

# Ethno Botanical Interviews on *Dorema Aucheri* Boiss. (Apiaceae), A Medicinal Species in Southern Iran



Yousef Ajani\* and Regine Claßen Bockhoff

Institute of Organismic and Molecular Evolution (iomE), Johannes Gutenberg-University, Bentzelweg, Germany

Submission: May 26, 2018; Published: June 06, 2018

\*Corresponding author: Yousef Ajani, Institute of Organismic and Molecular Evolution (iomE), Johannes Gutenberg-University, Bentzelweg, Germany  
Email: ajanisef@yahoo.com

## Abstract

*Dorema aucheri* Boiss is a perennial mono carpic species endemic to the southern parts of Iran. Traditionally, gums, young leaves and branches are used for medicinal and nutritional purposes. The gums are harvested for local and international trading. To get information about the conservation status of the species, we interviewed 27 indigenous informants from 12 villages around M. Hezar, S Iran. The main questions referred to the plant parts used, the type and frequency of harvesting and the effects of defoliation and gum harvesting in individual plants and populations. Furthermore, we were interested in the local income per person, the trade chain and the final products of *Dorema aucheri* used in foreign countries. The results indicate that gums were traditionally used as a poultice to treat skin cracks, but are now harvested mostly for trade. The price of the gum increases more than 10-fold through the trade chain. In foreign countries, the gum is used for different purposes like porcelain cements, incense materials and expectorant. The interviews also showed that the local people depend on gum collection and that sustainable use of the plants is urgently needed.

**Keywords:** Ethno botanical Interviews; Conservation; *Dorema Aucheri*; Gum

## Introduction

Iran is a large country with ca. 1.6 million square kilo meters. The variegated climatic, edaphic and topographic conditions caused highly diverse vegetation in the country. In total, 7,300 species are known [1], 850-900 of these (13%) used as medicinal and aromatic species [2,3]. Iran has a long tradition in medicine and a broad knowledge on the use of medicinal plants [4]. Depending on their significance as medicinal, spice or food plants, species are used locally or widely. Some are even exported to different countries which increase the rate of harvesting and may have a destructive effect on the populations of the respective species. Recently, it is reported that the tubers of different Iranian species of *Orchis* (Orchidaceae) were exported to Turkey to be used in ice-creams or tea powder [5]. Due to over exploitation, the species are calling a walk-up alarm for conservation. This is also true for *Ferula assa-foetida* L. and *F. gummosa* (Apiaceae), two important medicinal plants listed in the Iranian Plant Pharmacopeia. They are locally extinct, and now introduced as endangered species [6,7].

Apiaceae is one of the largest plant families in the Flora of Iran (112 gen. 364 spp.) including many medicinal and aromatic plants [2,7-9]. The genus *Dorema* D. Don has seven species in Iran, two of them, *D. ammoniacum* D. Don and *D. aucheri* Boiss,

being endemic. Species of the genus are perennial mono carpic, i.e., they pass a rosette stage for 3-4 years and then flower only once. Except *D. glabrum*, all species are distributed in arid and semi-arid areas of central and southern parts of Iran [10-11]. The gums ("gum ammoniac") from *D. ammoniacum* and *D. aucheri* are extracted and traditionally used as anti-spasmodic and expectorant [12-14]. In southwest Iran, the young leaves and branches are used to make a pickle and to treat digestive disorders. Massive harvesting of the plant for trading has caused a considerable decrease in population size threatening the species [14]. In contrast, ethno botanical studies in southeast Iran have shown that the gums are used as expectorants, anti-spasmodic and preparing glues [15]. Studies on the conservation status of the species in this area are lacking. In the present study, interviews with indigenous informants aim to identify the use of *D. aucheri* in southeast Iran and its conservation status.

