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NOTES ON NEGLECTED AND UNDERUTILIZED CROPS

Traditional uses of Kurdish medicinal plant *Pistacia atlantica* subsp. *kurdica* Zohary in Ranya, Southern Kurdistan

Hiwa M. Ahmed

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Abstract Kurdistan is an area where famous for its biodiversity of plants particularly Southern Kurdistan. Traditional uses of the medicinal plants have not been well-studied or documented. Thus, the study of Kurdish ethnobotany may be crucial for understanding local plant uses. This is the first study and therefore, the objective of this investigation was to document traditional uses of Kurdish medicinal plant *Pistacia atlantica* subsp. *kurdica* Zohary in Ranya, Sulaymaniyah Province, Iraqi Kurdistan. An ethnobotanical filed study was conducted via semi-structured interviews of Twenty-five elderly informants to document traditional knowledge in Ranya during 2016. Data was analysed by comparison with the ethnobotanical literature of Kurdistan. The use-value (UVd) index was developed and used to calculate the citation of diseases only for single plant species. The results found that the tree has a long history of therapy for 20 different types of human diseases and problems. The high UVd value recorded for peptic and duodenal ulcers, dysentery, cholesterol which were (1, 0.48, 0.32) respectively, by eating gum in raw internally application. While the external application for skin problems was (0.68). The high UVd of Kurdish chewing gum in the form of chewing for clearing mouth, gum diseases, relieving abdominal pain were (1, 0.92, 0.92) respectively. The high UVd of fruits of this plant in the form of bead for removing depression and stress relief were (1, 0.92). A comparison with the previous Kurdish ethnobotanical studies showed new medicinal uses. Unripe fruits from this plant are used as a snack, while the ripe and unripe fruits are used to make various different foods as an ingredient. The beautiful dried fruits are used to make a bead. The current study found that this is one of the valuable wild tree plants that grown in Kurdistan naturally for many years. It has played a vital role in the health and commerce in this area through the millennia and has economic and ethnopharmacological activity since antiquity.

Keywords Chewing gum · Dareben · Ethnobotany · Kurdistan · Middle East · Terebinth

H. M. Ahmed (✉)
Department of Extension, Bakrajo Technical Institute, Sulaimani Polytechnic University, Sulaymaniyah, Kurdistan Region, Iraq
e-mail: hiwa2009@yahoo.com

Introduction

Pistacia atlantica subsp. *kurdica* Zohary is a native Kurdish wild flowering tree plant, that is widely distributed in the Zagros Mountains of Kurdistan (particularly in Western and Northern Iran, Eastern and Northern Iraq, Southern Turkey and Northern Syria) so-called Kurdistan (Sharifi 2014). It is grown naturally over this region and known as *Dareben* or *Dar qezwan* in Kurdish that belongs to Anacardiaceae family that can produce resinous sap. *Pistacia* has

about twenty species, which five species mainly: *P. atlantica* Desf., *P. vera* L., *P. terebinthus* L., *P. khinjuk* Stocks, and *P. lentiscus* L. regarded as the most popular (Bozorgi et al. 2013). While, *P. atlantica*, *P. vera* and *P. lentiscus* have a great economic and pharmaceutical importance (Hatamnia et al. 2014). It is known that *atlantica* has three subspecies; *kurdica*, *mutica* and *cabulica*.

The production of the tree is used for a variety of industrial and traditional uses, including food and herbal medicine. In recent years, herbal medications and phytotherapeutics have been of interest to the clinicians, due to rich in bioactive compounds, and rational prices (Kazemi et al. 2012). Numerous pharmacognostic and pharmacological investigations of medicinal and aromatic plants have been conducted to ascertain their therapeutic properties (Hussain et al. 2011). *P. atlantica* subsp. *kurdica* has a long history of traditional medicinal uses since antiquity to cure and prevent a variety of human illnesses with positive results on gastrointestinal ailments and several digestive problems such as peptic ulcers, diarrhea, gastritis and intestinal upsets (Minaiyan et al. 2015). Exudate gums of the tree contain resins and volatile oil and pinenes, sabinene and limonene are the main ingredients of its oil (Minaiyan et al. 2015; Najafi et al. 2014; Sharifi and Hazell 2012).

