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Optimizing Yield and Quality of Winter Cereal Grain Forages

Matt Akins
Department of Animal and Dairy Sciences
University of Wisconsin-Madison

Extension
UNIVERSITY OF WISCONSIN-MADISON

Outline

-Winter cereal grain forage management

-Yield and quality tradeoff

-Economics?

-Fall-grown oat forage

Cereal Grain Forages

- Provide soil cover after corn silage or soybeans
- Use of nutrients from fall-applied manure
- Opens up double-crop opportunity
- Potential high quality forage source

Cereal Forage Management

- Species: Winter rye or triticale prevalent
  -Rye generally matures earlier in spring; can be more winter hardy and tolerant of poor conditions
  -Triticale has wider harvest window; some issues with winter hardiness
- Fertility:

  40-60 lb N/acre for commercial sources applied in spring

  Up to 80 lb N/acre from manure

  -can establish crop then liquid manure in fall

Cereal Forage Management

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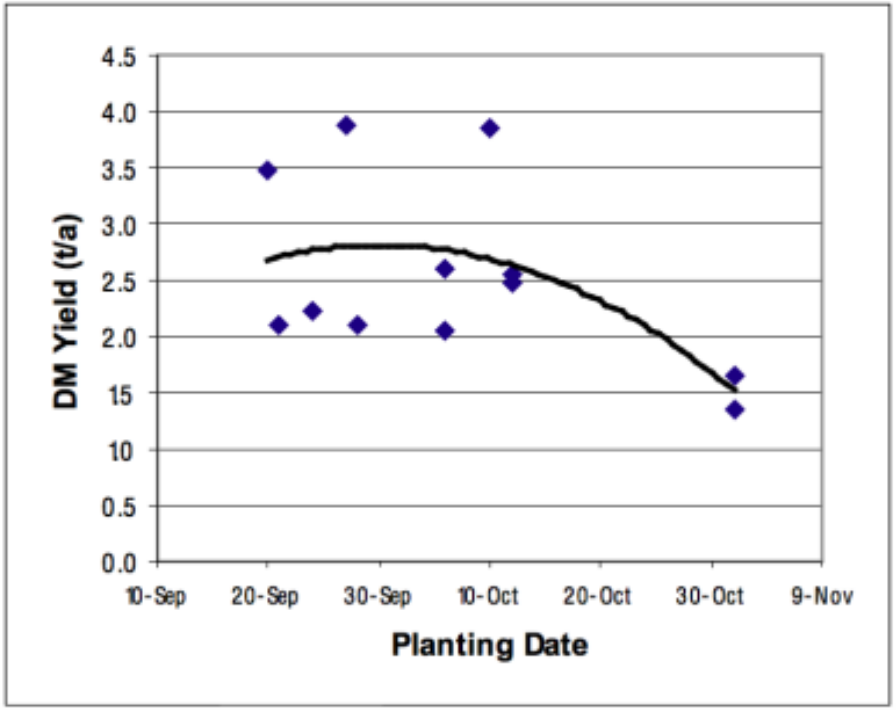
- Establishment:
  -90 to 112 lb (2 bushels)/acre at 1 -1.5" depth
  -Shallow seeding may result in poor winter survival

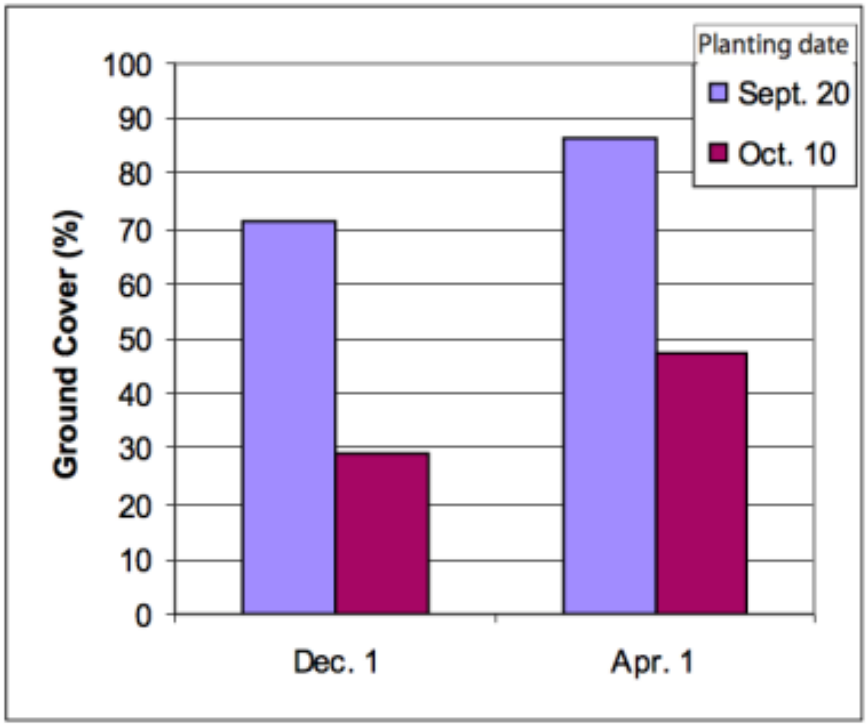
Fall planting date is important

*Must consider rotation interval for previous herbicides

Effect of planting date on rye forage yield.



Effect of planting date on soil cover.



