verified 6/18/01).

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A Fast & Accurate Pregnancy Test for Corn - (*Bob Nielsen*) –

- Silk clipping can interfere with pollination success
- Silk detachment within days of successful pollination is an easy indicator of pollination progress

As corn rootworm beetles, Japanese beetles, and other obnoxious critters feast on corn pollen, they often unintentionally clip ear silks to an extent that pollination may be impeded. While you may be tempted to apply insecticides at the first sign of these insects, Purdue entomologists tell us that treatment is not necessary unless the silks are being continuously clipped back to less than 1/2 inch long before pollination is 50 percent complete. Silk length is easy to measure, but how do you determine how the progress of pollination?

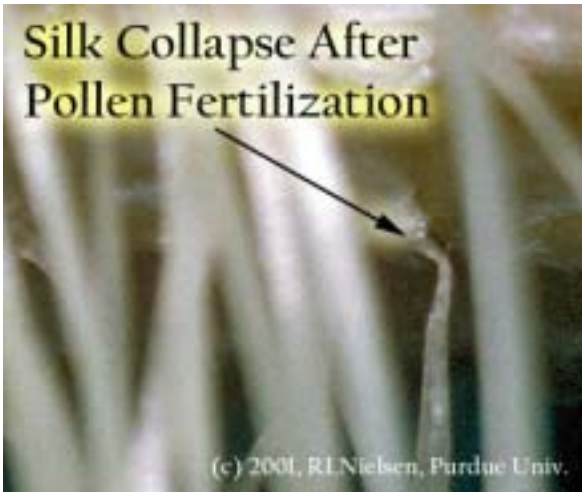
Within 10 to 14 days after silking, you can easily estimate the success of pollination by inspecting ears for kernel blister development. At that point in time, the developing kernels will resemble white blisters on the cob. But by then, the insect damage has already occurred. Luckily for us, the corn plant has a quicker mechanism for indicating the current progress of pollination.

Silk Detachment From Fertilized Ovules.

Remember that each potential kernel (called an ovule) on the ear develops its own silk that elongates and eventually emerges from the tip of the ear shoot. The silks provide the pathway for the pollen to access the ovules.

Once a single pollen grain is 'captured' by a silk, the pollen grain germinates and develops a pollen tube that contains the male genetic material. Given adequate moisture and temperature, the pollen tube grows down the length of the silk within 24 hours and fertilizes the ovule.

Within 2 to 3 days after an ovule has been successfully fertilized, the base of the silk will collapse and detach from the immature kernel. The kernel itself will usually not be recognizable to the naked eye at this stage.



Silks of unfertilized ovules remain attached, however, and will continue to lengthen and be receptive to pollen for up to 10 days after emergence from the ear shoot. Even if never fertilized, silks will remain attached to the ovules. Within days of full silk emergence, therefore, pollination progress may be estimated on individual ears by estimating percent silk detachment.

The Ear Shake Technique.

For each ear, make a single lengthwise cut from the base of the ear shoot to the tip with a sharp knife, through the husk leaves to the cob. Slowly unwrap the husk leaves, taking care not to rip any silks from the ovules yourself. Then gently shake the ear. Silks of fertilized ovules will drop away, silks from unfertilized ovules will remain attached.

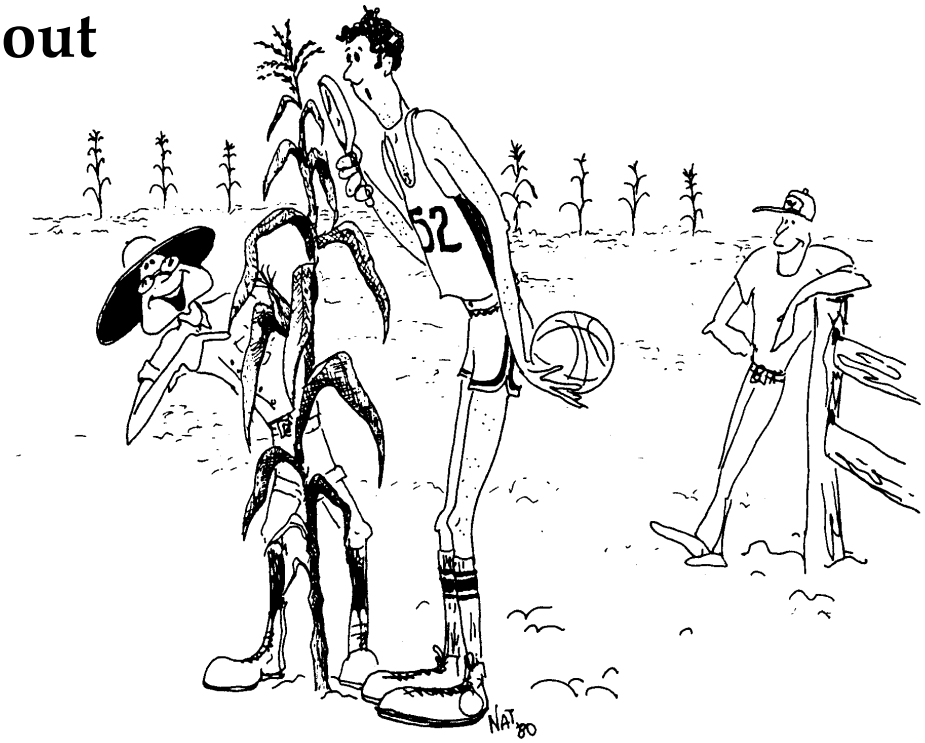
With practice, pollination progress can be easily determined by estimating the percentage of silks that fall away from the cob. Sampling several ears at random throughout a field will provide an indication of the progress of pollination for the whole field.

