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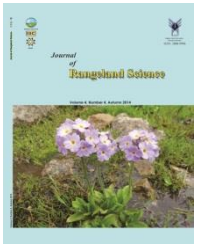

Research and Full Length Article:

Study of Physiognomy and Origin of Plant Species in Sarshiv Area of Marivan, Iran

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Received on: 19/05/2014
Accepted on: 06/10/2014

Abstract. Vegetation of each region is one of the most important phenomena of nature and is the best guide to judge about the ecological sciences of that region because the plants are resistant organisms that have endured the long term conditions of all kinds of environmental conditions for a long period of time and have adapted with environmental stresses. Therefore floristical investigation of each region is outmost importance for that region and it serves as a birth certification document. It also reviews geographical and floristical origins of each region which is the most effective method for managing and protecting the available genetic resources. The aim of this study was introducing flora, life form and plant chorotypes in Sarshiv rangelands, west of Marivan, Iran. The method of sampling was random- systematic with 76 plots. Floristical studies showed that there were 39 families, 116 genera and 139 plant species in this area. The most important families in this area were Asteraceae (20 species), Papilionaceae (Fabaceae) (16 species), Apiaceae (11 species) and Poaceae (10 species). Among all species identified in this region, one was endemic and the three other species were considered as rare. Investigation of life forms based on Raunkiaer method showed that there were various plants in different life form. Among all of them, Terophytes (35%) and Chamaephytes (3%) had the highest and the lowest plant species, respectively. The review of the geographical distribution of plants in the region showed that the species belonged to different Chorotypes and Irano-Turanian (50%) and European–Siberian (1%) had the highest and the lowest plant species of the region, respectively.

Key words: Flora, Life forms, Plant geography, Chorotypes, Sarshiv area

Introduction

The nature and quality of vegetation cover is an important factor for soil conservation because it plays a major role in reducing the erosive impact of precipitation in degraded areas in semi-arid regions (Turan and Filiz, 2011). Vegetation of each region is one of the most important phenomena of nature and the best judging guide to the ecological sciences of that region. Because the plants are resistant organisms they have endured in the long term conditions and events of all environmental and have adapted with environmental stresses (Atashgahi *et al*., 2009). Floristical investigation of each region is important for that region and it functions as a birth certification document. It also reviews it functions as a geographical and floristical origin of each regionwhich is the most effective method for managing and protecting the available genetic resources (Vaseghi *et al*., 2008). The life form of each plant is fixed character that is based on morphological adaptation to environment conditions. The important life forms in various communities are related to structure and there are many life form classifications but among them the practical system is Raunkiaer (Atashgahi *et al*., 2009).

The classification of plant species in Raunkiaer method is based on vegetative buds location after unfavorable season. Raunkiaer classification method assume that plants morphology are in relationship with climatic factors. On the basis of Raunkiaer classification, plants are classified into 6 categories: phanerophyte, chamaephyte, hemicryptophyte, terophyte, epiphyte and geophyte (Kent and Coker, 1992). Each species has unique ecological range and can tolerate a certain amount of changes in the environment. Any field distribution may be limited or extensive (Atashgahi *et al*., 2009). In order to better study the distribution area, scientists such as Takhtajan and Zohary, had divided the world territory into different kinds (Takhtajan, 1986; Zohary, 1963). Iran has special geobotanic in the Middle East situation, so that as the bridge between the four major regional phytogeography i.e. Irano-Turanian, European-Siberian, the Sahara-Saudi Arabian and Sudan (Zohary, 1963).

The European-Siberian is characterized in the sub provenance hyrcanian. Irano-Turanian region include three-quarters of Iran's area (Zohary, 1963). Several studies on the flora, the introduction of flora and life forms has been done (Zohary, 1963; Zohary, 1973; Asri and Mehrnia, 2001; Asri and Eftekhari, 2002; Ashrafi *et al.*, 2004; Vakili Shahre Babaki *et al*., 2001; Kashipazha *et al*., 2004, basiri *et al*., 2011; Rahimi and Atri, 2013). The aim of this study was to determine florist list, life forms and chorology of plants in the Sarshiv of rangelands Marivan area in Iran.

Materials and Methods

Study area

The studied area (Marivan) in the West of Kordestan, is located between 45°16 '52" to 45°29'58" eastern longitude and 36°9'45" to 36°25'45" north latitude geographical range (Basiri and Mozayyan, 2010) (Fig. 1).

