Purdue Cooperative Extension Service

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In This Issue

Insects, Mites, And Nematodes

Japanese Beetle Season Begins - (*Christian Krupke and John Obermeyer*)

- Grub feeding is mostly over, now it's beetle time
- Watch for activity on soybean, and later on corn silks

Scattered reports of Japanese beetle adults indicate that their presence will soon be felt. Within two weeks, most areas in the state should be seeing this notorious pest in crops and around the home. The good news is that so far, the populations seem to be lower. The bad news is that somewhere in the state this summer, their wrath will be felt! Oh yes, it will be felt indeed my friends.

This year's adults are the result of eggs that were laid by female beetles last summer. After these eggs hatched, the grubs immediately begin to feed on a wide variety of roots and decaying organic matter in the soil. This feeding is typically not noticed and not economic. They continue feeding until cold temperatures prompt them to move deeper in the soil profile to overwinter. Early in spring, the surviving grubs return to near the soil surface to feed, and this is when

False Japanese beetle, similar in appearance, but lacking white-tufts of hair on its rear. This species is often found in very sandy soil areas and usually emerges before the Japanese beetle. (*Photo credit: Bob Nielsen*)

Japanese beetle are more iridescent in color with distinct white-tufts of hair along the abdomen and distinctively on the rear-end.

they cause the most problems in field crops. Spring root feeding by the grubs can result in serious damage to early-planted crops, especially corn. Fortunately, we have heard of very few grub problems this year.

Japanese beetles are generalists both as adults and larvae and will feed on more than 350 different species of plants, but are especially fond of roses, grapes, smartweed, soybeans, corn silks, flowers of all kinds, and overripe fruit. Beetle damage to cultivated crops is often minimal and defoliation (leaf removal) on soybean typically looks much worse than it is, and is often most severe along borders, where “drive-by scouting” tends to occur. The beetles often congregate in several areas of a soybean field, feeding on and mating in the upper canopy. The beetles’ iridescent, metallic color also frequently catches the attention of those doing “windshield” field inspections. Closer inspection will often reveal that weeds (e.g. smartweed) have made fields even more attractive to the beetles. Happy Scouting!

Western Bean Cutworm Trapping Begins – (*John Obermeyer*)

Once again, our faithful network of pheromone trap cooperators are at work, this time monitoring for western bean cutworm. As you can see from the following table, a few moths have been captured recently, indicating the beginning of a multiple week emergence from their overwintering sites, deep within the soil. Within a matter of weeks, we will know how successful this pest was at surviving the cold winter of 2013/14. Understand that trap captures are an indicator of western bean cutworm’s activity in an area, used to better time scouting trips to vulnerable cornfields. Significant moth captures, over consecutive nights, should trigger scouting for egg masses and newly hatched larvae in corn, excluding traited varieties with resistance, that will soon tassel. More in future issues of the *Pest&Crop*!

Western bean cutworm pheromone, trap, and “kill” strip.

Armyworm Pheromone Trap Report - (*John Obermeyer*)

County/Cooperator	Wk 1 = 4/3/14 - 4/9/14; Wk 2 = 4/10/14 - 4/16/14; Wk 3 = 4/17/14 - 4/23/14; Wk 4 = 4/24/14 - 4/30/14; Wk 5 = 5/1/14 - 5/7/14; Wk 6 = 5/8/14 - 5/14/14; Wk 7 = 5/15/14 - 5/21/14; Wk 8 = 5/22/14 - 5/28/14; Wk 9 = 5/29/14 - 6/4/14; Wk 10 = 6/5/14 - 6/11/14; Wk 11 = 6/12/14 - 6/18/14; Wk 12 = 6/19/14 - 6/25/14											
	1	2	3	4	5	6	7	8	9	10	11	12
Dubois/SIPAC Ag Center			2	0	0	1	0	0	1	2	3	5
Jennings/SEPAC Ag Center	0	0	0	0	0	0	0	0	0	0	0	10
Knox/SWPAC Ag Center	0	0	0	0	0	0	0	0	0	0	0	0
LaPorte/Pinney Ag Center	0	0	1	1	14	3	0	0	0	0	1	
Lawrence/Feldun Ag Center	1	8	10	10	0	5	0	0	3	0	0	11
Randolph/Davis Ag Center	0	2	1	1	1	0	0	0	0	0	3	0
Tippecanoe/Meigs			1	0	0	0	0	0	0	1	2	11
Whitley/NEPAC Ag Center	0	1	2	17	20	35	0	0	0	2	2	

