Purdue Cooperative Extension Service

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In This Issue

Insects, Mites, And Nematodes

Some Wireworm Damage Being Reported - (*John Obermeyer, Christian Krupke, and Larry Bledsoe*)

- Portions of or whole fields have been damaged by wireworm this spring.
- The end is near: As soils warm and crops grow, damage will end for the season.
- The "jury is still out" on the effectiveness and economics of the newer seed-applied insecticides.

A few pest managers have called to inform us of some fields of corn and soybean with wireworm damage. Mid-April planted corn was faced with poor weather conditions that posed considerable challenges to these plants before they even got out of the ground. In view of this, we may have been fortunate not to have had extensive damage from any of the seed/seedling feeders (i.e., grubs, maggots, and wireworms).

The most pressing question has been, how much longer will the wireworm feed on the crop? The answer is a two-fold discussion, 1) when will the soils warm and 2) how fast will the crop grow. It is not unusual for soils to stay cool throughout May, which it will this year. As air temperatures rise, so will the soil. This triggers the wireworm larva to begin descending in the soil profile to find cooler temperatures. Obviously at the same time, the crop begins to rapidly grow, both above and below ground, which lessens the impact of wireworm feeding. Typically wireworm damage "disappears" after the first week of June. In other words, they are deeper in the soil and minor root feeding is not critical to the plant.

Are low and/or high rates of insecticide-treated seed (i.e., Cruiser and Poncho) reducing seed/seedling feeding insects' impact on field crops? What few successful research trials that have been conducted and the array of field observations reported makes it difficult to make a judgment.

Wireworm damaged seedling

There certainly have been some promising comparisons when treated versus untreated seed is planted in fields damaged by these seed-feeding insects. Then again, just as many reports of “failure” have been received. We need more information, and would welcome your comments and observations from this planting season.

Armyworm Look-Alike in Wheat – (*John Obermeyer, Christian Krupke, and Larry Bledsoe*)

- Sawfly larvae and damage may be confused with armyworm.
- Sawfly in wheat is unusual, heavy populations could lead to head clipping.
- Quick inspections for sawfly larvae can be conducted with a sweep net, more intensive scouting is necessary with high populations.
- Suggested treatment threshold and insecticides are given.

George Watters, Agriliance, informed us of some small larvae being found in northern Indiana wheat fields and causing minor defoliation. Alert dealers, asked to check on the situation, were pretty certain they were not young armyworm. They were correct in their assessment, the worms have been identified from pictures as sawfly larvae, probably grass sawfly (*Pachynematus* sp.).

The sighting of foliage feeding sawfly larvae in wheat fields is unusual in the Midwest. And although this species was feeding on the leaves, it was minor and economic damage is not expected. Full size larvae, about 1.25 inches, may feed on stems causing head clipping much like armyworm. Another closely related insect, the wheat stem sawfly, occasionally causes problems in northern regions of the United States. This species, as the name implies, feeds only in the stem causing lodging of small grains.

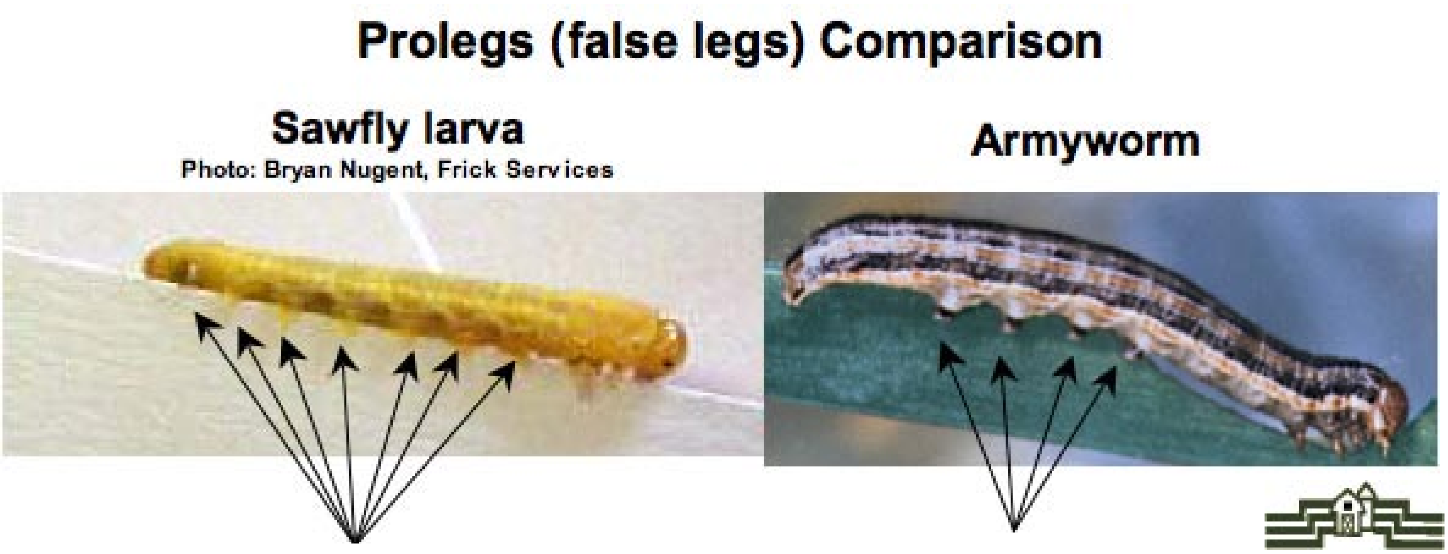
Adult sawfly are actually stingless wasps that mate and lay eggs on grasses early in the spring. Larvae, which are at first are light in color (almost translucent) and later become green, feed throughout most of May and eventually crawl down into the soil to pupate. Ironically, very small parasitic wasps are partially responsible for keeping sawflies controlled naturally. For reasons unknown, conditions this spring favored the sawfly and not the parasites.