## Material and Method

### Study Area And Species

In southeast Iran, *Dorema aucheri* grows at different slopes of M. Hezar, Kerman province, at altitudes of 3000-3600m [10,16-17]. While some populations are naturally protected against

grazing and harvesting, others are close to farmlands or villages where they can be easily exploited. We prepared a structured interview using questionnaires (suppl. 1). The most important questions referred to the used parts of the plant, the type and frequency of harvesting, the income for each person per year, the effect of harvesting on individual plants and populations and the license for harvesting. We interviewed 27 indigenous informants from 12 villages around M. Hezar who were chosen

randomly or deliberately, living very close to the habitats of the species (Figure 1). Due to difficulties in the communication with women, the interviews were mainly conducted with males either at their working places or, sometimes, at their homes. Before starting the interviews, we picked fresh samples of *Dorema aucheri* and showed them to the informants to reduce mistakes and misinterpretations (Figure 2).

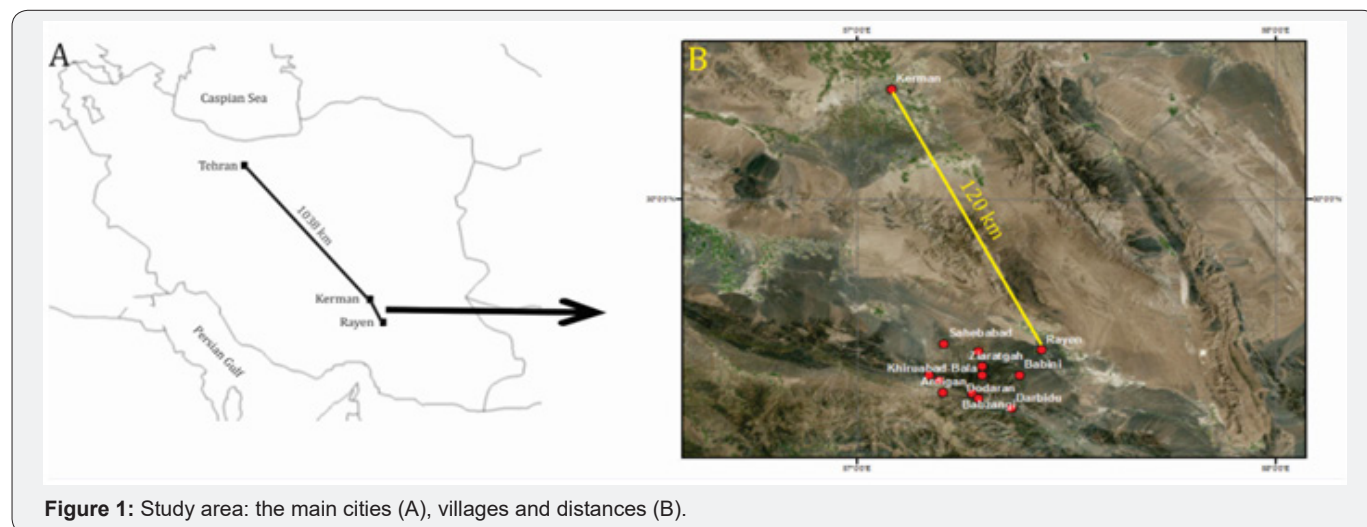


Figure 1: Study area: the main cities (A), villages and distances (B).



Figure 2: Interview with indigenous informants in the story (A), in homes with men and women (B-C) and in the field (D).

## Results

Based on direct contact with authorities of the Natural Resources Organization in Rayen, harvesting of the gums is only possible with a license given by authorities in the city of Kerman, the centre of the province.

### Collection of Gums

In the studied area, the gum is collected in three ways.

a) The natural form is called “tear-form”. A beetle from the Curculionidae family stings into the fresh stem of a flowering

plant, immediately stimulating fresh gum production. This gum is fluid and white in the beginning and becomes yellow and viscous when exposed outside. Based on the interviews, this gum type has the best quality. It can be collected as long as the stem remains fresh, each time with an interval of 4-5 days. On average, a single plant produces 60 gr. However, as collection is very time-consuming, the natural way of gum production is little used by the people (Figure 3).

b) The second way is the shoot incision method. The fresh stem is crashed by a sharp knife before or during anthesis

stimulating gum production. After a few days, the gum can be collected. On average, each plant produces about 100 gr. Its quality is not as good as in the naturally produced way and, therefore, the gum is mixed with other plant extractions (Figure 3). Even worse, since the plant is single-stemmed,

this collecting type can be destructive for the plant. This is particularly the case when the gum is collected in an early stage of a thesis hindering the individual to set fruits and seeds (Figure 3).



