

AN OVERVIEW: EUISETUM ARVENSE (EUISETACEAE)

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ABSTRACT

Equisetum arvense, commonly known as field horsetail, is a perennial, spore-bearing plant with a rich evolutionary history dating back over 300 million years. It is widely distributed across temperate regions, thriving in moist environments such as riverbanks, meadows, and wetlands. The plant is characterized by its hollow, jointed stems and a deep rhizome system, making it highly resilient and often invasive. Traditionally, *E. arvense* has been valued in herbal medicine for its diuretic, anti-inflammatory, and remineralizing properties, attributed to its high silica, flavonoid, and alkaloid content. However, its invasiveness poses challenges in agriculture, where it can outcompete crops and prove difficult to eradicate. While it holds promise in medicinal and industrial applications, careful management is required to balance its benefits and potential drawbacks.

Keywords- *Equisetum arvense*, Horse tail, medicinal uses, Pharmacological actions

1. INTRODUCTION

Equisetum arvense, commonly known as field horsetail, is a perennial, spore-bearing plant belonging to the Equisetaceae family. It is one of the oldest plant species on Earth, dating back to the Paleozoic era, over 300 million years ago. This ancient plant is widely distributed across temperate regions of North America, Europe, and Asia, thriving in moist soils, grasslands, and riverbanks. Field horsetail is well known for its unique, hollow, jointed stems and high silica content, which contribute to its historical uses in medicine, agriculture, and even as a natural abrasive. Traditionally, it has been used in herbal medicine for its diuretic, anti-inflammatory, and bone-strengthening properties. However, it can also be considered a troublesome weed due to its deep rhizomes and rapid spread. Despite its invasive nature, *Equisetum arvense* remains a fascinating plant with significant ecological, medicinal, and historical importance. This present review is an attempt to generate interest among the masses regarding its immense role and treating several disorders.

PLANT PROFILE

Taxonomical Classification

Kingdom : Plantae
Phylum : Pteridophyta
Class : Equisetopsida
Order : Equisetales
Family : Equisetaceae
Genus : *Equisetum*
Species : *Equisetum arvense*

Synonyms

Equisetum borbonicum Rich.
Equisetum fluviatile var. *arvense*
Equisetum palustre var. *arvense*

Vernacular names

English : Field horsetail
French : Prêle des champs
German : Acker-Schachtelhalm
Spanish : Cola de caballo
Italian : Equiseto dei campi
Portuguese : Cavalinha
Russian : Khvoshch polevoy
Chinese : Mù zéi
Japanese : Sugina
Hindi : Ashwapuccha
Arabic : Dhayl al-hisan

PLANT DESCRIPTION

Aerial stems dimorphic; vegetative stems green, branched, 2-60(-100) cm; hollow center $\frac{1}{3}$ – $\frac{2}{3}$ stem diameter. Sheaths squarish in face view, 2-5(-10) × 2-5 (-9) mm; teeth dark, 4-14, narrow, 1-3.5 mm, often cohering in pairs. Branches in regular whorls, ascending, solid; ridges 3-4; valleys channeled; 1st internode of each branch longer than subtending stem sheath; sheath teeth attenuate. Fertile stems brown, lacking stomates, unbranched, shorter than vegetative stems, with larger sheaths, fleshy, ephemeral.

Morphological features

- **Stems**
Fertile stems (spring): Brown, unbranched, bearing cone-like spore-producing structures (strobili).
Sterile stems (summer): Green, jointed, hollow, with whorled branches resembling a bottlebrush.
- **Leaves**
Reduced to small, scale-like structures fused around the stem.
- **Roots**
Extensive, creeping rhizomes that contribute to its invasive nature.
- **Reproduction**
Spore-based reproduction, with no flowers or seeds

PLANT DISTRIBUTION

Equisetum arvense, or field horsetail, is widely distributed across temperate regions of the world. It thrives in moist, well-drained soils and is commonly found in meadows, riverbanks, wetlands, and disturbed areas such as roadsides and agricultural fields.

Global Distribution

- North America: Found throughout Canada, the United States, and Mexico, particularly in temperate and boreal regions.
- Europe: Widespread across most of Europe, from the UK and Scandinavia to Southern and Eastern Europe.
- Asia: Common in temperate regions, including China, Japan, Korea, India, and Russia.
- Africa: Limited presence, mainly in cooler regions and mountainous areas.
- South America: Found in Argentina, Chile, and other temperate zones.
- Australia & New Zealand: Introduced in some regions and considered invasive in certain areas.

Habitat Preferences

- Grows in moist, sandy, or clay-rich soils near rivers, lakes, and wetlands.
- Can tolerate a wide range of conditions, from woodlands to grasslands and even disturbed sites like roadsides and farmlands.
- Prefers areas with high humidity and moderate to cool temperatures, though it can adapt to drier regions.

Invasive Nature

- Due to its deep rhizome system, *E. arvense* spreads aggressively and is considered a weed in agriculture, competing with crops and being difficult to eradicate.

USES

Equisetum arvense has been used in traditional medicine, herbal remedies, and modern pharmacology due to its rich silica, flavonoid, and antioxidant content. Here are its primary uses:

1. Traditional uses

Equisetum arvense was used traditionally for tuberculosis, as a catarrh in the kidney and bladder regions, as a hemostatic for profuse menstruation, nasal, pulmonary and gastric hemorrhages, for brittle fingernails and loss of hair, for rheumatic diseases, gout, poorly healing wounds and ulcers, swelling and fractures and for frostbite.

