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Artemisia Species: Traditional Uses and Importance in Pharmacology

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Abstract: In folk medicine, the effects of using *Artemisia* in the treatment of maladies have been discussed for the past century. Review papers on ethnopharmacology and laboratory studies of the pharmacological effects and herbal components make up the majority of the articles on this plant. Artemisia-based clinical investigations on the treatment of inflammatory bowel disease, dyspepsia, etc. are anticipated given the validation of the digestive effects of this plant in traditional medicine in several countries. Regarding the aforementioned discoveries, it was discovered that the use of this substance in traditional literature and indigenous medicine was consistent with the fresh findings, and many of these studies may have their origins in traditional and indigenous uses. This demonstrates the usefulness of this inherited knowledge from our ancestors as a possible modern therapy or treatment.

Keywords: *Artemisia absinthium* L., edible wormwood, pharmacology, traditional uses.

Introduction

Research on the medicinal and biological functions of *Artemisia* species has drawn more attention in recent years. This definitely has something to do with the 2015 Nobel Prize in Medicine, which was given for the discovery of artemisinin, a sesquiterpenoid lactone that can treat malaria and is found in the plant *Artemisia*

annua (annual mugwort).

To assess the significance of this species in both traditional phytotherapy and contemporary medicine, the goal of this investigation was to review the literature reports on *A. absinthium*. The most recent biological actions that have been verified by research were highlighted.

Artemisia absinthium L. is a plant of the genus *Artemisia* that is well-known and has a significant role in the history of medicine. Since ancient times, the species has been utilized to treat helminthiases and a variety of gastrointestinal conditions. Modern pharmacological research has concentrated on validating and elucidating the mechanisms underlying these conventional lines of activity.

A. absinthium also plays a significant role in the manufacture of cosmetics nowadays. Additionally, it is well-established in the food business as a spice and as the foundation for alcoholic beverages. It is now a subject of biotechnological study as well (Szopa et al., 2020).

Botanical Information

Wormwood, also known as *Artemisia absinthium* L. (*Asteraceae*), is a herb. North Africa, West Asia, and Europe are the origins of *A. absinthium*. It is a species that is tipically found in Scotland, England, and Poland. The species was brought to and became adapted to North America, South America, and Australia (Van Wyk and Wink, 2004).

A. absinthium is a perennial plant that resembles a shrub and grows to a height of 80 cm. In some settings, it even grows as tall as 1.5 meters. The entire plant has a robust pubescence and an overpowering, acrid smell (Ahamad et al., 2019; Amidon et al., 2014; Prezes Urzedu et al., 2017). The leaves of *A. absinthium* feature glandular trichomes that secrete essential oils as well as covering T-hairs that serve a protective purpose by shielding the plant from extreme heat and protracted drought (Amidon et al., 2014; Hayat et al., 2009).

The stem is heavily pubescent, ribbed, and grey-green; typically, it has five flattened longitudinal furrows. The flower-bearing portion of the stem has a maximum diameter of 2.5 mm. Additionally, the leaves develop a grey-green hue and become heavily pubescent on both sides. Where they are located on the plant

determines how they are shaped. The upper leaves are lanceolate, the lower leaves are not as sharply split, and the base leaves have long petioles and blades that are triangular, oval, bi-, or tripinnatisect (Ahamad et al., 2019; Amidon et al., 2014).

The loose panicles that emerge from the leaf axils contain the capitulum inflorescences. There are tubular hermaphrodite blooms and light-yellow ligulate female flowers in all these semicircular or circular heterogamous capitulum. Long and grey involucral bracts with ensiform outer and oval interior leaves cover the capitulum. In Central Europe, the plant's flowering season starts around the end of July and lasts into October. The fruit is a tiny, brown-striped achene (Ahamad et al., 2019; Amidon et al., 2014; Prezes Urzedu et al., 2017).

A. absinthium primarily reproduces vegetatively through its roots. Although the roots of this species are sensitive to over irrigation, which soon results in rotting, the species is not vulnerable to infections. When the first blossoms appear, the time for harvesting officially begins. The woody portions are left alone while the leafy branches and basal leaves are removed. Several times a year might be designated for harvesting (Amidon et al., 2014).

Wormwood plantations last between seven and ten years, reaching their peak production in the second or third year. Twice a year, in the late spring and at full bloom, the plant can be harvested (Simon et al., 1984).

