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Resilience at the border: traditional botanical knowledge among Macedonians and Albanians living in Gollobordo, Eastern Albania

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Abstract

**Background:** Ethnobotany in South-Eastern Europe is gaining the interest of several scholars and stakeholders, since it is increasingly considered a key point for the re-evaluation of local bio-cultural heritage. The region of Gollobordo, located in Eastern Albania and bordering the Republic of Macedonia, is of particular interest for conducting ethnobiological studies, since it remained relatively isolated for the larger part of the 20th Century and is traditionally inhabited by a majority of ethnic Macedonians and a minority of Albanians (nowadays both sharing the Muslim faith).

**Methods:** An ethnobotanical survey focused on local food, medicinal, and veterinary plant uses was conducted with 58 participants using open and semi-structured interviews and via participant observation.

**Results:** We recorded and identified 115 taxa of vascular plants, which are locally used for food, medicinal, and veterinary purposes (representing 268 total plant reports). The Macedonian Traditional Ecological Knowledge (TEK) was greater than the Albanian TEK, especially in the herbal and ritual domains. This phenomenon may be linked to the long socio-cultural and linguistic isolation of this group during the time when the borders between Albania and the former Yugoslavia were completely closed. Moreover, the unusual current food utilisation of cooked potatoes leaves, still in use nowadays among Macedonians, could represent the side effect of an extreme adaptation that locals underwent over the past century when the introduction of the potato crop made new strategies available for establishing stable settlements around the highest pastures. Additionally, the difference in use of *Helichrysum plicatum*, which is popular in the local Macedonian folk medicine but absent among Albanians, confirms the particular significance of this taxon as it relates to the yellow colour of its flowers in South Slavic folklore.

**Conclusion:** Botanical studies with an ethnographic approach are crucial for understanding patterns of use of plants within given cultures. Importantly, such studies can also allow for analysis of the dynamics of change in these TEK patterns over the time. The results of this study may be important as baseline data set to be used in rural development programs in Gollobordo, aimed at fostering community-based strategies of management of natural resources.

**Keywords:** Ethnobotany, Albania, Gollobordo, Macedonians, Potato leaves

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Background

Ethnobiological studies conducted in recent years in Eastern Europe have highlighted complex, dynamic systems of folk botanical, mycological, and ecological knowledge [1-28]. This heritage is known in the ethnobiological literature as Traditional Ecological Knowledge (TEK), which has been defined as a “cumulative body of knowledge, practice and belief evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment” [29].

In particular, the portion of TEK concerning plants is nowadays increasingly considered crucial in South and South-Eastern Europe for fostering community-based strategies of management of natural resources. It may also represent the starting point for initiatives aimed at the reevaluation of local plants devoted to both small scale food and herbal markets and eco-touristic initiatives [30-37]. Additionally, studies focused on plant uses that have been conducted in Eastern Europe with an in-depth historical or ethno-historical approach [38,39] or via archival research and/or contemporary surveys conducted among botanists remembering their childhood [40-44] have demonstrated how plant perceptions change over time, in response to a complex interplay of socio-cultural, environmental, and economic dynamics.

In the past few years, we have concentrated our research on the botanical knowledge overlaps and exchanges between South Slavs and Albanians in multi-cultural or bordering areas in South-Eastern Europe [26,39] and on the resilience of TEK [45] among diasporas in the same area [46]. In these studies, we observed phenomena of hybridization of botanical knowledge, as well as a more “herbophilic” [47] attitude of the Slavs in comparison to the Albanians. In the current study, we wanted to further analyze the local botanical knowledge systems among Macedonians and Albanians living in the Gollobrodo region, in Eastern Albania.

We could postulate that ethnic Macedonians in this area in Albania preserved much of their original folk botanical heritage because of their isolation in the past decades. This isolation was especially evident during the Communist period (1945–1991), both from the Albanian neighbors and also from those Macedonians, who remained after the creation of the Albanian state (1912) on the other side of the border (at the time within the territory of the Kingdom of Serbia, later Kingdom of Serbs, Croats and Slovenes and then Yugoslavia, nowadays Republic of Macedonia). Nevertheless, the fact that both the Albanian and Macedonian communities of Gollobrodo share the same faith (Islam) for the most part, with some intermarriage in the past decades, there may have been some exchange of botanical knowledge. In order to assess all of this, we designed the objectives of this study to: 1) record traditional uses of local botanicals (both cultivated and wild) for food, medicine, and veterinary purposes among Macedonians and Albanians; 2) verify the occurrence of an expected richer, “more conservative” Macedonian ethnobotany; and 3) analyze differences and commonalities in the traditional plant knowledge between the two communities and to propose some explanatory models.

Methods

Study area

The current study was conducted in eight villages of the Gollobrodo area, in Eastern Albania, bordering the Republic of Macedonia (Figure 1); the focus was on three villages inhabited by ethnic Macedonians: Klenje (1,203 m.a.s.l.), Gjinovec (1,252 m.a.s.l.), and Stëblovë (1,200 m.a.s.l.) – this last village included within the newly established Shebenik–Jabllanes National Park, with an overall permanent population of approx. 300 inhabitants (while Gjinovec is only inhabited nowadays during the late spring and summer months); and three villages inhabited by Albanians: Sebisht (915 m.a.s.l.), Borovë (940 m.a.s.l.), and Zabzun (1,028 m.a.s.l.), with an overall permanent population of approx. 300 inhabitants as well. Additionally, in order to have a sample more adherent to the ethnic proportion of Gollobrodo (for which more than two-thirds is inhabited by Macedonians), a few additional interviews were also conducted in the larger Macedonian villages of Ostren i madh (948 m.a.s.l., approx. 1000 inhabitants) and Trebisht (782 m.a.s.l., approx. 1,000 inhabitants).

The local economy is based on small-scale farming and pastoralist activities, with a significant portion of the population that migrates to Tirana and/or other city centers and sometimes back for a few months in their villages only during the late spring and summer months (Figure 2). According to the Albanian Institute of Statistics data, Gollobrodo and the entire Eastern and North-Eastern region of Albania (covering Peshkopia and Kukës counties) are among the economically poorest areas of not only the country, but also all of Europe [48]. All of the villages in the Gollobrodo are nowadays permanently inhabited only by families of Islamic faith, while until the 1990s, most of the Macedonian villages also had an important Christian Orthodox component. The local dialect of the Macedonian minority, now spoken by less than 3,000 inhabitants, has been the focus of a number of studies conducted by Slavic linguists in the past Century. Two remarkable field ethnolinguistic and ethnographic studies have also been conducted in Gollobrodo in recent years [49,50].

The climate of this area is continental, with very harsh temperatures and snowfall during the winter season. The landscape around these villages is dominated by low mountains covered by the Quercus frainetto woodland.
belt, and by the *Fagus sylvatica* woodland belt at higher elevations. Sometimes it is possible to find some woodland fragments of *Quercus cerris* (in soil containing more clay) and *Castanea sativa* (in more acidic soil); in addition, there is some reforestation by *Pinus nigra*, probably carried out during the Communist period (1945–1991). The landscape is also covered by large extensions of secondary patches of semi-natural dry and humid grassland. A riparian marshy vegetation is found along the valleys, which is frequently fragmented and residual, dominated by some species of *Salix*, such as *S. alba*, *S. eleagnos* (sometimes really large) and, less frequently, *S. purpurea*. In the secondary succession, it is easy to find some different shrub species such as *Corylus avellana*, *Cornus mas*, *Juniperus communis*, *Crataegus monogyna*, *Crataegus sericea* and *Juniperus oxycedrus*. Up to the village of Klenje, within a high plateau, we could observe a large population of *Prunus cocomilia*.

The main herbal vegetation in the villages is anthropogenic, with ruderal/nitrophylic species and cultivars like *Vitis labrusca*, some fruit trees (esp. *Prunus* species) and some vegetables; *Vitis labrusca* is traditionally cultivated climbing on trees with light pruning.

The main trees are situated in a gradient between wild and domesticated conditions: *Fraxinus excelsior*, *Quercus cerris*, *Q. frainetto* (mostly as totem trees), *Prunus avium*, *P. domestica*, *P. cerasus*, *P. cerasifera*, *Juglans nigra*, *Cydonia oblonga*, *Malus domestica*, *Pyrus communis*, *Robinia pseudoacacia*, *Populus nigra*, *Ailanthus altissima*, *Syringa vulgaris*, *Acer campestre*, while the most common shrubs are *Rosa canina* s.l. and *Rubus hirtus*, *R. caesius*, *R. ulmifolius*, and *Clematis vitalba*.