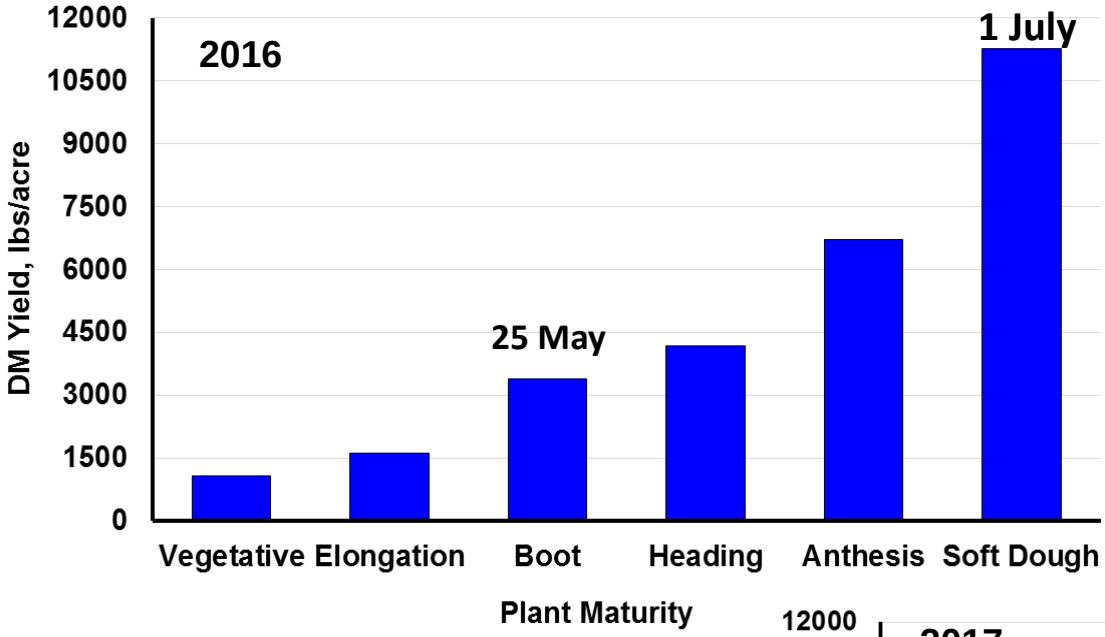
Winter Rye Forage Yields/Quality

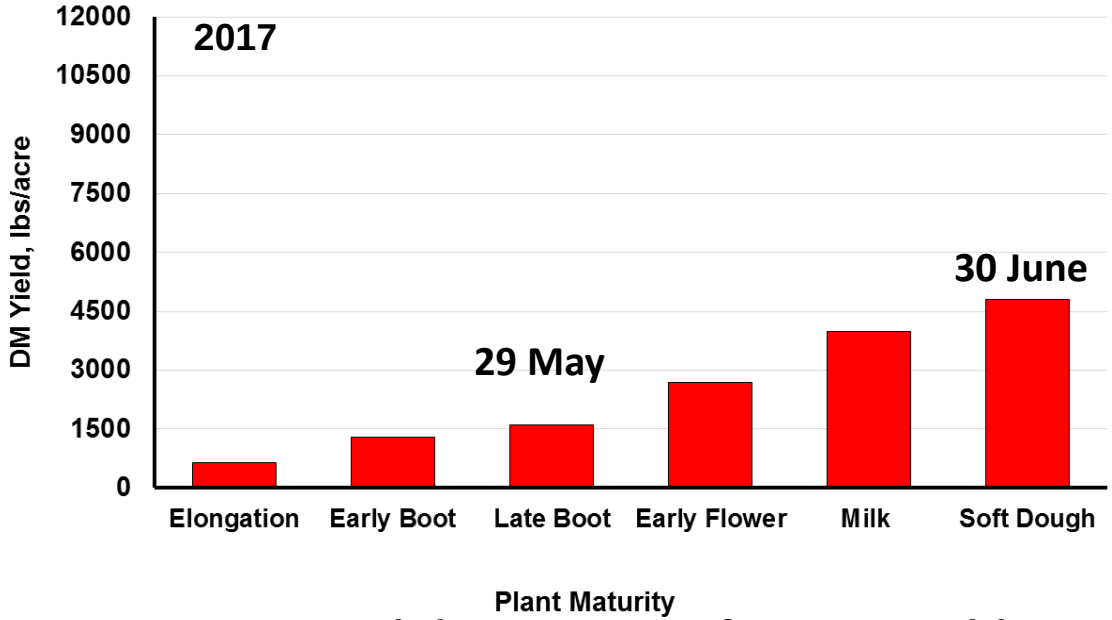
Table 1: Rye forage yield, quality and nutrients removed by harvest.

	Average	Range
Yield (ton/acre)	2.37	1.34–3.88
RFQ	180	149–205
CP (%)	16.2	13.3–19.0
ADF (%)	27.6	24.6–31.4
NDF (%)	52.2	47.2–56.7
P (%)	0.39	0.29–0.48
K (%)	3.05	2.10–4.37
Nutrient removal (lb/acre) dry matter basis, harvested at boot stage		
N	121	69–178
P_2O_5	42	29–71
K_2O	178	110–344

Data from 3 southern WI sites from 2004-2006 (Stute et al.)

