What's Cropping Up?

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FIELD CROP INSECT UPDATE

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Potato Leafhopper: Potato leafhopper has arrived in mass on the thunder storms over the Memorial Day weekend. They were polite enough to arrive within the historical window of " Memorial Day plus or minus a week" and make the prediction correct for another year. Reports from western NY indicate that a large population of hoppers arrived and alfalfa fields were immediately over threshold where the regrowth from first harvest was under 12 inches in height. Please consult the Cornell Guide for Integrated Field Crop Management for scouting procedures and treatment thresholds.

Section 18 Emergency Registration for Warrior on mixed alfalfa-grass stands: There is **NO** section 18 registration for Warrior on mixed stands for the 2006 growing season. A request was not submitted due to the expectation of a full registration by Syngenta for the 2006 growing season for Warrior on mixed stands. If the alfalfa field was clear-seeded to alfalfa and the grass in the field was volunteer, the clear-seeded labels for insecticides are legal for these situations. If the field was seeded with a mixture of alfalfa and grass, there is currently no legal insecticide which can be used to control potato leafhopper in these fields.

Future Potato Leafhopper Management: Due to the improvement of potato leafhopper resistant alfalfa varieties in the past 5 years, all new seedings should be planted to one of the newer leafhopper resistant varieties. This recommendation is valid for both mixed seedings of alfalfa-grass and clear seedings of alfalfa. In the cases where the leafhopper resistant varieties have more expensive seed, the improved yield and quality from these varieties during periods of high leafhopper populations more than pays for the increased seed costs. Additional savings are gained because insecticides are not needed to control leafhoppers.

Seed Corn Maggot – Soybeans and Corn: With the cool spring in 2006, reports have been rolling in about stand losses from this insect. The worst cases are correlated to the plow down of green manure crops containing high populations of clover or alfalfa that were not killed last fall. Farmers planted their crops into the freshly buried green manure crop within a few days of the field being plowed and the seed was not treated with insecticide or no planter box insecticide was used. In one case, nearly 100 acres of soybeans required replanting due to large stand losses from seed corn maggot in a field where wheat-clover stubble was plowed down a short time before the soybeans were planted. Lower level stand losses are often associated with fields that received high rates of manure and other organic matter. Stand loss from this insect can vary widely from a few hundred plants per acre to complete loss of the field depending on the field conditions, amount of fresh organic matter in the field and the presence of newly emerged seed corn maggot adult flies. Management of this insect to prevent stand loss requires the seed either be treated with an insecticide active on secondary insects pests or a planter-box insecticide needs to be used.

Alfalfa Snout Beetle Spreads in Northern NY: At the request of the Northern NY Agricultural Development Project, the NNY Agriculture Extension Educators from Jefferson, Lewis, St. Lawrence, and Franklin Counties conducted a fall survey for alfalfa snout beetle larvae and feeding damage in their counties. Survey results confirmed that Jefferson Co. remains nearly totally infested and the infested areas in the remaining counties significantly increased in size. In Lewis Co., infested fields were identified throughout the agricultural area west of the Black River and the historical infested area around New Bremen has increased to several farms. In St Lawrence Co, areas of new infestations were identified and the snout beetle infestation in Franklin Co has spread from a single farm to a large area in the central part of the county. At present, there remains no viable control of this devastating insect. However, the impact of this insect can be minimized with a short alfalfa rotation of 3 years. Promising research continues with the search for a snout beetle resistant alfalfa variety from the Cornell Forage Breeding Program and continuing efforts focused on the biological control of this European insect. In 2002, the snout beetle populations on the John Peck farm located in Jefferson Co. crashed from 2.5 million beetles per acre to a very low level. Biological control research has been conducted on the Peck farm since the early 1990's with the hope that an effective biological control organism can be identified. We are now cautiously optimistic that the biological control organisms released on the Peck farm are responsible for the population crash in 2002 and are responsible for the continuing nearly non-detectable snout beetle presence on the farm. Snout beetle biological control research plots are being established in 4 additional NNY counties during 2006. Snout beetle research has been supported in part by the Northern NY Agricultural Development Project for many years.

