INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Review Article

Overview Of Sustained Release Beads

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ARTICLE INFO

Published: 13 Oct 2025
Keywords:
Food poisoning and spoilage, Caesalpinia pulcherrima, Extracts, Antimicrobial activity
DOI:
10.5281/zenodo.17337129

ABSTRACT

With continuous increase in the human population, the cases of food poisoning and spoilage are on the rise. Such spoilage of foods to avoid the growth of unwanted microorganisms in order to protect from poisoning is generally achieved by the use of preservatives. But due to continuous exposure of the microorganism with the same preservatives have been resulted to create resistance against it. So, in order to search for the new preservatives, the petroleum ether, chloroform, acetone, methanol and aqueous extracts of Caesalpinia pulcherrima (L.) leaves have been examined against Bacillus cereus, Escherichia coli and Aspergillus niger HN-2 microorganisms for antimicrobial activity. The conducted experimental results clearly indicated about its ability to restrict the growth of tested microorganisms generally responsible for food poisoning and spoilage. Since, the previous reported toxicity studies already showed its safety profile, these plant extracts can surely be the matter of alternative choice as food preservatives.

INTRODUCTION

Food poisoning resulted due to microbial contamination presents a significant public and economic health problem for human society. Amongst many strategies for inhibiting the growth of undesirable microorganisms, in order to avoid food spoilage and ultimately to poisoning, is the use of chemical agents commonly known as 'preservatives'. [1] Various kinds of microorganisms such as gram negative bacteria like *Salmonella typhi*, *Escherichia coli*, *Pseudomonas aeruginosa* along with gram positive like *Staphylococcus aureus*, *Bacillus cereus* and fungi like *Aspergillus niger* are common food spoiler. Most outbreaks of *Escherichia coli*, rod-shaped gram-negative bacteria, had been linked with the consumption of undercooked products, pork sausages and salami. The ability of *Escherichia coli* to adapt to acidic environment in gastro intestinal tract made it as one of the most dangerous pathogens in the food

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

products. [2, 3] *Aspergillus niger* is a fungus responsible for the disease called 'black mold' to fruits and vegetables as well as a common food contaminant.[4] While, *Bacillus cereus* is estimated to be responsible for 1%–12% of all food poisoning outbreaks worldwide with diarrheal and emetic syndrome.[5-13]

Although chemical preservatives have proven its efficient role in controlling the growth of such undesired microorganisms, but still, newer ways are required to avoid their unpleasant side effects as well as growing microbial resistances as a serious concern. For such purposes, researchers are focusing the use of plant extracts with antimicrobial activities as preservatives due to its relative safety. [14]

Caesalpinia pulcherrima (L.) (Family- Fabaceae) commonly known as 'peacock flower' is widely known ornamental tree distributed throughout the tropical and sub-tropical region including India, China, Africa and native to West Indies. [15, 16]

C. pulcherrima reported to have various pharmacological activities like anthelmintic, antimalarial, antidiabetic and antimicrobial attributed to richness of phytoconstituents like saponins, terpenoids, tannins, alkaloids and many more. [17-20] Various scientific studies have concluded the relative safety of *C. pulcherrima* leaf extracts with LD_{50} value of more than 2,000 – 4,000 mg/kg in experimental Wistar albino rats and mice respectively. [21, 22] Due to all such findings, our main objective of the study was to evaluate the antimicrobial activity of *C. pulcherrima* leaf extracts against food borne pathogenic and spoilage bacteria and fungi namely *Bacillus cereus*, *Escherichia coli* and *Aspergillus niger* HN-2 respectively.

Review Of Literature

SUMMARY AND DISCUSSIONS

Conflict Of Interest

The authors declare that there is no conflict of interest.

ACKNOWLEDGEMENT

The authors would like to acknowledge the library facility of the college for this work.

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HOW TO CITE: Bhumika Kolse*, Disha Ramdham, Ayushi Sabane, Bhumika Gandhre, Koshish Gabhane, Vikrant Salode, Nilesh Banarase, Overview of Sustained Release Beads, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 10, 1102-1107 https://doi.org/10.5281/zenodo.17337129