Different parts of *Pistacia* species have been investigated for various pharmacological and biological activities with mostly focusing on the resin of *P. atlantica* subsp. *kurdica* that is known as mastic. Five genotypes of *Dareben* were investigated by (Hatamnia et al. 2014) and they found the highest total phenolic 3969 (for hull of B4 genotype) and flavonoid contents 773 (for hull of B4 genotype) mg GAE/100 g. in hull extracts than shell and kernel extracts. Hull extract with higher total phenolic content had higher antioxidant activity than those of other fruit parts. Anti-Helicobacter pylori effects of *P. atlantica* subsp. *kurdica* were studied and satisfactory results were obtained (Najafi et al. 2014; Sharifi and Hazell 2012). The gum obtained from *Dareben* can be used for controlling cutaneous leishmaniasis (Taran et al. 2010), strong acetylcholinesterase (AChE) inhibition (Benamar et al. 2010), alpha-amylase and alpha-glucosidase inhibitory effects (Hamdan and Afifi 2004), anti-tumor activity (Rezaei et al. 2012). The anti-inflammatory potential of oral gum of *P.atlantica* subsp. *kurdica* and its volatile oil in an experimentally induced colitis have also shown the positive result (Minaiyan et al. 2015).

Kurdistan is well-known for its great diversity in wild plants due to the geographical diversity and variable climatic conditions (Ahmed 2016; Pieroni et al. 2017). It is home to the primitive site of Shanidar Cave, at which a few scientists have argued the earliest evidence of medicinal plant use is found (dating to 35,000–65,000 years ago) (Hussain et al. 2011). In addition, Chermo in Southern Kurdistan (Iraqi Kurdistan) was found to be one of the oldest agricultural communities in the world, dating back to 7090 BCE (Lietava 1992; Braidwood et al. 1983; Braidwood and Braidwood 1950). The traditional uses and natural therapies of these plant species have not been well-studied or documented and exploited. These traditional knowledge, sometimes are in danger due to poor contacts between older and younger generations or lost by transmission orally from one generation to the next among traditional health practitioners. To the best of my knowledge, this is the first study regarding the traditional and folk uses of *P. atlantica* subsp. *kurdica* (*Dareben* or *Dar qezwan*) in Ranya. Therefore, this study was conducted to document indigenous knowledge of traditional uses of *P. atlantica* subsp. *kurdica*, and to record and document the traditional production process of Kurdish chewing gum (*Bnêştî Kurdî*) from this plant.

Materials and methods

Study area

The field study was conducted in a few villages of Ranya region of SE Kurdistan (Iraqi Kurdistan) (Fig. 1). Ranya is the center of the administration of Raparin (self-administered zone) consisting of Ranya (*Bîtwên*) and Qeladze (*Pîşder*) districts. It is affiliated to Sulaymaniyah governorate-KRG. The region of Ranya has been inhabited since ancient times and is rich in archaeological sites such as Şimşare, Basmusyan, Dême, Kameryan, Derbendî Ranya, Boskîn hills and Ranya castle. The modern history of Ranya dates back to the Ottoman Empire period in (1789) when the first district commissioner was appointed. It is very well-known for fertile plain across Southern Kurdistan for agriculture and tourism. The people of the Ranya have participated in a number of revolutions against the tyrant Iraqi regimes; the most famous

