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Medicinal usage of wild plants in the historic regions of Livonia and Courland in the 19th century

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Declaration in Lieu of Oath

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I hereby declare in lieu of an oath that I have composed the enclosed master's thesis entitled

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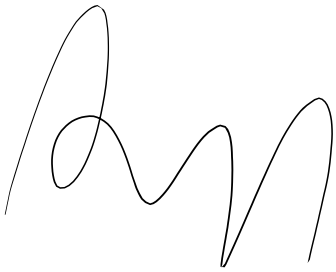

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Abstract

Background

Historical ethnobotanical data can offer valuable information about past human-nature relationships as well as serve as basis for diachronic analysis. This thesis aims to document medicinal plant uses in the 19th century mentioned in German-language sources in the historic regions of Estonia, Livonia and Courland. Furthermore, to analyze the gathered data in regards of plant families and medicinal use categories and finally to qualitatively compare the results with various studies from the study area and surrounding regions with recently acquired data as well as historic data.

Methods

Data was mainly obtained by systematic manual search in various relevant historical German-language works focused on the medicinal use of plants in Livonia and Courland. Data about plant and non-plant constituents, their usage, the mode of administration, used plant parts and their German and local names was extracted and collected in a database in form of Use Reports.

Results

In total, there are 1662 use records (UR) of plants, corresponding to 68% of the total UR, which referred to 345 taxa identified on species level and 43 on genera level, belonging to 266 genera and 89 families. 97 records were not specified on the species level. Asteraceae with about 14% make up the biggest part on family level, followed by Lamiaceae and Rosaceae, both with about 6%. 1201 of the UR were attributed to medicinal uses, with skin diseases/symptoms being the most mentioned medicinal use category, followed by digestive diseases/symptoms and general and unspecified diseases/symptoms.

Conclusions

The results of this study show that medicinal plant usage was diverse taxa-wise as well as across the examined regions. Despite the limited flora, close geographical vicinity and culturally similar backgrounds, people from historical Courland and Livonia expressed high biocultural diversity in the use of folk medicines. There are overlaps, especially concerning widespread taxa and long known plant usages, but the similarities between the regions were less than expected.

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First and foremost, I am truly grateful for the supportive and patient guidance from my two supervisors, Prof. Renata Sõukand and Yuliya Prakofyeva MSc. Their professionalism kept me on track and helped tremendously to finish this thesis.

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1. Introduction

1.1. Medicinal plant usage – "folk medicine"

In the last century, using medicinal plants saw a continuing decrease and modern medicine ultimately took the lead in means of treating diseases, especially in developed countries. However, using herbal remedies for curing ailments has been increasing again in the past decades all over the world, also in developed countries. (Jamshidi-Kia et al. 2018, Singh 2015, Thomford et al. 2018, Yatoo et al. 2017).

The challenge today is to gather the relevant information before the knowledge is lost because of the passing of older generations. Learning about medicinal usages of plants is particularly affected. Furthermore, the ongoing deterioration of ecosystems puts high stress on the plants and eventually leads to losing many plant species, genera and families (Buenz et al. 2004, Halberstein 2006, Fatemeh et al. 2018).

Traditional knowledge about the medicinal usage of plants is not static at all. New plants are incorporated, some practices persist up to date, newly developed therapeutic treatments find their way into ethnopharmacopoeias and replaces former uses, input from other cultures gets mixed with existing knowledge, yet there may be a significant loss of knowledge observed overall. Usages of such popular medicinal plants also see decreasing numbers, as they get replaced more and more by the rapid development of modern medicine in the last few decades. Although some exceptions do exist, the folk medicinal usage of some species persisted all over Europe until today (Pardo-de-Santayana et al. 2015).

Therefore, serious research is required to study the various forms of stored traditional environmental knowledge, especially botanical and medicinal knowledge. Historical written corpora on the use of plants contain precious knowledge still useful today. The local ethnopharmacopoeias are extremely important as they guide research to which plant genera, sometimes specific taxa, are worth to examine in more detail (Bauer Petrovska 2012, Buenz et al. 2004, Pardo-de-Santayana et al. 2015).

Especially the linguistic perspective in ethnobotanical research offers fascinating research possibilities. Svanberg et al. (2019) underline the importance of ethnobotanical analysis when it comes to trying to understand how people cope with their natural surroundings as well as extracting information about linguistic or cultural traits or even climate change (Svanberg et al. 2019).

Besides the examples stated above, such data also gives insights on changes in ecology and seasonal activities of farming. According to Kujawska et al. (2015), analyzing archival data about plants "threw new light on plant use and management in the Galicja region in the interwar period. It also increased our understanding of the central role of plants in spheres such as folk medicine, church ceremonies and animal wellbeing." (Kujawska et al. 2015).

Despite the diverse information of historical herbal texts, such documents have to be treated and investigated with care and consciousness of the possible errors they could contain (Kalle and Sõukand 2021). Another aspect one has to be aware of is that the etic perspective, when taken by outsiders, can be easily incomplete (Bye and Linares 2016).

Hence ethnobotany may undergo a further increase as a relevant scientific field for finding solutions for recent and important problems and can advance understanding of the relationship of different cultures to nature (Kalle and Sõukand 2021, Pardo-de-Santayana et al. 2015).

1.2. Aims of the study

The aims of this study are as follows:

1) Identifying all medicinal plant and non-plant usages stated by the authors of the selected historical sources creating a database for further analysis and future data mining.
2) On the example of selected available bibliographical data related to medicinal plants traditionally used to treat various diseases in historical Livonia and Courland
    a. Describing the stated plants, the diseases, the remedies and their preparation.
    b. Comparing the uses outlined between the selected authors.
    c. Comparing the uses in the studied regions, outlining differences and similarities.

The database covers the regions of historic Estonia, Livonia and Courland. This region was chosen because of several reasons. For one, various ethnographic and ethnobotanical works were produced in the 19th century in different languages, German being one of them, and they are scientifically sound and valuable. They are not necessarily published, one example is Johann Heinrich Rosenplänters field notes, a field book and loose leaf herbarium vouchers (Kalle and Sõukand (2021). While the areas limited size allows comprehensive study, the various different ethnic groups lead to new comparisons. Besides that, this region, especially

Estonia, is also well studied in recent years, as it is in the focus of several studies from the last decades (see for example Kalle and Sõukand 2021, Raal and Sõukand 2005, Sõukand and Raal 2005, Sõukand and Kalle 2011, Sõukand and Kalle 2016 or Sõukand et al. 2020). That allows contributing another part to the bigger picture, allowing more detailed comparisons and adding new insights from a different perspective.

Furthermore, the focus is on herbal texts written in the German language in the 19th century. The selected authors have gathered their data on different geographical scales and are overall overlapping. Friebe (1805) and Alksnis (1894) gathered their data on the largest scale (all three regions respectively Livonia and Courland), Wiedemann (1876) collected his data in Estonia. The other authors worked on a smaller scale. Luces (1829) data is valid for the island of Saaremaa, Aronson (1891) data for the western part of Courland and the data from Bermann and Ludwig (1904) and Ludwig (1905) are related to Riga and its surroundings. Hoelzl (1861) has to be stated exceptionally, as his data comes from Galicia.

For detailed analysis, the works of Luce, Alksnis and Aronson were selected, as they cover all the regions and are exemplary for ethnobotanical and -graphical works on medicinal plant usage in the 19th century.

Besides creating a database and gaining access to a new perspective on folk medicine documented by German-speaking authors in 19th century Eastern Europe, I expect to highlight the rich biocultural diversity in the use of medicinal plants recorded in Estonia, Livonia and Courland.

The work contributes to the research supported by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (Starting Grant project “Ethnobotany of divided generations in the context of centralization”, grant agreement No. 714874).

2. Background

2.1. Herbals and their influence on traditional medicine in Europe

Herbal texts reach back as far as to the ancient Egyptians around 3100 BC. Later on, the Greeks and Romans started around 400 BC to document besides the plants and herbs their medicinal remedies more precisely. Probably most known from that era is physician Pedanius Dioscorides (AD 40–90) who wrote "De Materia Medica", which had a significant influence on the understanding of medicine in general in that time, but also inspired many people to write herbal texts themselves. His influence reaches up to and can be seen especially in the Middle Ages. In those times, herbal texts and recipe books were used as standard mean of creating knowledge about medicinal usages of plants available. Monasteries were an essential provider of such texts, as the monks and nuns had practical botanical knowledge and the writing skills, knowledge from earlier centuries was updated and expanded. With the beginning of printing, herbal texts got very popular, as production and spreading got way easier. In the 17th century, inspired by Carl Linnaeus, a lot of data about medicinal plants was gathered and writing documents and reports about detailed experiences and observations in this field got very popular among scholars and botanically and medicinally experienced amateurs (Buenz et al. 2004, Halberstein 2005, Jamshidi-Kia et al. 2018, Pardo-de-Santayana et al. 2015). Such books were besides doctors and pharmacies important sources for people to learn about drugs and official medicine, given they were literate.

Although herbals are of big importance for ethnobotanical research, they have to be examined and used with care and full awareness of their background and where and how the information for compiling them was gathered. Sõukand et al. (2020) had a detailed look on the currently popular use of *Epilobium angustifolium* L. and its origin in Eastern Europe. They had a deep insight into the literature worldwide and backtracked indications of usages all the way back to Dioscorides work "Materia Medica". A confusion of different names for the same species, wrong translations, transfer of usages of other species to *E. angustifolium*, spreading of misinterpretations and no identifications in the first term in the basic work of Dioscorides lead to a chain of misunderstandings, misinterpretations and further dissemination by scientist and popular authors resulting in the recent popularity of *E. angustifolium*. The authors conclude that "[…] it is most likely just a series of misinterpretations and the ambivalent name that created the perception of *E. angustifolium* as a potent medicine worthy of investigation at the beginning of the 21st century." (Sõukand et al. 2020).

Dioscorides work is of great popularity and had a significant influence on many botanists. Leonti and colleagues found in several studies (Leonti et al. 2009, Leonti et al. 2010, Leonti 2011), that in Italy - they also assume the rest of Europe - many local pharmacopoeias show distinct parallels to "Materia Medica". Furthermore, they show that knowledge from Dioscorides' work as well as from botanists from the Middle Ages, for example Matthioli (1568), is still present in recent studies from the last decades (Leonti et al. 2009, Leonti et al. 2010, Leonti 2011). This underlines on the one hand the importance and the influence of such texts; on the other hand, it shows the necessity of being aware of the origin of knowledge and data when it comes to making conclusions (Leonti et al. 2009, Leonti et al. 2010, Leonti 2011). Leonti et al. (2010) estimated in their study in Campania, that 20% (every fifth) of medicinal plant usages mentioned in recent publications can be traced back directly to Matthiolis (1568) and thus also to Dioscorides "De materia medica" (Leonti et al. 2010).

Leonti (2011) describes in his paper a so-called "feedback loop". Information gathered by scientists reaches the people and knowledge gets assimilated and will then be incorporated and modified. Researchers in the field again will gather data about these uses and publish studies about it, generating a circle of information. This loop between people, researchers and the media conditions progressively scientific results. "It is doubtful that this will provide an innovative input to natural product research or even lead to new drug discoveries. It is also questionable whether this development serves for the conservation of local knowledge. The indiscriminate repetition of data does neither help to assess and develop indigenous pharmacopoeias." (Leonti 2011)

Therefore, differentiation between local, widespread and newly introduced knowledge, a thorough analysis of the sources of the knowledge and an awareness of the possible errors and misunderstandings that could have happened in the production process of herbals and texts on plant usage is crucial for future ethnobotanical research. Furthermore, standards for writing popular herbals and distinguishing the sources of the usages indicated as well as standards and guidelines on interpreting historical data should be introduced to "try to keep a critical and analytical scientific approach otherwise we run the risk of getting entangled in myths" (Leonti 2011, Sõukand et al. 2020).

Another aspect, which has to be considered in the importance of herbals and books on plants and folk medicine, is the literacy level of a society. For a long time, most people were illiterate, even when the era of printing, books and mass media started in the 17th century. They could not contribute to nor understand nor had access to the increasing numbers of books and texts (Leonti 2011). This also applies to the study area of this thesis, as in Livonia, the "reading

revolution" not happened until the middle of the 19th century (Kalle and Sõukand 2021). Transmission of cultural knowledge in illiterate societies is assumed to happen orally. Although the filtering down model of knowledge being passed from a scientific to a popular level is an accepted principle (Foster 1994) it is still important to keep in mind how the knowledge of such books, as it was not directly comprehendible for the people, reached them anyway.

2.2. Ethnobotany and traditional medicine

"Ethnobotany" as an own term came up at the end of the 19th century, but contributions to this topic were already made long before from scientists and experts of a variety of related research fields like botany, ecology or geography. In the 18th century, folk knowledge was an important information source. Mainly gathered by travelers, specific popular knowledge about plants and animals was recognized and used by scientists. The discovery of new drugs was, at least in earlier days, in the interest of scholars and they were confident in being successful. Today, although not a primary objective anymore, it gets again increasing attention. In the 19th century ethnobotanical, research started to become a scientific field, clarifying and harmonizing the methodological approach and defining clear aims.

Current trends should tend towards systemizing already collected data by ethnographers and linguists in the last centuries, recording still unknown traditions, implementing other research tools like dendrochronology, material analysis or doing more studies on local and traditional environmental knowledge (Pardo-de-Santayana et al. 2015, Svanberg et al. 2011).

2.2.1. Recent studies

The studies hereafter presented focus on analyzing already present historical data and put it into a current context, as the author of this thesis is doing too, following the above stated suggestion of Pardo-de-Santayana et al. (2015) and Svanberg et al. (2011).

Teixidor-Toneu et al. (2020) conducted a study in Norway to find out more about the usage and transmission of utilitarian and folk plant knowledge over some 200 years. They chose to do a diachronic study on two important and influential Norwegian floras, one from the 18th century, the other from the late 20th century. They show that the influence of the historic flora on the more recent one is negligible because of factors as the authors had different aims and

purposes of writing the book, differences in social and economic circumstances of the society, as well as different perceptions of nature and human-nature relationship. Thus, different plants, plant uses and use categories can be found in both floras. Nonetheless were the authors able to identify over a hundred unchanged traditional uses. Furthermore, they show that "the scientific description of natural products and their uses at this time remained largely without impact on local practices in Norway." (Teixidor-Toneu et al. 2020).

Kujawska et al. (2015) analyzed in their study a Lexicon of polish ethnographer Adam Fischer, focusing on Ukraine and Poland, to gather data for lying a foundation for future diachronic research of Eastern European ethnobotany. They were able to get new insights in how plants were used in the interwar period in Galicia as well as where and for what plants were used most often (Kujawska et al. 2015). In their study of 2017, Kujawska et al. (2017) again analyzed the Lexicon of Adam Fischer, this time focusing on the Polish-Lithuanian-Belarusian borderland. Gathering a variety of data, the authors did not come up with a conclusive synthesis, but rather with a presentation of various plant usages, contributing again rich data for future diachronic research in this area. Nonetheless, comparing the data from this area with the data from their earlier study on the Ukrainian-Polish area, they found that "[…] although peasants in the compared regions used quite different species to treat illnesses, they were used in similar ways, and to treat a similar spectrum of illnesses" (Kujawska et al. 2017).

Spałek et al (2019) analysed the use reports of drugs of the recipes of the "Krummhübel" herbalists, a village in the south of Poland. Those herbalists where the first in the region to treat various diseases with their medication. The authors created a database with all the use reports and show usage patterns and recommendations from the herbalists. They found that many plants used by the herbalists were well known also in other regions, but they also used exclusively some exotic plant. Moreover, the effects of the treatments of the herbalists are mainly the same as of today's medicine, although they also found some novelties. Furthermore, they state that "Remedies that lost importance over time as well as drugs used for diseases now controlled by conventional medicine may be interesting starting points for research on herbal medicine and drug discovery.". They suggest reproducing the remedies according to the recipes to understand the former medicine in more detail and find help in new drug discovery (Spałek et al 2019).

Pollio et al. (2008) investigated the change of usage of *Ruta* spp. (Rutaceae) over time, from Hippocratic medicine to today. The authors gathered data from ancient Greek medical literature, in which medicinal usages were first mentioned, added further medicinal details from other ancient medical and scientific literature and finally complemented the data with

botanical information from works from Theophrastus (387–278 BCE). The concluded that *Ruta* spp. has been up to today constantly represented in herbals and books on medicinal plants, whereas medicinal usages where only preserved partly, while symbolic and religious value grew over time (Pollio et al. 2008).

Kalle and Sõukand (2021) investigated the unpublished book and herbarium on local plants of Estophile Pastor Johann Heinrich Rosenplänter and examined, besides specific botanical information, especially the local plant names and the influence of illiteracy on plant usage and categorization. By doing so, the authors gained insight into the culture and its contact with nature, which are not visible at first sight (Kalle and Sõukand 2021).

The cultural significance of plants can be deduced from their names. For example, plants were named according to their usage, e.g. “joosja rohhi” would be herbs used for rheumatism herbs or plants used for dyeing got the prefix “dye-“. Also, culturally important days in the year found entrance in the naming, for example “Saint John's Day herb” for plants flowering around Midsummer's Day (June 24). Another example is naming plants according to their appearance, spruce-like plants had the prefix “spruce-“ or if animals ate the rhizomes of a plant, the name got the prefix according to the animal. Furthermore, a diachronic analysis can show use changes over time. Potentilla argentea is an example of a plant, which lost its importance nowadays despite being serving various functions in the past. But there are also plants, which are still in common use today (Kalle and Sõukand 2021).

The shown studies underline the diverse application possibilities of historical ethnobotanical research and the recent value of ethnobotanical data. The analysis can contribute to understanding in which cultural fields plants are used and important, offer a rich basis of information for ethnobotanical and diachronic research, helping to understand better how societies and their folk culture develop and change over time, as well as help in understanding modern medicinal practises better and contribute to approval of new herbal drugs (Kujawska et al. 2015, Kujawska et al. 2017, Spałek et al 2019).

Furthermore, Casas et al. (2016) emphasize the contribution of ethnobotanical research to other research fields for analyzing problems like the relationship of humans to nature, their dealing with natural resources, interaction with ecosystems or the influence of humans on the “distribution and abundance of the flora of the world and the historical configuration of ecosystems”. Moreover, they state the importance of (historical) ethnobotany for understanding “[…] factors influencing the origins of agriculture […]” as well as “[…] evolutionary ecological processes […]“ (Casas et al. 2016).

Nevertheless, Teixidor-Toneu et al. (2020) show that comparing historical data with contemporary data may not provide the assumed results because of social, cultural and socio-economic differences of the society in different times (Teixidor-Toneu et al. 2020).

3. Historical background

Fig. 1: Location of Estonia and Latvia in Europe.

