What's Cropping Up?

A NEWSLETTER FOR NEW YORK FIELD CROPS & SOILS

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Fall Grain Seed Suggestions for 1997

Bill Pardee
Dept. of Plant Breeding

Cayuga and NYBatavia, new white wheats from Cornell, can reduce the risk of pre-harvest sprouting for New York growers. Such sprouting can begin when summer showers keep mature heads wet. Older white wheat varieties are particularly sensitive. Sprouting processes can commence if mature kernels are kept wet for only 24 hours. Cayuga has the strongest sprouting resistance of any soft white wheat known. NYBatavia is close behind. Both varieties are from the breeding program of Mark Sorrells, Cornell wheat breeder.

Ample supplies of Certified seed are available for these and other varieties. The following is a review of top choice varieties for New York wheat growers.

Cayuga has the strongest sprouting resistance of any white wheat, matching the seed dormancy of red wheats. Cayuga has had the highest test weights of any variety in Cornell tests. Cayuga is a high yielding variety, approaching NYBatavia and Geneva in this potential. Cayuga is a tall variety, with an attractive near-white straw. Cayuga should draw interest for its three strengths, sprouting resistance, heavy test weight, and high yields of quality straw. Ample stocks of Certified seed are available.

NYBatavia can often outyield Cayuga, and is moderately sprouting resistant. NYBatavia surpasses other white varieties (except Cayuga) in test weight. NYBatavia stands well and has an attractive light colored straw. NYBatavia has shown superior winter hardiness during the past two tough winters. Last year several growers reported their highest yields ever from NYBatavia. Certified seed stocks are ample.

Geneva, Harus, and Pioneer brand **2737W,** popular varieties, continue to perform well for white wheat growers in New York. All three are high yielders, with good straw strength and test weights. **Marilee**, new from Canada, equals the best in yield, and has some resistance to sprouting.

Soft red wheat interest is expanding in New York, as several millers develop markets for products using red wheat flour. Best bet red varieties include Pioneer brands **2545** and **2510**, **Susquehanna** and **Pennmore**. A new variety, **Menden**, from Michigan, has topped Cornell yield trials for the past three years, and shows strong promise. Certified seed will be available through Agri-Culver.

Winter barley growers are likely to find **Pennco** their best choice. Pennco was developed at Penn State and Certified seed suppliers are available.

Aroostook is the best choice among rye varieties. Aroostook has greater winter hardiness than common or Balbo type strains. It also had stronger standability in Cornell's trials this year.

Presto triticale is fall planted, like wheat (unlike spring triticales, often planted with peas). Presto can serve several purposes, for fall and spring grazing, for spring harvest as forage, or as a high yielding grain crop. Presto regularly outyields the best wheat varieties. Presto grain makes a desirable feed when rolled, cracked or steamed. It has the energy value of corn, with higher protein. Triticale grain must normally be fed on the farm, since no established markets have yet developed.

The blue tag of Certified seed assures growers that their seed is high in quality and correctly named. Certified seed fields are inspected for freedom from weeds, off-type plants, seed-borne diseases and varietal identity. Seed samples must be high in seed germination, cleanliness and purity. Seed Certification in New York is carried out by the NY Seed Improvement Project, in Cornell's Department of Plant Breeding.

1996 Cornell Wheat Tests, Top Varieties

Variety	Grain Yield (Bu/A)	Test Weight (Lbs/Bu)	Lodging Score (0-9)	Sprout Score (0-5)	Plant Height (Inches)
	3 year Averages, 1994-96				
Cayuga	59	60	1.4	1.6	41
NYBatavia	62	57	1.0	3.6	35
Geneva	63	58	1.4	4.4	36
Harus	62	59	1.0	3.6	36
2737W (Pioneer)	66	57	1.9	4.7	32
Marilee	65	56	1.5	3.6	36

Agricultural Management

Agricultural Environmental Management: Building from Experience

Barbara Bellows, AEM Outreach Coordinator

The conference and workshop, **Agricultural Environmental Management: Building from Experience**, brought together over 200 participants from agricultural agencies, environmental groups, and the private sector to learn about the Agricultural Environmental Management (AEM) initiative and discuss agricultural environmental management practices and programs. The AEM initiative is a statewide effort designed to assist farmers in implementing environmental stewardship practices on their farms through the use of an approach which is voluntary, locally implemented, educational, scientifically-based, and motivated by incentives. Agencies involved in the AEM initiative include the New York State Departments of Agriculture and Markets, Environmental Conservation, Health, and State, the Soil and Water Conservation Committee, the Soil and Water Conservation Districts, the Natural Resource Conservation Service, Cornell Cooperative Extension, New York State Conservation District Employees' Association, and the Farm Bureau.