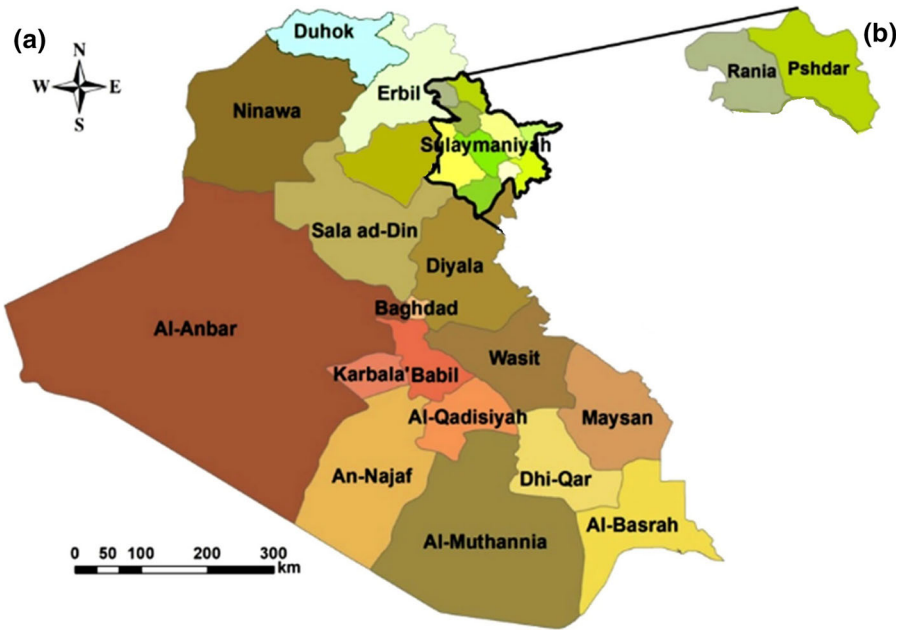

Fig. 1 **a** Map of Iraq, **b** Map of the Ranya area, where the field study was conducted

uprising was 5th March 1991, which later liberated the whole Iraqi Kurdistan. The uprising of Ranya achieved a great victory for the Kurdish people; therefore the town known as, Uprising Gate '*Derwazey Raperîn*'. The geographic coordinates (latitude and longitude) of Ranya city, are 35°33′0″N and 45°26′0″E, and elevation is about 2895 ft (882 m) above sea level and the total population of Raperin is more than 338,000 persons. Lake Dukan, created by the construction of a hydroelectric dam, is near the town and split Ranya and Qeladze. Center of Ranya is surrounded by four mountains ranges, the *Kêwereş*, the *Hacila*, the *Asos* and *Makok*. The following mountain villages located within Ranya and Qeladze were visited in 2016: *Kani Tû*, *Dole gom*, *Ali rêş*, *Bestê* (Fig. 1), each village counting a population between 250 and approx. 1500 inhabitants. The visited villages in the study area have a horticultural and pastoralist economy, with a specific focus on the traditional production and trade of Kurdish chewing gum; most of the local inhabitants speak Sorani (Central) Kurdish dialects.

Data collection

In this research, an ethnobotanical filed study was conducted to document traditional knowledge on *P. atlantica* subsp. *kurdica* (*Dareben* or *Dar qezwan*). The survey was carried out via semi-structured interviews of informants who have traditional knowledge concerning uses of *P. atlantica* subsp. *kurdica*. Twenty-five elderly informants (20 males and 5 females) were interviewed in their local language (Kurdish) after Prior Informed Consent was verbally obtained. During interviews, the ethnopharmacy of this plant mostly trunk exudates from the plant (*Bnêşte kal*), the production process of Kurdish chewing gum (*Bnêştî Kurdî*) from the plant where it is grown to marketing, the traditional uses of fruits of the plant (*Qezwan*) for food and as well as for bead (*Tesbih'*) have been recorded and evaluated. The consent for the publication of individual participant's image has been obtained from them. The Code of Ethics of the International Society of Ethnobiology (2008) was strictly followed. For ethical considerations connected to the fieldwork, prior to conducting the interviews, permission and ethical approval were obtained from the Bakrajo Technical Institute and Sulaimani Polytechnic University.

Data analysis

The information obtained during the interviews was statistically analysed using Microsoft Office Excel

software (2010). On the basis of the data given by the informants in the study area, the comparison has been made with all the relevant ethnobotanical literature of Kurdistan (Ahmed 2016). In order to identify any new uses of this plant species which have never been reported before. Additionally, the use value (UVd) of taxa was developed and determined.

Use-value for one species

The use-value (UVd) index was developed and used to calculate the citation of diseases only for one plant species during interviews. This can be used to quantitative analyses of traditional medicinal uses of one plant within the whole study in order to identify the therapeutic potential of particular plant species (whole or/and single part). So i have developed the formula adapted from (Phillips and Gentry 1993) and (De Albuquerque et al. 2007). It is calculated as follows:

$$\mathrm{UVd} = \sum \mathrm{U}/\mathrm{n}$$

where UVd refers to the use value of the single species for specific diseases, U is the sum of the total number of use citations by all informants for a given specific diseases, n the total number of informants usually is fixed.

