What's Cropping Up?

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Protecting Your Germinating Corn and Soybean Stands from Seed Corn Maggot and Wireworms

E. J. Shields
Dept of Entomology

Stand losses from seed corn maggot and wireworms often go undetected in both corn and soybeans. These insects commonly reduce stands between 3,000-8,000 plants per acre and on occasion reduce corn and soybean plant populations below 15,000 per acre. Missing plants from seed corn maggot and wireworm losses is often confused with poor germination blamed on poor seed quality, poor soil moisture or poor planting practices. Soybeans exhibit aboveground symptoms to seed corn maggot injury. The presence of "snake heads"; emerged soybean stems without leaves or growing point indicates stand losses from seed corn maggot.

Seed Corn Maggot Biology

Adult seed corn maggots are medium sized flies, very similar in appearance to the common house fly. Adult flies are present throughout the growing season and locate egg laying sites by alternately flying close to the ground's surface or searching the moist soil cracks on the soil surface. The adult female flies are searching for egg laying sites close to decaying plant material or germinating seed to provide a food source for the newly hatched larvae. Adult flies lay eggs in these moist soil cracks near these potential food sources and typical looking fly larvae (maggots) hatch from the eggs within a few days. After hatching, larvae move through the soil searching for decaying plant matter or germinating seeds to feed on. Large seeded crops like corn or soybeans are very susceptible to seed corn maggot attack resulting in stand losses. Germinating corn seed are often killed or severely injured thereby reducing plant populations within an area of the field or throughout the entire field. Fields in which animal or green manure crops have been used have a greater potential for seed corn maggot attack than fields not using these manures. However, non-manured fields are also "at risk" from seed corn maggot damage.

Wireworm Biology

Wireworm larvae are long, smooth, very hard bodied, yellowish to reddish brown and commonly occur in grass sods feeding on roots of numerous grass plants. This insect becomes an economic problem when these grass sods are plowed and planted to large seeded crops like corn or soybeans. Wireworms are the larvae of the common "click beetles" which are attracted to lights during warm summer months. Several different species of wireworms can be economic pests with a 2-7 year lifecycle (egg to adult). Wireworm populations are difficult to access and usually occur in low to moderate levels. Stand losses from wireworm feeding typically range from 2,000 to 5,000 plants per acre.

Management of Seed Corn Maggot and Wireworms

Losses from these two insects are easily and inexpensively prevented with the regular use of insecticide added to the planter box as a seed treatment. **Corn and soybean seed is seldom pretreated with insecticide effective for control of seed corn maggot and wireworms.** Any commercial seed treatment containing the insecticides diazinon and lindane are effective for control of seed corn maggot along with wireworms. Examples of two such products are Agrox DL Plus and Germate Plus . Seed treater is typically packaged in small packets which contain the correct amount of material to treat 1 bag of seed corn. For maximum effectiveness, seed needs to be evenly coated with the seed treatment. If a <u>plate type or plateless planter</u> is being used, pour 1/2 bag of seed into the seed hopper then sprinkle 1/2 of the seed treatment packet on the surface of the seed and mix thoroughly with a wood stick. Pour the remainder of the seed into the hopper, sprinkle the remainder of the seed treatment on the surface of the seed and repeat mixing. In <u>air planters</u>, seed and seed treater **<u>must be mixed in a bucket before dumping seed into the seed drum.</u>** If seed corn and seed treater are dumped separately into the seed drum, the drum action will not adequately coat the seed with seed treater and protect the seed from seed corn maggot and wireworm injury.

Crop Management

Grass Management for Lactating Cows
I. Forage Yield

Jerry H. Cherney, Robert F. Lucey, and Leon Hatch
Department of Soil, Crop & Atmospheric Sciences

Properly managed perennial grass can produce high forage yields for lactating dairy cows, as well as improve the manure/nutrient management situation on most dairy farms. We currently have perennial grass experiments at Willsboro, Valatie, Canton, Chazy, Mt. Pleasant, Ithaca, and Aurora, NY. Grass species, varieties, cutting management, manure management, and commercial fertilizer treatments are among the factors being evaluated relating to grass production for lactating dairy cows. This is a summary of some of our results to-date, mostly referring to grass that will be harvested and stored, as opposed to grazed. This article discusses forage yield, while the second article in this series will cover harvest and feeding of grass.