WinterTriticale Forage – Central WI

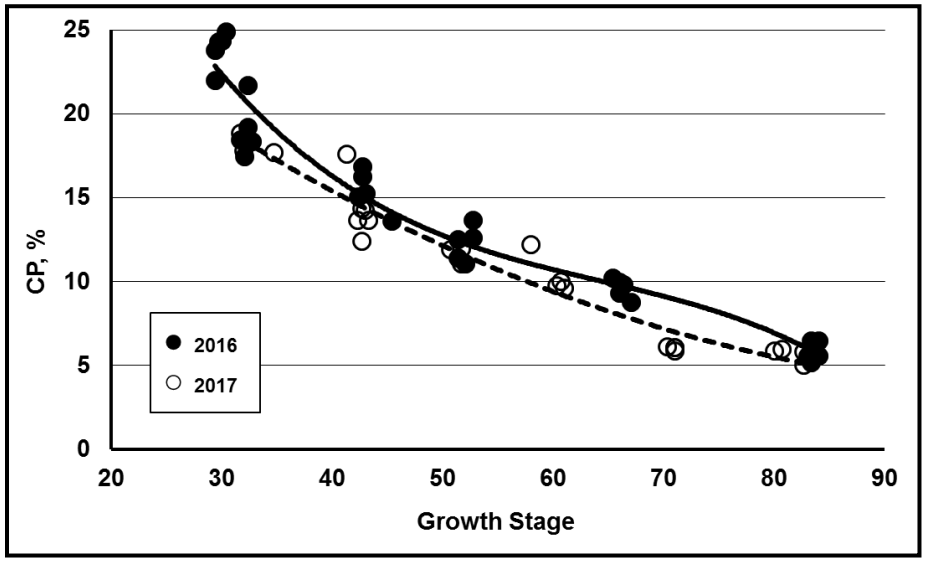


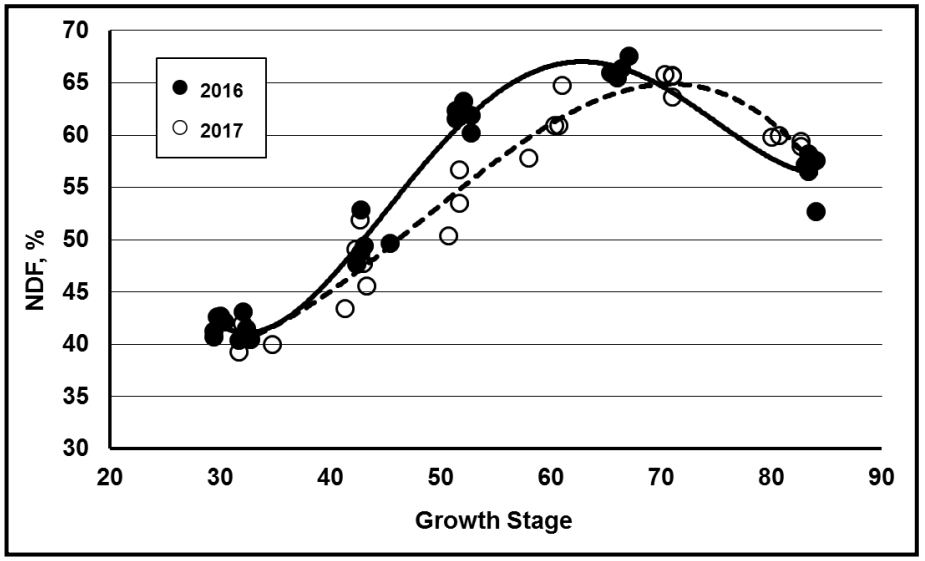


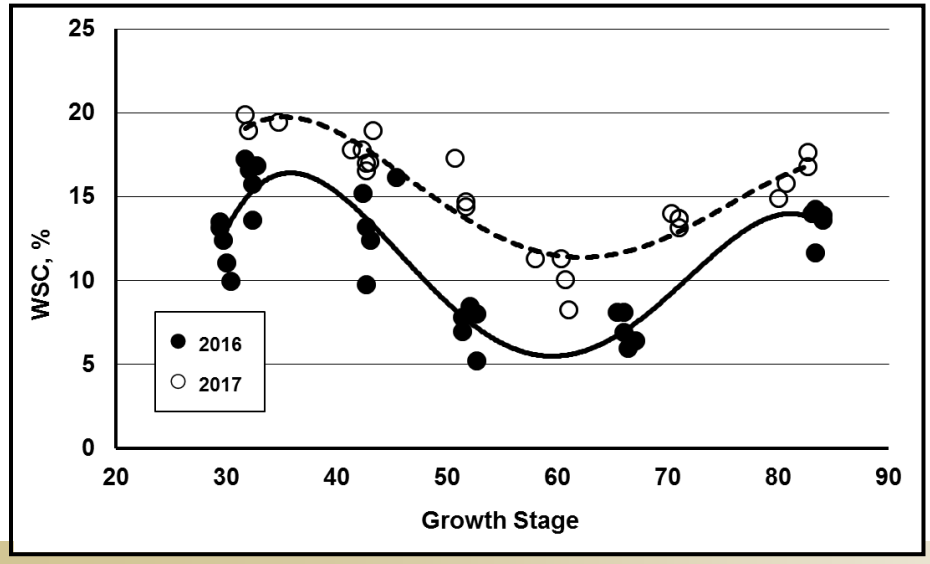
Slide courtesy of Wayne Coblentz

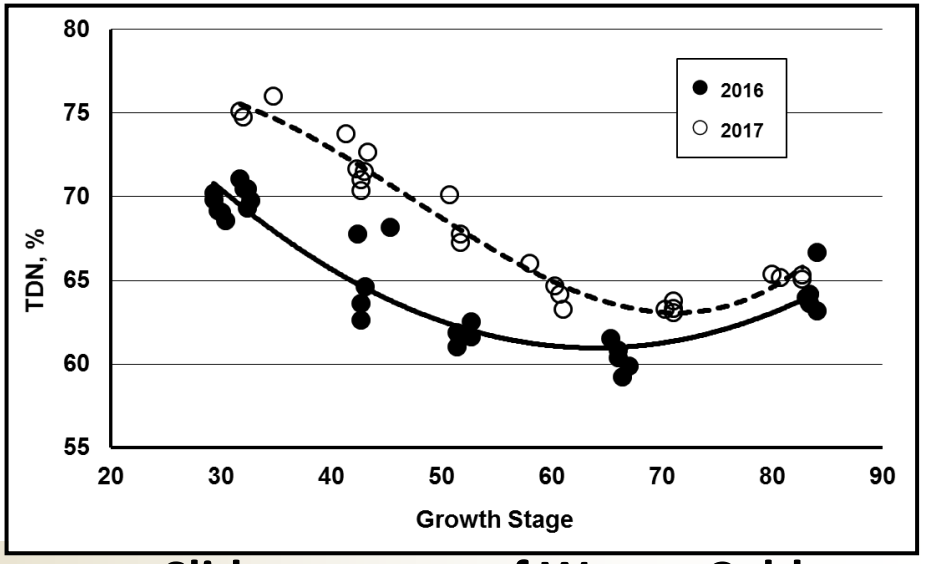
Effects of Growth Stage on Nutritive Value of Triticale

20-29 Tillering
30-39 Elongation
40-49 Boot
50-59 Heading
60-69 Flowering
70-79 Milk
80-89 Dough
90-99 Ripening



