Pest & Crop

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In This Issue

Insects, Mites, and Nematodes

Corn Lodging Reported - (*John Obermeyer, Rich Edwards, and Larry Bledsoe*) -

- Recent storms have revealed some damage from rootworm larval feeding
- Evaluations must be made now, root regrowth will mask and correct some for damage

Corn lodging has been reported this week by Greg Bossaer, White County CES; Dan Childs, Monsanto; and Bob Nielsen, Purdue Extension Agronomist. Damage has varied from lodging in isolated spots (typical) to whole fields laying flat. Much needed rains, coupled with gusty winds, have revealed damage from rootworms and from shallow root systems. Some producers may be in for a surprise this fall as they harvest and find areas of elbowed corn. Now is the time when cornfields need to be evaluated for rootworm damage; post-mortem, or harvest, diagnosis is difficult at best.

Corn plants that have tilted or lodged should be dug, not pulled, washed and then inspected for root feeding damage (scars and roots completely chewed off). Pay particular attention to the nodes of roots just below and above the soil surface, since these may have been completely destroyed. Other possible reasons for lodging and poor root systems may be compaction from wet planting or poor nodal root development during the dry/hot weather of recent weeks ("floppy" corn). If the damage is from rootworm feeding, there is nothing that can be done to correct it for 2002. However, these fields may have very high beetle populations, and silk clipping and interference with pollination could be a problem and should be watched for. Those producers who used full rates of rootworm insecticides should contact their dealer or product manufacturer representative, if they are not satisfied with their level of control.

Corn lodging damage (Greg Bossaer, White County CES)

Severe rootworm feeding (Dan Childs, Monsanto)

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Silk Clipping Damage – (*John Obermeyer, Rich Edwards, and Larry Bledsoe*) –

- Monitor pollinating plants for silk damage
- Concentrate on silk length and amount of pollen yet to be shed
- Treatment after 50% pollination will not pay

Rootworm and Japanese beetles continue to emerge throughout the state. If beetles are present in commercial cornfields during pollination, control may be necessary if the silks are clipped off to within 1\2 inch or less of the tip of the ear before 50% pollination is completed. It has been suggested that 5 beetles per plant can result in the need for control, however, many fields have had higher numbers during pollination with little or no silk clipping activity. So, don't judge the need for treatment based on beetle numbers.

On the other hand, research with inbreds in seed production fields has shown that 2 to 3 rootworm beetles per plant can significantly reduce ear fill. For additional information on rootworm beetles see Extension Publication E-49-W, *Managing Corn Rootworms - 2002* (Rev. 1/02) or download a copy at, <http://www.entm.purdue.edu/entomology/ext/targets/e-series/e-list.htm>.

Rootworm beetle silk clipping

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Grasshoppers in Field Borders - (*John Obermeyer, Rich Edwards, and Larry Bledsoe*) -

- Grasshopper nymphs seen damaging crops
- Biology of grasshoppers given
- Scouting methods and economic thresholds described

Reports of numerous grasshoppers around and within field edges have been received. Some feeding damage has been noted as grasshoppers move through crops. Fortunately, what we are seeing is nothing compared to the grasshopper infestations and damage taking place in the Western Plains. There, plants, and even wooden fence posts, are being consumed in their path.

Eggs, laid in the soil last fall, normally hatch from late May through July. After the nymphs hatch, they normally feed for 2 to 3 weeks near the area where the eggs were laid. When their food source becomes scarce or when their early feeding sites are mowed or otherwise destroyed, the nymphs move to other feeding sites, including nearby crops. The best time to manage threatening grasshopper populations is when they are still in the nymphal stage (wingless). They are easier to control at this time since they are less mobile and more susceptible to insecticides. However, you should not apply a control just because they are in the nymphal stage. An economic population needs to be present to justify treatment. Another consideration is that under high moisture conditions, a naturally occurring fungal disease may quickly spread through the grasshopper population. Grasshoppers observed clinging to crops and weeds, and not hopping away as you approach them, are most likely diseased and are dead or will soon die.

Grasshopper nymph

To determine the need for grasshopper control, check crop and non-crop areas to pinpoint infestations. In at least 5 random locations within each infested area, estimate the number of grasshoppers within approximately one square yard. Determine the infestation level for each sample area, and for each crop and non-crop area as a whole.

