Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06066, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06066
EGU General Assembly 2008

Selenium levels in Austrian agriculture and nutrition

M. Sager

Competence Centre of Elements, Austrian Agency for Health and Food Safety (Email: manfred.sager@ages.at)

Austria is a low- selenium country. Daily needs for human nutrition have been estimated to range within 0,02 - 0,1 mg per day. Whereas the needs for the essentials Cu-Fe-Mn-Zn are covered by about 1/4 kg of local wholemeal bread, 1 kg of (any) local bread is needed to satisfy the above selenium needs. As a result of the general soil inventory, the median occurrence in arable soils is 0,20 mg/kg and in grassland it is 0,29 mg/kg. No significant changes within the soil profile nor between regions of different underlying geological units, were found. When selenite containing fertilizer solution was applied to chernozem model soil columns (30 cm), it was largely fixed within the first 5 cm. In the eluates, largely non-selenite selenium was found, which was not co-precipitated in ochres or CaCO3 precipitates upon aeration. Some selenium might appear in the eluates together with sulfate without retention, and the washout might increase after drying periods. A comprehensive screening of Austrian cereal samples in 1992-94 revealed for winter wheat a median of 0,027 mg/kg, and for winter rye a median of 0,013 mg/kg selenium, but the frequency distributions were skewed; more than a third of the wheat samples and more than half of the rye samples contained just less than 0,020 mg/kg. The selenium contents of the cereals did not depend on the sort or the soil concentration, but varied from year to year. When fertilization of low -Se maize and wheat fields was done utilizing a 20:8:8 mineral fertilizer with 16 mg/kg Se as selenate, there was linear uptake of Se, and transfer to maize grains was lowest. Crops grown at the cambisol had the highest selenium concentrations, and at the high adsorptive clay soil, the lowest, though the mobility of anions should be higher at higher pH. Se- utilization rate was about 2 % of added Se, and some memory remained for the subsequent year. After milling of wheat grains, maximum ash content was found in the bran fraction, whereas the ash in the first

milled fraction (< 9 μm) was at minimum. The conventionally determined ahs contents strongly correlated with total P, K, and Mn, as well as also with Ca-Cu-Fe-Zn. Sulfur and selenium in the milled fractions, however, go along with crude protein (total N) and gluten. For baking of (white) bread rolls, flours were mixed to contain 0,7 % ash content. No significant selenium volatilization occurred in the baking process (18 min/ 220? at a level of permitted 0,4 mg/kg Se, either from added Na-selenate, nor from metabolized Se (got via Se- fertilization of wheat crops). Currently, Se-uptake of wheat and fractionation in the milling process within variations grown at similar sites, are tested. In Austria, basic components of animal feedstuffs like cereals and soya, are usually below 0,15 mg/kg Se, except fishmeal. To meet the requirements of domestic animals, commercially available feedstuffs are permitted to get selenium as sodium selenite or selenate added up to a total contents of 0,5 mg/kg selenium, beneath other essential trace elements (Cu ?Mn ?Fe ?Zn ?Co - Mo), in order to promote optimum growth and resistance to various illnesses. Thus, median concentrations in composite feeds were 0,4 mg/kg, in supplementary feeds 1,42 mg/kg, and and in mineral feeds 20 mg/kg, with some variations due to the target animal (period 2002 - 2005). Thus, manures and dungs from intense farming as well as the organic fertilizers made thereof contain significantly more selenium than the soils. Samples from the same period contained median concentrations of 0,58 mg/kg in cattle manures, 0,77 mg/kg in biogas residues, 0,79 mg/kg in poultry dungs, 1,30 mg/kg in pig dung, 2,08 mg/kg in sewage sludges, and 3,62 mg/kg in pig manures, with respect to dry mass. Similarly, the proportion selenium/sulfur increased from cereals to biogas residues, to poultry manures, till to pig manures. Thus, on a long term, use of organic fertilizers from conventional farming will increase soil selenium levels. Finally, the results of an inventory of commercially available ready made meals for human consumption are presented.