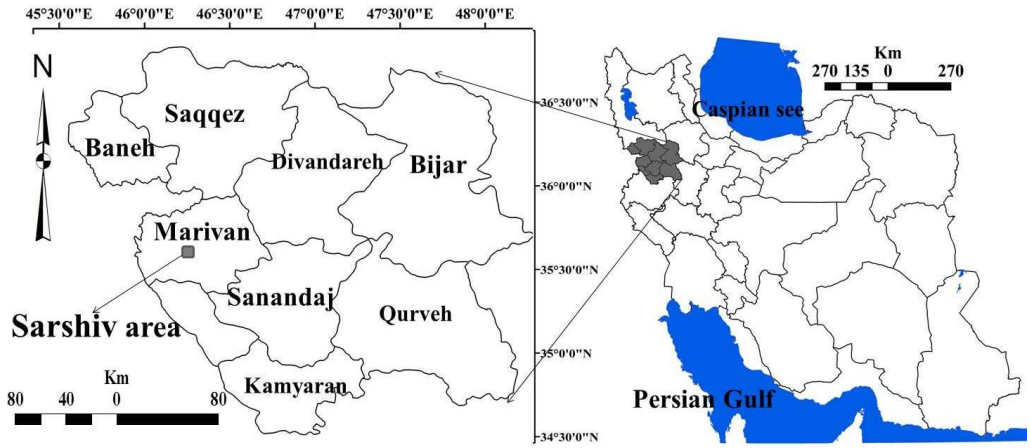


Fig. 1. Geographical location of study area (Sarshiv of Marivan, Iran)

The area of this region is 243 ha and the area within the high 1400 to 1950 m above sea level. For description of the climate, the stations closest to the watershed were used. The method is based on regional climate Amberger, is wet-cold (Anonymous, 1997).

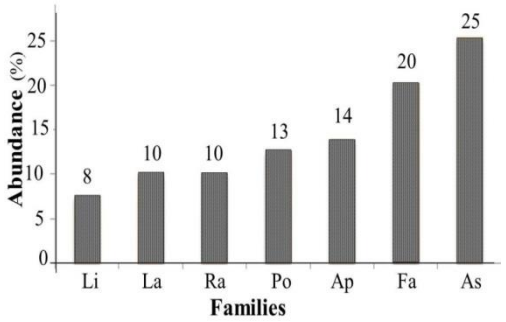
Research methods

Plant samples were collected by random-systematic in 76 plots (Okland, 1990). Sampling consists of 9 transect that the first one was random and the others were collected in 200 m far of each other in south and north in comparison with the first sampling. In present study a square releve with an area of 1 m^2 was regularly considered on each transect. The plant species were identified using valid sources such as Flora Iranica (Rechinger, 1998), Flora of Iraq (Townsend and Guest, 1985), Flora of Turkey (Davis, 1984), Flora of Iran (Assadi *et al*., 1987). Also Zohary classification (Zohary, 1963) was used for the geographical distribution and the Raunkiaer method was used for life form classification (Raunkiaer, 1934). Biological reference of Iranian species was used for identification of native, rare and endangered species (Ghahraman and Attar, 1998).

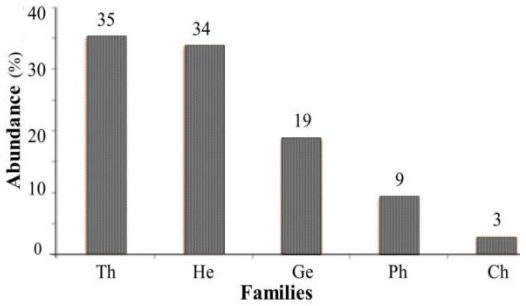
Results

The results showed that the region consists of 39 families, 116 genera and 139 species of plants (Table 1). 23 species and 116 species belong to monocotyledon and dicotyledon angiosperms, respectively. The main families were Asteraceae, Fabaceae, Apiaceae and Poaceae, with 20, 16, 11 and 10 percent species, respectively.

