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Ethnobotany, Phytochemistry, Pharmacology and Nutritional Potential of Medicinal Plants from Asteraceae Family

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Abstract: The Asteraceae family has a worldwide distribution with a special focus on the Mediterranean, Eastern Europe, and Asia Minor. It contains approximately 33,000 plant species with over "1600 to 1700" genera worldwide in tropical and subtropical climates. Over the centuries, Asteraceae plants have been used as medicinal plants throughout the world. There are several well-known taxa in the Asteraceae family, including lettuce, chicory, artichoke, daisy, and dandelion, which have been used for centuries in food and medicine. The family members are quite diverse, but they all share a common chemical composition. For example, inulin is a natural polysaccharide with strong prebiotic properties and is found in all species. The majority of species are annual, biennial, or perennial herbaceous plants, and they can be found all over the world. This family includes astringents, anti-inflammatory drugs, diaphoretics, nerve tonics, laxatives, wound healing products, blood flow disorders, headaches, pains, flatulence, dysentery, hemorrhoids, ulcers, and cachexia-causing illnesses. In addition to their anti-inflammatory, analgesic, and antipyretic properties, some of these species also possess high antioxidant properties, as demonstrated in studies using extracts of roots, stems, bark, leaves, flowers, fruits, and seeds. The Asteraceae species whose natural antioxidant properties have the greatest potential for use in the medicine, cosmetics, and food industries are identified. Asteraceae species have been reported to contain flavonoids, phenolic acids, coumarins, monoterpenoids, sesquiterpenes, diterpenes, and triterpenes, and sterols. In this way, various species of Asteraceae plants have been identified and collected that have proven effective and useful for treating a variety of human diseases. This manuscript describes the medicinal properties along with the peculiar phytoconstituents and pharmacological properties and nutritional potential of various Asteraceae plants.
Keywords: Asteraceae • Antioxidants • Phytochemistry • Medicinal properties • Bioactive compounds

Introduction

The ability of plants to synthesize secondary metabolites with potential biological activity has long contributed to the development of medicine. In traditional medicine, plants were used in a number of different ways to treat numerous illnesses. Approximately 80% of the world population still relies on conventional and folk medicine, primarily in the form of remedies, according to the World Health Organization. Traditional medicine uses plants to produce drugs that are cheaper, easier to access and have fewer side effects than synthetic drugs (Rolnik, A and Olas, B., 2021). The Asteraceae family is one of the most diverse groups of plants. Its high efficiency throughout the angiosperm phylogeny appears in the Asterideae. There are approximately 33,000 recognized species in the Asteraceae plant family. Additionally, it contains "1,600 to 1,700" genera worldwide, excluding Antarctica. As a result of the range of species in temperatures ranging from temperate to cold-temperate to subtropical, this family is also referred to as a cosmopolitan family. The Asteraceae family is divided into three subfamilies: Asteroidea, Barnadesioideae, and Cichorioideae (Michel et al., 2020). These plants are identified by hairy,

fragrant leaves and flat clusters of little flowers at the apex of the stem. Because these flowers are available a variety of colors, several kinds are attractive garden plants. The Asteraceae family is usually known as the aster, daisy, or sunflower family. The name "Asteraceae" springs from the parent genus Aster. While "Compositae" is an earlier but still valid term, refers to the distinctive inflorescence, a singular kind of pseudanthium seen in only a few other angioplasties (Ghazal 2019). The Asteraceae are mostly herbs, subshrubs or shrubs, trees, or vines. *Baccharis trimera* (Less) DC. (gorse), *sweet false chamomile* L. (camomile), *Cynara scolimus* L. (artichoke), *Vernonia condensata* Baker ("boldo-da-bahia"), and *Arnica montana* L. are its most vital representatives (true arnica). These species are commonly used and marketed as herbal remedies, implying that Asteraceae species have substantial potential as a source of bioactive chemicals. (Maia et al., 2010; Mello et al., 2008). They also contain edible oils (*Helianthus annuus* L., sunflower), insecticides, and latex, and are consumed as leafy vegetables (e.g., garden lettuce L., lettuce) and utilized as decorative plants (Wu et al., 2006). The bulk of the Asteraceae family members are medicinal plants that have therapeutic applications. Achillea, Carthamus, Chromolaena, Emilia, and Pluchea are among them. As well as having therapeutic applications, Asteraceae members have a long history of traditional medicine. Some members have been cultivated for thousands of years for medical and edible purposes. Asteraceae are mostly found in subtropical areas with arid and semi-arid climates, but they are known and widely distributed worldwide as well (Rolnik, A and Olas, B., 2021). Plant-derived remedies are used for thousands of years in most parts of the world to combat microbiological infections. (Chariandy et al., 1999; Bhavnani and Ballow, 2000). The Scientists discovered a roughly 50-million-year-old Asteraceae family fossil blossom. The relationships are described as antidiuretic, antipyretic, carminative, anthelmintic, anti-inflammatory, cardiotonic, and in healing dyspepsia, jaundice, leprosy, cough, asthma, ulcers, vomiting, etc (Jan et al., 2009). In addition, the Asteraceae family has remarkable economic and ecological importance as vegetables, oil wells, insecticides, and ornamental garden plants (Jansen and Palmer, 1987; Katinas et al., 2007). The Asteraceae family contains many plants used for traditional medicine in Turkey. Tea made from *Achillea aleppica* and *Achillea biebersteinii* was recommended for abdominal pain. For wounds and other injuries, *Chrysophthalmum montanums* aerial parts were boiled and applied. Roots were often consumed to reduce high blood pressure. In addition, *Notobasis syriaca* seeds were used for liver disease. *Matricaria aurea* was recommended twice a day to treat bronchitis, sore throat, and cough (Eruygur et al., 2019). The present review aims to combine the traditional and ethnobotanical importance of numerous medicinal plants belonging to the family Asteraceae.

