Ethnobotanical uses of *Helichrysum* species: A review of traditional medicinal practices

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Review

Abstract

Background: The genus *Helichrysum* Mill. (Asteraceae) comprises approximately 500-600 species and has a long history of traditional medicinal use. This review aimed to evaluate the geographical distribution, plant parts, preparation methods, and medicinal indications associated with *Helichrysum* species.

Methods: A literature review was conducted between April and September 2026 using Scopus, PubMed, and TR Dizin, supplemented by Google Scholar and ResearchGate. Publications identifying *Helichrysum* taxa and documenting traditional medicinal uses were eligible. Of 110 sources, 10 were excluded, 80 were included in the ethnobotanical analysis, and 20 were retained as supporting references. An ethnobotanical record represented a documented traditional medicinal use associated with an identifiable taxon. Data were analyzed descriptively, and medicinal indications were classified using the WHO ICD-11 Browser. Uses without classifiable medical indications were excluded from ICD-11 analysis.

Results: ICD-11 classification yielded 275 chapter assignments, primarily involving symptoms, signs or clinical findings (n = 75; 27.27%), followed by genitourinary (n = 49; 17.82%), digestive (n = 32; 11.64%), and respiratory diseases (n = 31; 11.27%). Türkiye and South Africa were prominent geographical locations. Flowers and aerial parts were commonly used, while infusion and decoction predominated as preparation methods.

Conclusions: *Helichrysum* species exhibit diverse traditional medicinal uses. Further pharmacological, toxicological, and clinical studies are needed to establish their efficacy and safety.

Keywords: Ethnobotany, Biological activity, *Helichrysum*, Pharmacology, Phytochemistry

Background

Helichrysum Mill. is an important medicinal plant belonging to the Asteraceae family; the name *Helichrysum* comes from the Greek words *helios* (sun) and *chrysos* (gold) since many of the species have strikingly bright yellow flowers (Lourens, 2008). The genus includes about 500 to 600 species, which are widely spread in Africa, Madagascar, Australia and Eurasia, the

highest number of species being in Africa, especially in South Africa (Akaberi 2019). The genus distributed in Turkey, 35 taxa and 25 species are recorded (Güner *et al*. 2012).

The medicinal use of plants from the *Helichrysum* genus has been known for over two thousand years; the earliest written reference to this practice can be found in the works of Theophrastus of Eresos (Historia Plantarum, 3rd-2nd centuries BCE). In these writings, "Heleiochrysos" is given as a remedy—usually combined with honey—for burns as well as for stings and bites caused by venomous animals. Pedanius Dioscorides (c. 1st century CE) likewise mentioned in his book “De Materia Medica” that preparations made from *Helichrysum* flowers soaked in wine have diuretic properties and are used in the treatment of urinary tract disorders, snake bites, sciatica and hernias (Akinyede *et al.* 2021). Moreover, the Russian Pharmacopeia, the Pharmacopea Helvetica and the Polish Pharmacopoeia all state that *Helichrysum* species have cholagogue and bile-flow-enhancing properties. Moreover, although *Helichrysi arenarii flos* has not been included in the European Pharmacopoeia (7th ed., 2011), the State Pharmacopoeia of the USSR (1990), Pharmacopoeia Helvetica (7th ed., 1987), and Polish Pharmacopoeia (6th ed., 2002) listed it as an official herbal drug for its choleretic and cholagogue properties (Pljevljakušić *et al.* 2018).

Phytochemical studies have shown that these plants contain a high amount of phenolic compounds, especially phloroglucinol derivatives and flavonoids (Dănăilă-Guidea *et al.* 2022). It is known that these compounds are largely what account for the various biological activities of the plants. The ethnopharmacological significance of this genus is based not only on its traditional use for a long time but also on the wide variety of chemical constituents found in the plants.

Botanical characteristics of *Helichrysum* Mill. species

Helichrysum species are recognized for their woolly, hairy or glandular parts, which are quite noticeable. They are considered to be perennials and may have either an herbaceous or subshrubby habit. The leaves are simple, have smooth margins and are in shape from linear to oblanceolate or spatulate; they are usually arranged alternately. The inflorescences consist of flower heads arranged in terminal corymbs; these flower heads may be disk-shaped or discoid and can range from spherical to cylindrical; their length is about 3-12 mm (Maroyi, 2019). The phyllaries are pluriseriate and imbricate, with colors ranging from white, straw-yellow, yellow, orange to red, and have a distinct scarious texture which is responsible for their "everlasting" look. The receptacle is characterized by being flat and not protected, while the flowers are mainly yellow. The flowers can be either hermaphroditic or marginally female. The corollas are tubular with five lobes and have glandular structures in the upper part. The fruits are cylindrical achenes, often glandular, and are accompanied by a pappus composed of yellowish, large-celled and scabrous to barbellate hairs (Davis, 1982; Pljevljakušić *et al.* 2018). In Türkiye the species *Helichrysum arenarium* (L.) Moench, *Helichrysum armenium* DC., *Helichrysum graveolens* (M. Bieb.) Sweet. and *Helichrysum plicatum* DC. are polymorphic; these species can be distinguished by the hairs on their roots and by whether or not they have swollen sterile shoots (Karakaya & Güner, 2015). Although capitulum morphology, which is regarded as a diagnostic feature, can be used to identify the species it is often difficult to do so. Some species have discoid capitula with female flowers at their margins. Other species, on the other hand, have homogamous discoid capitula, a structural characteristic defined by the presence of discoid anthers (Davis, 1982).

General overview of traditional uses

The use of *Helichrysum* species in the field of ethnobotany dates back over a long period and covers huge geographical areas. They have had a important role in traditional medicine because they have been employed in the treatment of a wide range of illnesses. It is a well-established practice, referred to as that of the "immortal flowers", to use these plants by means of infusions (Les *et al.* 2017).

In Africa and specifically in South Africa, various species of *Helichrysum* are widely used in traditional medicine as a means of treating a great many ailments such as fever, headaches, disorders of the respiratory tract, wound care, reproductive health problems and complications that occur after childbirth (Maroyi, 2019; Maroyi, 2023). It has also been recorded that these species are used in the treatment of a variety of conditions, including influenza, the common cold, disorders of the nervous system and diseases of the digestive system (Les *et al.* 2017). Moreover, it is known that they are used in the treatment of gastrointestinal disorders, allergic conditions and dermatological diseases because of their soothing qualities (Stafford *et al.* 2005). Many species of *Helichrysum* are also used in Europe. For example, in Central Europe the flowers of *H. arenarium* are commonly used for antiseptic, coleretic and spasmolytic properties (Viegas *et al.* 2014). In Türkiye *H. graveolens* is used as a remedy for diabetes, for wound healing and as a diuretic (Aslan *et al.* 2007). Evidence from the Caucasus region, situated on the border between Türkiye and Georgia, also shows that *Helichrysum* species—especially when

made into infusions—are used in the treatment of gastrointestinal disorders (Kazancı *et al.* 2020). It has also been found that *H. plicatum* is used as a medicinal treatment for urinary tract diseases and has been tested as a treatment for diabetes.

