

# Formulation and Evaluation of Suppositories of Ethanolic Extract of *Cassia fistula* Flower

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**ABSTRACT:** The present study focused on the formulation and evaluation of herbal suppositories containing ethanolic extract of *Cassia fistula* flower for antibacterial activity. The flowers were collected, authenticated, shade-dried, and extracted using Soxhlet apparatus using ethanol as solvent. The prepared suppositories were evaluated for melting point, hardness, softness, disintegration, and in-vitro dissolution studies. The results suggest that the formulated herbal suppositories possess acceptable physicochemical properties and can be considered as a potential alternative for local antibacterial therapy.

**KEY WORDS:** *Cassia fistula*, Herbal Suppository, Hardness, Disintegration, Dissolution, Softening, Breaking.

## I. INTRODUCTION

### Semisolid Dosage Forms and Suppositories

Semisolids are a significant category of pharmaceutical dosage forms used as carriers for drugs delivered topically via various routes, including the skin, mucosa, and vagina. These forms are advantageous due to their easy application and ability to deliver a wide variety of drug molecules.

A suppository is a specific semisolid dosage form designed for rectal or vaginal administration. While the term suppositorium means "substitute"—as they evolved as a more convenient alternative to liquid enemas—they have been used globally for centuries, with historical references appearing in Hebrew Scriptures and Egyptian papyri. *Cassia fistula*, commonly known as Golden Shower or Indian Laburnum is a member of the Fabaceae family. The genus *Cassia* is widely distributed

across Africa, Asia, and the Americas and has been utilized as a medicinal plant since ancient times. It is recognized for its physiologically active macromolecules, and approximately 20 Indian species are specifically used to treat chronic disorders. An antibacterial is any natural or synthetic substance that inhibits or kills microorganisms such as bacteria, fungi, or protozoa. In a suppository, this antibacterial activity is harnessed locally. As the suppository base melts or dissolves at body temperature, it releases a high concentration of the active antimicrobial ingredient directly into the body cavity or blood stream.

## II. MATERIALS AND METHODS

### Collection and Authentication:

The floral specimens of *Cassia fistula* L. (Fabaceae) were collected for this study. The plant material was officially identified and authenticated by Dr. S. Soosairaj, Associate Professor in the Department of Botany at St. Joseph's College (Autonomous), Tiruchirappalli, Tamil Nadu. The authentication was conducted on August 29, 2025, following the taxonomic guidelines outlined in the Flora of Northern and Central Tamil Nadu by John Britto S. (2019). A voucher specimen has been preserved for academic reference and can be accessed under the Reference Number 8173 at the Department of Botany, St. Joseph's College. Following authentication, the fresh flowers were cleaned and prepared for the ethanolic extraction process.

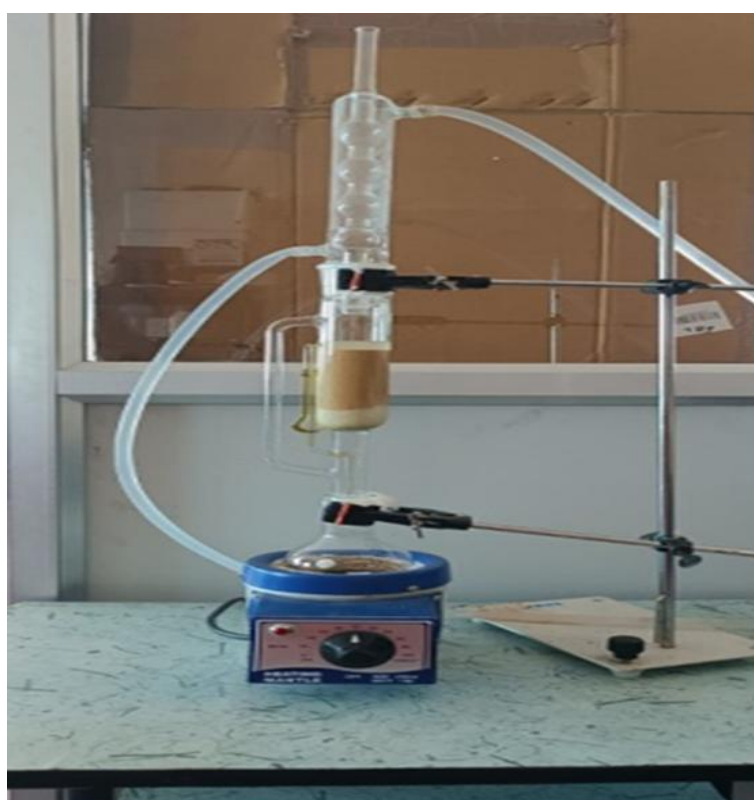
### Preparation of Floral Extract:

The collected flowers of *Cassia fistula* were thoroughly cleaned with distilled water to remove any surface impurities and subsequently

shade-dried at room temperature. The dried floral material was then ground into a coarse powder using a mechanical grinder.

For the extraction process, a Soxhlet apparatus was utilized. Approximately 40 grams of floral powder were placed in the siphon tube, and 95% ethanol was used as the menstrum. The extraction was carried out continuously for 24 hours to ensure the complete exhaustion of the bioactive constituents. Following the extraction, the resulting solution was

collected in a beaker. To obtain the concentrated crude extract, the solvent was evaporated using a controlled heating method on a hot plate at a constant temperature of 30–40°C. This low-temperature evaporation was maintained until the solvent had completely dissipated, leaving behind a thick, concentrated ethanolic extract which was then stored in an air-tight container at 4°C for further formulation.



