



Formulation And Evaluation Of An Anti-Inflammatory Gel From Cassia Auriculata

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ABSTRACT:

Herbal formulations have emerged as effective alternatives to synthetic drugs due to their natural origin, reduced side effects, and long-standing use in traditional medicine. Among these, topical herbal gels offer localized action, better patient compliance, and minimal systemic absorption. Cassia auriculata, a medicinal plant widely used in Ayurveda, possesses notable anti-inflammatory, antioxidant, and antimicrobial properties owing to its rich content of flavonoids and phenolic compounds. The present study focuses on the formulation and evaluation of a herbal anti-inflammatory gel using the methanolic extract of Cassia auriculata.

Keywords: Anti-Inflammatory, Cassia Auriculata,

Introduction:

Cassia Auriculata is a flowering shrub belonging to the family Fabaceae. It is also known as Tanner's Cassia or Avaram Senna. It is a drought resistant evergreen shrub grows abundantly in dry regions, especially in scrub forests and roadsides. Typically it grows to a height of 1-2.5 meters. It consist of various bioactive compounds such as Flavonoids, Tannins, Saponins, Alkaloids, Glycosides and Phenolic compounds. Among these, Flavonoids and Phenolic compounds are most and abundant in Cassia Auriculata for both anti-inflammatory and anti-oxidant effects. It also helps in soil enrichment. Being a member of Fabaceae (Leguminosae) family, it helps in nitrogen fixation through symbiotic bacteria- Rhizobium in its root nodules which improves fertility and enhances the availability of nitrogen for nearby plants. As it is also a Drought-resistance plant, its growth in dry, nutrient-poor makes it ideal for wasteland vegetation, helping in ecosystem restoration. [1, 2]



fig no. 1 plant

Physiology of skin:

■ Skin –

The skin is the largest organ of the human body and makes of 16% of body weight. It is about 1.5 to 2 square meters in average adult. Skin plays as a protective barrier role between the internal organs and the external environment.

■ Main functions –

1. Protection: Shields body from bacteria, chemicals, and physical impacts.
2. Sensation: Contains nerve endings that detect touch, pressure, pain, and temperature.
3. Excretion: Sweat glands help remove waste products like urea and salts.
4. Temperature regulation: Through sweat glands and blood vessels, skin helps maintain body temperature.

■ Anatomy-

The skin is made up of three main layers:

1. Epidermis
2. Dermis
3. Hypodermis

1. Epidermis

It is made up of Stratified epithelium and has no blood vessels in its structure. It has sub-layers as stratum basale, stratum spinosum, stratum granulosum, stratum lucidum, stratum corneum.

2. Dermis

It is made up of connective tissue, blood vessels, nerves. It has two layers Papillary layer and Reticular layer. Dermis mainly consists of hair follicles, sebaceous glands, sweat glands, blood & lymph vessels and nerve endings

3. Hypodermis (Subcutaneous layer)

It is made up of loose connective tissue and fat. It anchors skin to muscles and bones below. Stores energy and provides insulation and cushioning.

INFLAMMATION

Inflammation is the body's natural response to injury, infection or harmful stimuli. It is caused by various chemical mediators such as Histamine, Prostaglandins, Cytokines and Bradykinin. The purpose of inflammation is to remove harmful agents like bacteria, viruses, toxins, repair damaged tissues and alert the immune system to the problem area.

Mechanism of action –

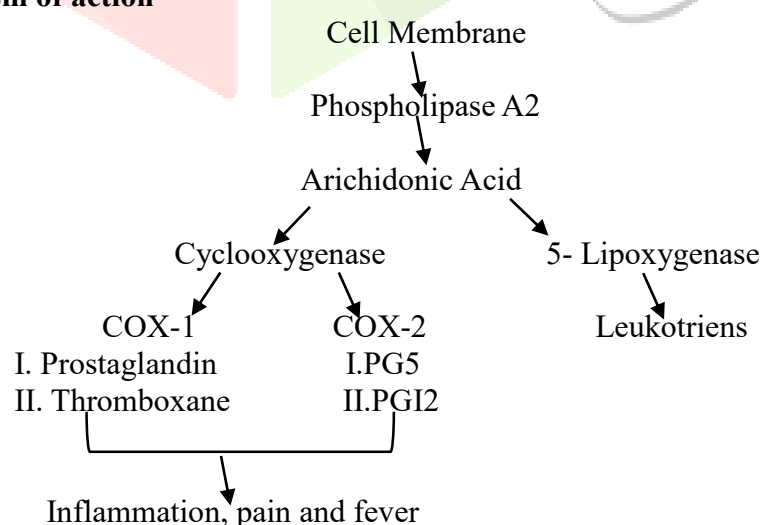




fig no.2 inflammation

ANTI-INFLAMMATORY GEL

An Anti-inflammatory gel is a topical medication applied directly to the skin to reduce inflammation, pain and swelling. They work same as NSAID'S. Gels have a semi-solid, water-based structure that promotes quick drug penetration through the skin, providing faster relief. Unlike ointments or creams, gels are non-greasy, cooling and easy to spread which enhances patient compliance.