2. Cosmetic and Skincare Uses

- Found in shampoos, creams, and serums for anti-aging and hair strengthening.
- Used in herbal toners for oily skin due to its astringent properties.

3. Industrial Uses

- Used as a natural scouring agent due to its high silica content.
- Formerly used to polish metal and wood.

4. Culinary and Nutritional Uses

- Used in herbal teas and tinctures for general health benefits.
- Rich in minerals (silica, potassium, calcium), beneficial for bone and skin health.

5. Agricultural and Environmental Uses

- Acts as a natural pesticide in organic farming.
- Helps improve soil quality due to its mineral-rich composition.

PHARMACOLOGICAL ACTIONS

Equisetum arvense has been widely used in traditional medicine due to its diverse pharmacological properties, largely attributed to its bioactive compounds such as silica, flavonoids, alkaloids, and phenolic acids. Some of its key pharmacological actions include:

1. Diuretic Action

E. arvense is known for its strong diuretic effect, increasing urine output and promoting kidney function. This action is primarily due to its high potassium and flavonoid content, which stimulate renal filtration and excretion of excess fluids. It has been traditionally used for conditions like urinary tract infections, kidney stones, and fluid retention.

2. Anti-inflammatory and Antioxidant Activity

The flavonoids and phenolic compounds in E. arvense exhibit significant anti-inflammatory effects, reducing oxidative stress and inflammatory responses in the body. These properties make it beneficial for conditions like arthritis, skin irritation, and wound healing.

3. Bone and Connective Tissue Strengthening

High silica content supports collagen production, enhancing bone mineralization and connective tissue health. It has been used in traditional medicine for osteoporosis, arthritis, fractures, and brittle nails. It supports the cartilage regeneration, improving joint mobility.

4. Antimicrobial and Antifungal Effects

E. arvense possesses antimicrobial properties, particularly against bacterial and fungal infections. It has been traditionally applied to wounds and skin infections to promote healing and prevent microbial growth.

5. Astringent and Wound Healing Properties

The tannins in E. arvense contribute to its astringent action, helping to contract tissues, reduce bleeding, and promote wound healing. It has been used topically for cuts, ulcers, and skin conditions like eczema.

6. Antidiabetic Potential

E. arvense may help regulate blood sugar levels by enhancing insulin sensitivity. The presence of bioactive compounds like flavonoids contributes to its hypoglycemic effects.

7. Neuroprotective Effects

E. arvense may have neuroprotective benefits due to its antioxidant properties, potentially aiding in cognitive health and neurodegenerative conditions.

8. Enhancing Cellular Defense Systems

Increases the activity of antioxidant enzymes such as superoxide dismutase (SOD), catalase, and glutathione peroxidase, which help detoxify reactive oxygen species (ROS).

9. Anti-Aging and Skin Protection

The high silica content supports collagen production, reducing oxidative stress in skin cells, promoting wound healing, and preventing premature aging.

10. Skin Health

Used in topical creams and ointments for eczema, acne, and rashes. Acts as a natural astringent, tightening skin and reducing excessive oil production.

11. Urinary Tract & Kidney Health

Natural diuretic that increases urine flow, helping in urinary tract infections (UTIs), kidney stones, and bladder issues. Prevents fluid retention (edema) by eliminating excess water from the body. Supports prostate health and may help in conditions like benign prostatic hyperplasia (BPH).

12. Hair and Nail Strengthening

Silica content strengthens hair and nails, reducing hair thinning and brittleness. Used in hair growth treatments for its scalp-stimulating effects.

13. Digestive & Gastrointestinal Support

Used for stomach ulcers, gastritis, and indigestion due to its anti-inflammatory and astringent properties. Helps in cases of diarrhea and intestinal irritation.

14. Respiratory Health

Traditionally used to treat coughs, bronchitis, and tuberculosis, helping to clear mucus and reduce lung inflammation.

15. Cardiovascular Benefits

May help reduce high blood pressure due to its diuretic effect. Improves blood circulation and capillary strength.

16. Menstrual & Reproductive Health

Helps regulate heavy menstrual bleeding due to its astringent properties. Traditionally used to ease menstrual cramps and menopausal symptoms.

17. Immune-Boosting Properties

Strengthens the immune system by reducing inflammation and oxidative stress.

18. Collagen Synthesis and Tissue Regeneration

The high silica content promotes collagen production, which is essential for skin repair, tissue regeneration, and strengthening connective tissues. Enhances fibroblast activity, leading to faster wound closure.

19. Hemostatic Effects

The tannins in *E. arvense* help tighten tissues and reduce bleeding, promoting faster clot formation. Useful for minor cuts, ulcers, burns, and surgical wounds.

2. CONCLUSION

Equisetum arvense (field horsetail) is an ancient, spore-bearing plant with significant medicinal, ecological, and industrial value. Its unique biochemical composition, rich in flavonoids, phenolic acids, silica, and alkaloids, contributes to its diverse pharmacological actions, including antioxidant, anti-inflammatory, diuretic, antimicrobial, and bone-strengthening properties. Despite its medicinal potential, *E. arvense* is also considered invasive in agriculture due to its deep rhizome system and ability to rapidly colonize disturbed environments. Proper management is necessary to balance its benefits with its ecological impact. Overall, *Equisetum arvense* remains an important plant in traditional medicine, pharmacology, and ecological studies, offering a promising natural resource for future therapeutic applications. Further research is needed to establish standardized dosages and confirm its long-term safety and efficacy.

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