

Recognition of Some Plant Species in Dena Biosphere Reserve, Iran

Ali Rahimi*¹ , Nadia Kamali²

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Abstract

The Dena Biosphere Reserve is one of the most important protected mountain ecosystems in southwestern Iran. It includes protected areas, the Dena National Park, Eastern Dena, the Padna no-hunting areas in Isfahan Province, Khorram-Naz, and some open areas. This study aimed to investigate the relationship between environmental gradients and vegetation distribution patterns in the Dena Biosphere Reserve. The combination of climatic, weather, and ecological factors has caused the interaction of parameters affecting plant growth and development, and has shown its effects in the formation of numerous formations, the presence and abundance of many species, and the high biodiversity and species richness. Significant altitudinal variations resulted in distinct vegetation zones, including the two high and low parts in populations of the same species. While the northern slopes lack forest cover, and in some places have completely scattered shrub cover. Towards the high altitudes, the final limit of forest growth, the heath formation, is established. Above the heath range, the formation of alpine vegetation begins. At the upper altitudes, especially on the peaks of the Dena, the vegetation is mainly annual and very small and thin. These vegetations grow as short herbaceous plants in the shelter of rocks and within the veins of rocks and dunes of the peaks, without being clearly visible or covering the appearance of these areas. The results highlight the critical role of altitudinal gradients in shaping vegetation patterns and biodiversity conservation within the Dena Biosphere Reserve.

Keywords: Biodiversity, Dena, Biosphere reserve, Plants, Protected area

Introduction

Protected areas play an important role in conserving biodiversity and implementing multilateral environmental agreements. watersheds protection, soil conservation and flood prevention, preservation of genetic diversity, maintenance of wildlife habitats,

protection of plant habitats, particularly those of rare or endangered native species, conservation of aquatic and terrestrial biodiversity, preservation of natural heritage, provision of conditions for the sustainable use of resources by local communities,

1-Forests, Rangelands and Watershed Research Department, Kohgiluyeh-Boyerahmad Agriculture and Natural Resources Research and Education Center, AREEO, Yasouj, Iran

2- Research Institute of Forests and Rangelands, Agricultural Research Education and Extension Organization (AREEO), Tehran, Iran

*Corresponding author email address: rahimi.ali1362@yahoo.com

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and opportunities for education, research, tourism and recreation are among the benefits of protected area (Ebadi, 2014). Dena Biosphere Reserve is considered one of the most valuable places in terms of landscape and biodiversity in the world. This reserve experiences a temperatures ranging from 27 to 49 °C, an average relative humidity of 46.4%, and annual rainfall of 823 mm. Approximately 860 plant species belonging to 376 genera and 73 families have been recorded from the flora of the Dena Biosphere Reserve, of which nearly 20% are endemic. The fauna of the reserve includes 25 mammalian species belonging to seven orders, 85 bird species, 25 reptile species, two amphibian species, eight fish species, and more than 30 butterfly species. In addition to its rich flora, the Dena Biosphere Reserve supports various animals, including mammals, birds, reptiles, amphibians, fish, and butterfly species, have been reported for the fauna of the Dena Biosphere Reserve (Aramshinia and Abdipour, 2016). The Dena region, which includes the highest peak of the Zagros mountain range, containing a substantial poportion of the Iran's fauna and flora and is regarded as one of the richest biodiversity hotspot. The terrestrial

and aquatic ecosystems of the region are strongly influenced by its water resources, while the Dena Glacier plays a major role in providing water to downstream areas (Abedi et al., 2012). two major soil types have been identified in Dena: The first occurs in mountainous areas at very high elevations, whereas the second is found in fan-shaped and rocky landscapes characterized by sharp and elongated peaks composed mainly of hard limestone, with slopes ranging from 70 to over 100%. Elvation in these mountainous areas varies from 3100 to 4278 m above sea level. According to the Farabou classifications method, these soils are classified within the group lacking developed soil cover, and in some areas very shallow gravelly Lithic soils occure (Jafari-Kukhdan, 2014). Altitude is the primary determinant of vegetation distribution in this area, while slope is the second most influential factor Floristic investigations have identified four major vegetation formations in the region, tree formations (Figure 1), shrub formations, cushion plants (Figure 2), and herbaceous plants (Aramshinia and Abdipour, 2016).

