

⁹⁰Sr uptake in the freshwater liverwort *Riccia fluitans* L.

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⁹⁰Sr is a radioactive isotope of strontium produced by nuclear fission, with a half-life of 28.8 years. This artificial radioisotope is present in natural ecosystems as the results of radioactive fallout from nuclear weapons or releases during nuclear power plants accidents; because of its similarity with Ca²⁺ is quickly incorporated into the biota. The high mobility of Sr²⁺ in aquatic compared with terrestrial ecosystems makes the uptake and accumulation of ⁹⁰Sr²⁺ higher in aquatic than in terrestrial plants (Kalinichenko *et al.*, 2018). Here we analyse the uptake rate, kinetics and retention, concentration factor (CF) of ⁹⁰Sr in the freshwater liverwort *Riccia fluitans*.

⁹⁰Sr uptake by *R. fluitans* shows a bi-phasic kinetics that fits the Michaelis & Menten model in both micro and milimolar concentration ranges. Apparent semi-saturation constants (K_m) were 15 μ M and 2 mM for the high and low affinity ranges, respectively. The presence of the K⁺ channels blocker tetraethylammonium (10 mM TEA) inhibits ⁹⁰Sr uptake by only a 25%. However, the presence of 1 mM La³⁺ completely inhibits ⁹⁰Sr uptake in this plant. Maximum incorporation rate occurs at alkaline external pH (8.3), either in plants grown in the presence of K⁺ (K⁺-sufficient plants) or in the absence (K⁺-deficient plants). Finally, gradual increases of the Ca²⁺ concentration in the assay medium progressively inhibits ⁹⁰Sr uptake. CF values are higher in K⁺-deficient plants, with a maximum of 1500, than in K⁺-sufficient, (maximum CF of 600) and show similar responses to inhibitors, pH or Ca²⁺ than the described for uptake rates. CF values progressively decrease at increasing external Ca²⁺ concentrations, higher CF values are found at pH 8.3 but lower values are observed in the presence of TEA, being close to zero in the presence of La³⁺. The different ⁹⁰Sr uptake rates in K⁺-sufficient and K⁺-deficient plants and TEA sensitivity indicate that one part of ⁹⁰Sr would be transported through non-selective cation channels. Furthermore, Ca²⁺ and La³⁺ sensitivities suggest that ⁹⁰Sr could be incorporated through Ca²⁺ channels.

References

Kalinichenko *et al.*, 2018. Gupta D. K. & Walther C. (eds), *Behaviour of Strontium in Plants and the Environment*. Springer International Publishing AG 2018. Doi: 10.1007/978-3-319-66574-0_9

Acknowledgements & Funding

Spanish MINECO: BFU2017-85117-R and BIO2016-81957-REDT