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Historical ethnopharmacology of the herbalists from Krummhübel in the Sudety Mountains (seventeenth to nineteenth century), Silesia

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Abstract

Background: Krummhübel (after 1945, Karpacz) in the Sudety Mountains (now SW Poland) was called “the village of pharmacists”. At the end of the seventeenth century, there were 57 households, of which about 40 were inhabited by herbalists. Krummhübel herbalists were the first in the Sudety region who applied medicinal mixtures for the treatment of various diseases (using, among others, plants, oils, minerals and even viper venom) in contrast to previous herbalists who only indicated the use of individual plant species for specific diseases. Riesengebirge (in Polish Karkonosze) potions were sold in Austria, the Czech Republic, Poland and Russia, and some of them could even be purchased in Scandinavia and England. The purpose of this paper is an ethnopharmacological analysis of historical texts of herbalists from Krummhübel. Based on their recipes, we analysed the use reports of drugs. Recently, research on ethnobotany and ethnopharmacological analyses of historical materials or egodocuments related to formulations used in folk medicine have become an important source of acquiring knowledge about new medicines.

Methods: Based on 46 recipes of Krummhübel herbalists re-written by Reitzig (1943), we analysed the use reports of drugs which included plant taxa and other constituents such as animal formulations, fungi, inorganic and organic substances and minerals as well as tinctures (with alcohol/spirit) and elixirs (without alcohol/spirit). For each usage mentioned in the text, we recorded (i) the putative botanical identity of the taxon; (ii) the plant family or origin of other than the plant constituent; (iii) the reported plant part; (iv) the number of the recipe; (v) the name of the recipe; (vi) the vernacular name of ingredient; (vii) the described symptom, ailment or specific use; (viii) our modern (viz. biomedical) interpretation of the described symptom or ailment; (ix) the mode of administration; and (x) the category of use under which we filed the specific use. We also cross-checked the medicinal plants of Krummhübel herbalists with the species described in old manuscripts and regional surveys and compared their use with contemporary plant use.

Results: The paper introduces the generated database comprising 348 use reports of 46 drugs based on 70 plant taxa and other constituents. Besides, we address patterns such as the frequent recommendation of Fabaceae herbs for respiratory system issue and gynaecology and Asteraceae for respiratory system and cardiovascular problems. Gastrointestinal use reports are based on Asphodelaceae, Burseraceae and Rosaceae species.

(Continued on next page)

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Conclusions: 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. It seems to be important to attempt to reproduce therapeutic mixtures from the preserved recipes of Krummhübel herbalists, which offers an opportunity to learn more about the real effects of the former medicines and their therapeutic activity. The obtained data can also be used to search for new drugs.

Keywords: Medicinal plants, Mixtures, Folk medicine, Phytotherapy history, Phytopharmacy, Ethnobotany,

Background

Caspar Schwenckfeld, a municipal doctor from Hirschberg (after 1945, Jelenia Góra), was one of the first medicinal plant explorers operating in the Silesia region. Two monographs of great value are the result of his scientific work. Chronologically, his scientific work describing resorts in Warmbrunn (after 1945, Cieplice), Landeck (after 1945, Łądek-Zdrój), Flinsberg (after 1945, Świeradów) and Salzbrunn (after 1945, Szczawno) appeared first [1, 2], and 7 years later, another monograph was released. It describes 50 species of plants that were used in phytotherapy at the turn of the seventeenth century in health resorts in the Sudety Mountains (in German, Sudeten), SW Poland, mainly in Warmbrunn [3]. Many species of medicinal plants formerly used in phytopharmacy now have scientifically demonstrated medicinal properties based on their diverse chemical compositions (e.g. [4–8]).

The purpose of the work is an ethnopharmacological analysis of historical texts of the so-called Krummhübel laboratory workers, who were active in the Sudetes (Central Europe) from the seventeenth to nineteenth centuries. Our research will contribute to a better understanding of treatments for diseases in this region prior to the development of the pharmacological industry. It will also provide in-depth insight into old methods of treatment. So far, no research has been carried out on ethnopharmacological activities of the herbalists from Krummhübel. In particular, this study may guide research on novel phyto-therapeutic agents, inform safety evaluations and help to prove the tradition of use in terms of drug regulations [9, 10].

We also cross-checked the medicinal plants of Krummhübel herbalists with the species described in five manuscripts and regional surveys, including Matthioli (1563) [11], Schwenckfeld (1607) [3], Mattuschka (1779) [12], Kneipp (1892) [13], Fischer (1930s) [14] and Madaus (1938) [15]. Besides, we compared their uses with those of other contemporary plants.

Recently, research on ethnobotany and ethnopharmacological analysis of historical materials or egodocuments, related to preparations used in folk medicine, has become an important source of acquiring knowledge about new medicines [10, 16]. Our study may constitute a part of this trend.

Karpacz (formerly Krummhübel) is a town located in Silesia in Poland. Until the mid-sixteenth century, this region belonged to the Kingdom of Bohemia, and in 1526, it became a part of the Habsburg Empire. As a result of the Silesian wars in the years 1740–1742, Silesia came under the rule of the Kingdom of Prussia and remained within the German borders until 1945. After World War II, under the terms of the agreements at the Yalta Conference and the Potsdam Agreement (both in 1945), German Silesia, east of the rivers Oder (now Odra) and Lusatian Neisse (now Nysa Łużycka), was transferred to Poland. This region included Krummhübel (after 1945 renamed Karpacz), the area of the herbalists' activities described in this article [17, 18].

The beginnings of the production of herbal medicinal mixtures in the Sudety Mountains are related by multiple sources. One of them speaks of two protestants, well-known medics from Prague, who fled to the town of Krummhübel in the Sudety Mountains in the late seventeenth century to avoid punishment for participation in a bloody duel. Niclaus and Solomon found refuge in the house of Melchior Grossmann, where they established the first pharmacy in Krummhübel and introduced their saviour and his friend Jonas Exner to the art of producing herbal ointments, powders and tinctures [19–24]. At the end of the seventeenth century, Krummhübel had 57 households, of which about 40 were inhabited by herbalists, also known as “Laboranten” (in German). For this reason, Krummhübel was called “the village of pharmacists” [23–30]. The herbalists' houses were log cabins with pitched roofs, timber framing and very distinctive interiors. The largest room on the ground floor, built of granite stones, was a laboratory with a large kitchen oven and distillation equipment (Fig. 1).

In the adjacent room, the medicinal raw material was produced and portioned. A side chamber, where cabinets, barrels, crates and shelves were located, served as a warehouse for storing products, and an airy loft served as a drying room for herbs. The dried products were stored in small free-standing structures due to the danger of fire [23, 31]. Next to the laboratory building, there was a backyard with medicinal plants, where, among others, the following plants were grown: *Plantago lanceolata* L., *Pimpinella anisum* L., *Menyanthes trifoliata*

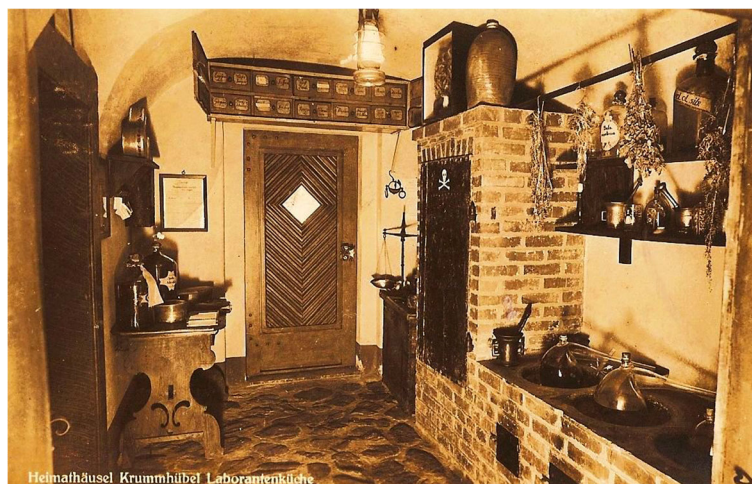


Fig. 1 The museum dedicated to the herbalists from Krummhübel. Postcard from 1938 (collection of K. Spálek)

L., *Artemisia absinthium* L., *Centaurium erythraea* Rafn. subsp. *erythraea*, *Verbascum densiflorum* Bertol., *Carum carvi* L., *Trigonella foenum-graecum* L., *Valeriana officinalis* L., *Achillea millefolium* L., *Linum usitatissimum* L., *Alcea rosea* L. var. *nigra* Cav., *Taraxacum* spp., *Calendula officinalis* L., *Althaea officinalis* L., *Polygonum aviculare* L., *Rosa canina* L., *Ruta graveolens* L., *Salvia officinalis* L. and *Thymus pulegioides* L. Shrubs were also popular: *Viburnum opulus* L. and *Sambucus nigra* L. The most widespread plant, used for the production of many medicines, was *Digitalis purpurea* L., which still commonly grows on the slopes of the Sudety Mountains [23, 25, 32–34]. The other most popular plants used to manufacture medicaments were *Carlina acaulis* L., *Primula elatior* (L.) Hill, *Arnica montana* L., *Lilium martagon* L., *Rhodiola rosea* L. and *Crocus* sp., i.e. probably *C. sativus* L. There are no voucher specimens associated with this study, so precautions in the identification of plant taxa in old written documents discussed by Łuczaj [35] were taken. Herbalists from Krummhübel enriched many drugs with powder roots of *Mandragora officinarum* L. [23], a plant species from the Solanaceae family, originating from the Mediterranean area and the Middle East and also grown in Krummhübel [36]. The following raw materials were used in therapeutics of the Mediterranean countries: the root *Mandragorae radix* and the herb *Mandragorae herba*, both of which contain tropane alkaloids. The root has anaesthetic and hypnotic properties, while the herb, with a lower content of alkaloids, is used in homoeopathy as a drug of analgesic properties for rheumatic diseases. *Mandragora officinarum* is one of the plants with the longest history of use in phytotherapy. It has already been mentioned in Egyptian papyri from 3000 years BC [4, 37, 38]. In the Middle Ages, a great cult developed around this plant as a panacea for any disease and a

magical agent. At the end of the sixteenth century, the species disappeared from most of the drug stores and were obtained from the official European herbal market [36]. However, herbalists from Krummhübel used it until the end of the seventeenth century [25]. They were also the first in central Europe to use the herb *Drosera rotundifolia* L.—*Droserae herba* as a medicinal agent that had already been confirmed by Rittman [25]. Earlier, alchemists had examined the secretions of this plant's glandular hairs that digest insects as they searched for preparations that could produce gold or a youth elixir. It also belonged to the group of so-called sacred herbs. Nowadays, this species is strictly protected by law in Poland, and the material for medicinal use comes from import only. Extracts of *Droserae herba* include derivatives of naphthoquinone, flavonoids and organic acids, which have antibacterial and antispastic properties [6, 7, 39]. The herbalists from Krummhübel also introduced *Rhodiola rosea* to phytotherapy in the Sudety region [25]. In medical practice, the rhizome of this species is now used, *Rhizoma Rhodiolae*, which has stimulating properties and enhances concentration and increases physical activity. It is used to treat tiredness, neurosis and anaemia [5, 39]. For these disorders, it was used in the form of mixtures by the Krummhübel herbalists [25].

To describe medicines, the herbalists used notes, armoria and prescriptions. Latin names were used to protect their trade secrets. Knowledge of Latin was required during the masters exam for herbalists, which was introduced around the year 1700. It was then that herbalists from Krummhübel and the surrounding area formed the common herbalists' guild, one of the first in Central Europe. Medicinal knowledge was usually kept in secret by family members and passed from one generation to another. In the eighteenth century, Krummhübel herbalists manufactured more than 200 proprietary medicines [22–25, 40].

We confirmed that they were the first in the Sudetes who applied medicinal mixtures to the treatment of diseases (using, among others, plants; oils; powdered minerals, including rock crystal and amethyst; and animal formulations—adder venom, deer horns, toads, salamanders and frogs), and they left their medical legacy in writing [23] in contrast to previous herbalists, who only indicated the use of individual plant species for specific diseases. (The first researcher who published data on the distribution of medicinal plants and their therapeutic properties from the described area was the renaissance physicist Caspar Schwenckfeld from Hirschberg. The naturalist, however, did not provide and did not use any medicinal mixtures [1].) Medications from Krummhübel were mixed with water, wine, honey, oils, salts, acids and alcohol distilled in local or domestic distilleries [31, 37]. For instance, the tincture of *Arnica montana* was used as a painkiller and anti-inflammatory drug against digestive system disorders as well as used externally for bruises, frostbite and open wounds [23].

However, not all of these plants can be found in the recipes that have survived to this day (e.g. *Arnica montana*, *Rhodiola rosea* or *Mandragora officinarum*) [23]. Nevertheless, it was confirmed that specimens of these species so far are stored within the collections of the Museum of Sports and Tourism in Karpacz, and they certainly were used by the herbalists from Krummhübel.

The reign of the House of Hapsburg in Hirschberg brought no restrictions on the herbalists' activities. However, the situation changed after 1740, when the area came under the rule of Prussia. As the popularity of the goods produced by the herbalists of Krummhübel increased, resentment and jealousy of doctors and pharmacists rose as well, since they considered them charlatan family clans who made fortunes from human illnesses [23, 31]. The desire to limit their activities also resulted from the Prussian administration's wish to organise, e.g. health care, on a national level. The office of the Collegium Medicum et Sanitatis (Royal Council of Physicians and Pharmacists) intervened to limit the activity of the herbalists, and the production of herbal medicines by so-called laboratory workers was then only possible with an official license, and not based on the rules of the guild. The Act of 1740, issued by the Prussian government, reduced the number of legally operating herbalists to 30 persons only. To obtain a license, one had to wait for the death of a guild member and go through a long official procedure. In 1796, the herbalists' guild comprised 27 members [23, 24]. The leaders of the guild were Christian Ignatius Exner (guild master), Benjamin Gottlieb Exner (guild chief) and Johannes Christoph Grossmann (guild chief assistant). The oldest known book by Krummhübel herbalists was produced in 1792 [22–25] and contained 150 recipes for mixtures

made from local medicinal plants. From the late eighteenth century onwards, the herbalists encountered more and more difficulties. In 1796, the Prussian government allowed them to produce and sell only 46 medicines [23, 24]. Junker [24] provides a full list of them: (1) *Aqua apoplectica alba s. pauperum, weißes Schlagwasser*; (2) *Aqua apoplectica rubra, rotes Schlagwasser*; (3) *Balsamus anglicus, englischer Haupt- und Universalbalsam*; (4) *Balsamus embryonum liquidus, stärkender Kinderbalsam*; (5) *Balsamus sulphuris*; (6) *Balsamus vitae, Lebensbalsam*; (7) *Elixir pectorale*; (8) *Elixir proprietatis Paracelsi*; (9) *Elixir vitrioli Mynsichti*; (10) *Elixir uterinum*; (11) *Essentia absinthii composita*; (12) *Essentia alexipharmaca*; (13) *Essentia amara*; (14) *Essentia anti-dysenterica, Ruhrtropfen*; (15) *Essentia carminativa*; (16) *Essentia castorei*; (17) *Essentia corticum aurantium*; (18) *Essentia dulcis*; (19) *Essentia lignorum*; (20) *Essentia myrrhae*; (21) *Essentia rhei amara*; (22) *Essentia stomachica composita, stärkende Gall- und Magentropfen*; (23) *Essentia succini*; (24) *Essentia absinthii simplex*; (25) *Liquor anodynus mineralis Hofmanni*; (26) *Mixtura symplex*; (27) *Morsuli anthelmintici*; (28) *Pulvis anthelminticus*; (29) *Pulvis bezoardicus*; (30) *Pulvis dentifricus, Zahnpulver*; (31) *Pulvis marchionis, Margrafenpulver*; (32) *Pulvis sternutatorius viridis, Hauptpulver*; (33) *Pulvis vitae*; (34) *Species zum Brust- und Blutreinigungsthee*; (35) *Spiritus comu cervi*; (36) *Spiritus matricalis*; (37) *Spiritus melissae compositus*; (38) *Spiritus niri dulcis*; (39) *Spiritus salis ammoniaci aromatica*; (40) *Spiritus salis ammoniaci volatilis*; (41) *Spiritus tartari*; (42) *Spiritus theriacalis*; (43) *Tinctura bezoardica*; (44) *Tinctura coralliorum*; (45) *Tinctura laxans*; and (46) *Tinctura antimonii tartarisata*.

All 46 known recipes were provided by Reitzig [23], because he was studying the original manuscripts and recipes of the herbalists from Krummhübel, located in the then pre-war museum [41]. These manuscripts have not survived—they were lost in the war turmoil, which was confirmed directly by the Museum of Sports and Tourism in Karpacz and by the local libraries.

In 1797, licensed pharmacists persuaded the Prussian government to withdraw the privilege of selling the so-called drop of Krummhübel at fairs; it was one of the best-known medicines produced by the herbalists [31, 37]. In 1799, information was provided about a complementary treatment in the Warmbrunn spa by an anonymous relation of the practitioner. A herbalist with the initials P.I. was described, and during his presence at the spa, he was offering medicinal herbal mixtures to patients on request [23].

Despite the growing administrative difficulties, the popularity of medications from Krummhübel continued to increase. Among others, the eminent writer and representative of German Romanticism, Johann Wolfgang

von Goethe, took an interest in medicinal herbs [42, 43]. Riesengebirge (in Polish Karkonosze, in the Western Sudetes) potions were sold in Austria, the Czech Republic, Poland and Russia, and at the turn of the nineteenth century, some of them could also be purchased in Scandinavia and England. In 1810, in the Sudetes, a company named W. Koerner & Co. was founded, which specialised in the production of liqueurs and tinctures prepared from Sudetic herbs [23, 24]. In subsequent years, the pharmacist herbalists of Krummhübel were affected by further restrictions. They were suspected of practicing black magic, secret cults, alchemy and possessing devil's knowledge. In 1809, the authorities of Legnica Province (in German Kreis Liegnitz) banned the herbalists from conducting door-to-door trade. In the period from 1831 to 1832, a cholera epidemic raged in Central Europe, also reaching the Sudetes [31]. Fears of the disease were so great that the government decided to reach out for help from the Krummhübel herbalists. Carl Traugott Ende, who came from a family with a long tradition of herbalists, prepared medications for patients and was a member of the anti-cholera epidemic committee [23]. Despite this, the administrative restrictions on herbalists were restored after the end of the plague [42, 43]. In 1843, a royal edict was issued to limit the allowable number of simple Riesengebirge (Karkonosze) herbal medicines from 46 to 21. The list of 21 medicinal preparations approved in 1845 by the district doctor Dr. Schaeffer is as follows [23]: (1) *Aqua apoplectica alba s. pauperum*; (2) *Aqua apoplectica rubra (Schlagwasser)*; (3) *Balsamum anglicus, englischer Haupt- und Universalbalsam*; (4) *Balsamum vitae, Lebensbalsam*; (5) *Elixir pectorale, Brustelixir*; (6) *Essentia amara*; (7) *Essentia carminativa*; (8) *Essentia corticum aurantium*; (9) *Essentia dulcis*; (10) *Essentia lignorum*; (11) *Essentia rhei Amara, bittere Rhabarber Tinktur*; (12) *Essentia stomachica composita, stärkende Gallund Magentropfen*; (13) *Liquor anodynus, mineralis Hoffmanni Hoffmannsche Tropfen*; (14) *Pulvis sternutatorius viridis, Hauptpulver*; (15) *Pulvis Vita, Lebenspulver*; (16) *Species pectorales, Brust- und Blutreinigungsthee*; (17) *Spiritus melissae compositus, Karmelitenwasser*; (18) *Spiritus salis ammoniaci, aromaticus sive Spirit. volatilis oleosus Sylvii*; (19) *Spiritus salis ammoniaci volatilis*; (20) *Spiritus niri dulcis*; and (21) *Tinctura Coralliorum, Corallen Tinktur*.

