

Article

Traditional Uses of Medicinal Plants in South-Western Part of Lithuania

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Abstract: Changes in people's dependence on the resources of the immediate natural environment and in the ways in which information is transmitted may result in the loss of some of the traditional knowledge of plants and their uses. In order to investigate and preserve this knowledge, a comprehensive ethnobotanical study was carried out in a little-studied ethnographic region. Knowledge about the plants used for treatment was collected through open-ended and semi-structured interviews in villages and small rural settlements in southwestern Lithuania. In total, 30 informants reported 103 plant and 1 lichen species. Although the survey was carried out in a small area, up to five local names per species were recorded. The most frequently used species were *Matricaria chamomilla*, *Tilia cordata*, *Artemisia absinthium* and *Plantago major*. The largest number of plant species was used to treat digestive and respiratory system disorders. Wild plants were mentioned in 71.0% of all use reports, while a relatively higher proportion of cultivated plants was recorded among the new uses. Decoction and infusion were the most commonly used, while some unusual preparations have been recorded in past uses. Research showed that the diversity of plant species used for healing has declined over the last 20 years and that part of traditional ethnobotanical knowledge is disappearing.

Keywords: ethnobotany; folk medicine; traditional knowledge; traditional medicine

Citation: Karpavičienė, B.

Traditional Uses of Medicinal Plants in South-Western Part of Lithuania.

Plants **2022**, *11*, 2093. <https://doi.org/10.3390/plants11162093>

Received: 20 July 2022

Accepted: 8 August 2022

Published: 11 August 2022

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1. Introduction

Traditional knowledge acquired over centuries, adapted to the local culture and environment and passed on from one generation to the next must be respected and preserved, while synergies between modern science and indigenous knowledge must be encouraged [1]. Accordingly, the number of articles on ethnobotany and herbalism increased 6.3-fold at the beginning of the 21st century, and modern ethnobotanical research has recently gained more attention in Central Europe [2,3]. However, most of these studies geographically cover African and Asian countries and are still relatively rare in Northern Europe, the Baltics and other former Soviet bloc countries [2,3]. Until the 21st century, ethnobotanical research in Lithuania was dominated by the ethnologist's view of folk medicine, where the only thing that mattered was which herb cured which disorder [4]. In the last two decades, when pharmacy students at the Lithuanian University of Health Sciences began to choose ethnopharmacological research as the basis for their Master's thesis, research on traditional medicine in Lithuania has intensified. However, such works usually remain unpublished.

The diversity of plant species used in traditional medicine depends on the diversity of the regional flora, the availability and accessibility of plant resources and the associated knowledge of their use as herbal medicines [5]. The spontaneous Lithuanian flora includes about 1350 vascular plant species [6]. According to Naumavičius [7], a third of these species are considered phytotherapeutically effective (259), prospective (112 species) or potential (87 species). However, not all these species are common and occur throughout Lithuania.

Access to the natural environment is essential to preserve traditional practices and knowledge about the use of wild plants [8]. Although some of the population still have access to natural resources and diverse knowledge of the medical use of plants, the majority relies on a very narrow selection and a rather restricted herbal landscape [9]. Changes in the landscape or in the abundance of plant resources can lead to changes in the ethnobotanical repertoires held by people and a loss of local knowledge [10]. On the other hand, the use of herbal medicinal products and supplements increased significantly over recent decades [11]. This renewed interest in traditional herbal medicine in more developed societies can be attributed to changes in lifestyles, with a growing demand for natural products [12]. However, the transmission of knowledge through texts and other media containing local as well as non-local knowledge has a more immediate and more prolonged effect than oral transmission [13]. With the popularisation of certain complementary and alternative remedies for human health, the knowledge of some intensively marketed species has increased [14].

In order to secure the survival of knowledge on how to use locally grown plants, more attention on the regional level needs to be given to preserving and supporting the distribution of such place-specific knowledge [15]. Changes in people's dependence on the resources of the immediate natural environment and in the ways in which information is transmitted may result in the loss of some of the traditional knowledge of plants and their uses. In order to preserve this knowledge, a comprehensive ethnobotanical study was carried out in a relatively little-studied ethnographic region. The aim of this study was 1) to document and analyse local knowledge on the current and past uses of medicinal plants and 2) to assess historical changes in medicinal plant use.

2. Results and Discussion

2.1. Diversity of Plants Used for Treatment

A total of 103 vascular plant and 1 lichen species were recorded in this study. A total of 136 vernacular plant names were registered (1.3 names per species), of which 48 (35.3%) correspond to officially approved Lithuanian genus names. This group included relatively more cultivated plant species (27.1%) and trees or shrubs (20.8%) than the group of plants named with specific vernacular names (13.6% and 6.8%, respectively). Apart from simple linguistic variations, six vernacular plant names are not recorded in any literature sources or databases. Most of the medicinal plants were registered under one vernacular name, while *Plantago major* and *Symphytum officinale* L. were registered under five names each, none of which corresponded to the officially approved Lithuanian names of these species. Vice versa, the five vernacular names referred to two or three different species each. Even 14 vernacular plant names coincided with the official Lithuanian names of another plant genus. Such mix-ups of names can be a trap for inexperienced or inattentive researchers. According to Łuczaj [16], in ethnobotanical studies, this type of error is the most common in species identification.

The species belonged to 52 families, of which Asteraceae, with 17 species, was the most frequent, followed by Rosaceae (11 species) and Lamiaceae (8 species, Table 1). These three families have the largest number of medicinal plant species in the native flora of Lithuania [7]. However, no species belonging to the Fabaceae family were recorded in this study, although it is the fourth most abundant family in Lithuania. According to Leonti [13], the plant families belonging to the Euasterids (e.g., Asteraceae, Apiaceae, Lamiaceae, Solanaceae) are generally overused, while families belonging to the Poales (e.g., Poaceae, Cyperaceae) are underrepresented in medicinal floras. Accordingly, only one species belonging to Poales, *Briza media*, was recorded in this study. Two species, namely *Cirsium vulgare* (Savi) Ten. and *Ranunculus repens* L., reported by the informants, were not identified as medicinal [7].