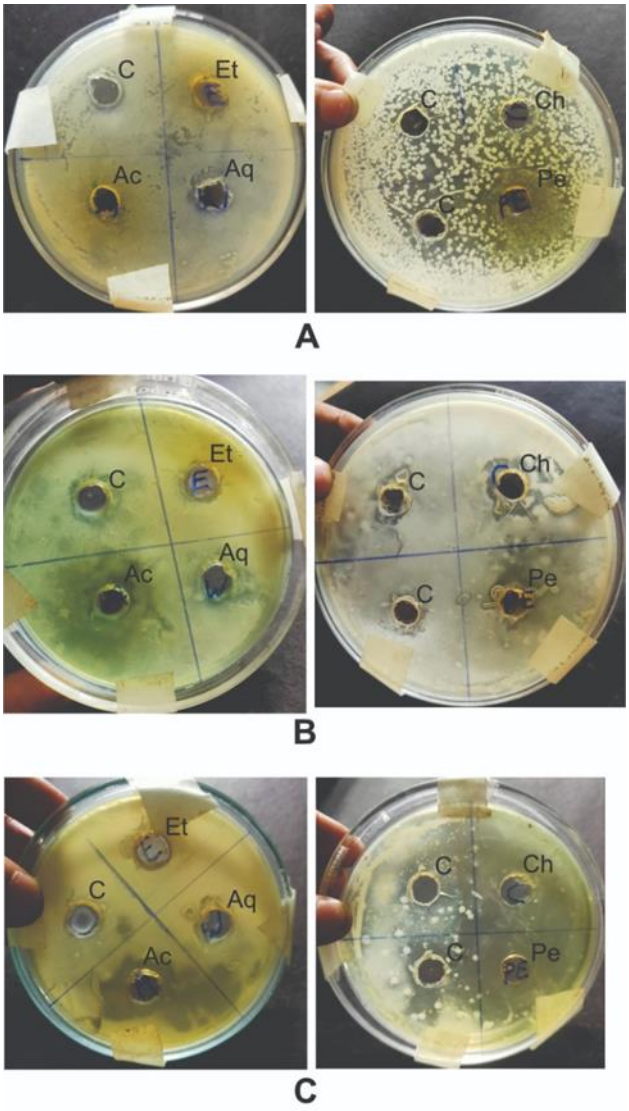

Fig. 1: Antimicrobial assay against (A)- *Bacillus cereus*, (B)- *Escherichia coli* and (C)- *Aspergillus niger* HN-2; Et- Ethanolic extract, Aq- Aqueous extract, Ac- Acetone extract, Ch- Chloroform extract, Pe- Petroleum ether extract and C- Control

Table 1: *Phytochemical screening*

Phytoconstituents	Tests	Petroleum ether extract	Chloroform extract	Acetone extract	Ethanol extract	Aqueous extract
Carbohydrates	Molisch's	-	-	-	+	+
	Fehling's	-	-	-	+	+
	Barfoed's	-	-	-	+	+
	Bial's Orcinol	-	-	-	+	+
	Selwinoff's	-	-	-	+	+
	Tollen's phloroglucinol	-	-	-	+	+
Proteins	Biuret	-	-	-	-	+
	Million's	-	-	-	-	+
	Sulphur containing	-	-	-	-	+
Alkaloids	Mayer's	+	-	+	-	-
	Wagner's	+	-	+	-	-

	Hager's	+	-	+	-	-
	Dragendroff's	+	-	+	-	-
Saponin glycosides	Foam	-	+	-	+	+
	Haemolysis	-	+	-	+	+
Anthraquinone glycosides	Borntrager's	-	-	-	-	_
Steroids	Salkowski's	+	+	-	-	-
	Legal's	+	+	-	-	-
Flavonoids	Shinoda	+	+	+	+	+
Terpenoids	Salkowaski's	+	+	+	+	-
	Liebermann-Burchard's	+	+	+	+	-
Tannins	Ferric chloride	+	+	+	+	+
	Lead acetate	+	+	+	+	+
	Potassium dichromate	+	+	+	+	+
	Gelatin	+	+	+	+	+
Amino acids	Ninhydrin	-	-	-	-	+

+ represents"present"and–represents"absent"

Table 2: ***Antimicrobial assay and MIC***

Extracts	**Minimum Inhibitory Concentration (MIC)**		
	Bacillus cereus	***Escherichia coli***	***Aspergillus niger HN-2***
Petroleum ether	50 mg/ml	80 mg/ml	> 100 mg/ml
Chloroform	> 100 mg/ml	> 100 mg/ml	> 100 mg/ml
Acetone	> 100 mg/ml	40 mg/ml	40 mg/ml
Ethanol	> 100 mg/ml	> 100 mg/ml	> 100 mg/ml
Aqueous	> 100 mg/ml	> 100 mg/ml	> 100 mg/ml