The Northwest Experiment Station News

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Cornstalks - A Source of Head Scab Fungus

by Carol E. Windels, Plant Pathologist

Why be concerned about corn production in areas where small grains are grown? Because these crops share the same pathogen - *Fusarium graminearum* (also known as *Gibberella zeae*). On corn, *Fusarium* causes stalk rot at the lower internodes, which weakens stalks and sometimes results in lodging. On wheat and barley, the fungus causes scab (also known as head blight), a disease that significantly lowers yields and grain quality. *Fusarium* can also cause root rot and seedling blight of small grains.

The Minnesota Crop Improvement Association recently funded a corn stalk rot survey conducted by University of Minnesota plant pathologists, Dr. Carol E. Windels, Northwest Experiment Station, Crookston and Drs. Thor Kommedahl and Ward C. Stienstra, St. Paul. In early October of 1985 and 1986, they examined 40 randomly selected cornfields in twelve counties in northwest Minnesota for symptoms of stalk rot. Small pieces of stalk tissue also were collected and assayed in the laboratory for *Fusarium*.

Stalk rot symptoms occurred in <1% of the plants in 1985 and in 2% in 1986. However, laboratory analysis of stalk tissue showed that *Fusarium* was often present in these "symptomless" cornstalks. In fact, it was found in 20% of the cornstalks collected in 1985 and in 36% in 1986.

When corn harvest is delayed, cornstalks senesce and continue to become infected by *Fusarium*. Consequently, fields harvested late in the season (late October) are more likely to have stalk rot. For example, stalk rot lodging was rare in early October, 1985, but a field sampled on October 28 averaged 35% lodging and *Fusarium* was present in 70% of the cornstalks.

In the 40 fields sampled, old cornstalk refuse from the previous year was present

Stalk breakage of cornstalk near soil line caused by Fusarium.

in 14 fields. *Fusarium* was present in 28% of the corn refuse pieces collected from these fields in 1985 and in 24% in 1986. Furthermore, *Fusarium* was in stalk refuse of every corn-to-corn field sampled.

Fusarium not only overwinters on corn residue on the soil surface, but also on wheat and barley stubble. A wheat rot survey conducted by C.E. Windels and C. Holen found that *Fusarium* infected 3% of wheat roots in 1985 and 11% in 1986. Spores produced on these various sources of residue are carried by air currents to cereal heads at flowering. Studies in other geographic regions show that corn usually is the most significant source of *Fusarium* inoculum. Whether that is true in northwest Minnesota is uncertain because of the relatively few acres of corn grown in comparison to the extensive acreage of small grains.

Scab is not a problem every year because of variation of weather. *Fusarium* infects cereal heads when the crop is flowering, but only if weather conditions are favorable for spore production on residues and for disease development (high humidity and rainfall and optimum temperatures of 77-86 F). When conditions are dry, *Fusarium* will not produce spores and scab will not occur. In the last few years, scab has been an increasing problem in northwest Minnesota. One or more of several possibilities may explain this phenomenon: 1) weather conditions favorable for scab development at heading, 2) more cereal root residue and other *Fusarium*-infected residue on the soil surface because of reduced tillage practices, and 3) increasing acreages of corn.

In summary, corn refuse on the soil surface provides inoculum for both corn and small grain diseases. The presence of *Fusarium* in corn refuse may be potentially more damaging to small grain than to corn.

Entire head on left is permanently bleached by scab; Two spikelets on head on right are also bleached by scab.

Smith's Comments

The last piece of farm machinery has been cleaned up and stored for the upcoming winter months. It has literally been a long growing season. The last killing spring frost occurred on April 21, with the first killing fall frost occurring on October 1, which resulted in a 162-day frost-free growing season. Not bad for northern Minnesota. The long season, coupled with above normal temperatures in April, May and June, and timely rainfall helped produce record fall crop yields. The Station's overall corn crop will average over 135 bu/a, with one field topping 150 bu/a. Had anyone told me that this type of yield was possible, with 80-day corn hybrids, even five years ago, I'd probably have laughed. Yields of sugarbeet, alfalfa, and soybean followed suit.