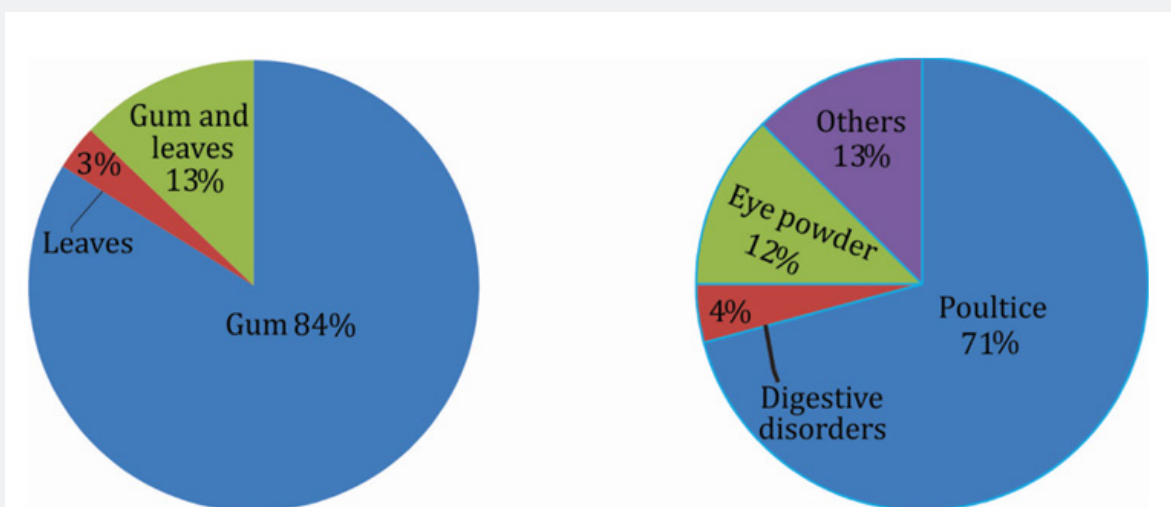
**Figure 3:** Different types of gum collection: tear-type (natural type of gum production, A), shoot incision (B) and destructive shoot incision (C).

c) Root tapping is usually performed in individuals with a thick root and the potential to produce the flowering stem in the following year. It is performed in July-August when the rosette leaves of the current year start to wilt. To accelerate aging, the leaves are bent down stopping the movement of the gum and increasing its accumulation in the roots. Then, to keep them in position, a heavy stone is left on them. After a few days, when the leaves are all yellow, they are removed and the upper part of the root is cut by a knife. To prevent any dust, sand or litter, the exposed roots are isolated with large flat stones. After 3-4 days, the gum can be collected. As in the stem incision method, the roots are cut deeply (at least 1cm) to reach the fresh parts. Gum collection can be repeated five times giving on average 200 grm per plant. This type of gum collection is the most destructive one killing the plant. Furthermore, the gums usually contain some sands and litter decreasing their quality.

### Traditional uses of the gum

In the study area, the plant is named Kaal, but the gum has different names like Oshtork, Eshterk, Shotork. The gum constitutes the most important part of the plant (97%) traditionally used for different purposes (Figure 4).

- a. The gum is mainly (71%) used as a poultice for curing skin cracks (Figure 4). For this purpose, the dried gum is, first, powdered with a hammer, then heated to become fluid, and finally mounted on the skin and fixed for 2-3 days. The cracked skin will be completely improved in this way.
- b. Sometimes, the gums are used as ornamental products (12%, Figure 4). Like in the previous method, it is first powdered and then intensively heated to obtain ash. The ash is mixed with some oils like Eucerin acting as a medium and can then be used as an eye powder.



**Figure 4:** The percentage of different plant parts used of *Dorema aucheri* (left) and different traditional uses of the gum (right).

