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Corn silage test plot to increase profitability for dairy farmers and reduce winter wind & water erosion

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Abstract
This project looked at two ways to help dairy farmers - improvement of corn silage used in feeding their herds and adding a cover crop with potential for feed and erosion control.

Keywords
Water quality quantity and management

Disciplines
Agribusiness | Agronomy and Crop Sciences | Water Resource Management

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1) Can the use of a fall cover crop be incorporated after corn silage harvest to improve land and protect it from water and wind erosion while providing a usable feed source? and 2) what tools are available to evaluate important corn silage yield traits relevant to dairy producers?

A 1) Results showed how rye was planted, maintained, and harvested and how timing of planting can affect the growth and overall use of rye. 2) Twelve locally grown hybrids were selected to evaluate corn silage yield traits and used in the MILK2006 Equation and Corn Picker analyses. Producers learned how traits are analyzed and what tools are available to them to make a profitable decision.

Background

Corn silage is harvested from about 1.8 percent of Iowa corn acres. Most corn silage is grown in the northeast and northwest portions of the state where the majority of dairy herds are located and is critical to the nutrition needs of these animals. Corn grown for silage is harvested early enough that a cover crop of winter rye can be planted at the end of the growing season. When no-till winter rye is planted after the silage is harvested, the land is protected from winter wind and water erosion. The rye, harvested in mid- to late May, is medium-quality protein forage, which makes ideal feed for heifers or dry cows.

This project on corn silage had two objectives.
1. Show how to increase a farmer’s profitability by testing corn hybrids for economically important corn silage yield traits.
2. Offer information about the most efficient ways to adopt winter rye as a fall cover crop that can help conserve soil.

Approach and methods

The two-year project plot was located on rented land about five miles from the Northeast Iowa Dairy Center in Calmar. The location was chosen for its uniform soil quality and cropping history, and because it had good public access. Twelve of the more popular locally grown corn hybrids were planted in four-row plots 30 feet long. Each group was replicated three times. Each fall, after the trial was totally harvested, chisel plowed and field cultivated, winter rye was seeded at a rate of one bushel per acre.

Several measurements were made during the project. In early June, stand counts determined germination and seedling vigor. In July, silking data were collected. In fall, two rows, each 25 feet long, were harvested from each plot to determine silage yield.
Subsamples were taken from each plot to analyze silage nutritional content, including dry matter, minerals, protein, acid detergent fiber, neutral detergent fiber; neutral detergent fiber digestibility, lignin and fat content.

Results and discussion

Management of rye establishment was a major focus of this project. Planned manure applications following corn silage harvest can be an obstacle to timely rye planting. A possible option to avoid delayed planting is to apply manure after the rye is planted and has emerged. Rye planted in mid-to-late September vs. later in the fall produces higher forage yield, and tends to mature slightly earlier the next spring. Yield potential does not significantly decline until rye planting dates are delayed to mid-October. Later planting results in less winter soil cover, reducing soil protection. However, since the rye grows rapidly in spring, acceptable forage yields still can be achieved with a later October planting.

Corn hybrid selection is a critical and sometimes difficult process for profitable production of corn silage and milk, because silage yield and quality can differ greatly among hybrids. This trial allowed producers to consult multiple sources (university, seed companies, and on-farm trials) to determine hybrid selection.

Overall silage quality commonly is summarized in a single variable known as milk/ton. This is an overall indication of silage quality, and it is estimated from forage analyses for crude protein, neutral detergent fiber, neutral detergent fiber digestibility, starch and non-fiber carbohydrate.

Milk/ton (silage quality) often is shown along with milk/ac (silage yield x quality). Milk/ac is calculated by multiplying milk/ton by silage dry matter (DM) yield. The results show that milk/ac is largely influenced by silage yield, making it possible for a hybrid to have high milk/ac with low milk/ton. The data collected through the corn silage project provided information that can be used by the producer and livestock nutritionist to select hybrids with maximum nutritive value for the herd.

Conclusions

This project demonstrated to farmers/landowners how the use of rye as a cover crop can be incorporated into their cropping systems. It also showed producers how to evaluate corn silage hybrids and the value of these evaluations to their operation.