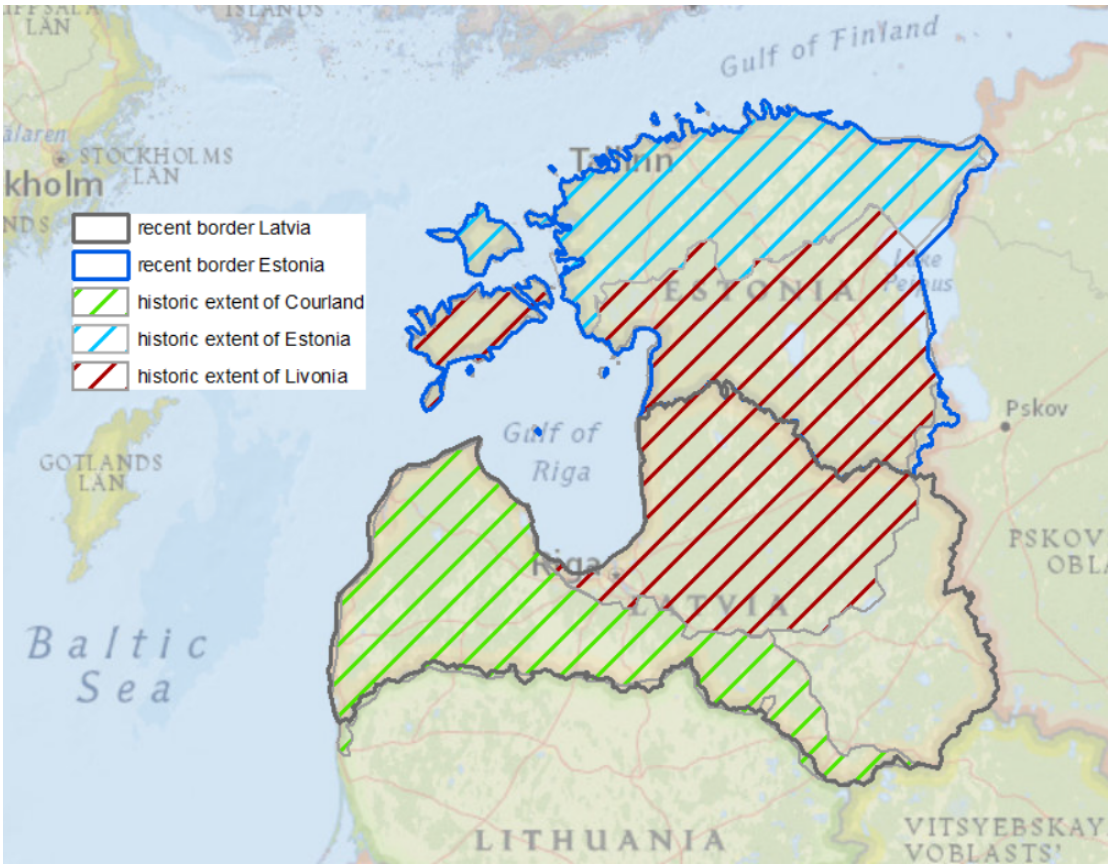

Fig. 2: Historic borders (at the year 1888) compared to today's borders (edited by Martin Anegg; base map ArcGIS, historic map by H. Laakmann (Wittram 1973).

The German influence in the studied area began at the ending of the Middle Age, when German merchants, who were engaged in trading with people from the eastern and southern Baltic Sea, asked crusaders to protect them from corsairs. The crusaders had an interest on their own, namely Christianising and subduing the local pagan population, and were themselves supported by the church. After the first attempts failed, the church called for a crusade of those regions at the end of the 12th century (Drost 2014, Kasekamp 2010, O'Connor 2015, Rauch 1970, Tuchtenhagen 2005).

After finishing the crusade, the crusaders founded the city of Riga and the so-called "Schwertbrüderorden" (order of the brothers of the sword), which soon was merged with the Teutonic Order. The local population was brought under German rule, enfeoffing the people and surrounding lands and establishing a new town life and social order. Besides the crusaders and clergy, nobility, vassals and merchants were in high social classes, while the local people (Estonians and Latvians), mainly farmers, where put into the lower classes (Kasekamp 2010, Plath 2014, Selart 2014, Tuchtenhagen 2005). Plath (2014) called this the first of four waves of German immigration, in that case the crusaders settling and bringing along German clergy and nobility. The second wave happened continuously between the 14th and 17th century (Plath 2014). All this led to a substantial transformation of old Livonia (currently Latvia and Estonia). Growing towns got economic and political centers of the region and had again considerable influence on changing the socio-economic structures in Livonia. In these towns, the German influence could be easily seen when looking at buildings or listening to the language spoken, especially in administrative and judicial circumstances (Drost 2010, Tamm and Mänd 2020).

In the Middle Ages, the population was split in Germans and locals (land people), the main ethnic groups, from which the Germans, although being in the minority, possessed a higher social status than the local people, mostly peasants (Selart 2014). Social hierarchy was based on economic exploitation and political suppression of local Latvian and Estonian lower classes by the German upper class. The balance of power was clearly in favour of the Germans, as for example superb estates compared to the huts of the peasants or general privileging of Germans over local people clearly show (Plath 2011). They were also distinguished by the language they speak. The Germans were often the landlords, keeping the Estonian and Latvian peasants low. The peasants felt the oppression as a socially lower class in every way, economically, legally and culturally. It was a social division of people based on economic exploitation (Mertelsmann 2011, Selart 2014). They were rising up in social classes, becoming literate and having a social career meant in that time becoming "German" (Selart 2014) or being "Germanized" (Tamm and Mänd 2020).

At the beginning of the 16th century, the pressure applied on the Teutonic Order by neighbouring countries as well as a religious upheaval rose to the point where the German leaders had to surrender. Livonia was split and distributed to the rivalling powers, Poland, Denmark and Sweden (Plakans 2011, Wittram 1973).

The Polish rulers made many concessions to the German nobility by keeping their influence and power structures. In the beginning of the Swedish rulership, German structures as well as their power relations were preserved too. But by time, the Swedish started to reduce land property rights (transferring them to the Swedish crown), thus reducing the influence of the German nobility and increasing the rights of the peasants, who weren't serfs anymore and could manage their farmlands on their own (Drost 2010). This occupation lasted until the end of the 18th century and was accompanied by recurrent conflicts, changing power relations (especially in Livonia and Estonia) and attempts of structural changes of the society, homogenisation of the social classes and cultural assimilations were made (Kasekamp 2010, O'Connor 2015).

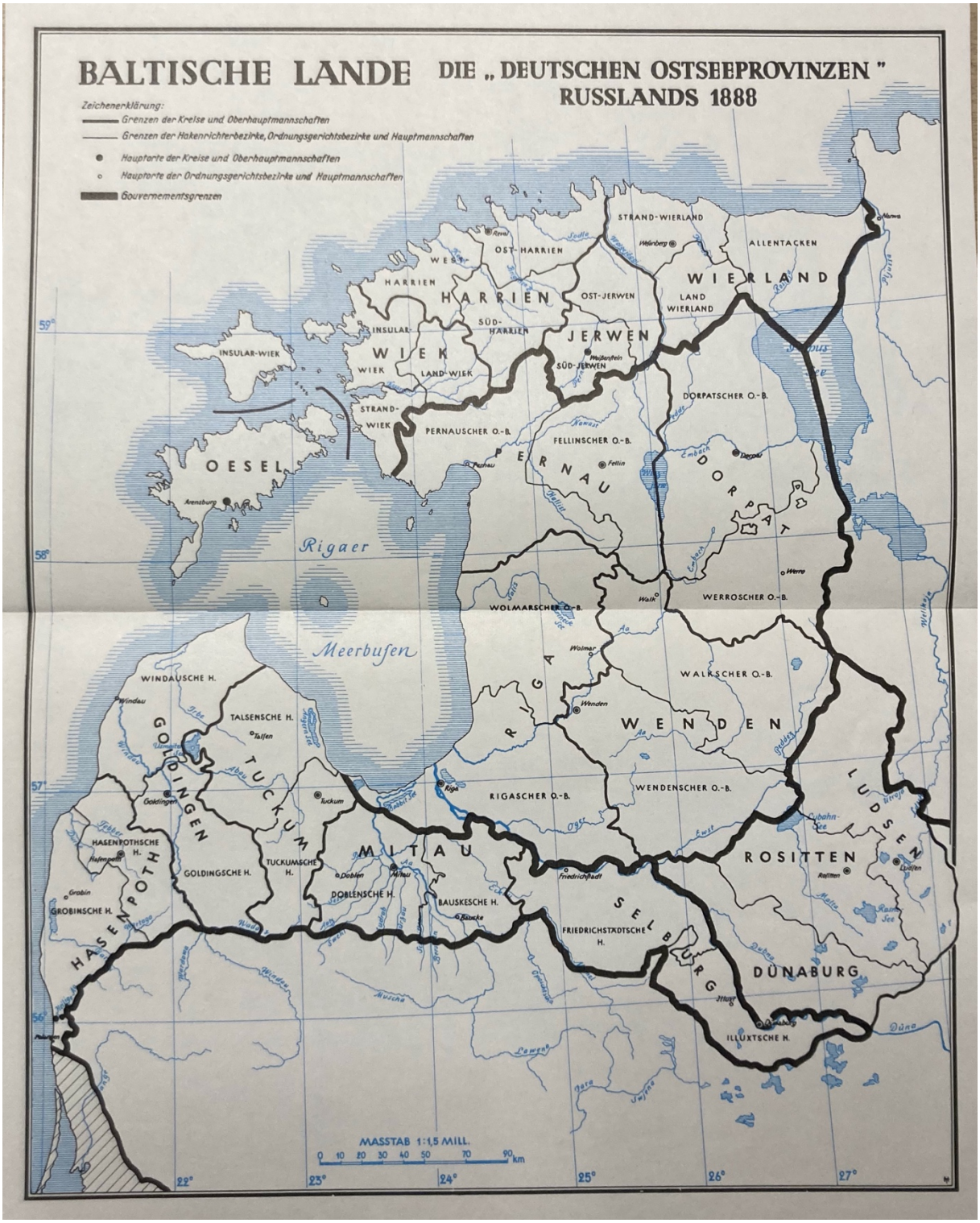

Fig. 3: The extent of Estonia, Livonia and Courland in 1888 (drawn by H. Laakmann (Wittram 1973))

At the beginning of the 18th century, after events like the Great Estonian famine or the great northern Wars, the third wave of German immigration began. In this wave, many academics and professional and specialized workers came to Estonia and Livonia. It was also during this wave, that the social group of "Literates", German academics and intellectuals, emerged and built an important and influential social class (Plath 2014, Tuchtenhagen 2010, Wittram 1973).

Courland, as an exception, was during that period relatively stable and independent from the polish sovereignty (Drost 2010, Plakans 2011).

In the end of the 18th century, Russia took over the rule over Livonia and Courland, which should last until World War One. Reformations, national movements, development of a national understanding, broader education, transition from agrarianism to industrialism, urbanisation where processes which started during the Russian sovereignty (O'Connor 2015, Rauch 1970, Tuchtenhagen 2010, Wittram 1973). Furthermore, they also introduced Russian law and administration structures, weaking the German nobility and strengthening the Russian nobility, which induced yet another vital change in the social structure (Drost 2010).

Urbanisation and an economic upturn of the cities led local people to migrate into cities, increasing the number of Latvian and Estonian people among the inhabitants and becoming the dominant population (Drost 2010, Kasekamp 2010, Rauch 1970, Wittram 1973). Although often at least half of the town inhabitants were "non-Germans", the German importance and influence was still apparent, especially when examining for example law and administrational structures, spoken language or architecture (Tamm and Mänd 2020).

Furthermore, a new class of agricultural and industrial workers emerged, changing the social structure and amplifying national movements and a stronger consciousness of the own nation (Drost 2010, Kasekamp 2010, Tuchtenhagen 2010). This can be described as a "national awakening" (Rauch 1970). People started overcoming the identity of being a province of Russia and thinking of their homelands as their own countries. The German intellectuals intensified this process by intensively discussing "about a "Baltic" identity in opposition to Russification process" (Drost 2010). Besides that, also an opposition to the Germans was established (Selart 2014). The rise of those movements was intensified by teachers and clerics, who were being more and more often locals or Russians, as well as the attempts of cultural assimilation by the Russian empire. National movements in Estonia arise around the middle of the 19th century (Wittram 1973, Tuchtenhagen 2010).

In the first half of the 19th century, German-speaking intellectuals and publishers having scientific interest in the Latvian people and language, raised the ideas of the Latvian nation and introduced it to the academic world and later on to the locals. These efforts brought about an effect in the second half of the 19th century. Literature and science were being publishing increasingly in Latvian and Estonian languages and more and more locals got access to it, as primary school education among local people was rising. However, the Germans were in the

hope that by being better educated, people would cherish the German more again (Kasekamp 2010, Plakans 2011, Tuchtenhagen 2010).

Furthermore, conflicts fought between upper and lower social classes were shifting towards ethical conflicts, which emphasizes again the growing importance of nationality (Tuchtenhagen 2010).

Besides all that, the Russian empire enforced at the end of the 19th century their "Russification" plans to establish the Russian culture and power by filling leading posts in the administration with people loyal Russia, introducing Russian as mandatory official and school language and strengthening the influence of the Russian-orthodox church. These attempts added yet another layer to the growing change processes (O'Connor 2015, Rauch 1970, Tuchtenhagen 2010, Wittram 1973).

This altogether led to a decreasing influence of the still mostly German upper-class and a move from being an elitist class towards a minority. Furthermore, while the first three waves of German immigration meant coming from Germany to the Baltic regions, the fourth wave, starting in the late 19th century, saw the Germans actually leaving the country again, going back to Germany. Mostly because of losing privileges and influence (Plath 2014, Tuchtenhagen 2010).

4. Material and methods

4.1. Database

Through literature research, I identified the historical works to be included in the database. I was looking for German texts about medicinal plant usage between 1750-1920 in the historic regions of Courland, Livonia and Estonia. I used the online libraries of the Online Catalogue Ester (Estonian Library Network Consortium), the Biodiversity Heritage Library (Biodiversity Heritage Library), the Baltic Digital Library (Bałtycka Biblioteka Cyfrowa) and google scholar, as well as citations and mentions of other relevant authors done by the authors of already chosen books.

The following books and articles were used for the database:

- Wilhelm Christian Friebe (1805) - Oekonomisch-technische Flora für Liefland, Ehstland und Kurland (Friebe 1805)
- Johann Wilhelm Ludwig von Luce (1829) - Heilmittel der Ehsten auf der Insel Oesel (Luce 1829)
- Karl Hoelzl (1861) – Botanische Beiträge aus Galizien (Hoelzl 1861)
- Ferdinand Johann Wiedemann (1876) – Aus dem Inneren und Äusseren Leben der Ehsten (Wiedemann 1876)
- Emil Aronson (1891) - Ueber die Volksheilmittel der Letten (Aronson 1891)
- J. Alksnis (1894) - Materialien zur lettischen Volksmedizin (Alksnis 1984)
- P. Bermann and F. Ludwig (1904) – Pflanzen des Rigaschen Krautmarktes (Bermann and Ludwig 1904)
- F. Ludwig (1905) – Die Heilpflanzen des Rigaschen Krautmarktes (Ludwig 1905)

Based on historical articles and books, I have created a database by reading them, manually selecting relevant information and putting it into the database. Every independent use in the sources was accounted for as Use Record (UR) and was entered on a separate row in the excel spreadsheet. For each usage mentioned, the following information was elicited from the text, if present:

(i) the constituent type;
(ii) the (by the original author) given scientific plant name and its recent putative equivalent;
(iii) the plant family;
(iv) the plant genus;
(v) the name of non-plant constituents (if possible scientific name);

(vi) the (by the author) given German name of the constituent;
(vii) the common recent German name of the constituent;
(viii) the common recent English name of the constituent;
(ix) the name of the constituent in local language (if given);
(x) how the constituent gets prepared;
(xi) if a plant, which part of is used;
(xii) mode of administration – internally or externally;
(xiii) the ailment (given by the author) for which constituent is used;
(xiv) the recent interpretation of the given ailment;
(xv) the type of malady, organ- and symptom-defined category (classified with ICD-11);
(xvi) food usage, recent interpretation;
(xvii) other usage, recent interpretation (other than medicinal or food usage);
(xviii) the author's information source (when differing to standard indication);
(xix) original text if needed;
(xx) translated text if needed and
(xxi) additional comments.

Besides recording all the medicinal usages of the different plants stated, also information on other usages like food use or veterinary medicinal uses were transcribed from the chosen texts and books as thoroughly as possible and to allow further data mining and comparison possibilities for future studies. Moreover, also non-plant constituents were transcribed, for the same reason stated above.

The transcribed constituents were categorized as animalistic, application, chemical, composition, food, fungi, human, mineral, other and plant. This classification was made following the arrangement made by Luce and Aronson in their texts, whereby some categories were added respectively split in several groups by me. Animalistic (containing animals themselves as well as products derived from them like manure, egg or castoreum), Application (containing cupping, phlebotomy, usage of steam baths etc.), chemical (containing acids, oil etc.), composition (containing plasters, soap, spiritus etc.), food (contain bread, butter, wine etc.), fungi, human (containing body parts of corpses, sweat, hair etc.), mineral (containing brass, silver, mercury, sulphur etc.), natural/flora/fauna (containing grass, soil, water etc.), objects (containing knife, broom, shoes, splints etc.) other (containing constituents which are not fitting in any category) and plant.

Each named usage of a constituent was recorded as a separate entry in the database and every use record is a unique combination of a constituent with its mode of administration, plant part (if applicable) and medicinal or other usage.
The procedure of interpreting the historical medicinal data was as follows:

1) At first, the original mentioned disease or symptom stated in German was set into recent medicinal context, trying to identify and understand the disease to be able to interpret it correctly. If it was not possible to find an according recent equivalent, the described diseases were interpreted according to the symptoms or conditions associated with the disease by the author.
2) After that, the identified disease was translated into English and put into the ICD-11 database (WHO 2018) to find the correspondence to a modern equivalent and classify it accordingly.
3) As a final step, the translated disease was unified according to the ICPC-2 classification (WHO 2012), preparing the data for further analysis and future comparison with other datasets.

Interpreting historical medicinal data can be challenging. One of the biggest challenges is to interpret and identify by now outdated medicinal terminology, for which no recent equivalent exists, and the authors don't give for example further description of the disease or associated symptoms, which would ease the interpretation. Such an example is for example "artheibisches Fieber" mentioned by Luce. It is most likely some kind of fever, as "Fieber" suggests, but the word "artheibisch" did not give any clue on what specific fever it could be and there were no English translations found nor any entries in medicinal dictionaries or the like. Additionally, Luce did not specify any symptoms or described the fever in more detail, making it impossible to identify the specific fever meant in this case.

Another example would be "Rose" mentioned by Alksnis. Although the author is a doctor and also described associated symptoms, it was not possible to identify which specific disease the author meant, as today different diseases are associated with the historical term of "Rose". Furthermore, Luce states that "[…] doch nennt der Ehste manches Rose, was es nicht ist." (but the Estonian calls many things "Rose", which in the end it isn't) many diseases are called "Rose", respectively often many different symptoms are associated with the disease, which can be misleading or in many cases just be wrongly associated.

Another example is "sich verhoben haben / sich verrissen haben / Verreissung", describing symptoms coming from working too hard or with a wrong posture. While the authors only describe the origin of the pain but do not clarify further where the symptoms occur

respectively what exactly those symptoms could be, clear identification is here not possible. For the database, I have chosen to interpret this as indifferent pain often concerning the back and categorized it as musculoskeletal, but the pain could potentially radiate into the limbs or evoke a headache for example.

When analyzing the data, one has to be aware of such interpretation problems, although I have tried to avoid inaccuracies as thoroughly as possible. This interpretation problem has to be considered and addressed in a possible future detailed rework of the database.

Furthermore, demotic used descriptions for a variety of different diseases or descriptions of certain "conditions" can complicate a proper interpretation. The medicinal background of the authors, whose works were included in this database, offers in this case an advantage, as they tend to use less colloquialism and more scientific terminology.

In general, nearly all of the described diseases, symptoms or conditions were possible to identify and set into a recent context.

In an additional step, important categories for analysis and future comparison with data from other studies, were unified according to the classifications used in other ethnobotanical and ethnomedicinal studies to facilitate future comparisons with similar datasets.
These categories are

(xxii) plant name unified (with The Plant List);
(xxiii) plant genus unified (with The Plant List);
(xxiv) plant family unified (with APW);
(xxv) medicinal usage unified (with ICPC2) and
(xxvi) the general category of the unified medicinal usage.

Category (xxvi) was introduced to allow more general comparisons, as it just covers the general ailment category, while category (xxv) provides the detailed disease/symptom, allowing a more detailed analysis concerning specific diseases.

If I was not able to identify or rightly interpret a given constituent or any information of one of the categories stated above, the respective information was marked with a question mark in brackets "(?)". Items with such a marking were excluded from the analysis.

The stated plant parts, which were used, are categorized as follows (with their respective abbreviation in square brackets): barks [BARK], exudates (incl. gums, resins and saps) [EXUD],

flowers (incl. inflorescences and parts thereof) [FLOW], fruits [FRUI], herbs (= aerial parts, incl. branches and shoots) [HERB], leaves [LEAV], seeds [SEED], subterranean parts (incl. bulbs, rhizomes, roots and tubers) [SUBT] and wood [WOOD]. If not stated which part was used, then the part was classified as herb. This categorization follows the terminology used by the authors contributing to this study. Statements concerning "die Pflanze" (the plant) or "Grünzeug" (greens) were classified as herb. Otherwise, the parts stated by the authors were the same in English terms, hence the categorization. Furthermore, other studies, like Staub et al. (2016) and Spałek et al. (2019) also used this categorization.

