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ORIGINAL RESEARCH PAPER in ETHNOBOTANY

# Ethnobotanical Knowledge Through the Slovak Folk Songs as a Reflection of Intangible Biocultural Heritage

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## Abstract

Folk songs reflect a deep interrelationship between man and nature that developed over centuries and can be viewed as biocultural heritage. This study aims to present the most important plant and landscape elements in the traditional songs of Slovakia. In this study, 4,341 Slovak folk songs were analyzed. Songs carrying information about vascular plant species were analyzed according to the song type and the fragment of the song where plant species or landscape elements appeared. This information was used to create a dataset of all the mentioned vascular plants and their use. Plants were mentioned in 31% of Slovak folk songs, which corresponded to 1,354 songs. A total of 121 plant taxa were identified, of which 56 were wild, 50 were cultivated, 13 were exotic, and two were unidentified, corresponding to 50 plant families. The most cited from all mentioned plants (including both identified, or unidentified taxa) were rose (9%), grapevine (5.7%), rosemary (5.1%), rye (4.1%), maple (3.9%), and apple (3.9%). Landscape elements were mentioned in 26.4%, corresponding to 1,148 songs. The folk songs reflected the mainly mountainous character of Slovakia. Forests were the most mentioned, corresponding to 30.6% of landscape element citations. Folk songs contribute to the preservation of traditional ecological knowledge and help to better understand past relationship of our ancestors to land and nature.

## Keywords

ethnobiology; song genre; plant use

## 1. Introduction

The field of biocultural diversity has arisen as an area of transdisciplinary research that investigates the links between the world's linguistic, cultural, and biological diversity as manifestations of the diversity of life (Maffi, 2005). Biocultural diversity helps identify changes in human–nature interactions and reconnect people with nature (Vierikko et al., 2016). All mentioned diversities are under threat, and the loss of diversity at any level has dramatic consequences for humanity and Earth (Maffi, 2005). There are different expressions of biocultural diversity: they can be reflected by human-constructed heritage objects, which may increase the cultural value of domesticated landscapes (Agnoletti et al., 2015), or in ethnobiological knowledge. Ethnobotanical studies usually focus on edible wild plant species (Biscotti & Pieroni, 2015; di Tizio et al., 2012; Łuczaj et al., 2013; Łuczaj & Szymański, 2007), plant species used for beverage production (Sõukand et al., 2013, 2015), and plant species used for medicinal purposes (Fedorowski, 1897; Han & Gizem, 2015), but studies aimed at both medicinal and wild food plants have also been the focus of some research (Nedelcheva et al., 2017; Varga et al., 2019).

Ethnographic studies from Slovakia were published at the edge of the nineteenth and twentieth centuries by the ethnographer and botanist Jozef Ľudovít Holuby (1836–1923). One of his pioneering studies was the first ethnobotanical account of children's use of plants (Holuby, 1896). Current ethnobotanical studies in Slovakia

are related to the use of wild edible plants (Končeková et al., 2020; Łuczaj, 2012; Stoličná, 2016) or plants used in folk phytotherapy that has a magical aspect (Varkhol, 2002).

However, to a large extent, biocultural diversity involves different expressions of intangible biocultural heritage, such as place names, local songs, proverbs, dances, and local traditions (Ibarra et al., 2013), which communicate empirical knowledge conditioned by natural, geographic, and economic conditions. Ethnobotanical information can also be found in folklore (including songs), but with an awareness of the unique perspective it can provide (Martin, 1995). The authors mainly focused on local or aboriginal songs viewed as reservoirs of traditional ecological knowledge and with strong interlinkages to nature (Curran et al., 2019; Fernández-Llamazares & Lepofsky, 2019; Ivanova et al., 2021; Svanberg, 1998), studied aboriginal dances (Clark, 2004) and storytelling (Fernández-Llamazares & Cabeza, 2018), or combined visual art and scientific and social science methods to examine the biocultural landscape (Polfus et al., 2017).

Several studies' detailed analyses of song texts have revealed ethnobotanical knowledge and biocultural memories in several European countries. Some of the earliest were by the Polish ethnographer Oskar Kolberg (1814–1890), who recorded different folklore expressions (songs, folk tales, proverbs, or riddles), along with many references to the medicinal, magical, and dietary use of plants, and the Czech ethnographer Primus Sobotka (1879), who focused on the symbolic and mythological significance of individual plant species in the songs of the Slavic nations. Later, other studies were performed, e.g., in Lithuania (Seskauskaite, 1995), Spain (Cardaño & Herrero, 2014; Herrero & Cardaño, 2015), Bulgaria (Ivanova et al., 2021), and Slovenia (Fišer, 2022), embedding important social, physical, emotional, and spiritual ties to local ecologies (Fernández-Llamazares & Lepofsky, 2019). More detailed studies on the ethnobotanical knowledge reflected in Slovak folk songs are lacking.