All perennial grasses will produce reasonable yields if present in good stands and fertilized adequately. On good alfalfa soils, alfalfa will typically yield about 0.5 ton/acre more dry matter than grass with recommended N fertilization. However, if the soil resource is not well adapted to growing alfalfa, grass will produce higher yields than alfalfa. Grass yields will range from less than 1 to about 2 tons/acre without any N fertilization, with the variation related to native soil fertility. Table 1 contains hay yields (@ 12% moisture) for 5 grass species sown in 1993 and managed under commercial N fertilization at recommended rates (Willsboro, NY). Varieties were selected to have similar heading dates across species.

Tall fescue had consistently and significantly higher yields than other species. Unfortunately, forage yield and quality are not the only factors determining economic survival of varieties. Stargrazer tall fescue has proven to be a very poor seed producer and was recently permanently removed from the market because of this problem. In grass variety trials in other states in the region, tall fescue varieties have been consistently higher yielding than other grass species. Smooth bromegrass plots produced reasonable yields, but only a fraction of the yield was actually smooth bromegrass. Other grasses, including native orchardgrass filled in where bromegrass had been eliminated by the cutting management.

Yields were considerably reduced in a dry growing season (1995). Timothy produced unexpectedly high yields, but was more affected than other species by dry conditions (1995). Application of up to 30 tons/acre of semi-solid manure (data not shown) resulted in yields about 1/3 lower than recommended commercial N fertilizer in 1994-1996. In 1997, however, similar yields were produced from commercial N applications vs. manure applications for orchardgrass and tall fescue. The site did not have a history of manure application prior to 1993.

Timothy and orchardgrass varieties (six of each) were established at two sites differing in soil drainage in 1993 at Canton, NY. Grass was fertilized with commercial N according to recommendations and harvested 4 times in 1994 and 3 times in 1995-97. Hay-equivalent yields (Table 2) shows that timothy has maintained its yield on the more poorly-drained site, while orchardgrass yield is reduced. Across years, *Richmond* and *Tiller* timothy outyielded other timothy varieties, while orchardgrass varieties were more variable. Yields vary by soil type and season. A two-fold difference in yields from a given field can be expected in wet vs. dry years. Grass yields over

Table 1. Yield (tons/acre) of grass species under commercial N fertilization, at 75 lbs actual N/acre in the early spring, and 50 lbs actual N/acre prior to each regrowth. Four harvests were taken in 1994, and three harvests in 1995-97.

Species	1994	1995	1996	1997
Timothy (*Tiller*)	5.3	2.4	4.4	3.6
Orchardgrass (*OKAY*)	5.1	2.8	3.9	3.9
Reed canarygrass (*Palaton*)	5.5	2.9	4.4	3.7
Smooth bromegrass (*York*)	5.3	2.8	4.4	4.0
Tall fescue (*Stargrazer*)	7.0	3.3	5.1	5.1

(see GRASS, page 7)

Postemergence Herbicides Control Triazine-Resistant Common Ragweed and Common Groundsel

Weed Management

Russell R. Hahn, Dept. of Soil, Crop and Atmospheric Sciences

Cropland weed populations are dynamic. Changes in populations result from the mechanical, cultural, and chemical weed control measures used. Control measures target the dominant or most troublesome weeds and may or may not control those of least importance. If these seemingly unimportant weeds escape control and reproduce year after year, they eventually dominate the population.

An example from the not so recent past was the development of populations dominated by triazine-resistant (TR) biotypes or strains of common lambsquarters. It is believed that a few TR individuals within this species were in the original population. With repeated and sometimes exclusive use of triazine herbicides since about 1960, the susceptible individuals were controlled while the resistant ones escaped control and reproduced. These resistant biotypes now dominate the populations in many fields.

