Initial blood urea nitrogen concentration predicts subsequent blood urea nitrogen concentration in beef cows

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Introduction

In cattle, extreme (low or high) levels of blood urea nitrogen (BUN) concentration are indicative of poor efficiency in utilisation of nitrogen resources. Currently, no studies have been performed to investigate how an individual animal's efficiency changes under different environmental conditions. The objective of this study was to determine whether beef cattle can maintain their relative BUN concentration rank when exposed to varying levels of dietary nitrogen supplementation, and whether other factors determine BUN in beef cattle.

Materials and Methods

Ten Hereford and 11 Nguni cows, aged between 2 and 16 years, were utilised in two crossover designs. In the first design, cows were exposed to diets containing normal and high crude protein (CP) levels. At the end of the first crossover design, cows received a normal diet for one week before commencement of the second design. In the second crossover design, cows were fed diets containing normal and low CP levels. Blood urea nitrogen concentration was measured 17-21 times (mean = 20) during the study. A linear mixed-effects model was used to assess whether baseline BUN concentration (measured one week before onset of the study) was predictive of subsequent BUN concentration in individual cows. The model was also used to assess whether any of the measured variables were predictive of subsequent BUN concentrations.

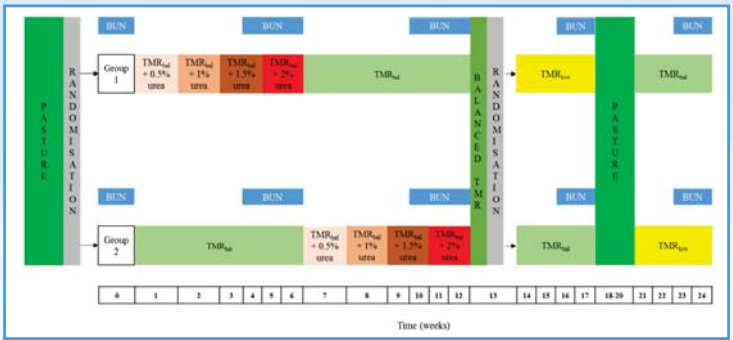


Fig 1. Summary of dietary treatments and sampling periods for the two groups of cows (BUN = blood urea nitrogen sampling period; TMR_{bal} = diet formulated to provide 7.9% crude protein; TMR_{low} = diet formulated to provide 4.4% crude protein; TMR_{high} = diet formulated by adding 20kg of feed grade urea to a ton of TMR_{bal}).

Results

Baseline BUN concentration was a significant predictor of subsequent BUN concentration in individual cows (P = 0.004). Other variables that were significantly associated with subsequent BUN concentration were breed (P = 0.033), the previous and current diet (P < 0.001) and the week during which sampling was performed (P < 0.001). A unit increase in initial BUN concentration was associated with an increase of 0.206mmolL^{-1} in subsequent BUN concentration over the entire study period.

