

## Edible woody plants growing wild in the Tbilisi environs (Georgia, South Caucasus)

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### Abstract

In the environs of Tbilisi (Georgia, South Caucasus), 57 species of wildy grown trees and shrubs used for food by the local population have been identified. Five species of them are naturalized plants for Tbilisi area. The usage of edible trees and shrubs for food is diverse. Their different parts are used for food purposes - fruits, flowers, leaves, shoots. Moreover, the same species is used in different ways. It should be noted that the use of wildy grown trees and shrubs for food has decreased a lot in the last period. The main reasons for this are: (1) the population of Tbilisi and its surroundings mostly buys products in agricultural markets and supermarkets, (2) the rural population also grows various fruits in their homesteads, (3) a large part of the city population does not know about the use of various edible trees and shrubs.

**Keywords:** Tree; Shrub; Species; Ethnobotany; Use of plants

### 1. Introduction

Identification of edible plants and study of their traditional use is one of the topical issues of modern ethnobotany. Georgia (Caucasus) is rich in wild edible plants, a prominent place among which is taken by trees and bushes.

Tbilisi, the capital of Georgia, which is distinguished by its diverse culture and traditions, was selected as the object of the research. Besides, the current territory of the city includes villages that existed independently in the recent past, and there are lots of historical settlements in the vicinity of the city. In addition, Tbilisi's surroundings are characterized by a very rich floristic diversity, which in turn is a precursor to the formation and diversity of ethnobotanical traditions.

The aim of our research was to reveal trees and shrubs used for food widely spread in Tbilisi area; to determine the forms of their use by the local population and to what extent the old traditions and culture of the use of plants (in this case, trees and shrubs) have been preserved

### 2. Material and methods

#### 2.1. Study area

##### 2.1.1. Location and physical-geographical conditions of Tbilisi

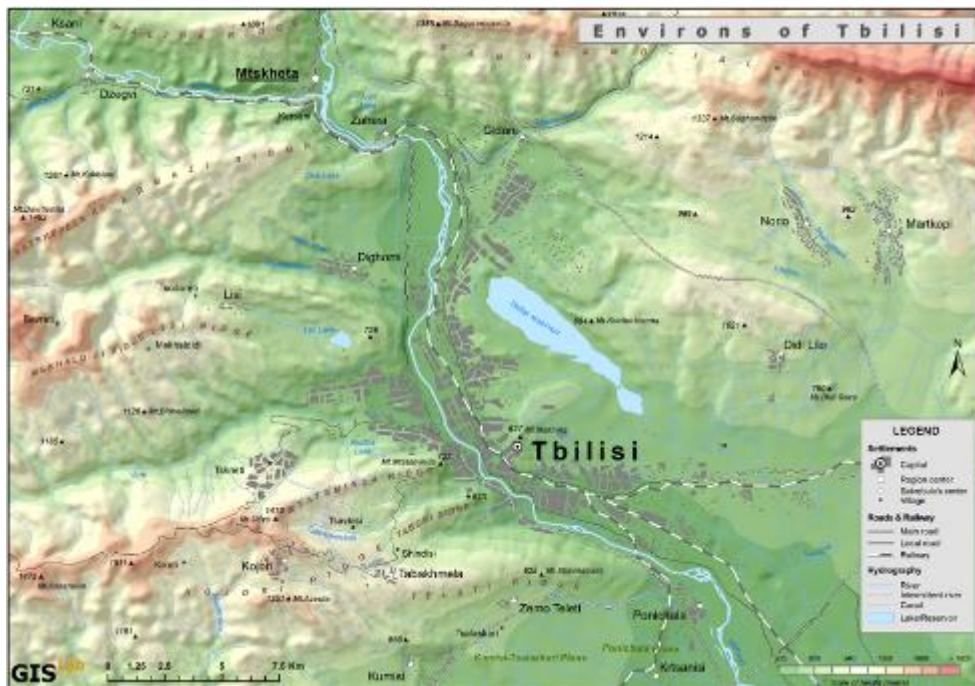
Tbilisi is the capital of Georgia, located in Caucasus ecoregion, particularly, is Southern Caucasus (Figure 1).