Treatment of field margins is probably justified if counts exceed 15 or more nymphs or 8 adults (winged) per square yard. In soybean fields, control may be needed if defoliation levels exceed 40% prior to bloom or 25% from blooming to pod fill. In corn, it may be advisable to treat if an average of 3 or more grasshopper nymphs per square yard are counted. In many cases, spot treatment may be sufficient to control the grasshoppers.

Recommended control materials can be found in Extension Publication E-77-W, *Soybean Insect Control Recommendations - 2002* (Rev. 1/02) or E-220-W, *Corn Insect Control Recommendations - 2002* (Rev. 1/02). Both can be downloaded at: < http://www.entm.purdue.edu/entomology/ext/targets/e-series/e-list.htm>.

Grasshopper damage on corn

Grasshopper nymphs damage to soybean

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Black Light Trap Catch Report
(Ron Blackwell)

County/Cooperator	6/25/02 - 7/1/02							7/2/02 - 7/8/02						
	VC	BCW	ECB	SWCB	CEW	FAW	AW	VC	BCW	ECB	SWCB	CEW	FAW	AW
Clinton/Blackwell	0	2	4	0	0	0	0	-	-	-	-	-	-	-
Dubois/SIPAC	1	0	0	0	0	0	4	0	2	0	0	0	0	21
Jennings/SEPAC	0	0	0	0	0	0	0	1	0	3	0	0	0	25
Knox/SWPAC	1	0	0	0	0	0	0	1	1	1	0	0	0	0
LaPorte/Pinney Ag Center	0	2	43	0	0	0	0	7	6	2	0	0	0	15
Lawrence/Feldun Ag Center	0	1	0	0	0	0	4	0	3	0	0	0	0	10
Randolph/Davis Ag Center	2	1	11	0	0	0	16	0	9	2	0	0	0	148
Vermillion/Hutson	0	2	2	0	0	0	2	0	1	0	0	0	0	0
Whitley/NEPAC	0	0	15	0	0	0	5	4	8	3	0	0	0	95

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

Agronomy Tips

Timing of Crop Stress is Critical! - (*Bob Nielsen*) -

Last month, I wrote an article about the importance of the timing of stress and the existence of other stress factors in determining whether or not stand establishment problems developed on some of the few acres of early-planted corn (**Some Corn Afflicted With TMDS Syndrome**, *P&C Newsletter*, 6/14/02). Recently, colleagues in Entomology here at Purdue reported that corn rootworm (CRW) larvae were feeding on the roots of late-planted corn in some first-year corn after soybean fields and that dramatic stunting subsequently developed (**Rootworm Damage Being Reported on Late-Planted Corn**, *P&C Newsletter*, 6/28/02 and **Stunting and Lodging of Late-Planted Corn**, *P&C Newsletter*, 7/5/02).

The incidence of CRW larval injury to late-planted corn seedlings serves as another morbid example of the importance of the timing of stress relative to crop growth stage plus the existence of other complicating stresses in determining whether or not subsequent crop stunting occurs. I've walked some of these fields and want to share my thoughts with you on these teachable examples.

Root injury to first-year corn by CRW larvae is not unusual in many parts of Indiana and Illinois due to the development of the variant of CRW that no longer preferentially lays eggs in corn fields. What was unusual this year was the preponderance of corn acres planted in late May throughout Indiana due to excessive and frequent rains earlier in the season. The late corn planting also coincided with CRW egg hatch and larval feeding activity.

Consequently, CRW larvae were "waiting at the table" in some fields at the time of corn emergence and initial seedling development whereas normally, with earlier corn planting, corn is much further developed (close to V6 leaf stage) before CRW egg hatch occurs and CRW larvae begin their feeding activities. In fields that I walked in late June, there was evidence of CRW larval feeding on the seminal (seed) roots and often the first set of nodal roots originating from the crown of the plants. In some cases, the mesocotyl of the young seedlings also showed evidence of CRW larval feeding injury.

In and of itself, the CRW injury to seminal and nodal roots is not unusual. What is important to understand, though, is the timing of this injury relative to crop growth stage. This injury occurred to very young corn seedlings that were just beginning to form permanent (nodal) root systems rather than injury to well-established corn plants closer to V6 in growth stage.

Such stress to the initial nodal root system of very corn plants will stunt further crop development by itself, but the proverbial "straw that broke the camel's back" was the concurrent hot and dry weather conditions that were rapidly drying the upper two or more inches of surface soil in some of these fields. Remember that the crown of a corn plant is positioned at about three-fourths inch (2 cm) below the soil surface. The excessively dry and hot soil imposed further stress on the nodal root development, leading to wilting of seedlings and eventual death for some.

