Growth and urinary nitrogen excretion of heifers with diverse genetic merit grazing low quality forage

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Dairy cattle that graze perennial ryegrass and white clover pasture often receive nitrogen (N) in excess to their requirement (Pacheco and Waghorn, 2008). This excess N can be lost to the environment, particularly when water infiltration and runoff levels are high such as in autumn and spring (Di and Cameron, 2002). Cows with greater genetic merit have increased feed efficiency and reduced N excretion (Cheng et al., 2014). Limited studies have been conducted to understand the differences between animals with high and low genetic potential in a dryland grazing system with low-quality forage typical of south eastern Australia. This study was conducted on a dryland ryegrass pasture at Dookie college in northern Victoria to evaluate the growth and urinary N loading of heifers with diverse genetic merit.

Forty-eight Holstein Friesian heifers with known genotype of Balanced Performance Index (BPI) were grouped into high (HBPI; n = 24) and low (LBPI; n =24) genetic groups. Each genetic group was further divided into six replication grazing groups of four heifers per replicate. Apparent dry matter intake (DMI) was calculated based on the difference between pre- and post-grazing herbage mass, herbage regrowth rate and the area grazed for 29 days. All heifers were weighed after a fasting for twelve hours overnight at the start and the end of the study. Blood and urine samples were collected from each heifer on measurement days 16 and 25 for analysis of plasma urea N (PUN). Urinary N excretion was estimated from PUN and live weight.

Table 1. Average daily growth, DMI, PUN, Urinary N% and N loading of HBPI and LBPI heifers

Parameters	HBPI	LBPI	SED	P value
Experimental period average daily growth (kg/heifer/day)	1.2	1.1	0.21	0.66
DMI (kg DM/heifer/day)	11.5	10.8	0.91	0.6
N intake (g/cow/day)	111.9	95.4	7.53	0.05
N loaded in soil (g/hectare)	7880	4954	963.6	0.01

The ryegrass contained 9.3 MJ ME/kg DM and 5.9 % crude protein on a DM basis. Dry matter intake and growth rate were similar ($P>0.05$) between treatments. Urinary N loading in soil was 59% higher in HBPI group compared to the LBPI group ($P<0.05$; Table 1). The study demonstrated that compared with LBPI heifers, HBPI heifers potentially caused higher N pollution in the current dryland grazing system. However, a study that measures individual animal DMI and urinary N excretion is required to confirm the genetic differences observed in this study.

References

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