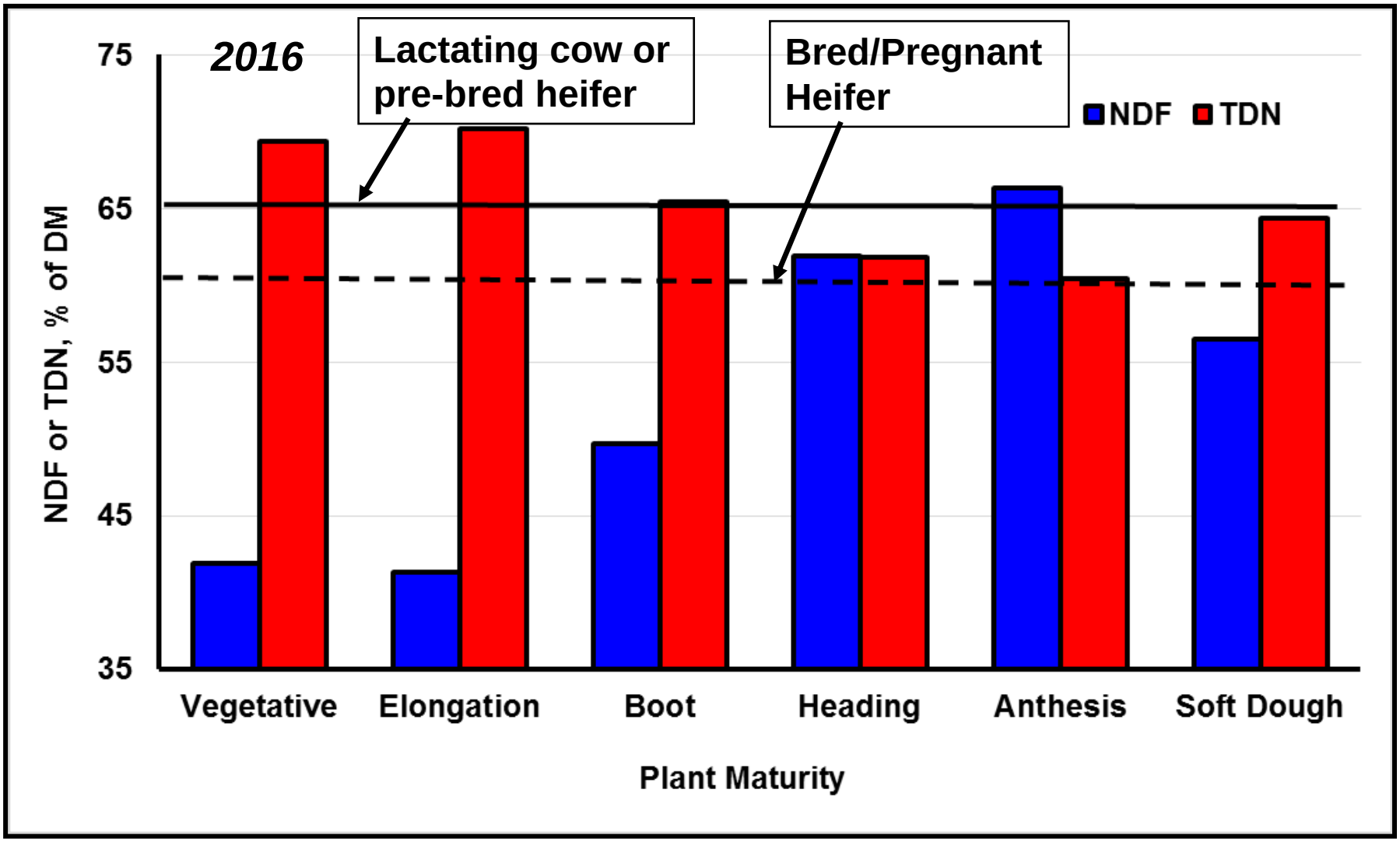




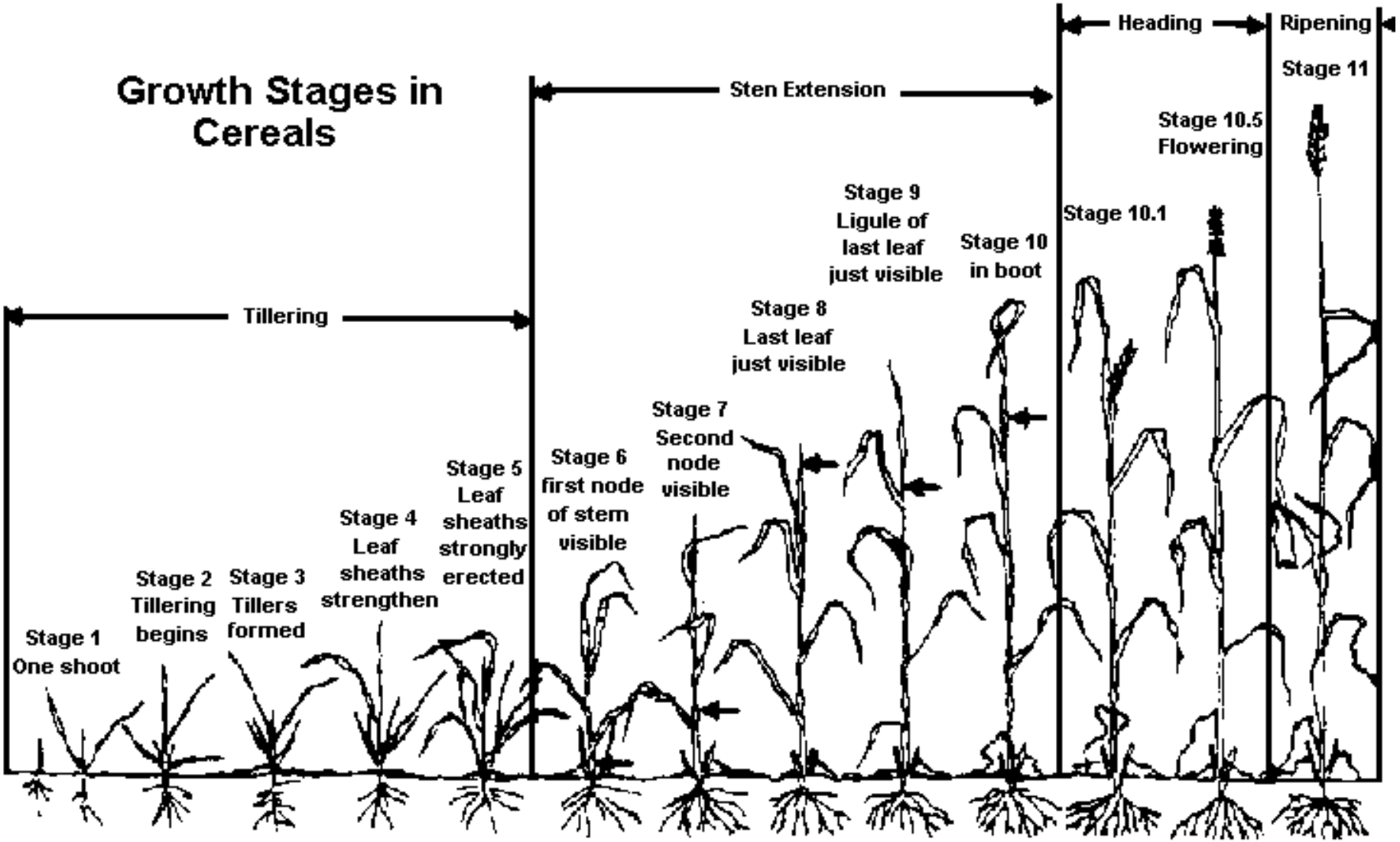


Slide courtesy of Wayne Coblentz

Effects of Growth Stage on Harvest Decisions



Courtesy of Wayne Coblentz



http://corn.agronomy.wisc.edu/Crops/Wheat/images/L007/feekes1.gif

Cover Crop Research Project in Brown and Dane County

	Rye (5 farms)	Triticale (3 farms)
Dry matter %	29.0% (22 – 45%)	28.3% (22 - 34%)
Protein, % DM	13.5% (10.5 – 17%)	13.7% (9.4 – 16.4%)
aNDF, % DM	62.5% (59 – 64%)	62.2% (57 – 69%)
NDFD 30hr (% of NDF)	62.1% (60 – 65%)	66% (60 – 70%)
uNDF 240hr (% of DM)	13.6% (11.5 – 15%)	12.2% (10 – 14.5%)
TDN, % DM	59.1% (55 – 62.5%)	61% (58 – 62.5%)
Milk/ton DM	2524 lb (2222 – 2733 lb)	2593 lb (2448 – 2700 lb)

Diet Inclusion Rates?

Lactating Cows

- Excellent source of digestible fiber at **boot stage**
- Up to 1/3 of the forage DM possible
- Partial or complete replacement of haylage source likely best option to maintain production
- Replacement of corn silage will likely lower production and be less economical

Lactating Cow Diets From Farms using Ryelage

	Farm 1	Farm 2
Ingredient % of diet DM		
Corn silage	21.5	22.4
Alfalfa silage	21.4	8.1
High Quality Ryelage	16.9	7.8
Corn/byproducts/minerals	41.2	62.7