In the fields I walked, there were also interesting patterns of stunted and nearly normal plants within the field. What was unusual was that the nearly normal plants seemed to coincide with the trafficked areas of the field (tractor and planter tires) where soil compaction was the greatest.

These nearly normal plants often exhibited similar levels of root injury due to CRW feeding, but several nodal roots of each plant had successfully elongated into the moist soil profile below the upper dry two inches. Plants that were stunted but not wilted usually had at least one nodal root that had managed to elongate down to moist soil. In contrast, almost every severely wilted plant could be characterized by not having any nodal roots below the excessively dry upper two inches of soil.

I could only surmise that the trafficked areas of the field had not dried out as rapidly as the non-trafficked areas after earlier rains and that the young corn plants had a bit longer opportunity to successfully establish one or more nodal roots before the excessive heat settled in by mid-June.

Injured corn plants in those fields that received rainfall from the spotty thunderstorms the last week of June survived the CRW damage, but now comprise the less favorable component of the tall corn/short corn phenomenon that characterizes those fields today. Injured and severely wilted corn plants in those fields that did not receive rainfall from the spotty thunderstorms have likely moved on to that "Great Corn Field in the Sky."

Bottom Line: As with good comedy, timing is everything, especially when it comes to the effects of severe early season stress on corn. Do not discount the potential effects of a seemingly minor stress when the timing of its occurrence relative to crop growth stage or other complicating stress factors is "perfect" for crop injury.

Related References:

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Obermeyer, John, Rich Edwards, and Larry Bledsoe. 2002. Rootworm Damage Being Reported on Late-Planted Corn [Online]. Pest & Crop Newsletter, No. 15, June 28. Purdue Univ. Coop. Extension Service. <http://www.entm.purdue.edu/entomology/ext/targets/p&c/P&C2002/P&C15_2002.pdf> (Verified 7/5/02).

Obermeyer, John, Rich Edwards, and Larry Bledsoe. 2002. Stunting and Lodging of Late-Planted Corn [Online]. Pest & Crop Newsletter, No. 16, July 5. Purdue Univ. Coop. Extension Service. <http://www.entm.purdue.edu/entomology/ext/targets/p&c/P&C2002/P&C16_2002.pdf > (Verified 7/5/02).

Variable plant size throughout field

Root damage caused by CRW larvae feeding

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Root Lodging Concerns in Corn - (*Bob Nielsen*) -

The welcome rainfall in recent days was accompanied by strong winds that resulted in dramatic root lodging for corn in some fields around the state. Some folks are asking why the root lodging was so severe in some fields and what the consequences will be for the downed corn plants. I offer my two-cents' worth on the subject.

Strong wind by itself does not always cause root lodging. The pattern of root lodging I observed in several fields this week strongly suggested that some of the thunderstorms packed powerful downdrafts that lodged corn plants in every direction of the compass. It is difficult for corn of any age or level of health to withstand such powerful wind forces.

Other contributing factors also played a role in "setting up" the plants for a fall. The list of factors to choose from in 2002 is long and includes:

- Reduced root systems due to severe corn rootworm (CRW) injury, especially in later-planted corn fields,
- Shallow root systems due to compaction from tilling wet soils this spring,
- Reduced root systems due to excessively wet and cold soils during initial nodal root formation for early-planted corn,
- Reduced root systems due to excessively dry or cloddy soils during initial nodal root formation for later-planted corn,
- Reduced root systems due to nematode injury on sandier soils back in May,
- Reduced root systems due to nitrogen deficiency in areas of fields where significant nitrogen loss had occurred earlier,

- Reduced root systems due to inhibition by low soil pH in areas of fields,
- Soaked surface soils due to heavy rainfall at the time of the wind damage that made it easier for the roots to be "pulled" by the force of the wind.

Growth Stage Influence. The consequences of root lodging depend heavily on the growth stage of the plants at the time of the damage. The younger the corn (and therefore shorter), the more apt it is to "straighten up" following severe root lodging without noticeable "goose-necking" of the plant. This is particularly true with root-lodged corn that is knee-high or shorter.

Older and taller corn becomes increasingly less likely to "straighten up", but will instead "goose-neck" as the upper stalk internodes continue their elongation. The "goose-necking" or curvature of the upper stalk results from a hormonally driven (auxin) geotropic response to the horizontal or nearly horizontal position of the downed plant. Large areas of "goose-necked" corn can create headaches during harvest and increase mechanical harvest loss of grain if stalks or ears break off before being captured by the combine header.

