e-ISSN: 2320-4230, p-ISSN: 2961-6085

Journal of Drug Discovery and Therapeutics

Available Online at www.jddt.in

CODEN: - JDDTBP (Source: - American Chemical Society)

Volume 11, Issue 06: 2023, 72-78

Prosopis Cineraria as Hepatoprotective: A Review

Rajesh Asija[1], Amandeep Swami[2], Vishwaroop Singh[3]

[1]Professor and Principal, Department of Pharmaceutics, Maharishi Arvind Institute of Pharmacy, Jaipur

[2]Associate Professor, Department of Pharmacology, Maharishi Arvind Institute of Pharmacy, Jaipur

[3]Research Scholar, Department of Pharmacology, Maharishi Arvind Institute of Pharmacy, Jaipur

Received: 13-09-2023 / Revised: 23-10-2023 / Accepted: 14-11-2023

Corresponding author: Vishwaroop Singh

Conflict of interest: No conflict of interest.

Abstract:

Prosopis cineraria (L.) Druce, belonging to the Leguminosae family's Mimosoideae subfamily, is referred to as Ghaf. The herb has sociological, ethnological, traditional, and medicinal effects on people's lives. The idea is to provide an overview of the most recent research with detailed information, emphasizing the plant's potential for bioactivity. The goal of the review was to update the data on therapeutic activities that had been published in scientific journals and to offer a thorough tabulation of the data in a format that would be helpful to academic researchers. A thorough scientific investigation of P. cineraria (L.) was conducted to determine the phytochemical constituents of the leaf, stem, pod, and bark as well as their safety and pharmacological information. Using the condensed scientific knowledge of P. cineraria (L.), the review aids in identifying gaps in the field and future opportunities.

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

Introduction

The Prosopis cineraria (L.) Druce occurs in most of the world's hot arid and semi-arid regions as native or introduced species. The Great Indian Desert, popularly known as the Thar, the arid regions is characterized by the extremely arid climate with low and erratic rainfall, dry atmosphere and high wind velocities. P. cineraria (L.). Its population is centered on the of India and Pakistan, but smaller populations occur in Iran, Afghanistan, and the Arabian Peninsula, P. cineraria (L.) is an important native species to the Northeastern United Arab Emirates (UAE), locally known as Ghaf and is among few trees growing in the arid deserts of the UAE and constitute a major ecological feature and is beneficial for the growth and development of other species. The climate of the UAE is characterized by high temperatures, high humidity, and low rainfall Bedouin traditional lifestyle in UAE has been very much associated with the Prosopis trees and their products. The rapid growth and modernization of infrastructure

have led to noticeable changes in the Emirati way of life. As the country rapidly modernizing and due to rapid change in socioeconomic conditions of the country, the dependency of Bedouins become less and less on the plant. Less number of people get benefit by the plant as was practiced earlier. Therefore, the plant has been badly neglected for scientific studies. The negligence is reflected from the fact that almost no scientific work has been carried out on the plants especially from the medicinal and nutritional potential point of view.

The genus Prosopis as described by Burkart consists of 44 species. They have been introduced globally and have become invasive in many places, as native or introduced species. P. cineraria (L.) mainly distributed in the deserts of India, Pakistan, Afghanistan, Iran, and the Arabian Peninsula. In the Arabian Peninsula, P. cineraria (L.) exists mostly in the UAE and Oman, Prosopis has been reported to occur in 129 countries globally and many more countries are climatically suitable.

P. cineraria (L.) produce antibacterial properties. The antibacterial activity was tested against clinical isolate, the methanol extract showed better results against all pathogens in comparison to standard antibiotic drug. Aqueous and chloroform extract of the unripe pods of did not showed any activity against E.coli, P. aeruginosa and S. typhi. The ethyl ether and alcoholic extracts showed positive reactions against all S. aureus, E. coli and Candida albicans. The microbial activity has been reported due them to the presence of flavonoids and tannins57 . P. cineraria (L.) has been shown protective role in reducing glucose levels as well as in increasing body weight, decreasing in the blood glucose, antihyperglycaemic activity decreasing the fasting blood glucose level in mice, and reducing the oxidative damage in the tissues of diabetic animal. Sharma and Singlas reported that Prosopis extracts showed insulinogenic effect; and caused significant increase in the serum insulin levels.