**Field study**

In May 2013, in-depth open and semi-structured interviews were conducted with community members (n = 58, 43 Macedonians and 15 Albanians; age between 9 and 87 years old), which were selected using snowball sampling techniques. Study participants were asked about traditional uses of food, medicinal, veterinary, and ritual plants (in use until a few decades ago or still in use nowadays) via semi-structured and open interviews, walks in the natural environment in the proximity of the villages together with informants, and participant observation within the households. Specifically, local name(s) of each quoted taxon, the plant part(s) used, in-depth details about its/their manipulation/preparation and actual medicinal or food use(s) were recorded. Interviews were conducted in Albanian or Macedonian languages with the help a bilingual simultaneous translator. Prior informed
consent was always verbally obtained prior to conducting interviews and researchers adhered to the ethical guidelines of the American Anthropological Association [51]. During the interviews, informants were always asked to show the quoted plants. Voucher specimens were taken for the wild taxa, when available, and are deposited at the herbarium of the School of Biosciences and Veterinary Medicine of the University of Camerino, Italy (Herbarium Universitatis Camericensis; acronym: CAME).

Taxonomic identification was conducted according to the official Flora of Albania [52-55] and the previous Albanian Excursion Flora [56]. For Crataegus spp. we referred to the Rosaceae’s taxonomy in Euro + Med Plant-Base [57]. Family assignations follow the Angiosperm Phylogeny Group III system [58]. Local plant names were transcribed following the rules of the standard Ghegh Albanian and Macedonian languages.

Results and discussion

Overall, we recorded the local uses of 116 taxa of vascular plants; we documented 268 plant reports, 105 for food, 87 for human medicine, and 76 for veterinary applications.

Given the variety of means through which data were elicited in the field, detailed cultural importance, frequency and consensus indexes, which do always require consistently performed interviews, were not considered in the data analysis.

However, in the tables and in the data used for the comparison we included only plant uses reported by at least two informants, as well as those uses, which were quoted by the majority of the interviewees.

Food plants

The food use of 55 taxa were recorded, 25 of which are wild or semi-domesticated (Table 1).

Among the most uncommon uses, we have to mention the use of potato leaves, both for sarma (leaves rolled around a minced meat and rice filling) and especially as filling for white corn-flour based pies (laknur or byrek in Albanian, konat in Macedonian), which is still very common among the Macedonians living in the highest villages of Gollobordo, while among Albanians this was remembered as a past use only. We found this use of potato leaves as filling for savory pies to be quite common in Gollobordo in June, after the “nettles season” (Urtica dioica), which is the primary wild plant used in the early spring, while Rumex spp. dominates later in the season as a pie filling ingredient. We recently found a similar relictual use among the last Albanians living in the upper Reka valley, on the Macedonian side of Mount Korab [39].

The archaeologist Michael Galaty and his team have recently conducted intensive field research in the mountainous Shala Valley in Northern Albania. Galaty has proposed that the Little Ice Age and the introduction of maize, which took place in the Balkans starting from the 16th Century [59,60], played a crucial role in the remarkable demographic expansion in this area in the 17th and 18th Century [61]. We believe that the introduction of the potato crop (Solanum tuberosum) in the mountainous areas of the Western Balkans and in the Gollobordo area (presumably at the end of the 19th Century) may have also similarly determined a remarkable vertical expansion of the inhabited landscape, offering locals for the first time in the history of the region the possibility to permanently colonize and settle the higher pastures. As a side-effect of this shift, which was sustained by an increase of food resources (dairy products and potatoes), the leaves of the potato plant may have also been considered as a vegetable, especially in the spring, where this would have largely become available and when not many other green leafy vegetables are available (apart from wild nettles and Rumex spp.). The toxic glycoalkaloid content of the potato leaves could perhaps be reduced by the way in which they are traditionally collected and prepared. Only the young leaves are gathered and they are boiled in water before being used as a pie filling. Indeed, research on the chemistry of S. tuberosum leaves has demonstrated that glycoalkaloid content (measured by levels of α-solanine and α-chaconine) are at their lowest in the young leaves, with those appearing on the most distal allocation of the stem having the overall lowest glycoalkaloid content [62]. However, the boiling step likely reduces small level of the overall glycoalkaloid content, thus the final product would be expected to contain a somewhat bitter quality, and indeed, our participants confirmed that the pie made with potato leaves is appreciated exactly because of its “bitter taste”.

On the other hand, the consumption of “bitter” potatoes (with high glycoalkaloid contents) has been well discussed by Timothy Johns [63] for the case of the Aymara population in Southern America, where bitter potato varieties (jank’o and luj’i) were often eaten unprocessed after the harvest.

Other important uncommon cultivated food sources we found included the young leaves of corn (Zea mays) as pie filling, and bean leaves for use in sarma. Upon consideration of trees, the rare food use of Prunus cocomilia for producing home-made raki should be better analyzed under the viewpoint of sensory analysis for possible local economic development outcomes. In fact, the local knowledge on mixing, fermenting, and home-distilling various Prunus tree fruits in Gollobordo, as in other areas of the Balkans, seems to be extremely sophisticated.

Medicinal plants

The recorded local uses of 53 medicinal plant taxa are reported in Table 2. It is worthwhile to mention the case of Helichrysum plicatum (Figure 3), which is the most quoted taxon among the Macedonians of Gollobordo.
Table 1 Local food plant uses recorded in the study area

| Taxon, family and voucher specimen code | Recorded Albanian folk name(s) | Recorded Macedonian folk name(s) | Status | Plant part(s) used | Traditional modalities of consumption and other recorded information | Alb  | Mac |
|----------------------------------------|--------------------------------|----------------------------------|--------|-------------------|---------------------------------------------------------------------|------|-----|
| Allium cepa L.                          | Qepa                           | Кромид                           | C      | AP, Bu            | Raw and cooked (traditionally filling for pies made with corn flour - *byrek*<sup>ALB</sup>/koma<sup>MAC</sup>)               | +    | +   |
| Amaryllidaceae                         |                                |                                  |        |                   |                                                                     |      |     |
| Allium porrum L.                        | Pras                           | Праз                             | C      | AP                | Filling for pies                                                    | +    |     |
| Amaryllidaceae                         |                                |                                  |        |                   |                                                                     |      |     |
| Allium sativum L.                       | Hurdhëra                       | Лук                             | C      | Bu                | Seasoning                                                           | +    | +   |
| Amaryllidaceae                         |                                |                                  |        |                   |                                                                     |      |     |
| Atriplex hortensis L.                   | Laboda                         | Лабода, Лобода                   | C      | L                 | Filling for pies                                                    | +    | +   |
| Amaranthaceae                          |                                |                                  |        |                   |                                                                     |      |     |
| Beta vulgaris L.                        | Panxhari                        |                                  | C      | R                 | Ingredient for making *halva*<sup>*</sup>                           | +    |     |
| Amaranthaceae                          |                                |                                  |        |                   |                                                                     |      |     |
| Brassica oleracea L.                    | Liakër, Liakra                  | Зелка, Расол                     | C      | L                 | Pickled/lacto-fermented in water and salt; the liquid resulting from of the lacto-fermentation (*rasol*) was eaten with bread by the poorest community members<sup>+</sup> | +    | +   |
| Brassicaceae                           |                                |                                  |        |                   |                                                                     |      |     |
| Capsicum annuum L.                      | Spec                           | Пиперка                          | C      | Fr                | Cooked                                                               | +    |     |
| Solanaceae                             |                                |                                  |        |                   |                                                                     |      |     |
| Castanea sativa Mill.                   | Kostenja                        |                                  | W      | Fr                | Boiled or roasted                                                   | +    | +   |
| Fagaceae                               | CAME 26314                     |                                  |        |                   |                                                                     |      |     |
| Cornus mas L.                           | Thana                          | Дрен                             | W      | Fr                | Fermented and distilled into *raki*                                 | +    | +   |
| Cornaceae                              | CAME 26279                     |                                  |        |                   |                                                                     |      |     |

<sup>*</sup>Fermented into vinegar

<sup>+</sup>Syrup and compote (dried fruits boiled with water and sugar)

<sup>++</sup>Concentrated syrup/soft jam (*pekmez*)