- c. Rarely (4%, Figure 4), the gums are used internally. A small amount of powdered gum is drunken with water to treat digestive disorders.
- d. Dried leaves are also used as fodder for livestock. Fresh stems are collected in May-June, exposed to the sun to be dried and stored in dry storages until winter when there are not enough herbs in the pastures.
- e. Rarely, fresh leaves are used as bio-pesticides in rice-fields. The fresh leaves are collected and then left in the main water canals, especially in the main entrances of the field. It is believed that some natural compounds are released into the water acting against nematodes.

### Gum Uses At Present and People’s Income

At present, the gums are mainly collected by local people for their own livelihood. Some people collect the gum for both own use and sale. However, the amount of self-consumption is very low (50gr/year), the rest is sold. The gum is exported to foreign countries to be mainly used in ships as isolators or glue industries.

The gums are usually collected by root incision (83%) and only sometimes as natural products (tear-form) and shoot incision (17%). The amount of the collected gum depends in all cases on the skills of the collectors and the size and density of the population. Gums after root tapping are collected by specialized (21%) or common collectors (62%). A specialized collector can cut on average 120 plants per day, gaining about 5 kg gum per day. Pending on the collector and the population, the amount of collected gum can increase to more than 80 kg per month. The tear form of gum collection only achieves about 600 mg per day and totally 3 kg from 50 plants. The gums are sold directly to

local traders. Sometimes, collectors go to the city and sell the gum to a shop. Gum prices depend on the quality ranging from 12\$ (root incision) to 15\$ (tear form) per kilo. Based on these data, a specialized collector can earns 300 to 1.000\$ per month which is much higher than the income of 45\$ from collecting naturally produced gum (tear-form).

### Trade Chains of The Gums Based on Interviews and Contacts With Traders (Figure 5)

The gums are usually bought by local traders in the villages who may sell them in the city of Rayen close to the villages. However, as the price of the gum is the same in the city and the villages, the local traders prefer to sell the gum in Kerman, the capital of Kerman province ca. 120 km and N Rayen. Here, the price of the gum is more than 20\$/kg. From Rayen, the gum is sold to main traders in Tehran (1038 km N Kerman), the capital city of Iran. Sometimes, it is also sold in other large cities like Esfahan or Shiraz (south Iran), where the price of the gum is the same as in Tehran, i.e., about 40\$/kg or three times more than in the villages. Based on personal communication with commercial companies in Tehran, the gum is exported to foreign countries mainly the United Arab Emirates (UAE), China and France. The price of the gums increases to more than 160\$/kg, i.e. the 13-fold of the original price. It is traded with the commercial name “Gum Ammoniac” originating from *Dorema ammoniacum*. In the UAE, the gum is mainly used as a biotic aromatic material in holy places like churches. It is burnt in small plates and placed near the main doors. In some countries like UK, the gum is used as porcelain cements. Sometimes, it is used in medicinal industries as expectorant. Only a small amount of gums is used in Iranian industries. An example is Esfahan, where it is used as isolator in ships and as good adhesive in glue industry.



Figure 5: Trade chain of the gum from local dealers to Tehran and foreign countries like UK

### Effect of Harvesting on Plants and Populations

Most of the collectors (92%) already know that a license is essentially needed for gum collecting. They also know that

root tapping has destructive effects on the plant population. In their view, stem incision can be destructive in young stems before flowering, but not destructive in the fruiting stage. Most

people (70%) agreed that the population size of the species is decreasing. Many of them (43%) explained this by the long dry seasons in recent years. Only 27% believed that it might be influenced by over-harvesting of the gums. Other people (15%) said that the populations are increasing due to suitable rainfall in recent years.. The same percent of the interviewed people (15%) were neutral arguing that the populations were stable during the last years.