Nutrition model estimates		
Energy allowable milk, lb/d	96	93
IOFC, $/day	9.08	9.97

Example Diet for Pregnant Heifer -18 months old; 1200 lbs; 150 days pregnant

Ingredient	% of diet DM	lbs DM	Cost/day
Triticale silage, heading ($100/ton DM)	80	19.2	$0.72
Corn silage ($110/ton DM	19.5	4.7	$0.26
Urea ($400/ton)	0.5	0.12	$0.02
	Total	24	$1.25
Nutrients			
CP%	13.2%		
NDF%	56%		
TDN%	62%		
Energy allowable gain	2.0 lb/day		

Cereal Forage Economics

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	CS w/o rye	CS w/ rye	Alfalfa (4 year avg)	Rye	Rye	Rye
Yield, tons DM/acre	7.4	6.7	5.0	1.0	2.0	3.0
Value ($/TDM)	$100	$100	$160	$160	$160	$160
Costs $/acre						
Seed/Planting	$144	$144	$17	$38	$38	$38
Nutrients (N,P,K,S), spreading, soil test	$157	$152	$159	$66	$98	$161
Pesticides/Spraying	$38	$38	$25	-	-	-
Interest	$27.60	$27.44	$17.12	$8.32	$10.88	$13.52
Harvest	$168	$152	$292.50	$110	$110	$110
Total Cost/acre	$540.60	$522.44	$523.67	$222.32	$256.88	$295.52
Cost/TDM	$73.05	$77.98	$104.73	$222.32	$128.44	$97.51

Calculated by Kevin Shelley, 2019 data

Fall-grown Oat Forage

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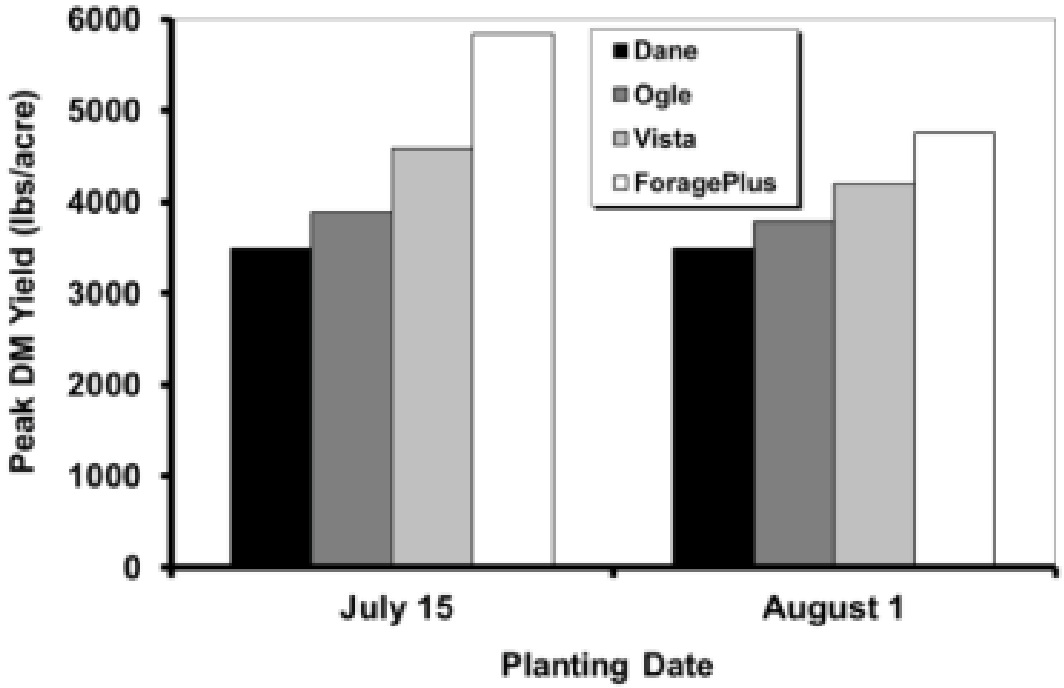
Establish in late July or early August (not recommended past Aug 15th)