<sup>+</sup> Jam

(Fermented?) beverage obtained boiling the fruits in water for a few hours (the resulting beverage is kind of a fruit soda, which is kept in the fridge or in the cellar; considered very healthy, is often consumed adding sugar)
| Taxon, family and voucher specimen code | Recorded Albanian folk name(s) | Recorded Macedonian folk name(s) | Status | Plant part(s) used | Traditional modalities of consumption and other recorded information | Alb | Mac |
|----------------------------------------|-------------------------------|---------------------------------|--------|-------------------|------------------------------------------------------------------|-----|-----|
| Corylus avellana L. Betulaceae CAME 26242 | Leithija | Лешник | W Se | Raw and dried | | + | + |
| Crataegus monogyna Jacq. Rosaceae CAME 26280 | Cut, Murriz | Глогиня, Глогиня дива (C. monogyna), Глогиня питома (C. sericea) | W Fr | Snack | | + |
| Crataegus sericea Dzekov 5 Rosaceae CAME 26278 | | | | | | |
| Cucumis sativus L. Cucurbitaceae CAME 26291 | Kastravec | Краставица | C Fr | Pickled/lacto-fermented (in water and salt) | Fermented beverage | + | + |
| Cucurbita maxima Duch Cucurbitaceae | Kungull | Тиква | C Fr | Filling for pies; pickled/lacto-fermented (in water and salt) | | + | + |
| Cydonia oblonga Mill. Rosaceae CAME 26290 | Ftoi | Дуња | C Fr | Jams (sometimes prepared dipping in a preliminary procedure the fruits pieces in water and lime, then boiling with sugar, so that the fruit pieces remained hard at the end) | Compote (fruits boiled with water) | + | + |
| Daucus carota L. Apiaceae CAME 26208 | | | | Lacto-fermented in water and salt | Fermented (?) beverage obtained boiling the fruits in water for a few hours (the resulting beverage is kind of fruit soda, which is kept in the fridge or in the cellar) | + |
| Fagus sylvatica L. Fagaceae | Ahu | Бук | W K | Raw as snack (however, consumption of large amounts may generate headaches)* | | + | + |
Table 1 Local food plant uses recorded in the study area (Continued)

| Taxon, family and voucher specimen code | Recorded Albanian folk name(s) | Recorded Macedonian folk name(s) | Status | Plant part(s) used | Traditional modalities of consumption and other recorded information | Alb | Mac |
|----------------------------------------|--------------------------------|---------------------------------|--------|--------------------|---------------------------------------------------------------|-----|-----|
| CAME 26249                             |                                |                                 |        |                    |                                                              |     |     |
| *Fragaria* × *ananassa* Duch. ex Rozier | Lule shtrydhe                 | C                               | Fr     | Raw                | +                                                             |     |     |
| *Fragaria vesca* L.                    | *Derthea, Dirthene*           | Ягодка, Ягода                    | W      | Raw                |                                                              | +   | +   |
| *Helianthus tuberosus* L.               | Шалгун                         | SD                              | T      | Raw or cooked      |                                                              |     |     |
| *Hordeum vulgare* L.                    | Јачмен                         | C                               | Frfl   | Bread (mixed with rye flour)* | + |
| *Juglans regia* L.                      | Орев                           | SD; C                           | K      | Raw, or various cakes | + |
| *Juniperus communis* L.                 | Dlinja                         | Смрека                          | W      | Fermented and distilled into raki | + |
| *Lactuca sativa* L.                     | Sallata                        | Лоштика                        | C      | Raw of filling for pies | + |
| *Malus domestica* Borkh.                | *Molla* (Molla e kuqe, Sterkinka) | Яболка (италианска, кисели, Ренета, Штерка) | C      | Raw and dried (hoshaf) | + |
| *Malus sylvestris* (L.) Mill.           | *Molla e egër*                 | Дива Јаболка                     | W      | Sliced and dried; consumed boiled | + |
| *Rosaceae*                             | CAME 26247                     |                                 |        |                    |                                                              |     |     |
| *Rosaceae*                             | CAME 26312                     |                                 |        |                    |                                                              |     |     |
| *Rosaceae*                             | CAME 26238                     |                                 |        |                    |                                                              |     |     |
| *Rosaceae*                             | CAME 26253                     |                                 |        |                    |                                                              |     |     |
| *Rosaceae*                             | CAME 26236                     |                                 |        |                    |                                                              |     |     |
| *Rosaceae*                             | CAME 26238                     |                                 |        |                    |                                                              |     |     |

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| Taxon, family and voucher specimen code | Recorded Albanian folk name(s) | Recorded Macedonian folk name(s) | Status | Plant part(s) used | Traditional modalities of consumption and other recorded information | Alb | Mac |
|----------------------------------------|--------------------------------|---------------------------------|--------|-------------------|------------------------------------------------------------------|-----|-----|
| CAME 26288                             |                               |                                 | C      | L                 | Fermented into vinegar                                           | +   | +   |
| *Medicago sativa* L.                   | Jonxha                        |                                 |        |                   | Cooked, as an emergency (famine) food*                            |     | +   |
| Fabaceae                               | CAME 26292                    |                                 |        |                   |                                                                  |     |     |
| *Morus alba* L.                        | Mani                          | Мурвичка                        | C      | Fr                | Jams and compote                                                  |     | +   |
| Moraceae                               | CAME 2631                     |                                 |        |                   |                                                                  |     |     |
| *Phaseolus vulgaris* L.                | Fasulja, Grosh                | Грая                            | C      | Fr, Se            | Fermented and distilled into raki                                 | +   |     |
| Fabaceae                               |                                 |                                 | L      |                   | Filling for pies                                                  |     | +   |
|                                         |                                |                                 |        |                   |                                                                  |     |     |
|                                         |                                |                                 |        | Sarmi             |                                                                  |     |     |
|                                         |                                |                                 |        |                   |                                                                  |     |     |
|                                         |                                |                                 |        | Sarma             |                                                                  |     |     |
|                                         |                                |                                 |        |                   |                                                                  |     |     |
|                                         |                                |                                 |        |UF                 | Cooked, filling for pies                                          | +   |     |
| *Prunus cerasifera* Ehrh.              | Kumbullë Elbasani,            | Слива Елбасанска, kokormadhe     | SD     | Fr                | Fermented and distilled in raki                                  |     | +   |
| Rosaceae                               | CAME 26266                    |                                 |        |                   |                                                                  |     |     |
|                                         | Qershija                      | Цреша (питома)                 | C      | Fr                |                                                                  |     | +   |
|                                         |                                |                                 |        |                   |                                                                  |     |     |
|                                         |                                |                                 |        |                   |                                                                   |     |     |
| *Prunus avium* (L.) L.                 | Qershija                      | Цреша (питома)                 | C      | Fr                |                                                                  |     | +   |
| Rosaceae                               | CAME 26240                    |                                 |        |                   |                                                                   |     |     |
|                                         |                                |                                 |        |                   |                                                                   |     |     |
|                                         |                                |                                 |        |                   |                                                                   |     |     |
|                                         |                                |                                 |        |                   |                                                                   |     |     |
|                                         |                                |                                 |        |                   |                                                                   |     |     |
| Taxon, family and voucher specimen code | Recorded Albanian folk name(s) | Recorded Macedonian folk name(s) | Status Plant part(s) used | Traditional modalities of consumption and other recorded information | Alb  | Mac |
|-----------------------------------------|--------------------------------|---------------------------------|---------------------------|---------------------------------------------------------------|------|-----|
| Prunus cerasus var. marasca (Host) Vis. | Qershija e egrë | Дива цреша | W, C Fr Raw | + | + |
| Prunus coqomilia Ten. | Дива слива | W Fr | Fermented and distilled into raki | + |  |
| Prunus domestica L. | Кumbulla | Слива (блага, магарица, жолта, синица) | C Fr | Raw and dried | + | + |
| Prunus spinosa L. | Kolumbria, Kurmulia | Дива слива | W Fr | Gathered after the frost and consumed raw as snack, or fermented and distilled into raki, or transformed into a compote | + |  |
| Pyrus communis L. | Dardha | Круша | C Fr | Raw and dried | + |  |
| Pyrus pyaster (L.) Burgsd. | Dhardhë e egër, Gorrica | Дива круша | W Fr | + |  |
| Pyrus amygdaliformis Vill. | | | | Compote (fruits boiled with water and sugar) | + |  |
| | | | | Jam | + |  |
| | | | | Fermented and distilled into raki | + |  |
| | | | | Fermented (?) beverage obtained boiling the fruits in water for a few hours (the resulting beverage is kind of fruit soda, which is kept in the fridge or in the cellar) | + |  |
| | | | | Gathered after the frost, ripened on straw, and consumed dried or in compote | + | + |
| Taxon, family and voucher specimen code | Recorded Albanian folk name(s) | Recorded Macedonian folk name(s) | Status Plant part(s) used | Traditional modalities of consumption and other recorded information | Alb Mac |
|----------------------------------------|-------------------------------|---------------------------------|---------------------------|---------------------------------------------------------------|--------|
| *Ribes multiflorum* Kit. ex Roem. et Schult. | Диво грозје | W Fr | Jam + | + |
| *Grossulariaceae* CAME 26263 | | | | |
| *Rubus idaeus* L. | Малина | W, C Fr | Snack | + |
| *Rosaceae* CAM 26321 | | | | |
| *Rubus hirtus* Waldst. et Kit. | Fermoza, Manaferra | Капина | W Fr | Raw and jams + | + |
| *Rosaceae* CAME 26258 | | | | |
| *Rubus ulmifolius* Schott | | | | |
| *Rosaceae* CAME 26310 | | | | |
| *Rubus caesius* L. | | | | |
| *Rosaceae* CAME 26245 | | | | |
| *Rumex acetosa* L. | Ufull, Uthull | Киселец | W L | Boiled, then in filling for pies (*byrek*<sub>ALB</sub>/komat<sub>MAC</sub>) or as vegetables cooked with rice and dairy products (*buranje*<sub>ALB</sub>/zeje<sub>MAC</sub>), traditionally dried and then used during the whole winter | + |
| *Polygonaceae* CAME 26243 | | | | |
| *Rumex conglomeratus* Murray | | | | |
| *Polygonaceae* CAME 26286 | | | | |
| *Rumex conglomeratus* Murray | | | | |
| *Polygonaceae* CAME 26286 | | | | |
| *Polygonaceae* CAME 26286 | | | | |
| *Polygonaceae* CAME 26286 | | | | |
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| Taxon, family and voucher specimen code | Recorded Albanian folk name(s) | Recorded Macedonian folk name(s) | Status | Plant part(s) used | Traditional modalities of consumption and other recorded information | Alb | Mac |
|----------------------------------------|--------------------------------|----------------------------------|--------|-------------------|---------------------------------------------------------------|-----|-----|
| Rumex patientia L. Polygonaceae         | Lepjeta                        | Щавел                            | W L    | Boiled, then used filling for pies or as vegetables cooked with dairy products; traditionally dried and then used during the winter | + +  |     |
| Secale cereale L. Poaceae               | Thekna                         | Рж                               | C Fr ll| Mixed with corn flour, bread, esp. in the past*                      | + +  |     |
| Solanum lycopersicum L. Solanaceae     | Domate, Patlixhan kuqe         | Црвени патлициани                | C UF   | Lacto-fermented in water and salt                                | + +  |     |
|                                        |                                 | Fr                               |        | Roasted and decocted, as a kind of coffee                        |     |     |
| Solanum melongena L. Solanaceae        | Patlixhan i zezë                | Црни патлициани                  | C Fr   | Cooked (emergency/famine food)*                                  |     |     |
| Solanum tuberosum L. Solanaceae        | Patate                         | Компири                          | C T    | Cooked                                                           | + +  |     |
|                                        |                                 |                                  | YL     | Filling for pies (only in the past among Albanians)*. The bitter taste is particularly appreciated by the Macedonian communities; young potato leaves are the most common filling for the traditional pie (komat) in June, after the young nettle’s season end | + +  |     |
| Taraxacum officinale Weber ex F.H. Wigg. Asteraceae | Qumështhore                   | Млечак, Млекаица, Жело         | W L    | Salads                                                           |     |     |
|                                        |                                |                                  |        |                                                                |     |     |
| Urtica dioica L. Urticaceae             | Hjeth, Hisel, Hithra, Hith     | Коприва                          | W YL   | Boiled, then used in filling for pies or cooked with rice and dairy products |     |     |
| Vaccinium myrtillus L. Ericaceae        | Borovnica, Rrush i egër        | Диво грозје, Цршине               | W Fr   | Snack                                                            | + +  |     |
|                                        |                                |                                  |        | Fermented into a fruit soda-like beverage                       |     |     |
|                                        |                                |                                  |        | Compote                                                          |     |     |
|                                        |                                |                                  |        | Fermented into wine or vinegar                                   | + +  |     |
| Taxon, family and voucher specimen code | Recorded Albanian folk name(s) | Recorded Macedonian folk name(s) | Status | Plant part(s) used | Traditional modalities of consumption and other recorded information | Alb | Mac |
|----------------------------------------|---------------------------------|----------------------------------|--------|-------------------|---------------------------------------------------------------|------|------|
| CAME 26265                             |                                 |                                  |        |                   | Concentrated juice (pekmez) + Fermented (?) beverage obtained boiling the fruits in water for a few hours (the resulting beverage is kind of fruit soda, which is kept in the fridge or in the cellar) + Sarma + |      |      |
| *Zea mays* L. | Misër | Пченка | C | Frfl | Bread, pies | + + | |
| Poaceae | | | | | | | |
| | | | | | | | |
| Diverse tree species | | | W; C | WA | Added to flour, water, and eggs for producing home-made noodles (*juřka*) | + |
| | | | | | As a disinfectant, rubbed onto the sheep’s stomach before it is cooked and eaten | + |
| | | | | | Added to water when boiling corn | + |