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**Figure 1** Location of Georgia and Tbilisi City in the Caucasus ecoregion (Map by Lachashvili et al. [1, 2])

The Tbilisi environs includes the part of Mtkvari River basin from the village of Dzegvi to the section between Ponichala-Rustavi. Geographical units of different origin and geological age converge in the vicinity of Tbilisi, significantly complicating the terrain. The hypsometric amplitude of the Tbilisi area is from about 350 meters to 1875 meters above sea level [3, 4, 5, 6] (Figure 2).



**Figure 2** Physical-geographic map of Tbilisi environs (Map by Lachashvili et al. [6])

The surroundings of Tbilisi are in the crossing area of different types of climate zones. In particular, the following climate zones are indicated here [7, 8]:

- Transitional climate from a moderate warm steppe to a moderate humid with hot summer and two minimums of precipitation per year (BS-Cxa);
- Moderate humid climate with moderately cold winter and prolonged warm summer and two minimums of precipitation per year (Cxb);
- Moderate humid climate with moderately cold winter and hot summer and two minimums of precipitation per year (Cxa);
- Moderate humid climate with cold winter and prolonged cool summer and two minimums of precipitation per year (Dxbk').

Main ones are grey-cinnamonic, cinnamonic and brown forest soils, presented in different modifications. Alluvial soils are developed on the riverside terraces. Rocky bedrock devoid of soil cover and scree-stony ecotypes are also found. Loamy and clayey-sandy badlands are rare [5, 6, 9, 10].

### 2.1.2. Floristic and ecosystem diversity of Tbilisi area

Tbilisi environs are distinguished by high biodiversity. About 1600 species of vascular plants are spread here [11, 12]. About 180 species of them are woody plants (trees and shrubs) [4, 5]. Although the specific share of trees and shrubs in the floristic composition of the Tbilisi area is not large, their role in the creation of vegetation and landscapes is high. They create forests and shrubberies, which are one of the main creators of the landscapes of Tbilisi. Forests and shrubberies are the most important recreational areas of Tbilisi vicinity. In addition to them, vegetative communities of steppes, meadow-steppes, and desert-semidesert vegetations are widespread in Tbilisi. Vegetative communities of wetlands, as well as rocky and scree-stony ecotopes are rare and fragmented [13-25].

It should be noted that individual units of trees and shrubs can be found in herbaceous communities in addition to forests and shrubberies.

### 2.1.3. The villages and towns of Tbilisi environs

There are about 40 villages with different status in the Tbilisi environs, some of which are currently under the jurisdiction of the Tbilisi City Municipality. Three townships - Kojori, Tskneti and Didi Lilo are under the jurisdiction of Tbilisi Municipality. The city of Mtskheta - the ancient capital of Georgia – is in the vicinity of Tbilisi as well. It is worth noting that some of the villages of the 18th-19th centuries on the outskirts of Tbilisi have been "absorbed" by city and now they are districts of Tbilisi.

## 2.2. Data collection

Ethnobotanical surveys were mainly conducted in 2017-2023 years. Earlier information provided by elderly and very old people has also been used. The survey was conducted among the population of both villages and cities of Tbilisi. Surveys and interviews of the respondents were carried out both in the homesteads and houses of the participants, and in nature (in the field). 225 respondents were interviewed with gender balance (142 women and 83 men). Among them, 78 interviewees are residents of Tbilisi, and 147 are rural residents. Surveys were conducted in the form of semi-structured interviews (pre-prepared and validated questionnaires) based on the informed consent of the respondents. The survey of the respondent was always carried out in the Georgian language. The age of the respondents ranges from 20 to 95 years.

## 2.3. Name of plants

The Latin names of taxa are based on the international databases [26, 27, 28, 29, 30]. Local (Georgian) names of plants are given according to the names used by the surveyed population.

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## 3. Results and discussion

57 wildy grown species of trees and shrubs, used by the local population for food purposes, were identified in the vicinity of Tbilisi. They belong to 13 families and 25 genera. By families these plants are distributed as follows: *Rosaceae* – 37 species, *Fagaceae* – 4, *Cupressaceae* – 3, *Elaeagnaceae*, *Moraceae*, *Ulmaceae* – 2-2, *Berberidaceae*, *Cornaceae*, *Corylaceae*, *Juglanaceae*, *Lythraceae*, *Malvaceae*, *Smilacaceae* – one species each. The following genera are distinguished by richness of species: *Rosa* – 9 species, *Crataegus* – 8, *Rubus* – 7, *Cotoneaster* – 4, *Juniperus* and *Quercus* – 3-3. The remaining 18 genera are represented by only one species each.

