An ethnobotany of Kakheti and Kvemo Kartli, Sakartvelo (Republic of Georgia), Caucasus

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Abstract

Background: Kakheti and Kvemo Kartli are historical provinces of Georgia located on the south-facing macro-slope of the eastern part of the Greater Caucasus (Kakheti) and east of the Lesser Caucasus (Kvemo Kartli). In this study we documented traditional plant use in Kakheti and Kvemo Kartli.

Methods: Fieldwork was conducted in August-November 2018. Interviews using semi-structured questionnaires were conducted with 40 participants (26 women and 14 men), with oral prior informed consent.

Results: We encountered 215 plant species belonging to 157 genera of 114 vascular plant families, and 3 fungal species and 5 undetermined fungi of at least 5 genera, belonging to at least 3 fungal families being used in the research region. Of these 114 vascular species were exclusively wild collected, 88 were grown in homegardens, and 18 were both grown in gardens and collected in the wild. Plants and their uses mostly overlapped among the areas within the region, with a slightly wider divergence in uses than in plants. The environmental fit analysis showed that a large degree of this variation was explained by differences among participant communities. The elevation of the participant community significantly fit the ordination in plant-space and explained a large degree of the variation in plant species reported but not in use-space. Gender was not significant in plant-space but was important in use space.

Conclusions: The lack of forest plant use, and both forest and garden plant-use knowledge in Kakheti and Kvemo-Kartli might be traced to the fact that both regions are close to large markets in the region, which make it less necessary to grow or forage many species. In addition, Kakheti is easily one of the most fertile regions in Georgia, with a very short winter and there is essentially no need for foraging wild species e.g. for Phkhali. Lagodekhi, with its almost subtropical climate, is an extreme example of that, with almost no recorded forest plant use.

Key words: Caucasus, ethnobotany, plant use, traditional knowledge, post-soviet development

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Background

Georgia harbors a tremendous diversity of crops and crop wild relatives, and plant use for medicine and other purposes is very common (Akhalkatsi et al. 2018a,b), and can often be traced back millennia (McGovern et al. 2018). Plant use is indeed widely shared among different ethnic and religious communities (Kordzakhia and Javakhishvili 1971, Söderlind 2015). In this study we focused on the regions Kakheti and Kvemo-Kartli (Fig. 1). The vegetation of the region includes montane forest, subalpine, alpine, subnival and nival zones and corresponds to the East Caucasian, i.e. Iberian, type of the vegetation vertical zonation (Gagnidze and Davitadze 2000; Zazanashvili et al. 1999). Most inhabitants speak Georgian, although small groups speak Azeri, Lak, Ude, Ossetian and Chechen (Beridze et al. 2003).

Kakheti (წახეთი) was formed as administrative region in 1991 after independence from the USSR, in eastern Georgia from the historical province of Kakheti and the small, mountainous province of Tusheti. In this paper we focus only on the traditional Kakheti region. Kakheti has a strong linguistic and cultural identity, since its ethnographic subgroup of Kakhetians speak the Kakhetian dialect of Georgian.

Traditionally, Kakheti has been subdivided into four areas: Shida Kakheti (შიდა წახეთი, Shida Kakheti) to the east of Tsiv-Gombori mountain range, along the right bank of the Alazani River; Gare Kakheti (გარე წახეთი, Gare Kakheti) along the middle lori River basin; Kiziq' (ქიზიყი) between the Alazani and the lori; Gaghma Mkhari (გაღმა მხარი, Gaghma Mkhari) on the left bank of the Alazani.

The Kingdom of Kakheti-Hereti was an early Medieval monarchy in eastern Georgia, centered at the province of Kakheti, with its capital first at Telavi. It emerged in c. 1014 AD, under the leadership of Kvirike III the Great. At the beginning of the twelfth century did Georgian King David the Builder (c.1089–1125) incorporate Kakheti permanently into the Greater Georgian Kingdom. After the disintegration of the Georgian Kingdom, Kakheti became an independent Kingdom in the 1460s. From the early 16th century till the early 19th century, Kakheti and its neighboring Kartli came under intermittent Iranian rule. In 1762, the Kakhetian Kingdom was united with the neighboring Georgian
Kingdom of Kartli into the Kingdom of Kartli-Kakheti under King Heraclius II. Following the Treaty of Georgievsk and the sack of Tbilisi by Agha Mohammad Khan, in 1801 the Kingdom of Kartli-Kakheti was annexed to the Russian Empire. Kakheti is home to ancient Georgian Orthodox Christian sites like Bodbe Monastery (Fig. 2), and the ancient center of wine production in Georgia (Fig. 3).
Kvemo Kartli (ქვემო ქართლი) is a historic province and current administrative region in southeastern Georgia, originally part of the Kakhetian Kingdom. Kvemo Kartli has been settled by humans for millions of years. Especially the Dmanisi area (Fig. 4), is known for its hominid fossils of Homo georgicus, with an age between 1.6 and 1.8 million years, and the region has been settled by hominids ever since.

The region is one of the most economically developed in Georgia. After Tbilisi, the region is ranked second in industrial production. Apart from Georgians, Kvemo Kartli also hosts a large Azeri and Armenian population, and from the early 19th century to the second world war was home to a large number of Caucasus Swabians (a population of German origin), who had considerable influence especially on local agricultural production. In the early 19th century, 2629 Swabian radical Pietists immigrated to Georgia on invitation of Tsar Alexander I. Around 500 large families founded eight colonies near Tbilisi in 1818, supported by the Russian government. In colloquial language they were soon called the “Schwabendörfer”. The largest village was Katharinienfeld, where initially 95 families, later 116 families lived. The name should honor the Württemberg Queen Catherine, the sister of Tsar Alexander I. The other villages, Marienfeld, Elisabeththal, Alexandersdorf and Petersdorf made a name for themselves because of their straight, cobbled streets. In 1918 there were more than 24,000 German colonists in Georgia. In the same year, Stalin relocated all Caucasian Germans who were not married to locals to Kazakhstan and Siberia. The houses of the German settlers were given to migrants from other regions of Transcaucasia. Only a few Caucasian Germans returned to the Caucasus in the post-war period. In 2002 there were about 30 older women of German origin in Bolnisi.

Flora and vegetation
The Caucasus region contains an amazing variety of vascular plants, with about 6300 described species (Gagnidze (2002). The number of endemic taxa known for the Caucasus region is set at 2791 (Schatz et al., 2009).

The Botanical exploration of the Caucasus started in the 17th century. Jean-Baptiste Chardin (1686), described the gardens in Tiflis, Georgia, as well as the surrounding areas as result of a journey in 1672-1673. Joseph Delaporte published similar impressions in 1768 (Gogolishvili & Skhiereli, 1986). Botanist Joseph Pitton de Tournefort, published a large treatment of the Caucasus flora and
vegetation in 1717. Johann Christian Buxbaum published a five-volume flora of the region in (1728-1740). The first real flora of the Caucasus region was however prepared by Adolf Marschall von Bieberstein (1808-1819). In the 20th century most of the Caucasus region formed part of the former Soviet Union, and botanically well studied in that time (Grossheim, 1928-1934, 1939-1967; Takhtajan, 2003-2012). A large number of detailed treatments of the Caucasus flora were compiled by Alexander Grossheim, who published the most complete Flora of the Caucasus (1928-1934). Starting in the 1940s, Grossheim produced also a series of volumes on human plant use for Armenia, Azerbaijan and Georgia (Grossheim, 1942, 1943, 1946, 1949, 1952). Especially his Manual of the Caucasian Plants (Grossheim, 1949) is still a standard reference today. Nakhutrishvili (1999) produced the most comprehensive vegetation description for the Caucasus.

The high biodiversity in the Caucasus is found in a wide variety of vegetation types. A large portion of the region is covered by broad-leaved and coniferous forests (Galushko, 1978-1980; Doluchanov, 1989; Nakhutrishvili, 1999; Zazanashvili et al., 1999, 2000). In the northern Caucasus, forests are mostly found in the western part, while moving further east forested areas are more and more restricted to areas along streams, and in Dagestan, steppe and shrub formations are prevalent (Ltvinskaya and Murtazaliev, 2009). The forest cover was estimated to be 36% in Georgia (Doluchanov, 1989), and forest cover has diminished from 35% to 11% in Azerbaijan. (Schatz et al., 2009). However, usage change, especially a reduction of sheep in the Northern Caucasus, as led the timeline to extend upwards in many areas (Bussmann et al., 2014, 2016a-d, 2017a-b).