For the preparation of medicaments, only 24 strictly specified types of fruits and barks, 20 types of roots, 16 species of herbs (= aerial parts), 10 seeds and flowers and 2 species of timber were allowed [23]. In 1843, the Prussian government stopped issuing new licenses for herbal practices, which was the beginning of the end of the herbalists' activity. In the Riesengebirge (Karkonosze), the herbalists' art began to fade away in the second half of the nineteenth century. It

was still possible to find some isolated cases of treatment using local herbs in later years, albeit only on a small scale. The last herbalist of the herbalists' guild died on 28 March 1884 [23, 44].

The heritage of the herbalists from Krummhübel, regarding the use of medicinal plants and their mixtures, remained, mainly in the Sudety Mountains, until the beginning of the twentieth century, especially in folk medicine. *Drosera rotundifolia* may be presented as an example. It was used in the form of infusions for poor digestion, whooping cough and sclerosis by the residents of the Masyw Ślęży Mountains (in German Zobten-Gebirge) until the beginning of the twentieth century, although the species has not been found in the area so far [45].

The good reputation of Krummhübel herbalists and their gardens with medicinal plants is evidenced by the fact that they were visited by famous German botanists, including Max von Uechtritz [46].

Research on the activities of herbalists of Krummhübel was conducted by Will Erich Peuckert (1895–1969), a world-famous German ethnographer and ethnologist. In 1934, Peuckert became a professor at the Universität Breslau (University of Wrocław) and created a museum dedicated to the Krummhübel herbalists [23], which was, however, closed in the 1950s. Nowadays, an exhibition on pharmacist workers, including numerous exhibits, is held by the Museum of Sports and Tourism in Karpacz, which is the successor of the pre-war museum [47, 48].

Material and methods

Based on 46 recipes by Krummhübel herbalists, re-written by Reitzig [23], we performed the analysis of use reports of drugs, which included plant taxa and other constituents such as animal formulations, fungi, inorganic and organic substances, minerals and tinctures (with alcohol/spirit) and elixirs (without alcohol/spirit). For each usage mentioned in the text, we recorded (i) the putative botanical identity of the taxon; (ii) the plant family or origin of other than the plant constituent; (iii) the reported plant part; (iv) the number of the recipe; (v) the name of the recipe; (vi) the vernacular name of the ingredient; (vii) the described symptom, ailment or specific use; (viii) our modern (viz. biomedical) interpretation of the described symptom or ailment; (ix) the mode of administration; and (x) the category of use under which we filed the specific use. Each recorded combination of the variables was counted as one individual (therapeutic) use report.

The following 10 plant parts or products were differentiated: barks, exudates (incl. gums, resins and saps), flowers (incl. inflorescences and parts thereof), fruits (incl. parts thereof), herbs (= aerial parts, incl. branches and shoots), leaves, oils (e.g. linseed oil), seeds,

subterranean parts (incl. bulbs, rhizomes, roots and tubers) and wood. If there was no information on which plant part was used, it was qualified as an herb. The modes of administration were divided into two groups: internal (e.g. drops, many tinctures) and external (e.g. ointments and poultices). Use reports were classified into organ-, symptom- and ailment-defined categories of use, largely following the bioprospecting-oriented classification scheme proposed by Staub et al. [10]. The applied 15 categories of use citations comprise the following: andrology (incl. male fertility and venereal diseases: gonorrhoea, syphilis), antidotes (internally applied), cardiovascular problems, dermatology (e.g. tumours, injuries and wounds), fever, gastroenterology (e.g. appetite, intestinal obstruction, lithiasis liver and tympanites), gynaecology (incl. female fertility and venereal diseases: gonorrhoea, syphilis), musculoskeletal ailments (e.g. cramps, gout, rheumatism, scurvy and spasms), neurology (incl. psychosomatic ailments), oral cavity (e.g. dentistry and stomatitis), others (“internal wounds” and “for breast” but others than connected with respiratory system), parasites (e.g. anthelmintics), respiratory system (e.g. cleansing lungs and the upper respiratory tract, plague, tuberculosis) and urology (e.g. diuretics, lithiasis and kidneys).

This work also aimed at recalling the activities of Krummhübel herbalists and their input into the medical use reports of plants at that time. Taking this into account, we present selected species of medicinal plants and mixtures used by them, based on their recorded recipes. We selected the plant species that were most often used in mixtures and which were simultaneously growing in the medicinal plant gardens of Krummhübel herbalists. To achieve all these goals, we translated available source texts, including books, articles from magazines and guides as well as press notes on the activity of Krummhübel herbalists, from German.

We compared the medicinal plants of Krummhübel herbalists with the medicinal plant lists of Europe by cross-checking the species used in manuscripts and regional surveys, including Matthioli [11], Schwenckfeld [3], Mattuschka [12], Kneipp [13], Fischer (1930s) [14] and Madaus [15]. Matthioli's book [11] is one of the most popular ethnobotanical studies and describes medicinal species; it was translated into a few languages. Schwenckfeld's publication [3] constitutes the fullest analysis of therapeutic properties of the warm springs in Warmbrunn (Cieplice) as well as the plants used in spa and healing treatments [49]. Mattuschka is known for the work on the natural history of plants native to Silesia, in which he indicates species with medicinal properties [12]. Kneipp, one of the founders of the naturopathic medicine movement, developed his “Nature Cure” form of therapy based on subalpine plants from the Allgäu in Bavaria, which were used in folk

medicine, and based on those, he cultivated in the garden [50, 51]. Fischer's data (1930s) comprise the most complete information on folk botany, with nearly 250 plant species, used in the folk culture in the whole area of pre-World War II, Poland, which also includes the present Western Ukraine and parts of Belarus and Lithuania [14]. In his book, a German medical doctor, Madaus [15], discusses homoeopathic products and their use as therapeutic agents.

The paper follows the newest guidance referring to the analysis of historical texts [52]. Plant identifications were established by cross-checking the names and descriptions in the *Flora Europaea* [53] with the confirmed data that the individual species were growing in the area at that time [32, 33] or/and were cultivated in Krummhübel herbalists gardens [46] or/and are stored within the collections of the Museum of Sports and Tourism in Karpacz; thus, they certainly were used by the Krummhübel herbalists. Species names were checked against The Plant List 1.1 [54], and family names follow the Angiosperm Phylogeny Group IV [55].

Results

Patterns of the diversity of drugs

In total, among 46 drugs, 70 plant taxa were recorded. Of these, 52 taxa, included in 29 drugs, could be identified to the species and 18 taxa in 13 drugs were identified to the genus level. For 3 ingredients of plant origin, which were included in 5 drugs, no taxa identification was possible. Besides herbal, other constituents were used, including animal formulations (e.g. castoreum, corals, deer antlers, earthworms, scorpions, snakes), fungi, inorganic and organic substances (e.g. calcium, Sp[iritus] Vitrioli, Sp. Nitri dulcis, Sp. Nitri, Sp. Tartari, wax) and minerals (e.g. potash, pumice, salt) as well as elixirs and tinctures. These components were exclusively used in 13 drugs.

Overall, 348 use reports (i.e. unique combinations of a specific taxon or another origin of a constituent, plant part, route of administration and specific use in individual recipes) were recorded. Internal applications, mainly as drops in tea or water (283 use reports), prevail over external applications such as ointments or poultices (69 use reports) (Fig. 2). Seventy-four records have no reported uses, i.e. when Reitzig's [23] original did not clearly state the ailment they were used. The same remark applies to the lacking mode of administration (61 records). A full dataset of the recorded plant taxa, plant parts and other constituents used, as well as the therapeutic uses, is presented in Additional file 1: Table S2 and at the end of this paper.

More than 45% of drugs stemmed from herbs (= aerial parts) (118), while the remaining percentage consisted of exudates (41), subterranean organs (29), flowers (25) and

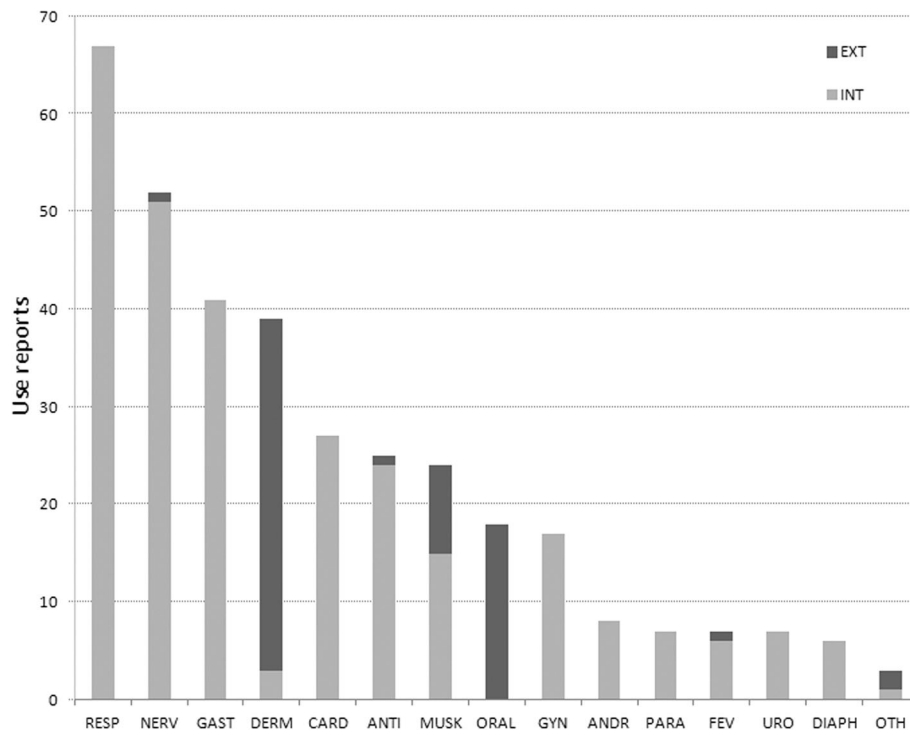


Fig. 2 Number of use reports by category of use and mode of administration (N = 348). ANDR, andrology; ANTI, antidotes; CARD, cardiovascular problems; DERM, dermatology; DIAPH, diaphoretic; FEV, fever; GAST, gastroenterology; GYN, gynaecology; MUSK, musculoskeletal ailments; NERV, neurology; ORAL, oral cavity; OTH, others; PARA, parasites; RESP, respiratory system; URO, urology

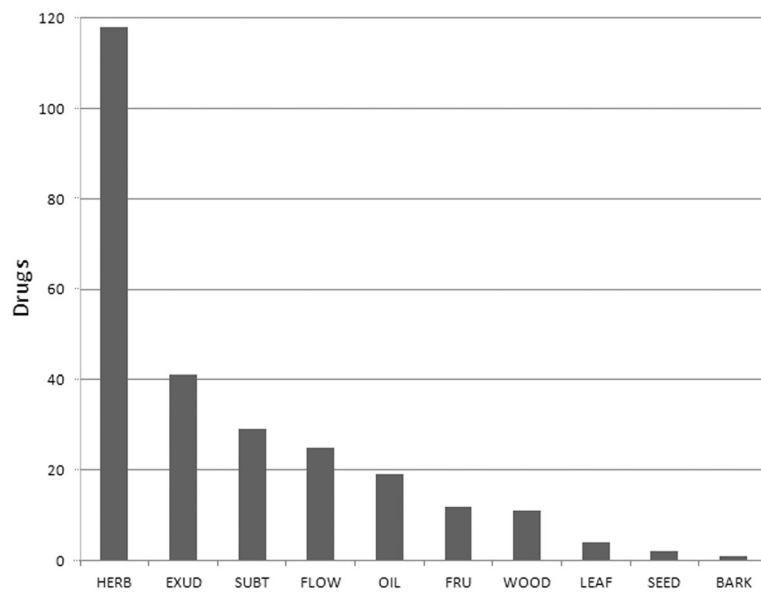
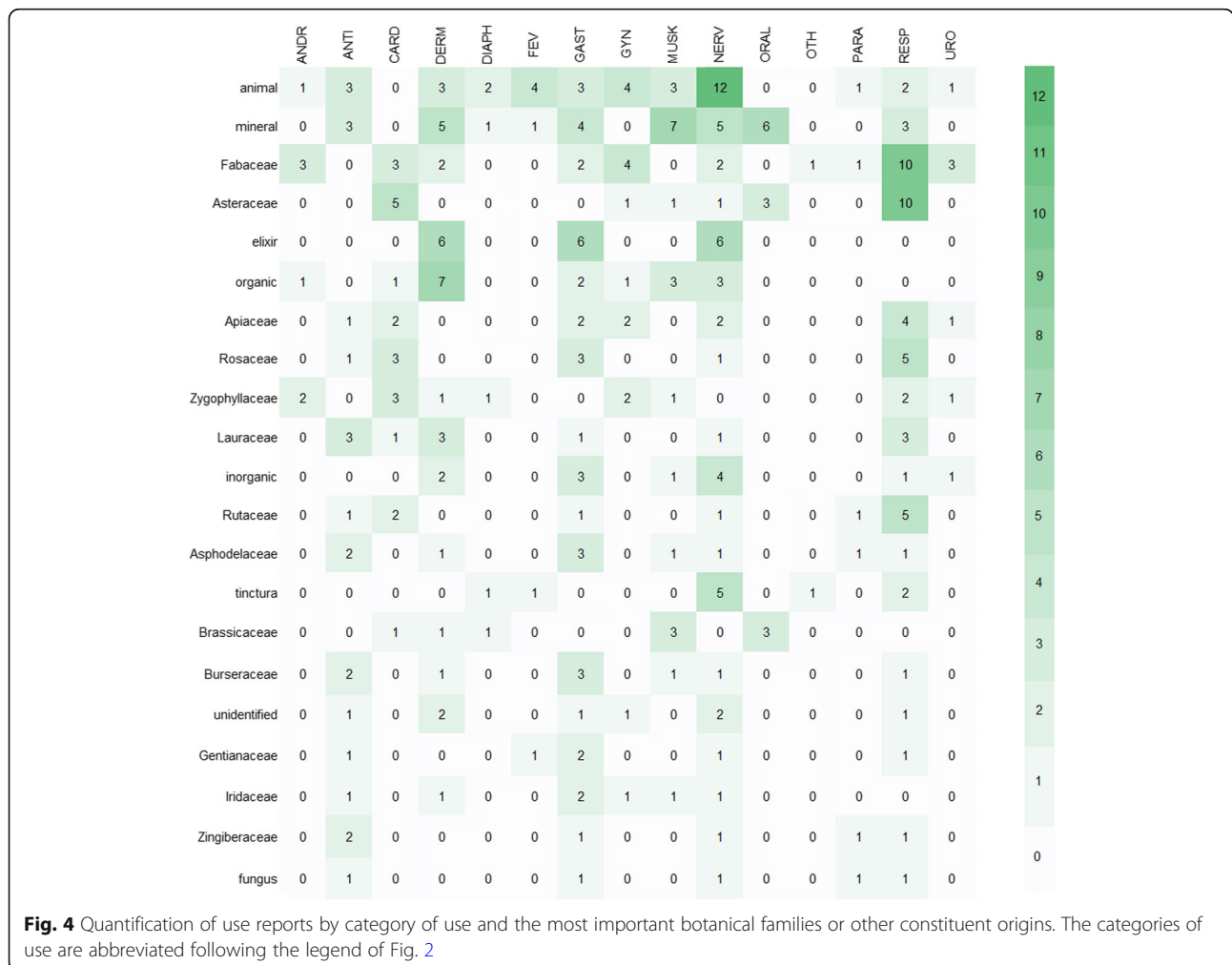
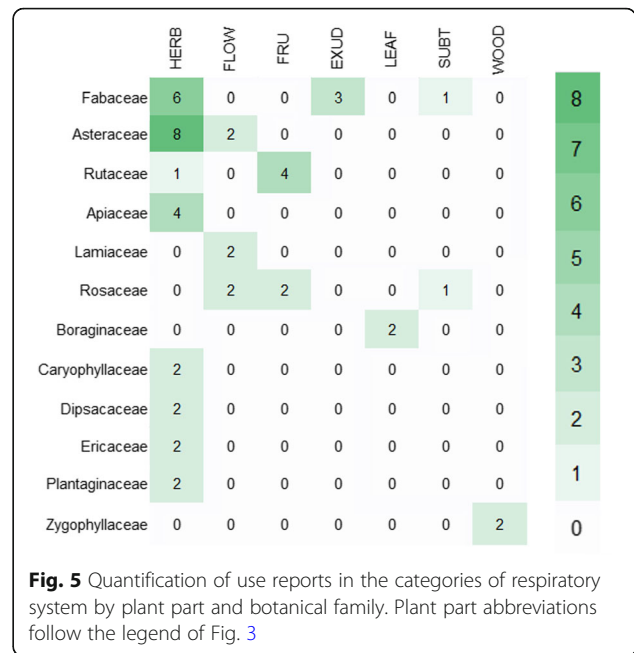


Fig. 3 Number of drugs by plant part (N = 262). BARK, barks; EXUD, exudates; FLOW, flowers; FRU, fruits; HERB, herbs (= aerial parts); LEAF, leaves; OIL, oils; SEED, seeds; SUBT, subterranean parts; WOOD, wood

other less frequent plant parts (Fig. 3). The drugs were derived from members of 32 vascular plant families, with Asteraceae (9 taxa; 22 drugs), Fabaceae (8 taxa; 33 drugs) and Apiaceae (7 taxa; 26 drugs) being the most frequent ones.