The use of trees and shrubs as food is diverse. The local population uses their various parts as raw food, and for making various foods, juices, infusions and teas, as well as alcoholic beverages. Accordingly, three categories of usage have been identified: 1. used for food, 2. used for non-alcoholic beverages, 3. used for alcoholic beverages.

### 3.1. Trees and shrubs used for food

The range of trees and shrubs used for this purpose is rich – 40 species. Their fruits are mostly used (Table 1). The use of fruits is various. They are used as raw food, as well as jams, dried fruit, Tklapi (traditional Georgian puréed fruit roll-up leather), churchkhela (Georgian sweet), compotes, etc. Besides, fruits of one and the same species can be used in different ways and purposes. Using leaves for food is rare (*Berberis vulgaris* L.). *Smilax excelsa* L., can be distinguished, from the young sprouts of which food (Pkhali) is prepared in the spring.

It is worth mentioning that in the last period, the collection and use of fruits of wildy growing trees and shrubs has greatly decreased. The main reasons for this are: (1) The population of Tbilisi and its surroundings mostly buys products in agricultural markets and supermarkets, (2) the rural population also grows various fruits in their homesteads, (3) a large part of the city population does not know about the use of edible trees and shrubs. In addition, the fruits of different plants are mainly used as raw food by hikers, people walking in nature, and shepherds/herdsmen.

**Table 1** Trees and shrubs used for food

Species (Latin name)	Local Name (transliteration)	Plant part used	Use description
<i>Prunus amygdalus</i> Batsch	Nushi	Fruit	Eaten raw, gozinaq'i (chopped nuts fried in honey)
<i>Berberis vulgaris</i> L.	K'ots'akhuri	Fruit, leaf	Eaten raw, compote, as spice the fruits are used to mix meat dishes, sauce; the fresh leaves are used to make salads and soups.
<i>Celtis caucasica</i> Willd.	Ak'ak'i, K'avk'asiuri ak'ak'i	Fruit	Eaten raw
<i>Celtis glabrata</i> Steven Planch.	ex Ak'ak'i, Shishveli ak'ak'i	Fruit	Eaten raw
<i>Cornus mas</i> L.	Shindi	Fruit	Eaten raw, dried fruit, fruit cookie, jam, compote, preserved alive in sugar
<i>Corylus avellana</i> L.	Tkhili	Fruit	Eaten raw, Churchkhela (sweets made from grapes' juice and nuts), Eaten raw, gozinaki (chopped nuts fried in honey)
<i>Cotoneaster morulus</i> Pojark.	Chit'ak'omsha	Fruit	Eaten raw
<i>Cotoneaster racemiflorus</i> (Desf.) C. Koch	Chit'ak'omsha	Fruit	Eaten raw
<i>Cotoneaster saxatilis</i> Pojark.	Chit'ak'omsha	Fruit	Eaten raw
<i>Cotoneaster suavis</i> Pojark.	Chit'ak'omsha	Fruit	Eaten raw
<i>Crataegus caucasica</i> K. Koch	K'uneli	Fruit	Eaten raw, in dried form used to make new compotes
<i>Crataegus kyrtostyla</i> Fingerh.	Ts'iteli k'uneli	Fruit	Eaten raw, in dried form used to make new compotes
<i>Crataegus meyeri</i> Pojark.	K'uneli	Fruit	Eaten raw, in dried form used to make new compotes
<i>Crataegus microphylla</i> K. Koch	Ts'iteli k'uneli	Fruit	Eaten raw, in dried form used to make new compotes

