Where tulips and crocuses are popular food snacks: Kurdish traditional foraging reveals traces of mobile pastoralism in Southern Iraqi Kurdistan

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Abstract

Background: Iraqi Kurdistan is a special hotspot for bio-cultural diversity and for investigating patterns of traditional wild food plant foraging, considering that this area was the home of the first Neolithic communities and has been, over millennia, a crossroad of different civilizations and cultures. The aim of this ethnobotanical field study was to cross-culturally compare the wild food plants traditionally gathered by Kurdish Muslims and those gathered by the ancient Kurdish Kakai (Yarsan) religious group and to possibly better understand the human ecology behind these practices.

Methods: Twelve villages were visited and 123 study participants (55 Kakai and 68 Muslim Kurds) were interviewed on the specific topic of the wild food plants they currently gather and consume.

Results: The culinary use of 54 folk wild plant taxa (corresponding to 65 botanical taxa) and two folk wild mushroom taxa were documented. While Kakais and Muslims do share a majority of the quoted food plants and also their uses, among the plant ingredients exclusively and commonly quoted by Muslims non-weedy plants are slightly preponderant. Moreover, more than half of the overall recorded wild food plants are used raw as snacks, i.e. plant parts are consumed on the spot after their gathering and only sometimes do they enter into the domestic arena. Among them, it is worth mentioning the consumption of raw wild crocus corms, also still common in Turkish Kurdistan and that of wild tulip bulbs, which was documented to be popular until the beginning of the twentieth century in the Middle East. Comparison with other ethnobotanical field studies recently conducted among surrounding populations has shown that Kurds tend to gather and consume the largest number of non-weedy wild vegetables.

Conclusion: The collected data indicate robust traces of nomadic pastoralism in Kurdish traditional foraging. This finding confirms that studies on wild food plant gathering in the Fertile Crescent and Turco-Arabic-Iranic regions of the Middle East are crucial for understanding the possible evolution of wild food plant gathering through history within the post-Neolithic continuum between pastoralism and horticulturalism.

Keywords: Wild food plants, Foraging, Ethnobotany, Kurds, Kakais, Human ecology

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Introduction

Is Kurdistan truly an important hotspot for traditional gathering of wild vegetables in the Middle East? Are foraging patterns of different ethno-religious groups living in Kurdistan and surrounding areas similar, and if so, why? What are the possible origins of Kurdish foraging?

The current field study tries to address these questions by analysing the wild food ethnobotany of a broad area of Southern Iraqi Kurdistan ranging from the biblical Nineveh Plains in the west to the semi-desert area of the Garman Region of Kalar to the east, i.e. a bordering plain area where the Kurdish population ends at the Arabian realm.

The region that we nowadays call Kurdistan, which is divided among the modern nation states of Syria, Turkey, Iraq, and Iran, and its surrounding territories are a very essential area for understanding the human ecology of food and the evolution of human nutrition patterns, as this area was home to a remarkable portion of the Neolithic Revolution. Some crucial archaeological sites in this northern and eastern part of the Fertile Crescent (i.e. Çayönü Tepesi, Göbekli Tepe, Jarmo, Mureybet, Tell Abu Hureyra, Tell Sabi Abyad; dating to 7500–10,500 BC) have traced the transition from hunting and gathering to the first sedentary settlements, as well as the domestication of cereals, pulses, and various mammals [1–4].

Moreover, in the very recent ethnobotanical literature, Kurdistan seems to emerge as a remarkable bio-cultural food refugium [5] for wild food plants and foraging customs, if compared with other Mediterranean and Near Eastern areas, especially in terms of the number of botanical taxa still currently utilized [6–13]. In addition, the Kurdish region is located at the crossroad of four important cultural areas (Turkish, Arabic, Persian, Caucasian) and still hosts diverse ethnic, linguistic, and religious minority groups who have peacefully lived together for centuries. In particular, we recently found that in Northern Iraq, affiliation to different religious communities, which possibly had an effect for centuries on kinship relations and then on the vertical transmission of Local/Traditional Environmental Knowledge and Practice (TEK) related to food within the household, has shaped different foraging patterns [14]. The differences we observed were especially remarkable between Christian Assyrians, whose wild food plants are mainly represented by synanthropic weeds, and Muslim Kurds, who favour wild plants growing in the mountains, and we postulated that this disparity could be related to the ethogenesis of the two groups: post-Neolithic horticulturalists and nomadic pastoralists, respectively.