This method evaluates the relative importance of the medicinal species for specific diseases based on its relative use among local informants. UVd values range between 0 and 1, where 1 indicates the highest level of informant consent and 0 the lowest. A high use value indicates the potential importance of the plant species for specific ailment conditions reported.

Results and discussion

Kurdistan represents a crucial region in the Middle East for understanding patterns of human evolution in the use of medicinal and food plants and especially wild trees as well as for assessing the influences of the major, surrounding bio-cultural macro-area. Ethnobotany of Kurdistan is a very interesting and unexplored subject in ethnobiology. The area is rich in biodiversity of plants and recording these data and traditional knowledge should take priority for Kurdistan Regional Government, and urgent action is required.

Taxonomy and nomenclature

Synonyms

According to http://www.theplantlist.org/, it has three synonyms: *P. atlantica* subsp. *kurdica* Rech. f., *Pistacia atlantica* var. *kurdica* Zohary, *Pistacia eurycarpa* Yalt.

Common names

Iraq (Kurdish: Dareben or Dar qezwan; Arabic: botom), Iran: Baneh, Pakistan: Gwan, Turkey: Bıttım, Cyprus: Gum Tree, English: Mastic tree or Terebinth.

Distribution

Iraq (Kurdistan Region or S Kurdistan), Turkey (N Kurdistan), Iran (E Kurdistan, and other parts), Syria, Armenia, Lebanon (Antilebanon), Afghanistan, Pakistan.

Short description and cultivation

It is a deciduous tree growing up to 7 m tall with branches spreading and growing erect to form a dense crown. The stem is stout and covered with fissured bark. Old trees may have trunks measuring 2 m in diameter; it may take 200 years for a tree to reach 1 m wide (Pourreza et al. 2008). Leaves deciduous, usually imparipinnate, 10.2–18.2 cm long, 9–13.5 cm wide, membranaceous; petiole flattened; rachis narrowly winged. Leaflets (1–3) 5–7, 4.5–6.5 cm long, 1.5–3.8 cm wide, average ratio 2.3-1, lanceolate, obtuse, puberulent, margin ciliated to glabrous; terminal leaflet 5.2–8 cm long, 2.5–4 cm wide. Flowers are small with sepals and (3–7) petals or without petals in some species. Staminate panicles have not seen. Pistillate panicles to 18 cm long branched from above base, stout. Drupes bright red, wider than long, to 7 mm long and 8 mm wide (Sharifi 2014). There is no cultivation reported, as it is harvested from the wild in some areas of its natural range. Although the extent and sustainability of this practice is unknown, human effects such as tourism, road construction and sewage pollution from local villages, as well as heavy grazing constitute threats to this species in the Zagros Mountains of Iraqi Kurdistan (The IUCN Red List of Threatened Species 2016).

Ailments treated by plants

The present study found that the *P. atlantica* subsp. *kurdica* is traditionally used to treat 20 different types of ailments and diseases in the study area. Table 1 lists the utilized medicinal plant arranged by botanical name, Kurdish name, plant part, administration, medicinal uses, Use citations, UVd, Recorded in Kurdish ethnobotany literature. This plant provides excellent and important medicinal uses through the millennia for treatment and relief of peptic and duodenal ulcers, dysentery, flatulence, liver fibrosis, abscess, cholesterol, high blood pleasure, antibacterial, antifungal, skin injury, clearing mouth, gum disease, strengthening teeth, relieving abdominal pain, improving memory, reducing stress, asthma, cough, removing depression. Use values (UVd) indicate the relative importance of medical plant species for a specific disease based on its relative use among local informants. In this study, as shown in Table 1 the highest UVd value recorded for peptic and duodenal ulcers, dysentery, cholesterol which were (1, 0.48, 0.32) respectively, by eating gum (*Bnêşte kal*) in raw internally application to treat these above mentioned ailments. While the UVd external application of gum (*Bnêşte kal*) in raw for skin problems was (0.68). Furthermore, the high UVd for another medical application of this plant which called Kurdish chewing gum (*Bnêştî Kurdî*) in the form of chewing for clearing mouth, gum diseases, relieving abdominal pain, strengthening teeth were (1, 0.92, 0.92, 0.72) respectively. In addition, the high UVd for fruits of this plant (*Qezwan*) in the form of Bead (*Tesbih'*) for removing depression and stress relief were (1, 0.92).

