5. SUMMARY AND CONCLUSIONS

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The current investigating aims at spotlighting the importance of cation exchange phenomenon as one of the most important processes affecting soil in many different ways among which sodicity, fertilization and contamination of soil with hazardous heavy elements. Fulfilling such aims required quantifying the ion exchange process through calculation of selectivity coefficient of soils and their important components for cations of special concern. Thus, two surface soil samples were undertaken from Borg El-Arab (representing the calcareous soils) and Moshtohor (representing the Nile alluvial noncalcareous soils). Both the selected soils besides their separated clay fractions, the organic matter – free soils and two commercial clay minerals dominating in these soils were interduced in Na-Ca, K-Ca and Cd-Ca exchange equilibria. Equivalent fractions of the proper elements in equilibrium solution and on abovementioned exchange materials besides of the selectivity coefficient of these materials were computed. The obtained results could by summarized in the following:

First- For Na-Ca exchange equilibria:

1- Increasing Na/Ca ratio in equilibrium solution resulted in increase equivalent fractions of exchangeable on all the investigated exchange materials. However, the used exchange materials showed quite different variations in this concern.

2- All the calculated selectivity coefficients tended to decrease with increasing Na/Ca ratio at the equilibrium

solutions indicating some performance for Na over Ca at the low Na concentrations and vice versa.

3- The values of selectivity coefficients of the clay fractions separated from the studied soils were generally higher than the corresponding ones of the examined soils themselves. On the other hand, removal of organic matter from soils resulted in lower selectivity coefficients compared with soil or their clay components.

4- Values of the selectivity coefficients of both attapulgite and bentonite clay minerals for Na were inversely related to the values of Na equivalent exchangeable fraction on these exchangers.

5- Correlation coefficients between sodium adsorption ratio SAR and exchangeable sodium ratio (ESR) were highly significant indicating that the SAR value would be reliable parameter for estimating exchangeable Na on soil complex, however, assessment of sodicity hazard requires also calculation of the selectivity coefficients of soils for Na ion to integrate the picture.

Second: For K-Ca exchange equilibria:

1- Increasing K/Ca ratio in equilibrium solution resulted in a gradual increase in equivalent fraction of exchangeable K on all the exchange materials.

2- Values of the investigated selectivity coefficients of all exchange materials tended to decrease with increasing K/Ca ratio in equilibrium solution indicating to the higher preference for K adsorption at the lower K concentrations

in soil solution, however, these values seemed dependent on type of exchange material as well. The variations in calculated selectivity coefficient could be explained on basis of differentiations in mineralogical composition exist the exchange the used exchange materials.

3- Removal of organic matter caused selectivity coefficients of the investigated soils for K to increase slightly.

4- Relatively higher selectivity coefficients for K were shown by bentonite as compared with attapulgite.

Third : For Cd-Ca exchange equilibria:

1- Values of exchangeable Cd fractions differed depending on Cd/Ca ratio equilibrium solution and type of the exchange material involving its organic matter content and its mineralogical composition.

2- Values of selectivity coefficients revealed always higher preference for Ca relative to Cd although very slightly higher affinity for Cd was shown by attapulgite over bentonite.

3- Cd adsorption by all the exchange materials obeyed Frundlich adsorption isotherm indicating that adsorption is the main process by which Cd is retained to soils at the concentrations normally encountered in soils or even polluted soils.

It may be concluded from the aforementioned summary that: