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FORMULATION AND EVALUATION OF POLYHERBAL GEL FOR ANTI-INFLAMATORY ACTIVITY

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Abstract: Three medicinal plants with strong anti-inflammatory potential—Cynodon dactylon (L.) Pers., Cassia tora Linn., and Cassia alata Linn.—were chosen for this study and will be combined into polyherbal gel.The dried methanolic extracts of Cynodon dactylon (L.) Pers., Cassia tora Linn, and Cassia alata Linn were used to create the gels. Studies on skin irritation, viscosity, spreadability, pH, and homogeneity of polyherbal gel formulations were assessed. Rat paw edema produced by formalin and carrageenan were used to measure the anti-inflammatory effects. In both acute and chronic settings, it was discovered that the individual and polyherbal gel of Cassia alata Linn, Cassia tora Linn, and Cynodon dactylon (L.) Pers had an anti-inflammatory effect. Comparing polyherbal gel to separate gels, which likewise demonstrated a synergistic effect

I. INTRODUCTION

All around the world, traditional medicines are an integral part of health care systems. Roughly 75% of people on Earth are dependent on using plants and plant extracts in medicine. Several Indian medicinal plants are associated with a range of pharmacological properties due to the presence of diverse photochemical classes in them. Non-steroidal anti-inflammatory medicines, or opoids, are commonly used to treat a variety of inflammations, but they have serious adverse effects, including itching and redness. Therefore, it appears that a more advantageous search for additional options is required. The review of the literature showed that there are a wide range of plants in the plant world that have anti-inflammatory properties. Flavonoids are found in a number of well-known plants, including Acacia nilotica, Withania somnifera, Glycyrrhiza glabra, Boswelia serrata, Phyllanthus amarus, and Eclipta alba.
Consequently, an effort was undertaken to investigate the potential synergistic anti-inflammatory efficacy of individual extracts as well as extract combinations in a single dosage form 1.

Gel formulations are utilized for topical medication delivery due to their simplicity of application, extended contact time, and reduced adverse effects to alternative oral delivery and topical preparation.

It has been discovered that the plants Cassia tora and Cassia alata Linn have been utilized traditionally for their numerous medicinal qualities, including their anticancer activity. 2.
, antibacterial activity 5, antioxidant activity 6, skin condition and wound-healing activity 3, 4, and oral anti-inflammatory activity 7. Antiviral activity 8, antidiabetic activity 9, antifungal activity 10, antibacterial activity 11, antioxidant activity 12, antiulcer activity 13, skin disorder and wound-healing activity 14, and 15 are just a few of the therapeutic qualities for which the plant Cynodon dactylon has been traditionally used.

The rising acceptance of natural and herbal remedies, the simplicity of obtaining raw materials, their affordability, and the scarcity of side reactions led us to examine and assess Cynodon dactylon's anti-inflammatory potential in conjunction with by mixing into a topical polyherbal gel containing Cassia tora and Cassia alata and evaluating its anti-inflammatory properties. We shall try to determine any synergistic activity through the combination of the 16 extracts.

Extract preparation involved drying the fresh leaves of Cassia alata, Cassia tora, and the aerial portion of Cynodon daphnion at 400 degrees in a hot air oven. C to prevent phytoconstituent breakdown. Following drying, the plant components were placed in a tightly sealed container and roughly ground using a Willy mill. Using pet ether (60–800), roughly 185 g, 100 g, and 125 g of powdered Cassia alata, Cassia tora, and Cynodon dactylon, respectively, were defatted in a soxhlet apparatus. Methanol was used to extract it further after defatting. To recover the solvent, the collected extracts underwent distillation to concentrate them. Desiccators were used to store concentrated extracts until they were needed.

The dried methanolic extracts of Cassia tora Linn., Cassia alata Linn., and Cynodon dactylon (L.) Pers were used to make the gel, along with 1% carbopol-940 as a gelling agent. Both polyherbal gels and gels made of specific plant extracts were made. Diclofenac sodium gel was prepared using the same process as a standard.

Materials and Methods:

Collection of Plants Materials: The leaves of cassia tora and Cassia alata were collected from Hingna, MIDC area, of Chail-chowk. The aerial part of Cynodon dactylon was collected from medicinal plant garden of Abhilashi University school of pharmacy, chailchowk and identified by Department of Botany, Sardar Patel University, Mandi.

Preparation of Extract:
Extract preparation involved drying the fresh leaves of Cassia alata, Cassia tora, and the aerial portion of Cynodon dactylon in a hot air oven at 400 degrees Celsius to prevent phytoconstituent degradation. Following drying, the plant components were placed in a tightly sealed container and roughly ground using a Willy mill. Using Pet. Ether (60-800), roughly 185 gm, 100 gm, and 125 gm of powder each of Cassia alata, Cassia tora, and Cynodon dactylon were defatted in a Soxhlet apparatus. Methanol was used to extract it further after defatting. To recover the solvent, the collected extracts underwent distillation to concentrate them. Desiccators were used to store concentrated extracts until they were needed again.

Preparation of polyherbal gel:
Carbopol-940 (1%) was used as a gelling agent while the dried methanolic extracts of Cassia tora Linn., Cassia alata Linn., and Cynodon dactylon (L.) Pers were used to make the gel. Both polyherbal gels and gels made from specific plant extracts were made.

