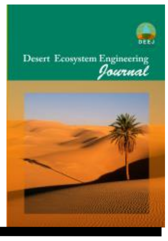
DEEJ (2021) 10 (32) 125-133

University of Kashan

Desert Ecosystem Engineering Journal

Journal homepage: http://deej.kashanu.ac.ir



Investigating the Relationship Between Species Richness and Vegetation of Different Vegetative Forms: A Case Study of Middle Taleghan

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Received: 08/02/2021 Accepted: 10/08/2021

Extended Abstract

Introduction: The loss of biodiversity worldwide and its impact on ecosystems' functions and performance over the past few decades has led to the conduct of many studies in this regard. On the other hand, identifying the reasons behind and the processes involved in changes made in species diversity has remained a challenge in ecological research. However, as vegetation is one of the factors that affect the richness of species, this study sought to investigate the relationship between species richness and vegetation percentage in the middle Taleghan rangelands.

Materials and Methods: considering the effects of livestock grazing, pasture condition and tendency, soil erosion, soil depth, and the percentage of rocks and pebbles at each site, the researchers of this study identified five levels of turbulence and stress in order of importance, including high turbulence and medium stress, medium turbulence and medium stress, medium turbulence and low stress, low turbulence, and moderate stress and low turbulence and low stress. To this end, random-systematic sampling was performed on the representative areas of each sampling unit to collect the required samples.

Moreover, the number of plots was determined via the statistical method of 21 (one square meter) and the sampling was performed along two to three transects (100 to 150 meters long) in the representative areas of the study sites (a total of 735 plots). In each plot, first, the list of plants was recorded and their life forms were identified individually. Furthermore, different regression models were used to investigate the relationship between canopy cover percentage and species richness. These models were developed in such a way that the researchers were able to insert the amount of species richness (species per square meter) as a dependent variable (response) and the percentage of vegetation canopy as an independent variable in the relevant equations.

On the other hand, to investigate the relationship between species richness and canopy cover percentage of plant species, first, the matrix of the data regarding the plant species cover percentage in different plots and sites was produced, followed by the modeling of regression equations via vegan and IME 4 packages in R software. Moreover, this study used a hybrid model to model the regression relationships between species richness and vegetation percentage. To this end, the best model was selected based on AIC standard statistics from among different regression models fitted on species richness and percentage of the vegetation canopy. It should be noted that as the results of such a statistic are separately calculated for each effect, and that the best model is selected based on the lowest value of the statistic, two or more models are selected as the best model in cases where the difference of the statistic is less than 2 in two or more models. Finally, R2C and R2m values were calculated for the best model using the MuMIn package in R software.

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DOI: 10.22052/deej.2021.10.32.61

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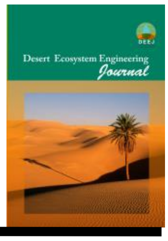

Results: The study's results indicated that the logarithm-quadratic model was the best-fitted model for the relationships between species richness and percentage of vegetation canopy for forbs, grasses, and shrubs. It was also found that the highest variance in modeling was explained by the fixed effect (based on R2m values). Therefore, the broad-leaf weeds and the shrubs had the highest and lowest variance, respectively. The results also showed that the relationship between species richness in different vegetative forms and the percentage of vegetation canopy were Gaussian but not complete. Moreover, the Gaussian model was observed more on the left side of the curve. Furthermore, in the broad-leaf weeds, the highest species richness was observed in moderate turbulence and stress and the lowest one was found in low turbulence and stress. On the other hand, in wheatgrass plants, the highest species richness was observed at high turbulence levels and the lowest one was found at low turbulence and stress.

According to the study's results, the quadratic model was identified as the best-fitted model for the relationships between species richness and canopy cover percentage. Also, it was found that species richness was increased with increasing vegetation percentage and that the species richness decreased (Gaussian relationship) with increased vegetation percentage. Moreover, the highest amount of species richness was found in low turbulence and moderate stress and medium turbulence and low stress, and its lowest amount was observed in low turbulence and low stress. Furthermore, the highest species richness was found in 60-65% of the vegetation.

Discussion and Conclusion: The results showed that the relationship between species richness and canopy cover percentage was of Gaussian type and that the amount of species richness increased with an increase in the percentage of vegetation, and this increasing trend continued almost to 60% of the vegetation. Moreover, it was found that the species richness decreased with an increase in the percentage of vegetation (more than 60% of vegetation), which may be attributed to reduced light intake, which, in turn, would lead to a Gaussian relationship.

Furthermore, according to the study's results, the highest species richness was observed at moderate turbulence and stress, and the lowest was observed at the level of low turbulence and stress. On the other hand, in wheatgrass plants, the highest species richness was observed at a high turbulence level, which could be due to the effect of grazing intensity and turbulence on species of the wheatgrass family. In general, a Gaussian relationship was observed in the whole study area between species richness and vegetation. Therefore, as measuring vegetation is easier and more accessible than other parameters such as biomass, it can be used as a parameter to predict species richness in rangelands. Moreover, considering the fact that a few studies have so far been conducted on the investigation of such a relationship in Iranian rangelands, and on the threshold at which vegetation is at its maximum species richness, examining such a relationship can help the relevant officials manage and maintain vegetation as much as possible so that that optimal species richness is obtained in the ecosystem.

Keywords: Combined model, Gaussian relationship, Species richness, Taleghan, Vegetative form.