In this study we documented traditional plant use in Kakheti and Kvemo Kartli and hypothesized that (1) plant use knowledge in general would lower in these regions than in the rest of Georgia, that (2) most plant use would center on home gardens (3) that the consumption of herbs as “Pkhali” (herb pie), very prevalent in other regions of Georgia, would be limited, and that (4) there would essentially be no trace of Swabian traditional knowledge in the region.

Materials and Methods

Ethnobotanical interviews

Fieldwork was conducted in August-November 2018. Interviews using semi-structured questionnaires were conducted with 40 participants (26 women and 14 men), with oral prior informed consent (Fig. 5). The participants were selected by snowball sampling, trying to reach gender balance and represent members of different age groups (37–85 years). However, most participants were over 45 years old, because only very few younger people remain in remote Georgian villages. All interviews were carried out in the participants’ homes and gardens by native speakers of Georgian and its local dialects, and then translated into English. Plants grown in the home gardens were used as prompts, while wild-collected species were free listed. Wild-collected and garden species were identified directly in the field, as well as using literature (Flora of Georgia Committee 1971-2011; Makashvili 1952-1953), and voucher collections deposited in the National Herbarium of Georgia (TBI). The nomenclature of all species follows www.tropicos.org, under APGIII (Angiosperm Phylogeny Group 2009). The spelling of vernacular names was standardized using Makashvili (1991). Fungal nomenclature follows MycoBank (http://www.mycobank.org).

Statistical analysis

Distance among informants was calculated for two matrices: one in which columns represented plant species reported, and one in which columns represented uses reported. We calculated distance with the Bray-Curtis method and used the metaMDS function in the R package vegan (Oksanen et al. 2018) to implement nonmetric multidimensional scaling. The resulting ordinations plot individuals more closely together who report similar plants (in the case of the first matrix) or similar uses (in the case of the second matrix). We then fit different continuous variables (elevation of community and age of individual) and categorical variables (gender of individual, community, and district) using to test whether each variable explains the location of informants in the ordination, also using vegan (Oksanen et al. 2018). We compared these fits to 999 randomized shuffles of the environmental variables to calculate significance. We calculated informant consensus for a given use category as the number of use reports minus the number of taxa over the number of use reports minus one:

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We ranked species by three metrics: cultural importance value, the sum within species across all plant-uses of the number of informants reporting a plant-use over the number of informants reporting the plant; use diversity, the Shannon Index of uses (calculated with vegan, Oksanen et al. 2018); and use value, the number of reports of a species over total number of informants asked in a region (Philips and Gentry 1993).
Results
We encountered 215 plant species belonging to 157 genera of 114 vascular plant families, and 3 fungal species and 5 undetermined fungi of at least 5 genera, belonging to at least 3 fungal families being used in the research region. Of these 114 vascular species were exclusively wild collected, 88 were grown in homegardens, and 18 were both grown in gardens and collected in the wild (Table 1).

The most important use categories were food, and medicinal. For the demographics of all participants see Table 2.
### Table 1 - Plants used in Kahketi and Kvemo Kartli