Helichrysum stoechas (L.) Moench. and *Helichrysum italicum* (Roth) G. Don are included in the vegetation of the Mediterranean area; they have shown anti-inflammatory effects, contribute to protection, and can be used in the treatment of disorders of the digestive system (Mulet, 1991; Rivera *et al.* 2008; González-Tejero, 1989). *H. italicum* essential oil is also generally employed in aromatherapy for the treatment of scars, clotting and a number of dermatological conditions (Viegas *et al.* 2014).

However, certain *Helichrysum* species have an even wider range of uses. For example, *Helichrysum nudifolium* (L.) Less. has a variety of preparations and uses and *Helichrysum caespititium* (DC.) Harv. has been used both as a medicine and as an aphrodisiac (Maroyi, 2019). In contrast, *Helichrysum odoratissimum* (L.) Sweet. has been found to be effective in the treatment of insomnia, menstrual cramps, respiratory disorders and wounds (Maroyi, 2019). The leaves and stems contain high levels of vitamins and minerals, which may explain their traditional use. These South African-native species contain flavonoids, suggesting that traditional uses could form a valuable basis for future pharmaceutical research (Akinyede *et al.* 2021; Nkemzi *et al.* 2022).

Phytochemical properties and biological activities of *Helichrysum* Mill. species

The *Helichrysum* species, which are commonly referred to as "immortal flowers," have been shown to possess significant pharmaceutical potential, attributable to their abundant secondary metabolite content. This genus contains a plethora of bioactive compounds, including flavonoids, phenolic acids, terpenoids, pyrones and phloroglucinol derivatives (Akaberi *et al.* 2019; Voynikov, 2025). These compounds form the basis of the plant's broad spectrum of biological activity and support its widespread use in traditional medicine (Akinyede *et al.* 2021; Nkemzi *et al.* 2022). There are distinct differences among *Helichrysum* species in terms of phytochemical content and biological effects. For instance, while the metabolomic profile of *Helichrysum splendidum* Less. revealed strong interactions between flavonoids and terpenoids and cancer-related proteins (Lephatsi *et al.* 2023), it has been reported that the phenolic compounds and flavonoids found in *H. armenium* is associated with strong antioxidant and enzyme-inhibitory activities (Kekeç *et al.* 2024). Furthermore, it has been posited that certain compounds, including chlorogenic acid and cinnamic acid, may serve as potential biomarkers for anti-HIV activity (Yazdi *et al.* 2022).

A salient biological property of the *Helichrysum* species is their pronounced antioxidant activity. This phenomenon is hypothesized to be predominantly attributable to their elevated polyphenolic content (Babotă *et al.* 2018; Albayrak *et al.* 2010). Furthermore, it has been demonstrated that various species exhibit antibacterial, antifungal and antiparasitic properties and are effective against different pathogens (Maroyi, 2019; Matrose *et al.* 2022). In particular, it has been reported that ethanol extracts exhibit high antifungal activity against fungal pathogens such as *Botrytis cinerea* (Matrose *et al.* 2022). When evaluated in terms of metabolic diseases, it is noted that some *Helichrysum* species possess potential therapeutic effects in the treatment of diabetes and obesity due to their ability to inhibit α-amylase and lipase enzymes (Jaradat *et al.* 2020). Furthermore, their inhibitory effects on carbonic anhydrase and acetylcholinesterase enzymes suggest the potential for these plants to be utilised in the treatment of neurodegenerative and metabolic diseases (Aydın, 2020; Kekeç *et al.* 2024). It has been documented that certain species manifest anti-HIV and anticancer properties due to specific phytochemical compounds (Yazdi *et al.* 2022; Lephatsi *et al.* 2023). It is evident that a particular species, namely *H. italicum*, is garnering significant attention within the domains of food, cosmetic and pharmaceutical industries. The underlying rationale for this attention is attributed to the species' elevated nutritional value, its capacity to function as an effective antimicrobial agent and its non-toxic nature. However, it has been reported that some extracts may exhibit toxic effects, thus emphasizing the importance of safety studies (Primitivo *et al.* 2022).

Materials and Methods

Study area

Among the records that could be evaluated at the country level, the highest number was found in Turkey (n = 38), followed by Spain (n = 18), South Africa (n = 18), and Italy (n = 14). These four countries account for a significant portion of the records in the dataset. A smaller number of records were reported for Portugal (n = 3), Tanzania (n = 3), Lithuania (n = 1), Bosnia and Herzegovina (n = 1), Iran (n = 1), Palestine (n = 1), Burundi (n = 1), and Madagascar (n = 1). This distribution indicates that ethnobotanical information in the reviewed literature is particularly prominent in the Mediterranean region and southern Africa (Figure 1).

The dataset also includes nine records identified as “Southern and Central Africa.” Since these records could not be reliably assigned to a single country, they were not combined with those from the Republic of South Africa and were retained as a separate regional category. Similarly, records defined solely as “Europe,” “the Mediterranean region,” or “the Poland-Lithuania-Belarus border region” have not been included in the country-level geographic mapping. However, these records have not been excluded from the general ethnobotanical dataset.

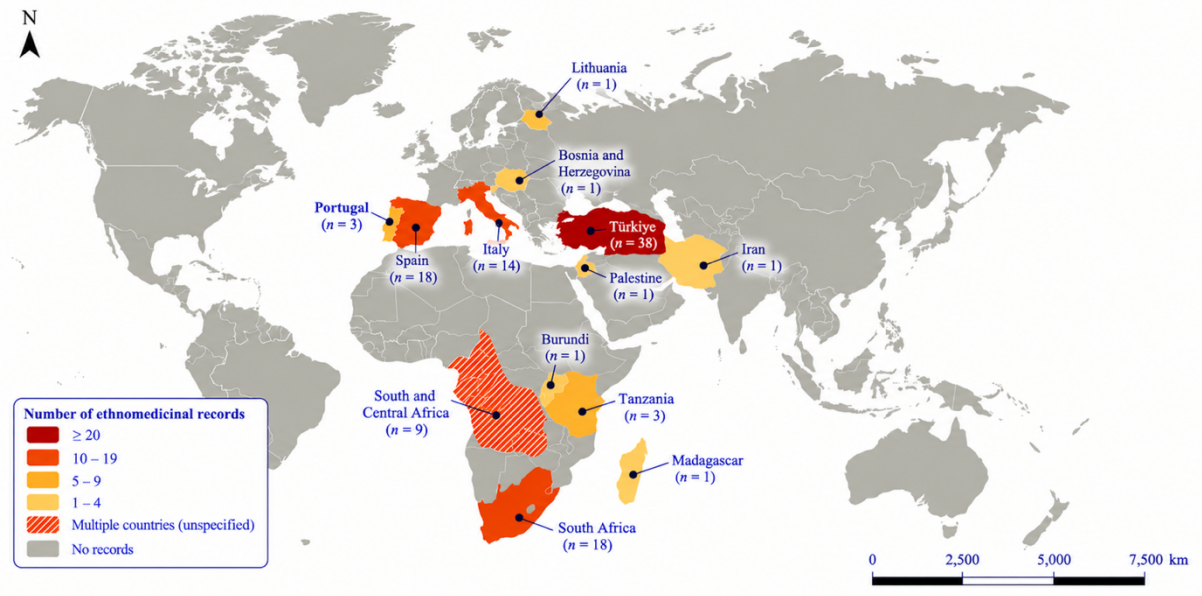


Figure 1. Geographical distribution of the included studies. n: number of ethnomedicinal records.

