

DETERMINATION OF DY, EU AND YB IN ANIMAL DIGESTS USING ICP-OES WITH AXIAL AND RADIAL VIEW CONFIGURATIONS

Edivaldo E. Garcia^a, Ana Rita A. Nogueira^b and Joaquim A. Nóbrega^c

a. Universidade Paranaense, Umuarama – Pr, Brasil

b. Embrapa Pecuária Sudeste, São Carlos – SP, Brasil

c. Universidade Federal de São Carlos, Caixa Postal 676, São Carlos – SP, 13565-905, Brasil
djan@zaz.com.br

Lanthanides have been used as inert markers to study passage rate of digests in ruminants. In this study, sheep received ground corn marked with Dy³⁺, Eu³⁺ and Yb³⁺, and fecal marker excretion curves were used to estimate kinetics of digesta passage rate. Samples of 250 mg were decomposed with 5 ml of 50% v/v HNO₃ and 1 ml of 30% v/v H₂O₂ by using closed-vessel flasks in a microwave oven (ETHOS 1600, Milestone). The final volumes of digested samples were made up to 50 ml with distilled-deionized water (Milli-Q[®], Millipore, USA). Dysprosium, Eu and Yb determinations were carried out by employing axial and radial viewed ICP's, both from Varian (Vista AX and Vista RD CCD Simultaneous), using Sturman-Masters nebulization chamber and V-groove nebulizer. Quantification was based on a matrix-matching procedure because the operation of the ICP's in robust conditions were not enough to eliminate matrix effects. For both ICP's, robust conditions were similar (radio frequency power of 1.2-1.3 kW and carrier gas of 0.7 l min⁻¹). By using axial viewed ICP, the detection limits (DLs) for Dy, Eu and Yb calculated using the background equivalent concentration (BEC) were enhanced by factors of 18, 3 and 6, respectively, in comparison with those obtained under robust conditions using the radial viewed ICP. The differences in sensitivities between the two ICP's were still higher using non-robust conditions, mainly for Dy, which has poor sensitivity for the radial viewed ICP. The DL's were degraded by factors of 1-9 under robust conditions due to the increase in the background intensity in comparison with non-robust conditions in the axial view configuration. The DL's were improved by factors of 1-2 using radial viewed ICP operating with robust conditions in comparison with non-robust conditions, due to the signal intensity increase. The Mg II 280.270 nm / Mg I 285.213 nm intensity ratios were determined using 5 µg ml⁻¹ Mg²⁺ solution in 1% v/v HNO₃ medium for the robust and non-robust conditions using both ICP's. The Mg II / Mg I ratios were higher using axial viewed ICP in comparison with the radial viewed ICP probably due to the higher residence time with the former.

Table. Detection limits, quantification limits and Mg II / Mg I intensity ratios obtained for the Dy, Eu and Yb

| Figures of merit | Dy | | Eu | | Yb | |
|---------------------------|-------------------|----------------------|-------------------|----------------------|-------------------|----------------------|
| | Robust condition | Non-robust condition | Robust condition | Non-robust condition | Robust condition | Non-robust condition |
| DL (ng ml ⁻¹) | 1.56 ^a | 0.18 ^a | 4.04 ^a | 1.88 ^a | 1.07 ^a | 1.03 ^a |
| | 27.4 ^b | 36.4 ^b | 11.0 ^b | 15.0 ^b | 6.00 ^b | 11.3 ^b |
| Mg II / Mg I | 6.4 ^a | 4.8 ^a | 6.4 ^a | 4.8 ^a | 6.4 ^a | 4.8 ^a |
| | 5.2 ^b | 2.5 ^b | 5.2 ^b | 2.5 ^b | 5.2 ^b | 2.5 ^b |

^a axial viewed ICP; ^b radial viewed ICP