Unlike armyworm, which feed at night or on dark, cloudy days, sawfly larvae feed throughout the day. Because sawflies’ coloration blends into the vegetation, a sweep net would be useful to determine their presence. If populations of 10 or more larvae per 100 sweeps are found, then plants should be examined more closely. By shaking undisturbed plants in multiple locations in the field, count and calculate the number of larvae per foot of row that fall to the ground. Populations as low as 0.4 larvae/foot of row have been suggested by the University of Delaware as the treatment threshold. Understand that this is only a suggestion, because research on this insect hasn’t been conducted in the Midwest. Though it is extremely unlikely that treatment will be required, the insecticides below are labeled to control sawfly in wheat, be sure to note the pre-harvest interval.

Insecticides for Sawfly Control in Wheat

Insecticide	Rate & Formulation/Acre	Pre-Harvest Interval (Days)
cyhalothrin (Warrior)*	2.56 – 3.84 fl. oz. EC	30
zeta-cypermethrin (Mustang Max)*	1.76 – 4.0 fl. oz. EW	14

* Restricted Use Product



Potato Leafhopper Have Arrived - *(John Obermeyer, Christian Krupke, and Larry Bledsoe)*

- Sample newly cut alfalfa fields for leafhoppers.
- If yellowing has already occurred, it is too late to prevent damage for this cutting .
- Management guidelines are given.

Sightings of potato leafhopper are being reported in various crops. Unlike black cutworm moths this spring, potato leafhopper hasn't had a problem traveling to Indiana from afar. Alfalfa producers should begin sampling their alfalfa shortly after cutting.

Potato leafhoppers are small, wedge-shaped, yellowish-green insects that remove plant sap with their piercing-sucking mouthparts. Leafhopper feeding will often cause the characteristic wedge-shaped yellow area at the leaf tip, which is referred to as "hopper burn." Widespread feeding damage can cause a field to appear yellow throughout. Leafhopper damage reduces yield and forage quality through a loss of protein. If left uncontrolled for several cuttings, potato leafhoppers can also significantly reduce stands.

Hopper burn on alfalfa

Timely scouting and applying insecticides when necessary can prevent potato leafhopper damage. Treatment is preventative and not curative. Thus, to effectively prevent economic losses, treatments must be applied before yellowing occurs. Usually the best results are obtained when treating small alfalfa, so be sure to scout the alfalfa regrowth for leafhoppers after cutting.

The need to treat for leafhoppers can be determined prior to the appearance of damage if fields are surveyed on a regular basis. To assess leafhopper populations and the potential for damage, take at least 5 sets of 20 sweeps with a 15" diameter sweep net in representative areas of a field. Carefully examine the contents of the sweep net, count the number of adults and nymphs, and calculate the number of leafhoppers per sweep. Use the guidelines given below to determine the need for treatment. For recommended insecticides see Extension Publication E-220, *Alfalfa Insect Control Recommendations* - 2005 which can be viewed at <www.entm.purdue.edu/entomology/ext/targets/e-series/e-list.htm>.

Management Thresholds for Potato Leafhoppers

Stem Height in Inches	Leafhoppers(Adults/ Nymphs) Average Number Per Sweep
under 3	0.2
4 - 6	0.5
7 - 12	1.0
greater than 12	1.5

Black Light Trap Catch Report - *(John Obermeyer)*

County/Cooperator	5/10/05 - 5/16/05							5/17/05 - 5/23/05						
	VC	BCW	ECB	SWCB	CEW	FAW	AW	VC	BCW	ECB	SWCB	CEW	FAW	AW
Dubois/SIPAC Ag Center	0	0	0	0	0	0	4	1	1	0	0	0	0	3
Jennings/SEPAC Ag Center	0	0	0	0	0	0	6	0	0	0	0	0	0	0
Knox/SWPAC Ag Center	0	0	0	0	0	0	2	0	1	0	0	0	0	2
LaPorte/Pinney Ag Center	1	0	0	0	0	0	4	0	0	0	0	0	0	2
Lawrence/Feldun Ag Center	0	0	0	0	0	0	8	0	0	0	0	0	0	2
Randolph/Davis Ag Center	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Tippecanoe/TPAC Ag Center	0	0	0	0	0	0	7	0	0	0	0	0	0	1
Vermillion/Hutson	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Whitley/NEPAC Ag Center	0	1	0	0	0	0	21	0	0	0	0	0	0	5

