What's Cropping Up?

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Sclerotinia Crown and Stem Rot: A Risk Factor for Summer Alfalfa Seedings

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Wet spring weather often causes growers to postpone alfalfa seeding until late summer. While this practice produces benefits, it may also increase the risk of loss from Sclerotinia crown and stem rot, caused by the fungus *Sclerotinia trifoliorum*. This disease has increased in New York over the last decade. Significant losses to *Sclerotinia* were observed this spring in New York fields that were seeded in August 1993 and had heavy snow cover.

The Disease

Although infection of seedlings occurs in the fall and the disease develops under snow cover in winter, symptoms are seen primarily in spring of the year following seeding. The disease is best observed on cool, moist, spring mornings on wilting, dying plants in small scattered patches. Affected plants have soft, mushy stem bases and crowns. A weblike, cottony mold spreads from plant to plant under cool, moist conditions. The white mold becomes compressed within infected stems, forming hard, black survival structures, called sclerotia, that will fall to the ground and may survive for several years. *Sclerotinia* can cause partial or complete loss of young stands, but losses are seldom incurred in established stands following the first spring harvest.

Epidemic Development

Initial infection of alfalfa occurs between mid September and the first hard freeze in autumn. Tiny, cup-shaped fruiting bodies are formed on sclerotia on the soil surface and they forcibly discharge ascospores that are disseminated by air currents. The spores germinate on young foliage in water films provided by dew or rain. *Sclerotinia* colonizes alfalfa under cool, moist conditions and continues to do so when temperatures remain above freezing under snow cover. Heavy and late spring snows are very favorable for disease development. Only young alfalfa plants are highly susceptible to ascospore infection. Therefore, the later the crop is seeded after mid-July, the greater the risk of loss from Sclerotinia. Red clover, by contrast, is susceptible to ascospore infection even as a mature plant. The pathogen also attacks other small-seeded legumes such as birdsfoot trefoil, crown vetch, and various clovers.

Fields at Risk

Anecdotal evidence from Ohio suggests that alfalfa seedlings within 50 feet but less than 200 feet of a sclerotia-infested field are at risk of significant infection. Plant pathologist Landon Rhodes at Ohio State University has constructed a 'risk ladder' of factors that increase the risk of damage by *Sclerotinia* in alfalfa establishment. Some of these factors, in order of increasing risk, are August seeding, seeding late August or later, reduced or no tillage, seeding into existing sod, high proportion of legumes (especially red clover) in previous crop or pasture, and disease previously observed in field.

Management

The key to managing this disease is to be aware of its presence on your farm and to avoid infection of young alfalfa plants in the fall. Alfalfa cultural practices should be designed to avoid the risk factors mentioned above. When *Sclerotinia* is confirmed in a forage legume crop, care should be taken not to disseminate sclerotia to other fields by movement of firstcut hay in the spring. When a previously infected stand becomes unproductive, the soil should be moldboard plowed (unless it is on an erodible site), and at least a 2 year rotation to a grain crop (with no underseeded legume) be implemented. There are currently no fungicides available for control of *Sclerotinia*. All recommended alfalfa varieties are susceptible although some may be more susceptible than others. I recently learned that some seed companies are close to marketing new alfalfa varieties in the Northeast which promise significant levels of resistance to *Sclerotinia*. These varieties may prove useful to growers who must delay alfalfa seeding until August.

SOIL MANAGEMENT

Fertilization of Winter Small Grains

W. Shaw Reid and Bill Cox
Soil, Crop and Atmospheric Sciences

Fertilization of winter grains involves two different times, fall and spring, for adding fertilizers. Fall fertilization involves adding nutrients needed for successful establishment, and fall and early spring growth. Spring fertilization involves topdressing N at the correct time, rate and source to achieve maximum growth and yield without lodging. In New York most of the fall applied nitrogen not taken up by the plant is lost during winter; therefore not available to the plant in the spring. Using nitrification inhibitors does not prevent most of the nitrogen from being lost.

Fall Fertilization

During the fall, winter grains must produce sufficient top and root growth to survive the cold winter temperatures, wet soil, frozen soil or frost heaving conditions. Phosphorus is usually the most important fertilizer nutrient for stand establishment although some fertilizer nitrogen and potassium may be required. Studies on barley grown on a low soil test P soil in Wyoming county during 1968 and 1969 (Figure 1) show that phosphorus banded at seeding increased yields. There was an interaction between barley variety and phosphorus. The older Hudson variety produced a higher yield with low P than did the 'new' Schuyler variety. However, Hudson yielded less at the higher P rates. The photo shown on page 145 of the *Field Crops and Soils Handbook* shows winter barley response to phosphorus on the Musgrave Research Farm. The photo shows an increase in plant survival and in plant size shortly after growth resumed in the spring with increasing P rates from 0 to 80 #/A. The increased plant population and size at the higher P rates resulted in healthier plants, faster recovery from winter injury, better spring growth, more tillers and higher yields of both grain and straw.

