Influence of soil chemistry on the uptake of iodine by grass

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Iodine is essential to the health of humans and animals, including grazing cattle. Smyth and Johnson recently reported a mean iodine concentration of 10.6 mg kg-1 in topsoils of Northern Ireland (Smyth and Johnson 2011), which is relatively high compared to global concentrations reviewed by Johnson, where nearly half the samples contained less than 2.5 mg kg-1 iodine (Johnson 2003). The coastal proximity of most of Northern Ireland's land area should provide a substantial source of iodine, yet anecdotal evidence suggests that iodine supplementation is still necessary to prevent iodine deficiency diseases (IDD) in many grazing cattle.

There is a strong correlation (Pearson correlation = 0.756, $p < 0.001$) between concentrations of iodine in soil and grass in samples collected for this study, but soil iodine concentration does not fully predict grass iodine concentration. This discrepancy is linked to speciation of iodine in the soil and prompted further investigation into the influence of soil chemistry on iodine dynamics. Soils from Northern Ireland were spiked with the radio isotope 129I (t1/2 = 15.7 million years) and perennial rye grass was used to investigate the relative uptake by grass of freshly-added and 'native' iodine (127I). Size exclusion chromatography coupled to ICP-MS was used to determine iodine speciation in soil solution, which together with ICP-MS analysis of total 127I and 129I in both grass and soil, enabled the uptake of iodine to be linked to soil chemistry and iodine speciation.

Evaluation of soil properties on grass uptake of iodine will allow the development of a predictive model to better understand areas where IDD is likely to be more prevalent. This will inform the planning of measures to reduce IDD in areas most at risk, for example improved targeting of iodine supplementation for cattle by farmers.

References

Johnson, C. C. (2003). Database of the iodine content of soils populated with data from published literature, British Geological Survey Commissioned Report.

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