Effect of maturity and conservation of grass/clover on digestibility and rumen pH in heifers

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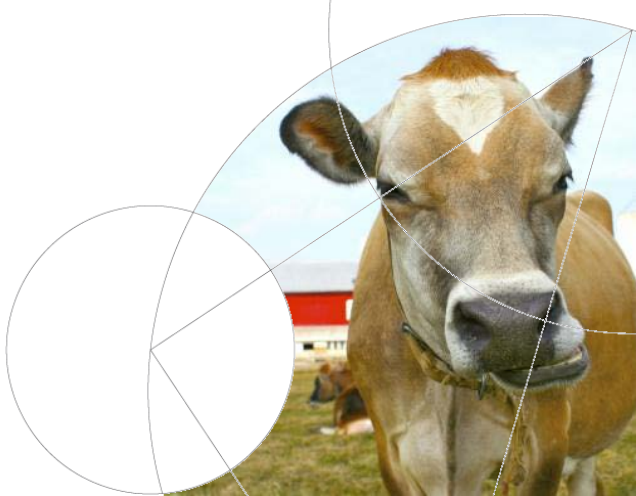



Grass and clover plant maturity
NDF content
iNDF/NDF
OM digestibility

What if high quality grass/clover forages are fed in vast amounts in feed rations for dairy cattle?

Rumen pH?
Digestibility?

Objective

To assess rumen pH development and apparent digestibility in heifers fed spring-harvest grass/clover forages

Hypothesis

Early maturity → less NDF
→ more pdNDF
→ fast $k_d$pdNDF

} higher OM digestibility
} low rumen pH

chemical composition
availability of OM for digestion
↓
digestibility and rumen pH

Forages and feeding

Grass/clover of primary growth

Early harvest (May 9, early veg. stage, 30% clover)
Late harvest (May 25, veg. stage, 46% clover)

Silage: Prewilted (40% DM), chopped (19mm), baled, and wrapped
Hay: prewilted in field (70% DM), barn dried, baled

Forages fed at 90% ad libitum level, no concentrate supplement

Forage nutrient composition

	Early harvest (May 9)		Late harvest (May 25)	
Composition	Silage	Hay	Silage	Hay
DM, %	45	84	25	83
CP, % of DM	19	17	16	13
NDF, % of DM	31	43	41	50
pdNDF, % of NDF	92	94	88	89
$k_d$pdNDF, %/h	10.2	8.8	4.2	6.1
Digestible OM, %	82	79	74	75

Experimental design

- Latin square design, 2x2 factorial arrangement of treatments
- 4 rumen fistulated heifers, 435±30 kg

Period / Heifer	1	2	3	4
1	Early silage	Early hay	Late silage	Late hay
2	Late silage	Early silage	Late hay	Early hay
3	Late hay	Late silage	Early hay	Early silage
4	Early hay	Late hay	Early silage	Late silage

Statistical analysis

- Analysis of variance
- Fixed effects of conservation method, time of harvest and experimental period
- Random effect of heifer

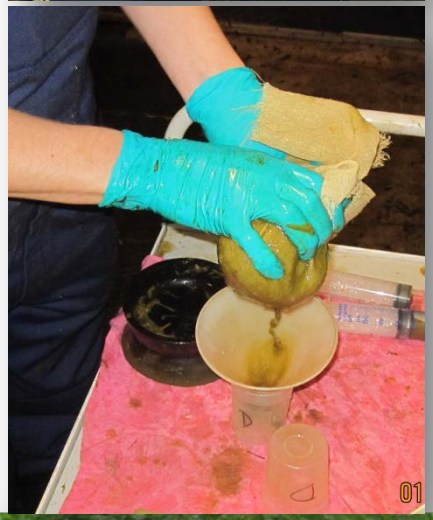
Apparent digestibility

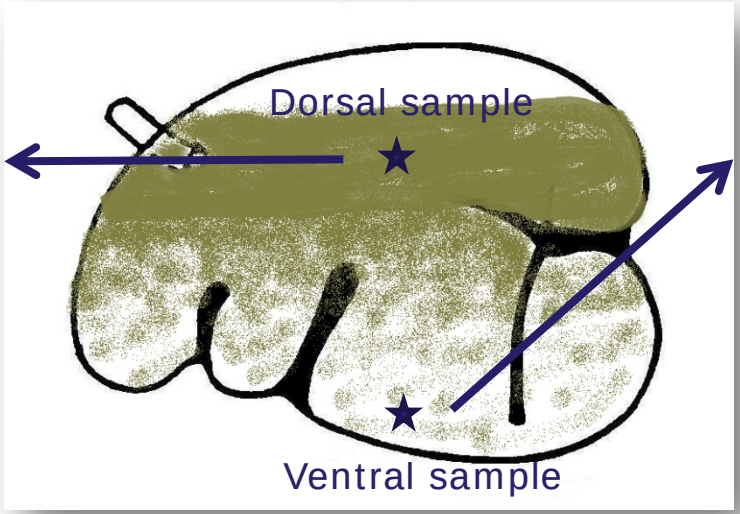
Marker technique

- 5 g Cr_2O_3 added through fistula before the two meals

- Feces collected rectally 3 times/day for 3 days
- Chromic oxide determined colorimetrically -> feces output
- Digestibility calculated from fecal output of nutrients relative to ingested nutrients

Rumen fluid sampling for pH measurement





- Sampling in 1 hour intervals
- from 7:30 to 15:30 (-0.5 and 7.5 h relative to feeding)
- Immediate measurement of pH

