What's Cropping Up?

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Recommended Corn Silage Hybrids for New York

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Cornell University evaluates 95-115 day corn silage hybrids at two locations in central/western NY and 75-100 day corn silage hybrids at two locations in Northern NY. We arrange the hybrids in the field into 5-day relative maturity (RM) groups (i.e. 95-100, 101-105 day hybrids, etc.) and harvest one or more RM groups at a particular site when the hybrids are in the 60-70% moisture range. We also take an initial 10,000-gram sample from each plot and then sub-sample to 700 grams to determine moisture and to run silage quality analyses on all four replications of each hybrid at each site.

MILK2006, a spreadsheet from the University of Wisconsin, calculates milk/ton, a silage quality index, derived from neutral detergent fiber (NDF), NDF digestibility (30 hr), crude protein, ash, and starch concentrations from the quality analyses. MILK2006 also calculates milk yield/acre of each hybrid by combining silage yield and milk/ton values. We recommend hybrids that have comparative milk yields of greater than 100 across the two sites (the average milk yield of each hybrid RM group is adjusted to 100 and hybrids within the RM group with above-average milk yields have values above 100). We list the comparative milk yields as well as comparative silage yields and milk/ton values for recommended hybrids in central/western (Table 1) and Northern NY (Table 2). **Hybrids within each table should only be compared within RM groups. Hybrids that have been tested more than 1 year should be given more weight because they have performed above-average in more environments.**

Central/Western NY

New hybrids dominated the 94-100 day RM performances in 2008. The hybrids 88C97CB/LL from Garst, 5057VT3 from GROWMARK FS, and 1900F/RR/HX from LICA had exceptional silage yields at both Aurora and Groveland Station in 2008. Also, HiD.F.-3000-6 from Dairyland Seed had the highest silage yield in the 94-100 day RM at Groveland Station. The hybrid 54T42 from Dyna-Gro Seed had high silage yields for the second year in a row, especially at the Aurora site in 2008. The new hybrid 4888 from GROWMARK FS had above-average milk/ton values in 2008 and N39Q-CB/LL/RW, a new NK brand hybrid, had above-average yields at both sites. The hybrids 946 LRR and 99 S7 from LICA had exceptional silage yields for the second or third year in a row.

The hybrid TA557-00F from T.A. Seeds continued to perform well in 2008 in the 101-105 day RM group with above-average silage yields, especially at Groveland Station. New hybrids, however, also dominated the 101-105 day RM group with 1056 SRR from LICA and HL B337 and HL SVT50 from Hyland having much above-average silage yields at both sites. Also, the new hybrid 552GR from Doebler's had above-average silage yields and above-average milk/ton values at both sites in 2008. Another new hybrid from Hyland, HL SR59, also had above-average silage yields at both sites.

The new hybrid HTS62-01CR from HYTEST SEEDS had the highest average silage yields in the 106-110 day RM group across the two sites in 2008. Previous recommended hybrids, 34A89 from Pioneer and HL S067 from Hyland, continued to have much-above average silage yields in 2008. Also, new hybrids N64Z-CB/LL/RW, an NK brand, which also had above-average milk/ton values, TA607-20 from T.A. Seeds, and 660BVR from Doebler's had much above-average silage yields across both sites.

A new hybrid, DKC61-69, a DEKALB brand, had a much above-average silage yield and above-average milk/ton value in the 111-115 day RM group in 2008. New hybrids, 6277VT3 from GROWMARK FS and 33F88 from Pioneer, which also had an above-average milk/ton value, had above-average silage yields. The new hybrid TMF2Q716 from Mycogen had above-average silage yields, whereas new hybrids 57V40 from Dyna-Gro Seed and 83L65CB/LL/RW from Garst had above-average milk/ton values. The new hybrid DKC67-87, a DEKALB brand, and the previously recommended

Crop Management

Table 1. Recommended 95-115-day corn silage hybrids in New York based on tests in Cayuga Co. (Aurora Research Farm) and Livingston Co. (Southview Farms).

