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FORMULATION AND EVALUATION OF ANTI-INFLAMMATORY ACTIVITY OF GUGGUL AND BOSWELLIA CREAM

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ABSTRACT

The primary goal of this study was to formulate and assess an anti-inflammatory cream containing Guggul and Boswellia gums.10 grams of guggul (*Commiphora wightii*) and Boswellia (*Boswellia serrate*) gums were separately extracted using maceration with water and two types of oil (olive oil and sesame oil). The resulting oil and water extracts were then used to prepare two anti-inflammatory creams, formula 1 and formula 2. The anti-inflammatory activity by utilizing albumin denaturation method and the physicochemical properties of the prepared creams were analysed.Various parameters were examined to study the physicochemical properties of both creams. It was found that formula-I exhibited superior physicochemical properties. The anti-inflammatory activity was evaluated using samples and a standard drug at concentrations of 100µg/ml, 200µg/ml, 300µg/ml, and 400µg/ml. Interestingly, both Guggul and Boswellia shows anti-inflammatory activity equivalent to the standard drug diclofenac sodium.The results suggest that the utilization of Guggul and Boswellia in an anti-inflammatory cream is advised for the management of different inflammatory conditions.

Keywords:*Commiphora wightii*, *Boswellia serrate*, maceration, wet gum method, anti-inflammatory, albumin denaturation

INTRODUCTION:

Inflammation is a physical reaction to injury, infection, or destruction and the inflammation signs includes heat, redness, discomfort, swelling, and disrupted physiological processes. When tissues are harmed by physical trauma, toxic chemicals, or microbial infections, inflammation serves as a protective response. These inflammatory responses are responsible for various disorders such as allergies, cardiovascular dysfunctions, metabolic syndrome, cancer, and autoimmune diseases. To control and suppress inflammatory conditions, Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) are commonly prescribed. However, these shows negative effects such as indigestion, stomach ulcers, and in some cases liver and kidney problems.To mitigate these side effects and enhance therapeutic efficacy, purified natural compounds derived from plants are utilized in the development of new medications **[1]**.

Throughout history, plants have been an excellent source of medicinal properties, with numerous records documenting the use of herbs in traditional medicine to alleviate various inflammatory ailments. In this research guggul gum and Boswellia gum are taken as main ingredients for the formulation. The major chemical constituents in Guggul and Boswellia are guggulosterones (I, II, III, IV, V) and boswellic acid respectively. These guggulosterones and boswellic acid are responsible for anti-inflammatory activity **[2, 3]**.

This current investigation is to formulate and evaluate a topical preparation in the form of emulsion type of cream using Guggul gum and Boswellia gum.

MATERIALS AND METHODS:

Collection of Materials:

The Guggul gum was obtained from Shri Shyam enterprises, Ghaziabad, Uttar Pradesh, India. whereasthe Boswellia obtained from Neeraj traders, Uttar Pradesh. After collecting, the materials were identified by colour and odour.

Extraction of Guggul and Boswellia:

Maceration

Oil extract: Fresh gums of Guggul and Boswellia were placed in a container along with equal amounts of olive oil and sesame oil and closed. The mixture was then left to macerate for a period of 3-7 days. This mixture was agitated intermittently. Once the 3-7 days had passed, the mixture was filtered using a masculine cloth to collect the filtrate. This filtrate was then utilized in the formulation process **[4]**.

Figure 1: Boswellia gum

Figure 2: Guggul gum

Water extract: This process is also identical to the oil extraction, except that water is used as the solvent instead of oil.

