Effects of feeding cows with sugarbeet pulp silage and compound feed with urea supplementation on milk production and quality

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Problem

- Food industry development results in increasing amounts of by-products. Some of them have a certain feeding value. Rational use of these products might increase feed resources, lower the utilization costs and, consequently, reduce environment pollution.

Fact

- There are in Lithuania two sugarbeet factories, in which in 2008 were processed about 339.1 thous t. of sugarbeet.
- After processing 1000 kg sugarbeet produce about 540 kg of sugarbeet pulp with approximately 13 % dry matter (DM) content (Jeroch et al., 1999).
- For more effective feeding of animals, the DM content is increased to about 22 % by pressing the pulp.
- Does it mean that both sugarbeet factories accumulate about 108.5 thous t. of sugarbeet pulp with approximately 22 % DM content.

Theoretics

- Sugarbeet pulp (fresh and ensiled) is eaten willingly by cattle.
- Sugarbeet pulp silage in the diets of lactating cows could constitute up to 30 % of the allowance on DM basis (Hemingway et al. 1986; Jeroch et al. 1999).
- Inclusion of sugarbeet pulp silage in the diets of cows allows to reduce the level of compound feeds.
- The protein content of sugarbeet pulp is low and amounts to on the average 117.8 – 124.9 g/kg DM.
- Diets containing higher amounts of sugarbeet pulp silage should be supplemented with protein rich compound feeds. Consequently, more expensive protein materials – oil meals, cakes, etc. – should be used in the production of compound feeds.

Theoretics

- Alongside with natural plants, nitrogenous non-protein materials such as urea may be used to increase the protein content of compound feeds for cattle. The nitrogen from these materials is used for the synthesis of microbial protein in the rumen.
- Urea or other nitrogenous non-protein matter may constitute as equivalent by nitrogen up to 3 % of crude protein content in the compound feeds for cows (Weinreich et al. 1992).

