Impact of soil organic matter content on Se migration and solid partition

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Selenium (Se) is an essential element for life however it becomes rapidly toxic with a safety range extremely narrow. In environment, Se could exists as oxyanions and reacts directly or indirectly with the numerous components of the soil (minerals, organic matter, microorganisms). Understanding its complex behaviour is currently needed to improve risk assesment models.

It is commonly admitted that minerals are the main carrier phases of Se in soils, however the role of the organic matter (SOM) is poorly documented and still ambiguous. This study was focused on the impact of SOM on Se solid partition (chemical extractions) and its migration availability. Se sorption tests were performed on 3 grassland soils before and after their SOM have been removed (NaOH and NaOCl washs). The initial amounts of SOM differed between soils from 1.7% (R1) to 7.7% (R3), although they were all constituted by the same mineral background. Removing the SOM had a great impact on Se behaviour leading: (1) to decrease slightly the sorbed Se amount (max. 5%) and (2) to modify severely Se solid partition by increasing the available Se fractions ($CaCl_2$ + K_2HPO_4) and by decreasing the more stable fractions (NaOH, Na_2SO_3 and NaOCl) (Figure). Thus, the SOM played a dual role on Se retention : it favoured unsolubilization of an important fraction of Se but it may also limit the extent of this fraction (eg. aqueous complexation).

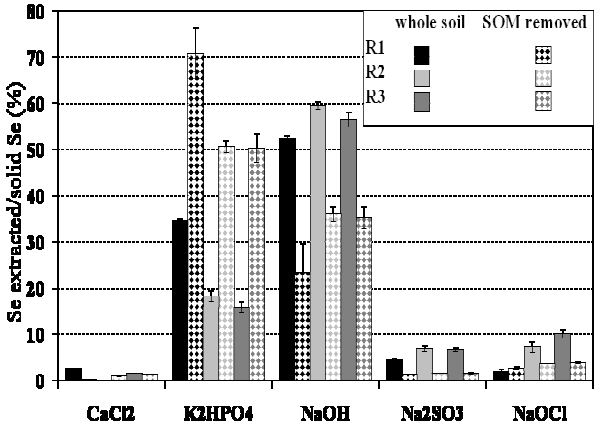

Figure : Se solid partition determined by sequential extraction

More, the results obtained with the 3 whole soils suggested that the quality of SOM could play an important role in the Se retention : fresh grass seems to increase sorbed Se and Se is preferentially associated with fulvic acids (fulvic and humic acids separated after NaOH extraction).