Results - Feed intake

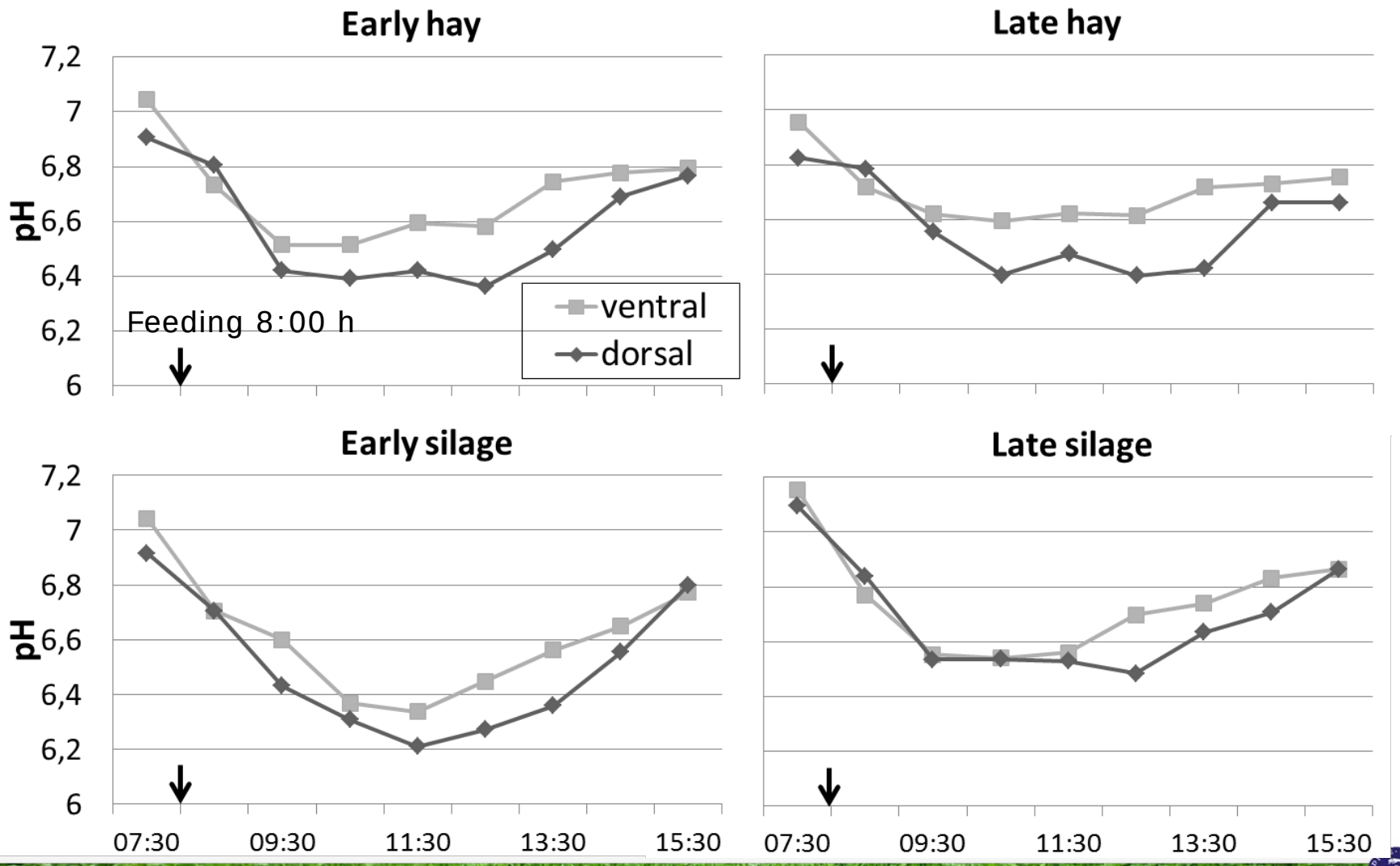
	Early harvest		Late harvest			*P*-value	
Intake	Silage	Hay	Silage	Hay	SEM	Harvest	Conservation
DM, kg	8.7	9.4	7.2	7.2	0.6	<0.001	NS
NDF, kg	2.7	4.1	3.0	3.6	0.3	NS	<0.001

Results – Apparent digestibility

	Early harvest (May 9)		Late harvest (May 25)		P-values		
Digestibility, %	Silage	Hay	Silage	Hay	H	C	H × C
OM	83	82	79	78	<0.001	0.013	NS
NDF	87	88	80	80	<0.001	NS	NS
pdNDF	94	95	90	90	0.008	NS	NS

Digestible OM, % (Tilley & Terry)	82	79	74	75

Results – rumen pH



Results – rumen pH

	Early harvest (May 9)		Late harvest (May 25)		P-values		
Variable	Silage	Hay	Silage	Hay	H	C	H × C
Min. dorsal pH	6.18	6.14	6.46	6.48	<0.001	NS	NS
Min. ventral pH	6.34	6.42	6.46	6.58	0.045	NS	NS
Mean rumen pH	6.56	6.75	6.71	6.75	0.001	NS	NS

Summary of results

Grass and clover plant maturity ↓ →

- ↑ OM, NDF and pdNDF digestibility
- ↓ rumen pH (never below 5.9)

Silage compared with hay →

- ↓ NDF content (DM loss)
- ↑ OM digestibility
- No effect on rumen pH

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Co-authors and supervisors

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Thank you for listening

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