Prowl Combinations Widely Used

The standard recommendation for TR lambsquarters in field corn has been to apply Prowl preemergence or early postemergence in combination with atrazine or Bicep. These combinations also provided control of velvetleaf, annual grasses, and nutsedge. Although these Prowl combinations controlled these target weeds, their widespread and repeated use has led to TR populations of common ragweed and common groundsel in some fields.

It is widely known that Prowl is not effective against all biotypes of ragweed and preliminary research indicates that Prowl does not control groundsel either. In addition, most other soil-applied corn herbicides including the acetamides like Micro-Tech and Dual are also weak against these species. As a result, cultivation or sequential postemergence herbicide applications are needed to manage these TR weeds.

Effectiveness of Postemergence Herbicides

A combination of field and greenhouse research results indicate there are excellent postemergence herbicides for control of TR ragweed and groundsel. Effectiveness ratings of postemergence corn herbicides for TR ragweed, pigweed, lambsquarters, and groundsel are shown in the table. TR ragweed can be controlled with postemergence applications of Banvel or several of the ALS (acetolactate synthase) inhibiting herbicides. Beacon, Exceed, Permit, and Scorpion III all have excellent activity against this weed. Although Accent is also an ALS inhibitor, it does not provide acceptable ragweed control. Other herbicides that may not provide acceptable ragweed control are Buctril, Resource, and Tough.

While several of the ALS inhibitors have excellent ragweed activity, none of them, including Pursuit, has shown good activity against groundsel in greenhouse experiments. The list of herbicides that are both effective and labeled for groundsel is very short. While several non-mobile photosynthesis inhibitors provide excellent groundsel control, only Buctril is labeled for this weed.

Although not yet widespread, there is concern about the development and spread of TR ragweed and groundsel. To avoid these new weed problems or to control existing populations of these annual weeds, field corn growers must check their fields for escaped weeds when the corn has three or four true leaves. These early season observations will reveal how effective soil-applied herbicides have been, if used, and suggest the possible need for cultivation or postemergence herbicide applications.

Effectiveness of Postemergence Corn Herbicides for TR Weeds

Herbicides	Ragweed	Pigweed	Lambs	Ground
Accent	Poor	Good	Poor	Poor
Banvel	Excel	Excel	Excel	Poor
Beacon	Excel	Good	Fair	Poor
Buctril	Fair	Poor	Excel	Excel
2,4-D	Fair	Good	Good	Poor
Exeed	Excel	Good	Good	Poor
Permit	Excel	Good	Poor	Poor
Resource	Fair	Poor	Poor	-
Scorpion III	Excel	Excel	Excel	-
Tough	Poor	Excel	Excel	Excel

Insect Management

New Alfalfa Varieties Aid Potato Leafhopper Management

J. Keith Waldron, Livestock and Field Crops IPM Program
Julie Hansen, Department of Plant Breeding and Biometry

New alfalfa varieties have been developed which have resistance to potato leafhopper (PLH), one of the Northeast's leading alfalfa insect pests. Resistant varieties could protect alfalfa from PLH injury, reduce insecticide use, and protect forage quality, thereby enhancing net profitability.

Until recently, thechief defense against these migratory insects was to monitor PLH populations in alfalfa fields weekly after first cutting through early September. Should PLH populations exceed the economic threshold, early harvest or treatment with an appropriately labelled insecticide are recommended. Varietal resistance to PLH, while not eliminating the need for field monitoring, would add an important, complimentary alfalfa management tool.

To compare the effectiveness of PLH resistant varieties in the seeding year, field trials were established in 1997 at Clarendon (western) and Ithaca (central) New York. The trials contained a total of nineteen varieties: eight with some level of resistance to PLH, eight susceptible to PLH and three unknowns. Plots were established April 24 at the Clarendon site and May 7th at the Ithaca site. Plots were monitored for PLH activity and evaluated for yield, dry matter, quality, and PLH damage (1 to 5 scale where 1 is no apparent injury and 5 is severe injury).

