Journal of Biomedical and Pharmaceutical Research
Available Online at www.jbpr.in
CODEN: - JBPRAU (Source: - American Chemical Society)
NLM (National Library of Medicine): ID: (101671502)
Index Copernicus Value 2022: 83.05
Volume 13, Issue 6: 2024, 6-11
Review Article
ISSN (Online): 2279-0594
ISSN (Print): 2589-8752

A Review of Prosopis Cineraria as Hepatoprotective

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Article Info: Received: 14-10-2024 / Revised: 23-10-2024 / Accepted: 26-11-2024
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DOI: https://doi.org/10.32553/jbpr.v13i6.1191
Conflict of interest statement: No conflict of interest

Abstract

Abstract: Prosopis cineraria (L.) Druce is known as Ghaf and is a member of the Mimosoideae subfamily of the Leguminosae family. The plant affects people's life in sociological, ethnological, traditional, and therapeutic ways. The goal is to highlight the plant's potential for bioactivity while offering a comprehensive summary of the most recent studies. The review's objectives were to provide a comprehensive tabulation of the data in a style that would be useful to academic researchers and to update the data on therapeutic actions that had been published in scientific journals. To ascertain the phytochemical components of the leaf, stem, pod, and bark as well as their safety and pharmacological details, a comprehensive scientific study of P. cineraria (L.) was carried out. The review helps identify future opportunities and limitations in the field by using the condensed scientific information of P. cineraria (L.).

Keywords: Phytochemical, Pharmacological, Leguminosae, Ghaf, Prosopis Cineraria

Introduction

The Prosopis cineraria (L.) druce is a native or introduced plant that grows in most hot, dry, and semi-arid regions of the world. The Great Indian Desert, also referred to as the Thar, is an arid region distinguished by its extremely dry environment, high wind speeds, dry atmosphere, and little to no rainfall. L. cineraria P. P. cineraria (L.), also known locally as Ghaf, is a significant native species to the Northeastern United Arab Emirates (UAE). It is one of the few trees that grow in the arid deserts of the UAE and is a major ecological feature that aids in the growth and development of other species. Its population is concentrated in India and Pakistan, with smaller populations found in Iran, Afghanistan, and the Arabian Peninsula. High temperatures, high humidity, and little precipitation define the UAE's environment. The Bedouin people's traditional way of life has long been closely linked to Prosopis trees and their products. The Emirati way of life has changed noticeably as a result of the infrastructure's quick development and modernisation. The Bedouins are becoming less and less dependent on the plant as a result of the nation's fast modernisation and the swift shift in the socioeconomic landscape. As was formerly the case, fewer people benefit from the plant. As a result, scientific research on the plant has been severely neglected. The fact that virtually little scientific research has been done on the plants, particularly from the perspective of their potential for medicine and nourishment, is indicative of the carelessness. According to Burkart, there are forty-four species in the genus Prosopis. As natural or introduced species, they have spread around the world and have become invasive in many locations. P. cineraria (L.) is

primarily found in the Arabian Peninsula, Iran, Afghanistan, Pakistan, and India's deserts. Prosopis has been reported to occur in 129 countries worldwide, with many more having climatically acceptable conditions. On the Arabian Peninsula, P. cineraria (L.) is primarily found in the United Arab Emirates and Oman.

Antibacterial qualities are produced by P. cineraria (L.). When the antibacterial activity was evaluated against clinical isolates, the methanol extract outperformed the conventional antibiotic medication against all infections. The unripe pods' aqueous and chloroform extracts exhibited little antibacterial action against S., P. aeruginosa, or E. coli. Typhi. Alcoholic and ethyl ether extracts exhibited favourable responses against every S. E. aureus. Candida albicans with E. Coli. The presence of flavonoids and tannins57 has been linked to the indicated microbial activity. P. cineraria (L.) has demonstrated a protective role in lowering blood glucose levels, raising body weight, lowering blood glucose, lowering fasting blood glucose levels in mice, and reducing oxidative damage in diabetic animal tissues. Prosopis extracts demonstrated an insulinogenic effect and significantly raised serum insulin levels, according to Sharma and Singlas.

Both analgesic and antipyretic properties

Significant analgesic and antipyretic effects were shown by several leaf extracts. In experimental rats, petroleum ether, ethyl acetate, and ethanol extracts of stem bark demonstrated a notable analgesic effect. Analgesic effects were demonstrated by the ethanol extract. In mice, a methanolic extract of P. cineraria (L.) dried stem bark demonstrated enhanced nootropic action. In isolated rabbit tracheal preparations, methanolic extract from the stem bark demonstrated vasodilator, bronchodilator, and spasmolytic properties. The length of convulsions was significantly reduced by the methanolic extract.