Traditional music can reveal much about social and cultural patterns but should not be seen as a simple reflection (Elbourne, 1976). Folk songs are interesting sources of information that can be used to understand the relationship between people and plants and can also reveal changes in plant symbolism and use over time and space (Fišer, 2022). They can be seen as mirrors of the village community's soul and each individual's fate. Everything a village man encountered over centuries is found in the songs (Elscheková, 1995).

The musical heritage of Slovakia is rich and well preserved. Its richness is also documented in the UNESCO's *Elements on the Lists of Intangible Cultural Heritage* (2022) represented by eight elements, four of which relate to music and singing (i.e., the fujara and its music, the music of Terchová, the bagpipe culture, and multipart singing of Horehronie). In addition to representing heritage on its own, folk songs may contain many more pieces of hidden information. They may reveal some long-forgotten plant uses; for example, they may reveal that the local people's attitude towards native plants gradually became the basis of plant conservation (Fišer, 2022).

Despite the rich musical heritage and the successful effort to register it in the list of intangible cultural heritage of Slovakia, Slovak folklore remains unexplored from a biological point of view. In this study, we analyzed Slovak folk songs to highlight the significance and diversity of vascular plants in traditional Slovak songs and to determine the importance of plants in the daily life of the peasant population in Slovakia in the past. We hypothesize that, species cultivated for consumption, and due to the mountainous character of Slovakia the forest trees will represent the majority of the plant references and that the linden tree, considered by Slovaks as the national tree, will be one of the most frequently mentioned plant species in folk songs.

## 2. Material and Methods

### 2.1. Area of Study

Slovakia is a relatively small Central-European country with a total area of 49,034 km$^2$. Based on the census of the Slovak Statistical Office in 2021 (Statistical

Office of the Slovak Republic, 2021), there are 5,449,270 inhabitants, mostly of Slovak nationality (83.8%), followed by Hungarian, Romani, Czech, and Ruthenian nationalities. The Roman Catholic religion predominated (56%). Slovakia comprises two basic geomorphologic units belonging to the Alpine–Himalayan system: the Carpathians and the Pannonian Basin. In total, 126 representative landscape types were identified in Slovakia. Mountain types occupy the largest proportion of Slovakia (53% of the land area), followed by lowlands (29%) and basins (18%) (Miklós et al., 2006). According to the *Green Report on the Forest Sector of the Slovak Republic* (Ministry of Agriculture and Rural Development of the Slovak Republic, 2021), deciduous forests predominate, with a share of 53.5%, followed by coniferous trees (26.2%) and mixed forests (20.3%). The most dominant forest tree species were beech (34.6%), spruce (21.8%), and oak (10.4%).

### 2.2. Song Selections

Slovak folk songs were reviewed from two sources. The main source was the second edition of the largest and most extensive collection of Slovak folk songs published in six volumes (Galko, 1972, 1973, 1976, 1978, 1981, 1983), containing 4,137 songs (the first edition was published between 1880 and 1926). Contributors collected songs from most regions of Slovakia. While choosing songs for the press, editors chose the principle of diversity, but subjective opinions were also applied. Slovak folk songs from abroad, specifically from Hungary, the former Yugoslavia, and some Gipsy songs (all in the Slovak language) were also included. The second source was a smaller collection of folk songs (204 songs), representing a wide range of Slovak folk song genres (Elscheková, 1995). Only songs not recorded in the first collection were selected from the second source to avoid duplicity. Duplications occurred in song verses. Songs with duplicated content higher than 50% were only analyzed if they mentioned new plant species.

### 2.3. Plant Identification and Data Analyses

Altogether, 4,341 songs from the abovementioned sources were reviewed. Those carrying information about vascular plant species were analyzed according to the song genre and the fragment of the song where the plant species appeared. This was used to create a dataset of all mentioned vascular plants and their use. If the plant was identified at the genus level only, the term "species" is used in this study to refer to several species of one genus. The species identified in the particular songs were recorded only once for each song, even if repetition of some verses or words containing plant names occurred in these songs. For each plant taxon, its occurrence was recorded as growing in the wild, cultivated, or exotic if not present in the area.

The songs were written in different dialects, which are numerous in Slovakia, complicating the determination of plant species. We have recorded several examples of synonyms, diminutives, and polysemy, e.g., "štrbák" can refer to *Cirsium oleraceum* (L.) Scop. (Łuczaj, 2012) or *Sonchus arvensis* L. (Stoličná, 1997), both of which were edible plants in Slovakia in the past. In two cases, plant identification was impossible, and these plants were included in the analysis as unidentified plants referring to the local Slovak name only.

Species or plant parts (e.g., fruits such as apple and strawberry) that were directly mentioned in the songs or products mentioned together with the plant name (e.g., "maple violin" and "linden table") were included in the plant species list. However, the species list also includes plants that are not directly mentioned in the song texts; instead, they are mentioned as specific products. This is only the case for food products such as sugar, chocolate, and specific meals made from cereals and alcoholic beverages (especially wine, which was most frequently mentioned in alcoholic beverages, while grape vines were mentioned less frequently). We included these products in the species list to facilitate comparative plant use with studies from other European countries. However, these species (species, genus, or family level) and their products were clearly identified in the list of plants mentioned in Slovak folk songs and their use (Table S1).