Position in the History

Wormwood was well-known to the ancient Egyptians, who utilized it in religious rituals and as a medicine (Rodway, 1979). Originally used for a variety of ailments, it is now typically consumed on its alone or combined with other teas to treat a variety of digestive conditions. Another use for the extremely bitter essential oil is as a vermifuge. Wormwood extracts have also been promoted as effective folk treatments for colds, rheumatism, fevers, jaundice, diabetes, and arthritis. Prior to the widespread usage of hops, beer was flavored with *Artemisia absinthium* (J. Nat. Prod. 2001).

Some preparations made from poisonous plants are utilized as food or medicine. In antiquity the fresh leaves of *Artemisia absinthium* were applied topically to help newborns wean. Aerial components of the plant, available as decoctions and spirits, are

always thought to be digestive for both humans and animals (Pereira, 2020).

Wormwood essential oil is used sparingly in the fields of scent and cosmetics, as well as in several external analgesics (Heath, 1977). (Lawrence, 1977). In recent years, rather than pure plant extracts, research has centered on the possible medical effects of specific chemicals and groupings of compounds (Perez-Souto, 1992; Hernandez et al., 1990).

A. absinthium extracts have been shown to have a variety of biological activities, which include insecticidal activity of an alcoholic extract against by the stored crop pest *Sitophilus granarius* and nematocidal activity against *Meloidogyne incognata* and *Helicotylenchus dihystera* (Ignatowicz and Wesolowska, 1994). (Korayem et al., 1993). Two diastereomeric homoditerpene peroxides from the aerial parts of *A. absinthium* have been shown to have antimalarial activity against *Plasmodium falciparum* (Rucker et al., 1991; 1992), while Zafar et al. (1990) tested aqueous and alcoholic extracts against a strain of *Plasmodium berghei* in mice and showed that they had strong schizontocidal properties.

The hepatoprotective benefits of an aqueous/methanolic preparation, whose mode of action was theorized to partially include the suppression of microsomal drug-metabolizing serum transaminase enzymes, are among the other intriguing qualities attributed to wormwood extracts (Gilani and Jambaz, 1995). In the area of ontology, extracts from wormwood's aerial parts failed to exhibit direct antitumor effects against Sarcoma 180, Erlichs carcinoma, Melanoma B-16, Louis' lung carcinoma, and Pliss' lymphosarcoma, but they did exhibit a definite antimetastatic effect that could be utilized as a remedy against homeostasis disturbance (Gribel and Pashinskii, 1991).

Wormwood is occasionally grown for decorative purposes and, after drying, is also utilized in floral arrangements (Gabriel, 1979).

Absinthe - an intriguing drink

Due to the plant's extremely bitter flavor, there are just a few culinary uses for it. For boiled or roasted fatty meats, tender leaves and non-woody top sections are typically used as seasoning, either fresh or dried, to enhance flavor and make the meats easier to digest (Kybal, 1980). According to Martindale (1982), wormwood is still

used as a flavoring in small amounts in alcoholic beverages including absinthe, bitters, tonics, liqueurs, and vermouth, which is a mixture of wines flavored with wormwood and other flavors.

An intriguing example is absinthe. This liqueur with a taste similar to liquorice was developed in Switzerland but became the national beverage of France in the 1890s. Wormwood, a key component of absinthe, is combined with hyssop, fennel, anise, badiane, angelica, and some other botanicals to create a poisonous mix. It caused a haze in heavy drinkers, which was spasmodically broken up by seizures, and frequently proved fatal. It was also extremely addictive and finally had a cult following in France, where it is believed to have influenced an entire generation. According to Arnold (1989), there is strong proof that post-impressionist painter Vincent van Gogh was an absinthe addict, and some of his Auvers paintings contain motifs like flames of thuja trees.

Similar to many other "drugs," absinthe started to be seen as a serious social issue. Twenty million liters were drank annually by 1910, but absinthe was outlawed in Switzerland in 1907 due to crime connected to the drink. It was forbidden in France after being outlawed in the USA in 1912 as a result of pressure from army generals who were eager to shift the blame for their failure in the First World War. In addition to the issues that can result from adding wormwood extracts as a flavoring component to alcoholic beverages, using wormwood for specific medical conditions can also have hazardous repercussions. It can develop a habit if used frequently or in high dosages (Simon et al., 1984), which can lead to restlessness, anxiety, and depression. It can develop a habit if used frequently or in high dosages (Simon et al., 1984), leading to agitation, vomiting, convulsions, and even brain damage—all classic symptoms of narcotic overdose.