Table 1: Formulation Table

S. No.	Name of the ingredient	Formula-1 (10 gm)	Formula-2 (10 gm)	Role
1	Extract (Guggul & Boswellia)	Oil extract (2 ml)	Water extract (2 ml)	Anti-inflammatory agents
2	Acacia	2 gm	2 gm	Emulsifier
3	Sesame oil	3 ml	4 ml	Oil phase
4	Olive oil	3 ml	4 ml	Oil phase
5	Water	4 ml	2 ml	Aqueous phase
6	Sodium benzoate	0.1 gm	0.1 gm	Preservative

Preparation of Anti-inflammatory cream:

Wet gum method

Determine the amount of oil, water and gum needed for the formulation in the ratio of 4:2:1 respectively. Combine gum acacia with water to create mucilage. Gradually add the necessary quantity of oil in small increments while rapidly triturating until a primary emulsion is formed. After that incorporate the remaining water, oil, and preservative in small portions with consistent trituration to reach the final volume. Stir the mixture thoroughly to achieve a homogeneous emulsion **[5]**.

Physicochemical evaluation:

The formulated creams were tested using standard protocol for various physicochemical parameters **[6, 7, 8]**.

pH

By using the standard buffer solutions pH 4 and 7, the pH meter was calibrated. Then 0.5 gms of the cream was dissolved in 50 ml distilled water and the pH of the cream was measured.

Viscosity

The formulations viscosity was measured by employing Brookfield viscometer at a rotational speed of 100 RPM, utilizing spindle no 52.

Appearance

The appearance of the formulated creams was assessed by colour, roughness and pearlescence.

Homogeneity

The homogeneity of the creams was assessed by touch and visual appearance.

Ease of removal

By using tap water to wash the area where the cream was applied, the cream's ease of removal was evaluated.

Irritancy test

The specified area was applied with the cream and the time of application was recorded. Regular intervals were observed for up to 24 hours to check for any signs of irritancy, erythema and edema. which were then reported.

Accelerated stability test

The formulations were kept for stability testing at both room temperature and elevated temperature for a period of 90 days.

In-vitro anti-inflammatory activity

Methodology

The potential anti-inflammatory effects of unidentified raw extracts can be assessed through in vitro testing for their ability to inhibit the denaturation of egg albumin. A reaction mixture was prepared by combining 0.2 mL of 1-2% egg albumin solution, 2 mL of the sample extract or standard (Diclofenac sodium) at different concentrations (0.01mg/mL, 0.1 mg/mL, 1mg/mL and 10mg/mL). 2.8 mL of phosphate-buffered saline (pH 7.4) to achieve a total volume of 5 mL.A control mixture was also created by mixing 2 mL of triple-distilled water, 0.2 mL of 1-2% egg albumin solution, and 2.8 mL of phosphate-buffered saline to reach a total volume of 5 mL. The reaction mixtures were then incubated at 37±2°C for 30 minutes and subsequently heated in a water bath at 70±2°C for 15 minutes. Following cooling, the absorbance was measured at 280 nm using a UV/Vis spectrophotometer with triple-distilled water as the blank. The percentage inhibition of protein denaturation was calculated using below equation **[9, 10]**.

$$\text{Percentage of inhibition} = \frac{\text{Absorbance of Control} - \text{Absorbance of sample}}{\text{Absorbance of control}} \times 100$$

Preparation of 1% egg albumin solution

Fresh eggs from hens or egg albumin powder which can be easily obtained from stores can be utilised to create a 1% egg albumin solution. To prepare the egg albumin solution using a fresh egg, it is important to crack the egg carefully and transfer 1 ml of the translucent part into 100 ml of distilled water. Thorough stirring is necessary to ensure proper mixing. The transparent part of the egg is known as albumin. It is crucial to use cold water while preparing the solution, because hot water will cause coagulation.

Preparation of phosphate buffer (pH 7.4)

Phosphate buffer solution which having pH 7.4 was prepared by using the official method mentioned in I.P ,1996. The composition of the PBS includes disodium hydrogen phosphate, potassium dihydrogen phosphate, sodium chloride and distilled water.