PLH Populations

Potato leafhopper populations reached record numbers in 1997. More than 55% of alfalfa fields monitored in statewide IPM efforts last season were at economic risk from potato leafhopper, about three times the average number generally expected. PLH populations at the Ithaca site exceeded economic threshold on 8 of the 12 sampling dates. PLH were not as plentiful at the Clarendon site, only exceeding threshold 2 of the 6 sampling dates. Results of the Ithaca site will be highlighted. The Ithaca trial was harvested once on July 18. Insufficient regrowth, apparently due to a combination of PLH injury and drought, prevented a second harvest.

Variety Comparisons

Overall comparisons for yield and PLH damage score were statistically significant at the Ithaca site which had high PLH populations (Table 1). Resistant varieties were significantly higher in yield and had lower PLH damage scores. At the Clarendon site, with moderate PLH populations, resistant varieties had significantly lower PLH damage scores than susceptible varieties, but were not significantly different in yield. Ranking of the resistant varieties for PLH damage at both locations was similar.

The range of PLH damage scores for the resistant varieties was from 2.5 to 4.2 at Ithaca. Interestingly, the varieties that were the most resistant to PLH damage were not necessarily the highest yielding varieties and visa-versa. The resistant varieties with the lowest PLH damage scores may have more wild germplasm in their background resulting in slightly lower yield than varieties that are resistant but have higher PLH damage scores.

Forage quality analyses (NIR) indicated resistant varieties averaged higher seeding year quality values than susceptible varieties: 16.8% vs. 16.2% crude protein, 26.9% vs. 25.4% acid detergent fiber and 36.8% vs. 35.4% neutral detergent fiber. Forage value comparison (FORVAL) determined the resistant varieties averaged $31 higher hay value per acre in the seeding year than the susceptible varieties.

Although the Northeast does not often face the severe level of PLH damage observed in 1997, the probability that at least one or more of the production years/harvests will be severely damaged by PLH, during the life of an alfalfa stand is high. In a year with severe PLH pressure, the additional seed cost of resistant varieties would likely be offset by increased hay yields and quality, and reduced insecticide costs.

Conclusions

Under heavy insect pressure, PLH resistant alfalfa varieties in the seeding year were significantly higher in yield and lower in PLH damage scores than the susceptible varieties. Differences in yield were not noted under moderate insect pressure. Within the group of resistant varieties there was variation in PLH damage. This variation was not correlated with yield and was consistent over the two locations. This preliminary data is encouraging, however, seeding year data may not be truly predictive of variety performance over time since many seedlings do not survive the first winter. Overwintering survival measurements and experiments with established stands of resistant and susceptible varieties are planned in 1998 to verify or dispute these seeding year results.

Table 1: Yield and potato leafhopper damage score from Ithaca trial site seeding year (7/18/97)

Entry Resistant Varieties	Source	Yield (T/A @ 0% moisture) (adj.)	Yield (% of Trial Average)	PLH Damage Score (1=none 5=severe)
5347LH	Pioneer	1.22	122	3.0
Safeguard	Kinder	1.20	120	3.3
AmeriGuard 301	America's Alfalfa	1.19	119	3.6
DK121 HG	DEKALB Genetics	1.17	117	2.5
Clean Sweep 1000	Agway	1.16	116	2.5
Interceptor	AgriPro	1.07	107	4.2
TrailBlazer	Croplan Genetics	1.04	104	2.5
Arrest	Novartis	1.04	104	2.5
Average of Resistant Varieties		1.14	114	3.0
Susceptible Varieties				
W-L 325 HQ	W-L	1.06	106	4.8
WH 80	W-L	1.00	100	5.0
Alfagraze	Check	0.98	98	5.0
Vernal	Check	0.97	97	4.8
Oneida VR	Check	0.96	96	5.0
Viva	Semico	0.93	93	4.4
NY9008	Cornell	0.92	92	5.0
NY9144	Cornell	0.91	91	4.8
Arrow	America's Alfalfa	0.90	90	3.8
W-L 322 HQ	W-L	0.88	88	4.0
Rhino	Geertson Seed Farms	0.80	80	4.8
Average of Susceptible Varieties		0.94	94	4.7
Overall Average		1.00		4.0
	F-test (a)	3.29 **		21.72 **
	LSD (.05)	0.22		0.6

(a) ns = not statistically significant, ** = statistically significant at P < .01.

