Abstract:

Summary For three successive years (2011-2013), the floristic diversity and vegetation composition of the functional groups in the southern part of the Eastern Desert, between latitudes 26o 45' to 24o 1'N and longitudes 32o 45' to 35o 00'E that covers a total area of about 54500 km2, were investigated through four transects (3 crossing the Eastern Desert and one along the Red Sea). These transects were (1) Qena-Safaga road, (2) Idfu-Marsa Alam road, (3) Aswan-Khartit-Gimal and (4) Red Sea Coastal Plain. A floristic-count list was taken from the 142 stands to represent the floristic composition, functional groups, chorology and occurrences (Q-values). These stands were distributed as follows: 6 stands at Aswan-Berenece road, 6 at Wadi Kharit, 10 at Wadi Natash, 6 at El-Shikh El-Shazly Marsa-Alam road, 20 stands at Wadi Gimal and its tributary (Wadi Hafafit), 26 stand at Idfu-Marsa Alam road, 22 at Qena-Safaga road, and 46 from the Red Sea. Each stand was georeferenced using a GPS. The recorded taxa were classified according to the four functional groups (trees, shrubs, perennial herbs and annual herbs). The number of species within each functional group category was expressed as a percentage of total number of species in the study area. Soil samples were collected from each stand, and the soil texture, soil moisture content, organic matter (OM), electric conductivity (EC), total soluble salts (TSS), pH, major ions (Na+, K+, Ca+2, Mg+2, Cl-, SO4-2 and HCO3-) were determined. A total of 94 plant species belonging to 33 different families were recorded (62 perennials and 32 annuals), with Asteraceae, Zygophyllaceae, Fabaceae, Poaceae, Chenopodiaceae, and Brassicaceae as the largest families. Shrubs represented the largest functional group (30.9%), while perennial herbs represented the smallest one (12.8%). Species occurrence 999 (Q-value) revealed that Zilla spinosa, Acacia tortilis subsp. raddiana, Morettia philaeana, Salsola imbricata subsp. imbricata, Zygophyllum coccineum and Citrullus colocynthis had wide ecological range of distribution (dominant species, Q-values ≥ 0.2). Calculations of species occurrence and dominance revealed that 58 species represent rare and very rare taxa. Most of the recorded species in the study area were Saharo-Arabian chorotype which represented by 77.5%. On the contrary, the widely distributed species belonging to cosmopolitan, palaeotropical, and pantropical chorotypes constituted about 12.8% of the recorded flora. The endemic species were completely absent. Studying the distribution of functional groups within the studied transects showed significant difference for the Red Sea transect among the others. The shrubly species were the most widely distributed layer among the 4 transects. On the other hand, the shrubs of Zygophyllum album, Nitria retusa, Limonium axillare, Crotalaria aegyptiaca, Arthrocnemum macrostachyum, Cornalca monacantha and Capparis spinosa were confined to the Red Sea transect. The perennial herb (Citrullus colocynthis) was distributed in the southern part (Wadi Natach). The trees of Balanites aegyptiaca and Capparis decidua were recorded only in Wadi Gimal (T3). Comparing the flora of the study area with the northern part showed that the floristic diversity in the northern part is three times (163 species; 103 confined to the northern part) higher than that of this southern one. It can be concluded that the application of cluster analysis technique has provided useful tool in classifying stands into many vegetation groups coinciding with ecological variations. Classification of the data set yielded 6, 7, 4 and 6 vegetation groups for T1, T2, T3 and T4, respectively. The analysis of variance (ANOVA) application to the species diversity 999 indices (SR and H') showed significant difference between the groups within each transect. The communities (vegetation groups) of first transect were (A): Zilla spinosa- Caroxylon imbricatum- Ziziphus spina-christi group, (B): Zilla spinosa group, (C): Zygophyllum coccineum-Aerva javanica group, (D1): Zilla spinosa- Zygophyllum coccineum group, (D2): Zygophyllum coccineum-Tamarix nilotica group and (E): Caroxylon imbricatum- Morettia philaeana Trichodesma africanum-Citrullus colocynthis group. Along Idfu-Marsa Alam transect (T2), the plant discerned plant communities were (A1): Zilla spinosa- Caroxylon imbricatum- Morettia philaeana group, (A2): Zilla spinosa- Caroxylon imbricatum group, (B1): Zilla spinosa-Acacia tortilis subsp. raddiana group, (B2): Zilla spinosa-Aerva javanica-Pulicaria undulata subsp. undulata- Pergularia tomentosa group, (C): Zilla spinosa-Astragalus vogelli group, (D1): Fagonia thebaica-Morettia philaeana group, (D2): Zilla spinosa- Caroxylon imbricatum- Fagonia thebaica- Morettia philaeana group The southern transect (T3) communities were (A): Balanites aegyptiaca group, (B): Acacia tortilis subsp. raddiana group, (C): Morettia philaeana group and (D): Zilla spinosa-Astragalus eremophilus-Cotula cinerea group. Meanwhile, the Red Sea coast (T4) was characterized by many salt-tolerant, salt excretive species and Red Sea elements within the 6 communities; (A): Zilla spinosa-Zygophyllum coccineum group, (B): Tamarix nilotica-Zygophyllum coccineum group, (C): Nitria retusa-Tamarix aphylla group, (D): Zygophyllum album group, (E1): Tamarix nilotica group and (E2): Limonium axillare group. The soil-vegetation relationships were assessed by both DCA and CCA. CCA analysis showed well the relative positions of species and sites along the most important ecological gradients. Both ordination techniques 999 clearly indicated that ordination of vegetation groups generally separated from each other and sometimes interconnected. The segregation of these groups along...
both axis of biplot implies that edaphic factors seem to play an important part in the distribution pattern of the species in the study area. Each species is distributed in its own way according to its own genetic and physiological characteristics, and its relation to both physical environment and interaction with other species. Hence, no two species are alike in distribution. Soil texture, moisture content, salinity, sulphates and organic matter contents were highly correlated with the distribution patterns of species. Studying the functional groups (trees, shrubs, perennial herbs and annual herbs) responses to soil variables showed spatial changes that may affect functional groups. Canonical correspondence analysis (CCA) used to elucidate the responses of the studied FGs to their environment. These four FGs were equally responded to water content and Ca+2; meanwhile the K+ and organic matter were the most important factors to the trees followed by the salinity factors (Na+ and Cl-). Trees, shrubs and perennial herbs showed similar responses to pH, Mg+2 and SO4-2. Gravels and fine sand were significant to shrubs and annual herbs. Also, coarse sand and clay had an importance to the lower layer (annual herbs). In addition, HCO3- showed its effect only on the perennial herbs. The species diversity indices of the FGs showed significant correlations with the soil gradients. There was a correlation between the coarse sand and trees diversity. However, water content was significantly affects the annual herbs diversity. Meanwhile, the perennial herbs diversity showed significant correlations with 11 soil variables (soil texture and WC were not included).

**Keywords:**

KEYWORDS: Diversity, desert vegetation, CCA, Egypt, functional traits, vegetation-environment relationships

**Published In:**

LAP LAMPERT Academic Publishing , NULL , 250