Purdue Cooperative Extension Service
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In This Issue

Insects, Mites, And Nematodes

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

	5/15/12 - 5/21/12							5/22/12 - 5/28/12						
County/Cooperator	**VC**	**BCW**	**ECB**	**WBC**	**CEW**	**FAW**	**AW**	**VC**	**BCW**	**ECB**	**WBC**	**CEW**	**FAW**	**AW**
Dubois/SIPAC Ag Center	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Jennings/SEPAC Ag Center	0	0	0	0	0	0	0	0	0	12	0	0	0	0
Knox/SWPAC Ag Center	0	0	0	0	0	0	0	7	6	0	0	1	0	47
LaPorte/Pinney Ag Center	0	0	0	0	0	0	6	1	0	10	0	0	0	20
Lawrence/Feldun Ag Center	0	0	0	0	0	0	1	0	0	1	0	0	0	4
Randolph/Davis Ag Center	0	1	0	0	0	0	1	0	1	0	0	0	0	5
Tippecanoe/TPAC Ag Center	0	1	0	0	0	0	5	4	2	27	0	0	0	39
Whitley/NEPAC Ag Center	0	0	0	0	0	0	15	0	0	6	0	0	0	13

VC = Variegated Cutworm, BCW = Black Cutworm, ECB = European Corn Borer, WBC = Western Bean Cutworm, CEW = Corn Earworm, FAW = Fall Armyworm, AW = Armyworm

Weeds

Prevalence and Influence of Stalk Boring Insects on Glyphosate Activity on Indiana and Michigan Giant Ragweed – (*Bill Johnson, Corey Gerber, John Obermeyer, and Travis Legleiter*)

This article is a summary of an scientific study we published in the journal *Weed Technology* in 2007. If you want to read the leaded, full bodied version, see this citation: Ott, E. J., C. K. Gerber, D. B. Harder, C. L. Sprague, and W. G. Johnson. 2007. Prevalence and influence of stalk boring insects on glyphosate activity on Indiana and Michigan giant ragweed (*Ambrosia trifida*). Weed Technol. 21:526-531.

INTRODUCTION

Giant ragweed (GRW) plants have been shown to serve as a host to stalk boring insects (SBIs) such as the European corn borer (ECB), the stalk borer, the celery leaftier, the cocklebur weevil, the ragweed borer, and a longhorn beetle. In addition, we receive many questions regarding the influence of SBIs on glyphosate activity as well as the biology of SBIs that utilize GRW as a host. The objectives of this article is to report on some of the previous work we have done to 1) determine the prevalence, distribution and identity of SBIs in GRW at various times during the growing season in Indiana and Michigan, and 2) determine the influence of ECB, giant ragweed size, glyphosate rate, and spray carrier volume on GRW control with glyphosate under greenhouse conditions.

MATERIALS AND METHODS

Field Survey. Four regions in Indiana (northeast, northwest, central, and southwest), and three regions in Michigan (central, southeast, and southwest) were surveyed once in August 2004 and once in June, August, and September of 2005. In each region, five random soybean fields where GRW plants were present at the time of sampling were selected arbitrarily for observations. In June 2005, five GRW plants 1-foot tall, and five GRW plants larger than 1 foot (up to 2 foot tall) were collected from each field and dissected to determine if SBIs or SBI tunnels were present.

During the mid-August and mid-September sampling time, ten GRW plants protruding above the soybean canopy were arbitrarily collected from each field. Individual plant heights were recorded, and a visual subjective assessment was made regarding whether or not the GRW plant had escaped control with glyphosate. These plants were also dissected to determine if SBIs or SBI tunnels were present. During each of the sampling times, if SBIs were found, the insects were collected and preserved in vials containing 70% isopropyl alcohol. Insect specimens were identified with a dissecting microscope to the family level.

Greenhouse Study. GRW seedlings (1- to 2-inches tall) were collected from the Purdue University Agronomy Center for Research and Education near West Lafayette, Indiana and transplanted into pots with growth media. Pots were placed in the greenhouse under supplemental lights. When GRW plants were 4-inches tall, 2 to 4 ECB neonate larvae were placed on designated plants.