| Plant family    | Scientific name                        | Georgian Name and (Transliteration) | Name other language and (Transliteration) (Lak, Ude, Ossetian and Tushetian) | Use description                        | Part used      | Location   |
|-----------------|----------------------------------------|-------------------------------------|-----------------------------------------------------------------------------|----------------------------------------|----------------|------------|
| Actinidiaceae   | Actinidia callosa Lindl.               | კივი (k'ivi)                        | Human Food                                                                  | Fruit                                  | Garden         |
| Adoxaceae       | Sambucus ebulus L.                     | ანწლი (ants'li), ანწილი (ants'ili) | Human Food (Raw and Alcohol), Medicinal (Tincture),                         | Fruit                                  | Forest         |
| Adoxaceae       | Sambucus nigra L.                      | ანწლი (ants'li), ანწილი (ants'ili) | Human Food, Medicinal                                                       | Fruit                                  | Forest         |
| Adoxaceae       | Viburnum opulus L.                    | (dzakhvelia), წორო (ts'oro)        | Medicinal (Cough), Utensils and Tools (Tools)                               | Fruit, Stem                            | Forest         |
| Agaricaceae     | Agaricus arvensis Schaeff.             | ქამა (k'ama)                        | Human Food                                                                  | Fruit                                  | Forest         |
| Amaranthaceae   | Amaranthus paniculatus L.              | ოორული ჯიჯლაყა (ts'iteli jijlaq'a), ოორული ოქრო (tatrula pkhali) | Human Food (Phkhali)                                                        | Leaves, Stem                           | Forest         |
| Amaranthaceae   | Amaranthus retroflexus L.              | ჩვეულებრივი ჯიჯლაყა (chveulebrivi jijlaq'a), წოწნარა (ts'ots'nara), ოორული ოქრო (tetr mi khali), ოორული ოქრი (tvitmaivala), ოორული ოქრო (mkhali-balaki), წოწნარა (ts'ots'nara), ოორული ოქრო (ts'riant'eli) | Human Food (Phkhali)                  | Leaves, Stem                           | Forest         |
| Amaranthaceae   | Amaranthus speciosus L.                | ოორული ჭამბალო (jijlaq'a-q'vavili) | Human Food (Phkhali, raw)                                                  | Leaves, Root                           | Garden         |
| Amaranthaceae   | Beta vulgaris L.                       | ჭარხალი (ch'arkhali)               | Human Food                                                                  | Root                                   | Garden         |
| Amaranthaceae   | Beta vulgaris L. ssp. cicla (L.) Moq.  | მანგოლდი (mangoldi)                | Human Food                                                                  | Leaves, Stem                           | Garden         |
| Amaranthaceae   | Chenopodium album L.                   | ნაცარქათამა (natsarkatama), ოოორო (mkhali) | Human Food (Phkhali)                                                        | Leaves, Stem                           | Forest         |
| Amaranthaceae   | Chenopodium bonus-henricus L.          | ნაცარქათამა (natsarkatama)        | Human Food (Phkhali)                                                        | Leaves, Stem                           | Garden         |
| Family               | Species (Common Name) | Georgian Name(s) | Uses and Applications                                                                 | Parts Used | Environment |
|----------------------|-----------------------|------------------|---------------------------------------------------------------------------------------|------------|-------------|
| Amaranthaceae        | Chenopodium foliosum  | ნაცარქათამა (natsarkatama) | Human Food (Phkhali)                                                                   | Leaves     | Forest      |
| Amaranthaceae        | Spinaca oleracea L.   | ისპანახი (isp'anakhi) | Human Food, Medicinal (Blood pressure)                                               | Leaves, Stem | Garden      |
| Amaryllidaceae       | Allium cepa L.        | ხახვი (khakhvi)   | Human Food (Phkhali, pickled, raw), Utensils and Tools (Dye)                          | Leaves, Bulb, Stem | Garden      |
| Amaryllidaceae       | Allium sativum L.     | ნიორი (niori)    | Human Food (Pickled, raw)                                                             | Leaves     | Forest      |
| Amaryllidaceae       | Allium ursinum L.     | მთის ღანძილი (mtis ghandzili), ღანძილი (g'andzili), სობო (sobo) | Human Food (Pickled, raw)                                                             | Leaves     | Forest      |
| Apiaceae             | Anethum graveolens L. | კამა (k'ama), ცერეცო დიდი კამა (tseretso didi k'ama) | Human Food (Spice, Condiment), Medicinal (Infusion)                                   | Leaves, Stem, Dry Seeds | Garden      |
| Apiaceae             | Anthriscus sylvestris L. | ჭყიმი (ch'q'imi), ღიმის დედა (g'imis deda) | Human Food (Phkhali)                                                                   | Leaves     | Forest      |
| Apiaceae             | Apium graveolens L.   | ნიახური (niakhuri) | Human Food (Phkhali, spice)                                                           | Leaves     | Garden      |
| Apiaceae             | Chaerophyllum aureum L. | ყინტორა (q'int'ora), ხოზო (khozo) | Human Food                                                                            | Buds       | Forest      |
| Apiaceae             | Chaerophyllum bulbosum L. | ღიმი (g'imi), ატოლი (at'oli) | Human Food (Pickled)                                                                  | Leaves, Stem | Forest      |
| Apiaceae             | Chaerophyllum caucasicum (Fisch.) B. Schischk | ღიმი (g'imi), ატოლი (at'oli) | Human Food (Phkhali)                                                                  | Leaves, Stem | Forest      |
| Apiaceae             | Coriandrum sativum L. | ქინძი (kindzi)   | Human Food (Phkhali, Spice)                                                           | Leaves      | Garden      |
| Apiaceae             | Daucus carota L. ssp. sativus | სტაფილო (st'apilo) | Human Food                                                                            | Root, Leaves, Stem | Garden, Forest |
| Apiaceae             | Falcaria vulgaris Bernh. | კოფრჩხილა (k'oprchkhila), ბატიფეხა (bat'ipekha) | Human Food (Phkhali, pickled)                                                        | Leaves, Stem | Forest      |
| Apiaceae             | Heracleum sosnowskyi Manden | დიყი (diq'i), ხევსურის დიყი (khevsuris diq'i), დიყინა (diq'ina) | Human Food (Pickled)                                                                  | Lower part of Stem, Seeds | Forest      |
| Family         | Species                                                                 | Common Names                      | Uses                                              | Location         |
|---------------|-------------------------------------------------------------------------|-----------------------------------|--------------------------------------------------|------------------|
| Apiaceae      | *Heracleum* sp.                                                         | დიყი (diq'i)                      | Human Food (Pickled)                             | Forest           |
| Apiaceae      | *Hyppomaratum* crispum (Pers.) Boiss.                                   | ბურბურა, ქარქვეტა (burbura, karkvet'a) | Human Food (Phkhali), Medicinal                  | Leaves, Forest   |
| Apiaceae      | *Petroselinum* crispum (Mill.) Fuss                                   | ახნაქრუხში, მაღდანოზი (okhrakhushi, mag'danozi) | Human Food (Spice), Medicinal                    | Leaves, Garden   |
| Apocynaceae   | *Vinca* major L.                                                       | გველის სურო (gvelis suro)        | Medicinal (Blood pressure)                       | Leaves, Garden   |
| Araliaceae    | *Hedera* colchica (K. Koch) K. Koch                                     | ჰურო (suro)                       | Medicinal                                        | Leaves, Garden   |
| Asparagaceae  | *Asparagus* officinalis L.                                               | სატაცური (sat'atsuri)             | Human Food (Phkhali, cooked)                     | Leaves, Forest, Garden |
| Asparagaceae  | *Yucca* filamentosa L.                                                  | იუკა (iuk'a)                      | Utensils and Tools                              | Leaves, Garden   |
| Asphodelaceae | *Aloe* barbadensis Mill.                                                | ალოე (aloe)                       | Medicinal                                       | Whole Plant, Garden |
| Asteraceae    | *Achillea* millefolium L.                                               | ფარსმანდუკი, მელაგუნდა (parsmanduk'i, melagunda) | Medicinal                                        | Leaves, Forest   |
| Asteraceae    | *Arctium* lappa L.                                                      | იროვანდი, ძირხვენა (orovandi, dzirkhvena) | Human Food (Phkhali)                            | Leaves, Forest   |
| Asteraceae    | *Artemisia* dracunculus L.                                              | ვარდკაჭაჭა, ტიტა (vardk'ach'ach'a, t'it'a) | Human Food (Phkhali, Beverage), Medicinal (Bath) | Leaves, Garden, Forest |
| Asteraceae    | *Bidens* tripartida L.                                                  | არქცუ (ork'bila), ხათალდიდნყ (chereda, khataldidinq') | Medicinal                                        | Flower, Garden   |
| Asteraceae    | *Calendula* officinalis L.                                              | გულყვითელა, კალენდულა (gulq'vitela, k'alendula) | Human Food (Phkhali, Coffee replacement), Medicinal (Diarrhea) | Buds, Leaves, Garden, Root, Garden |
| Asteraceae    | *Cichorium* intybus L.                                                  | თეთრი ნარი, ნარი (tetri nari, nari) | Medicinal                                        | Leaves, Garden   |
| Asteraceae    | *Cirsium* incanum (S.G. Gmel.) Fisch. ex M. Bieb.                      | ტეთრი ნარი, ნარი (tetri nari, nari) | Medicinal                                        | Leaves, Garden   |
| Asteraceae    | *Erigeron* canadensis L.                                                | ტარხუნა (t'arkhuna)               | Human Food, Medicinal                            | Leaves, Garden   |
| Asteraceae    | *Helianthus* tuberosus L.                                               | მიწავაშლა, მიწის ვაშლი (mits'avashlia, mits'is vashli) | Human Food, Medicinal                            | Root, Garden     |
| Family              | Species                                      | Common Names | Part Used               | Use                              | Habitat     |
|---------------------|----------------------------------------------|--------------|-------------------------|----------------------------------|-------------|
| Asteraceae          | *Matricaria chamomila* L.                   | *გვირილა* (gvirila) | leaves, flower          | Medicinal                        | Garden      |
| Asteraceae          | *Pyrethrum* sp.                             | *გვირილა* (gvirila), *მინდვრის გვირილა* (mindvis gvirila) | leaves, whole plant          | Medicinal                        | Forest      |
| Asteraceae          | *Serrula quinquefolia* Bieber ex Willd.     | *გვირილა* (gvirila), *მოთხოვნა მინდვრის გვირილა* (pinhvani mindvis gvirila) | leaves, flower              | Human Food                         | Forest      |
| Asteraceae          | *Silybum marianum* (L.) Gaertn.             | *გვირილა* (gvirila), *მინდვრის გვირილა* (mindvis gvirila) | leaves, seed               | Medicinal (Liver)                 | Forest      |
| Asteraceae          | *Tagetes patula* L.                         | *ყვითელი ყვავილი* (qhvitheli qhvavili), *იმერული ზაფრანა* (imeruli zaphrana), *იაყააქ* (yaq'aaku) | leaves, petals             | Human Food (Spice)                 | Garden      |
| Asteraceae          | *Taraxacum officinale* Wigg.                | *ბაბუაწვერა* (babuats'vera) | leaves, stem, root, flower | Human Food (Phkhali), Medicinal (Cold) | Garden, Forest |
| Asteraceae          | *Tragopogon* sp.                           | *ფამფარა* (pampara) | leaves                 | Human Food (Phkhali)             | Forest      |
| Asteraceae          | *Tussilago farfara* L.                      | *ვირისტერფა* (virist'erpa) | leaves                 | Medicinal (Infusion)             | Forest      |
| Asteraceae          | *Xanthium strumarium* L.                    | *ღორის ბირკა* (g'oris birk'a), *ბირკა* (birk'a), *ცეცხლეკალა* (tsetskhlek'ala), *კუტეკალა* (kutesk'ala) | leaves                 | Human Food (Phkhali), Medicinal    | Forest      |
| Berberidaceae       | *Berberis vulgaris* L.                      | *კოწახური* (k'ots'akhuri) | leaves                 | Human Food                        | Forest      |
| Betulaceae          | *Carpinus caucasica* Grossh.                | *რცხილა* (rtskhila) | stem, root, tool        | Utensils and Tools (Tools)        | Forest      |
| Betulaceae          | *Alnus barbata* C.A. Mey.                   | *მურქა* (murykh'a), *ნახო* (nakho) | leaves                 | Utensils and Tools (Tools)        | Forest      |
| Betulaceae          | *Betula litwinowii* Dolich.                 | *აჭი* (arq't) | leaves                 | Utensils and Tools (Tools)        | Forest      |
| Betulaceae          | *Betula pendula* Roth                       | *აჭი* (arq't) | leaves                 | Utensils and Tools (Tools)        | Forest      |
| Betulaceae          | *Carpinus caucasica* Grossh.                | *შავი რცხილა* (shavi rtskhila) | leaves                 | Utensils and Tools (Tools)        | Forest      |
| Betulaceae          | *Carpinus orientalis* Mill.                 | *ჯაგრცხილა* (jagrtskhila), *თეთრი რცხილა* (tetri rtskhila) | leaves                 | Utensils and Tools (Tools), Fuel (Firewood) | Forest      |
| Family       | Genus and Species                          | Scientific Name     | Common Names (Georgian) | Part(s) Used          | Use(s)                          | Habitat(s)  |
|--------------|--------------------------------------------|---------------------|-------------------------|-----------------------|---------------------------------|-------------|
| Betulaceae   | Corylus avellana L.                        |Betulaceae Corylus avellana L. | თხილი (tkhili)          | Human Food            | Fruit                           | Garden      |
| Betulaceae   | Corylus pontica K. Koch.                  |Betulaceae Corylus pontica K. Koch. | თხილი (tkhili)          | Human Food            | Fruit                           | Forest      |
| Boletaceae   | Boletus edulis Bull.                      |Boletaceae Boletus edulis Bull. | თხილი (tkhili)          | Human Food            | Fruit                           | Forest      |
| Boraginaceae | Symphytum caucasicum M. Bieb.             |Symphytum caucasicum M. Bieb. | თხილი (tkhili)          | Human Food            | Fruit                           | Forest      |
| Brassicaceae | Brassica oleracea L.                      |Brassicaceae Brassica oleracea L. | თხილი (tkhili)          | Human Food            | Fruit                           | Garden      |
| Brassicaceae | Brassica oleracea L. var. italica         |Brassicaceae Brassica oleracea L. var. italica | თხილი (tkhili)          | Human Food            | Leaves                          | Garden      |
| Brassicaceae | Capsella bursa-pastoris L.                |Brassicaceae Capsella bursa-pastoris L. | თხილი (tkhili)          | Human Food            | Leaves                          | Forest      |
| Brassicaceae | Lepidium sativum L.                       |Brassicaceae Lepidium sativum L. | თხილი (tkhili)          | Human Food            | Leaves                          | Garden      |