## 3. Results

### 3.1. General Overview

In total, 31% of songs contained plant references, corresponding to 1,354 songs. In total, 2,199 plant mentions, including 2,019 mentions of identified plant taxa (species, genus, or family level), two unidentified species (Figure 1), and 178 citations of trees, herbs, shrubs, or cereals mentioned without closer taxonomic specification, were recorded. Several genres of folk songs are distinguished, as shown in Figure 2.

Most plant citations appeared in girl songs (e.g., prewedding songs and prank songs that were sung by girls and young women), followed by youth (songs sung by young men on various occasions, often mixing several genres in one song, such as love, military, social or labor themes) and love songs. Other genres were significantly less represented.

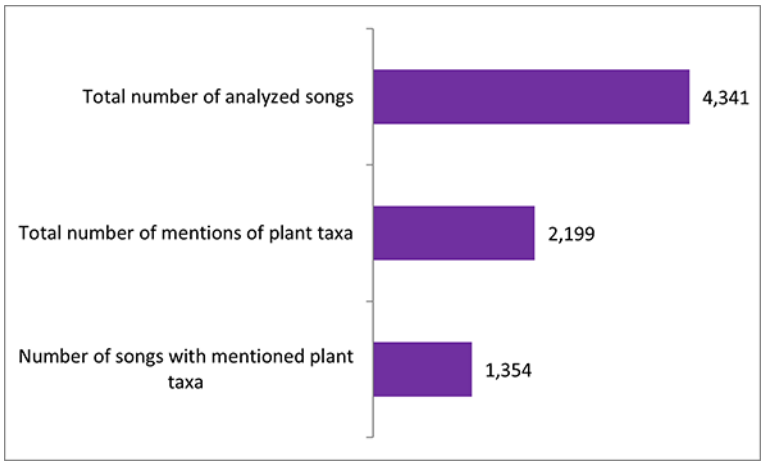


**Figure 1** The number of songs containing vascular plant citations and the total number of analyzed songs and plant mentions.

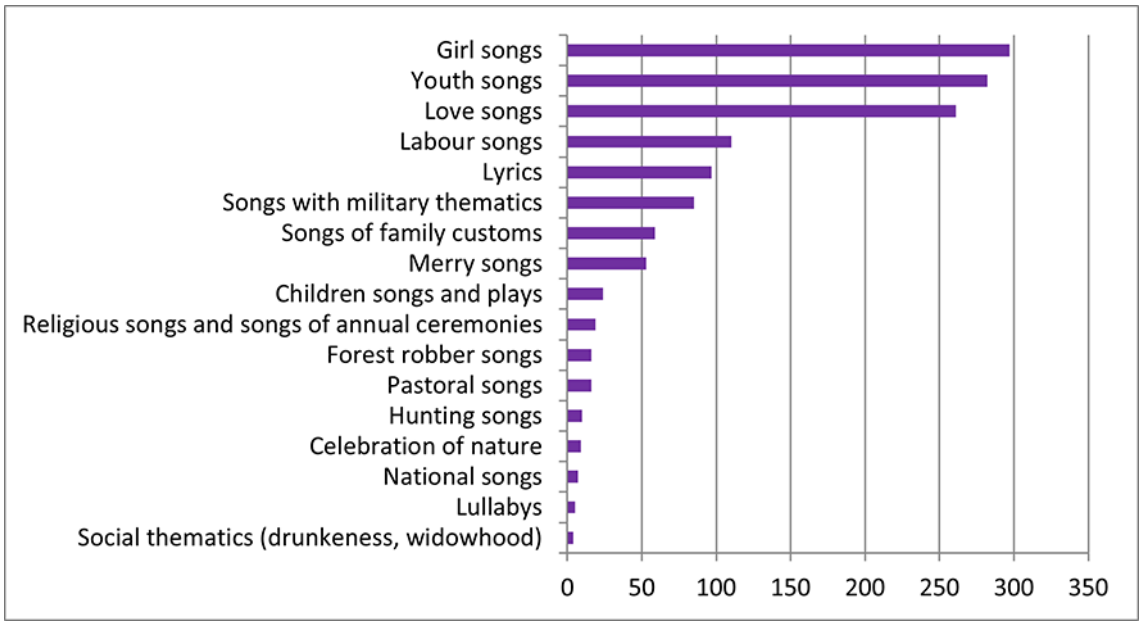


**Figure 2** Plant citations according to folk song genre.

### 3.2. Plant Species Analysis

Three basic categories of plant species were identified in Slovak folk songs. These were wild (containing 56 species), cultivated (50 species), and exotic (13 species). Table S1 summarizes all the plant taxa mentioned in the Slovak folk songs.

#### *3.2.1. Wild Plant Species*

Altogether, 608 citations of wild plant species (27.6% of all plant mentions) and 175 citations of undefined wild species cited as forest trees, shrubs, or herbs (8% of all plant mentions) were recorded. Wild species with a frequency ≥4 in Slovak folk songs are summarized in Figure 3.