Beneficial effects on animals health

The herb *of A. absinthium* is distinguished by a potent flavor that can influence how animals perceive their food. Ruminant meal that includes the dried plant has been demonstrated to increase appetite in the animals (Kim et al., 2002), table 1.

In one of the tests, it was determined whether *A. absinthium* stimulated sheep's appetites. Four groups of 16 sheep each received a different diet were formed from the flock's 16 total members. The

animals in the first group were fed basic concentrates at a rate of 300 g/kg dry matter (DM) and rice straw at a rate of 700 g/kg DM. In the second group, silage containing *A. absinthium* was substituted for 50 g/kg of DM straw; in the third group, it was 100 g/kg, and in the fourth group, it was 150 g/kg. The study's findings demonstrated that adding silage containing *A. absinthium* to sheep's diets greatly boosted the amount of feed they ate. Additionally, enhanced digestion, greater nitrogen retention, and a rise in the number of microorganisms engaged in nitrogen assimilation were noted (Kim et al., 2006).

The results of A. Hanwoo steers were also used to examine the effects of silage containing *A. absinthium* on feed intake. The same research methodology was applied, and increases in food delivery, digestion, animal growth rate, carcass quality, and fatty acid content were noted (Kim et al., 2012).

For the prevention of haemonchosis in ruminants, mixtures of dried traditional medicinal plants are used as nutraceuticals as an alternative to chemotherapeutics. The impact of wormwood, mallow, and their combination on the diet on the parasitological status as well as inflammatory response in lambs experimentally infected with *Haemonchus contortus* was determined. The study assessed the in vitro anthelminthic effects of various doses (50-1.563 mg/mL) of the aqueous extracts of these plants using the egg hatch test. According to the findings, neither medicinal plant's potent in vitro anthelmintic action was fully supported *in vivo* (Mravčáková et al., 2020).

The effectiveness of wormwood (*Artemisia absinthium* L.) supplementation and exogenous fibrolytic enzymes on lamb development performance was investigated. Crossbred lambs aged 4-6 months (n=15) were divided into three groups of five at random and fed for 90 days before undergoing a six-day metabolic testing. Animals in all the groups were given complete feed made of oats and straw, supplemented with wormwood herb at 4.5% of dry matter (DM), either by itself (G-2) or in combination with a cocktail of exogenous fibrolytic enzymes at 0.6% of DM (G-3), which served as the control (G-1). Herb supplementation had a favorable (P′0.05) impact on metabolizable energy intakes and digestible crude protein intakes (113.85 g/d and 9.20 MJ/d in G-2, and 120.42 g/d and 9.72 MJ/d in G-3). The addition of herbs had a positive (P′0.05) impact on the amounts of metabolizable energy and digestible crude protein consumed (113.85 g/d and 9.20 MJ/d in G-2, and 120.42 g/d and 9.72 MJ/d in G-3, respectively, compared to 87.38 g/d and 7.25

MJ/d in G-1). The mean digestibility values for organic matter (67.65% in G-2 and 69.79% in G-3) and crude protein (68.60% in G-2 and 71.26% in G-3) were substantially higher in the G-3 compared to G-1 and G-2, whereas the values for various fibre fractions were higher (P0.05). In comparison to the control group (6.92 kg and 76.89 g/d), there were substantially (P0.01) larger total body weight gains (10.92 kg in G-2 and 12.30 kg in G-3) and average daily gains (121.33 g/d in G-2 and 136.67 g/d in G-3. It was determined that adding wormwood herb alone as a feed addition to lamb complete meals accelerates growth rate as measured by increased body weight and body measures (Beigh et al., 2018).