Western Bean Cutworm Adult Pheromone Trap Report
Week 1 = 6/19/14 - 6/25/14

County	Cooperator	WBC Trapped							
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Adams	Kaminsky/New Era Ag/Monroe	0							
Adams	Roe/Mercer Landmark/Decatur	0							
Allen	Anderson/Syngenta/Churubusco								
Allen	Gynn/Southwind Farms/Ft. Wayne	0							
Allen	Kneubuhler/G&K Concepts/Harlan	0							
Bartholomew	Bush/Pioneer Hybrids/Columbus	0							
Benton	Babcock/Ceres Solutions/Boswell	0							
Boone	Neal Campbell/Beck's Hybrids/Atlanta	0							
Clark	Haynes/Clark Co. CES/Charlestown								
Clay	Bower/Ceres Solutions/Brazil	0							
Clay	Bower/Ceres Solutions/Bowling Green	0							
Clinton	Foster/Purdue Entomology/Rossville	0							
DeKalb	Hoffman/ATA Solutions/Auburn	0							
DuBois	Eck/Dubois Co. CES/Jasper	0							
Fountain	Mroczkiewicz/Syngenta/Rob Roy	0							
Fulton	Jenkins/North Central Co-op/Kewanna	0							
Fulton	Jenkins/North Central Co-op/Rochester	2							
Gibson	Schmitz/Gibson Co. CES/Princeton								
Hamilton	Campbell/Beck's Hybrids/Atlanta	0							
Hendricks	Nicholson/Nicholson Consulting/Greencastle	0							
Howard	Myers/Meyers Ag Svc/Kokomo								

County	Cooperator	WBC Trapped							
		Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Jasper	Overstreet/Purdue CES/Wheatfield								
Jasper	Ritter/Brodbeck Seeds/Rensselaer								
Jay	Shrack/Ran Del Agri Svc/Parker City	0							
Jennings	Bauerle/SEPAC/North Butlerville	0							
Knox	Bower/Ceres Solutions/Vincennes	0							
Knox	Bower/Ceres Solutions/Freelandville	0							
Knox	Bower/Ceres Solutions/Oaktown	0							
Knox	Hoke/SWPAC/Vincennes	0							
Lake	Kleine/Kleine Farms/Cedar Lake	0							
Lake	Moyer/Dekalb Hybrids/Shelby	0							
Lake	Moyer/Dekalb Hybrids/Schneider	0							
LaPorte	Barry/Kingsbury Elevator/Plymouth								
LaPorte	Rocke/Agri Mgmt Solutions/Wanatah	0							
LaPorte	Rocke/Agri Mgmt Solutions/LaCrosse	0							
Miami	Early/Pioneer Hybrids/Peru	0							
Montgomery	Stine/Nicholson Consulting/Wingate	0							
Newton	Moyer/Dekalb Hybrids/Lake Village	0							
Porter	Leuck/PPAC/Wanatah N	0							
Putnam	Nicholson/Nicholson Consulting/Greencastle	0							
Randolph	Boyer/DPAC/Farmland	0							
Rush	Schelle/Falmouth Farm Supply/Carthage								
Starke	Wickert/Wickert Agronomy Services /N. Judson	0							
Sullivan	Bower/Ceres Solutions/Sullivan E	0							
Sullivan	Bower/Ceres Solutions/New Lebanon	3							
Sullivan	Bower/Ceres Solutions/Farmersburg	3							
Tippecanoe	Bower/Ceres Solutions/Lafayette	3							
Tippecanoe	Nagel/Ceres Solutions/Otterbein								
Tippecanoe	Obermeyer/Purdue Entomology/Agry Farm	0							
Tippecanoe	Westerfeld/Monsanto Res.Farm/W. Lafayette								
Whitley	Walker/NEPAC/Columbia City								