Soil Health

Soil Health Assessment and Management: Measurements and Results

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For the past four years, the Cornell Soil Health PWT has been working to develop a holistic approach to soil management. As we discussed in the March-April issue of What's Cropping Up, soil health emphasizes the integration of physical, chemical and biological soil properties for the purpose of sustainable agricultural management. In this article we will discuss some of the results from the recent research efforts and discuss the proposed soil health testing that we intend to offer to complement the existing soil chemical tests offered by Cornell Nutrient Analysis Laboratory.

In this 3-year project we have analyzed over 700 soil samples across New York State for physical, chemical and biological soil properties. We collected samples from three types of farms:

SOIL PROPERTIES MEASURED

CHEMICAL
1. Available Phosphorus
2. Nitrate Nitrogen
3. Exchangeable Potassium
4. Exchangeable Magnesium
5. Exchangeable Calcium
6. pH
7. Organic Matter Content

BIOLOGICAL
1. Root Disease Potential
2. Benficial Nematodes
3. Parasitic Nematodes
4. Potential Mineralizable N
5. Decomposition Rate
6. Particulate Organic Matter
7. Active Carbon Test
8. Weed Seed Bank
9. Microbial Respiration Rate
10. Glomalin

PHYSICAL
1. Bulk Density
2. Macro-porosity
3. Meso-porosity
4. Micro-porosity (Available Water Capacity)
5. Residual Porosity
6. Penetration Resistance at 10 kPa
7. Saturated Hydraulic Conductivity
8. Dry Aggregate Size (<0.25mm)
9. Dry Aggregate Size (0.25-2.00mm)
10. Dry Aggregate Size (2.00-8.00mm)
11. Wet Aggregate Stability (0.25-2.00mm)
12. Wet Aggregate Stability (2.00mm-8.00mm)

FIELD MEASUREMENTS
1. Penetrometer Resistance
2. Infiltration

Total of 31 Soil Measurements

Figure 1. Chemical, Biological and Physical properties measured for Soil Health Assessment

1. Research farm experiments: to help establish useful indicators from long-term soil management experiments under controlled conditions.

2. Growers' on-farm experiments: to have field demonstrations and document soil health improvements from alternative management practices.

3. Commercial farm samples: To provide perspective under a range of soil health conditions in the real world.

Thirty-one properties were measured, as listed in Figure 1. The chemical properties are those associated with the standard soil test, while the physical and biological properties are newly-established or existing methodologies that allow for fairly rapid soil testing.

Results

Table 1 shows some results on soil physical indicators from two tillage experiments in Aurora and Willsboro, New York comparing conventional tillage (Plow Till) and no tillage (No Till).

Although a few comparisons were non-significant (ns), most indicators show more favorable values (lower bulk densities, and high numbers for all others) for the no-till than the plow-till treatments. Notably, aggregate stability had more than doubled under 13 years of no-tillage, indicating that these soils are less susceptible to slaking, sealing, hardsetting and runoff. Higher values for porosity indicators indicate that the no-till soil is more resilient to extreme wetness (when aeration is critical) and drought (when water retention is critical). Lower bulk densities generally indicate a better rooting environment. The no-till treatment in general showed more favorable soil properties compared to plow till.

Table 2 shows some results from a rotation experiment on loamy sand and sandy clay soils in

Table 1. 13 Year Tillage Experiments in Aurora and Willsboro, NY (ns=non-significant)

Soil Health Indicator	Silt Loam (Aurora)		Clay Loam (Willsboro)	
	Plow Till	No Till	Plow Till	No Till
Bulk Density (g/cm^3)	ns	ns	1.21	1.03
Pores >30 microns (%)	13	17	12	16
Pores > 0.1 microns (%)	ns	ns	29	34
Available Water Capacity (%)	12	16	ns	ns
Water Stable Aggregates- 0.25-2mm (%)	20	41	30	68

Table 2. Rotation Experiment in Willsboro, NY (ns=non-significant).

