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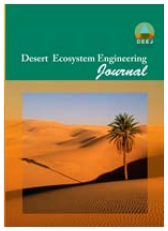

A study of changes in vegetation along environmental gradients in desert areas (Case study: west rangelands of Ferdows)

Moslem Rostampour,[1*] Reza Yari,[2] Javad Chezgi [3]

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Expanded abstract

Introduction: Considering the sensitive and fragile conditions of the ecosystems of arid and semi-arid regions, determining the contribution of factors affecting species diversity is of particular importance. In dry and desert areas, vegetation and species diversity are affected by topographical, edaphic and climatic characteristics The relationship between biodiversity and local environment is one common thread in biogeography and plant ecology. In arid regions, research in this area is very limited, species diversity patterns and species abundance distributions change in response to habitat heterogeneity in desert regions. One of the factors of heterogeneity in habitats of dry and desert areas is soil salinity. Soil salinity is one of the important environmental problems that causes problems for plants in different ways. This research examines the changes in species diversity with increasing altitude above sea level and changes in the soil properties in the west rangelands of Ferdows.

Material and Methods: For this purpose, sampling was done from the lowest point of the region, the edge of the playa, from where the first species of *Se. rosmarinus* were observed, and the sampling was continued up to the heights of the summer rangelands, which was *Stipa barbata* type. Vegetation characteristics such as vegetation cover percentage, density, α and β species diversity indices and species abundance distribution (SAD) in each representative area were determined. At the beginning, middle and end of each transect, soil sampling was done (0-30 cm depth). The combined sample of each transect was transferred to the soil science laboratory of the Faculty of Agriculture of Birjand University, and the physical and chemical characteristics of the soil include EC, pH, N, K, Ca, Mg, Na, Cl, bicarbonates, organic matter, lime, gypsum, and soil texture and saturated moisture. It was determined using EC meter, pH meter, Kjeldahl, spectrophotometer, calcium meter, hydrometer and acetone and weight method. Also, the height above sea level of each transect was determined by GPS.The most important environmental factors affecting the distribution of plant types were identified by multiple regression analysis and PCA. Multiple regression was performed by backward elimination method. Before PCA analysis, centering and scaling were done on the matrix of environmental factors. Scree plot was used to determine the most important components. In order to determine the most important environmental factors with each of the PCA axes, Pearson's correlation coefficient was used. All statistical tests were performed by R software (R Core Team, 2021).

Results: The results of this research showed that with the increase in elevation, the percentage of vegetation, number of species and species diversity increased. The results show that with the increase in elevation, from the first type to the last type, about 95% of plant species have changed. Multiple regression results showed that altitude had the highest effect on the vegetation cover percentage (β= 0.53). Gypsum and magnesium cause the

1. Assistant Professor, Department of Rangeland and Watershed Management and Research Group of Drought and Climate Change, Faculty of Natural Resources and Environment, University of Birjand, Birjand, Iran; E-mail: rostampour@birjand.ac.ir
2. Assistant Professor, Khorasan-e-razavi Agricultural and Natural Resources Research and Education Center, Agricultural Research, Education and Extension Organization (AREEO), Mashhad, Iran
3. Assistant Professor, Department of Rangeland and Watershed Management, Faculty of Natural Resources and Environment, University of Birjand, Birjand, Iran

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presence of *Se. rosmarinus*. The results show that the general regression equation does not have the necessary validity, because the VIF values of some environmental factors are very high. After removing the environmental factors with high VIF, among the studied variables, only saturated moisture, alkalinity, magnesium, organic matter, nitrogen, lime, gypsum, sand and height remained in the regression equation. The results show that there is a significant linear relationship between environmental factors and vegetation percentage with a determination coefficient of 0.79 ($p<0.001$ and F: 6.13). Among the environmental factors, height above sea level was the only factor whose regression coefficient became significant and remained in the equation, and it also has the highest influence coefficient ($\beta=0.53$). Therefore, the height above sea level has the greatest effect on the percentage of vegetation Elevation and soil moisture saturation are effective in the distribution of *Zy. atriplicoides* and *St. barbata* in the mountainous. Also, sand is effective in the distribution of *Ca. polygonoides* and *St. pennata.*

Discussions and Conclusion According to the results, the vegetation properties and biodiversity show different reactions to the dominant environmental gradients of the study area. Also, the beta diversity is very high, indicating the severe variations in species composition from the beginning of the environmental gradient to the end of the gradient. One of the most important aspects of innovative and applied research is the phytosociological study of the study area for the first time, as well as the study of biodiversity and species distribution patterns. Therefore, the results of this study can be applied to planning rangeland reclamation and combating desertification.

Keywords: Elevation, Soil Texture, Soil Salinity, Biodiversity, Arid Regions.