As gels are applied topically, they bypass liver metabolism, improving the bioavailability of the active compound.

In the most of the formulation extract of plant material is taken, so gel formulations can help stabilize plant extracts and phytochemicals that may degrade in other dosage forms. They can incorporate multiple herbs or drugs synergistically, enhancing anti-inflammatory action.

Aim: To formulate and evaluate anti-inflammatory gel from *Cassia Auriculata* L.

Objective:

- 1.To formulate a safe and effective topical gel from herbal extract.
- 2.To assess the anti-inflammatory activity of gel
- 3.To study efficacy and safety of prepared anti-inflammatory gel.

PHARMACOGNOSTICAL PROFILE OF HERBAL DRUG:

Name of herbal drug used: *Cassia auriculata* L.

Family: Fabaceae

Synonyms: Tanner's Cassia, Avaram Senna, Tarwar

Biological source: It is obtained from Dried flowers and leaves of *Cassia auriculata* belonging to family Fabaceae

Macroscopical characters:

- **Leaves-** Compound, alternate, pinnate with 8-12 pairs of leaflets. Leaflets are oval, smooth and light green.
- **Flowers-** Bright yellow, attractive, with five petals, blooming in clusters.
- **Stem-** Erect, woody, and cylindrical.
- **Pods-** Flat, oblong, and brownish containing several seeds [3,4]

Chemical constituents:

Flavonoids, Tannins, Glycosides, Phenolic Compounds, Saponins, Terpenoids. Main constituent in *Cassia auriculata* is Flavonoids which is responsible for Anti-inflammatory and Anti-oxidant activity of the plant. [5]

In Flavonoids – **Kaempferol & Quercetin** are main structures for the activity.

USES:

1. It is used as a traditional medicine for inflammation.
2. It is applied in skin disorders, eye infection, and as a blood purifier
3. Decoction of flowers and leaves is used in treating Diabetes.
4. Cassia flower tea is consumed as a herbal health drink in southern India
5. It is used in treating acne, rashes, and infections.

Experimental Work:**Materials and methods:**

Cassia Auriculata L. flowers were procured from the local area of Jath, Sangli, Maharashtra, India and authenticated at P.V.P Mahavidyalaya Kavathe Mahankal, Sangli.

Preparation of extract:

Extraction of Cassia Auriculata L. Leaves: The flowers of Cassia auriculata are collected, cleaned and washed under tap water to remove soil and other fungus damaged leaves. Then the flowers are shade dried for 5-7 days and ground into powder form. 6 gm of powdered flowers were subjected to successive extraction using methanol by Maceration for 72 hours. After the maceration process completed, the extract solution is filtered and collected the extract into beaker. [6,7]



fig no.1 grinding



fig no.2 maceration

Formulation Preparation: The ingredients used in preparation of formulation are listed below in the table

table no.1 composition of gel

Sr no.	Ingredient	Composition	Role
1.	Cassia auriculata L. extract	4ml	Anti-Inflammatory
1.	Carbopol 940	1gm	Gelling agent
2.	Propylene Glycol	6ml	Moisturizing agent
3.	Triethanolamine	QS	Surfactant, Emulsifier
4.	HPMC	1gm	Viscosity
5.	Methyl Paraben	0.4ml	Preservative
6.	Glycerin	1ml	Humectant
7.	Starch	1gm	Thickening agent
8.	Distilled water	QS	Vehicle
9.	Orange oil	2.2ml	QS

- 1.First water is taken into the beaker and gelling agent Carbopol 940 was added with continuous stirring.
- 2.Laboratory stirrer was used for mixing ingredients during the gel formulation.
- 3.After that Glycerin, Methyl Paraben, HPMC, Propylene Glycol and Triethanolamine were added one by one in the formulation with continuous stirring.
- 4.Then the drug extract is added in it.
- 5.Starch was added act as a thickening agent
- 6.All the ingredients are continuously mixed with laboratory stirrer until the gel was transparent and jelly-like in appearance.
- 7.Lastly some drop of orange oil was added to mask the odor of extract.

Evaluation parameters of gel formulation:

A. Physical properties: In physical properties the color, odor, appearance and consistency was observed. [8,9]

1. Color: The color of gel was observed by visual observation-
2. Odor: The odor of gel was found to be characteristic.
3. Appearance: The appearance of gel is examined by visual examination-
4. Consistency: The gel was examined by rubbing it on hand. The gel having a smooth consistency.

table no.2 physical properties

Sr no.	Properties	Observation
1.	Color	Light Brown
2.	Odor	Characteristic
3.	Appearance	Jelly
4.	Consistency	smooth

Stability study:

Stability study was taken by record the gel activity for month of time period and observe its changes.

table no.3 stability studies

Sr.No	Duration parameters	Appearance	Color	Odour
1	7 days at 25 ⁰ c	Semisolid	Light Brown	Characteristics
2	15 days at 25 ⁰ c	Semisolid	Light Brown	Characteristics
3	30 days at 25 ⁰ c	Semisolid	Light Brown	Characteristics

As per results are shown in raw 3, formulation showed no significant changes in appearance, color, and odour after 30 days.