Analgesic Activity and Antipyretic activity

Different extracts of leaves exhibited significant analgesic activity and antipyretic activity. Petroleum ether, ethyl acetate and ethanol extracts of stem bark showed a significant analgesic activity in experimental rats. Ethanol extract exhibited analgesic activity.

Methanolic extract of dried stem bark of P. cineraria (L.) showed improved nootropic activity in mice. Methanolic extract from the stem bark exhibited spasmolytic, bronchodilator, and vasodilator activities in isolated rabbit tracheal preparations. Methanolic extract showed significant reduction in duration of convulsions.

Prosopis cineraria:

Prosopis cineraria, commonly known as the Ghaf tree, is a drought-tolerant tree native to arid regions of Asia, including the Indian subcontinent. It has several traditional uses and is known for its adaptability to harsh environmental conditions. Here's an overview of the microscopic, macroscopic, physiological aspects, as well as the collection and extraction processes for Prosopis cineraria:

Microscopic Analysis:

1. Leaf Structure:
- Examine the cellular structure of the leaves, including the epidermis, stomata, and vascular bundles.
- Identify any specialized structures such as trichomes or glandular structures.

Macroscopic Analysis:

1. Overall Plant Characteristics:

- Observe the general appearance of the tree, considering its size, shape, bark, and growth habits.
- Note the characteristics of leaves, flowers, and pods.

2. Pod Characteristics:

- Prosopis cineraria is known for its distinctive long, flat pods. Examine the macroscopic features of these pods.

Physiological Analysis:

1. Drought Adaptations:

- Explore the physiological adaptations of Prosopis cineraria to arid environments, such as water storage mechanisms and reduced transpiration.

2. Nitrogen-Fixing Ability:

- Understand its role as a nitrogen-fixing tree and its contribution to soil fertility.

Collection of Plant:

1. Selection:

- Ensure accurate identification of Prosopis cineraria.
- Choose healthy specimens for collection.

2. Timing:

- Harvest plant parts at the appropriate time, considering the growth cycle. Pods, for instance, may be collected when mature.

3. Parts Collected:

- Different parts of the tree may be collected for various purposes, including leaves, pods, and bark.

Extraction Process:

1. Harvesting:

- Clean the collected plant material to remove any extraneous matter.

2. Drying:

- Dry the plant material to reduce moisture content, preserving it for further processing.

3. Extraction Methods:

- Water Extraction: Utilize water as a solvent to extract water-soluble compounds.
- Ethanol or Methanol Extraction: Extract bioactive compounds using organic solvents.

4. Concentration and Purification:

- Concentrate the extract by removing excess solvent or water.
- Purify the extract if needed for specific applications.

5. Analysis:

- Conduct chemical analysis to identify and quantify compounds, especially focusing on bioactive components.
- Implement quality control measures to ensure the extract meets standards.

Prosopis cineraria is of interest for its medicinal properties, forage value, and potential in agroforestry. The specific extraction methods can vary based on the targeted compounds and the intended use of the extract. For the most accurate and up-to-date information, consulting scientific literature or experts in the field is recommended.

Phytochemical Constituents/Compounds of The Plant And Bioactivity P. cineraria (L.) were investigated for various phytochemical constituents such as alkaloids, carbohydrates, steroids, proteins, phenols, tannins, flavonoids, glycosides, and saponins as per Indian Pharmacopoeia.

Seeds The seeds contain protein, carbohydrates, seed protein is constituted of alanine, arginine, aspartic acid, glutamic acid, glycineserine, isoleucine-leucine, histidine, lysine, methionine, phenylalanine, proline, threonine, tyrosine, valine, and traces of tryptophan ; also contains fixed oils, fatty acid such as palmitic acid, stearic acid, oleic acid & linoleic acid, sterols like campstool, stigmasterol, βsitosterol, stimasta-5, 24(28)-dien-3 β-ol, stimasta-1,3,5- triene, stimasta-4,6-dien-3-one. The

seed lipids contain a relatively large proportion of unsaturated fatty acids, with linoleic and oleic acids being predominant. Seeds have been reported to contain the chemical compounds Prosogerin C, Prosogerin D, Prosogerin E, Gallic acid, patuletin, patulitrin, luteolin, and rutin; flavones from seeds.

