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Prosopis Cineraria as Hepatoprotective: A Review

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Abstract:

In the ever-evolving landscape of pharmaceuticals, innovative drug delivery systems continue to emerge, seeking to optimize treatment outcomes and patient experiences. Gastric floating beads, a pioneering development, have garnered substantial attention due to their unique ability to transform drug delivery. This abstract provides a concise overview of gastric floating beads, their innovative design, applications, advantages, challenges, and future potential. Gastric floating beads are engineered microspheres designed to remain buoyant within the stomach, facilitating controlled and prolonged drug release. Comprising a hydrophobic polymer matrix and a gas-generating agent, these beads harness the production of carbon dioxide upon exposure to gastric acid, rendering them buoyant and capable of targeted drug delivery. The applications of gastric floating beads span a spectrum of pharmaceutical needs. They are particularly well-suited for extended drug release, offering a consistent and sustained therapeutic effect. Their buoyant nature allows for targeted drug delivery within the stomach, thereby improving drug bioavailability while reducing systemic side effects. Simplified dosing schedules enhance patient adherence, a vital factor in the success of many treatment regimens. The revolutionary mechanism of gastric floating beads is rooted in their design. The interaction between the gas-generating agent and gastric acid initiates the release of carbon dioxide, creating a low-density environment that enables the beads to float on the gastric fluid. This unique feature supports their ability to dispense drugs at a controlled rate, optimizing their absorption through the stomach lining.

Keywords: Floating Beads, Prolonged, Gastric Fluid, Microspheres, Advantages

Introduction

Urolithiasis is a common condition affecting many parts of the world, with a peak prevalence of 5-10% in western societies . Recurrent calculi can be prevented in most patients by the use of a simplified evaluation, reasonable dietary and fluid

recommendations, and directed pharmcologic intervention. Serum studies and 24-hour urine collections are the mainstays of metabolic investigation and usually are warranted in patients with recurrent calculi. Although some stones are the result of inherited conditions, most result from a complex interaction between diet, fluid habits, and genetic predisposition. Calcium-sparing diuretics such as thiazides often are used to treat hypercalciuria. Citrate medications increase levels of this naturally occurring stone inhibitor. Allopurinol can be helpful in patients with hyperuricosuria, and urease inhibitors can help break the cycle of infectious calculi. Aggressive fluid intake and moderated intake of salt, calcium, and meat are recommended for most patients.

In general, urinary stones may contain various combinations of chemicals. The most typical stones contain calcium in combination with either oxalate or phosphate. Much less common are the uric acid stones and the rare cystine stones. Urinary stones have become increasingly common in most parts of the world in recent years. It was found that 80% of kidney stone cases are among men and only 20% are women.

TYPES OF STONES

There are numerous types of renal stones that differ in pathogenesis and composition. The majority of kidney stone is composed of calcium oxalate and is caused by metabolic disorders that are often treatable.

Calcium Stones- The most common constituent of urinary tract calculi is calcium. The majority stones contain calcium in combination with oxalate, phosphate, or occasionally uric acid. Such stones are radio-opaque.

Calcium oxalate- Also called mulberry stones, these stones are characteristically dark brown/ black in colour, with a dense, smooth appearance shows the crystals under electron microscopy. When viewed under light microscopy calcium oxalate monohydrate crystals are seen as dumbbell-shaped.

Calcium phosphate- Calcium hydroxyphosphate stones commonly comprise a significant proportion of carbonate to form apatite stones. These stones are usually white in colour and are comparatively poorly crystallized compared to hydrated acid calcium phosphate stones.

Non-calcium stones

Uric acid stones- Uric acid stones may consist of uric acid only, or they also may contain calcium. Uric acid is a by-product of ingested or endogenous purine metabolism and is excreted in the urine primarily in insoluble form. Diets high in purines, especially those containing meats and fish, result in hyperuricosuria, and, in combination with low urine volume and low urinary pH, can exacerbate uric acid stone formation.

Struvite stones- Struvite stones, also known as infection or triple-phosphate stones, consist of magnesium, ammonium, and calcium phosphate. They occur more often in women than in men and are the leading cause of staghorn calculi. They are associated with substantial morbidity infection. Signs of struvite stones include urinary pH greater than 7, staghorn calculi, and urease that grow bacteria on culture (proteus, klebsiella, pseudomonas).

Cystine stones- These are rare stones occurring in 1% of stone patients, due to an autosomal recessive disorder of dibasic amino acid transport leading to decreased cystine resorption in the kidney. People who are homozygous for cystinuria excrete more than 600 mg per day of insoluble cystine. The stones are greenish- yellow,flecked with shiny crystallites, and are moderately radio-opaque with a rounded appearance.

