THE ROLE OF SOIL CONDITIONERS IN LIMITING CHEMICAL SOIL DEGRADATION IN EL-SAFF REGION

BY

Dalia Nabil Ibrahim Hassan

(B.Sc. Science (Applied Chemistry), Damascus Univ., 1997)

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I would like to express my deepest thanks and gratitude to **Dr. Gamal Ghoneim S. Beheiry**, assistant prof. of soils, Soil Conservation Department, Desert Research center, for suggesting the topics of this thesis, his planning of research, supervision, valuable advice, capable guidance and constructive criticism which greatly contribute to the completion of this work.

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Special thanks to **Dr. Mohamed Hussein Ali**, assistant prof. of soils, Soil Conservation Department, Desert research Center, for his contribution to the completion of this work, sincere guidance, valuable help and advice.

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Approval Sheet

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ABSTRACT

Dalia Nabil Ibrahim Hassan. The Effect of Soil Conditioners in Limiting Chemical Soil Degradation in El-Saff Region. Unpublished M. Sc. Thesis, University of Ain Shams, Faculty of Science, Department of Chemistry, 2005.

The present investigation was carried out to study the effect of pollutants resulting from industrial activities at El-Saff region on agricultural soil and plant. It comprised two separate parts. The first dealt with monitoring experiment and the second was a pot experiment.

The monitoring experiment was carried out near Tafla Bricks Factory to monitor the pollution during four seasons of the year. Using the later as a starting point, five distances from the source of pollution were selected, zero, 250, 500, 750 and 1000 m. Soil, plant, water and air samples were collected from the previous distances during the four seasons of the year (from Summer 2003 to Spring 2004).

The data indicated that heavy metals content in irrigation water at the four seasons were within the permissible levels, while they are relatively high in air. This indicates that such factory was the main source of pollution. Values of heavy metals in air decreased with increasing distance away from the source of pollution and the highest values were associated with summer and spring seasons.

Also, data showed slight accumulation of heavy metals in soil at zero distance and decreased with increasing the distance from the factory. The highest values of soil heavy metals were obtained with summer season.

Data indicated that the concentration of heavy metals reached the critical levels in some plants, the highest values were recorded with turnip, onion and olive plants. Cd and Pb concentration in plant tissues decreased with increasing the distance from the factory, while there was no remarkable trend shown with other metals. Also, the concentration of heavy metals differed from season to another for the same plant type without clear trend.

The pot experiment was carried out under greenhouse conditions in Desert Research Center (September 2003) to study the role of farmyard manure (0, 10, 20 m^3/fed.) as a natural soil conditioner and polyvinyl acetate (0, 0.5, 1.0 %) as a synthetic soil conditioner in reducing heavy metals of soil and consequently plant. Surface soil samples were taken in summer season from the previous five distances.

Spinach plant was cultivated as an indicator of heavy metals reduction by soil conditioners where it is considered as hyper accumulator of heavy metals.

The data indicated that the application of these soil conditioners increased significantly soil organic matter content, total soil nitrogen, available phosphorus as well as availability of soil micronutrients (Fe, Mn, Zn and Cu) while the application of the two conditioners under investigation decreased significantly soil pH, soil salinity and available heavy metals (Ni, Cd and Pb) in soil.

Regarding the effect of soil conditioners on spinach plant, data showed that the application of both farmyard manure and polyvinyl acetate significantly increased the dry weight of spinach yield as well as its content and uptake of nitrogen, phosphorus and Fe, Mn, Zn and Cu. The rate of increment increased with increasing the application rate of the two soil conditioners. On the other hand, the application of the two conditioners significantly decreased the concentration of Ni, Cd and Pb in spinach plants, while they increased the uptake of these metals by spinach plants.

It is clear that the application of farmyard manure at a rate of 20 m^3/fed. was superior to all other treatments as it caused significant and positive changes in soil chemical properties and enhanced the dry weight yield of spinach and its nutrients content and uptake. It also caused significant reduction in heavy metals content of soil and plant.

Key words: El-Saff region, air pollution, soil conditioners, soil properties, available nutrients, heavy metals, spinach productivity.

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