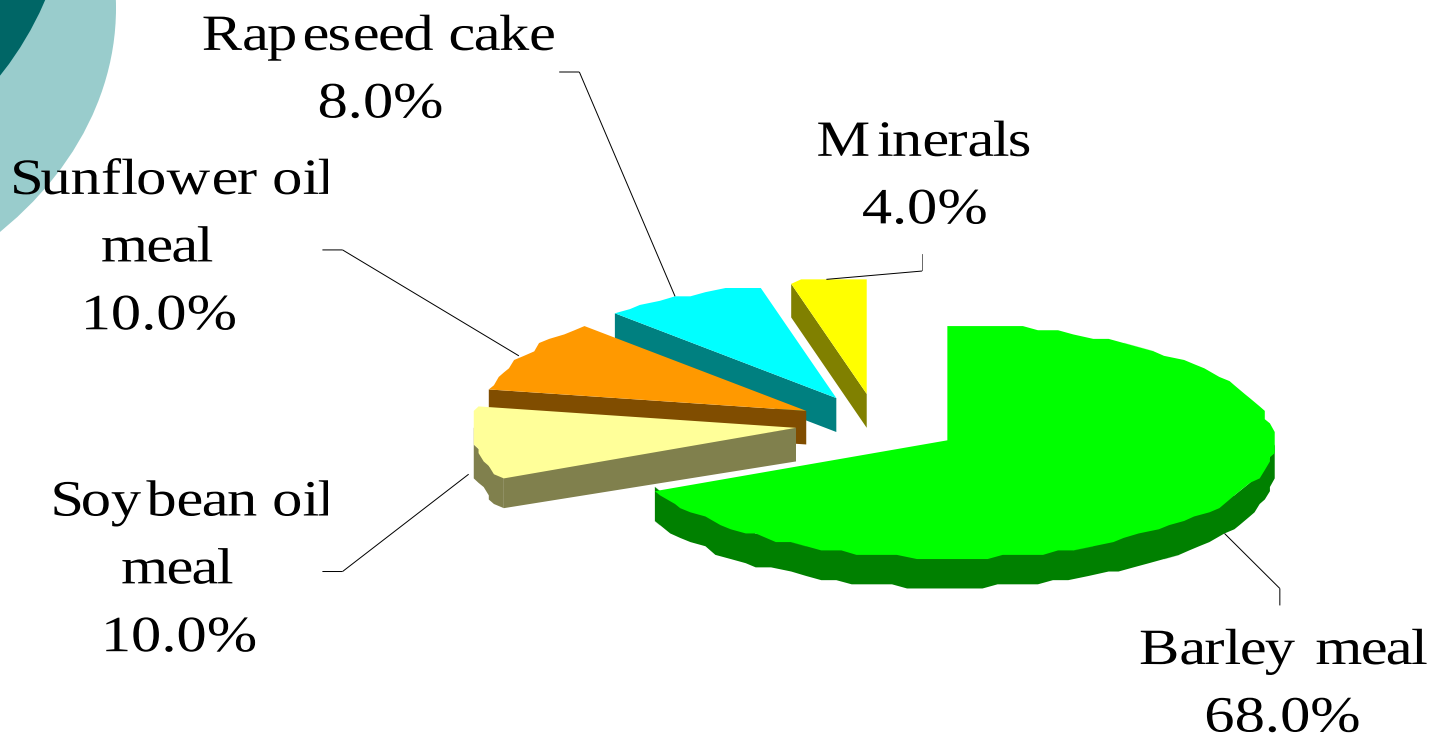
Aim of this study

- This study was designed to investigate the effects of sugarbeet pulp silage and urea containing compound feed on the digestion processes in the rumen of cows, milk production and quality.

Feeding trial design

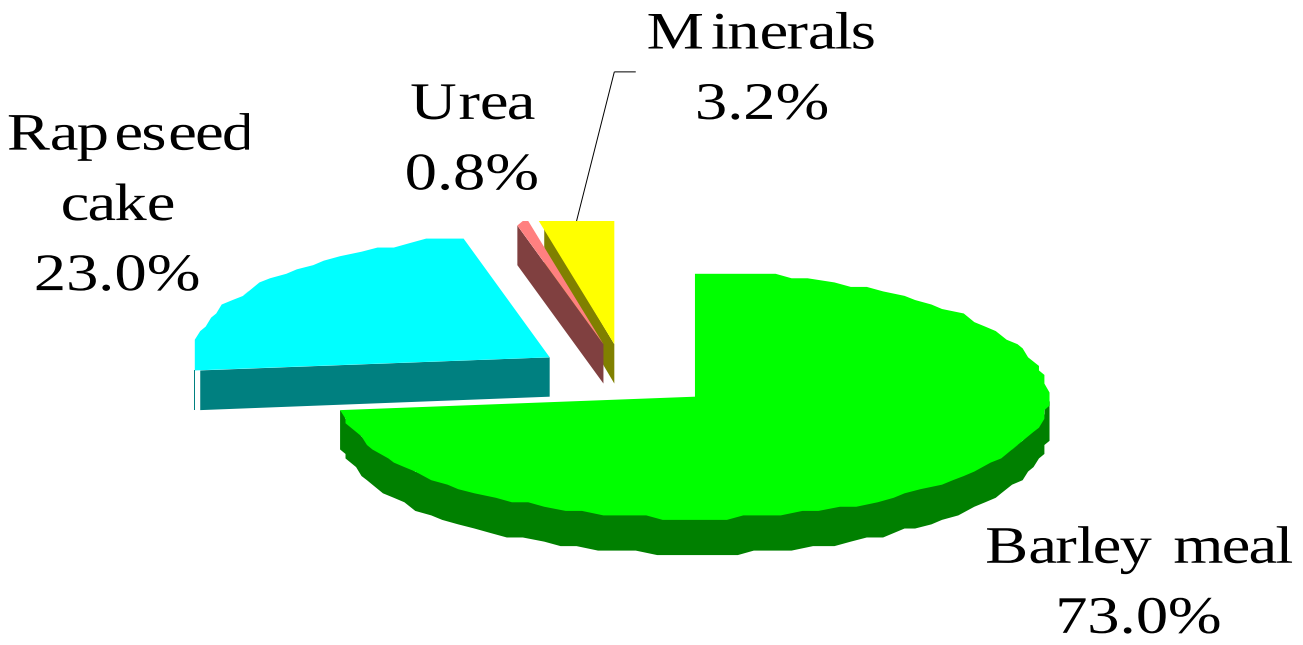
- The feeding trial was carried out with Lithuanian Black- and –White cows. Two groups of cows analogous by age, milk production in the previous lactation, calving time and milk production at the time of group formation of 6 newly calved cows each were used in the trial. The average productivity of the cows in the previous lactation was approx. 5000 kg 4.30 % fat and 3.30 % protein content milk.
- The trial consisted of two – pre-experimental (20 days) and experimental (72 days) – periods. During the experimental period both groups of cows received the same sugarbeet pulp silage based diets. The control group of cows were fed compound feed No.1 and the experimental group received compound feed No.2.
- The animals in both groups were healthy and had the same housing conditions. The cows were tethered, automatically watered and milked twice daily.