The plants were sprayed with glyphosate when they were either 6- or 18-inches tall with various glyphosate rates (0, 0.38, 0.75, or1.5 lb ae/A), and spray carrier volumes (10 or 20 GPA). Ammonium sulfate was included in each glyphosate treatment. At 21 days after glyphosate treatment, all GRW plants were dissected to confirm ECB tunneling in the desired plants, and dried before dry weights were recorded.

RESULTS AND DISCUSSION

Prevalence of SBIs and Tunneling in GRW. In August 2004, SBI tunneling was observed in 66 to 79% of the GRW plants examined in Indiana, and 35 to 64% of GRW plants examined in Michigan (Table 1). In June 2005, SBIs and tunneling were observed in 10 to 26% of all GRW plants examined in Indiana and 4 to 30% of all GRW plants examined in Michigan. In Indiana, the only SBI family present at this time was Noctuidae. In Michigan, the SBI families identified during this sample time included Noctuidae, Pyralidae, and Tortricidae. In August 2005, 54 to 88% of Indiana GRW plants and 48 to 70% of Michigan GRW plants exhibited SBI tunneling. Five different SBI families were identified in GRW plants at this sample time which included Cerambycidae, Curculionidae, Languriidae, Noctuidae, and Tortricidae.

In September 2005, 76 to 94% of all GRW plants examined in Indiana contained SBI tunneling, whereas only 64 to 74% of all GRW plants sampled in Michigan contained SBI tunneling. The same five families detected in the August sample times were also detected during this sample time. During the August and September sample times, SBIs were found in 8 to 42% of the plants with SBI tunnels, suggesting that the SBIs previously present in GRW stems had completed larval development, pupated and emerged as adults from the GRW plants.

Overall, insect tunneling and infestation levels were similar in both states in June. Slightly higher percentages of GRW plants contained insect tunnels in Indiana during the August and September surveys as compared to Michigan. Throughout the growing season, six SBI families were identified, three families from the order Coleoptera, and three families from the order Lepidoptera. The Coleopteran families identified in this survey included Cerambycidae, Curculionidae, and Languriidae, and the Lepidopteran families identified in this survey were Noctuidae, Pyralidae, and Tortricidae. The most frequently found SBI families were Cerambycidae, Curculionidae, Noctuidae, and Tortricidae. The Languriidae family has not been previously reported to utilize GRW as a host.

Frequency of Late-Season GRW Escapes with SBIs or SBI Tunneling. The percentage of GRW plants that survived a herbicide application and contained SBIs and/or SBI tunnels ranged from 28 to 40% in Indiana in August 2004 (Table 2). In Michigan during this same sample time, only 5 to 31% of GRW plants displayed herbicide injury and contained evidence of SBIs and/or SBI tunneling. Based on surveys, in August 2005, 28 to 62% of GRW escaped herbicide application in Indiana and contained evidence of SBI activity (Table 2). Higher percentages of GRW plants with SBI tunnels survived a herbicide application in 5 out of 8 regions in 2004 and 5 out of 5 regions in 2005.

Greenhouse study. Glyphosate efficacy on 6-inch tall GRW plants was enhanced by ECB activity at the 0.38 and 0.75 lb ae/A rate at both carrier volumes (Table 3). This occurrence is likely due to the following reason. The glyphosate treatments to 6-inch GRW were applied 5 to 7 days after the ECB were placed on the plants, at which time the plants were under considerable stress from the initial boring of the ECB into the small plant stems. Glyphosate efficacy at the 1.5 lb ae/A rate was not influenced by ECB activity.

Results from the control of 18-inch plants did not show significant carrier volume effects. Glyphosate efficacy was reduced by the presence of ECB activity on 18-inch tall plants at the 0.38 and 0.75 lb ae/A rate (Table 2), but not at the 1.5 lb ae/A rate. Glyphosate had little effect on 18-inch tall plants with ECB activity at the 0.33 lb ae/A rate. On 18-inch tall plants, utilization of the 0.75 or 1.5 lb ae/A rates provided better control than the 0.38 lb ae/A rate.