Table 1. The number of species of Lithuanian native medicinal plants in the most abundant families according to Naumavičius [7] and their number and ratio recorded in this study.

| Family | Species number | | Species ratio, % |
|-----------------|----------------|------------|------------------|
| | Naumavičius | This study | |
| Asteraceae | 46 | 12 | 26.1 |
| Rosaceae | 32 | 11 | 35.5 |
| Lamiaceae | 29 | 6 | 20.7 |
| Fabaceae | 26 | 0 | 0 |
| Apiaceae | 19 | 2 | 10.0 |
| Polygonaceae | 19 | 3 | 15.8 |
| Ranunculaceae | 18 | 2 | 11.1 |
| Brassicaceae | 17 | 1 | 5.9 |
| Salicaceae | 17 | 0 | 0 |
| Ericaceae | 15 | 5 | 33.3 |
| Cyperaceae | 14 | 0 | 0 |
| Plantaginaceae | 11 | 1 | 9.1 |
| Caryophyllaceae | 10 | 1 | 10.0 |
| Orobanchaceae | 10 | 1 | 10.0 |
| Poaceae | 10 | 1 | 10.0 |

The most frequently mentioned species were *Matricaria chamomilla* with 34 UR, reported by 16 informants, and *Tilia cordata*, with 25 UR, reported by 19 informants, followed by *Artemisia absinthium*, *Plantago major*, *Acorus calamus*, *Vaccinium vitis-idaea*, *Thymus pulegioides* and *Vaccinium myrtillus* L (Table 2). These plant species, with the exception of the last three, are easily accessible as they are very commonly occurring or cultivated in the immediate environment. The top eight species were used to treat the most common health problems: digestive, respiratory and urinary system disorders, wounds and infections. According to Petkevičiūtė and Mekas [4], the most popular plant species used in Lithuania in both modern and traditional medicine are *Matricaria recutita*, *Thymus vulgaris* L., *Mentha piperita* L., *Calendula officinalis* L., *Echinacea purpurea* (L.) Moench., *Valeriana officinalis* L., *Melissa officinalis* L. and *Leonurus cardiaca* L. However, most herbal remedies and teas sold in pharmacies originate from imported raw materials [17].

Table 2. Medicinal (M) and veterinary (V) uses of wild and cultivated plants in the south-western part of Lithuania. The data were collected from interviews with 30 informants.

| Latin name | Local name | Part used (use records) | Use ¹ (use records) | Preparation |
|--------------------------------|------------|-------------------------|--------------------------------|--|
| <i>Achillea millefolium</i> L. | Kraujažolė | Leaf (1) | M, E: (1) wound | Fresh, crushed |
| <i>Acorus calamus</i> L. | Totorka | Rhizome (13) | M, I: (8) stomach problems | Decoction; maceration in alcohol with pepper or juniper ‘berries’; dried powder with water; fresh with honey |
| | | | M, E: (3) hair strengthening | Decoction |
| | | | M, I: (1) diarrhoea | Decoction |
| | | | M, I: (1) appetite stimulation | Decoction |
| | | Leaf (1) | M, E: (1) repellent for fleas | Added in pillow and mattress stuffing |

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|---|----------------------------|------------------------|--|--|
| <i>Aesculus hippocastanum</i> L.* | Kaštonas, kaštanas | Flower (2) | M, E: (1) varicose veins M, E: (1) joint problems | Maceration in alcohol Maceration in alcohol |
| | | Seed (3) | M, E: (3) joint problems | Maceration in alcohol; decoction for bath |
| | | | | |
| <i>Agrimonia eupatoria</i> L. | Morstytžolė | Aerial part (1) | M, I: (1) stomach problems after heavy lifting of weights | Infusion mixed with a spoon of lard or butter |
| <i>Alchemilla vulgaris</i> L. s.l. | Raskila | Aerial part (4) | M, I: (2) stomach problems | Infusion |
| | | | M, I: (1) diarrhoea | Decoction |
| | | | M, I: (1) inflammation, infection | Decoction |
| <i>Allium cepa</i> L.* | Cibulis | Bulb (5) | M, I: (2) otitis | Juice, one drop into ear |
| | | | M, I: (1) cough | Fresh with milk and honey |
| | | | M, E: (1) runny nose | Juice to lubricate the nose |
| | | | M, E: (1) hair strengthening | Grated bulb mixed with oil |
| <i>Allium sativum</i> L.* | Česnakas | Bulb (7) | M, I: (4) as vermifuge | Fresh |
| | | | M, E: (2) toothache | Fresh |
| | | | M, E: (1) bruises | Fresh |
| <i>Alnus glutinosa</i> (L.) Gaertn. | Elksnis | Bark (2) | M, V, I: (2) diarrhoea | Decoction |
| | | Leaf (2) | M, E: (1) bruises | Fresh, young sticky |
| | | | M, E: (1) sore legs | Fresh, young sticky |
| <i>Aloe arborescens</i> Mill.* | Alijošius | Leaf (3) | M, I: (1) otitis M, E: (1) wrinkles M, I: (1) lung infection | Juice into ear Juice Fresh with honey; decoction |
| <i>Amaranthus caudatus</i> L.* | Burnotas | Aerial part (1) | M, I: (1) women's health problems | Infusion |
| <i>Anethum graveolens</i> L.* | Krapas | Aerial part (1) | M, I: (1) blood pressure | Infusion |
| <i>Arctium</i> sp. | Godas, god-lapis varnalėša | Root (1) | M, I: (1) stomach problems | Fresh |
| | | Leaf (1) | M, E: (1) joint problems | Fresh |
| | | Inflorescence (2) | M, I: (1) cough | Decoction |
| | | | M, I: (1) furuncle | Decoction |
| <i>Arctostaphylos uva-ursi</i> (L.) Spreng. | Meškauogė | Aerial part (2) | M, I: (2) urinary tract infections, urinary incontinence | Decoction |
| <i>Artemisia absinthium</i> L. | Metėlė | Aerial part, leaf (24) | M, V, I: (12) diarrhoea | Decoction; infusion |
| | | | M, I: (5) stomach problems | Infusion; fresh leaf with salt |

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| | | | M, I: (4) bellyache M, I: (2) appetite stimulation M, I: (1) as vermifuge | Decoction; infusion Infusion Infusion |
| <i>Artemisia cina</i> O.Berg** | Lisninkas | Inflorescence (1) | M, I: (1) as vermifuge | Infusion |
| <i>Beta vulgaris</i> L.* | Cviklis, brokas | Root (2) | M, E: (2) headache | Compress with fermented juice |
| | | Leaf (2) | M, E: (2) joint problems, sore legs | Fresh |
| <i>Bistorta officinalis</i> Delarbre | Vėžiukas, senšaknė | Rhizome (2) | M, I: (1) cancer M, I: (1) stomach problems after heavy lifting of weights | Maceration in alcohol Maceration in alcohol, mixed with lard or rendered lardon |
| <i>Brassica oleracea</i> L.* | Kopūstas | Leaf (6) | M, E: (3) bruises, swelling | Fresh |
| | | | M, E: (1) tetter | Fermented juice |
| | | | M, I: (1) stomach problems | Fresh juice |
| | | | M, E: (1) headache | Fresh |
| <i>Briza media</i> L. | Blakutės | Inflorescence (2) | M, I: (2) urinary tract infection | Decoction; infusion |
| <i>Bryonia alba</i> L.* | Perstups | Root (1) | M, I: (1) stomach problems after heavy lifting of weights | Grated fresh and fried with rendered lardon |
| <i>Bryophyllum pinnatum</i> (Lam.) Oken* | Paleistuvė | Leave (1) | M, I: (1) cancer | Maceration in alcohol |
| <i>Calendula officinalis</i> L.* | Medetka | Inflorescence (7) | M, I: (2) women's genital tract infection | Infusion |
| | | | M, E: (2) inflammation, infection | Infusion |
| | | | M, I: (1) cough | Infusion |
| | | | M, I: (2) various problems, body cleansing | Decoction; infusion |
| <i>Callisia fragrans</i> (Lindl.) Woodson* | Ūsas | Leaf (1) | M, E: (1) joint problems | Maceration in alcohol |
| <i>Calluna vulgaris</i> (L.) Hull | Viržovė | Aerial part (1) | M, E: (1) sedative | Decoction, bath |
| <i>Cardamine pratensis</i> L. | Miegālė, miegžolė | Aerial part (4) | M, E: (4) insomnia | Put under pillow |
| <i>Carum carvi</i> L. | Kimelis | Fruit (9) | M, I: (3) diarrhoea | Decoction |
| | | | M, I: (2) induce lactation | Decoction |