| Brassicaceae | Raphinastrum rugosum L. All.              |Brassicaceae Raphinastrum rugosum L. All. | თხილი (tkhili)          | Human Food            | Leaves                          | Garden      |
| Campanulaceae| Campanula latifolia L.                    |Campanulaceae Campanula latifolia L. | თხილი (tkhili)          | Human Food            | Leaves, Stems                   | Forest      |
| Cannabaceae  | Humulus lupulus L.                        |Cannabinaceae Humulus lupulus L. | თხილი (tkhili)          | Human Food            | Leaves                          | Garden      |
| Cannaceae    | Canna indica L.                           |Cannaceae Canna indica L. | თხილი (tkhili)          | Human Food            | Leaves                          | Garden      |
| Caryophyllace| Stellaria media (L.) Vill.               |Caryophyllace Stellaria media (L.) Vill. | თხილი (tkhili)          | Human Food            | Leaves                          | Garden      |
| Cornaceae    | Comus mas L.                              |Cornaceae Comus mas L. | თხილი (tkhili)          | Human Food            | Leaves                          | Garden      |
| Cornaceae    | Swida australis (C.A. Mey.) Pojark ex Grossh. |Cornaceae Swida australis (C.A. Mey.) Pojark ex Grossh. | თხილი (tkhili)          | Human Food            | Leaves                          | Garden      |
| Corylaceae   | Carpinus caucasica Grossh.                |Corylaceae Carpinus caucasica Grossh. | თხილი (tkhili)          | Human Food            | Leaves                          | Garden      |
| Corylaceae   | Corylus ibericus L.                       |Corylaceae Corylus ibericus L. | თხილი (tkhili)          | Human Food            | Leaves                          | Garden      |
| Family               | Genus                      | Species                                      | Common Name in Georgian | Part(s)       | Use(s)                      | Location  |
|----------------------|----------------------------|----------------------------------------------|--------------------------|---------------|-----------------------------|-----------|
| Crassulaceae         | Sempervivum cacasicum      | Rupr. ex Boiss.                             | კლდის დუმა (k’ldisduma Tushetian) | Leaves       | Medicinal (Impotence, Wounds) | Garden    |
| Cucurbitaceae        | Bryonia dioica             | Jacq.                                        | ლეშურა, ადამის ძირი (leshura, adamis dziri) | Leaves       | Human Food (Phkhali)         | Forest    |
| Cucurbitaceae        | Citrullus lanatus          | (Thunb.) Matsum. & Nakai                    | ჰუჭერო (Svan) (tchqhero) | Stem          | Medicinal (Urinary - Kidney) | Garden    |
| Cucurbitaceae        | Cucumis sativus            | L.                                           | კიტრი (k’it’ri)         | Leaf          | Human Food (Cooked, Pickled) | Garden    |
| Cucurbitaceae        | Cucurbita sp.              |                                              | გოგრა (gogra)            | Fruits        | Human Food (Cooked, Pickled) | Garden    |
| Cucurbitaceae        | Citrullus lanatus          | (Thunb.) Matsum. & Nakai                    | ჰუჭერო (Svan) (tchqhero) | Stem          | Medicinal (Urinary - Kidney) | Garden    |
| Cucurbitaceae        | Cucurbita sp.              |                                              | გოგრა (gogra), ყაბაყი (q’abaq’i) | Fruit         | Human Food                  | Garden    |
| Cupressaceae         | Juniperus depressa         | Raf. ex M’Murtrie                            | ღვია (g’via)             | Leave         | Fuel for smoking ham        | Forest    |
| Cupressaceae         | Juniperus sabina           | L.                                           | ჸვიტა (shvit’a), ცხენისკუდა (tskhenisk’uda) | Leaves       | Medicinal                   | Garden    |
| Cupressaceae         | Juniperus sabina           | L.                                           | ჸვიტა (shvit’a), ცხენისკუდა (tskhenisk’uda) | Leaves       | Medicinal                   | Garden    |
| Dryopteridaceae      | Dryopteris filix-mas       | (L.) Schott.                                 | ჩადუნა (chaduna), ჩადი (chadi) | Stem          | Human Food (Phkhali), Utensils and Tools (Filter for Wine) | Forest    |
| Ebenaceae            | Diospyros lotus            | L.                                           | ჩადი (chadi)             | Leaf          | Human Food                  | Garden    |
| Elaeagnaceae         | Elaeagnus sp.              |                                              | ხურმა (khurma)           | Fruits        | Human Food                  | Forest    |
| Ericaceae            | Vaccinium myrtillus        | L.                                           | შალშავი (shalshavi)      | Leaf          | Human Food                  | Forest    |
| Fabaceae             | Gleditsia sp.              |                                              | გელიდიჩია (gledichia), მურმანის ეკალი (murmanis ek’ali) | Leaves       | Medicinal, Utensils and Tools (Tools) | Forest    |
| Fabaceae             | Lathyrus roseus            | Steven                                       | არჯაკელი (arjak’eli)     | Leaf          | Human Food (Phkhali)        | Forest    |
| Fabaceae             | Phaseolus sativus          | L.                                           | ლობიო (lobio)            | Leaf          | Human Food                  | Garden    |
| Family     | Species                        | Common Name(s) | Uses                                                                 | Parts Used | Growing Area |
|------------|--------------------------------|----------------|----------------------------------------------------------------------|------------|---------------|
| Fabaceae   | *Pisum sativum* L.             | Barda          | Human Food, Animal Food (Cows)                                        | Seeds      | Garden        |
|           | *Robinia pseudoacacia* L.      | Ak'atsia, lobos khe | Human Food (Pickled), Utensils and Tools (Poles)                      | Flower, Stem | Forest        |
|           | *Trigonella caerulea* (L.) Ser.| Utskho suneli  | Human Food (Spice)                                                    | Seeds      | Garden        |
|           | *Vicia faba* L.                | Tsertsvi       | Human Food, Animal Food (Cows)                                        | Seeds      | Garden        |
| Fagaceae   | *Castanea sativa* Mill.        | Ts'abil, ch'iper | Human Food, Utensils and Tools (Tools)                                | Fruit, Stem | Forest        |
|           | *Fagus orientalis* Lipsky      | Ts'ipela       | Human Food, Utensils and Tools (Tools), Construction (Timber), Animal Food (Fodder), Fuel (Firewood) | Fruit, Seeds, Stem | Forest |
| Fagaceae   | *Quercus iberica* M. Bieb      | Mukha, kartuli mukha, ts'ali mukha, nile | Human Food, Utensils and Tools (Tools), Construction (Timber), Animal Food (Fodder), Fuel (Firewood), Human Food, Medicinal | Stem, Fruit, Leaves | Forest |
| Fagaceae   | *Quercus macranthera* Fisch. & C.A. Mey. ex Hohen. | K'avk'asiuri mukha, Mukha, patari mukha | Utensils and Tools (Tools)                                            | Stem       | Forest        |
| Fungi      |                                | Miligaumachi   | Human Food                                                            | Fruiting body | Forest        |
| Fungi      |                                | Tsianasoko     | Human Food                                                            | Fruiting body | Forest        |
| Geraniaceae| *Pelargonium* sp.              | Motskhari      | Medicinal                                                            | Leaves     | Garden        |
| Grossulariaceae | *Ribes* sp.             | Motskhari      | Human Food                                                            | Fruit      | Forest        |
| Guttiferae | *Hypericum perforatum* L.     | K'razana        | Medicinal, Utensils and Tools (Dye)                                   | Leaves, Flowers, Stem, Root | Forest |
| Family          | Genus and Species                      | Common Names (Georgian, Ossetian) | Uses                                                                 | Habitats                      |
|-----------------|----------------------------------------|-----------------------------------|----------------------------------------------------------------------|-------------------------------|
| Juglandaceae    | *Juglans regia* L.                     | კაკალი (k'ak'ali), ჰექე (heke)    | Utensils and Tools (Tools), Human Food, Utensils and Tools (Dye)     | Stem, Fruit, Seeds, Root       |
|                 | *Pterocarya pterocarpa* (Michx.) Kunth ex Iljinsk. | ლაფანი (lapani)                  | Utensils and Tools (Tools)                                           | Stem                          |
| Lamiaceae       | *Lamium album* L.                      | ჭინჭრის დედა (ch'inch'ris deda)  | Human Food (Phkhali)                                                | Leaves, Forest                |
|                 | *Lamium purpureum* L.                  | ბებრისკონკა (bebbrisk'onk'a), ბებრიკონკა (bebrik'onk'a) | Human Food (Phkhali)                                                | Leaves, Forest                |
|                 | *Leonurus cardiaca* L.                 | შავბალახა (shavbalakha)          | Medicinal                                                            | Leaves, Garden                |
|                 | *Mentha pulegium* L.                   | პიტნა (p'it'na), ტყის პიტნა (t'q'is p'it'na) | Human Food (Raw, Tea), Medicinal                                    | Leaves, Garden                |
|                 | *Ocimum basilicum* L.                  | რეჰანი (rehani), საშკულავი (sashk'ulavi) | Human Food (Phkhali), Medicinal (Infusion)                          | Leaves, Stem                  |
|                 | *Satureja hortensis* L.                | ქონდარი (kondari)                | Human Food (Spice)                                                  | Leaves, Garden                |
|                 | *Satureja spicigera* (C. Koch) Boiss.  | ქონდარი (kondari)                | Human Food (Phkhali)                                                | Leaves, Stem                  |
|                 | *Thymus sp.*                           | ბეგქონდა (begkondara), ველური ქონდარი (veluri kondari), მინდვრის ქონდარი (mindvris kondari) | Human Food (Phkhali), Medicinal (Infusion)                          | Leaves, Forest                |
|                 | *Ziziphora serpyllacea* M. Bieb.       | ურცი (urtsi)                     | Medicinal                                                            | Leaves, Forest                |
| Lauraceae       | *Laurus nobilis* L.                    | დაფნა (dapna)                    | Human Food (Phkhali)                                                | Leaves, Garden                |
| Liliaceae       | *Polygonatum glaberrimum* C. Koch.     | სვინტრი (svint'ri)               | Human Food (Phkhali)                                                | Leaves, Forest                |
| Lythraceae      | *Punica granatum* L.                   | ბროწეული (brots'euli)           | Human Food (Raw, Tkhemali), Utensils and Tools (Dye)                | Fruit, Stem                   |
| Malvaceae       | *Althaea spp.*                         | ტუხტი (t'ukht'i)                 | Human Food (Phkhali)                                                | Leaves, Forest                |
|                 | *Malva neglecta* L.                    | ბალბა (balba)                   | Human Food (Phkhali), Medicinal                                    | Leaves, Garden                |
|                 | *Malva sylvestris* L.                  | ბალბა (balba)                   | Human Food (Phkhali)                                                | Leaves, stem                  |
|                 |                                        |                                   |                                                                     | Forest, Garden                |
| Family          | Genus and Species                        | Common Names                          | Uses                              | Parts Used                           | Habitats            |
|-----------------|------------------------------------------|---------------------------------------|-----------------------------------|--------------------------------------|---------------------|
| Malvaceae       | *Tilia caucasica* Rupr.                  | ცაცხვი (tsatskhvi), ჰადას (hadas)    | Medicinal (Infusion), Utensils and Tools (Tools) | Leaves, Stem              | Forest              |
| Moraceae        | *Ficus carica* L.                        | ლეღვი (leg'vi)                        | Human Food, Medicinal             |                       | Fruit, Leaves      | Forest              |
| Moraceae        | *Morus alba* L.                          | თუთა (tuta), შავი (shavi)            | Human Food, Medicinal, Animal Food (Silkworms) |                       | Garden              |
| Moraceae        | *Mirabilis jalapa* L.                    | გულისაბა (gulisaba)                  | Utensils and Tools (Tools Tool handles) |           |                   | Forest              |
| Moraceae        | *Syringia vulgaris* L.                   | იასამანი (iasamani)                  | Medicinal                          |                       | Leaves              | Forest              |
| Moraceae        | *Matthiacea struthiopteris* (L.) Todd.   | ჩადუნა (chaduna), ჩადი (chadi)       |                       |                       |                    | Forest              |
| Moraceae        | *Syringia vulgaris* L.                   | იასამანი (iasamani)                  |                       |                       |                    | Forest              |
| Oleaceae        | *Fraxinus excelsior* L.                  | ცოხ (izid - Udin), ცოხ (ipan - Ossetian) | Utensils and Tools (Tools Tool handles) |           |                   | Forest              |
| Oleaceae        | *Oxalis corniculata* L.                  | მანჭკვალა (mantchkvala)              | Human Food (Phkhali)              |                       | Leaves, Stem, Whole Plant Stem | Garden              |
| Oleaceae        | *Chelidonium majus* L.                   | ქრისტესიხლა (krist'esiskhla)        | Medicinal, Utensils and Tools (Dye) |                       | Leaves, Stem, Seed, Young Leaves and Stems | Forest, Garden |
| Oleaceae        | *Papaver somniferum* L.                  | ყაყაჩო (q'aq'acho)                  | Human Food (Seeds, Phkhali)        |                       | Forest              |
| Paulowniaceae   | *Paulownia imperialis* Sieb.             | პავლონია (pavlonia)                 | Utensils and Tools (Tools)         |                       | Stem                | Forest              |
| Physalacriaceae | *Armillaria mellea* (Vahl) P. Kumm       | მანჩხვალა (manchkhvala)              | Human Food                         |                       | Fruiting body       | Forest              |
| Pinaceae        | *Picea orientalis* (L.) Peterm.          | ნაძვი (nadzvi)                       | Human Food, Utensils and Tools (Tools) |                       | Cone young, Stem   | Forest              |
| Pinaceae        | *Pinus sosnowskyi* Nakai                 | ქერი (keri)                         | Human Food, Utensils and Tools (Tools) |                       | Cone young, Stem   | Forest              |
| Pinaceae        | *Setaria italica* (L.) P. Beauv.         | ფეტვი (pet'vi)                       |                       |                       |                    | Garden              |
| Poaceae         | *Avena sativa* L.                        | შვრია (shvria)                      |                       |                       |                    | Garden              |