Wild trees were represented by 17 plant taxa. Most citations belonged to *Acer* sp. and *Quercus* sp., whereas *Abies alba* Mill. and *Tilia* sp. were mainly mentioned in the diminutives. *Fagus sylvatica* L. was in folk songs connected to gemmation and greening in 11 cases. Although *Picea abies* (L.) H. Karst. currently has a dominant position among coniferous trees, it was mentioned in only two cases. *Pinus cembra* L. has been mentioned mainly in connection with its nuts.

The most mentioned from wild shrub taxa were *Rubus idaeus* L. mentioned as raspberry bushes (e.g., in the meaning "set the sun behind the raspberry bush"), but also fruits (mostly in the sense of their harvest), and *Viburnum* sp., cited mainly in the sense of the beauty of both males and females.

*Viola* sp. was the most common wild herbal plant in Slovak folk songs. In a quarter of its citations, different species of violet were distinguished by color (white, red, and blue). *Fragaria* sp. was usually personified and represented youth and beauty. Another often-used phrase was "to pick strawberries." The scent of *Convallaria majalis* L. was emphasized, and it was also mentioned in connection with making buttonholes. A weed that was abundant in the past, *Agrostemma githago* L., was also reflected in the songs.

Several herbaceous species that occurred in nature in the past were a common part of the people's diet and were also mentioned in folk songs. These include *Lathyrus*

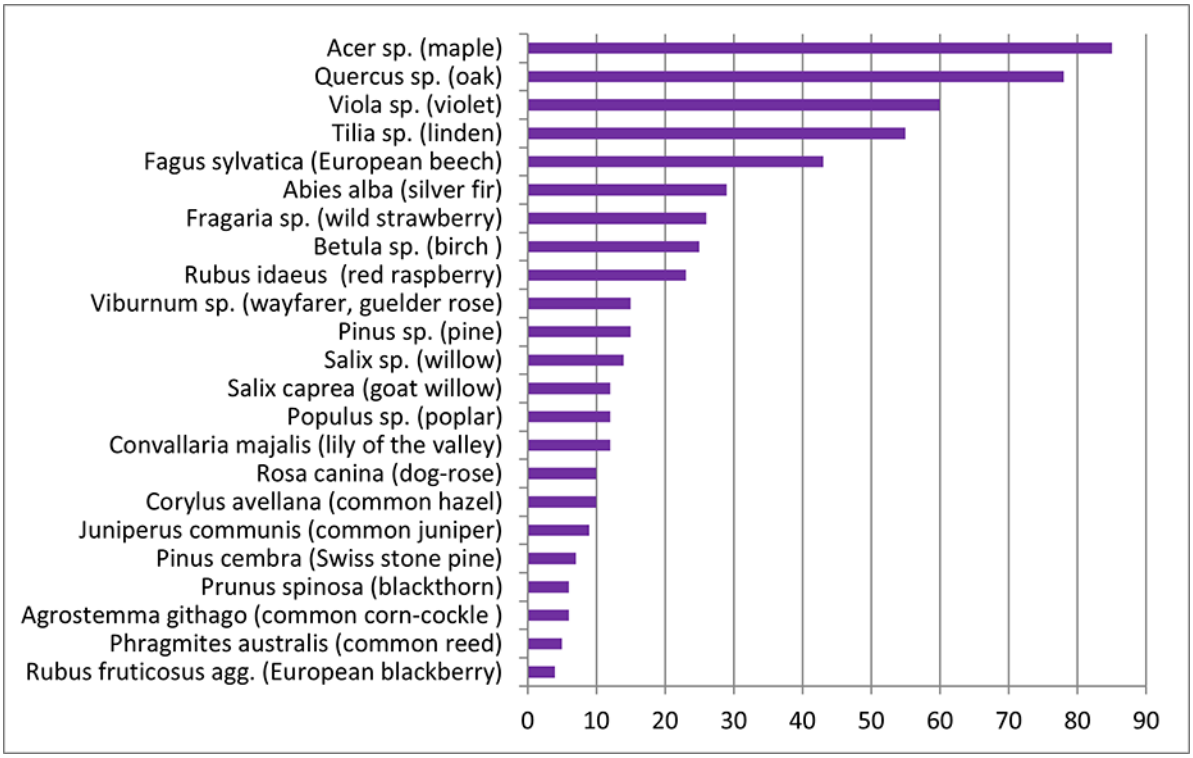


**Figure 3** Representation of wild species with a frequency ≥4 in Slovak folk songs.

*tuberosus* L. or *Atriplex hortensis* L. Meadow species such as *Salvia* sp. or *Centaurea* sp., and species of moist environments such as *Caltha palustris* L. or *Myosotis* sp. ("forget-me-not by the brook") were only sporadically mentioned.