To characterise the therapeutic preferences, the associations between taxonomy, plant part or other constituent origins and categories of use were analysed (Figs. 4 and 5). The most frequently cited constituents were those obtained from animals and minerals. Animal formulations were recommended for neurology (12), gynaecology (4) and fever (4), while minerals were suggested for musculoskeletal ailments (7), oral cavity (6), neurology (5) and dermatology (5). Among the plant families, Fabaceae species were relatively frequently cited for respiratory system (10) and gynaecology (4), as well as Asteraceae for respiratory system (10) and cardiovascular problems (5).

The use citations for respiratory system issues are the most frequent ones (67; Fig. 2) and cover ailments concerning the lungs (21) and the upper respiratory tract



(21) as well as plague (17). The remedies for these conditions are taxonomically diverse, including 7 different drugs derived from 34 plant taxa. Herbs of the families Asteraceae and Fabaceae account for a comparably high number of use reports in this category (8 and 6, respectively; Fig. 5) and include *Achillea* spp., *Cyanus segetum* Hill. (= *Centaurea cyanus* L.), *Matricaria* spp., *Glycyrrhiza glabra* L., *Hedysarum* spp. and *Ononis spinosa* L.

The category of nervous system and psychosomatic disorders (52; Fig. 2) includes plague (17), stroke (9), pain of the body (5), headache (3), brain disease (3) or postpartum discomfort (3). The most frequently used constituents were those not obtained from plants, but from animals (12), or were elixirs (6) and minerals (5).

Gastrointestinal use reports (41; Fig. 2) mainly comprise stomach and intestine problems (29) but also refer to appetite (9). Apart from the prevalence of elixirs (6) and minerals (4) in drugs, some use citations are based on Asphodelaceae (3), Burseraceae (3) and Rosaceae (3) species such as *Aloë* spp., *Commiphora* spp., *Potentilla erecta* (L.) Rausch. and *Rosa* spp.

Dermatology is the fourth largest category of use reports (39; Fig. 2) and mainly covers injuries and wounds

(19) as well as applications for cleaning the head (5) and drying out feet (5). Organic substances (7) and elixirs (6) were the most frequently mentioned drugs. Among the plant families, Lauraceae oils (3) and Oleaceae exudates (3), including species such as *Cinnamomum camphora* (L.) J. Presl and *Olea europaea* L., were mostly recommended for uses.

The drugs mentioned for cardiovascular problems (6) are mainly remedies for blood purification (3), while 2 are recommended against oedema (i.e. wood of *Guaiacum officinale* L. and Sp. Tartari (= Weinstein-Geist)) and flowers of *Rosa* spp. as a heart tonic.

Sample recipes and plant species

The extract of *Gentiana lutea* L.—*Essentia Gentianae* was recommended in the absence of appetite and for stomach pains. This plant was confirmed to be cultivated by the Krummhübel herbalists in their pharmaceutical gardens [46]. The original recipe was as follows: “Nimm 2 Loth gröblich gestossene Enzian-Wurzel, 1 Qv. starken Branntwein, halte es in der Wärme bis es sich gefärbet, hernach seige sie durch grau Pappier.—*Dienet in Schwachheit des Magens, bey allen 3 und 4 tägigen*

bleibt das A. Cornu Cervi in der Filtrier-Tütche, thue den Sp. in einen Kolben, zeuch solchen herüber, so hast du den Sp. C. C. rectificat.

Mixtura Simplex.

℞ Oli acris (℞ ℞ ri) jegliches 1
℞ Sp. Camphor 1 Quart

Gesse dieses in den Kolben, und noch darzu 4 Qv. starken ℥, nebst 4 Qv. Wasser. — Ziehe es in der Sandkapelle den besten Spi. herüber.

Elixir Proprietatis Paracelsis, Magen Elixir.

Nimm: 4 Loth Aloe
2 Loth Pottasche
1/2 Ql. Safran.

Solches in einen Krug gethan, und 4 Quart Branntwein herüber gegossen, und an der Wärme stehen lassen bis die Aloe völlig zergangen, und wo es noch zu dicke, kann noch 1 oder 2 Qv. Branntwein drunter gegossen werden, so ist es fertig.

Auf eine andre Art:

78

Nimm: 4 Loth Aloes
2 Loth Myrrhen
1 Ql. Safran
2 Loth Pottasche.

Diese Species in einen Krug gethan, und 4 Qv. übergezogenen Branntwein drüber gegossen, und in der Wärme stehen lassen bis es dicke genug worden, hernach davon abgegossen, so ist es fertig. Es dienet dieses Elixir vor einen verdorbenen Magen, macht Appetit zum Essen, führet die Unreinigkeiten ab. Wovon 30, 40, 50 bis 60 Tropfen können gebraucht werden. — Aeusserlich ist es gut zum Heilen in allen Schäden.

Elixir Vitrioli Mynsichti.

Nimm: 1 Dreyer Flasche Corallorum
1 Pfund Ess. Carminativae Wedelii
1 Glas Ess. Pectoralis
1/2 Pfund roth. Schlagwasser
1/4 Pfund Sp. Vitrioli.

Dieses alles zusammen in eine 2 Quartige Flasche gegossen, wohl untereinander gemischt, hernach durch grau Pappier laufen

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Fig. 6 Original recipe using saffron (bottom part of page 78 and top part of page 79, from Reitzig [23]). Abbreviations: 1 Loth—about one large spoon (in Prussia, this equalled 14.606 g); 1 Quintl.—1/4 of Loth, which was about 3.651 g; Qv.—250 ml. [Elixir Proprietatis Paracelsis, stomach elixir—take 4 spoons of aloe (*Aloë vera* (L.) Burm.f.), 2 spoons of potash, 1/8 spoon of saffron (*Crocus* probably *sativus*). Put it in a pitcher and pour 4 quarts [4 × 1.14504 l] of strong spirit, then leave it in a warm place until aloe will completely dissolve, or, if it is still visible, you can add 250 ml or 500 ml of strong spirit until it is ready [i.e. well dissolved]. In a different way: take 4 spoons of aloe, 2 spoons of myrrh, 1/4 spoon of saffron and 2 spoons of potash. Put these species in a pitcher and add 1 l of strong spirit; leave it in a warm place until it is thick enough and pour off when ready. This elixir is served against stomach problems, increases appetite and detoxifies the body. You can take it starting from 30, 40, 50 up to 60 drops. Externally, it is good for healing any injuries.]

Fiebern 30 bis 40 Tropfen gebraucht" ([23]; explanation of abbreviations in the caption of Fig. 6) [Take 2 spoons of coarsely minced [great yellow] gentian root (*Gentiana lutea*), 250 ml of strong spirit, and keep it in a warm place until it is dyed; afterwards, seep it through grey paper—serve it in weakness of the stomach, using 30 to 40 drops on all 3 and 4 days of fever.]

An extract from *Crocus* (probably *sativus*) was used by Riesengebirge (Karkonosze) herbalists as a spice and a dye (saffron). The extract also helped against digestive system diseases and circulatory problems. When dosed appropriately, it was considered an aphrodisiac and even a hallucination-inducing agent. Some quantitative recipes for this plant are also preserved (Fig. 6, from Reitzig [23]).

A tincture made from the root of *Carlina acaulis* (a common plant in the area), recommended for digestion, was also appreciated for its antibacterial and antipyretic properties (Fig. 7). Sulphuric acid, manufactured in the Sudetes until the early nineteenth century, was of great importance to the production of herbal potions [22–25]. In the valley of the Kamienna river, there was a facility that produced sulphuric acid from pyrite shale. The term "vitriol" was the essence of the alchemical formulas, contained in the motto:

visita interiorum terrae rectificando invenies operae lapidem (i.e. descend into the belly of the Earth, and in distilling you will find the stone of the work) [38, 56].

Discussion

By using a systematic data extraction technique, we elucidated several salient therapeutic patterns in preserved recipes of Krummhübel herbalists. These include the importance of Fabaceae plants for respiratory system diseases and gynaecology, as well as Asteraceae for respiratory system and cardiovascular problems. Generally, the use citations for respiratory system issues are the most frequent ones and cover ailments concerning the lungs and the upper respiratory tract as well as plague. The remedies for these conditions are taxonomically diverse, including 7 different drugs derived from 34 plant taxa. Gastrointestinal use reports mainly comprise stomach and intestine problems but also refer to appetite and are based on Asphodelaceae, Burseraceae and Rosaceae species. Moreover, animal formulations were recommended for neurology, gynaecology and fever, while minerals were suggested for musculoskeletal ailments, oral cavity, neurology and dermatology.

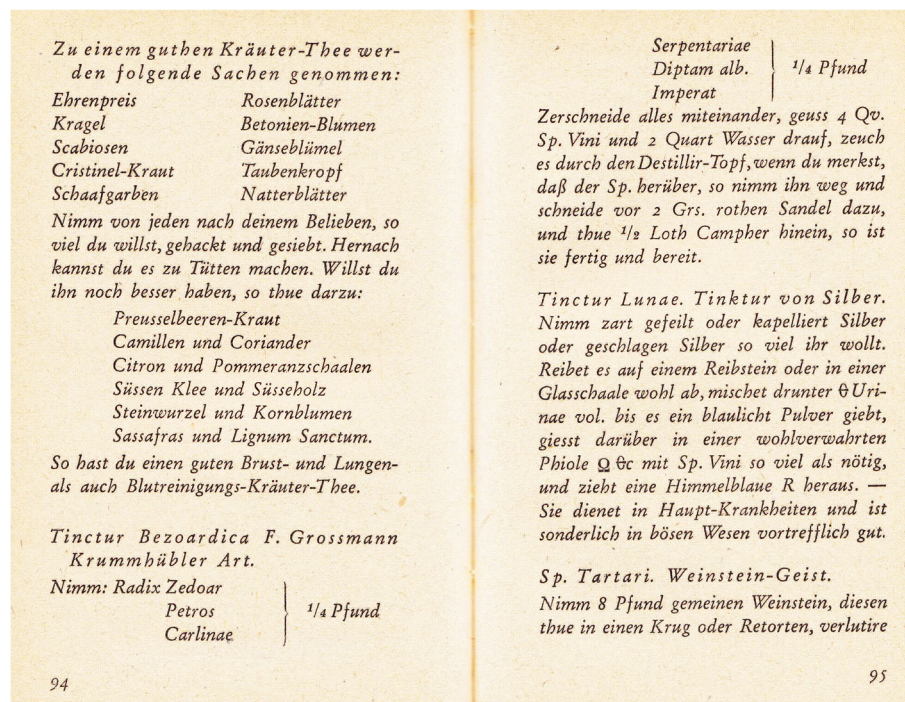


Fig. 7 Original recipe using *Carlina acaulis* (bottom part of page 94 and top part of page 95, from Reitzig [23]). Abbreviations: 1 Loth—about 1 large spoon (in Prussia, this equalled 14.606 g); Qv.—250 ml; Grs.—gram [g]. [Tinctur Bezoardica of F. Grossmann in the way of Krummhübel—take Zedoary root (white turmeric, *Zedoariae radix*, *Curcuma zedoaria* (Christm.) Roscoe), parsley root (*Petroselinum crispum* (Mill.) Fuss), stemless carline thistle root (*Carlinae radix*, *Carlina acaulis*)—all together 125 g, as well as black cohosh root (*Serpentariae radix*, *Actaea racemosa* L. = *Cimicifuga racemosa* (L.) Nutt.), burning bush root (*Dictamnus albus radix*, *Dictamnus albus* L.), masterwort root (*Imperatoriae radix*, *Peucedanum ostruthium* (L.) W.D.J. Koch = *Imperatoria ostruthium* L.)—all together 125 g. Chop everything together, add 1 l of Spiritus vini and 2.273 l of water, then pass it through the distiller glass. When the spirit has evaporated, the distillation can be finished and 2 g of sliced red sandal wood with half a spoon of camphor can be added. It is ready to use.]

This confirms that medicinal plants were commonly used in ethnomedicine for centuries, because they were the only drugs available to residents of many regions. Knowledge about their healing properties was passed down orally from generation to generation [57]. The past importance of mountain species and the frequent uses against envenomations and intoxications mirror the closer interaction of past societies with their biological environment and different ecological, epidemiological and hygienic conditions.

In the fifteenth century, the first herbaria and also herbals, written by doctors or other professionals, began to appear in Europe [57]. These items, however, do not take into account knowledge about medicinal plant mixtures provided by folk therapists. The phenomenon of herbalists from Krummhübel is connected with the fact that these unprofessional therapists left their knowledge on plant mixtures in a written form to be used for centuries in traditional folk medicine in the Sudety region.

The history of herbalists from Krummhübel shows that historical events, in this case, the disappearance of a well-established knowledge, has a lot to teach us now, such as regulations and restrictions kill traditions, which can also happen nowadays. An example may be the Kneipp phytotherapy method, recognised and currently used in health resort treatments. This method was known in the folk medicine of the Allgäu region in Southern Germany, and in the nineteenth century, it was not allowed as a therapy for a relatively long time (e.g. [58–61]).

The systematic analysis of herbal texts offers unique insights into past herbal medicine [10]. Thus, we also confirm the suggestion of Staub et al. [10] that those drugs with discontinued use might represent interesting starting points for drug discovery and the evaluation of old herbal medicine, especially that the information on this subject was strictly protected and included in the professional secrecy of the Krummhübel herbalists' guild, not available to outsiders for centuries.

Medicinal plants of Krummhübel herbalists used in other ethnobotanical studies

The highest share of the flora documented as medicinal plants by Krummhübel herbalists was recorded in Madaus [15] and Matthioli [11] and constituted 76.4 and 66.7%, respectively. This indicates that many plants used in medical treatment by Krummhübel herbalists were also known in other regions and in different periods. The medicinal plants, documented in all publications considered, included *Angelica* spp., *Carlina acaulis* L., *Gentiana* spp., *Juniperus* spp., *Rosa* spp. and *Veronica* spp. (Table 1). All of them are native or indigenous plants occurring in Central Europe. Additionally, *Gentiana* spp., *Juniperus* spp. and *Rosa* spp. were used for

medicinal purposes through all other time periods in Switzerland [62]. While Polish inhabitants of the Carpathians, among others, valued *Angelica archangelica* L. and *Carlina acaulis* L. [57]. In the contemporary literature, only the use of *Veronica officinalis* is mentioned, but the use of *Veronica chamaedrys* and *V. beccabunga* is documented in ethnobotanical studies [62], and different *Veronica* species were cultivated in local Silesian gardens [46].

On the other hand, in therapeutic mixtures of Krummhübel herbalists, eight taxa were exclusive, including mainly exotic plants such as *Copaifera officinalis* L., *Drimys winteri* J.R. Forst. & G. Forst., *Hedysarum* spp., *Myristica fragrans* Houtt., *Piper longum* L., *Silene baccifera* (L.) Roth and *Syzygium aromaticum* (L.) Merr. & L.M. Perry. Although they originate from various parts of the world, they were quite frequently used in several remedies by Krummhübel herbalists and are still highly important herbs in modern folk medicine. The oleoresin of *Copaifera* trees has been widely used in Neotropical regions for thousands of years and remains a popular treatment for a variety of ailments [63]. One of the most ancient and valuable spices of the Orient is clove (*Syzygium aromaticum* (L.) Merr. & L.M. Perry), which has a wide spectrum of biological activity [64]. The exotic plants used by Krummhübel herbalists may also refer to the scholarly origin of their knowledge. This, and the considerable overlap of the nomenclature with the old herbals, indicates that the recipes might have been originated (even if later modified) from the monastic tradition dating back to at least the sixteenth century [65, 66], and they may go back even to antiquity. For example, by producing and marketing drugs to the public, Italian Renaissance nuns both augmented the medical resources available in urban society and acquired roles of public significance beyond the spiritual realm [66](Table 2).

