2009 Iowa Corn Silage Yield Trial and Rye Cover Crop Demonstration

A.S. Leaflet R2518

Dale Thoreson, Iowa State University Extension Dairy / Beef / Forages Field Specialist;
Brian Lang, ISU Extension Agronomist

Introduction

Corn silage is harvested from about 1.8% of Iowa corn acres. Most corn silage is harvested in the northeast and northwest portions of the state where the majority of dairy herds are located. In these regions, corn silage is a major portion of the row-crop acres. Because no independent yield trials are being conducted on corn hybrids for silage, a coalition consisting of ISUE Field Specialists, NICC instructors, the NE Iowa Dairy Foundation, and several seed corn representatives initiated a corn silage hybrid trial at the NE Iowa Dairy Foundation farm in 2008. This is the second year of the corn silage trial. Results from 12 corn hybrid varieties are presented in this report as well as data on rye coverage planted between corn crops in 2008 – 2009.

Materials and Methods

The trial was established at the same location on a Fayette silt loam soil 5 to 9% slopes and moderately eroded (63C2). A randomized complete block design was used with three replications of each hybrid. The previous (2008) crop was corn harvested for corn silage. The trial was planted on May 18, 2009 and harvested on September 12, 2009. The plots were treated with 2 quarts Harness Extra plus 3 ounces of Hornet per acre, early post emergence. No rootworm control was applied at planting. The trial received 10,000 gallons dairy manure, in the fall of 2008, from the large manure storage pit at the Foundation's farm. Manure analysis was 27-7-15 pounds N - P_20_5 - K_20 per 1000 gallons. An additional 80 pounds per acre nitrogen was side dressed in spring 2009.

Twelve hybrids (Table 1) were planted in 4-row plots 30 feet long. Each was replicated three times. Plant populations were recorded on June 1 at the V-2 stage. The harvested area consisted of 10 foot of row from the middle two rows of each plot. A 10 foot 4-by-4 was laid beside each row to obtain a uniform cutting height of 4 inches. Harvested plants were weighed on a platform scale. Six stalks from each plot were randomly selected to be chopped in a wood chipper. Two samples were taken from the chopped silage after aggressively stirring the contents. Each sample was placed in a two quart plastic bag, labeled and placed under ice for transport. One set of samples was transported that day to Dairyland Laboratories, Inc, Arcadia, Wisconsin. The other set was transported to the Dairy Foundation freezer for back-up purposes. All samples were coded so that laboratories were blind to hybrid variety and company.

Dairyland Laboratory conducted dry matter and wet chemistry analysis of each sample. Tests included crude protein, acid detergent fiber, neutral detergent fiber, neutral detergent fiber digestibility at 24 and at 30 hours, in-vitro dry matter digestibility at 24 and 30 hours, starch, fat, lignin and ash. The laboratory also calculated milk per ton using "Milk2006" an adaptation of milk 2000 reported by R. Shaver, University of Wisconsin. Milk2006 approximates animal performance based on a standard cow weight and milk production level (1350 lb. body weight and 90 lb/day at 3.8% fat). The values used to calculate Milk2006 were based on laboratory values for hybrid moisture, crude protein, NDF, NDF digestibility (48 hours), starch, ash, NDFICP and ether extract (fat). Field calculations were used for dry matter yield. No kernel processing was assumed.

Winter rye was seeded after the 2008 trial was totally harvested, chisel plowed and field cultivated. A rate of one bushel per acre was used. The rye was harvested April 24, 2009 by clipping eight one square foot plots in a criss-cross pattern due to the effects of the chisel plow and field cultivating obscuring individual plot locations. Tonnage was measured from two subsamples. The subsamples were dried on a Koster Crop Tester and sent to Dairyland Laboratories. The laboratory conducted dry matter and NIR analysis of both samples. Tests included crude protein, acid detergent fiber, neutral detergent fiber , lignin, acid detergent insoluble crude protein as a percentage of crude protein and dry matter, neutral detergent insoluble crude protein as a percent of crude protein and dry matter, protein solubility, fat, ash, calcium, phosphorous, magnesium, potassium, sulfur and sugar. Because these samples were unusual, they were verified by wet chemistry.

