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Rare Plant Species of the Protected Area of Kalmand-Bahadoran, Yazd Province, Iran

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Abstract

In this study, we collected and determined rare plant species from protected areas of kalmand-Bahadoran located in 30-105 km SE of Yazd City in the Yazd Province. Analyses of the flora showed that, there is 148 vascular plant species in this area. Threatened species of this region analyzed, according to the IUCN criteria. On the basis of this study, four categories of rare species so called Endangered, vulnerable, lower risk and data deficient are determined and the list of these species has been presented. Result showed that, there is 34 threatened plant species in this protected area. Finally, floristic composition, and species richness of this area is discussed.

Keywords: Flora, Biologic form, rare species, Kalmand-Bahadoran.

1. Introduction

Nowadays the procedure of investigation, recognition, and maintenance of herbal species, especially useful and rare ones has gained vital importance in the world. It constructs a foundation for sustainable development and presents principle and logical utilization of nature and natural resources and is defined as a basis for protecting and maintaining herbal species and genetic treasure. Therefore, aiming at recognition and introduction of rare and useful species of plants and animals all over the world and adopting necessary approaches to prevent from their extinction, International Union for Conservation of Nature and Natural Resources (IUCN) has been established.

Among studies conducted in Iran by Iranian and foreign botanists about collection and identification of plants we may refer to Iran's flora [12], *Iranica* flora [14], *Orientalis* flora [3], Iran's herbs [9], Iran's flora [2], Iran's *Asastragalus bisulcatus* (*astragalus* spp) [8], study of Iran's desert flora and herbs [7] and etc.; however, although some floras are arguent for research and educational purposes, there not only do exist documented floras published regarding various parts of Iran but also there are less studies about rare species according to patterns and criteria of IUCN organization.

To achieve this goal, one protected zone of Yazd province i.e. Kalmand-Bahadoran protected zone is selected. The reason for selecting this zone stems from this fact that those plants of this area are to some extent being preserved from livestock foraging and human destruction and therefore study of this area flora is applicable and beneficial. Up to now flora of some protected zones like Turan and Kavir [14, 15], Arasbaran [1], are being investigated. In Yazd province there are some investigations conducted on province total-floras [10] and various regions including Kalmand-

Bahadoran and KuheBafgh protected zones [6]as well as other locations. However, there is not any documented report about Yazd’s protected zones plants.

2. Study area

Kalmand-Bahadoran protected zone with approximately 255 thousands hectare situated 30 to 105 kilometers far in southeast of Yazd alongside Yazd-Kerman road at 31° and 20’ of north latitude and 54° and 30’ of east longitude. The zone mean attitude is 1616 above sea level and it is claimed as Kalmand-Bahadoran protected zone in 1994. The highest point is Medvar Mountain with altitude of approximately 3290 meters and the lowest part is positioned in Mahdiabad plain with an altitude of 1400 meters. Based on meteorological statistics annual precipitation average is 100 millimeters. The highest amount of rainfall occurs in January–February (22/21 millimeter). As it is observed in ambro-thermic diagram of the region drought period is started from the second half of March (beginning of Farvardin) and continues till second part of November (beginning of Azar). Maximum temperature average is 29/44 and coldest average is 5/22⁰C; moreover annual humidity average is 30%.

3. Methods of investigating rare and endangered species

Researchers use various criteria for identification, investigation, and classification of rare species like limited geographical propagation and low population; in 1985, Grime, beside above criteria, considered hard bio-environmental conditions and heavy environmental changes as important factors in determining rare species. Rabinowitz(1981) identified some rare species based on geographical range of propagation, habitat features, and population size. Fielder and Ahouse(1992) described rare classes according to species, spatial dispersion and their chronological resistance. In order to determine and classify rare species, some researchers use various routinesliketaxonomy, chronology, endemism, the quality of settlement and natural proliferation, the manner of plants utilization by human beings, livestock, wildlife, and finally illness and diseases, lack of bio-reactions that causes population reduction and therefore species extinction.

In this study, some criteria such as limited geographical propagation, human utilization of plants, livestock, wildlife, population amount, biologic form, how to settle and natural reproduction, have been used in determining rare species classes of investigated zone. Among 8 classes of rare plants, based on IUCN classification principles, we have identified 4 classes as follows:

1. Endangered species facing extinction (En)
2. Vulnerable species (Vu)
3. Lower Risk species (LR)
4. Data Deficient species (DD)

4. Results

Preliminary Results achieved from KalmandBahadoranprotected zone show that there are 148 herbal species in this zone. Among them rare species were extracted and their biologic form featureswere determined as in table 1.

