

Effects of different utilization levels on species richness changes in Saral grassland , Kurdistan Province

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Introduction Species richness reflects the number of species in a plant community . It is one of the most important plant based evaluation indices for rangeland ecosystems (Cingolani *et al.* , 2005) . The present research was conducted to evaluate effects different utilization levels upon species richness within grasslands of the Saral region of Kurdistan .

Materials and methods Three areas (reference , key and critical areas) were selected from within the Sarel region . Species richness data were collected using Whittaker plots . Ten plots in each area were used to and data were analyzed using regression ($S = \beta + \beta \log x + \epsilon$) , Where : S : average number of species in each plots , β : intercept , β : species richness changes per area unit , ϵ : error amount and x : plot size (0 . 1 , 1 , 10 , 100 and 1000) . Finally , regression coefficient (β) and intercept (β) were compared by using t-student statistical method together . Paired regressions showed species richness changes . Minitab13 software was used for this comparing .

Results and conclusion The statistical models for each area (key , reference and critical areas) were obtained as below : $S_{key} = 3 . 56 + 3 . 76 \log x$, $S_{Reference} = 3 . 83 + 4 . 53 \log x$ and $S_{Critical} = 1 . 77 + 1 . 99 \log x$.

The determination coefficients of above equations are respectively 0 . 94 , 0 . 98 and 0 . 98 at 1% level . Regression paired comparing for key and reference area showed that t-calculated (0 . 53) was smaller than t-table . Therefore there was not a significant difference between these two areas . The t-calculated value was bigger than t-table in reference and critical areas and in key and critical areas . These results show that both key and critical areas are susceptible to species number changes . Figure 1 , 2 and 3 show regression equations and lines at key , reference and critical areas .

Discussion Key and reference areas were not different . We assumed then that moderate grazing had the same effects as no grazing on species richness . This result is similar to those obtained by Mesdaghi (1980) . With heavy grazing (critical area) there was an obvious reduction of species richness which can be serious risk for rangeland . Utilization based on a key area in each management level is the best approach for rangeland protection and conservation .

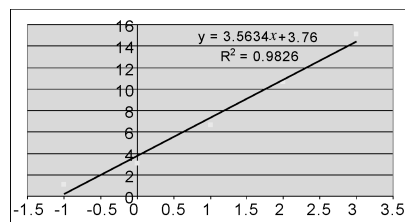


Figure 1 Regression equation of key area .

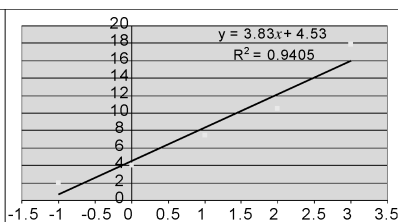


Figure 2 Regression equation of reference area .

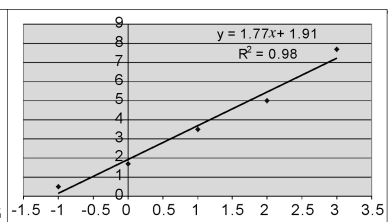


Figure 3 Regression equation of critical area .

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