Flowers The isolation of a flavone glycoside Patulitrin 4-pentamethoxy-7-hydroxy flavone from flowers of P. cineraria (L.) has been reported. The presence of phytochemicals in Prosopis flowers that include Patuletin Glycoside patulitrin, luteolin and rutin sitosterol, spicigerine, and flavone derivatives Prosogerin A and Prosogerin B.

Leaves Amino acids isolated from leaves are Aspartic acid, Glutamic acid, Serine, Glycine, Histidine, Threonine, Arginine, Alanine, Proline, Tyrosine, Valine, Methionine, Cysteine, Isoleucine, Leucine, Phenylalanine and Lysine; phenolic acid derivatives. Garg and Mittal reported that the leaves contain 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 along with a piperidine alkaloid spicigerine. The leaves also showed the presence of large proportion of unsaturated fatty acids, with linoleic acid and oleic acid.

The mechanism underlying the action of gastric floating beads is revolutionary. Upon exposure to the acidic environment of the stomach, the gas-generating agent initiates the release of carbon dioxide. This creates a low-density environment within the beads, allowing them to float on the gastric fluid. As they float, they release the drug payload, which is subsequently absorbed through the stomach lining, leading to optimized drug delivery. The advantages of gastric floating beads are substantial. They improve drug bioavailability, especially for medications with poor solubility, reducing the variability in plasma drug concentration and minimizing side effects. By simplifying dosing regimens, these beads have the potential to enhance patient adherence, a critical aspect of successful therapy. Plant 50% Hydro alcoholic extract of the leaves and stem bark showed No mortality recorded within 24 h. No significant changes in behavior, breathing, cutaneous effects, sensory nervous system responses. The extracts did not produce significant changes in hematological parameters compared to the control. Methanolic extract of the leaves was found safe at 100mg/kg body weight. Methanolic extract LD50 was reported to be 122.47 mg/kg body weight. The leaves extract was found to be safe up to maximum dose of 2 g/Kg body weight of the rats. Hydro- alcoholic extract of the leaves and bark showed LD50 higher than 2000 mg/kg77. Aqueous extract of the bark was reported to be safe. Methanolic extract of the leaves showed significant decreased the viability of the cells, the Flavoneglycoside Patulitrin from the flowers exhibited cytotoxic activity.

Future Prospective The current trend of increasing use of herbal medicines and their growing popularity all over the world, the search for drugs and dietary supplements derived from plants have accelerated in recent years. The increasing use and fast-growing market of herbal medicines and widespread use of herbal medicines is likely to increase even further throughout the world in the coming years with more and more scientific evidence of their quality, efficacy and safety coming from the researchers. The available data on P. cineraria (L.) can provide evidential support for the clinical development of P. cineraria (L.) as adjuvant therapy. We believe P. cineraria (L.) fulfils the criteria for its

selection of the plant based on its therapeutic potential and toxicity profile, and also availability of the plant. It is observed from various studies that the P. cineraria (L.) have a number of pharmaceutical and medicinal properties and according to this; it is effective in the treatment of a number of chronic diseases. We hope the therapeutic potential of P. cineraria (L.) could be best connected, towards a possible integration into the healthcare system.

Conclusion:

Gastric floating beads represent a transformative leap in drug delivery, promising to reshape the pharmaceutical landscape. Their unique mechanism, applications, and advantages provide compelling reasons to believe in their potential. While challenges persist, ongoing research and innovation are likely to overcome these obstacles, ushering in a new era of personalized medicine and improved patient outcomes. In a world where effective drug delivery is pivotal, gastric floating beads stand as a symbol of innovation, offering hope for a healthier.