| Poaceae         | *Hordeum vulgare* L.                     | ქერი (keri)                         |                       |                       |                    | Garden              |
| Poaceae         | *Secale cereale* L.                      | ჭვავი (ch'vavi)                     |                       |                       |                    | Garden              |
| Poaceae         | *Setaria italica* (L.) P. Beauv.         | ჭვავი (ch'vavi)                     |                       |                       |                    | Garden              |
| Family          | Species                          | Common Name (Georgian)                  | Use                          | Other Uses                                      |
|-----------------|----------------------------------|----------------------------------------|-------------------------------|------------------------------------------------|
| Poaceae         | *Triticum dicoccum* Schrank     | თალუ (asli)                           | Human Food                    | Seed                                            |
| Poaceae         | *Zea mays* L.                   | ხოჭახი (simindi)                      | Human Food, Medicinal         | Seeds, Garden                                   |
| Polygonaceae    | *Polygonum aviculare* L.        | ანალი (asli)                          | Human Food (Phkhali)          | Leaves, Forest                                  |
| Polygonaceae    | *Rheum rhabarbarum* L.          | ანალი (asli)                          | Human Food (Phkhali)          | Leaves, Forest                                  |
| Polygonaceae    | *Rumex acetosa* L.              | გჰურა (mgshauna)                      | Human Food (Khachapuri, Phkhali) | Leaves, Forest                                  |
| Polygonaceae    | *Rumex scutatus* L.             | ლახტარა (lakht'ara)                   | Human Food (Khachapuri, Phkhali) | Leaves, Forest                                  |
| Polygonaceae    | *Rumex sp.*                     | გოლო (g'olo)                          | Human Food (Phkhali, Pickled), Medicinal, Utensils and Tools (Dye) | Leaves, Young Stems, Root                      |
| Polypodiaceae   | *Polypodium vulgare* L.         | კილამურა (k'ilamura), ძირტკბილა (dzirt'k'bila) | Medicinal (Cough), Utensils and Tools (Tools) | Root                                           |
| Portulacaceae   | *Portulaca oleracea* L.         | დანდური (danduri), კატკატო (k'at'k'at'o) | Human Food, Medicinal         | Leaves, Forest, Garden                          |
| Rhamnaceae      | *Paliurus spina-christi* Mill.  | ჯადა (dz zapo, jago (jagi))           | Utensils and Tools (Fences), Medicinal (Infusion) | Leaves                                          |
| Rhamnaceae      | *Ziziphus jujuba* Mill.         | უნაბი (unabi), ურნაბი (urnabi)       | Human Food                    | Fruit                                           |
| Rhododendrcae   | *Rhododendron caucasicum* Pall. | დეკა (dek'a)                          | Medicinal (Infusion)          | Leaves, Forest                                  |
| Rosaceae        | *Crataegus curvisepala* Lindm.  | თეთრი კუნელი (tetri kuneli), კვინელი (k'vineli) | Human Food (Raw, Tea), Medicinal | Fruits, Leaves                                  |
| Rosaceae        | *Crataegus pentagyna* Waldst.   | შავი კუნელი (shavi kuneli), კვინელი (k'vineli) | Human Food (Raw, Tea), Medicinal | Fruits, Leaves                                  |
| Rosaceae        | *Crataegus sp.*                 | ქუნელი (k'uneli), ქუნელი (q'avisperi kuneli) | Human Food (Raw, Tea, Compote), Medicinal (Infusion) | Fruits, Leaves                                  |
| Rosaceae        | *Cydonia oblonga* L.            | კომში (k'omshi)                       | Human Food, Utensils and Tools (Tools), Medicinal (Infusion) | Fruit, Stem, Garden                            |
| Rosaceae        | *Eriobotrya japonica* (Thunb.) Lindl. | მუშმულა (mushmula), ბუშმალა (bushmala) | Human Food, Utensils and Tools (Tools), Medicinal (Infusion) | Fruit, Garden                                   |
| Rosaceae                      | Fragaria vesca L.                     | მარწყვი (marts'q'vi)                      | Human Food | Fruit | Garden |
|-------------------------------|--------------------------------------|------------------------------------------|------------|-------|--------|
| Rosaceae                      | Fragaria x ananassana Duchesne ex Rozier | მარწყვი (marts'q'vi)                      | Human Food | Fruit | Garden |
| Rosaceae                      | Malus orientalis Uglizk.              | ვაშლი, მაჟალო (vashli, mazhalo)         | Human Food (Phkhali, Raw) | Fruit | Garden, Forest |
| Rosaceae                      | Mespilus germanica L.                 | ზღმარტლი, ყირიპ (zg'mart'li, q'irip') | Human Food | Fruit | Forest |
| Rosaceae                      | Prunus amygdalus Batsch               | ვაშლატამა (vashlat'ama)                  | Human Food | Fruit | Garden |
| Rosaceae                      | Prunus avium (L.) var. silvestris     | ბალამწარა (balamtsara)                  | Human Food | Fruit, Leaves | Garden |
| Rosaceae                      | Prunus cerasus L.                     | ალუბალი (alubali)                       | Human Food | Raw, Phkhali) | Garden, Forest |
| Rosaceae                      | Prunus divaricata Ledeb.              | ტყემალი, ტიყი (t'q'emali, t'iq'i)        | Human Food | Raw, Tkhemali) | Garden |
| Rosaceae                      | Prunus dulcis Mill. D.A. Webb.        | ხუში (nushi)                            | Medicinal | Fruit | Garden |
| Rosaceae                      | Prunus insititita L.                  | გოგ'ნოშო (g'og'nosho), მურაკი (murak'i) | Human Food | Fruit | Forest |
| Rosaceae                      | Prunus padus L.                       | ატამი (at´ami)                          | Human Food | Fruit | Garden |
| Rosaceae                      | Prunus persica (L.) Batsch             | პანტა (p'ant'a)                         | Human Food | Fruit | Garden |
| Rosaceae                      | Prunus spinosa L.                     | ტყის მურაკი (t'q'is murak'i)             | Human Food | Fruit | Forest |
| Rosaceae                      | Prunus vachuschtii Bregaze            | ალუჩა (alucha)                         | Human Food | Fruit | Garden |
| Rosaceae                      | Prunus x domestica L.                 | ქლიავი, ჭანჭური (kliavi, ch'anch'uri)  | Human Food | Fruit | Garden |
| Rosaceae                      | Pyrus caucasica Fed.                  | პანტა (p'ant'a)                         | Human Food | Fruit | Garden |
| Rosaceae                      | Pyrus communis L.                     | მსხალი (mskhali)                       | Human Food | Fruit | Garden |
| Rosaceae                      | Rosa sp.                              | ასკილი, ვარდი (ask'ili, vardi)         | Human Food (Raw, Jam), Medicinal | Fruit | Flowers |
| Rosaceae                      | Rubus fruticosus L.                   | მაყვალი (maq'vali)                      | Human Food (Raw, Jam) | Fruit | Forest |
| Rosaceae                      | Rubus ideus L.                        | ჯოლი (zholi), ჯოლო (zholi)           | Human Food, Medicinal | Fruit, Leaves | Garden, Forest |
| Rosaceae                      | Rubus sp.                             | მაყვალი (maq'vali)                      | Human Food | Fruit, Stem | Forest |
| Rosaceae                      | Sorbus aucuparia K. Koch              | ჭნავი, ცირცელი (ch'navi, tsirtseli)     | Human Food (Infusion), Utensils and Tools | Fruit | Forest |
| Rosaceae                      | Sorbus aucuparia K. Koch              | ჭნავი, ცირცელი (ch'navi, tsirtseli)     | Human Food (Infusion), Utensils and Tools | Fruit | Forest |
| Rosaceae                      | Rosa sp.                              | მაყვალი (maq'vali)                      | Human Food | Fruit, Stem | Forest |
| Rosaceae                      | Sorbus aucuparia K. Koch              | ჭნავი, ცირცელი (ch'navi, tsirtseli)     | Human Food | Fruit, Stem | Forest |
| Family       | Species                                                | Common Names          | Type                              | Plant Part       | Area                  |
|--------------|--------------------------------------------------------|-----------------------|-----------------------------------|------------------|-----------------------|
| Rosaceae     | *Sorbus terminalis* C.Crantz.                         | Tameli               | Human Food                       | Fruit            | Forest                |
| Rubiaceae    | *Rubia tinctorum* L.                                  | Endro                | Utensils and Tools (Dye)         | Stem             | Garden                |
| Russulaceae  | *Lactarius deliciosus* (L. ex Fr.) S.F. Grey          | Chada                | Human Food                       | Fruiting body    | Forest                |
| Rutaceae     | *Citrus limon* (L.) Burm. f.                          | Limoni               | Human Food                       | Fruit            | Garden                |
| Salicaceae   | *Populus pyramidalis* Rozier                          | Alvis khe            | Utensils and Tools (Tools)        | Stem             | Forest                |
| Salicaceae   | *Populus sp.*                                          | Verkhvi              | Utensils and Tools (Tools)        | Stem             | Forest                |
| Salicaceae   | *Salix alba* L.                                        | Ts'orri              | Utensils and Tools (Tools)        | Stem             | Forest                |
| Salicaceae   | *Salix babylonica* L.                                 | Dzets'na, T'ats'nura| Utensils and Tools (Tools)        | Stem             | Forest                |
| Salicaceae   | *Salix caprea* L.                                      | Mggnali, Polp'ala, Firipi| Medicinal, Utensils and Tools (Tools) | Leaves, Stem | Forest                |
| Santalaceae  | *Viscum album* L.                                      | Pitri                | Veterinary                        | Whole Plant      | Garden, Forest Garden |
| Sapindaceae  | *Acer campestre* L.                                    | Nek'erchhal        | Utensils and Tools (Tools)        | Stem             | Garden                |
| Sapindaceae  | *Acer cappadocicum* Gled.                              | Korapi               | Utensils and Tools (Tools)        | Stem             | Forest                |
| Sapindaceae  | *Acer trautvetteri* Medw.                              | Mg'almits Bok'vi    | Utensils and Tools (Tools)        | Stem             | Forest                |
| Scrophulariaceae | *Verbascum sp.*                                  | Kerikpla          | Medicinal (Hemorrhoids)           | Leaves           | Garden                |
| Simaroubaceae | *Ailanthus altissima* (Mill.) Swingle            | Khemq'rali, Gvelis khe, Mq'rali khe | Medicinal (Insect repellant), Utensils and Tools (Tools) | Leaves, Stem | Garden                |
| Smilacaceae  | *Smilax excelsa* L.                                    | Ek'alig'chi, EkA'la, Maq'al, G'i'ch'i| Human Food (Phkhali)           | Leaves           | Forest                |
| Solanaceae   | *Capsicum annuum* L.                                   | Ts'its'ak'a, Mts'are ts'its'ak'a | Human Food (Pickled, Raw)         | Fruit            | Garden                |
| Family         | Species                                              | Common Names                                                                 | Usage                                                                 | Part   | Habitat  |
|---------------|------------------------------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------|--------|----------|
| Solanaceae    | Capsicum annuum L. ssp. bulgari                      | ოთხთათმი (tsit'aka bulgaruli), ჭიჩქირა (k'bil'i tsit'sak'ia)               | Human Food (Pickled, Raw)                                            | Fruit  | Garden   |
| Solanaceae    | Lycium barbarum L.                                   | თეთრეკა (tetrek'ala), ჭალური (katsvi)                                    | Medicinal, Utensils and Tools (Fences)                                | Fruit, Stem | Forest  |
| Solanaceae    | Lycopersicum esculentum L.                           | პომიდორო (p'midori)                                                      | Human Food (Pickled, Raw)                                            | Fruit  | Garden   |
| Solanaceae    | Nicotiana rustica L.                                  | თამბაქო (tambako)                                                        | Cultural (Smoking tobacco)                                          | Leaves | Garden   |
| Solanaceae    | Nicotiana tabacum L.                                 | თამბაქო (tambako)                                                        | Cultural (Snuff)                                                    | Leaves | Garden   |
| Solanaceae    | Physalis alkekengi L.                                | ონტკოფა (ont'k'opa)                                                      | Human Food                                                          | Fruit  | Garden   |
| Solanaceae    | Solanum melogena L.                                  | თეთრეკა (tetrek'ala)                                                      | Human Food                                                          | Fruit  | Garden   |
| Solanaceae    | Solanum pseudocapsicum L.                            | თეთრეკა (tetrek'ala)                                                      | Human Food (Phkhalil, cooked)                                       | Fruit  | Garden   |
| Solanaceae    | Solanum tuberosum L.                                 | თეთრეკა (tetrek'ala)                                                      | Human Food (Pickled)                                                | Fruit  | Garden   |
| Staphyleaceae | Staphylea colchica Steven                            | ჯონჯოლი (jonjoli), ჭონჯოლა (jonjola)                                   | Human Food (Pickled)                                                | Forest, Young shoots | Garden  |
| Taxaceae      | Taxus baccata L.                                      | ურთხელი უთხოვარი (urtkheli utkhovari)                                  | Construction (Timber)                                              | Stem   | Forest   |
| Tropaeolaceae | Tropaeolum majus L.                                  | ჯონჯოლი (jonjoli)                                                      | Human Food (Phkhalil)                                               | Leaves | Garden   |
| Ulmaceae      | Ulmus sp.                                             | სველჯ თელა (svelj - Tela)                                                | Utensils and Tools (Tools), Medicinal (Fractures)                         | Stem, Root | Forest  |
| Urticaceae    | Urtica dioica L.                                      | ჭინჭარი (ch'inch'ari)                                                   | Human Food (Phkhalil, Kinkali)                                       | Leaves | Forest   |
| Violaceae     | Viola sp.                                             | ია (ia), იაია (iaia)                                                     | Human Food                                                                         | Fruit  | Forest   |
| Vitaceae      | Vitis sylvestris W. Bartram                          | უსურვაზი (usurazi)                                                      | Human Food, Ornamental                                               | Fruit  | Garden   |
| Vitaceae      | Vitis vinifera L.                                     | ყურძენი (q'urdzeni)                                                     | Human Food                                                                         | Fruit  | Garden   |
Table 2. Participants in Kakheti and Kvemo Kartli