Results and Discussion

Result from the twelve hybrid varieties (Relative Maturity (RM), Whole Plant Moisture, Dry Matter and Silage Yield and Quality Traits) are shown in Table 2. Results from two rye forage samples are shown in Table 3.

Implications

The corn plot received modest hail damage in 2009. The hail appeared to cover the entire plot. An error in planting protocols occurred in the corn trial this year. No rootworm insecticide was applied at planting. Not all hybrids contained a rootworm resistant gene. The plot was confirmed to have rootworm feeding scars pre-harvest. The entire trial was harvested to allow statistical analysis to

determine if there was a significant reduction in yield or nutrient content of the two hybrids that did not have the rootworm resistant gene. Statically these hybrids did not separate from the rest so they remained part of the trial. Corn maturity was much slower than typical this year. Based on an August 5, 2009 survey of the trial, plots ranged from zero percent silked to 100% silked. We estimated ½ kernel milk line to be attained by September 16, 2009. Harvest was conducted on September 12th but obviously the average moisture of 75.8% was higher than the 65% desired in corn silage.

Winter rye had very little growth the fall of 2008. However fall and spring growth were probably adequate to prevent wind erosion. The rye would have had to be planted very shortly after silage harvest to be useful as a silage crop in the following spring

Explanation of Quality Traits:

- CP = crude protein.
- ADF = acid detergent fiber. Acid detergent fiber represents the less digestible portion of the corn forage, containing cellulose, lignin and heat damaged protein. ADF is closely related to the digestibility of forages. Lower ADF implies the forage is more digestible. More mature plant material will contain higher ADF concentrations. A low concentration of ADF is desirable.
- NDF = neutral detergent fiber. This is a measure of fiber content of the corn forage. It is less digestible than non-fiber constituents of the forage. Forages with high NDF levels have lower energy. NDF is also a measure of potential forage intake. High NDF levels decrease the potential forage intake. Low NDF content is desirable.
- NDFD = neutral detergent fiber digestibility. The portion of the neutral detergent fiber digested by animals at a specified level of feed intake. High NDFD is desirable
- IVTDMD = (In-vitro) digestible dry matter. This is a measure of forage digestibility.
- Starch = starch from the grain, along with digestible component of the fiber, accounts for the majority of the energy in corn silage.
- Lignin = Lignin is the highly indigestible portion of the forage.

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Participating Companies:
American Organics, P. O. Box 382, Warren, IL 46792
Dairyland Seeds Co Inc, 3570 County Rd H, Kewaskum, WI 53040
Dyno-Gro, 1065 Broadway Ave, San Pablo, CA 94806-2260
Monsanto Seed Group, DeKalb Genetics, 3100 Sycamore Road, DeKalb, IL 60115
Mycogen Seeds, 9330 Zionsville Rd, Indianapolis, IN 46268
Pioneer Hi-Bred International, 7000 NW 62nd Ave, Johnston, IA 50131

Table 1. Corn Silage Hybrid Traits.

					Relative
Company	**Hybrid**	**CRW**			**maturity**
Dairyland	DS9009	VT3		RR	109
Dairyland	DS8208	HXX	LL		108
DEKALB	DKC61-69	VT3		RR	111
DEKALB	DKC59-64	VT3		RR	109
Dyna-Gro	V5082	VT3		RR	110
Dyna-Gro	V4884	HXT		RR	108
Mycogen	F2F725	HXX	LL		113
Mycogen	F2F569	HXX	LL	RR	105
Pioneer	P34A89	HXX	LL	RR	109
Pioneer	P1395	HXX	LL	RR	113
Brownseed	64143SK	None			107
Brownseed	688743SK	None			111

Table 2. Relative Maturity (RM), Whole Plant Moisture, Dry Matter and Silage Yield, and Quality Traits for Corn Hybrids Planted at Calmar (Winneshiek County) in 2009.