Therapeutic effects of medicinal plants in traditional and modern medicine

It is estimated that over 50% of the available drugs are currently somehow derived from medicinal plants [67, 68]. Herbal medicine (phytotherapy) is widely being used across the world on a constantly growing basis. Plant drug application is based on the experiences of traditional medicine or on new scientific research and experimental results, i.e. conventional medicine. Many medicinal plants are applied through self-medication or at the recommendation of a physician or pharmacist [69]. Phytotherapy is among the major “complementary” treatments in current use by doctors and other therapists throughout Europe [70]. Contemporary European use and trade in medicinal and aromatic plants are extensive, with eight countries (Germany, Spain, France, the Netherlands, Italy, the UK,

Table 1 Medicinal plants listed in Krummhübel herbalist recipes (seventeenth to nineteenth centuries) and their occurrences in manuscripts and regional surveys, including Matthioli [11], Schwenckfeld [3], Mattuschka [12], Kneipp [13], Fischer [14] and Madaus [15]

| Krummhübel herbalists, seventeenth to nineteenth centuries | Matthioli (1563) [11] | Schwenckfeld (1607) [3] | Mattuschka (1779) [12] ^a | Kneipp (1892) [13] | Fischer (1930's) [14] ^b | Madaus (1938) [15] |
|---|---|--|--|--------------------|--|--|
| <i>Achillea</i> spp. | + (as <i>Ptarmica</i>) | – | + (as <i>A. millefolium</i> , <i>A. ptarmica</i>) | + | + (mainly as <i>A. millefolium</i> L., rare <i>A. ptarmica</i> L.) | + (as <i>A. ptarmica</i> , <i>A. millefolium</i> *, <i>A. moschata</i>) |
| <i>Actaea racemosa</i> L. = <i>Cimicifuga racemosa</i> Nutt. | – | – | – | – | + (as <i>A. spicata</i> L.) | + |
| <i>Aloë</i> spp. | + | + (as <i>Aloes Balsam</i>) | – | + | + (as <i>A. succotrina</i> Lam.) | + (many species*) |
| <i>Anacyclus pyrethrum</i> (L.) Lag. = <i>Anacyclus officinarum</i> Hayne | – | – | – | – | – | +* |
| <i>Angelica</i> spp. | + (as <i>Angelica maior</i> , <i>A. minor</i>) | + (as <i>A. erratica</i>) | + (as <i>A. sylvestris</i>) | + | + (as <i>A. archangelica</i> L., <i>A. sylvestris</i> L.) | + (many species*) |
| <i>Artemisia vulgaris</i> L. | + (as <i>Artemisia</i>) | – | + | + | + | +* |
| <i>Bellis perennis</i> L. | + (as <i>Bellis minor</i>) | + (as <i>B. minima</i>) | + | – | + | +* |
| <i>Carlina acaulis</i> L. | + (as <i>Chamaeleon albus</i>) 261 | + | + | + | + | + |
| <i>Cinnamomum camphora</i> (L.) J.Presl | + (as <i>camphora</i>) | – | – | – | + | +* |
| <i>Cinnamomum verum</i> J.Presl | – | – | – | – | + | + (as <i>C. zeylanicum</i> *) |
| <i>Citrus × aurantium</i> L. | + | – | – | – | – | +* |
| <i>Citrus limon</i> (L.) Osbeck | + | – | – | – | – | + (as <i>C. limonum</i>) |
| <i>Citrus</i> spp. | + (as <i>Citria malus</i>) | – | – | – | – | + (many other species) |
| <i>Cochlearia officinalis</i> L. | – | – | + | + | – | +* |
| <i>Commiphora</i> spp. | – | – | – | – | – | + (as <i>C. abyssinica</i> , <i>C. mukul</i> , <i>C. myrrha</i>) |
| <i>Copaifera officinalis</i> L. | – | – | – | – | – | – |
| <i>Coriandrum sativum</i> L. | + (as <i>Coriandrum</i>) | – | – | – | – | + |
| <i>Crocus</i> (probably) <i>sativus</i> L. | + (as <i>Crocus florens</i>) | – | – | – | + | – |
| <i>Curcuma zedoaria</i> (Christm.) Roscoe | + | – | – | – | – | +* |
| <i>Cyanus segetum</i> Hill. = <i>Centaurea cyanus</i> L. | + (as <i>Cyanus minor</i>) | – | + | – | – | +* |
| <i>Dictamnus albus</i> L. | + | – | – | – | – | + |
| <i>Dorstenia contrajerva</i> L. | – | – | – | – | + | – |
| <i>Drimys winteri</i> J.R. Forst. & G. Forst. | – | – | – | – | – | – |
| <i>Echium vulgare</i> L. | + (as <i>Echium</i>) | – | – | – | – | – |
| <i>Elettaria cardamomum</i> (L.) Maton | + (as <i>C. minus</i> , <i>C. medium</i> , <i>C. maius</i>) | – | – | – | – | + |
| <i>Ferula assa-foetida</i> L. | + (as <i>Ferula</i> = <i>Nathex</i>) | – | – | – | – | +* |
| <i>Foeniculum vulgare</i> Mill. | + (as <i>Foeniculum</i>) | – | – | + | + | +* |
| <i>Gentiana</i> spp. | + (as <i>Gentiana minor</i> = <i>cruciata</i> , <i>Gentiana</i>) | + (as <i>G. major caeruleo flore</i> , <i>G.</i>) | + (as <i>G. lutea</i> , <i>G. centaurium</i> , <i>G.</i>) | + | + | + (many species*) |

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|--|---|---|---|--------------------|------------------------------------|--|
| | (probably <i>lutea</i>) | <i>minor punctato flore</i>) | <i>amarella</i>) | | | |
| <i>Glycyrrhiza glabra</i> L. | + (as <i>Glycyrrhiza liquiritia</i>) | – | – | – | – | +* |
| <i>Guaiacum officinale</i> L. | + (as <i>Lignum guaiacum</i>) | – | – | – | – | +* |
| <i>Guaiacum sanctum</i> L. or <i>G. officinale</i> L. | + (as <i>Lignum guaiacum</i>) | – | – | – | – | – |
| <i>Hedysarum</i> spp. | – | – | – | – | – | – |
| <i>Helleborus niger</i> L. | + | – | + | – | – | +* |
| <i>Indigofera</i> spp. | – | – | – | – | – | + |
| <i>Inula helenium</i> L. | + (as <i>Elenium</i>) | – | + | – | + | +* |
| <i>Juniperus</i> spp. | + (as <i>Juniperus</i> , as <i>Sabina</i>) | + | + (as <i>I. communis</i>) | + | + (as <i>J. communis</i> L.) | + (many species*) |
| <i>Laurus nobilis</i> L. | + (as <i>Laurus</i>) | + (as <i>L. Alexandrina</i> Matthioli) | – | + | – | +* |
| <i>Lavandula</i> spp. | + | – | – | + | – | +* |
| <i>Linum usitatissimum</i> L. | + (as <i>Linum</i>) | – | + | + | + | +* |
| <i>Matricaria</i> spp. | + (as <i>Camomilla</i>) | – | + (as <i>M. chamomilla</i> , <i>M. parthenium</i>) | + | + (as <i>M. chamomilla</i> L.) | + (as <i>M. chamomilla</i> *, <i>M. discoidea</i> *) |
| <i>Melissa officinalis</i> L. | + (as <i>Melissa</i>) | – | + (as <i>M. calamintha</i>) | + | + | +* |
| <i>Mentha aquatica</i> L. var. <i>crispa</i> (L.) Benth. | + (as <i>Mentha aquatica</i>) | – | – | + | + (as <i>Mentha</i> spp.) | + |
| <i>Myristica fragrans</i> Houtt. | – | – | – | – | – | – |
| <i>Myroxylon balsamum</i> (L.) Harms | – | – | – | – | – | +* |
| <i>Nasturtium officinale</i> R.Br. | + (as <i>Nasturtium aquaticum</i>) | – | – | + | + | +* |
| <i>Olea europaea</i> L. | + (as <i>Olea domestica</i>) | – | – | + | – | – |
| <i>Ononis spinosa</i> L. | + (as <i>Ononis</i>) | – | + (as <i>O. aruensis</i>) | – | + | +* |
| <i>Origanum majorana</i> L. | + (as <i>Maiorana</i>) | – | – | – | – | +* |
| <i>Persicaria bistorta</i> (L.) Samp. = <i>Polygonum bistorta</i> L. | + (as <i>Bistorta</i>) | – | + | – | + | – |
| <i>Petasites</i> sp. | + (as <i>Petasites falso dieta</i>) | + | + (as <i>Tussilago petasites</i>) | – | – | + (many species*) |
| <i>Petroselinum crispum</i> (Mill.) Fuss. | + (as <i>Pertoselinum vulgare</i>) | – | – | – | – | + (as <i>P. sativum</i> *) |
| <i>Peucedanum ostruthium</i> (L.) W.D.J. Koch = <i>Imperatoria ostruthium</i> L. | – | – | + | – | – | + |
| <i>Pimpinella anisum</i> L. | + (as <i>Anisum</i>) | + (as <i>P. major</i> L. Huds., <i>P. minorcrispa</i>) | – | + | + | +* |
| <i>Piper longum</i> L. | – | – | – | – | – | – |
| <i>Potentilla erecta</i> (L.) Räusch. | + (as <i>Tormentilla</i>) | – | + (as <i>Tormentilla erecta</i>) | – | – | + (as <i>P. tormentilla</i> *) |
| <i>Pterocarpus santalinus</i> L. fil. | – | – | – | + | – | – |

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|---|---|--|--|--------------------|---|--------------------------|
| <i>Pulicaria vulgaris</i> Gaertn. | – | – | – | – | + | – |
| <i>Pyrus</i> sp. | + | – | – | – | + (as <i>P. communis</i> L.) | + (as <i>P. malus</i> *) |
| <i>Rheum rhabarbarum</i> L. | + | – | – | – | – | – |
| <i>Rosa</i> spp. | + | + (as <i>R. alpina</i> , <i>R. rubra</i>) | + (as <i>R. canina</i> , <i>R. alba</i>) | + | + | + (many species*) |
| <i>Rosmarinus officinalis</i> L. | + (as <i>Rosmarinus coronaria</i>) | + (as <i>R. sylvaticus</i>) | – | + | + | +* |
| <i>Sassafras</i> spp. | – | – | – | – | – | +* |
| <i>Scabiosa</i> spp. | + (as <i>Scabiosa minor</i>) | – | + (as <i>Scabiosa succisa</i> and <i>S. aruensis</i>) | – | + (as <i>Succisa pratensis</i> Moench = <i>Scabiosa succisa</i> L.) | + (different species*) |
| <i>Senna</i> spp. | + (as <i>Sena</i>) | – | – | – | – | +* |
| <i>Silene baccifera</i> (L.) Roth = <i>Cucubalus baccifer</i> L. | – | – | – | – | – | – |
| <i>Stachys officinalis</i> (L.) Trevis = <i>Betonica officinalis</i> L. | + (as <i>Betonica</i>) | – | + | – | + | + |
| <i>Styrax</i> spp. | + | – | – | – | – | – |
| <i>Syzygium aromaticum</i> (L.) Merr. & L.M.Perry | – | – | – | – | – | – |
| <i>Vaccinium vitis-idaea</i> L. | – | – | + | + | + (as <i>V. myrtillus</i> L.) | +* |
| <i>Veronica</i> spp. | + (as <i>Veronica mas</i> , <i>V. foemina</i>) | + | + (as <i>V. officinalis</i> , <i>V. beccabunga</i>) | + | + | + (many species*) |
| <i>Viola</i> spp. | + (as <i>Viola purpurea</i>) | – | + (as <i>V. odorata</i>) | + | + | + (many species*) |
| <i>Zingiber officinale</i> Roscoe | + (as <i>Zinziber</i>) | – | – | – | + | +* |
| Σ = 72 | Σ = 48 | Σ = 11 | Σ = 25 | Σ = 24 | Σ = 33 | Σ = 55 |

*Denotes to Madaus [15], asterisk shows the description of use or recipe; no asterisk—plant was only listed

^aThe register of Mattuschka [12] includes only species listed by the author as having medicinal properties

^bBased on Kujawska et al. [14]

the Russian Federation (not disaggregated by Russia-in-Europe) and Poland) being the top 20 global importers by volume of pharmaceutical plants. The top six exporters of these plants in Europe include Germany, Poland, Spain, Bulgaria, Albania and France [71, 72]. A large part of modern drugs has its roots in ancient traditions. Until today, ancient scripts have exerted a strong influence on the use of herbal medicine, and the repeated empirical testing and scientific study of health care claims guide and shape the selection of efficacious treatments and evidence-based herbal medicine [73].

Medicinal plants used by herbalists from Krummhübel were remedies for multiple ailments. The taxa that achieved the highest use or were recognised as the most versatile remedies with multiple pharmacological indications were *Aloë* spp., *Copaifera officinalis* L., *Guaiacum officinale* L., *Commiphora* spp. and *Crocus* (probably) *sativus* L. Comparison of the uses of the plants

considered with their contemporary use, described in publications involved with herbal medicine and pharmacognosy (e.g. [36, 74–77]), showed some novelties.

The most frequently mentioned properties of *Aloë* spp. are gastrointestinal activities, hepato-protective properties and beneficial effects against skin problems such as wounds, injuries and infective diseases in both the Islamic traditional medicine [78] and in modern medicine [36, 74, 76, 77]. According to Krummhübel herbalists, it has also antihelminthic properties and can be used as a remedy for the treatment of scurvy.

Copaiba (*Copaifera* sp.) has a wide range of ethno-pharmacological indications, including the treatment of the following: cystitis, urinary incontinence, gonorrhoea and syphilis; respiratory ailments including bronchitis, strep throat, haemoptysis, pneumonia and sinusitis; infections in the skin and mucosa such as dermatitis, eczema, psoriasis and wounds; ulcers and lesions of the

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23]