Brand/Co.	Hybrid	Comparative Silage Yield	Comparative Milk/Ton	Comp. Milk Yield	Years in Test
		----------%----------			no.
		95-100 day Relative Maturity			
Garst	88C97CB/LL	110	99	109	1
Dyna-Gro Seed	54T42	110	99	109	2
Dairyland Seed	HiD.F.-3000-6	110	99	109	1
GROWMARK FS	5057VT3	110	98	108	1
LICA	1900F/RR/HX	108	98	105	1
LICA	946 LRR	102	101	104	3
Growmark FS	4888	101	101	102	1
NK	N39Q-CB/LL/RW	103	99	101	1
LICA	99 S7	103	98	101	2
		101-105 day Relative Maturity			
T.A. Seeds	TA557-00F	108	101	109	5
LICA	1056 SRR	111	98	108	1
Hyland	HL B337	108	100	108	1
Doebler's	552GR	102	103	105	1
Hyland	HL SVT50	107	98	105	1
Hyland	HL SR59	104	98	101	1
		106-110 day Relative Maturity			
HYTEST SEEDS	HTS62-01CR	109	100	110	1
Pioneer	34A89	108	100	107	4
Hyland	HL S067	107	100	107	8
NK	64Z-CB/LL/RW	105	102	106	1
T.A. Seeds	TA607-20	107	99	106	1
Doebler's	660BVR	105	99	104	1
		111-115 day Relative Maturity			
DEKALB	DKC61-69	105	102	107	1
T.A. Seeds	TA689-00F	109	99	106	3
GROWMARK FS	6277VT3	104	100	105	1
Pioneer	33F88	103	101	105	1
DEKALB	DKC67-87	107	97	104	1
Dyna-Gro Seed	57V40	100	102	102	1
Mycogen	TMF2Q716	102	99	102	1
Garst	83L65CB/LL/RW	98	102	101	1
Fielder's Choice	NG6793	100	101	101	1

Table 2. Recommended 80-100-day corn silage hybrids in Northern NY based on tests in St. Lawrence Co. (Greenwood Farms) and Jefferson Co. (Ron Robbins Farm in 2008).

Brand	Hybrid	Comparative Silage Yield	Comparative Milk/Ton	Comp. Milk Yield	Years in Test
		----------%----------			no.
		80-85 day Relative Maturity			
T.A. Seeds	TA290-19	107	103	110	1
T.A. Seeds	TA240-00	106	102	108	1
		86-90 day Relative Maturity			
Hyland	HL SR35	107	100	107	2
Pioneer	38N87	101	101	101	2
		91-95 day Relative Maturity			
Hyland	HL B294	119	101	121	1
Mycogen	TMF2N422	113	103	116	2
LICA	946 LRR	109	101	110	3
LICA	1900F/RR/HX	112	98	110	1
Mycogen	TMF2L416	107	101	108	2
Hyland	HL S047	102	101	103	1
DEKALB	DKC45-79	102	99	101	1
		96-100 day Relative Maturity			
DEKALB	DKC50-44	106	102	107	1
LICA	99 S7	108	100	107	2
T.A. Seeds	TA476-11	104	97	101	1
Pioneer	36Y26	100	101	101	1
Fielder's Choice	NG6520	101	100	101	1

TA689-00F from T.A. Seeds had the highest silage yields in the 111-115 day RM group when averaged across the two sites.

Northern NY (Table 2)

Two new hybrids from T.A. Seeds, TA290-19 and TA240-00, yielded exceptionally well in the 80-85 day RM group at both sites in 2008. Also, both hybrids had above-average milk/ton values at both sites. A new hybrid, HL SR35 from Hyland yielded exceptionally well in the 86-90 day RM in 2008. Also, 38N87 from Pioneer yielded well at Sackets Harbor in 2008.

Two new hybrids dominated the 91-95 day RM group in 2008 with HL B294 from Hyland and 1900F/RR/HX from LICA having much-above average silage yields in 2008. Previously recommended hybrids, TMF2N422 andTMF2L416 from Mycogen, and 946 LRR from LICA, also had much above-average silage yields in 2008. In addition, all three of the previously recommended hybrids continued to have above-average milk/ton values. New hybrids HL S047 from Hyland and DKC45-49, a DEKALB brand, also had above-average silage yields.

A new hybrid, DKC50-44, DEKALB brand, had an above average silage yield and milk/ton value in the 96-100 day RM group in 2008. The previously recommended hybrid, 99-S7 from LICA once again had much-above silage yield. Also, the new hybrid TA476-11 from T.A. Seeds had above-average silage yield, whereas the new hybrid 36Y26 from Pioneer had an above-average milk/ton value across sites in 2008.