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| | | | M, I: (2) abdominal bloating | Decoction |
| | | | M, I: (1) intestine problems | Decoction |
| | | | M, I: (1) blood pressure | Decoction |
| <i>Centaurea cyanus</i> L. | Vosilka | Inflorescence (8) | M, I: (4) cough | Infusion |
| | | | M, I: (3) lung infection | Infusion |
| | | | M, I: (1) sleeping problems | Infusion |
| <i>Centaureum erythraea</i> Rafn | Širdažolė | Aerial part (2) | M, I: (2) heart problems, chest pain | Infusion |
| <i>Cetraria islandica</i> L. | Samanos | Aerial part (1) | M, I: (1) heavy cough | Infusion |
| <i>Chelidonium majus</i> L. | Ugniažolė | Aerial part (2) | M, I: (1) diarrhoea | Infusion |
| | | | M, I: (1) cancer | Infusion used in drops |
| | | Latex (3) | M, E: (1) cataract | Fresh |
| | | | M, V, E: (2) warts | Fresh |
| <i>Cirsium vulgare</i> (Savi) Ten. | Piktdagis | Inflorescence (3) | V, I: (1) stimulate cow reproduction | Fresh inflorescence without spines |
| | | | M, I: (1) women's health problems | Decoction |
| | | | M, I: (1) furuncles | Decoction |
| <i>Comarum palustre</i> L. | Vėžiažolė | Rhizome (1) | M, E: (1) leg ulcer | Maceration in alcohol |
| <i>Convallaria majalis</i> L. | Kanvalijos | Flower (3) | M, I: (3) heart problems | Maceration in alcohol |
| <i>Corylus avellane</i> L. | Riešutas | Seed (1) | M, I: (1) organism enhancing | Fresh |
| <i>Cota tinctoria</i> (L.) J.Gay | Arnika | Inflorescence (1) | M, I: (1) stomach problems | Decoction |
| <i>Crataegus</i> spp. | Gudobelė | Flower (1) | M, I: (1) heart problems | Decoction |
| <i>Daphne mezereum</i> L. | Žalčialunkis | Twig (1) | M, E: (1) toothache | Fresh |
| <i>Daucus carota</i> subsp. <i>sativus</i> (Hoffm.) Schübl. & G.Martens* | Morka | Root (1) | M, I: (1) diarrhoea | Fresh, finely grated |
| <i>Elsholtzia ciliata</i> (Thunb.) Hyl. | Smirdelka | Aerial part (1) | M, E: (1) joint problems | Decoction, bath |
| <i>Equisetum arvense</i> L. | Asiūklis, ašuoklis | Aerial part (1) | M, I: (1) urinary tract | Decoction |
| <i>Euphorbia helioscopia</i> L. | Liktoriai, pienė, pienius | Latex (4) | M, E: (3) warts | Fresh |
| | | | M, E: (1) splinter | Fresh |
| <i>Euphrasia</i> sp. | Akišveitė | Aerial part (1) | M, E: (1) eye problems | Infusion |

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| <i>Fragaria vesca</i> L. | Žemuogė | Aerial part (1) | M, I: (1) cough | Infusion |
| <i>Frangula alnus</i> Mill. | Skirpstas | Bark (1) | M, I: (1) laxative | Decoction |
| <i>Galium aparine</i> L. | Limpanti žolė | Aerial part (2) | V, I: (2) stimulate cow reproduction | Infusion |
| <i>Geum urbanum</i> L. | Žiognagė | Aerial part (1) | M, I: (1) diarrhoea | Decoction |
| <i>Glechoma hederacea</i> L. | Rietena | Aerial part (1) | M, I: (1) cough | Infusion |
| <i>Helichrysum arenarium</i> (L.) Moench | Katinpėdėlė, šiaudinė | Inflorescence (2) | M, I: (1) liver problems, jaundice M, I: (1) cough | Infusion Infusion |
| <i>Hyssopus officinalis</i> L.* | Ysopas | Aerial part (1) | M, I: (1) abortifacient | Decoction |
| <i>Humulus lupulus</i> L. | Apynys | Fruit (6) | M, I: (2) insomnia M, E: (2) hair strengthening M, I: (2) cough | Decoction; pillow stuffing Decoction Infusion |
| <i>Hypericum perforatum</i> L. | Jonžolė | Aerial part (7) | M, I: (3) panacea M, I: (2) bowels problems M, I: (2) nerves | Decoction; infusion Infusion Infusion; maceration in alcohol |
| <i>Inula helenium</i> L.* | Debesils | Root (5) | M, I: (1) stomach problems after heavy lifting of weights M, I: (2) bowel problems M, I: (1) urinary tract problems M, I: (1) body strengthening | Decoction Decoction Decoction Decoction |
| <i>Juniperus communis</i> L. | Kadugys | Root (1) Berry-like cone (1) | M, I: (1) cough M, I: (1) stomach problems | Maceration in alcohol Maceration in alcohol |
| <i>Knautia arvensis</i> (L.) Coult. | Vyriškoji moteržolė | Aerial part (1) | M, I: (1) women's health problems | Infusion |
| <i>Lamium album</i> L. | Nedilginanti dilgėlė, gud-moterė | Aerial part (3) | M, I: (2) women's health problems, vaginal candidiasis M, I: (1) anaemia | Decoction; infusion Infusion |
| <i>Leonurus cardiaca</i> L. | Sukatžolė | Aerial part (1) | M, I: (1) sedative | Infusion |
| <i>Linum usitatissimum</i> L.* | Linas | Seed (11) | M, E: (5) foreign object in the eye V, I: (3) bloat in cattle | Linseed is placed in the eye and removed after some time Decoction |