The administration mode was recorded and divided into either internally (internal ingestion in any way) or externally (for example in the form of ointments or compresses) administrated.

Interpretation of past pathologies and setting them in a recent context can pose often issues as described above. To ensure the correctness of the interpretations, original description and names of ailments were cross-checked with Hiller and Melzig (2006) and the GenWiki of the "Verein für Computergenealogie e.V. (2020).

The recent interpretation of the ailments stated was done according to the International Statistical Classification of Diseases and Related Health Problems, Version 11 (ICD-11) of the World Health Organisation (WHO 2018). This classification is divided into the following ailment categories:

1 - Certain infectious or parasitic diseases
2 - Neoplasms
3 - Diseases of the blood or blood-forming organs
4 - Diseases of the immune system
5 - Endocrine, nutritional or metabolic diseases
6 - Mental, behavioural or neurodevelopmental disorders
7 - Sleep-wake disorders
8 - Diseases of the nervous system
9 - Diseases of the visual system
10 - Diseases of the ear or mastoid process
11 - Diseases of the circulatory system
12 - Diseases of the respiratory system
13 - Diseases of the digestive system
14 - Diseases of the skin
15 - Diseases of the musculoskeletal system or connective tissue
16 - Diseases of the genitourinary system
17 - Conditions related to sexual health
18 - Pregnancy, childbirth or the puerperium
19 - Certain conditions originating in the perinatal period
20 - Developmental anomalies
21 - Symptoms, signs or clinical findings, not elsewhere classified
22 - Injury, poisoning or certain other consequences of external causes
X - Extension Codes (for example for agents)

The unification of the recent interpretation of the ailments was done with the International Classification of Primary Care (ICPC) of the WONCA International Classification Committee (WHO 2012). The classification involves the following categories (with the respective abbreviations used by the author in the database and the analysis in square brackets):

A - General and Unspecified diseases [Geun]
B - Blood, Blood Forming Organs and Immune Mechanism [Blim]
D - Digestive [Dige]
F - Eye [Eye]
E - Ear [Ear]
K - Cardiovascular [Card]
L - Musculoskeletal [Musc]
N - Neurological [Neur]
P - Psychological [Psyc]
R - Respiratory [Resp]
S -Skin [Skin]
T - Endocrine/Metabolic and Nutritional [Endo]
W - Pregnancy, Childbearing, Family Planning [Pcfp]
X - Female Genital [Geni]
Y - Male Genital [Geni]
Z - Social Problems [Soci]

Those categories are segmented further into symptoms/complaints, infections, neoplasms, injuries, congenital anomalies and other diagnoses. This classification was used for further analysis. This ICPC2-categorisation will be used for further analysis because it facilitates an easier comparison with other studies in the future. Furthermore, the ICPC2 is less clinical than the ICD, making the classification of reported ailments and symptoms easier and better appliable to the "ethnomedical reality" (Staub et al. 2015, Staub et al. 2016). The categories "X - Female Genital" and "Y - Male Genital" were combined into one group "Genital" [Geni], because almost no records concerning diseases of male genitalia were made by any of the contributing authors. Further categories were added by the author to cover non-medicinal usages. They are as follows:

a) "Accessories and Decoration" [ACDE] – including usages like wreaths, adding in bouquets etc.
b) "Body" [BODY] – including usages for body hygiene, for hair restoring, for baths generally etc.
c) "Food" [FOOD] – including usages of plants as food or in food and beverages
d) "Harmful" [HARM] – including reports of poisonous plants or usages to kill someone
e) "Insecticides" [INSE] – including usages as an insecticide or to drive away insects
f) "Other" [OTHE] – including all usages, which do not fit in any of the other categories
g) "Superstition" [SUST] – including usages based on superstitious believes or which are associated with witchcraft or the like

h) “Veterinary” [VETE] – including veterinary-medicinal usages concerning animals and pets

4.2. Detailed analysis of the works of the authors Luce, Alksnis and Aronson

Luce gathered his data on the island of Saaremaa (today Estonia), Alksnis in the whole of Livonia and Courland (today mainly Latvia, the northern part of Livonia belongs to Estonia) and Aronson in the southwestern part of Courland (today Latvia) (see figure 4).

Latvia and Estonia are situated in Eastern Europe, with approximately 64500 km^2 respectively 45000 km^2. Estonia is the more northern country of the two. It borders Latvia in the south, Russia in the east, the Gulf of Finland in the north and the Baltic Sea in the east. Latvia is bordering Lithuania in the south, Russia and Belarus in the east, the Baltic Sea in the west and Estonia in the north (Knappe and Waack 2004).

The landscape is part of the Easter European lowlands, being shaped by mellow hills with only small mountains (highest rise in Estonia is 318m high), partly up to nearly 50% forests – mainly pine, spruce and birch, but also junipers, limes and oak trees are common; the more south, the more mixed and deciduous the forests get – alternating with meadows and swamps. Rivers are also a few lakes and rivers, mostly meandering into the Baltic Sea. Along the coast are salt grasses and rearward pine forests with scattered meadows. Forest floors are, depending on the respective type of forest, covered with moss, sedges, blue- and lingonberries and heaths. A lot of different wild berries and mushrooms can also be found there (Knappe and Waack 2004, se also Lehmann (1895, pp. 62 et seqq.) and Schmidt (1855, pp. 22 et seqq.)).

The climate in Estonia is coined by the Baltic Sea. It often is moist, with short summers and early winters, temperatures range between ~-1,5 and ~20° Celsius. Coastal areas have a more balanced and milder climate than eastern parts. The relative humidity is around 70%, annual precipitation between 550 and 600mm. Podzol soils are prevailing, but also meadow carbonate soils and carbonate soils are present, as well as occasionally marshy soils because of the climate (Knappe and Waack 2004).

The climate in Latvia is in a transition zone between maritime and continental climate. Temperatures vary from -5 to 17° Celsius. Annual precipitation is around 700mm and evaporation is small, resulting in soils tending to wet out faster. Here too, podzol soils are

prevailing, but also meadow carbonate soils can be found as well as swamps and marshes (Knappe and Waack 2004).

Those regions underwent constant changes of rulership and the attempts of the respective occupants to imprint their cultures onto the occupied countries. Starting with a German invasion and their takeover of power in the 13th century, a German society as well as a German ruling social class was established. This German influence should last nearly until World War I. At the end of the 16th century, Livonia was parted during reformation between Denmark, Sweden and Poland. Following that, Sweden captured Livonia, while Courland stayed Polish. In the beginning of the 18th century, the Russians took over the power in Livonia and Estonia, and in the end of the 18th century also over Courland. The Russian reign lasted until World War I, after which Estonia (former Estonia and the northern part of Livonia) and Latvia (Courland and the southern part of Livonia) became independent. The for the time of the authors relevant border situation in relation to the recent borders can be seen in figure 2. In figure 4 are the areas indicated, where the authors descriptions come from and also can be applied.

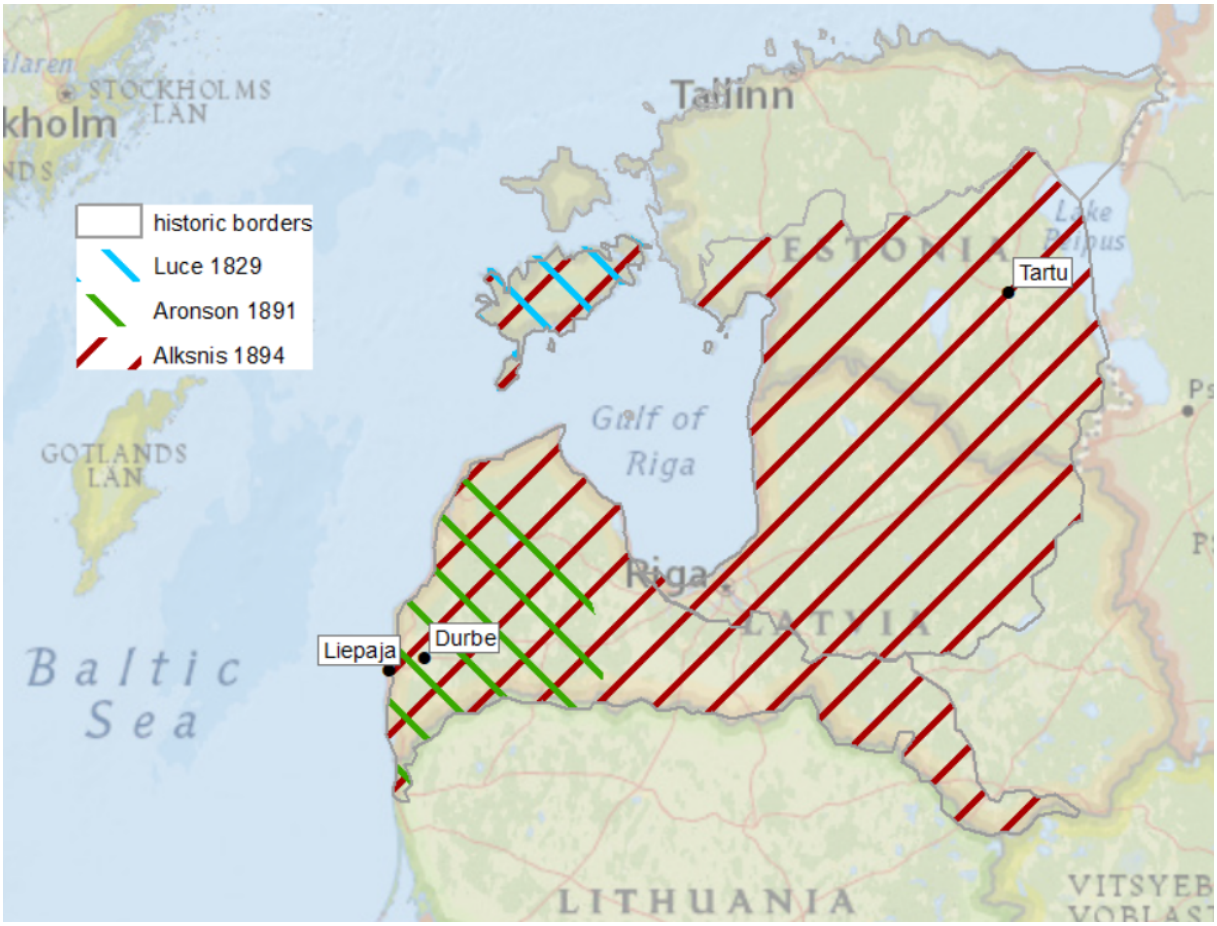

Fig. 4: Coverage of gathered data by the authors (edited by Martin Anegg; base map form ArcGIS, historic borders drawn by H. Laakmann (Wittram 1973)).

The plants and their names given by the authors were checked for credibility by

- spot-checking with the Flora Europaea (Tutin et al. 1993) to confirm the plant identification and with floras of that time (Fleischer, Grindel, Fischer, Schmidt) to confirm that they were really growing there at the time and by
- checking the descriptions of the plants and the stated local and German names to confirm that the authors described the plants they thought they would describe with Vilbaste (1993), Beiche (1872), Genaust (2013) and Hiller and Melzig (2006) and by
- spot-checking some described usages of internationally popular plants with other herbal texts and books from that time (Dragendorff 1898, Krebel 1858, Rosenthal 1861) and by
- a cross-check done by Raivo Kalle and Renata Sõukand.

The unified species names and genera were checked against and follow "The Plant List" (The Plant List 2019), family names were checked against and follow the "APW" (Stevens 2020). These unified categories were later on used for the analysis.

Plant identification is sometimes not straight forward. Although the authors most of the time state the latinized botanical name of the plant, there can still problems occur. One such example is *Hippocrepis comosa* recorded by Luce, which checks with "The Plant List" where it is confirmed as *Hippocrepis comosa* L. A more detailed check with the Floras of Fischer and Grindel (Fischer 1791, Grindel 1803) showed no entry of this species and Fleischer (Fleischer 1853) marked it as "zweifelhaft für die hiesige Flora" (doubtful to be in local flora). Also, the geographic range is in Central, Western and Southern Europe (Gbif 2021). Additionally, it could not be found in the "Eesti taimede levikuatlas" (Atlas of the Estonian flora, https://elurikkus.ee/en/plant-atlas).
This leads to the strong suspicion of a wrongful plant identification by Luce leading to the exclusion of this record for further analysis.

Another such example for Luce is *Cnicus serratuloides*, confirmed as *Cirsium serratuloides* (L.) Hill in The Plant List. But it was not found in any of the used floras and checking the species distribution area, it is found the middle and eastern part of Russia and northern parts of Mongolia and China (gbif.org). Examining closer the Estonian name did not bring any aid for clarifying the species. This is again strongly suggesting a wrongful identification by Luce. But because there are other species of the Cirsium genus growing in the Baltic regions, the record is kept as *Cirisum* sp.

Alksnis also has some difficult cases. One such example is *Lappa* and *Lappa tournefortii*. Both are not clearly identifiable. With *Lappa*, Alksnis could have meant *Arctium Lappa*, but there is no possibility to clarify on species level, as the author does not give any other clues except the name. Therefore, both were summarized to *Arctium* ssp.

“Speedeja Sahle“, a herb used for the diseases “speedejs un schnaudsejs”, is not identifiable either. No other hints are given by Alksnis, no Latin name, no description of the plant itself, nor a German name, only the local name. With the help of Andra Simanova and Baiba Pruse, additional information on the diseases and other plants used as remedy could be found, but no details on the “Speedeja Sahle “. The plant is therefore mentioned in the database, but because it could not be attributed to a specific plant species, it is excluded from further statistical analysis.

Another thing that especially Alksnis did a few times, was just stating the German name of the constituent. Examples here are “Kohl” (cabbage – *Brassica oleracea* L.), “Turmkraut” (tower mustard – *Turritis glabra* L.), “Linde” (lime tree) or “Pflaumensaft” (plume juice). In such a case, the trivial name was interpreted with the help of Beiche (1873) and Genaust (2013) to check for which species the trivial name was or is still used. In cases where the trivial name was not sufficient to determine the species, either other sources were used to identify it or, if no clear identification as possible, the plant genus was used. For the cabbage for example, to identify it on species level, the way how it was prepared gave the deciding clue to *Brassica oleraceae* L., as this was the only species prepared that way at the time (Sōukand). *Tilia*, as well as other trees like *Quercus* or *Betula* were recorded on the genus level, as there are more than one species, which could have been meant: *Tilia cordata* (more likely) or *T. latifolia*, but 4 possible *Betula’s*, most probably *B. pendula* and *B. pubescens* Ehrh.

Two other examples of difficult cases in Alksnis records are *Sedum vulgare* Link and *Aconitum Lycoctonum* L. *Sedum vulgare* Link is not mentioned neither in Fischer (1791), nor in Grindel (1803) nor in Fleischer (1853) and also the other authors did not mention it. Furthermore, there is only on record of this species in Estonia from 1864, other records only come from Central Europe. The situation of *Aconitum Lycoctonum* L. is similar, but there are a few records of it in Estonia and Latvia and Schmidt (1855) and Grindel (1803) mention it in their floras, while Fischer and Fleischer don’t mention it. The uncertainty of identification for both this species is too high to be certain, so both will be handled in the analysis as *Sedum* sp. respectively *Aconitum* sp.

In general, accounting for all known values has been done. Use records, which were in any of the categories unidentifiable or uncategorisable kept the "(?)" marking and were excluded from further analysis.

For creating the graphs and diagrams, different programs were used. Most of the diagrams concerning statistical data about the database were created with Excel, while the Venn diagrams comparing the different authors were created online with http://bioinformatics.psb.ugent.be/webtools/Venn/, with the Venn diagram plotter written by Kyle Littlefield for the Department of Energy (PNNL, Richland, WA) and the Three circle overlap added by Matthew Monroe in 2007 (PNNL, Richland, WA) (Program started in August 2004), as well as the Venn diagram drawing tool created by Luana Micallef and Peter Rodgers (2014).

All the maps were created and edited with ArcGIS Desktop Advanced, the historical base maps were created by Heinrich Laakmann and obtained from Wittram (1973).

Although I am providing some general statistical overview of the whole database, not all of it was used for the detailed analysis. The focus was set on three authors, namely Luce, Alksnis and Aronson, and on the records classified in the "plant" category of those authors. This limitation was done to ease the analysis and to have a more detailed look on specific research questions. The respective authors were chosen to cover the whole region of interest, to cover authors of different backgrounds and make other comparisons possible, like for example comparing Luces records with the records of Johann Heinrich Rosenplänter (Kalle and Sõukand 2021) or comparing popular plant usage in neighbouring countries.

Comparisons of species with their specific medicinal usage were always made with the combination of the species with the general medicinal use category their usage was mentioned in, not on the emic diseases level.

4.3. Comparison with other results

Several recent studies (briefly introduced below) from the same study region as well as from other Eastern European countries were selected for comparison with this study.

It has to be noted that some of the studies, for example the ones of Pranskuniene et al. (2018), Simanova et al. (2020) and Mattalia et al. (2021), use different quantification methods. For

this study, Use Reports (UR) were used, meaning how often a taxon, for example, was mentioned for all diverse uses. Simanova et al. (2020) and Mattalia et al. (2021) used Detailed Use Reports (DUR), where the UR are multiplied with how often the specific UR was mentioned by their interviewees. This adds the dimension of the popularity of a UR to the analysis. Pranskuniene et al. (2018) also used the frequency of reports as measurements.

In case the sought results were not reported directly, they were computed on the basis of the detailed result tables given in the studies. If this was not possible and a comparison still was made, it is specifically indicated, either in the tables or in the text. Nevertheless, the data was used for comparison, as one can get a feeling for the recent situation as well as noticing tendencies, similarities and differences in the datasets.

The results of the analysis of the database are shown in chapter 5. These results are then compared with the results of the other studies in chapter 6, to draw further conclusions and providing a larger context.

Sõukand and Kalle (2012) investigated in their study the medicinal plant usage of people in two parishes in Estonia, comparing archived records of traditional ecological knowledge with the individual knowledge of their interviewees.

Sõukand and Pieroni (2016) investigated the effects of a border in the Bukovina on the changes in usages of medicinal and wild food plants among an ethnic group, which got split by that border. They conducted interviews gathering information about medicinal, wild food and veterinary plant usages, as well as other remedies. Furthermore, they compared the field data with historical sources.

Kujawska et al. (2017) investigated archival data from polish ethnographer Adam Fischer for the Polish-Lithuanian-Belarusian border area. They applied different cultural importance indices and compared them with a study the conducted two years earlier in the western Ukraine with the same intentions.

Pranskuniene et al. (2018) tried to “assess the ethnopharmaceutical knowledge regarding traditional use of natural substances for medicinal purposes” of people in the Samogitia region in northwestern Lithuania (bordering the historic Courland). They also compared their results with the results of a study conducted ten years earlier in the same region. They also conducted interviews with several respondents from different age groups and asked for specific

information about “local names of plants, their preparation techniques, parts used, modes of administration, and application for therapeutic purposes” (Pranskuniene et al. 2018).

Mattalia et al. (2020) did their study in the Bukovina region in the Ukraine and Romania with a focus on knowledge transmission across boarders among the local ethnic group living there. They conducted interviews with people from both countries recording medicinal and food usages of plants and the knowledge sources of the interviewees.

Sile et al. (2020) did a literature research on traditional ethnobotanical knowledge in Latvia. They categorized the plant records according to the ICPC. They also added mode of administration, plant parts used and dosage forms.

Simanova et al. (2020) did their study in the very southeastern part of Latvia, where they conducted interviews with people from 27 different villages. They addressed the differences in medicinal plant usage across very diverse social groups in the same environment.

Kalle and Sõukand (2021) analyzed the herbaria and manuscripts of Estonian Pastor Johann Heinrich Rosenplänter (1782–1846), a Baltic German-speaking amateur botanist, with the aim to “understand the ethnobotany of a preliterate society” by focusing especially on the local plant names.

Mullalija et al. (2021) and Mustafa et al. (2020) did their study in the central and southern part of Kosovo, respectively, with the aim to assess if there are any differences in plant usage among communities of different ethnic affiliations who have been living together for centuries. They conducted interviews with people with a lot of traditional environmental knowledge and focused on medicinal and food usage of wild plants.