In summary, Noctuidae (Indiana and Michigan), Pyralidae (Michigan), and Tortricidae (Michigan) families were found to utilize GRW plants as a host during the time window when the initial postemergence glyphosate applications were being made to soybeans in June of 2005. Although our survey did not determine if SBIs infested GRW before or after initial glyphosate applications were made, the possibility of SBI's having a negative influence on glyphosate efficacy is plausible based on the results of our greenhouse study.

Five different insect families were identified at the August sample times; Cerambycidae, Curculionidae, Languriidae, Noctuidae and Tortricidae. It is likely that these insect families infest GRW after the initial postemergence glyphosate applications. However, they may have infested GRW before rescue sprays were made in July. Control failures with July applications could be due to a number of causes including environmental factors, inadequate rates for the large plants typically present during this spray timing, poor spray coverage of lower leaves due to the soybean canopy, and the high percentage of plants which contain SBIs and/or SBI tunnels.

Table 1. Percent of giant ragweed plants with stalk boring insect tunnels and stalk boring insects present in various regions of Indiana and Michigan. N=50 plants per regions. In each field 10 plants were investigated: five plants were less than 1-foot tall and five plants were 1- to 2-foot tall.

	Region								State Avg.	
Sample Time	Central Indiana	Northeast Indiana	Northwest Indiana	Southwest Indiana	Central Michigan	Southeast Michigan	Southwest Michigan	LSD (0.05)	IN	MI
	% Of Giant Ragweed Plants With Stalk Boring Insect Tunnels									
Aug 2004	72	79	66	68	40	35	64	18	71	46
June 2005	18	26	24	20	20	18	30	NS	22	23
Aug 2005	84	54	58	88	54	48	70	18	71	57
Sept 2005	88	76	84	94	68	74	64	16	86	69
	% Of Giant Ragweed Plants With Stalk Boring Insects Present									
Aug 2004	18	16	20	24	10	12	22	NS	20	15
June 2005	12	10	16	18	4	8	18	NS	14	10
Aug 2005	18	28	40	36	8	6	20	26	31	11
Sept 2005	42	24	32	28	38	36	32	NS	32	35

Table 2. Percent of giant ragweed plants which survived a herbicide application and showed herbicide injury symptoms in late-season field surveys in Indiana and Michigan. N = 50 plants per region.

Sample Time	Insect Tunneling Present	Region							LSD (0.05)
		Central Indiana	Northeast Indiana	Northwest Indiana	Southwest Indiana	Central Michigan	Southeast Michigan	Southwest Michigan	
		%							
Aug 2004	No	12	2	12	0	13	25	20	13
	Yes	32[b]**	28***	40**	36***	22	31	5***	17
Aug 2005	No	4	6	2	0	--[a]	--	--	NS
	Yes	65***	38***	38***	28***	--	--	--	19

[a]No data recorded.
[b]Significant difference between plants with and without the presence of insect tunneling: P = *(0.05), **(0.01), ***(0.001) determined by a t-test.

Table 3. Influence of giant ragweed height, glyphosate rate and carrier volume, and the presence of European corn borer (ECB) tunneling on giant ragweed dry weight.

	Giant Ragweed Height					
	6 - Inch				18-inch	
	Carrier Volume					
	10 GPA		20 GPA		Pooled Over Carrier Volume	
	ECB Larva And Tunneling Present					
Glyphosate Rate	Yes	No	Yes	No	Yes	No
lb ae/a	Dry Weight (% Of Non-Treated)					
0	93	100	90	100	96	100
0.38	64	81	60	82	92	83
0.75	47	62	44	70	81	73
1.5	45	46	41	55	75	70
LSD (0.05)	-----------11-----------				-----------6-----------	