		Population	Harvest	Dry matter	Silage			
		V5 stage	moisture,	yield	yield	CP	ADF	NDF
Hybrid	RM	plts/acre	%	tons/ac	tons/ac	%	%	%
DKC61-69	111	31,833	74.3	8.5	33.2	7.2	23.6	42.1
DKC59-64	109	33,500	74.5	9.0	35.3	6.3	27.0	46.0
V5082	110	33,667	75.4	8.2	33.6	7.4	26.1	44.4
V4884	108	35,000	75.8	8.1	33.6	7.1	26.0	43.9
P34A89	109	34,500	75.7	8.3	34.2	6.8	28.0	47.8
DS8208	108	33,333	76.2	8.2	34.5	7.0	26.1	44.0
DS9009	109	33,167	76.1	8.4	35.2	7.4	25.8	45.7
688743SK	111	32,167	74.3	7.0	27.4	7.1	25.8	44.9
64143SK	107	32,833	75.8	6.9	28.6	7.4	26.8	47.2
F2F569	105	34,500	77.6	7.5	33.5	7.2	26.1	45.5
P1395	113	30,500	75.9	7.6	31.7	6.8	24.7	42.2
F2F725	113	34,000	77.6	6.8	30.5	6.9	25.8	46.2
Average		**33,250**	**75.8**	**7.9**	**32.6**	**7.0**	**26.0**	**45.0**
LSD 0.05		2,594	1.7	0.6	2.6	0.6	2.1	2.8

	NDFD	NDFD	IVTDMD				MILK	MILK
	24	30	30	Starch	Lignin	Fat	2006	2006
Hybrid	%	%	%	%	%	%	per ton	per acre
DKC61-69	52.5	58.6	82.6	24.6	2.7	1.7	2,700	23,007
DKC59-64	50.3	54.2	78.9	21.9	3.0	1.2	2,427	21,841
V5082	52.2	59.1	81.8	21.5	2.7	2.1	2,617	21,595
V4884	53.1	56.9	81.1	21.5	3.0	2.1	2,576	20,914
P34A89	51.1	56.2	79.1	18.2	2.7	1.9	2,397	19,942
DS8208	47.4	55.8	80.6	20.5	2.9	1.6	2,362	19,424
DS9009	49.4	55.6	79.7	18.9	2.6	1.4	2,271	19,105
688743SK	52.9	58.4	81.3	21.7	2.7	1.9	2,610	18,328
64143SK	54.1	57.8	80.1	18.6	3.2	2.3	2,588	18,009
F2F569	61.7	64.7	83.9	15.8	1.7	1.5	2,332	17,564
P1395	52.3	57.2	81.9	19.3	2.7	1.2	2,148	16,457
F2F725	63.0	68.1	85.2	15.7	1.9	1.5	2,392	16,303
Average	**53.3**	**58.5**	**81.4**	**19.8**	**2.7**	**1.7**	**2,452**	**19,374**
LSD 0.05	5.0	4.1	2.3	3.4	0.6	0.5	257	2,639

Table 3. Yield, Dry Matter and Quality Traits for Rye Forage.

Sample	NW-SE 1	NE-SW 2
Yield DM T/acre	0.1319	0.1679
Yield Silage T/acre	0.6	0.8
CP %	26.25	26.01
ADF	20.0	20.0
aNDF	34.77	36.0
Lignin	2.38	2.31
AD-ICP/CP	5.45	5.31
AD-ICP/DM	1.4	1.38
ND-ICP/CP	20.35	20.27
ND-ICP/DM	5.34	5.27
Solubility	31.89	31.45
Fat	4.1	4.1
Ash	12.59	12.91
Ca	0.6	0.6
P	0.55	0.56
Mg	0.16	0.16
K	3.72	3.65
S	0.28	0.28
Sugar	18.58	18.6
TDN	67.92	67.41
NFC	23.6	22.28
NE_L OARDC	70.18	69.62
NE_G OARDC	45.03	44.4
NE_M OARDC	72.34	71.63
DDM	73.32	73.32
DMI	3.45	3.33
RFV	196.09	189.27