

The effects of feeding plantain and ryegrass-clover pasture on urinary nitrogen composition of dairy heifers

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Earlier work from Van Groenigen et al. (2006) suggested that a higher urinary hippuric acid (HA) concentration, one of nitrogen (N) components in the urine, may lead to reduced N emission. There have been few studies into the effects of feeding plantain (PL) on urinary N composition, despite PL has been promoted as a potential forage to mitigate N pollution on farm. Therefore, this study aimed to explore the effects of feeding PL vs. New Zealand industry standard perennial ryegrass-white clover pasture (PW) on urinary nitrogen composition of dairy heifers.

Studies 1 and 2 were carried out under grazing conditions (Cheng et al., 2016) with 24 heifers allocated into two treatment groups (PL vs. PW). Spot urine samples were collected from each heifer on two occasions during the study. Study 3 was conducted through indoor feeding (Cheng et al., 2017), with six heifers allocated one of two treatments (PL vs. PW). Spot urine samples were collected from each heifer during a 3-day measurement period. Urine samples were analysed for urinary N and HA content. ANOVA was used for analysis with individual heifer per treatment as replication and forage treatment as the fix effect.

In studies 2 and 3, heifers consuming PL had respectively 1.7 and 2.7 times lower urinary N concentration than those on PW (Table 1), while not in study 1. Feeding heifers with PL reduced HA concentration by 43% and 47% in studies 2 and 3, respectively, but had no effect in study 1.

Table 1. Nitrogen, urea, hippuric acid concentrations and hippuric acid/nitrogen ratio in urine of heifers offered ryegrass-clover pasture or plantain.

Study	Urinary composition	Pasture	Plantain	SED	P-value
1	Nitrogen (g/kg)	2.1	2.8	0.52	0.099
1	Hippuric acid (mmol/L)	7.0	7.3	1.56	0.823
2	Nitrogen (g/kg)	4.8	2.9	0.54	< 0.001
2	Hippuric acid (mmol/L)	13.3	7.6	2.43	< 0.01
3	Nitrogen (g/kg)	3.8	1.4	0.59	< 0.001
3	Hippuric acid (mmol/L)	7.52	4.0	1.94	0.048

To the best of our knowledge, this is the first research work documents heifer urinary N composition from feeding PL. This current preliminary analysis demonstrated inconsistent effects of feeding PL vs. PW on urinary N composition. Future research is needed to confirm the findings.

References

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