Crop Management

Soybean Production Costs in New York

Bill Cox, Dept. of Soil, Crop and Atmospheric Sciences

New York producers harvested about 105,000 acres of soybeans last year. The current favorable soybean to corn price ratio may result in more soybean acreage in 1998. Crop producers, who had never grown soybeans previously, grew them for the first time in 1997. Likewise, crop producers, who have not yet grown soybeans, are considering soybeans in 1998. Let's examine soybean production costs, opportunities to reduce production costs, and some opportunities to increase yields in New York to prompt new and experienced soybean growers to closely examine their production practices.

Soybean production costs, calculated using custom rates for machinery costs and a land rental fee of $60/acre, average about $220/acre (Table 1). Machinery costs, which include either moldboard or chisel plowing plus two additional secondary tillage operations, average about $65/acre. Seed costs (at a seeding rate of 225,000 seeds/acre), which include inoculum costs, average about $25/acre. Herbicide costs average about $35/acre and fertilizer costs average about $5/acre. Additional costs for hauling, interest (8.5%), insurance, and land rental, average an additional $92/acre.

Soybean prices in New York averaged $5.78 during the last 10 years with a high of $7.30/bushel in 1988 and a low of $5.00/bushel in 1994. New York soybean yields have averaged about 35 bu/acre during the same period. Consequently, many growers, who have tried soybeans in the last 10 years, have not made money because 38 bu/acre is the break-even yield at a $5.78/bu price and $220/acre production costs (Table 2). Obviously, experienced or potential soybean producers will have to either decrease production costs, increase yields, or receive more favorable prices for their crop to make soybeans more profitable.

Opportunities to reduce soybean production costs include less tillage and less herbicide costs. Results from the Farming for Maximum Efficiency (MAX) program indicate that a no-till system can reduce machinery costs by about $20/acre. If growers have no-till equipment and experience with no-till, they should consider reducing or eliminating tillage operations for soybean production. Proper and consistent seeding depth (1 – 1½ "), however, is crucial for soybean stand establishment so only growers who are experienced with no-till equipment should consider this practice. The use of Roundup Ready® soybean varieties has the potential to decrease herbicide costs by about $20/acre. Seed costs, however, would increase to about $30/acre because of the $5/bag technology fee. Nevertheless, the use

(see SOYBEAN, page 7)

Table 1. Average soybean production costs in New York.

Input	$/acre
Machinery*	65
Seed**	25
Fertilizer	5
Herbicides	35
Drying and Hauling	5
Int. on Oper. Capital	17
Crop Insurance	8
Land Rent	60
Total	221

* Machinery expenses calculated using custom rates.
** Seed costs for soybean include seed innoculant.

Table 2. Net return/acre for soybeans at different prices and yields when production costs average $220 or $185/acre.

Soybean Price	Yield (bu/acre) 25	30	35	40	45	50	55
			$220/acre production costs				
4.50	-107.50	-85.00	-62.50	-40.00	-17.50	5.00	27.50
5.00	-95.00	-70.00	-45.00	-20.00	5.00	30.00	55.00
5.50	82.50	-55.00	-27.50	-	27.50	55.00	82.50
6.00	-70.00	-40.00	-10.00	20.00	50.00	80.00	110.00
6.50	-57.50	-25.00	7.50	40.00	72.50	105.00	137.50
7.00	-45.00	-10.00	25.00	60.00	95.00	130.00	165.00
7.50	-32.50	5.00	42.50	80.00	117.50	155.00	192.50
			$185/acre production costs				
4.50	-72.50	-50.00	-27.50	-5.00	17.50	40.00	62.50
5.00	-60.00	-35.00	-10.00	15.00	40.00	65.00	90.00
5.50	-47.50	-20.00	7.50	35.00	62.50	90.00	117.50
6.00	-35.00	-5.00	25.00	55.00	85.00	115.00	145.00
6.50	-22.50	10.00	42.50	72.00	107.50	140.00	172.50
7.00	-10.00	25.00	60.00	95.00	130.00	165.00	200.00
7.50	2.50	40.00	77.50	115.00	162.50	190.00	227.50