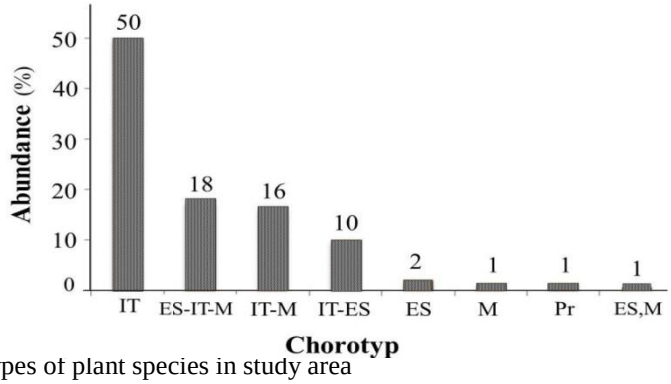
The most important families are listed (Fig. 2A). Terophytes (35%), Hemicryptophytes (34%), Phanerophytes (9%), Geophytes (19%) and Chamaephytes (3%) were included in life forms (Fig. 2B). Among 139 species identified, 1 and 3 species were endemic and rare species respectively. Geographical area analysis showed the Irano- Turanian (50%), Mediterranean (1.5%), Europe and Siberian (2%), Polyregional (1/5%), Irano Turanian and Mediterranean (17%), Irano-Turanian and Europe and Siberian (10%), Mediterranean and Europe and Siberian (1%) and Mediterranean and Europe and Siberian and Irano-Turanian (17%) (Fig. 2C). The only endemic species was *Astragalus (Caprini) piranshahricus* and rare regional species are: *Helianthemum ledifolium* var. *ledifolium*, *Rosularia sempervivoides* and *Valerianella carinata*.



A) Frequency of different families in terms of number of species in study area
Ap: Apiaceae, Li: Liliaceae, Fa: Fabaceae, Po: Poaceae, La: Lamiaceae, Ra: Ranunculaceae and As: Asteraceae



B) Frequency of life forms of plants in study area
Th= Therophytes, Ge= Geophytes, Ph= Phanerophytes, Ch=Chamaephytes, He=Hemicryptophytes



C) Various Chorotypes of plant species in study area
IT: Irano-Turanian, IT-M: Irano-Turanian and Mediterranean, M-ES-IT: Mediterranean and Europe and Siberian and Irano-Turanian, IT-ES: Irano-Turanian and Europe and Siberian, ES: Europe and Siberian, M: Mediterranean, M-ES: Mediterranean and Europe and Siberian

Fig. 2. Families (A), life forms (B) and chrotypes (C) in terms of number of species in Sarshiv of Marivan region, Kurdestan province, Iran

Table 1. List of species, life forms and chorotypes in Sarshiv of Marivan region

Families	Species	Life Forms	Chorotypes
Spermatophytes/Angiospermae/Dicotyledonae			
Aceraceae	*Acer monspessulanum* L. subsp. *cinerascens* (Boiss.)Yaltiric	Ph	IT
Anacardiaceae	*Pistacia atlantica* Desf.	Ph	IT
Apiaceae (Umbelifera)	*Bunium elegans* (Fenzl) Freyn	Cr	IT-M
	Chaerophyllum macrospermum (Spreng.) Fisch. & C.A.Mey	He	ES-IT-M
	Chaerophyllum macropodon Boiss.	He	IT
	Falcaria vulgaris Bernh.	He	ES-IT-M
	Ferula orientalis L.	He	IT
	Ferulago stellata Boiss.	He	IT
	Prangos ferulacea (L.) Lindl.	He	ES, M, IT
	Scandix pecten-veneris L.	Th	ES, M, IT
	Smyrniopsis aucheri Boiss.	He	IT
	Smyrnium cordifolium Boiss.	He	IT
	Torilis leptophylla (L.) Reichenb.	Th	M-IT-ES
Aristolochiaceae	*Aristolochia bottae* Jaub. & Spach	He	IT
Asteraceae (Compositae)	*Achillea millefolium* L. subsp. *millefolium*	He	ES-IT
	Anthemis haussknechtii Boiss. & Reut. var. *calva* Eig	Th	IT
	Centaurea behen L.	Th	IT
	Chamaegeron oligocephalus Schrenk	Th	IT
	Chardinia orientalis (L.) O. Kuntze	Th	IT
	Crepis sancta (L.) Babcock subsp. *sancta*	Th	IT
	Rhaponticum insigne (Boiss.) Wagenitz	He	IT
	Echinops orientalis Trautv.	He	IT
	Gundelia tournefortii L.	He	IT
	Inula thapsoides (M. B. ex Willd.) Spreng.	Cr	IT
	Lactuca serriola L.	Ch	IT-ES-M
	Onopordon acanthium L.	He	IT
	Picnomon acarna (L.) Cass.	Th	IT, M
	Senecio vernalis Waldst. & Kit.	Th	IT-ES-M
	Serratula cerinthifolia (Sm.) Boiss.	He	IT, M
	Sonchus asper (L.) Hill subsp. *glaucescens* (Jordan) Ball.	Th	IT, M
	Steptorrhamphus persicus (Boiss.) O. & B. Fedtsch	He	IT