<i>Crataegus orientalis</i> Pall. ex M.Bieb.	K'nap'a	Fruit	Eaten raw, in dried form used to make new compotes
<i>Crataegus pontica</i> K. Koch	Q'ambro	Fruit	Eaten raw, in dried form used to make new compotes
<i>Crataegus pentagyna</i> Waldst. Kit. ex Willd.	Shavi k'uneli	Fruit	Eaten raw, in dried form used to make new compotes
<i>Crataegus pseudoheterophylla</i> Pojark.	K'uneli	Fruit	Eaten raw, in dried form used to make new compotes
<i>Cydonia oblonga</i> Mill.	K'omshi	Fruit	Eaten raw, jam, compote
<i>Elaeagnus angustifolia</i> L.	Pshat'i	Fruit	Eaten raw
<i>Fagus orientalis</i> Lipsky	Ts'ipeli	Fruit	Eaten raw, roasted
<i>Ficus carica</i> L.	Leghvi	Fruit	Eaten raw, dried fruit, jam
<i>Hippophae rhamnoides</i> L.	Katsvi	Fruit	Eaten raw, preserved alive in sugar
<i>Juglans regia</i> L.	K'ak'ali	Fruit	Eaten raw, Churchkhela (sweets made from grapes' juice and nuts), Eaten raw, gozinaki (chopped nuts fried in honey) jam, spice
<i>Malus orientalis</i> Uglitzk.	Majhalo	Fruit	Eaten raw, dried fruit, fruit cookie
<i>Mespilus germanica</i> L.	Zghmart'li	Fruit	Eaten raw
<i>Morus alba</i> L.	Tetri tuta	Fruit	Eaten raw, jam
<i>Prunus divaricata</i> Ledeb.	T'q'emali	Fruit	Eaten raw, dried fruit, fruit cookie, jam, compote, sauce
<i>Prunus spinosa</i> L.	K'vrinchkhi	Fruit	Eaten raw, dried fruit, fruit cookie, jam, preserved alive in sugar
<i>Punica granatum</i> L.	Brots'euli	Fruit	Eaten raw, sauce, spice
<i>Pyrus communis</i> subsp. <i>caucasica</i> (Fed.) Browicz	P'ant'a	Fruit	Eaten raw, compote
<i>Rubus anatolicus</i> Focke	Maq'vali	Fruit	Eaten raw, jam, compote, preserved alive in sugar
<i>Rubus caesius</i> L.	Dzaghlnaq'vala	Fruit	Eaten raw, jam, compote, preserved alive in sugar
<i>Rubus caucasicus</i> Focke	Maq'vali	Fruit	Eaten raw, jam, compote, preserved alive in sugar
<i>Rubus dolichocarpus</i> Juz.	Dzudzumaq'vala	Fruit	Eaten raw, jam, compote, preserved alive in sugar
<i>Rubus hirtus</i> Waldst. & Kit.	Baghis maq'vali	Fruit	Eaten raw, jam, compote, preserved alive in sugar
<i>Rubus ibericus</i> Juz.	Maq'vali	Fruit	Eaten raw, jam, compote, preserved alive in sugar
<i>Rubus idaeus</i> L.	Zholo	Fruit	Eaten raw, jam, compote, preserved alive in sugar
<i>Smilax excelsa</i> L.	Ek'alghich'i	Shoot	Pkhali, rare as eaten raw
<i>Sorbus graeca</i> (Spach) Lodd. ex Schauer	Amp'ura	Fruit	Eaten raw

### 3.2. Trees and shrubs used to make non-alcoholic beverages

The amount of trees and shrubs used for this purpose is not as small – 26 species. Table 2 shows that the fruits and flowers of trees and shrubs are used for preparation of non-alcoholic beverages.