Literature search and data collection

A comprehensive literature review was conducted between April and September 2026 to identify existing information on the traditional medicinal uses of *Helichrysum* species. Relevant publications were identified through searches of Scopus, PubMed, and TR Dizin (ULAKBİM). Google Scholar and ResearchGate were also used as supplementary search resources to identify relevant publications and obtain accessible full texts. During the literature search, the keywords “*Helichrysum*,” “ethnobotany,” “ethnomedicinal uses,” “traditional medicine,” and “medicinal plants” were used individually and in various combinations, including “*Helichrysum* and ethnobotany.” The search was limited to publications in English and Turkish. Additionally, the reference lists of relevant publications were reviewed to identify further studies.

The scientific names of the reported *Helichrysum* taxa were checked using the Global Biodiversity Information Facility (GBIF) and Bizim Bitkiler (Türkiye Bitkileri Listesi) to verify current taxonomic nomenclature and identify accepted scientific names and synonyms where applicable. These resources were used for taxonomic verification rather than as primary sources of ethnomedicinal use records.

Eligibility criteria

The identified publications were evaluated to determine whether they contained information on *Helichrysum* species and were relevant to the scope of the study. Publications were considered eligible for the ethnobotanical data analysis when they provided identifiable *Helichrysum* taxa and information on their traditional medicinal uses, including preparation methods where reported.

Publications that did not contain relevant ethnobotanical information or other material contributing to the objectives of the review were excluded during the initial screening. Sources used to support the introduction, methodological framework, and discussion were distinguished from publications used for quantitative ethnobotanical data extraction. These supporting references, including scientific publications and relevant online resources, were retained for contextual and interpretative purposes but were not included in the quantitative ethnobotanical analysis.

For the ICD-11-based analysis, only records describing classifiable medical indications were considered. Records reporting practices without a specified medical indication, such as “ritual use, burning as incense, use as a fumigant or insecticide, and

use for a pleasant smell", were excluded from the ICD-11 classification. These records were excluded only from the ICD-11-based analysis and not necessarily from the broader ethnobotanical dataset.

A total of 110 sources were identified during the literature review. Ten publications were excluded during the initial screening because they did not provide information relevant to the objectives of the review. Of the remaining 100 sources, 80 publications provided suitable data on the traditional medicinal uses of *Helichrysum* species and were included in the ethnobotanical data analysis. The remaining 20 sources were used to support other sections of the manuscript and did not contribute directly to the quantitative ethnobotanical dataset.

Data organization and Analysis

The 80 publications included in the ethnobotanical analysis were examined for *Helichrysum* species, geographic locations, plant parts used, preparation methods, and reported traditional medicinal uses. The extracted data were organized into a structured dataset, and scientific names were verified using GBIF and Bizim Bitkiler to ensure taxonomic consistency.

Descriptive analyses were performed using frequencies and percentages to evaluate the distributions of species, geographic locations, plant parts, preparation methods, and medicinal indications. Reported medicinal uses were classified according to the relevant chapters of the World Health Organization's International Classification of Diseases, 11th Revision (ICD-11), using the WHO ICD-11 Browser. Each medicinal indication was assessed separately and assigned to the corresponding ICD-11 chapter based on its reported terminology, allowing multiple chapter assignments where appropriate. Accordingly, certain indications, such as cough, headache, and unspecified rheumatism, were classified under Chapter 21 (Symptoms, signs or clinical findings), consistent with the ICD-11 Browser classification. ICD-11 percentages were calculated based on the total number of chapter assignments rather than the number of ethnobotanical records.

The findings were presented in tables and graphs to identify underlying trends and distribution patterns.

Results

Summary of ethnobotanical studies

Figure 2 displays the frequency of the ten most frequently recorded *Helichrysum* species in the dataset. *H. italicum* is the most frequently recorded species, with 28 records, followed by *H. plicatum* with 17 records, *H. arenarium* and *H. caespititium* with 10 records each, and *H. serotinum* with 7 records. This distribution highlights the predominance of certain *Helichrysum* species in the reviewed ethnobotanical records and suggests their potential relevance for further phytochemical and pharmacological investigation.

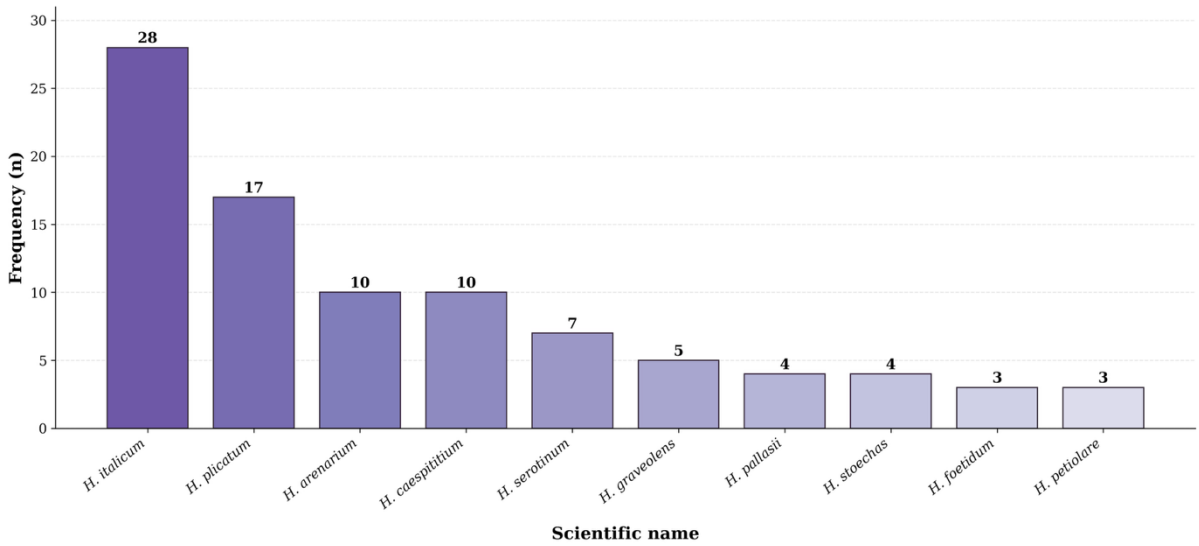


Figure 2. Distribution of the Most Frequently Cited *Helichrysum* Species

Ethnobotanical data of *Helichrysum* species reported in the literature. are given in Table 1.

Table 1. Ethnobotanical data of *Helichrysum* species reported in the literature.