### *3.2.2. Cultivated Plant Species*

In total, 1,201 citations of cultivated plants (54.6% of all plant mentions) and 180 citations of undefined species of grains and fruit trees (8.2% of all plant mentions) were recorded. The representation of cultivated species with a frequency of ≥4 in Slovak folk songs is shown in Figure 4.

Of the cultivated trees, *Malus domestica* Borkh. had the most citations at 84 (apple fruits were mentioned 56 times). The second most frequently mentioned was pear at 49 times. In almost half of the cases, the pear was associated with aloneness (the most commonly used phrase was "alone as a pear in the field"). Sweet cherries and vineyards were also significantly represented.

Only three cultivated shrub species were represented; however, they had the most citations. Those were *Rosa* sp., *Vitis vinifera* L., and *Rosmarinus officinalis* L. *Rosa* sp. was the most abundant, not only within the shrub species category but from all plant species, appearing in 197 songs. The rose in Slovak folk songs embodies mainly female beauty but occasionally male attractiveness. Both men and women are compared to roses by color ("red cheeks like a rose") or scent. In several cases (24 times), the mention of roses was connected to buttonholes, which were used mainly at weddings. However, this species also presented sadness (14 mentions). A commonly used expression was "plant roses on the graveyard." The second most cited was *Vitis vinifera* L., mentioned both as a plant or fruit (19 mentions) but mostly as the product, i.e., wine (107 mentions). *Rosmarinus officinalis* L. was prized for its ever greenness reflected in folk songs as "green rosemary" (45 mentions) and is mentioned especially in love and girl songs. Rosemary was widely used for making wedding decorations (buttonholes). However, it was also the most connected to sadness and death ("rosemary grows on the grave," "to plant rosemary on graveyard," or "he lays dead in rosemary").

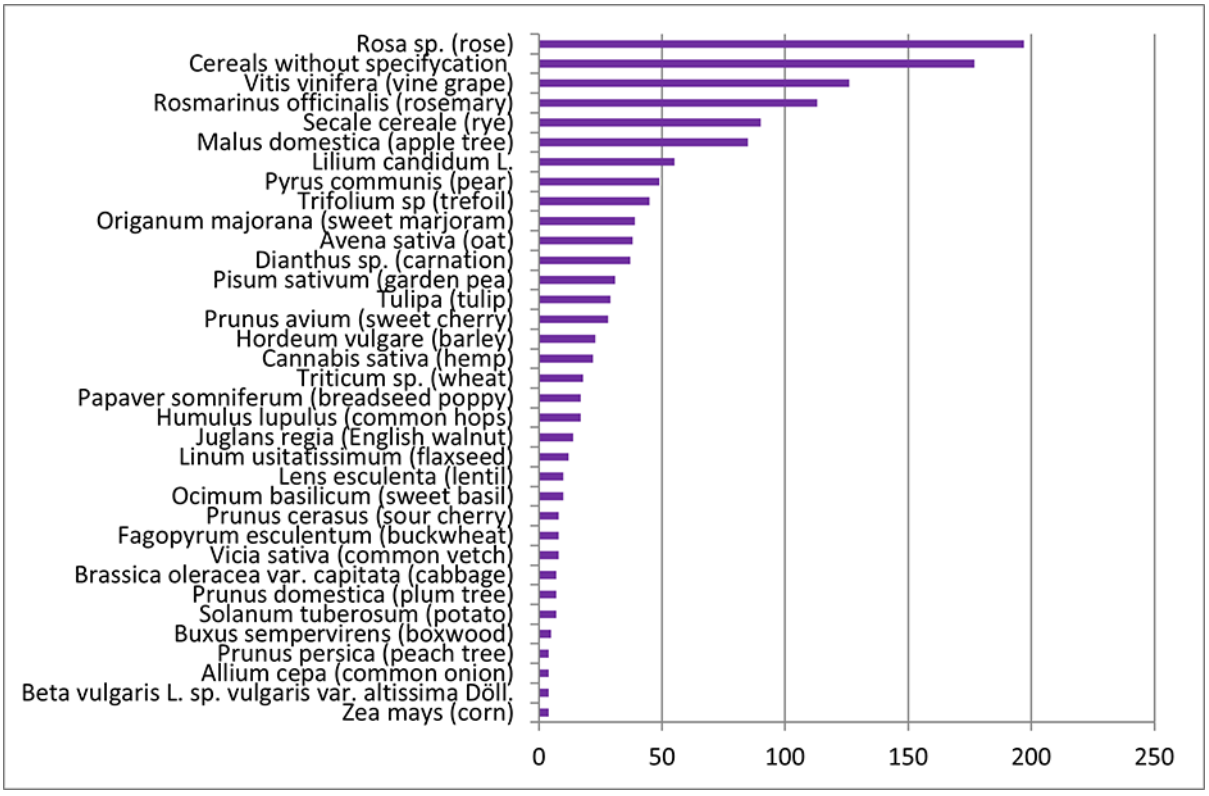


**Figure 4** Representation of cultivated species with frequency ≥4 in Slovak folk songs.

Other aromatic plant species (such as *Origanum majorana* L. (39 citations), usually mentioned as "green marjoram" and *Ocimum basilicum* L. (10 citations), grown in gardens and valued for its scent ("flavored sweet basil"), were connected to making buttonholes in several cases), were also frequently mentioned. *Trifolium* sp. was widely used as fodder, and its mentions were mostly related to mowing and grazing. Clover was frequently used in diminutives. We recorded 55 citations of *Lilium candidum* L., which symbolized opposite emotions: sadness and death ("to plant white lily on the grave") and joy ("to make buttonholes"). This species has often been personified by males and females ("he/she is as beautiful as lily").