3 bushels/acre (96 lb seed) with 40 lb N/acre

Variety selection depends on planting date

-Later maturing forage types if early planting (late July)

-Earlier maturing grain types if late planting (past 1st week of August)

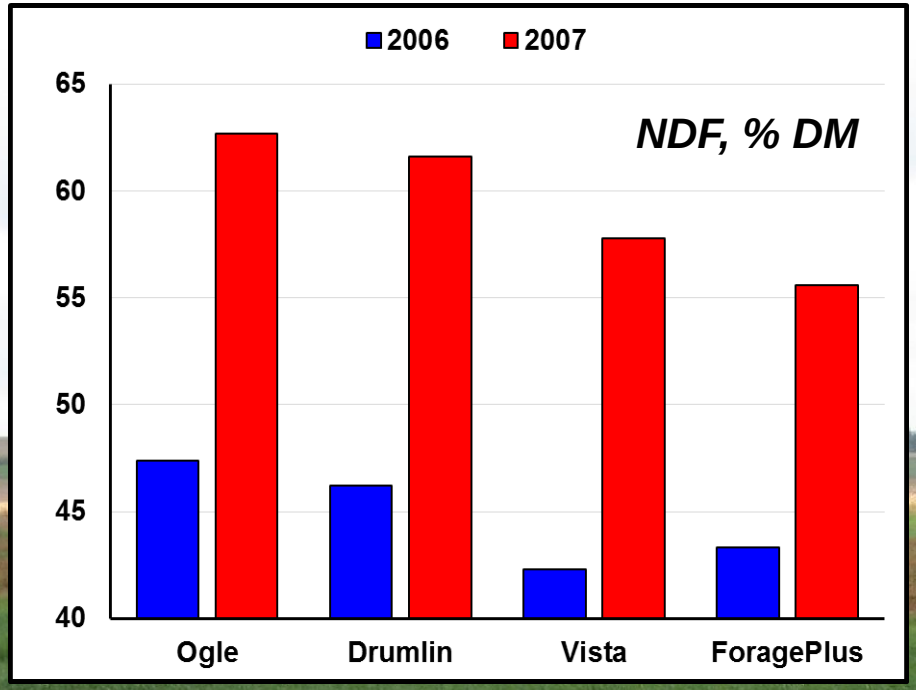


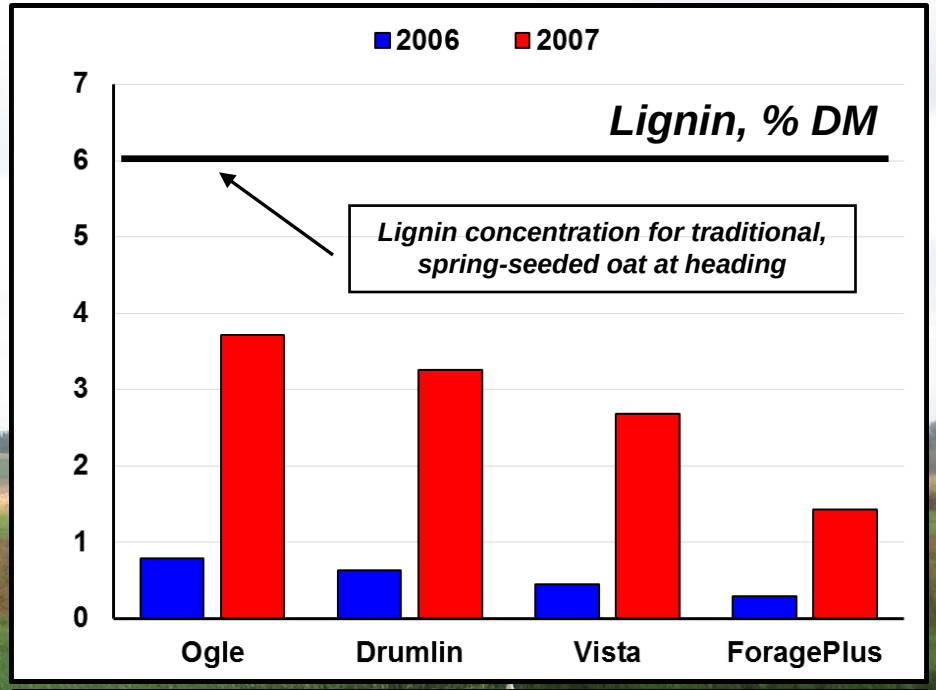
Coblentz et al., 2011

Fall-grown Oat Forage: Quality

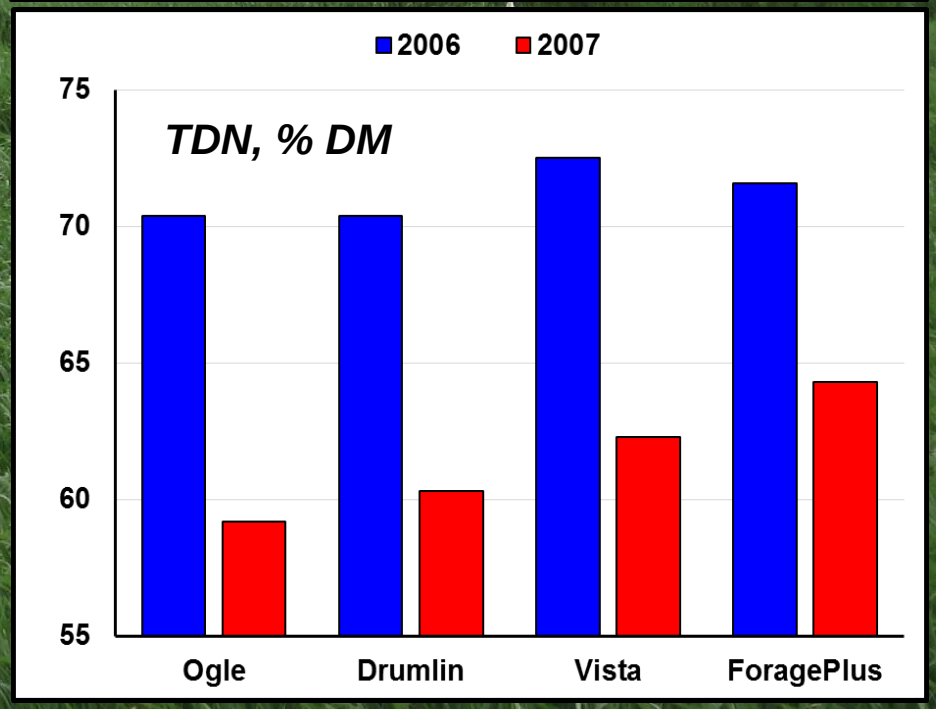