Indicators showing management difference	Loamy Sand (Willsboro)		Sandy Clay (Willsboro)	
	Corn after Grass	Continuous Corn	Corn after Grass	Continuous Corn
Bulk Density (g/cm^3)	1.31	1.36	ns	ns
Pores >30 microns (%)	ns	ns	10	16
Pores > 0.1 microns (%)	42	38	ns	ns
Available Water Capacity (%)	28	23	24	20
Water Stable Aggregates- 0.25-2mm (%)	34	10	ns	ns

Willsboro, NY, comparing corn after eight years of orchard grass with continuous corn. In general, soil health indicators were better for the corn after grass, supporting the notion that rotation of corn with sod crops results in better soil health. Available water capacity was significantly different for both soil types. These indicators are useful in assessing soil health but they must be considered and interpreted separate for each soil type.

Another experiment was recently established at the Gates farm in Geneva, NY and compares the effects of three tillage systems, three cover cropping conditions and two rotations on soil health and crop growth. Figure 2 shows the effect of these treatments on root disease potential, an integrative biological indicator that is especially important in vegetable systems. Reduced tillage, combined with cover crops, led to a gradual but significant reduction in root disease potential as measured by the root bio assay. No-till with vetch cover crop had the least root disease potential over the past two years of measurement.

Figure 3 shows the distribution of root disease potential for commercial vegetable grower field samples measured as part of the project during 2004 and 2005. There is a shift in the distribution towards lower root disease potential for organic production systems compared to conventional systems. This was expected as previous studies have shown root disease suppression in systems with high organic matter inputs.

The appropriate time for soil sampling was also evaluated. It was determined that the results of several of the tests depended on whether the soil was sampled during either the early, middle, or late part of the growing season, or whether it occurred prior or after tillage. We therefore concluded that meaningful results can only be obtained from samples that are collected during the early-season pre-tillage period.

Selection of Indicators

One of the purposes of the project was to identify soil health indicators that were most useful for adoption as part of routine soil health testing. Some criteria for selection of indicators were:

1. Sensitivity to management
2. Functional relevance
3. Consistency and reproducibility
4. Ease and cost of sampling
5. Cost of laboratory analysis

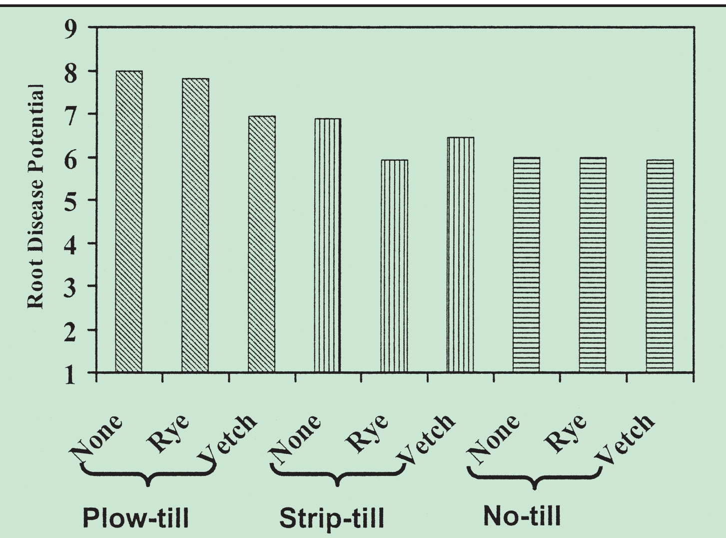

Figure 2. Tillage and cover crop system experiment at Gates Farm, Geneva, NY

6. Opportunity to be estimated by regression methods

Based on the above criteria, we tentatively developed a two-tiered approach for soil health assessment in New York. Tier 1 consists of indicators which can be measured or estimated rapidly and are fairly inexpensive to process (Table 3). These indicators have the potential of being measured and/or estimated rapidly, are relatively inexpensive to process, and Tier 1 rely on sampling methods that are similar to those used for standard chemical test.

