



**SIGNIFICANCE OF ARTEMISIA VULGARIS L. (COMMON MUGWORT) IN THE HISTORY OF MEDICINE AND ITS POSSIBLE CONTEMPORARY APPLICATIONS SUBSTANTIATED BY PHYTOCHEMICAL AND PHARMACOLOGICAL STUDIES**

Khamroeva Sarvinoz Azamat kizi

3rd Year Student of the Faculty of Pharmacy,

Tashkent Pharmaceutical Institute

**Annotation**

*Artemisia vulgaris* L. (common mugwort) is a species with great importance in the history of medicine and was called the “mother of herbs” in the Middle Ages. It is a common herbaceous plant that exhibits high morphological and phytochemical variability depending on the location where it occurs. This species is well known almost all over the world. Its herb—*Artemisiae vulgaris herba*—is used as a raw material due to the presence of essential oil, flavonoids, and sesquiterpenoids lactones and their associated biological activities.

**Keywords:** medical history, traditional medicine, chemical composition, biological activity

**Introduction**

In 2015, the awarding of the Nobel Prize in Medicine for the discovery of artemisinin, a compound of plant origin found in *Artemisia annua* (annual mugwort), inspired the researchers to study the phytochemical and pharmacological properties of other species of the genus *Artemisia*. Recently, this species has been taken under consideration to be active toward the virus SARS-CoV-2 and disease COVID-19. *Artemisia vulgaris* L. (common mugwort) is one of the best-known species of this genus, which has a widespread distribution in the natural habitats worldwide (Europe, Asia, North and South America, and Africa). For many centuries, this species has been mainly used for treating gynecological ailments and gastrointestinal diseases. Recently, researches have proved that this species exhibits antioxidant, hypolipidemic, hepatoprotective, antispasmodic, analgesic, estrogenic, cytotoxic, antibacterial, antifungal, hypotensive, and broncholytic effects. The different applications of this plant species have been possible due to its rich chemical composition, which especially includes essential oils, flavonoids, sesquiterpene lactones, phenolic acids, coumarins, and other groups of metabolites.



The presence of essential oil in *A. vulgaris* contributes to the significance of this species as a culinary spice in the food industry in various regions of the world. Currently, this species is also increasingly used in the production of cosmetics in Europe as well as in Asia and North America .

### **Botanical Characteristics**

The species *A. vulgaris* shows high morphological variability depending on the place of occurrence . Comparative studies conducted between different populations revealed variability in the branching (presence or absence and extent), leaf shape, and root diameter of the plant . The high variability of *A. vulgaris* has been confirmed by the study conducted by Barney and DiTommaso on two populations collected from different, geographically isolated areas of Ithaca (USA). The authors found that plants from one population had densely hairy stems and light green leaves, each with a few deep notches, whereas those collected from another part of the city had almost smooth stems and dark green leaves with many deep notches . *Artemisia vulgaris* is a herbaceous plant which grows up to a length of 2.5 m and has a width of 75 cm. It is characterized by an intense aroma that is readily released when the leaves are crushed , and a spicy taste . The plant has a thick main root and many small, fibrous lateral roots. The roots take on a light-brown color and measure up to 1 cm. They remain in the upper layer of the soil, at a depth of 7–18 cm, forming a vast, underground network . The stems of the plant are slightly wavy, straight, or branched, having a brown color at the lower end, and become woody with age, appearing green further up and purple at the top. Some of the stems are also hairy . The leaves are 5–10 cm long. They are set densely, and alternately, primarily in the upper parts of the stem. The lower leaves with short petioles are divided into segments and take on a feathery shape, while the middle and upper ones are smaller and single or double pinnate. The dorsal side of the leaves has a dark green color, while the ventral side is whitish and tomentose. Small, almost bare, yellowish or brown-red flowers are embedded in small baskets that form heavily branched panicles with numerous lanceolate bracts at the top of the shoots. One basket may contain around 15–30 flowers with numerous stamens. Studies conducted in the eastern part of the USA showed that the inflorescences contain 52% of ligulate flowers and 48% of tubular flowers, of which 25–50% are female



### **Natural Habitats and Cultivation**

Most sources indicate that *A. vulgaris* originated from Europe and Asia, and from there, this species was brought to North America, probably at the beginning of the 16th century. At present, the plant is abundantly seen in many regions of the world, ranging from the Himalayas in Asia, through Europe, to the warm areas of North America. The only continent where *A. vulgaris* does not occur is Antarctica. This species is widely considered a weed. It can be found in many habitats, for example, on roadsides, along rivers, or in abandoned mines, thickets, tree nurseries, and arable or other fields, where it interferes with the growth of different plants. Individual populations of *A. vulgaris* are well adapted to live in a wide range of pH and various soil types, including sandy and loamy. Due to its extensive root system, this plant can quickly occupy large areas. Controlling the spread of *A. vulgaris* is very difficult because only a few effective ways can limit its growth. As a species with low requirements, *A. vulgaris* can easily colonize successive sites and displace native species. Thus, it can easily disturb the local ecosystems. This species is cultivated on an industrial scale in Italy, France, Brazil, and Japan, as well as in the mountainous regions of India and Sri Lanka. It is also possible to grow this plant in home gardens or can be obtained from natural habitats. The aerial parts of the plant die each year, and hence, they are harvested at the beginning of flowering. The parts are obtained by cutting the tops of shoots, while the woody stems are omitted. Then, these are dried in airy drying sheds under natural conditions. After drying, the herb has a spicy, bitter taste and a balsamic aroma. The appropriate time to harvest the roots is at the beginning of winter. Drying is carried out at 40 °C in drying sheds. The roots that are properly harvested and dried are brittle and have a light-brown color. Various groups of compounds can be distinguished in *A. vulgaris*, including sesquiterpenoid lactones, flavonoids, coumarins, phenolic acids, sterols, polyacetylenes, carotenoids, vitamins, and cyanogenic glycosides. Essential oil is another important substance found in the plant. Due to the high intraspecific diversity and discrepancies in the chemical composition of the plant determined by using various test methods, it is difficult to indicate a distinct phytochemical profile for *A. vulgaris*. A characteristic feature of this species is the presence of sesquiterpenoid lactones, including psilostachyin, psilostachyin C, and vulgarin, and also artemisinin was confirmed. In addition, the presence of flavonoids—derivatives of kaempferol and quercetin, and coumarin compounds, such as esculin, umbelliferone, and scopoletin, is a distinguishing attribute of the plant.