The gel has good stability.

B. Determination of pH:

Take 2gm of gel dissolve into 10 mL of distilled water and used to check digital pH meter.
pH-6.40

C. Determination of viscosity:

Viscosity of the formulated gel was determined using viscometer . speed 60 rpm at 25⁰c and reading to be noted.

Viscosity-500p

D. Clarity checking : The prepared gel was evaluated in glass container and observed under glass.

E. Wash ability: Formulation was applied on hand and observe under running water it is easily washable.

F. Irritancy test: The prepared gel was applied on skin and observed any lesions, irritation etc. [10,11]

G. In vitro anti-inflammatory activity by Protein denaturation method:

The reaction mixture (10 mL) consisted of 0.4 mL of egg albumin (from fresh hen's egg), 5.6 mL of Phosphate buffered saline (PBS, pH 6.4) and 100 µL of different concentration sample.

Similar Volume of double-distilled water served as control. Then the mixtures were incubated at (37⁰c ±2) in a incubator for 15 min and then heated at 70⁰c for 5 min.

After cooling, their absorbance was Measured at 660 nm by using vehicle as blank. Diclofenac sodium at the concentration was used as Reference drug and treated similarly for determination of absorbance. The percentage inhibition of Protein denaturation was calculated by using the following formula, % Inhibition = $\frac{C - T}{C}$

Where, T = absorbance of test sample

C = absorbance of control

Observation table :

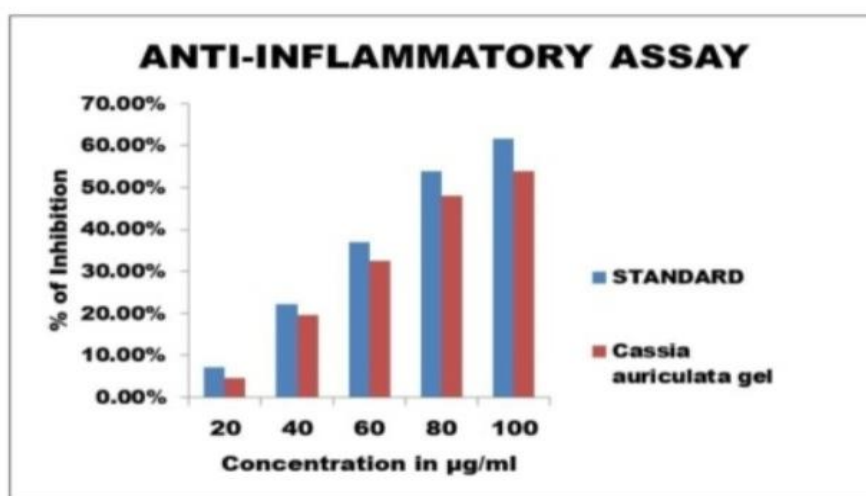
SR. NO	Sample code	Concentration (µg/ml)	Protein denaturation assay					
			Absorbance at 660nm				% Inhibition	IC50 (µg/ml)
			Test 1	Test 2	Test 3	Mean		
1	Control		1.54	1.54	1.54	1.54	-	76.11
2	Standard(Diclofenac Sodium)	20	1.30	1.32	1.30	1.30	15.58%	
		40	1.20	1.20	1.22	1.20	22.07%	
		60	0.96	0.97	0.98	0.97	37.01%	
		80	0.72	0.72	0.71	0.71	53.89%	
		100	0.41	0.38	0.43	0.40	74.02%	
3	Cassia auriculata gel	20	1.48	1.47	1.47	1.47	4.54%	96.11
		40	1.26	1.22	1.24	1.24	19.48%	
		60	1.02	1.05	1.04	1.04	32.46%	
		80	0.81	0.77	0.84	0.80	48.05%	
		100	0.72	0.72	0.71	0.71	53.89%	

Images of activity:





Graphical Data:



Conclusion of the study:

At the different concentrations the sample of herbal gel *Cassia Auriculata* shows the moderately good anti-inflammatory activity as compared to standard Diclofenac Sodium.

Conclusion:

Results of the study shows that the prepared herbal gel formulation from extract of *Cassia Auriculata* has anti-inflammatory and wound healing property and can be used to treat skin-related conditions. The efficacy and potency of the prepared gel is proved through physical analysis. Thus, this herbal formulation can serve as a natural and effective alternative to synthetic anti-inflammatory agents.

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