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Alliment | Ailment_interpretation | Mode | Category |
|---|------------------|------|---------------|--|---------------------------------|------------------------------|----------------------------------|------|----------|
| - | Animal | - | 1 | Sp. Lumbricorum, Regenwurm-Spiritus | Regenwürmer (Gemeine Regenwurm) | - | - | - | - |
| - | Tinctura | - | 1 | Sp. Lumbricorum, Regenwurm-Spiritus | Sp. Vini | - | - | - | - |
| - | Animal | - | 2 | Sp. Cornu Cervi, Hirschhorn-Geist | Hirschhorn | - | - | - | - |
| - | Tinctura | - | 3 | Mixtura siplex | Oli acris | - | - | - | - |
| <i>Cinnamomum camphora</i> (L.) J.Presl | Lauraceae | OIL | 3 | Mixtura siplex | Sp. Camphor | - | - | - | - |
| - | Mineral | - | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Pottasche (potash) | verdorbenen Magen | Against stomach problems | INT | GAST |
| - | Mineral | - | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Pottasche | führt die Unreinigkeiten ab | Detoxifies the body | INT | ANTI |
| - | Mineral | - | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Pottasche | zern Heilen in ellen Schäden | Good for healing of any injuries | EXT | DERM |
| - | Mineral | - | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Pottasche (potash) | macht Appetit zum Essen | Increases appetite | INT | GAST |
| <i>Aloë</i> spp. | Asphodelaceae | HERB | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Aloe | verdorbenen Magen | Against stomach problems | INT | GAST |
| <i>Aloë</i> spp. | Asphodelaceae | HERB | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Aloe | führt die Unreinigkeiten ab | Detoxifies the body | INT | ANTI |
| <i>Aloë</i> spp. | Asphodelaceae | HERB | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Aloe | zern Heilen in ellen Schäden | good for healing of any injuries | EXT | DERM |
| <i>Aloë</i> spp. | Asphodelaceae | HERB | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Aloe | macht Appetit zum Essen | Increases appetite | INT | GAST |
| <i>Commiphora</i> spp. | Bursaceae | EXUD | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Myrrhen | verdorbenen Magen | Against stomach problems | INT | GAST |
| <i>Commiphora</i> spp. | Bursaceae | EXUD | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Myrrhen | führt die Unreinigkeiten ab | Detoxifies the body | INT | ANTI |
| <i>Commiphora</i> spp. | Bursaceae | EXUD | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Myrrhen | zern Heilen in ellen | Good for healing of any | EXT | DERM |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Aliment | Ailment_interpretation | Mode | Category |
|--|------------------|------|---------------|--|---------------------------|---|----------------------------------|------|----------|
| <i>Commiphora</i> spp. | Burseraceae | EXUD | 4 | Paracelsis, Magen Elixir Elixir Proprietatis Paracelsis, Magen Elixir | Myrrhen | Schäden | injuries | | |
| <i>Crocus</i> probably <i>sativus</i> L. | Iridaceae | FLOW | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Safran | verdorbenen Magen | Against stomach problems | INT | GAST |
| <i>Crocus</i> probably <i>sativus</i> L. | Iridaceae | FLOW | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Safran | führt die Unreinigkeiten ab | Detoxifies the body | INT | ANTI |
| <i>Crocus</i> probably <i>sativus</i> L. | Iridaceae | FLOW | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Safran | zum Heilen in ellen Schäden | Good for healing of any injuries | EXT | DERM |
| <i>Crocus</i> probably <i>sativus</i> L. | Iridaceae | FLOW | 4 | Elixir Proprietatis Paracelsis, Magen Elixir | Safran | macht Appetit zum Essen | Increases appetite | INT | GAST |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | Ess. Carminativae Wedelii | reinigt das Haupt | Cleans the head | EXT | DERM |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | Ess. Pectoralis | reinigt das Haupt | Cleans the head | EXT | DERM |
| - | Animal | - | 5 | Elixir Vitrioli Mynsichti | Corallorum | reinigt das Haupt | Cleans the head | EXT | DERM |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | roth. Schlagwasser | reinigt das Haupt | Cleans the head | EXT | DERM |
| - | Inorganic | - | 5 | Elixir Vitrioli Mynsichti | Sp. Vitrioli | reinigt das Haupt | Cleans the head | EXT | DERM |
| - | Animal | - | 5 | Elixir Vitrioli Mynsichti | Corallorum | trocknet die Füße aus | Dries out the feet | EXT | DERM |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | Ess. Carminativae Wedelii | trocknet die Füße aus | Dries out the feet | EXT | DERM |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | Ess. Pectoralis | trocknet die Füße aus | Dries out the feet | EXT | DERM |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | roth. Schlagwasser | trocknet die Füße aus | Dries out the feet | EXT | DERM |
| - | Inorganic | - | 5 | Elixir Vitrioli Mynsichti | Sp. Vitrioli | trocknet die Füße aus | Dries out the feet | EXT | DERM |
| - | Animal | - | 5 | Elixir Vitrioli Mynsichti | Corallorum | macht Appetit | Increases appetite | INT | GAST |
| - | elixir | - | 5 | Elixir Vitrioli Mynsichti | Ess. Carminativae Wedelii | macht Appetit | increases appetite | INT | GAST |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | Ess. Pectoralis | macht Appetit | Increases appetite | INT | GAST |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | roth. Schlagwasser | macht Appetit | Increases appetite | INT | GAST |
| - | Inorganic | - | 5 | Elixir Vitrioli Mynsichti | Sp. Vitrioli | macht Appetit | Increases appetite | INT | GAST |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | Ess. Carminativae Wedelii | bewahrt vor dem Schlage und der Schweren-Noth | Prevents stroke | INT | NERV |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | Ess. Pectoralis | bewahrt vor dem Schlage und der Schweren-Noth | Prevents stroke | INT | NERV |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Aliment | Ailment_interpretation | Mode | Category |
|-----------------------------------|------------------|------|---------------|---------------------------|---------------------------|---|--|------|----------|
| - | Animal | - | 5 | Elixir Vitrioli Mynsichti | Corallorum | bewahret vor dem Schlage und der Schwere-Not | Prevents stroke | INT | NERV |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | roth. Schlagwasser | bewahret vor dem Schlage und der Schwere-Not | Prevents stroke | INT | NERV |
| - | Inorganic | - | 5 | Elixir Vitrioli Mynsichti | Sp. Vitrioli | bewahret vor dem Schlage und der Schwere-Not | Prevents stroke | INT | NERV |
| - | Animal | - | 5 | Elixir Vitrioli Mynsichti | Corallorum | verwahret den ganzen Leib vor allen Schmerzen | Protects the whole body from all pain | INT | NERV |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | Ess. Carminativae Wedelii | verwahret den ganzen Leib vor allen Schmerzen | Protects the whole body from all pain | INT | NERV |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | Ess. Pectoralis | verwahret den ganzen Leib vor allen Schmerzen | Protects the whole body from all pain | INT | NERV |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | roth. Schlagwasser | verwahret den ganzen Leib vor allen Schmerzen | Protects the whole body from all pain | INT | NERV |
| - | inorganic | - | 5 | Elixir Vitrioli Mynsichti | Sp. Vitrioli | verwahret den ganzen Leib vor allen Schmerzen | Protects the whole body from all pain | INT | NERV |
| - | Animal | - | 5 | Elixir Vitrioli Mynsichti | Corallorum | stärket Magen und Eingeweide | Strengthens the stomach and intestines | INT | GAST |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | Ess. Carminativae Wedelii | stärket Magen und Eingeweide | Strengthens the stomach and intestines | INT | GAST |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | Ess. Pectoralis | stärket Magen und Eingeweide | Strengthens the stomach and intestines | INT | GAST |
| - | Elixir | - | 5 | Elixir Vitrioli Mynsichti | roth. Schlagwasser | stärket Magen und Eingeweide | Strengthens the stomach and intestines | INT | GAST |
| - | Inorganic | - | 5 | Elixir Vitrioli Mynsichti | Sp. Vitrioli | stärket Magen und Eingeweide | Strengthens the stomach and intestines | INT | GAST |
| - | Animal | - | 6 | Elixir Uterini Grolly | Castor od. Bibergeil | allen Mutterkrankheiten | Postpartum discomfort | INT | NERV |
| - | Animal | - | 6 | Elixir Uterini Grolly | Castor od. Bibergeil | allen Mutterkrankheiten | Postpartum discomfort | INT | GYN |
| ? | ? | EXUD | 6 | Elixir Uterini Grolly | Oleum Succini | allen Mutterkrankheiten | Postpartum discomfort | INT | NERV |
| ? | ? | EXUD | 6 | Elixir Uterini Grolly | Oleum Succini | allen Mutterkrankheiten | Postpartum discomfort | INT | GYN |
| <i>Artemisia vulgaris</i> L. | Asteraceae | HERB | 6 | Elixir Uterini Grolly | Artemisiae oder Beyfuss | allen Mutterkrankheiten | Postpartum discomfort | INT | NERV |
| <i>Artemisia vulgaris</i> L. | Asteraceae | HERB | 6 | Elixir Uterini Grolly | Artemisiae oder Beyfuss | allen Mutterkrankheiten | Postpartum discomfort | INT | GYN |
| <i>Crocus probably sativus</i> L. | Iridaceae | FLOW | 6 | Elixir Uterini Grolly | Safran | allen Mutterkrankheiten | Postpartum discomfort | INT | GYN |
| <i>Crocus probably sativus</i> L. | Iridaceae | FLOW | 6 | Elixir Uterini Grolly | Safran | allen Mutterkrankheiten | Postpartum discomfort | INT | NERV |
| <i>Pimpinella anisum</i> L. | Apiaceae | OIL | 6 | Elixir Uterini Grolly | Oleum anisi | allen Mutterkrankheiten | Postpartum discomfort | INT | GYN |
| <i>Pimpinella anisum</i> L. | Apiaceae | OIL | 6 | Elixir Uterini Grolly | Oleum anisi | allen Mutterkrankheiten | Postpartum discomfort | INT | NERV |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Aliment | Ailment_interpretation | Mode | Category |
|--------------------------------------|------------------|------|---------------|---|------------------|--------------------------|------------------------|------|----------|
| <i>Perocarpus santalinus</i> L. fil. | Fabaceae | HERB | 6 | Elixir Uterini Grolly | rothen Sandel | allen Mutterkrankheiten | Postpartum discomfort | INT | GYN |
| <i>Perocarpus santalinus</i> L. fil. | Fabaceae | HERB | 6 | Elixir Uterini Grolly | rothen Sandel | allen Mutterkrankheiten | Postpartum discomfort | INT | NERV |
| - | Inorganic | - | 7 | Elixir anti Scorbutic: Elixir vor den Scharbock | Sp. Nitri dulcis | vor den Scharbock | Against scurvy | INT | MUSK |
| - | Mineral | - | 7 | Elixir anti Scorbutic: Elixir vor den Scharbock | Pottasche | vor den Scharbock | Against scurvy | INT | MUSK |
| Aloë spp. | Asphodelaceae | HERB | 7 | Elixir anti Scorbutic: Elixir vor den Scharbock | Aloe | vor den Scharbock | Against scurvy | INT | MUSK |
| <i>Cochlearia officinalis</i> L. | Brassicaceae | HERB | 7 | Elixir anti Scorbutic: Elixir vor den Scharbock | Sp. Cochlear | vor den Scharbock | Against scurvy | INT | MUSK |
| <i>Commiphora</i> spp. | Burseraceae | EXUD | 7 | Elixir anti Scorbutic: Elixir vor den Scharbock | Myrrhen | vor den Scharbock | Against scurvy | INT | MUSK |
| <i>Crocus probably sativus</i> L. | Iridaceae | FLOW | 7 | Elixir anti Scorbutic: Elixir vor den Scharbock | Safran | vor den Scharbock | Against scurvy | INT | MUSK |
| <i>Nasturtium officinale</i> R.Br. | Brassicaceae | HERB | 8 | Spirit. Cochlear: Löffel-Kraut-Geist | Brunnenkresse | Blutreinigung | Blood purification | INT | CARD |
| <i>Nasturtium officinale</i> R.Br. | Brassicaceae | HERB | 8 | Spirit. Cochlear: Löffel-Kraut-Geist | Brunnenkresse | treibt den Schweiß | Diaphoretic | INT | DIAPH |
| <i>Nasturtium officinale</i> R.Br. | Brassicaceae | HERB | 8 | Spirit. Cochlear: Löffel-Kraut-Geist | Brunnenkresse | widersteht der Fäule | Prevents ulcers | INT | DERM |
| <i>Nasturtium officinale</i> R.Br. | Brassicaceae | HERB | 8 | Spirit. Cochlear: Löffel-Kraut-Geist | Brunnenkresse | widersteht dem Scharbock | Prevents scurvy | INT | MUSK |
| <i>Guaiacum officinale</i> L. | Zygophyllaceae | WOOD | 9 | Sp. Sassafras. Franzosen-Holz-Geist | Franzosen-Holz | reinigt das Geblüth | Blood purification | INT | CARD |
| <i>Guaiacum officinale</i> L. | Zygophyllaceae | WOOD | 9 | Sp. Sassafras. Franzosen-Holz-Geist | Franzosen-Holz | treibt Schweiß | Diaphoretic | INT | DIAPH |
| <i>Guaiacum officinale</i> L. | Zygophyllaceae | WOOD | 9 | Sp. Sassafras. Franzosen-Holz-Geist | Franzosen-Holz | treibt Harn | Diuretic | INT | URO |
| <i>Guaiacum officinale</i> L. | Zygophyllaceae | WOOD | 9 | Sp. Sassafras. Franzosen-Holz-Geist | Franzosen-Holz | Wassersucht | Oedema | INT | CARD |
| <i>Guaiacum officinale</i> L. | Zygophyllaceae | WOOD | 9 | Sp. Sassafras. Franzosen-Holz-Geist | Franzosen-Holz | Gilederreissen | Rheumatism | INT | MUSK |
| <i>Guaiacum officinale</i> L. | Zygophyllaceae | WOOD | 9 | Sp. Sassafras. | Franzosen-Holz | Krätze | Scabies | EXT | DERM |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Alliment | Ailment_interpretation | Mode | Category |
|--|------------------|------|---------------|--|------------------------------------|--|---|------|----------|
| <i>Guaiacum officinale</i> L. | Zygophyllaceae | WOOD | 9 | Franzosen-Holz-Geist Sp. Sassafras. Franzosen-Holz-Geist | Franzosen-Holz | Franzosen | Syphilis | INT | ANDR |
| <i>Guaiacum officinale</i> L. | Zygophyllaceae | WOOD | 9 | Sp. Sassafras. Franzosen-Holz-Geist | Franzosen-Holz | Franzosen | Syphilis | INT | GYN |
| - | Animal | - | 10 | Sp. Lumbri- corum, Regenwürmer-Geist | Regenwürmer (Gemeine Regenwurm) | gegen Krampf | Against cramp (skurcz) | EXT | MUSK |
| - | Animal | - | 10 | Sp. Lumbri- corum, Regenwürmer-Geist | Regenwürmer (Gemeine Regenwurm) | gegen Gebrechen der Nerven | Against nerve ailments | EXT | NERV |
| - | Animal | - | 10 | Sp. Lumbri- corum, Regenwürmer-Geist | Regenwürmer (Gemeine Regenwurm) | gegen die Schlagflüss gerühmet | Against stroke | INT | NERV |
| - | Animal | - | 10 | Sp. Lumbri- corum, Regenwürmer-Geist | Regenwürmer (Gemeine Regenwurm) | gegen die Schmerzlaufende Gicht | Against the painful gout | EXT | MUSK |
| - | Animal | - | 10 | Sp. Lumbri- corum, Regenwürmer-Geist | Regenwürmer (Gemeine Regenwurm) | hat eine Schmerzstillende Kraft | Antiphlogistic | INT | FEV |
| - | Animal | - | 10 | Sp. Lumbri- corum, Regenwürmer-Geist | Regenwürmer (Gemeine Regenwurm) | treibt Schweiß | Diaphoretic | INT | DIAPH |
| - | Animal | - | 10 | Sp. Lumbri- corum, Regenwürmer-Geist | Regenwürmer (Gemeine Regenwurm) | treibt Harn | Diuretic | INT | URO |
| - | Animal | - | 10 | Sp. Lumbri- corum, Regenwürmer-Geist | Regenwürmer (Gemeine Regenwurm) | Reissen in Gliedern | Rheumatism | EXT | MUSK |
| - | Animal | - | 11 | Sp. Viperarum, Nattergräten-Geist | Nattergräten | vor toller Hunde und giftiger Thiere Biss | Against bites of mad dogs and poisonous animals | INT | ANTI |
| - | Animal | - | 11 | Sp. Viperarum, Nattergräten-Geist | Nattergräten | vor toller Hunde und giftiger Thiere Biss | Against bites of mad dogs and poisonous animals | EXT | ANTI |
| - | Animal | - | 11 | Sp. Viperarum, Nattergräten-Geist | Nattergräten | hitzi- gen Fiebern | High fevers | INT | FEV |
| - | Animal | - | 11 | Sp. Viperarum, Nattergräten-Geist | Nattergräten | hitzi- gen Fiebern | High fevers | EXT | FEV |
| <i>Carlina acaulis</i> L. | Asteraceae | SUBT | 12 | Allgem. Bezoar. Tinct. - Nach Krummhübel Art. | Eberwurzel | - | - | - | - |
| <i>Cinnamomum camphora</i> (L.) J.Presl | Lauraceae | OIL | 12 | Allgem. Bezoar. Tinct. - Nach Krummhübel Art. | Campfer | - | - | - | - |
| <i>Dorstenia contrajena</i> L. | Moraceae | SUBT | 12 | Allgem. Bezoar. Tinct. - Nach Krummhübel | Ra. Bezoardica alba | - | - | - | - |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Aliment | Ailment_interpretation | Mode | Category |
|--|------------------|------|---------------|--|--------------------|--|---|------|----------|
| <i>Petasites</i> sp. | Asteraceae | SUBT | 12 | Allgem. Bezoar. Tinct. - Nach Krummhübler Art. | Pestilenzwurzel | - | - | - | - |
| <i>Peucedanum ostruthium</i> (L.) W.D.J.Koch | Apiaceae | SUBT | 12 | Allgem. Bezoar. Tinct. - Nach Krummhübler Art. | Meistenwurzel | - | - | - | - |
| <i>Pericaria bistorta</i> (L.) Samp. = <i>Polygonum bistorta</i> L. | Polygonaceae | SUBT | 12 | Allgem. Bezoar. Tinct. - Nach Krummhübler Art. | Ottenwurzel | - | - | - | - |
| - | Inorganic | - | 13 | Mixtura siplex | Sp. Nitri | - | - | - | - |
| - | Inorganic | - | 13 | Mixtura siplex | Sp. Tartari | - | - | - | - |
| - | Animal | - | 14 | Tinctura Castori, Bibergeil-Tinctur | Bibergeil | allen Mutterbeschwerden | Postpartum discomfort | INT | NERV |
| - | Animal | - | 14 | Tinctura Castori, Bibergeil-Tinctur | Bibergeil | allen Mutterbeschwerden | Postpartum discomfort | INT | GYN |
| <i>Pterocarpus santalinus</i> L. fil. | Fabaceae | HERB | 14 | Tinctura Castori, Bibergeil-Tinctur | rothen Sandel | allen Mutterbeschwerden | Postpartum discomfort | INT | GYN |
| <i>Pterocarpus santalinus</i> L. fil. | Fabaceae | HERB | 14 | Tinctura Castori, Bibergeil-Tinctur | rothen Sandel | allen Mutterbeschwerden | postpartum discomfort | INT | NERV |
| <i>Ferula assa-foetida</i> L. | Apiaceae | - | 15 | Ess. Asha foetida, Teufelsdreck-Essenz | Gummi asha foetida | - | - | EXT | - |
| <i>Ferula assa-foetida</i> L. | Apiaceae | EXUD | 15 | Ess. Asha foetida, Teufelsdreck-Essenz | Gummi asha foetida | dienet vor Milz | Spleen | INT | CARD |
| <i>Ferula assa-foetida</i> L. | Apiaceae | EXUD | 15 | Ess. Asha foetida, Teufelsdreck-Essenz | Gummi asha foetida | dienet vor Mutter | Uterus | INT | GYN |
| - | Animal | - | 16 | Ess. Castor, Bibergeil- Essenz | Bibergeil | stillet die Mutterbeschwerung und das böse Wesen | Calms down postpartum discomfort including depression | INT | NERV |
| - | Animal | - | 16 | Ess. Castor, Bibergeil- Essenz | Bibergeil | stillet die Mutterbeschwerung und das böse Wesen | Calms down postpartum discomfort including depression | INT | GYN |
| - | Animal | - | 16 | Ess. Castor, Bibergeil- Essenz | Bibergeil | curriret den Schlag | Heals stroke | INT | NERV |
| - | Inorganic | - | 17 | Schwarzenberger Gnad und Lebens- Balsam | Bals. Sulphur | viele Tugenden beygelegt werden | It has many advantages | - | - |
| ? | Organic | - | 17 | Schwarzenberger Gnad und Lebens- | Oleum Petrae | viele Tugenden beygelegt werden | It has many advantages | - | - |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Aliment | Ailment_interpretation | Mode | Category |
|--|------------------|------|---------------|--|------------------------------------|---|--|------|----------|
| ? | ? | EXUD | 17 | Balsam Schwarzenberger Gnad und Lebens-Balsam | Oleum Ther[e]bjinth. | viele Tugenden beygelegt werden | It has many advantages | - | - |
| ? | ? | EXUD | 17 | Schwarzenberger Gnad und Lebens-Balsam | Ol. Succini | viele Tugenden beygelegt werden | It has many advantages | - | - |
| <i>Juniperus</i> spp. | Cupressaceae | EXUD | 17 | Schwarzenberger Gnad und Lebens-Balsam | Oleum Juniperi | viele Tugenden beygelegt werden | It has many advantages | - | - |
| ? | ? | EXUD | 18 | Engl. Balsam | Venetian Therebinth. | - | - | - | - |
| <i>Angelica</i> spp. | Apiaceae | HERB | 18 | Engl. Balsam | Angelica | - | - | - | - |
| <i>Cinnamomum veurum</i> J.Presl | Lauraceae | BARK | 18 | Engl. Balsam | Zimmt (Zimt) | - | - | - | - |
| <i>Citrus limon</i> (L.) Osbeck | Rutaceae | FRU | 18 | Engl. Balsam | Citronschaal | - | - | - | - |
| <i>Citrus</i> spp. | Rutaceae | FRU | 18 | Engl. Balsam | Pomeranzenschaal | - | - | - | - |
| <i>Elettaria cardamomum</i> (L.) Maton | Zingiberaceae | HERB | 18 | Engl. Balsam | Cardemome | - | - | - | - |
| <i>Foeniculum vulgare</i> Mill. | Apiaceae | HERB | 18 | Engl. Balsam | Fenchel | - | - | - | - |
| <i>Indigofera</i> spp. | Fabaceae | HERB | 18 | Engl. Balsam | Balsam Indigo | - | - | - | - |
| <i>Inula helenium</i> L. | Asteraceae | HERB | 18 | Engl. Balsam | Alant | - | - | - | - |
| <i>Juniperus</i> spp. | Cupressaceae | HERB | 18 | Engl. Balsam | Wacholder | - | - | - | - |
| <i>Laurus nobilis</i> L. | Lauraceae | HERB | 18 | Engl. Balsam | Loorbeer | - | - | - | - |
| <i>Lavandula</i> spp. | Lamiaceae | HERB | 18 | Engl. Balsam | Lavendel | - | - | - | - |
| <i>Melissa officinalis</i> L. | Lamiaceae | HERB | 18 | Engl. Balsam | Melisse | - | - | - | - |
| <i>Mentha aquatica</i> L. var. <i>crispa</i> (L.) Benth. | Lamiaceae | HERB | 18 | Engl. Balsam | Krausemünze | - | - | - | - |
| <i>Myristica fragrans</i> Houtt. | Myristicaceae | FLOW | 18 | Engl. Balsam | Muscat-Blüthen | - | - | - | - |
| <i>Pimpinella anisum</i> L. | Apiaceae | HERB | 18 | Engl. Balsam | Anis | - | - | - | - |
| <i>Rosmarinus officinalis</i> L. | Lamiaceae | FLOW | 18 | Engl. Balsam | Rosmarin-Blüthen | - | - | - | - |
| <i>Syzygium aromaticum</i> (L.) Merr. & L.M.Perry | Myrtaceae | HERB | 18 | Engl. Balsam | Nelcken | - | - | - | - |
| - | Mineral | - | 19 | Ol. Phylloporum seu Laterinum, Ziegel-Oel | neue Ziegel in Feuer recht glühend | erweicht und hat in harten Geschwulsten vortrefflichen Nutzen | Softens and has excellent benefits in hard tumours | EXT | DERM |
| <i>Linum usitatissimum</i> L. | Linaceae | OIL | 19 | Ol. Phylloporum seu Laterinum, Ziegel- | Oleum Lini od. Leinöl | erweicht und hat in harten Geschwulsten vortrefflichen | Softens and has excellent benefits in hard | EXT | DERM |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Alliment | Ailment_interpretation | Mode | Category |
|---|------------------|------|---------------|------------------------------------|-----------------|--|-------------------------------------|------|----------|
| | | | | Oel | | Nutzen | tumours | | |
| <i>Copaifera officinalis</i> L. | Fabaceae | EXUD | 20 | Balsamus Copeive | Copeive | gegen den Tripper | Against gonorrhoea | INT | GYN |