The conference and workshop was held at the Holiday Inn in Auburn on May 27-28 and highlighted presentations from existing watershed agricultural programs focusing on Keuka Lake, Skaneateles Lake, Canandaigua Lake, Wappingers Creek, Otsego Lake, the Upper Susquehanna River, and the New York City Reservoirs. "Tools" sessions provided participants with short training sessions on technical subjects, such as nutrient management, as well as on management subjects, such as conflict resolution and consensus decision making. During discussion workshops, participants discussed recommendations for the implementation of each of the key components of the AEM initiative. Following is a brief summary of their discussions:

Voluntary Implementation of Environmental Practices: Agriculture is cited as a primary source of non-point source pollution. Voluntary implementation of environmental stewardship practices may avert the enactment of environmental regulations. For farmers to implement agricultural environmental management practices voluntarily, they need to understand the benefits of the practices, both to the environment and to their farming operation. Farmers will be motivated to implement best management practices (BMPs) which are compatible with their current farming activities and which provide them with short to medium term economic returns on investment.

Local-Implementation of Program Activities: Each locality has its own priority environmental concerns based on local resource use practices, climate, soil conditions, and topography. AEM Program implementation can provide local personnel with the flexibility to identify priority environmental concerns and BMPs designed to address these local concerns. This flexibility is developed through a combination of clear, easy to implement program guidelines, local capacity building, and the integration of AEM efforts into comprehensive watershed management activities.

Educational: Resource conservation and environmental protection is a low priority concern for many members of both farming and non-farm communities. This is especially true in areas where neither an environmental crisis, such as a waste dump, or an environmental focal point, such as a lake, exist. Educational materials should help all community members understand the relationship between their land use practices and environmental quality. Educational materials will assist farmers in identifying environmental risk factors associated with their farming operations while simultaneously acknowledging their current stewardship efforts. To be useful for community members, educational materials will be targeted to the needs and interests of priority populations and be free of unnecessary jargon and acronyms.

Scientifically-based: AEM is based on the assumption that by replacing high environmental risk farming practices with BMPs, improvements in environmental quality will be realized. Scientific testing is required to ensure BMPs meet critical levels of environmental protection. Scientific assessments of baseline conditions com-

(see AGRICULTURAL, page 7)

Resistance to Wheat Spindle Streak Mosaic Virus Is Important in New York

Disease Management

Gary C. Bergstrom , Plant Pathology
Mark E. Sorrells, Plant Breeding

Wheat spindle streak mosaic is a serious and widespread disease of winter wheat in New York and much of the eastern Great Lakes region that can reduce yields of susceptible cultivars by up to one-third of their potential. It is the predominant cause of what New York growers have recognized for decades as a transient yellowing of the crop in April and May, usually no longer apparent during the warmer months of June and July. The importance of this disease has been underestimated.

The Disease

Symptoms are most easily discerned in early to mid May as thin yellow streaks with tapered ends on leaves. Streaks may coalesce to give a 'mosaic' or general yellowed appearance to the leaves. Eventually lesions may become tan to brown, looking like fungal leaf blotches, and the leaves die. Symptoms seldom appear on new leaves that emerge after daytime temperatures have risen into the 70's. The disease is incited by wheat spindle streak mosaic virus (WSSMV), which is soilborne and transmitted to wheat roots by swimming spores of a fungus called *Polymyxa* that lives in the roots of wheat and other grasses. The virus and its fungal vector occur in virtually every New York soil where wheat has been grown.

Epidemic Development

Infection of wheat roots by viruliferous fungal spores occurs in autumn and spring, but significant yield reductions are believed to occur only in plants infected in autumn. The fungus (and associated virus) survives in the soil for many years between wheat crops as 'resting' spores. Swimming spores are produced from these resting structures and they infect wheat roots and transmit the virus when the soil is waterlogged even for a brief period in autumn after the seedlings have emerged. Disease incidence may be greater in poorly drained areas of fields or, in general, following wet conditions in September and October. Foliar symptoms are not evident until sometime after the crop greens up in spring. The prevalence and severity of symptoms and resulting reductions in grain yield depend on temperature conditions in March through May. Favorable average daily temperatures for symptom development are 36 to 52 F. In an analysis of 52 different situations in New York, the yield of WSSMV-susceptible cultivars relative to that of WSSMV-resistant cultivars decreased by an average of 0.45% per day as net spring days in the favorable temperature range increased from 20 to 45. Hence, WSSMV was an important factor in wheat production in 1996 and 1997, both years with prolonged cool springs.