| informant code | gender | age | community | elevation m | district       |
|----------------|--------|-----|-----------|-------------|----------------|
| 256            | F      | 80  | Verona    | 1260        | Sagarejo       |
| 257            | M      | 68  | Verona    | 1260        | Sagarejo       |
| 258            | F      | 73  | Verona    | 1260        | Sagarejo       |
| 259            | F      | 80  | Sig‘nag’i | 790         | Sig‘nag’i      |
| 260            | M      | 80  | Nukriani  | 970         | Sig‘nag’i      |
| 261            | F      | 80  | Nukriani  | 970         | Sig‘nag’i      |
| 262            | F      | 60  | Kvemo Magaro | 550     | Sig‘nag’i      |
| 263            | M      | 60  | Kvemo Magaro | 550     | Sig‘nag’i      |
| 264            | F      | 49  | Kedeli    | 720         | Sig‘nag’i      |
| 265            | M      | 60  | Kedeli    | 720         | Sig‘nag’i      |
| 266            | F      | 45  | Kedeli    | 720         | Sig‘nag’i      |
| 267            | F      | 50  | Kedeli    | 720         | Sig‘nag’i      |
| 268            | F      | 55  | Kedeli    | 720         | Sig‘nag’i      |
| 269            | F      | 45  | Kedeli    | 720         | Sig‘nag’i      |
| 270            | F      | 50  | Kedeli    | 720         | Sig‘nag’i      |
| 271            | F      | 55  | Kedeli    | 720         | Sig‘nag’i      |
| 272            | M      | 72  | Zinobiani | 600         | Kvareli        |
| 273            | M      | 70  | Lagodekhi | 450         | Lagodekhi      |
| 274            | F      | 40  | Akhalsopeli | 400     | Kvareli        |
| 275            | F      | 50  | Akhalsopeli | 460     | Kvareli        |
| 276            | F      | 55  | Akhalsopeli | 460     | Kvareli        |
| 277            | F      | 55  | Akhalsopeli | 460     | Kvareli        |
| 278            | F      | 66  | Satskhene | 775         | Kvareli        |
| 279            | M      | 62  | Chantlikure | 400     | Kvareli        |
| 280            | F      | 60  | Chantlikure | 400     | Kvareli        |
| 281            | F      | 42  | Pona      | 400         | Kvareli        |
| 282            | M      | 63  | Sagrasheni | 1180    | Tetritskaro    |
| 283            | M      | 60  | Sagrasheni | 1180    | Tetritskaro    |
| 284            | M      | 60  | Asureti   | 720         | Tetritskaro    |
| 285            | M      | 78  | Sagrasheni | 350     | Tetritskaro    |
| 286            | F      | 74  | Sagrasheni | 350     | Tetritskaro    |
| 287            | F      | 40  | Chkhikvta | 893         | Tetritskaro    |
| 288            | M      | 37  | Chkhikvta | 893         | Tetritskaro    |
| 289            | M      | 79  | Tetritskaro | 1120   | Tetritskaro    |
| 290            | F      | 65  | Sagrasheni | 350     | Tetritskaro    |
| 291            | F      | 65  | Sagrasheni | 350     | Tetritskaro    |
| 292            | F      | 70  | Sagrasheni | 350     | Tetritskaro    |
| 293            | F      | 70  | Sagrasheni | 350     | Tetritskaro    |
| 294            | F      | 70  | Sagrasheni | 350     | Tetritskaro    |
| 295            | F      | 70  | Sagrasheni | 350     | Tetritskaro    |
| 296            | F      | 70  | Sagrasheni | 350     | Tetritskaro    |
| 297            | F      | 55  | Sagrasheni | 350     | Tetritskaro    |
| 298            | M      | 82  | Didi magareti | 1098 | Tetritskaro    |
| 299            | F      | 85  | Didi magareti | 1098 | Tetritskaro    |
| 300            | F      | 55  | Kvemo Magaro | 500     | Sig‘nag’i      |