One Last Comment.

While the 'ear shake' technique will tell you how much of the ear has been fertilized, remember that pollination progress is also determined by pollen shed duration. Check the tassels in early to mid-morning hours to determine whether pollen shed is still occurring. If pollen shed is finished, it doesn't matter how badly those nasty insects are clipping silks. Unfertilized ovules will remain unfertilized ovules if there is no pollen left in the field. Spraying the bejeebers out of a field at that point is simply a costly form of revenge! For more information on the pollination process, see this week's accompanying articles on tassels and silks (*Pest&Crop* #15).

Don't forget, this and other timely information about corn can be viewed at the Chat 'n Chew Café on the World Wide Web at <http://www.kingcorn.org/cafe>. For other information about corn, take a look at the Corn Growers' Guidebook on the World Wide Web at <http://www.kingcorn.org/>.

Bug Scout



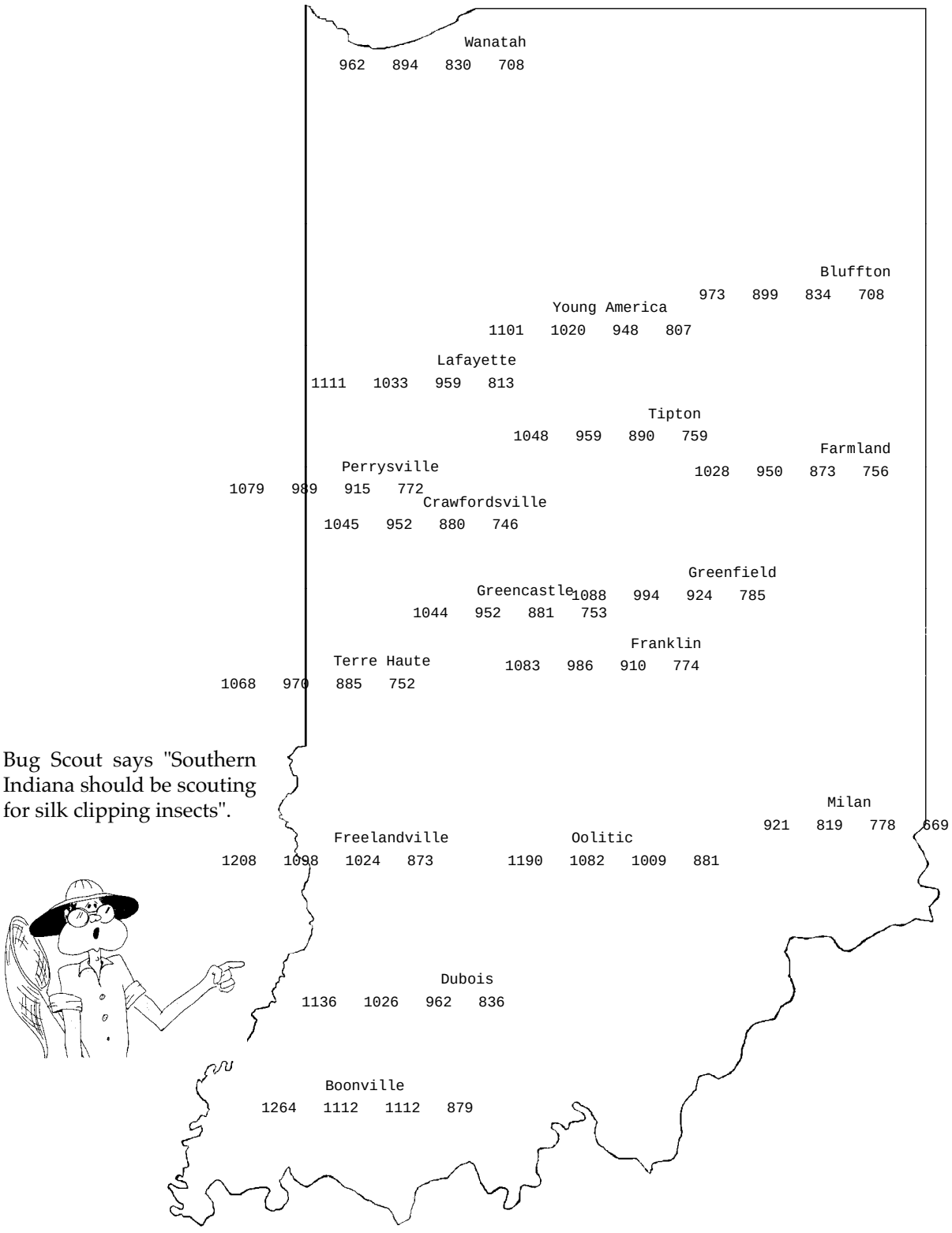
Geez... Bug Scout, they don't teach us this on the court!

