

Lactational responses of grazing dairy cows to Na or K fertilization of pastures

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The effects of Na fertilizer supply to pasture have only recently been studied and beneficial effects on dairy cow productivity have been established (e.g. see recent review by Chiy and Phillips, 1995, Sodium in Agriculture, Chalcombe Publications, Canterbury, Kent, 107- 144). Improvements in milk yield and composition with Na supply in these studies are partly mediated through a commensurate reduction in excess K supply. Dairy cows have invariably high outputs of Na in milk in relation to the low Na content of pasture. In addition, enhancing the Na content of pasture increases grazing time and biting rate, suggesting that the appetite for Na-enhanced herbage is increased. In the present study, the productivity of dairy cows of four yield classes is compared on grazing pastures receiving zero or 250 equivalent Na or K cations/ha/annum, with Cl⁻ as the anion.

Thirty-six Estonian Red heifers were blocked according to age, live weight, calving date, milk yield and milk composition into four yield classes : Low (L), Medium (M), High (H) and Very High (VH) yielders. Within each block cow were randomly assigned to one of the treatments arranged in the block design : Grazed on pasture that received zero Na or K (N) or 250 equivalents Na or K/ha/annum. The grazing area consisted of three fields each partitioned by electric fences into three paddocks corresponding to the three grazing treatments. During the 8 am and 3 pm milking,

the milk yield of cows was recorded and aliquot samples were taken, bulked in proportion to yield and analysed for milk fat, protein, lactose and bacterial cell contents.

There was less rejected herbage in the Na treatment (P = 0.033). Cows grazing the Na-fertilised pastures produced 9.4 % more milk. This increased milk yield responses was greatest for the L (15 % increase), progressively diminished and was not evident in the VH (2 %). Na fertilizer also produced a 26 % reduction in milk bacteria cell counts below the average of the N and K treatment. Conversely, K fertilizer application to pasture increased milk bacteria cell count by 54 % and 34 % respectively above the Na and N treatments respectively. Application of K fertilizer also decreased milk yields (kg/day) of the L (N 9.2, K 7.7, Na 10.6), but not the M (N 11.0, K 11.6, Na 12.6), H (N 13.2, K 12.9, Na 13.2) and VH (N 14.1, K 15.2, Na 14.7).

It is concluded that 1. Sodium supply to pasture produced an increase in milk yield and reduction in milk bacterial cell contents by up to 15 and 55 % respectively. The reduction in cell count suggests that the cow's immunocompetence is stimulated. 2. The increase in milk yield with Na is greater in low yielding than high yielding cows. This may be due to a greater effect of enhanced herbage palatability on low yielding cows which are not achieving their intake potential.

Milk yield and Quality				Standard error of difference (probability)		
	N	K	Na	Treatment	Block	Block x treatment
Milk yield (kg/day)	11.7	11.7	12.9	0.32 (0.02)	0.37 (0.00)	0.65 (0.00)
Fat content (g/kg)	42.7	43.0	41.1	1.22 (0.15)	1.41 (0.24)	2.22 (0.01)
Protein content (g/kg)	32.0	32.5	31.6	0.41 (0.53)	0.47 (0.00)	0.81 (0.01)
*Bacteria cell (x 10 ⁵ /ml)	31.7	42.4	27.6	0.03 (0.03)	0.20 (0.19)	0.34 (0.21)

* Means are original values, but statistics are the results of Log₁₀ transformation as data was skewed