**Table 2** Trees and shrubs used to make non-alcoholic beverage

Species (Latin name)	Local Name (transliteration)	Plant part used	Ethnobotanical uses
<i>Berberis vulgaris</i> L.	K'ots'akhuri	Fruit	Juice
<i>Cornus mas</i> L.	Shindi	Fruit	Juice
<i>Crataegus caucasica</i> K. Koch	K'uneli	Flower	Tea, infusion
<i>Crataegus kyrtostyla</i> Fingerh.	Ts'iteli k'uneli	Flower	Tea, infusion
<i>Crataegus meyeri</i> Pojark.	K'uneli	Flower	Tea, infusion
<i>Crataegus microphylla</i> K. Koch	Ts'iteli k'uneli	Flower	Tea, infusion
<i>Crataegus orientalis</i> Pall. ex M.Bieb.	K'nap'a	Flower	Tea, infusion
<i>Crataegus pontica</i> K. Koch	Q'ambro	Flower	Tea, infusion
<i>Crataegus pentagyna</i> Waldst. Kit. ex Willd.	Shavi k'uneli	Flower	Tea, infusion
<i>Crataegus pseudoheterophylla</i> Pojark.	K'uneli	Flower	Tea, infusion
<i>Hippophae rhamnoides</i> L.	Katsvi	Fruit	Juice
<i>Prunus spinosa</i> L.	K'vrinchkhi	Fruit	Juice
<i>Punica granatum</i> L.	Brots'euli	Fruit	Juice
<i>Quercus macranthera</i> Fisch. & C. A. Mey. ex Hohen.	Mukha	Fruit	Beverage – it is used to making “coffee” (coffee replacement)
<i>Quercus petraea</i> subsp. <i>iberica</i> (Steven ex M. Bieb.) Krassiln.	Mukha	Fruit	Beverage – it is used to making “coffee” (coffee replacement)
<i>Quercus robur</i> subsp. <i>pedunculiflora</i> (K. Koch) Menitsky	Mukha, Ch'alis mukha	Fruit	Beverage – it is used to making “coffee” (coffee replacement)
<i>Rosa canina</i> L.	Ask'ili	Fruit	Infusion
<i>Rosa corymbifera</i> Borkh.	Ask'ili	Fruit	Infusion
<i>Rosa marschalliana</i> Sosn.	Ask'ili	Fruit	Infusion
<i>Rosa micrantha</i> Borrer ex Sm.	Ask'ili	Fruit	Infusion
<i>Rosa mollis</i> Sm.	Ask'ili	Fruit	Infusion
<i>Rosa prilipkoana</i> Sosn.	Ask'ili	Fruit	Infusion
<i>Rosa spinosissima</i> L.	Shavi ask'ili	Fruit	Infusion
<i>Rosa tomentosa</i> Sm.	Ask'ili	Fruit	Infusion
<i>Rosa transcaucasica</i> Manden.	Ask'ili	Fruit	Infusion
<i>Tilia begoniifolia</i> Steven	Tsatskhvi	Flower	Tea, infusion

### 3.3. Trees and shrubs used to make alcoholic beverages

Today, the use of wildy grown trees and shrubs for the production of alcoholic beverages at home is rare. Fruits of the following species are used for distilling vodka: *Prunus mahaleb* L., *Cornus mas* L., *Juniperus foetidissima* Willd., *Juniperus oxycedrus* L., *Juniperus polycarpus* K. Koch, *Malus orientalis* Uglitzk., *Morus alba* L., *Prunus divaricata* Ledeb., *Pyrus communis* subsp. *caucasica* (Fed.) Browicz, *Crataegus caucasica* K. Koch, *Crataegus kyrtostyla* Fingerh., *Crataegus meyeri* Pojark., *Crataegus pentagyna* Waldst. Kit. ex Willd., *Crataegus pseudoheterophylla* Pojark..

Besides, some woody plants are used to add aroma, flavor and color to vodka. These are: *Quercus petraea* subsp. *iberica* (Steven ex M. Bieb.) Krassiln. (bark), *Juglans regia* L. (walnut partitions and bark), *Morus alba* L. (roots and stems) and fruits of various species of *Rubus* L..

### 3.4. Floristic composition of wildy grown edible trees and shrubs identified in Tbilisi area

**Table 3** Floristic composition of edible woody plants growing wild in the Tbilisi environs

Family	Species	Key synonyms
<b>GYMNOSPERMAE</b>		
<i>Cupressaceae</i>	<i>Juniperus foetidissima</i> Willd.	
	<i>Juniperus oxycedrus</i> L.	<i>Juniperus rufescens</i> Link.
	<i>Juniperus polycarpus</i> K. Koch	<i>Juniperus excelsa</i> subsp. <i>polycarpus</i> (K. Koch) Takht.
<b>ANGIOSPERMAE</b>		
<b>Dycotyledoneae</b>		
<i>Berberidaceae</i>	<i>Berberis vulgaris</i> L.	
<i>Cornaceae</i>	<i>Cornus mas</i> L.	
<i>Corylaceae</i>	<i>Corylus avellana</i> L.	
<i>Elaeagnaceae</i>	<i>Elaeagnus angustifolia</i> L.,	
	<i>Hippophae rhamnoides</i> L.	
<i>Fagaceae</i>	<i>Fagus orientalis</i> Lipsky,	
	<i>Quercus macranthera</i> Fisch. & C. A. Mey. ex Hohen.	
	<i>Quercus petraea</i> subsp. <i>iberica</i> (Steven ex M. Bieb.) Krassiln.	<i>Quercus iberica</i> Steven ex M. Bieb.
	<i>Quercus robur</i> subsp. <i>pedunculiflora</i> (K. Koch) Menitsky	<i>Quercus pedunculiflora</i> K. Koch
<i>Juglanaceae</i>	<i>Juglans regia</i> L.	
<i>Lythraceae</i>	<i>Punica granatum</i> L.	
<i>Malvaceae</i>	<i>Tilia begoniifolia</i> Steven	<i>Tilia caucasica</i> Rupr.; <i>T. rubra</i> subsp. <i>caucasica</i> (Rupr.) V. Engl.; <i>T. dasystyla</i> subsp. <i>caucasica</i> (V. Engl.) Pigott
<i>Moraceae</i>	<i>Ficus carica</i> L.,	
	<i>Morus alba</i> L.	
<i>Rosaceae</i>	<i>Cotoneaster morulus</i> Pojark.	
	<i>Cotoneaster racemiflorus</i> (Desf.) C. Koch	
	<i>Cotoneaster saxatilis</i> Pojark.	
	<i>Cotoneaster suavis</i> Pojark.	
	<i>Crataegus caucasica</i> K. Koch	
	<i>Crataegus kyrtostyla</i> Fingerh.	
	<i>Crataegus meyeri</i> Pojark.	
	<i>Crataegus microphylla</i> K. Koch	
	<i>Crataegus orientalis</i> Pall. ex M.Bieb.	