Prosopis Cineraria:

The Ghaf tree, or Prosopis cineraria, is a drought-tolerant tree that grows naturally in dry areas of Asia, particularly the Indian subcontinent. It is renowned for its capacity to adapt to adverse weather conditions and has a number of traditional uses. An outline of Prosopis cineraria's microscopic, macroscopic, physiological, and collection and extraction procedures is provided below:

Macroscopic Evaluation

Macroscopic examination involves observing the physical characteristics of Prosopis cineraria seeds and other plant parts.

General Description

Seed

Color: Brown to dark brown., Shape: Oblong or ellipsoid, with a smooth and glossy surface, Size: Approximately 0.5–1 cm in length., Odor: Mild and characteristic, Taste: Slightly bitter or astringent.

Microscopic Evaluation

Microscopic evaluation provides detailed insight into the anatomical features of Prosopis cineraria seeds, ensuring its identification at the cellular level.

Transverse Section (T.S.) of Seed

1. **Seed Coat**

- **Epidermis**: Outer layer composed of compactly arranged cells, sometimes covered with a cuticle.
- **Hypodermis**: Layers of sclerenchymatous cells providing mechanical support.

2. **Cotyledons**

- Large parenchymatous cells packed with stored food material like starch and proteins.
- Presence of oil globules or aleurone grains may be observed.

3. **Endosperm**

- Thin layer surrounding the cotyledons, sometimes absent in mature seeds.

Powder Microscopy

Powder microscopy is performed on powdered seeds to observe specific microscopic characteristics.

- **Sclerenchymatous Fibers**: Long, thick-walled cells with pointed ends.
- **Parenchymatous Cells**: Polygonal or irregular cells with starch grains.
- **Starch Grains**: Oval or rounded, appearing bluish-black under iodine staining.
- **Oil Globules**: Small, round, and refractive under the microscope.
- **Crystals**: Calcium oxalate crystals (if present) are prismatic or needle-shaped.

Chemical Tests for Identification

Perform chemical tests to complement the microscopic evaluation:

- **Iodine Test**: For starch grains (blue-black color).
- **Sudan III Test**: For oils (red staining).
- **Phloroglucinol and HCl**: For lignified cells (red staining).

Methods of Extraction:

Preparation Method for Alcoholic Extract of Prosopis cineraria

Collection and Authentication: Collect mature Prosopis cineraria seeds from a reliable source or directly from the plant. Clean the seeds thoroughly to remove dirt, debris, and contaminants. Authenticate the plant material by a botanist or herbarium expert.

Drying and Pulverization: Dry the seeds in the shade to prevent degradation of active phytochemicals. Once dried, grind the seeds into a coarse powder using a mechanical grinder or mortar and pestle.

Extraction Process: Solvent Selection: Use ethanol (70% or 95%) as the solvent, as it efficiently extracts both polar and non-polar phytoconstituents. Weighing: Accurately weigh the seed powder, typically 100–500 g depending on the scale of extraction.

Maceration or Soxhlet Extraction: Soxhlet Method: Load the powdered seeds into the thimble of a Soxhlet apparatus. Set up the apparatus with ethanol as the solvent in a round-bottom flask. Heat the solvent at its boiling point (about 78°C for ethanol) to allow continuous reflux for 6–8 hours. Collect the extract in the flask and concentrate it.

Concentration: Concentrate the filtered extract using a rotary evaporator or by heating on a water bath at 40–50°C to remove the solvent. void overheating to preserve heat-sensitive phytochemicals.

Drying: Transfer the concentrated extract to a petri dish and dry it under reduced pressure (vacuum desiccator) or in a hot air oven at a controlled temperature (~40°C).

Prosopis cineraria is interesting because of its potential in agroforestry, fodder value, and medicinal qualities. Depending on the targeted chemicals and the extract's intended usage, different extraction techniques may be used. It is advised to reference scientific literature or subject-matter specialists for the most accurate and current information.

A variety of phytochemical components, including alkaloids, carbohydrates, steroids, proteins, phenols, tannins, flavonoids, glycosides, and saponins, were examined in P. cineraria (L.) in accordance with the Indian Pharmacopoeia.