Scientific Name	Part Used	Preparation	Ethnomedicinal Uses	Location	References
Helichrysum appendiculatum (L.fil.) Less.	Leaves	Topical, Infusion	Circumcision wounds	South Africa	(Grierson & Afolayan, 1999)
Helichrysum arenarium (L.) Moench	Aerial parts	Infusion Essential oil	Flu Rheumatism	Türkiye	(Polat *et al.* 2015)
	Aerial parts	Decoction	Liver diseases	Lithuania	(Prakofjewa *et al.* 2026)
	Flowers	Decoction	Kidney stones	Türkiye	(Hoşcan, 2026)
	Whole plant	-	Lung infection, abdominal pain, diarrhea	Polish-Lithuanian-Belarus	(Kujawska *et al.* 2017)
Helichrysum arenarium subsp. *aucheri* (Boiss.) Davis & Kupicha	Aerial parts	Infusion	Immunostimulant, antidiabetic, laxative, diuretic, peptic ulcer, antitussive, aphtha	Türkiye	(Gözcü *et al.* 2024)
	Aerial parts	Infusion	Colds and flu, rheumatism	Türkiye	(Polat *et al.* 2015)
	Aerial parts	Infusion	Diabetes, kidney stones	Türkiye	(Mükemre *et al.* 2015)
	Flowers	Infusion	-	Türkiye	(Karaköse, 2026)
	Flowers; stem	Decoction, Infusion	Common cold, urinary tract infection, dyspepsia, immune booster, stomach disorders, abdominal pain, menopause; oedema; weight loss; cholesterol, wounds, dysmenorrhea, jaundice, kidney stones, lung disease, influenza	Türkiye	(Karaköse, 2022)
Helichrysum arenarium subsp. *rubicundum* (K.Koch) P.H.Davis & Kupicha	Aerial parts	Infusion	Diuretic, nephralgia, kidney stones	Türkiye	(Altundag & Ozturk, 2011)
Helichrysum armenium DC.	Aerial parts	Infusion	Diabetes, kidney stones	Türkiye	(Mükemre *et al.* 2015)
	Flowers	Decoction	Kidney stone, diuretic, jaundice in babies	Türkiye	(Karakaya *et al.* 2019)
Helichrysum caespititium (DC.) Sond. ex Harv.& Sond.	Whole plant	-	Anti-emetic	South and Central Africa	(Maroyi, 2019)

	Whole plant	-	Boost immunity	South and Central Africa	(Mugomeri *et al.* 2016; Maroyi, 2019)
	Whole plant	-	Burnt as incense	South and Central Africa	(Moteetee *et al.* 2019; Maroyi, 2019)
	Whole plant	-	Depressed fontanelle	South and Central Africa	Maroyi, 2019)
	Whole plant mixed with other plants roots	-	Fatigue	South and Central Africa	(Semenya & Maroyi, 2018; Maroyi, 2019)
	Whole plant	-	Fumigant	South and Central Africa	(Moteetee *et al.* 2019; Maroyi, 2019)
	Whole plant	-	Hypertension	South and Central Africa	(Semenya *et al.* 2018; Maroyi, 2019)
	Whole plant	-	Liver problems	South and Central Africa	(Kose *et al.* 2015; Maroyi, 2019)
	Whole plant	-	Skin infections	South and Central Africa	(Mamabolo *et al.* 2018; Maroyi, 2019)
	Whole plant	Oral	Diabetes	South Africa	(Semenya *et al.* 2012)
Helichrysum candolleanum H.Buek	Roots, leaves, fruit	Decoction	Retained placenta	South Africa	(Mpolokeng *et al.* 2026)
Helichrysum chionophilum Boiss. & Balansa	Aerial parts	Infusion	Nephralgia, kidney gravel	Türkiye	(Kültür *et al.* 2021; Sargın, 2015)
Helichrysum congolanum Schltr. & O. Hoffm.	Leaves	-	Infections	Burundi	(Nzoyisubiziki *et al.* 2026)
Helichrysum cymosum (L.) D. Don	Leaves	Decoction	Cough and cold, pains, infected wounds, headache	South Africa	(Nkemzi & Ekpo, 2022)
	Whole plant	-	Cough, catarrh, colds, headache, menstrual pain, fever, wounds, flatulence, pulmonary problems, skin infections, pertussis, vomiting, improves immunity and appetite	South Africa	(Maroyi, 2019)
Helichrysum faradifani Elliott	Aerial parts, flowers	Decoction	Insecticidal, wound healing, disinfectant, syphilis, diarrhea, cough, headache	Madagascar	(Benelli *et al.* 2018)

Helichrysum foetidum (L.) Moench	Leaves	Topical (poultice)	Infected sores	South Africa	(Grierson & Afolayan, 1999)
	Leaves	-	Pneumonia	Tanzania	(Kacholi, 2026)
	Leaves, roots	Topical (poultice)	Sores, infected wounds, herpes, influenza, eye problems, sedative, menstrual pain	South Africa	(Nkemzi & Ekpo, 2022)
Helichrysum graveolens (M.Bieb.) Sweet	Aerial parts	Infusion	Anthelmintic, appetizer, nerve tonic	Iran	(Amiri & Joharchi, 2013)
	Aerial parts, flowers	Topical (crush)	Kidney disorder, wound healing, dyspepsia	Türkiye	(Akbulut *et al.* 2022)
	Flowers	Maceration, Infusion	Diabetes	Türkiye	(Orhan *et al.* 2014)
	Flowers	Decoction	Kidney problems	Türkiye	(Ezer & Arisan, 2006)
	Flowers	Decoction	Controlling symptoms of diabetes mellitus; wound healing; diuretic	Türkiye	(Aslan *et al.* 2007)
Helichrysum gymnocomum DC.	Leaves	Decoction	Diabetes	South Africa	(Oyedemi *et al.* 2009)
Helichrysum italicum (Roth) G. Don	Aerial parts	Infusion	Colds	Italy	(Pieroni, 2000; Viegas *et al.* 2014)
	Aerial parts	Essential oil	Dermatologic disorders	Portugal	(Viegas *et al.* 2014)
	Flowers and leaves	Infusion, essential oil	Allergies, colds, cough, skin, liver, gallbladder disorders, inflammation, infections, sleeplessness, conjunctivitis	Spain	(Melián *et al.* 2017)
	Flowers	Infusion	Toothache, oral antiseptic	Spain	(González-Tejero, 1989; Viegas *et al.* 2014)
	-	-	Digestive disorders, catarrh	Spain	(Pardo de Santayana *et al.* 2005; Viegas *et al.* 2014)
	Flowers	Infusion	Toothache, oral antiseptic	Spain	(Barber *et al.* 2005; Viegas *et al.* 2014)
	Flowers	Infusion	Digestive disorders	Spain	(Parada, 2007; Viegas *et al.* 2014)