References

1. Haldhar SM. Report of Homoeocerus variabilis (Hemiptera: Coreidae) on khejri (Prosopis cineraria) in Rajasthan, India: incidence and morphometric analysis. Florida Entomologist, 2012; 848-53.
2. Gallacher D, Hill J. Status of Prosopis cineraria (Ghaf) tree clusters in the Dubai Desert Conservation Reserve. Tribulus, 2005; 15: 3-9.
3. Abdel Bari E, Fahmy G, Al Thani N, Al Thani R, Abdel-Dayem M. The Ghaf Tree, Prosopis cineraria in Qatar Environmental Studies Centre and National Council for Culture, Arts and Heritage, Doha, 2007; 165.
4. TS Mohamed Saleem, C Madhusudhana Chetty, S Ramkanth, VST Rajan, K Mahesh Kumar, Gauthaman K: Hepatoprotective Herbs – A Review International Jouranal of research in Pharmceutical Sciences 2010; 1(1): 1-5.
5. Arvind S Negi, JK Kumar, Suaib Luqman, Karuna Shanker, MM Gupta, SPS Khanuja: Recent Advances in Plant Hepatoprotectives: A Chemical and Biological Profile of Some Important Leads. Medicinal Research Reviews (2008); 28(5): 746 -772.
6. Richardo et al: Carbon Tetrachloride HepatotoxicityPharmacological review 1967; 19:145-208.
7. Alric L, M Fort, et al.: Study of host and virus related factors associated with spontaneous hepatitis C virus clearance. Tissue antigens 2000; 56(2): 154-58.
8. Mitchell JR, Jollow DJ, Potter WZ, Gillette JR and Brodie BB. : Acetaminophen-induced hepatic necrosis. IV. Protective role of glutathione.Journal of Pharmacology and Experimental Therapeutics 1973; 187: 211–217.
9. Huggette Houghton PJ, Hylands PJ, Mensah AY, Hensel A, Deters AM: In vitro tests and ethnopharmacological investigations: wound healing as an example. Journal of Ethnopharmacology 2005; 100(1-2): 100-107.
10. Ulanganathan I, Divya D, Radha K, Vijayakumar TM and Dhanaraju MP: Protective effect of Luffa acutangula (Var) amara against carbon tetrachloride-induced hepatotoxicity in experimental rats. Research Journal of Biological Sciences 2010; 5(9): 615-624.
11. Hewawasam RP, Jayatilaka KAPW, Pathirana C and Mudduwa LKB: Hepatoprotective effect of Epaltes divaricata extract on carbon tetrachloride induced hepatotoxicity in mice. Indian Journal of Medical Research, 2004: 30-34.