VC = Variegated Cutworm, BCW = Black Cutworm, ECB = European Corn Borer, SWCB = Southwestern Corn Borer, CEW = Corn Earworm, FAW = Fall Armyworm, AW = Armyworm

Black Cutworm Adult Pheromone Trap Report
Week 1 = 5/12/05 - 5/18/05 Week 2 = 5/19/05 - 5/25/05

County	Cooperator	BCW Trapped		County	Cooperator	BCW Trapped	
		Wk 1	Wk 2			Wk 1	Wk 2
Adams	Roe/Mercer Landmark	0	1	Marshall	Barry/Fulton-Marshall Co-op	0	0
Allen	Gynn/South Wind Farm	0	0	Marshall	Shanks/Plymouth Pioneer	0	-
Benton	Babcock/AgroKey	2	0	Newton	Babcock/AgroKey	0	0
Clay	Smith/Growers Co-op (Brazil)	0	0	Putnam	Nicholson/Consultant	-	-
Clay	Smith/Growers Co-op (Clay City)	1	16	Randolph	Boyer/Davis-Purdue Ag Center	0	3
Elkhart	Kauffman/Crop Tech Inc.	1	0	Rush	Tacheny/Pioneer Hi-Bred	24	4
Fountain	Hutson/Purdue CES	0	0	Sullivan	Growers Co-op (Sullivan E)	0	3
Fulton	Jenkins/Fulton-Marshall Co-op	0	0	Sullivan	Growers Co-op (Sullivan W)	0	2
Gibson	Hirsch Farms	-	-	Sullivan	Growers Co-op (New Lebanon)	14	0
Greene	Maruszewski/Worthington Pioneer	3	0	Tippecanoe	Obermeyer/Purdue CES	0	0
Knox	Growers Co-op (Fritchton 1)	0	0	Tipton	Johnson/Pioneer	-	-
Knox	Growers Co-op (Fritchton 2)	0	0	Vermillion	Hutson/Purdue CES	0	0
Knox	Smith/Growers Co-op (Oaktown)	0	0	Warren	Babcock/AgroKey	1	0
Lake	Kliene Farms (1)	0	-	White	Reynolds/Vogel Popcorn	0	0
Lake	Kliene Farms (2)	1	-	Whitley	Walker/NEPAC	2	2

Agronomy Tips

Singin' From The Same Sheet of Replant Music - *(Bob) Nielsen, Greg Shaner, Purdue Univ. and Peter Thomison, Patrick Lipps, Ohio State Univ.)*

Germination and stand establishment for mid-April planted corn in parts of Indiana and Ohio have been stressed beyond their limits this year as a result of cold temperatures, imbibitional chilling injury, excessive rainfall, saturated soils, dense surface crusting, and seedling diseases during the first four weeks after planting. Stand establishment problems have been particularly common for corn planted 4 to 5 days prior to the onset of the cold snap and heavy rains of late April. Consequently, estimates of the number of replanted acres are higher than normal and perhaps greater than any year in recent history.

Typically, the greatest challenge in making a replant decision is assessing the health and survival of the original stand of corn. Unfortunately, as in most years, some percentage of replanted fields will not return an economic gain to the grower because the replant "trigger" was pulled on the basis of emotion, peer pressure, or misinformation. The following points are intended to make sure everyone is "singing from the same sheet of music" when it comes to assessing troublesome stands of corn.

- Fields of otherwise healthy looking corn should not be replanted simply because of injury to the plants' seminal (also called embryonic) root systems.
  - Having said this, it is true that assessing the true health of plants in some fields has been difficult at best. Growers have often been uncertain whether they are dealing with 20,000 healthy plants (and thus likely not economical to replant in mid-May) or 20,000 "wanna-be" "half-hearted" "weak-kneed" and otherwise less than vigorous plants that will never regain their potential glory to produce maximum sized ears. The adage "patience is a virtue" is very applicable to the need for growers to allow damaged stands time to demonstrate their ability to recover or not.
- Every field needs to be judged on its own merits (or demerits).
  - It is particularly irresponsible this planting season to be handing out blanket recommendations on replanting based on observations (or hearsay) from other fields, perhaps with totally different scenarios. Fields that initially looked equally troublesome during emergence have often become polar opposites in terms of their eventual stand establishment.
- The nutrient reserves in the kernel endosperm can completely sustain a young corn seedling from