Botanically characteristics of the family Asteraceae

The Asteraceae family is one of the largest flowering plant families, with over 1,600 genera and over 33,000 plant species grouped into three subfamilies (Ghazal, 2019). They are found all across the planet, inhabiting every imaginable scenario. This family is represented in India by approximately 138 genera and 708 species, which are found primarily in the Himalayas and mountains of Southern and Western India. In India, there are around 18,664 species of higher plants, with nearly 900 species belonging to the Asteraceae family (Hajra et al., 1995; Chopra, 2000). Asteraceae plants are commonly found in forests and high-altitude grasslands but are less common in tropical regions and also have a diverse morphology too. The trees of some species can reach 30 meters or more, such as

Dasyphyllum excelsum in Chile and *Vernonia arborea* in Malaysia. However, many are shrubs, like rabbit brush or rose rosette trees, perennials, or less annual herbs. Sunflowers range from 1 to 3 meters tall and become almost perennial over time (Bohm and Stuessy., 2001). The smallest species are those of the genus Mnioides found in the Peruvian Andes. There are several types of leaves, some large, others small, spiny, and some nonexistent, with their functions taken over by the green stem. The leaves are covered with indumentum and hairs of all lengths and colors. The *Jerusalem artichoke*, for instance, has thin, yellow flowers on a tall stalk surrounded by indumentum and hairs of all lengths and colors.

Bioactive constituents of the family Asteraceae

These phytoconstituents may include alkaloids, flavonoids, terpenes/terpenoids, glycosides, phenolics, phytosterols, fatty acids etc. In recent years, the Asteraceae family has been thoroughly explored and the presence of chemically varied natural compounds of important pharmacological and therapeutic relevance has been reported. This bioactivity has been linked to antimicrobial, antiviral, anthelmintic, anti-diuretic, febrifuges, carminative, anti-inflammatory, cardiotonic properties, as well as the treatment of dyspepsia, jaundice, leprosy, cough, asthma, ulcers, and vomiting. The popular genus of this family i.e., *Echinops*, *Artemisia*, *Wedelia*, *Spilanthes*, *Tridax*, *Chrysathemum*, *Achillea*, *Amaranthus*, *Inula*, *Saussurea*, *Ageratum*, *Arnica*, *Aster*, *Plectocephalus*, *Gaillardia*, *Arctium*, *Cynara*, *Anthemis*, *Cichorium*, *Xanthium*, *Dahlia*, *Taraxacum*, *Tagetes*, *Calendula* etc. have its unique volatile chemical compositions. The various bioactive componds present in plant species of asyterase family are tabulated in structure are shown in Figure 1.

Table 1, Bioactive compounds founds in different species of Asteraceae family

Species	Bioactive constituents	Class	Structure
C. cardunculus L.	Quercetin (1)	Phenols and flavonoids	1
Leuzea carthamoides Willd. DC	Eriodictyol (2) and patuletin (3)	Flavonoid	2,3
Pectis brevipedunculata Sch. Bip	Essential oils- Citral (4), geranial (5), limonene (6), and a-pinene (7)	Monoterpene compounds, hydrocarbons, sesquiterpenes, alcohols and aldehydes	4,5,6,7
Tagetes erecta L.	Citric acid (8), and malic acid (9)	Tricarboxylic acid	8,9
Artemisia campestris L	3,5-dicaffeoylquinic acid (10), 5-caffeoylquinic acid (11), and vicenin-2 (12)	Flavonoids	10,11,12
Baccharis trimera (Less.) DC	Rutin (13) quercetin (1)	Flavonoids and terpenes	1,13