Management with Resistant Cultivars

Sowing seed of resistant cultivars is the one effective control strategy currently available against WSSMV. In the mid 1980's we observed that WSSMV was less prevalent in newer, higher-yielding cultivars like Geneva than in

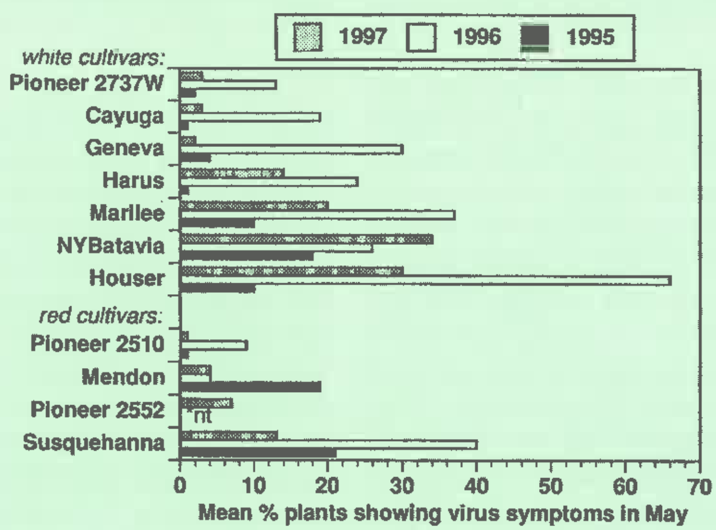

Figure 1. Relative resistance of New York winter wheat cultivars to wheat spindle streak mosaic virus. Disease incidence was recorded in May of three years in three subplots per year in a WSSMV nursery in Ithaca, NY; red and white wheats were rated in separate experiments. *Pioneer 2552 was not tested in 1995 or 1996

(see RESISTANCE, page 7)

Soil Fertility

Estimating Cation Exchange Capacity from Soil Test

W. Shaw Reid, Dept. of Soil, Crop & Atmospheric Sciences

Cation Exchange Capacity (CEC) is the capacity of the soil to hold positively charged ions called cations. CEC is expressed either as milliequivalents of cations per 100 grams of soil (meq/100 grams of soil) or cmol cations/kg soil. The two values are numerically equivalent. There are two groups cations in soils: basic cations (calcium [Ca^{++}], magnesium [Mg^{++}], sodium [Na^{+}] and potassium [K^{+}]) which result in a higher soil pH and acid forming cations (hydrogen [H^{+}], aluminum [Al^{+++}], iron [Fe^{++}] and manganese [Mn^{++}]) which result in a lower soil pH. Other cations such as zinc [Zn^{++}], copper [Cu^{++}], lead [Pb^{+++}], etc. are ususally present in insufficient qunatities to contribute significantly to the CEC even though they may be important to plant growth.

Computing CEC

CEC is the sum of the basic and acid cation groups. The basic group is computed by dividing the soil test value for each element by its equivalent weight (molecular weight/valence) and multiplying by 20 to convert from pounds per acre to the meq/100 grams of soil. The conversion factors are: calcium = 400, magnesium = 240, potassium = 720, and sodium = 460. The soil test extracting solution (Morgan's extract) removes about 90% of the total quantity of cations on the exchange complex; therefore the sum of the bases is divided by 0.90 to correct for the extraction efficiency.

The exchange acidity (EA) as reported by the Cornell soil test (barium chloride-triethanolamine method) is the sum of the acid cations (H^{+} Al^{+++}, Mg^{++}, and Fe^{++}) expressed as meq/100 grams of soil measured to pH 8.0 or 100 percent base saturation.The exchange acidity is currently reported for all samples with a soil pH of 6.1 or less.