germination through about leaf stage V1 (one visible leaf collar) or V2 (Hochholdinger et. al., 2004).
  - ° Consequently, prior to development of post-embryonic nodal roots from the crown area of the plant, good health of the kernel and mesocotyl is paramount for seedling survival and vigor.
    - A healthy kernel and mesocotyl can enable a seedling with damaged embryonic roots to survive until nodal roots begin developing from the crown area.
  - ° Significant disease development in the kernel and/or mesocotyl prior to nodal root development is usually considered to be the proverbial "kiss of death" for young seedlings.
    - The same prognosis holds true for severe insect injury (wireworms, seedcorn maggots, white grubs) or any other stress that damages the kernel or mesocotyl prior to nodal root development.
  - ° The importance of kernel and mesocotyl health to plant survival slowly diminishes as successive sets of nodal roots form from the crown of the plant (see below).
- Health of the radicle and lateral seminal roots (aka embryonic roots) prior to nodal root development is desirable, but is not as critical for the survival of young seedlings as is the health of the kernel and mesocotyl.
  - ° Injury or death of embryonic roots due to fungal diseases is obviously not desirable, but does not impose a death penalty on the seedlings.
    - A return to cold and wet soil conditions, coupled with cloudy days not conducive for plant photosynthesis, would indeed favor the continued development of these seedling diseases and perhaps eventual seedling death or severe plant stunting.
    - Conversely, warmer and drier soils, coupled with plenty of sunshine for plant photosynthesis, would favor rapid corn root development plus would slow the progress of the disease organisms.
  - ° Loss of the radicle root, in and of itself, has no direct bearing on subsequent development or morphology of the corn plant.
- Post-embryonic nodal roots begin to elongate from the first stalk node in the crown area of plants shortly after leaf stage V1 and are usually distinctly visible by V2.
  - ° Individual "rings" of nodal roots will continue to develop from subsequent stalk nodes over time, approximately at the same pace as the emergence of leaf collars, up to the 7th or 8th stalk node.
  - ° By the time a plant reaches approximately V4 (four visible leaf collars), three "rings" of nodal roots should be visible at the crown of the plants. Such plants are essentially independent from any further sustenance that the kernel may yet be able to furnish.
  - ° While nodal root initiation usually does not occur beyond the 7th or 8th stalk nodes, lateral branching and dry matter accumulation of existing nodal roots continues throughout the growing season, although at an ever-decreasing rate once pollination occurs.
- The primary (harvestable) ear in corn is not initiated until approximately V5 (five visible leaf collars). Consequently, stress prior to V5 has no direct effect on ear size determination unless its eventual outcome is a severely stunted plant. The main consequence of stress from planting through the early leaf stages is the potential loss in effective plant population, one of several components that determine final grain yield.

Related References

Hochholdinger, Frank, Katrin Woll, Michaela Sauer, and Diana Dembinsky. 2004. **Genetic Dissection of Root Formation in Maize (Zea mays) Reveals Root-type Specific Developmental Programmes.** Annals of Botany 93: 359-368.

Lipps, Patrick. 2005. **Assessing Corn Seedling Emergence and Seedling Diseases.** Crop Observation Reporting Network, Ohio State Univ. Available online at <http://corn.osu.edu/story.php?setissueID=82&storyID=45> [URL verified 5/19/05].

Lipps, Patrick and Peter Thomison. 2005. **Corn Emergence Problems and Replant Decisions.** Crop Observation Reporting Network, Ohio State Univ. Available online at <http://corn.osu.edu/story.php?setissueID=83&storyID=461> [URL verified 5/19/05].

Nielsen, R.L. (Bob). 2003. **Estimating Yield and Dollar Returns from Corn Replanting.** Purdue Univ. Cooperative Ext. Service Publication AY-264-W. Available online at <www.agry.purdue.edu/ext/pubs/AY-264-W.pdf> [URL verified 4/28/05].

Nielsen, R.L. (Bob). 2004a. **Germination Events in Corn.** Corny News Network. Purdue Univ. Available online at <www.kingcorn.org/news/articles.04/Germination-0502.html> [URL verified 5/19/05].

Nielsen, R.L. (Bob). 2004b. **The Emergence Process in Corn.** Corny News Network. Purdue Univ. Available online at <www.agry.purdue.edu/ext/corn/news/articles.04/Emerge-0502.html> [URL verified 5/19/05].

Nielsen, R.L. (Bob). 2004c. **The Roots of the Matter.** Corny News Network. Purdue Univ. Available online at <www.kingcorn.org/news/articles.04/Roots-0511.html>. [URL verified 5/19/05].

Nielsen, R.L. (Bob). 2005a. **I've Got The Corny Stand Establishment Blues….** Corny News Network, Purdue Univ. Available online at <www.kingcorn.org/news/articles.05/StandEstablishment-0503.html>. [URL verified 5/8/05].

Nielsen, R.L. (Bob). 2005b. **Stress Continues for Corn Growing Under Refrigerated Conditions.** Corny News Network, Purdue Univ. Available online at <www.kingcorn.org/news/articles.05/RefrigCorn-0429.html>. [URL verified 5/3/05].

Thomison, Peter. 2005. **Check Corn Fields for Emergence Problems.** Crop Observation Reporting Network, Ohio State Univ. Available online at <http://corn.osu.edu/story.php?setissueID=82&storyID=452>. [URL verified 5/19/05].

Thomison, Peter. 2005. **Corn Replanting Considerations - don't be in rush to replant.** Crop Observation Reporting Network, Ohio State Univ. Available online at <http://corn.osu.edu/story.php?setissueID=81&storyID=450> [URL verified 5/19/05].

Ear Size Determination in Corn - (*Bob Nielsen*)

- Ear shoots are initiated at multiple stalk nodes very early in a corn plant's development.
- Ear size determination of the uppermost (harvestable) ear begins by the time a corn plant has reached knee-high and finishes 10 to 14 days prior to silk emergence.

