FORMULATION AND EVALUATION OF POLY HERBAL ANTI-INFLAMMATORY CREAM

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Abstract

The goal of this study was to create and assess a polyherbal anti-inflammatory cream that contained C. alata, C. tora, and C. dactylon extracts. Using carrageenan- and formalin-induced rat paw edoema models, the cream formulations were made using varied extract concentrations and tested for their anti-inflammatory efficacy. The outcomes demonstrated that the polyherbal cream had more anti-inflammatory action and a synergistic impact than individual formulations of the plant extracts. The combination formulation shown action comparable to that of the common medication diclofenac gel in the formalin-induced rat paw edoema model, whereas the 4% C. alata gel formulation demonstrated the best suppression of paw edoema in the carrageenan-induced rat paw edoema model. According to the study's findings, a cream made of multiple herbal anti-inflammatory ingredients might be a good option for the treatment of local inflammation.

Keywords: Polyherbal, anti-inflammatory, cream, formulation, evaluation.

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1. INTRODUCTION

A topical preparation known as polyherbal anti-inflammatory cream combines a variety of plant extracts with anti-inflammatory effects. In order to create a polyherbal cream, the right plant extracts must be chosen, their active compounds must be standardised, and the ideal proportions of the ingredients must be determined [1]. Various physical, chemical, and biological tests are used to assess the cream's quality, safety, and effectiveness . Plant extracts were chosen for the polyherbal cream's formulation based on their historical anti-inflammatory uses as well as scientific research [2]. Turmeric, ginger, neem, aloe vera, chamomile, and licorice are a few of the plant extracts that are frequently utilised in polyherbal anti-inflammatory lotions. Curcumin, gingerols, and other bioactive substances are included in these plant extracts [3].

These plant extracts contain bioactive substances that have been shown to have anti-inflammatory properties, including curcumin, gingerols, azadirachtin, aloin, chamazulene, and glycyrrhizin [4]. To guarantee consistent potency and efficacy of the finished product, it is crucial to standardise the active components in plant extracts. To achieve the best anti-inflammatory efficacy and reduce any potential negative effects, the ratios of the plant extracts in the formulation are also essential. As a result of the end product's characteristic cream formulation, it is simple to apply to the affected area and has improved penetration into the skin [5].

A variety of physical, chemical, and biological tests are used to evaluate the polyherbal anti-inflammatory cream. Chemical tests involve analysing the active components and contaminants in the cream, while physical tests evaluate the cream's stability, look, and texture. In vitro and in vivo models are used in biological testing to ascertain the cream's anti-inflammatory efficacy. Additionally, safety assessments are carried out to make sure the cream won't have any unfavourable effects when applied to the skin.

At last, choosing relevant plant extracts, standardising the active ingredients, figuring out the best ratios, and assessing the cream's physical, chemical, and biological qualities are all steps in the formulation and assessment of a polyherbal anti-inflammatory cream. For the treatment of inflammatory disorders, a carefully created and tested polyherbal anti-inflammatory cream can be a secure and efficient substitute for traditional anti-inflammatory drugs.

1.1. Objective of the Study

Using carrageenan- and formalin-induced rat paw edoema models, this study sought to assess the anti-inflammatory potential of individual and polyherbal gels containing extracts of Curculigo alata, Cassia tora, and Cynodon dactylon, as well as to contrast their effectiveness with that of the widely used drug diclofenac gel. The purpose of the study was to determine whether these herbal preparations had any potential for treating both localised acute and chronic inflammation.

1.2. Need of the study

The requirement for this study is to create a polyherbal gel formulation utilizing removes from *Cassia tora, Cassia alata, and Cynodon dactylon* plants for effective application. The gel is expected to have mitigating and pain-relieving properties for the treatment of agony and inflammation. The review plans to assess the physicochemical properties, skin disturbance potential, extrudability, and security of the created gel definitions. The consequences of this study can add to the advancement of a successful and safe skin gel definition for the treatment of agony and inflammation.