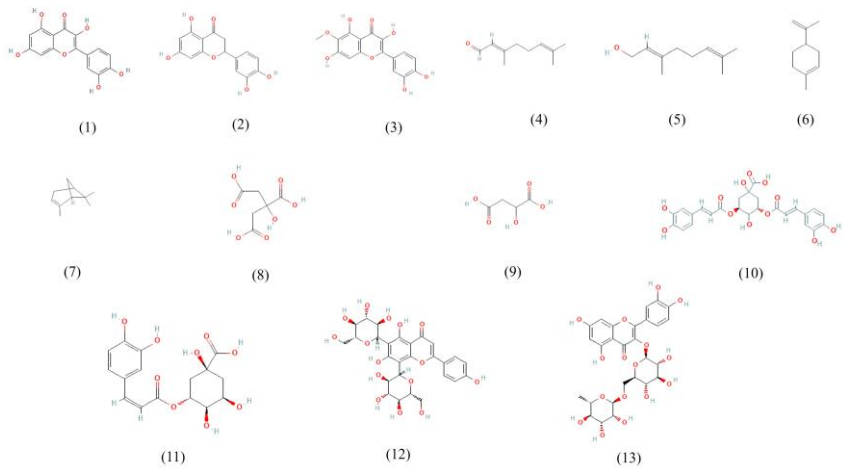

Figure 1, Structure of different bioactive phytoconstituents present in plant species of Asteraceae family (Source: https://pubchem.ncbi.nlm.nih.gov/).

Ethnobotanical and Ethnomedicinal properties

The term "Ethnobotany" has frequently been considered with "economic botany" or "traditional medicine" (Jain, 1987). Plants have been a great resource of medicinal products which are used for the treatment of several ailments. The reports of folk medicine play an initial and important role for the novel drug development from natural sources. The ethnobotanical studies reveal the preparation and usage information of the plants used among the people living in rural areas. From these valuable data, the ethnopharmacological studies are conducted to find a scientific verification for the usage of the plants and with further phytochemical analysis, the compounds responsible from the activities are elucidated. Asteraceae family plants have been found to possess diverse biological effects referring to in vivo and in vitro researches conducted (Shah et al., 1981). The bitter, hot, harsh, and dry taste of Asteraceae plants makes them useful as a pain reliever, diuretic, febrifuge, carminative, anthelmintic, anti-inflammatory, aphrodisiac, cardiotonic, stomach ache, dyspepsia, jaundice, leprosy, cough, asthma, ulcers, vomiting, and so on (Jan et al. 2009). In ethnobotanical studies in the Mediterranean, the Lamiaceae (15.40 percent), Asteraceae (11.90 percent), and Rosaceae are the most important (5.57 percent). These have a vast number of taxa, having Asteraceae being one of the most diverse (Funk et al. 2009). Aspirin, atropine, artemisinin, colchicine, digoxin, ephedrine, morphine, quinine, quinidine, reserpine, Taxol, vincristine, and vinblastine are a few examples of essential plant-derived chemicals. Spilanthes paniculate flower heads are chewed to relieve toothache and throat and gum affections. Tanacetum vulgare flowering tops and leaves give an essential oil used as a liniment for gout, rheumatism, and chronic ulcers. *Taraxacum officinales* rhizomes and roots are the source of the medicine taraxacum, which is used as a moderate laxative, hepatic stimulant, and tonic.

Nutritional potential of family Asteraceae

It has been found that many species of Asteraceae can be included in a regular, healthy diet. Researchers examined the protein content of the Asteraceae and found that protein ranged from 0.4 to 6.13 grams per 100 grams of edible parts, while fiber varied between 2.55 and 13.44 grams. Na, K, Ca, Mg, and vitamins A, B, C, and D are also abundant in the roots, leaves and flowers (Garcia-Herrera et al., 2014). The majority of plants have very low-fat content. The plants *Crepis vesicaria* and *Sonchus oleraceus* both grow in the Mediterranean area. Both are wild edible plants and are commonly used as salad ingredients in Italian cuisine. Approximately

50% of the recommended daily allowance (RDA) of vitamin A is provided by 100 grams of *C. vesicaria* leaves, while over 80% is provided by *S. oleraceus* leaves (Panfili et al., 2020). Additionally, both species contain high levels of thiamine: 200 g of material supplies 15% of the RDA of thiamine. Also, 200g of *S. oleraceus* contains nearly 14 mg of lutein per day, which has been linked to reduced rates of macular degeneration associated with aging. Absinthe is flavored with *Artemisia absinthium*, a popular addition to wine and spirits. Young leaves of *Inula crithmoides* are eaten raw, and its fresh shoots can be added to a salad or pickled. Safflower seeds are used in cheese manufacturing and the leaves in food coloring. The seeds of *Carthamus tinctorius* are especially popular in Portugal (Bessada et al., 2015).