Material and methods

This protected area is located in the



Fig. 1. Oak forest cover in Dena Biological Reserve



Fig. 2. Cushion plant species and types of agave in the Dena region

western Iran, in the central Zagros Mountains, between $51^{\circ} 6' - 51^{\circ} 57' E$ longitude and $30^{\circ}36' - 31^{\circ}17'N$, latitude, spanning the provinces of Kohgiluyeh and Boyer Ahmad, Isfahan, and Chaharmahal-Bakhtiari. The vegetation cover of the reserve was surveyed during the 2023 growing seasons. Collected specimens were labeled, numbered and placed in plastic bags and transferred to the laboratory of the Agricultural and Natural Resources Research Center of Kohgiluyeh and Boyer Ahmad Province. To remove dust, soil, and mud from the roots, stems and leaves, the specimens were washed with water. Damaged, diseased or dried plant parts were removed using scissors, and the specimens were subsequently dried between sheets of blotting paper or clean newspaper. Then, the plants of the prepared samples were identified using the floras of Iranica (Rechinger, 1963-1998), Iran (Asadi, 1988-1993), and Iranian species (Masoumi, 1986, 1989, 1995, 1990 a, 1990 b; Masoumi and Hamzeh, 2003).

Results and discussion

The strong differences between the different parts of the Dena, whose effects in the form of climatic and temperature changes have caused ecological separation between the populations of the two high and low parts in populations of the same species. While the northern slopes lack forest cover and in some places have completely scattered shrub cover. Towards the high altitudes, the final limit of forest growth, the heath formation, is established. Above the heath range, the formation of alpine vegetation begins. At the upper altitudes,

especially on the peaks of the Dena, the vegetation is mainly annual and very small and thin. These vegetations grow as short herbaceous plants in the shelter of rocks and within the veins of rocks and sand dunes of the peaks, without being clearly visible or covering the appearance of these areas. The reproductive and vegetative organs of these plants usually have intense colors to cope with high amounts of ultraviolet radiation. Some of the plant species identified in the Dena region are shown in Table (1) and Figure (3).

Also, some of the most important medicinal plant species identified in the Dena region are listed in Table 2 and Figure 4.

Finally, the combination of climatic, environmental, and ecological factors leads to interactions among factors affecting plant growth and development, and resulted in the development of diverse vegetation communities, the occurrence and abundance of numerous species, and the remarkable biological diversity of this region (Jafari-Kukhdan, 2014). A total of 25 mammalian species belonging to seven orders, 85 bird species, 25 reptile species, two amphibian species, 8 fish species, and more than 30 butterfly species have been recorded in the Dena Biosphere Reserve (Aramshinia and Abdipour, 1395). Mammals such as brown bear, wild goat, Iranian squirrel, boar, wolf, jackal, common fox, rabbit, leopard, sable, otter, weasel, common shrew, hedgehog, yellow deer, roe deer, striped hyena, caracal, and wild cat have been observed in the reserve (Malekian and Bagheri, 2015). According to the survey conducted between 1997 and 2000, the population size of the

leopard, jackal, and Iranian squirrel in the reserve has showed a trend (Abadi et al., 2012). Wildfires, as one of the consequences of climate change, can have severe negative effects on animal species (Eskandari, 2015). Climatic studies have shown that rising temperatures during the study period

reduced snow- cover in the region, which in turn contributed to a decline in forest cover (Abadi et al., 2012). wildfire can also severely affect plant species by destroying extensive areas of vegetation within a short period of time. Previous studies in the forests of Golestan Province, have shown a positive