As corn nears pollination, it also nears its full height. Recovery or "straightening up" from root lodging in corn at this point in time is not very likely because stalk elongation is nearly complete. Severe root lodging at or during pollen shed can greatly reduce the pollination success of the downed plants because the silking ears are often covered by leaves of other fallen plants and thus prevented to varying degrees from capturing pollen and, thus, fertilizing ovules on the ear. The photosynthetic stress imposed on the downed plants by lodging-induced root injury and lessened light interception due to the downed plants shading each other likely also limits survivability of any fertilized ovules on the ears as well.

Influence of Root System Health. Recovery from severe root lodging is hindered for those plants whose root systems are already limited (e.g., by soil compaction or soggy soils) or injured (e.g., by CRW larvae feeding). If additional root injury occurs from the root lodging itself, the plants may struggle greatly as they attempt to recover.

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/>.

Severe root lodging in V12 corn

Limited root system caused by combination of CRW larvae feeding on roots and dry soils during nodal root formation

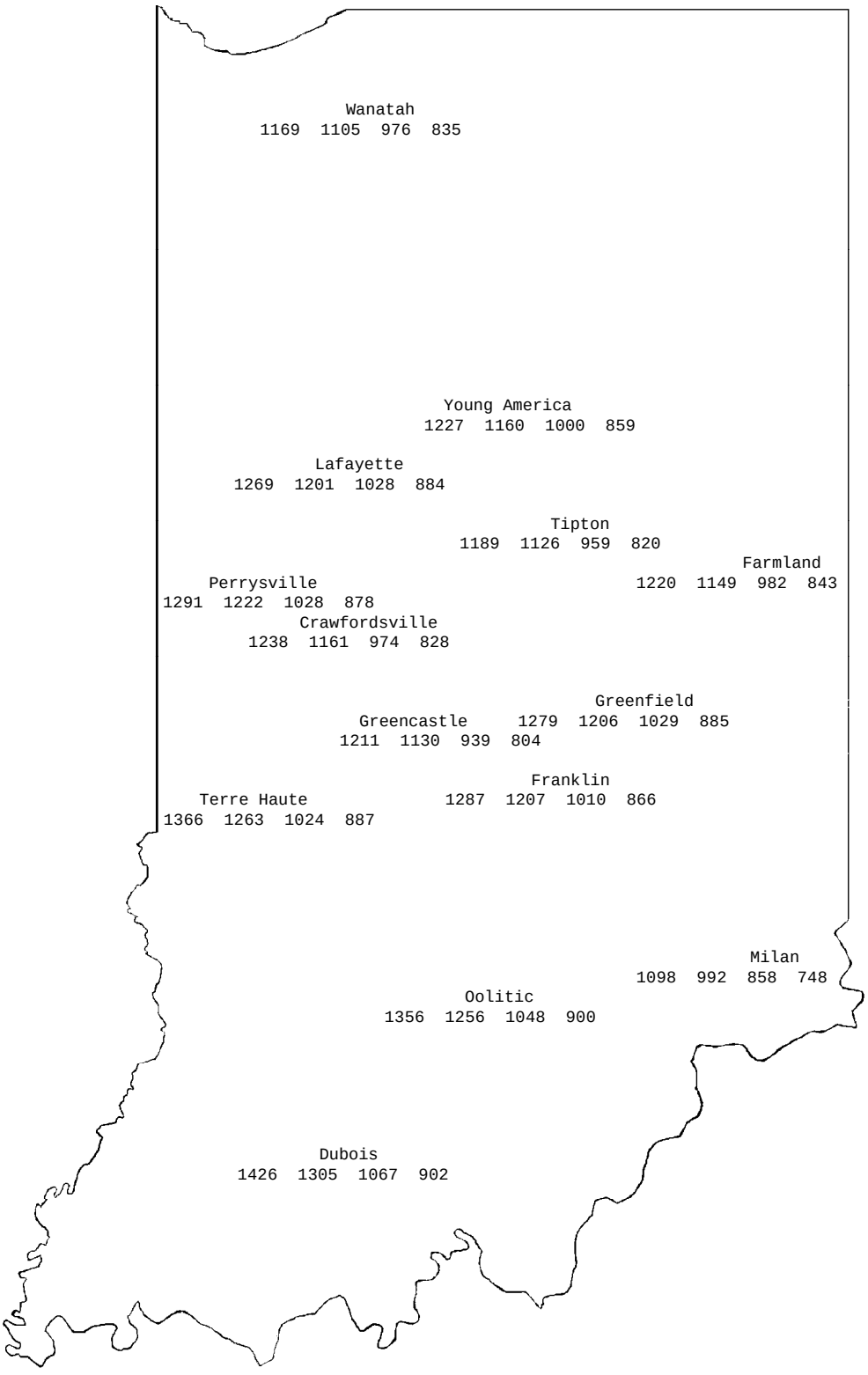
CRW larva found within root mass

Weather Update

MAP KEY			
Location			
GDD(2)	GDD(10)	GDD(43)	GDD (75)

Temperature Accumulations from Jan. 1 to July 10, 2002

GDD(2) = Growing Degree Days from April 21 (2% of Indiana's corn planted), for corn growth and development
GDD(10) = Growing Degree Days from May 5 (10% of Indiana's corn planted), for corn growth and development
GDD(43) = Growing Degree Days from May 26 (43% of Indiana's corn planted), for corn growth and development
GDD(75) = Growing Degree Days from June 2 (75% of Indiana's corn planted), for corn growth and development



4" Bare Soil Temperatures 7/10/02

Location	Max.	Min.
Wanatah	86	74
Winamac	86	75
W Laf Agro	83	76
Tipton	81	79
Farmland	87	71
Perrysville	84	79
Crawfordsville	75	73
Terre Haute	93	78
Oolitic	82	77
Dubois	99	77

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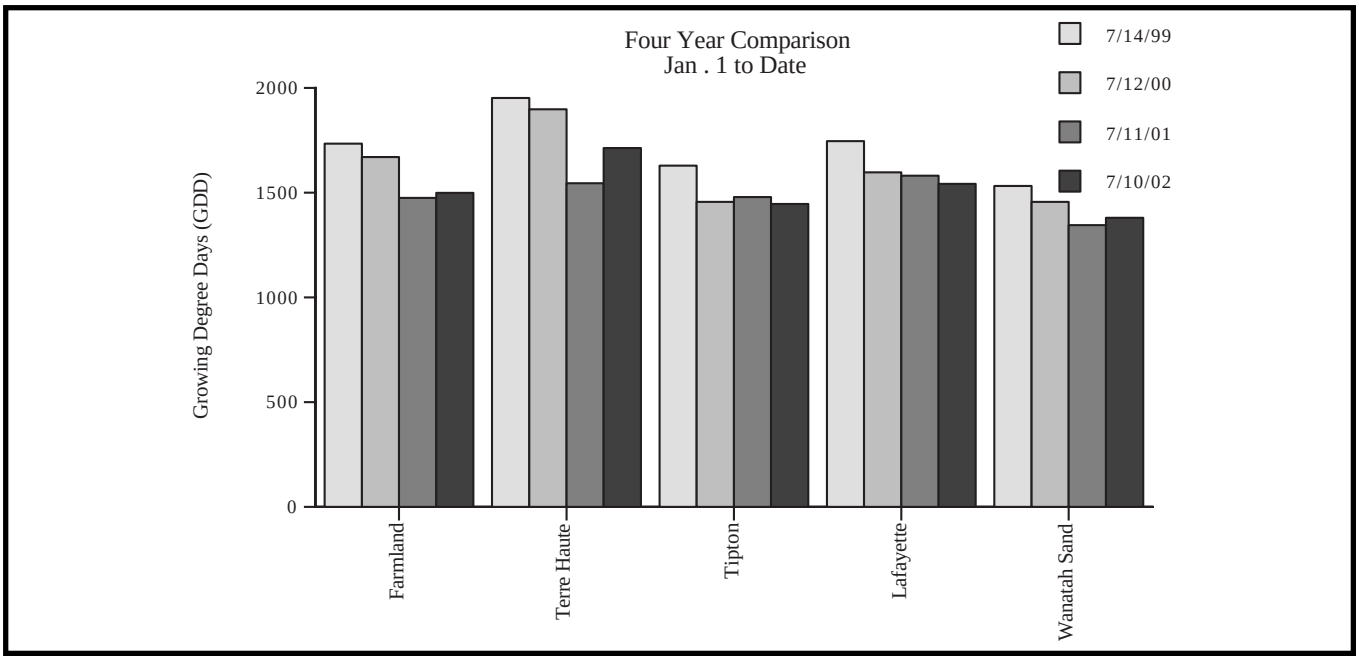

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