
***ERYNGIUM FOETIDUM* L: AN UPDATED REVIEW OF ITS PHYTOCHEMISTRY, ETHNOMEDICINAL APPLICATIONS AND PHARMACOLOGICAL POTENTIAL**

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ABSTRACT

In most tropical climates, *Eryngium foetidum* L., a biennial herb, is widely utilized as a medicinal plant. It is becoming more and more significant as a spice plant that is grown in Australia, Vietnam, India, and other countries using well-established methods for optimum output. Additionally, it has several ethnomedical applications, such as treating burns, earaches, fevers, hypertension, constipation, fits, asthma, stomachaches, worms, problems with infertility, snake bites, diarrhoea, and malaria. It was evident that the growing plant's geographic location affected the essential oil's composition variability. The plant's attributed to its abundance of bioactive components, which include phenolic compounds, flavonoids, tannins, alkaloids, saponins, essential oils, and vitamins. *Eryngium foetidum* has been shown through scientific research to possess antioxidant, antibacterial, anti-inflammatory, analgesic, antidiabetic, hepatoprotective, anticancer, cardioprotective, and neuroprotective qualities. The plant is widely used as a culinary herb and as a source of pharmacological and nutraceutical compounds in addition to its therapeutic use. All things considered, *Eryngium foetidum* is a useful medicinal plant with enormous potential for the creation of cutting-edge therapeutic medicines and functional health products.

KEYWORDS: *Eryngium Foetidum* L, Ethnomedicine use, Phytochemistry, Pharmacological properties.

INTRODUCTION

Mexican coriander, spirit weed, fit weed, cilantro, bhandhania, and shado beni are some of the prevalent local names for *Eryngium foetidum* L. (Umbelliferae–Apiaceae) [1]. The plant is native to the West Indies and Tropical America, where it is utilized as food and medicinal. It has become naturalized and is frequently grown in Tropical Africa, South Asia, the Pacific islands, and the warmer southern regions of Europe. The plant is used as food by the indigenous inhabitants of Northeast India^[1] *Eryngium foetidum* is a tropical herb that grows best in damp or moist environments on open banks or in pastures. It is a biennial and has a strong scent. The stems are solitary and often branching, while the roots are mushy. The entire plant has a potent smell and is glabrous. The oblanceolate leaves grow in a basal rosette pattern, are 8–20 cm long, have serrated margins, and have a yellowish spine. Whitish inflorescences appear as a noticeable apical grass on long branches (30–50 cm). The fruit is globose to ovoid and has spherical, 1-2 mm long protrusions all over it ^[2,3,4]. *Eryngium foetidum* is a tropical herb that grows best in damp or moist environments on open banks or in pastures. It is a biennial and has a strong scent. This species is also utilized in ethnomedicine because it has demonstrated potential use in gastrointestinal tract disorders and functions as an antibacterial, analgesic, anti-inflammatory, anthelmintic, anticonvulsant, and anticancer agent, demonstrating its significant ethnopharmacological significance for humans. ^[1]

BOTANICAL DESCRIPTION

The leafy herb *Eryngium foetidum* is found throughout the world's tropical regions. From southern Mexico to Panama via Brazil and from Cuba to Trinidad, it is native to tropical regions like America and Caribbean islands. Tropical regions including Africa, South Asia, Southern Europe, and the Pacific islands are where it is typically grown. For use and export to the United States, it is widely grown in Puerto Rico and Costa Rica. ^[5]

Eryngium foetidum (Figure 1) is a biennial, strongly scented herb with dark green, fleshy, waxy leaves that are oblanceolate in form, 30 cm long and 4 cm wide, and have serrated or dentate margins; Each border teeth bears a short, thick stem from a basal rosette with a faint yellow spine spirally organized around it. Fruits are globose to ovoid with uniformly branched fibrous roots; flowers are sessile, bisexual, white, narrow, oblonged, and notched petals; corollas are creamy white with green calyx; sepals are tubular, acute, persistent, longer than petals, and form an umbel inflorescence on a long stalk that emerges from the leaf rosette at the bottom^[6]



Fig.1 Representing image of *Eryngium foetidum* L.