It is an important component of the natural vegetation which displays discontinuous pattern of distribution over Kurdistan. It has significant economic and traditional medicinal value across Southern Kurdistan. The tree itself can be used for fuel, the trunk exudates from this plant, which is called in Kurdish (*Bnêşte kal* or *Bnêşte tal*) has long history of therapy and can be used in raw and boiled for treating many diseases. Unripe fruits from this plant are used to consumption as a snack, while the ripe and unripe fruits (*Qezwan*) are used to make various different foods as an ingredient. The beautiful dried fruits are used to make Bead (*Tesbih'*).

Comparison with the Kurdish ethnopharmacobotany

It seems that few studies have been conducted in Kurdistan (Southern Kurdistan or Iraqi Kurdistan, Eastern Kurdistan or Iranian Kurdistan, Northern Kurdistan or Turkish Kurdistan, Western Kurdistan or Syrian Kurdistan), and particularly Southern Kurdistan regarding of traditional medicinal uses of plants. Thus, this is the first study carried out to record medicinal and traditional uses of this species. To identify new medical uses of this plant, the current study was compared to previous studies conducted in Kurdistan mostly within Northern Kurdistan (Ahmed 2016; Al-Douri and Al-Essa 2010; Bahmani et al. 2012; Amiri and Joharchi 2013; Al–Douri 2014; Cakilcioglu and Turkoglu 2010; Alaadin 2014; Ahmad and Askari 2015; Bahmani et al. 2014; Mati and de Boer 2011; Cakilcioglu et al. 2011; Çakılcıoğlu et al. 2010; Polat et al. 2013; Kaval et al. 2014; Khatun et al. 2012; Naghibi et al. 2014; Hayta et al. 2014; Mükemre et al. 2015; Tahvilian et al. 2014; Tetik et al. 2013; Özdemir and Alpınar 2015) and results found (Table 1) new traditional medicinal uses of *P. atlantica* subsp. *kurdica* in the villages of Ranya obtained from twenty-five informants who were interviewed (20 males and 5 females). Results confirming that the trunk exudates from this plant has a long history of therapy and can be used in raw internally to treat peptic and duodenal ulcers, dysentery, skin injuries, flatulence, liver fibrosis, abscess, cholesterol, high blood pleasure, antibacterial, antifungal. Kurdish chewing gum (*Bnêştî Kurdî*) the processed trunk exudates from this plant is used to clear mouth, gum disease, strengthening teeth, relieving abdominal pain, improving memory and reducing stress, asthma, cough. Moreover, fruits of this plant (*Qezwan*) which is used to make Bead (Tesbih') has used to remove depression and stress relief. While the previous study showed *Bnêşte kal* was used to cure gastrointestinal problems. A mixture of this gum with finely shredded soap made from *Pistacia* oil used as a dressing to clean old wounds or to erupt boils. A tea made from the dried fruit is used as antidiarrheal medicine (Ahmad and Askari 2015). It has been used traditionally to treat and relieve upper abdominal discomfort, dyspepsia and peptic ulcers, gastralgia, masticatory as well as by dentists for filling teeth (Sharifi 2014).

Table 1 Traditional medicinal uses of *P. atlantica* subsp. *kurdica* Zohary in the villages of Ranya