-Cool temperatures cause minimal lignin formation and high digestibility

-Also cool temps cause hardening and sugar accumulation





Variety	2006	2007
Ogle	Elongated (3.8)	Heading
Drumlin	Elongated (3.3)	Early heading
Vista	Elongated (3.3)	Late Boot
ForagePlus	Elongated (2.1)	Elongated



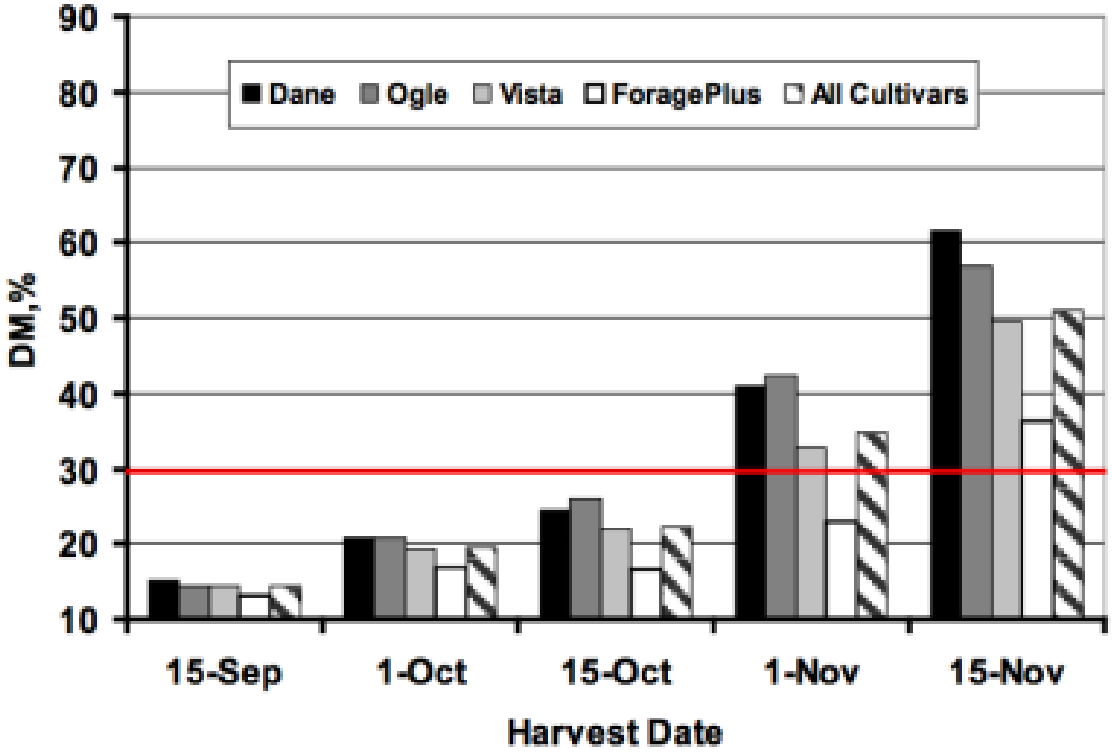
Coblentz and Walgenbach (2010)

Harvest?