Weeds

Purdue University Weed Scientist's on the Hunt for More Glyphosate Resistant Giant Ragweed – (*Bill Johnson and Travis Legleiter*) -

As postemergent herbicide applications are being made in abundance this time of year, now is the time to be on the lookout for weedy survivors. Purdue University Weed Science is currently looking for fields with giant ragweed that have survived an application of glyphosate as this may signal a resistant population. Giant ragweed—unlike other glyphosate-resistant weeds in Indiana such as marestail, waterhemp, and Palmer amaranth—is unique in that there are two distinct resistant phenotypes. Although one response is similar to what one might see with other glyphosate-resistant weeds (minor chlorosis 3 to 7 days after application proceeded by normal growth) the second type of response is noticeable much sooner and more closely resembles symptoms from a contact herbicide. In these resistant plants, mature leaves rapidly turn necrotic within 2 days after application but may happen in as little as 6 hours while, newly emerged leaves are initially chlorotic but eventually resume normal growth. If you are interested in viewing time lapse photography of a rapid necrosis phenotype, take a look at this YouTube video at this site - <https://www.youtube.com/watch?v=eXTxEX5WpPw>- or you can type in "Purdue giant ragweed youtube" in google to find it as well.

If you suspect you have a glyphosate-resistant giant ragweed population, please contact Nick Harre by email <nharre@purdue.edu> or phone (618-314-0581) with location information. If a live whole-plant sample is available, confirmation of resistance and which resistant phenotype is present can be provided likely within this growing season. This information will enable us to assess and share the frequency of glyphosate-resistant giant ragweed in the state. This project was made possible in part with funding from the Indiana Soybean Alliance and the United Soybean Board.

Glyphosate-resistant responses in giant ragweed. Photo taken 3 days after a 3x dose of glyphosate

The unique resistant response to glyphosate in giant ragweed mimicking injury from a contact herbicide. Photo taken 6 hours after application

Necrosis from a single drop of glyphosate solution (5% v/v) on a rapid necrosis phenotype of resistant giant ragweed.

Agronomy Tips

Pale Green Soybeans Persisting? – (*Shaun N. Casteel*) -

We can often scout or drive past field after field of soybean in June that are pale green to yellowish in color. The soybeans look pitiful and plum pathetic. Soybeans are usually going through the awkward stage of life during June. They are growing faster than nitrogen can be supplied from soil (residual N and mineralization of organic matter), cotyledons, and developing nodules. Soybeans usually encounter this rapid growth and limited N supply between V2 to V3 growth stages (2 to 3 unrolled trifoliates). Soybeans in the picture below are encountering N limitation earlier (V1, one unrolled trifoliate) due to cool and wet conditions associated with heavy corn residue.

Soybean will take up N from the soil in addition to the nutrient supply from the cotyledons (~7 to 10 days as the seedling becomes established). *Bradyrhizobium japonicum* infect the root hairs of soybean to form nodules that will eventually fix atmospheric N. The infection occurs early, but the active fixation does not occur until V2 or so. Thus, the pale colored plants are a result of a temporary N shortage since the developing nodules aren't at full speed and the plant is growing rapidly. Soybeans typically overcome this temporary shortage of N within 5 to 7 days, and supplemental N is not warranted.

Growing conditions (too wet as well as too dry) can intensify the N shortage. Cool and wet soil conditions, especially saturated soils, will limit oxygen supply to soybean roots and bacteria. Soybeans grow and develop by burning plant energy (photosynthates) with the assistance of oxygen. Thus, soybean (and rhizobia) growth is limited under wet conditions. In fact, nodules can die under prolonged saturation. On the opposite end of the spectrum, nodulation and N fixation of soybean are among the first plant processes hindered by very dry and high temperatures. A rejuvenating rain will activate nodulation and N fixation.

