

Applying multivariate analysis in semi-steppe rangelands (Case study : steppe rangelands of Fars province , Iran)

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Introduction This research has been done by using DCA and CCA ordination techniques and TWINSpan as classification method for determining the most important factors affecting the semi-steppe rangelands vegetation structure in Fars province of Iran through 2400-2800 m and determining ecological vegetation groups distributed in semi-steppe rangelands .

Materials and methods In ILWIS GIS software the slope , aspect and final landforms of studied area were prepared . Vegetation sampling was done in 1 m² quadrats along four 300 m . lengthwise transects and eight 100 m . widthwise transects in middle of May in 2006 . For soil sampling , we use land form map and Sorenson similarity index . In general parameters such as soil structure , texture (clay , loam , sand) , organic carbon , EC , N , P , K , pH , CaCO₃ and CaSO₄ was measured in 0 to 30 cm . Then all data in Pc-Ord software were imported and analyzed by DCA , CCA , MRPP and TWINSpan techniques .

Results Using CCA and Montcarlo test in 2400-2800 meters showed correlation of environmental factors to ordination axes as being shown in Table 1 .

Table 1

Altitudinal stratum	Environmental factors	Correlation(%)	Ordination axes
2400-2500	Sand , Nitrogen	84.3	1
2400-2500	Slope ,Aspect ,EC ,Clay ,Silt ,K ,P ,Organic Carbon	81.8	2
2400-2500	CaCO ₃ ,C/N ,Altitude ,Slope ,CaSO ₄ ,pH	61.7	3
2500-2600	Altitude , Slope ,Aspect ,K ,Clay	84.9	1
2500-2600	EC ,pH , CaCO ₃ ,C/N ,Silt	83.3	2
2500-2600	CaSO ₄ ,Organic Carbon ,N ,P ,Sand	70.5	3
2600-2700	Aspect ,EC ,N ,K ,Clay	95.2	1
2600-2700	Altitude ,Slope ,CaSO ₄ ,EC ,C/N ,P ,Sand	99.3	2
2600-2700	CaCO ₃ ,Organic Carbon ,Silt	97.3	3
2700-2800	Altitude , CaCO ₃ ,Sand	83.1	1
2700-2800	Aspect ,EC ,Organic Carbon ,C/N ,P ,K ,Silt	72.2	2
2700-2800	Slope ,CaSO ₄ ,pH ,N ,Clay	60	3

Conclusions The results are shown in Table 2 .

Table 2

Altitudinal stratum	Ecological Group
2400-2500	1 . <i>Artemisia aucheri</i> - <i>Astragalus arbusculus</i>
	2 . <i>Stachys inflata</i> - <i>Euphorbia sp.</i>
	3 . <i>Astragalus rhodocemius</i> - <i>Gundelia tournefortii</i>
	4 . <i>Astragalus arbusculus</i> - <i>Astragalus cephalantus</i>
	5 . <i>Astragalus cephalantus</i> - <i>Thymus vulgar</i>
2500-2600	1 . <i>Astragalus cephalantus</i> - <i>Artemisia aucheri</i>
	2 . <i>Hertia angustifolia</i> - <i>Astragalus arbusculus</i>
	3 . <i>Hertia angustifolia</i> - <i>Astragalus mycranthus</i>
	4 . <i>Hertia angustifolia</i> - <i>Artemisia aucheri</i>
2600-2700	1 . <i>Artemisia aucheri</i> - <i>Phlomis orientalis</i>
	2 . <i>Prangos ferulacea</i> - <i>Stachys inflata</i>
	3 . <i>Prangos ferulacea</i> - <i>Artemisia aucheri</i>
	4 . <i>Artemisia aucheri</i> - <i>Ferula ovina</i>
	5 . <i>Prangos ferulacea</i> - <i>Daphne mucronata</i>
	6 . <i>Daphne mucronata</i> - <i>Ferula ovina</i>
2700-2800	1 . <i>Amygdalus lycioides</i> - <i>Daphne mucronata</i>
	2 . <i>Artemisia aucheri</i> - <i>Ferula ovina</i>

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