(SOYBEAN, from page 6)

of Roundup Ready soybeans could reduce production costs by an additional $15/acre. If soybean producers can reduce production costs to $185/acre, 32 bu/acre is the break-even yield at a soybean price of $5.78/bu (Table 2).

Opportunities to increase soybean yields include selection of high-yielding varieties and the use of narrow row spacing. Soybean varieties differ in yield potential by 10 to 15%. Simply selecting the best variety can increase yields by 5 bu/acre. Soybean growers should spend as much time examining the performance of their soybean varieties as they do their corn hybrids to insure that they are selecting the best variety. Also, soybean producers should drill their soybean varieties at 7" row spacing. Research at Cornell over the last 5 years has consistently demonstrated a 5 to 10% yield advantage for narrow rows.

In closing, the adoption of new technology such as zone-till or Roundup Ready soybean varieties can reduce soybean production costs by about $35/acre. Likewise, the selection of the best soybean variety planted in narrow rows may increase yields by 5 bu/acre or more. New York crop producers should carefully evaluate their production practices to insure that they're producing a high-yielding crop at maximum efficiency. Careful attention to production practices will result in maximum profit for both new and experienced soybean producers.

(GRASS, from page 2)

the past 4 years at recommended N fertilizer rates have ranged from 3 to over 7 tons hay (12% moisture) per acre across NY.

Summary

Perennial grasses can produce high yields and are better suited to many of the less well-drained soils in New York state. Although timothy and smooth bromegrass were expected to be killed out by intensive harvest management, only smooth bromegrass stands were severely damaged by intensive cutting. Tall fescue looks very promising agronomically as a dairy forage, but more research is needed from a forage quality standpoint.

Table 2. Yield (tons/acre) of timothy and orchardgrass varieties under commercial N fertilization, at 75 lbs actual N/acre in the early spring, and 50 lbs actual N/acre prior to each regrowth. Four harvests were taken in 1994, and three harvests in 1995-97. Grasses were sown in 1993 on a better-drained site (up slope) and a less well-drained site (down slope).

Species	1994	1995	1996	1997
Timothy				
Up slope site	4.6	4.2	5.0	4.1
Down slope site	3.9	4.2	4.9	3.8
Orchardgrass				
Up slope site	5.0	4.2	5.2	3.8
Down slope site	4.3	4.0	4.3	3.0

Timothy varieties: Chazy, Climax, Mariposa, Mohawk, Richmond and Tiller.
Orchardgrass varieties: Benchmark, Dawn, Haymate, OKAY, Pennlate and Axiom.

Calendar of Events

June 4	Small Grains Management Field Day, Aurora, NY
June 28 - July 1	Northeastern Branch ASA Annual Meeting, Amherst, MA
July 8-12	Northeastern Division, American Phytopathological Society, Burlington, VT
July 10	Aurora Field Day, Musgrave Research Farm, Aurora, NY
July 14	Weed Science Field Day, Musgrave Research Farm, Aurora, NY
July 15	Weed Science Field Day, Thompson Research Farm, Freeville, NY
October 18-22	ASA, CSSA, SSSA Annual Meetings, Baltimore, MD
November 8-12	Joint Meeting of American Phytopathological Society and Entomology Society of America, Las Vegas, NV
January 4-7	Northeastern Weed Science Society Annual Meeting, Cambridge, MA

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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