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2011 CORN PEST RISK SURVEY RESULTS

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In 2010, South Dakota was ranked among the top six corn producing states in the US. Producers planted 4.55 million acres of corn and harvested 4.22 million acres. Corn yield per harvested acre averaged 135 bushels. The total production for corn-for-grain was 569.7 million bushels and silage production totaled 3.645 million tons (USDA-NASS 2011).

Most corn production occurs east of the Missouri River in South Dakota. South Dakota is divided into nine agricultural statistical districts. Six of these areas are located in the eastern and central part of the state (primarily east of the Missouri River), where most of the intensive crop cultivation takes place.

Corn Root worm is just one of a host of insect pests confronting South Dakota corn producers each year. To address this economic issue, South Dakota State University and USDA-Agricultural Research Service field office in Brookings, SD began a project to investigate the issue of corn pest risks in South Dakota. Having successfully conducted a field survey in 2010, the second year report on the field census component of the project is discussed below.

Corn Pest Risk Project

The authors received a USDA-AFRI seed grant from the AFRI Plant Bio-Security Program (award # 2009-05007) for a two year study (2010-2011). The objective of the project is to develop a better understanding of the type of insects currently inhabiting South Dakota cornfields.

The project looks at insect pests that pose a danger to corn yield. Currently, we have an idea of the corn insects that growers face in our state, but their distribution and the severity of infestation are unknown. We completed our first summer field survey in 2010. In 2011, we used similar methods to those used in collecting data during the 2010 field study. The field survey team visited 20 South Dakota counties and collected samples from 25 farms, three fewer than in 2010. Nearly 45% of the farms visited were new to the study.

Weather conditions in 2011 delayed planting. The field survey team timed their farm visits to coincide with corn tasselling (early August; soon after plants have tasseled). Producers participating in the study pre-selected refuge cornfields for the survey team to sample, and 50 plants per field were examined for insects. Particular attention was paid to the number of corn rootworm adults (western, southern, and northern rootworms), corn earworm, European corn borer (ECB), western bean cutworm, and aphids (corn leaf aphid).

The project's short run objective is to develop a census of current insects inhabiting eastern South Dakota corn fields. The long run goal is to develop a two stage risk assessment tool that provides reliable forecasting capabilities for estimating the risk from a specific high consequence (economic damage to

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yield) insect becoming established in corn production areas in South Dakota at the county level. The risk assessment model will be based on: 1) county characteristics favorable to establishment of high consequence arthropods in a specific SD county; and 2) field sampling at the county level for targeted pests identified as potential threats to South Dakota corn production. However, additional survey data will be needed to develop a prototype pest alert system at the county level. The development of such a model would enhance producers' ability to target corn pest management resources efficiently. The results of our first and second year census on corn insect populations for Eastern South Dakota are provided below.

Corn Pest Sample

The 2011 (see Table1) and 2010 (see Table2) data are reported in this research report. This survey represents the second coordinated effort to sample South Dakota corn production for insect pests. This information is critical given the rapid development and marketing of novel tools for managing insect pests in corn (especially Bt hybrids, insecticidal seed treatments). We counted all insects found on refuge corn (no BT, no insecticidal seed treatment) on 25 farms in 20 counties located in East-River South Dakota. Fifty corn plants were sampled in each of the sites visited. Two sites were sampled in five counties: Codington, Minnehaha, Miner, Walworth and Yankton. One site was sampled in fifteen counties: Clay, Day, Deuel, Douglas, Edmunds, Faulk, Hanson, Hamlin, Hughes, Hutchison, Jerauld, Lake, McPherson, McCook, Roberts, and Spink.

For the purposes of this report, pests found in the various counties were categorized as caterpillar, aphids, and rootworms. The caterpillar pests were made up of western bean cutworm, European corn borer, and corn earworm. The corn rootworms included western, northern, and southern rootworms and aphids which were primarily corn aphids. These pests never exceeded economic thresholds at any of the sites. European corn borer was the most consistent pest found, but the maximum infestation level was 20% of the plants infested at a single site. The European corn borers' economic injury levels are around 1.5 larvae per plant implying that farms of SD experienced on average only $1/10^{th}$ of the pest population to reach this injury level in 2011. A likely factor for this low level of pests may be the area-wide suppression of pests due to high adoption rates of genetically modified (GM) crops.

Beneficial Insects

We found a diverse community of beneficial insects (insect predators) at all of the sampled farms, including spiders, lacewings, pirate bugs, lady beetles, and syrphid flies. The 2011 Survey showed approximately 166,000 predators per acre living in the plant foliage, whereas the 2010 survey recorded up to 147,000 predators per acre.

At this time we are unable to determine a cause for the rise in the beneficial insect community in 2011. However, we view this increase as positive change in the insect population living in South Dakota corn fields. The beneficial insect community contains predators that help control corn insect pests, and they should be preserved and encouraged through farm management practices as a free source of pest management for producers in the South Dakota.

Final Stage of the Project

We have completed the first stage of the project by collecting census data which involves delving into the types of pests that affect South Dakota corn and the next stage is to develop methodology to predict corn pest infestation outbreaks in South Dakota at the county level. However, before model development can begin additional pest survey data is needed.