5. Results

5.1. General description of the database

Overall, a total of 2444 use records (UR) were extracted from eight books and articles.
The largest portion of the URs is accounted for by the category “plant”, 1662 records making up 68% of the whole dataset. The second biggest category is “animalistic” records with about 9%, followed by “mineral” with a 7% share.

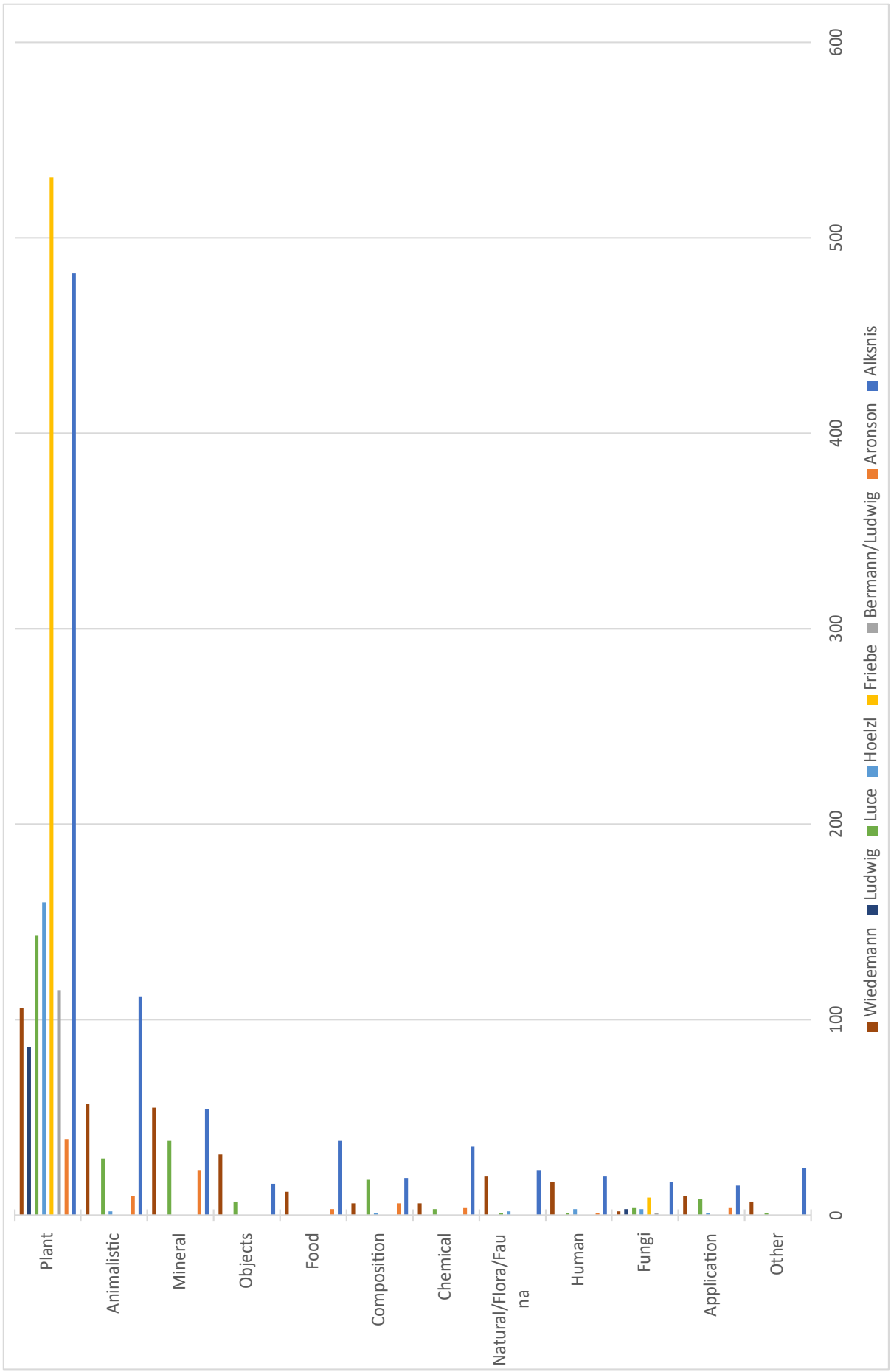

Fig. 5: Number of use records per type of and per author (whole database)

The most stated plant is *Artemisia absinthium* L., followed by *Achillea millefolium* L., *Hypericum perforatum* L., *Verbascum thapsus* L. and *Ledum palustre* L.
The most stated constituent in the animalistic category is the cow, followed by snakes and the pig. In the category mineral, salt is mentioned the most, followed by chalk and copper.

Regarding the mode of administration, of the 2444 URs, for 1063 (43%) of them, a specification was not possible because either it was not stated, or it was not clearly assignable to one of the categories. Of the remaining 1381 URs, 749 (54%) were External, 611 (44%) where Internal and 21 (2%) were External and Internal.

Looking at the plant parts used, the category “HERB” is mentioned by far the most often and makes up nearly half (~48%) of the mentioned parts used. The other categories are split relatively even.

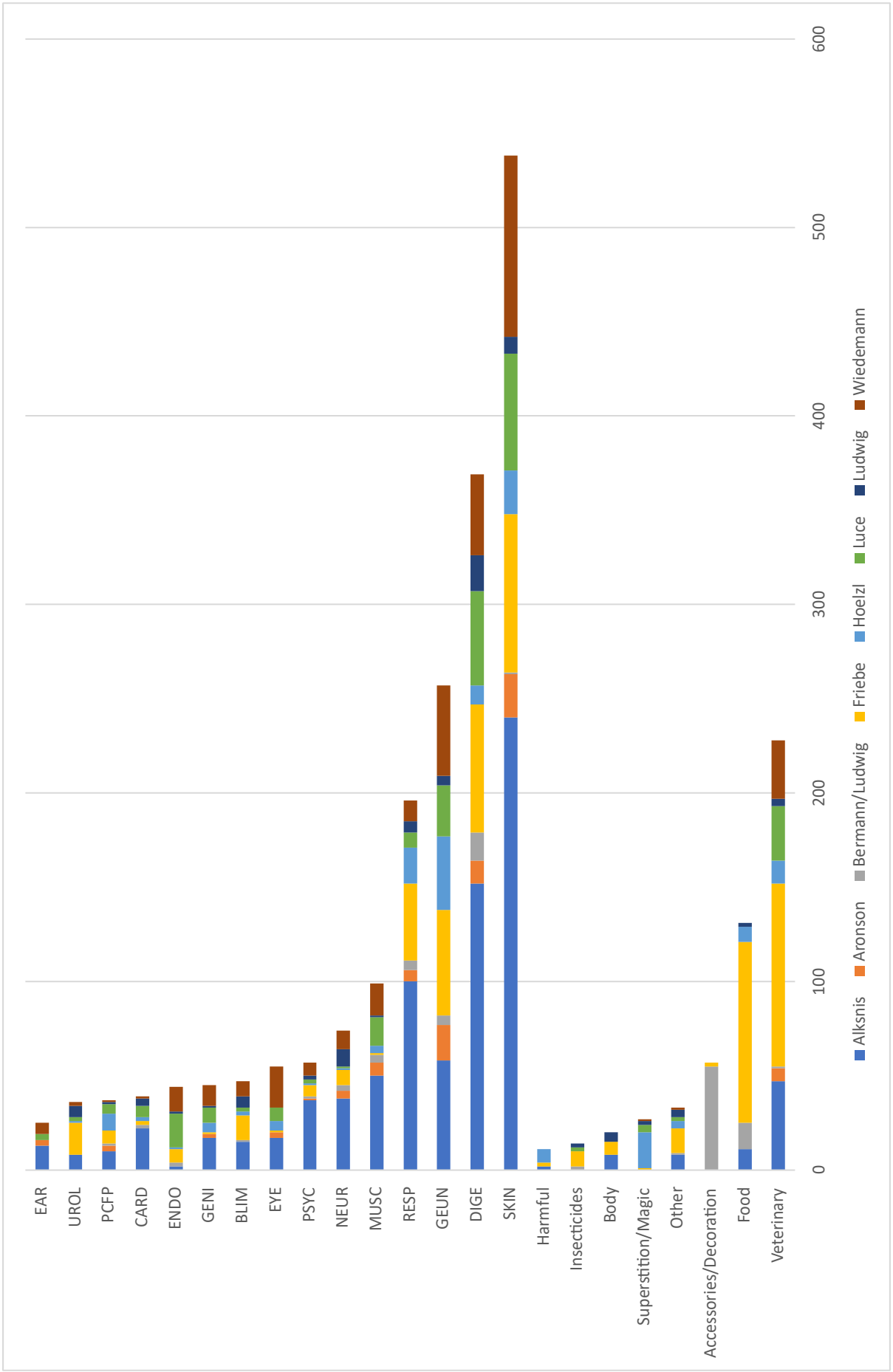

Fig. 6: Number of Use Records per use category per author (whole database)

The records can be split up according to the usage categories into human-medicinal, with 1918 URs, about 75%, and non-medicinal, with 521 URs, about 25% of all of the URs.

In the medicinal use categories, diseases from the category “Skin” are mentioned the most (~22%), followed by the category “Digestive” (~15%) and “General and Unspecified” (~11%). In the non-medicinal use categories, Veterinary is the most mentioned (~9%), followed by “Food” (~5%) and “Accessories/Decoration” (~2%).

In total, in plants there are 1662 records, which referred to 345 Taxa identified on species level and 43 on genera level, belonging to 266 genera and 89 families. 97 records were not specified on the species level, one record was not specified on the genus level and one record was not identifiable. Asteraceae with about 14% make up the biggest part on family level, followed by Lamiaceae and Rosaceae, both with about 6%.

I’ve chosen for this thesis to limit the more detailed analysis to the books of Luce, Alksnis and Aronson as they are covering a closely related and to a certain extent overlapping territory (see figure 4). Furthermore, I limited the detailed analysis to the medicinal use of plants as this is the most presented category in those authors (see figure 5).

The mode of administration and plant parts used are of secondary importance, therefore there was no further analysis made.

5.2. Plant uses described in the selected authors Luce, Alksnis and Aronson

5.2.1. Luce - Heilmittel der Ehsten auf der Insel Oesel (1829)

Dr. Johann Wilhelm Ludwig von Luces book „Heilmittel der Ehsten auf der Insel Oesel“ (Remedies of the Estonians of Oesel Island) is an essay about popular medicine, specifically on the medicinal usage of different constituents of the locals from the island Oesel (today Saaremaa). On 159 pages, the author presents use reports he experienced himself or gathered from various locals during a time of 38 years. He also includes own experiments and findings, as well as some regressions on topics like blue pox epidemies on the Island.

Luce came as pastor to Saaremaa but studied later on medicine in Germany before returning to the Island. He also had a high botanical knowledge and even has his own botanical author abbreviation. His intention of writing the book was to share the experiences he made with the

local people's folk medicinal customs "as one of them", bringing this knowledge to a bigger audience.

He sorted the book by the type of constituent, having sectioned it into mineralistic, herbal, animalistic, instrumental and fantastic constituents respectively remedies.

Luce gathered his reports almost exclusively on the island of Saaremaa (German "Oesel"), although later authors cite his book and data for the whole of Estonia. Being the only one of the three authors, Luce also provided local plant names.

Luce reported 143 plant usages, of which 71 Taxa were identified on the species level, belonging to 71 genera and 39 families. One record, "*Pimpinella* L." was not identifiable on the species level.

Asteraceae are mentioned most often (17%, 11 taxa, 24 UR), followed by Ranunculaceae (11%, 4 taxa, 16 UR) and Apiaceae (6% 4 taxa, 8 UR).

Ranunculus acris L. is the most diversely used species with five UR, followed by *Hypericum perforatum* L. with four UR, and *Chelidonium majus* L. and *Veronica officinalis* L. with three UR each.

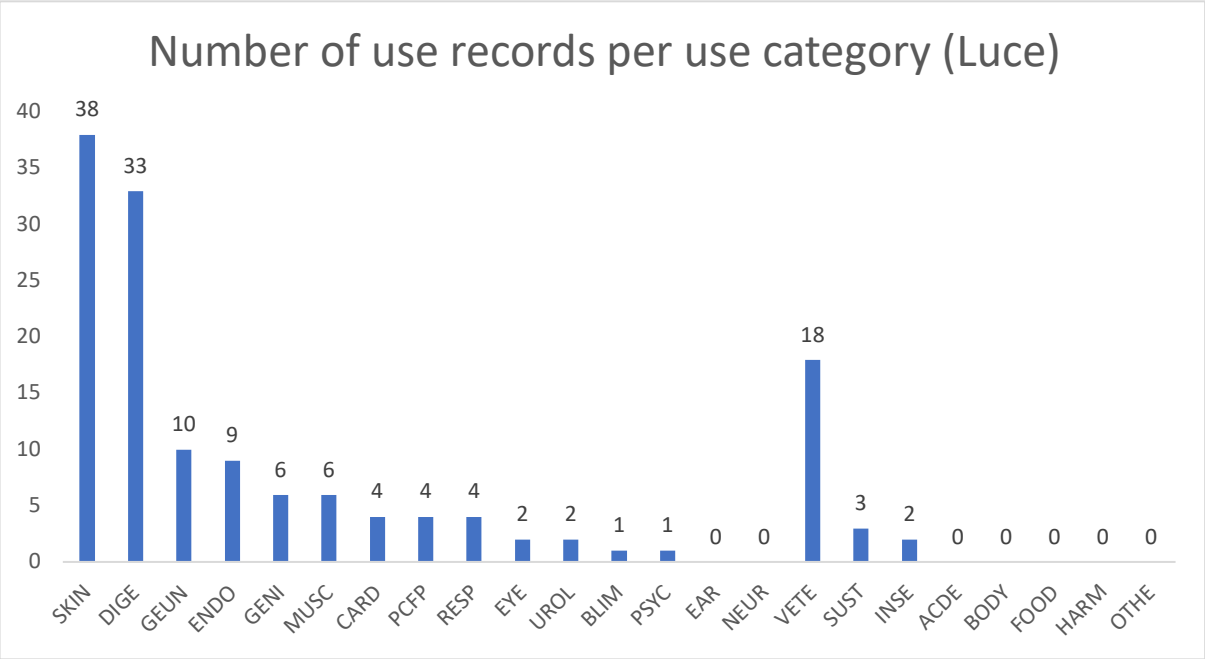

Fig. 7: Number of UR per use category, plants only

In figure 7 can be seen that the medicinal category concerning skin diseases and symptoms (27%, 38 UR, 28 taxa) is the most mentioned one, followed by the category digestive (23%, 33 UR, 23 taxa). With a big gap general and unspecified diseases/symptom (7%, 10 UR, 10 taxa) and endocrine/metabolism/nutritional diseases/symptoms (6%, 9 UR, 7 taxa) follow on third respectively fourth place.

Regarding non-(human-) medicinal use categories (16%), veterinary medicine (13%, 18 UR, 16 taxa) is up front and almost the only category with records.

Having a closer look at the digestive diseases and symptoms described, symptoms like abdominalgia, diarrhea or jaundice are mentioned the most (15 UR), followed by dysentery, worm infestation and toothache (all with 5 UR). In the skin diseases category, eczema and rashes (both 5 UR) are mentioned the most, followed by ulcers and wounds (unspecified) (both with 4 UR).

Among the plant parts, the category "HERB" is by far the most mentioned with 58%, followed by "SUBT" (subterranean parts) with 10% and "Multiple" (more than one part mentioned for one administration) with 7%. But there is at least one UR for every category.

The mode of administration is spread evenly between external (35%) and internal (34%), while 28% of the records were not classifiable.

5.2.2. Alksnis - Materialien zur lettischen Volksmedizin (1894)

"Materialien zur lettischen Volksmedizin" (Materials on the Latvian folk medicine) is a contribution of Jakob Alksnis in the fourth volume of Rudolph Koberts "Historische Studien aus dem pharmakologischen Institute der kaiserlichen Universität Dorpat" (Historical studies from the pharmacological institute of the imperial university of Dorpat (today Tartu)). Alksnis was Latvian, studying medicine with interests in gathering cultural-historical data and "ethnological interesting things". For his 117-page long article, he gathered Latvian and Russian literature on folk medicine, reworked it and translated it into German. Alksnis also added a lot of his own experiences gathered during education in Durbe, Liepāja (southwestern Courland, today Latvia) and Tartu (then Livonia, today Estonia) (see figure 4) and of working as a military doctor. Additionally, he got data and help from a certain Doctor Raphael (whose office was situated in Durbe) as well as data from several volumes of a Latvian-wide

newspaper, which had a dedicated column about medicinal plant usage. Therefore, his data can be seen as representative for the whole of Livonia and Courland.

It had a scientific purpose, making knowledge for non-Russian speakers available, trying to give future Latvian doctors insights in how people utilize popular medicinal knowledge, rising their awareness for it and also trying to promote a rational approach to the administration of medicine. The scientific approach to the topic can also be seen in the article. Alksnis first gives medicinal information on the diseases, then continues with reporting very factual the different constituents used to treat the respective disease as well as their preparation. He tries to give a realistic image of his compatriots.

His article is sorted by the different disease categories, which are inner medicine, animalistic parasites, skin, eyes, ears, teeth, chirurgical, instrumental, tumors, infectious, nervous, birth, women, children, miscellaneous, animalistic and word magic (not covered in the database).

Despite not providing local plant names (except for one, which was not identifiable), Alksnis often stated the local names for the diseases he described, showing his clear focus on the medicinal aspect of his report.

Alksnis reported 482 plant usages, of which 171 Taxa were identified on species level and 32 on genera level, belonging to 165 genera and 66 families. 70 records were not specified on species level, one record, “Alloideae”, was not specified on genus level and one record, “Speedja Sahle”, was not identifiable on any level.

Asteraceae are mentioned the most (11%, 18 taxa, 51 UR), followed by Solanaceae (8%, 7 Taxa, 37 UR) and Rosaceae (7%, 14 Taxa, 33 UR).

Species with the most diverse uses are *Arnica montana* L., *Juniperus* sp., *Ledum palustre* L., *Mentha × piperita* L., *Menyanthes trifoliata* L., *Hyoscyamus niger* L. and *Urtica urens* L., all with five UR.

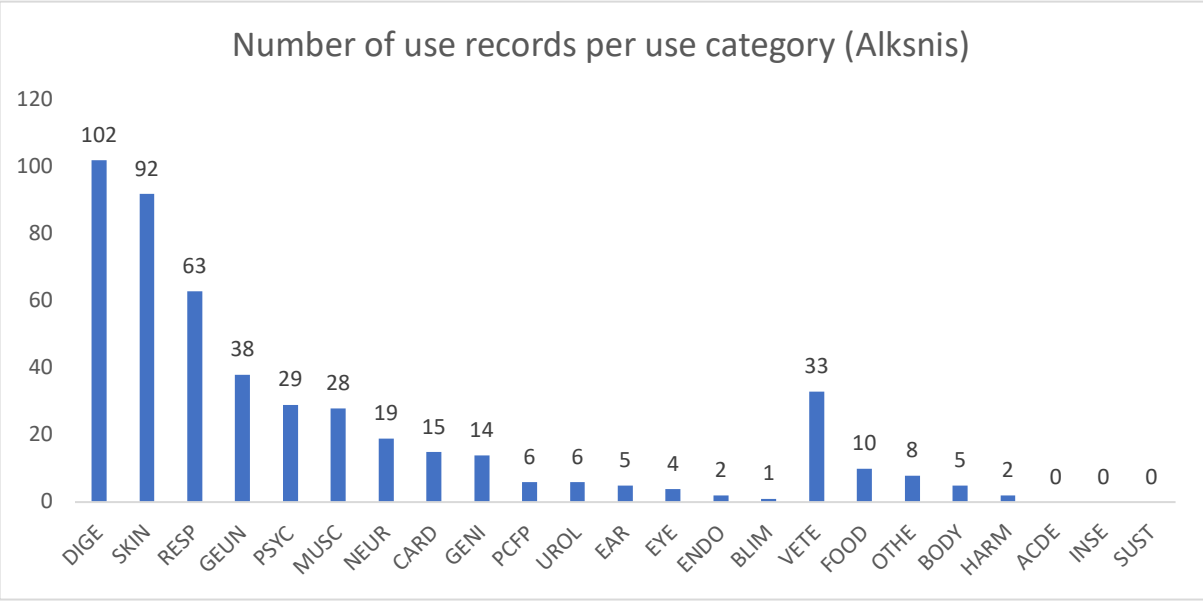

Fig. 8: Number of UR per use category, plants only

Figure 8 shows that digestive diseases and symptoms (21%, 102 UR, 71 taxa) are the most mentioned use category, followed by skin diseases/symptoms (19%, 92 UR, 52 taxa). With a big gap, categories respiratory diseases/symptoms (13%, 63 UR, 37 taxa) and general and unspecified diseases/symptoms (8%, 38 UR, 27 taxa) follow on third respectively fourth place. Regarding non-(human-) medicinal use categories (12%), also for Alksnis veterinary medicine (7%, 30 UR, 33 taxa) is up front.