I have seen and heard many reports of persistent off-coloring of soybeans plus slow growth this season. Again, soybeans from V2 to V3 are typically pale green and recover from the N shortage within a week. However, it is not normal for soybeans to still be pale green for over 10 days or from growth stages V4 onward. I suggest digging up the plants in these fields to assess if the nodules are white, red, or dead. White nodules are immature, but developing. Red or pinkish interior of the nodules indicates that N fixation has started. Brown to mushy nodules are dead and will not supply N. Young soybeans, V2 to V3, may only have three to five actively-fixing nodules (pink to red interior). Soybeans from V4 and onward should have eight or more actively-fixing nodules with more nodules developing. Nutritional analyses of the most recent mature leaves of soybean will help to pinpoint if N or another nutrient is deficient.

Supplemental N may be warranted in severe cases, but you need to be certain that N is limited beyond the normal situations or the ponded areas. Forty to sixty pounds of N per acre has been beneficial in these situations provided it was applied between late vegetative growth (~V5) to early reproductive growth (R1). Please note, higher N rates can inhibit nodulation and fixation. Urea treated with a urease inhibitor is the preferred N source since UAN will damage foliage at these rates. You may also consider a blend of polymer-coated urea to provide a slow release of N until the nodules become active. Lower N rates applied foliarly will green-up soybeans, but will not supply enough N if nodulation is severely limited.

Slow soybean growth and/or persistent off-coloring could be caused by a number of factors. Cool and wet conditions (via growing season and/or heavy corn residue) limit soybean development (shoots, roots, and nodules), allow pathogen infections such as pythium to occur, and compromise soybeans ability to metabolize some herbicides. Limitations to root development will likely limit nodule development and thus, N supply.

Effects of Flooding or Ponding on Corn Prior to Tasseling – (*Bob Nielsen*) -

Recent intense rainfall events (technically referred to as "toad stranglers" or "goose drowners") have caused flooding of low-lying corn fields or ponding (standing water) in poorly drained swales within fields. Other areas within fields, while not technically flooded or ponded, may remain saturated for lengthy periods of time.

What are the prospects for recently submerged corn fields or plants simply enduring days and days of saturated soils? The flippant answer is that such suffering crops will survive until they die.

What I mean to say is that no one can tell you with certainty the day after the storm whether a ponded area of a corn field will survive or whether there will be long-term yield consequences until enough time has gone by such that you can assess the actual recovery of the damaged plants. We can, however, talk about the factors that increase or decrease the risks of severe damage or death to flooded soils.

- Plants that are completely submerged are at higher risk than those that are partially submerged.
    - Plants that are only partially submerged may continue to photosynthesize, albeit at limited rates.
- The longer an area remains ponded, the higher the risk of plant death.
    - Most agronomists believe that young corn can survive up to about 4 days of outright ponding if temperatures are relatively cool (mid-60's°F or cooler); fewer days if temperatures are warm (mid-70's°F or warmer).
    - Soil oxygen is depleted within about 48 hours of soil saturation. Without oxygen, the plants cannot perform critical life sustaining functions; e.g. nutrient and water uptake is impaired and root growth is inhibited (Wiebold, 2013).
- Even if surface water subsides quickly, the likelihood of dense surface crusts forming as the soil dries increases the risk of emergence failure for recently planted crops.
    - Be prepared with a rotary hoe to break up the crust and aid emergence.
- The greater the deposition of mud or old crop residues on plants as the water subsides, the greater the stress on the plants due to reduced photosynthesis.
    - Ironically, such situations would benefit from another rainfall event to wash the mud deposits from the leaves.
- Mud and crud that cakes the leaves and stalks encourage subsequent development of fungal and bacterial diseases in damaged plant tissue. In particular, bacterial ear rot can develop when flood waters rise up to or above the developing ears of corn plants (Nielsen, 2003).
- Corn younger than about V6 (six fully exposed leaf collars) is more susceptible to ponding damage than is corn older than V6.

- This is partly because young plants are more easily submerged than older taller plants and partly because the corn plant's growing point remains below ground until about V6. The health of the growing point can be assessed initially by splitting stalks and visually examining the lower portion of the stem (Nielsen, 2008a). Within 3 to 5 days after water drains from the ponded area, look for the appearance of fresh leaves from the whorls of the plants.