| <i>Copaifera officinalis</i> L. | Fabaceae | EXUD | 20 | Balsamus Copeive | Copeive | gegen den Tripper | Against gonorrhoea | INT | ANDR |
| <i>Copaifera officinalis</i> L. | Fabaceae | EXUD | 20 | Balsamus Copeive | Copeive | gegen Saamenfluss | Against nocturnal emission | INT | ANDR |
| <i>Copaifera officinalis</i> L. | Fabaceae | EXUD | 20 | Balsamus Copeive | Copeive | gegen die Franzosen gerühmet | Against syphilis | INT | ANDR |
| <i>Copaifera officinalis</i> L. | Fabaceae | EXUD | 20 | Balsamus Copeive | Copeive | gegen die Franzosen gerühmet | Against syphilis | INT | GYN |
| <i>Copaifera officinalis</i> L. | Fabaceae | EXUD | 20 | Balsamus Copeive | Copeive | gegen brennenden Harn | Dysuria or painful urination | INT | URO |
| <i>Copaifera officinalis</i> L. | Fabaceae | EXUD | 20 | Balsamus Copeive | Copeive | in allen äusserlichen und innerlichen Verwundungen | In all external and internal wounds | EXT | DERM |
| <i>Copaifera officinalis</i> L. | Fabaceae | EXUD | 20 | Balsamus Copeive | Copeive | in allen äusserlichen und innerlichen Verwundungen | In all external and internal wounds | INT | OTH |
| <i>Copaifera officinalis</i> L. | Fabaceae | EXUD | 20 | Balsamus Copeive | Copeive | Steinschmerzen | Lithiasis | INT | GAST |
| <i>Copaifera officinalis</i> L. | Fabaceae | EXUD | 20 | Balsamus Copeive | Copeive | Steinschmerzen | Lithiasis | INT | URO |
| <i>Copaifera officinalis</i> L. | Fabaceae | EXUD | 20 | Balsamus Copeive | Copeive | Lungensucht | Tuberculosis | INT | RESP |
| <i>Myroxylon balsamum</i> (L.) Harms | Fabaceae | EXUD | 21 | Balsam Opo | - | vor langwieriges Keuchen | Against protracted wheezing | INT | RESP |
| <i>Myroxylon balsamum</i> (L.) Harms | Fabaceae | EXUD | 21 | Balsam Opo | - | heilet frische Wunden | Heals fresh wounds | EXT | DERM |
| <i>Myroxylon balsamum</i> (L.) Harms | Fabaceae | EXUD | 21 | Balsam Opo | - | dient zur Schwind- und Lungensucht | Tuberculosis | INT | RESP |
| <i>Citrus limon</i> (L.) Osbeck | Rutaceae | FRU | 22 | Kayserl. und Königl. Lebens-Pulver | Zitronenschalen | - | - | - | - |
| <i>Drimys winteri</i> J.R. Forst. & G. Forst. | Winteraceae | HERB | 22 | Kayserl. und Königl. Lebens-Pulver | weiss Zimmt | - | - | - | - |
| <i>Foeniculum vulgare</i> Mill. | Apiaceae | HERB | 22 | Kayserl. und Königl. Lebens-Pulver | Fenchel | - | - | - | - |
| <i>Glycyrrhiza glabra</i> L. | Fabaceae | HERB | 22 | Kayserl. und Königl. Lebens-Pulver | Süssholz | - | - | - | - |
| <i>Inula helenium</i> L. | Asteraceae | HERB | 22 | Kayserl. und Königl. Lebens-Pulver | Alant | - | - | - | - |
| <i>Pimpinella anisum</i> L. | Apiaceae | HERB | 22 | Kayserl. und Königl. Lebens-Pulver | Anis | - | - | - | - |
| <i>Coriandrum sativum</i> L. | Apiaceae | HERB | 23 | Fein Schwarzenberger | Coriander | - | - | - | - |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Vernacular | Alliment | Ailment_interpretation | Mode | Category |
|--|------------------|------|---------------|--|-----------------------------|-------------------------|------|----------|
| <i>Foeniculum vulgare</i> Mill. | Apiaceae | HERB | 23 | Haupt-Pulver Fein Schwarzenberger Fenchel Haupt-Pulver | - | - | - | - |
| <i>Helleborus niger</i> L. | Ranunculaceae | HERB | 23 | Fein Schwarzenberger Niesewurzel Haupt-Pulver | - | - | - | - |
| <i>Lavandula</i> spp. | Lamiaceae | HERB | 23 | Fein Schwarzenberger Lavendel Haupt-Pulver | - | - | - | - |
| <i>Origanum majorana</i> L. | Lamiaceae | HERB | 23 | Fein Schwarzenberger Majoran Haupt-Pulver | - | - | - | - |
| <i>Pimpinella anisum</i> L. | Apiaceae | HERB | 23 | Fein Schwarzenberger Anis Haupt-Pulver | - | - | - | - |
| <i>Pulicaria vulgaris</i> Gaertn. | Asteraceae | HERB | 23 | Fein Schwarzenberger Cristinekraut Haupt-Pulver | - | - | - | - |
| - | Fungus | - | 24 | Wurm-Pulver Lerchenschwamm | Wurm | Anthelmintic | INT | PARA |
| - | Animal | - | 24 | Wurm-Pulver roth und weisse Korallen | Wurm | Anthelmintic | INT | PARA |
| Aloë spp. | Asphodelaceae | HERB | 24 | Wurm-Pulver Aloes | Wurm | Anthelmintic | INT | PARA |
| <i>Curcuma zedoaria</i> (Christm.) Roscoe | Zingiberaceae | SEED | 24 | Wurm-Pulver Zitwersamen | Wurm | Anthelmintic | INT | PARA |
| <i>Dictamnus albus</i> L. | Rutaceae | HERB | 24 | Wurm-Pulver weiss Diptam W. | Wurm | Anthelmintic | INT | PARA |
| <i>Senna</i> spp. | Fabaceae | LEAF | 24 | Wurm-Pulver Sennes-Blätter | Wurm | Anthelmintic | INT | PARA |
| <i>Viola</i> spp. | Violaceae | SUBT | 24 | Wurm-Pulver Viol. Wurzel | Wurm | Anthelmintic | INT | PARA |
| - | Mineral | - | 25 | Zahn-Pulver Bimstein | benimmt Scharbock | Against scurvy | EXT | MUSK |
| - | Mineral | - | 25 | Zahn-Pulver gebrannt Alaun | benimmt Scharbock | Against scurvy | EXT | MUSK |
| - | Mineral | - | 25 | Zahn-Pulver Bimstein | benimmt Mundfäule | Against stomatitis | EXT | ORAL |
| - | Mineral | - | 25 | Zahn-Pulver gebrannt Alaun | benimmt Mundfäule | Against stomatitis | EXT | ORAL |
| - | Mineral | - | 25 | Zahn-Pulver Bimstein | schwarze Zähne werden weiß | Black teeth turn white | EXT | ORAL |
| - | Mineral | - | 25 | Zahn-Pulver gebrannt Alaun | schwarze Zähne werden weiß | Black teeth turn white | EXT | ORAL |
| - | Mineral | - | 25 | Zahn-Pulver Bimstein | macht wackelnde Zähne feste | Makes wobbly teeth firm | EXT | ORAL |
| - | Mineral | - | 25 | Zahn-Pulver gebrannt Alaun | macht wackelnde Zähne feste | Makes wobbly teeth firm | EXT | ORAL |
| <i>Anacyclus pyrethrum</i> (L.) Lag. = <i>Anacyclus officinarum</i> Hayne | Asteraceae | SUBT | 25 | Zahn-Pulver Bertran Wurzel | benimmt Scharbock | Against scurvy | EXT | MUSK |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Aliment | Ailment_interpretation | Mode | Category |
|---|------------------|------|---------------|------------------------------------|--------------------|-----------------------------|-------------------------|------|----------|
| <i>Anacyclus pyrethrum</i> (L.) Lag. = <i>Anacyclus officinarum</i> Hayne | Asteraceae | SUBT | 25 | Zahn-Pulver | Bertran Wurzel | benimmt Mundfäule | Against stomatitis | EXT | ORAL |
| <i>Anacyclus pyrethrum</i> (L.) Lag. = <i>Anacyclus officinarum</i> Hayne | Asteraceae | SUBT | 25 | Zahn-Pulver | Bertran Wurzel | schwarze Zähne werden weiß | Black teeth turn white | EXT | ORAL |
| <i>Anacyclus pyrethrum</i> (L.) Lag. = <i>Anacyclus officinarum</i> Hayne | Asteraceae | SUBT | 25 | Zahn-Pulver | Bertran Wurzel | macht wackelnde Zähne feste | Makes wobbly teeth firm | EXT | ORAL |
| <i>Myristica fragrans</i> Houtt. | Myristicaceae | FLOW | 25 | Zahn-Pulver | Muscat-Blüthen | benimmt Scharbock | Against scurvy | EXT | MUSK |
| <i>Myristica fragrans</i> Houtt. | Myristicaceae | FLOW | 25 | Zahn-Pulver | Muscat-Blüthen | benimmt Mundfäule | Against stomatitis | EXT | ORAL |
| <i>Myristica fragrans</i> Houtt. | Myristicaceae | FLOW | 25 | Zahn-Pulver | Muscat-Blüthen | schwarze Zähne werden weiß | Black teeth turn white | EXT | ORAL |
| <i>Myristica fragrans</i> Houtt. | Myristicaceae | FLOW | 25 | Zahn-Pulver | Muscat-Blüthen | macht wackelnde Zähne feste | Makes wobbly teeth firm | EXT | ORAL |
| <i>Nasturtium officinale</i> R.Br. | Brassicaceae | HERB | 25 | 08 | Brunnenkresse | benimmt Scharbock | Against scurvy | EXT | MUSK |
| <i>Nasturtium officinale</i> R.Br. | Brassicaceae | HERB | 25 | Zahn-Pulver | Brunnenkresse | benimmt Mundfäule | Against stomatitis | EXT | ORAL |
| <i>Nasturtium officinale</i> R.Br. | Brassicaceae | HERB | 25 | Zahn-Pulver | Brunnenkresse | schwarze Zähne werden weiß | Black teeth turn white | EXT | ORAL |
| <i>Nasturtium officinale</i> R.Br. | Brassicaceae | HERB | 25 | Zahn-Pulver | Brunnenkresse | macht wackelnde Zähne feste | Makes wobbly teeth firm | EXT | ORAL |
| <i>Syzygium aromaticum</i> (L.) Merr. & L.M.Pery | Myrtaceae | HERB | 25 | Zahn-Pulver | Nelcken | benimmt Scharbock | Against scurvy | EXT | MUSK |
| <i>Syzygium aromaticum</i> (L.) Merr. & L.M.Pery | Myrtaceae | HERB | 25 | Zahn-Pulver | Nelcken | benimmt Mundfäule | Against stomatitis | EXT | ORAL |
| <i>Syzygium aromaticum</i> (L.) Merr. & L.M.Pery | Myrtaceae | HERB | 25 | Zahn-Pulver | Nelcken | schwarze Zähne werden weiß | Black teeth turn white | EXT | ORAL |
| <i>Syzygium aromaticum</i> (L.) Merr. & L.M.Pery | Myrtaceae | HERB | 25 | Zahn-Pulver | Nelcken | macht wackelnde Zähne feste | Makes wobbly teeth firm | EXT | ORAL |
| - | Animal | - | 26 | Recept von einem besonderen Elixir | Biebergeil | In pest | Against plague | INT | NERV |
| - | Animal | - | 26 | Recept von einem besonderen Elixir | Biebergeil | In pest | Against plague | INT | RESP |
| - | Fungus | - | 26 | Recept von einem besonderen Elixir | Lerchenschwamm | In pest | Against plague | INT | NERV |
| - | Mineral | - | 26 | Recept von einem besonderen Elixir | Terra Sigill | In pest | Against plague | INT | NERV |
| - | Mineral | - | 26 | Recept von einem besonderen Elixir | Potaschen (potash) | In pest | Against plague | INT | NERV |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Vernacular | Aliment | Ailment_interpretation | Mode | Category |
|-------------|------------------|------|---------------|---|-----------------------------|--------------------------------|------|----------|
| - | Fungus | - | 26 | besonderen Elixir Recept von einem besonderen Elixir | In pest | Against plague | INT | RESP |
| - | Mineral | - | 26 | Terra Sigill Recept von einem besonderen Elixir | In pest | Against plague | INT | RESP |
| - | Mineral | - | 26 | Potaschen (potash) Recept von einem besonderen Elixir | In pest | Against plague | INT | RESP |
| - | Animal | - | 26 | Biebergeil Recept von einem besonderen Elixir | herrl. Magen-Essenz | Against stomach problems | INT | GAST |
| - | Fungus | - | 26 | Recept von einem besonderen Elixir | herrl. Magen-Essenz | Against stomach problems | INT | GAST |
| - | Mineral | - | 26 | Terra Sigill Recept von einem besonderen Elixir | herrl. Magen-Essenz | Against stomach problems | INT | GAST |
| - | Mineral | - | 26 | Potaschen (potash) Recept von einem besonderen Elixir | herrl. Magen-Essenz | Against stomach problems | INT | GAST |
| - | Animal | - | 26 | Biebergeil Recept von einem besonderen Elixir | Praeservativ vor alle Gifte | Protection against all poisons | INT | ANTI |
| - | Fungus | - | 26 | Recept von einem besonderen Elixir | Praeservativ vor alle Gifte | Protection against all poisons | INT | ANTI |
| - | Mineral | - | 26 | Terra Sigill Recept von einem besonderen Elixir | Praeservativ vor alle Gifte | Protection against all poisons | INT | ANTI |
| - | Mineral | - | 26 | Potaschen (potash) Recept von einem besonderen Elixir | Praeservativ vor alle Gifte | Protection against all poisons | INT | ANTI |
| ? | ? | ? | 26 | Theriac [as antidote to poisons, especially on viper venom] Recept von einem besonderen Elixir | In pest | Against plague | INT | NERV |
| ? | ? | ? | 26 | Theriac [as antidote to poisons, especially on viper venom] Recept von einem besonderen Elixir | In pest | Against plague | INT | RESP |
| ? | ? | ? | 26 | Theriac [as antidote to poisons, especially on viper venom] Recept von einem besonderen Elixir | herrl. Magen-Essenz | Against stomach problems | INT | GAST |
| ? | ? | ? | 26 | Theriac [as antidote to poisons, especially on viper venom] Recept von einem besonderen Elixir | Praeservativ vor alle Gifte | Protection against all poisons | INT | ANTI |
| Aloë spp. | Asphodelaceae | HERB | 26 | Aloe Recept von einem besonderen Elixir | In pest | Against plague | INT | NERV |
| Aloë spp. | Asphodelaceae | HERB | 26 | Aloe Recept von einem besonderen Elixir | In pest | Against plague | INT | RESP |
| Aloë spp. | Asphodelaceae | HERB | 26 | Aloe Recept von einem besonderen Elixir | herrl. Magen-Essenz | Against stomach problems | INT | GAST |
| Aloë spp. | Asphodelaceae | HERB | 26 | Aloe Recept von einem besonderen Elixir | Praeservativ vor alle Gifte | Protection against all poisons | INT | ANTI |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Vernacular | Alliment | Ailment_interpretation | Mode | Category |
|---|------------------|------|---------------|---|-----------------------------|--------------------------------|------|----------|
| <i>Angelica</i> spp. | Apiaceae | HERB | 26 | besonderen Elixir Recept von einem besonderen Elixir | In pest | poisons Against plague | INT | NERV |
| <i>Angelica</i> spp. | Apiaceae | HERB | 26 | Recept von einem besonderen Elixir | In pest | Against plague | INT | RESP |
| <i>Angelica</i> spp. | Apiaceae | HERB | 26 | Recept von einem besonderen Elixir | herrl. Magen-Essenz | Against stomach problems | INT | GAST |
| <i>Angelica</i> spp. | Apiaceae | HERB | 26 | Recept von einem besonderen Elixir | Praeservativ vor alle Gifte | Protection against all poisons | INT | ANTI |
| <i>Cinnamomum camphora</i> (L.) J.Presl | Lauraceae | OIL | 26 | Recept von einem besonderen Elixir | In pest | Against plague | INT | NERV |
| <i>Cinnamomum camphora</i> (L.) J.Presl | Lauraceae | OIL | 26 | Recept von einem besonderen Elixir | In pest | Against plague | INT | RESP |
| <i>Cinnamomum camphora</i> (L.) J.Presl | Lauraceae | OIL | 26 | Recept von einem besonderen Elixir | herrl. Magen-Essenz | Against stomach problems | INT | GAST |
| <i>Cinnamomum camphora</i> (L.) J.Presl | Lauraceae | OIL | 26 | Recept von einem besonderen Elixir | Praeservativ vor alle Gifte | Protection against all poisons | INT | ANTI |
| <i>Commiphora</i> spp. | Burseraceae | EXUD | 26 | Recept von einem besonderen Elixir | In pest | Against plague | INT | NERV |
| <i>Commiphora</i> spp. | Burseraceae | EXUD | 26 | Recept von einem besonderen Elixir | In pest | Against plague | INT | RESP |
| <i>Commiphora</i> spp. | Burseraceae | EXUD | 26 | Recept von einem besonderen Elixir | herrl. Magen-Essenz | Against stomach problems | INT | GAST |
| <i>Commiphora</i> spp. | Burseraceae | EXUD | 26 | Recept von einem besonderen Elixir | Praeservativ vor alle Gifte | Protection against all poisons | INT | ANTI |
| <i>Curcuma zedoaria</i> (Christm.) Roscoe | Zingiberaceae | SUBT | 26 | Recept von einem besonderen Elixir | In pest | Against plague | INT | NERV |
| <i>Curcuma zedoaria</i> (Christm.) Roscoe | Zingiberaceae | SUBT | 26 | Recept von einem besonderen Elixir | In pest | Against plague | INT | RESP |
| <i>Curcuma zedoaria</i> (Christm.) Roscoe | Zingiberaceae | SUBT | 26 | Recept von einem besonderen Elixir | herrl. Magen-Essenz | Against stomach problems | INT | GAST |
| <i>Curcuma zedoaria</i> (Christm.) Roscoe | Zingiberaceae | SUBT | 26 | Recept von einem besonderen Elixir | Praeservativ vor alle Gifte | Protection against all poisons | INT | ANTI |
| <i>Dictamnus albus</i> L. | Rutaceae | HERB | 26 | Recept von einem besonderen Elixir | In pest | Against plague | INT | RESP |
| <i>Dictamnus albus</i> L. | Rutaceae | HERB | 26 | Recept von einem besonderen Elixir | In pest | Against plague | INT | NERV |
| <i>Dictamnus albus</i> L. | Rutaceae | HERB | 26 | Recept von einem besonderen Elixir | herrl. Magen-Essenz | Against stomach | INT | GAST |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Vernacular | Aliment | Ailment_interpretation | Mode | Category |
|---|------------------|------|---------------|---------------------------------------|---|--|------|----------|
| <i>Dictamnus albus</i> L. | Rutaceae | HERB | 26 | Weiss Diptam | Präservativ vor alle Gifte | problems Protection against all poisons | INT | ANTI |
| <i>Gentiana</i> spp. | Gentianaceae | HERB | 26 | Entian | In pest | Against plague | INT | NERV |
| <i>Gentiana</i> spp. | Gentianaceae | HERB | 26 | Entian | In pest | Against plague | INT | RESP |
| <i>Gentiana</i> spp. | Gentianaceae | HERB | 26 | Entian | herrl. Magen-Essenz | Against stomach problems | INT | GAST |
| <i>Gentiana</i> spp. | Gentianaceae | HERB | 26 | Entian | Präservativ vor alle Gifte | Protection against all poisons | INT | ANTI |
| <i>Potentilla erecta</i> (L.) Rausch. | Rosaceae | SUBT | 26 | Tormentille | In pest | Against plague | INT | NERV |
| <i>Potentilla erecta</i> (L.) Rausch. | Rosaceae | SUBT | 26 | Tormentille | In pest | Against plague | INT | RESP |
| <i>Potentilla erecta</i> (L.) Rausch. | Rosaceae | SUBT | 26 | Tormentille | herrl. Magen-Essenz | Against stomach problems | INT | GAST |
| <i>Potentilla erecta</i> (L.) Rausch. | Rosaceae | SUBT | 26 | Tormentille | Präservativ vor alle Gifte | Protection against all poisons | INT | ANTI |
| <i>Rheum rhabarbarum</i> L. | Polygonaceae | HERB | 26 | Rhabarbara | In pest | Against plague | INT | NERV |
| <i>Rheum rhabarbarum</i> L. | Polygonaceae | HERB | 26 | Rhabarbara | In pest | Against plague | INT | RESP |
| <i>Rheum rhabarbarum</i> L. | Polygonaceae | HERB | 26 | Rhabarbara | herrl. Magen-Essenz | Against stomach problems | INT | GAST |
| <i>Rheum rhabarbarum</i> L. | Polygonaceae | HERB | 26 | Rhabarbara | Präservativ vor alle Gifte | Protection against all poisons | INT | ANTI |
| – | Mineral | – | 27 | Arcanum duplicatum | Krampf | Antispasmodic | INT | MUSK |
| – | Mineral | – | 27 | Antimon daphoreticum | Krampf | Antispasmodic | INT | MUSK |
| – | Mineral | – | 27 | Tartarus vitriolatus | Krampf | Antispasmodic | INT | MUSK |
| – | Mineral | – | 27 | Cinabar antimon | Krampf | Antispasmodic | INT | MUSK |
| <i>Cinnamomum camphora</i> (L.) J.Presl | Lauraceae | OIL | 28 | Theriac oder Mithridat Campher | Theriac [as antidote to poisons, especially on viper venom] | Antidote | INT | ANTI |
| <i>Juniperus</i> spp. | Cupressaceae | EXUD | 28 | Theriac oder Mithridat Jochandel-Saft | Theriac [as antidote to poisons, especially on viper venom] | Antidote | INT | ANTI |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Aliment | Ailment_interpretation | Mode | Category |
|-----------------------------------|------------------|------|---------------|--|----------------|---|------------------------|------|----------|
| <i>Laurus nobilis</i> L. | Lauraceae | HERB | 28 | Theriac oder Mithridat | Lorbeere | Theriac [as antidote to poisons, especially on viper venom] | Antidote | INT | ANTI |
| <i>Piper longum</i> L. | Piperaceae | SEED | 28 | Theriac oder Mithridat | langen Pfeffer | Theriac [as antidote to poisons, especially on viper venom] | Antidote | INT | ANTI |
| <i>Zingiber officinale</i> Roscoe | Zingiberaceae | SUBT | 28 | Theriac oder Mithridat | Ingwer | Theriac [as antidote to poisons, especially on viper venom] | Antidote | INT | ANTI |
| <i>Coriandrum sativum</i> L. | Apiaceae | HERB | 29 | Aqua Hungarica, Schlagwasser | Coriander | - | - | - | - |
| <i>Rosmarinus officinalis</i> L. | Lamiaceae | HERB | 29 | Aqua Hungarica, Schlagwasser | Rosmarin | - | - | - | - |
| - | Animal | - | 30 | Scorpion-Oel | Scorpione | - | - | - | - |
| <i>Olea europaea</i> L. | Oleaceae | EXUD | 30 | Scorpion-Oel | Baumöl | - | - | - | - |
| - | Animal | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Cornu Cervi | Pestilenz | Against plague | INT | NERV |
| - | Animal | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Cornu Cervi | Pestilenz | Against plague | INT | RESP |
| - | Mineral | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Salz | Pestilenz | Against plague | INT | NERV |
| - | Mineral | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Salz | Pestilenz | Against plague | INT | RESP |
| - | linctura | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Sp. Vini | Pestilenz | Against plague | INT | NERV |
| - | Tinctura | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Sp. Vini | Pestilenz | Against plague | INT | RESP |
| - | Mineral | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Salz | Suchen | Epidemics | INT | - |
| - | Animal | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Cornu Cervi | Suchen | Epidemics | INT | - |
| - | Tinctura | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Sp. Vini | Suchen | Epidemics | INT | - |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Aliment | Ailment_interpretation | Mode | Category |
|-------------|------------------|------|---------------|--|---|--------------------------------------|------------------------|------|----------|
| - | Animal | - | 31 | Cervi, Flüchtig, Hirschhorn-Salz | Cornu Cervi | trefflich Schweissstreibendes Mittel | Excellent diaphoretic | INT | DIAPH |
| - | Mineral | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Salz | trefflich Schweissstreibendes Mittel | Excellent diaphoretic | INT | DIAPH |
| - | Tinctura | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Sp. Vini | trefflich Schweissstreibendes Mittel | Excellent diaphoretic | INT | DIAPH |
| - | Animal | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Cornu Cervi | Fiebern | Fevers | INT | FEV |
| - | Mineral | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Salz | Fiebern | Fevers | INT | FEV |
| - | Tinctura | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Sp. Vini | Fiebern | Fevers | INT | FEV |
| - | Animal | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Cornu Cervi | Hauptschmerzen | Headache | INT | NERV |
| - | Mineral | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Salz | Hauptschmerzen | Headache | INT | NERV |
| - | Tinctura | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Sp. Vini | Hauptschmerzen | Headache | INT | NERV |
| - | Animal | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Cornu Cervi | Steck und Schlag-Flüssen | Prevents stroke | INT | NERV |
| - | Mineral | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Salz | Steck und Schlag-Flüssen | Prevents stroke | INT | NERV |
| - | Tinctura | - | 31 | Sal. volatile-Cornu Cervi, Flüchtig, Hirschhorn-Salz | Sp. Vini | Steck und Schlag-Flüssen | Prevents stroke | INT | NERV |
| - | Mineral | - | 32 | Schwarzenberger Heil- und Wundpflaster | Rubrick (as "Rubrica fabrilis (Rötel); bekannt war auch Siegelerde aus Striegau") | flüssigen alten Schäden | Healing old wounds | EXT | DERM |