Conclusion

Hybrid selection is one of the most important management practices that affect corn silage yield and quality. With high grain corn prices, hybrid selection for corn silage has increased in importance. We urge seed companies to enter their hybrids in our corn silage hybrid testing program so New York dairy producers can make informed decisions, based on tests under NY environmental conditions. You can access the detailed 2008 Corn Silage Hybrid Report at our Web site, http://css.cals.cornell.edu/cals/css/extension/publications.cfm

Crop Management

Recommended Roundup Ready Soybean Varieties for New York

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New York farmers planted about 235,000 acres to soybeans in 2008 and averaged 45 bu/acre, the second highest yields on record in NY (46 bu/acre in 2006). Soybean prices, following crude oil prices closely, have dropped significantly this fall into the $8.00 bushel range. Prices are expected to recover, however, as the winter begins.

Varieties show significant yield differences in our trials so variety selection is a management practice that strongly determines how much profit growers realize. The varieties in Table 1 are recommended varieties for central/western NY, based on tests in Cayuga (Aurora Research Farm) and Livingston Co. (Henry Everman Farm in Dansville). The varieties in Table 2 are recommended varieties for Northern NY, based on tests in Jefferson (Ron Robbins's farm in Sackets Harbor) and Clinton Co. (Minor Institute in Chazy). We recommend varieties that have average relative yields of more than 100% across the two sites in central/western or Northern NY (100% relative yield equals the mean yield of the test). Recommended varieties, which have been tested more than one year, have performed well over different growing seasons in NY so more consideration should be given to those varieties. **When looking at relative yields in Tables 1 and 2, only compare relative yields of varieties within a Maturity Group.**

Central/Western NY (Table 1)

The Aurora site was exceptionally wet this year from mid-June through August (11.78 inches or rain). Some white mold disease incidence was noted but symptoms were mostly mild and yields were high (64 bu/acre for 10 Group I and 62 bu/acre for 22 Group II varieties that were entered in our trials). The Dansville site was extremely wet in July and August (11.18 inches of precipitation in those two months and 13.88 inches from mid-June through August), which resulted in severe white mold and lodging problems and below average yields for that site (55 and 60 bu/acre, respectively). There was a strong variety by site interaction with some varieties yielding well at Aurora but not as well at Dansville and vice versa.

HS 199RR from GROWMARK FS, which yielded exceptionally well at both sites in 2008 (68 and 69 bu/acre), continues to be a highly recommended late Group I variety (Table 1). Also, HS 122aRR from GROWMARK FS, which yielded exceptionally well at Dansville (68 bu/acre) and average at Aurora (61 bu/acre) in 2008, continues to be a highly recommended early Group I variety for central/western NY. AG0808, a new Asgrow brand Group 0 variety, yielded very well in the Group I tests at Aurora (66 bu/acre) and at Dansville (58 bu/acre) as did AG1406 (63 and 58 bu/acre, respectively), a new Asgrow brand Group I variety. HS 188RR, a Group I variety from GROWMARK FS, yielded

Table 1. Relative yields of recommended Group I and Group II Roundup Ready soybean varieties for Central/Western New York, based on tests in Cayuga and Livingston Co over the last few years.

VARIETY	COMPANY/BRAND	RELATIVE YIELD (%)	YEARS IN TEST
		GROUP I VARIETIES	
HS 199RR	GROWMARK FS	109	5
HS 122aRR	GROWMARK FS	108	2
AG0808	Asgrow	105	1
AG1406	Asgrow	102	1
HS 188RR	GROWMARK FS	101	2
		GROUP II VARIETIES	
AG2108	Asgrow	112	1
HS 20R80	GROWMARK FS	107	1
AG2002	Asgrow	105	2
AG2802	Asgrow	105	3
AG2406	Asgrow	105	1
S24-NJ1	NK	104	2
HS 2766(NRR)	GROWMARK FS	104	1
HS 217RR	GROWMARK FS	103	4
33D27	UAP	103	2
AG2110	Asgrow	103	3
S21-N6	NK	102	3
SSG2205	Seedway	101	4

exceptionally well at Aurora (71 bu/acre) but not as well at Dansville (48 bu/acre).