Further investigations using winter wheat (Figure 2) demonstrate that P is primarily responsible for the response. The Arrow wheat experiment was conducted on a moderately well drained soil low in soil test P on the Musgrave Research Farm. The wheat received no fertilizer, nitrogen alone, phosphorus alone or both nitrogen and phosphorus in the fertilizer band at planting. These treatments were applied at each of 5 planting dates. Phosphorus alone or with nitrogen always increased yields. Although the yields were lower for the later plantings dates, the increases obtained from the phosphorus were larger than. Nitrogen alone did not increase yields and most often decreased yields. Nitrogen with phosphorus did not always increase yields more than phosphorus alone.

From these and other studies it was concluded that phosphorus banded at planting was critical for winter grains; thus the recommendation to band most if not all of the phosphorus is included in the soil test recommendations.

To obtain the responses illustrated within these studies, the P must be banded at planting. Banding for small grains means placing the phosphorus about 1 inch below the seed with the grain drill at planting. Broadcasting the fertilizer will not produce the same response as banding. Generally, broadcasting and plowing the phosphorus down will produce little yield response above the no fertilizer plots. Jim Capron, Cooperative Extension Agent in the Finger Lakes region, reports an 11 bushel increase in winter wheat yield harvested in 1994 where the fertilizer was banded rather than broadcasting.

Nitrogen in the fall is often unnecessary. If applied, it should be placed in the fertilizer band with the phosphorus and should not exceed about 20 #/A. Use of urea and/or diammonium phosphate in the fertilizer band at planting have shown population, growth and yield reductions. Avoid using these materials within the band. If use of diammonium cannot be avoided, reduce the rate of phosphorus to about 20 #/A and do not use any additional N from any ammonium source.

The potassium requirement is best obtained from soil test considering the yield potential, the potassium supplying power of the soil and extractable potassium. Potassium placement and timing is less critical than for phosphorus. Up to 50 #/A of potassium can be applied in the fertilizer band at planting along with about 20 pounds of N; however to avoid injury do not exceed about 75 #/A of nitrogen + potash in the fertilizer band. If larger quantities are required, broadcast and incorporate most of the potassium with only a small amount being applied in the fertilizer band at planting.

Spring Fertilization

Spring fertilization involves applying only nitrogen as a topdressing. The questions involved with spring fertilization are when should the N topdressing be applied, how much and what source of nitrogen should be used.

When should the nitrogen topdressing be applied?

When the plant survives the winter and remains green, there is sufficient N within the plant for rapid very early season growth. Thus, the winter grains should not be topdressed until after growth begins in the spring and the plants can utilize the applied N, thus reducing the chance of N loss. A study during 1984 and 1985 at the Musgrave Research Farm, Aurora NY (Table 1) suggest that topdressing winter wheat at any time during April produces near optimum yields. Several studies by Cox (Table 2), Knapp and/or Reid have shown that a single April application of nitrogen produces the same yield as applying 2/3 of the nitrogen in April and 1/3 later.

How much N should be applied?

For winter wheat following a previous grain crop there are 2 conditions to be considered: 1. No fungicides and growth regulators and 2. the "high yield wheat program" using fungicides where lodging is not a problem or with growth regulators.

For winter wheat following a grain crop and no fungicides applied, a topdressing of 40 to 60 #/A of N is sufficient for optimum yields. More nitrogen often causes lodging without increasing yields; therefore, if N from the soil or past crops is expected to be higher than normal, use only 20 to 40 #/A N.

With fungicides and lodging not a problem, a higher N topdressing rate can be used as illustrated by the data from Cox (Table 2). In these experiments the optimum N topdress rate was 90 #/A. As stated earlier splitting the N rate into two spring applications did not increase yields. Other data by Cox, Knapp, and Reid confirm the 90 #/A N rate for the high yield conditions.

What source of N for topdressing should be used?