European corn borer damage to giant ragweed, lab study

Close-up of clover stem borer larva and giant ragweed tunneling

Different weed species and insect tunneling

Marestail control failure due to insect tunneling

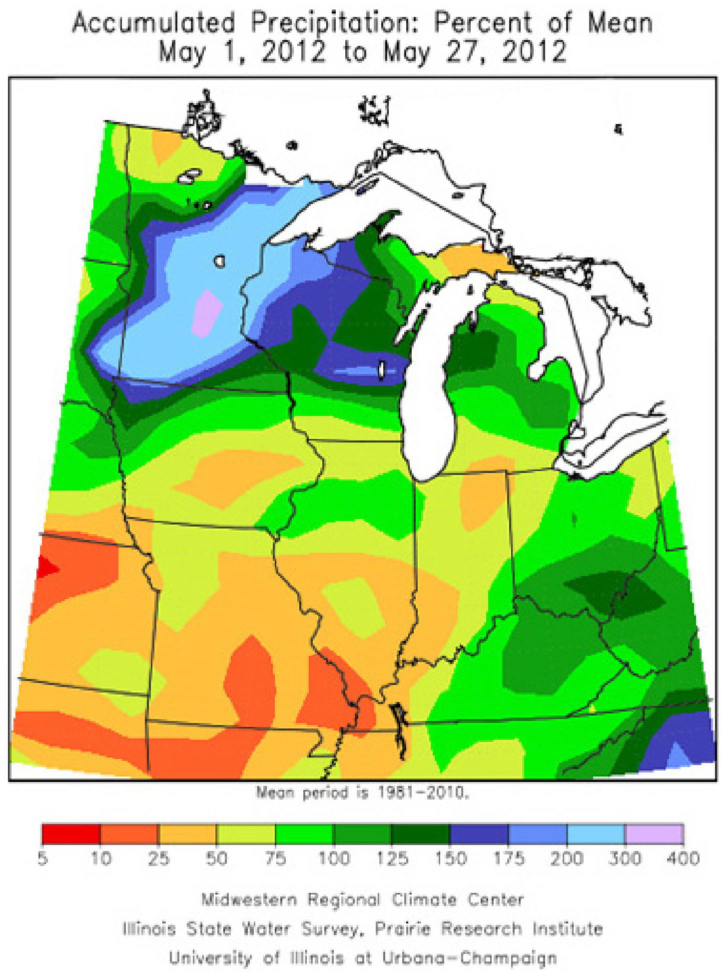
Agronomy Tips

Hot & Dry; More of the Same Not Good for Corn Yield – (*Bob Nielsen*) -

Hot and dry; more of the same; second article in a week; worried growers; nervous markets; 8- to 14-day outlook not promising........

The talk uptown at Stu's Bar and Grill over the Memorial Day weekend revolved around the continued spell of hot and dry weather throughout most of Indiana and the possible effects on the yield of this year's corn crop. Some of the promise of the early-planted crop is withering away much like the corn crop in some fields that is already showing symptoms of wilting and leaf rolling. One of the regulars recalls hearing that some Extension corn guy at the university reminded folks a month ago that planting date is but one of a gazillion yield-influencing factors for corn and that a record early planting of the state's corn crop does not guarantee record high yields.

The bad news is that the crop is beginning to noticeably suffer in areas of the state. Plant mortality has reduced populations in some fields. Initial development of the nodal root system has been restricted in some fields. Leaf rolling (plant wilting) is occurring in some fields in corn that has barely entered the rapid growth phase. Many fields have yet to develop the healthy dark green associated with a crop that has entered the rapid growth phase, probably because their root systems are functioning poorly in response to the excessively dry soil conditions. The appearance and color of plants throughout many fields are extremely variable and painful for growers to look at.



So, what can be said about the effects of the continuing combination of excessively warm temperatures and dry conditions to date on the prospects for corn yield this fall? Well, we can describe the effects but it is difficult to predict the exact results on grain yield.

Grain yield in corn is the multiplicative result of plant population, kernel number per plant, and weight per kernel. The effects of stress on grain yield are determined by how the stress directly or indirectly affects these components of grain yield.

Effective plant population (plants with ears at harvest) is largely determined during the first 30 to 45 days after planting. Stand establishment this season in Indiana has been challenging for some due to cold injury, frost injury, fertilizer injury, soil crusting, seedling blights, and excessively dry surface soils. Stand loss due to excessively dry soils in early-planted fields is still possible if drought conditions worsen. Stand loss due to excessively dry soils is more likely for later planted fields whose younger plants may succumb to drought stress before their nodal root systems develop well enough to tap into deeper soil moisture. Indeed, reports of "rootless" or "floppy" corn have been coming in from a number of areas in the Midwest.