A new Group II variety, AG2108, an Asgrow brand, yielded exceptionally well in 2008 at Aurora (69 bu/acre) and at Dansville (67 bu/acre) as did HS 20R80 (65 and 63 bu/acre, respectively), a new GROWMARK FS variety. AG2002 (60 and 67), AG2802 (58 and 65), and AG2406 (60 and 66 bu/acre, respectively), Asgrow brand varieties, also yielded well in 2008. S24-NJ1, an NK brand, yielded exceptionally well at Aurora (68 bu/acre) but not as well at Dansville (52 bu/acre) in 2008. HS 2766(NRR), a new Group II variety from GROWMARK FS yielded average at Aurora (58 bu/acre) but exceptionally well at Dansville (68 bu/acre), whereas HS 217RR yielded exceptionally well at Aurora (67 bu/acre) and slightly above average at Dansville (61 bu/acre). Other recommended varieties include 33D27 from UAP (62 and 63 bu/acre); AG2110, an Asgrow brand (58 and 64 bu/acre); S21-N6, an NK brand (60 and 62 bu/acre); and SG2205 from Seedway (60 and 61 bu/acre, respectively).

Northern NY (Table 2).

The Sackets Harbor and Chazy sites were also exceptionally wet this year with both sites receiving 11-12 inches of precipitation from mid-June through August. Lodging was a significant problem at the Sackets Harbor site but there was minimal lodging at Chazy. Nevertheless, Chazy had below average yields for that site (61 and 63 bu/acre), whereas the Sackets site had average yields (51 and 50 bu/acre for 10 Group I and 12 Group II varieties, respectively). Frost occurred during the first week of October at both sites so some Group II varieties, which had not attained physiological maturity at that time because of the cool August conditions, had reduced yields.

HS 199RR, HS 122aRR, and TS1440R, which yielded exceptionally well at Sackets Harbor (55-57 bu/acre) and average at Chazy (58-62 bu/acre) in 2008, continue to be highly recommended Group I varieties for Northern NY. AG0808, the Group 0 variety, and TS1790R, a new Group I variety from T.A. Seeds, had average yields at Sackets (50 bu/acre) and exceptional yields at Chazy (~66 bu/acre). S18-Y3, a new NK brand variety, and AG1406 had average yields at Sackets Harbor (50 bu/acre) but above-average at Chazy (~65 bu/acre).

Recommended Group II varieties, which are grown only in areas of NNY near the Lakes with warmer nights and later fall frosts, include HS 217RR (63 and 61); S20-P5, a new NK brand Group II variety (48 and 68); Ag2002 (50 and 63); and AG2108 (47 and 67 bu/acre, respectively).

Table 2. Relative yields of recommended Group I and Group II (only close to Lake Ontario) Roundup Ready soybean varieties for Northern New York, based on tests in Jefferson and Clinton Co. over the last few years.

VARIETY	COMPANY/BRAND	RELATIVE YIELD (%)	YEARS IN TEST
		GROUP I VARIETIES	
HS 199RR	GROWMARK FS	105	5
AG0808	Asgrow	104	1
TS1790R	T.A. Seeds	104	1
S18-Y3	NK	102	1
HS 122aRR	GROWMARK FS	102	2
TS1440R	T.A. Seeds	102	3
AG1406	Asgrow	101	1
		GROUP II VARIETIES	
HS 217RR	GROWMARK FS	105	3
S20-P5	NK	103	1
AG2002	Asgrow	103	2
AG2108	Asgrow	102	1

Conclusion

Variety selection strongly influences yield and subsequent profit. Commercial varieties can have yield differences of 5-10 bu/acre with different lodging resistances. Correct soybean variety selection can result in huge profit differences so growers should consider all sources of information when selecting varieties. More detail of the 2008 New York State Soybean Variety Tests are posted on our Web site, http://css.cals.cornell.edu/cals/css/extension/publications.cfm

Weed Management

Dandelion Management Guidelines for Zone/No-Tillage Corn

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Weeds have different life cycles and tillage systems affect the types of weeds in a field. In conventionally tilled summer annual crops most weeds are either summer annuals like lambsquarters and foxtails, or creeping perennials like horsenettle. Winter annual, biennial, and simple perennial weeds do not survive in fields that are plowed, however these weeds can be a problem when tillage is minimized or eliminated in zone/no-tillage cropping systems. Among those that can be most problematic are simple perennials like dandelions. While dandelions live for many years, they only spread by forming seed. Most NY perennial forages are infested with dandelions and each one produces an abundance of seed with a tuft of hairs to facilitate wind movement. As a result, dandelions readily infest adjacent zone/no-tillage fields.