Botanical name	Kurdish name	Plant part	Administration	Medicinal uses	Use citations	UVd	Recorded in Kurdish ethnobotany literature
Pistacia atlantica subsp. *kurdica* (Anacardiaceae family)	*Dareben, Dar qezwan*	*Bnêşte kal* (gum)	Internal application, eating in raw	Peptic and duodenal ulcers	25	1	Gastrointestinal problems (Bahmani et al. 2014)
				Dysentery	12	0.48	
				Flatulence	7	0.28	
				Liver fibrosis	5	0.2	
				Abscess	15	0.6	
				Cholesterol	8	0.32	
				High blood pleasure	6	0.24	
				Antibacterial	5	0.2	
				Antifungal	4	0.16	
			External application in raw	Skin injury	17	0.68	A mixture of this gum with soap made from pistacia oil to clean old wounds or to erupt boils (Bahmani et al. 2014)
		Bnêştî Kurdî	Chewing in boiled	Clearing mouth	25	1	
				Gum disease	23	0.92	
				Strengthen teeth	18	0.72	
				Relieve abdominal pain	23	0.92	
				Improve memory	7	0.28	
				Reduce stress	7	0.28	
				Asthma	6	0.24	
				Cough	4	0.16	
		Qezwan (Fruit)	Tea made from dried *Qezwan*				Diarrhea (Bahmani et al. 2014)
		Qezwan (Fruit)	*Tesbih'* (Bead)	Remove depression	25	1	
				Reducing stress	23	0.92	

Production of Kurdish chewing gum (*Bnêştî Kurdî*)

The informants have also provided the following knowledge on this plant. This is a natural and valuable plant, which is grown in mountains area, requires a cold winter with lots of snow, and cool and moderate weather in summer. If the plant not cut and overuses during collecting resin, then it can be lived for 500 years, during this time the benefits of this plant will continue for a human. The history of the production process of Kurdish chewing gum (*Bnêştî Kurdî*) is not known so far, it has transmitted orally from generation to other.

The production of Kurdish chewing gum (*Bnêştî Kurdî*) requires someone skilled and experienced, and with patience. It is the hardest process with lots of tiredness that local people can perform in the mountains area of which *Pistacia atlantica* subsp. *kurdica* Zohary (*Dareben*) is covered. This process usually starts at the end of the spring season and beginning of the summer, especially between 15 June and 15 August, sometime in warmer years, this can be started earlier because of the three following reasons:

1. The rain has not fallen.
2. The higher temperature makes (mastic) resin to come out more from the plant.
3. The tree (*Dareben*) is absorbed as a good amount of the moisture and is active.

First stage

This stage is known as soil preparation. Clay soil should be prepared by determining and clearing the site for soil, which is called (*Glîncan*, *Mloge* or *kenge* is the pit in which the soil is taken). Certainly the soil consistency must be very good quality, to protect the clay from being cracked, otherwise, it can not be stuck to the bark of the *Dareben* tree and falling down. For this reason, dig in the ground to obtain the desired amount of the white soil to sift using the sieve so that the unwanted material can be split and removed. After that, the obtained soil mixes with some water and kneads properly to get clay, occasionally hay adds to the clay to get more consistency and to not being affected by rain.

Fig. 2 Kurdish person trying to making injury of the *Pistacia atlantica* subsp. *kurdica* Zohary tree

Second stage

In this stage, the tree is injured by a sharp adze tool (*Teşwêy tîj*) which requires an experienced person and called (*leleker* or *leloder* or *klênder*) in order to not damage the plant in the long term (Fig. 2). This is the most important action because excessive damage to the tree may reduce resin production and threaten tree death that measuring the more and less product as if the injuries (*lelekan*) is bigger, then the amount of resin coming out will be less than expected. The action of injury (*leladanewe* or *brîndarkrdn*) must be in a site of the tree which has not been injured before for some time, due to remaining the sign of this for three to four years. The injuries have to be zigzag, not straight at the same level, neither horizontal nor vertical. This also should not be done on the nodes as it has no resin, and a small number on the branches and twigs can be applied since the stem is rich in this material. The distance between injuries (*lelekan*) should be (15–20) cm with (5–10) cm length and approximately (5) cm width.