The clinical biomarker for the impact of food changes on physiological health state is the hemo-biochemical profile. The objective of the current study was to determine the impact of adding wormwood (*Artemisia absinthium* Linn.) as a feed addition on sheep's blood metabolic profile (BMP). In a perfectly randomized design, 15 crossbred lambs between the ages of 4 and 6 months were divided into three groups and fed for 90 days before undergoing a 6-day digestibility testing. Animals in every groups were given complete diets made of oats and straw, enriched with wormwood herb at 4.50% dry matter (DM), either on its own (Hrb) or in conjunction with a cocktail of exogenous fibrolytic enzymes (EFE) at 0.60% DM (HrbEz), which served as the control (Con). Animals in all groups had their haemato-biochemical parameters examined at the beginning (0d) and then every month after that (30, 60 and 90d). When compared to control, wormwood herb ingestion had a significant beneficial effect on dietary digestible nutrient intakes and contents (p0.05), as well as the overall suggests of the majority of blood cell indictors, serum lipid profiles, and hepato-renal functioning test profile characteristics (p0.01). When compared to animals that weren't supplemented, the BMP of lambs given wormwood herb showed superior physiological health state. Conclusion: Wormwood herb, either alone or in conjunction with EFE, can be successfully included in the food of lambs to raise them intensively without causing any negative effects on their haemato-biochemistry (Beigh Yasir Afzal et al., 2019).

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Increased interest in natural products is a result of the focus on organic livestock production. In this study, the impact of wormwood (*Artemisia absinthium*) on sheep wool qualities and economics will be assessed. For a three-month in vivo feeding trial, 15 crossbred sheep were divided into three groups: control (Con) fed a basal diet; groups fed diets supplemented with 4.50% herb, either alone (Hrb); and groups fed diets supplemented with 0.60% EFE (exogenous fibrolytic enzymes) (HrbEz), the levels chosen based on the best in vitro assay results. After a six-day digestibility test near the end of the feeding phase, the animals were shaved. Wormwood herb additions significantly (P .05) improved the amounts of intakes of digestible nutrients. Higher yields of both dirty and clean wool (P .05) led to a decrease in wool production costs of 11.3% in the Hrb group and 22.2% in the HrbEz group when compared to the control, with no differences in any other fiber quality criteria other than fiber length. It was determined that adding 4.50% wormwood herb and 0.60% EFE to sheep's diets improved wool growth economically while having no negative effects on quality (Beigh et al., 2021).

Table 1.

Health effects of wormwood

Species	Plant material	Extract type	Collection period	Spontaneous flora or cultivated	Country	Animal species	Effects	References
Wormwood (*Artemisia sp.*)	sun-dried plant	-	May and June, 2000	Spontaneous flora	Korea	Hanwoo steers and sheep	increase appetite, improve meat quality, reduce feed costs – *in vivo* study	Kim et al., 2002
Artemisia absinthium L.	dried plant	aqueous extracts	-	Cultivated	Slovak Republic	sheep	anthelminthic effects (dietary supplements)-*in vitro*, *in vivo* studies	Mravčáková et al., 2020
Artemisia absinthium L.	dry matter	-	-	Cultivated	India	lambs	enhance growth rate in terms of higher body weight and body measurements – *in vivo* study	Beigh et al., 2018
Artemisia absinthium L.	dry matter	-	-	Cultivated	India	lambs	better physiological health status compared to un-supplemented animals – *in vivo* study	Beigh et al., 2019
Artemisia absinthium L.	dry matter	-	-	Cultivated	India	lambs	positive significant effect on dietary digestible nutrient contents and intakes; better physiological health status compared to un-supplemented animals. – *in vivo* study	Beigh et al., 2020
Artemisia absinthium L.	dry matter	-	-	Cultivated	India	sheep	better wool growth economically *in vitro*, *in vivo* studies	Beigh et al., 2021

Conclusions

Wild edible plantss are gaining interest for use primarily in the food industry, where they could help drive the agricultural sector, contributing to the development of various regions, while obtaining functional foods by providing natural bioactive components as beneficial as phenolics, which could improve the products' value, both economically and sanitary.

Herbal remedies frequently work effectively because of a variety of ingredients present rather than a single, highly concentrated, pure component.

The variety and synergy of plant polyphenols, as well as the mixture of bioactive chemicals that collectively have an impact and contribute to a given pharmacological efficacy, determine the action of dry medicinal plants.

As a result, research like the one being done now to increase the feeding value using bioactive and highly nutritive herb plants like wormwood may be crucial for beef production, as it will not only improve meat quality but also reduce feed costs.

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