The dandelion problem has been exacerbated by the increased acreage of glyphosate-resistant crops where, all too often, residual herbicides are not used in combination with glyphosate to prevent germination and establishment of dandelions. As a result, dandelions can become a serious problem after several years of continuous zone/no-tillage cropping. An example of this rapid infestation was observed in a production field at the Musgrave Research Farm near Aurora when Roundup Ready soybeans with no residual herbicides were followed by no-tillage wheat. This observation was followed by the realization that control recommendations for this perennial weed were inadequate. Research efforts since the fall of 2005 have focused on finding better control measures.

Fall Versus Spring Application

Conventional wisdom suggests that fall applications should provide better dandelion control than spring applications. This may be true if applications are made early when dandelions are actively growing, but late fall applications do not seem to give the same level of control as their spring counterparts. An experiment at Aurora, compared treatments applied in mid-November 2005 and again in early May 2006. Early May evaluation revealed that several of the fall applications had provided excellent burndown of dandelions. Among them were 22 fl oz/A of Roundup Original MAX, 0.5 oz/A of Basis, and the combination of these two treatments with an average burndown rating of 91% in early May. Unfortunately, many of the dandelions in these treatments recovered by early July. Control with Basis alone declined to 22%, while control with Roundup alone, Roundup plus Basis, as well as Roundup plus 1 pt/A of 2,4-D (Weedar 64) was between 50 and 60% 8 months after treatment (MAT) (Table 1). When applied in early May, results in Table 1 show that control 2 MAT was 68, 75, and 83% with Roundup alone, Roundup plus 2,4-D, or Roundup plus Basis respectively. Basis application in the spring was no better than in the fall (22%).

Express Herbicide Improves Control

An experiment established at Aurora in late October 2006 examined how Express (tribenuron) might help with dandelion control. In this experiment, dandelion control with 1 pt/A

Table 1. Dandelion control ratings made 8 or 2 months after treatment (MAT) following fall or spring herbicide applications at Aurora.

		% Control 7/4/06	
Herbicides*	Rate Amt/A	Fall – 8 MAT	Spring – 2 MAT
2,4-D (Weedar 64)	2 pt	32	35
Basis	0.5 oz	22	22
Roundup OM	22 fl oz	50	68
Roundup OM + 2,4-D (Weedar 64)	22 fl oz 1 pt	53	75
Roundup OM + Basis	22 fl oz 0.5 oz	58	83
LSD (0.05)		9	9

*Applied with 0.25% (v/v) nonionic surfactant.

Table 2. Dandelion control ratings made 6 and 8 months after treatment (IMAT) following fall herbicide applications at Aurora.

		% Control		
Herbicides*	Rate Amt/A	6 MAT	8 MAT	Yield Bu/A
Basis	0.33 oz	73	17	16
+ Express	0.125 oz	99	35	53
Basis	0.5 oz	70	17	13
+ Express	0.125 oz	98	45	62
Untreated	-	0	0	11
LSD (0.05)		5	9	18

*Applied with 1 pt/A 2,4-D Low Vol Ester.

of 2,4-D (Low Vol 4 Ester) with 0.33 or 0.5 oz/A of Basis averaged 72 and 17% 6 and 8 MAT respectively (Table 2). When 0.125 oz/A of Express was added to these Basis plus 2,4-D treatments, average control improved to an average of 98 and 40% 6 and 8 MAT respectively. Average corn yield increased about 40 Bu/A with the addition of Express to these fall treatments.

Additional information on the contribution of Express was collected following early preplant (EPP) treatments in mid-May 2008. The addition of 0.25 oz/A of Express to 0.5 oz/A of Basis plus 1 pt/A of 2,4-D (Low Vol 4 Ester) and 1% crop oil concentrate (COC) increased dandelion control from 77 to 96% 6 weeks after treatment (WAT). A separate treatment of 0.275 oz/A of Express plus 1 pt/A of 2,4-D and 1% COC controlled 93% of the dandelion 6 WAT. While control with 22 fl oz/A of Roundup WeatherMAX was 25%, control with Roundup plus 1 pt/A of 2,4-D was 87% 6 WAT.