Having a closer look at the digestive diseases and symptoms described, symptoms like abdominalgia, diarrhea, heartburn or jaundice are mentioned the most (61 UR), followed by teeth problems (19 UR) and dysentery (11 UR). In the skin diseases category, cauterizations, panaritium, rhagades and sore points (all 8 UR) are mentioned the most. Symptoms like coughs, sore throat or pleuritis (28 UR) are mentioned the most often in the category of respiratory diseases, followed by pertussis (10 UR) and pulmonary tuberculosis with 9 UR.

Among the plant parts, the category “Herb” is by far the most mentioned with 57%, followed by “Fruit” with 10% and “Subterranean” with 8%. But there is at least one UR for every category.

The mode of administration is quite undifferentiated, as the group of records, which were not classifiable, is with 41% the biggest. Internal administration is with 36% much more often mentioned than external administration with 21%.

5.2.3. Aronson - Ueber die Volksheilmittel der Letten (1891)

Dr. Emil Aronsons article “Ueber die Volksheilmittel der Letten“ (On the folk remedies of the Latvians) is a contribution in the 19th volume of the “Magazin” (Magazine) of the Lettisch-literärische Gesellschaft (Latvian literature society). Motivated by the gap of Latvian data in the dissertation of Dr. Wassily Demitsch (“Literärische Studien über die wichtigsten russischen Volksheilmittel aus dem Pflanzenreiche” – Literary studies about the most important Russian folk remedies from the plant kingdom), Aronson wrote this 19-page long contribution with his own experiences from his medicinal work in his doctor’s office in Liepāja (former Libau). He wanted to not miss important usages, because of prejudices towards non-scientifical-medicinal administrations. Besides that, Aronson wants to show that besides superstition- or curiosity-driven usages also suchlike exist, which can be useful for at the time medicinal sciences. He sometimes cites Luce to compare Latvian uses with Estonian ones or to add additional information.

He sorted his article as Luce by constituent types, where he categorized the constituents in mineralistic, herbal and animalistic constituents and applications.

Aronson used almost exclusively experiences and data gathered in his own doctor’s office in Liepāja. Even when he states that he wants to fill a gap of data for Latvia, his data reflect the uses from the surrounding area of Liepāja (see figure 4).

Aronson writes in the foreword of his article, that he thinks it is important to take peoples usages seriously, as there are many examples of folk remedies, which were incorporated in conventional medicine and that he does not want to miss any possibly helpful remedies just because of prejudice or contempt. He tries to filter “good” and sound usages form bad ones. Furthermore, he states that folk remedies are cheap, available for everyone, easy to get, simple to use and everybody believed in the success of the administration. Aronson did not provide any local names, neither for diseases. He is the author with the least information on local names.

Aronson reported 39 plant usages, of which 20 taxa were identified on the species level, belonging to 19 genera and 14 families. Two records, both “*Quercus*”, were not specified on species level.

Asteraceae are mentioned the most (26%, 6 taxa, 10 UR), followed by Caprifoliaceae (15%, 1 Taxa, 6 UR) and Lauraceae (10%, 1 Taxa, 4 UR).

Species with the most diverse uses are *Valeriana officinalis* L. in five different use categories, followed by *Matricaria chamomilla* L. and *Cinnamomum camphora* (L.) J.Presl in four different use categories each.

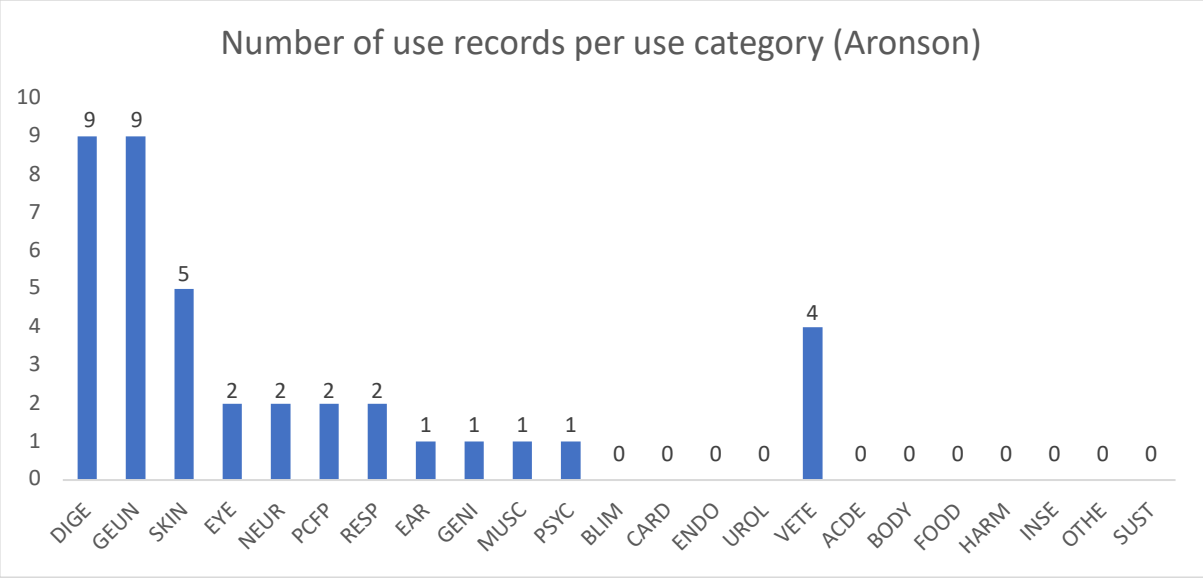

Fig. 9: Number of UR per use category, plants only

As in figure 9 shown, the most mentioned use categories are digestive diseases and symptoms (23%, 9 UR, 4 taxa) and general and unspecified diseases/symptoms (23%, 9 UR, 5 taxa), followed by skin diseases/symptoms (13%, 5 UR, 3 taxa) in third place.
Regarding non-(human-) medicinal use categories (12%), veterinary medicine (10%, 4 UR, 2 taxa) is the only one mentioned.

Having a closer look at the digestive diseases and symptoms described, symptoms like abdominalgia, diarrhea or cramps are mentioned the most. In the general and unspecified diseases category, different general symptoms like fever, inflammation or pain are mentioned as well as for example “different states of faintness”. Symptoms like coughs, sore throat or pleuritis (28 UR) are mentioned the most often in the category of skin diseases, besides that, growths (3 UR), wound medication and ulcers (1 UR each) are mentioned.

Among the plant parts, the category “Herb” is by far the most mentioned with 54%, followed by “Flower” with 13%. Categories “Leaves” and “Wood” are the only ones with no UR.

5.2.4. Comparison of Luce, Alksnis and Aronson

A few remarks have to be considered, when using the data by those authors. The first issue concerns the plant identification by the authors. While the information provided by the authors was carefully investigated to minimize interpretation errors from my side, one has to be aware of possible faulty plant identification by the authors themselves or by the sources they used. Luce for example has made several potential identification mistakes leading to taxa, which seem at least peculiar. Criticism on Luces work can also be found in literature from that time. Schmidt (1855) states the following: „[…] so zeigen doch schon seine zahlreichen unhaltbaren neuen Arten, wie wenig man sich auf seine Angaben verlassen dürfe." ([…] based on the many untenable new species one can see [in Luce's work, A/N], how little one can rely on his [Luces, A/N] records.). Also Lehmann (1895) offers criticism: „[…] die vielen, oft zweifelhaften Pflanzenarten, die in ihren [Fischer, Grindel, Friebe, Luce, de Bray, A/N] Schriften fürs Balticum angeführt werden, aber von oben genannten neueren Floristen [Fleischer, Lindemann, Wiedemann und Weber, Schmidt, Winkler, Klinge, A/N] als dubios excludiert sind […]" (the many and mostly dubious species, which are stated in their [Fischer, Grindel, Friebe, Luce, de Bray, A/N] texts for the Baltic region, but which got excluded for being dubious by later botanists [Fischer, Grindel, Friebe, Luce, de Bray, A/N]).
Despite this criticism, nearly all later published books and texts used for this database cite Luce and even use the citation often for the whole of Estonia.

On the other hand, Alksnis got his data from a newspaper where people sent in plants and their usages and had to rely on the examination done by the newspaper and on the identification respectively statement of the people themselves, who often did not have sufficient botanical knowledge to identify plants correctly.

In retrospect, detecting misidentifications by the authors is difficult and sometimes not possible. Therefore, after checking the data thoroughly, it has to be taken to a certain amount as it is, but possible errors have to be kept in mind. Furthermore, it has to be considered, that the unproportional amount of use records among the authors makes general assumptions possible, but detailed conclusions have to be treated carefully.

Another interesting aspect of potential influence on the results is the fact, that all three authors are doctors. While this influence only can be confirmed after a deeper analysis, it still is worth the consideration. All three could have potentially included knowledge, which they considered as "normal" or well-known, whereas this knowledge among the major part of population, being medicinal laymen, could have been less popular or even unknown.

Looking at all three authors together, the use category digestive is the most mentioned one (144 UR, 25%), followed by skin (135 UR, 23%), respiratory (69 UR, 12%), general and unspecified (55 UR, 10%) and musculoskeletal (35, 6%). The most mentioned non-(human-) medicinal category is veterinary medicine (55 UR, 8%)

This is also fitting with the results of the general analysis, where Skin diseases are mentioned the most (22%), followed by digestive diseases (15%), general and unspecified diseases/symptoms (11%), respiratory (8%) and musculoskeletal (4%). The most mentioned non-(human-) medicinal category is veterinary medicine (9%).

The most mentioned plant family are Asteraceae (77 UR, 13%), followed by Solanaceae (42, 7%), Roasceae (34 UR, 6%), Apiaceae (26 UR, 5%) and Lamiaceae (24 UR, 4%).

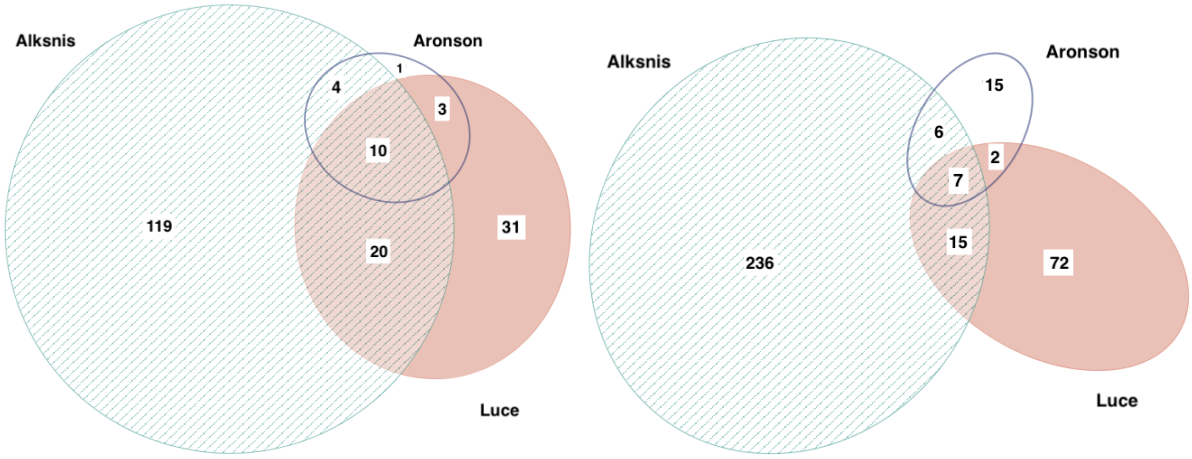

Fig. 10: Venn diagram on species (left) and their specific medicinal usage (right)

Overall, 144 unique taxa were recorded from all three authors for medicinal usage, of which ten taxa are mentioned from all three authors: *Achillea millefolium* L., *Allium cepa* L., *Arnica montana* L., *Artemisia absinthium* L., *Matricaria chamomilla* L., *Nicotiana rustica* L., *Strychnos nux-vomica* L., *Taraxacum officinalis* L., *Valeriana officinalis* L. and *Verbascum thapsus* L.

The usages of those species vary across the authors. While there are examples of similar usages either from all three or at least two authors, there are also examples of different usages. Also, the amount of UR per plant varies from author to author.

These results show a very diverse usage across the different regions, not only in terms of taxa, but also in terms of medicinal usage of those.

While there are overlaps, especially popular and widespread plants like *Artemisia absinthium* or *Achillea millefolium*, the authors also often mention unique species, which are not reported by the others, like *Glycyrrhiza glabra* L. for Luce or *Consolida regalis* Gray for Alksnis.

Regarding medicinal usage, overlaps often occur, but also a lot of differences can be seen. *Artemisia absinthium* has overlapping as well as unique usages among the authors. Luce and Alksnis mention abdominalgia and dysentery, Aronson and Alksnis mention fever. Unique usages are for Luce malaria and ulcers, for Alksnis internal diseases and actual neurosis. Also, Dioscorides mentioned many different uses for *A. absinthium*, among which is also abdominalgia, but also jaundice or ear problems.

Tanacetum vulgare is also an example for similar usages. Luce and Alksnis bot state to be used against worm infestation.

Ledum palustre offers an interesting example. While Luce only mentions a usage against lice, also Alksnis mentions not only this usage, but also for pulmonary tuberculosis, bone pain and general deteriorating health. *Ranunculus acris* is a similar case, but the other way round. While Luce states usages for gout, dropsy, vesicating, amaurosis, hip pain, rheumatism and fever, Alksnis mentions uses for rashes during a cold and for burn blisters.

There are also examples of very different usages of the same species among the authors, although these are rare. One such example is Viola tricolor L., which Luce states is used for eczema (skin category), while Alksnis sates a usage for pertussis (respiratory category). Another example is *Silene vulgaris* (Moench) Garcke, which Luce states is used for uropathy and urinary retention (which suggests also the German and English trivial name, both including the bladder)(urological category), while Alksnis states an usage against joint rheumatism (musculoskeletal category). Interestingly, Dioscorides already mentioned this species, but used as a stomachic agent (digestive category), again for a different medicinal category then the other two.

Regarding the amount of UR per taxa, 50% of the records of Alksnis and Aronson are taxa with only one UR, for Luce it is even 60%. And while 16% of the records of Luce and Aronson are taxa with more than two UR, for Alksnis it is 28% of the taxa. Examples for multifunctionality are *Artemisia absinthium,* where Luce has 5 UR, Alksnis 6 UR and Aronson 2 UR or *Valeriana officinalis*, where Luce has 2 UR, Alksnis 8 UR and Aronson 6 UR and *Taraxacum officinale*, where all three authors only have 1 UR.

This demonstrates high biocultural diversity within the limited temporal and spatial frame, but there were also some all-rounders which were either used more often in different ways for certain diseases or were used for other medicinal categories.

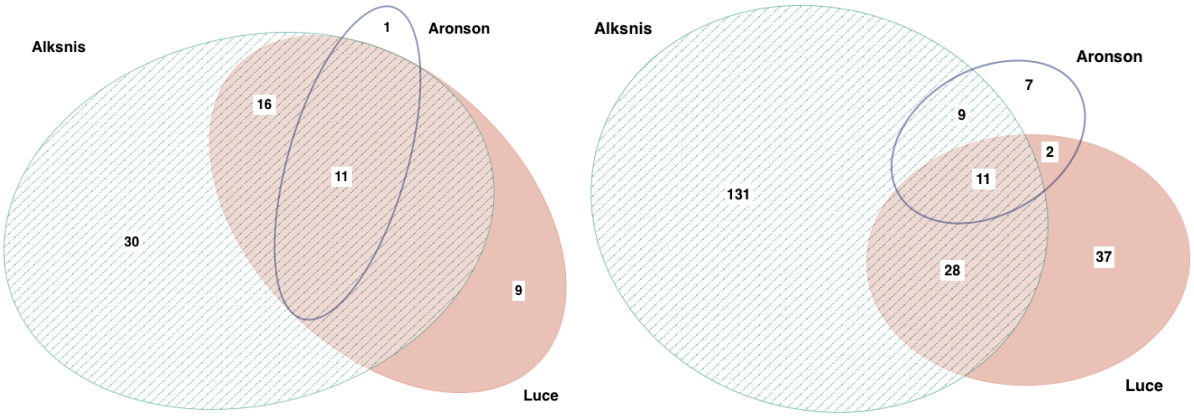

Fig. 11: Venn diagram on families (left) and with their specific medicinal usage (right)

When comparing the records family wise, the numbers have to be treated carefully. The fact that the amount of use records and the number of different sources per author vary strongly has a strong impact here, making it difficult to draw detailed conclusions.

Although Alksnis shows a much bigger range of plant families, he does not only cover a much bigger area and much more data with more sources, but he also states families, which are one first sight peculiar and sometimes questionable, like Zygophyllaceae for example.

There are 225 different combinations of plant families and ICPC-2 medicinal categories. The ten most commonly mentioned combinations are Asteraceae used for Skin diseases (21 UR), digestive diseases (19 UR), respiratory diseases (9 UR) and general and unspecified health issues (7 UR). Contributing to the digestive category are also Solanaceae (11 UR), Apiaceae (10 UR), Caprifoliaceae (9 UR) and Rosaceae (8 UR). Solanaceae were used furthermore for skin (8 UR) and general and unspecified (8 UR) issues.

Having a closer look on the most diversely used families in medicinal use categories, all three authors actually show different results. While at Luce, the family of Ranunculaceae is with 8 different categories the top one, Alksnis and Aronson both have Asteraceae on top with 12 respectively 8 different categories used in. Asteraceae rank second at Alksnis with 6 different categories used in. Rosaceae, being the second most diversely used family at Alksnis with 11 different categories, this family is at fourth most for Aronson (3 different categories) and with only two different medicinal categories used in for Luce not amongst the top ones.

The Venn diagrams in figure 11 show a comparison between the authors records of species, genera, families and the respective medicinal usage. Although the rather limited flora, there is still high use diversity.

The flora in Estonia and Latvia is overall similar, despite both countries having a high variety of plant-geographical zones. This means that the flora the people gathered the plants from is providing similar families and taxa. This can be seen in the distinct overlaps on all three taxonomic levels. Noteworthy here is, that the flora of Saaremaa is very distinct compared to the mainland of Estonia (Kalle and Sõukand 2016), which can be seen in clear differences in the comparison of Luce with Rosenplänter (see chapter 6.1.).

But, considering the clear differences on the use level, there is still a high use diversity, albeit the limited flora and similar plants used. This shows that even though the close geographical proximity and a similar historical background and culture, an interchange and homogenization of local ecological knowledge did only happen on a rather small level. There are several reasons possibly contributing to this, such like borders – in this case between Livonia and Estonia; illiteracy – no possibility of broadening knowledge through herbal books and texts; little to no travelling and no exchange with other communities; staying in known networks, relying on established knowledge and medicinal structures; or no interest in acquiring further knowledge. How strong the impact of those reasons was, and which one was the deciding factor, or if there were other reasons accountable for the little homogenization has to be an issue for future research, if even possible to find out in retrospect.

Another aspect, which has to be kept in mind concerning species diversity, is possible misidentifications of the plants by the authors, which I already mentioned earlier. This can contribute to skewed result in species diversity, leading to overestimate the diversity more than it is actually in reality.

6. Discussion

6.1. Comparison with historical data

In this chapter, the results of this study are compared with the results with studies on historical ethnobotanical data in Latvia and Estonia. Additionally, a study with data from the Polish-Lithuanian-Belarusian borderland is added for comparison.