Protein, carbohydrates, and trace amounts of tryptophan are all present in seeds. The seed protein is made up of alanine, arginine, aspartic acid, glutamic acid, glycineserine, isoleucine-leucine, histidine, lysine, methionine, phenylalanine, proline, threonine, tyrosine, valine, and histidine. It also contains fixed oils, fatty acids like palmitic acid, stearic acid, oleic acid, and linoleic acid, as well as sterols like campstool, stigmasterol, βsitosterol, stimasta-5, 24(28)-dien-3 β-ol, stimasta-1,3,5-triene, and stimasta-4,6-dien-3-one. Linoleic and oleic acids predominate among the comparatively high percentage of unsaturated fatty acids found in the seed lipids. Prosogerin C, Prosogerin D, Prosogerin E, gallic acid, patuletin, patulitrin, luteolin, and rutin are chemical substances that have been reported to be present in seeds; flavones from seeds.

Flowers Patulitrin 4-pentamethoxy-7-hydroxy flavone, a flavone glycoside, has been isolated

from P. cineraria (L.) flowers. The flavone derivatives Prosogerin A and Prosogerin B, luteolin and rutin sitosterol, spicigerine, and patuletin glycoside patulitrin are among the phytochemicals found in Prosopis flowers.

Aspartic acid, glutamic acid, serine, glycine, histidine, threonine, arginine, alanine, proline, tyrosine, valine, methionine, cysteine, isoleucine, leucine, phenolic acid derivatives, and lysine are among the amino acids that have been extracted from leaves. According to Garg and Mittal, the leaves contain a piperidine alkaloid called spicigerine, as well as steroids like campesterol, cholestrol, sitosterol and stigmasterol, actacosanol, hentriacontane, methyl docosanoate, Diisopropyl-10, 11-dihydroxyicosane-1,20-dioate, tricosan-1-ol, and 7,24-Tirucalladien-3-one. Additionally, a significant amount of unsaturated fatty acids, including oleic and linoleic acid, were present in the leaves.

The breakthrough process behind the operation of gastric floating beads. The gas-generating agent starts to emit carbon dioxide when it comes into contact with the stomach's acidic environment. The beads are able to float on the stomach juice because of the low-density environment this produces inside of them. They optimise drug delivery by releasing the drug payload while they float, which is then absorbed through the stomach lining. Gastric floating beads have a lot of benefits. They minimise negative effects and decrease fluctuation in plasma drug concentration, which enhances drug absorption, particularly for drugs with poor solubility. These beads may improve patient adherence, which is essential for effective treatment, by making dose schedules simpler. Within 24 hours, no mortality was observed in the plant's 50% hydroalcoholic extract of the leaves and stem bark. Behaviour, respiration, cutaneous impacts, and sensory nerve system responses did not significantly change. Haematological parameters were not significantly altered by the extracts as compared to the control. At 100 mg/kg body weight, the methanolic extract of the leaves was deemed safe. The LD50 of the methanolic extract was found to be 122.47 mg/kg body weight. The maximum dosage of 2 g/kg of the rats' body weight was confirmed to be safe for the leaf extract. The LD50 of the leaves and bark hydro-alcoholic extract was greater than 2000 mg/kg77. The bark's aqueous extract was said to be harmless. The flavoneglycoside patulitrin from the flowers had cytotoxic action, while the methanolic extract of the leaves significantly reduced the viability of the cells.

Prospects for the Future Given the present global trend of increased usage of herbal medicines, the hunt for medications and nutritional supplements made from plants has intensified in recent years. Herbal medications are becoming more and more popular worldwide, and their rapidly expanding industry is expected to continue to rise in the years to come as researchers continue to provide scientific proof of their efficacy, safety, and quality. The therapeutic development of P. cineraria (L.) as an adjuvant therapy can be supported by the data currently available on the species. Based on its toxicity profile, therapeutic potential, and availability, we think P. cineraria (L.) satisfies the requirements for plant selection. Numerous investigations have found that P. cineraria (L.) has a variety of medicinal and pharmacological qualities, making it useful for treating a range of chronic illnesses. In order to potentially integrate P. cineraria (L.) into the healthcare system, we expect that its medicinal potential can be best connected.

Conclusion

In conclusion, gastric floating beads promise to revolutionise the pharmaceutical industry and mark a revolutionary advancement in drug delivery. There are strong arguments to believe in their potential because of their special mechanism, uses, and benefits. Even while there are still difficulties, more research and creativity should be able to solve them, bringing about better patient outcomes and a new era of personalised medicine. Gastric floating beads represent innovation and hope for a healthier future in a world where efficient medicine delivery is essential.

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