1.3. Plan of Work

- Literature review: Conduct a comprehensive review of existing research on herbal extracts with anti-inflammatory properties and their applications in topical creams. Identify the most effective extracts and combinations for reducing inflammation.
- Formulation development: Select appropriate herbal extracts based on their anti-inflammatory activity and compatibility with topical formulations. Develop different formulations with varying concentrations of the selected extracts, excipients, and preservatives.
- Optimization of formulation: Evaluate the different formulations for physical appearance, stability, and efficacy using various techniques such as viscosity measurement, pH determination, and in vitro release studies. Select the optimal formulation based on the results.
- Safety evaluation: Perform skin irritation and sensitization tests on the optimal formulation to ensure its safety for use on humans.
- In vivo evaluation: Conduct animal studies to evaluate the anti-inflammatory efficacy of the cream on animal models of inflammation, such as carrageenan-induced paw edema and croton oil-induced ear edema.

- Statistical analysis: Analyze the data obtained from the in vivo studies using statistical techniques to determine the level of significance and the effectiveness of the formulation.
- Final formulation: Prepare the final formulation based on the optimized formulation and safety and efficacy evaluations.
- Stability studies: Conduct stability studies on the final formulation to evaluate its shelf-life and storage conditions.
- Quality control: Develop a quality control protocol to ensure the consistency and quality of the final product.
- Conclusion: Summarize the findings of the study and evaluate the potential of the developed cream for treating inflammation. Identify any limitations of the study and suggest future research directions.

2. REVIEW OF LITERATURE

1. Dubey, S., and Dixit, A. K. (2023) [8] checked on, the therapeutic potency of a few polyherbal formulations from various medicinal vegetations is added together because of their impact on injury healing. The writing search was performed on Pubmed, Scopus, and ScienceDirect information bases between 2010-2020. PRISMA strategy was applied to extract important information about polyherbal formulations. A sum of 54 articles were selected under all subjects for the information extraction according to the PRISMA guidelines. These 54 articles have top notch scores ≥3. 43 records were utilized for the story examination, while nine records were utilized for the critical investigation in the account audit. Further, subject wise key informational indexes were screened from the selected writing and summed up in an even structure. Bibliometric examination of the Scopus data set has likewise caused to notice restricted academic writing showcasing randomized clinical preliminaries in the current subject. The vast majority of these polyherbal formulations are tried in lab scale studies, in this manner portraying further research choices. Polyherbal formulations are effective in promoting the injury healing process. They can invigorate different physiological functions that accelerates the process of healing. These formulations merit further investigation in clinical preliminaries, and production up scaling will support the creation of another skyline of polyherbal wound healing products.
2. Babu, R., Semwal, A., Sharma, S., Kumar, S., and Khan, A. (2022) [9] focused on the formulation of polyherbal cream and their evaluation by using different evaluation boundaries of the current research are to form polyherbal cream and to assess the polyherbal cream. The piece technique was utilized for the planning of cream. The evaluation boundaries are coming under this heading physical boundary like color was somewhat white green, the scent was characteristics, consistency was smooth and the state was semisolid. PH of the cream was 6.5; Spread ability was 7.4g. cm/sec time expected for this test was 15 sec, Launderability was effectively launderable, the cream was nonirritant, viscosity of the planned cream was 39010 cps and no stage detachment was seen during storage of polyherbal cream. This cream formulation was utilized in acne for antibacterial property. This cream formulation was o/w sort of emulsion; hence this formulation was effortlessly washed with plane water after application.
3. Mate, A., Ade, P., Pise, A., More, S., Pise, S., and Kharwade, R. (2021) [10] concentrated on three medicinal plants Citrus sinensis, Curcuma longa and Aloe barbadensis having significant antibacterial potential were selected to form a polyherbal gel for the administration of acne vulgaris issue. Extraction of Citrus sinensis, Curcuma longa and Aloe barbadensis was finished and characterized. The topical gels were arranged which comprised extract of orange strip, aloevera, and turmeric with an alternate concentration. The pre-arranged gel was kept at room temperature for 24 hours and assessed. In light of the review, polyherbal anti-acne gel showed significant antibacterial activity on Staphylococcus aureus and Staphylococcus epidermis with no aggravation. The physicochemical evaluation of created formulation showed clear, uniform and liberated from fiber and particle. It was likewise noticed great spread ability and consistency with pH closer to skin. Subsequently, the review result concluded that the polyherbal gel with extract of Citrus sinensis, Aloe barbadensis and Curcuma longa with concentration 0.2%, 1% and 0.8% respectively was a fitting formulation for the first-line topical treatment of acne vulgaris.
4. Kola-Mustapha, et. al. (2020) [11] conducted to investigate the analgesic and anti-inflammatory activities of leaf extracts of *Chasmanthera dependens* and Chenopodium ambrosioides; figure out and assess polyherbal