Guidelines for Zone/No-Tillage Corn

These results, along with supplemental labeling and 2(ee) recommendations for Express, have led to new recommendations for pre-plant or at-planting burndown and control of dandelion in zone/no-tillage corn. Express may be applied at 0.25 to 0.5 oz/A for burndown and control of emerged weeds. For dandelion control, Express should be applied in combination with 2,4-D LVE and either 1% (v/v) COC or modified seed oil, or with 0.25-0.5% (v/v) nonionic surfactant. While supplemental labeling allows spring application of Express for other emerged weeds, the current 2(ee) recommendation for dandelion control is limited to fall applications. Hopefully, this recommendation will be expanded to include spring applications for dandelion before the 2009 growing season. If so, growers should allow at least 14 days between application and planting corn.

Applications of "normal" rates of glyphosate plus 1 pt/A of 2,4-D LVE in fall or spring prior to corn planting are also recommended with the addition of COC to enhance control. In addition to these dandelion recommendations, there is evidence that Callisto, alone or as a component of Lumax or Lexar, can provide additional dandelion control.

Nutrient Management

Nitrogen Benefits of Winter Cover Crops
Agronomy Fact Sheet Series - Fact Sheet 43

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Cover crops have received increasing interest from farmers in recent years. The reasons vary from erosion control and nutrient uptake to improved soil quality and increasing organic matter. As fertilizer prices continue to increase and producers aim to reduce nitrogen (N) loss to the environment, producers are asking about the N fertilizer replacement value (NFRV) of winter cover crops for corn.

We conducted a literature review to (1) identify cover crops most suitable for use as winter crop crops in corn cropping systems in the Northeast and (2) evaluate and summarize studies on (a) the NFRVs of winter cover crops for the next corn crop, (b) N accumulation by the cover crops, and (c) environmental and management variables that most affect NFRVs, N uptake capacity, and synchronization of N release with N needs of the next corn crop.

In this factsheet we summarize our review of many years of cover crop research with particular emphasis on the Northeast. We present findings on the N benefits of winter cover crops that can help corn producers choose and manage winter cover crops to best meet their cropping system needs and environmental management goals.

Cover Crops Suitable for the Northeast

In the Northeast, the cold winter period from November to March reduces fall and spring growing time for winter cover crops and winter survival compared to warmer regions of the United States, so it is important to understand basic cover crop options.

Crops examined for use as winter cover crops in the Northeast include legumes such as various vetch and clover species, as well as small grains and grasses including wheat, barley, and cereal rye.

Reports on cold hardiness of seedlings of these species vary. One reason for varying winter survival may be the effect of establishment date (Table 1). Establishment varies in the Northeast where Plant Hardiness Zones 3-8 are represented (USDA 1990); warmer locations in the Northeast can seed toward the later end of the range, but cooler locations should plan on seeding toward the earlier end of the range.

As can be seen in Table 1, ideal establishment times for most legume cover crops precede corn grain and soybean harvest. These cover crops typically are most effectively established if seeded after winter cereals or corn silage, interseeding into standing soybeans in 30-inch row spacing or into corn when it is 12-24 inches tall, or aerial seeded at tasseling in August. Cereal Rye is the most cold tolerant among small grain cover crops and may still be established after corn grain or soybean harvest, depending on time of harvest and fall weather.

Table 1: Recommended seeding rate and establishment dates for winter cover crops most commonly used on dairy farms in the Northeastern US, adapted from Clark (2007) and Duiker (unpublished data).

Cover crop	Seeding rate	Seeding window
	lbs/acre	
Hairy vetch	13-18	Aug. 1–Sept. 30
Crimson clover	9-13	Aug. 1–Sept. 30
Red clover	7-9	Feb. 1–June 15[a]
Wheat	55-110	Sept. 15–Nov. 1
Barley	45-90	Sept. 15–Oct. 15
Cereal Rye	55-110	Sept. 15–Nov. 15

[a] Red clover will not have an appreciable nitrogen fertilizer replacement value for corn if not established early in the year preceding spring plowdown or kill.

Nitrogen Fertilizer Replacement Value (NFRV) of Cover Crops for Corn

- Cover crop studies surveyed in the literature review include hairy vetch, bigflower vetch, crimson clover, red clover, arrowleaf clover, and cereal rye.

