



## Age and Cultivar Effects on Heavy Metal and Metalloid Concentration in Alfalfa

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Metals and metalloids occur naturally in soils. Many of them are micronutrients. All of them are toxic elements in excess. Our research determined metal and metalloid concentrations (i.e., Al, As, Ba, Be, B, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Mo, Ni, Se, Ag, Sr, Tl, Th, Sn, Ti, U, V, and Zn) in two alfalfa (*Medicago sativa L.*) cultivars grown in the Brown soil zone of Saskatchewan. Because alfalfa is valued for bioremediation and also utilized for animal feed, we investigated varietal differences in dried above-ground biomass and accompanying soil samples among years since stand establishment. We found one-year old Beaver (tap-rooted) and Rangelander (creeping-rooted) stands contained higher levels of metals and metalloids compared to three and five-year established alfalfa. Significant differences among years since establishment in concentrations of Al, As, Ba, Cd, Co, and Pb for both cultivars; Tl for Beaver and Cr, Fe, Ti, and V for Rangelander were found. Exceptions to these trends were Mo, Se, and Sr. Mo was highest in the five-year old crop; Se and Sr were highest in the three-year old crop. We found negative correlations between alfalfa Se concentrations and cation exchange capacity and between alfalfa Sr concentrations and soil organic matter. There were no correlations detectable between metal and metalloid concentrations in crop and associated soil samples. While soil properties define the dynamics and speciation of metals and metalloids present in the soil, a plant's anatomical and physiological characteristics (i.e., root morphology) ultimately determines the metal absorption and uptake rates.

2009. 62nd Society for Range Management Annual Meeting. Paper No. 1000-12.