Several sources of N were compared for spring topdressing of Winter wheat during 1984 and 1985 (Table 3). In the wet spring of 1984, ammonium nitrate produced slightly lower yields than the other sources. Probably some of the nitrate was either denitrified or lost by leaching. During the dry spring of 1985 and to a lesser extent in 1984, urea produced lower yields than either ammonium nitrate or ammonium sulfate. Some of the N was probably lost by volatilization of ammonia from the soil surface before rain moved the urea into the soil. The best source to use depends upon the cost per pound of N and the expected soil conditions. Since April weather is more often wet than dry, an ammonium source such as ammonium sulfate is probably favored; however, if the price per pound of N is too high other sources are readily available and may produce as much depending upon the spring weather conditions.

Summary

An optimum fertilization program for winter grains should include soil testing to obtain the optimum phosphorus and potassium rates. If soil N is likely to be low, 10 to 20 #/A of N should be banded in the fall. Most, if not all, of the phosphorus should be applied in the fertilizer band at planting. The potassium can be broadcast before planting or up to about 50 #/A can be applied along with the phosphorus in the fertilizer band. The fertilizer source used in the fertilizer band should not include urea or diammonium phosphate.

Spring topdressings of N depends upon the yield potential, lodging and residual N supply. For high yield wheat following a grain crop, about 90 #/A of nitrogen applied as a single April topdressing will produce optimum yields. Without fungicides, but lodging not much of a problem, apply 40 to 60 #/A of N. If lodging is likely to be a problem such as following potatoes, a legume cover crop, or a long fallow period, reduce the N topdressing rate to 30 to 40 #/A.

(See continuation on page 4)

SOIL MANAGEMENT

Table 1. Grain yield of winter wheat from 60 lb. N applied at various times.

Date		Grain (Bu/A)
March	1	66
March	15	73
April	1	76
April	15	77
May	1	76
May	15	65
June	1	60

Table 2. Yields of winter wheat as influenced by topdressed N

Rate #/A	Grain Bu/A	Straw Tons/A
0	57	1.18
30	73	1.53
60	85	1.75
90	91	2.06
120	91	1.84
30 + 60*	88	1.92
60 + 30*	87	1.92
60 + 60*	92	1.81

*Second N application applied at GS 6

Table 3. Grain yield of winter wheat from 75 #/ N using various sources

Nitrogen Source	Grain Yield (Bu/A) 1984	1985	Mean
Ammonium Nitrate	69	86	78
Nitrogen Solution	74	-	-
Ammonium Sulfate	75	87	81
Urea	72	74	73

Figure 1

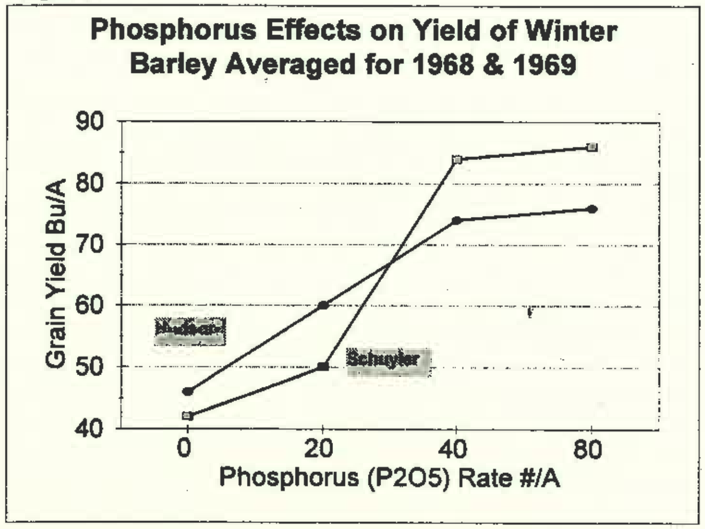
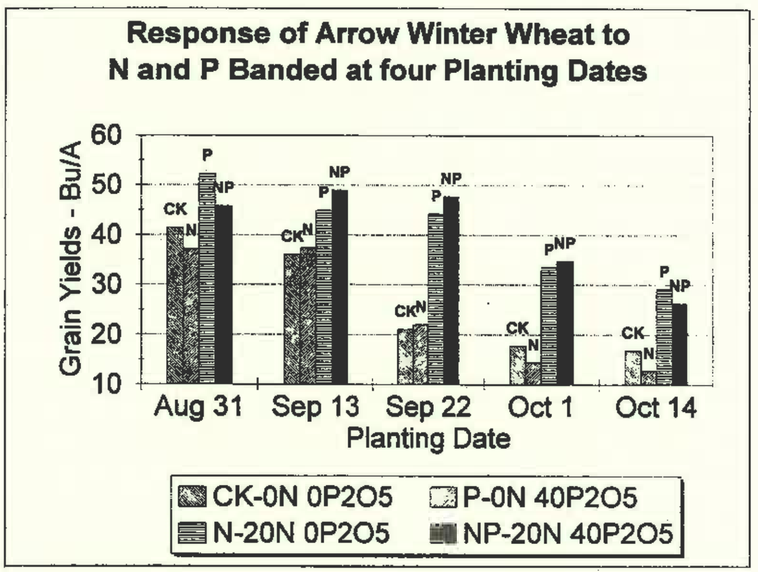