The number of harvestable kernels per ear is an important contributor to the grain yield potential of a corn plant. Severe plant stress during ear formation may limit the potential ear size, and thus grain yield potential, before pollination has even occurred. Optimum growing conditions set the stage for maximum ear size potential and exceptional grain yields at harvest time. The size of what will become the harvestable ear begins by the time a corn plant has reached knee-high and finishes 10 to 14 days prior to silk emergence.

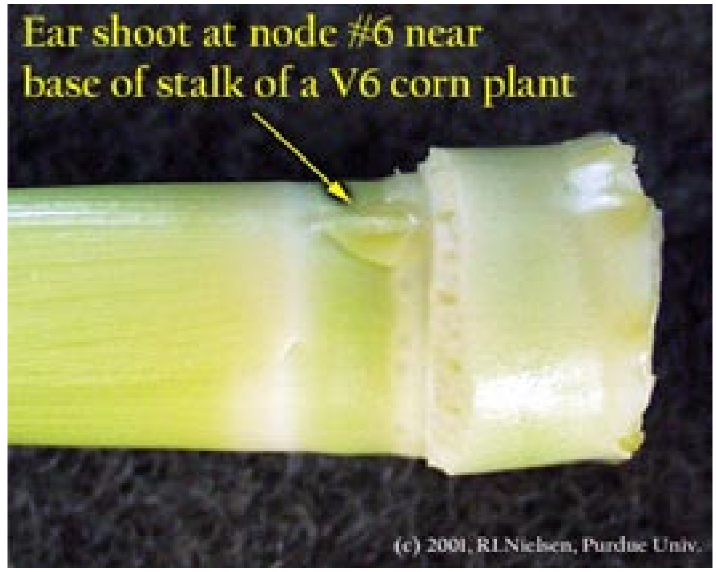
Ear Shoot Development

An axillary meristem forms at each stalk node (behind the leaf sheath) beginning at the base of the stalk and continuing toward the top (acropetally for you wordsmith fans) except for the upper six to eight nodes of the plant. Each axillary meristem initiates husk leaves at the nodes of the ear shank and eventually an ear itself at the tip of the ear shank.

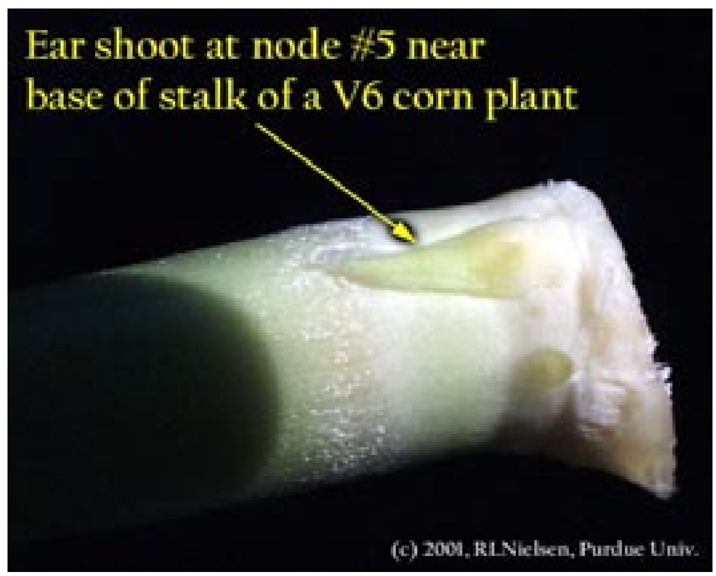
By about the V5 or V6 stages of development (five to six visible leaf collars), the growing point (apical meristem) of the corn plant finishes the task of initiating leaf primordia and completes its developmental responsibilities by initiating the tassel primordium of the plant. At about the same time that the tassel is initiated, the uppermost harvestable (and final) ear is also initiated (Lejeune and Bernier, 1996). This uppermost ear is normally located at the 12th to 14th stalk node, corresponding to the 12th to 14th leaf of the plant.

Careful removal of the leaves from a stalk, including leaf sheaths, at about growth stage V10 (ten visible leaf collars) will usually reveal 8 to 10 identifiable ear shoots. Each ear shoot originates at a stalk node, behind its respective leaf sheath. At growth stage V10, these tiny ear shoots primarily consist of husk leaf tissue. The developing ears themselves are only a fraction of an inch in length.

Initially, the ear shoots found at the lower stalk nodes are longer than the ones at the upper stalk nodes simply because the lower ones were created earlier. As time marches on, the upper one or two ear shoots assume priority over all the lower ones and ultimately become the harvestable ears. Development of the upper ears is favored over the lower ones because of hormonal "checks and balances", plus the proximity of the upper ear to the actively photosynthesizing leaves of the upper canopy.



Ear shoot at Node #6 of V6 plant.



Ear shoot at Node #5 of V6 plant.