*: first record of the species in Albania.

In bold: folk taxa quoted by more than 40% of the informants.
C: cultivated; SD: semi-domesticated; W: wild.
*: past use.
+: recorded use.

Plant part(s) used: AP: aerial parts; Bu: bulbs; Fr: fruits; Frfl: flour from fruits; K: kernels; L: leaves; R: roots; Se: seeds; St: stems; T: tubers; UF: unripe fruits; Wo: wood; WA: ashes from wood; YL: young leaves.
| Taxon, family and voucher specimen code | Folk name(s) recorded among Albanians | Folk name(s) recorded among Macedonians | Status | Plant part(s) used | Recorded modalities of medicinal uses(s) and treated pathologies | Alb | Mac |
|----------------------------------------|--------------------------------------|----------------------------------------|--------|------------------|---------------------------------------------------------------|-----|-----|
| Achillea collina (Becker ex Rchb.f.) Heimerl | Бело цве | W | Fl | Decoction: cica | + |
| Asteraceae | | | | trizing on wounds | |
| Achillea millefolium L. | | | | | |
| Asteraceae | | | | | |
| CAME 26294 | | | | | |
| Allium cepa L. | # | # | C | J | Instilled in the ear for treating earaches | + |
| Amaryllidaceae | | | | | |
| Allium porum L. | # | # | C | AP | Heated, mixed with water and salt, to externally treat chilblains | + |
| Amaryllidaceae | | | | | |
| Allium sativum L. | # | # | C | Bu | Consumed as an anti-hypertensive | + |
| Amaryllidaceae | | | | | |
| Arum italicum Mill. Shakulliza | | | | | |
| Araceae | | | | | |
| Asplenium trichomanes L. Fier guri | | | | | |
| Aspleniaceae | | | | | |
| CAME 26293 | | | | | |
| Bovista sp. | Фене arrushe, Fushkaica | W | DFB | Externally applied on wounds | + |
| Agaricaceae | | | | | |
| Cirsium arvense (L.) Scop. Овцец | | | | | |
| Asteraceae | | | | | |
| Cornus mas L. | # | # | W | Fr | Consumed as snack for strengthening the heart | + |
| Cornaceae | | | | | |
| CAME 26279 | | | | | |
| Fermented into vinegar, applied on the breast: anti-fever | | | | | |
| Fermented and distilled in raki, drunk: anti-asthmatic; believed to able to treat “seven” diseases | | | | | |
| FB | As part of the lule ditvere (“flower of the summer”) bunch, which is hang in March on the churn and on the stable doors, as a good omen for the diary production | | | | | |
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| Pieroni et al. Journal of Ethnobiology and Ethnomedicine 2014, 10:31 | | | | | |
| Pieroni et al. Journal of Ethnobiology and Ethnomedicine 2014, 10:31 | | | | | |
| Taxon, family and voucher specimen code | Folk name(s) recorded among Albanians | Folk name(s) recorded among Macedonians | Status | Plant part(s) used | Recorded modalities of medicinal uses(s) and treated pathologies | Alb | Mac |
|----------------------------------------|---------------------------------------|-----------------------------------------|--------|-------------------|---------------------------------------------------------------|-----|-----|
| Corylus avellana L. Betulaceae          | W FB                                  |                                         | W      | As part of the lule ditvere ("flower of the summer") bunch, which is hung in March on the churn, as a good omen for the dairy production | +   |     |
| Crataegus monogyna Jacq. Rosaceae       | W Th                                  |                                         |        | Externally applied: for treating snake bites                   | +   |     |
| Crataegus sericea Dzekov Rosaceae       | L; F                                  |                                        | L; F   | Infusion: for treating headaches, insomnia, hypertension, anti-rheumatic, anti-cancer | +   |     |
|                                    |                                      |                                        | Fr     | Decoction: cardiotonic, stomachaches, anti-fever, anti-rheumatic |     |     |
|                                    |                                      |                                        | FB     | As part of the lule ditvere ("flower of the summer") bunch, which is hung in March on the churn and on the stable doors, as a good omen for the dairy production; same at St. George’s day (May 6th): considered propitiatory for the good health of the animals | +   |     |
| Crucita laeves Opiz Rubiaceae           | Gjak edhe qumëshe                      |                                        | W AP   | Crushed, mixed with salt, and given as fodder to the sheep at St. George’s Day (May 6th): considered propitiatory for the good health of the animals | +   |     |
| Cytusia oblonga Mill. Rosaceae           |                                        |                                        | C L    | Infusion: stomachache                                        | +   | +   |
| Euphorbia characias L. Euphorbiaceae    |                                        |                                        | W R    | As part of the lule ditvere ("flower of the summer") bunch, which is hang on the churn, as a good omen for the dairy production | +   | +   |
| Fraxinus excelsior L. Oleaceae           |                                        |                                        | W L    | Infusion: diuretic                                           | +   |     |
| Helleborus odorus Waldst. et Kt. ex Willd. Ranunculaceae | Kukarek, Lule ditvere Kukurek |                                        | W R    | Inserted on the horse ear: panacea                           | +   |     |
Table 2 Medicinal local plant uses recorded in the study area (Continued)