Figure 2



Trends in Forage Seed Use in New York

CROP MANAGEMENT

Bill Pardee
Plant Breeding

This spring New York farmers sowed about 125,000 acres of alfalfa, using close to 2 million pounds of seed. They also sowed over 600,000 pounds of timothy seed, about 350,000 pounds of red clover seed, and significant amounts of other forage legumes and grasses. These estimates are based on long-term trends in forage seed use, drawn from our annual survey of seed shipments by wholesale seed companies.

This survey has been carried out each year since 1956, and is unique in the country. Trends observed in seed use have helped seed companies anticipate seed needs, extension workers plan teaching programs, and plant breeders focus their breeding effort. Following long-term trend lines, we've been able to note which kinds and varieties are gaining favor with farmers, as well as those that are on the skids.

Results from 1993 were recently published, and these show several interesting trends. Overall, forage seed use was up in 1993, reflecting improved spring planting conditions over 1992. Alfalfa seed use was up over 20%, as was red clover. Birdsfoot trefoil sales were down, as were many of the grasses.

Reed canarygrass continued to increase in popularity, with sales up over one-third in 1993. Reed canary grass is attracting attention because of its vigor, wide soil adaptability (wet and dry), and its ability to recycle manure nitrogen into forage feed. The low-alkaloid varieties Palaton and Venture made up most Reed canarygrass sales.

For further details on these and other figures related to forage seed sales in the Northeast send for a copy of the 1993 Report, Northeast Seed Use Survey, Small Seeded Grasses and Legumes, W.D. Pardee, 253 Emerson, Cornell University, Ithaca, NY 14853

Sales by variety showed Oneida VR continuing as the most popular alfalfa variety, based on its Verticillium wilt resistance and its high overall performance. However seed company proprietary varieties held much of the alfalfa market, with nearly 200 names available.

Popular red clover varieties included Marathon (19% of sales) and Arlington (12%), along with over a dozen company varieties (23%). Common medium (no-name) red clover sales held above one-third in red clover volume.

Among other species, the Norcean variety (82%) was the most popular birdsfoot trefoil. Climax (51%) continued its longtime leadership among the timothy varieties. Saratoga (31%) has been the most popular bromegrass variety for nearly 30 years, but York (21%), new from Cornell, is rising fast and should soon become the leader. Pennlate topped the orchardgrass varieties, as it has for

Trends in Forage Seed Use in New York, 1989-93

	NY Seed Use (in 1000 lbs.)		
	1989-91 Ave	1992	1993
Alfalfa	1730	1547	1943
Red clover	352	281	370
Birdsfoot trefoil	165	93	84
Ladino	18	13	11
Alsike	70	62	82
Timothy	657	615	653
Bromegrass	127	99	99
Orchardgrass	59	51	49
Sudangrass	12	8	18
Sorghum-Sudan	490	281	365
Reed canarygrass	35	36	50
Ryegrass	69	35	31

(See Trends, page 7)

CROP MANAGEMENT

Kernel Milk Line Stage and Corn Harvest

Bill Cox
Soil, Crop and Atmospheric Sciences

Many researchers suggest that the position of the kernel milk line is a useful guide in determining when to harvest corn silage. Nevertheless, considerable variation exists between kernel milk line and whole plant moisture across environments. For example, Minnesota data (Table 1) suggest that whole plant moisture averages 69% at the 1/2 milk line stage and 65% at the 3/4 milk line (milk line 3/4 of the way down the kernel). In contrast, Pennsylvania data suggest that whole plant moisture averages only 61% at the 1/2 milk line (Table 1). In a Wisconsin study, whole plant moisture averaged 65% at the 1/2 milk line in 1988 and 1989 but 70% in 1990 (Table 1). Such variability between whole plant moisture and milk line could make it difficult for dairy producers to successfully use the milk line to harvest at the optimum harvest moisture for their particular storage system.