While this year's growing season is history, plans are already being made for 1988. Dr. John Lamb, soil scientist, will take part in a seven state study designed to improve or correct the wind erosion model as it relates to soil erosion in the Red River Valley. The study will be completed in 1991 with results affecting government agriculture programs in 1992. This is a joint project with the United States Department Agriculture, Agricultural Research Service.

The documentation necessary for the construction of a new grain and feed handling center on the Station has been completed. Hopefully, the project will begin around the first of May and will be completed by the time grain harvest starts next August. The facility will consolidate the Station's grain storage now scattered over 40 acres and six structures and provide the livestock research departments with the latest ration formulating equipment available. Needless to say, the farm, maintenance and livestock departments are looking forward to its completion.

Death has claimed several close and highly respected friends of the Station. Ralph Smith, former superintendent of the West Central Experiment Station at Morris, passed away September 10 after a long illness. Virgil LaPlante, a neighbor as well as friend, also passed away after a short illness on September 20. The Station has purchased alfalfa stumpage from Virgil over the years and his smiling face and words of encouragement, when the walls seemed to be crumbling, will be sorely missed. Carl Spong, longtime employee of Central Livestock Association, passed away October 19. Carl was well known in the livestock and 4-H circles and his dedication and contributions to making northwest Minnesota a better place to live will be hard to duplicate. To the families of these friends, the staff extends their sympathy.

As this is the last issue of 1987, the Staff of the Northwest Experiment Station wish all of you a happy holiday season and a blessed and prosperous New Year.

Calendar of Events

Sheep Day
November 5

Beef Cattle Day
December 9

Dairy Day
January 13, 1988

Beef Cow-Calf Day
Red Lake Falls
January 20, 1988

Red River Valley
Winter Shows
February 12-18, 1988

International Sugarbeet
Growers Institute &
Machinery Show
March 16 & 17, 1988

Crops and Soils Day
July 20, 1988

New Accountant Joins Staff

If you've had an occasion to call the Business Office at the Northwest Experiment Station lately and a man answered the phone, that's the new Senior Accountant, Brad Heppner. Brad replaced Sady Newell who retired on June 30.

Brad was born and raised on a dairy farm by Munich, North Dakota. However, after graduation from high school he made his way south where he attended Mayville State College and graduated with a Bachelor's Degree in business administration and accounting.

Previous to his joining the NWES, Brad was employed as the bookkeeper and business manager of Community News, Inc., a newspaper at Mayville.

Brad is single and in his spare time, he enjoys duck and deer hunting, golf, raquet ball, and baseball.

Welcome to the Experiment Station Brad.

Foliar N On Spring Wheat

John A. Lamb, Soil Scientist,

In 1987 a new study was started at the Northwest Experiment Station, Crookston to evaluate the effect of applying additional N to spring wheat during the growing season. The N was applied as a spray at three different stages of growth to wheat which had been fertilized according to a 0-2' nitrate - N soil test for 60 bushel yield goal. The main motivations for this research have been: 1) reported increases in grain yields and protein contents from Western Europe and the Eastern US, and 2) relatively high discount price on wheat with protein contents less than 14%. The particular treatments included three N materials (28-0-0 or Urea Ammonium Nitrate Solution - UAN, 20-0-0 or liquified Urea, and N-Sure, an Arcadian product which is supposed to produce less leaf burn and have a low potential to volitilize), five N rates (0, 10, 20, 40 and 80 pounds per acre), and three application times (tiller, boot, and heading).

The spring wheat variety 'Marshall' was planted April 21, at 100 pounds seed per acre and harvested July 28, 1987. Marshall was used because of its characteristic low protein content and high acreage. Nitrogen content of plant, grain yield and grain protein content were measured. Leaf tissue burn was also observed one week after fertilizer application.