With respect to the fact that there is not complete information available on the regions' flora in the past years and yet no exact investigation is being carrying out regarding rareness of species in Iran, about 34herbalspecies were identified as endangered class in this region that mostly clas-sified as lower risk category. Table 1 shows rare and vulnerablespecies of the above mentioned region.

Scientific Name	Rare class	Biologic form
Apiaceae		
PrangoscheilanthifoliaBoiss.	LR	He.
Asteraceae		
Centaureagaubae (Bornm.) wagenitz	LR	He.
CentaureaispahanicaBoiss.	LR	He.
Cirsiumspactabilis DC.	LR	He.
Cousiniapiptocephala Bunge.	LR	He.
EchinopsцератопhorusBoiss.	LR	He.
JurineabungeiBoiss.	DD	He.
Jurinea radians Boiss. Subsp radians	DD	He.
Boraginaceae		
OnosmastenosiphonBoiss.	LR	He.
Brassicaceae		
Alyssum bracteatumBoiss. , Buhse	LR	Th.
IsatisrugulosaBge.exBoiss.	LR	Th.
SamerariaelegansBoiss.	LR	Th.
Sterigmostemumlongistylum(Boiss).Bornm.	LR	Th.
Caryophyllaceae		
AcanthophyllumchloroleucumRech.f ., Aell	DD	Ch.
Lamiaceae		
Nepetasaccarata Bunge.	LR	Th.
NepetaSatureioidesBoiss.	LR	Th.
ZatariamultifloraBoiss.	LR	Ch.
Liliaceae		
Allium chloroneurumBoiss.	LR	Cr.
Papilionaceae		
Astragalus (Choronopuse) jesdianusBoiss. , Buhse	LR	He.
Astragalus (choronopus) vanilla Boiss.	LR	He.

Scientific Name	Rare class	Biologic form
AstragalusbakaliensisBge.	LR	Th.
AstragalusbiovulatusBge.	LR	Th.
AstragaluscampylanthusBoiss.	LR	He.
AstragaluseriostomusBornm.	Vu	Ch.
AstragalusglaucacanthusFisch.	LR	Nph.
AstragalusmicrophysaBoiss.	LR	Ch.
GlauciumcalycinumBoiss.	LR	He.
Plumbaginaceae		
AcantholimonscorpiusBoiss.	LR	Ch.
Polygonaceae		
CalligonumbungeiBoiss	LR	Nph.
Primulaceae		
DionysiajanthinaBornm. , Winkler	Vu	He.
Resedaceae		
Reseda macrobotrysBoiss.	LR	He.
Tamaricaceae		
Reaumuriaoxiana (Ledch.) Boiss.	LR	Ch.
TamarixroseaBge.	Vu	Ph.

Tab 1. List of Rare plant species of Kalmand Bahadoran Yazd Province

Rare categoriesinclude:*Endangered species facing extinction (En),vulnerable species (Vu), and Lower Risk species (LR), Data Deficient species (DD)*
Biologic form include: *Throphytes(Th),Criptophytes(Cr),Hemicryptophytes(He), Phanerophytes(Ph.), Nanophanerophytes (Nph)*

5. Summary and Conclusions

The investigated region is situated in the heart of Iran’s central plateau and is assumed as IranoT ouranian’svegetativeregion. Totally, regarding plants, this regionis less enriched than the whole country. The existence of limited number of tree and shrub species even in sparse and sporadic-form shows that this area is poor concerningvariety and amount of woody species. Based on in-formation achieved from this research most of the herbal species included at firstperennialshrub species that may tolerate drying conditions and regarding low precipitation they can continue their survival and finely reproduce in rainy years and secondlyannual species that are drought escape and whendrought is prevailed they biologically turn to dormant.Herbal speciesof the re-gion are mainly belonging to *Astraceae, Paplionaceae,andBrassicaceae*families. Herbal species were to some extent immune from destruction in recent years since they are protected by Environmen-tal Protection Agency and because livestock manager were removed from the region; however,

recent droughts caused their population and frequency to be declined meaningfully. According to Zohri view point important Iran's locations regarding floristic enrichment, percentage of exclusive and rare species, are Alborz and Zagros mountain ranges and some single mountains like Karkas, Shirkooh in Yazd, and south Kerman mountains. The investigated region is relatively near Shirkooh and its endangered species is not so much as indicated in table 1. The endangered species are mostly among lower Risk class and their biologic form character is described as hemicryptophyte 47%, Therophyte 23.5%, Chameophyte 12%, and rarely Phanerophyte and NanoPhanerophyte.

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