Composition of control (No.1) compound feed



12.51 MJ ME/kg DM, 214.9 g CP/kg DM

Composition of experimental (No.2) compound feed

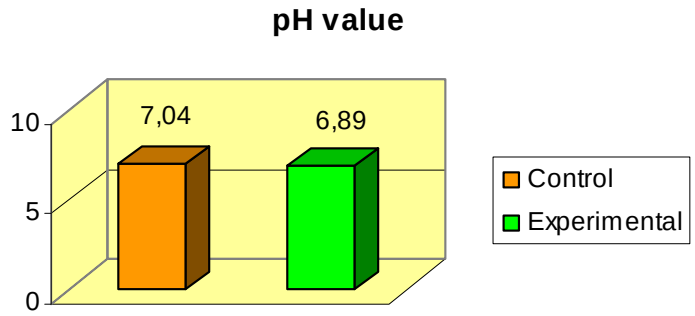


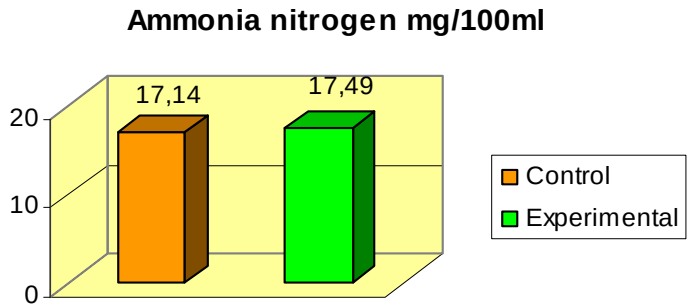
12.24 MJ ME/kg DM, 231.0 g CP/kg DM

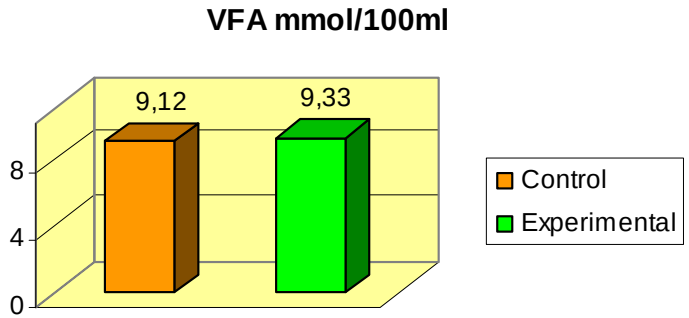
Average composition of dairy cow diets on as-fed basis

Feedstuff	Group of cows	
	Control	Experimental
Hay (kg)	2.0	2.0
Perennial grass silage (kg)	20.6	21.0
Sugarbeet pulp silage (kg)	25.0	25.0
Compound feed No.1 (kg)	7.5	-
Compound feed No.2 (kg)	-	7.5
Analytical data (intake from feeds):		
Dry matter (kg)	18.57	18.54
Metabolizable energy (MJ)	203.73	201.33
Crude protein (g)	2803.0	2778.0
Crude fiber (g)	4441	4471
Calcium (g)	185	154
Phosphorus (g)	77	86

Indicators of the rumen contents during experimental period







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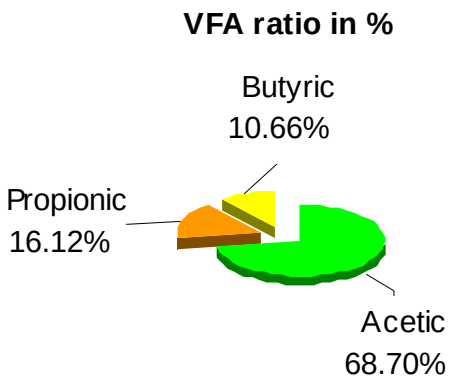
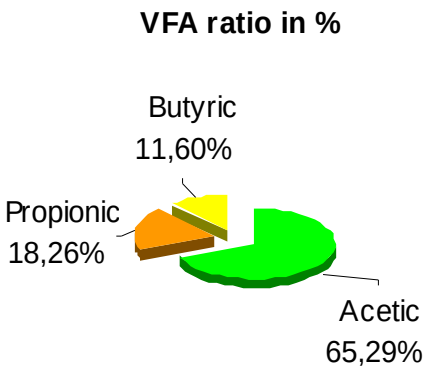