Among the many uses of chicory in the kitchen, the green leaf is a staple ingredient in salads and a popular addition to sandwiches. It contains 22.15 mg of vitamin C per 100 g and over 60% of its total organic acid content comes from malic acid. Coffee substitutes can be made from the roots, which contain no caffeine (Sanchez-Mata et al., 2012). Nonalcoholic and alcoholic beverages can be enhanced with chicory extracts. The inulin content of chicory root varies from 11 to 20 grams per 100 grams of fresh roots and is around 44% per 100 grams of dry roots. Insulin levels fluctuate with the season and are lowest in autumn (Nwafor et al., 2017). The mature flowers of the *Cynara cardunculus* (artichoke) were used as coagulants in cheese making, and the immature flowers were enjoyed on special occasions by the rich of Ancient Greece and Rome. The majority of flowers consumed today are frozen or canned delicacies, and they are often used to make plant-based milk and cheeses (Perovic et al., 2021).

Tagetes erecta, commonly known as the Mexican marigold, is used as a food colorant; the flowers are also added to poultry feed to reduce cholesterol levels and increase yolk pigmentation (Gostin et al., 2019).

There are also edible parts of *Helianthus tuberosus*, the *Jerusalem artichoke*, which contain vitamins and minerals like potassium and phosphorous. Inulin, a complex carbohydrate that can promote human health, is also found in *J. artichoke* tubers; 100 grams of tubers contain almost 10 grams of inulin, which is believed to promote health (Inulin increases the absorption of calcium, magnesium and various other minerals. Because of its low caloric value and ability to mimic traditional fat, it can be used in cookies, cakes, and bread as an effective substitute for regular sugars and fats. In Canada, *J. artichoke* tubers are fermented and served as a prebiotic drink with blueberry juice. Their juice can be used to enhance the characteristics of fermented milk products (Munim et al., 2017).

Chemical Characteristics and Health Benefits of Asteraceae Family

The phytochemical components of many Asteraceae species are attributed to their pharmacological properties, including essential oils, lignans, saponins, polyphenolic compounds, phenolic acids, and sterols (Achika et al., 2014). Various members of the Asteraceae family, including *Cirsium arvense*, *Onoporidium acanthium*, *Centaurea solstitailis*, and *Carduus acanthoides*, were found to have phenolic contents ranging from 8.035 to 90.305 mg GAE/L (milligrams of the gallic acid equivalent of plant extract), and total flavonoid contents ranging from 18.031 to 185.437 mg QE/L (milligrams of quercetin equivalents) (Koc et al., 2015). This plant contains a wide variety of phenolic compounds, including chicoric acid, kaempferol, luteolin, quercetin, and apigenin. A number of these acids can also be found in the underground parts of plants, for example, chicory roots contain caffeic acid, chlorogenic acid, and isovanillic acid (Petropoulos et al., 2019). Additionally, many triterpenes have been identified in Taraxacum species, which is

an important family member, including taraxacin, taraxacin acid, fardiol, arnidiol, taraxasterol, and amine. Ascorbic acid, fumaric acid, citric acid, and malic acid are also naturally present in many plants (Hu et al., 2018). The lignan arctiin, a glucoside of artigenin, occurs in numerous species of Asteraceae, notably *Centaurea imperialis*, *Forsythia viridissima* and *Saussuerea heteromallav*, and was first isolated from *Arctium lappa*. A variety of pharmacological effects of arctiin include cytotoxicity, antiproliferative effect and desmutagenic effect. It also acts as a platelet-activating factor antagonist and calcium antagonist (Tourchi et al., 2016).

An herb commonly known as wormwood is *Artemisia absinthium*. In addition to being added to biological sprays against pests due to their odor, it also has a range of health benefits, including diuretic, digestive, balsamic, and depurative properties. It is also recommended for the treatment of leukemia. *Erigeron canadensis* exhibits snake antivenom activity in its aerial part as well as antiplatelet and anticoagulant activity that are primarily induced by arachidonic acid-induced cyclooxygenases. Preparation of this plant inhibits plasma clot formation in human plasma by inhibiting prothrombin and partial thromboplastin times. Cofactor II of heparin has also demonstrated significant anti-II activity (Michel et al., 2020).

Many Asteraceae, especially *Taraxacum* spp, *Reicardia picroides*, *Sonchus oleraceus* and *Picris echioides*, have bacteriostatic and bacterial potency against *Salmonella tymphimurium*, *Bacillus aureus*, *Escherichia coli* and *Staphylococcus aureus*. They have also demonstrated antifungal activity against *Penicillium ochrochloron* (Petropoulos et al., 2019).