References

Fausti, Scott, John Lundgren, and Emmanuel Opoku. 2011 "*Corn Pest Risk Survey Results*". Economics Commentator No.528, Department of Economics, South Dakota State University, Brookings, SD, February 28.. http://www.sdstate.edu/econ/commentator/loader.cfm?csModule=security/getfile&PageID=1177406

United States Department of Agriculture National Agriculture Statistics Service. South Dakota Agriculture 2011, various tables.

Table 1. Average Insects Counts by Sample site for 2011 Corn Risk Survey

		----------Average Pest Per Plant ---------				
Plant Site	County	Caterpillar	ECB	Aphid	Rootworms	Predators
1	Minnehaha	0.16	0.04	1.06	1.64	2.12
2	Minnehaha	0.26	0.10	0.04	0.90	3.38
3	Yankton	0.18	0.02	0.04	0.14	9.54
4	Yankton	0.12	0.02	0.28	0.78	8.42
5	Clay	0.20	0.00	0.56	0.52	6.20
6	Hutchison	0.06	0.00	0.18	1.60	4.84
7	Douglas	0.22	0.10	0.00	0.06	5.84
8	Hanson	0.06	0.04	0.02	7.60	2.66
9	Jerauld	0.08	0.04	0.00	0.04	11.48
10	Miner	0.26	0.14	0.08	0.04	7.52
11	Miner	0.02	0.00	0.00	1.22	1.64
12	Lake	0.36	0.16	0.08	1.60	3.58
13	Lake	0.04	0.02	0.04	0.08	2.04
14	Deuel	1.02	0.00	0.40	0.02	3.16
15	Codington	0.02	0.00	1.08	0.00	3.70
16	Codington	0.00	0.00	0.18	0.06	2.14
17	Roberts	0.20	0.02	0.28	0.14	4.20
18	Day	0.06	0.00	8.04	0.02	3.96
19	Spink	0.18	0.06	0.04	1.42	4.48
20	Faulk	0.40	0.02	0.12	0.28	8.20
21	Edmunds	0.16	0.04	0.14	0.00	7.84
22	McPherson	0.92	0.06	0.59	0.00	3.76
23	Walworth	0.06	0.00	0.00	0.00	7.26
24	Walworth	0.22	0.02	0.10	0.16	12.54
25	Hughes	0.26	0.18	0.04	0.02	7.70
Total	statewide	5.52	1.08	13.39	18.34	138.20
Average	**statewide**	**0.22**	**0.04**	**0.54**	**0.73**	**5.53**

- Mean SEM for predators per plant was: 5.53 $\pm$ 0.60 predators per plant.
- The number of corn plants is around 31,000 per acre. Approximately 166,000 predators per acre living in the foliage.
- ECB economic injury level is around 1.5 larvae per plant. 1/10 the population in 2011.

Table 2. Average Insects Counts by Sample site for 2010 Corn Risk Survey

		----------Average Pest Per Plant ----------				
Plant Site	County	Caterpillar	ECB	Aphid	Rootworms	Predators
1	Hutchinson	0.06	0.02	1.71	1.20	1.69
2	Hutchison	0.12	0.12	0.46	0.04	3.10
3	Douglas	0.08	0.08	0.84	0.02	4.48
4	Deuel	0.02	0.00	0.40	0.06	1.73
5	Deuel	0.02	0.00	11.18	0.08	3.80
6	Hamlin	0.06	0.02	7.51	0.04	4.17
7	Codington	0.04	0.04	3.90	0.12	3.36
8	Codington	0.12	0.04	1.14	0.08	2.90
9	Yankton	0.18	0.12	7.16	0.58	6.72
10	Hanson	0.04	0.02	0.20	0.02	5.80
11	Hanson	0.12	0.10	0.54	1.36	4.02
12	Jerauld	0.54	0.42	0.12	0.08	3.44
13	Hand	0.10	0.08	0.54	0.06	6.62
14	Hand	0.02	0.00	2.48	0.06	5.94
15	Hughes	0.30	0.44	0.12	0.60	2.84
16	Hughes	0.18	0.14	0.22	0.20	5.82
17	Campbell	0.12	0.06	5.82	0.02	7.84
18	Campbell	0.12	0.10	1.02	0.02	4.70
19	Edmunds	0.54	0.10	8.86	0.76	7.26
20	McPherson	0.10	0.00	1.68	0.02	6.62
21	McPherson	0.51	0.00	2.63	0.04	5.86
22	Brown	0.06	0.00	52.45	0.06	10.32
23	Brown	0.06	0.02	3.00	0.02	5.56
24	Faulk	0.10	0.10	19.84	0.00	8.84
25	Minnehaha	0.66	0.58	29.28	0.30	4.48
26	McCook	0.36	0.28	4.72	0.34	2.64
27	Lake	0.06	0.00	7.54	0.00	3.80
28	Brookings	0.14	0.14	0.00	0.16	2.66
Total	statewide	4.83	3.02	175.36	6.34	137.01
Average	statewide	0.17	0.11	6.26	0.23	4.89

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