Ear Size Determination

Row number and kernel number per row are two of several yield components in corn. Typically, from 750 to 1000 ovules (potential kernels) develop on each ear shoot. The number of kernel rows multiplied by the number of kernels per row determines total kernel number per ear. Actual (harvestable) kernel number per ear averages between 400 and 600. For a 16-row ear, one kernel per row is equal to about five bushels per acre (for average populations).

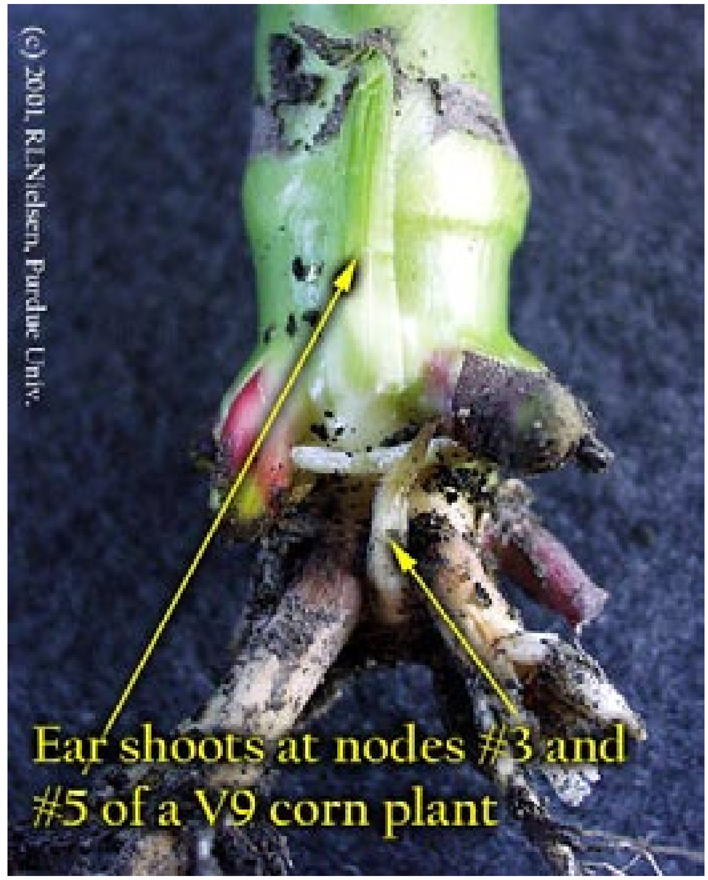
Ear shoot at Node #4 of V6 plant.

Upper ear shoots and tassel of V9 plant.

Like so many other processes in the corn plant, kernel row number determination on an ear proceeds in an acropetal fashion (from base to tip). Kernel row number determination of the uppermost ear begins shortly after the ear shoot is initiated (V5 to V6) and is thought to be complete as early as V8 (Strachan, 2004).

Kernel rows first initiate as "ridges" of cells that eventually differentiate into pairs of rows. Thus, row number on ears of corn is always even unless some sort of stress disrupts the developmental process. True row number is often difficult to visualize in tiny ears dissected from plants younger than about the 12-leaf stage.

Row number is determined strongly by plant genetics rather than by environment. This means that row number for any given hybrid will be quite similar from year to year, regardless of growing conditions. Some exceptions to this include the effects of injury from the post-emergence



Ear shoot at Node #3 and 5 of V9 plant.

application of certain sulfonylurea herbicides or nearly complete defoliation by hail damage prior to growth stage V8.

The potential number of kernels per row is complete by at least V15 and maybe as early as V12 (Strachan, 2004). Kernel number (ear length) is strongly affected by environmental stresses. This means that potential ear length will vary dramatically from year to year as growing conditions vary. Severe stress can greatly reduce potential kernel number per row. Conversely, excellent growing conditions can encourage unusually high potential kernel number.

Final Comments

Because ear initiation does not occur until about V5, stress prior to this leaf stage has no direct bearing on ear size determination UNLESS that stress eventually results in a severely stunted or weakened plant. This is particularly true for stress events that damage only the above ground portion of young seedlings without damage to the plants' growing point regions. Such damaged plants usually can recover well with little evidence of the damage some weeks down the road.

Severe stress from about V5 to V12 that severely limits photosynthesis can directly interfere with ear size determination and result in fewer kernel rows (less likely) or fewer kernels per row (more likely). While such early stress can be important, recognize that severe stress that occurs shortly before to shortly after pollination has a far greater potential to reduce yield per day of stress.

Related References

Bonnett, O.T. 1966. **Inflorescences of Maize, Wheat, Rye, Barley, and Oats: Their Initiation and Development.** Bulletin 721. Univ. of Illinois, College of Ag., Agricultural Expt. Sta.

Lejeune, P. and G. Bernier. 1996. **Effect of environment on the early steps of ear initiation in maze (Zea mays L.)** Plant, Cell and Environment, 19:217-224.

Ritchie, S.W., J.J. Hanway, and G.O. Benson. 1993. **How a Corn Plant Develops.** Iowa State Univ. Sp. Rpt. No. 48. Available online at <http://maize.agron.iastate.edu/corngrows.html>. [URL verified 6/9/03].