LEAF BURN:

There were definite differences in leaf burn caused by N source and amount of N applied. N-Sure and Urea caused the least amount of leaf damage. At the 80 lb/A rate approximate 33% of the leaf area was burned. UAN (28%) burned approximately 66 to 75% of the leaf. This occurred at all application times. At the lower rates, a smaller amount of area was burned, but with similar trends among N sources.

GRAIN YIELD:

Grain yield was significantly affected by the rate of N applied *(Figure 1).* The maximum grain yield increase (1.5 bu/A) occurred at the 20 and 40 lb N/A rate. This occurred for all N sources. The effectiveness of the N source was effected by the time of application (Figure 2). At the tiller stage, the largest grain yield was with Urea. N-Sure had the smallest yield. At the boot stage, all three N sources performed similarly. On the final application time, heading, the N-Sure and UAN performed superior to Urea. When comparing the leaf burn data with the grain yield information, it was surprising that the grain yields for the UAN treatment were not severely suppressed. A possible explanation may be the early moisture stress which affected plant tiller development, may have masked the grain yield decrease that normally would have occurred from the additional leaf burn stress. In a more optimal moisture year, this effect may become pronounced.

GRAIN PROTEIN:

The grain protein content was only effected by N rate (Figure 3). The protein content increased with the increased amount of N applied. The increase was 0.5% for the first 10 lb N/A and another 0.5% for the next 70 lb N/A. No effect occurred because of time of application or N source *(Table 1).*

ECONOMICS:

What does this mean? You got a small yield (1.5 bu/A) increase and only 1% increase in protein. What is the bottom line?

Assume that: N costs 18¢/lb
Protein discount at 30¢/bu/%

At 20 #/A fertilizer cost	= $(3.60)
Protein increase 0.6% x 50 bu x $.30	+9.00
Yield increase 1.5 bu x 3.00	+4.50
	$ + 9.90

A producer increases income by $9.90. This must at least cover application cost to be profitable. Application costs vary considerably and each instance must be evaluated separately. The increase in protein content at today's discounts makes the application of N attractive.

This was the first year of the study. It is planned to continue for at least one more cropping year to ascertain if additional N application to spring wheat can consistently increase grain yield and protein content.

Figure 1 - Grain Yield bu/A

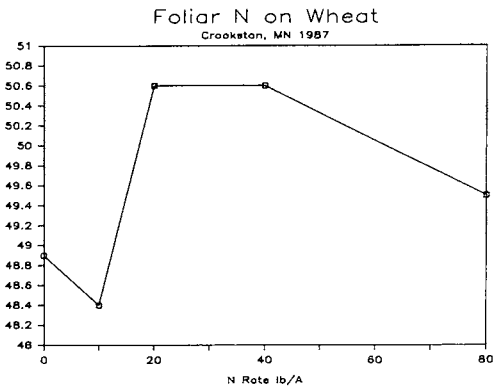

Figure 2 - Grain Yield bu/A

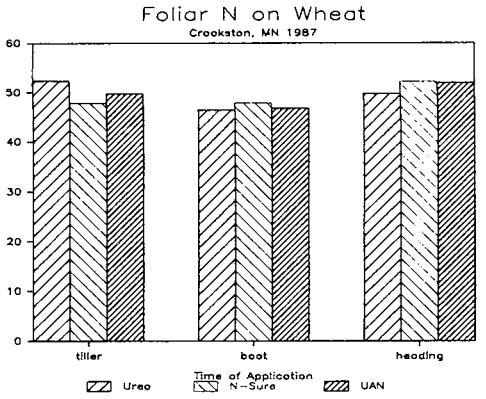

Figure 3 - Grain Protein %

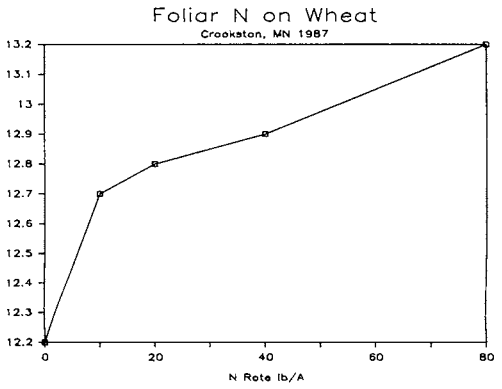

TABLE 1. The effect of application time and N source on grain protein content, Crookston, MN, 1987.