In the present study, which we conducted at the most southern edge of the Kurdish Autonomous Region in Iraq, we considered two diverse ethno-religious Kurdish groups: the Muslim and the Kakai (also named Yarsani) communities. The term kurd—possibly derived from the Middle Persian kwrt, meaning nomad or tent-dweller [14]—emerged in the sixteenth century to describe a few heterogeneous nomadic shepherding tribes living in the Central Persian Plateau, and their origins are probably to be found in different pre-existing civilizations, among them that of the Medes, which possibly also gave rise to the Baluchi people [15]. Kurds were mainly Islamicised by the Turks between the twelfth and the fifteenth centuries [16] while Yarsanism is instead a monotheistic faith which specifically emerged from Shia Islam in Western Iran in the fourteenth century [16].

A previous study that we conducted in Hawraman, SE Iraqi Kurdistan, showed that the wild food ethnobotanies of Yarsani (Kakai) and Muslim Kurds entirely overlap [17]. Despite the very small sample of Yarsani informants that could be considered, we interpreted this finding as the result of a rapid acculturation process that Yarsanis living in that area had to go through during the past two decades, when they were heavily threatened by the spread of radical Jihadism. As a consequence, Hawramani Yarsanis were forced to abandon their home village of Hawar and move to main Kurdish towns, where they lived together with their Muslim counterparts, returning to the village only during the summer months or at weekends [17].

In this study, we wanted to further verify this finding by using a broader sample which included Yarsanis still living in their original villages in the Nineveh and Garman plains.

The specific research objectives of this study were therefore:

- To record the local names and specific traditional culinary uses of local wild food plants among Kurds living in different locations of Southern Iraqi Kurdistan;
- To compare the data collected among the two considered religious/ethnic communities (Kakai and Muslim Kurds); and
- To compare the data with all the available Middle Eastern and Mediterranean wild food ethnobotanical literature, in order to possibly trace commonalities and differences, which could be linked to historical and/or human ecological dynamics.

Methods

Research area and field study

The field study was conducted in Southern Kurdistan (within the border of Iraq) in the spring of 2019, during which time we visited 12 villages (Fig. 1) inhabited by Kakai and Muslim Kurds, with a population ranging between 100 and 5000 inhabitants. The
villages are located mainly in plain areas along the plateaus cut by the lower Great Zab, Little Zab, and Sirwan rivers, which are all tributaries of the Tigris. The lower Great Zab River cuts the Biblical Nineveh Plain (Fig. 2), while the Sirwan River runs through the Garmian region (Fig. 3). The two religious communities we considered are strictly endogamic, and intermarriages are still not allowed, nor commonplace; both Muslim and Kakai Kurds speak Sorani Kurdish, the latter group often mixing this with their original Gorani (also called Gurani) language. Gorani is considered by linguists to be part of the Zaza-Gorani language which does not fall under the Kurdish language group, although it still belongs to the NW branch of Iranian languages [18]. Nevertheless, all Gorani speakers as well as Kakais consider themselves Kurds and they speak proper Kurdish too.

The vegetation of our study area belongs to the Armeno-Iranian Province of the Irano-Turanian Region [19] and, according to the Köppen-Geiger classification system [20], presents a hot semi-arid climate (BSh), with extreme temperatures in the summer that in the town of Kalar may easily reach 50 °C.

The villages we considered rely upon small-scale horticultural and especially pastoralist subsistence economies, with some of the younger and middle-aged population working in the public sector in the main cities. Fifty-five Kakai Kurds (28 men and 27 women) and 68 Muslim Kurds (40 men and 28 women) aged between 31 and 79 years were interviewed. Respondents were
selected among the middle-aged and elderly villagers who have a strong link to traditional agro-pastoral activities and still actively practise the custom of gathering wild plants. The focus of the interviews, which were conducted in Sorani Kurdish, was the local names, modalities of gathering, and detailed culinary uses of the currently collected wild food plants. The data were acquired also via free-listing exercises, group walks through the natural landscape, and participant observation.

Prior informed consent was verbally obtained before each interview, and the Code of Ethics of the International Society of Ethnobiology [21] was followed.

Villages of the Nineveh Plain are still heavily affected by the consequences of the occupation of Mosul and the surrounding territory by the terrorist groups of the former Islamic State of Iraq and Syria (ISIS, 2014–2017), with several internal refugees still living in camps, after the occupiers were expelled from Mosul city and its contiguous areas. Kurdish Peshmerga (military forces of the autonomous Kurdistan Region in Iraq) did not allow the field researchers to go to all the villages that we had planned to visit in the Nineveh Plain, since their safety could not be guaranteed given that a number of ISIS affiliates may still be hiding in this area close to Mosul.

