The effect of supplementing maize silage to Jersey cows on kikuyu pasture

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Introduction

During the past five years the winter rainfall has reduced while the summer rainfall has increased in the southern Cape. More farmers are planting maize as a silage crop during summer as they cannot rely on growth of ryegrass during winter on dry lands. Very limited data is available on the effect of supplementing maize silage to cows grazing on kikuyu under irrigation. The objective of the study was to determine the effect of feeding different levels of maize silage to Jersey cows grazing kikuyu pasture on: Milk production, milk composition, liveweight change, body condition score and rumen pH.

Materials and methods

Maize silage made during 2003 was supplemented at 0, 14 and 28% of total intake to Jersey cows grazing kikuyu pasture as indicated in Table 1. The study was done during March and April 2005.

Sixty cows were randomly allocated to the three treatments (20 cows per treatment). Groups were balanced for milk production four weeks prior to the start of the study, days in milk and lactation number. The average daily milk production of cows four weeks prior to the start of the study, days in milk and lactation number was 16.1 ± 1.67 kg, 16.1 ± 1.64 kg and 16.1 ± 1.67 kg; 89 ± 56.8 days, 85 ± 44.5 days and 83 ±

Table 1. Estimated DM intake (kg/day) of Jersey cows grazing on Kikuyu pasture

	Control	Low Maize Silage	High maize silage
Pasture*	10kg (74%)	8kg (59.3%)	6kg (44.4%)
Maize silage	0kg	2kg (14.7 %)	4kg (29.4%)
Concentrate**	3.6kg (26%)	3.6kg (26%)	3.6kg (26%)

Pasture* = estimated pasture intake, pasture availability should not limit intake
Concentrate** = 15% CP and 11.5 MJ ME/kg on an as fed basis

47.3 days and 3.5 ± 1.5, 4.1 ± 1.5 and 4.5 ± 1.9 lactations for the control, 2kg DM maize silage and 4kg DM maize silage groups respectively. Milk production was recorded daily and milk composition every 14 days during the measurement period. Cows were weighed and condition scored on two consecutive days at the start and end of the experimental period. Samples of pasture, maize silage and concentrate were taken weekly during the measurement period. All cows grazed as one group from 07:30 to 14:00 and from 16:00 to 06:00 the next morning. The silage was fed separately to the low and high silage group before the afternoon milking from 14:00 to 15:30. Cows were milked at 06:00 and 15:30 and were fed 2kg (as is) of concentrate during each milking. The experimental period consisted of an adaptation period of 10 days and a measurement period of 50 days. Nine to twelve hectares of kikuyu pasture were grazed depending on the growth rate of the grass. The total amount of pasture needed per day was estimated at 480kg. At a growth rate of 40kg/day, 12ha of pasture was needed. The average pasture height was measured before and after grazing by taking 100 readings on each grazing strip before and after grazing with a rising plate disk meter (RPM). The DM yield was estimated by using the following equation: Yield (kg DM/ha) = (Average Height RPM X 60) – 360.

Four rumen fistulated cows were added to each of the control and the high silage treatment groups. The cows were adapted to diets for 21 days followed by a measurement period of 8 days after which cows were switched over to high maize silage treatment and the control. The rumen pH of cows was measured with data loggers fitted on the cows and pH electrodes that were inserted into the rumen. The rumen pH was measured at 10 minute intervals for 48h followed by a 48h rest period. This procedure was repeated twice resulting in a total of four days pH measurement.

Results and discussion

The milk production, milk composition, live weight and condition score is presented in Table 2.

The supplementation of maize silage increased milk and fat corrected milk production and decreased the milk urea nitrogen levels. Milk butterfat, protein and lactose content were not affected by supplementing maize silage. Cows on all the treatments lost weight and supplementing of silage did not affect life weight change. The condition score of cows on the low maize silage treatment was lower than that of cows on the high silage treatment at the start of the study. The condition score of cows on the low maize silage treatment increased slightly during the study while that of cows on the high maize silage diet decreased. The condition score did not differ between treatments at the end of the study.

The pasture height, yield and growth and is shown in Table 3. The pasture height after grazing indicates that pasture was not limiting as there was still 512kg and 384kg DM left above a height of 3cm (RPM height

of 6) during March and April respectively. The growth of kikuyu was lower during April compared to March.

Cows on the high maize silage treatment consumed 12kg of wet silage (4kg DM) per cow just after being taken off the pasture. When opening the cannula of cows on the control treatment open space could be seen in the rumen just before milking while the rumens of the high maize silage cows were totally filled and the electrode probe was inserted into the rumen with difficulty. The rumen pH of cows fed no silage and cows fed 12kg of silage (4kg DM) is shown in Figure 1. The intake of silage resulted in a direct decrease in rumen pH. The pH was however not below 6 for longer than 2h.