Participants were little differentiated by plant species reported, and age was not a distinctive factor for species knowledge differences (Fig. 6 A,B). However, in case of different plant uses, some clear differences were visible (Fig. 6 D,E). The location of the participant community significantly fit the ordination in plant-space (C, \( r^2 = 0.261 \)) and in use-space (E, \( r^2=0.373 \)) (Fig. 6 C,F). Overall, the elevation of the study community and the community location were the main separating variables for differences in both plant-space, with the community location being the most explicative factor (\( r^2=0.6763, P=0.001 \); Table 3) and use-space \( r^2=0.6628, P=0.001 \); Table 4), although in the latter gender and age also were highly significant in explaining differences in use, with women and older participants showing a higher knowledge of different plant uses. The number of plant species used in the research area, as well as their uses were much lower than reported from other areas of Georgia, with a mean of 41.1 plants known by participant (versus 58.1 in other areas), and a mean of 42.4 uses (versus 62.7 in other areas) (Figs. 7 and 8). The trend to know fewer species was less evident for cultivated species.
than for forest plants (Fig. 9). However, when observing plant uses, the lack of knowledge, as compared to other regions, was as significant for forest and garden species (Fig. 10).

Fig. 6. Participants ordered by their distance in plants reported (A,B,C) and in uses reported (D,E,F). Participants are more differentiated by plant species reported (A, participants shown but plant species hidden for visual clarity) than by use reported (D, participants and uses shown).
Table 3. Environmental fit on ordination of individuals in plant-space