Third stage

After preparing the clay and injury, then the (*Koçele*, *Kodile*, *Koçke* is a clay aggregate that used to collect the resin from tree) should be prepared in order to fix it in the injured site on the tree stem, and this must start in branches and twigs on the top of the tree directing to down not vice versa, to protect *Koçeles* from being broken (Fig. 3). It has to be near the injury places to collect the trunk exudates (*Bnêşte kal*), which may

Fig. 3 Kurdish man making *Koçele* (*Koçke*) with fixing on *Pistacia atlantica* subsp. *kurdica* Zohary stem

Fig. 4 *Pistacia atlantica* subsp. *kurdica* Zohary stem covered by *Kodile* viewed from *top* to *down* side

weigh as much as (100–150) g. We have to be sure the *Koçeles* are stick well to the tree and the depth is enough for gathering a high amount of *Bnêşte kal*, with putting only a *Koçele* on one injured site about 50 *Koçele* for a tree. After finishing this, we should wait for (10–15) days until filling the *Koçeles* for full or half, then we start to injure tree for the second time which called re-injuring (*dûlelekrdn* or *dûcar brîndarkrdn*) but at the same site of the first time and a bit bigger. At this time, we have to cover the *Koçeles* to keep them clean and this need to perform very carefully and precisely because the tree covered by these *Koçeles* and any defect will impact on the results may lead to a loss. It has been strongly recommended that to not do more injury than two, as it usually damages to the tree *Dareben* (Fig. 4).

Fourth stage

After *dûcar brîndarkrdn*, we should wait for (10–12) days again until *Koçeles* getting full; this varies according to the local areas. Generally, this takes 20–30 days then the *Koçeles* are removed from the tree to collect the *Bnêşte kal* (Fig. 5). It should be done

Fig. 5 The process of collecting trunk exudate (*Bnêşe kal*) from *Pistacia atlantica* subsp. *kurdica* Zohary tree, **a** *Koçele* full of trunk exudate (*Bnêşte kal)*, **b** collecting the trunk exudate *(Bnêşte kal)*

in the early morning in order to not melt the material, and it has to be started from the bottom working to the upwards, which is the opposite of the attaching during the third stage. Finally, the obtained *Bnêşte kal* will be filtered to clean from the unwanted materials and send it to the market.

Bnêşte kal is colored white with a nice smell, mastic structure and viscosity, and quite bitter taste in raw form. *Bnêşte kal* is boiled with an equal amount of water under 70–80 °C for 30 min with removing foam over it to get more clear not grey, after that it puts in cold water for some time then kneads properly to remove bitter taste, eventually, Kurdish chewing gum will be ready for chewing. While, some of the *Bnêşte kal* is exported to other countries, and mostly consumed within Kurdistan. The most characteristic of Kurdish chewing gum is that its taste will continue during chewing, as opposed to artificial chewing gum which has its taste limited for some time.

The following reasons influence *Bnêşte kal*: Raining is the most important factor causing the product to lose. Additionally, firing around the tree, animals, wild animals who try to climb a tree, birds, insects particularly honeybee, the wind also affect it.

Food

The Kurdish diet includes a wide variety of fruits and vegetables. The fruits of this tree (*Dareben*) is called

Fig. 6 The immature fruits (*Qezwan*) of *Pistacia atlantica* subsp. *kurdica* Zohary in the village of Kanî tû in Ranya

Qezwan and widely used as a food additive in Pickles by indigenous people either as dried or green because it has a wonderful odour and taste. The unripe fruits which are called *Qezwan* or *Ferike Qezwan* are used to make jam and for consumption in raw form as a snack like nuts during the spring season (Fig. 6). The previous study by (Hatamnia et al. 2014; Ahmad and Askari 2015) reported some similar results, but has not clearly described some uses such as the immature fruits of *Darqezwan* are eaten fresh before the stony endocarp (inner fruit wall) hardens; the mature fruits are salted and the seeds are eaten. Another uses of Qezwan, is that local people collect the ripe fruits and