Weather Update

Temperature Accumulations from Jan. 1 to June 29, 2001

MAP KEY
Location
GDD(4) GDD(10) GDD(60) GDD(90)

GDD(4) = Growing Degree Days from April 14 (4% of Indiana's corn planted), for corn growth and development
GDD(10) = Growing Degree Days from May 1 (10% of Indiana's corn planted), for corn growth and development
GDD(60) = Growing Degree Days from May 5 (60% of Indiana's corn planted), for corn growth and development
GDD(90) = Growing Degree Days from May 12 (90% of Indiana's corn planted), for corn growth and development



Bug Scout says "Southern Indiana should be scouting for silk clipping insects".

4" Bare Soil Temperatures 6/27/01

Location	Max.	Min.
Wtfd Mills	78	69
Wanatah	89	70
W Laf Agro	89	73
Tipton	75	67
Farmland	84	63
Perrysville	78	71
Crawfordsville	80	70
Trafalgar	81	67
Liberty	79	67
Terre Haute	78	70
Vincennes	76	66
Oolitic	87	67
Dubois	91	66

Pest&Crop
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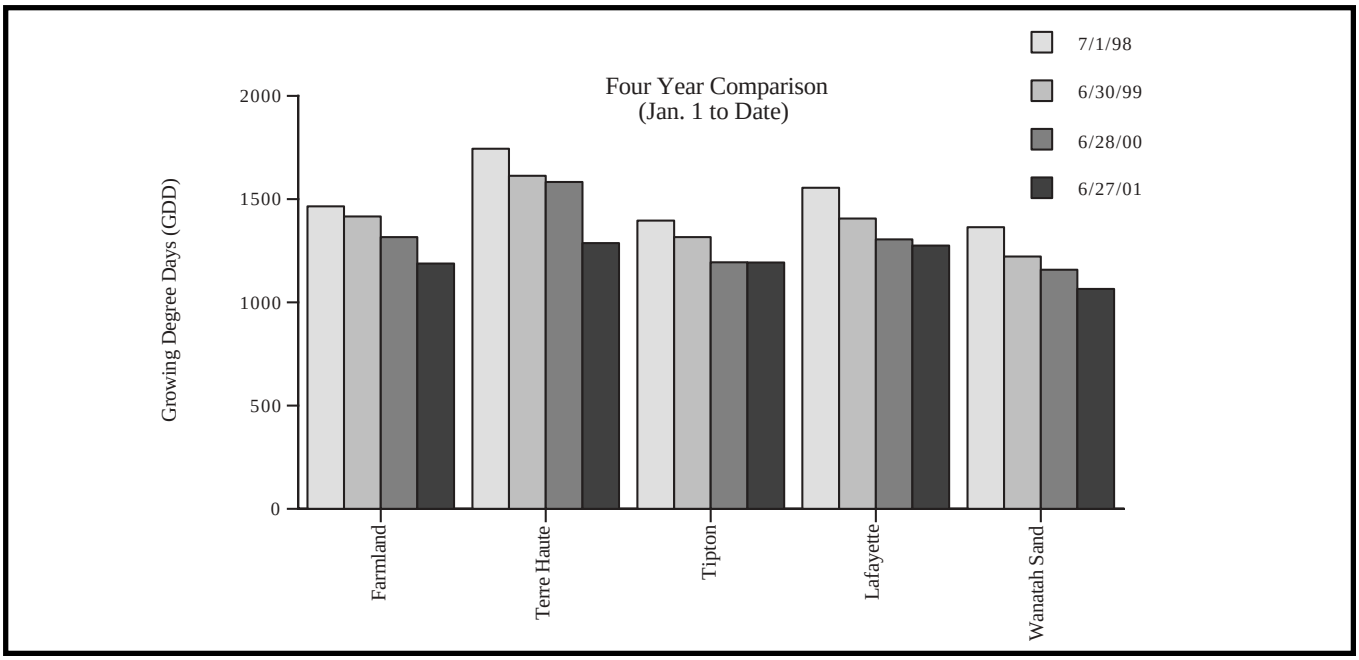

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