Flowers	Infusion	Liver, gall disorders, cough	Bosnia & Herzegovina	(Redzic, 2007; Viegas *et al.* 2014)
Flowers	Infusion	Bronchitis, pharyngitis	Italy	(Passalacqua *et al.* 2007; Viegas *et al.* 2014)
Flowers	Decoction, Infusion	Cough	Italy	(Guarino *et al.* 2008; Viegas *et al.* 2014)
Flowers	Infusion	Skin inflammation	Spain	(Latorre, 2008; Viegas *et al.* 2014)
-	-	Intestinal parasitic infections	Spain	(Segarra i Durà, 2008; Viegas *et al.* 2014)
-	Topical	General medicinal use	Spain	(Rivera *et al.* 2008; Viegas *et al.* 2014)
Flowers, leaves, stem	-	Wound healing	Italy	(Cornara *et al.* 2009; Viegas *et al.* 2014)
Flowers and leaves	Inhalation	Sleeplessness, headache, cough	Italy	(Cornara *et al.* 2009; Viegas *et al.* 2014)
Flowers	Infusion	Inflammation, cough	Italy	(Cornara *et al.* 2009; Viegas *et al.* 2014)
Flowers	Decoction	Various ailments	Italy	(Cornara *et al.* 2009; Viegas *et al.* 2014)
Flowers	Decoction	Asthma	Italy	(Di Novella *et al.* 2013; Viegas *et al.* 2014)
Flowers	Decoction	Antiasthmatic fumigations	Italy	(Di Novella *et al.* 2013)
Flowers	Infusion	Digestive disorder, gastralgia, cough, mouth ailments, liver disease, herpes	Spain	(Benítez *et al.* 2010)
Leaves, flowers	Infusion	Cough, colds, tracheitis, laryngitis	Italy	(Uncini *et al.* 1999; Viegas *et al.* 2014)
Leaves	Oral	Stomach ache	Italy	(Cornara *et al.* 2009; Viegas *et al.* 2014)
Whole plant	Infusion	Ritual use	Europe	(Łuczaj *et al.* 2024)
Whole plant	Infusion, essential oil	Inflammatory and allergy conditions, such as asthma	Mediterranean region	(Furlan & Bren, 2023)

			and skin inflammatory conditions		
Helichrysum italicum (Roth) G.Don subsp. *tyrrhenicum*	Whole plant	Infusion	Diaphoretic and pectoral	Italy	(Cocco *et al.* 2022)
Helichrysum italicum subsp. *italicum*	Flowers	Infusion	Digestive disorders, gastralgia	Spain	(Benítez *et al.* 2010; Viegas *et al.* 2014)
Helichrysum italicum subsp. *microphyllum* (Willd.) Nyman	Whole plant	Infusion	Allergy	Italy	(Bruni *et al.* 1997; Viegas *et al.* 2014)
	Whole plant	Decoction	Skin diseases (alopecia)	Italy	(Ballero *et al.* 2001; Viegas *et al.* 2014)
Helichrysum nudifolium var. *pilosellum* (L.fil.) Beentje	Leaves	Topical	Circumcision wounds	South Africa	(Grierson & Afolayan, 1999)
Helichrysum odoratissimum (L.) Sweet	Leaves	Decoction	Insomnia,coughs and colds	South Africa	(Ramadwa & Meddows-Taylor, 2026; Lall & Kishore, 2014)
	Stem and leaves	Topical	Wound healing	South Africa	(Ndlovu & Fisher, 2026)
Helichrysum orientale (L.) Gaertn.	Aerial parts	Infusion	Diuretic, prostate	Türkiye	(Yalçın *et al.* 2021)
Helichrysum pallasii (Spreng.) Ledeb.	Aerial parts	Decoction	Kidney stones	Türkiye	(Mükemre *et al.* 2015)
	Aerial parts	Infusion	Diuretic, cough, kidney stones, nephralgia	Türkiye	(Altundag & Ozturk, 2011)
	Flowers	Decoction	Urinary infection	Türkiye	(Güneş *et al.* 2017)
	Flowers	Decoction, Infusion	Indigestion, cough	Türkiye	(Demir & Üzgüç, 2026)
Helichrysum pallidum DC.	Roots	-	Cleanses a baby after breast feeding, charm to make a person forgotten or invisible to enemies	South Africa	(Kose *et al.* 2015)
Helichrysum paronychioides DC.	Root	Infusion	Cough, blood cleansing, pain, diarrhea	South Africa	(Mpolokeng *et al.* 2026)
Helichrysum patulum (L.) D. Don	Aerial parts	Infusion	Asthma, influenza, heart trouble, backache, kidney disease	South Africa	(Nkemzi & Ekpo, 2022)

	Leaves, roots	Decoction, Infusion	Wound healing, colds, respiratory problems, postpartum conditions, skin infections, stomach ailments	South Africa	(Maroyi, 2019)
Helichrysum petiolare Hilliard & B.L. Burtt	Leaves	Infusion	Coughs, colds, catarrh, headache, fever, menstrual disorders, urinary tract infections, wound dressing, heart conditions, stress, hypertension, anxiety	South Africa	(Nkemzi & Ekpo, 2022)
	Whole plant	Decoction	Diabetes	South Africa	(Erasto *et al.* 2005)
	Whole plant	Decoction, Infusion	Abdominal pains, coughs and colds, catarrh, headache, fever, menstrual disorders and urinary tract infections, heart problems, chest pains, hypertension, stress, anxiety	South Africa	(Serabele *et al.* 2021)
Helichrysum plicatum DC.	Flowers	Infusion	Diabetes, hepatitis, kidney stones	Türkiye	(Polat *et al.* 2013)
	Flowers	Infusion	Weight loss, urinary tract disorders, jaundice, infertility, gastroenteritis	Türkiye	(Akbulut & Zengin, 2023)
	Flowers and Leaves	Decoction, Infusion, Topical	Kidney stones, wounds, scars, hemostatic, constipation, jaundice in babies	Türkiye	(Karakaya *et al.* 2019)
	Flowers	Topical (pomade)	Wound healing	Türkiye	(Tetik, 2013)
	Flowers	Decoction	Wound healing	Türkiye	(Akbulut & Özkan, 2022)
Helichrysum plicatum subsp. *polyphyllum* (Ledeb.) P.H.Davis & Kupicha	Flowers	Decoction	Diarrhoea, intestinal disease	Türkiye	(Altundag & Ozturk, 2011)
Helichrysum plicatum. subsp. *plicatum*	Aerial parts	Decoction	Diabetes	Türkiye	(Dalar, 2018)