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| | | | M, E: (1) toothache | Hot porridge, application on the cheek |
| | | | M, E: (2) furuncle, fester | Porridge in milk or water |
| <i>Lysimachia nummularia</i> L. | Gurgulžolė | Aerial part (2) | M, I: (2) stomach problems after heavy lifting of weights, bellyache | Infusion |
| | | | M, I: (8) diarrhoea | Decoction |
| | | | M, I: (3) stomach problems, bellyache | Decoction |
| <i>Matricaria chamomilla</i> L. | Remunėlė, ramunėlė, ramunaitės | Inflorescence (34) | M, E: (6) eye problems, infection | Decoction |
| | | | M, I: (6) constipation | Infusion |
| | | | M, E: (4) wound | Decoction; infusion |
| | | | M, I: (3) sore throat | Decoction; infusion |
| | | | M, I: (3) fever | Infusion |
| | | | M, I: (1) cough | Infusion |
| <i>Mentha</i> sp.* | Mėta, šaltmėtė | Aerial part (6) | M, I: (2) sedative | Infusion |
| | | | M, I: (1) improving digestion | Infusion |
| | | | M, I: (1) colds | Infusion |
| | | | M, I: (1) cough | Infusion |
| | | | M, I: (1) kidneys problems | Infusion |
| <i>Menyanthes trifoliata</i> L. | Puplaiškis | Leaf (9) | M, I: (4) stomach problems, | Decoction; infusion |
| | | | M, I: (2) diarrhoea | Decoction |
| | | | M, I: (2) appetite stimulation | Infusion |
| | | | M, I: (1) improving digestion | Infusion |
| | | Root (1) | M, I: (1) stomach problems | Macerated in alcohol |
| <i>Paeonia</i> sp.* | Bijūnas | White flower (1) | M, I: (1) vaginal candidiasis | Infusion |
| | | Red flower (1) | M, I: (1) amenorrhea | Infusion |
| <i>Petasites hybridus</i> (L.) G.Gaertn., B.Mey. & Scherb. | Šaukštis | Leaf (1) | M, E: (1) toe web space fungal infection | Fresh |
| <i>Peucedanum palustre</i> (L.) Moench | Trūkžolė | Leaf (1) | M, I: (1) stomach problems after heavy lifting of weights | Fresh with butter |
| | | Root (1) | M, I: (1) stomach problems after | Macerated in alcohol |

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| | | | heavy lifting of weights | |
| <i>Pinus sylvestris</i> L. | Pušis | Bud (3) | M, I: (2) lung problems M, E: (1) joint problems | Decoction Decoction, bath |
| <i>Piper nigrum</i> L.** | Pipiras | Seed (2) | I: (2) diarrhoea | Mixed in water |
| | | | M, E: (10) wounds, bruises, swelling | Fresh |
| | | Leaf (15) | M, I: (3) stomach problems | Decoction; infusion |
| <i>Plantago major</i> L. | Traukžolė, trauklapis, raugžolė, rauglapis, rasakila | Inflorescence with seeds, seed (2) | M, E: (2) felon M, I: (2) stomach problems | Fresh; salo covered with fresh leaf Decoction |
| | | Whole plant with root (2) | M, I: (1) diarrhoea M, E: (1) joint pain | Decoction Macerated in alcohol |
| <i>Polygonatum multiflorum</i> (L.) All. | Pakalnutė | Rhizome (3) | M, E: (3) freckles | Fresh juice |
| | | | M, I: (3) urinary tract stones | Infusion |
| <i>Polygonum aviculare</i> L. | Takažolė | Aerial part (6) | M, I: (2) stomach problems also after heavy lifting of weights M, I: (1) bladder problems | Decoction Infusion |
| <i>Potentilla anserina</i> L. | Sidabražolė | Aerial part (1) | M, I: (1) strengthening potency | Decoction |
| <i>Potentilla erecta</i> (L.) Raeusch. | Vėžašaknis, degsnis, vėžiukas, | Rhizome (7) | M, I: (5) cancer M, I: (2) stomach problems | Maceration in alcohol Decoction; maceration in alcohol |
| | | | M, E: (2) helping baby sleep peacefully | Incense of dry herb |
| <i>Prunella vulgaris</i> L. | Juodgalvėlė | Aerial part (7) | M, I: (2) helping baby sleep peacefully M, E: (1) children's startle M, I: (1) fright of snake M, I: (1) cough | Infusion Incense of dry herb Infusion Infusion |
| <i>Quercus robur</i> L. | Ažuolas | Bark (5) | M/V, I: (5) diarrhoea | Decoction |
| <i>Ranunculus repens</i> L. | Karpažolė | Aerial part (1) | M, E: (1) warts | Fresh, smashed |

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| <i>Rheum rhabarbarum</i> L.* | Barbaras, rābarbaras | Petiole (1) | M, I: (1) appetite stimulation | Kompot |
| <i>Rubus idaeus</i> L. | Avietē | Stem, aerial part (12) | M, I: (5) fever | Decoction |
| | | | M, I: (5) cough | Decoction |
| | | | M, I: (2) sore throat, hoarseness | Decoction |
| <i>Rumex crispus</i> L. | Arkliarūgštē | Root (1) | M, E: (1) warts | Fresh mixed with sour cream |
| <i>Ruta graveolens</i> L.* | Rūta | Leaf (11) | M, I: (7) bellyache | Fresh with/without salt; fresh, cooked with omelette |
| | | | M, I: (1) hearth problems | Fresh |
| | | | M, I: (1) nerves | Infusion |
| | | | M, E: (1) hair strengthening | Decoction |
| | | | M, I: (1) abortifacient | Decoction |
| <i>Sanguisorba officinalis</i> L. | Kraujažolē, šakutēs | Aerial part (3) | M, I: (2) diarrhoea, dysentery | Decoction |
| <i>Scrophularia nodosa</i> L. | Bervidis | Aerial part (1) | M, I: (1) poisoning | Infusion |
| | | | M, E: (1) radiculitis | Infusion |
| <i>Silene vulgaris</i> (Moench) Garcke | Pūsliukēs, pūslelē | Aerial part (7) | M, I: (2) bladder inflammation | Decoction; infusion |
| | | | M, I: (1) incontinence | Infusion |
| | | | M/V, I: (2) urinary retention | Infusion |
| | | | M, I: (1) heavy menstruation | Decoction |
| | | | M, I: (1) vaginal candidiasis | Decoction |
| <i>Solanum dulcamara</i> L. | Virbinyčia, saldymedis | Stem (2) | M, I: (1) cough | Fresh, to chew |
| <i>Solanum tuberosum</i> L.* | Bulvė | Tuber (10) | M, I: (1) sore throat | Fresh, to chew |
| | | | M, I: (2) cough | Boiled unpeeled for inhalation of steam |
| | | | M, E: (2) sore throat | Boiled unpeeled, warming compress |
| | | | M, E: (2) eye inflammation | Fresh grated |
| | | | M, E: (1) bruises, burns | Fresh grated |
| | | | M, E: (2) bladder inflammation | Sit on pot with hot boiled unpeeled potatoes |
| | | | M, I: (1) stomach problems | Fresh grated, diluted |
| | | Sprout (1) | M, E: (1) warts | Boiled, smashed |
| <i>Sorbus aucuparia</i> L. | Šermukšnis | Fruit (2) | M, I: (2) constipation | Fresh or dried |