The wild plant species mentioned by the informants were collected, when available, and identified by the authors according to the Flora of Turkey and the East Aegean Islands [22]; this resource was chosen because the Flora of Iraq is still unfinished (with only five completed volumes [23]). The collected specimens were stored at the Herbarium of the Department of Environmental Sciences, Informatics, and Statistics, Ca’ Foscari University of Venice (UVV, specimens KURD66-KURD106) and at the Herbarium of the Estonian University of Life Sciences (TAA, specimens KURD01-KURD59). When specimens were not available, a possible identification was attempted by asking the informants to describe the plant and its habitat as well as possibly show mobile phone pictures, and by comparing the recorded folk name with the most exhaustive dictionary of Kurdish plant folk names [24].

Nomenclature follows the standards set by The Plant List database [25], while plant family assignments follow the current Angiosperm Phylogeny Group designations [26]. Local plant names were reported in the Latin alphabet; among the phonemes that do not occur in English, it is worth mentioning that the voiceless velar fricative was reported as “x” and voiceless uvular stop as “q”.

Data analysis
Collected data were compared with the entire Kurdish wild food ethnobotanical literature available in English or Russian [6–13, 17, 27, 28] and with that of various territories in the Near/Middle East and the Caucasus, where ethnobotanical field studies focusing on wild food plants have been sporadically conducted during the past decades [29–37].

Finally, the most comprehensive reviews on the wild food and medicinal plants used in Iraq [38] and the entire Near East/Caucasus [39] were considered.

Results and discussion
South Kurdish foraging
Table 1 presents the wild food plants reported by the informants as gathered and consumed. In the table, along with the botanical taxa, families, and voucher codes, we report the folk names that we recorded in the study area, as well as the used plant parts, their traditional culinary uses, and the quotation frequency for both religious groups (proportion of the overall informants citing the food use of a given folk taxon).

In total, 54 folk wild plant taxa and 2 folk wild fungal taxa (corresponding to 65 identified botanical taxa and 4
| Botanical taxon/taxa, family, and voucher specimen code(s) | Recorded local name(s) | Used parts | (Etc) taste characteristics | Traditional culinary use | Quotation |
|-----------------------------------------------------------|------------------------|------------|-----------------------------|--------------------------|----------|
| *Allium ampeloprasum* L., KURD11                         | Koraya, Qorada, Qurada  | Aerial parts | Pungent                      | Seasoning                | M        |
| *Allium scorpioides* (Wendelbo) Wendelbo, Amaryllidaceae  | Keriwal                | Whole plant | Pungent                      | Bread seasoning; snack    | M, K     |
| *Allium paradoxum* (M. Bieb.) G. Don, Amaryllidaceae*    | Kol                    | Young leaves | Light pungent and sweetish   | Cooked                   | M        |
| *Allium paradoxum* (M. Bieb.) G. Don, Amaryllidaceae*    | Kat†, Knal®, Piçek®, Siçek® | Leaves     | Light pungent and sweetish   | Consumed raw as sawza; bread and yogurt seasoning; cooked with rice or bulgur; preserved in brine (lacto-fermented) | KK, M |
| *Anchusa azurea* Mill., Boraginaceae, KURD100             | Gezerwan, Gozerwan, Gurmiza | Young aerial parts | Herbaceous                  | Boiled                   | K, MM    |
| *Arum rupicola* Boiss., Araceae, KURD92, possible other *Arum* spp., and *Dranunculus vulgaris* Schott, Araceae, KURD99 | Kardi, Kardu, Xas | Leaves | Pungent                      | Boiled in “sumac water” (suspension of water and sumac fruits) and then cooked in various ways (often with rice/bulgur and wild leek); preserved in brine (lacto-fermented) or dried (sometimes in necklaces) | KK, MMM |
| *Asparagus* sp., *Asparagaceae*                          | Marije®, Marjock®      | Shoots     | Slightly bitter              | Cooked with rice         | K        |
| *Bongardia chrysogonum* (L.) Spach, Berberidaceae, KURD96 | Gabla, Galba           | Shoots     | Herbaceous (earthy)          | Cooked                   | M        |
| *Bunium paucifolium* DC., Apiaceae, KURD89               | Dobeldobana*, Dobel*   | Tubers     | Sweetish and crunchy         | Snack; boiled            | KK       |
| *Crocus biflorus* Mill.® and possibly other *Crocus* spp., Iridaceae | Pîtok, Pîçek, Pîjok®, Pîjok, Pîvok | Corms (after removal of fibrous tunic) | Herbaceous (earthy) and crunchy | “Social snack” | KK, MM |
| *Erodium cicutarium* (L.) L’Hér. and *Erodium moschatum* (L.) L’Hér., Geraniaceae, KURD79, KURD77 | Agiaklak®, Darzila, Dendulaklak®, Gaaderzile, Menikalaklak® | Young infructescences | Herbaceous                   | Snack (sometimes considered a medicinal food for treating stomach-aches) | KK, MM |
| *Geranium tuberosum* L., Geraniaceae#                    | Pushien                | Tubers     | Crunchy                      | Snack; preserved in brine (lacto-fermented) | M        |
| *Glycyrrhiza glabra* L. Fabaceae                         | Balek*                | Young stems (peeled) | Sweet                      | Snack                   | K        |
| *Gundelia tumefactori L.* Asteraceae, KURD97              | Çinget®, Kinger       | Internal parts of the tender whorls and upper part of the root; seeds (an) | Slightly bitter (whorls); nutty (seeds) | Whorls; boiled; preserved in brine (lacto-fermented); seeds; boiled in salty water, then roasted, and | KK, MMM, K (whorls), M (seeds) |
Table 1 | Traditionally gathered wild food plants recorded among Muslim and Kakai Kurds in the study area (Continued)