|       | r^2  | p-value |
|-------|------|---------|
| Age   | 0.0475 | 0.347   |
| Elevation | 0.2843 | 0.001 *** |
| Gender | 0.1021 | 0.009 ** |
| Community | 0.6763 | 0.001 *** |
| District | 0.2632 | 0.004 ** |

Table 4. Environmental fit on ordination of individuals in use-space

|       | r^2  | p-value |
|-------|------|---------|
| Age   | 0.2897 | 0.001 *** |
| Elevation | 0.0880 | 0.146   |
| Gender | 0.1797 | 0.001 *** |
| Community | 0.6628 | 0.001 *** |
| District | 0.3732 | 0.001 *** |

Fig. 7. Number of plant uses reported by each participant in this study (2018) in comparison to previous studies in Georgia (2013-2017).

Discussion

As we hypothesized, the number of plant species used in the research area, as well as their uses were much lower than reported from other areas of Georgia, with a mean of 41.1 plants known by participant (versus 58.1 in other areas), and a mean of 42.4 uses (versus 62.7 in other areas), equally for Svaneti-Lechkhumi-Khevsureti (Bussmann et al. 2014, 2016a), Samtske-Javakheti (Bussmann et al. 2017a,b), and high altitude Tusheti-Khevsureti (Bussmann et al. 2016b, 2017c), and thus lower than species numbers and use reports than other areas in the wider Georgia (Bussmann et al. 2016c, Bussmann 2017; Zenderland et al. 2019). This might well be explained by the fact that Kakheti and Kvemo Kartli have fertile soils and short winters, and thus agricultural production is possible almost all year round. For this reason, foraging for wild vegetables is simply not a necessity, and expectedly herbal dishes like *Pkhali* are rarely found.

In addition, the entire region has easy access major markets, which again reduces the need for foraging. Likewise, the closeness to major health centers with well-functioning public health infrastructure reduces greatly the need to use herbal medicines.

The prevalence of wild collected species for medicinal applications, and garden species for food, was very similar in other regions (Bussmann et al. 2017a; Pieroni and Sõukand 2017).

Most species and uses were widely spread across the region Overall participants showed a high informant consensus in all use-categories. The large exceptions where Lagodekhi and Sagarejo, with very few species used, and Lagodekhi with a very low informant consensus (Table 5). This might be explained by the fact that both regions harbor large numbers of immigrants from other areas of Georgia, which all have different plant use traditions.
Fig. 9. Number of plant species known by each participant for forest and garden species.

Fig. 10. Number of use reports by each participant for forest and garden species.

Table 5. Mean informant consensus across use categories among informant districts, with total number of use reports and taxa.

| District    | N Use Categories | Total Use Reports | Total Taxa | ICF mean | ICF sd |
|-------------|------------------|-------------------|------------|----------|--------|
| Kvareli     | 5                | 463               | 127        | 0.61     | 0.19   |
| Lagodekhi   | 3                | 68                | 58         | 0.1      | 0.14   |
| Sagarejo    | 4                | 123               | 42         | 0.76     | 0.16   |
| Sig’nag’i   | 4                | 534               | 145        | 0.64     | 0.15   |
| Tetritskaro | 8                | 887               | 145        | 0.79     | 0.14   |
While many houses in some regions of Kvemo-Kartli still clearly show their Swabian heritage, no traces whatsoever of plant knowledge or plant names that might trace back to that heritage could be found, which indicates that after their deportation to Kazakhstan and Siberia during the 1940s, very few Swabians returned to the Caucasus, and their original contribution to local knowledge was completely erased.

Overall the research region showed a lower species number in comparison to a wide variety of studies published from other parts of Europe. The number of food species was low in comparison to other areas in the wider Mediterranean and Caucasus (Carvalho 2016; Dolina et al. 2017; Hajdari et al. 2018; Kasper-Pkosz et al. 2016; Korkmaz et al. 2016; Łuczaj et al. 2017, 2019; Mattalia et al. 2020; Melián et al. 2017; Mustafa et al. 2020; Nedelcheva et al. 2017; Oztürk et al. 2018; Polat et al. 2017; Pawera et al. 2017; Pieroni and Cattero 2018; Pieroni and Sůkandr 2017, 2019; Pieroni 2017; Pieroni et al. 2018, 2019, 2020; Savo et al. 2019; Sůkandr et al. 2017, 2019, 2020; Yeşil et al. 2019), and the number of medicinal species also was lower than in comparative studies (Pieroni and Sůkandr 2017; Nedelcheva et al. 2017; Melián et al. 2017; Sůkandr et al.- 2017; Carvalho 2016; Polat et al. 2017; Kasper-Pkosz et al. 2016; Korkmaz et al. 2016a; Dolina et al. 2017, Korkmaz et al. 2016b; Hajdari et al. 2018; Oztürk et al. 2018; Pawera et al. 2017; Pieroni 2017; Pieroni et al. 2018). The low variety of fungal species used as food was astonishing, especially when compared to other adjacent areas in Georgia, e.g. Racha, where fungal use was found to be very common (Kupradze et al. 2015; Bussmann et al. 2018).

Our results confirmed our hypothesis that (1) plant use knowledge would be lower in these regions than in the rest of Georgia, that (2) most plant use would center on home gardens (3) that the consumption of herbs as "Pkhal" (herb pie), very prevalent in other regions of Georgia, would be limited, and that (4) there would essentially be no trace of Swabian traditional knowledge in the region.

Conclusions

The lack of forest plant use, and both forest and garden plant-use knowledge in Kakheti and Kvemo-Kartli might be traced to the fact that both regions are close to large markets in the region, which make it less necessary to grow or forage many species. In addition, Kakheti is easily one of the most fertile regions in Georgia, with a very short winter and there is essentially no need for foraging wild species e.g. for Pkhal. Lagodekhi, with its almost subtropical climate, is an extreme example of that, with almost no recorded forest plant use. Overall the results on plant use in the Kahketi region need to be taken with a grain of salt, because a large part of the population of the region is actually not original from Kahketi. Many Imeretians and Ossetians moved to the region since independence and brought their plant knowledge with them. Thus, this study might be regarded as a snapshot of intercultural plant knowledge, which is however not equal to these plants actually being used in everyday life.

Declarations

List of abbreviations: Not applicable.
Ethics approval and consent to participate: Oral informed consent was obtained from all participants before conducting interviews.
Consent for publication: No personal information is disclosed, any person shown in an image gave their consent for publication.
Conflict of interests: The authors declare that they have no conflict of interests.
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Author contributions: RWB, NYPZ, SS, ZK, DK, DT and KB designed the study; RWB, NYPZ, SS, ZK, DT and KB conducted the fieldwork, RHE conducted the main statistical analysis; RBU, NYPZ and RHE analyzed the data and wrote the manuscript; all authors read, corrected and approved the manuscript.

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