Herbal medicines have several phytoconstituents which exert their

beneficial effects in urolithiasis by multiple mechanisms. Drugs with multiple mechanisms of protective action may be one way forward in decreasing tissue injury in human disease. Urolithiasis denotes stones originating anywhere in the urinary tract including kidneys and bladder. Herbs are used as medicine since time immemorial. Bladder stones form almost exclusively as a result of urinary stasis and recurrent infections due to bladder outlet obstruction or neurogenic bladder. Traditional plants are constantly being evaluated for possible antilithiac activity in a systemic manner. The present-day medical management of urolithiasis is either costly or not without side effects.

Anti-urolithiatic activity refers to the ability of a substance to prevent or reduce the formation of urinary stones, also known as urolithiasis or kidney stones. Kidney stones are solid masses that form in the kidneys from the buildup of substances such as calcium, oxalate, and phosphate. These stones can cause severe pain and discomfort and may lead to complications if not addressed. Several natural and synthetic compounds have been studied for their potential anti-urolithiatic activity. Hydration is a fundamental preventive measure. Increased fluid intake can help dilute urine and reduce the concentration of stone-forming substances. Citrate inhibits the formation of calcium oxalate stones by binding with calcium, preventing it from crystallizing. Various herbs have been studied for their potential anti-urolithiatic properties. Examples include Phyllanthus niruri (Chanca Piedra), which has been traditionally used in some cultures for kidney stone prevention. Adequate levels of dietary calcium can bind to oxalate in the intestines, preventing its absorption and reducing the risk of calcium oxalate stone formation. Magnesium may also play a role in inhibiting stone formation. Certain medications, such as thiazide diuretics, can alter urine composition and reduce the risk of stone formation. Allopurinol may be prescribed to inhibit the formation of uric acid stones.

Cichorium Intybus:

Cichorium intybus, commonly known as chicory, is a plant that is cultivated for its leaves, which are used in salads, and its roots, which are often roasted and used as a coffee substitute. Here's a general overview of the microscopic, macroscopic, physiological aspects, as well as the collection and extraction processes for Cichorium intybus:

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.

1. Root Structure:
- Investigate the cellular composition of the root tissues.

Macroscopic Analysis:

1. Overall Plant Characteristics:
- Observe the plant's general appearance, size, color, and growth habits.
- Note the characteristics of leaves, flowers, and roots.

2. Flower and Seed Characteristics:
- Study the structure of flowers and seeds for identification purposes.

Physiological Analysis:

1. Metabolic Pathways:
- Explore biochemical pathways, especially those related to the production of secondary metabolites like inulin, which is abundant in chicory roots.

2. Adaptations to Stress:

- Understand how chicory adapts to environmental stressors, such as drought or nutrient deficiencies.

Collection of Plant:

1. Selection:
- Ensure accurate identification of Cichorium intybus.
- Choose healthy plants for collection.
2. Timing:
- Harvest the plants at the appropriate time in their life cycle. For leaves, this might be during the growing season, while roots are often harvested in the fall.
3. Parts Collected:
- Leaves are typically collected for culinary use, and roots may be collected for various purposes, including extraction of inulin.

Extraction Process:

1. Harvesting:
- Clean the collected plant material to remove soil and other impurities.
2. Drying:
- Dry the leaves or roots to reduce moisture content and preserve the plant material.
3. Extraction Methods:
- Water Extraction: Chicory roots, for example, can be processed with water to extract inulin.
- Solvent Extraction: Use solvents such as ethanol for extracting other bioactive compounds.
4. Concentration and Purification:
- Concentrate the extract by removing excess water or solvent.
- Purify the extract if necessary, especially for obtaining specific compounds.
5. Analysis:
- Conduct chemical analysis to identify and quantify the compounds present.
- Ensure quality control measures are in place.

Traditional uses

Historically, chicory was grown by the ancient Egyptians as a medicinal plant. The dried and roasted roots are used as coffee substitutes and additives, young leaves can be added to salads and vegetable dishes, while chicory extracts are used for the production of invigorating beverages. The plant was used traditionally for the treatment of diarrhea, to strengthen the prostate and other reproductive organs, for the treatment of pulmonary disease and cough, cancer, hangover, for purification of biliary tract, liver complaints, as spasmolytic, to relief of symptoms related to mild digestive disorders (such as feeling of abdominal fullness, flatulence, and slow digestion) and temporary loss of appetite. Among internally uses areIt was also used in sore throat, hemorrhoids, tuberculosis, abdominal cramps, melancholy, deafness, rashes and as laxative for children. Parts used: Aerial part, flowers seeds and roots.