As a result of this project, farmers should consider several factors when they decide to establish and harvest rye. Some variables are the timing of corn silage harvest and manure application, and the timing of seeding rye to establish at least 3-4 inches of growth before frost. Low prioritization of timely planting relative to other work in the farm operation can result in stand failures or lower forage yields in spring.
The other conclusion of this project was the need for a single tool to accurately compare hybrids. This project used two different tools (Corn Picker and Milk 2006); however, they do not result in the same hybrids being chosen. Institutions and industry need to be aware of these differences when communicating results with producers.

**Impact of results**

Choosing the right hybrid can have a major impact on a dairy farm. For example, assume the Northeast Iowa Dairy Foundation has a 3,000-ton corn silage feed requirement. If Hybrid A yields 33 tons/ac and Hybrid B yields 28 tons/ac, this farm would need to harvest 107 acres for silage if planting Hybrid B, but only 91 acres if planting Hybrid A. In this simplified example, the selection of Hybrid A over Hybrid B would have allowed the Dairy Foundation to have an extra 16 acres for grain harvest. At 190 bushels/ac, this would be 3,040 bushels of extra corn to feed or sell, with a value of $21,280 at $7.00/bushel. This example demonstrates the importance of yield, but it does not take into account silage quality. Since corn silage is an energy source for animal performance, producers will look at both silage yield and quality when determining hybrids.

The results of the corn silage test plot also identified the need for a unified tool in comparing hybrids. The two existing tools should be merged to create one tool that provides costs of production across different herd sizes and allowing producers to input hybrids of their choice for evaluation.

The use of rye as a cover crop is an important management practice. However, the importance of timing rye planting and establishment is critical to its success from an erosion standpoint as well as for forage yield and quality. This project showed how to implement timely management practices.

The corn silage test plot provided learning opportunities for students in many different ways. Those involved in the planting, monitoring and harvesting of the test plot learned firsthand how data is collected and analyzed in a research project. Once data was collected and analyzed, all dairy and agronomy students at Northeast Iowa Community College used the information in the classroom to understand the importance of a cover crop and using tools to evaluate corn silage hybrid selection.

Seed companies found value in this project because it provided independent validation of product performance. Nutritionists also used the information when consulting with dairy herds during the hybrid selection process to ensure that selected hybrids had the necessary nutritive value for their dairy herd.
Education and outreach

Publications stemming from this project include:

- Iowa State University Animal Science Leaflet-R2518 2009 Iowa Corn Silage Yield Trial and Rye Cover Crop Demonstration (Authors: Dale Thoreson, Brian Lang)
- Iowa State University Animal Science Leaflet-R2519 Use of Corn Picker for Silage to Evaluate Corn Silage Hybrids (Author: Dale Thoreson)
- Iowa State University Animal Science Leaflet-R2605 2010 Iowa Corn Silage Yield Trial and Rye Cover Crop Demonstration (Authors: Jennifer Bentley and Brian Lang)
- Iowa State University Animal Science Leaflet-R2606 Use of “Corn Picker for Silage” to Evaluate Corn Silage Hybrids-2010 Trials Update (Author: Jennifer Bentley)
- Iowa State University Animal Science Leaflet-R2607 Use of “Corn Picker for Silage” to Evaluate Corn Silage Hybrids-2009 Trials Update (Author: Dale Thoreson)

A research report was compiled using statistical analysis to determine true differences, and all information was shared at the Northeast Iowa Community-Based Dairy Foundation’s annual meetings in 2009 and 2010. Every dairy producer in the 17 northeast Iowa counties (Dairy Foundation members and non-members) was invited to the seminar where Dale Thoreson presented on the project. Results also were distributed through ISU Extension’s Dairy Team newsletter that is sent to every Iowa dairy producer and Brian Lang’s Crop Notes newsletter that is distributed via email. Results are available on the Dairy Center’s website (www.iowadairycenter.com) and the ISU Extension Dairy Team website (www.extension.iastate.edu/dairyteam).

Leveraged funds

The Dairy Foundation provided labor and equipment used for the corn silage test plot. Seed companies provided vacuum sealer, bags and labor on the day the plot was harvested. These companies also submitted a user fee ($150/hybrid).