Short paper and poster abstracts: 38th Congress of the South African Society of Animal Science

The effect of adding a lactic acid bacterial inoculant to maize at ensiling on milk production and milk composition of Jersey cows.

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Introduction

Maize (*Zea mays*) is the most popular cereal crop conserved as silage in many parts of the world. It is regarded as an ideal silage crop with a relatively high dry matter (DM) content, low buffering capacity and adequate water soluble carbohydrates for fermentation to lactic acid. Very little information is available on the epiphytic microflora of forage crops in South Africa. Insufficient numbers of viable homofermentative lactic acid bacteria on a crop at harvesting could result in a delay in the drop of pH of plant material during ensiling, higher loss of nutrients and silage with a poor intake (Woolford, 1984). The adding of homofermentative lactic acid bacteria to a crop at ensiling will ensure that sufficient viable lactic acid bacteria are present (Woolford, 1984). Although problems with the ensiling of maize are seldom encountered in South Africa, the adding of inoculants might improve the silage quality. The aim of this study was to determine the effect of adding a lactic acid bacterial inoculant to maize at ensiling on the intake and milk production of Jersey cows fed maize silage diets.

Material and methods

Four hectares of maize (PAN 6364) were planted on the 10 December 1997 at the Outeniqua Experimental Farm (30° 58' S, 22° 25' E, altitude 210m). The maize was harvested at the half to three-quarter milk line at a dry matter content of 30% on the 18th of March 1998. The maize was ensiled with or without the addition of a lactic acid bacterial (LAB) inoculant (Maize-all; Alltech Biotechnology Pty Ltd). The inoculant was applied on the silage chopper with an applicator to provide 10^6 colony forming units (CFU) of lactic acid bacteria per gram of fresh material. One bunker of 4m x 1.2m x 25m was filled with control and one bunker with inoculated silage within a period of four days (2 days/bunker). After eight months of ensiling, the silage was fed to Jersey cows. Aerobic stability of silage after removal from the bunker was determined every two weeks during the feed-out period by monitoring temperature changes in the silage. Twenty-two multiparous cows were blocked in pairs according to milk production (previous 4 weeks), days in milk, lactation number, live weight and condition score. Within each pair, cows were randomly allocated to control or inoculated silage treatment. The control and inoculated maize silage was fed to the two groups of cows for two periods of 30 days in a two by two latin square design. Each period consisted of a 10 day adaption period and 21 day measurement period. Milk production was recorded daily and milk composition weekly. A composite sample of afternoon and morning milk was taken for determination of protein, butterfat, lactose and milk urea nitrogen. Live weight and condition score of cows was determined on day 0, 30 and 60 of the experimental period. Samples of control silage, inoculated maize silage and concentrates were taken on Mondays, Wednesdays and Fridays and were frozen at -4°C. Samples were pooled for each 7 days of the experimental period, resulting in three composite samples of control silage, inoculated silage and concentrate for each period. Cows were milked two times per day at 05h00 and 15h00, and 3kg of concentrate was fed after each milking. The concentrate consisted of 34.2% maize, 15% wheat, 5% molasses meal, 6% fishmeal, 5% wheat bran, 12% cottonseed, 18% cottonseed oilcake, 2% feed lime, 0.5% dicalcium phosphate, 1% salt, 1% urea, 0.3% mineral premix on a dry matter basis. The concentrate was formulated to contain 23.3% crude protein, 12 MJ ME/kg, 1.1% Ca and 0.65% P on a dry matter basis. Silage was fed individually to cows at *ad lib* plus 10%. Dry matter intake of silage was determined on a daily basis. Silage was fed from 8h00 to 12h00 and from 16h30 to 20h30. Cows were in a rest camp with access to water only from 12h00 to 15h30 and from 20h30 to 07h00.

Results and discussion

The intake, milk production and milk composition of Jersey cows fed maize silage diets is given in Table 1. The milk production, fat corrected milk production and milk composition did not differ significantly between the control and inoculated silage diets. The intake of inoculated silage was significantly ($P < 0.05$) higher than that of the control silage. The intake of silage for the group of cows fed the inoculated silage in period 1 was 8.68 kg

DM/day, and this decreased to 7.49 kg DM/day during period two when control silage was fed. This decrease of 1.19 kg in silage intake coincided with a drop of 0.8 kg in milk production for group 1.

Table 1 Intake, milk production and milk composition of Jersey cows fed control or inoculated maize silage diets**.**

	Control	Inoculant	P	SEM*
Period 1	**Group1**	**Group 2**		
Milk production (kg/day)	16.0	16.4	0.69	0.70
Fat corrected milk production (kg/day)	17.8	17.9	0.94	0.60
Butterfat %	4.79	4.64	0.58	0.18
Protein %	3.55	3.50	0.37	0.03
Dry matter intake (kg/day)				
Silage	7.88	8.68	0.12	0.35
Total	13.33	14.13		
Period 2	**Group 2**	**Group 1**		
Milk production (kg/day)	15.6	16.0	0.64	0.71
Fat corrected milk production (kg/day)	17.2	17.8	0.50	0.60
Butterfat %	4.75	4.80	0.81	0.17
Protein %	3.49	3.58	0.12	0.04
Dry matter intake (kg/day)				
Silage	7.49	8.55	0.01	0.27
Total	12.95	14.01		

*SEM = Standard error of mean

The liveweight and condition score of cows is given in Table 2. During period two the higher intake of inoculated silage compared to control silage may explain the liveweight increase of 7 kg for the inoculated maize silage group compared to the liveweight loss of 1 kg on the control maize silage group.

Table 2 Liveweight and condition score of cows fed control or inoculated maize silage diets

	PERIOD 1 (Control)			**PERIOD 2 (Inoculant)**		
GROUP 1	**Start**		**End**	**Start**		**End**
Liveweight (kg)	355		368	368		375
		(+13)			**(+7)**	
Condition score	2.1		2.3	2.3		2.5
		(+0.2)			**(+0.2)**	
	PERIOD 1 (Inoculant)			**PERIOD 2 (Control)**		
GROUP 2	**Start**		**End**	**Start**		**End**
Liveweight (kg)	329		341	341		340
		(+12)			**(-1)**	
Condition score	2.0		2.1	2.1		2.2
		(+0.1)			**(+0.1)**	

Conclusions

The adding of a lactic acid bacterial inoculant to maize silage resulted in a significantly ($P < 0.05$) higher silage intake by Jersey cows but milk production and milk composition were not significantly affected.

Reference

Woolford, M. K., 1984. The Silage Fermentation. Marcel Dekker Inc., New York. pp. 18.