| | | | | |
|--|--|-------------------|---|--|
| <i>Symphytum officinale</i> L. | Taukžolė, kaulažolė, juodšaknė, kiaulpienė, trūkžolė | Root (9) | M, E: (2) joint problems | Fresh grated and mixed with lard |
| | | | M, I: (1) bowels inflammation | Fresh or dried |
| | | | M, I: (1) low gastric acidity | Fresh or dried |
| | | | M, I: (1) stomach problems after heavy lifting of weights | Cut into slices and cooked with omelette |
| | | | M, I: (1) children's body strengthening | Dried |
| | | | M, I: (1) nerves | Decoction |
| | | | V, I: (2) appetite stimulation | Fresh |
| <i>Syringa vulgaris</i> L.* | Alyva | White flower (1) | M, I: (1) vaginal candidiasis | Infusion |
| <i>Tanacetum balsamita</i> L.* | Moteržolė | Leaf (5) | M, I: (3) diarrhoea, nausea | Fresh, cooked with omelette |
| | | | M, I: (1) women's problems | Infusion |
| | | | V, E: (1) to lure honeybees | Fresh, rub entrance of empty hive |
| <i>Tanacetum parthenium</i> (L.) Sch.Bip.* | Moteržolė | Leaf (1) | M, I: (1) bowels problems | Fresh, cooked with omelette |
| <i>Tanacetum vulgare</i> L. | Bitkrėslė | Inflorescence (4) | M, I: (1) cancer | Decoction |
| | | | M, I: (1) abortifacient | Infusion used for long period |
| | | | V, E: (1) insect repellent | Fresh, rub into skin or fur |
| <i>Taraxacum officinale</i> F.H.Wigg. | Pienė | Inflorescence (1) | V: I: (1) diarrhoea | Decoction |
| <i>Thalictrum lucidum</i> L. | Moteržolė, trūkžolė | Aerial part (2) | M, I: (2) stomach problems after heavy lifting of weights | Infusion |
| | | Leaf (3) | M, I: (3) bellyache; diarrhoea | Fresh, cooked with omelette |
| <i>Thuja occidentalis</i> L.* | Čisai, tuja | Twigs (3) | M, E: (1) unsafe intercourse | Decoction, bath |
| | | | M, I: (1) epilepsy | Infusion |
| | | | M, I: (1) toothache | Decoction |
| <i>Thymus pulegioides</i> L. | Čiobrelis, čiobriukas | Aerial part (13) | M, I: (9) cough | Decoction, infusion |
| | | | M, I: (1) fever | Infusion |
| | | | M, I: (1) body strengthening | Infusion |
| | | | M, E: (1) helping baby sleep peacefully | Decoction for bath soak |

| | | | | |
|---------------------------------|----------------|-----------------------------|---|---------------------------------|
| | | | M, I: (1) heart problems | Infusion |
| | | | M, I: (13) fever | Decoction, infusion |
| | | | M, I: (7) cough | Decoction, infusion |
| | | | M, I: (2) influenza | Infusion |
| <i>Tilia cordata</i> Mill. | Liepa | Flower (24) | M, I: (1) bronchitis | Infusion |
| | | | M, I: (1) running nose | Infusion |
| | | Bark (1) | M, E: (1) burning | Inner part of fresh peeled bark |
| <i>Tropaeolum majus</i> L.* | Žemčiūgai | Aerial part (1) | M, I: (1) cough | Infusion |
| | | | M, I: (7) cough | Decoction, infusion |
| | | | M, I: (1) lung infection | Infusion |
| <i>Tussilago farfara</i> L. | Šalpusnis | Inflorescence (10) | M, I: (1) asthma | Infusion |
| | | | M, I: (1) sore throat | Infusion |
| | | | M, E: (1) wounds | Fresh |
| | | Leaf (2) | M, E: (1) sore legs | Fresh |
| | | Aerial part (5) | M, E: (5) hair strengthening | Decoction |
| | | | M, I: (1) lung problems, cough | Decoction |
| <i>Urtica dioica</i> L. | Dilgėlė | | M, E: (3) hair strengthening | Decoction |
| | | Root (5) | M, I: (1) fever, contraindication high blood pressure | Decoction |
| <i>Urtica urens</i> L. | Mažytė dilgėlė | Aerial part (1) | M, E: (1) joint problems | Fresh, whipping |
| | | | M, I: (7) diarrhoea | Dried fruits; decoction |
| <i>Vaccinium myrtillus</i> L. | Mėlynė | Fruit, fruit with twig (13) | M, I: (5) eye problems | Dried fruits; decoction |
| | | | M, I: (1) trembling hands | Dried fruits; decoction |
| <i>Vaccinium oxycoccos</i> L. | Spanguolė | Fruit (2) | M, I: (1) appetite stimulation | Fresh |
| | | | M, I: (1) bladder problems | Fresh |
| | | | M, I: (7) bladder problems | Decoction |
| | | | M, I: (2) urinary incontinence | Decoction |
| <i>Vaccinium vitis-idaea</i> L. | Bruknė | Leaf (12) | M, I: (1) typhoid fever | Decoction |
| | | | M, I: (1) cough | Decoction |
| | | | M, I: (1) eye problems | Decoction |
| | | Fruit (1) | M, I: (1) bladder problems | Fresh |
| | | Root (11) | M, I: (4) nerves | Decoction |

| | | | | |
|---------------------------------|-------------------------|-----------------|-----------------------------|-----------------------|
| | | | M, I: (4) hearth problems | Decoction |
| <i>Valeriana officinalis</i> L. | Valerijonas, budrijolas | | M, I: (1) sleeping problems | Decoction |
| | | | M, I: (1) stomach problems | Maceration in alcohol |
| | | | M, I: (1) headache | Decoction |
| <i>Viburnum opulus</i> L. | Putinas | Fruit (2) | M, I: (1) cold | Jam |
| | | | M, I: (1) abortifacient | Decoction |
| <i>Viola arvensis</i> Murray | Našliukės | Aerial part (1) | M, I: (1) epilepsy | Infusion |

¹ Methods of application: I = internally; E = externally. * Cultivated. ** Non-local origin.

2.2. Categories of Disorders

The 487 use reports were divided into 14 groups according to the disorders they were indicated to treat. The largest proportion of UR (25.9%) was recorded, and the highest number of plant species (37) was used to treat digestive system disorders (Table 3). Despite the fact that the use of more than half of the plant species in the treatment of this group was mentioned only once, *Fic* was the highest among all the disorder groups. This was due to the frequent reference to several species, namely *Artemisia absinthium*, *Matricaria chamomilla*, *Menyanthes trifoliata* L. and *Acorus calamus*.