	Aerial parts	Aroma	For a nice smell	Türkiye	(Korkmaz, 2024)
	Aerial parts	Infusion	Kidney disorders, diuretic, rheumatis, joint pain	Türkiye	(Bağci & Ulukaya, 2026)
	Aerial parts	Decoction	Diabetes	Türkiye	(Mükemre *et al.* 2015)
	Aerial parts	Decoction	Kidney stones	Türkiye	(Kaval, 2014)
	Aerial parts	Decoction, Infusion	Kidney stones, nephralgia, diabetes, cough, diarrhea, diuretic, stomachic, antidepressant	Türkiye	(Altundag & Ozturk, 2011)
	Flowers	Topical (poultice; decoction-based)	Wound healing	Türkiye	(Sezik *et al.* 2001)
	Flowers	Maceration, Infusion	Diabetes	Türkiye	(Orhan *et al.* 2014)
	Flowers	Infusion	Cholesterol	Türkiye	(Güneş *et al.* 2017)
	Flowering stem	-	Kidney gravel	Türkiye	(Saraç *et al.* 2013)
Helichrysum plicatum subsp. *pseudoplicatum* (Nábělek) Davis & Kupicha	Aerial parts	Decoction	Diabetes, kidney stones	Türkiye	(Mükemre *et al.* 2015)
Helichrysum sanguineum (L.) Kostel.	Aerial parts	-	Urological infectious diseases; oxidative stress	Palestine	(Jaradat *et al.* 2018)
Helichrysum schimperi (Sch. Bip. ex A.Rich.) Moeser	Root		Stomachache, diarrhea	Tanzania	(Kacholi, 2026)
Helichrysum serotinum subsp. *picardii* (Boiss. & Reut.) Galbany, L. Sáez & Benedí	Aerial parts	Essential oil	Dermatomycosis	Portugal	(Viegas *et al.* 2014)
	Aerial parts	Decoction, Infusion	Analgesic properties, dermatologic, respiratory and digestive disorders, allergic or infectious components	Portugal	(Pereira *et al.* 2017)
Helichrysum serotinum subsp. *serotinum*	Flowers	Infusion	Digestive disorders	Spain	(Mulet, 1991; Viegas *et al.* 2014)
	-	-	Analgesic, anti-odontalgic, astringent, antiemetic, dermatologic tonic	Spain	(Rivera & Obón, 1995; Viegas *et al.* 2014)

	-	Decoction	Stomach cleanser	Spain	(Viegas *et al.* 2014)
	Flowers	Decoction	Helminthic infections	Spain	(Rivera *et al.* 2008; Viegas *et al.* 2014)
	Flowers	Infusion	Cough, mouth ailments, liver disease, herpes	Spain	(Benítez *et al.* 2010; Viegas *et al.* 2014)
Helichrysum setosum Harv.	Leaf	-	Epilepsy	Tanzania	(Kacholi, 2026)
Helichrysum stoechas (L.) Moench	Flowers and leaves	Infusion, essential oil	Allergies, colds, cough, skin, liver, gallbladder disorders, inflammation, infections, sleeplessness, conjunctivitis	Spain	(Melián *et al.* 2017)
	Flowers	Infusion	Digestive disorder, gastralgia, cough, liver disease	Spain	(Benítez *et al.* 2010)
	Flowers	Infusion	Influenza, cold, fever, nervousness, diuretic, gallbladder, urinary bladder, digestive and pancreas problems	Spain	(Les *et al.* 2017)
	Flowers	Infusion	Kidney stones, urinary tract disorders	Türkiye	(Akbulut & Yılmaz, 2022)

Figure 3 illustrates the distribution of preparation methods, products or preparations, and administration routes reported for *Helichrysum* taxa. Among the preparation methods, infusion was the most frequently reported in 52 records, followed by decoction with 34 records and maceration with 2 records. Regarding products and preparations, essential oils were reported in six records, while poultices and pomades were documented in three and one records, respectively. Among the explicitly reported administration routes, topical application was the most common with 10 records, followed by oral administration with 2 records and inhalation with 1 record. These findings indicate that infusion and decoction were the predominant documented preparation methods, whereas topical application was the most frequently specified administration route. Preparation methods, products, and administration routes were evaluated separately because they represent distinct aspects of traditional medicinal practices.

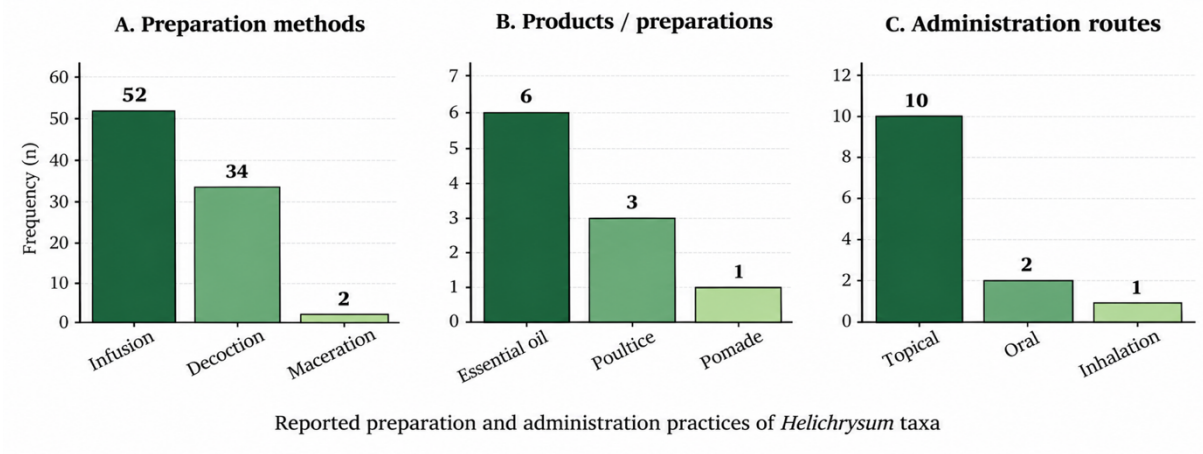


Figure 3. Distribution of preparation methods (A), products or preparations (B), and administration routes (C) reported for *Helichrysum* species.

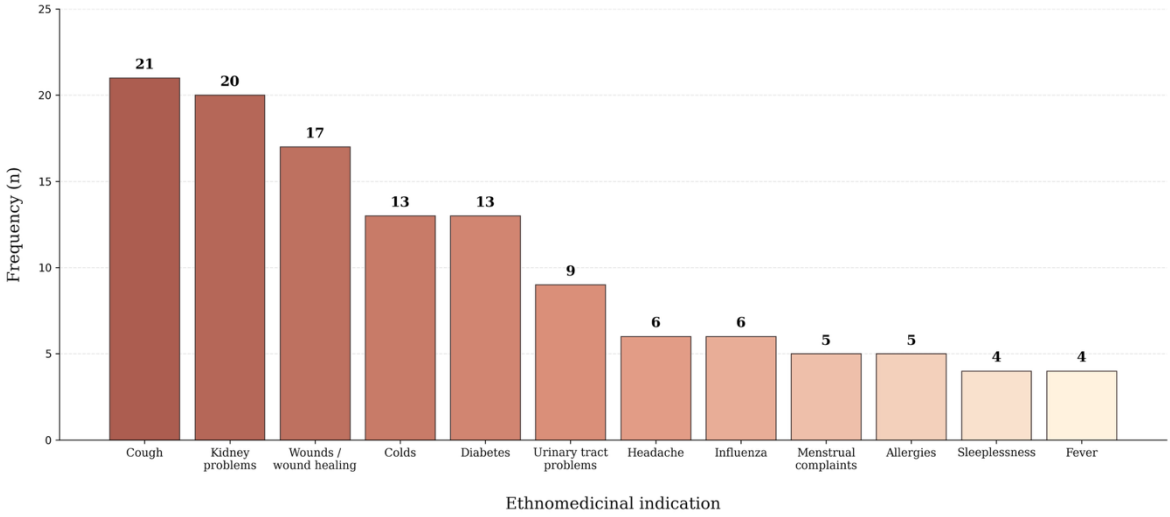


Figure 4. Distribution of the Most Frequently Reported Ethnomedicinal Indications of *Helichrysum* Species

Figure 4 illustrates the most frequently reported ethnomedicinal indications of *Helichrysum* species in the dataset. Cough was the most commonly documented indication with 21 records, followed by kidney-related problems with 20 records, wounds/wound healing with 17 records and headache 6 records were also reported, alongside several less frequent indications. The figure presents only the most frequently documented indications rather than the complete range of traditional medicinal uses identified in the review.