| Botanical taxon/taxa, family, and voucher specimen code(s) | Recorded local name(s) | Used parts | (Etic) taste characteristics | Traditional culinary use | Quotation |
|----------------------------------------------------------|------------------------|------------|-----------------------------|-------------------------|-----------|
| *Imperata cylindrica* (L.) Raeusch., Poaceae, KURD95     | Piazoka                | Young aerial parts | Herbaceous | consumed as a “social snack” | M         |
| *Johrenia aromatica* Rech. f., Apiaceae, KURD69          | Baraza                 | Aerial parts | Aromatic | Recreation tea; “social snack” (this is consumption sometimes considered as a food medicine for treating kidney disease) | M         |
| *Lotyrhyn sp.*, Fabaceae⁴                               | Polka                  | Young fruits | Herbaceous | Snack | M         |
| *Malus orientalis* Uglitzk. ex Juz., Rosaceae⁴            | Sevelok, Sexun, Sier⁴  | Unripe fruits, fruits | Astringent and sour (unripe fruits); sour and sweet (ripe fruits) | Snack | KK, M     |
| *Malva neglecta* Waller, Malvaceae, KURD03               | Talakü⁵, Tolagra⁵, Tolka, Tolaka², Xobas* | Leaves, stems (peeled), and fruits | Herbsaceous and mucilaginous | Leaves: cooked with eggs, sarma; soups, preserved in brine (lacto-fermented); sometimes considered a medicinal food for treating heart disease; stems and fruits: snacks | KKK, MMM |
| *Matricaria chamomilla* L., Asteraceae, KURD 84           | Beibun, Gulaçarma⁶, Gulaçarmala, Gutlinka | Flowering tops | Aromatic | Recreational tea | KK, M     |
| *Mentha longifolia* L. and *Mentha spicata* L., Lamiaceae, KURD73, KURD08 | Ping, Punga           | Leaves | Aromatic | Seasoning (esp. yogurt); recreational tea (often with raisins) | KK, MMM |
| *Myrtus communis* L., Myrtaceae, KURD103                 | Mert                   | Leaves | Aromatic | Recreational tea | M         |
| *Nasturtium officinale* R.R., Brassicaceae, KURD57       | Çuzala, Kuzala, Pandirpoza⁶, Pizala⁶, Xuzala | Aerial parts | Pungent | Raw as sawza | KK, MM    |
| *Orothogalum balansae* Boiss. and possibly other O. spp., Asparagaceae, KURD94 | Aerial parts: Gelik, Glehu Bulbs: Formajşana, Hormçjçek, Humrajişana, Humrubuhanana, Şinişak⁷ | Aerial parts and bulbs | Herbsaceous (aerial parts); bitter and crunchy (bulbs) | Aerial parts: cooked; bulbs: snack cooked | KK, MM    |
| *Petasites albus* (L.) Gaertn., Asteraceae⁶               | Kasına                 | Leaves | Slightly bitter | Cooked | M         |
| *Pistacia atlantica* Desf., Anacardiaceae, KURD102       | Kaskauan⁸, Kaskavanis, Kaşkakau⁸, Kaskuan | Unripe fruits | Resinous | Seasoning mastaw (ayran) and terhana (mixture of bulgur/grains and yogurt); preserved in brine and consumed as a side-dish⁸ | KK, MMM |
| *Pleurotus* and possibly *Agaricus* spp., Pleurotaceae⁹   | Karçık⁹, Karg, Karzik, Xarçık, Xarzezik, Xuarezik | Fruiting bodies | Mushroom-like | Boiled and then fried | KK, MMM |
| *Portulaco oleracea* L., Portulaceae, KURD027            | Barpina, Palapina, Pizala | Aerial parts | Herbsaceous (mineral) and crunchy | Raw or cooked | K, MM     |
| *Prosopis farcta* (Banks and Sol.) J.F. Macbr., Fabaceae⁷ | Xarnik⁷, Xşapşaxa* | Seeds | Sweetish and nutty | Snack (sometimes consumed as a medicinal food for treating) | K         |
Table 1 Traditionally gathered wild food plants recorded among Muslim and Kakai Kurds in the study area (Continued)