Strachan, Stephen D. 2004. **Corn Grain Yield in Relation to Stress During Ear Development.** Pioneer, a DuPont Company. Available online at <www.pioneer.com/growingpoint/agronomy/library_corn/ear_development.jsp>. [URL verified 5/23/05. Note that access to this article requires registration (free) to Pioneer's Growing Point Web site.]

For other Corny News Network articles, browse through the CNN Archives at <www.kingcorn.org/news/archive.html>. For other information about corn, take a look at the Corn Growers' Guidebook at <www.kingcorn.org>.

No-till and Strip-till Corn Shines in 2005 - (*Tony J. Vyn*)

It has been a tough spring for Indiana corn farmers with prolonged cool weather conditions from April 20 to early May, soil crusting, and corn seedling rots resulting from cool and saturated soils. This has lead to many concerns for low or uneven stands, and the challenging decisions about whether to replant corn portions of some fields. Agronomists Bob Nielsen of Purdue and Peter Thomison of Ohio, with respective state pathology experts, have provided excellent advice about how to handle those decisions. See <www.agry.purdue.edu/ext/corn/news/articles.05/MidAprilCorn-0522.html>. However, the good news is that no-till and strip-till corn have survived this season as well as, or often better than, conventionally tilled corn.

Normally farmers think that if soils are cold with conventional tillage, they will be even worse with no-till in a cool spring. However, a lot depends on the time of day that you measure soil temperature, whether it is cloudy or sunny, just how much residue cover is above the temperature probe, and whether the relative soil moisture content is higher with no-till. Daily maximum soil temperatures during the first 4 weeks after planting are usually about 3°F warmer

Successful no-till corn establishement on clay loam soil near Columbia City. Planting Date: April 16, 2005.

Strip tillage corn (left) versus no-till corn (right) following soybean near Wanatah, IN. Planting Date: April 29, 2005.

Strip-till corn (left) versus no-till corn (right) after corn in rotation on loam soil near Wanatah, IN. Planting Date: April 29, 2005.

after chisel plowing than after no-till, and about equal for chisel plowing and strip tillage in the corn row area. Daily minimum temperatures are about equal for all 3 systems, although if any system has an advantage it tends to be no-till. If soils stay moist, daily minimum temperatures in no-till average about 1.0°F higher than with conventional tillage.

This spring, daily average soil temperatures were not substantially lower in no-till unless surface residue cover was very high (such as would be the case if no-till corn followed grain corn). In 2005, no-till corn emerged just a day or two later than conventional tillage on similar soils with common treatment planting dates. Unless there was a problem with seed treatments, no-till corn emergence percentages exceeded 95% of what was planted. In some cases, no-till corn completed emergence sooner because soil crusting limited corn emergence in conventional tillage. No-till soil typically crusts much less than other tillage systems since the soil structure at the surface becomes much more stable as a result of enriched organic matter and the lack of recent tillage operations that break up soil clods (and where it takes time for the bond strengths holding soil clods together - despite intense rain energy - to re-establish themselves). Long-term no-till also has the advantage of a multitude of large continuous pores to help drain the saturated water associated with intense rains. Conventional tillage disrupts these large pores, and can lead to more water ponding, and slower drainage.

In our tillage research plots this year, we planted 32,000 plants per acre in mid-April and achieved about 31,000 in no-till, moldboard and chisel plots in west-central Indiana (West Lafayette) and about 29,000 in no-till versus 27,000 in chisel in north-eastern Indiana (Columbia City). So, if anything, the corn stands in no-till are at least as good as those in conventional tillage. Our population results this year are not unusual. In fact, no-till corn stand establishment has never been significantly lower than that conventional tillage in over 80 comparisons conducted in the last 20 years. Simply put, we are more successful in getting good stands with no-till now because we have better planters, better seed treatments, and more stress-tolerant hybrids than we did 30 years ago.

And fall strip-till corn is really shining this year; it is off to a faster start than either no-till or chisel plow corn in Northern Indiana. Strip-till corn has the same reduction in soil crusting as no-till, but generally has the advantage of much warmer and drier seedbeds than no-till. To achieve the most optimum seedbed conditions with strip-till, it really helps if the planting operation left a level or slightly raised soil berm. Planting into a trench with overly aggressive soil cleaners will lead to cooler soil temperatures and wetter conditions around the seed. Strip-till's main advantages, though, are the additional planting flexibility (versus no-till), the high residue cover it leaves between the rows, and the opportunity it provides for deep fertilizer banding.

No Tillage: The Best Tillage Choice for Replanting

If replanting is necessary, no-till is by far the best option available. It takes the least time, results in the least likelihood of cloddy seedbeds that could result in uneven emergence, best preserves the benefits of any previously applied herbicides and starter fertilizer, requires less fuel, and has even less chance of reducing corn yields (relative to conventional-till) in late May planting versus planting in early to mid-April. So, even if you didn't no-till plant corn the first time, it is not too late to start. You may need a more robust planter, though, to achieve sufficient down pressure on the planting units to penetrate hard crusts on clay soils.