Table 3. Medicinal plant species number (SN), use reports (UR), use indices and the most popular plant species according to disorders categories.

| Category of disorders | SN | UR | SM ¹ | Fic ² | The most popular species with UR |
|---------------------------------|----|-----|-----------------|------------------|---|
| Digestive system | 37 | 126 | 0.54 | 0.71 | <i>Artemisia absinthium</i> 20 |
| Respiratory system | 25 | 70 | 0.56 | 0.65 | <i>Tussilago farfara</i> 10 |
| Genitourinary system | 20 | 43 | 0.55 | 0.54 | <i>Vaccinium vitis-idaea</i> 10 |
| Skin/hair | 19 | 39 | 0.58 | 0.53 | <i>Urtica dioica</i> 8 |
| Nervous system | 16 | 29 | 0.69 | 0.46 | <i>Prunella vulgaris</i> 5, <i>Valeriana officinalis</i> 5 |
| Infections/infestations | 14 | 40 | 0.64 | 0.67 | <i>Tilia cordata</i> 15 |
| Unspecified medicinal disorders | 13 | 21 | 0.46 | 0.40 | <i>Hypericum perforatum</i> 3 |
| Musculoskeletal system | 11 | 16 | 0.73 | 0.33 | <i>Aesculus hippocastanum</i> 4 |
| Veterinary medicine | 11 | 20 | 0.45 | 0.47 | <i>Artemisia absinthium</i> 3, <i>Linum usitatissimum</i> 3, <i>Quercus robur</i> 3 |
| Circulatory system | 10 | 16 | 0.70 | 0.40 | <i>Valeriana officinalis</i> 4 |
| Sensory system | 8 | 18 | 0.50 | 0.59 | <i>Matricaria chamomilla</i> 5, <i>Vaccinium myrtillus</i> 5 |
| Injuries | 9 | 24 | 0.67 | 0.65 | <i>Plantago major</i> 10 |
| Pain | 7 | 9 | 0.71 | 0.25 | <i>Allium sativum</i> 2, <i>Beta vulgaris</i> 2 |
| Pregnancy/birth/puerperium | 5 | 6 | 0.80 | 0.20 | <i>Carum carvi</i> 2 |

¹ SM = the single-mentioned items index. ² Fic = factor informant consensus index.

For treatment of respiratory system disorders, 25 species were used, with *Tilia cordata*, *Thymus pulegioides* L. and *Tussilago farfara* L. being the most commonly mentioned species. Urinary tract disorders were the most prevalent among the genitourinary system

disorders treated with medicinal herbs. These were most often treated with *Vaccinium vitis-idaea* and *Silene vulgaris* (Moench) Garcke. Various injuries were treated with eight plant species, the most popular being *Plantago major*. *Solanum tuberosum* was used to treat six categories of disorders, *Matricaria recutita*, *Mentha*, *Ruta graveolens* and *Thymus pulegioides* five. Among the 20 most frequently recorded plant species (according to UR), *Menyanthes trifoliata* was the only species used to treat only one group of disorders, namely digestive system disorders.

In most categories of disorders, more than half of the species were mentioned only once, with the single-mentioned items index ranging from 0.20 to 0.71 (0.49 on average, Table 3). The higher this index, the more single-mentioned species were listed in the disorder category and the higher the disagreement between informants, while low values of informant consensus factor indicate low medicinal plants homogeneity within a category of disorders. Only in four categories of disorders, namely digestive system, infections/infections, respiratory system and injuries, the consensus factor exceed 0.6 (Table 3). This means that informants rely more on plants to treat these categories of ailments. Meanwhile, the low F_{ic} values in the other categories of disorders suggest that either the plants are chosen randomly or informants do not share information about their use [18].

2.3. Usual and Unusual Preparation Methods

The most commonly used for treatment were the whole aerial part of the plant (39 species, 28.3% of UR), the flowers or inflorescences (20 species, 22.8% of UR), the leaves (20 species, 16.2% of UR) and the roots or rhizomes (18 species, 16.8% of UR). Only *Plantago major* has been reported to use the whole plant with above- and below-ground parts prepared as an aqueous decoction to treat diarrhoea and macerated in alcohol for the external treatment of joint pain. Most of the plant species (60%) were prepared for internal use, 17.1% for external and 22.9% for both internal and external use. The main methods of preparation were decoction (36.5% of UR) and infusion (28.6% of UR). Only in one case, when referring to the preparation of *Matricaria chamomilla* flowers, did the informants point out a significant difference in the therapeutic effect between the decoction and the infusion. According to six informants, the decoction inhibits diarrhoea, while the infusion has the opposite effect and is laxative. The use of *M. chamomilla* as a laxative is only registered in Moroccan and Greek traditional medicine, without indicating the importance of the method of preparation [19,20].

The harder parts of the plant (roots, rhizomes, stems, bark, dried fruit) were often prepared as decoctions or macerated in alcohol. When fresh, the leaves were usually used externally to treat minor injuries or swellings. Sometimes fresh leaves were eaten with salt (*Artemisia absinthium*, *Ruta graveolens*) or honey (*Aloe arborescens* Mill.). Fresh leaves of *Tanacetum balsamita* L., *T. parthenium* (L.) Sch.Bip and *Ruta graveolens* were mixed into an omelette and used to treat diarrhoea or other digestive disorders. A Renaissance Swiss physician Konrad Gesner called *T. balsamita* 'ovaria', because its leaves were used as a spice for egg dishes in the kitchen [21]. Moreover, the use of *T. balsamita* and *R. graveolens* to aromatise a specific type of omelettes as uncommon is recorded in Italy [22], while the use of *T. parthenium* for omelette preparation is prevalent among Slovenians in Northeast Italy [23]. In Slovenia, egg omelette and fried eggs are used medicinally for the treatment of gastrointestinal problems and dysmenorrhea when prepared with the following plants: *Achillea millefolium*, *Ruta graveolens*, *Tanacetum vulgare* and *Matricaria chamomilla* [24]. In Lithuania, old believers sometimes cook *Valeriana officinalis* roots with an omelette because, according to them, it is healthy and tasty [25].

Fresh *Symphytum officinale* roots, sliced and fried in butter, were also stirred into omelettes and used to treat rupture (straining) or upset stomachs (Lithuanian "trūkis", "skrandžio pasitęsimas"). A rupture is the folk name for abdominal pain and loss of appetite caused by overwork or the lifting of too heavy a weight. This ailment was also treated with a decoction of the roots of *Inula helenium* L. or an infusion or decoction of aerial parts of *Lysimachia nummularia* L., *Polygonum aviculare* L. and *Thalictrum lucidum* L.

Some herbal remedies for this disorder, i.e., an infusion of *Agrimonia eupatoria* L., fresh leaves of *Peucedanum palustre* (L.) Moench, alcoholic maceration of the roots of *Persicaria bistorta* (L.) Samp. and the freshly grated roots of *Bryonia alba*, were mixed with fats, such as butter, lard, or rendered lardon. On the other hand, the traditional use of some of these plant species (e.g., *Lysimachia nummularia*, *Thalictrum lucidum*, *Peucedanum palustre*) has completely disappeared, as all of the above-mentioned treatments for rupture were in the past.

The dried or fresh roots of *Plantago major* or grated roots of ‘trūkažolė’ (‘rupture herb’) are used to prepare omelettes to treat rupture [26,27]. However, the vernacular name ‘trūkažolė’ is often the name given to different plants used to treat rupture: e.g., *Symphytum officinale* (this study), *Plantago major* [27], *Pyrola* sp., *Peucedanum palustre*, *Chimaphila umbellata*, *Parnassia palustris*, *Centaureum erythraea* and others [28]. This is a serious trap for inexperienced researchers, as ‘trūkažolė’ is the official Lithuanian name for *Cichorium inthybus*.