| Taxon, family and voucher specimen code | Folk name(s) recorded among Albanians | Folk name(s) recorded among Macedonians | Status Plant part(s) used | Recorded modalities of medicinal uses(s) and treated pathologies | Alb | Mac |
|----------------------------------------|--------------------------------------|----------------------------------------|---------------------------|---------------------------------------------------------------|-----|-----|
| CAME 26282                             |                                      | F                                      | As part of the lule ditvere (“flower of the summer”) bunch, which is hang on the churn, as a good omen for the dairy production | +   | +   |
| *Helichrysum plicatum* DC. and other *Helichrysum* species Asteraceae | Borsilok i verdhë Свилен | W FAP | Infusion: appetizing, stomachaches, as a digestive, anti-diarrheal, cardiotonic, diuretic, anti-moths | +   |     |
| CAME 26274                             |                                      |                                        |                           |                                                               |     |     |
| *Hypericum perforatum* L. Hypericaceae | Балсам | W FAP | Infusion: stomachache | +   |     |
| CAME 26270                             |                                      |                                        |                           |                                                               |     |     |
| *Juglans regia* L. Juglandaceae | # # | SD UF | Infusion: for treating hyperthyroidism | +   |     |
| CAME 26238                             |                                      |                                        |                           |                                                               |     |     |
| *Juniperus communis* L. Cupressaceae | # # | W Fr | Infusion: diuretic, stomach-aches, anti-cold, bechic | +   | +   |
| CAME 26253                             |                                      |                                        |                           |                                                               |     |     |
| *Juniperus oxycedrus* L. Cupressaceae | Смрека | W Fr | Fermented and distilled into raki, which is drunk for treating asthma | +   |     |
| CAME 26267                             |                                      |                                        |                           |                                                               |     |     |
| *Malus domestica* Borkh. Rosaceae | # # | C Fr | Sliced and dried; consumed boiled for treating stomachache | +   |     |
| CAME 26236                             |                                      |                                        |                           |                                                               |     |     |
| *Malva sylvestris* L. Malvaceae | Леблебија | W Fr | Snack | +   |     |
| CAME 26295                             |                                      |                                        |                           |                                                               |     |     |
| *Matricaria chamomilla* L. Asteraceae | Kamomill | W FT | Infusion: recreational | +   |     |
| Taxon, family and voucher specimen code | Folk name(s) recorded among Albanians | Folk name(s) recorded among Macedonians | Status Plant part(s) used | Recorded modalities of medicinal uses(s) and treated pathologies Alb Mac |
|----------------------------------------|--------------------------------------|----------------------------------------|--------------------------|--------------------------------------------------------------|
| Melissa officinalis L. Lamiaceae CAME 26235 | Bosillek Micël | | C AP | Infusion: headaches + Infusion in external washes for newlyweds, as a good omen + High dosage to be avoided by males, who could lose their libido + |
| Nicotiana tabacum L. Solanaceae | Duhan | | C L | Dried and ground (tobacco), externally applied on wounds + |
| Orchis spp. Orchidaceae | Salep Салеп | | W R | Dried, powdered, then in decoction: panacea, reconstituent (often consumed with bread); to improve fertility in males + + |
| Origanum vulgare L. Lamiaceae CAME 26233 | Bozillek i malit, Çaj i malit, Çaj i zi, Çaj veni Планински чај | | W FT | Infusion: recreational, anti-flu, bechic + + |
| Phaseolus vulgaris L. Fabaceae | # # | | C Se | Infusion: anti-hepatitis + Infusion: for treating stomachaches, panacea |
| Plantago lanceolata L. Plantaginaceae CAME 26284 | Bar prenash, Dell, Lulë dheji, Premie Жилавец | | W L | Crushed and topically applied on wounds: haemostatic + + |
| Primula veris L. Primulaceae CAME 26317 | Lulë aguliçe, Lula dasht, Sgarifet Гороцвеќе | | W FAP | Infusion: for treating stomachaches + Infusion: panacea, cough + Infusion: intestinal troubles in kids + Infusion: externally applied on eye inflammations + |
| Taxon, family and voucher specimen code | Folk name(s) recorded among Albanians | Folk name(s) recorded among Macedonians | Status | Plant part(s) used | Recorded modalities of medicinal uses(s) and treated pathologies |
|----------------------------------------|--------------------------------------|----------------------------------------|--------|------------------|---------------------------------------------------------------|
| Prunus domestica L. Rosaceae            | #                                    | #                                      | C      | Fr               | Fermented and distilled in raki, topically applied, especially for wounds + + |
|                                        |                                      |                                        |        |                  | Fermented and distilled into raki, which is drunk hot with sugar for treating cold + |
|                                        |                                      |                                        |        |                  | Fermented and distilled into raki, externally applied with salt for treating toothache + |
| Prunus spinosa L. Rosaceae              | #                                    | W                                      | Fr     |                  | Infusion: anti-rheumatic and anti-fever + |
| Pyrus pyraster (L.) Burgsd. Rosaceae     | #                                    | #                                      | W      | Fr               | Decoction of the dried fruits with sugar: stomachaches + |
| Pyrus amygdaliformis Vill. Rosaceae     |                                      |                                        |        |                  | Infusion: stomachache anti-diarrheal + |
| Ribes multiflorum Kit. ex Roem. et Schult. Grossulariaceae | #                                    | W                                      | Fr     |                  | Consumed as snack and for treating digestive discomfort + |
| Rosa canina L. s.l. Karametha, Kroc, Kroza Rosaceae | Karametha, Шипинка | W                                      | Fr     |                  | Infusion: panacea + |
|                                        |                                      |                                        |        |                  | Infusion: anti-diarrheal, stomachaches + |
|                                        |                                      |                                        |        |                  | Infusion: sore throats, bechic, flu + |
|                                        |                                      |                                        |        |                  | Infusion: to treat "seven diseases", blood depurative, diuretic, cardiotonic, anti-fever + |
| Rubus hirtus Waldst. et Kit. Rosaceae   | #                                    | #                                      | W      | Fr               | Oleolite in topical application: anti-haemorrhoidal + |
| Rubus ulmifolius Schott Rosaceae        |                                      |                                        |        |                  |                                                            |

Table 2 Medicinal local plant uses recorded in the study area (Continued)
Table 2 Medicinal local plant uses recorded in the study area (Continued)

| Taxon, family and voucher specimen code | Folk name(s) recorded among Albanians | Folk name(s) recorded among Macedonians | Status | Plant part(s) used | Recorded modalities of medicinal uses(s) and treated pathologies | Alb | Mac |
|----------------------------------------|--------------------------------------|----------------------------------------|--------|-------------------|---------------------------------------------------------------|-----|-----|
| CAME 26310                             | Rubus caesius L. Rosaceae             |                                        |        |                   | Fermented and distilled into raki, which is considered cardiotonic + | +   |     |
|                                        |                                      |                                        | L      |                   | Infusion: for treating stomachaches, anti-diarrheal, esp. in children + |     |     |
|                                        |                                      |                                        | Sh     |                   | Externally applied on skin for treating infections +             |     |     |
| Sambucus ebulus L. Adoxaceae           | Див боз                               |                                        | W      | Fr                | Externally for treating herpes +                               |     |     |
| CAME 26254                             | Sideritis raeseri Boiss. et Heldr.    | Çai i bardhë, Çai mali                 | W      | FAP               | Infusion: flu +                                                 |     |     |
| Lamiaceae                              |                                       |                                        |        |                   |                                                               |     |     |
| CAME 26281                             | Solanum tuberosum L. Solanaceae       | #                                      | #      | C T               | Externally applied (in slices) for treating eye inflammations or head-aches* + |     |     |
| Asteraceae                             | Taraxacum officinale Weber ex F.H. Wigg. | #                                      | #      | W Fl              | As part of the *lule ditvere* ("flower of the summer") bunch, which is hung on the churn, as a good omen for the diary production + |     |     |
| CAME 26289                             | Thymus longicaulis C. Presl. Lamiaceae | Полоски чај                           | W      | AP                | Infusion: panacea +                                             |     |     |
| CAME 26272                             | Tilia platyphyllos Scop. Malvaceae    | Čaj blini                              | W      | Fl                | Infusion: panacea +                                             |     |     |
| CAME 26241                             | Ulmus minor Mill. and other Ulmus spp. Ulmaceae | Vidh                                   | W      | G                 | Infusion: recreational, flu +                                   |     |     |
|                                        |                                       |                                        |        |                   |                                                               |     |     |
| Taxon, family and voucher specimen code | Folk name(s) recorded among Albanians | Folk name(s) recorded among Macedonians | Status Plant part(s) used | Recorded modalities of medicinal uses(s) and treated pathologies Alb | Mac |
|---------------------------------------|--------------------------------------|----------------------------------------|--------------------------|-----------------------------|-----|
| CAME 26303                           | #                                    | #                                      | W L                      | Externally rubbed on the affected part (eventually with salt): anti-rheumatic + |     |
| *Urtica dioica* L.                    |                                      |                                        |                          |                             |     |
| Urticaceae                            |                                      |                                        |                          |                             |     |
| CAME 26262                           |                                      |                                        | L; R Infusion: anti-rheumatic |                             | +   |
|                                        |                                      |                                        | YL Cooked with rice with rice, eggs, and dairy products (*buranje*<sub>ALB</sub>/*zeje*<sub>MAC</sub>), as post-partum reconstituent |                             |     |
|                                        |                                      |                                        | AP Externally applied for treating bruises |                             | +   |
|                                        |                                      |                                        | R Decoction: anti-rheumatic |                             |     |
| *Vaccinium myrtillus* L.              | #                                    | #                                      | W Fr                     | Snack for treating stomachache + |     |
| Ericaceae                             |                                      |                                        |                          |                             |     |
| *Verbascum turgidum* Ten.             | Дропушке                            | W                                      | L                        | Infusion: anti-fever +       |     |
| Scrophulariaceae                      |                                      |                                        |                          |                             |     |
| CAME 26287                           |                                      |                                        | W C WC                   | Hot charcoal put in water and the resulting liquid in external washes on the face of the child suffering from the evil-eye; or thrown on the person suspected to be the gazer + |     |
|                                        |                                      |                                        | WC Powdered and applied on the mom’s breast to wean the baby* |                             |     |
| Diverse tree species                  | W; C                                 | WC                                     |                           |                             |     |
|                                        |                                      | DW                                      | Smoked, as a deterrent for bees and then anti-bites |                             | +   |
| Diverse tree species                  | W; C                                 | DW                                     |                           |                             |     |
|                                        |                                      | WA                                      | Externally applied (warm) on the cheek for treating toothache or on the neck for treating tonsillitis |                             | +   |
| Not identified                        | Млечка                               | W                                      | AP                       | Infusion: hepatitis +        |     |