gels from their combination in a bid to providing topical therapeutic answers for pain and inflammation. Pre-formulation studies (phytochemical examination, in vitro analgesic and anti-inflammatory activities) were conducted on the methanol leaf extracts of *Chasmanthera dependens* and *Chenopodium ambrosioides*. Individual and polyherbal gels were arranged using polymer *carbopol* 940 (1%) at combination proportions of 0:100, 25:75, 50:50, 75:25 and 100:0 *Chasmanthera: Chenopodium*. These home-grown gels were assessed for physical boundaries, pH, viscosity, extrudability and spread ability. Analgesic and anti-inflammatory activities of home-grown gels were assessed by their inhibitory activities (percentage inhibition) against COX-2, TNF-α, IL-10, PGE-2 and compared with commercial diclofenac gel. The phytochemicals of the two extracts detected gave changed contents of significant classes of secondary metabolites. The pre formulation inhibitory investigations of the two extracts showed portion subordinate inhibitory activities against COX-2, TNF-α, IL-10, PGE-2. The physical appearance, homogeneity, and consistency of the natural formulations were great.

5. Kavitha, A. N., Deepthi, V., and Nayeem, N. (2013) [12] pointed toward designing, formulating and evaluating a polyherbal ointment comprising of methanolic extracts of the leaves of Tectona grandis, Ficus religiosa and Caesalpinia pulcherrima. The boundaries assessed for wound healing were time of contraction and rigidity using excision and incision models. The creatures were isolated into gatherings and were treated with polyherbal formulation, standard gathering and one filled in as control Group. *Nitrofurazone* (0.2% w/w) was utilized as reference standard. The time of epithelization in the excision wound mode was viewed as 13.20 days, while in case of incision wound model the elasticity was 540 when compared to the controls, the outcomes were very significant. Various boundaries like pH, viscosity, spread ability and soundness were assessed. The formulation showed great spread capacity, great consistency, homogeneity, there was no change in the appearance, pH, and no stage division noticed toward the finish of the security studies. There was no evidence of skin aggravation. This study has uncovered that the poly home grown ointment has shown the injury healing effect because of the synergistic activity of the phytoconstituents present in the extracts and might be involved a possible natural formulation for wound healing.
6. Shrikhande, P. V. (2013) [13] conducted to create an *emulgel* formulation containing potential natural anti-inflammatory specialist viz., tea tree oil, lemongrass oil, ginger oleoresin and capsaicin. Inflammation and ailment remain difficult issue in the current time. Despite the fact that there are number of allopathic formulation accessible in market for the treatment of inflammation, yet this experience the ill effects of aftereffects like acid reflux, stomach pain, sickness, vomiting, loose bowels, constipation, liver harm, liquid maintenance, *nephrotoxiciy* etc. It is considered that the natural medication as more secure as compared to that of allopathic medicine on the lookout. The home-grown components like Tea tree oil, Capsaicin, Ginger oleo-resin, Lemon grass oil has been selected for the advancement of anti-inflammatory formulation, as from writing survey it uncovered that these are effective in the treatment of inflammation. Carbopol 940 can be utilized as gelling specialist. Tea tree oil, lemongrass oil, linseed oil, and capsaicin were incorporated into the gel structure of the topical delivery frame, and cowgie was used as a satiety booster. , in vitro delivery behavior, and anti-inflammatory evaluation were evaluated. Two different formulations with and without satiety enhancers were screened at preliminary levels and compared to diclofenac sodium with accelerated preparation. Anti-inflammatory reviews recommend that Cowgie emulsifying formulations are superior to all formulations including gels advertised.
7. Yamini, K., and Onesimus, T. (2013) [14] We compiled the order of events and ratings of a homemade anti-acne gel using neem leaf hydroalcoholic extract (Azadirachta indica) and a nutmeg product (myristica scented). Excellent antibacterial, antioxidant, and anti-inflammatory activity has been attributed to botanicals in writing. Different formulation batches, i. H. F1 through F15 were completed and evaluated for various limitations including color, appearance, consistency, washability, pH, spread ability and antimicrobial activity. The improved formulation was compared with the demonstrated readiness. An ideal of each boundary was found among all formulations focused on batch F4. Applying a homemade gel containing hydroalcoholic extracts of neem leaves (Azadirachta indica) and nutmeg products (myristica scented) is a great experiment.