Control group



Experimental group

Milk production of cows

Group	Period		In comparison with the pre-experimental period ±
	During the pre-experimental period *x* ± *SEM*	During the treatment *x* ± *SEM*	
Whole milk (kg per day)			
Control	21.65±1.21	25.49±2.86	+3.84
Experimental	21.58±2.22	26.69±4.00	+5.11
4% Fat corrected milk (kg per day)			
Control	18.93±0.33	24.54±2.81	+5.61
Experimental	19.83±2.23	25.09±3.67	+5.26

Milk quality

Item	Group	During pre-experimental period *x±SEM*	During the treatment *x±SEM*
Dry matter (%)	C*	11.54±0.30	12.62±0.61
	E	11.96±0.52	12.57±0.71
Fat (%)	C	3.17±0.25	3.76±0.45
	E	3.46±0.30	3.62±0.48
Protein (%)	C	2.89±0.21	3.10±0.21
	E	3.04±0.37	3.08±0.20
Including			
Casein (%)	C	2.44±0.24	2.60±0.18
	E	2.54±0.36	2.57±0.21
Soluble protein (%)	C	0.45±0.08	0.50±0.09
	E	0.50±0.04	0.51±0.11

* C – Control group; E – Experimental group; ** $p<0.05$.

Milk quality

Lactose (%)	C	4.73±0.17	4.82±0.14
	E	4.74±0.10	4.94±0.18 **
Ash (%)	C	0.74±0.13	0.74±0.04
	E	0.71±0.01	0.73±0.02
Calcium (%)	C	0.098±0.004	0.099 ±0.005
	E	0.093±0.061	0.096±0.005
Phosphorus (%)	C	0.088±0.014	0.089±0.013
	E	0.085±0.017	0.088±0.011
Urea (mg/100mL)	C	16.07±4.07	15.56±3.27
	E	14.25±0.92	16.33±5.11
Acidity (°T)	C	14.37±1.87	16.92±1.05
	E	15.50±1.51	17.07±1.16
Coagulation time (minutes)	C	47.5± 13.8	24.9±6.4
	E	30.2±6.49 **	22.6±7.6

* C – Control group; E – Experimental group; ** $p<0.05$.

Milk fat composition

Item		Group	During pre-experimental period *x*±*SEM*	During the treatment *x*±*SEM*
Saturated fatty acids (%)		C*	71.95±3.96	79.42±0.40
		E	70.13±2.86	73.18±0.99 **
Including				
	Volatile	C	6.77±1.12	7.72±1.14
		E	7.01±0.60	7.05±0.51
	Non volatile	C	65.18±5.09	71.70±1.08
		E	63.12±2.26	66.13±0.62 **

* C – Control group; E – Experimental group; **p < 0.05

Milk fat composition

Unsaturated fatty acids (%)	C	28.05±3.96	20.57±0.40
	E	29.87±2.86	26.82±0.99 **
Including			
Monounsaturated	C	26.01±3.92	18.41±2.84
	E	27.69±0.29	24.47±0.91 **
Polyunsaturated	C	2.04±0.04	2.17±0.18
	E	2.18±0.02	2.35±0.12
Saturated and unsaturated acid ratio	C	2.60±0.51	3.86±0.09
	E	2.36±0.32	2.73±0.14 **

* C – Control group; E – Experimental group; **p < 0.05

Economics

- The price of feeds for the average experimental diet was 23.2 % lower than that of control diet and, therefore, the expenses for production of 1 kg 4 % fat corrected milk were 21.8 % lower because the compound feed in the diet of experimental cows was cheaper due to soybean and sunflower oil meals replacement with cheaper local rapeseed cake and usage of urea.

- Thank you for your attention.

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