- More than half the studies on hairy vetch indicated a NFRV >70 lbs N/acre while 80% of the studies found NFRVs >50 lbs N/acre.
- Most studies that included a direct comparison between vetch and clover indicated greater NFRV for vetch.
- Cereal rye often showed negative NFRVs, most likely due to N immobilization resulting from decomposition of the high C:N cover crop residues.
- For N deficient situations, N immobilization upon cereal rye or small grain incorporation or chemical kill could be overcome by (1) delaying corn planting until 2-3 weeks after cover crop kill and/or (2) addition of fertilizer N or manure directly following cover crop kill/turnover. Immobilization of soil N will not be an issue when the residual inorganic soil N pool at cover crop termination is large (e.g., heavily manured fields).
- Tillage decisions (conventional tillage versus no-till systems with chemical kill of the cover crop) can impact both moisture and N dynamics. The limited research available in the literature indicates that chemical kill without incorporation tends to result in slower decomposition and more gradual N release than when tillage is used to terminate and incorporate the residue. But, additional research is needed.
- If legumes are established following small grains or interseeded into standing corn or soybean, fall N accumulation can be substantial. If seeded after corn silage or grain harvest, N accumulation in the fall is generally considerably lower for legumes than for cereal grains and grasses.

Winter Cover Crops as Catch Crop for End-of-Season Residual N

- High levels of residual N following corn harvest can occur due to limited crop uptake of fertilizer N in dry summers, inadequate accounting for manure N when calculating crop N needs, poor timing of N application with respect to crop uptake, and/or fall mineralization of soil organic matter and crop residues.
- If cover crops are seeded to capture residual N from the soil profile, cereal grains or grasses are recommended. This capture does not appear to result in an N credit to the following crop, but presumably contributes to accumulation or maintenance of soil organic N. For N-deficient situations, legumes are more appropriate winter cover crops.

In Summary

The NFRV for vetch was greater than for clover, while the NFRV of cereal rye was often zero or negative, reflecting N immobilization in soils with limited residual N. This immobilization could be overcome by allowing 2-3 weeks between kill and planting or by N addition following cover crop kill/turnover. A few studies suggest chemical kill results in slower decomposition and more gradual N release over time than cover crop plow-down. Research is inconclusive regarding the effect of tillage on NFRVs of cover crops. Cereal rye was most effective in uptake of residual (fall) N and is recommended as a catch crop in situations of excess N. For N-deficient situations, legumes are more appropriate winter cover crops.

Additional Resources

- "Managing Cover Crops Profitably". 3rd Edition. Handbook Series Book 9. Published by the Sustainable Agriculture Network, Beltsville, MD. http://www.sare.org/publications/covercrops/covercrops.pdf.

Disclaimer

This fact sheet reflects the current (and past) authors' best effort to interpret a complex body of scientific research, and to translate this into practical management options. Following the guidance provided in this fact sheet does not assure compliance with any applicable law, rule, regulation or standard, or the achievement of particular discharge levels from agricultural land.

For more information

Cornell University Cooperative Extension

Nutrient Management Spear Program
http://nmsp.css.cornell.edu

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Pest Management

Trefoil Wilt in New York and Vermont is Caused by a Unique Plant Pathogen

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Fusarium wilt, a soil-borne disease associated with rapid wilting, root discoloration, and plant death in seeding year stands of birdsfoot trefoil (Figure 1), was one of the principal factors in the decline of the once thriving trefoil seed industry in the Lake Champlain Valley of New York and Vermont in the 1970s and early 1980s. The disease can still be observed in remnant trefoil plants growing in hay fields in the region. Since the early 1990s this disease has also afflicted birdsfoot trefoil in forage production fields in Erie and Wyoming Counties in western New York. Yet little was known about the characteristics and biology of the fungus that produces these symptoms in trefoil.