3. MATERIAL AND METHOD

3.1. Material Collection

The plants used in this study come from two different sources. Aerial work of Cynodon dactylon was created by J.L. While collecting cassia tiger and cassia alata leaves from the MIDC area of Hinguna, Nagpur at the Chaturvedi College of Pharmacy, Nagpur.

3.2. Plant Material Preparation

The freshly collected leaves of Cassia alata, Cassia tora, and the flying fragment of Cynodon dactylon were dried in a hot air grill at 40°C to prevent the deterioration of phytoconstituents. The dried plant components were processed via a Willy machine into a coarse powder and stored in a container that was tightly sealed. Using Pet. Ether (60-800) in a soxhlet device, about 180 gm, 90 gm, and 120 gm of the powdered Cassia alata, Cassia tora, and Cynodon dactylon, respectively, were defatted. They were additionally extracted with methanol after defatting. To recover the soluble, the resulting extracts were concentrated through refining. The concentrated extracts were stored in desiccators pending further use.

3.3. Polyherbal Gel Preparation

Gels were prepared using dried methanolic extracts of Cassia tora Linn., Cassia alata Linn. Cynodon dactylon (L.) Pers and Carbopol-940 (1%) are gelation specialists. Single plant extract gels and multi-herb gels were assembled using similar techniques. Diclofenac sodium gel was prepared as a standard (see Table 1).

Table 1: Polyherbal Gel Composition

Formulation [C.A., C.T., C.D.]	Carbapol-940 (%)	Extract (%)	Propylene glycol (%)	Ethanol (%)	Methyl Paraben (%)	Propyl paraben (%)	EDTA (%)
Gel 1%	2	2	5	3	.3	.03	.04
Gel 2%	2	3	5	3	.3	.03	.04
Gel 4%	2	4	5	3	.3	.03	.04
Mixture	2	5	5	3	.3	.03	.04

3.4. Assessment

The evaluation of the created individual and polyherbal gels involved a few boundaries. The pH of each formulation was determined using a pH meter and physical appearance and homogeneity were visually assessed. Viscosity was measured using a Brookfield viscometer (model RVTDV II) at 100 rpm with spindle #6, and the spreading capacity was measured per 1 g of gel between two plates (20 cm x 20 cm). determined by measuring extension. The standard weight applied on the upper plate was 125 gm. Results for each boundary are introduced in Table 2.