Aqueous extract of chicory seed has both short term (about 2 hrs; on glucose tolerance test) and long-term effects on diabetes. Chicory may be useful as a natural dietary supplement for lowering the pace of diabetes progression. They reported that continued administration of C. intybus seed extract (500 mg/kg BW, 21 days) produced a sustained anti-hyperglycemic effect in STZ induced diabetic rats. Caffeoylquinic acid-rich extract from chicory seeds improved diet-induced metabolic disturbances like type 2 diabetes. An intra-peritoneal injection of C. intybus extract to STZ induced diabetic rats resulted in significant reduction in blood glucose and also reduction in lipid profile and malondialdehyde level and increased the reduced glutathione, superoxide dismutase, glutathione-S-transferase, and catalase activities as compared to the rats treated with STZ alone. These outcomes recommended that the C. intybus extract has antioxidant properties

and averts diabetes complication by modulation of oxidative stress system. Chicory has the capacity to target hyperglycemia, hyperlipidemia, insulin resistance, nonalcoholic fatty liver disease (NAFLD), and non-alcoholic steatohepatitis simultaneously, possibly via modulation of peroxisome proliferator-activated receptor-alpha/sterol receptor element-binding protein-1 ratio. A clinical study was done on 47 adult healthy volunteers divided into a test group that was given CRE orally and a placebo group that drank barley tea containing 10% coffee (ingesting 300 ml daily for 4 weeks) under a randomized, double-blind, placebo-controlled study. The CRE has ideal impacts including antihyperglycemic and antidyslipidemic impacts and additionally improved the bowel movement. Further, the level of adiponectin was significantly improved in the CRE group when the baseline and post-intervention values were compared. The folkloric use of chicory as hepatoprotectant has been welldocumented. Ethanolic extract of chicory given orally at doses of 6, 18, and 54 mg/kg BW per day showed a significant hepatoprotective effect by reducing the liver enzymes (aspartate transaminase [AST] and alanine transaminase . The results were highly significant at the dose of 54 mg/kg BW per day. An intra-peritoneal administration of methanol and water-extract of chicory to albino rats exhibited marked reduction in liver enzyme. Chicory exhibited a hepatoprotective effect and was highly effective in reducing serum ALT and AST even below the normal values of these enzymes could be obtained upon long-term.

Chemical Constituents

The health-promoting factors in these plant parts, commonly called phytochemicals, have extensive biological activities such as antioxidant, anticancer, anti-inflammatory, and α-glucosidase inhibition. The very common phytocompounds are phenolic acids, which include chlorogenic acids, and flavonoids (anthocyanins, flavonols, flavanone, and flavan-3-ols). The plant polyphenols usually occur as glycosides, which makes them less reactive and easier to store in the cell vacuole.

Conclusion:

C. intybus is a coffee substitute and its leaves, flowers, seeds and roots are traditionally used as herbal medicines since ancient times. Pilot studies have shown that CRE is beneficial in osteoarthritis has antithrombotic and anti-inflammatory effects and is beneficial in non-alcoholic fatty liver disease. Experimental studies on C. intybus seed extract in animal models showed hepatoprotective, antioxidative, antithrombotic, and antidiabetic properties. However, no systematic clinical study has been conducted to elucidate the role of chicory seeds in different disorders. The documented indigenous knowledge relating to various medicinal uses of chicory has been supported by phytochemical isolation and investigations of its biological activities. Nonetheless, many of its constituents have not been fully explored for their pharmacological potential and further research is necessary to gain the better understanding of the phytochemicals and mechanism of their action against various diseases. There is a lack of established Allopathic medicines for prevention of common lifestyle disorders. The inclusion of the plant in therapeutic regimen may be beneficial in developing a holistic approach involving indigenous and Allopathic systems for management of lifestyle disorders.

References

1. Hoffman David, 2003, Medical Herbalism: The Science and Practice of Herbal Medicine, Inner Traditions / Bear & Co, pp. 6.