| Botanical taxon/taxa, family, and voucher specimen code(s) | Recorded local name(s) | Used parts | (Etic) taste characteristics | Traditional culinary use | Quotation |
|-----------------------------------------------------------|-------------------------|------------|----------------------------|--------------------------|-----------|
| **Prunus arbutifolia** (Olivier) Meikle# Rosaceae         | Bayat, Bayu, Baul*      | Kernels   | Very bitter                | Boiled with salt and then consumed as a snack (preserved in the same brine) | K, M      |
| **Prunus cerasifera** Ehrh. and **Prunus microcarpa** C. A. Mey., Rosaceae# | Gelas*, Hali, Zardalu | Unripe fruits | Sour and astringent       | Snack                    | K, M      |
| **Prunus webbii** (Spach), Vierh., Rosaceae#            | Çakalove*               | Unripe fruits | Sour and astringent       | Snack                    | K         |
| **Quercus infectoria** G. Olivier, Fagaceae, KURD07   | Şokabaru                | Honeydew ("Kurdish manna"): Gazo; collected on oak leaves. Jok: collected on unripe acorns, (Fig. 9) | Sweet                 | Syrup                    | M         |
| **Quercus petraea** (Matt.) Liebl. and possibly **Quercus brantii** Lindl., Fagaceae, KURD101 | Banu, Şabalı              | Unripe and ripe fruits | Astringent | Unripe fruits; snack; ripe fruits; roasted or boiled and then roasted; eaten with honey against stomach-ache; preserved dried (mainly in the past) | K, MM     |
| **Rheum ribes** L., Polygonaceae, KURD104               | Rewas                   | Leaf petioles | Sour                    | “Social snack”           | K, MM     |
| **Rubus silvestris** Schott., Rosaceae#                  | Alga*, Tuturk            | Fruits     | Sweet                    | Snack                    | K, M      |
| **Rumex acetosella** L., **Rumex crispus** L. and possibly other **Rumex** spp., Polygonaceae, KURD50, KURD81 | Tripoka, Truska, Turşka*, Varm* | Leaves | Sour                      | Raw as sawza (R. acetosella); samra (R. crispus); tea for treating stomach-ache | K, MM     |
| **Satureja thymbra** L., Lamiaceae, KURD04             | Hasola, latra, Zatra    | Aerial parts | Aromatic                | Seasoning                | MMM       |
| **Scorzonera papposa** DC., Asteraceae#                 | Demko*, Gazer*, Halaluk, Haskelluk, Haslog, Karkaza, Perbala | Roots and leaves | Sweetish (roots); herbaceous (leaves) | Roots: raw snack (sometimes considered a medicinal food for treating stomach-ache); preserved in brine (lacto-fermented); leaves: cooked in yogurt | K, MM     |
| **Silybum marianum** (L.) Gaertn. and (more rarely) **Carduus pyreoccephalus** L., Asteraceae, KURD185, KURD22 | Çaubaza, Balagarn, Kalgara, Kaligana, Kaliga, Kalkana*, Kerbaşa, Kever, Kozep*, Kakan* | Young stems (peeled) | Slightly bitter and crunchy | “Social snack” | K, MMM |
| **Sinapis arvensis** L. and (more rarely) **Raphanus raphanistrum** L., Brassicaceae, KURD71, KURD75 | Fijela*, Gulasarda*, Tavar, Teyvكرة, Torpoka*, Turuska, Xartala, Xatala* | Young stems (peeled) and leaves | Slightly pungent | Stems: snack; leaves: soup | K, MM     |
| **Smyrnium cordifolium** Boiss., Apiaceae#             | Gnor, Natima            | Stems (peeled) | Aromatic                | Snack                    | MM        |
| **Solaniun nigrum** L., Solanaceae#                    | Arrosala*               | Fruits     | Herbaceous               | Snack                    | K         |
| **Terfezia and Tirmania** spp., Terfeziaceae, KURD106  | Diolaman*, Dombilan, Dumaran* | Fruit bodies | Mushroom-like           | Boiled and then cooked; often with eggs and onions; roasted; preserved in brine (lacto-fermented); tea for treating eye inflammations | KKK, MMM  |
fungal taxa) were recorded, while 5 plant folk taxa remained unidentified. This remarkable number of currently gathered wild food plants shows that Kurdistan still represents an extraordinary hotspot of traditional foraging in the world. This is confirmed also by all recent field studies conducted in different areas inhabited by Kurds [6–9, 11–13, 17], especially if we compare them with research outcomes recently found in surrounding non-Kurdish areas [34–36].