One of the most frequently mentioned was a group of grains, which was not specified at the species or genus level, and in the songs, it was mostly mentioned as food products. This group included four main grains used in Slovakia for bakery products (*Secale cereale* L., *Avena sativa* L., *Hordeum vulgare* L., and *Triticum* sp.) and their combinations, such as sturgeon [a mixture of wheat and rye, oat, and barley ("sturžica")], or cultivated species that were common in the past, for example, *Fagopyrum esculentum* Moench. and *Panicum miliaceum* L. We also found a mention of the ancient wheat variety *Triticum spelta* L. ("tenkeľ").

The low number of mentions of maize and potatoes as imported agricultural crops from America, did not reflect their later widespread use (especially potatoes) at the time of song recordings in the eighteenth and nineteenth centuries.

#### *3.2.3. Exotic Plant Species*

Exotic plants (13 species) were only sporadically mentioned, with 28 mentions corresponding to 1.3% of all plant citations. The most mentioned was *Coffea arabica* L. (coffee), which was connected to higher economic status ("to cook coffee for ladies"), followed by *Piper nigrum* L. mentioned mainly as a seasoning, *Nicotiana tabacum* L. mentioned as tobacco ("smoke tobacco"), *Lavandula* sp., and *Citrus limon* (L.) Burm. F. Other exotic plant species have been reported in fewer than three cases.

### 3.3. Landscape

The representation of individual landscape elements in folk songs reflects the mountainous character of Slovakia. Out of 1,253 recorded landscape elements mentioned in 1,148 songs, natural elements (forests, valleys, groves, grassy uplands, hill slopes, chines, and lowlands) accounted for 59.7%. Agricultural landscape elements (fields, meadows, gardens, fallow land, and orchards) accounted for 37.4%, and water areas (sea, wetlands, and ponds) were represented by only 3%.

Forests were the most mentioned of all analyzed landscape elements (30.6%), and evoked distance ("going far through the forests") or separation from loved ones ("he/she is behind the forests"). Valleys and groves were equally represented among the natural landscape elements (commonly mentioned as "deep valley"). In more than half of the cases, groves were emotionally perceived as "green groves."

Fields were the most mentioned of the managed landscape features, often underlining their extent ("wide field"), followed by meadows, usually highlighting their greenness ("green meadow"), and gardens that were often connected with a specific planted species ("rosemary in the garden" or "lily flowers in the garden"), or economic status ("in the manor garden"). Water areas were cited the least. Although Slovakia is not a seaside country, the sea was mentioned in 2.4% and expressed mainly distance ("they went to the sea") and separation ("she would jump over the sea"). Watercourses were not analyzed in this study (Figure 5).

### 3.4. Ethnobotanical Knowledge

Altogether, 673 different uses of plant species were identified in the song texts, summarized in Table S1. The food and beverage category was the most important group for plant usage, accounting for 49 taxa and 492 citations. The most frequently mentioned were cereals without closer specification and their products, such as

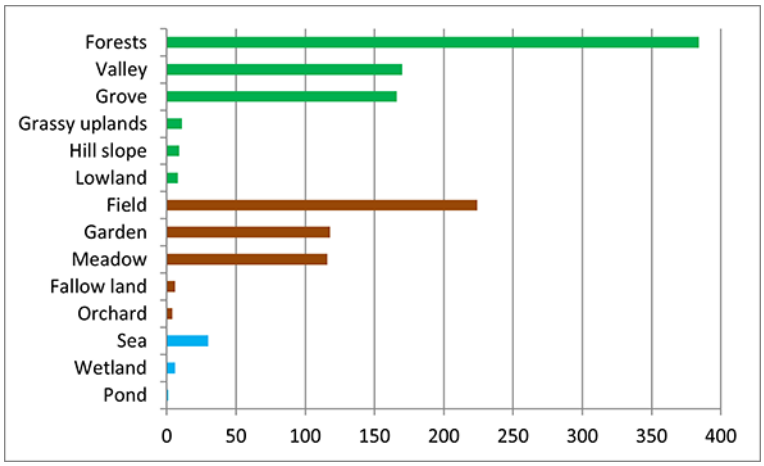


**Figure 5** Representation of landscape elements in Slovak folk songs.

bread and different types of pastry (151 mentions). Up to 14 types of flour meals were documented: bread, dumplings, noodles, porridge, cakes, gingerbread, buns, lokshe, bread rolls, buns, "opekance," "mrvenica," pies, and doughnuts, all made mainly with rye or oatmeal. Wine was the most mentioned beverage (107 mentions), followed by beer and other typical Slovak hard alcohols made with *Prunus domestica* L. ("slivovica") and *Juniperus communis* L. ("borovička"). Folk songs also mentioned sap made from *Acer* sp. and *Betula* sp.