### Discussion

The gums are collected by three different methods. The "tear" type has the best quality and purity. Although the skilled collectors were aware about the minor quality of the gum gained by root and shoot incision and about its destructive effects, they prefer to collect the gum by these methods due to higher quantity. In *Ferula assa-foetida* L. and *Dorema ammoniacum* D. Don, the same harvesting methods already led to severe destructions and it was recommended to avoid root incision [18]. Protection is also needed for *D. aucheri*. As the local people depend on the income from gum collection one should try to cultivate the plant or at least to disseminate seeds to increase the population. The quality of the gum is evaluated by its degree of contamination with biotic and abiotic materials like pieces of leaves, fruits, branches, sand and dust. However, in contrast to *Dorema ammoniacum* and *Ferula asa-foetida*, it is not yet analysed chemically. Knowing the active compounds of the species would give valuable information how far the endemic medicinal species *D. aucheri* could be used as a substitution for the likewise rare and endangered *D. ammoniacum*. Despite the occurrence of toxic compounds and potential hepatotoxic capacity of *D. aucheri*, the young leaves and branches are still used in SW Iran to make a pickle [14,19]. The biotic pesticide activity of the fresh leaves against nematodes in rice fields may relate with these toxic compounds. It is assumed that the amount of toxic compounds decreases in dried leaves by losing essential oils so that the leaves can be used to feed domestic animals in winter. This is already known in *Dorema aureum* Stocks [20]. Comparative studies of the toxic compounds in fresh and dried leaves may give valuable information about the rate of toxicity in the leaves.

Ethnobotanical studies have shown that the gums are traditionally used as glue and also internally to digestive disorders like diarrhea and constipation. *Dorema aucheri* was considered as possible source of "gum ammoniacum". In the past, it was also used for calligraphy [12,15,17,21]. Our results in this area, however, showed that the gums are used externally for medical purposes to treat the skin crack of farmers who are working in the farmlands, for ornamental reasons and rarely as digestive. The latter property may be explained by the presence of flavonoids in the leaves [22]. These compounds plus bioactive substances like elemicin and myristicin were already known from the roots of *Dorema glabrum* which have antibacterial, antifungal, anti-inflammatory and insecticide effects [23].

Remarkable anti-inflammatory compounds were also reported in the roots of *D. kopetdaghense* [24]. To increase the knowledge on the possible use of the plant, the chemical composition of the gum should be studied carefully.

### Conclusion

*Dorema aucheri* is an important food and medicinal plant in southern Iran. It can be considered as a substitution for *D. ammoniacum* [12]. Due to over-harvesting, populations of both species are endangered. Indigenous people know about the need to ask for a harvesting licence to collect gum and also about the destructive effect of root tapping. To protect the species and allow sustainable use at the same time, it is proposed to train the people about a safe way to collect the gum by official authorities. It is also recommended to maintain the population by collecting mature seeds and dispersing them in the habitats.

### Acknowledgment

We gratefully thank Dr. A. Ghorbani from University of Uppsala for his helpful comments, Mr. Ghaemaghmanian at the Central Organization of Natural Resources in Kerman province and his colleagues, Mr. Jafari, Mr. Bigoneh and Mr. Mortazavi for their helpful assistant in the field and in preparing accommodation in the city of Rayen. This research was financially supported by DAAD and Dr. Marie-Friedericke Wagner-Stiftung, Mainz, Germany.

### References

1. Rechinger KH (1963-2010) *Flora Iranica, Flora des Iranischen Hochlandes und Umräumenden Gebirge*. Akademische Verlagsgesellschaft und Naturhistorisches Museum, Graz & Wien, Austria, pp. 1-178.
2. Mozaffarian (2012) Identification of medicinal and aromatic plants of Iran. Farhange Moaser, Tehran, Iran.
3. Bagheri M, Raghan MS (1994) Study the status and use of medicinal plants in Iran and in the world (in Farsi). *Forest & Rangeland J* 33: 15-19.
4. Hooper D, Field H (1937) *Useful Plants and drugs of Iran and Iraq*. Field Museum of Natural History, Chicago, USA.
5. Ghorbani A, Gravendeel B, Naghibi F, de Boer H (2014) Wild orchid tuber collection in Iran: a wake-up call for conservation. *Biodivers Conserv* 23: 2749-2760.
6. Seiiedin Nejad SH (1991) Report of Utilization & Trade Office in 1991. Ministry of Agriculture, Iran, pp. 163.
7. Jalili A, Jamzad Z (1999) Red data book of Iran: a preliminary survey of endemic, rare and endangered plant species in Iran. Research Institute of Forests and Rangelands, Tehran.
8. Pimenov MG, Leonov MV (2004) The Asian Umbelliferae biodiversity database (ASIUM) with popular reference to south-west Asian taxa. *Turk J Bot* 28: 139-145.
9. Valiejo Roman CM, Terentieva EI, Samigullin TH, Pimenov MG, Ghahremani-Nejad F, et al. (2006) Molecular data (nrITS-sequencing) reveal relationships among Iranian endemic taxa of the Umbelliferae. *Feddes Repertorium* 117(5-6): 367-388.
10. Rechinger KH (1987) Umbelliferae. In Rechinger KH, *Flora Iranica*. Akademische Druck und Verlagsanstalt, Graz, Austria 162: 379-385.