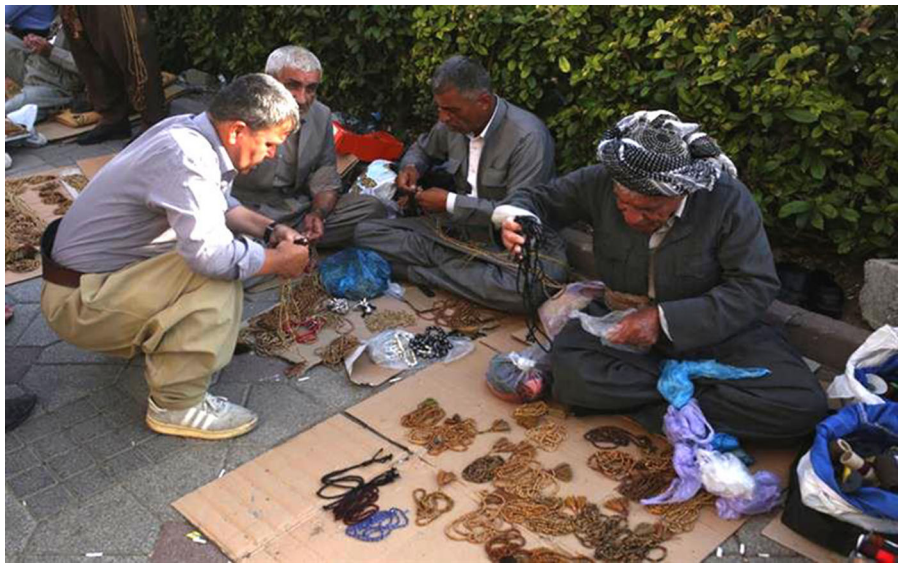

Fig. 7 Kurdish men selling different types of bead produced from fruits (Qezwan) of *Pistacia atlantica* subsp. *kurdica* Zohary tree

after drying at room temperature then grind them into flour, and later they use it as an additive to other foods as a special ingredient. Moreover, as favourite Kurdish drink is *Mastaw* (buttermilk); they also put *Qezwan* into this to make the drink more delicious. While the study by (Ahmad and Askari 2015) showed fresh or dried fruits of *P. atlantica* subsp. *Kurdica* are used as a condiment mixed with yogurt. The dried *Qezwan* can be used with rice recipes as well for Kurdish cuisine. This is probably promising a good result as nutraceuticals for human consumption (Fig. 7).

Bead (*Tesbîh'*)

Tesbih' is one of the *Dar qezwan* products that has been used widely by people in Kurdistan and other parts of the world either for religious rituals, e.g. to remember and get closer to the God in term of religion or as the prayer beads. They also use it to spare time and taking pleasure with removing depression and reducing stress. It is part of the Kurdish culture particularly elderly people, and nowadays getting popular among young people as well. Many people yearly harvest the *Qezwan* seeds from the *Dar qezwan* tree and making *Tesbih'* to make money. First of all, engravers going to the areas where the tree was grown and engraving the *Qezwans,* which are not picked over the tree in July, the *Qezwan* seeds will stay on the tree until October, then they collect it and bring to the sellers who they make *Tesbih'* for customers. There are some types of *Qezwan* such as *qezwany lareşe* which are more expensive than *bernznce* and *ebreq*. This has long history for local people to live on it. Similarly, (Ahmad and Askari 2015) reported the use of dry ripe fruits of *P.* to make necklaces and prayer beads.

Conclusions

The *Dareben* is one of the valuable wild tree plants that grown in Kurdistan naturally for many years. It has played an important role in health and commerce in this area through the millennia and has economic and ethnopharmacological activity since antiquity. Results exhibited that *Bnêşte kal* one of the products of this plant has been traditionally used to treat a wide range of diseases including to treat and prevent dysentery, flatulence, liver fibrosis, abscess, cholesterol, high blood pleasure, antibacterial, antifungal. The Kurdish chewing gum, which is made from *Bnêşte kal* is used to chew for pleasure and health benefits including clearing the mouth, gum disease, strengthening teeth, relieving abdominal pain, improving memory and reducing stress, asthma, and cough. Moreover, the fruits of this plant which called *Qezwan* consumed as snack in raw when it is unripe, while ripe and unripe *Qezwan* is used usually in food

and drinks as ingredient for making more tastier, and the dried ripe *Qezwan* also used to make the beads (*Tesbih'*) and to remove depression and reduce stress. It plays a significant role in the economy of local inhabitants and Kurdish ethnomedicine. This plant may be a good starting point interesting not only for pharmaceutical companies, to become a natural alternative system for better health and wellness, but also for utilizing as food and drink preservatives and cosmetics as well.

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Authors' contributions HA carried out the entire study: he designed the study, conducted the fieldwork, as well as the plant identification and the writing of the manuscript. The author read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest The researcher certifies that there is no conflict of interest with any financial organization regarding the manuscript.

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