A number of plants from the Asteraceae family demonstrate in vitro antimicrobial activity. *Ageratum conyzoides* and *Tagetes erecta* were found to have antimicrobial properties against various Gram-positive and Gram-negative bacteria in an antimicrobial screening assay (Phan Canh et al., 2020). *T erecta* inhibited *P aeruginosa* growth as well. Furthermore, chicory demonstrated an antimicrobial effect by inhibiting several Gram-positive and Gram-negative bacteria, such as *Aspergillus niger* and *Saccharomyces cerevisiae* (Perovic et al., 2021).

Antibacterial properties

Antimicrobial compounds which suppress or kill the growth of microorganisms such as bacteria, fungi, viruses etc. Plants are prosperous source of wide array of secondary metabolites to possess therapeutic properties (Martin et al., 2015).

Antioxidant properties

As a result of their high phenolic compound content, extracts from plants of the Asteraceae family are capable of scavenging free radicals. As phenolic compounds improve the endogenous antioxidant system, chelate metal ions, and prevent the formation of free radicals, they act as antioxidants (Tourchi et al., 2016). According to research, arctiin significantly slows the generation of intracellular reactive oxygen species (ROS) induced by H_2O_2. A fluorescence spectroscopy and liposome oxidation evaluation were used to measure the antioxidant activity of chicory leaves in vitro. A 250 g/mL leaf extract preparation inhibited lipid peroxidation by 88% (Michel et al., 2020). According to their chromatographic profiles, the plants contained high levels of anthocyanins, known to have strong antioxidant properties. Among the flavonolignans isolated from Silibum marianum's fruits and seeds is silibinin (SBN), a strong antioxidant. Its ability to scavenge free radicals, including peroxyl radicals and hydroxyl radicals, is impressive. By treating and attenuating the inflammation that triggers atherosclerosis, it also inhibits the NF-kB pathway (Bae et al., 2014).

Antifungal properties

Plants being as a rich source of active phytoconstituents possess antifungal properties against wide varieties of fungal strains. Antifungal potential of various plant species has been estimated by many workers. In the past few decades, the incidence of microbial skin infections especially dermatophyte infections have increased worldwide (Straten et al., 2003; Sharma and Borthakur, 2007; Jain et al., 2008). These diseases are common in the world's tropical and subtropical climates. They are a severe health problem not only because they are life threatening, but also because they inflict extreme discomfort, tension, agony, and ugliness. Such illnesses have been documented in several locations of India as well as other nations (Jain et al., 2008; Prasad et. al., 2005; Kannan et al., 2006; Straten et. al., 2003; Nweze, 2010). Traditional medicine is used by 80 percent of the population in various Asian and African nations for primary health care (Oyebode et al., 2016). These diseases are common in the world's tropical and subtropical climates. They are a severe health problem not only because they are potentially fatal, but also because they inflict extreme discomfort, anxiety, pain, and ugliness. Such illnesses have been documented in several locations of India as well as other nations (Jain et al., 2008; Prasad et. al., 2005; Kannan et al., 2006; Straten et. al., 2003; Nweze, 2010).

Anti-inflammatory activities

An extract of *Cynara scolymus*, an artichoke, showed anti-inflammatory activity in vivo in a study involving 60 male and 60 female Wistar rats. Among the Asteraceae, arctiin plays a crucial role in controlling inflammation by inhibiting the production of inflammatory mediators and the translocation pathway of nuclear factor (NF)-k, resulting in the suppression of cyclooxygenase-2 (COX-2) (Jafarinia and Jafarinia., 2019).The methanol extract from *Emilia sonchifolia* demonstrates anti-inflammatory effects by inhibition of edema induced by carrageenan Oleamide isolated from burdock can reduce the production of TNF-α and IL-4 Taraxacum species also demonstrate anti-inflammatory activity: extracts from dandelion flowers prevent the production of proinflammatory cytokines (Michel et al., 2020).

Plants for the treatment of urogenital problems

Urogenital refers to both the urine and genital organs. Urinary tract infections are one of the most prevalent types of infections in the body, accounting for around 8.1 million doctor visits each year. Women are predisposed to UTIs for anatomical reasons (Mahalik, et al., 2015). Urinary system issues might include renal failure, urinary tract infections, kidney stones, prostate enlargement, and bladder control issues. In the senior female population, one-third of women over the age of 50 have urogenital disorders. Lower urinary tract symptoms include incontinence, urethritis, and recurring urinary tract infections (Samsioe, 1998).

Plants for the treatment of cardiovascular problems

The use of plants in cardiovascular medicines is still widespread, and the fatality rate of cardiovascular diseases is rising each year. Cardiovascular disorders are one of the most common diseases in the world, and they prove to be one of the most significant threats to the health of people. Currently studies on medicinal plants' activity on cardiovascular disorders are commonly used in the treatment of cardiovascular disease, as shown in Table 6 (Michel et al., 2020).