**Figure:1 SOXHLET EXTRACTION PROCESS**

## II. METHOD OF PREPARATION

**Base Hydration :** Weigh the required amount of gelatin and allow it to swell in purified water for a specific duration to ensure proper hydration.

**Mixing the Base :** Add the specified quantity of glycerin to the hydrated gelatin mixture.

**Heating and Solubilization :** Heat the mixture gently using a water bath, stirring constantly until a clear, homogenous liquid base is formed. Cool to a semi-solid but flowable state. Incorporate 500 mg of the ethanolic *Cassia fistula* floral extract and 100 mg of Tween 80, stirring continuously to ensure uniform dispersion of the active ingredients.

**Molding :** Pour the final medicated mixture into stainless steel suppository moulds that have been pre-lubricated to prevent sticking.

**Solidification :** Allow the moulds to cool at room temperature, then transfer them to a refrigerator at 4°C for complete solidification.

**Demolding and Storage :** Carefully remove the solidified suppositories from the moulds and store them in an airtight container for subsequent evaluation.

S.NO	INGREDIENTS	FORMULATION CODE	
		F2	F3

1	Cassia fistula (mg)	500	500
2	Gelatin (g)	1.4	1.4
3	Glycerin(mg)	200	500
4	Tween 80 (mg)	100	100
5	Distilled water(ml)	q.s.	q.s.

**Table no: 1 Formulation of Suppositories**

#### IV. Evaluation of Suppositories

##### 1. Melting point:

The entire suppository was placed through a macro melting range test. Suppository from each formulation was inserted in a test tube containing phosphate buffer pH 7.2 and kept at constant temperature  $37 \pm 0.5^\circ\text{C}$ . The total time it took for the whole suppository to dissolve or disperse in the medium was measured. The melting time plays an important role in the release of active ingredients.

##### 2. Hardness test:

The tensile strength of the suppositories is determined by a hardness test. A Monsanto hardness tester was used to determine the hardness of the prepared suppositories. The potential to survive the risks of packaging and shipping is also shown by the hardness test.

##### 3. Softness Test:

Softness of a suppository is defined as the minimum weight required to break or deform the suppository at room or body temperature. This test ensures that the suppository is:

**Strong enough to withstand handling and packaging.**

**Soft enough to melt or dissolve after administration.**

Select one suppository free from visible defects. Place the suppository horizontally on the supports of the softness tester. Maintain the testing temperature at  $37 \pm 0.5^\circ\text{C}$  (to simulate body condition). Gradually apply weight on the suppository at a constant rate. Continue adding weight until the suppository breaks or shows visible deformation. Note the total weight applied at the point of breaking. Repeat the test for three suppositories. Calculate the average breaking weight.

##### 4. Disintegration test:

The disintegration test apparatus is used to calculate the time taken by the suppositories to fully disintegrate in the medium. Phosphate buffer pH 7.2

maintained at  $37 \pm 0.5^\circ\text{C}$  was used for the disintegration.

##### 5. In-vitro Dissolution study:

The USP type I rotating basket device was used for the in-vitro release test. The dissolving media was 900ml of pH 7.2 Phosphate buffer kept at  $37 \pm 0.5^\circ\text{C}$ . At 50 revolutions per minute, the suppository was inserted in the metal basket. Then, every 10 minutes, 5ml of the sample was taken, filtered, and examined using a UV spectrophotometer set to 304 nm. The experiments were extended for another 30 minutes.

#### V. Result and Discussion :

The herbal suppositories were prepared and subjected to evaluation of the various parameters.

##### MELTING POINT:

The formulated suppositories F2, F3 are evaluated for its melting range. The melting point plays an important role in the release of active ingredients.

Formulation code	Melting point time(min)
F2	09.45 $\pm$ 0.25
F3	12.48 $\pm$ 0.15

##### HARDNESS TEST:

The hardness of the suppositories was found to be 1 to 2. The potential to survive the risk of packaging and shipping is also shown by hardness test.

Formulation code	Hardness(kg/cm <sup>2</sup> )
F2	2.08 $\pm$ 0.3
F3	1.50 $\pm$ 0.15

##### SOFTNESS TEST:

Softness of suppository is defined as the minimum weight required to break or deform the suppository at room temperature the test ensures that the suppository is strong enough to withstand handling and packaging. Soft enough to melt or dissolve after administration.

Formulation code	Breaking weight(g)
F2	206 $\pm$ 3.4
F3	238 $\pm$ 1.5

##### DISINTEGRATION TEST:

The disintegration test apparatus is used to calculate the time taken by the suppositories to fully disintegrate in the medium.

Formulation code	Disintegration time
F2	06.13±0.09
F3	2.05±0.031

#### IN- VITRO DISSOLUTION STUDY:

Formulation code	Dissolution time
F2	0.436
F3	0.589

#### VI. CONCLUSION:

The study successfully formulated herbal suppositories of Cassia fistula extract using a glycerogelatin base. All the prepared formulations showed satisfactory physical appearance and stability. The evaluation parameters such as melting point, hardness, softness, and disintegration time were within acceptable limits. Among the formulations, F3 formulation exhibited better disintegration time and drug release profile compared to F2 formulation.

The optimized formulation demonstrated hardness and effective in-vitro dissolution characteristics. The use of herbal extract provides a natural and potentially safer alternative to synthetic antimicrobial agents. The suppository dosage form ensures the localized drug delivery and improved therapeutic effect. Overall, the study confirms the feasibility of developing effective herbal suppositories of Cassia fistula for antibacterial applications.

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