In the case of a rupture, there is even more confusion, as the word *trūkis* is also used to refer to a hernia. Similar confusion arises in Latvian, where the word *trūce* also means both folk disease ‘rupture’ and hernia. Sile et al. [29] even mention 22 plant species used to treat *hernia* in 19th-century Latvia. According to Sōukand and Raal [30], almost every problem related to the stomach area (except severe diarrhoea) can be called by this name.

Although, according to Pennacchio et al. [31], the worldwide use of plant-derived smoke for medicinal applications outnumbers all other uses, incense was one of the rarest of plant uses in our study. According to Petkevičius [32], incense is a rather specific treatment for fright. Similarly, in this study, *Prunella vulgaris* L. was used to incense a person scared of snakes or babies who were not sleeping well. Moreover, an infusion of the aerial part of *Prunella vulgaris* could also be prepared for the same purpose and used as a tea or bath. Similar to *Prunella vulgaris*, a decoction of the aerial part of *Thymus pulegioides* was used for bathing babies with sleep problems.

2.4. Selection of Medicinal Plants

Most of the recorded medicinal plants (61 species or 58.7%) were found in the close environment (gardens, meadows, pastures and fields) and could be easily accessed if needed. Although a positive correlation between the accessibility or availability and perceived usefulness of plant species has been repeatedly demonstrated [5], the use of some effective and easily accessible medicinal plants was not registered in this study. One such species was *Filipendula ulmaria* L., which is traditionally used for the supportive treatment of the common cold, and for the relief of minor articular pain [33]. There are several records of *Filipendula ulmaria* used for the treatment of sore joints [34], gastrointestinal disorders [25], stomach pain, diarrhoea, dysenter, hypertension and colds [35] in other parts of Lithuania, but not in this study. The second example of the mismatch between availability and perceived usefulness is *Sambucus nigra* L., the flowers of which are traditionally used for the relief of early symptoms of common cold [36]. *Sambucus nigra*, an invasive species in Lithuania [37], is traditionally cultivated as an ornamental species and is widespread in study sites. However, none of the informants reported medicinal use of this species, while it is one of the most commonly used plants to treat the common cold in the western part of Lithuania [38].

In addition to the species already mentioned, several other common and frequent pharmacopoeial species, such as *Betula pendula* Roth, *Elymus repens* (L.) Gould, *Plantago lanceolata* L. and *Solidago virgaurea* L., were not used for treatment, while *Achillea millefolium* L., *Equisetum arvense* L. and *Viola arvensis* Murray were mentioned only once each. Four of them, namely *Betula pendula*, *Elymus repens*, *Equisetum arvense* and *Solidago virgaurea*, are effective in treating urinary tract diseases, while *Vaccinium vitis-idaea* and *Silene vulgaris* were the most commonly used to treat these diseases in the study area.

The choice of *Silene vulgaris* as well as *Briza media* for the treatment of urinary system disorders are obvious examples of the choice of plants based on the doctrine of signatures

according to the shape of the organ to be treated, i.e., the bladder. Generally, both species are very rarely utilized for medicinal purposes. Similar to this study, *Silene vulgaris* is also used to treat urinary retention in Poland [39], and *Briza media* is used by old believers from Lithuania to cure inflammation of the urinary tract [25]. Other examples of the choice of plants based on the doctrine of signatures are the white flowers of *Peonia lactiflora* and *Syringa vulgaris* used to treat vaginal candidiasis and the red flowers of *Peonia* spp. are used to treat amenorrhoea.

2.5. Current and Past Uses of Wild and Cultivated Plants

Of the 104 species recorded, 71.2% were wild, dominated by common and abundant species (50% of wild species), while cultivated plants accounted for 26% and were dominated by popular cultivated species (66.7%). They belong to different groups: vegetables (e.g., *Solanum tuberosum* L., *Allium cepa* L., *A. sativum* L.), ornamental (e.g., *Ruta graveolens*, *Syringa vulgaris* L.), medicinal and aromatic (e.g., *Calendula officinalis*, *Mentha* spp.) and others. Rarely non-native plant parts were bought and used for treatment. Some native species were both collected in the wild and cultivated (e.g., *Matricaria chamomilla*, *Artemisia absinthium*, *Leonurus cardiaca* L.). Interviewees mentioned that *Matricaria chamomilla* used to be collected in the fields before herbicides were used, but now it is only cultivated. According to Zenderland et al. [40], the proportion of cultivated species among plants used for medicinal purposes in 18 studies varied from 7.8% to 28.2%.

The 487 notifications of use recorded in this study were grouped according to UR time: 51 plant species (256 UR) were reported as currently used, 77 (198 UR) were used in the past, and 25 (33 UR) are new uses. Only 8 species belonged to all three 3 categories, 34 to 2 and 62 to 1. More than half of the latter, namely 36 plant and 1 lichen species, have only been used in the past. Of these species, 78.4% were wild plants. Wild plants were mentioned in 71.0% of all UR, cultivated in 28.3% and exotic plants in only 0.6%. The analysis of UR in current and past use showed a fairly similar ratio, but a relatively higher proportion of cultivated plants was recorded among the new uses, i.e., 39.4% of the cultivated and 60.6% of the wild plant species were associated with UR of new uses.

The popular cultivated and abundant wild species were used more often, with 6.1 and 5.6 UR per species, respectively, than rare wild or rare cultivated species (Figure 1). Overall, cultivated plant species were more exploited than wild ones, with an average UR per species of 5.1 and 4.7, for cultivated and wild plants, respectively, but the difference was not statistically significant (Mann–Whitney U Test, $p = 0.890$). Eight medicinal plant species and one lichen recorded in the survey were classified as rare or of restricted distribution species in an area. All of them were mentioned only 1–2 times, with one very clear exception of *Menyanthes trifoliata*, which was mentioned by 10 informants. This shows the importance of this species in traditional medicine in the region.

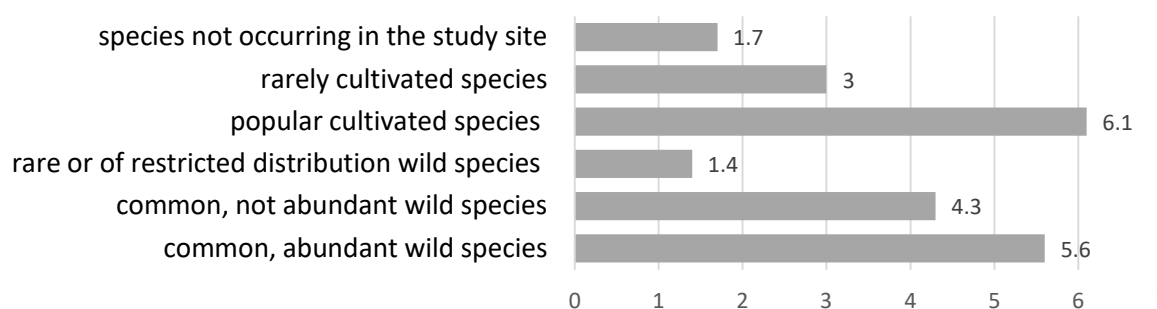


Figure 1. Mean use report of number per species in plant species frequency categories.