An example of CEC computation for soil test values of 2400 #/A Ca, 240 #/A of Mg, 360 #/A of K, 23 #/A of Na, and 11 meq/100 g EA gives:

Basic cation sum *= (2400/400 + 240 /240 + 360/780 + 23/460 meq/100 g soil)/0.90 extraction efficiency = (8.4 meq/100 g soil.*

Acidic cation sum *= 11.0 meq/100 g soil from the exchange acidity.*

CEC *= sum of basic cations + acidic cations = 8.4 + 11 = 19.4 meq/100 g soil.*

When the pH is > 6.1, the exchange acidity is not determined by the Cornell soil test; therefore, the CEC must be estimated from relationship between the basic cations and soil pH as shown in Figure 1. As the soil pH increases, there is a corresponding increase in the percent base saturation (1% of CEC occupied by basic cations) and a corresponding decrease in exchange acidity. These relationships are not linear. This general relationship occurs in most mineral soils with similar soil mineralogy and climate. At about pH 8.0 the soil is 100 percent saturated with basic cations. At pH 7.0 the soil is about 80% base saturated or 20% acid cations. Given the previous soil test values and a soil pH of 6.5 the CEC can be estimated by dividing sum of the bases by the percent base saturation from Figure 1. For example, at a soil pH of 6.3 the percent base saturation is estimated to be 67%. The sum of the bases computed above was 8.4 meq/100 g soil; therefore, the estimated CEC would be 8.4/0.67 = 12.5 meq/100g soil or cmol/kg soil for a soil with a pH of 8.0.

CEC and soil pH

The CEC is usually reported for a soil pH of 7.0 or about 80 percent base saturation rather than at a soil pH of 8.0 as computed above. To estimate the CEC for soil pH 7.0 instead of pH 8, multiply the base saturation at pH 8.0 by 0.80 because the soil is only 80% base saturated at pH 7.0. For the first example above, CEC @7.0 = 19.4 X 0.80 or 15.5 meq/100 grams or cmol/kg of soil and the second example would be 12.5 X 0.80 = 10.0 meq/100g soil.

Factors affecting CEC estimates

Notice that in the first computation of CEC, the sodium contributed only 0.05/0.9 or 0.06 meq/100 g to the CEC. Thus, omitting Na from the computation results in little change in the CEC for most soils in humid regions.

The CEC can be estimated from soil test results reasonably accurately using the above methods; however, the CEC in general and these computational methods specifically are affected by several factors that may reduce the accuracy of the estimates. If the soil has residual carbonates (lime) present that is dissolved by the soil test extracting solution, the method over estimates the CEC. If the soil pH is about 7.6 to 8.2 residual carbonates may be present. If the pH is above 8.2, high concentrations of sodium may be present. If residual lime or excess sodium is present, this method should not be used to estimate the CEC.

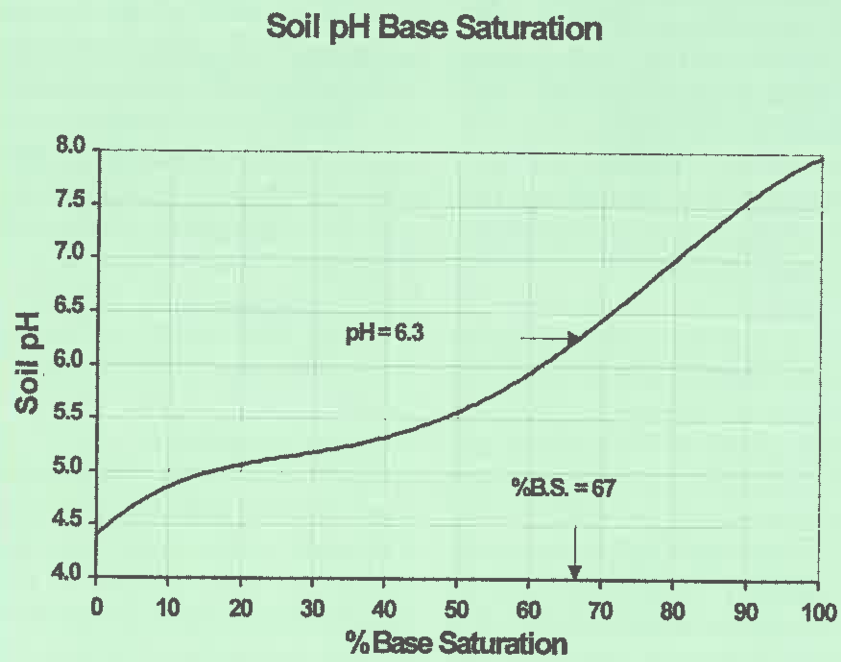

Figure 1 Relationship between soil pH and base saturation.

Some types of soil minerals also change their CEC with pH and do not follow the usual percent base saturation curves as shown in Figure 1. These minerals are usually not present in NY soils in sufficient concentrations to be of concern; however, some tropical soils contain large quantities of these minerals.