	Plant families *							
	Sõukand and Kalle (2012)	Kujawska et al. 2017	Sile et al. (2020)	Kalle and Sõukand (2021)	Anegg (2021)	Luce	Alksnis	Aronson
1	Erica	Astera	Astera	Astera	Astera	Astera	Astera	Astera
2	Astera/ Rosa	Lamia	Rosa	Plantagina	Solana	Ranuncula	Solana	Caprifolia
3		Rosa	Solana	Rosa	Rosa	Hyperica	Rosa	Laura
4	Caprifolia	Faba	Amaryllida	Brassica	Apia	Apia/Caprifolia/Faba/ Solana	Apia/ Erica	Rosa
5	Viola	Plantagina	Erica	Lamia	Lamia			

Table 1: Comparison of the most mentioned plant families in the studies of Sõukand an Kalle (2012), Kujawska et al. (2017), Sile et al. (2020) and Kalle and Sõukand (2021) with the results of this study.
** plant families without -ceae suffix*

	Plant families with the most taxa *							
	Sõukand and Kalle (2012)	Kujawska et al. 2017	Sile et al. (2020)	Kalle and Sõukand (2021)	Anegg (2021)	Luce	Alksnis	Aron-son
1	Rosa	Astera	Astera	Astera	Astera	Astera	Astera	Astera
2	Astera	Lamia/Rosa	Rosa	Lamia	Rosa	Ranuncula	Rosa	Apia
3	Erica	Lamia/Rosa	Lamia	Plantagina	Apia	Solana	Apia	Rosa
4	Lamia	Faba	Apia	Ranuncula	Lamia	Apia	Lamia	
5	Apia/Caprifolia/ Solana/Viola	Malva/Plantagnia				Fabia	Erica	

Table 2: Comparison of the plant families with the most taxa in the studies of Sõukand an Kalle (2012), Kujawska et al. (2017), Sile et al. (2020) and Kalle and Sõukand (2021) with the results of this study.
** plant families without -ceae suffix*

Plant family wise (table 1), Asteraceae and Rosaceae are among the most mentioned ones in all of the studies. Otherwise, the results are mixed, and no clear tendencies or correlation can be seen. This is also true for the results shown in table 2, concerning the plant families with the most mentioned taxa. While Asteraceae, Rosaceae and Lamiaceae are very prominent, the results diverge regarding the other families. Kujawska et al. (2017) report Fabaceae and Malvaceae/Plantaginaceae, Sile et al. (2020) and this study report Apiaceae, Kalle and

Sōukand (2021) report Plantaginaceae and Ranunculaceae and Luce (1829) had Solanaceae and Ranunculaceae among the families with the most mentioned taxa.

	Medicinal use categories							
	Sōukand and Kalle (2012)	Kujawska et al. 2017	Sile et al. (2020)	Kalle and Sōukand (2021)	Anegg (2021)	Luce	Alksnis	Aronson
1	Musc	Resp	Dige	Skin	Dige	Skin	Dige	Dige/ Geun
2	Geun	Dige	Resp	Geun	Skin	Dige	Skin	
3	Resp	Skin	Skin	Musc	Resp	Geun	Resp	Skin
4	Dige		Geun	Urol	Geun	Endo	Geun	
5	Endo/Skin		Musc	Dige	Musc	Geni/Musc	Psyc	

Table 3: Comparison of the most mentioned medicinal use categories in the studies of Sōukand an Kalle (2012), Kujawska et al. (2017), Sile et al. (2020) and Kalle and Sōukand (2021) with the results of this study.

Table 3, concerning the medicinal use categories, shows more similar results. Digestive, respiratory, skin and general and unspecified diseases/symptoms are always among the most mentioned ones. Also, musculoskeletal diseases/symptoms are prominent.

The results are especially close between Sile et al. (2020) and this study. While the most mentioned families with the most taxa and the most mentioned medicinal categories are, except from their order, the same, the only small difference occurs at the most mentioned families, where the fourth and fifth most mentioned plant family differ.

Comparing the plants with the most versatile uses (in terms of usage for different medicinal categories), the results are not overlapping at all. While Kujawska et al. (2017) report *Calendula officinalis*, *Cyanus segetum*, *Helichrysum arenarium*, *Betula* sp., *Prunella vulgaris*, and *Nuphar lutea* or *Lilium* sp. as the most versatile plant species, in this study *Valeriana officinalis* L., *Allium cepa* L., *Arnica montana* L., *Filipendula ulmaria* (L.) Maxim. and several others with the same versatile usage as *F. ulmaria* are among the most versatile used ones. In another study of the authors (also from Fischer in the Ukraine), they found the following species to be the most versatile ones: *Achillea millefolium*, *Tussilago farfara*, *Veratrum album*, *Allium sativum* and *Viola tricolor*.

The most diversely used species reported by Sile et al. (2020) is *Matricaria chamomilla*, followed by *Betula* sp., *Allium cepa* L., *Nicotiana* sp. L., *Valeriana officinalis* L., *Urtica* sp. L. and *Artemisia absinthium* L. While *Valeriana officinalis* L. and *Allium cepa* L. are also among the most versatile species in the results of this study, the other species differ.

This shows a clear difference in plant usage between the studied regions (Estonia/Latvia vs. polish-Lithuania-Belarusian border region), which are actually not far apart. Nevertheless, there is not one plant among the most versatile plants, which is reported in both studies. This concerns versatility of plants, but also comparing just the different species, the most mentioned ones are again without even one plant being in both studies among the top ones.

The taxa with the most UR reported by Sile et al. (2020) are *Matricaria chamomilla* L., followed by *Betula* sp. L., *Artemisia absinthium* L., *Achillea millefolium* L., *Allium sativum* L. and *Juniperus communis* L. They are also among the most popular ones (by how many different authors plant was mentioned). In this study, *Valeriana officinalis* L. has the most UR, followed by *Artemisia absinthium* L., *Allium cepa* L., *Verbascum thapsus* L. and *Achillea Millefolium* L. Sõukand and Kalle (2012) mentioned *Achillea millefolium* L., *Arctostaphylos uva-ursi* (L.) Spreng., Chamomilla spp., *Vaccinium vitis-idaea* L., *Ledum palustre* L., *Solidago virgaurea* L. to be the species with the most UR.

This shows that the flora and the available plant families were used similarly, but there are also some regional and local specific uses, which are accentuated differently by the authors. Also considering plant species, similar species are used, but also specifically used species can be seen. Similarities emerge especially with well-known, widespread taxa like *Matricaria chamomilla* or *Artemisia absinthium*, which are also very diversely used. Differences in UR can also occur, when certain authors report very specific, unique or single uses, which have only one source. While this usage may be unknown to others or rarely used, it contributes to the UR and the diversity of the plant usage.

However, the data gathered for this database seems to be well in the average of other historical data from Livonia.

Comparing the most mentioned families from Sile et al. with Alksnis alone (table 1), an even clearer overlap can be seen, as Alksnis' order of most mentioned families consists of the same families in the top five reported ones, just in a different order.

When comparing the results of this study with the results of Kalle and Sõukand (2021), differences increase clearly.

Rosenplänter gathered his data in the Parnu parish (then bordering Livonia) and wanted to gather plants from the whole of Estonia. Interestingly, he got help for plant identification from Luce (Kalle and Sõukand 2021).

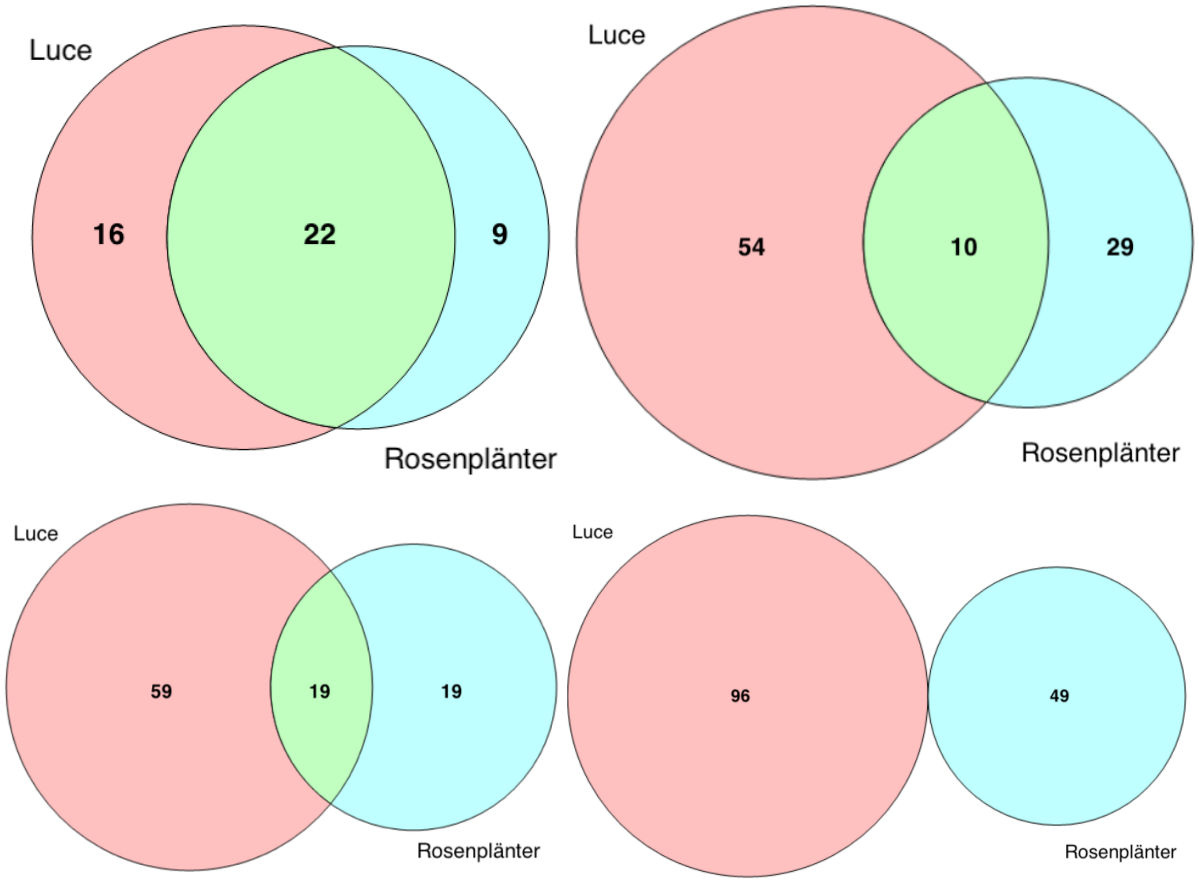

Fig. 12: Venn diagram on families (top left) and combined with their specific medicinal usage (top right), and on species (bottom left) and combined with their specific medicinal usage (bottom right), comparing the works of Luce (1829) and Kalle and Sõukand (2021).

The works of Luce and Rosenplänter are closest in both time and space. Comparing the data of Rosenplänter with Luce, the results show besides some no exact overlap in use, but some similarities in nomenclature and use on family level. While both authors have Asteraceae and Ranunculaceae among the plant families with the most diverse taxa, other families are differing: Rosenplänter has Lamiaceae and Plantaginaceae among the most mentioned ones, while Luce has Fabaceae and Solanaceae there. Regarding most mentioned plant families, differences get even more distinct. Both authors have Asteraceae as most mentioned plant family, but the following families are different for both Luce and Rosenplänter.

Looking at medicinal categories, results are again more similar. Both have skin, digestive and general and unspecified diseases/symptoms among the five most mentioned categories. The other two are different again.

These comparisons show that even though the geographical proximity, uses vary clearly and are very diverse. While both authors are matching in terms of medicinal usage of the plants and families used, the differences increase when looking at the results on the species level

and regarding how families are used medicinally. Especially noticeable is that there is not one overlapping medicinal use of a taxa between Luce and Rosenplänter, even though both worked at the same time, the one on the island of Saaremaa, the other on mainland Estonia. This underlines the differences of the folk medicines both described.

Furthermore, this indicates that regions which are close together still can be very different when it comes to popular plant usage, even when it's in the same country. Another reason for the differences lies in the island-mainland situation, meaning that although they are close together, usages could still have developed differently over time. Additionally, the flora of Saaremaa is very distinct compared to the mainland of Estonia (Kalle and Sõukand 2016), leading to a priori differences in terms of pant abundance. This also fits to the conclusion made earlier, that homogenization albeit the geographical proximity and cultural similarity did not happen or only happened in a very small context.

Moreover, ecosystems could be different enough to contain specific plant families, which do not have the required growing conditions in the other ecosystem. Additionally, different occupants in the past could have introduced different usages and plant knowledge, which could also be an explanation for the differences. Additionally, knowledge exchange in terms of folk medicinal knowledge was probably not much promoted and people stuck their medicine men and women they were used to and to the knowledge they already had.

6.2. Comparison with recent fieldwork

In this chapter, the results of this study are compared with the results of two recent studies in the same area.

	Plant families**					
	Pranskuniene et al. (2018)*	Simanova et al. (2020)*	Anegg (2021)	Luce	Alksnis	Aronson
1	Astera	Astera	Astera	Astera	Astera	Astera
2	Lamia	Rosa	Solana	Ranuncula	Solana	Caprifolia
3	Rosa	Betula	Rosa	Hyperica	Rosa	Laura
4	Erica	Erica	Apia	Apia/Caprifolia /Faba/Solana	Apia/ Erica	Rosa
5	Apia	Lamia	Lamia			

Table 4: Comparison of the most mentioned plant families reported in the studies of Pranskuniene et al. (2018), Simanova et al. (2020) and this study.

** no direct comparison possible ** plant families without -ceae suffix*

	Plant families with the most taxa**					
	Simanova et al. (2020)*	Pranskuniene et al. (2018)*	Anegg (2021)	Luce	Alksnis	Aronson
1	Astera	Astera	Astera	Astera	Astera	Astera
2	Rosa	Lamia	Rosa	Ranuncula	Rosa	Apia
3	Lamia	Rosa	Apia	Solana	Apia	Rosa
4		Apia	Lamia	Apia	Lamia	
5		Erica	Erica	Fabia	Erica	

Table 5: Comparison of plant families with the most mentioned taxa across the studies of Pranskuniene et al. (2018), Simanova et al. (2020) and this study.

** no direct comparison possible ** all plant families without -ceae suffix*

As in tables 4 and 5 can be seen, the plant families as such as well as in terms of most taxa per family are very similar. Asteraceae, Rosaceae, Lamiaceae, Apiaceae and Ericaceae are always among the most mentioned ones in all three studies.

This shows that the families are still used very similar compared to the 19th century and indicates that folk medicinal usages stayed, in general, very stable and similar over time. Changes in species usage, shown by the diversity of the taxa used across the studies (already on a small geographical scale), on the other hand show a more dynamic picture. Increasing knowledge on the effects and properties of the species, but also forgetting about usages of less popular plants and dismissing usages contributes to this constant changes. Additionally, the change of ecosystems, naturally but even more anthropogenically induced, has a negative influence on species abundance and therefore also the usage changes.

The taxa with most diverse use vary clearly across the different studies. Simanova et al. (2020) reported *Achillea millefolium*, followed by *Matricaria chamomilla*, *Hypericum* spp., *Pinus sylvestris* L. and *Tussilago farfara* L. Pranskuniene et al. (2018) on the other hand reported *Urtica dioica* L. as most diversely used taxa, followed by *Lamium album* L., *Mentha* x *piperita* L., *Calendula officinalis* L., *Echinacea purpurea* (L.) Moench. and *Sorbus aucuparia* L.

This result shows that the usage of the various taxa varies strongly across the different regions. Similarities occur, especially concerning widespread species *Achillea millefolium*, *Matricaria chamomilla* or *Urtica dioica*, but overall, the overlap is very small. This indicates a high diversity of usages across the regions with local specialties, but also regional similarities as well as conserved and still recent usages.

Popularity wise, the order of the most popular plants looks different compared to the order of taxa with the most diverse use, for Pranskuniene et al. (2018) as well as for Simanova et al. (2020). This indicates that the popularity of a plant does not have to coincide with the amount of UR.

	Medicinal use categories**					
	Pranskuniene et al. (2018)*	Simanova et al. (2020)*	Anegg (2021)	Luce	Alsknis	Aronson
1	Dige	Geun	Dige	Skin	Dige	Dige/ Geun
2	Geni	Resp	Skin	Dige	Skin	
3	Resp	Dige	Resp	Geun	Resp	Skin
4	Psyc	Musc	Geun	Endo	Geun	
5	Neur	Skin	Musc	Geni/Musc	Psyc	

*Table 6: Comparison of the most mentioned medicinal use categories reported in the studies of Pranskuniene et al. (2018), Simanova et al. (2020) and this study. * no direct comparison possible ** plant families without -ceae suffix*

Looking at the medicinal usage categories (see table 6), digestive and respiratory diseases/symptoms are among the most popular ones as well as among the categories with the most UR. Skin diseases on the other hand seem to have lost popularity but are also in terms of UR decreasing. Also, the category general and unspecified turns up often among the most mentioned categories. But there also seem to be certain medicinal categories, which are specifically in certain regions prominent, for example genitourinary diseases/symptoms reported second most popular by Pranskuniene et al. (2018) or endocrine, metabolic and nutritional diseases/symptoms reported by Luce (1829).

This shows that digestive diseases and symptoms are very common in all the regions and their treatment among the most popular ones, which was in terms of UR also the case in the 19th century.

Pranskuniene et al. (2018) offer the following explanation (at least for Lithuania): “This can be explained by the abundant and calorific Lithuanian cuisine, which may lead to gastrointestinal disturbances“. Sõukand and Kalle (2012) also reported intestinal problems like stomach pain or diarrhea to be mentioned often, concluding that “This refers to poor hygiene and the lack of food during the time preceding the questioning.”.

Considering skin diseases/symptoms, it seems that those diseases got less popular (in terms of popularity as well as amount of UR), because of the fact that they occur less often. Working habits have changed (less hard field work, therefore less physical superficial injuries) and hygiene standards have improved (less infections and rashes for example due to poor hygiene).

Pranskuniene et al. (2018) offer a further explanation for the prominence of genitourinary and respiratory diseases in their results: “Other two most popular indications [genitourinary and respiratory diseases, A/N] may be influenced by cool and moist northern Lithuanian climate. Most of genitourinary system diseases treatments were gender-specific, such as treatments of dysmenorrhea, menorrhagia, or other gynecological disturbances” (Pranskuniene et al. 2018).

The influence of climate on the number of respiratory diseases/symptoms encountered can also be applied to Estonia for example, where the climatic situation is similar. Also, Sõukand and Kalle (2012) argue, that the weather conditions have a significant influence on the occurrence of the various diseases: “[…] most treated conditions were related to the cold and wet climate: 12% of the use-reports treated cough and 9% tuberculosis, making those two the most common illnesses fought with plants in this region.” as well as “Rheumatic diseases (10%) and straining (7%), which are widespread health problems in wet and cold places, are also among the most often mentioned diseases […]”.

Sile et al. (2020) as well state that “male genital system disorder [s are] mentioned relatively rarely”. The gender specificity of genitourinary records was also obvious in this dataset. It mostly affected women-specific diseases and issues. There were virtually no “Men’s problems” mentioned, except for a few issues concerning boys, like urinary retention for example.

Simanova et al. (2020) furthermore analyzed, if among the plant families any “specialists”, families with specific uses, could be detected. They found the “three plant families with the most specific use(s) were Geraniaceae (used for problems with the ear), Asteraceae (general health, digestive, musculoskeletal and respiratory) and Betulaceae (general health) (Simanova et al. 2020).

In this dataset, it is difficult to find real “specialized” families. For many families, records from several different medicinal categories exist. Some families have skin diseases as their highest use category and are rather one sided, for example Plantaginaceae (7 out of 16 UR belonging

to the category skin), Papaveraceae (4/8 UR), Scrophulariaceae (7/12 UR), but other use categories are well present for those families as well. This one-sidedness can also be found in some families regarding digestive diseases, for example Caprifoliaceae (9/21 UR) or Apiaceae (10/26 UR).

The only example for families, which could be seen as specialists, are Loganiaceae for digestive issues (5/8 UR), Lauraceae (4/8 UR) for general and unspecified issues and Menyanthaceae for respiratory issues (4/8 UR). All three have at least half of their records of one diseases category and the other records are all single uses.

This suggests that the plant families were used broadly for several different diseases and symptoms, and only a few were specifically used for a certain medicinal category.