Application of Asteraceae in Human Health

As a result of the increasing interest in diet and therapy based on natural remedies for a wide range of ailments, there has been a significant increase in interest in diet. It is proven that a diet rich in plants, which are the best sources of antioxidants, plays a dominant role in preventing these diseases. For instance, inulin isolated from dandelion roots is used

microbiologically in high fructose syrup production. This is a replacement for the traditional one and plays a role in the prevention of diabetes and obesity. The lack of narcotic effect of coffee from dandelion roots makes it an excellent alternative to regular coffee. Dandelion leaf preparations are also added to health food products for diuretic problems in the USA. The roots of chicory also serve as a valuable source of functional foods and healthy foods. In cracker production, chicory roots are a healthy replacement for white flour and fat since they contain dietary fiber and inulin. In addition to low-calorie sweeteners that improve dietary fiber content, *Jerusalem artichoke* is also a source of remedies for a number of diseases. In Russia, the flowers are used to make tea, which, when consumed daily, boosts energy levels, improves immunity, and prevents kidney disease. *Jerusalem artichoke* tubers are recommended for obesity diets as they cause a feeling of satiation. However, more studies need to be conducted on the Asteraceae family to fully understand how it can be used to prevent disease or develop new drugs.

Table 2. Medicinal plants used for the treatment of respiratory diseases

S. No.	Botanical Name	Vernacular Name	Plant parts used	Native place	References
1.	*Aertimisia dubai*	Titeypati	Leaf and Young Shoot	East Himalaya	Sapkota, 2008
2.	*Ageratum conyzoides*	Goatweed	Leaves	Tropical America (Brazil)	Patel, 2012
3.	*Arctium lappa*	Greater burdock	Root, Seed, Leaf	Temperate Eurasia	Chan et al., 2011
4.	*Artemisia biennis*	Biennial wormwood	Leaves	North America	Kershaw, 2000
5.	*Artemisia maritima*	Sea wormwood, old woman	Aerial part	France, United Kingdom, Italy	Alamgeer et. al. 2018
6.	*Aster amellus*	Italian Star Wort	Roots	India, Europe	Mukherjee, 2006
7.	*Calendula officinalis*	Pot Marigold	Fresh young leaves	South Europe	Jeschke et al., 2009
8.	*Cichorium endivia*	Cultivated endive	Seeds	India or Egypt and China	Alamgeer et. al., 2018
9.	*Cichorium intybus*	Chicory	Whole plant	Northern Europe	Alamgeer et. al., 2018
10.	*Conyza sumatrensis*	Sidji (Lamso)	Leaves	North America	Focho et al., 2009
11.	*Cousinia stocksii*	Naryan Band	Gum and roots	South Asia	Alamgeer et. al., 2018
12.	*Eclipta prostrata*	Bhringraj, White head	Leaf	Native to Asia, widely distributed to India, China	Patel, 2012
13.	*Erigemn canadensis*	Canada Fleabane	Whole plant	North America	Mukherjee, 2006
14.	*Inula grantioides*	Cutch Inula	Whole plant	Oman (Dhofar), S. & E. Iran to NW. India (Gujarat).	Alamgeer et. al., 2018
15.	*Kussurec costus*	Kuth, Costus	Roots	India, Pakistan	Mukherjee, 2006
16.	*Lactuca serriola*	Prickly lettuce	Whole plant	Europe, Asia, and north Africa	Alamgeer et. al., 2018
17.	*Lobelia inflata*	Indian tobacco, Puke weed	Aerial part	North America	Hausner et al., 2013
18.	*Matricaria recutita*	Chmomila	Aerial part	Europe	Jeschke et al., 2009
19.	*Pseudognaphalium luteoalbum*	Jersey cudweed	Leave	Europe	Alamgeer et. al., 2018
20.	*Saussurea atkinsonii*	Louisa Saw- Wort	Aerial part	Western Himalaya	Alamgeer et. al., 2018
21.	*Saussurea lappa*	Kuth, costus	Root	South Asia, China	Zahara et al., 2014
22.	*Spilanthes paniculata*	Toothache plan	Flower, aerial part	Asia	Ali et al., 2015
23.	*Sphaeranthus indicus*	East Indian glob thistle	Whole plant	Asia, Australia	Galani et al., 2010
24.	*Tagetes erecta*	Genda phul (B|, French Marigold	Flowers, whole plant	Mexico	Mukherjee, 2006
25.	*Tridax procumbens*	Bhringraj	Leaf	Tropical Americas	Poddar et. al., 2020
26.	*Tussilago farfara*	Colt's foot	leaves	Europe, parts of western and central Asia	Alamgeer et. al. 2018
27.	*Vernonia anthelmentica*	Iron weed	Seeds	America	Alamgeer et. al. 2018
	Veaernonia cinera	Little ironweed Sahadevi (Hindi	Roots	Tropical Africa and tropical Asia	Shelar et al., 2014