Table 1. Some plant species identified in the Dena region

Species name	Family (dark)
<i>Allium brachyodon</i> Boiss.	Alliaceae
<i>Allium scabriscapum</i> Boiss. & Ky.	Alliaceae
<i>Pistacia atlantica</i> Desf. subsp. <i>kurdica</i> (Zohary) Rech. f.	Anacardiaceae
<i>Pistacia atlantica</i> Desf. subsp. <i>mutica</i> (Fisch. & Mey.) Rech. f.	Anacardiaceae
<i>Chaerophyllum macropodum</i> Boiss.	Apiaceae
<i>Cousinia barbeyi</i> C. Winkl.	Asteraceae
<i>Lappula microcarpa</i> (Ledeb.) Guerke in Engler & Prantl	Boraginaceae
<i>Nonnea persica</i> Boiss.	Boraginaceae
<i>Draba aucheri</i> Boiss.	Brassicaceae
<i>Lepidium draba</i> L.	Brassicaceae
<i>Acanthophyllum spinosum</i> (Desf.) C. A. Mey.	Caryophyllaceae
<i>Dianthus denaicus</i> Assadi	Caryophyllaceae
<i>Chenopodium foliosum</i> Aschers	Chenopodiaceae
<i>Salsola montana</i> Litw.	Chenopodiaceae
<i>Sedum nanum</i> Boiss.	Crassulaceae
<i>Juniperus excelsa</i> M. B., Besch.	Cupressaceae
<i>Cephalaria juncea</i> Boiss.	Dipsaceae
<i>Scabiosa olivieri</i> Coult.	Dipsaceae
<i>Equisetum arvense</i> L.	Equiestaceae
<i>Euphorbia macrostegia</i> Boiss.	Euphorbiaceae
<i>Quercus brantii</i> Lindl.	Fagaceae
<i>Corydalis verticillaris</i> DC.	Fumariaceae
<i>Biebersteinia multifida</i> DC.	Geraniaceae
<i>Ornithogalum persicum</i> Hausskn. ex Bornm.	Hyacinthaceae
<i>Hypericum perforatum</i> L.	Hypericaceae
<i>Ixiolirion tataricum</i> (Pall.) Herb.	Ixioliriaceae

<i>Juncus gerardi</i> Loisel. subsp. <i>persicus</i> (Boiss.) Snoge. in Rech. f.	Juncaceae
<i>Juncus inflexus</i> L.	Juncaceae
<i>Ajuga austro-iranica</i> Rech.f.	Lamiaceae
<i>Ballota aucheri</i> Boiss.	Lamiaceae
<i>Tulipa biebersteiniana</i> Schultes & Schultes	Liliaceae
<i>Linum album</i> Boiss.	Linaceae
<i>Malva neglecta</i> Wallr.	Malvaceae
<i>Morus nigra</i> L.	Moraceae
<i>Fraxinus angustifolia</i> Vahl.	Oleaceae
<i>Papaver rhoeas</i> L.	Papaveraceae
<i>Astragalus</i> (Poterion) <i>baba-alliar</i> Parsa subsp. <i>baba-alliar</i>	Papilionaceae
<i>Cicer spiroceras</i> Jaub. & Spach subsp. <i>spiroceras</i>	Papilionaceae
<i>Paronychia kurdica</i> Boiss.	Paronychiaceae
<i>Acantholimon melananthum</i> Boiss.	Plumbaginaceae
<i>Agrostis olympica</i> (Boiss.) Bor	Poaceae
<i>Alopecurus arundinaceus</i> Poir. in Lam.	Poaceae
<i>Polygonum molliaeforme</i> Boiss.	Polygonaceae
<i>Polygonum aridum</i> Boiss. & Hausskn.	Polygonaceae
<i>Ranunculus kotschyi</i> Boiss.	Ranunculaceae
<i>Thalictrum isopyroides</i> C.A.Mey.	Ranunculaceae
<i>Agrimonia eupatoria</i> L.	Rosaceae
<i>Cerasus microcarpa</i> (C. A. Mey.) Boiss. subsp. <i>microcarpa</i>	Rosaceae
<i>Galium verum</i> L.	Rubiaceae
<i>Rubia pauciflora</i> Boiss.	Rubiaceae

relationship between wildfire frequency and increases in annual temperature associated with climate change. In addition, wild frequency has been negatively associated with annual relative humidity, increasing as relative humidity declines (Eskandari, 2015).

Several national and international studies have proposed strategies for climate adaptation in protected areas. One proposed strategy involves identifying fire-prone and vulnerable areas, developing fire hazard

map, and employing predictive and early warning models to improve management and reduce wild-fire related losses (Farhi-Ashtiani et al., 2012). Another strategy involves monitoring, propagating, and cultivating endangered species, as well as organizing training workshops for local resource users and representatives of stakeholder to enhance awareness of climate change issues (Gámez et al., 2018). Managing livestock grazing and reducing anthropogenic disturbances contributed to



(*Acantholimon melananthum* Boiss.)