Table 2 Compact list of the vascular plant uses described in "Die Laborant von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Vernacular | Aliment | Ailment_interpretation | Mode | Category |
|---|------------------|------|---------------|--|---|---------------------------|-----------------------|----------|
| - | Organic | - | 32 | Schwarzenberger Heil- und Wundpflaster | Wachs | flüssigen alten Schäden | Healing old wounds | EXT DERM |
| - | Mineral | - | 32 | Schwarzenberger Heil- und Wundpflaster | Rubrick [as "Rubrica fabrilis (Rötel); bekannt war auch Siegelerde aus Striegau"] | in allen hitzigen Schäden | In all types of burns | EXT DERM |
| - | Organic | - | 32 | Schwarzenberger Heil- und Wundpflaster | Wachs | in allen hitzigen Schäden | In all types of burns | EXT DERM |
| <i>Cinnamomum camphora</i> (L.) J.Presl | Lauraceae | OIL | 32 | Schwarzenberger Heil- und Wundpflaster | Campher | flüssigen alten Schäden | Healing old wounds | EXT DERM |
| <i>Cinnamomum camphora</i> (L.) J.Presl | Lauraceae | OIL | 32 | Schwarzenberger Heil- und Wundpflaster | Campher | in allen hitzigen Schäden | In all types of burns | EXT DERM |
| <i>Olea europaea</i> L. | Oleaceae | EXUD | 32 | Schwarzenberger Heil- und Wundpflaster | Baumöl | flüssigen alten Schäden | Healing old wounds | EXT DERM |
| <i>Olea europaea</i> L. | Oleaceae | EXUD | 32 | Schwarzenberger Heil- und Wundpflaster | Baumöl | in allen hitzigen Schäden | In all types of burns | EXT DERM |
| - | Mineral | - | 33 | Nürnberger Salben | Rubrick [as "Rubrica fabrilis (Rötel); bekannt war auch Siegelerde aus Striegau"] | flüssigen alten Schäden | Healing old wounds | EXT DERM |
| - | Organic | - | 33 | Nürnberger Salben | Wachs | flüssigen alten Schäden | Healing old wounds | EXT DERM |
| <i>Cinnamomum camphora</i> (L.) J.Presl | Lauraceae | OIL | 33 | Nürnberger Salben | Campher | flüssigen alten Schäden | Healing old wounds | EXT DERM |
| <i>Olea europaea</i> L. | Oleaceae | EXUD | 33 | Nürnberger Salben | Baumöl | flüssigen alten Schäden | Healing old wounds | EXT DERM |
| - | Animal | - | 34 | Grüne Waldsalbe | Bock-Insekt [as tallow goat] | heilet alle Wunden | Healing all wounds | EXT DERM |
| - | Organic | - | 34 | Grüne Waldsalbe | Wachs | heilet alle Wunden | Healing all wounds | EXT DERM |
| - | Organic | - | 34 | Grüne Waldsalbe | Grünsplan | heilet alle Wunden | Healing all wounds | EXT DERM |
| ? | ? | EXUD | 34 | Grüne Waldsalbe | Hartz [as resin] | heilet alle Wunden | Healing all wounds | EXT DERM |
| ? | ? | EXUD | 34 | Grüne Waldsalbe | Terpentin | heilet alle Wunden | Healing all wounds | EXT DERM |
| - | Inorganic | - | 35 | Oleum Montis, Berg-Oel | Balsam Sulphuris | - | - | - |
| - | Animal | - | 35 | Oleum Montis, Berg-Oel | Oleum Cornu Cervi | - | - | - |
| ? | ? | EXUD | 35 | Oleum Montis, Berg- | Oleum Therebinth | - | - | - |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Alliment | Ailment_interpretation | Mode | Category |
|---|------------------|------|---------------|------------------------------|-------------------|-----------------|---------------------------------------|------|----------|
| <i>Linum usitatissimum</i> L. | Linaceae | OIL | 35 | Oleum Montis, Berg-Oel | Oleum Lini | - | - | - | - |
| - | Animal | - | 36 | Franzosen-Oel, Oleum Cuajaci | Cornu Cervi | Franzosen | Syphilis | INT | GYN |
| - | Animal | - | 36 | Franzosen-Oel, Oleum Cuajaci | Cornu Cervi | Franzosen | Syphilis | INT | ANDR |
| <i>Guaiacum officinale</i> L. | Zygophyllaceae | OIL | 36 | Franzosen-Oel, Oleum Cuajaci | Oleum Guajaci | Franzosen | Syphilis | INT | ANDR |
| <i>Guaiacum officinale</i> L. | Zygophyllaceae | OIL | 36 | Franzosen-Oel, Oleum Cuajaci | Oleum Guajaci | Franzosen | Syphilis | INT | GYN |
| <i>Linum usitatissimum</i> L. | Linaceae | OIL | 36 | Franzosen-Oel, Oleum Cuajaci | Oleum Lini | Franzosen | Syphilis | INT | ANDR |
| <i>Linum usitatissimum</i> L. | Linaceae | OIL | 36 | Franzosen-Oel, Oleum Cuajaci | Oleum Lini | Franzosen | Syphilis | INT | GYN |
| <i>Achillea</i> spp. | Asteraceae | HERB | 37 | guthe Kräuter-Thee | Schaaafarben | Blutreinigung | Blood purification | INT | CARD |
| <i>Achillea</i> spp. | Asteraceae | HERB | 37 | guthe Kräuter-Thee | Schaaafarben | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Achillea</i> spp. | Asteraceae | HERB | 37 | guthe Kräuter-Thee | Schaaafarben | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Bellis perennis</i> L. | Asteraceae | FLOW | 37 | guthe Kräuter-Thee | Gänseblümel | Blutreinigung | Blood purification | INT | CARD |
| <i>Bellis perennis</i> L. | Asteraceae | FLOW | 37 | guthe Kräuter-Thee | Gänseblümel | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Bellis perennis</i> L. | Asteraceae | FLOW | 37 | guthe Kräuter-Thee | Gänseblümel | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Stachys officinalis</i> (L.) Trevis = <i>Betonica officinalis</i> L. | Lamiaceae | FLOW | 37 | guthe Kräuter-Thee | Betonien-Blumen | Blutreinigung | Blood purification | INT | CARD |
| <i>Stachys officinalis</i> (L.) Trevis = <i>Betonica officinalis</i> L. | Lamiaceae | FLOW | 37 | guthe Kräuter-Thee | Betonien-Blumen | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Stachys officinalis</i> (L.) Trevis = <i>Betonica officinalis</i> L. | Lamiaceae | FLOW | 37 | guthe Kräuter-Thee | Betonien-Blumen | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Cyanus segetum</i> Hill. = <i>Centaurea cyanus</i> L. | Asteraceae | HERB | 37 | guthe Kräuter-Thee | Kornblumen | Blutreinigung | Blood purification | INT | CARD |
| <i>Cyanus segetum</i> Hill. = <i>Centaurea cyanus</i> L. | Asteraceae | HERB | 37 | guthe Kräuter-Thee | Kornblumen | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Cyanus segetum</i> Hill. = <i>Centaurea cyanus</i> L. | Asteraceae | HERB | 37 | guthe Kräuter-Thee | Kornblumen | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Citrus xaurantium</i> L. | Rutaceae | FRU | 37 | guthe Kräuter-Thee | Pommeranzschaalen | Blutreinigung | Blood purification | INT | CARD |
| <i>Citrus xaurantium</i> L. | Rutaceae | FRU | 37 | guthe Kräuter-Thee | Pommeranzschaalen | Lungenreinigung | Cleansing the lungs | INT | RESP |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Aliment | Ailment_interpretation | Mode | Category |
|---|------------------|------|---------------|--------------------|------------------|-----------------|---------------------------------------|------|----------|
| <i>Citrus xaurantium</i> L. | Rutaceae | FRU | 37 | guthe Kräuter-Thee | Pommeranzschalen | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Citrus limon</i> (L.) Osbeck | Rutaceae | FRU | 37 | guthe Kräuter-Thee | Citron | Blutreinigung | Blood purification | INT | CARD |
| <i>Citrus limon</i> (L.) Osbeck | Rutaceae | FRU | 37 | guthe Kräuter-Thee | Citron | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Citrus limon</i> (L.) Osbeck | Rutaceae | FRU | 37 | guthe Kräuter-Thee | Citron | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Coriandrum sativum</i> L. | Apiaceae | HERB | 37 | guthe Kräuter-Thee | Coriander | Blutreinigung | Blood purification | INT | CARD |
| <i>Coriandrum sativum</i> L. | Apiaceae | HERB | 37 | guthe Kräuter-Thee | Coriander | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Coriandrum sativum</i> L. | Apiaceae | HERB | 37 | guthe Kräuter-Thee | Coriander | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Echium vulgare</i> L. | Boraginaceae | LEAF | 37 | guthe Kräuter-Thee | Natterblätter | Blutreinigung | Blood purification | INT | CARD |
| <i>Echium vulgare</i> L. | Boraginaceae | LEAF | 37 | guthe Kräuter-Thee | Natterblätter | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Echium vulgare</i> L. | Boraginaceae | LEAF | 37 | guthe Kräuter-Thee | Natterblätter | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Glycyrrhiza glabra</i> L. | Fabaceae | HERB | 37 | guthe Kräuter-Thee | Süßholz | Blutreinigung | Blood purification | INT | CARD |
| <i>Glycyrrhiza glabra</i> L. | Fabaceae | HERB | 37 | guthe Kräuter-Thee | Süßholz | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Glycyrrhiza glabra</i> L. | Fabaceae | HERB | 37 | guthe Kräuter-Thee | Süßholz | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Guaiacum sanctum</i> L. or <i>G. officinale</i> L. | Zygophyllaceae | WOOD | 37 | guthe Kräuter-Thee | Lignum Sanctum | Blutreinigung | Blood purification | INT | CARD |
| <i>Guaiacum sanctum</i> L. or <i>G. officinale</i> L. | Zygophyllaceae | WOOD | 37 | guthe Kräuter-Thee | Lignum Sanctum | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Guaiacum sanctum</i> L. or <i>G. officinale</i> L. | Zygophyllaceae | WOOD | 37 | guthe Kräuter-Thee | Lignum Sanctum | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Hedysarum</i> spp. | Fabaceae | HERB | 37 | guthe Kräuter-Thee | Süßen Klee | Blutreinigung | Blood purification | INT | CARD |
| <i>Hedysarum</i> spp. | Fabaceae | HERB | 37 | guthe Kräuter-Thee | Süßen Klee | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Hedysarum</i> spp. | Fabaceae | HERB | 37 | guthe Kräuter-Thee | Süßen Klee | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Matricaria</i> spp. | Asteraceae | HERB | 37 | guthe Kräuter-Thee | Camillen | Blutreinigung | Blood purification | INT | CARD |
| <i>Matricaria</i> spp. | Asteraceae | HERB | 37 | guthe Kräuter-Thee | Camillen | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Matricaria</i> spp. | Asteraceae | HERB | 37 | guthe Kräuter-Thee | Camillen | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Ononis spinosa</i> L. | Fabaceae | HERB | 37 | guthe Kräuter-Thee | Steinwurzel | Blutreinigung | Blood purification | INT | CARD |
| <i>Ononis spinosa</i> L. | Fabaceae | HERB | 37 | guthe Kräuter-Thee | Steinwurzel | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Ononis spinosa</i> L. | Fabaceae | HERB | 37 | guthe Kräuter-Thee | Steinwurzel | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Aliment | Ailment_interpretation | Mode | Category |
|---|------------------|------|---------------|--------------------|--|-----------------|---------------------------------------|------|----------|
| <i>Pulicaria vulgaris</i> Gaertn. | Asteraceae | HERB | 37 | guthe Kräuter-Thee | Cristinel-Kraut | Blutreinigung | respiratory tract | INT | CARD |
| <i>Pulicaria vulgaris</i> Gaertn. | Asteraceae | HERB | 37 | guthe Kräuter-Thee | Cristinel-Kraut | Lungenreinigung | Blood purification | INT | RESP |
| <i>Pulicaria vulgaris</i> Gaertn. | Asteraceae | HERB | 37 | guthe Kräuter-Thee | Cristinel-Kraut | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Pyrus</i> sp. | Rosaceae | FRU | 37 | guthe Kräuter-Thee | Kragel [as the common name of the old pear variety Kragel Birne] | Blutreinigung | Blood purification | INT | CARD |
| <i>Pyrus</i> sp. | Rosaceae | FRU | 37 | guthe Kräuter-Thee | Kragel [as the common name of the old pear variety Kragel Birne] | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Pyrus</i> sp. | Rosaceae | FRU | 37 | guthe Kräuter-Thee | Kragel [as the common name of the old pear variety Kragel Birne] | Brustreinigung | cleansing the upper respiratory tract | INT | RESP |
| <i>Rosa</i> spp. | Rosaceae | FLOW | 37 | guthe Kräuter-Thee | Rosenblätter | Blutreinigung | Blood purification | INT | CARD |
| <i>Rosa</i> spp. | Rosaceae | FLOW | 37 | guthe Kräuter-Thee | Rosenblätter | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Rosa</i> spp. | Rosaceae | FLOW | 37 | guthe Kräuter-Thee | Rosenblätter | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Sassafras</i> spp. | Lauraceae | HERB | 37 | guthe Kräuter-Thee | Sassafras | Blutreinigung | Blood purification | INT | CARD |
| <i>Sassafras</i> spp. | Lauraceae | HERB | 37 | guthe Kräuter-Thee | Sassafras | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Sassafras</i> spp. | Lauraceae | HERB | 37 | guthe Kräuter-Thee | Sassafras | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Scabiosa</i> spp. | Dipsacaceae | HERB | 37 | guthe Kräuter-Thee | Scabiosen | Blutreinigung | Blood purification | INT | CARD |
| <i>Scabiosa</i> spp. | Dipsacaceae | HERB | 37 | guthe Kräuter-Thee | Scabiosen | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Scabiosa</i> spp. | Dipsacaceae | HERB | 37 | guthe Kräuter-Thee | Scabiosen | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Silene baccifera</i> (L.) Roth = <i>Cucubalus baccifer</i> L. | Caryophyllaceae | HERB | 37 | guthe Kräuter-Thee | Taubenkropf | Blutreinigung | Blood purification | INT | CARD |
| <i>Silene baccifera</i> (L.) Roth = <i>Cucubalus baccifer</i> L. | Caryophyllaceae | HERB | 37 | guthe Kräuter-Thee | Taubenkropf | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Silene baccifera</i> (L.) Roth = <i>Cucubalus baccifer</i> L. | Caryophyllaceae | HERB | 37 | guthe Kräuter-Thee | Taubenkropf | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Vaccinium vitis-idaea</i> L. | Ericaceae | HERB | 37 | guthe Kräuter-Thee | Preusselbeeren-Kraut | Blutreinigung | Blood purification | INT | CARD |
| <i>Vaccinium vitis-idaea</i> L. | Ericaceae | HERB | 37 | guthe Kräuter-Thee | Preusselbeeren-Kraut | Lungenreinigung | Cleansing the lungs | INT | RESP |
| <i>Vaccinium vitis-idaea</i> L. | Ericaceae | HERB | 37 | guthe Kräuter-Thee | Preusselbeeren-Kraut | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| <i>Veronica</i> spp. | Plantaginaceae | HERB | 37 | guthe Kräuter-Thee | Ehrenpreis | Blutreinigung | Blood purification | INT | CARD |
| <i>Veronica</i> spp. | Plantaginaceae | HERB | 37 | guthe Kräuter-Thee | Ehrenpreis | Lungenreinigung | Cleansing the lungs | INT | RESP |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Alliment | Ailment_interpretation | Mode | Category |
|--|------------------|------|---------------|--|--------------------|-------------------|---------------------------------------|------|----------|
| <i>Veronica</i> spp. | Plantaginaceae | HERB | 37 | gutte Kräuter-Thee | Ehrenpreis | Brustreinigung | Cleansing the upper respiratory tract | INT | RESP |
| – | Tinctura | – | 38 | Tinctur Bezoardica F. Grossmann Krummhübler Art. | Sp. Vini | – | – | INT | – |
| <i>Actaea racemosa</i> L. = <i>Cimicifuga racemosa</i> Nutt. | Ranunculaceae | SUBT | 38 | Tinctur Bezoardica F. Grossmann Krummhübler Art. | Radix Serpentariae | – | – | INT | – |
| <i>Carlina acaulis</i> L. | Asteraceae | SUBT | 38 | Tinctur Bezoardica F. Grossmann Krummhübler Art. | Radix Carifinae | – | – | INT | – |
| <i>Cinnamomum camphora</i> (L.) J.Presl | Lauraceae | OIL | 38 | Tinctur Bezoardica F. Grossmann Krummhübler Art. | Campher | – | – | INT | – |
| <i>Curcuma zedoaria</i> (Christm.) Roscoe | Zingiberaceae | SUBT | 38 | Tinctur Bezoardica F. Grossmann Krummhübler Art. | Radix Zedoar | – | – | INT | – |
| <i>Dictamnus albus</i> L. | Rutaceae | HERB | 38 | Tinctur Bezoardica F. Grossmann Krummhübler Art. | Radix Diptam alb. | – | – | INT | – |
| <i>Petroselinum crispum</i> (Mill.) Fuss. | Apiaceae | SUBT | 38 | Tinctur Bezoardica F. Grossmann Krummhübler Art. | Radix Petroselinij | – | – | INT | – |
| <i>Peucedanum ostruthium</i> (L.) W.D.J. Koch = <i>Imperatoria ostruthium</i> L. | Apiaceae | SUBT | 38 | Tinctur Bezoardica F. Grossmann Krummhübler Art. | Radix Imperat. | – | – | INT | – |
| <i>Pterocarpus santalinus</i> L. fil. | Fabaceae | HERB | 38 | Tinctur Bezoardica F. Grossmann Krummhübler Art. | rothen Sandel | – | – | INT | – |
| – | Inorganic | – | 39 | Tinctur Lunae, Tinktur von Silber | Silber | in bösen Wesen | Against postpartum depression | INT | NERV |
| – | Organic | – | 39 | Tinctur Lunae, Tinktur von Silber | Urine | in bösen Wesen | Against postpartum depression | INT | NERV |
| – | Tinctura | – | 39 | Tinctur Lunae, Tinktur von Silber | Sp. Vini | in bösen Wesen | Against postpartum depression | INT | NERV |
| – | Inorganic | – | 39 | Tinctur Lunae, Tinktur von Silber | Silber | Haupt-Krankheiten | Brain disease | INT | NERV |
| – | Organic | – | 39 | Tinctur Lunae, Tinktur von Silber | Urine | Haupt-Krankheiten | Brain disease | INT | NERV |
| – | Tinctura | – | 39 | Tinctur Lunae, Tinktur | Sp. Vini | Haupt-Krankheiten | Brain disease | INT | NERV |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Name of recipe | Vernacular | Alliment | Ailment_interpretation | Mode | Category |
|---|------------------|------|---------------|---|--|--------------------------------------|--------------------------------|------|----------|
| - | Organic | - | 40 | von Silber Sp. Tartari, Weinstein-Geist | Weinstein (tartar) | in der Gicht | Against gout | INT | MUSK |
| - | Organic | - | 40 | Sp. Tartari, Weinstein-Geist | Weinstein (tartar) | bey lahmen Gliedern | Against lame limbs | INT | MUSK |
| - | Organic | - | 40 | Sp. Tartari, Weinstein-Geist | Weinstein (tartar) | in Lähmung | Against paralysis | INT | NERV |
| - | Organic | - | 40 | Sp. Tartari, Weinstein-Geist | Weinstein (tartar) | in Scharbock | Against scurvy | INT | MUSK |
| - | Organic | - | 40 | Sp. Tartari, Weinstein-Geist | Weinstein (tartar) | Wassersucht | Oedema | INT | CARD |
| - | Organic | - | 40 | Sp. Tartari, Weinstein-Geist | Weinstein (tartar) | Rüdigkeit der Haut | Erythema | INT | DERM |
| - | Organic | - | 40 | Sp. Tartari, Weinstein-Geist | Weinstein (tartar) | eröffnet Verstopfung des Eingeweides | Removes intestinal obstruction | INT | GAST |
| - | Organic | - | 40 | Sp. Tartari, Weinstein-Geist | Weinstein (tartar) | Krätze | Scabies | INT | DERM |
| - | Organic | - | 40 | Sp. Tartari, Weinstein-Geist | Weinstein (tartar) | Franzosen | Syphillis | INT | ANDR |
| - | Organic | - | 40 | Sp. Tartari, Weinstein-Geist | Weinstein (tartar) | Franzosen | Syphillis | INT | GYN |
| - | Organic | - | 40 | Sp. Tartari, Weinstein-Geist | Weinstein (tartar) | Windsucht | Tympanites | INT | GAST |
| - | Elixir | - | 41 | Liquor anod Michaeli | rothen Schlagwasser oder Englischen Balsam | - | - | - | - |
| - | Inorganic | - | 41 | Liquor anod Michaeli | Sp. Nitri dulcis | - | - | - | - |
| - | Inorganic | - | 42 | Sp. Salammoniaci anisat. Salmiac-Geist mit Anis | Kalck | Magen | Against stomach problems | INT | GAST |
| - | Inorganic | - | 42 | Sp. Salammoniaci anisat. Salmiac-Geist mit Anis | Kalck | Nieren | For the kidneys | INT | URO |
| - | Inorganic | - | 42 | Sp. Salammoniaci anisat. Salmiac-Geist mit Anis | Kalck | stärkt die Brust | Strengthens the breast | INT | RESP |
| <i>Glycyrrhiza glabra</i> L. (as salty liquorice) | Fabaceae | SUBT | 42 | Sp. Salammoniaci anisat. Salmiac-Geist mit Anis | Salmiac | Magen | Against stomach problems | INT | GAST |