Soil Health

Table 3: Proposed Tier 1 indicators for soil health assessment.

Physical	Biological	Chemical
• Bulk density (Composite 6 cores in a plastic bag) • Aggregate Stability (2 - 0.25 mm) • Available Water Capacity (by measurement and estimation) • Textural class (by feel) • Field Penetration Resistance	• Potentially Mineralizable Nitrogen • Active Carbon • Root Rot Assay • Weed assay	• Standard Chemical Test

Tier 1 indicators include bulk density, wet aggregate stability, available water capacity, soil texture by feel, field measured penetration resistance, potentially mineralizable nitrogen, active carbon/organic matter, root rot assay, weed assay and the standard soil chemical test. We are still continuing to test the indicators and plan to start offering the tests on a commercial basis by the end of this year, in time for spring sample submissions.

Tier 2 analyses consist of a wide variety of "a la carte" measurements (as listed in Figure 1) from which selections can be made based on the interest of the client. In a future issue of "What's Cropping Up", we will discuss further details on the new soil health tests, including associated sampling protocols and interpretation of results, as well as planned training programs.

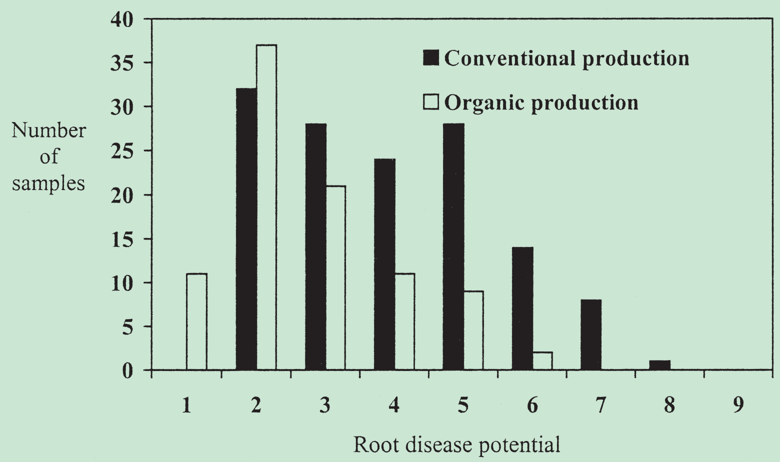

Figure 3. Organic versus Conventional Vegetable Production Systems (New York Commercial Vegetable Growers 2004 and 2005)

Musgrave Research Farm Field Day

July 20, 2006
9 am-3:30 pm
1256 Poplar Ridge Rd.
Aurora, NY 13026

9:00 am Registration & Refreshments in Fieldhouse
9:45 am Program begins

Presenter	Topic
Toni Ditommaso/Rachael Schuler	*Invertebrate Activity and Weed Seed Predation in Bt Corn*
Shawn Bossard/Quirine Ketterings	*Tools for Nitrogen Management in Corn*
Chuck Mohler	*Transitioning Lands to Organic Agriculture*
Elson Shields	*Update on Soybean Aphid*
Russ Hahn	*Dandelion Control in No-till Cropping Systems*
Mike Hoffmann/Jeffrey Gardner	*IPM Control of European Corn Borer*
Bill Cox	*Corn and Soybean Studies*
Gary Bergstrom	*Detecting & Managing Asian Soybean Rust in NY*
Harold van Es/Bob Schindelbeck	*Soil Health Assessment*

All presentations will be 20 minutes in length followed by a 10 minute period for questions and plot inspections
Program to be followed by an opportunity for discussion with presenters
CCA and DEC credits have been requested
Lunch will be provided

Weed Management

Glyphosate-Resistant Horseweed - Should We Be Concerned?

