Comparison of elimination capacity of uranium from the water pathway between periphytic algae, submerse macrophytes and helophytes (emerse vascular plants).

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One of the uranium-mining legacies is contamination of ground and surface waters with high toxic substances, including radioactive isotopes. Due to limited applicability of chemical cleaning procedures for such waters, the need for alternative technology has grown considerably. It was earlier observed that helophytes, emerse and submerse macrophytes and algae act as excellent sinks of uranium in wetlands (Brackhage & Dudel 2005, Mkandawire & Dudel 2005, Vogel & Dudel 2004, Vogel & Dudel). Thus, the proportion percentages range of uranium in organic matter (decayed litter) can be high too. However, the species specific elimination capacity of uranium on a specific area remains unknown, for example, under aerobic neutral to alkaline conditions with slightly soluble and mobile uranium. Consequently, we investigated and compared the uranium bioaccumulation capacity between higher aquatic plants, submerse macrophytes and their associated algae ("biofilm") in synthetic mine water (but without sediments) in the flowing-water simulation research facility of Federal Environmental Agency (UBA). The synthetic mine water was based on water quality and conditions in the "tailings" down stream of former uranium mine at Neuensalz-Mechelgrün, Vogtland (Saxony), which has P-Limitation, pH 7.2 ± 0.6, conductivity 600 to 700 µS cm^{-1}, and uranium concentration of about 200 µg L^{-1}. Under these conditions, helophytes (i.e. *Phragmites australis* TRIN. ex STEUD., *Typha latifolia* L. *Sparganium erectum* L.) accumulated up to 130 mg kg^{-1} uranium in dry matter during summer, between 50 and 70% of the uranium accumulated in the roots, especially in *P. australis*. Submerse macrophytes take up even uranium more than helophytes that some could even accumulate ten-fold more. For instance, *Elodea canadensis* MICHX. accumulated up to 150 mg kg^{-1} DW; mill foil (*Myriophyllum spicatum* L.) had maximum accumulation of 1600 mg U kg^{-1} DW. Mill foil has feathered leaf structures, which probably provided comparatively large surface with high number of uranium sorption sites. Further the older leaves are carries for associated microalgae in biofilms, which have high biomass turn over and accumulation capacity too due to high surface volume ratio. Therefore, the autotrophic microphytes or periphyton ("biofilms") play a key role in the elimination of uranium from the water pathway.

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