	<i>Crataegus pentagyna</i> Waldst. Kit. ex Willd.	
	<i>Crataegus pontica</i> K. Koch	<i>Crataegus azarolus</i> var. <i>pontica</i> (K. Koh) K.I.Chr.
	<i>Crataegus pseudoheterophylla</i> Pojark.	
	<i>Cydonia oblonga</i> Mill.	
	<i>Malus orientalis</i> Uglitzk.	<i>Malus sylvestris</i> subsp. <i>orientalis</i> (Uglitzk.) Browicz
	<i>Mespilus germanica</i> L.	<i>Crataegus germanica</i> (L.) Kuntze
	<i>Prunus amygdalus</i> Batsch	<i>Amygdalus communis</i> L., <i>Prunus dulcis</i> (Mill.) D.A. Webb
	<i>Prunus divaricata</i> Ledeb.	<i>Prunus cerasifera</i> Ehrh.
	<i>Prunus mahaleb</i> L.	<i>Cerasus mahaleb</i> (L.) Mill.; <i>Padelus mahaleb</i> (L.) Vasilcz.
	<i>Prunus spinosa</i> L.	
	<i>Pyrus communis</i> subsp. <i>caucasica</i> (Fed.) Browicz	<i>Pyrus caucasica</i> Fed.
	<i>Rosa canina</i> L.	
	<i>Rosa corymbifera</i> Borkh.,	
	<i>Rosa marschalliana</i> Sosn.	
	<i>Rosa micrantha</i> Borrer ex Sm.	
	<i>Rosa mollis</i> Sm.	
	<i>Rosa prilipkoana</i> Sosn.	
	<i>Rosa spinosissima</i> L.	
	<i>Rosa tomentosa</i> Sm.	
	<i>Rosa transcaucasica</i> Manden.	
	<i>Rubus anatolicus</i> Focke,	
	<i>Rubus caesius</i> L.	
	<i>Rubus caucasicus</i> Focke	
	<i>Rubus dolichocarpus</i> Juz.	
	<i>Rubus hirtus</i> Waldst. & Kit.	
	<i>Rubus ibericus</i> Juz.	
	<i>Rubus idaeus</i> L.	
	<i>Sorbus graeca</i> (Spach) Lodd. ex Schauer	<i>Aira graeca</i> (Spach) M. Roem.
<i>Ulmaceae</i>	<i>Celtis caucasica</i> Willd.	<i>Celtis australis</i> subsp. <i>caucasica</i> (Willd.) C. C. Towns.
	<i>Celtis glabrata</i> Steven ex Planch.	<i>Celtis planchoniana</i> K. I. Chr,
Monocotyledoneae		
<i>Smilacaceae</i>	<i>Smilax excelsa</i> L.	

#### 4. Conclusion

The study revealed that in the Tbilisi environs obtaining and use of woody plants as food is reduced and their traditional use is gradually being forgotten. However, the use of trees and shrubs for edible purposes is various. The local population uses their different parts as raw food, as well as for preparation of various foods, juices, infusions and teas,



as well as alcoholic beverages. Three categories of the use have been identified: 1. used for food, 2. used for non-alcoholic beverages, 3. used for alcoholic beverages.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

The authors declare that there are no conflicts of interest related to this study.

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