Table 2: Assessment Criteria for Prepared Polyherbal Gel Formulations

Formulation	Appearance	Homogeneity	Spreading diameter after 1 min (mm)	Viscosity (cp)
Diclofenac gel	White	Excellent	60	4450
C.A.				
1%	Light Green	Excellent	50	4620
2%	Light Green	Excellent	52	4720
4%	Light Green	Excellent	30	4810
4%	Light Green	Excellent	48	4840
4%	Light Green	Excellent	52	4750
C.T.				
1%	Light Green	Excellent	51	4650
2%	Light Green	Excellent	50	4660
C.D.				
1%	Light Green	Excellent	55	4740
2%	Light Green	Excellent	53	4770
Combination	Light Green	Excellent	49	4800

Skin aggravation studies were conducted on Wistar rodents of either sex weighing 150-200 grams. The examination used intact skin, with hair expulsion three days earlier. The guinea pig was treated with gels containing extracts, while the control Group received gel base just, both applied to the back of the creature. Treatment was administered every day for seven days, and the treated skin was examined for erythema and edema. Extrudability was assessed by filling the gel formulations into standard capped collapsible aluminum cylinders and measuring how much expelled gel. The cylinders were clamped between two glass slides, and 0.5 grams were placed over

the slides. The cap was eliminated, and the expelled gel was collected and gauged. The percentage of the expelled gel was calculated, with >90% considered excellent, >80% considered great, and >70% considered fair.

The steadiness of the gels was assessed according to the ICH guidelines. Moreover, the essential dermal disturbance index (PDII) was determined to classify the topical formulations into categories in view of the noticed acute toxic reactions following a single application of the gel on the skin for as long as 4 hours. The PDII score was calculated by adding up the scores saw at 12, 24, 48, and 72 hours, and the formulation was classified as either irritating or non-irritating in light of the PDII score.

There are some possible areas for evaluation of the polyherbal gel:

- Safety and toxicity: Before the polyherbal gel can be utilized for effective application, assessing its wellbeing and toxicity is significant. This should be possible by performing intense harmfulness tests and skin bothering tests on creatures. Persistent harmfulness and cancer-causing nature tests can likewise be led to assess the drawn-out wellbeing of the gel.
- Pharmacological activity: The polyherbal gel contains various spices, each with their own arrangement of pharmacological exercises. It would be helpful to decide the particular pharmacological exercises of the polyherbal gel, for example, calming, cell reinforcement, antimicrobial, and wound-mending impacts. In vitro and in vivo examinations can be performed to assess the gel's pharmacological properties.
- Formulation optimization: The detailing of the polyherbal gel can be upgraded to improve its dependability, bioavailability, and skin entrance. The impacts of various gelling specialists, additives, and emulsifiers can be contemplated to decide the ideal detailing of the gel.
- Clinical preliminaries: When the wellbeing and pharmacological movement of the polyherbal gel have been laid out, clinical preliminaries can be led to assess its viability in people. These preliminaries can incorporate randomized controlled preliminaries, twofold visually impaired examinations, and open-mark preliminaries to decide the viability of the gel in treating different skin conditions.
- Shelf-life stability: The soundness of the polyherbal gel can be assessed under various capacity conditions to decide its time span of usability. Sped up security testing can be utilized to decide the impacts of temperature, stickiness, and light on the gel's steadiness.

In general, further assessment of the polyherbal gel can assist with deciding its wellbeing, viability, and ideal detailing, which can prompt its expected use as a protected and compelling skin treatment for different skin conditions.

3.5. Pharmacological Studies

Chronic toxicity studies were conducted by applying a portion of a gram of the natural gel onto an area of roughly 6 cm^2 of skin, covering it with a cloth patch, and holding it in place with a semi-occlusive dressing for 4 hours prior to removing the patch. Skin perceptions were recorded an hour after patch evacuation, and control creatures were ready in a similar way using the gel base without home grown ingredients. On a daily basis, edoema or other toxic reactions, such as erythema or skin disturbance, were observed in both the test and control species. Scores for skin irritation ranged from 0 to 4, with 0 denoting the absence of any erythema or eschar formation and 1, 2, 3, and 4 denoting, respectively, exceedingly faint, distinct, moderate, and severe erythema to eschar development. Edoema was also graded on a scale of 0 to 4, with 0 denoting no edoema and 4 denoting severe edoema.

