ecological and taxonomical studies on psammophytes of egypt

omaran nasser ibrahim mohamed ghaly

Psammophytes are plants that inhabit the sand formations including: sand bars, sand hillocks and sand dunes in the coastal and inland deserts of Egypt. They are specialized plants due to their ecological and economical values. The present investigation deals with the ecological and taxonomical studies of seven psammophytic species categorized under two maingroups:I-Graminaceous species:The three selected Gramineae species are: Ammophila arenaria, Elymus farctus and Halopyrum mucronatum.II-Non- Graminaceous species:The four selected Non- Gramineae species are: Atriplex farinosa, Euphorbia paralias, Lotus polyphyllos and Populus euphratica.The studied psamtnophytic plants are characterized by a particular combination of morphological and anatomical adaptations allowing them to survive under water stress, high salt concentration, high temperature, and high irradiances. These adaptations include: Rolling or shedding of leaves to reduce transpiring area (Ammophila arenaria, Elymus farctus and Halopyrum mucronatum). Presence of salt bladder, white slivery hairs and wax layer on leaf surface (Atriplex farinosa, Lotus polyphyllos, Euphorbia paralias and Populus euphratica) which increase reflectance of solar159radiation and decrease cuticular transpiration. Presence of sand sheath (fine sand grains around root), increasing in root/ shoot ratio and long fibrous roots in the studied grass species to maintain and retain any moisture content around root. Deposition of thick cuticle, dense macro-hairs (unicellular hairs), leaf furrows, sunken stomata, narrow intercellular spaces, size and density of vascular system, CAM photosynthetic pathway (C4 plants) and stem assimilants are internal characters helping in suppression of the internal evaporation, increase the efficiency of photosynthetic activity and enable plants to quickly counteract water loss.A total of fifty two (52) stands were sampled representing the studied plants (12 stands for Ammophila arenaria, 10 stands for each of Elymus farctus and Atriplex farinosa two stands for each of Halopyrum mucronatum and Populus euphratica and 8 stands for each of Euphorbia paralias and Lotus polyphyllos). Stands and sites were selected on the basis of the field visual variation of vegetational coverage, climatic and edaphic characteristics prevailing in the study area.This investigation shows that climatic factors, soil salinity, calcium carbonate ratio„ and ratio of silt and clay are the most important factors affecting in morphological, anatomical, distribution and vegetation cover of the studied psammophytic species.Four of the studied plants, namely: Ammophila arenaria, Elytnus farctus, Lotus Polyphyllos and Euphorbia

paralias are restricted to the160Mediterranean coastal sand dunes, where the climate is mild and less arid favorable for plant life than in the inland extreme arid desert. While Atrzplex farinosa and Halopyrum mucronatum are restricted to the Red Sea coastal sand dunes. On the other hand Populus euphratica is restricted only to the sand dunes around the lakes of Siwa Oasis, Western Desert.Fifty three (53) plant species were associated to the studied species at different sites. These species are belonging to forty six (46) genera and 25 families. This low and limited number of species may be due to the instability of the soil of the sand dunes.The main families of the associated species are: Gramineae (16.98 %), Chenopodiaceae (13.2 %) and Compositae (11.32 %). Cruciferae, Umblliferae, Boraginaceae, etc are present in low ratio. The chorology of the studied associate species revealed that: most of the recorded species are: Mediterranean (30%), Saharo-Arabian (26.41%) and Mediterranean -Saharo-Arabian (9.43 %), elements.Few species are belonging to the Australian, Sudanian, Irano-Turanian, and Pluriregional elements. The life forms are: Chamaephyte (32 %), Hemicryptophyte (24.52 %), Phanerophyte (22.64 %), Therophyte(15.0%) and Geophyte (5.84%).Vegetation analysis were carried out quantitatively and qualitatively (by quadrat and line intercept methods) to determine the relative frequency, relative density and relative cover for each species.161Generally, the soil supporting the growth of the studied psammmophytic species are poor in all nutrients (mineral elements) and the organic matter contents. Soil are sandy formed mainly of coarse and fine sands, with little amount of silt and clay. Ammophilla arenaria, E. paralias, L. polyphyllos and E. farctus occurs in habitats with intermediate concentration of soluble salts with the highest levels of CaCO3. Populus euphratica, H. mucronatum and A. farinosa grows in habitats with high soil salinity and intermediated to high CaCO3 content.162ConclusionsThe results of the present study throw lights on representative seven plants inhabiting the sand formations of the Egyptian deserts. Sixconclusions could be obtained.1-The psammophytes are important plants ecologically and economically. They are capable of fixing sand dune movement in thedesert.2-Few studies have bean conducted on these plants, more studies are essentially needed particularly those aiming at rehabilitation and/or cultivation of the species proved to have ecological and economic valueseg. Populus euphratica and Atriplex farinosa.3-The restricted distribution of the grass Halopyrum mucronatum is an ecological phenomenon needs to be studied carefully. The plant is in fact endangered and should be protected. Its seeds should be kept in seedbanks.4-A proposal to carry out genetic studies on the wheat (Triticum spp.) and Elymus farctus to get new hybrid of wheat capable of living on the sand dune under desert condition worth to be encouraged.5-Continuous destruction of the psammophytic vegetation is obvious particularly in the coastal desert. The establishment of new coastal villages for tourists is the main factor. This will certainly lead to the extinction of the genetic resources of these valuable plants.6-A proposal aiming at arresting such destruction and rehabilitation ofthese plants is essentially needed.