RESULTS:

Physicochemical parameters

Table 2: Results of physicochemical evaluation

S. No.	Parameters	Formula-1	Formula-2
1	pH	5.28	4.74
2	Viscosity	24.06 cP	16.12 cP
3	Appearance	Brown	Light brown
4	Homogeneity	Uniform	Uniform
5	Ease of removal	Easy	Easy
6	Irritancy	No irritancy	No irritancy
7	Accelerated stability test	Stable	Stable

In-vitro Anti-inflammatory activity

Table 3: Results of invitro anti-inflammatory activity

S. No.	Concentration (µg/ml)	Absorbance	% of Inhibition (%)
Diclofenac			
1	100	1.175	40.83
2	200	0.637	67.92
3	300	0.576	70.99
4	400	0.401	79.80
Guggul			
1	100	1.202	39.47
2	200	0.645	67.52
3	300	0.608	69.38
4	400	0.457	76.98
Boswellia			
1	100	1.195	39.82
2	200	0.654	67.06
3	300	0.623	68.63
4	400	0.509	74.37

Control absorbance value – 1. 986

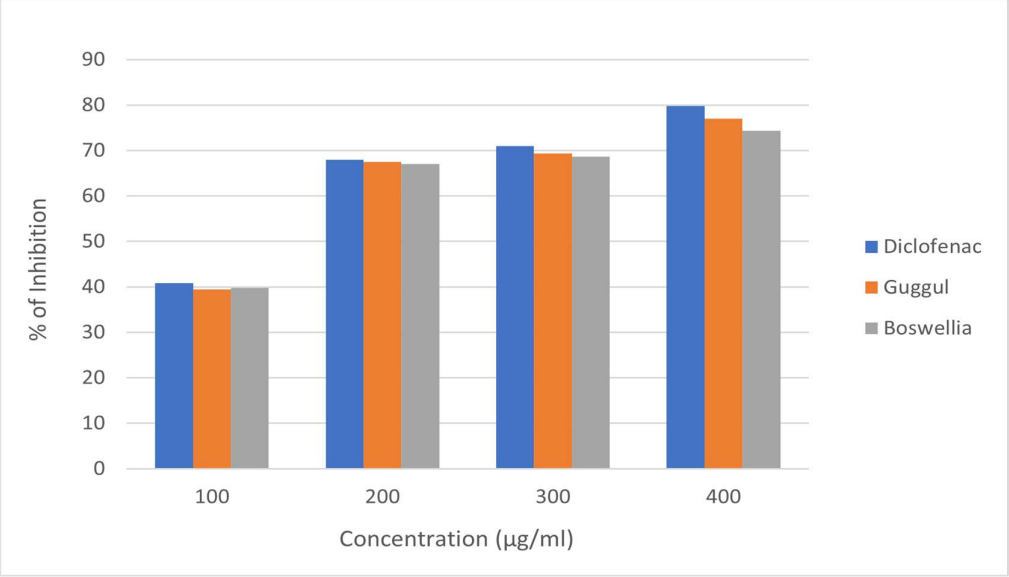

Figure 3: Graph in-vitro anti-inflammatory activity determination

DISCUSSION:

Physicochemical evaluation

The various physicochemical parameters like pH, viscosity, appearance, homogeneity, ease of removal, irritancy and accelerated stability studies of the formulated creams were performed and the results are shown in the **Table 2**. The pH of the formula-2 was found to be 4.74 and formula-1 is found to be 5.28 which is nearer to skin pH and viscosity is also better for formula-1i.e 24.06 cP. So, by considering all the results of the physicochemical parameters, formula-1 was found to be good one.

***In vitro* anti-inflammatory activity determination**

The impacts of the Guggul gum and Boswellia gum anti-inflammatory activity i.e. protein denaturation in egg albumin protein showed in the **Table 3 and Figure 3**. This results reveal that Guggul and Boswellia have significant anti-inflammatory activity by inhibiting the protein denaturation. At the concentration of 400 µg/ml the Guggul and Boswellia shows 76% and 74% of inhibition respectively, while the standard drug diclofenac sodium shows 79% of inhibition.

CONCLUSION:

The results of this investigation concludes that anti-inflammatory cream by using Guggul and Boswellia is an excellent dosage form to treat various inflammatory conditions because it is having less side effects. This research is prolongated to *in vivo* anti-inflammatory activity determination studies in future.

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