11. Mozaffarian V (2003) Two new genera of Iranian Umbelliferae. Bot Zhurn (Leningrad) 88: 88-94.
12. French DH (1971) Ethnobotany of the Umbelliferae. In Heywood VH Biology and Chemistry.
13. UNESCO (1960) Arid zone research-XIII medicinal plants of the arid zones. UNESCO, Paris, pp. 79.
14. Mosaddegh M, Naghibi F, Moazzeni H, Pirani, A, Esmaeili S (2012) Ethnobotanical survey of herbal remedies traditionally used in Kohghiluyeh va Boyer Ahmad province of Iran. J Ethnopharmacol 141: 80-95.
15. Rajaei P, Mohammadi N (2012) Ethnobotanical study of medicinal plants of Hezar mountains allocated in south east of Iran. Iran J Pharm Res 11(4): 1153-1167.
16. Mozaffarian V (2007) Flora Iran. Research Institute of Forests and Rangelands, Tehran 54: 349-350.
17. Rajaei P, Maassoumi AA, Mozaffarian V, Nejad Sattari T, Pourmirzaei A (2011) Alpine flora of Hezar montains (SE Iran). Rostaniha 12(2): 111-127.
18. Nadjafi F, Koocheki A, Ghasemi Arian A (2006) The status of exudates species in Iran and existing challenges in their sustainable utilization. Medicinal Plant Conservation 12: 22-28.
19. Mostafavi SH, Fazilati M, Mostafavi S-A, Vahhabi MR, Mostafavi F, et al. (2013) Hepato toxicity of *Dorema aucheri* (Bilhar) in Albino Mice. Archives of Iranian Medicine 16(9): 530-532.
20. Goodman SM, Ghafoor A (1992) The ethnobotany of southern Baluchistan, Pakistan, with particular reference to medicinal plants. Fieldiana: Botany 31: 1-84.
21. Harris D (2003) The calligrapher's bible: 100 complete alphabets and how to draw them. Barron's, London, pp. 246-247.
22. Wollenweber E, Dörr M, Rustaiyan A (1995) *Dorema aucheri*, the first umbelliferous plant found to produce exudate flavonoids. Phytochem 38(6): 1417-1427.
23. Delnavazi MR, Hadjiakhoondi A, Delafzar A, Ajani Y, Yassa N (2015) *Azeroides A* and *B*: two new phloracetophenone glycosides from the roots of *Dorema glabrum* Fisch & CA Mey. Med Chem Res 24: 287-796.
24. Zamani Taghizade Rabe S, Iranshahi R, Iranshahi M, Rastin R, Zamani Taghizade Rabe S, et al. (2015) Anti-inflammatory effect of new kopetdaghins A, C and E from *Dorema kopetdaghense*. Food and Agriculture Immunology 26(3): 430-439.



This work is licensed under Creative Commons Attribution 4.0 License  
DOI: [10.19080/IJESNR.2018.12.555827](https://doi.org/10.19080/IJESNR.2018.12.555827)

### Your next submission with Juniper Publishers will reach you the below assets

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats  
( Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission

<https://juniperpublishers.com/online-submission.php>