Although there are both in vivo and in vitro methods to assess anti-inflammatory activity, the carrageenan-induced paw edema method is commonly used for acute anti-inflammatory testing. Carrageenan is a mixture of polysaccharides obtained from Chondrus crispus, a plant native to the Irish Ocean, composed of sulfated galactose units. The earliest stage of the edoema that develops in a rodent's paw following carrageenan injection is attributed to the entry of histamine and serotonin. The second stage is attributed to the entrance of chemicals that are similar to prostaglandins, and the edoema that persisted between the first and second stages is attributed to the arrival of kinin-like substances.
Creature tests were conducted using Wister rodents weighing between 150-200 gm. The rodents were maintained under constant conditions, including a temperature of 30±1C, dampness of 35-55%, and a 12-hour light/12-hour dim cycle. They were furnished with food pellets and water not indispensable during the maintenance time frame. To induce pedal inflammation in the rodents, the Carrageenan

induced rodent paw edema strategy was utilized. The rodents were separated into 11 gatherings, including one control Group, one gathering with a standard (Diclofenac sodium Gel 0.5%), and Groupes with applications of 1 gm of 1%, 2%, 4% gel of *Cassia alata, Cassia tora, and Cynodon dactylon*, respectively. Furthermore, Groupes with applications of 1.0 gm and 0.5 gm of polyherbal gel were included.

The outcomes are reported as mean values and standard deviation is expressed as % Mean SD. Asterisks were used to indicate the statistical significance level for a two-way ANOVA followed by a Bonferroni posttest: *** p 0.001, ** p 0.01, and * p 0.05. These show that there is a significant deviation from the norm.

4. RESULTS AND DISCUSSION

Using carrageenan- and formalin-induced rodent paw edoema models, an analysis evaluated the anti-inflammatory effectiveness of polyherbal gels. The in vivo model of carrageenan-induced edoema, which has an early and a late stage, is frequently used to examine plant extracts' capacity to reduce inflammation. In the early stage, 5-hydroxytryptamine, histamine, bradykinin, and cyclooxygenase products are produced; in the late stage, neutrophil infiltration and ongoing generation of arachidonic acid metabolites are responsible. A statistical analysis revealed that the formulation comprising extracts considerably reduced edoema at each tested concentration as compared to the control group. Compared to standard gel formulations, 4% C. alata gel formulations were thought to have stronger anti-inflammatory effects. At 300 min after carrageenan injection, individual formulations of different concentrations of the plant extract (1%, 2%, and 4%) significantly inhibited paw edema in rodents (85.23%, 4% gel of C. alata). %). Standard diclofenac gel (1.5%) (69.23%).

A synergistic impact of 85.33% was seen when the formulation was combined and applied at a half quantity of the individual formulation (0.5 gm). Due to the inhibition of late-stage go between, arachidonic acid products, and prostaglandins of acute inflammation generated by carrageenan, the highest inhibition was observed 300 minutes after carrageenan injection. (For nuances, refer to Figure 1.