Some species used for treatment and beauty were also recorded; however, most were without taxonomic identification, e.g., "to gather herbs for pain." In several cases, it was possible to identify plant species used as remedies, such as *Allium cepa* L. to heal wounds, *Cannabis sativa* L. and *Sinapis arvensis* L. to apply to snakebite wounds, and *Citrus limon* (L.) Burm. F and *Acer* sp. leaves to use when injured by cutting. Plants used for beauty were sporadically mentioned in the songs (four species).

The making of buttonholes was a significant part of the wedding ceremony. Girls made buttonholes and gave them to men at weddings but also to loved persons as a sign of their engagement. Mainly flowering plant species such as (*Rosa* sp. and *Viola* sp.), evergreen species (*Rosmarinus officinalis* L., *Origanum majorana* L., and occasionally *Buxus sempervirens* L., or *Juniperus communis* L.), or plants valued for their scent (*Convallaria majalis* L.) were used for this purpose. The species embodying sorrow were mainly *Rosmarinus officinalis* L., *Rosa* sp., *Lilium candidum* L., and *Tulipa* sp. These species have been used for decorating graves and coffins.

We also recorded six plant species used for making furniture, e.g., *Acer* sp. ("maple table" and "maple bed"), *Tilia* sp. ("linden table"), or *Alnus* sp. ("alder bench"), and 13 species to make other woody handicrafts. The most mentioned plant taxa were *Acer* sp. (e.g., "maple violin"), *Fagus sylvatica* L. (e.g., "oak log"), *Linum usitatissimum* L. ("flax shirt"), *Salix* sp. ("willow whistle"), or *Rosa canina* L. ("dog rose fence"). Ten species were mentioned as forage, the most cited were *Trifolium* sp. and *Avena sativa* L.

## 4. Discussion

The importance of plants to local people is well reflected in folk songs. Plant references were recorded in 31% of Slovak folk songs, which is less than in Bulgaria (47.3%) but significantly higher than in Spain (19%) and Slovenia (14%). The most common species in the Slovak folk songs was *Rosa* sp. (10.4%). It is often used in metaphors or is personified. It also dominated the usage category, mainly for decorative purposes in wedding ceremonies (buttonholes), but its beauty was also appreciated in funerals for decorating graves. Similarly, this species had the highest incidence in folk songs in Spain (12.7%) and one of the highest in Bulgaria and Slovenia.

The second most cited species was *Vitis vinifera* L., mentioned as vineyards or fruits (19 citations) but mostly as its product, wine (107 mentions). The viticultural landscape is one of the oldest types of cultural and cultivated landscapes in Europe, and it creates unique genius loci with distinctive functions and appearances in many regions. They also form a special part of the agricultural landscape (Štefunková & Hanušin, 2019). Written sources have documented vineyard cultivation and wine production in Slovakia since the beginning of the eleventh century.

In the past, vineyards were grown on a much larger area in Slovakia, but at the end of the Middle Ages there was an abandonment of many vineyards. The regions where this activity has persisted and has been continued to this day are located in the south and east of Slovakia (Popelková, 2006) and cover 8,012 ha (Rozborilová, 2019).

The dominant position of *Vitis vinifera* L. has also been documented in songs of other nationalities (Fišer, 2022; Herrero & Cardaño, 2015; Ivanova et al., 2021).

Rosemary was the third most frequently mentioned species in Slovak folk songs. This species does not occur naturally in Slovakia. Its high citations were also recorded in the Slovenian study (the second most mentioned), but it was completely absent in Bulgarian folk songs.

Up to 14 types of flour meals have been documented. Rye and oatmeal were mainly used for their production. According to Němcová (1955), oat was used as livestock feed and as a substitute for other kinds of flour in the mountain areas. These two kinds of cereal also had the highest citations in Slovak folk songs. We also identified an ancient variety of wheat – *Triticum spelta* L. ("tenkel") in the folk songs. This term was probably used for all species of ancient husked wheat (*Triticum monococcum* L. and *Triticum dicoccum* L.). Its cultivation was relatively widespread, especially among serfs, but began to decline in the second half of the nineteenth century (Markuš, 1975). In the past, flour was commonly replaced by various ground plant tubers and roots during emergencies. At the turn of the eighteenth and nineteenth centuries, potatoes were used instead of these substitute foods. This occurred mainly in mountainous regions, where there was often a shortage of flour (Stoličná, 2002). Surprisingly, this imported agricultural crop was not adequately translated into folk songs, despite its widespread use.