- Extended periods of saturated soils AFTER the surface water subsides will take their toll on the overall vigor of the crop.
  - Some root death will occur and new root growth will be stunted until the soil dries to acceptable moisture contents. As a result, plants may be subject to greater injury during a subsequently dry summer due to their restricted root systems.
  - Nutrients like nitrogen are rapidly remobilized from lower leaves to upper, newer leaves; resulting in a rapid development of orange or yellow lower leaves.
  - Because root function in saturated soils deteriorates, less photosynthate is utilized by the root system and more accumulates in the upper plant parts. The higher concentration of photosynthate in the stems and leaves often results in dramatic purpling of those above-ground plant parts (Nielsen, 2012).
  - Damage to the root system today will predispose the crop to the development of root and stalk rots later by virtue of the photosynthetic stress imposed by the limited root system during the important grain filling period following pollination. Monitor affected fields later in August and early September for the possible development of stalk rots and modify harvest-timing strategies accordingly.
- Concomitant (I found a new word in the dictionary!) with the direct stress of saturated soils on a corn crop, flooding and ponding can cause significant losses of soil nitrogen due to denitrification and leaching of nitrate N.
  - Significant loss of soil N will cause nitrogen deficiencies and possible additional yield loss.
  - On the other hand, if the corn dies in the ponded areas it probably does not matter how much nitrogen you've lost.
- Lengthy periods of wet soil conditions favor the development of seedling blight diseases in young corn seedlings, especially those caused by Pythium fungi (Sweets, 2014).
  - Poorly drained areas of fields are most at risk for the development of these diseases and so will also be risky for potential replant operations.
- Certain diseases, such as common smut and crazy top, may also become greater risks due to flooding and cool temperatures (Pataky and Snetselaar, 2006; Sweets, 2011).
  - The fungus that causes crazy top depends on saturated soil conditions to infect corn seedlings.
  - The common smut fungal organism is ubiquitous in soils and can infect young corn plants through tissue damaged by floodwaters. There is limited hybrid resistance to either of these two diseases and predicting damage is difficult until later in the growing season.
- Wind damage to corn occurs either as stalk breakage (aka "green snap") or root lodging (plants uprooted

and laying nearly flat to the ground). The yield effect of "green snap" damage depends on the percentage of field affected and whether the stalk breakage occurs above or below the ear, but is usually serious regardless. Obviously, stalk breakage below the ear results in zero yield for that plant. Stalk breakage above the ear results in significant yield loss due to the loss of upper canopy photosynthesis capacity for that plant. Root lodged corn will recover or straighten up to varying degrees depending on the growth stage of the crop. Generally, younger corn has a greater ability to straighten up with minimal "goose-necking" than older corn. Yield effects of root lodging depend on whether soil moisture remains adequate for root regeneration, the severity of root damage due to the uprooting nature of root lodging, and the degree of "goose-necking" that develops and its effect on the harvestability of the crop.

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Weather Update

Weather Outlook by NOAA/NWS - (*Jim Noel, NOAA/ NWS/Ohio River Forecast Center*) -

The wet pattern that was forecast for our region in June continues as expected.

After a few drier days June will end wetter again.

The first half of July is projected to have above normal temperatures. It will be a humid first half of July. The humidity will keep maximum temperatures in check with most highs below 95. It will also keep low temperatures up in the 65-75 degree range.

With the heat dome to our south and cool pool to our north expect a ring of fire will setup the first half of July from the Dakotas to Minnesota to northern Iowa to Wisconsin to Michigan to northern Indiana to Ohio. The best chances for heavy rain appears to be the northern half of Indiana. Normal rainfall is not far from an inch a week.

The question is will the wetter and more humid pattern lead to any disease or other crop related issues?

Indications continue to suggest a turn to drier weather in later July or August.

Early harvest season indications are for another wetter than normal fall. This has been a trend for the last decade where autumn harvest seasons can be a challenge getting crops out with wetter than normal conditions and this may occur again this fall. We will update this in the coming weeks to month.

You can get the latest soil moisture, hydrologic conditions and outlooks at the NWS Ohio River Forecast Center website of <http://www.erh.noaa.gov/ohrfc/WRO.shtml>