Effect of level of nitrogen fertilization and protein supplementation on herbage utilization by grazing dairy cows. II. Faecal and urine nitrogen excretion

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Heavily fertilized grasses led to poor efficiency of N utilization in cows. This experiment aimed at studying the effect of lowering N fertilization and feeding protected protein on N balance of grazing dairy cows.

Three treatments were compared on perennial rye-grass pasture in a 3 x 3 latin square design: HN (60–80 kg N/ha/growth), LN (0–20 kg N), and LN + S (2 kg soyabean meal (SBM) cow/d). Experimental procedures were described by Peyraud *et al* (preceding article). The area was increased from 59 (HN) to 72 m^2/c/d (LN and LN + S) to obtain the same herbage allowance (28 kg OM/c/d above 7 cm cutting height) between treatments. N intake was calculated from herbage intake and N content of grazed herbage. The latter was estimated from bunches of tillers (around 50 cm^2/bunch, 15 bunches per treatment) cut to ground level. A subsample (200 tillers) was extended (cut bases placed together) and cut into 5-cm sections. Those sections lying between the top of the bunches and the mean height of sward after grazing (*ie* section 20–25 cm) were considered as herbage intake. Urine N was calculated by difference between intake, and milk and faecal output assuming no N retention. Ruminal fluid was sampled for ammonia determination between 7 am and 10 pm. Blood samples were collected from the caudal vein at 7 am for uremia analysis.

Lowering N fertilization decreased total N content in offered herbage from 27 to 19 g/kg OM ($P < 0.01$). N content in grazed herbage was higher because mean residual height after grazing was 23 cm, but the difference still remained between treatments (31 *vs* 26 g/kg OM for HN and LN, respectively) ($P < 0.01$). On LN sward, N intake was lowered, faecal N and milk N output remained unchanged, whereas urine N output was reduced ($P < 0.01$). Thus, LN treatment reduced N losses by 25% per cow and 42% per unit area compared with HN treatment. These results agreed with the lower ruminal ammonia and blood uremia levels observed in the LN treatment (table I). The SBM supplementation largely increased N intake but milk N output was only 14 g/d higher. N excretion was notably increased compared with the other treatments ($P < 0.01$). The difference was mainly due to urinary N flow (table I). However, milk output (0.35 l/m^2) and urinary N excretion (4.8 g/m^2) per unit area were similar between HN and LN + S treatment.

N excretion by grazing cows could be manipulated. Lowering N fertilizer is a good way to decrease N emission per cow. SBM supplementation increased milk yield but also urinary N output per cow.

Table I. Effect of treatments on N flows.

	HN	*LN*	*LN + S*
N intake (g/d)	503^a	423^b	594^c
N milk (g/d)	109^a	109^a	123^b
N faeces (g/d)	113^a	110^a	132^b
N urine (g/d)	281^a	204^b	340^c
(g/kg milk)	13.4^a	9.2^b	13.7^a
(g/m^2)	4.8^a	2.8^b	4.7^a
NH_3 (mg/l)	189^a	93^b	119^c
Uremia (mg/100 ml)	25.3^a	15.4^b	25.9^a

a, b, c Means with different superscripts are different ($P < 0.05$).