ecological studies on some desert plants

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1- This thesis presents an ecological survey of desertplants in north-west sinai of Egypt to elucidate theiradaptation to environment and ecological relationshipsbetween plant communities and habitats.2- The study area is a part of south-west Sinai embodyinga number of habitat and vegetation types. For the purposeof the present study, the area is divided into foursectorsi- The coastal plain sector.ii- Ayoun Musa sector.iii- Wadi Sudr sector.iv- El-Heitan sector.3- The course of the study included ·phytosociologicalanalysis of the main plant communities in the mainhabitat types. Ecophysiological studies were carriedout on the dominant species to elucidate their means ofadaptation to their arid and frequently salineenvironment.4- Due to wide variation in the habitat conditions in thesurveyed area, there are numerous plant communitiesthat may be classified into two categories according tothe salt content of their habitat :a) Halophytic communities :These exploit saline habitats and include tl}efollowing communities: Juncus rigidus. Cressa cretica,Alhagi maurorum, Halocnemum strobilaceum, Nitraria retusaand -Tamarix nilotica communities.b) Glycophytic communitiesThese are confined to non saline habitats and includethe following communities: Reaumuria hirtella, Anabasissetifera. zygophyllum coccineum. Hammada elegans, Anabasisarticulata, Lygos raetam and Tamarix nilotica communities.5- Part I of the thesis comprises information on Sinaiincluding geology and geomorphology of Sinai. Itincludes also review of literature and a briefdescription of the methods of vegetation, plant andsoil danalyses.6- Part II of the thesis includes information on the studyarea and discussion of the climatic features. This partincludes also the results obtained forphytosociological and ecophysiological studies.a) The phytosociological studies included analytical andsynthetic characters of the vegetation units (plantcommunities). Analysis of the soils associated with theplant communi ties was investigated to elucidate theirphysical and chemic.al characteristics. The habitattypes 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 marshesThe vegetation of littoral salt marsh is dominated byHalocnemum strobilaceum. This is a highly salt tolerantspecies that accumulates high amounts of salt within itstissue.The inland salt marshes at Ayoun Mus a aredistinguished into wet and dry salt marshes according tothe gradual rise of level of salt marsh and deeping of theunderground water. The lowest level in the salt marsh isoccupied by a zone of Juncus riqidus community where theunderground water is very shallow and the soil is verywet. When the level of wet salt marsh gets higher and thelevel of underground water becomes deeper (dry saltmarshes) , the vegetation is

dominated by cressa cretica,Alhaqi maurorum, Nitraria retusa and Tamarix niloticacommunities.(ii) Swamps :These are created as a result of flow of spring’swater at Ayoun Musa and ill-drainage. Phragmites australisand Typha domingensis were recorded in these swamps.(iii) Sand plains :The vegetation of the sand plains is dominated by thetwo succulent species Zygophyllum coccineum and Anabasisarticulata.{iv) Wadis :The vegetation of Wadi Sudr and affluent wadiscrossing Gebel El-Heitan is dominated by Reaumuria hitellaAnabasis setifera. Hammada elegans. Lygos raetam andTamarix nilotica.b) Ecophysiological studies included. the determination ofplant moisture content, degree of succulence, ashcontent, elemental composition of the ash as well asquantitative estimation of carbohydrate fractions,nitrogenus compounds, amino acids and fatty acids. Thestudies were carried out on the dominant species inwinter and summer seasons. The results obtainedrevealed that the plants of saline habitats attainedhigher values of succulence and moisture content thannon-saline habitats. The ash content of all halophytesand most of glycophytes was higher in summer than inwinter. This was associated with high acumulation ofNa+, K+, ca++, Mg++, p+++ and Cl.Meanwhile, glycophytic species attained higheraccumulation of nitrogenous compounds than halophytes.Total carbohydrates in halophytic and glycophytic speciesattained its highest value in winter. The total aminoacids was higher in glycophytes than in halophytes.Analysis of the fatty acids was carried using G.L.9.technique and revealed variations between the species of•the two ecological groups. The number of fatty acidsranged from 12 to 20 in glycophytes with linoleic, myristoleicand myristic as major fatty acids. In halophytes thenumber of fatty acids varried between 8 and 17 withmyristic and myrist-oleic as the major fatty acids.7-Part III of the thesis includes a general discussion ofthe results obtained included general remarks about thearidity of study area, the close relationship betweenvegetation and habitats, zonation of salt marshvegetation,the inclusion of the vegetation of principalwadis of well developed climax and subclimax communitytypes.Adapatation of glycophytes and halophytes toenvironmental factors was discussed in relation to therole of succulence, ash, minerals, metabolites and fattyacids.The last part of the general discussion comprised aclassification of the vegetation of the study area basedon similarity in structure. The different categoriesincluded (a) ground types (Cressa cretica community), (b)succulent half-shrub types (Zygophyllum coccineum,Anabasissetifera, ~ articulata.Hammada elegans.Reaumuria hirtellaand Halocnemum strobilaceum comunities), (c) non-succule~thalf-shrub types (Alhagi maurorum community), (d)succulent shrub types (Nitraria retusa community), (e)non-succulent shrub types (Lygos ractam and Tamarixnilotica communities), and (f) rush types (Juncus rigiduscommunity).