2. Rivera J, Loya A and Canallos R, 2013. Use of herbal medicines and implications for conventional drug therapy medical science. *Alternative and Integrative Medicine*, Vol. 2, Issue 6, pp.2-6.
3. Knoll Thomas and Pearle M. S., 2012. Clinical Management of Urolithiasis. Springer Heidelberg New York, pp. 1.
4. Pietrow P. K. and Karellas M. E., 2006. Medical Management of Common Urinary Calculi. American Family physician, Vol. 74, Issue 1, pp. 86-94.
5. Andersond, D.A. (1996) A survey of the incidence of urolithiasis in Norway from 1853 to 1966. *J. Oslo City Hosp*. **16**, 10–140.
6. Pietrow P. K. and Karellas M. E., 2006. Medical Management of Common Urinary Calculi. American Family physician, Vol. 74, Issue 1, pp. 86-94.
7. Barbas C, Garcia A, Saavedra L, Muros M., 2002. Urinary analysis of nephrolithiasis markers. Journal of Chromatography B., Vol. 781, pp. 433–455.
8. Aman S, Khandelwal M, Sharma AK, Prajapati P, Ayushi, Deepika. 2019. An overview on potent herbs for urolithiasis. International Journal of current Pharmaceutical Review and Research, 11(4): 1-9.
9. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network-(GRIN). National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov.4/cgi bin/npgs/html/taxon. pl?10543 (18 June 2015)
10. United State Department of Agriculture, Natural resources conservation Service. Plant Database, Cichorium intybus L., chicory, http://plants.usda.gov/core/profile? symbol=ciin
11. Flora of China, www. efloras.org, http://www.efloras.org/florataxon.aspx?flora _id=2 &taxon_id=200023652
12. Wang Q and Cui J. Perspectives and utilization technologies of chicory (Cichorium intybus L.): a review. African Journal of Biotechnology 2011; 10(11): 1966-1977
13. Bais HB and Ravishankar GA. Cichorium intybus L. – Cultivation, processing, utility, value addition and biotechnology, with an emphasis on current status and future prospects. J Sci Food Agric 2001; 81:467-484.
14. Judzentiene A and Badiene JB. Volatile constituents from aerial parts and roots of Cichorium intybus L. (chicory) grown in Lithuania. Chemija 2008; 19: 25-28.
15. -PDR for Herbal Medicines. Medical Economics Company, Inc. at Montvale, 2000: 181.
16. C. Carazzone, D. Mascherpa, G. Gazzani, and A. Papetti, "Identification of phenolic constituents in red chicory salads (*Cichorium intybus*) by high-performance liquid chromatography with diode array detection and electrospray ionisation tandem mass spectrometry," *Food Chemistry*, vol. 138, no. 2-3, pp. 1062–1071, 2013.
17. L. Plaza, B. De Ancos, and M. P. Cano, "Nutritional and health-related compounds in sprouts and seeds of soybean (Glycine max), wheat (Triticum aestivum.L) and alfalfa (Medicago sativa) treated by a new drying method," *European Food Research and Technology*, vol. 216, no. 2, pp. 138–144, 2003.
18. Bahar A, Tawfeq A, Abu B Siddiqui. 2003. Antihepatotoxic activity of seeds of Cichorium intybus. Journal of Ethnopharmacology, 87(2-3): 237-240.
19. Petrovic J, Stanojkovic A, Comic Lj, Curcic S. 2004. Antibacterial activity of

Cichorium intybus. Fitoterapia, 75(7-8): 737-739.

20. Marzia I, Sandra G, Catia G, Francesca L, Franco FV, Nadia M. 2005. Evaluation of the phenolic content in the aerial parts of different varieties of Cichorium intybus L. Journal of Agricultural and Food Chemistry, 53(16): 6497-6502.
21. Pushparaj PN, Low HK, Manikandan J, Tan BKH, Tan CH. 2007, Anti-diabetic effects of Cichorium intybus in Streptozotocin – induced diabetic rats. Journal of Ethnopharmacology, 111(2): 430-434.
22. Nandagopal S and Ranjitha Kumari BD. 2007. Phytochemical and antibacterial studies of Chicory (Cichorium intybus L.)- A multipurpose medicinal plant. Advances in Biological Research, 1(1-2): 17-21.
23. Vargas R, Perez RM, Perez S, Zavala MA, Perez C. 1999. Antiurolithiatic activity of Raphanus sativus aqueous extract on rats. Journal of Ethnopharmacology, 68(1-3): 335-338.
24. Jagannath N, Chikkannasetty SS, Givindadas D, Devasankaraiah G. 2012. Study of antiurolithiatic activity of Asparagus racemosus on albino rats. Indian Journal of Pharmacology, 44(5): 576-579.
25. Aman S, Gupta UK, Singh D, Khan T. 2020. In-vitro study of methanolic leaf extract of Chenopodium album for inhibition of calcium oxalate crystals. Pharmacovigilance for Healthcare Professionals: Scope and opportunities, Amity University, Madhya Pradesh, 88-91.
26. Atmani, F. and Khan, S.R. 2000. Effects of an extract from Herniaria hirsuta on calcium oxalate crystallization in vitro. *Br J Urol Int*, vol. 85, pp. 621-625.
27. Atmani, F. Slimani, Y. Mimouni, M. Hacht, B. 2003. Prophylaxis of calcium oxalate stones by Herniaria hirsuta on experimentally induced nephrolithiasis in rats. British Journal of Urology International, Vol. 92, pp. 137