*: first record of the species in Albania.  
In bold: folk taxa quoted by more than 40% of the informants.  
C: cultivated; SD: semi-domesticated; W: wild.  
*: past use.  
#: see Table 1.  
+: recorded use.  
Plant part(s) used: AP aerial parts; Bu bulbs; DFB dried fruiting body; DW decayed wood; FAP flowering aerial parts; FB flowering branches; Fl flowers; Fr fruits; FT flowering tops; G galls; J juice; L leaves; R roots; Se seeds; Sh Shoots; T tubers; Th thorns; UF unripe fruits; WA ashes from wood; WC charcoal from wood; YL young leaves.
Within this ethnic group, this medicinal herb is the most frequently used remedy as it is applied in the treatment of many diseases as a kind of panacea. The high cultural consensus concerning the use of *Helichrysum* spp. in the Macedonian and Bulgarian medical folklore is remarkable in the scientific literature. A number of folk names referred to this taxon in Bulgarian retain the root "smil", which has the meaning of physical beauty and health; moreover, in Bulgarian folk medicine, this taxon has been considered to be a real panacea and is often used for many purposes: as a diuretic, against dropsy, liver diseases, jaundice, stagnation of blood in the abdomen, tinnitus, low blood pressure, bone spikes, rheumatism, sciatica, rickets, worms, deafness and for treating skin diseases [64,65].

Veterinary plants
The uses of 57 plant taxa for ethnoveterinary purposes are reported in Table 3. Apart from a certain number of fodder plants and a few medicinal remedies, a large portion of this section of the local ethnobotany is represented by plants that are used ritually for the Georgyovden feast (corresponding to St. George's Day), in order to propitiate good health for the animals or a successful season for the dairy products. This tradition is especially relevant within the Macedonian community and it is well rooted within other South Slavic customs. In Bulgaria, for example, the St. George's Day is associated with plant decorations being used to "protect" the animals and the house: *Salix* spp., *Juglandis regia*, *Artemisia* spp., *Clematis vitalba*, *Glechoma hederacea*, *Veronica officinalis*, *Chamaecytisus hirsutus*, *Convallaria majalis*, *Ranunculus acris*, *Caltha palustris*, *Ajuga* spp., *Lamium purpureum*, and *Ranunculus ficaria* [65,67,68].

Drazheva has analyzed the coincidence of St. Georges' Day with the most important spring feast in rural Bulgaria, which is widespread with varied rituals [69]. According to this review, one of the main circles connected with St. George's Day focuses around the ritual taking of the sheep to their summer pasture, the ritual milking, the sacrificial practices devoted to a saint who has inherited the characteristic features of the patron-ancestor of the Thracian Heroes, including the open-air feast usually associated with them. A second circle of rites and customs connected to Georgyovden is intended for guaranteeing health and well-being for the family, with fortune-telling about the forthcoming wedding feasts for the young people, which is directly related with the reproduction of the community in both its biological and social dimensions.

Cross-cultural ethnobotany: Macedonian vs. Albanian plant knowledge
From our analysis of the overlap between the Macedonian and Albanian ethnobotanies, we could point out that majority of plant reports (approx. half) were quoted by Macedonians only. However, this could be due to the uneven sample selection between the two field studies: the number of the Macedonian informants was roughly three times larger than the number of the Albanian interviewees. On the other hand, it is important to note that only extremely limited new information was found in both communities after the first dozen in-depth interviews. Our findings could support the persistence of
| Taxon, family and voucher specimen code | Folk name(s) recorded among Albanians | Folk name(s) recorded among Macedonians | Status | Plant part(s) used | Recorded local use(s)/perceptions(s) | Alb | Mac |
|----------------------------------------|--------------------------------------|----------------------------------------|--------|--------------------|--------------------------------------|-----|-----|
| Acer campestre L.                      | Клен                                 | W Br                                   | Fodder (goats) | +                  |                                       |     |     |
| Sapindaceae                            |                                      |                                       |                    |                    |                                       |     |     |
| CAME 26252                             |                                      |                                       |                    |                    |                                       |     |     |
| Acer pseudoplatanus L.                 | Јавор                                 | W Br                                   | Fodder            | +                  |                                       |     |     |
| Sapindaceae                            |                                      |                                       |                    |                    |                                       |     |     |
| CAME 26313                             |                                      |                                       |                    |                    |                                       |     |     |
| Achillea millefolium L.                |                                      | W FAP                                  | Infusion: for treating rumination troubles | +                  |                                       |     |     |
| Asteraceae                             |                                      |                                       |                    |                    |                                       |     |     |
| CAME 26294                             |                                      |                                       |                    |                    |                                       |     |     |
| Allium sativum L.                      | #                                    | # C Bu                                  | In necklaces to be worn on the cow’s horns against the evil-eye (sysh, naok); evil-eye symptoms include the animal not producing milk | + + | Crushed, mixed with salt, and given as fodder to the sheep on St. George’s Day (May 6th): considered propitiatory for the good health of the animals |     |     |
| Amaryllidaceae                         |                                      |                                       |                    |                    |                                       |     |     |
| Avena sativa L.                        | Овес                                 | C Fr                                   | Fodder, esp. considered good for the horse’s coat | + |                                       |     |     |
| Poaceae                                |                                      |                                       |                    |                    |                                       |     |     |
| Beta vulgaris L.                       | #                                    | # C L                                  | Fodder (raw or in decoctions) | + + |                                       |     |     |
| Amaranthaceae                          |                                      |                                       |                    |                    |                                       |     |     |
| Bovista sp.                            | =                                    | = W DFB                                | Externally applied on wounds as an haemostatic (horses) | + |                                       |     |     |
| Agaricaceae                            |                                      |                                       |                    |                    |                                       |     |     |
| Capsicum annuum L.                     | #                                    | # C Fr                                  | Lacto-fermented; the resulting fruits opened and externally applied on the forehead for treating headaches | + |                                       |     |     |
| Solanaceae                             |                                      |                                       |                    |                    |                                       |     |     |
| Carpinus orientalis Mill.              | Шкоza                                | W Br                                   | Fodder at St. George’s Day (considered as a good omen) | + |                                       |     |     |
| Betulaceae                             |                                      |                                       |                    |                    |                                       |     |     |
| Pieroni et al. Journal of Ethnobiology and Ethnomedicine 2014, 10:31 | | | | | | |
| **http://www.ethnobiomed.com/content/10/1/31** | | | | | | |
### Table 3 Local plants considered for improving the animals' well-being in the study area (Continued)