Discussion

This review found that the traditional medicinal uses of *Helichrysum* species exhibit a wide variety. An evaluation of the reported indications according to the ICD-11 classification resulted in a total of 275 category assignments. The highest frequency was observed in the category of symptoms, signs, and clinical findings **(**n = 75; 27.27%), followed by genitourinary system diseases **(**n = 49; 17.82%), digestive system diseases (n = 32; 11.64%), and respiratory system diseases **(**n = 31; 11.27%)**.** These frequencies represent ICD-11 category assignments rather than individual ethnobotanical records, as multiple indications could be assigned to different categories. This distribution indicates that *Helichrysum* species are reported for a variety of health-related purposes in traditional medical systems. Similarly, Lourens *et al.* (2008) and Akaberi *et al.* (2019) reported that the genus has a wide variety of traditional uses (Table 2).

It is noteworthy that the category of symptoms, signs, and clinical findings is prominent in the ICD-11 classification. This may be related to the fact that a significant portion of traditional usage records are defined in terms of symptoms—such as cough, pain, or fever—rather than a specific disease diagnosis. Furthermore, certain traditional indications, such as cough and unspecified rheumatism, are classified under Chapter 21 in the WHO ICD-11 Browser rather than under the chapters corresponding to their associated organ systems. Therefore, when aligning traditional usage data with modern disease classifications, it is necessary to consider the differences between reported folk medicine terms and clinical diagnoses. Uses that did not specify a classifiable medical indication, including burning as incense, fumigation, ritual practices, cleansing infants after breastfeeding, charms intended to make individuals forgotten or invisible, and use for a pleasant smell, were excluded from the ICD-11-based analysis.

Table 2. ICD-11 categories and percentage distributions of traditional medicinal uses of *Helichrysum* taxa.

ICD-11 Category	**Reported Medicinal Uses**	**Frequency (n)**	**Percentage (%)**
21-Symptoms, signs or clinical findings	Rheumatism, abdominal pain, diarrhea, common cold, oedema, weight loss, jaundice, cough, laxative, jaundice in babies, depressed fontanelle, fatigue, headache, gastralgia, backache, rheumatism, joint pain, stomachache	75	27,27
16-Diseases of the genitourinary system	Kidney stones, dyspepsia, menopause, dysmenorrhea, diuretic, nephralgia, Kidney problems, urinary tract disorders, infertility, prostate, urinary infection	49	17,82
13-Diseases of the digestive system	Liver diseases, stomach disorders, peptic ulcer, aphta, liver problems, digestive disorders, gall disorders, indigestion, hepatitis, intestinal disease, stomachic, stomach cleanser	32	11,64
12-Diseases of the respiratory system	Lung infection, lung disease, colds, respiratory disorders, antitussive, pneumonia, tracheitis, laryngitis, asthma, antiasthmatic fumigations, respiratory problems	31	11,27
14-Diseases of the skin	Circumcision wounds, wounds, skin infections, Infected sores, wound healing, dermatologic disorders,	26	9,45
01-Certain infectious or parasitic diseases	Flu, influenza, infections, intestinal parasitic infections, inflammation, gastroenteritis, dermatomycosis, helminthic infections	21	7,64
05-Endocrine, nutritional or metabolic diseases	Cholesterol, diabetes	16	5,82
11-Diseases of the circulatory system	Hypertension, heart trouble	6	2,18
06-Mental, behavioural or neurodevelopmental disorders	Antidepressant	5	1,82
04-Diseases of the immune system	Immunostimulant, allergy	4	1,45

07-Sleep-wake disorders	Sleeplessness	4	1,45
09-Diseases of the visual system	Catarrh	3	1,09
18-Pregnancy, childbirth or the puerperium	Retained placenta, postpartum conditions	2	0,73
08-Diseases of the nervous system	Antiepileptic, epilepsy	1	0,36
		275	**100.00**

In addition to general disease categories, an examination of the distribution of specific indications reveals that certain traditional uses are reported more frequently. Across the entire dataset, cough (n = 21), kidney-related problems (n = 20), wounds and wound healing (n = 17), and the common cold and diabetes (n = 13) were among the most frequently recorded indications. The prominence of reports related to cough and the common cold suggests that respiratory complaints play a significant role in the traditional medicinal use of *Helichrysum* species. Antunes Viegas *et al*. (2014) reported that the species H. italicum is traditionally used for coughs, the common cold, and various inflammatory conditions. Similarly, Akaberi *et al*. (2019) identified respiratory-related applications as part of the traditional uses of the genus *Helichrysum*.

The species-indication bubble matrix, which includes the 10 most frequently documented *Helichrysum* species, reveals that patterns of traditional use vary among species. For this analysis, subspecies were grouped under their corresponding species. In particular, *H. italicum* stands out for its records associated with cough (n = 7) and the common cold (n = 3). *H. plicatum*, on the other hand, stands out for its reported uses for kidney-related problems (n = 7), diabetes (n = 6), and wounds or wound healing (n = 4). Similarly, *H. arenarium* is associated with kidney-related problems (n = 4) and influenza (n = 3). The fact that certain indications are documented in a more limited number of records for other species indicates that traditional usage patterns are not homogeneous across species. However, it should be noted that the matrix includes only the 10 most frequently documented species, while other species were excluded to enhance visual readability. Furthermore, the fact that certain species are represented by a greater number of records does not indicate that these species possess higher therapeutic efficacy. The observed differences may be related to geographic distribution, local traditional knowledge, and the intensity of research conducted on these species (Figure 5).

Traditional uses related to diabetes also reflect differences among species. Among the species examined, there are records of diabetes-related uses for *H. caespititium* and *H. plicatum*. Semenya *et al*. (2012) reported that among the Bapedi traditional healers in South Africa, *H. caespititium* is one of the plants used in diabetes management. This finding supports the traditional use of *H. caespititium* for diabetes documented in the present review. However, the documentation of ethnobotanical use does not imply that clinical efficacy has been proven; traditional practices related to diabetes must be further evaluated through pharmacological and clinical studies.