Summary

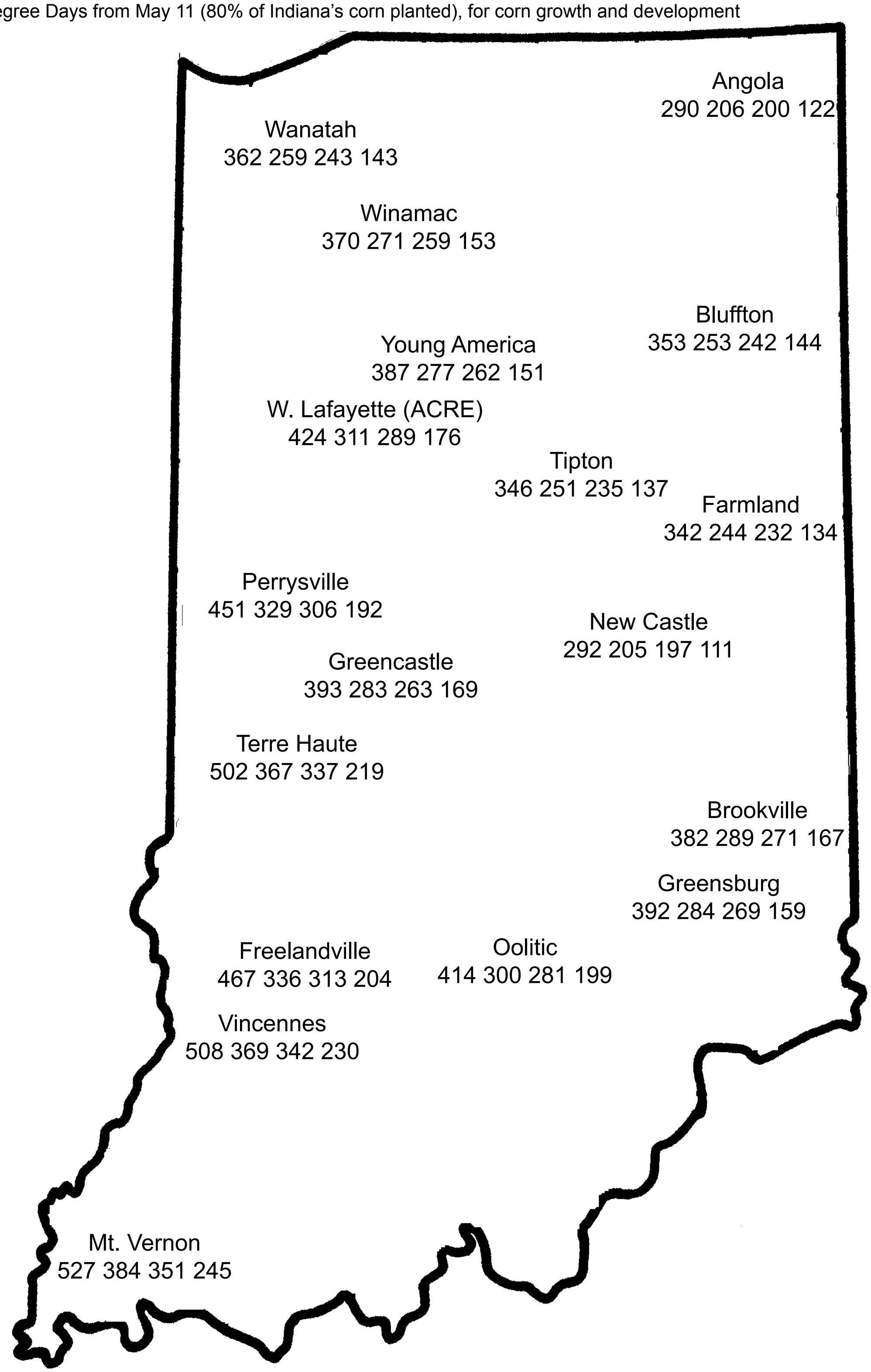
No-till corn and strip-till corn have both survived the test of this difficult spring. In fact, they in many cases out-performed fields that were field cultivated just ahead of planting. Our yield results aren't in yet for this year but, if it is consistent with previous years, no-till corn will yield within 5 bushels per acre of conventionally tilled corn planted after soybean. Strip-till corn will yield at least as good as conventionally tilled corn. Both systems will generally increase profits as long as planting isn't delayed substantially. No-till is the tillage option of choice for any replanting of corn that is still required. Furthermore, fears of a cool spring are not a justifiable reason to avoid preparing for either no-till or strip-till corn production in 2006.

Weather Update

Temperatures as of May 25, 2005

MAP KEY
Location GDD(10) GDD(35) GDD(55) GDD(80)

GDD(10) = Growing Degree Days from April 15 (10% of Indiana's corn planted), for corn growth and development
GDD(35) = Growing Degree Days from April 27 (35% of Indiana's corn planted), for corn growth and development
GDD(55) = Growing Degree Days from May 4 (55% of Indiana's corn planted), for corn growth and development
GDD(80) = Growing Degree Days from May 11 (80% of Indiana's corn planted), for corn growth and development



Average Daily 4" Bare Soil Temperature 5/25/2005

Location	Max.	Min.
Wanatah	67	
Columbia City	61	
W. Lafayette	68	
Farmland	63	
Butlerville	64	
Vincennes	73	