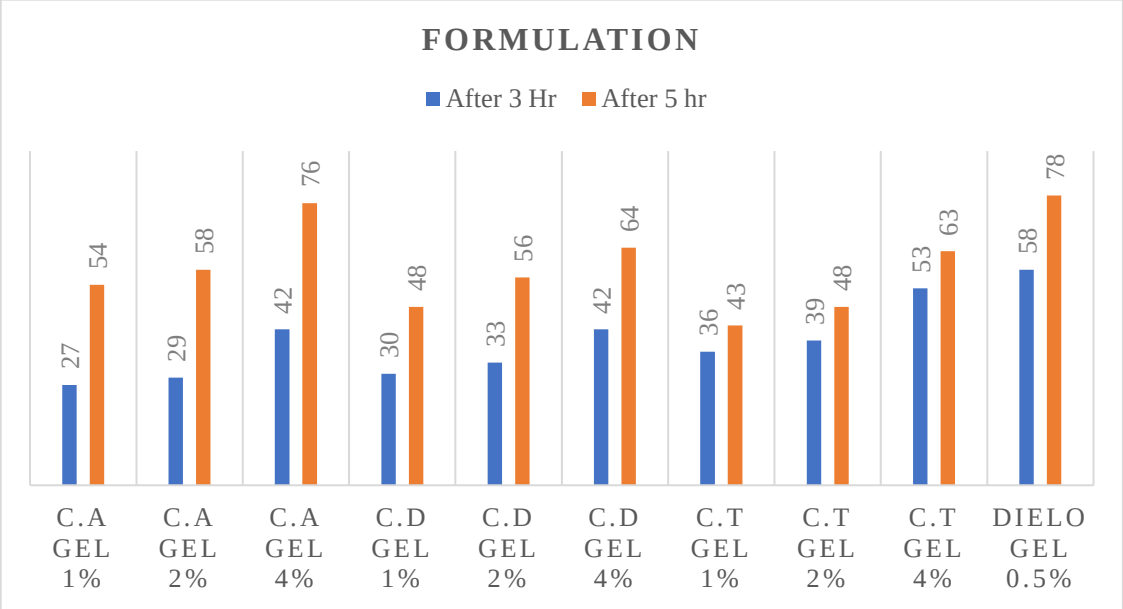

Figure 1: Anti-inflammatory Potential of C. Alata, C. Tora, and C. Dactylon Gels on Carrageenan-Induced Paw Edema in Rats

The review used the formalin-induced rodent paw edema model to investigate the effects of the polyherbal gels on both acute and chronic inflammation. The model involved 2% formalin in saline for chronic inflammation, which is biphasic and involves an early neurogenic component intervened by substance P and bradykinin, trailed by a tissue-intervened reaction involving histamine, 5-HT, and prostaglandins. Statistical examination uncovered that the formulation containing extracts significantly inhibited edema at all concentrations tried compared to the control group. In any case, the chronic model showed no significant outcome compared to the standard.

