SELENIUM DISTRIBUTION AND BEHAVIORIN SOME SOILS OF EGYPT

By

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B.Sc. Agric. Sci. (Soil Science), Fac. Agric., Cairo Univ., 1988
M.Sc. Agric. Sci. (Soil Science), Fac. Agric., Cairo Univ., 2005

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Title of Thesis: Selenium Distribution and Behavior in Some Soils of Egypt**.**
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ABSTRACT

Selenium is an essential element for humans, animals and some species of microorganisms. Selenium has been detected in many forms. Its application could lead to soil, plant and water selenium pollution. The objectives of this study were; 1) to study selenium distribution 2) to assess soil characteristics which are most highly related to Se content in different soils locations of Egypt. 3) to determine the values of some parameters related to Se transport in soils i.e. retardation factor, Peclet numbers and hydrodynamic dispersion coefficient.

For achieving these objectives, soil sampeles were collected from eighteen different locations (cultivated and uncultivated soils)of Egypt {(*i.e.*, Matrouh, El-Arish, El-Tina Plain, El-Hesynia Plain, El-Mansoura, El-Gabal El-Asfer (irrigated with sewage effluent for 15, 100 years of cultivated soils), El-Fayoum (Qaruon lake, and Kom Oshim) and Toshki}.Soil samples were collected at three depths: 0-30, 30-60 and 60-90 cm, such that to represent most of the variation in Egyptian soils. Plant samples were collected from the same locations of soil samples in cultivated soils. Irrigation water samples were collected from cultivated areas. Also samples of sludger and sewage effluent were taken from Elgabal Asfer region. Soil samples were analyzed for particle size distribution, OM, pH, CEC, $CaCO_3$ as well as both total and available selenium. The relation between indigenous soil parameters under study and selenium (total and available) was studied.

The results showed the Se amount of total (0.01 – 1.13 mg kg^{-1}) and available (0.0 -0.51 mg kg^{-}) had different values depending on the soil location, depth and l characteristics**.** The concentration of Se in different plant organs, ranged from 0.02 to 0.074 mg kg^{-1}.The lowest was in El-Arish and the highest was in Toshki. The data showed also that the Se amount was different depending on the plant part.

On the other hand, the selenium content in irrigation water ranged between 0.014 mg L^{-1} at El Arish area and 0.184 mg L^{-1} at El Fayum region. In sewage sludge, the total Se content was 0.125 mg kg^{-1}; and available Se content was 0.029 mg kg^{-1}.

The obtained correlation and regression equation between indigenous soil parameters and Selenium (total and available mg kg^{-1}) cleared that the clay, CEC, pH and sulfur were the most effective soil prporties on available and total soil selenium.

Concerning the values of the retardation factors and hydrodynamic dispersion coefficients,, all retardation factors of the different soils were less than one which means that the velocity of solute was higher than the water velocity due to negative expulsion. Peclet numbers for most of the studied profiles except for one column was much greater than one due to convection of selenium being higher than diffusion. The values of the hydrodynamic dispersion coefficient, in the mean were 9.04×10^{-5} to 1.98×10^{-3} m^2 $s^{-1}$for clay loam soils while the hydrodynamic dispersion coefficient were, in the mean of 4.54×10^{-3} to 2.75×10^{-2} m^2 s^{-1} for sandy loam soils.

Key words: Selenium, distribution, behavior, transport**,** soils in Egypt**.**

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