Families	Species	Life Forms	Chorotypes
	Galium aparine L.	Th	ES, M, IT
Scrophulariaceae	*Scrophularia nervosa* Benth. subsp. *nervosa*	He	IT
	Veronica polita Fries	Th	Polyregional
Valerianaceae	*Valerianella carinata* Loisel.	Th	IT
Violaceae	*Viola modesta* Fenzl.	Th	IT
	Viola odorata L.	Ge	IT,ES
Spermatophytes/Angiospermae/Monocotyledonae			
Alliaceae	*Allium eriophyllum* Boiss. var. *eriophyllum*	Ge	Polyregional
	Allium scabriscapum Boiss. & Ky.	Ge	IT
Araceae	*Arum conophalloides* Ky. ex Schott.	Ge	IT
Colchicaceae	*Colchicum specoisum* Steven	Ge	ES
Iridaceae	*Gladiolus kotschyanus* Boiss.	Ge	IT
Liliaceae	*Bellevalia longistyla* (Miscz.) Grossh.	Ge	IT
	Eremurus spectabilis M. B. subsp. *spectabilis*	Ge	IT, M
	Fritillaria persica L.	Ge	IT, M
	Muscari caucasicum (Griseb.) Baker.	Ge	IT
	Ornithogalum cuspidatum Bertol	Ge	IT
	Ornithogalum oligophyllum E. D. Clarke	Ge	IT, M
Orchidaceae	*Dactylorhiza umbrosa* (Kar. & kir.) Nevski	Ge	IT
	Comperia comperiana (Stev.) Ascherson & Graebner	Ge	IT
Poaceae (Graminea)	*Alopecurus myosuroides* Hudson var. *myosuroid*	Th	ES,IT,M
	Agropyron panormitanum Parl.	Ge	ES,M
	Bromus tectorum L. var. *tectorum*	Th	ES,IT,M
	Dactylis glomerata L. subsp. *glomerata*	He	ES,IT,M
	Eremopoa persica (Trin.) Roshev. var. *persica*	Th	IT, M
	Gaudinopsis macra (M.B.) Eig.	Th	ES,IT,M
	Hordeum bulbosum L.	Ge	ES,IT,M
	Melica persica Kunth. subsp. *persica*	He	IT, M
	Milium pedicellare (Bornm.) Roshev. ex Melderis	Th	M
	Poa bulbosa L. var. *vivipara* Koel.	Ge	ES,IT,M

Life form: Th= Therophytes, Ge= Geophytes, Ph= Phanerophytes, Ch= Chamaephytes, He= Hemicryptophytes
Chorotype: IT= Irano-Turanian, IT-M= Irano-Turanian and Mediterranean, M-ES-IT= Mediterranean and Europe and Siberian and Irano-Turanian, IT-ES= Irano-Turanian and Europe and Siberian, ES= Europe and Siberian, M= Mediterranean, M-ES= Mediterranean and Europe and Siberian

Discussion and Conclusion

Life forms have close relationships with environmental factors (Muller-Dombois and Ellenberg, 1974), and frequency of terophytes was due to the completion of vegetative plants during the short period before the start of the dry period. In agreement with the current study the terophytes life form was also the dominant life form of the Kotli district in Pakistan (Amjad, 2012). According to Archibold (1995), the frequency of hemicryptophytes in a region represents the cold and mountainous climate. Note that the regional climate is cold and wet based on Amberger, and hemicryptophytes plants have been influenced by the climate and are abundant. Other trees and shrubs of the Irano-Turanian elements can be found in this area such as *Pistacia atlantica*, *Crataegus pontica*, *Sorbus persica* and *Acer monspessulanum* subsp. *cinerascens* noted. Irano-Turanian elements in brushwood and semi brushwood that can grow normally among the oak species were *Salvia suffruticosa*, *Astragalus compactus* and *Astragalus* (*carpini*) *piranshahricus*. *Phlomis olivieri*, *Tuecrium polium* and *Dactylis glomerata* subsp. *glomerata* were semi steppe and steppe plants, which were grown patchy formed in this area. Because the Sarshiv of Marivan region is located in Irano-Turanian area, most of the plants in this area (50%) form vegetative elements of the Irano-Turanian. Also Because of the vicinity of vegetative European-Syberian and Mediterranean to Marivan region, part of the plants in this region was similar to Irano-Turanian, Mediterranean and European-Syberian. The similarity of the Irano-Turanian and Mediterranean is more than Irano-Turanian and European-Syberian in the studied area. Trees and shrubs, which are accompanied by oak species in different parts of Marivan region, are *Pyrus syriaca*, *Rosa canina* and *Cotoneaster nummularifolia*. Ahmadi *et al.* (2013) reported among all the species identified intheir study area, 52.2 % species (93 species) belong to the