Most of the quoted wild food plants are wild vegetables, and the majority of them are mainly consumed raw, both as wild greens and especially as snacks. The former refer to the Kurdish tradition of consuming raw herbs as a side-dish (sawza): both wild and cultivated greens (i.e. watercress, coriander, parsley, dill) appear on the table and are picked up by hand, before using the flatbread to scoop up the main dish. The latter (snacks) represent plant parts which are gathered and consumed raw on the spot.

Normally, thorny plants are gathered using a big knife for removing the thorny parts (Fig. 4), while a few others (i.e. Gundelia turnefortii) are dug out using a hoe (Fig. 5 and [40]) and gloves and taken home where they are further processed to eliminate the thorny outer parts.

Some wild plant ingredients, however, are cooked, while very few recorded wild plants are used as seasoning. Often, some green plant parts are preserved in brine via lacto-fermentation (especially in the past) or more often nowadays simply frozen.

### The importance of snacks

More than 60% (36 out of 59) of the overall recorded folk plant taxa (54 identified folk taxa and 5 unidentified folk taxa) are consumed as snacks, i.e. raw on the spot. Several of these snacked plants seem to be

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**Table 1** Traditionally gathered wild food plants recorded among Muslim and Kakai Kurds in the study area (Continued)

| Botanical taxon/taxa, family, and voucher specimen code(s) | Recorded local name(s) | Used parts | (Etic) taste characteristics | Traditional culinary use | Quotation |
|----------------------------------------------------------|-------------------------|------------|----------------------------|--------------------------|-----------|
| Thymus sp., Lamiaceae#                                   | Asbiela                 | Aerial parts | Aromatic                   | Seasoning                | M         |
| Tordylium aegypticum (L.) Lam., Apiaceae, KURD82         | Gurame*, Gurgemi, Nanáfá | Seeds       | Aromatic                   | Snack; seasoning         | K, MM     |
| Tragopogon colinus DC., Asteraceae*                      | Şing                    | Leaves and roots | Leaves: herbaceous, roots: sweetish | Cooked                   | M         |
| Tribulus terrestris L., Zygophyllaceae*                  | Peikola*                | Unripe fruits and seeds | Herbaceous (pea-like) | Unripe fruits: snack; Seeds: boiled | KK, M     |
| Tulipa montana Lind.*, and possibly other Tulipa spp., Liliaceae | Melbaša                 | Bulbs       | Sweetish and crunchy       | Snack                    | MM        |
| Vicia ervilia (L.) Willd., Fabaceae, KURD87              | Gadaño*                 | Young fruits | Herbaceous (pea-like)      | Snack                    | KK        |
| Zuphiphus jujuboides Mill., Rhamnaceae, KURD91           | Knar                    | Fruits      | Sweetish and sour          | Snack                    | M         |
| Unidentified (Amarillidaceae?) sp.                      | Zaxan*, Zotkal*, Zuzola* | Underground parts | Snack (sometimes considered a medicinal food for treating heart diseases) | KK |
| Unidentified (Apiaceae?) sp.                            | Şavbo*                  | Fruits      | Seasoning                  | K                        |
| Unidentified sp.                                         | Dantęķara*              | Fruits      | Snack; cooked              | K                        |
| Unidentified sp.                                         | Fetr*                   | Underground parts | Snack                   | M                        |
| Unidentified sp.                                         | Damkos*                  | Underground parts | Snack                   | K                        |

XKK very commonly quoted by Kakai Kurds (more than 40% of informants), KK very commonly quoted by Kakai Kurds (10–40% of informants), K rarely quoted by Kakai Kurds (less than 10% of informants), MMM very commonly quoted by Sunni Muslim Kurds (more than 40% of informants), MM commonly quoted by Sunni Muslim Kurds (10–40% of informants), M rarely quoted by Sunni Muslim Kurds (less than 10% of informants)

#Identification made on the basis of plant description, folk names, and/or pictures provided by the informants

*Local name recorded in the multi-ethnic (Kurdish, Arab, Shabak) village of Sherkan

*Local name recorded in Kakai villages only

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![Kurdish woman peeling stalks of Silybum marianum](image-url)
predominately gathered by men and especially by male teenagers while they are out in nature. Some of them do enter into the domestic arena and they represent “social snacks”, i.e. they are consumed raw during family and social gatherings (Fig. 6).