## History of Medicinal Use

Due to its widespread occurrence, *A. vulgaris* was well known in ancient Egypt, Greece, and Rome. According to ancient belief, its name is derived from the name of the Greek goddess Artemis, who is the patron of pregnant women and newly delivered mothers. Because of its beneficial effects on menstruation- and pregnancy-related ailments, *A. vulgaris* had great importance in the religious rites devoted to the goddesses Isis, Artemis, and Diana. The healing properties of this species were described in medical works in as early as the 1st century A.D. by Dioscorides in “*Materia medica*”, by Pliny the Elder in “*Naturalis Historia*”, and by Galen in “*De simplicium medicamentorum facultatibus*”. Furthermore, the mugwort plant was credited with warming and drying effects, and therefore, it was also recommended for the treatment of urological diseases, such as dysuria or nephrolithiasis. In medieval medicine, *A. vulgaris*, called “*mater herbarum*” (the mother of herbs), was used externally for treating wounds, against gout, and to remove leg fatigue, as well as in an attempt to treat fever. In addition, the plant gained popularity as a remedy for gastrointestinal ailments “resulting from cold”, including stomach pain, diarrhea, and intestinal colic. It was believed to be effective against jaundice when served with wine and against goiter when applied as a poultice. During the Renaissance, thanks to, inter alia, the invention of printing by J. Gutenberg, the holistic medicine flourished in Europe, lasting until the 18th century. At that time, in addition to women’s diseases, the therapeutic spectrum of *A. vulgaris* was expanded to include spleen and liver diseases. Additional recommendations appeared “for enlarged and distended spleen”, “against clogged liver”, and “for cold lower abdomen”. During the development of modern medicine in the 19th century, epilepsy and neurosis were included among the indications for treatment with mugwort. In the 20th century, the scientific and laboratory analyses of the composition of *A. vulgaris* led to the declaration that due to its high allergic potential the herb is not suitable for medicinal use and can only be used in culinary applications, and that its place in the household is the kitchen, not the medicine cabinet.

## Applications in Traditional Medicine

In Asian medicine, *A. vulgaris* is often used for alleviating gastrointestinal discomfort and treating gynecological diseases.



In China, *A. vulgaris* is traditionally used to treat cholera and leprosy. Other indications include hemorrhagic conditions, such as the presence of blood in sputum, stool, and vomit, and nosebleeds. The essential oil of this species is used as a popular herbal medicine called “Ai Hao,” and is prescribed for curing ulcers and diarrhea. In European folk medicine, after oral administration, the *A. vulgaris* herb stimulates the secretion of gastric juice. Hence, it is used against gastrointestinal catarrh, insufficient production of bile and digestive juices, flatulence, and poor appetite. The plant is also used as a relaxant for the gastrointestinal tract and bile ducts and for relieving colic, while the observed laxative effect is utilized in the treatment of obesity. It is also used as infusions for external use for alleviating rheumatic and leg pains, as well as for preparing sitz baths for hemorrhoids. Other traditional applications of *A. vulgaris* include the treatment of nervous system disorders such as insomnia, epilepsy, depression, and excessive stress exposure. Furthermore, it is recommended for relieving hypertension and inducing labor or miscarriage.

## Conclusion

*Artemisia vulgaris*, a species which played a significant role in the history of European medicine, was referred to in the Middle Ages as the “mother of herbs,” and used *inter alia* in treating gynecological and urological ailments and gastrointestinal tract diseases, is not a pharmacopoeial species today in the global allopathic medicine. However, it occupies an important position in traditional medicine, both in Europe and Asian countries, mainly China and India. Currently, *A. vulgaris* is the subject of numerous phytochemical and pharmacological studies. Phytochemical studies have proved the rich composition of the aerial parts of this plant, which consists of sesquiterpenoid lactones, flavonoids, and coumarins, and an essential oil made of qualitatively variable components. In turn, pharmacological studies have provided evidence of very valuable, previously unknown biological activities of the raw materials of *A. vulgaris*, including antioxidant, hypolipemic, hepatoprotective, antispasmodic, analgesic, antihypertensive, estrogenic, cytotoxic, antibacterial, and antifungal effects. Due to the high variability in its chemical composition, this species is also subject to biotechnological research, where attempts are being made to genotypically multiply high-production plants using micropropagation methods. A major part of this research is conducted by non-European research centers.



This is because the species is widely distributed on as many as four continents—Europe, Asia, North America, and South America—and there is a slightly greater interest in this species outside of Europe. The biological activities of the *A. vulgaris* raw material proven so far have raised hopes for a renaissance of the interest of contemporary medical world in the medieval “mother of herbs”

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