6.3. Comparison with Eastern and Central European studies

In this chapter, the results of this study are compared with the results of several studies with similar data from other European countries like Belarus, Kosovo, Ukraine and Romania.

	Medicinal use categories**								
	Sõukand and Pieroni (2016)	Mattalia et al. (2020) (Rom.)*	Mattalia et al. (2020) (Ukr.)*	Mullalija et al. (2021)	Mustafa et al. (2020)	Anegg (2021)	Luce	Alksnis	Aronson
1	Dige	Dige	Geun	Resp	Resp	Dige	Skin	Dige	Dige/ Geun
2	Resp	Resp	Resp	Geun	Dige	Skin	Dige	Skin	
3	Card	Geun	Dige	Card	Skin	Resp	Geun	Resp	Skin
4	Skin			Urol	Card	Geun	Endo	Geun	-
5	Geun			Dige	Endo	Musc	Geni/Musc	Psyc	-

*Table 7: Comparison of the most mentioned medicinal use categories reported in the studies of Sõukand and Pieroni (2016), Mattalia et al. (2020), Mullalija et al. (2021), Mustafa et al. (2020) and this study. * no direct comparison possible ** plant families without -ceae suffix*

As in table 7 shown, the medicinal use categories, which are mentioned most, are in general quite similar. Respiratory diseases/symptoms for example are mentioned four times as number one, one time as number two and two times as number three. This is the most prominent diseases category across the studies. Digestive diseases/symptoms are the second most common category, mentioned one time as number one, four times as number two, one time as number three and one time as number five. General and unspecified

diseases/symptoms are the third most frequent category, although already not in the top five in two studies.

The category with skin diseases/symptoms is the second most mentioned in this study, while in the other studies this category is way less prominent or not even reported in the most mentioned medicinal use categories. One explanation could be that in the past peasants were mostly farmers and had to do a lot of physical work, putting a high stress on their skin.

Furthermore, poor hygiene in combination with the hard, “dirty” field work could have also induced a lot of external symptoms like rashes or scab. This is also in accordance with the results of the studies with historical data (see chapter 6.1.), where both studies used for comparison have the skin category very prominently in first (Kalle and Sõukand 2021) and third (Sile et al. 2020) place, while the studies with recent data have this category less prominent placed or not even mentioned among the most common medicinal categories.

The same argument can be applied to the category of musculoskeletal diseases/symptoms, where the hard field work could be the reason for an increase of common symptoms (at the time) like joint pain, sore points, back or bone pain and rheumatism.

This does not only lead to a shift in the popularity respectively number of mentioning of disease categories, but as a result also the usage of plants changes, as some plants will lose importance or get abandoned, while other plants get more important or new plants emerge. Sõukand and Pieroni (2016) also came to this conclusion, when encountering historically used species, which are nowadays abandoned: “Some of these plants were used to treat now less-encountered diseases […]” (Sõukand and Pieroni 2016).

Looking at the most mentioned plant families in the studies of Sõukand and Pieroni (2016), Mustafa et al. (2020), Mullalija et al. (2021) and this study, Asteraceae, Rosaceae and Lamiaceae are among the five most mentioned plant families in all the studies. Besides this similarity, there are also unique families among the most mentioned ones, like Ericaceae for Sõukand and Pieroni (2016), Ranunculaceae for Luce (1829), Solanaceae for Alksnis (1894) or Caprifoliaceae for Aronson (1891).

This shows that common plant families are used in all the different regions similarly often, while there are also different prominent plant families among the most mentioned ones, distinct for every area. There are several reasons for this, like differences of abundance and

distribution across the various regions or differences in popularity and awareness in the respective folk medicines.

Examining the most common taxa mentioned in the various studies, a diverse picture arises. Species like *Achillea millefolium* L., *Artemisia absinthium* L., *Plantago major* L., *Hypericum* spp. (often H*. perforatum* L.) or *Matricaria chamomilla* L. are reported by most of the authors among the most used species. On the other hand, every region and the cultural group seems to have their own, distinct plants (and subsequently also medicinal usages of those species), which are often not even reported in the other studies, for example *Cornus mas* L. and *Crataegus monogyna* Jacq. reported by Mullalija et al. (2021) and Mustafa et al. (2021).

Besides the obvious influence of abundance and availability of the species – for example *Cornus mas* L., being very common in Southeastern Europe, while very rare to not abundant in the Baltics – these results show that for every region, special plant and medicinal usages have developed, underlining the uniqueness of the various folk medicines among not only different cultural, linguistic and religious groups, but also similar and even the same ones.

On the other hand, *Artemisia absinthium* L. or *Achillea millefolium* L. are widespread over all the different study regions. Furthermore, the knowledge about the medicinal properties of those plants and their usage is known for a long time, Dioscorides already described them and their medicinal usage. This on the other hand emphasizes the fact that there is a dissemination of knowledge and various plant usages all over Europe, and certain usages of plants are widespread, well known and popular.

6.4. Comparison with Dioscorides

As Leonti (2011) showed already a strong connection between and influence of Dioscorides work with later Italian ethnobotanical works, I was looking for similar results for the Estonian and Latvian region.

A few remarks have to be noticed regarding the analysis of Dioscorides. He actually covered about 1000 different remedies in his work “De materia medica”, of which are about 800 of herbal origin. For the purpose of this thesis, only the plants which were stated in Luce, Aronson and Alksnis were searched for in “De materia medica” and integrated into the database. This has an influence on the numbers of Dioscorides unique species and families. They are actually much higher than the numbers in the graphics below suggest. This restriction

was made as an analysis of the whole work would have been much more time consuming and, considering the research interest of this thesis, not relevant. As the comparison with Dioscorides is only one aspect of possible comparisons shown in this thesis, the specifically gathered data of Dioscorides is sufficient. Anyway, for future analysis, for example of the whole database, a more detailed and deep examination of “De materia medica” is needed.

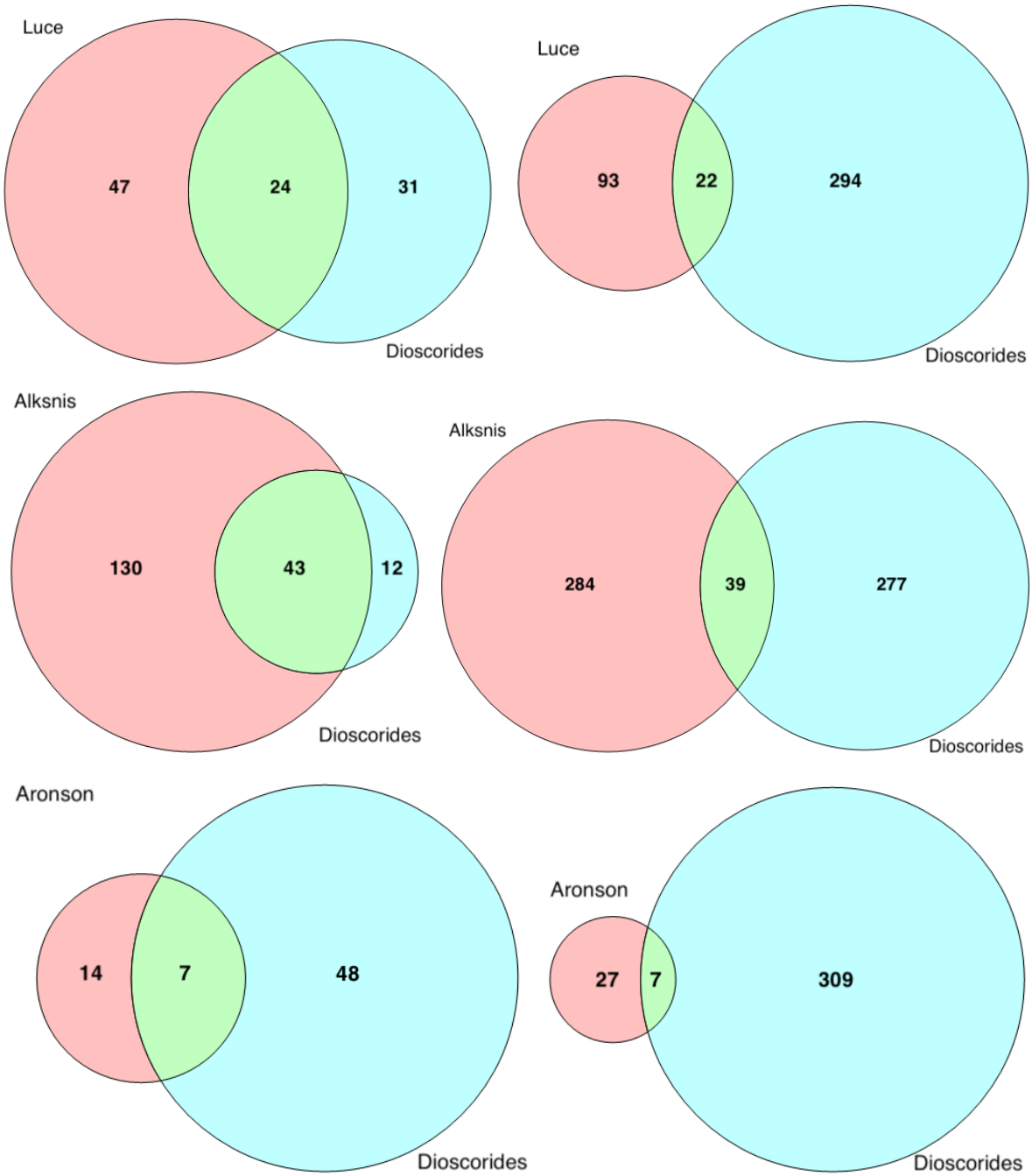

Fig. 13: Venn diagrams on species (left) and combined with their specific medicinal usage (right). Comparison each of Luce, Alksnis and Aronson with Dioscorides.

Figure 13 compares the records of species and their specific medicinal usage of Luce and Dioscorides. There are clear overlaps between the authors and Dioscorides, species-wise as

well as medicinal usage wise. For Luce, the overlaps are approximately 33% for the taxa and 20% for the specific uses, for Alksnis resp. 25% and 12% and for Aronson resp. 33% and 20%. Looking just at medicinal use categories, the overlap increases for all authors for both comparisons. For Luce, from 33% to 36% and from 20% to 23%, for Alksnis from 25% to 26% and from 12% to 15% and for Aronson from 33% to 32% (only decrease in overlap) and from 20% to 23%.

As mentioned already in the introduction, Leonti et al. (2011) concluded that up to 20% of the European folk medicinal knowledge are similar to the ones mentioned in Dioscorides' "De Materia Medica", which is also the case for the data of Luce, Alksnis and Aronson. This suggests an influence of Dioscorides on all the authors respectively the folk medicinal knowledge. An aspect, which has to be considered is the fact that especially Luce had, besides the scientific botanical and medicinal basic knowledge, a lot of practical experience and he also did develop remedies on his own. Although it is difficult to examine and verify this in retrospect, it can subsequently lead to overestimate the influence of Dioscorides. Therefore, to confirm with certainty the influence of Dioscorides, a deeper analysis is needed.

7. Conclusion, Outlook

As the results of this study show, medicinal plant usage was diverse despite the limited flora. Despite the close geographical vicinity and culturally similar backgrounds, people from historical Courland and Livonia expressed high biocultural diversity in the use of folk medicines. There are overlaps, especially concerning widespread taxa and long known plant usages, but the similarities between the regions were less than expected.

Comparisons with studies using historical data showed corresponding results regarding the distribution of use records among the various medicinal categories. Compared to recent studies, mostly the same use categories were among the most mentioned ones, but slight shifts could be detected, indicating that people still treat similar diseases with plants as they did in the past, but certain diseases are occurring less or not anymore, or modern medicine is more efficient in treatment.

A comparison with Dioscorides “De Materia Medica” in terms of medicinal usage of taxa showed overlaps up to 20%, indicating a potential influence of historical herbals on the authors compiling their own works. Still, folk medicines and popular medicinal knowledge have dynamic as well as conservative, stable elements. Moreover, cultural, linguistic and religious groups have their own folk medicine with unique elements.

The differences, but also some similarities across the various studies regarding used species and their specific medicinal usage, in historical as well as recent data shows that folk medicines are not closed and isolated, the opposite is true. They are dynamic, abandoning unpopular taxa or not anymore used treatments, while including knowledge from neighbors, immigrants, leading powers or historical sources. On the other hand, folk medicines can also be stable, conserving and maintaining specific taxa used and medicinal usages over time. Furthermore, unique usages in every dataset of the different studies underline the uniqueness of every folk medicine.

Moreover, the data acquired for this thesis offers various starting points for further research, like the analysis of the non-plant constituents, non-medicinal usages or the local names given by the authors. The data can as well potentially contribute to understanding historical cultures and their development better.

People were dealing with the same or similar diseases all over northeastern Europe, but their approach in treating them was very different. These variations in usage are not constrained

to boarders, different floras or big geographical distances, but begin already in neighboring regions, even among same cultural groups.

Therefore, future research on medicinal plant usage of the various cultural, linguistic and religious groups all across northeastern Europe is required to refine the knowledge about and understanding of folk medicines and people's traditional environmental knowledge.

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Appendix

Extract of the database containing all species named by Luce, Alksnis and Aronson with their associated family, botanical name, name according to source, local name (when given), their origin of use and their use stated by each author.

Family	Latin name	Latin name in source	Local name *	Origin of use **	Use Luce	Use Aronson	Use Alksnis
Acoraceae	*Acorus calamus* L.	*Acorus Calamus*	-	W[F]	-	-	Geun
Amaranthaceae	*Beta vulgaris* L.	*Beta vulgaris*	-	C	-	-	Dige, Resp
	Atriplex sp.	*Atriplex* (unspecified)	-	W, C	-	-	Skin
Amaryllidaceae	*Allium cepa* L.	*Allium cepa*	Sibbulas	C	Geun	Skin	Geni, Psyc, Resp, Skin
	Allium sativum L.	*Allium sativum*	Küislauk	C	Dige	-	Ear
	Allium schoenoprasum L.	*Allium schoenoprasum*	-	W	-	-	Resp
	Alloideae sp.	*Allioideae* (unspecified)	-	W	-	-	Neur

Apiaceae	*Levisticum officinale* W.D.J.Koch	*Levisticum officinale*	Liibstocki rohhi	C[F]	Skin	Geun	-
	Carum carvi L.	*Carum carvi*	Köömled	W, C (more in Est. than Liv.), P[F]	Dige, Pcfp	-	Dige, Endo, Resp
	Ferula assa-foetida L.	*Ferula asa foetida*	Tiwistriik	P	-	-	Psyc
	Pimpinella sp.	*Pimpinella L.*	-	W	Geun	-	Card
	Angelica archangelica L.	*Angelica archangelica*	-	W, C[F]	-	-	Dige
	Peucedanum ostruthium (L.) W.D.J.Koch	*Peucedanum ostruthium,* Radix Imperatoriae	-	P	-	-	Dige
	Laserpitium latifolium L.	*Laserpitium latifolium*	-	W	-	-	Dige
	Petroselinum crispum (Mill.) Fuss	*Petroselinum crispum*	-	C	-	-	Dige, Geun, Skin, Urol
	Daucus carota L.	*Daucus Carota*	-	C	-	-	Dige
	Cicuta virosa L.	*Cicuta virosa*	-	W[F]	-	-	Geun, Neur, Skin
	Ferula foetida (Bunge) Regel	*Scorodosma foetidum*	-	P	-	Dige	-
Araliaceae	*Hedera helix* L.	*Hedera helix*	Ragga mailase rohhi, Lude rohhi	W (although not seen yet)[F]	Musc, Skin	-	-
Asparagaceae	*Polygonatum odoratum* (Mill.) Druce	*Convallaria polygonatum*	-	W[F]	-	-	Musc
Asphodelaceae	*Aloe* sp.	*Aloe* (unspecified)	-	C	-	-	Dige
Asteraceae	*Tanacetum vulgare* L.	*Tanacetum vulgare*	Reinware rohhi, Solika rohhi	W, C[F]	Dige	-	Dige
	Artemisia absinthium L.	*Artemisia absinthium [L], Artemisia Absynthium[AL], Artemisia Absynthium[AR]*	Roi rohhi	W[F]	Dige, Geun, Skin	Dige, Geun	Dige, Geun, Psyc
	Tussilago farfara L.	*Tussilago farfara*	Paiso lehhed	W[F]	Skin	-	-
	Solidago virgaurea L.	*Solidago virgaurea*	Hoolmete rohhi	W[F]	Dige, Skin	-	-
	Jacobaea vulgaris Gaertn.	*Jacobaea vulgaris*	Rist haolmete rohhi	W	Geni	-	-
	Matricaria chamomilla L.	*Matricaria Chamomilla[L],* not stated[AL]	Kummelid	C[F]	Geun	Eye, Pcfp, Psyc	Dige, Pcfp

	Achillea millefolium L.	*Achillea Millefolium*	Raudrohhi	W, C[F]	Skin	Resp	Blim, Resp, Skin
	Calendula officinalis L.	*Calendula officinalis*	Koltsed aja öied	C	Geni, Resp, Skin	-	Dige
	Artemisia sieberi Besser	*Artemisia sieberi*	Usfi rohhi	W	Dige	-	-
	Arnica montana L.	*Arnica montana*[L AL], not stated[AR]	Arratöstmisehaiguse rohhi	W[F]	Musc	Geun, Musc	Dige, Geun, Musc, Resp, Skin
	Cyanus segetum Hill	*Centaurea cyanus*	-	W, C[F]	-	-	Eye, Psyc, Resp, Urol
	Cirsium lanceolatum (L.) Hill	*Cirsium lanceolatum*	-	W	-	-	Resp
	Artemisia cina Berg ex Poljakov	*Flores cinae*	-	P	-	Dige	Dige
	Cota tinctoria (L.) J.Gay	*Anthemis tinctoria*	-	W[F]	-	-	Dige
	Artemisia abrotanum L.	*Artemisia abrotanum*	-	C[F]	-	-	Geni, Skin
	Arctium spp.	*Lappa*[AL], *Lappa tournefortii*[AL], *Arctium Lappa L.*[D]	-	W[F]	-	-	Neur, Skin
	Leucanthemum vulgare (Vaill.) Lam.	*Chrysanthemum Leucanthemum*	-	W	-	-	Dige, Skin
	Taraxacum campylodes G.E.Haglund	*Taraxacum campylodes*[L], *Leontodon Taraxacum*[AL AR]	Sea öied, Sea pima rohhi, Sea nuppud, Woi rosid	W[F]	Skin	Skin	Skin
	Anthemis arvensis L.	*Anthemis arvensis*	-	W	-	-	Skin
	Artemisia vulgaris L.	*Artemisia vulgaris*	-	W[F]	-	-	Neur
	Helichrysum arenarium (L.) Moench	*Helichrysum arenarium*	-	W	-	-	Skin
	Bidens tripartita L.	not stated	-	W	-	-	Resp
Balsaminaceae	*Impatiens noli-tangere* L.	*Impatiens tangere noli*	-	W[F]	-	-	Skin
Betulaceae	*Betula pubescens* Ehrh.	*Betula pubescens*[L], *Betula alba*[AR]	Kasse pu	W, C[F]	Blim, Dige	Dige	-
	Betula sp.	not stated (unspecified)	-	W, C[F]	-	-	Dige, Musc,