Table 3, Medicinal plants used for anti-dermatological activities

S. No.	Botanical name	Vernacular name	Plant part used	Native place	References
1.	*Ageratum conyzoides*	Billy Goat weed, Jangli pudina	Leaves	Tropical America (Brazil)	Sharma et. al., 2014
2.	*Aspilia natalensis*	Wild creeping sunflower	Leaves	South Africa	Mabona et al., 2013
3.	*Artemisia annua*	Wormwood or sweet sagewort	Aerial part	Asia	Mirbehbahani et al., 2020
4.	*Artemisia biennis*	Biennial wormwood	Leaves	North America	Kershaw, 2000
5.	*Artemisia dubai*	Mugwort	Root	Asia, North America	Sapkota, 2008
6.	*Artemisia nilagirica*	Indian wormwood, Kunj	Leaves	North – Eastern Himalaya	Negi et al., 2011
7.	*Anaphalis neelgerriana*	Pearly everlasting	Leaf and head paste	North America	Bhat et al., 2013
8.	*Artemisia vulgaris*	Common mugwort	Aerial parts, Essential oil	Europe, Asia	Anwar et al., 2016
9.	*Aspilia africana*	Wild sunflower	Leaves	Africa	Komakech et al., 2019
10.	*Centaurea benedicta*	Holy thistle	Whole plant	Eurasia	Mabona et al., 2013
11.	*Calendule offkinolis*	Pot Marigold	Leaf, flowers	Mediterranean region	Mukherjee, 2006
12.	*Chrysocoma ciliate*	Beesbossie	Whole plant	Africa and Australia	Mabona et al., 2013
13.	*Eclipa alba*	Bhringaraj	Leaves	Asia	Meena et al., 2009
14.	*Eclipta prostrata*	Bhringraj, White head	Whole plant	Asia	Sharma et. al., 2014
15.	*Pluchea lanceolata*	Rasna	Leaves	West Himalaya	Meena et al., 2009
16.	*Senecio concolor*	Idambiso or ibohlololo	Leaves	South Africa.	Mabona et al., 2013
17.	*Sonchus asper*	Spiny sow-thistle	Leaves	Europe, Africa and Asia	Upadhyay et al., 2013
18.	*Sonchus oleraceus*	Milk thistle, sow thistle or smooth sow thistle	Whole plan	Europe	Mabona et al., 2013
19.	*Sphaeranthus indicus*	East Indian global thistle	Leaves	India	Galani et al., 2010
20.	*Tagetes erecta*	Marigold	Leaves	Mexico and Central America	Bhat et. al., 2012
21.	*Tagetes patula*	Genda	Leaf, Root	Mexico and Guatemala	Patel, 2012
22.	*Venidium arctotoides*	Bittergousblom or bitterblom	Leaves	South Africa	Mabona et al., 2013

Table 4, Medicinal plants used as Immunity boosters

S. No.	Botanical name	Vernacular name	Plant part use	Native place	References
23.	*Bidens pilosa*	Black fellows	Whole plant	South and Central America	Mukherjee et al., 2014
24.	*Cristium arvense*	Thistle, Field thistle.	Root	Europe and western Asia	Cripps, 2009
25.	*Echinacea sp.*	Purple Coneflowers	Petales	North America	Kathal1 et al., 2016
26.	*Eclipta prostrata*	Bhringraj, White head	Whole plant	Asia	Mukherjee et al., 2014
27.	*Erigeron annuus*	Annual Fleabane, Daisy fleabane	Flowers	America	Alderson, 2021
28.	*Sonchus asper*	Prickly sow-thistle Spiny sowthistle	Leaves	Europe, North America, western Asia	Upadhyay et al., 2013
29.	*Tagetes minuta*	Common Marigold	Leaves	Southern half of South America	Tereschuk et al., 1997
30.	*Taraxacum officinale*	Dandelion	Leaves, herbs	North America, Europe and Asia	Napoli et al., 2021; Babich et al., 2020
31.	*Tridax procumbens Linn*	Bhringraj	Leaves	Tropical America	Mir et al., 2017