Other Comments on CEC

The CEC of a soil is important because it determines the total amount of cations that the soil will retain. There needs to be a few meq/100 g of CEC in soils to prevent cations from leaching through the soil rapidly. Once the CEC is sufficiently high that the change in cation concentration or pH over the growing season does not influence plant growth, then the CEC is probably high enough. The CEC does however, influence several components in nutrient management such as soil pH and lime requirement. For example at any given soil pH such as 5.5 the greater the CEC, the higher the quantities of bases (lime) that must be added to increase the soil pH. Likewise, the lower the CEC the faster the soil pH will decrease with leaching, cropping, etc.

The CEC can be used to infer several other conclusions about soils and their management. The higher the CEC the more clay or organic matter in the soil. This usually means that the water holding capacity is greater because either or both the clay content and organic matter content is higher. At a given organic matter content the higher the CEC of NY soils, the higher the clay content

The CEC can be strongly influenced by the organic matter content of soils. The organic matter may have from 4 to 50 times higher CEC per given weight than the clay, thus a small change in the soil organic matter has large affect on the CEC.

Crop Management

Corn Emergence in 1997

W.J. Cox, Dept. of Soil, Crop & Atmospheric Sciences

May of 1997 was the third coldest May on record in upstate New York. Because of the dry conditions in April, may growers began corn planting in late April or early May. Unfortunately, some corn growers reported final corn stands that were less than expected. The cold May conditions and poor quality seed were the usual suspects in those situations where stands were less than expected.

We also began planting our experiments in late April and early May, but generally had satisfactory final corn stands (Table 1). The Aurora site, which averaged 6.2 F below normal in May, was as cold or colder than most locations in New York. Consequently, the cold May conditions probably did not directly or solely contribute to poor corn stands in 1997. Rather, the cold May conditions probably interacted with management practices at the particular sites to produce corn stands that were less than adequate. Let's review some management practices for early planted corn to avoid unsatisfactory corn stands in future years.

Planter Box Seed Treatment

Early-planted corn usually requires about 15 days for emergence. Unfortunately, corn typically required 20 to 25 days for emergence in 1997. If the corn seed resides in the soil before emergence for an extended period of time, the greater the opportunity for seed corn maggot or wireworm damage. Early planted corn requires a planter box seed treatment to minimize stand loss associated with seed corn maggot or wireworms.

Planting Depth

Cold soil temperature is the major constraint to early-planted corn so planting depth must be adjusted accordingly. Early-planted corn should be planted at a 1½ inch depth unless the use of certain herbicides require a seeding depth of 2 inches. Many of the fields that had poor corn stands this year were planted at the 2½ inch depth or greater. Unfortunately, many of those fields crusted after heavy rains, and corn could not emerge through the crust from the 2½ inch depth.

Seedbed Preparation

Uniform seed depth placement is important for early-planted corn, especially under very cold soil conditions. For our April 24 corn planting date, emergence ranged from 87% for corn under moldboard plow tillage to 75% emergence under ridge tillage. In upstate New York, emergence for early-planted corn is usually higher under moldboard plow tillage. For growers who practice conservation tillage or no-till, seeding rates should be adjusted upward to compensate for lower emergence.

Seed Vigor

Hybrids differ in seed vigor. We planted 18 hybrids in our May 2 experiment. Emergence ranged from 93 to 67% among the hybrids. Hybrids do differ in emergence rate under cold stressful conditions. Early-planted corn requires hybrids that have good to excellent vigor.

Conclusion

Weather conditions in May of 1997 resulted in very stressful conditions for early-planted corn. Nevertheless, emergency averaged 85 to 90% when hybrids with good vigor were planted with a planter box seed treatment at a 1½ inch depth under uniform seed bed conditions. Early-planted corn often encounters cold soil conditions so these management practices should be used annually to avoid potential corn stand problems.

Table 1. Corn emergence at the Aurora Resesarch Farm in different experiments in 1997.