Conclusions

Maize silage can effectively be used to supplement kikuyu pasture during March and April if pasture demand is higher than pasture supply.

Table 2: The effect of feeding maize silage on milk production, milk composition, live weight and condition score of Jersey cows grazing kikuyu pasture during March and April. Cows were and fed 4 kg concentrate per day. (n=20)

	Control	Low MS (2kg DM)	High MS (4kg DM)	LSD[d]
Milk production (kg/day)	13.8[b]	14.6[a]	14.9[a]	0.69
Fat corrected milk (kg/ day)	14.9[b]	16.1[a]	16.3[a]	0.79
Butterfat (%)	4.58	4.68	4.61	0.308
Protein (%)	3.59	3.54	3.62	0.138
Lactose (%)	4.48	4.59	4.59	0.083
MUN[e] (mg/dl)	18.2[a]	16.0[b]	14.0[c]	1.02
SCC[f] (X 1000)	202	203	254	148
Live weight start (kg)	395	383	391	17.1
Live weight end (kg)	387	376	378	17.5
Live weight change (kg)	-7.7	-7.6	-12.6	9.41
Condition score start	2.31[ab]	2.18[b]	2.43[a]	0.200
Condition score end	2.20	2.20	2.28	0.141
Condition score change	-0.11[ab]	+0.03[a]	-0.15[b]	0.158

[a,b,c] Means in the same row with different superscripts differ (P<0.05) , LSD[d] = Least significant difference, MUN[e] = Milk urea nitrogen, SCC[f] = Somatic cell count

Table 3: Pasture growth and grazing management on kikuyu pasture during March and April 2005 (n=28)

	March	April
Before grazing		
Pasture height (RPM)	38.5 ± 5.84	30.9 ± 5.14
Pasture yield (kg DM/ha)	2141± 379	1266 ± 298
After grazing		
Pasture height (RPM)	13.4 ± 1.46	12.4 ± 1.85
Pasture yield (kg DM/ha)	512 ± 94	384 ± 111
Pasture grazed (kg DM/ha)	1639 ± 357	1266 ± 298
Pasture growth (kg DM/ha/day)	58 ± 12.7	45 ± 10.6

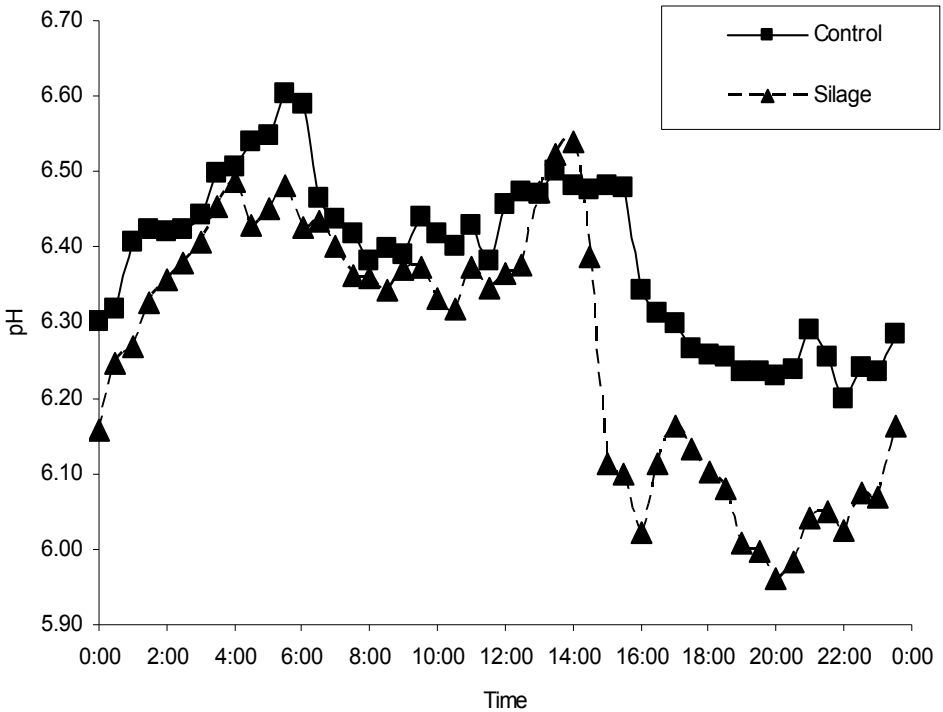

Figure 1. Rumen pH of Jersey cows grazing kikuyu in March 2005 fed 4 kg concentrate with or without the supplementation of 12 kg maize silage (n=4)

Milk production increased when maize silage was supplemented.

The feeding of maize silage did result in a decrease in rumen pH.

Although the results are not shown due to changed economic circumstances, at the time of the study the margin over feed cost increased as the level of feeding maize silage increased.