12. Ranjan KG, Anindya bose and mishra SK: Hepatoprotective activity of Tagets erecta against carbon tetrachloride-induced hepatic damage in rats. Acta poloniae pharmaceutica-Drug Research 2011; 68(6): 999- 1003.
13. Parameshwar P, Reddy YN, and Aruna Devi M: Hepatoprotective and antioxidant activities of Ziziphus rotundifolia (Linn.) against carbon tetrachloride-induced hepatic damage in rats. International journal of pharmaceutical sciences and nanotechnology 2012; 5(3): 1775-1779.
14. Ugwueze ME, Adonu CC and Attama AA: Evaluation of the hepatoprotective activity of root extracts of Millettia aboensis on carbon tetrachloride [CCl4] induced hepatotoxicity in rats. International Journal of Advanced Research 2013; 1(5): 65-70.
15. Krishna Mohan G, Pallavi E, Ravi Kumar B, Ramesh M and Venkatesh S: Hepatoprotective activity of Ficus carica Linn. leaf extract against carbon tetrachlorideinduced hepatotoxicity in rats. DARU 2007; 15(3): 162- 166.
16. Patience OO, Festus BC, Philip FU, Nneka RN, Ijeoma EA and Nkemakonam CO: Phytochemical analysis, hepatoprotective and antioxidant activity of Alchornea cordifolia methanol leaf extract on carbon tetrachlorideinduced hepatic damage in rats. Asian Pacific Journal of Tropical Medicine 2012: 289-293.
17. Hogade MG, Patil KS, Wadkar GH, Mathapati SS and Dhumal PB: Hepatoprotective activity of Morus alba (Linn.) leaves extract against carbon tetrachloride induced hepatotoxicity in rats. African Journal of Pharmacy and Pharmacology 2010; 4(10): 731-734.
18. Isaias BR, Maria del Rayo CC, Pilar CR, Hector GLG, Dalila CN, Francisco JAM and Elsa MTC: Hepatoprotective effect of Leucophyllum frutescens on wistar albino rats intoxicated with carbontetrachloride. Annals of Hepatology 2007; 6(4): 251-254.
19. Karunakar HE and Arun BJ: Hepatoprotective effect of Carissa carandas Linn root extract against carbon tetrachloride and paracetamol induced hepatic oxidative stress. Indian Journal of Experimental Biology, 2009; 47(8): 660-667.
20. Nwachukwu DC, Okwuosa CN, Chukwu PU, Nkiru AN and Udeani T: Hepatoprotective Activity of Methanol Extract of the Seeds of Sesamum Indicum in Carbon Tetrachloride Induced Hepatoxicity in Rats. Indian Journal of Novel Drug delivery 2011; 3(1): 36-42.
21. Allen JW, Hassanein T, Bhatia SN. Advances in bioartificial liver devices. Hepatol 2001;34:447-55. 24. Yu Y, Fisher JE, Lillegard JB, Rodysill B, Amiot B, Nyberg SL. Cell therapies for liver diseases. Liver Transpl 2012;18:9-21.
22. Fox IJ, Chowdhury JR, Kaufman SS, Goertzen TC, Chowdhury NR, Warkentin PI, et al. Treatment of the CriglerNajjar syndrome type I with hepatocyte transplantation. N Engl J Med 1998; 338:1422-6.
23. Sokal EM, Smets F, Bourgois A, Van Maldergem L, Buts JP, Reding R, et al. Hepatocyte transplantation in a 4-year-old girl with peroxisomal biogenesis disease: technique, safety, and metabolic follow-up. Transplant 2003;76:735-8.
24. Katsutoshi Naruse, Wei Tang and Masatoshi Makuuchi. Artificial and bioartificial liver support: A review of perfusion treatment for hepatic failure patients. World J Gastroenterol 2007;13:1516-21.
25. Ho MJ: Perspectives on tuberculosis among traditional Chinese medical

practitioners in New York City's Chinatown. Culture. Med Psychiatr 2006;30:105-22.
26. Stickel F, Schuppan D: Herbal medicine in the treatment of liver diseases. Dig Liver Dis 2007;39:293-304.
27. World Health Organization Division of Traditional Medicine: General Guidelines for Methodologies on Research and Evaluation of Traditional Medicines Geneva; World Health Organization; 2000.
28. Prete AD, Scalera A, Iadevaia MD, Herbal Products: Benefits, Limits, and Applications in Chronic Liver Disease. EvidenceBased Complementary and Alternative Medicine 2012 (2012): 19 pages.
29. Biernat L, Hartleb M, Kochel A. Drug-induced liver damage - a three-year study of patients from one gastroenterological department. Med Sci Monit 2002; 8: CR292-296.
30. Pandit A, Sachdeva T and Bafna P. Drug-Induced Hepatotoxicity: A Review. J Appl Pharm Sci 2012;02:233-43.
31. Chughlay MF, Kramer N, Werfalli M, Wendy Spearman, Mark Emmanuel Engel, and Karen Cohen. N-acetylcysteine for nonparacetamol drug-induced liver injury: a systematic review protocol. Syst Rev 2015;4:84.
32. Dass, Ervilla, & Sattigeri, B. Hepatoprotective effect of DLmethionine on diclofenac-induced hepatotoxicity in albino rats: an experimental study. Int J Res Med Sci 2018; 6:802-7.
33. Ervilla D, Sattigeri B. Diclofenac-Induced Liver Toxicity in Albino Rats; Dose Dependent Study. Paripex-Indian J Res 2018;7.
34. Schapira D, Bassan L, Nahir A.M and Scharf Y. Diclofenacinduced hepatotoxicity. Postgraduate Med J 1986;62:63-5.