Families	Species	Life Forms	Chorotypes
	Taraxacum montanum (C.A.Mey.) DC.	He	IT
	Tragopogon graminifolius DC.	He	IT, M
	Tragopogon reticulatus Boiss. & Huet	He	IT, ES
Boraginaceae	*Echium italicum* L. var. *italicum*	He	IT, M
	Onosma microcarpum DC.	He	IT
	Onosma sericeum Willd.	He	IT
	Symphytum kurdicum Boiss. & Hausskn.	He	IT
Brassicaceae	*Aethionema membranaceum* DC.	He	IT
	Alyssum linifolium Steph. ex Willd. var. *linifolium*	Th	IT, M
	Arabis caucasica Willd. subsp. *caucasica*	He	IT,M
	Conringia perfoliata (C.A.Mey.) Busch	Th	IT, ES
	Fibigia macrocarpa (Boiss.) Boiss.	He	IT
	Hesperis kurdica Dvorak et Hadac	He	IT
	Nasturtium officinale (L.) R. Br.	Cr	IT, ES
Campanulaceae	*Campanula involucrata* Auch.ex DC.	He	IT
Caprifoliaceae	*Lonicera nummulariifolia* Jaub. & Spach	Ph	IT, M
Caryophyllaceae	*Cerastium inflatum* Link ex Desf.	Th	IT
	Holosteum umbellatum L.	Th	IT, M
	Lepyrodiclis holosteoides (C.A.Mey.) Fenzl ex Fisch. & C.A.May.	Th	IT
	Silene ampullata Boiss.	He	IT
	Silene chlorifolia Sm.	He	IT
Cistaceae	*Helianthemum ledifolium* (L.) Miller var. *ledifolium*	Th	IT, M
Crassulaceae	*Rosularia sempervivoides* (Fisch.) Boriss.	He	IT
Dipsacaceae	*Pterocephalus plumosus* (L.) Coult.	Th	IT-ES-M
Euphorbiaceae	*Euphorbia azerbajdzhanica* Bordz.	Th	IT
	Euphorbia condylocarpa M.B.	He	IT, ES
	Euphorbia denticulata Lam.	He	IT
Fabaceae	*Astragalus tortuosus* DC.	Ch	IT, ES
	Astragalus caryolobus Bunge	He	IT
	Astragalus (Caprini) piranshahricus Maassoumi & Podl.	Ch	IT
	Astragalus compactus Lam.	Ch	IT
	Lathyrus cicera L.	Th	IT, M
	Lens cyanea (Boiss. & Hohen.) Alef.	Th	IT
	Lens orientalis (Boiss.) Hand.-Mzt.	Th	IT, ES
	Medicago rigidula (L.) var. *rigidula*	Th	IT, M
	Trifolium arvense L. var. *arvense*	Th	IT-ES-M
	Trifolium campestre Schreb.	Th	IT-ES-M
	Trifolium dasyurum C. Presl	Th	IT
	Trifolium pilulare Boiss.	Th	IT, M
	Trifolium stellatum L. var. *stellatum*	Th	M
	Vicia narbonensis L. var. *narbonensis*	Th	IT,ES
	Vicia variabilis Freyn & Sint.	He	IT,ES
Fagaceae	*Quercus brantii* Lindl. var. *persica* (Jaub. & Spach) Zohary	Ph	IT
	Quercus infectoria Oliv. subsp. *boissieri* (Reut.) O. Schwartz	Ph	IT
	Quercus libani Oliv.	Ph	IT
Gentianaceae	*Gentiana olivieri* Griseb.	Ge	IT
Geraniaceae	*Geranium rotundifolium* L.	Th	IT-ES-M
	Geranium tuberosum L. subsp. *micranthum* Schonbeck-Teme	Ge	IT
Hypericaceae	*Hypericum scabrum* L.	He	IT
Lamiaceae (Labiatae)	*Eremostachys laciniata* (L.) Bunge	He	IT
	Lallemantia peltata (L.) Fisch. & C.A.Mey.	Th	IT
	Lamium album L. subsp. *album*	He	IT,ES
	Mentha longifolia (L.) Hudson	Ge	IT-ES-M
	Phlomis olivieri Benth.	He	IT
	Salvia suffruticosa Montbr. & Auch. ex Benth.	Ph	IT
	Teucrium polium L.	He	IT, M
	Ziziphora capitata L. subsp. *capitata*	Th	IT
Malvaceae	*Alcea kurdica* (Schlecht.) Aleff	Th	ES,IT, M
Orobanchaceae	*Orobanche aegyptiaca* Pers.	Th	ES,IT, M
Papaveracea	*Papaver dubium* L.	Th	ES,IT, M
Podophyllaceae	*Bongardia chrysogonum* (L.) Boiss.	Ge	IT
Polygonaceae	*Rumex conglomeratus* Murr.	He	IT,ES
Ranunculaceae	*Adonis* sp.	Th	ES,IT,M
	Anemone coronaria L.	Ge	IT, M
	Ceratocephalus testiculatus (Crantz) Roth.	Th	IT, M
	Ficaria kochii (Ledeb.) Iranshahr & Rech. f.	Ge	IT
	Ranunculus arvensis L.	Th	ES,IT,M
	Ranunculus cicutarius Schlechtend.	Th	ES
	Ranunculus pinardi (Stev.) Boiss.	Th	ES,IT,M
	Thalictrum sultanabadense Stapf	He	IT
Rosaceae	*Cerasus microcarpa* (C.A.Mey.) Boiss. subsp. *microcarpa*	Ph	ES
	Cotoneaster nummularifolia Pojark.	Ph	IT
	Crataegus pontica C.Koch	Ph	IT
	Pyrus syriaca Boiss.	Ph	IT, M
	Rosa canina L.	Ph	ES,IT
	Sorbus persica Hedl.	Ph	IT
Rubiaceae	*Callipeltis cucullaris* (L.) Rothm.	Th	IT, S
	Cruciata taurica (Pallas ex Willd.) Ehrend.	He	IT