Time of Application	Grain Protein
	-----%-----
Tiller	12.8
Boot	12.9
Heading	12.9
N Source	
Urea	12.9
N-Sure	12.8
UAN	12.9

Bovine Growth Hormone

by George D. Marx, Dairy Scientist

A study is being conducted on part of the milking herd at the Northwest Experiment Station to determine the response to daily injections of bovine somatotropin (BST) a growth hormone. The project is in cooperation with the Department of Animal Science, St. Paul. Three different levels of BST are being studied along with a control group. The study will last approximately 18 months necessary to complete the 60 lactations scheduled in the protocol.

Objectives of this study are to gather additional information on BST which is also needed by the Food and Drug Administration to determine the effect of low levels of BST on milk secretion and to determine the optimum dose range. Parameters being studied include milk production and composition, feed intake, animal health, body condition, body weights, reproductive performance and efficiency of production under standard feeding conditions. The local veterinarian does all the physical exams on the cows, feed is analyzed at the St. Paul campus and Central DHIA Laboratory does the milk analysis on samples collected weekly on each cow on trial.

Current research with growth hormone and dairy cattle has created some controversey in the industry. Some question the need or desirability to develop technology for potentially increasing milk production when there is a milk surplus nationally. These same questions are raised each time a new technology is developed. When the milking machine came in, it was thought by some to be the demise of the dairy industry, the same was true about artificial insemination, the bulk milk tank and milking parlors. The advocates of BST view it as a powerful new management tool to help dairymen reduce production costs and improve profitability in a very cost-competitive world. Great Britain has approved the use of BST for commercial dairy production.

Experiments that have been conducted utilizing BST to date show an increased milk production of 8 to 25%. BST can be produced very cost effectively and economic studies show a greater return over feed costs when using the hormone. Early researchers knew this hormone was related to milk production and positively affected production. The only early source of the hormone was obtained from the slaughter house by taking numerous pituitary glands from cows and obtaining the natural product. Now through biotechnology, bacteria can be made to produce BST in the laboratory and several companies are gearing up to produce BST commercially once clearance is achieved.

A very important factor established early in the research is that bovine somatotropin is not active in humans, and milk from BST injected cows is completely safe for people to drink. Dairy cows (a bovine) have always produced somatotropin or growth hormone in their pituitary gland.

Presently, BST injections must be administered daily to a producing cow. Researchers are working on an embedded pump or slow release product which is expected to be available in a few years. The hormone BST cannot be fed orally as it is a protein and breaks down in the digestive system before it can be absorbed into the circulatory system.

The Food and Drug Administration will review all the information and studies before permitting the general use of BST by dairymen for lactating dairy cows. The Northwest Experiment Station trial will answer some of the questions related to this new management tool and technology, and how it can be utilized on a practical basis to benefit the dairymen in Minnesota and the country.

Rod Joins Dairy Crew

The newest member of the dairy crew is Rod Wegge from Nielsville. Rod joined the staff in May as an assistant farm animal attendant. His duties include feeding and caring of the dairy animals.

Rod was born and raised on a farm by Nielsville. He graduated from Climax High School and has worked for area farmers and was a semi-truck driver for Transystem's Inc. hauling sugarbeets.

Rod and his wife, Kim, who works for First American National Bank in Shelly, have two children. In his spare time, Rod enjoys playing raquet ball and softball.

Welcome to the Experiment Station, Rod.

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