(*Allium scabriscapum*)



Astragalus (Poterion) *baba-alliar* Parsa subsp.
(*baba-alliar*)



(*Fraxinus angustifolia* Vahl.



(*Alopecurus arundinaceus* .)



(*Galium verum*)

Fig. 3. Representative images of the studied plant species

the regeneration of tree and shrub species (Zolfaghari and Zamani, 2016). besides, recommendations for the conservation and management of the reserve can be as follows. Using mass media, such as radio and television, to raise public awareness of the ecological importance of native plant diversity, conserving endangered species through cultivation in botanical gardens and

conservation nurseries, Encouraging farmers and agricultural stakeholders to cultivate native medicinal plants in order to reduce harvesting pressure on wild populations and prevent their extinction, and Developing educational programs to promote the sustainable use of natural resources among local resource users and ensure the long-term conservation of the region's flora.

Table 2. Some of the medicinal plants identified in the Dena region

Species name	Family
<i>Allium ampeloprasum</i> L. subsp. <i>iranicum</i> Wendelbo	Alliaceae
<i>Allium stipitatum</i> Regel in Trudy	Alliaceae
<i>Dorema aucheri</i> Boiss.	Apiaceae
<i>Echinophora cinerea</i> (Boiss.) Hedge & Lamond	Apiaceae
<i>Ferula assa-foetida</i> L.	Apiaceae
<i>Ferula haussknechtii</i> Wolff ex Rech. f.	Apiaceae
<i>Ferulago angulata</i> (Schlecht.) Boiss.	Apiaceae
<i>Ferulago carduchorum</i> Boiss. & Hausskn. in Boiss.	Apiaceae
<i>Grammosciadium scabridum</i> Boiss.	Apiaceae
<i>Lagoecia cuminoides</i> L.	Apiaceae
<i>Prangos ferulacea</i> (L.) Lindl.	Apiaceae
<i>Biarum carduchorum</i> (Schott) Engl. in DC.	Araceae
<i>Achillea wilhelmsii</i> C. Koch	Asteraceae
<i>Artemisia chamaemelifolia</i> Vill.	Asteraceae
<i>Artemisia haussknechtii</i> Boiss.	Asteraceae
<i>Cichorium intybus</i> L.	Asteraceae
<i>Echinops kotschyi</i> Boiss.	Asteraceae
<i>Matricaria aurea</i> (Loefl.) Schultz-Bip.	Asteraceae
<i>Anchusa italica</i> Retz	Boraginaceae
<i>Dracocephalum kotschyi</i> Boiss.	Lamiaceae
<i>Thymus daëniensis</i> Celak.	Lamiaceae
<i>Zataria multiflora</i> Boiss.	Lamiaceae
<i>Teucrium polium</i> L.	Lamiaceae
<i>Rheum ribes</i> L.	Polygonaceae
<i>Plantago major</i> L.	Plantaginaceae
<i>Plantago lanceolata</i> L.	Plantaginaceae
<i>Glycyrrhiza glabra</i> L.	Papilionaceae



Cleome coluteoides



Prangos ferulacea (L.) Lindl.



Thymus daënnensis Celak



Allium stipitatum Regel



Plantago lanceolata L.



Teucrium polium L.

Fig. 4. Photographs of selected plant species

Conclusion

The Dena Biosphere Reserve, the tenth biosphere reserve designated in Iran and the 550th worldwide, encompasses the Dena National Park, the Khorram Naz and the Eastern Dena Protected Area, and the Padna no-hunting Areas in Isfahan Province. The pronounced differences across the Dena

Biosphere Reserve, reflected in variations of climate change and temperature, have led to ecological isolation among populations of the same species inhabiting different elevational zones. In addition, the geographical separation between the northern and southern parts of the reserve have substantially reduced the opportunities

for gene flow, and the combined effects these factors may have promoted genetic divergence and, ultimately speciation in the Dena region. Floristic studies show that the Dena Biosphere Reserve comprises four major vegetation formations, including boreal, shrub, cushion plant, and herbaceous formations, with oak constituting the dominant tree species. The reserve supports a rich diversity of medicinal plant species, many of which are of considerable ecological and economic importance. Finally, the interplay of climatic and ecological factors has influenced plant growth and development, contributing to the establishment of diverse vegetation formations, the occurrence of numerous formations, the presence and abundance of numerous species, and the remarkable biodiversity of this region.

