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Effects of chopping and maturity stage of whole-crop barley silage on feed intake, eating rate and chewing activity in dairy steers

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Background

- Whole-crop cereal silage is commonly made from big bales in Sweden.
- Material in bales is usually long or slightly cut
- Earlier study with young dairy steers showed a 20% higher DM intake in chopped whole-crop barley silage compared to long. (unpubl. data)

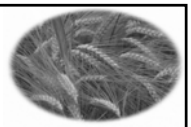
Objectives

Evaluate effects of
chopping and **maturity stage**
of whole-crop barley silage on

- Feed intake
- Eating rate
- Chewing activity

in growing dairy steers

Silages



- Whole-crop barley
- Harvested at heading and dough stage of maturity
- Prewilted at heading (18 h), not at dough stage
- Round baled in its long form
- Additives used
- Wrapped into 8 layers of plastic film
- Silages fed in its long form or precision chopped (18 mm theoretical length) before feeeding

Nutrient composition of long (L) and chopped (C) whole crop barley silage

	Heading		Dough stage		*P value*
	L	C	L	C	Maturity
DM, g kg^{-1}	372	360	416	416	0.006
Starch, g kg^{-1} DM	18	23	166	171	0.001
NDF, g kg^{-1} DM	499	507	484	496	NS
IVOMD*, g kg^{-1} OM	802	788	723	711	0.001

* *In vitro* organic matter digestibility after 96 hours incubation

Experimental design

- 8 Swedish Red dairy steers, 350 (+/-10) kg LW
- Whole crop barley silage
  - heading (H) and dough stage(D)
  - long (L) and chopped (C)
- Duplicated 4 X 4 Latin square
  - 4 three-week periods
  - 2 x 2 treatments : HL, HC, DL, DC

Feeds and feeding

- Whole crop barley silage fed *ad libitum* (15% residues)
- 0.6 kg of soy bean meal
- 100 g mineral feeds

In separate troughs

- Feeding twice a day

Feeding regime, collections and registrations

Day in an experimental period

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Ad libitum feeding																	Restrictive feeding			
Adaptation							Feed intake registration													
							Feeds and orts collected and composited					Feeds and orts collected and composited								
							Chewing activity Square 1					Chewing activity Square 2								E R*

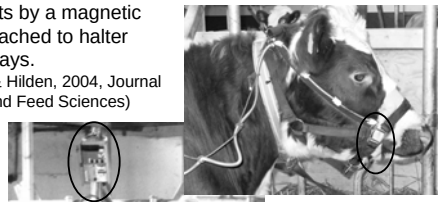
* Eating Rate

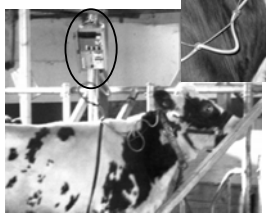
Eating rate

- Restrictive feeding, 85 % of *ad libitum intake*
- ¼ of daily allowance fed four times a day
- 20-minute eating time, any pauses registered
- Eating rate = $\frac{\text{Consumed feed (grams)}}{\text{Time spent eating (minutes)}}$

Chewing activity

Continuous recording of jaw movements by a magnetic sensor attached to halter during 4 days.
(Nørgaard & Hilden, 2004, Journal of Animal and Feed Sciences)





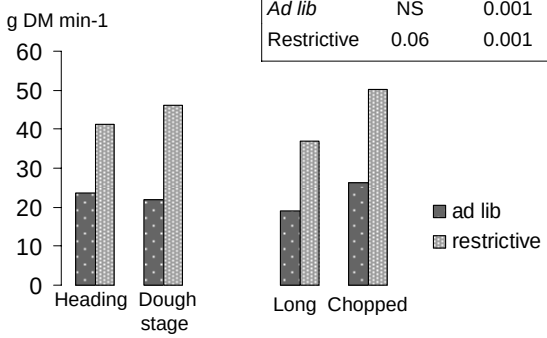
Ad libitum intake of long (L) and chopped (C) whole crop barley silage

	Heading		Dough stage		*P value*		
	L	C	L	C	M[1]	C[2]	M*C[3]
DM, kg day^{-1}	7.7^{ab}	7.5^{b}	7.4^{b}	7.9^{a}	NS	0.06	0.001
NDF, kg day^{-1}	3.8	3.8	3.5	3.7	0.01	0.03	0.06
DOM[4], kg day^{-1}	4.8	4.6	4.1	4.3	0.001	NS	0.03

[1]Maturity, [2]Chopping, [3]Interaction between maturity and chopping
[4]Digestible organic matter, DOM = OM*(IVOMD*0.926-8.269)*0.01

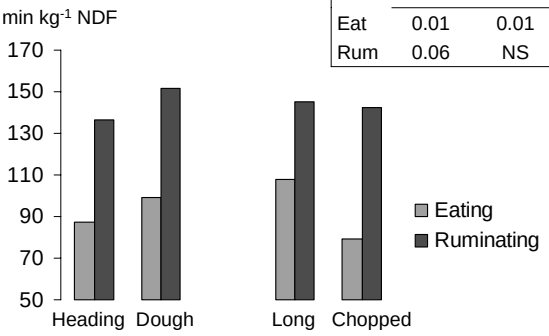
Eating rate

	P value	
	Maturity	Chopping
Ad lib	NS	0.001
Restrictive	0.06	0.001



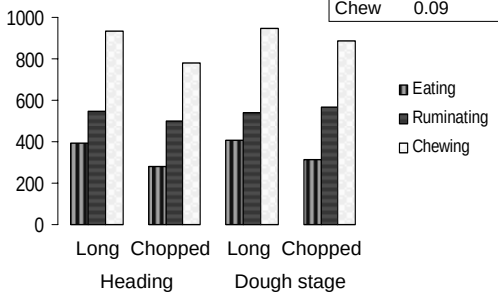
Eating and ruminating

	P value	
	Maturity	Chopping
Eat	0.01	0.01
Rum	0.06	NS



Time spent eating, ruminating and chewing

	P value	
	Maturity	Chopping
Eat	NS	0.001
Rum	NS	NS
Chew	0.09	0.01



Conclusions

- Chopping
  - increased intake of whole crop barley silage harvested at dough stage but not at heading
  - increased eating rate and decreased eating time.
  - did not affect ruminating time per kg NDF.
- Eating and ruminating time per kg NDF was shorter at heading than at dough stage

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THANK YOU!

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