CULTIVATION, PROPAGATION, HARVESTING AND STORAGE:

Eryngium. foetidum has long been used as food and is grown as a profitable crop in many tropical places. Documentation detailing the ideal growing, harvesting, and postharvest conditions for the crop has been documented^[7,8,9,10]. According to reports by Morales and O Campo et al. ^[7,8], the plant is difficult to grow and is rarely impacted by pests and diseases. This plant already has the technology needed to produce it in large quantities. To support the conventional claims of medical value, scientific research is required. There may be a chance to add value to an already-existing product and boost the economy of the areas that grow it for export if it is found that the conditions that favor the production of the herb in high yield for food purposes also preserve the plant's purported "medicinal properties."

PHYTOCHEMISTRY

Several secondary metabolites, including flavonoids, phenols, tannins, saponins, ascorbic acid, and terpenoids, were discovered by phytochemical screening of this plant ^[11,12]. Calcium, iron, riboflavin, carotene, vitamins A, B, and C, and essential oils are all abundant in the herb's aerial sections ^[13]. Over 85% moisture, 3.3% protein, 0.6% fat, 6.5% carbohydrate, 1.7% ash, 0.06% phosphorus, and 0.02% iron are found in the fresh leaves ^[13]. There is evidence of the nutritional significance of the plants found in South China, Assam, and India ^[14]. The amount of *Eryngium. foetidum* essential oil can range from 0.1 to 0.95% of the leaves' dry weight ^[13]. E-2-dodecenal ("eryngial") , which Koolhaas originally reported in 1932 is a significant component of the oil ^[15]. Human cytochrome P450 2E1 is known to be significantly inhibited by eryngial ^[16]. According to this observation, ingesting a traditional plant extract that contains eryngial in sufficient amounts may have the potential to inhibit

drug metabolism, increasing the potency of medications taken concurrently with it and raising concerns about potential harmful herb–drug interactions. A pentacyclic triterpenoid saponin and O-glycoside²¹ were obtained from the chloroform extracts of dried aerial parts using soxhlet extraction and chromatographic fractionation^[17]. Phenolic chemicals are abundant in *Eryngium foetidum*^[18]. Leitão et al.^[22] discovered that the leaves of *Eryngium foetidum* contained large phenolic substances including ferulic acid and chlorogenic acid as well as major carotenoids like all-trans-lutein and all-trans- β -carotene.

TRADITIONAL – ETHNOMEDICINE USE

The leaves and roots have been used in traditional medicine to treat insanity, skin illnesses, mucosal diseases, lung conditions, diabetes mellitus, stomach problems, and nervous system disorders like convulsions, paralysis, spasms, and pains^[19]. *Eryngium foetidum* has been used to treat fever and colds, burns, earaches, pneumonia, flu, child convulsions, malaria, hypertension, constipation, worm infections, and problems related to infertility^[20,21]. Additionally, it has been claimed to treat a number of toxins, such as venom from scorpions and snake bites^[5]. In West Africa, the plant's aerial portions were used to treat gastrointestinal conditions like diarrhea, respiratory conditions like sinusitis, cough, cold, and asthma, and rheumatism with crushed leaves in heated palm oil^[23]. *E. foetidum* is frequently used to alleviate inflammation in traditional Chinese medicine^[24]. *Eryngium foetidum* leaves are used as a flavoring in curries, chutneys, stews, and soups^[25]. When evaluated for effectiveness against fibroblast cell lysis following treatment with venom from *Heterometrus laoticus* scorpions, Uawonggul et al.^[26] discovered that the plant extracts were hardly effective. The phytochemical examination of *Eryngium foetidum*, which was found in coastal Odisha, India, was examined by Acharya et al.^[27] They observed that the leaves and branches of *E. foetidum* were primarily composed of 10-undecenal, followed by 2,4,6-trimethylbenzaldehyde, (Z)-9-tetradecenal, and (Z)-7-tetradecenal. According to this study, seasonal *C. sativum* and *Eryngium foetidum* have similar chemical profiles, and *Eryngium foetidum* can be utilized in place of seasonal *C. sativum*.

PHARMACOLOGICAL PROPERTIES

Eryngium foetidum has anti-inflammatory, antioxidant, antibacterial, antifungal, anti-helminthic, anti-tumor, anti-diabetic, antimalarial larvicidal, and anticonvulsant properties, according to multiple research.