References

- Abedi, Z., Masah Bavani, A.R., Jafari Kokhdan, A.A., Hojjati, K. and Badam Firouz, J., 2012. Revealing changes in climatic variables and fauna and flora of the Western Dena Protected Area in past periods. *Proceedings of the First International Conference on Environmental Crises and Solutions for Its Improvement*, Kish Island, Iran.
- Arameshinia, P. and Abdipour, J., 2016. Introducing the natural landscape of Dena Biosphere Reserve. *Proceedings of the First National Conference on Natural Resources and Sustainable Development in Central Zagros*, Shahrekord University, Shahrekord, Iran.
- Ebadi, A., 2014. Environmental analysis of biodiversity in the Dena Protected Area using the DPSIR model. *Proceedings of the Second National Conference on Planning, Environmental Protection and Sustainable Development*, Tehran, Iran.
- Eskandari, S., 2015. The relationship between climate change and forest fires in Golestan Province. *Iranian Journal of Forest and Rangeland Protection Research*, 13(1), pp. 1–10.
- Farhi-Ashtiani, A., Ghods-Khah-Darya, M., Mohammadi-Samani, K. and Amin-Amalshi, M., 2012. Investigation of fire-sensitive and critical areas with emphasis on drought using PDSI, AHP and GIS (Case study: Saravan Forest, Gilan Province). *Iranian Journal of Forest and Rangeland Protection Research*, 10(2), pp. 95–113.
- Gómez, A.E., Ivanova, A. and Juárez, E., 2018. Community adaptation to climate change and biodiversity conservation in natural protected areas: The case of El Vizcaíno Biosphere Reserve, Mexico. In: A. Ortega-Rubio (ed.) *Mexican Natural Resources Management and Biodiversity Conservation*. Cham: Springer International Publishing, pp. 405–429.
- Jafari-Kokhdan, A.A., 2014. *Identification and Introduction of Plant Species of Dena Biosphere Reserve*. Final Research Project Report. Yasuj: General Directorate of Environmental Protection of Kohgiluyeh and Boyer-Ahmad Province.
- Malekian, M. and Bagheri, R., 2015. The effect of size and shape of protected areas on the richness and species diversity of mammals: A case study of Kohgiluyeh and Boyer-Ahmad Province. *Journal of Animal Research*, 28(2), pp. 233–243.

- Masoumi, A.A., 1986. *Flora of Iran*. Vol. 1. Tehran: Forests and Rangelands Research Institute.
- Masoumi, A.A., 1989. *Flora of Iran*. Vol. 2. Tehran: Forests and Rangelands Research Institute.
- Masoumi, A.A., 1990a. *The Genus Populus in Iran*. Vol. 4. Tehran: Forests and Rangelands Research Institute.
- Masoumi, A.A., 1990b. *Populus*. In: M. Asadi, A.A. Masoumi, M. Khatamsaz and V. Mozaffarian (eds.) *Flora of Iran*. Vol. 43. Tehran: Forests and Rangelands Research Institute.
- Masoumi, A.A., 1995. *Flora of Iran*. Vol. 3. Tehran: Forests and Rangelands Research Institute.
- Masoumi, A.A. and Hamzeh, B., 2003. A unique new species of *Populus* without close relatives from Kermanshah, Iran. *Iranian Journal of Botany*, 10(1), pp. 59–61.
- Rechinger, K.H. (ed.), 1963–1998. *Flora Iranica*. Vols. 1–180. Graz, Austria: Akademische Druck- und Verlagsanstalt.
- Zolfaghari, R. and Zamani, S.M.A., 2016. Relationship between tree and shrub species regeneration and environmental factors in the Western Dena Protected Area (Posht-e-Kore Unit). *Iranian Journal of Forest and Poplar Research*, 24(2), pp. 297–309.