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The introduction and widespread use of glyphosate-resistant (GR) or Roundup Ready crops, along with reports of GR weeds in neighboring states, has raised questions about the potential for developing GR weed populations in NY State. A review of GR weed populations around the World helps put this potential problem in perspective. After 30+ years of glyphosate use, only eight weed species have developed populations of GR biotypes, while more than 90 weed species have developed resistance to ALS (acetolactate synthase) herbicides in about that same period.

The first documented case of a GR weed was rigid ryegrass in Australia (1996) (Table 1) and subsequently in California (1998). A second ryegrass, Italian ryegrass, has since developed GR populations in Chile (2001) and in Oregon (2004). GR populations of several other weeds have developed far from our shores; goosegrass in Malaysia (1997), and both hairy fleabane and buckhorn plantain in South Africa (2003). Closer to home, horseweed (sometimes called marestail) was confirmed as GR in Delaware (2000), common ragweed in Missouri and Arkansas (2004), and Palmer amaranth in Georgia (2005). Of these, GR horseweed is perhaps of greatest concern in NY.

Table 1. Glyphosate-resistant weeds*

Year	Common Name	Scientific Name	Location
1996	Rigid ryegrass	*Lolium rigidum*	Australia
1997	Goosegrass	*Eleusine indica*	Malaysia
2000	Horseweed	*Conyza canadenis*	USA-Delaware
2001	Italian ryegrass	*Lolium multiflorum*	Chile
2003	Hairy fleabane	*Conyza bonariensis*	South Africa
2003	Buckhorn plantain	*Plantago lanceolata*	South Africa
2004	Common ragweed	*Ambrosia artimisiifolia*	USA-Missouri
2005	Plamer amaranth	*Amaranthus plameri*	USA-Georgia

* Heap, I. International weed resistance monitoring site. http://www.weedscience.org

Horseweed Distribution

GR populations of horseweed have been confirmed in 13 states, including several neighboring states (Table 2). Horseweed is native to North America and is commonly found in fallow fields, pastures, roadsides, and wasteland. Although not common in conventionally tilled and planted fields, it is common where no-tillage cropping is practiced. Many of the states now reporting GR horseweed have a long history of no-tillage cropping. In these areas, overwintering horseweed plants may have been subjected to glyphosate selection pressure since the 1970s when growers started using Roundup for burndown in no-tillage fields. With repeated glyphosate use over the years, the susceptible plants were likely controlled while individual GR plants went to seed allowing a population shift to one that is dominated by resistant biotypes of horseweed.

Horseweed Description

Horseweed is a winter or summer annual that reproduces by seed that germinate in spring or late summer. Seed that germinate in late summer over-winter as rosettes (basal clusters of leaves not separated by stem elongation). These basal rosettes rapidly elongate (bolt) to produce erect flowering stems. Mature plants are unbranched at the base and may be 6 feet tall with many small flowering branches near the top (Figure 1). Seeds are about 1/16 inch long with many white bristles on the end. These bristles allow for wind dispersal of horseweed seed. It is the potential for wind dispersal that raises the level of concern about the spread of GR horseweed. Few would question wind dispersal in the surface boundary layer (SBL) within a field or even to neighboring fields. However, successful long distance dispersal requires that seed escape the SBL and move into the planetary boundary layer (PBL) of the atmosphere where wind speed increases and geographically induced turbulence and eddies are greatly reduced. In an effort to better understand the potential for long-distance seed dispersal, Shields, et. al. (1), used large radio-controlled airplanes to sample low layers of the PBL for seed downwind from a horseweed infestation.