Women forage instead mainly wild vegetables (especially weeds) that are normally further processed and cooked, or even simply consumed raw as a side-dish (sawza).

Raw plant snacks are indeed an interesting phenomenon in food anthropology: they have rarely been reported in ethnobotanical studies [41], as they are probably not systematically captured in the interviews, which are not normally designed to address this hidden subject. According to the literature we analysed, in Middle Eastern ethnobotanical studies, they have been sometimes counted together with plants that are consumed raw within the domestic arena, as side-dishes or salads.

Although these limitations make a robust comparison with other ethnobotanical studies very difficult, we formulate here the hypothesis that snacks may have emerged during the development of mobile pastoralism. Personal observations and other ongoing field studies conducted within our research group confirm that in areas where pastoralism has been predominant in the past centuries (i.e. Sardinia), edible thorny Asteraceae, which were traditionally peeled and consumed on the spot while bringing herds to pasture, play a crucial role in the local folk diet. It is worth mentioning here that foraging pastoralist practices were possibly the origin of two currently very popular vegetables in the Mediterranean and the Near East: artichoke, which was domesticated in the central Mediterranean area a couple of thousand years ago [42], and wild akoob/kenger (Gundelia turnefortii), still widely used in the Arabic, Israeli, and Kurdish cuisine [13, 39, 43].

Among the most uncommon wild plant snacks we recorded, it is important to highlight the variety of underground food items, such as those of Allium, Bunium, Chaerophyllum, Crocus, Geranium, and Tulipa spp. All the recorded plant snacks present a particular sensory characteristic (Table 1): they are crunchy. This observation suggests the possible role of plant texture and especially crunchiness—maybe even more than their taste—in shaping cultural preferences for specific vegetable ingredients in predominately pastoralist cultures.

Among the recorded plant snacks, it is interesting to underline the current consumption of wild crocus corms and tulip bulbs. The gathering of raw crocus corms (Fig. 7) in our study area is still very commonly practiced, even by young people, and it is popular also in some areas of Turkish Kurdistan and of Jordan [11, 12, 31].

Bulbs of wild mountain tulips (Tulipa montana) were instead reported to be consumed in Iraqi Kurdistan in the past century [38] when they were even said to be sold at the Mosul market, as well as gathered in Beluchistan and Afghanistan [39, 44], while Tulipa armena bulbs have recently been reported to be (very rarely) consumed raw in Turkish Kurdistan [45]. Consumption of cooked tulip bulbs has been known to occur in Europe during times of famine, such as the last century in the Netherlands [46], where interest in tulip domestication and the celebration of the beauty of its flowers, which possibly started in Persia during the tenth century, arrived in the sixteenth century from the Ottoman Court [47]. To our surprise, crocuses and tulips are not highly regarded in our study area as ornamentals in home gardens, where Fritillaria imperialis instead represents the most desired bulbous ornamental plant.

Muslim Kurd vs. Kakai Kurd wild food ethnobotany
Figure 8 illustrates the overlap between wild food ethnobotanies of Muslims and Kakais.
Figure 8a reports the overall gathered folk plant taxa and, in brackets, the vegetable snacks, while Fig 8b illustrates the most commonly quoted wild vegetable genera or species. Taxa that are not weeds (defined here as plants that “grow entirely or predominantly in situations markedly disturbed by man without being deliberately cultivated” [48]) are reported in bold.

Figure 8c shows instead the predominance of the wild food plant tastes.

No remarkable differences could be found among the two communities in terms of overall gathered plant taxa and their wild vegetable snacks (Fig. 8a). However, the wild food ethnobotany of the Kakai seems to be more restricted, and commonly quoted non-weedy wild vegetables are prevalent among Muslims, thus possibly disclosing stronger traces of mobile pastoralism within this latter group (Fig. 8b). This is confirmed by the comparison of the predominance of the wild food plant tastes (Fig. 8c), where Muslim Kurds seem to slightly prefer aromatic and crunchy taste/texture, which are common features of non-synanthropic Apiaceae vegetable snacks that are normally gathered in the mountains.