| Taxon, family and voucher specimen code | Folk name(s) recorded among Albanians | Folk name(s) recorded among Macedonians | Status | Plant part(s) used | Recorded local use(s)/perceptions(s) | Alb | Mac |
|-----------------------------------------|--------------------------------------|----------------------------------------|--------|-------------------|--------------------------------------|-----|-----|
| CAME 26301 Chelidonium majus L. Papaveraceae | Gjak edhe qumësht | W | AP | Crushed, mixed with salt, and given as fodder to the sheep on St. George's Day (May 6th): considered propitiatory for the good health of the animals, but also as a blood depurative and galactagogue + |
| CAME 26250 Chenopodium album L. Amaranthaceae | Llabot | W | AP | Fodder + |
| CAME 26300 Clematis vitalba L. Ranunculaceae | Kurpna Повит | W | AP | Fodder + |
| CAME 26279 Cornus mas L. Cornaceae | # | # | W | Fl | Honey plant + |
| CAME 26242 Corylus avellana L. Betulaceae | # | # | W | Fl | Honey plant + |
| CAME 26280 Crataegus monogyna Jacq. Rosaceae | # | # | W | Fl | Honey plant + |
| CAME 26280 Crataegus sericea Dzekov? Rosaceae | # | # | W | Fl | Honey plant + |
| CAME 26278 Crucia laevipes Opiz Rubiaceae | = | W | AP | Hung on churns and stable doors on St. George's Day (May 6th) as a good omen for the dairy production + |
| | | | | Crushed, mixed with salt, and given as fodder to the sheep on St. George's Day (May 6th): considered propitiatory for the good health of the animals + |
| Taxon, family and voucher specimen code | Folk name(s) recorded among Albanians | Folk name(s) recorded among Macedonians | Status | Plant part(s) used | Recorded local use(s)/perceptions(s) | Alb | Mac |
|----------------------------------------|--------------------------------------|-----------------------------------------|--------|-------------------|-------------------------------------|-----|-----|
| CAME 26276                             |                                      | C                                       | Fr     | Fodder            |                                     |     |     |
| Cucurbitina maxima Duch. # #           |                                      | C                                       | Fr     | Fodder            | +                                   |     |     |
| Cucurbitaceae                          |                                      |                                         |        |                   |                                     |     |     |
| Cydonia oblonga Mill. # #              |                                      | C                                       | Fl     | Honey plant       | +                                   |     |     |
| Rosaceae                               |                                      |                                         |        |                   |                                     |     |     |
| CAME 26290                             |                                      | L                                        |        | Infusion: stomachache |                                     |     |     |
|                                      |                                      | FB                                       |        | Hung on churns and stable doors on St. George's Day (May 6th) as a good omen for the dairy production | + |     |
| Euphorbia characias L. # #             |                                      | W                                        | WP     | Considered poisonous and irritating the skin | + |     |
| Euphorbiaceae                          |                                      |                                         |        |                   |                                     |     |     |
| Fagus sylvatica L. # #                 |                                      | W                                       | Fr     | Fodder (esp. sheep) | + +                                |     |     |
| Fagaceae                               |                                      |                                         |        |                   |                                     |     |     |
| CAME 26298                             |                                      | L                                        |        | Fodder, esp. for sheep and equines | + +                                |     |     |
|                                      |                                      | Wo                                       |        | Burned, as repellent for the bees when removing honey from the hives | + |     |
| Fraxinus excelsior L.                  |                                      | W                                       | Br     | Fodder for sheep  | +                                   |     |     |
| Oleaceae                               |                                      |                                         |        |                   |                                     |     |     |
| CAME 26304                             |                                      | R                                        |        | Inserted on the horse ear; panacea | +                                   |     |     |
|                                      |                                      | BFAP                                     |        | Hung on the entry gates (to homes and stables), or on the churn on St. George's Day (May 6th): considered a good omen | + + |     |
| Helleborus odorus Waldst. et Kit. ex Willd. | =                              | W                                       | AP     | Ritually hung on doors and gates on March 13th as a good omen | + + |     |
| Ranunculaceae                          |                                      |                                         |        |                   |                                     |     |     |
| CAME 26282                             |                                      | R                                        |        | Inserted on the horse ear; panacea | + |     |
|                                      |                                      | BFAP                                     |        | Hung on the entry gates (to homes and stables), or on the churn on St. George's Day (May 6th): considered a good omen | + + |     |
| Helichrysum plicatum DC. # =           |                                      | W                                       | FAP    | Infusion: for treating rumination troubles and diarrhea; kerato-conjunctivitis in sheep | + |     |
| and other Helichrysum spp.             |                                      |                                         |        |                   |                                     |     |     |
| Asteraceae                             |                                      |                                         |        |                   |                                     |     |     |
| Taxon, family and voucher specimen code | Folk name(s) recorded among Albanians | Folk name(s) recorded among Macedonians | Status | Plant part(s) used | Recorded local use(s)/perceptions(s) | Alb | Mac |
|----------------------------------------|--------------------------------------|----------------------------------------|--------|-------------------|-------------------------------------|-----|-----|
| Hordeum vulgare L.                     | Жито                                        |                                       | C      | Fr                | Fodder, esp. considered good for improving the beauty of horse's coat |    | +   |
| Poaceae                                |                                       |                                       |        |                   |                                     |     |     |
| Malus domestica Borkh.                 |                                       |                                       | C      | L                 | Fodder for goats                    |    | +   |
| Rosaceae                               |                                       |                                       |        |                   |                                     |     |     |
| CAME 26236                             |                                       |                                       |        |                   |                                     |     |     |
| Medicago sativa L.                     | Jonxha                                     |                                       | C      | AP               | Galactagogue for animals            |    | +   |
| Fabaceae                               |                                       |                                       |        |                   |                                     |     |     |
| CAME 26292                             |                                       |                                       |        |                   |                                     |     |     |
| Melissa officinalis L.                 |                                       |                                       | W      | FI                | Honey plant                        |    | +   |
| Lamiaceae                              |                                       |                                       |        |                   |                                     |     |     |
| CAME 26235                             |                                       |                                       |        |                   |                                     |     |     |
| Populus nigra L.                       | Plepi                                    |                                       | W      | L                 | Fodder                             |     | +   |
| Salicaceae                             |                                       |                                       |        |                   |                                     |     |     |
| CAME 26302                             |                                       |                                       |        |                   |                                     |     |     |
| Primula veris L.                       |                                       |                                       | W      | FAP               | Hung on churns and stable doors on St. George's Day (May 6th) as a good omen |    |     |
| Primulaceae                             |                                       |                                       |        |                   |                                     |     |     |
| CAME 26317                             |                                       |                                       |        |                   |                                     |     |     |
| Prunus avium (L.) L.                   |                                       |                                       | W      | Br                | Fodder                             |    | +   |
| Rosaceae                               |                                       |                                       |        |                   |                                     |     |     |
| CAME 26240                             |                                       |                                       |        |                   |                                     |     |     |
| Prunus domestica L.                    |                                       |                                       | C      | L                 | Fodder for goats                   |    | +   |
| Rosaceae                               |                                       |                                       |        |                   |                                     |     |     |
| CAME 26239                             |                                       |                                       |        |                   |                                     |     |     |
| Prunus cerasus L.                      |                                       |                                       | C      | Br                | Fodder                             |    | +   |
| Rosaceae                               |                                       |                                       |        |                   |                                     |     |     |
Table 3 Local plants considered for improving the animals’ well-being in the study area (Continued)

| Taxon, family and voucher specimen code | Folk name(s) recorded among Albanians | Folk name(s) recorded among Macedonians | Status | Plant part(s) used | Recorded local use(s)/perceptions(s) | Alb | Mac |
|----------------------------------------|--------------------------------------|-----------------------------------------|--------|-------------------|-------------------------------------|-----|-----|
| Pteridium aquilinum (L.) Kuhn          | Fier                                 | W L                                     | Bedding for animals               | + |
| Dennstaedtiaceae                       |                                      |                                         |                                   |   |
| CAME 26315                             |                                      |                                         |                                   |   |
| Quercus cerris L.                       | Bung, Çarri, Dushk, Lis              | W Fr                                    | Fodder for sheep and goats        | + + |
| Fagaceae                               |                                      |                                         |                                   |   |
| CAME 26256                             |                                      |                                         |                                   |   |
| Quercus lusitanica Ten.                |                                      |                                         |                                   |   |
| CAME 26256                             |                                      |                                         |                                   |   |
| Robinia pseudoacacia L.                | Akac, Bagren                         | W Sa                                    | Externally instilled in the ear for treating earaches | + |
| Fabaceae                               |                                      |                                         |                                   |   |
| CAME 26305                             |                                      |                                         |                                   |   |
| Rosa canina L. s.l.                    | W Fl                                 | Honey plant                             | + |
| Rosaceae                               |                                      |                                         |                                   |   |
| CAME 26237                             |                                      |                                         |                                   |   |
| Salix alba L.                          | Shelçë, Shelgë                       | W L                                     | Fodder for goats                  | + |
| Salicaceae                             |                                      |                                         |                                   |   |
| CAME 26251                             |                                      |                                         |                                   |   |
| Salix alba L.                          | Shelçë                               | W L                                     | Fodder for goats                  | + |
| Salicaceae                             |                                      |                                         |                                   |   |
| CAME 26248                             |                                      |                                         |                                   |   |
| Salix purpurea L.                      |                                      |                                         |                                   |   |
| Salicaceae                             |                                      |                                         |                                   |   |
| CAMNE 26255                            |                                      |                                         |                                   |   |
| Salvia verticillata L.                 | Gombelik, Lule bulli                 | W AP                                    | Fodder                           | + |
| Lamiaceae                              |                                      |                                         |                                   |   |
| Taxon, family and voucher specimen code | Folk name(s) recorded among Albanians | Folk name(s) recorded among Macedonians | Status | Plant part(s) used | Recorded local use(s)/perceptions(s) | Alb | Mac |
|----------------------------------------|--------------------------------------|----------------------------------------|--------|-------------------|-------------------------------------|-----|-----|
| **Sambucus ebulus** L. Adoxaceae CAME 26254 | = | = | W | Fr | Externally for treating wounds in sheep | + | |
| **Secale cereale** L. Poaceae | # | # | C | St | | | |
| **Solanum tuberosum** L. Solanaceae | # | # | C | T | Fodder | + | |
| **Syringa vulgaris** L. Oleaceae CAME 26309 | Јоргован | C | FB | | Hung on churns and stable doors on St. George’s Day (May 6th) as a good omen for the dairy production | + | |
| **Tanacetum macrophyllum** (Waldst. et Kit.) Sch. Bip. Asteraceae CAME 26269 | Вратика | W | AP | | Together with nettles, this is rubbed on the goat’s mammarys on St. George’s day (May 6th) to improve milk production | + | |
| **Tanacetum vulgare** L. Asteraceae CAME 26268 | W | AP | | | Hung on churns and stable doors on St. George’s Day (May 6th) as a good omen for the dairy production | + | |
| **Taraxacum officinale** Weber ex F.H. Wigg. Asteraceae CAME 26289 | # | # | W | Fl | Crushed, mixed with salt, and ritually given as fodder to the animals on St. George’s Day (May 6th); considered a good omen and galactagogue | + | |
| **Trifolium pratense** L. Fabaceae CAME 26297 | Detelina | W | L | | Fodder for sheep | + | + |
| **Trifolium incarnatum** L. ssp. molineri (Homem.) Ces. Fabaceae | | | | | Honey plant | + | |
Table 3 Local plants considered for improving the animals’ well-being in the study area (Continued)