*Acer* sp., *Quercus* sp., and *Tilia* sp. were the most dominant forest tree species in Slovak folk songs. The representation of wild tree species was closest to the Slovenian study, with 17 wild tree species recorded in Slovakia compared to 16 in Slovenia. However, differences were observed in the abundance of individual plant taxa (in Slovenia, the most mentioned were *Tilia* sp., *Acer* sp., and *Fagus sylvatica* L.). A high representation of maple and oak was also recorded in Bulgaria, but the references to linden were missing in Bulgarian songs, even though they are present in Bulgaria (Zhelev et al., 2020). Folk songs also mentioned sap made of *Acer* sp. [including *Acer campestre* L., but probably also *Acer pseudoplatanus* L., as documented by Svanberg et al. (2012)] and *Betula* sp., which have been also documented in historical documents (Holuby, 1891, 1896).

Ten of the most frequently mentioned plant species in Slovak folk songs are listed in Table 1. Their abundance was compared to that of other European cultures where ethnobotanical studies based on folk songs were performed. Based on this, we consider rose, grapevine, and apple trees as cultural keystone species, according to the concept of Garibaldi and Turner (2004), as these species were among the ten most mentioned in all analyzed European countries.

According to an ethnobotanical review of wild edible plants in Slovakia, at least 106 species of vascular plants used as food, seasoning, and beverages have been recorded in Slovakia since the nineteenth century (Łuczaj, 2012). In Slovak folk songs, a significantly lower number of plant references was recorded, accounting for 49 edible species (used as food or drink), of which 17 were wild plants.

We recorded several endangered vascular plant species in the folk songs. *Pinus cembra* L. occurs naturally only in the High Tatras Mountains. Swiss stone pine forests cover only 751 ha at altitudes ranging from 1,179 m to 1,821 m and are listed among the NATURA 2000 habitats (Zięba et al., 2019). Another endangered species is *Juniperus sabina* L. (Feráková et al., 2001), with only one citation in folk songs.

**Table 1** Ten most mentioned species in Slovak folk songs and their representation in folk songs of other European cultures.

| Scientific name | Common name | Slovakia | Bulgaria | Slovenia | Spain |
|---|---|---|---|---|---|
| *Rosa* sp. | Rose | 1 (197) | 7 (165) | 7 (97) | 1 (351) |
| *Vitis vinifera* L. | Grape vine | 2 (126) | 2 (279) | 1 (214) | 2 (197) |
| *Rosmarinus officinalis* L. | Rosemary | 3 (113) | | 2 (162) | |
| *Secale cereale* L. | Rye | 4 (90) | 5 (263) | | |
| *Acer* sp. | Maple | 5 (85) | | | |
| *Malus domestica* Borkh. | Apple tree | 6 (85) | 1 (295) | 9 (72) | 6 (71) |
| *Quercus* sp. | Oak | 7 (78) | | | |
| *Viola* sp. | Violet | 8 (60) | | | |
| *Lilium candidum* L. | Madonna lily | 9 (55) | | 6 (103) | |
| *Tilia* sp. | Linden | 10 (55) | | 8 (97) | |

The first number shows the order of the first 10 most cited plant species in the songs of individual countries, and the number in parentheses shows the number of citations in the songs.

In Slovakia, savins naturally occur only in the Poloniny Mountains located in the north of Slovakia. A weed that was abundant in the past, *Agrostemma githago* L., was also reflected in songs. Its occurrence is bound to the traditional farming of cereal fields (especially rye and oatmeal). Currently, this species is rare and has been assigned to the red list of Slovak vascular plant species that are critically endangered. *Lilium martagon* L. and *Lilium bulbiferum* L. subs. *bulbiferum* are listed in the red list of Slovak vascular plants in the lower risk and vulnerable category (Feráková et al., 2001).

Among all mentions of plant species, 33.8% were references to different types of use. The traditional ecological knowledge of former generations has been partially transmitted into folk songs, representing a significant biocultural heritage. The folk songs reflect the attitude of local people towards native and cultivated plants, which played an important role in everyday life of mainly peasant communities, and which are, according to Elscheková (1995), perhaps the most valuable musical and poetic legacy in Slovakia that has been preserved for generations.

## 5. Conclusion

Folk songs play a significant role in preserving traditional ecological knowledge. In the case of Slovakia, this knowledge represents 673 mentions of the uses of plants in Slovak folk songs for making furniture, handicrafts, decoration, treatment, or as forage. However, most plants were mentioned in relation to food and beverages. The most frequently cited plants in folk songs were rose, grapevine, rosemary, and rye. The predominantly mountainous landscape character of Slovakia was also reflected in Slovak folklore, and forests were the most mentioned landscape elements. In the past, rye was mainly grown due to less favorable climatic conditions; therefore, it is not surprising that it was the most cited plant species from the grains. Studying folk songs within an ethnobotanical context may reveal valuable information on the material and symbolic use of plant species. The findings can be useful for a better understanding of the relationship between former local communities and nature and can help revive traditional ecological knowledge, which is slowly disappearing.

## 6. Supplementary Material

The following supplementary material is available for this article:

Table S1. List of plants and their use mentioned in the Slovak folk songs.

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