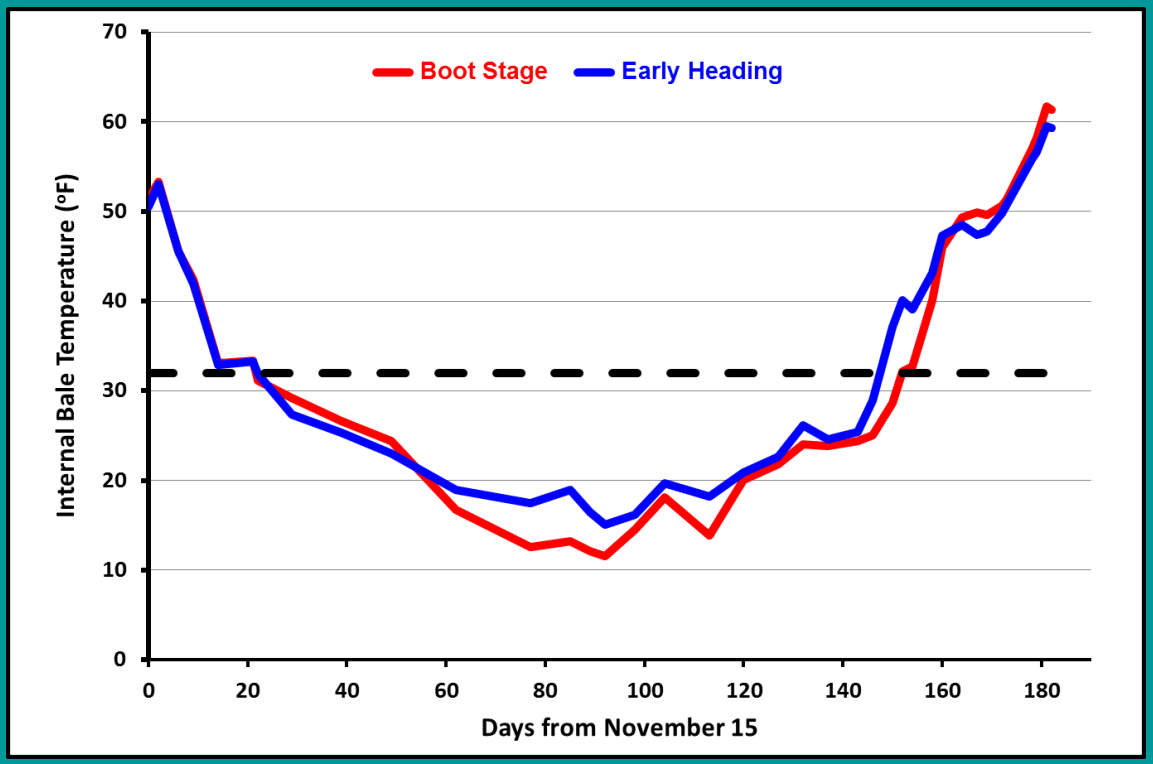
-Grazing is ideal in late fall

-Wilt/chop in Oct

-Possible to direct chop in November



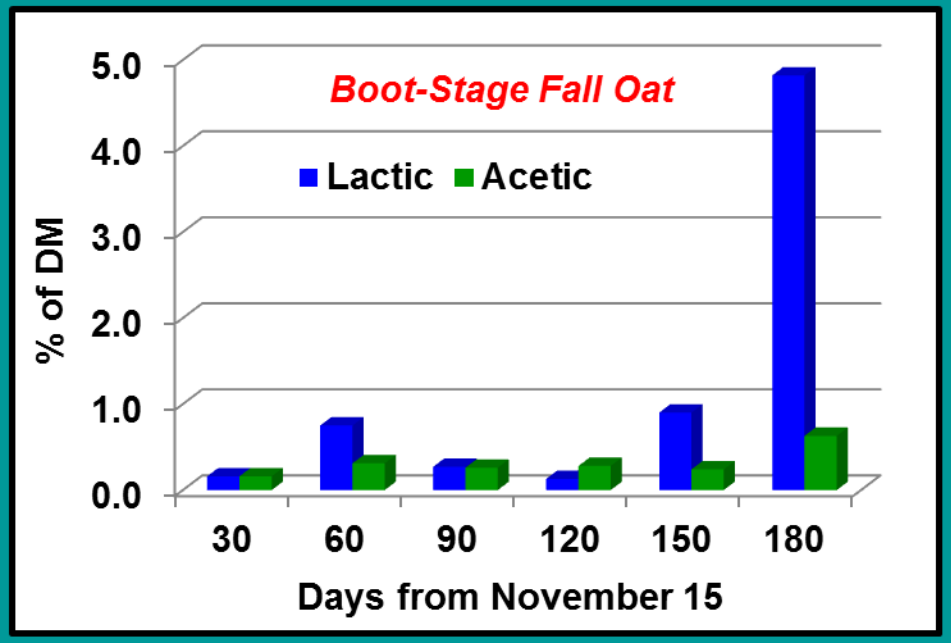
Data from Coblentz et al., 2011
Picture courtesy of Wayne Coblentz

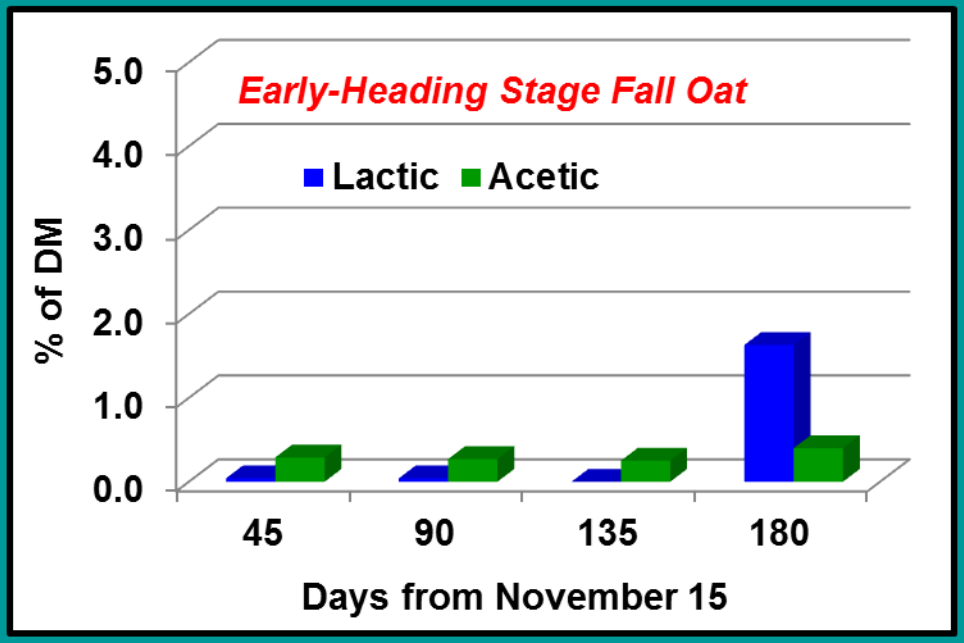


Be cautious about late Fall harvests

Effects of Cold Weather on Fermentation of Fall-Grown Oat

Coblentz et al. (2015)





Summary

Cereal grain forages can offer many benefits

-Early planting will maximize fall and spring growth

-Maturity is key to optimizing quality

-Next crop and animal needs dictate harvest timing

Resources at UW ICPM and Forage websites

Planting Winter Rye after Corn Silage:

Managing for Forage

Jim Stute, University of Wisconsin (UW) Extension, Rock County
Kevin Shelley, UW Nutrient and Pest Management Program
Dwight Mueller, UW Arlington Agricultural Research Station
Tim Wood, UW Lancaster Agricultural Research Station

Thank You!
Questions?

www.fyi.uwex.edu/heifermgmt
msakins@wisc.edu
715-384-9459