							Pcfp, Skin
	Alnus glutinosa (L.) Gaertn.	*Alnus glutinosa*	-	W	-	-	Dige, Skin
Boraginaceae	*Symphytum officinale* L.	*Symphytum officinale*	-	W[F]	-	-	Skin
	Myosotis sp.	*Myosotis* (unspecified)	-	W	-	-	Psyc
Brassicaceae	*Raphanus raphanistrum* subsp. *sativus* (L.) Domin	*Raphanus niger*	-	W[F]	-	-	Resp, Musc
	Cardamine sp.	*Cardamine*	-	W	-	-	Card
	Armoracia rusticana P.Gaertn., B.Mey. & Scherb.	*Cochlearia armoracia*	-	W, C[F]	-	-	Dige
	Cochlearia officinalis L.	*Cochlearia officinalis*	-	P	-	-	Card
	Brassica oleraceae L.	not stated	-	C	-	-	Neur
	Berteroa incana (L.) DC.	*Berteroa incana*	-	W	-	-	Psyc
Campanulaceae	*Campanula trachelium* L.	*Campanula trachelium*	-	W	-	-	Geun
Cannabaceae	*Humulus lupulus* L.	*Humulus lupulus*	Hummalad	W, C[F]	Dige	-	-
	Cannabis sativa L.	*Cannabis sativa*	-	C, (W)[F]	-	-	Dige
Caprifoliaceae	*Valeriana officinalis* L.	*Valeriana officinalis*	Paldrian, Üllekäija rohhi	W[F]	Dige, Pcfp	Dige, Geni, Geun, Neur	Card, Dige, Psyc, Resp
	Succisa pratensis Moench	*Succisa pratensis*[L], *Scabiosa succisa*[AL]	Tölbi jurega Pibe lehhed, Peetri Pibe lehhed	W[F]	Dige, Geun	-	Dige
Caryophyllaceae	*Herniaria glabra* L.	*Herniaria glabra*	Söötreia rohhi	W	Skin	-	-
	Silene vulgaris (Moench) Garcke	*Silene vulgaris*[L], *Silene inflata*[AL D]	Pöie rohhi	W	Urol	-	Musc
	Dianthus deltoides L.	*Dianthus deltoides*	-	W	-	-	Dige
	Saponaria officinalis L.	*Saponaria officinalis*	-	W, C[F]	-	-	Psyc, Skin
Celastraceae	*Parnassia palustris* L.	*Parnassia palustris*	-	W	-	-	Card, Geun
Convolvulaceae	*Convolvulus arvensis* L.	*Convolvulus arvensis*	Jooksja rohhi, Kurre katlad, Lippo rohhud, Lippo warrekad	W	Endo	-	-
	Convolvulus sp.	*Convolvulus*	-	W	-	-	Skin

Crassulaceae	*Sedum acre* L.	*Sedum acre*	-	W[F]	-	-	Geun, Musc
	Sempervivum globiferum L.	*Sempervivum soboliferum*	-	P	-	-	Ear
Cucurbitaceae	*Cucumis sativus* L.	not stated[AL], *Cucumis sativus* L.[D]	-	C	-	-	Dige
Cupressaceae	*Juniperus* sp.	*Juniperus* (unspecified)	-	W, (C)[F]	-	-	Card, Dige, Ear, Resp, Skin
	Juniperus sabina L.	*Sabina*	-	W, (C)[F]	-	-	Pcfp
Cyperaceae	*Carex flava* L.	*Carex flava*	-	W[F]	-	-	Resp
	Carex arenaria L.	*Carex arenaria*	-	W[F]	-	-	Geni, Musc
Dryopteridaceae	*Dryopteris filix-mas* (L.) Schott	*Aspidium filix mas*[AL], *Polystichum filix mas* Roth.[D]	-	W	-	-	Skin
Equisetaceae	*Equisetum sylvaticum* L.	*Equisetum sylvaticum*	Rammi rohhi	W	Dige	-	-
Equisetaceae	*Equisetum* sp.	*Equisetum* (unspecified)	-	W[F]	-	-	Musc
	Equisetum hyemale L.	*Equisetum hyemale*	-	W[F]	-	-	Card, Geni
Ericaceae	*Ledum palustre* L.	*Ledum palustre*	Käelud	W[F]	Skin	-	Card, Geun, Musc, Resp, Skin
	Pyrola rotundifolia L.	*Pyrola rotundifolia*	Lambakörwad, Lutöbbi rohhi	W[F]	Endo	-	-
	Vaccinium myrtillus L.	*Vaccinium Myrtillus*	-	W[F]	Resp	-	Dige, Resp
	Arctostaphylos uva-ursi (L.) Spreng.	*Arctostaphylos uva-ursi*	-	W[F]	-	-	Dige
	Chimaphila umbellata (L.) Nutt.	*Chimaphila umbellata*	-	W	-	-	Musc
	Empetrum nigrum L.	*Empetrum nigrum*	-	W, (C)[F]	-	-	Dige, Skin
	Vaccinium vitis-idaea L.	*Vaccinium vitis-idaea*	-	W[F]	-	-	Geun, Musc, Skin
	Vaccinium microcarpum (Turcz. ex Rupr.) Schmalh.	*Vaccinium oxycoccus*	-	W[F]	-	-	Neur
Euphorbiaceae	*Euphorbia helioscopia* L.	*Euphorbia Helioscopia*	-	W	-	-	Dige

Fabaceae	*Ononis spinosa* subsp. *hircina* (Jacq.) Gams	*Ononis spinosa*	Lude rohhi	W[F]	Endo, Musc	-	-
	Hippocrepis comosa L.	*Hippocrepis comosa*	Hoolmete rohhi	W?	Dige	-	-
	Glycyrrhiza glabra L.	*Glycyrrhiza glabra*	Kolne pu	P	Geni, Musc	-	-
	Cassia fistula L.	*Cassia fistula*	-	P	-	-	Resp
	Trifolium aureum Pollich	*Trifolium agrarium*	-	W[F]	-	-	Dige, Geni
	Senna alexandrina Mill.	*Foliae sennae*	-	P	-	-	Dige
Fagaceae	*Quercus robur* L.	*Quercus robur*	Tamme pu	W, C[F]	Skin	-	-
	Quercus sp.	not stated (unspecified)[AL], *Quercus sp.*[D]	-	W, C[F]	-	Dige	Dige, Geun
	Quercus infectoria G.Olivier	*Quercus infectoria*	-	P	-	-	Dige
Gentianaceae	*Centaurium erythraea* Rafn.	*Erythraea centaurium*	-	W[F]	-	-	Dige, Musc
	Gentianella amarella (L.) Harry Sm.	*Gentiana amarella*	-	W	-	-	Dige, Psyc
	Gentiana sp.	*Gentiana* (unspecified)	-	W	-	-	Dige
Geraniaceae	*Geranium robertianum* L.	*Geranium Robertianum*	Rülli küined, Russekud, Punnase rosi rohi	W[F]	Skin	-	-
	Geranium pusillum L.	*Geranium pusillum*	-	W	-	-	Resp, Skin
	Erodium cicutarium (L.) L'Hér.	*Erodium cicutarium*	-	W	-	-	Dige
	Geranium sp.	*Geranium* (unspecified)	-	C	-	-	Ear
	Geranium sylvaticum L.	*Geranium sylvaticum*	-	W	-	-	Geni
Grossulariaceae	*Ribes rubrum* L.	*Ribes rubrum*	-	W, C[F]	-	-	Resp
Hypericaceae	*Hypericum perforatum* L.	*Hypericum perforatum*	Emmaste rohhi, Raeste punned	W[F]	Dige, Geni, Resp, Skin	-	Geni, Geun
Iridaceae	*Crocus* sp.	*Crocus* (unspecified)	-	C	-	-	Dige
	Gladiolus sp.	*Gladiolus* (unspecified)	-	C	-	-	Dige
Lamiaceae	*Glechoma hederacea* L.	*Glechoma hederacea*	Rosi rohhi, Kassi naered	W[F]	Skin	-	Dige, Resp
	Origanum vulgare L.	*Origanum vulgare*	Naeste punned	W[F]	Geni	-	Dige
	Thymus serpyllum L.	*Thymus serpyllum*	Rabanduse rohhi	W, (C)[F]	Skin	-	-

	Prunella vulgaris L.	*Prunella vulgaris*	-	W	-	-	Resp
	Mentha × piperita L.	*Mentha piperita*	-	C, (W)[F]	-	-	Card, Dige, Musc, Neur, Resp
	Mentha spicata L.	*Mentha crispa*	-	C, (W)[F]	-	Neur	Dige, Resp
	Thymus pulegioides L.	*Thymus chamaedrys*	-	W	-	-	Resp
	Rosmarinus officinalis L.	not stated[AL], *Rosemarinus officinalis L.*[D]	-	C, P	-	-	Neur
	Lamium album L.	*Lamium album*	-	W	-	-	Geni
	Salvia glutinosa L.	*Salvia glutinosa*	-	C	-	-	Geni
Lauraceae	*Laurus nobilis* L.	*Laurus nobilis*	Loorberid	P	-	-	Geun, Skin
	Cinnamomum camphora (L.) J.Presl	*Cinnamomum camphora*[L], *Laurus Camphora*[AR]	Kampwer	P	Endo	Dige, Ear, Geun	-
Linaceae	*Linum usitatissimum* L.	*Linum usitatissimum*	-	C	-	-	Eye, Geun, Skin
	Linum catharticum L.	*Linum catharticum*	-	W[F]	-	-	Psyc
Loganiaceae	*Strychnos nux-vomica* L.	*Strychnos nux-vomica*[L AR], *Nux vomica*[AL]	rebbase rohhi	P	Dige	Dige, Geun	Dige, Neur, Skin
Lycopodiaceae	*Lycopodium clavatum* L.	*Lycopodium clavatum*	Nöia rohhi, Terwise rohhi	W[F]	Dige, Skin	-	-
	Lycopodium selago L.	*Lycopodium selago*	-	W[F]	-	-	Dige, Skin
Malvaceae	*Tilia* sp.	not stated (unspecified)	-	W, C[F]	-	-	Dige, Resp, Skin
Melanthiaceae	*Paris quadrifolia* L.	*Paris quadrifolia*	Hora marjad, Usfilak	W[F]	Geun	-	-
Menyanthaceae	*Menyanthes trifoliata* L.	*Menyanthes trifoliata*	-	W[F]	-	-	Card, Dige, Geun, Neur, Resp
Nymphaeaceae	*Nymphaea alba* L.	*Nymphaea alba*[L], *Nymphaia alba L.*[D]	Wallged ja koltsed kuppo lehhed	W[F]	Card	-	-
	Nuphar lutea (L.) Sm.	*Nuphar lutea*[L], *Nuphar luteum*[AL], not stated[D]	Wallged ja koltsed kuppo lehhed	W, (C)[F]	Card	-	-

	Nymphaea sp.	*Nymphaea* (unspecified)	-	W	-	-	Geun
Oleaceae	*Syringa* sp.	*Syringa* (unspecified)	-	W[F]	-	-	Resp
	Fraxinus excelsior L.	*Fraxinus excelsior*	-	W, C[F]	-	-	Musc, Neur
Orchidaceae	*Epipactis palustris* (L.) Crantz	*Epipactis palustris*	-	W	-	-	Endo, Psyc
	Dactylorhiza maculata (L.) Soó	*Orchis maculata*	-	(W)[F]	-	-	Geni, Pcfp
Orobanchaceae	*Pedicularis* sp.	*Pedicularis* (unspecified)	-	W	-	-	Skin
Oxalidaceae	*Oxalis acetosella* L.	*Oxalis acetosella*	-	W[F]	-	-	Geun
Papaveraceae	*Chelidonium majus* L.	*Chelidonium majus*	Werre urma rohhi	W, C[F]	Dige, Eye, Skin	-	Skin
	Papaver somniferum L.	*Papaver somniferum*	-	W, C	-	-	Psyc
Pinaceae	*Pinus sylvestris* L.	*Pinus sylvestris*	Manna pu	W, (C)[F]	Dige, Endo, Skin	-	-
	Picea sp.	not stated (unspecified)	-	W	-	-	Dige
Piperaceae	*Piper nigrum* L.	*Piper nigrum*	Walge ja must pippat	P	Dige	-	-
	Piper sp.	not stated	-	P	-	-	Dige, Ear, Resp, Skin
Plantaginaceae	*Veronica officinalis* L.	*Veronica officinalis*	jooksja rohhi, jaani rohhi, mailase rohhi	W[F]	Endo, Geun, Skin	-	-
	Plantago major L.	*Plantago major*	Tee lehhed	W[F]	Skin	-	Dige, Skin, Urol
	Veronica beccabunga L.	*Veronica beccabunga*	-	W[F]	-	-	Geun, Musc
	Veronica agrestis L.	*Veronica agrestis*	-	W	-	-	Psyc
	Veronica arvensis L.	*Veronica arvensis*	-	W	-	-	Psyc
	Veronica longifolia L.	*Veronica longifolia*	-	W	-	-	Skin
	Linaria vulgaris Mill.	*Linaria vulgaris*	-	W[F]	-	-	Skin
Poaceae	*Avena* sp.	not stated	-	(W, C)[F]	-	-	Dige, Resp
	Secale cereale L.	not stated	-	C	-	-	Dige, Resp, Skin
	Briza media L.	*Briza media*	-	W	-	-	Dige, Geun

	Hordeum vulgare L.	not stated	-	C	-	-	Eye, Skin
	Alopecurus pratensis L.	not stated	-	W, C[F]	-	-	Geun
	Calamagrostis sp.	*Calamagrostis* (unspecified)	-	W	-	-	Geni
	Triticum sp.	not stated[AL], *Triticum* L.[D]	-	(W, (C))[F]	-	-	Skin
Polygalaceae	*Polygala* sp.	*Polygala* (unspecified)	-	(W, C)[F]	-	-	Geun, Psyc
	Persicaria maculosa Gray	*Polygonum persicaria*	-	W[F]	-	-	Skin
	Polygala amara L.	*Polygala amara*	-	W[F]	-	-	Psyc
	Polygala vulgaris L.	*Polygala vulgaris*	-	W[F]	-	-	Geni
Polygonaceae	*Rumex obtusifolius* L.	*Rumex obtusifolius*	Hobbosehoblikad	W	Dige, Skin	-	-
	Rumex crispus L.	*Rumex crispus*	-	(W)[F]	-	-	Dige, Skin
Polypodiaceae	*Polypodium vulgare* L.	not stated[AL], *Polypodium vulgare* L.[D]	Rinna rohhi	W[F]	Resp	-	-
Primulaceae	*Lysimachia vulgaris* L.	*Lysimachia vulgaris*	-	W, (C)[F]	-	-	Dige
Ranunculaceae	*Actaea spicata* L.	*Actaea spicata*	Akkitse haiguse rohi	W[F]	Geun, Psyc	-	Psyc
	Anemone nemorosa L.	*Anemone nemorosa*	Külma ellased	W[F]	Eye, Skin	-	-
	Ranunculus acris L.	*Ranunculus acris*	Tullikad, Sobia rohhi, Jooksja rohhi, Pöld ingwerid, Tullililled	W[F]	Card, Endo, Geun, Musc, Skin	-	Skin
	Caltha palustris L.	*Caltha palustris*	Warsa kabjad, Kuller kuppud	W[F]	Dige	-	-
	Consolida regalis Gray	*Delphinium consolida*	-	W, (C)[F]	-	-	Dige, Resp
	Aconitum napellus L.	*Aconitum napellus*	-	C, W	-	-	Skin
	Ficaria verna Huds.	*Ranunculus ficaria*	-	W, (C)[F]	-	-	Card
Rhamnaceae	*Rhamnus cathartica* L.	*Rhamnus cathartica*	Paaks pu	W, (C)[F]	Dige, Skin	-	Resp
	Frangula alnus Mill.	*Rhamnus frangula*	-	W, (C)[F]	-	-	Dige, Musc, Skin, Urol
Rosaceae	*Filipendula ulmaria* (L.) Maxim.	*Filipendula ulmaria*[L], *Spiraea ulmaria*[AL]	Wormid, Naeste rohhi	W[F]	Pcfp	-	Dige, Eye, Neur, Skin
	Rubus chamaemorus L.	*Rubus chamaemorus*	Murrakad, (Kabbarad, Kaas marjad)	W[F]	Card	-	-

	Fragaria vesca L.	*Fragaria vesca*	-	W, (C)[F]	-	-	Dige, Resp
	Rubus idaeus L.	*Rubus idaeus*	-	W, C[F]	-	-	Resp, Skin
	Malus sylvestris (L.) Mill.	not stated[AL], *Malus*[D]	-	W, C[F]	-	-	Skin
	Potentilla erecta (L.) Raeusch.	*Tormentilla*	-	W[F]	-	-	Dige, Musc
	Sorbus aucuparia L.	*Sorbus aucuparia*	-	W, C[F]	-	-	Geun, Musc
	Prunus padus L.	*Prunus padus*	-	W, C[F]	-	Geun, Skin	Card, Neur, Urol
	Comarum palustre L.	*Comarum palustre*	-	W[F]	-	-	Musc
	Rubus saxatilis L.	*Rubus saxatilis*	-	W[F]	-	-	Musc
	Filipendula vulgaris Moench	*Spiraea vulgaris*[AL], *Spiraea filipentdula L.*[D]	-	W, C[F]	-	-	Dige
	Rubus caesius L.	*Rubus caesius*	-	W[F]	-	-	Card
	Prunus domestica L.	not stated[AL], *Prunus domestica L.*[D]	-	C	-	-	Pcfp
	Prunus cerasus L.	*Prunus cerasus*	-	W, C[F]	-	Pcfp	Pcfp
	Geum urbanum L.	*Geum urbanum*	-	W[F]	-	-	Geni
Rubiaceae	*Galium boreale* L.	*Galium boreale*	Maddarad	W[F]	Geni	-	-
	Asperula sp.	*Asperula* (unspecified)	-	(W)[F]	-	-	Dige
Sapindaceae	*Aesculus hippocastanum* L.	*Aesculus hippocastanum*	-	C[F]	-	-	Musc
Saxifragaceae	*Chrysosplenium alternifolium* L.	*Chrysosplenium alternifolium*	-	W	-	-	Dige, Skin
Scrophulariaceae	*Verbascum thapsus* L.	*Verbascum thapsus*	Ühheksa mehhe wäggi	W[F]	Resp, Skin	Resp	Geun, Musc, Skin
	Scrophularia sp.	*Scrophularia* (unspecified)	-	W	-	-	Card
Solanaceae	*Hyoscyamus niger* L.	*Hyoscyamus niger*	Hüllo koera rohhi, Hüllo koera hänna rohhi	W[F]	Dige	-	Dige, Musc, Neur, Psyc, Skin
	Nicotiana rustica L.	*Nicotiana rustica*[L AL], *Nicotiana tabac. Rustica*[AR]	Tubbaka lehhed	C	Dige, Skin	Eye, Skin	Dige, Geun, Resp, Skin

	Solanum dulcamara L.	*Solanum dulcamara*	Solika rohhi	W, (C)[F]	Dige	-	Dige, Geun
	Capsicum annuum L.	*Capsicum annuum*	Turgi pippar	P	Geun	-	Dige, Geun, Musc
	Datura stramonium L.	*Datura stramonium*	-	C, (W)[F]	-	-	Neur, Resp
	Solanum tuberosum L.	*Solanum tuberosum*	-	C	-	-	Geun, Neur, Skin
	Solanum americanum Mill.	*Solanum nigrum*	-	W[F]	-	-	Psyc
Taxaceae	*Taxus baccata* L.	*Taxus baccata*	Juhha pu	W, (C)[F]	Skin	-	-
Thymelaeaceae	*Daphne mezereum* L.	*Daphne mezereum*	-	W, C[F]	-	-	Dige, Geun
Urticaceae	*Urtica urens* L.	*Urtica urens*	-	W[F]	-	-	Musc, Neur, Resp, Skin, Urol
Viburnaceae	*Sambucus ebulus* L.	*Sambucus ebulus*[AL,] not stated[D]	-	W, C[F]	-	-	Skin
	Viburnum opulus L.	*Viburnum opulus*	-	W, C[F]	-	-	Skin
	Sambucus nigra L.	*Sambucus niger*	-	W, C[F]	-	-	Card, Skin
Violaceae	*Viola tricolor* L.	*Viola tricolor*	Mailase rohhi	W	Skin	-	Resp
Violaceae	*Viola arvensis* Murray	*Viola arvensis*	-	W	-	-	Psyc
Zingiberaceae	*Alpinia galanga* (L.) Willd.	*Alpinia galanga*	Jalgendi jured	P	Pcfp	-	-
	Aframomum melegueta K.Schum.	*Grana paradisi*	-	P	-	-	Dige
	Alpinia officinarum Hance	*Alpinia officinarum*	-	P	-	-	Dige
	Curcuma zedoaria (Christm.) Roscoe	*Curcuma zedoaria*	-	P	-	-	Dige
Zygophyllaceae	*Guaiacum officinale* L.	not stated	plussas drape[AL]	P	-	-	Neur

* Local name according to Luce (1829)

** Origin of use - wild (W), cultivated (C) or purchased (P); according to Friebe (1805)[F] and various modern sources like Kukk (1999)