Evaluation of polyherbal gel:

1. **pH:** Using a pH meter, the pH of each individual and polyherbal gel composition was found.

2. **Appearance and homogeneity:** Visual observation was utilized to assess the physical appearance and homogeneity of the generated individual and polyherbal gels.

3. **Viscosity:** A Brookfield viscometer (Model RVTDV II) was used to measure the viscosity of both individual and polyherbal gels at 100 rpm. spindle number six

4. **Spreadability:** After one minute, the spreading diameter of one gram of gel between two horizontal plates (20 cm x 20 cm) was measured to assess the gel formulations' spreadability.

5. **Studies on skin irritation:** 150–200 gm wistar rats of both sexes were employed in these investigations. The skin that was still whole was used. Three days before to the trial, the rat had its hair plucked. The test animals were given the gel containing the extracts. On the back of the animal

used as a control, gel base was applied. The animals received daily treatments for up to seven days, after which the treated skin was visually inspected for erythema and edema.

6. **Extrudability:** Standard capped collapsible aluminum tubes were filled with gel compositions, which were then sealed by crimping the end. Records were kept on the tube weights. The tubes were clamped after being positioned between two glass slides. After covering the slides with 0.5 gm, the cap was taken off. Weighing and collecting the extruded gel's quantity was done. It was determined what percentage of the gel had been extruded (>90% extrudability = excellent, >80% extrudability = good, >70% extrudability = fair).

7. **Stability study:** The ICH criteria were used to evaluate the gels' stability.

8. **Primary Dermal Irritation Index (PDII):** Dermal irritation is the development of skin damage that can be reversed by applying a test chemical for four hours at most. The Primary Dermal Irritation Index (PDII) is a technique used to group topical formulations into different groups according to the acute toxic effects that are shown after just one application of the formulation to the skin. The formulation can be rated as irritating or non-irritating based on the PDII score. Primary Dermal Irritation Index (PDII): 12 + 24 + 48 + 72 hours of PDII observations.

Pharmacological studies:

Studies on chronic toxicity: A half-gram of the herbal gel was used as the test substance, and it was applied to a skin area measuring about 6 cm2 and covered with a gauze patch. A appropriate semi-occlusive dressing was used to hold the patch loosely against the skin for four hours before it was removed. The test chemical that remained after the four-hour exposure period was eliminated without affecting the skin's integrity or the preexisting reaction.

One hour after the patch was taken off, observations were made. Rats served as the control group. They were prepped similarly, and 0.5 gm of the gel base—a gel made with all the materials omitting the herbal mixture—was applied comparable to the test animals (rats) and observations were made regarding the control animals.

Every day, the test animals and the control animals were observed. day for any signs of hazardous responses, such as erythema or edema, or skin irritation. The skin irritation was graded on a scale of 0 to 4, with 4 denoting severe, moderate, well-defined, and very little erythema to eschar formation, respectively, and 0 representing no skin erythema and eschar formation. Additionally, it had a score range of 0–4, with 4 denoting severe edema and 0 denoting no edema. Measured on 12+24+48+72 hours, the Primary Dermal Irritation Index (PDII) is equal to PDII.

Rat paw edema caused by carrageenan: According to Winter et al.'s 1962 approach, the animal experienced pedal inflammation. Rats were split up into eleven groups, each containing six rats. Group I- acted as the control and was administered with a gel basis. Group II was the reference group and used the usual (0.5%) Diclofenac sodium Gel. Group X - XI applied 1.0 gm and 0.5 gm of polyherbal gel, whereas Group III - IX applied 1 gm of 1%, 2%, and 4% gel of Cassia alata, Cassia tora, and Cynodon dactylon,respectively.
After administering the medication for an hour, 0.1 ml of carrageenan (1% w/v) in normal saline was injected into the left hind paw's subplanter region to cause edema. Paw thickness was calculated using

Rat paw edema generated by formalin: Depending on the formalin content, this model was utilized to study both acute and chronic inflammation. Two percent formalin in saline was employed for the chronic model. Formalin-induced edema is biphasic; substance P and bradykinin mediate an early neurogenic component, which is followed by a recognized involvement of histamine, 5-HT, and prostaglandin in a tissue-mediated response.

The formula used to compute the percentage inhibition of edema was % Inhibition = 1- {a-x/b-y} x 100, where,
a= paw thickness of test animal after treatment
x= initial paw thickness of test animal
b= paw thickness of control animal after treatment
y= initial paw thickness of control animal.

Conclusion: Based on the investigation, the information demonstrated that the polyherbal gels made from the dried methanolic extracts Tora Cassia Linn., Tora Cassia When compared to regular Diclofenac gel, alata Linn. and Cynodon dactylon (L.) Pers.f showed the strongest anti-inflammatory activity. According to phytochemical testing, the methanolic extracts contained glycosides, carbohydrates, flavonoids, steroids, and resin. These substances may inhibit or counteract the production of prostaglandins and bradykinins. When compared to individual gels, the polyherbal gels demonstrated a synergistic effect that may be helpful in the management of localized inflammation.

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