We have used the milk line as a guide to corn silage harvest in our research plots from 1988 to 1993. In all years, we have collected more than 200 samples from at least 10 different hybrids. From 1988 through 1990, we harvested at the 2/3 milk line stage because the Minnesota data suggested that this stage would correspond to about 66% whole-plant moisture. In 1988, a very dry year, whole plant moisture averaged 58% at the 2/3 milk line stage (Table 2). In 1989 and 1990, years when only 3 inches of precipitation were recorded from silking to harvest, whole plant moisture averaged about 60%. In all 3 years of the study, Pioneer 3540 compared to the other hybrids tested averaged about 3% higher in moisture.

In our corn silage studies from 1991 to 1993, we harvested at the 1/2 milk line stage. In 1991 and 1992, years when more than 6 inches of precipitation were recorded from silking to silage harvest, whole plant moisture averaged 66% at the 1/2 milk line. In 1993, however, another year when conditions were dry after silking, whole plant moisture averaged 63% at the 1/2 milk line stage.

The data suggest that environmental conditions, especially precipitation after silking, greatly influences the relationship between whole plant moisture and milk line stage. Apparently, when conditions are dry during grain-filling, corn remobilizes sugars from the stalk to the grain to meet the grain-filling requirement. When sugars and other nutrients remobilize from the stalk and leaves, corn prematurely begins the senescence process, which results in lower whole plant moisture at the 1/2 milk line stage. In contrast, whole plant moisture may average 70% at the 1/2 milk line in cool wet years. In 1992, we observed that many hybrids that did not receive an adequate number of growing degree days (GDD) to make physiological maturity by late September, accelerated milk line development in late September and early October. In other words, the milk line developed too fast for the given number of GDD. Predictably, these hybrids had whole plant moistures close to 70% at the 1/2 milk line stage.

Because of the variability between growing seasons for whole plant moisture and kernel milk line development, we recommend using the milk line as a guide on when to begin corn silage harvest. We recommend testing each hybrid for whole plant moisture (moisture tester, microwave, oven, etc.) at the 1/4 milk line stage of development (milk line 1/4 down the kernel). Typically, the 1/4 milk line stage occurs about 125 GDD or 7 to 10 days after the full dent stage under most New York growing conditions. Understandably, warm conditions would shorten and cool conditions would lengthen the number of days after denting. Corn silage producers can then decide at the 1/4 milk line stage whether to begin harvest or to wait a few more days.

(See Corn Harvest, page 7)

RESIDUE

(Trends, From Page 5)

over 20 years. Pennlate's leadership is threatened by improved new varieties, that are higher in forage and seed yields.

Sorghum-sudangrass use was up by 30%. Some of this added volume was sown by Northern NY farmers to fill in for forage stands lost due to winter-kill.

Ryegrass continued to decline in use, as farmer interest in grasses shifted towards reed canarygrass and, apparently, timothy.

The five year trends, from 1989 through 1993, show alfalfa and reed canary grass sales increasing, with red clover and timothy holding about even. Sales declined for birdsfoot trefoil, bromegrass, orchardgrass and ryegrass.

Increased interest in pastures for intensive grazing may shift future interest among these forage species. Most of the seed reported here was probably purchased by farmers to sow hay and silage crops. If pasture use expands we may see renewed use of pasture species, such as ladino, alsike and orchardgrass. The rise in reed canarygrass sales may be an early indicator of such trend.

(From Corn Harvest, Page 6)

Table 1. Whole plant moisture of corn silage at the 1/2 milk line stage of development.

LOCATION	YEAR(S)	WHOLE PLANT MOISTURE (%)
Minnesota	1984, 85, 86	69
Pennsylvania	1986 & 87	61
Wisconsin	1988 & 89	65
Wisconsin	1990	70

Table 2. Whole plant moisture of corn silage at specific milk line stages of development at Aurora, NY.

YEAR(S)	MILK LINE STAGE	GROWING CONDITIONS	MOISTURE (%)
1988	2/3	Hot and dry	58
1989 & 90	2/3	Dry after silking	60
1991 & 92	1/2	Wet after silking	66
1993	1/2	Dry after silking	63

Calendar of Events

Sept. 8	Aurora Field Day - Aurora Research Farm
Sept. 26-27	NYS GIS Conference - Holiday Inn, Albany, NY
October 11	Field Crop Dealer Meeting - Holiday Inn, Waterloo, NY
October 12	Field Crop Dealer Meeting - Best Western, Canton, NY
October 13	Field Crop Dealer Meeting - Century House, Latham, NY
October 14	Field Crop Dealer Meeting - Sheraton Inn, Batavia, NY
October 19-21	Northeastern American Phytopathology Meeting - Ramada Inn, Ithaca, NY
Nov. 13-18	American Society of Agronomy Meetings - Seattle, WA.

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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