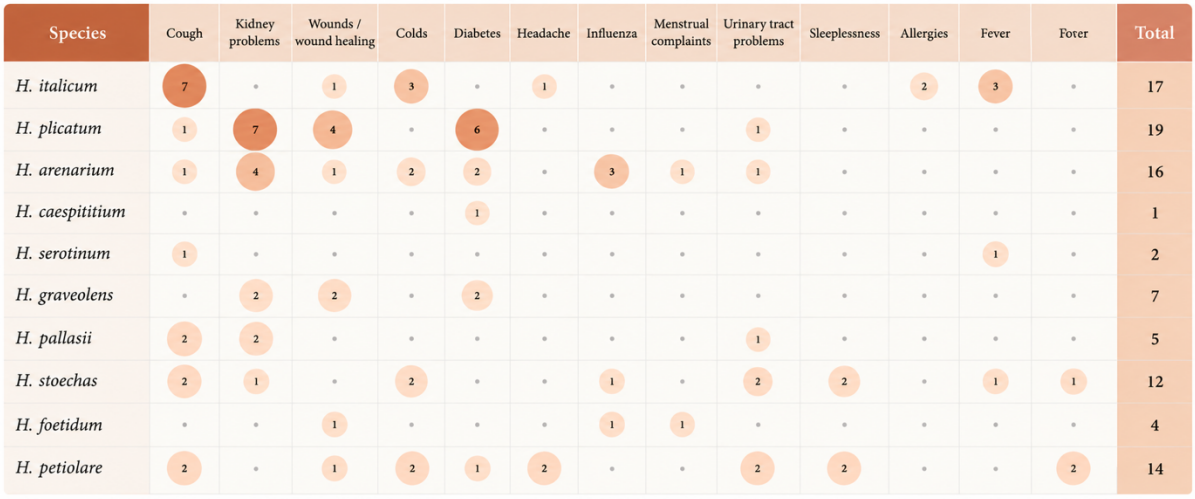


Figure 5. Species-indication bubble matrix of the ten most frequently documented *Helichrysum* species.

The plant parts preferred in the traditional use of *Helichrysum* species and the methods of preparation are also important for the evaluation of ethnobotanical practices. In the present analysis, flowers, leaves, and above-ground parts were associated with various preparation methods. In particular, the use of flowers in the form of infusions (n = 24; 63.2%) and

decoctions (n = 16; 42.1%) is noteworthy. Antunes Viegas *et al*. (2014) reported that flowers and leaves play a significant role in the traditional use of the *H. italicum* species. This indicates that the preferences for plant parts observed in the present review align with traditional practices documented in the literature.

The prominence of infusions and decoctions among preparation methods suggests that water-based preparations hold a significant place in the examined records of traditional use. However, the distribution of preparation methods varies depending on the plant part. For example, leaves are seen to be used not only in infusions and decoctions but also in topical applications. This diversity indicates that traditional usage patterns may vary not only according to plant species but also according to the plant part used and the intended application (Table 3).

Table 3. Distribution of preparation methods according to plant parts used.

Plant part used	Infusion n (%)	Decoction n (%)	Essential oil n (%)	Topical n (%)	Not reported n (%)
Flowers (n = 45)	27 (60.0)	17 (37.8)	2 (4.4)	4 (8.9)	2 (4.4)
Aerial parts (n = 27)	15 (55.6)	9 (33.3)	2 (7.4)	1 (3.7)	1 (3.7)
Leaves (n = 21)	7 (33.3)	6 (28.6)	2 (9.5)	6 (28.6)	4 (19.0)
Whole plant (n = 19)	5 (26.3)	3 (15.8)	1 (5.3)	0 (0.0)	11 (57.9)
Roots (n = 6)	2 (33.3)	2 (33.3)	0 (0.0)	1 (16.7)	2 (33.3)
Stems (n = 4)	1 (25.0)	1 (25.0)	0 (0.0)	1 (25.0)	2 (50.0)
Fruits (n = 1)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)

Table note: Values represent frequencies (n) and percentages (%) calculated within each plant-part category. Multiple plant parts and preparation methods may be reported in a single ethnomedicinal record; therefore, percentages may exceed 100% when summed across a row.

Pharmacological studies provide an important basis for comparison when evaluating traditional usage patterns. Serabele *et al*. (2021) demonstrated differences in the chemical profiles and antimicrobial activities of the species *H. odoratissimum* and *H. petiolare*, which are used interchangeably in traditional practices. This finding indicates that species with similar traditional uses should not be considered pharmacologically equivalent. Similarly, Spínola and Castilho (2017) reported findings regarding the in vitro antidiabetic potential of *H. melaleucum* extracts. However, these results should not be directly generalized to other species within the same genus.

One of the significant limitations of the present review is that usage frequencies reflect the frequency of records documented in the examined publications rather than the actual prevalence of use in the community. Furthermore, differences in taxonomic nomenclature, the merging of subspecies at the species level, and the repeated reporting of the same traditional knowledge in different sources may affect the interpretation of the results. Lourens *et al*. (2008) emphasized that taxonomic uncertainties within the genus *Helichrysum* pose a significant challenge in the evaluation of ethnobotanical literature.

In conclusion, the ICD-11 classification, the species-indication matrix, and the analysis of plant parts and preparation methods make it possible to evaluate the traditional medicinal uses of *Helichrysum* species from various perspectives. These findings contribute to the understanding of the diversity of traditional knowledge and provide a foundation for future ethnobotanical, phytochemical, and pharmacological research conducted on a species-by-species basis.

Conclusion

This review demonstrates that *Helichrysum* species have traditionally been used in various geographic regions to address a wide range of health issues. Classifying records of traditional use according to ICD-11 disease categories has highlighted the diversity of the genus's ethnomedical applications; in particular, it has shown that uses related to symptoms and clinical findings, as well as those involving the genitourinary, digestive, and respiratory systems, are prominent. In terms of specific indications, cough, kidney-related problems, wounds and wound healing, and the common cold were among the most frequently reported uses.

The species-indication analysis revealed that traditional usage patterns differed among *Helichrysum* species, while the evaluation of plant parts used and preparation methods highlighted the importance of traditional practices such as infusions and decoctions. These findings contribute to the systematic evaluation of traditional medical knowledge regarding the *Helichrysum* genus and to a better understanding of the differences in usage among species.

Although the literature reports antioxidant, antimicrobial, anti-inflammatory, and metabolic biological activities associated with various *Helichrysum* species, the current experimental evidence is insufficient to clinically validate all traditional uses. In particular, toxicological evaluations, standardization of herbal preparations, and clinical studies are limited for many species.

Consequently, this study contributes to the documentation of existing ethnobotanical knowledge by revealing the diversity of traditional medicinal uses of *Helichrysum* species and species-specific usage patterns. The findings may help identify priority areas for future species-focused ethnobotanical, phytochemical, and pharmacological research. However, the preservation of traditional knowledge and the safeguarding of local communities' knowledge base must be an integral component of such research.

Declarations

List of abbreviations: ICD-11-International Classification of Diseases, HIV - Human Immunodeficiency Virus

Ethics approval and consent to participate: Ethics approval is not applicable, and all authors gave their consent before starting the study.

Consent for publication: All authors have read and approved the manuscript for publication.

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