Much of the state's crop has reached the V5 leaf stage of development (5 visible leaf collars) or has progressed beyond this stage. The uppermost, harvestable ear is initiated by the apical meristem of corn at about V5. The potential number of kernel rows per ear is determined by roughly leaf stage V7 (six to eight days after V5). Potential kernel row number is strongly determined by a hybrid's genetic background and is fairly resilient to the effects of stress. However, severe stress that occurs within the small window of time from V5 to V7 can indeed restrict kernel row number determination and is certainly a risk this year for crops under severe drought stress during those leaf stages.

Number of potential kernels per row on an ear is less of a genetic characteristic and much more influenced by growing conditions. This component of ear size determination is not complete until the V12 to V15 stages of leaf development and, thus, is vulnerable to potential stress over a longer period of time than is kernel row number determination. Consequently, severe and/or prolonged stress of any kind during this time period can restrict the potential length of the ears (i.e., fewer potential kernels per row).

While not actually a yield component, potential plant size is also largely determined during the vegetative period of growth prior to pollination. Severe stress of any kind during the rapid growth phase can result in shorter, smaller plants for the remainder of the season. Severely stressed plants also cannibalize lower leaves in an effort to remobilize nutrients to maintain the health of the upper canopy. The resulting smaller, less productive photosynthetic "factory" will be less capable of producing the photosynthate required during the important grain filling period after pollination and, thus, kernel weight may suffer even if conditions improve late in the season.

That just about sums up the short-term fearmongering for the 2012 Indiana corn crop. The good news is that the season is yet young and the return of moderate growing conditions could still turn around this crop. But time's awasting. The sooner the dry spell breaks, the sooner additional loss in yield potential can be avoided.

Pray for rain or turn on the irrigation.

Related Reading

Crop Management Information for Drought-Damaged Field Crops. Purdue Univ. <http://www.kingcorn.org/cafe/drought> [URL accessed May 2012].

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Nielsen, RL (Bob). 2010a. Root Development in Young Corn. Corny News Network, Purdue Univ. <http://www.kingcorn.org/news/timeless/Roots.html> [URL accessed May 2012].

Nielsen, RL (Bob). 2010b. "Rootless" or "Floppy" Corn Syndrome. Corny News Network, Purdue Univ. <http://www.kingcorn.org/news/timeless/FloppyCorn.html> [URL accessed May 2012].

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Wiebold, Bill. 2012. Early Corn Root Development. Integrated Pest & Crop Management Newsletter, Univ. of Missouri. <http://ipm.missouri.edu/IPCM/2012/5/Early-Corn-Root-Development/> [URL accessed May 2012].

Wiebold, Bill. 2012. Rootless Corn. Integrated Pest & Crop Management Newsletter, Univ. of Missouri. <http://ipm.missouri.edu/IPCM/2012/5/Rootless-Corn/> [URL accessed May 2012].

Bits & Pieces

2012 Purdue Weed Day – (*Bill Johnson*) –

The 2012 Purdue Weed Day is scheduled for Thursday June 28, 2012. The program will begin at 8:30 AM Eastern Daylight Time at the Throckmorton Purdue Agricultural Center, 8343 US 231 South, Lafayette, IN 47909-9049. The farm is located approximately 5 miles south of Lafayette on the corner of county road 800 South and U.S. 231 South. Come a little early and have coffee and a doughnut with us. Water and soft drinks will be available during the tour. For those attending the 2012 Purdue Weed Day, we have applied for 3 CCH's for category 1.

Weed pressure is quite good and postemergence treatments have been applied. The herbicide plots will give you a chance to look at new herbicide resistance trait technology in corn and soybean and how it compares to the products currently on the market. We will also have trials to address spray water quality and it's impact on herbicide efficacy. In addition, our weed science graduate students will be available to discuss their research projects.

An attendance form is located on the Purdue Weed Science Website at <http://www.btny.purdue.edu/weedscience/temp/WeedDay2012.html>. You may also call Amy Deitrich at 765-494-9871. Please register if you plan to attend. This will allow us to maintain a mailing list and to estimate coffee, doughnut and soft drink needs for the Weed Day.

Weather Update