1. Antibacterial activity: A bacterium that infects the stomach is called *Helicobacter pylori*. Twenty percent of individuals experience gastroduodenal disorders associated with this infection, and about fifty percent of people test positive for its presence. Mabeku *et al.* [28] used methanol extracts of *Eryngium foetidum* (500 mg/kg) in both in vitro and in vivo experiments in rats to gauge the decrease in the bacterial load of six strains. Both in vitro and in vivo, the extracts produced a large number of metabolites and antipathogenic qualities with efficacy comparable to ciprofloxacin. Due to higher concentration of bioactive agents in ethyl acetate, Linguarajo *et al.* [29] confirmed that the bacteria *E. coli* (zone of inhibition 17 mm), *P. aeruginosa* (zone of inhibition 28 mm), *Bacillus subtilis* (zone of inhibition 20 mm), *S. aureus* (zone of inhibition 25 mm), and fungus *Candida albicans* (zone of inhibition 18 mm). Thus, the scientists verified the microbiological activity of *Eryngium foetidum* in traditional medicine. The plant is used in Karnataka, India, for wound healing and digestive diseases, respectively, in the form of plaster and tea.

2. Antioxidant activity: Some bioactive molecules located in the essential oils of plants provide a protective role for cells against the detrimental effects of reactive oxygen species, so they are classified as natural antioxidants. They impede the degradation processes tied to aging and diseases like cancer, cardiovascular issues, and neurological problems. Singh *et al.* [30] evaluated the extraction of chemical substances from *Eryngium foetidum* leaves and observed increased quantities in acetone and methanol solvents, which were rich in polyphenols, tannins, anthocyanins, flavonoids, carotenoids, and ascorbic acid. These conclusions reveal that this plant has substantial promise within the pharmacological and food domains. The growth stage of *Eryngium foetidum* affects its antioxidant capacity; during the juvenile stage, which occurs between 90 and 120 days after germination, the leaves produce more bioactive chemicals with antioxidant activity, such as polyphenol and flavonoids [31].

3. Antifungal activity: Lingarajo *et al.* [32] and Borah *et al.* [33] assessed the potential of extracts from *Eryngium foetidum* leaves and discovered antifungal activity for *C. albicans* with high inhibition. This indicates that compounds produced by the species can be helpful in treating diseases caused by this pathogen, such as gynecological tract infections. Additionally, it attests to the effectiveness of this plant when utilized in customary societies.

4. Anti-inflammatory activity: Additionally, an anti-inflammatory effect was noted by Dawilal *et al.* [34] and Mekhora *et al.* [35]. Their results show that the plant plays a significant role in reducing the inflammatory process and has a strong potential to be used as a dietary supplement to lower the risk of cancer linked to inflammation.

CONCLUSION:

Eryngium foetidum L.(Apiaceae), commonly known as Mexican coriander or culantro, is a valuable herb used both in cooking and for traditional medicine. It has considerable ethnopharmacological potential. The plant contains various phytochemicals, such as essential oil components like (2E)-2-dodecenal (eryngial), phenolic compounds, flavonoids, carotenoids, phytosterols, terpenoids, and other secondary metabolites, which are closely connected to its medicinal value. Eryngial is believed to be one of the main components of the plant and strongly influences its biological properties. Historically, *Eryngium foetidum* has been used to treat digestive issues, fever, pain, infections, inflammation, and parasitic diseases. A number of pharmacological activities, including antioxidant, antibacterial, antifungal, anthelmintic, anti-inflammatory, analgesic, antidiabetic, hepatoprotective, and neuroprotective effects, have been demonstrated through experimental studies, supporting many of its traditional uses. However, much of this evidence comes from laboratory and animal studies without clinical confirmation. Differences in the plant part used, extraction methods, chemical composition, and geographic origin can also influence the observed pharmacological effects. Therefore, further research is needed to assess the safety, effectiveness, and therapeutic value of the plant. This includes studies on extract standardization, identification of bioactive compounds, pharmacokinetics, mechanism of action, toxicity, and well-planned clinical trials. Overall, *Eryngium foetidum* is a promising source of bioactive compounds that could be used in the development of functional foods, pharmaceuticals, and nutraceuticals. Combining traditional knowledge with modern phytochemical and pharmacological research can help in creating standardized and scientifically validated products from this under-researched medicinal plant.

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