SUMMARY

5. SUMMARY

The present work was carried out to evaluate the status of nitrogen in the soils of Kalubia Governorate, Egypt. The studied area was represented by thirty one surface soil samples collected from the different locations along three traversing lines extending from eastern rim Governorate towards the west direction where Domiatta branch of River Nile is occured.

This work included physical and chemical analyses of the collected soil samples, fractionation of soil nitrogen using the method of Keeney and Nelson (1982) and an adsorption study of nitrate and ammonium on ten representative soil samples using a procedure proposed by Beckett (1964). This work also included a Neubauer experiment using rye grass as an indicator plant, to evaluate the availability of each fraction of soil nitrogen.

Simple correlations were computed to identify the relationship between the parameters of 'soil nitrogen (various status of soil nitrogen contents of adsorption isotherm as well N-uptake by rye grass) and the characteristics of soil (soil texture, organic matter, calcium carbonate, pH, EC and CEC).

The obtained results can be briefly summarized as follows.

(A) **General properties of the tested soil samples:**

1. Almost all the investigated soil samples were cultivable and most of them are clayey or clay loam in texture, with few exceptions especially at the eastern locations of Kalubia Governorate.
2. The calcium carbonate content of the soils was low and ranged between 0.19 and 4.5%.

3. The organic matter content in the investigated soil samples was extremely low and ranged between 0.40 and 5.13% .

4. The soil pH values lie in general on the alkaline side. All soils had pH values exceeding 8.0, except for the soils of El-Gabal El-Asfar, which have been under irrigation with sewage effluent for the past 60 year or more.

5. The values of soluble salts (EC) show that almost all the investigated soils were non-saline, except for Balaqs and Meet-Halfa soils which have EC values exceeding 4.0.

6. Values of the cation exchange capacity (CEC) were relatively high and ranged between 10.37 and 43.47 me/g soil.

(B) Status of soil nitrogen:

1. The values of total nitrogen in soils varied between 500 mg/kg (in light-textured soils) and 2565 mg/kg (in heavy-textured soil's).

2. Available nitrogen (which is represented by nitrogen in root zone in a chemical form readily absorbed by plants) ranged between 10.5 and 66.9 mg/kg.

3. Fractionation of soil inorganic nitrogen showed that NH_4-N content ranged between 0.0 and 35.0 mg/kg soil and NO3-N ranged between 2.49 and 662.49 mg N/kg soil. Nitrate was found in minor amounts.

Statistical analysis of the obtained data showed a number of significant correlations as follows:

- Significant and positive correlations between N-uptake by we grass and each of total and available nitrogen in the studied soils were obtained. On the other hand, non of nitrogen

fractions (NH_4 , NO3 and NO_2) was significantly correlated with N-uptake by rye grass.

- Total nitrogen content in soils was positively and significantly correlated with organic matter, CaCO3 content, CEC and clay content but negatively and significantly correlated with coarse sand content.
- Available nitrogen was positively and significantly correlated with silt content, clay content and soil organic matter.

(C) Adsorption parameters of NOS and $NH4^+$:

1. The results showed close fitness to Van Huay and Freundlich adsorption isotherm in both cases of NO3 and NH_4^+ ions, but Van Huay was the superior. However, a decrease in fitness with Langmuir isotherm was observed in case of NH: but it completely failed in case of NO3 .
2. The affinity constant (n) of Van Hauy equation ranged between 30 and 247 in case of NO3 adsorption and significantly correlated with N uptake by rye grass as well as with silt content, clay content, $CaCO_3$ content and soil CEC. This constant (n) ranged between 5.5 and 107.1 in case of NH_4 adsorption and significantly correlated with clay content, soil CEC and CaCO3, but its correlation with N-uptake was insignificant.
3. The theoretical desorption constant (b) ranged from —4.6 to —17.0 with NO3 adsorption and significantly, but negatively, correlated with N-uptake by rye grass, soil CEC and EC. Values of this constant with NH_4^+ adsorption were positive in the light-textured soils and negative in the heavy-textured

ones and significantly positive correlated with N-uptake by lye grass, organic matter, CaCO3 content and soil CEC.

4. Experimental desorption of NO3 ranged between zero and 3.1 pg/g and significantly correlated with N-uptake by rye grass and silt content. Values of the experimental desorption of NH_4' fluctuated between zero and 2 gg/g and significantly correlated with N-uptake by rye grass, silt, clay and CaCO3 contents as well as with OM and CEC.

(D) Ammonium fixation capacity by soils:

1. Ammonium fixation capacity ranged from 71 to 225 me/100 g soil. Soil which showed low fixation capacity of NH_4^+ are those of low clay content and light texture.

2. A highly significant relationship was obtained between NH4+ fixation capacity of soils and N-uptake by rye grass.

3. Highly significant correlations were also obtained between NH_4^+ fixation capacity and clay, CaCO3 and organic matter contents, but the relationship with coarse sand was negative and highly significant.

(E) **Nitrogen = uptake by rye grass:**

1. Nitrogen-uptake by rye grass ranged between 0.293 and 1.760 mg/pot.

2. Highly significant relationships between N-uptake by we and CEC, clay, silt and organic matter contents were obtained. Significant but negative relationships, were also obtained with coarse sand and soil pH.