The number of species used in the past exceeded the number of currently (last two decades) used species in almost all species frequency groups. However, the average

number of UR per species was higher for the currently used than for the past used (on average 5.0 and 2.6, respectively). More than half (55.3%) of the 38 species whose use was mentioned only once had been used in the past, and 28.9% were newly used species.

The true extent of knowledge loss and the exact speed at which it occurs is very difficult to assess, as different diseases are common at different ages. However, this assumption is not always correct, as informants often applied their knowledge to the treatment of their relatives at different ages. Although the last 20 years were chosen for the study, some plant species have been out of use for much longer. Despite all the exceptions, the data show that the variety of plant species used for healing is decreasing and that traditional knowledge about plants and their uses is declining.

3. Materials and Methods

3.1. Study Area

The information was collected in villages and small rural settlements in southwestern Lithuania (Figure 2), centred on 55° 2' 0.2" N and 22° 43' 16" E. The territory is situated on a plain at an altitude of 10–70 m above sea level and covers 193 km², of which 17% are hemi-boreal mixed broadleaved-coniferous forests. The study area is more agrarian compared to the whole territory of Lithuania, where forests account for 33.5% of the total area. The remaining part of the study area is almost entirely covered by agricultural land, with inclusions of settlements, semi-natural grasslands and small transition mires and quaking bogs. In Lithuania, as in other post-soviet Baltic states, land use has changed over the last decades, with an abundance of abandoned land, more clear-cutting of forests, while marginal areas with natural meadow vegetation are no longer mowed and are overgrown with bushes [41].

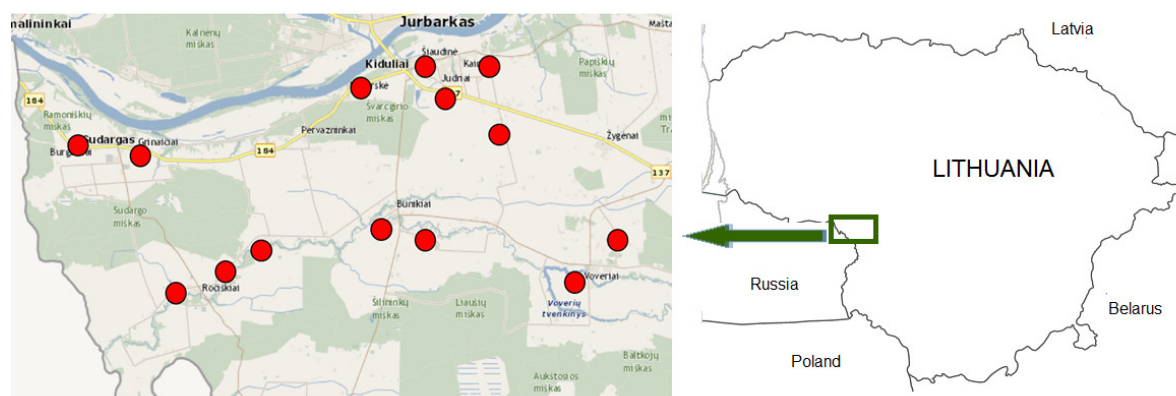


Figure 2. Map of the study area. Locations where data were collected are marked with a red circle.

The study area is bordered to the north by the River Nemunas and to the west by the Kaliningrad Oblast, which was the northern part of East Prussia until the end of the Second World War. Since then, the use of German words has left its mark on the current everyday language of the study region [42].

In Lithuania, herbalism is seen as a female “monopoly” [43]. Although many people in rural Lithuania had at least some knowledge of herbs, it was mostly women who treated their family members, relatives and neighbours [44]. According to Gukauskienė and Juknyte [45], in Lithuania, 35% of women aged 41–70 use medicinal plants, while only 12% of men in this age group use plants for treatment.

3.2. Data Collection

The study was carried out in the summer of 2013. Ethnobotanical knowledge was collected through open and semi-structured interviews. Informants identified by other local people as having significant knowledge about plants and healing were interviewed.

A total of 30 informants (29 women and 1 man), aged 47–91 years, were interviewed. The median age of the informants was 80 years, and only three of them were younger than 60 years. Participants who consented to take part in the study were asked to report on the use of plants: what the plants were called, what parts of the plant were collected, how they were processed and what diseases were treated. To identify changes in the use of plants, respondents were asked to indicate when a particular treatment was used: 1) all the time the same (hereinafter referred to as current use); 2) in the past (not used in the last two decades); 3) only in the last two decades (new use). If necessary, informants were asked to show fresh or dried plants or to describe the appearance and habitat of the plant as precisely as possible. If there were problems in identifying the species, informants were shown the most likely fresh plants. Some genera with more than one species occurring in the study area and difficult to identify by folk taxonomy, such as *Arctium*, *Crataegus*, *Euphrasia* and *Mentha*, were identified at the genus level. The plant names follow Plants of the World Online [46].

3.3. Data Analysis

The data were structured into use reports (UR), which reflect the use of a particular part of the plant, prepared or used in a particular way, for a specific medicinal category, multiplied by the number of people mentioning such use [47]. Plant species were divided into six groups according to their frequency in the study site:

- 1) common and abundant wild species;
- 2) common but not abundant wild species;
- 3) rare or of restricted distribution wild species;
- 4) popular cultivated species;
- 5) rarely cultivated species;
- 6) species not occurring in the study site.

The disorders mentioned by the respondents were categorised according to Cook [48], with the addition of two further categories: cancer and veterinary medicine. A single-mentioned item index (SM) for each disorder category was calculated according to Pirker et al. [49] as

$$SM = n_{tr}/n_t \quad (1)$$

where n_{tr} = number of taxa that are reported in each category only once, and n_t = number of taxa used in each category. The higher this ratio, the more single-mentioned species were listed in the disorder category and the higher the disagreement between informants.

The informant consensus factor (F_{ic}) was calculated according to Heinrich et al. [50] as

$$F_{ic} = (n_{ur} - n_t)/(n_{ur} - 1) \quad (2)$$

where n_{ur} = number of use reports in each category, and n_t = number of taxa used in each category. A high value (close to 1) indicates that relatively few taxa (species) are mentioned by a large proportion of informants, while a low value indicates that the informants disagree on the taxa to be used in the treatment within a category of disorders [50].

Author Contributions: Conceptualization, methodology, software, validation, investigation, writing and visualization, B.K. The author has read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: All the data are included in the present study.

Acknowledgments: The author is grateful to the publishing house Versmės for the opportunity to participate in their expedition.

Conflicts of Interest: The author declares no conflict of interest.

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