| Taxon, family and voucher specimen code | Folk name(s) recorded among Albanians | Folk name(s) recorded among Macedonians | Status | Plant part(s) used | Recorded local use(s)/perceptions(s) | Alb | Mac |
|----------------------------------------|--------------------------------------|----------------------------------------|--------|-------------------|--------------------------------------|-----|-----|
| *Trifolium* spp.                        |                                      |                                        |        |                   |                                      |     |     |
| Fabaceae                               |                                      |                                        |        |                   |                                      |     |     |
| *Urtica dioica* L.                      | #                                    | #                                      | W      | AP                | Honey plant +                         |     |     |
| Urticaceae                             |                                      |                                        |        |                   | Rubbed onto the mammary of cows affected by the Evil-Eye + |     |     |
| CAME 26262                              |                                      |                                        |        |                   |                                      |     |     |
| Fabaceae                               |                                      |                                        |        |                   | Together with *Tanacetum macrophyllum*, this is rubbed onto goat mammary on St. George’s day (May 6th) as a good omen for dairy production + |     |     |
| *Vicia ervilia* (L.) Willd.             | Уров                                | C                                      | Se     |                   | Fodder +                             |     |     |
| Fabaceae                               |                                      |                                        |        |                   |                                      |     |     |
| *Zea mays* L.                           | #                                    | #                                      | C      | Fr                | Fodder, esp. for increasing the growth speed of lambs and for improving the coat of horses + + |     |     |
| Poaceae                                |                                      |                                        |        |                   | Galactagogue for all animals +       |     |     |
| Diverse tree species                    | W; C                                 | WA                                     |        |                   | Repellent against other insects in the bee hives + |     |     |
| Not identified                          | Лула манушаче                       | W                                      | FAP    |                   | Hung on home gates, churns and stable doors on St. George’s Day (May 6th) as a good omen + |     |     |
| Not identified                          | Spencer                              | W                                      | R      |                   | Inserted on the animal ear for treating diverse diseases + |     |     |

*: first record of the species in Albania.

In bold: folk taxa quoted by more than 40% of the informants.

C: cultivated; SD: semi-domesticated; W: wild.

*: past use.

#: see Table 1.

=: see Table 2.

+: recorded use.

Plant part(s) used: AP aerial parts; Br branches; Bu bulbs; BAFP Branches with flowering aerial parts; FAP flowering aerial parts; FB flowering branches; Fl flowers; Fr fruits; L leaves; R roots; Sa sap; Se seeds; St stems; T tubers; Wo wood; WA ashes from wood; WP whole plant.
a more “herbophilic” attitude among South-Slavs, as we have already postulated in previous cross-cultural comparative studies in the Western Balkans [26,46]. Moreover, since Macedonians were and also are those in the study area who trade/sell the largest share of wild crafted medicinal herbs to the nearby Albanian towns (i.e. Elbasan, Tirana) and markets or via Albanian middle men, their knowledge of these plants remains within their sphere of household economics. Thus, these activities may have delayed the decrease of local plant knowledge among this population.

The plant reports found in common between the two communities are approx. one third of the overall recorded plant reports (Jaccard Index: 0.29). This would demonstrate some diverging trajectories of the ethnobotanies of the two groups, despite many years of living together in the same area and sharing the same religious faith. Nevertheless, these commonalities demonstrate how cultural edges are particularly significant in biocultural diversity [70].

The overlaps of the folk plant reports in the three considered domains (food, human medicine, and veterinary) are represented in Figure 4. In all three domains, the Jaccard Index measuring the similarity of the data sets collected among Albanians and Macedonians in Gollobordo is 0.29, although internal uses of medicinal plants (teas) and also ritual uses of veterinary plants made at Georgyovden seem to be much more relevant among Macedonians.

We recently applied the concept of resilience to migrants’ ethnobotanies [45], while defining resilience as the capability of socio-ecological systems to absorb disturbances and to retain their basic structures and functions, which includes in particular four pillars [71]: 1) the capability of the systems of learning to live with change and absorb it; 2) of nurturing diversity for reorganisation and renewal; 3) of combining different kinds of knowledge for learning; and 4) of creating opportunities for self-organisation. The remarkable resilience evident in the Macedonian medical and veterinary ethnobotanies is indicative of a complex cultural adaptation processes that this community underwent. Moreover, the isolation of this community may related to the difficulties that Macedonians have experienced in accessing the mainstream Albanian culture and institutionalized health as well; the proof of this isolation can be seen in the generation of elderly women, who are the health care givers within the households and often still show difficulties in fluently speaking the Albanian language. Isolation could be ultimately seen then also as a kind of adaptive mechanism. This also shows how negotiations among diverse ethnic groups in mountainous areas could be linked to the practice of symbiotic relations and pluralism, as in the case studies of the Wakhi and Kyrgyz and Pashtu and Shugni of the Pamir [72,73].

In 1956, Fredrik Barth proposed for his field site in the mountains of Swat, North Pakistan, a path-breaking reflection for those times concerning the link between the use of certain ecological niches and ethnic boundaries [74]. According to his observations, the distribution of ethnic groups ecological niches is controlled by the distribution of species each group is able to exploit. Moreover, different ethnic groups may exploit the same ecological niche only if the weaker of them would be
better in using marginal environments. The history of Gollobordo’s Macedonians in the last century seems to confirm this, since this group remained concentrated in the highest and most inhospitable village sites, while Albanians began to replace Macedonians in the villages located to lowest altitudes. The Macedonian group had to learn to make use of these marginal areas and the affiliated local resources, including the use of potato leaves for food and the reliance on several herbal medicines, in both the domestic arena and for trade. Although partly symbiotic, the relationship between the two communities has not been equal and the Macedonians have occupied the more marginalized socio-cultural niche.

Conclusions
Local environmental resources derived from plants continue to play an important role in the provision of dietary and medical care for both humans and their livestock in Gollobordo’s communities. We could confirm a more herbophilic attitude of the Macedonians, especially with regards to medicinal and veterinary plants, while the overlaps between the Albanian and the Macedonian ethnobotanies are still relatively limited (restricted to a quarter of the overall recorded plant reports). This confirms that in Gollobordo, despite the two communities having shared the same religion and the same environmental space for many decades, the “original” TEK systems still persist, perhaps due to the geographical and cultural isolation of the area, especially with regards to the Macedonian community. Initiatives aimed at generating an endogenous rural development and especially at fostering sustainable gathering activities of local plants – as well as their small-scale trade and eco-tourism – should seriously consider these cultural divergences. This could in turn promote a tighter collaboration between the two communities and help to sustain the threatened linguistic and cultural heritage of the Macedonian minority.

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

Authors’ contribution
AP and KV conducted the field study and identified the plant samples. AP, AN, and CLQ analyzed the collected data; AH and BM contributed to the comparison with the Bulgarian ethnobotany and folklore; AP and CLQ wrote the manuscript and drafted the discussion. All authors read and approved the final manuscript.

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