In a research article published in the January 2009 issue of the journal Plant Disease, Michael Wunsch and coauthors Alexandra Baker, David Kalb, and Gary Bergstrom document the identity of the causal fungus as a unique biological strain of Fusarium oxysporum that they named as form species 'loti' to denote its pathogenicity on trefoil (Lotus species). The Cornell plant pathologists utilized plant inoculation experiments and molecular genetic analyses to characterize a collection of the fungus isolated from symptomatic trefoil plants from diverse locations in New York and Vermont between 1985 and 2004. The isolates collected from wilted birdsfoot trefoil caused severe wilt and root discoloration in greenhouse grown plants of birdsfoot trefoil; a low level of disease in some pea plants; but no disease in alfalfa, red clover, dry bean, or soybean plants (Table 1). Also included in the experiments were reference isolates of Fusarium oxysporum form species 'medicaginis' from alfalfa, form species 'pisi' from pea, and an isolate of F. oxysporum from red clover; none of these fungal isolates caused significant disease in birdsfoot trefoil while each produced disease in the host plant from which they had been isolated originally (Table 1).

The genetic analyses employed by the authors suggest that a single strain of F. oxysporum causes Fusarium wilt in New York and Vermont. Each of the isolates designated as form species 'loti' showed vegetative compatibility (a measure of self-recognition in fungi that is useful for assessing genetic similarity) when grown together in laboratory cultures with every other 'loti' isolate. The DNA sequence of three specific genes was determined for each fungal isolate and compared to published gene sequences for other isolates of F. oxysporum. Each of the 'loti' isolates had identical DNA sequence over the three genes and clustered together in a separate group from isolates that are pathogenic on other plant hosts. Thus the trefoil wilt pathogen found in New York and Vermont appears to be a unique biological strain with a plant host range different from that of any Fusarium fungus studied previously. To date this pathogen is known to occur only in certain areas of New York and Vermont. Movement of infested hay or soil is the most likely mechanism for geographic spread of this fungus. The new genetic tools developed at Cornell should be useful for tracking any future movement of the trefoil wilt pathogen to new areas.

Table 1. Summary of vascular wilt symptoms induced in legume species following inoculation of plants with specific isolates of Fusarium oxysporum. Reactions ranged from 0 (no symptoms) to ++++ (severe root necrosis, wilting, and death).

Plant species inoculated:	F. oxysporum f.sp. *loti* from trefoil	F. oxysporum f. sp. *medicagins* from alfalfa	F. oxysporum f. sp. *pisi* from pea	F. oxysporum from red clover
Birdsfoot trefoil	+++	0	0	0
Alfalfa	0	++++	0	0
Red clover	0	0	0	++
Pea	+	+	++++	+
Dry bean	0	0	0	0
Soybean	0	0	0	0

Figure 1. Typical progression of symptoms (left to right) of Fusarium wilt in birdsfoot trefoil plants.

Forage producers whose soils are infested by F. oxysporum f. sp. loti can consider growing the birdsfoot trefoil variety 'Pardee' which was developed at Cornell and selected for its moderate resistance to this pathogen [Smith et. al. What's Cropping Up? 2008. Volume 18 (1): 10-11].

Reference:

Wunsch, M.J., Baker, A.H., Kalb, D.W., and Bergstrom, G.C. 2009. Characterization of Fusarium oxysporum f. sp. loti forma specialis nov., a monophyletic pathogen causing vascular wilt of birdsfoot trefoil. Plant Dis. 93:58-66.

Calendar of Events

Jan. 5-8, 2009	**Northeastern Weed Science Society Annual Meeting, Baltimore, MD**
Jan. 6, 2009	**New York State Agribusiness Association Annual Meeting, Auburn, NY**
Jan. 12-13, 2009	**The Science Behind Cornell Nutrient Management Guidelines, Auburn, NY**
Jan. 14, 2009	**Western New York Corn Congress, Batavia, NY**
Jan. 15, 2009	**Finger Lakes Corn Congress, Waterloo, NY**
Jan. 22, 2009	**South Central New York Winter Crop Meeting, Clarion Inn, Ithaca, NY**
Jan. 28, 2009	**Corn Expo, Waterloo, NY**
Feb. 3, 2009	**Corn Day 2009, Cooperstown, NY**
Feb. 4, 2009	**Western New York Soybean and Small Grains Congress, Batavia, NY**
Feb. 5, 2009	**Finger Lakes Soybean and Small Grains Congress, Waterloo, NY**
Feb. 9-13, 2009	**Weed Science Society of America Annual Meeting, Orlando, FL**
Feb. 10-12, 2009	**Empire State Fruit and Vegetable Expo, Syracuse, NY**
Feb. 11, 2009	**Madison County Crop Congress, Cazenovia, NY**

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