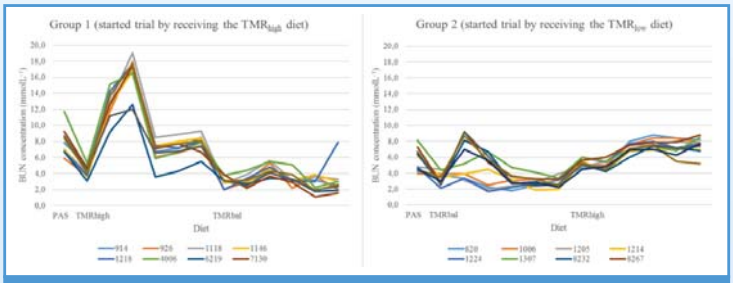
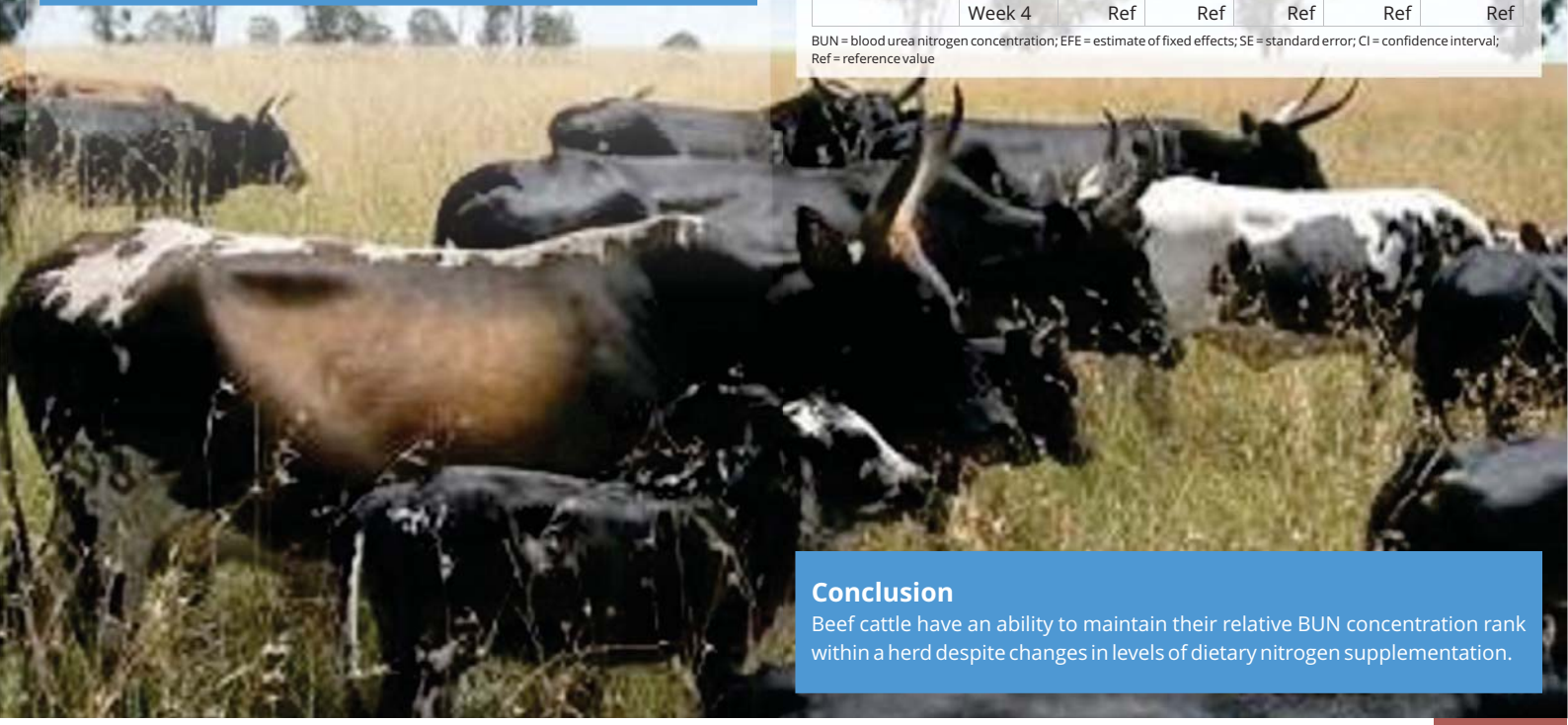


Fig 2. Blood urea nitrogen (BUN) concentrations of individual animals while they were on pasture, TMR_{bal} and TMR_{high} dietary treatment. (PAS = pasture; TMR_{bal} = Diet containing 7.9% crude protein; TMR_{high} = diet containing higher than normal levels of crude protein).

Table 1. Predictors of subsequent BUN concentration within the herd

Variable	Level	EFE	SE	95% CI of EFE		*P* value
				Lower	Upper	
Initial BUN		0.206	0.607	0.069	0.344	0.004
Breed						0.033
	Hereford	0.541	0.250	0.045	1.037	0.033
	Nguni	Ref	Ref	Ref	Ref	Ref
Previous Diet						< 0.001
	TMR_{bal}	-1.515	0.253	-2.013	-1.016	< 0.001
	TMR_{high}	-0.883	0.356	-1.585	-0.180	0.014
	Pasture	Ref	Ref	Ref	Ref	Ref
Current Diet						< 0.001
	TMR_{low}	-0.378	0.289	-0.948	0.193	0.193
	TMR_{bal}	Ref	Ref	Ref	Ref	Ref
	TMR_{high}	4.644	0.280	4.092	5.197	< 0.001
Week						< 0.001
	Week 1	-0.295	0.361	-1.004	0.415	0.415
	Week 2	1.269	0.351	0.578	1.959	< 0.001
	Week 3	-0.138	0.344	-0.813	0.538	0.689
	Week 4	Ref	Ref	Ref	Ref	Ref

BUN = blood urea nitrogen concentration; EFE = estimate of fixed effects; SE = standard error; CI = confidence interval; Ref = reference value



Conclusion

Beef cattle have an ability to maintain their relative BUN concentration rank within a herd despite changes in levels of dietary nitrogen supplementation.