regions of Irano-Turanian and other species belong to other chorotypes. The result of this study is similar to their findings and mostly this is due to regional similarity such as climate condition and topography and micro relief (Leutner *et al*., 2012) that has an effect on vegetation. Rahimi and Atri (2013) in a research on flora of Miandasht Wildlife Refuge in Northern Khorassan Province, Iran, reported that the most of identified species were Irano-Turanian. Basiri *et al*. (2011) also mentioned that a large number of plant species in River Forest Behbahan, Iran, belonging to the regions of Irano-Turanian and common areas of Irano-Turanian and Mediterranean eruption, were the most important ecological groups.

Investigations of the vegetation diversity in this area, revealed that a number of plants were endemic and rare. The presence of endemic species was among the fundamental criteria for characterizing biodiversity of a territory (Giuseppe, 2013). There were an endemic species (*Astragalus* (*carpini*) *piranshahricus*) and three rare species (*Helianthemum ledifolium* (L.) Miller var. Ledifolium, *Rosularia sempervivoides* (Fisch.). Although Boriss and *Valerianella carinata* Loisel in this region have small areas, there are a lot of genetic resources that should be Protected and reserved and because of the importance of plants (their production and other applications), it is necessary to establish certain laws and regulations in order to protect some of the rare species or sensitive ecosystem. In a Northernareas of Khorassan 11.6% (29 of all 256) plant species were endemic (Rahimi and Atri, 2013). Plants resources are a valuable genetic pool that should be protected. Although they may not be used today, there may be a fundamental need for them in near future. And should be considered that knowledge and identify is necessary before any action about using plants.

Acknowledgements

We would like to appreciate Kurdistan University benevolent cooperation and dedication of their laboratory for our research. We would also like to express our sincere gratitude to the Dr. Seyyed Mohsen Hoseini and Dr. Moslem Akbari Nia (Tarbiat Modares University) for their help.

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