Table 5, Plants for the treatment of urogenital problems

S. No.	Botanical name	Vernacular name	Plant part used	Native place	References
1.	*Artimisia absinthium*	Wormwood, Mastiyarah	Leaves	Eurasia, Northern Africa	Hussain et al., 2017
2.	*Artimisia herba-alba*	white wormwood	Leaves and Flowers	Spain, France	Alzweiri et al., 2011
3.	*Artemisia nilagirica*	Indian wormwood	Leaf and Stem Oil	North eastern Himalaya	Mohanty et al., 2018
4.	*Baccharis genistelloide*	Carqueja	Leaves and stem	South America to Chile	De-la-Cruz et al., 2007
5.	*Blumea laciniata*	Cutleaf Blumea, Cutleaf false oxtongue	Shrub	Tropical & Subtropical Asia to Pacific.	Rai et al., 2010
6.	*Blumea mollis*	Soft Blumea	Whole plant	Tropical & Subtropical Old World	Devi et al., 2011
7.	*Blumea oxyodonta*	Spiny Leaved Blumea	Leaf	Indo- China	Dinde et al., 2018
8.	*Calendule offkinolis*	Scotch Marigold	Leaf, flowers	Mediterranean region	Mukherjee, 2006
9.	*Eclipta alba*	False Daisy	Leaves and Flowers	Asia	Soni and Soni, 2017
10.	*Eupatorium cannbinum*	Holy rope	Leaves and Roots	Europe	Al-Snafi, 2017
11.	*Lactuca sativa*	Lettuce, Garden lettuce	Leaf, Stam	Southwest Asia	Noumedem et al., 2017
12.	*Sphaeranthus indicus*	East Indian global thistle	Whole herb	India	Galani et al., 2010

S. No.	Botanical name	Vernacular name	Plant part used	Native place	References
13.	*Taraxacum officinale*	Pitachumki, Common Dandelion	Aerial parts, Roots	Europe, Asia	Mukherjee, 2006
14.	*Xanthium strumarium*	Cocklebur	Root	North America	Islam et al., 2009

Table 6, Medicinal plants used for cardiovascular diseases

S. No.	Botanical name	Vernacular name	Plant part use	Native place	References
1.	*Ageratum conyzoides* L.	Billy Goat weed	Root	Tropical America (Brazil)	Rai et al., 2010
2.	*Artimisia absinthium*	Wormwood	Aerial part	North Africa, Temperate regions of Eurasia	Michel et al., 2020
3.	*Artimisia campestris* L.	Field wormwood	Aerial part (leaves, stalk, and stems)	Eurasia and North America	Dib et al., 2017
4.	*Bidens pilosa L.*	Spanish needles, beggar's ticks, devil's needles	South America	Leaf	Michel et al., 2020
5.	*Blumea laciniata*	Cutleaf Blumea, Cutleaf false oxtongue	Herb	Asia to Pacific	Rai et al., 2010
6.	*Chamaemelum nobile* (L.) All.	Chamomile	Whole plant	Roman chamomile	Zeggwagh et al., 2009
7.	*Cynara scolymus* L.	Global artichoke	Leaf	Mediterranean	Mocelin at al., 2016
8.	*Gundelia tournetortti* L.	Kuub	Seeds	South America	Sharaf and Ali, 2004
9.	*Inula cappa* DC	Sheep's Ear	Shrub	West Himalya	Rai et al., 2010
10.	*Launaea intybacea*	Lettuce	Whole plant	India	Michel et al., 2020
11.	*Sonchus wightianus*	Wight's Sow-Thistle	Root	China, the Indian Subcontinent	Rai et al., 2010
12.	*Stevia rebaudiana (Bert.) Bertoni.*	Sweet leaf, Sugar plant	Leaf, Stem	Paraguay	Patel, 2012
13.	*Tridax procumbens (L.) L.*	Ghamra or coat buttons	Leaves	India	Michel et al., 2020

Conclusions

A large number of ornamental plants come under the family, along with food, dye, oil-producing, and medicinal plants. It is possible for Asteraceae taxa to disperse over long distances, and they have used this ability to reach distant lands through long-distance dispersal. The subfamily Barnadesioideae can be considered the basal branch of the Asteraceae. There are many uses for the Asteraceae family, including vegetables (lettuce, artichokes, endives), oil (sunflower, safflower), pesticides (pyrethrum), and garden ornamentals (chrysanthemum, dahlia, marigold, and numerous others). The leaves of *Lactuca sativa*, commonly known as the garden lettuce or salad plant, are used to make a salad. It is believed that man consumes the tubers of *Helianthus tuberosus* and *Cynara scolymus*. There is a plant called *Tragopogon porrifolium* that has tasty roots. It is often called Vegetable oyster. *Chichorium intybus* (Chicory) roots are used to blend coffee after it has been roasted. *Helianthus*

annuus (Sunflower) seeds contain an edible fatty oil. Heart patients can benefit from oil derived from the seeds of *Carthamus tinctorius* (Safflower, Kusum). In addition to being used in the manufacture of soaps, paints, varnishes, linoleum, and many other products, *Tagetes minuta* (Stinking Roger) and *T panda* (French marigold, Genda) produce a strong aromatic essential oil that is used in hair care products in the form of an antibiotic, an insect repellent, and a modifier. As an antioxidant, antibacterial, antifungal, antiallergic, and memory-booster, it is also utilized in high-end perfumes.

Competing Interests:

The author declares no conflict of interest. The manuscript has not been submitted for publication in another journal.

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