

SUMMARY

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- 1- This thesis presents an ecological survey of desert plants in north-west Sinai of Egypt to elucidate their adaptation to environment and ecological relationships between plant communities and habitats.
- 2- The study area is a part of south-west Sinai embodying a number of habitat and vegetation types. For the purpose of the present study, the area is divided into four sectors :
 - i- The coastal plain sector.
 - ii- Ayoun Musa sector.
 - iii- Wadi Sudr sector.
 - iv- El-Heitan sector.
- 3- The course of the study included phytosociological analysis of the main plant communities in the main habitat types. Ecophysiological studies were carried out on the dominant species to elucidate their means of adaptation to their arid and frequently saline environment.
- 4- Due to wide variation in the habitat conditions in the surveyed area, there are numerous plant communities that may be classified into two categories according to the salt content of their habitat :
 - a) Halophytic communities :

These exploit saline habitats and include the following communities: Juncus rigidus, Cressa cretica,

Alhagi maurorum, Halocnemum strobilaceum, Nitraria retusa and Tamarix nilotica communities.

b) Glycophytic communities :

These are confined to non-saline habitats and include the following communities: Reaumuria hirtella, Anabasis setifera, zygophyllum coccineum, Hammada elegans, Anabasis articulata, Lygos raetam and Tamarix nilotica communities.

5- Part I of the thesis comprises information on Sinai including geology and geomorphology of Sinai. It includes also review of literature and a brief description of the methods of vegetation, plant and soil danalyses.

6- Part II of the thesis includes information on the study area and discussion of the climatic features. This part includes also the results obtained for phytosociological and ecophysiological studies.

a) The phytosociological studies included analytical and synthetic characters of the vegetation units (plant communities). Analysis of the soils associated with the plant communities was investigated to elucidate their physical and chemical characteristics. The habitat types within the study area were classified into (i) littoral and inland salt marshes, (ii) swamps, (iii) Sand plains and (iv) wadis.

(i) Littoral and inland salt marshes :

The vegetation of littoral salt marsh is dominated by Halocnemum strobilaceum. This is a highly salt tolerant species that accumulates high amounts of salt within its tissue.

The inland salt marshes at Ayoun Musa are distinguished into wet and dry salt marshes according to the gradual rise of level of salt marsh and deeping of the underground water. The lowest level in the salt marsh is occupied by a zone of Juncus rigidus community where the underground water is very shallow and the soil is very wet. When the level of wet salt marsh gets higher and the level of underground water becomes deeper (dry salt marshes), the vegetation is dominated by Cressa cretica, Alhagi maurorum, Nitraria retusa and Tamarix nilotica communities.

(ii) Swamps :

These are created as a result of flow of spring's water at Ayoun Musa and ill-drainage. Phragmites australis and Typha domingensis were recorded in these swamps.

(iii) Sand plains :

The vegetation of the sand plains is dominated by the two succulent species Zygophyllum coccineum and Anabasis articulata.

(iv) Wadis :

The vegetation of Wadi Sudr and affluent wadis crossing Gebel El-Heitan is dominated by Reaumuria hitella, Anabasis setifera, Hammada elegans, Lygos raetam and Tamarix nilotica.

- b) Ecophysiological studies included the determination of plant moisture content, degree of succulence, ash content, elemental composition of the ash as well as quantitative estimation of carbohydrate fractions, nitrogenous compounds, amino acids and fatty acids. The studies were carried out on the dominant species in winter and summer seasons. The results obtained revealed that the plants of saline habitats attained higher values of succulence and moisture content than non-saline habitats. The ash content of all halophytes and most of glycophytes was higher in summer than in winter. This was associated with high accumulation of Na^+ , K^+ , Ca^{++} , Mg^{++} , P^{+++} and Cl .

Meanwhile, glycophytic species attained higher accumulation of nitrogenous compounds than halophytes. Total carbohydrates in halophytic and glycophytic species attained its highest value in winter. The total amino acids was higher in glycophytes than in halophytes.

Analysis of the fatty acids was carried using G.L.Ç. technique and revealed variations between the species of

the two ecological groups. The number of fatty acids ranged from 12 to 20 in glycophytes with linoleic, myrist-oleic and myristic as major fatty acids. In halophytes the number of fatty acids varried between 8 and 17 with myristic and myrist-oleic as the major fatty acids.

7- Part III of the thesis includes a general discussion of the results obtained included general remarks about the aridity of study area, the close relationship between vegetation and habitats, zonation of salt marsh vegetation, the inclusion of the vegetation of principal wadis of well developed climax and subclimax community types.

Adapatation of glycophytes and halophytes to environmental factors was discussed in relation to the role of succulence, ash, minerals, metabolites and fatty acids.

The last part of the general discussion comprised a classification of the vegetation of the study area based on similarity in structure. The different categories included (a) ground types (Cressa cretica community), (b) succulent half-shrub types (Zygophyllum coccineum, Anabasis setifera, A. articulata, Hammada elegans, Reaumuria hirtella and Halocnemum strobilaceum communities), (c) non-succulent half-shrub types (Alhagi maurorum community), (d)