NEWS RELEASE

SCOTT GUNDERSON
MANITOWOC COUNTY UW-EXTENSION DAIRY AGENT
COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF WISCONSIN-EXTENSION

August 28, 2004

Planning for the Inevitable First Frost on Corn

Thanks to Mike Rankin, Fond du Lac County UW-Extension Crops and Soils Agent for the following.

Even the greatest of optimists would have to conclude that there's a lot of corn headed for a confrontation with the first fall frost. Over the next couple of months, much will be said and written about the effects of a fall frost on immature corn and soybeans. First and foremost, producers need to be realistic in their expectations of whether corn has a snowball's chance in you know where of making grain. Once the crop gets beyond the point where silage is an option, there is no turning back. The logical place to start is to define what it is that constitutes a killing frost for corn. After all, not all frosts are created equal and certainly there will be a wide variation in corn maturity when that first frost does occur.

Corn is killed when temperatures are near 32 degrees for a few hours, and when temperatures are near 28 degrees for a few minutes. Less damaging frost occurs when temperatures are around 32 degrees and conditions are optimum for rapid heat loss from the leaves to the atmosphere, i.e. clear skies, low humidity, and/or no wind. The stem on a corn plant is a temporary storage organ for material that eventually moves into the kernels. Grain yield will continue to increase about 7 to 20% after a light frost that only kills the leaves as long as the stem is not killed (see Table 1).

Table 1. Potential grain yield losses after frost

Corn Development stage	Killing frost (Leaves and stalk)	Light frost (Leaves only)
	percent yield loss	
R4 (Soft dough)	55	35
R5 (Dent)	40	25
R5.5 (50% kernel milk)	12	5
R6 (Black layer)	0	0

derived from Afuakwa and Crookston, 1984

Harvesting Immature Corn for Silage

Virtually all of the post-monsoon planted corn will be harvested for silage. What can we expect from the crop in terms of yield and quality? Let's begin to take a look...

Moisture

When dealing with frosted, immature corn, it's often difficult to gauge whole-plant moisture content. Frosted leaves can offer the appearance of a drier plant than what may actually be the case. Leaves comprise only about 10-15% of plant dry matter. However, the same rules apply with immature corn that apply with mature corn. Whole plant moisture is a critical factor that drives quality and storability. A three-year UW study at Marshfield indicates that immature whole-plant corn will be excessively high in moisture for direct ensiling without some dry-down (Table 2). As a "rule of thumb", corn will lose 1/2% per day in moisture from milk stage to black layer. There is no evidence of increased whole-plant drying rates following frost and prior to maturity. However, waiting for multiple frosts will result in lower forage quality. The optimum time to harvest then becomes a trade-off between moisture and quality. Immature corn often needs to be ensiled at a higher than desirable moisture content to maintain quality and uniform particle size.

Table 2. Influence of kernel maturity stage on whole-plant moisture , yield, and forage quality (Marshfield, 1988-90).[1]

	Whole Plant					
Kernel Maturity Stage	Moisture	Yield	CP	ADF	NDF	Digestibility
	%	ton/A	%	%	%	%
Soft Dough	76	5.4	10.3	27	53	77
Early Dent	73	5.6	9.9	24	48	79
1/2 Milk	66	6.3	9.2	23	45	80
3/4 Milk	63	6.4	8.9	24	47	80
No Milk	60	6.3	8.4	24	47	79

1/ Average of four hybrids

Forage Quality and Yield

The nutritional value of slightly immature corn made for silage is not dramatically different than for mature corn (Table 3). Yield increases while quality decreases from just before silking until corn reaches the dough stage. The concept to remember is that soluble carbohydrates are primarily in the stalk in immature corn rather than having been converted to starch in the kernel for "normal" corn. Either way, the animal will utilize the product. Farmer experience and research data both confirm that crude protein content will be higher in immature corn silage. Obviously, dry matter yields will be lower with the immature corn and final animal performance will weigh heavily on proper fermentation and freedom from molds in the silage.

Table 3. Corn silage yield and quality response to harvest date. Corn planted on May 11 (Arlington, WI)

Harvest Date	**Corn Stage**	**W.P. Moisture**	**D.M. Yield**	**C.P.**	**NDF**	**Milk/ Ton**	**Milk/ Acre**
		%	T/A	%	%	Lbs.	Lbs.
July 11	V11	92	1.1	18	49	1700	1900
July 21	V14	90	2.2	15	50	1700	3800
July 31	Silking	85	3.8	12	55	1300	5000
Aug 10	Blister	83	5.0	11	58	1100	5500
Aug 21	Milk	84	5.7	10	65	700	3700
Aug 30	Dough	82	6.4	10	60	1000	6500
Sept 10	Dent	76	8.0	9	51	1700	13400
Sept 21	50% Milk	75	8.6	9	48	1900	16300
Oct 5	20% Milk	66	8.2	8	43	2300	18800

- END -