Table 2 Compact list of the vascular plant uses described in "Die Laboranten von Krummhübel" [23] (Continued)

| Plant taxon | Family or origin | Part | No. of recipe | Vernacular | Aliment | Ailment_interpretation | Mode | Category |
|---|------------------|------|---------------|---|---|--------------------------------|------------------------------|----------|
| <i>Glycyrrhiza glabra</i> L. (as salty liquorice) | Fabaceae | SUBT | 42 | Sp. Salammoniaci anisat. Salmiac-Geist mit Anis | Salmiac | Nieren | For the kidneys | INT URO |
| <i>Glycyrrhiza glabra</i> L. (as salty liquorice) | Fabaceae | SUBT | 42 | Sp. Salammoniaci anisat. Salmiac-Geist mit Anis | Salmiac | stärkt die Brust | Strengthens the breast | INT RESP |
| <i>Pimpinella anisum</i> L. | Apiaceae | HERB | 42 | Sp. Salammoniaci anisat. Salmiac-Geist mit Anis | Anis | Magen | Against stomach problems | INT GAST |
| <i>Pimpinella anisum</i> L. | Apiaceae | HERB | 42 | Sp. Salammoniaci anisat. Salmiac-Geist mit Anis | Anis | Nieren | For the kidneys | INT URO |
| <i>Pimpinella anisum</i> L. | Apiaceae | HERB | 42 | Sp. Salammoniaci anisat. Salmiac-Geist mit Anis | Anis | stärkt die Brust | Strengthens the breast | INT RESP |
| - | Tinctura | - | 43 | Unächt. Recept zur Ess. dulcis | Spiritur abgezogen von Englisch Balsam oder vom rothen Schlagwasser | - | - | - - |
| <i>Pterocarpus santalinus</i> L. fil. | Fabaceae | HERB | 43 | Unächt. Recept zur Ess. dulcis | rothen Sandel | - | - | - - |
| - | Tinctura | - | 44 | Tinct. Benzoes | Sp. Vini | vor die Brust | For the breast | INT RESP |
| - | Tinctura | - | 44 | Tinct. Benzoes | Sp. Vini | vor die Brust | For the breast | EXT OTH |
| <i>Styrax</i> spp. | Syracaceae | EXUD | 44 | Tinct. Benzoes | Gummi Benzoe | vor die Brust | For the breast | INT RESP |
| <i>Styrax</i> spp. | Syracaceae | EXUD | 44 | Tinct. Benzoes | Gummi Benzoe | vor die Brust | For the breast | EXT OTH |
| <i>Rosa</i> spp. | Rosaceae | FLOW | 45 | Tinctura Rosarum, Rosen-Tinctur | Rosenblätter | kühlt und stärket das Herz | Strengthens the heart | INT CARD |
| <i>Rosa</i> spp. | Rosaceae | FLOW | 45 | Tinctura Rosarum, Rosen-Tinctur | Rosenblätter | stärket die Leber | Strengthens the liver | INT GAST |
| <i>Rosa</i> spp. | Rosaceae | FLOW | 45 | Tinctura Rosarum, Rosen-Tinctur | Rosenblätter | stärket den Magen | Strengthens the stomach | INT GAST |
| <i>Gentiana</i> spp. | Gentianaceae | SUBT | 46 | Ess. Gentiana, Enzian-Wurzel-Essenz | Enzian-Wurzel | allen 3 und 4 tägigten Fiebern | In all 3 and 4 days of fever | INT FEV |
| <i>Gentiana</i> spp. | Gentianaceae | SUBT | 46 | Ess. Gentiana, Enzian-Wurzel-Essenz | Enzian-Wurzel | in Schwachheit des Magens | In weakness of the stomach | INT GAST |

uterus; leishmaniasis and leucorrhea; anaemia; headaches; and snake bites. It is also used for its aphrodisiac, stimulant, anti-inflammatory, antiseptic, anti-tetanus, antirheumatic, antiherpetic, anthelmintic, anticancer, antitumour (prostate tumours) and antiparalytic properties ([63] and references cited herein). Many of these indications were also mentioned by Krummhübel herbalists and are recognised by modern medicine [74, 76, 77].

Guaiacum (*Guaiacum officinale* L.) is stated to possess antirheumatic, anti-inflammatory, diuretic, mild laxative and diaphoretic properties [74, 76, 77]. Traditionally, it has been used for subacute rheumatism, also in syphilitic and gouty affections, and specifically for chronic rheumatism and rheumatoid arthritis [75]. Additional medicinal uses mentioned by Krummhübel herbalists include the treatment of oedema and scabies as well as blood purification.

Myrrh is a sap-like substance (resin) that is released from cuts in the bark of trees belonging to the genus *Commiphora*. Myrrh has antimicrobial, astringent, carminative, expectorant, anticatarrhal, antiseptic and vulnerary properties. Traditionally, it has been used for aphthous ulcers, pharyngitis, respiratory catarrhs, common cold, furunculosis, wounds and abrasions, specifically for mouth ulcers, gingivitis and pharyngitis [75]. It is unknown which *Commiphora* species was used by Krummhübel herbalists, but they recommended it, among others, as a remedy for scurvy and plague as well as to stimulate appetite.

Crocus sativus L., commonly known as saffron, is used in folk medicine as an antispasmodic, eupeptic, gingival sedative, anticatarrhal, nerve sedative, carminative, diaphoretic, expectorant, stimulant, stomachic, aphrodisiac and emmenagogue. Furthermore, modern pharmacological studies have demonstrated that saffron extract or its active constituents have antitumor effects, radical scavenger properties and hypolipemic effects [75]. Krummhübel herbalists additionally used this plant in their medical mixtures as remedies for scurvy, any injuries and to support post-partum recovery.

Since time immemorial, people have tried to find medications to alleviate pain and to cure various diseases. In every period, every successive century from the development of humankind and advanced civilisations, the healing properties of certain medicinal plants were identified, recorded and passed on to successive generations. The benefits of one society were conveyed to another, which upgraded the old properties and discovered new ones, until the present days. The continuous and perpetual interest of people in medicinal plants has led to today's modern and sophisticated fashion of their processing and usage [69].

Conclusions

This paper presents a data mining approach and a survey of the herbal drugs contained in Reitzig. Our study revealed that many plants used in medical treatments by Krummhübel herbalists were also known in other regions between the sixteenth and twentieth centuries. The medicinal plants documented in all ethnobotanical studies considered include *Angelica* ssp., *Carlina acaulis* L., *Gentiana* spp., *Juniperus* spp., *Rosa* spp. and *Veronica* spp. However, eight, mainly exotic plants, were exclusive in therapeutic mixtures of Krummhübel herbalists. They encompass *Copaifera officinalis* L., *Drimys winteri* J.R. Forst. & G. Forst., *Hedysarum* spp., *Myristica fragrans* Houtt., *Piper longum* L., *Silene baccifera* (L.) Roth and *Syzygium aromaticum* (L.) Merr. & L.M. Perry. Although these taxa originate from various parts of the world, they were quite frequently used in several remedies by Krummhübel herbalists and are still important herbs in modern phytotherapy. Besides, the preserved recipes of Krummhübel herbalists also cover animal, fungus and mineral formulations and other organic and inorganic ones. Comparing such old data with contemporary herbal medicine and phytotherapy might enhance our understanding of modern practices and help to document the tradition of use, which is required for the regulatory approval of new herbal drugs. We showed that therapeutic effects of medicinal plants used by Krummhübel herbalists in traditional and modern medicine are mainly congruent, but there are also some novelties.

Currently, based on the achievements of Krummhübel herbalists, it seems to be important to attempt to reproduce therapeutic mixtures from the preserved recipes. This would provide an opportunity to learn more about the real effects of the former medicines and their therapeutic activities. The obtained data can also be used in the search for new drugs.

Additional file

Additional file 1: A full dataset of the recorded plant taxa, plant parts and other constituents used, as well as the therapeutic uses. (XLSX 37 kb)

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Data on the ethnobotanical/medical uses of plants are presented in this article in Table 1.

Authors' contributions

KS, IS and JP conceived and designed the study. JP and MP conducted the data collection and analysed the data. Literature retrieval was done by KS, IS and JP. KS, IS and JP drafted the manuscript. JP participated in the design and coordination. JP identified the plant species and reviewed the ethnobotanical literature. JP and MP revised the manuscript. All authors read and approved the final manuscript.

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