Collections were made during a 3-day period in September 2005 at the University of Delaware Research and Education Center near Georgetown, DE. Two aircraft were flown simultaneously at two different altitudes during each of three 30-minute sampling periods each day. Daily adjustments were made in time and altitude to sample a cross section of the atmospheric vertical mixing during the period of daily seed release. Multiple horseweed seed were collected at heights ranging from 135 to 460 feet above ground level suggesting that seed were entering the PBL of the atmosphere where long-distance transport is possible. With wind speeds in the PBL frequently exceeding 45 mph, horseweed seed dispersal can easily exceed 300 miles in a single dispersal event.

Figure 1: Horseweed plant showing the lower part of the leafy stem, upper part of the stem with flowers, and seed with slender bristles on one end. From: *Weeds of the North Central States*, North Central Regional Research Publication No. 281.

Management Implications

With increasing zone no-tillage acreage along with increasing use of GR crops and repeated use of glyphosate herbicides, GR horseweed populations could develop in NY. In addition, it appears NY might also "inherit" GR horseweed seed from existing GR populations in neighboring states. For these reasons, it seems prudent that NY farmers be vigilant of any horseweed that is not readily controlled with glyphosate and that they employ an aggressive herbicide resistance management plan. The key element of such a plan involves rotating herbicides with different sites of action and using tank mixes/pre-mixes or sequential applications that include herbicides with different sites of action.

1. Shields, E.J., J.T. Dauer, M.J. VanGessel, and G. Neumann. Horseweed (*Conyza canadensis*) seed collected in the planetary boundary layer. Weed Science. *Submitted*.

Table 2. Distribution of glyphosate-resistant horseweed in the United States*

Year	State	Year	State
2000	Delaware	2002	Ohio
2001	Kentucky	2003	Arkansas
2001	Tennessee	2003	Mississippi
2002	Indiana	2003	North Carolina
2002	Maryland	2003	Pennsylvania
2002	Missouri	2005	California
2002	New Jersey		

* Heap, I. International weed resistance monitoring site. http://www.weedscience.org

Calendar of Events

Jul. 6, 2006	Cornell Weed Science Field Day, Valatie, NY
Jul. 6, 2006	Seed Growers Field Day, Ithaca, NY
Jul. 12, 2006	Cornell Weed Science Field Day, Aurora, NY
Jul. 13, 2006	Cornell Weed Science Field Day, Freeville, NY
July 20, 2006	Musgrave Research Farm Field Day, Aurora, NY
Jul. 29-Aug.2, 2006	American Phytopathological Society, Quebec City, Canada
Oct. 24, 2006	Field Crop Dealer Meeting, Comfort Suites, 7 Northside Drive, Clifton Park, NY
Oct. 25, 2006	Field Crop Dealer Meeting, Holiday Inn, 1777 Burrstone Road, New Hartford, NY
Oct. 26, 2006	Field Crop Dealer Meeting, Batavia Party House, 5762 East Main Road, Batavia, NY
Oct. 27, 2006	Field Crop Dealer Meeting, Auburn Holiday Inn, 75 North Street, Auburn, NY
Nov. 7-9, 2006	NE Division of the American Phytopathological Society, Burlington, VT
Nov. 12-16, 2006	American Society of Agronomy Meetings, Indianapolis, IN
Nov. 29-Dec.1, 2006	National Soybean Rust Symposium, St. Louis, MO
Dec. 5-7, 2006	NE Region Certified Crop Advisor Conference
Dec. 10-12, 2006	National Fusarium Head Blight Forum, Raleigh, NC

What's Cropping Up? is a bimonthly newsletter distributed by the Crop and Soil Sciences Department at Cornell University. The purpose of the newsletter is to provide timely information on field crop production and environmental issues as it relates to New York agriculture. Articles are regularly contributed by the following Departments at Cornell University: Crop and Soil Sciences, Plant Breeding, Plant Pathology, and Entomology. **To get on the mailing list, send your name and address to Pam Kline, 234 Emerson Hall, Cornell University, Ithaca, NY 14853.**

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