Planting Date	Treatment	Planting Rate	Emergence	Days to Emerge
April 24	Moldboard Plow	30,100	26150 (87%)	20
	Chisel Plow	30,100	24610 (82%)	21
	Ridge Tillage	30,100	22500 (75%)	21
April 30	High Population	51,000	43400 (85%)	24
	Recommended Population*	36,000	28700 (80%)	24
May 2	High Population	41,000	34815 (85%)	23
	Recommended Population*	33,000	24365 (80%)	23
May 7	High Population	37,000	31960 (86%)	19
	Recommended Population**	30,000	24675 (83%)	19
May 14	High Population	51,000	44875 (88%)	14
	Recommended Population*	36,000	29750 (83%)	14

* Corn Silage Study
** Corn Grain Study

(AGRICULTURAL, from page 2)

bined with regular monitoring of changes in conditions can be used to determine the effectiveness of BMP implementation on improving environmental quality. Conference participants recommended using a combination of analytical, indicator-based, and perceptual information to obtain baseline and monitoring data. Analyses of improvements in environmental quality due to the implementation of BMPs can be used to motivate farmers to implement environmental stewardship practices as well as to demonstrate the benefits of the AEM initiative to the non-farm community.

Motivated by Incentives: Economic and social incentives can motivate farmers to implement agricultural environmental management practices. Several state and federal programs can provide farmers with up to 75% cost share to implement BMPs. State programs include the NY State Agricultural Non Point Source Abatement and Control Program which is funded by the Clean Water / Clean Air Bond Act and the Environmental Protection Fund. Federal conservation programs, entitled under the 1995 Farm Bill, include EQIP (Environmental Quality Incentives Program) and CRP (Conservation Reserve Program). Private sector incentives will permit the AEM initiative to reach more farmers and allow farmers to address additional environmental risk concerns on their farms. Participants recommended the development of a directory of public and private sector programs available to assist farmers identify and implement environmental stewardship practices.

To further assist local programs implement AEM activities in their area, regional training meetings are being scheduled for this fall. These meetings will provide participants with detailed information on the tiered approach and how to conduct farm environmental assessments and design whole farm plans. For more information about the statewide AEM conference or the upcoming regional training meetings, please contact Barbara Bellows (Cornell Cooperative Extension) at 607-255-4537 or email bcb5@cornell.edu or John Wildeman (Department of Agriculture and Markets) at 518-457-9271.

(RESISTANCE, from page 3)

previously grown cultivars like Frankenmuth. Relative disease reaction of currently recommended cultivars is shown in Figure 1. Each of these cultivars is significantly more resistant than progenitor cultivars such as Frankenmuth or Pioneer 2548, which consistently showed disease incidences of 60-100%. Resistance to WSSMV is observed mainly as what virologists have described as a tendency to avoid being infected. This is a different concept from the qualitative resistance that growers are used to with diseases such a rust. No wheat cultivar is immune to WSSMV. Under environments favorable for the fungal vector and the virus (as occurred in the 1996 study at Ithaca), significant numbers of plants of resistant cultivars may also be infected; these plants show as high a level of virus detected with antibodies as plants of susceptible cultivars. Although somewhat arbitrary designations, we have grouped recommended cultivars as resistant (Pioneer 2737W, Cayuga, Geneva, Pioneer 2510, Mendon, Pioneer 2552), moderately resistant (Harus, Susquehanna), and moderately susceptible (Marilee, NY Batavia), based on the data presented here and other studies not shown. Since environment plays such an important role, a cultivar may appear more or less resistant than we have categorized it here. The best differentiation, based on low between-subplot variation, occurred in 1997. Our best indicator, to date, of virus-induced yield loss (up to 33% when all plants are infected) is the percentage of plants showing symptoms in May. To relate research findings to growers' fields, we cite surveys in the late 1980's in which WSSMV incidences in fields of Geneva and Harus were consistently less than 5% while incidences of around 20% were seen in Houser and incidences of over 50% were seen in Ticonderoga and Frankenmuth. On farms with a history of WSSMV problems, we recommend the sowing of cultivars designated as moderately resistant or resistant.

Calendar of Events

August 9-13	American Phytopathological Society Annual Meeting, Rochester, NY
August 19-20	New York State Agri-Business Association Summer Tour, Waterloo, NY
October 14	Field Crop Dealer Meeting, Albany, NY
October 15	Field Crop Dealer Meeting, Vernon, NY
October 16	Field Crop Dealer Meeting, Batavia, NY
October 17	Field Crop Dealer Meeting, Waterloo, NY
October 26-31	American Society of Agronomy Meetings, Anaheim, CA
December 10-11	CCA Training, Triphammer Lodge and Conference Center, Ithaca, NY

What's Cropping Up? is a bimonthly newsletter distributed by the Department of Soil, Crop and Atmospheric Sciences 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: Soil, Crop and Atmospheric Sciences, Plant Breeding, Plant Pathology, and Entomology. **To subscribe, send a check for $8.00 along with the form at the right.**

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