The available ethnographic literature may confirm this finding, since the traditional subsistence economy of Yarsanis/Kakais, which emerged in Iran during medieval times, was mainly based upon small-scale horticulturalism and handicrafts (weaving) [49], whereas most Kurds were more frequently nomadic and semi-nomadic pastoralists [50].

In other studies that we have conducted in recent years in the Balkans and the Middle East, we have demonstrated that religious groups living in the same environment may sometimes show different ethnobotanies, possibly because endogamic patterns play an important role in influencing vertical and, to less extent, also oblique transmission of folk plant knowledge [13, 51–54].

In the current study, however, we did not observe remarkable differences between the two studied communities. One possible reason can perhaps be found in the large utilization of wild plant snacks: we observed that these are mainly gathered in the study area by young male community members, and therefore, horizontal (peer-to-peer) transmission of plant knowledge may have been predominant in our sample.

Comparison with the Middle Eastern ethnobotany and human ecology of Kurdish foraging

Comparison of the current data with some of the most recent wild food ethnobotanical literature on the Middle East shows that a few wild plants have only rarely been recorded as being consumed: this is the case for the botanical genera *Tulipa*, *Lilium*, *Crocus*, *Dracunculus*, *Johrenia*, and *Bongardia*. Among the most uncommon customs linked to plants, we recorded the tradition of gathering the famous “Kurdish manna” (Fig. 9), well known in historical accounts of travels to Kurdistan [55], and references therein, produced by a few oak acorn species, and whose consumption in syrup is still very highly esteemed by elderly Kurds. Oak dew is known to be produced only under certain climatic conditions during a few days in early June (on the leaves) and in September (on the fruits) and not every year. The acorns or leaves covered by the dew are boiled in water and filtered, and the resulting solution is evaporated (Fig. 9).

Moreover, we analysed the data in terms of possible human ecological origin, i.e. calculating the proportion of weeds among the quoted wild vegetables as a proxy...
Fig. 8  

a Comparison of the overall wild food plant taxa and vegetable snacks quoted by Muslim and Kakai Kurds.  
b Comparison of the most commonly quoted wild vegetable genera/species reported by Muslim and Kakai Kurds (in bold we indicated non-weedy genera/species).  
c Comparison of the predominant tastes of the wild plants quoted by Muslim and Kakai Kurds (data also take in account their quotation frequency, see Table 1)
for analysing possible horticultural/sedentism-driven foraging patterns.

Table 2 compares the percentage of weedy vegetables in the current study area and in a few selected wild food ethnobotanical studies conducted among other surrounding populations of the Middle East and the Mediterranean, and the predominance of non-weeds among Kurds and Azeris is remarkable when compared with that recorded among Arabs and especially ethnic Assyrians and Greeks.

This data suggests the idea that Kurds may have shaped their foraging habits upon their nomadic pastoralist subsistence economy, while the sedentism and horticulturalism of the Fertile Crescent have left heavy traces in the foraging patterns of Assyrians [13] and later—when the post-Neolithic foodscape moved westwards—Greeks and other Mediterraneans.

Conclusion
The overall gathered data not only show a remarkable resilience of foraging traditions in Southern Kurdistan, but also document the food consumption of several wild plant ingredients as raw snacks, i.e. crocus corms and tulip bulbs. While no very significant divergences were found among the two studied religious communities of Muslim and Kaki Kurds, among the Muslim Kurds, non-weedy plants were clearly more prevalent among the most commonly quoted wild vegetables, as Kakai Kurds have historically been more horticulture oriented. At the same time, the large prevalence of snacks, especially among Muslim Kurds, confirms robust traces of pastoralism in the Kurdish foraging of wild foods.

Our study calls for further field surveys in surrounding regions of the Middle East, Caucasus, and Eastern Mediterranean aimed at analysing how TEK concerning wild plants change across time and space and for a better understanding of the diachronic trajectories of the use of wild plant foods before and after the development of agriculture until today.

Finally, the recorded Kurdish bio-cultural food heritage could find concrete applications in rural development projects aimed at promoting small-scale food products and eco-tourism, considering the very difficult times this area has gone through and is still partially going through.

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Authors’ contributions
AP and RS designed the study and framed the theoretical and methodological setting. AP, HZ, and RS conducted the field research. HIMA contributed to the phytolinguistic part of the study. AP and RS interpreted the findings. AP drafted the first version of the manuscript, which was later revised by all authors. All authors read and approved the final manuscript.

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Prior informant consent was always verbally obtained before each interview. The research followed the ISE Code of Ethics Guidelines [19].

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Not applicable.

Competing interests
The authors declare that they have no competing interests.

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