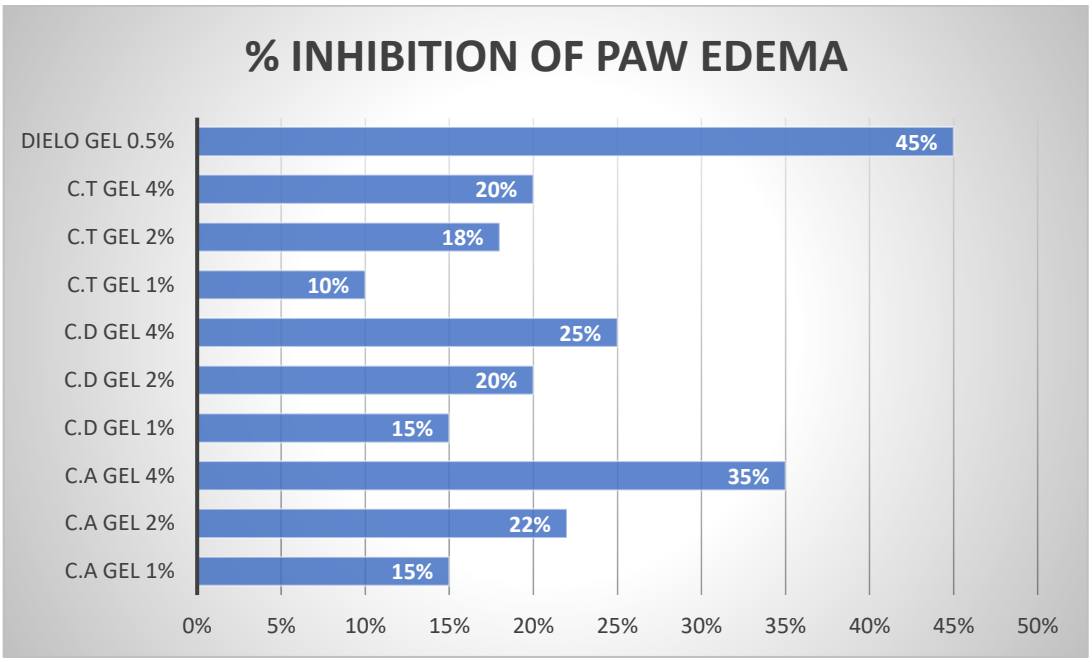

Figure 2: Topical Gel Formulations and their Anti-inflammatory Effects on the Late Phase of Formalin-Induced Paw Edema in Rats

After nine days, the 4% gel of C. alata showed suppression (29.30%) of paw edoema in rats, which was comparable to the usual medication diclofenac gel 0.5% (45.88%). The combined formulation displayed synergistic effects (40.21%) in comparison to the individual formulation and anti-inflammatory effects that were comparable to those of the conventional gel formulation. These findings imply that C. alata, C. tora, and C. dactylon individual and polyherbal gels have anti-inflammatory effects in both acute and chronic models, with the polyherbal gel showing a synergistic effect. This might help in the management of localised inflammation. (For more information, see Figures 2 and 3.)

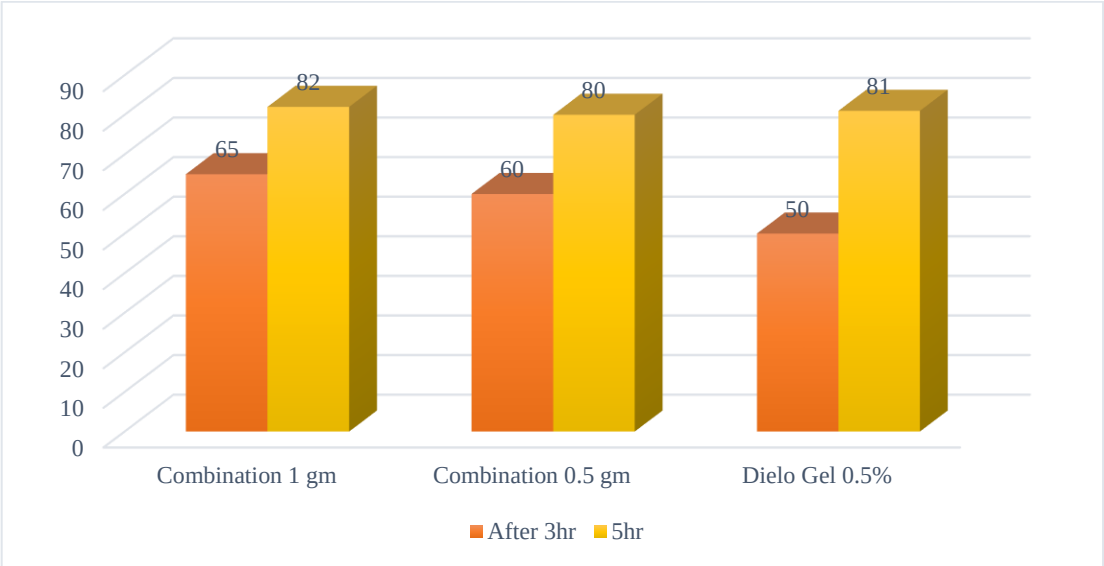

Figure 3: Anti-inflammatory Effects of Polyherbal Gel Combinations on Early and Late Phases of Carrageenan-Induced Paw Edema in Rats

5. CONCLUSION

Using carrageenan-induced and formalin-induced rat paw edoema models, the study sought to synthesise and assess the anti-inflammatory efficacy of polyherbal gels including extracts of C. alata, C. tora, and C. dactylon. The study's findings demonstrated that both single- and multi-herbal gels have anti-inflammatory effects in

models of both acute and chronic inflammation. In comparison to individual gels, the polyherbal gel demonstrated a synergistic effect that may be

helpful for the treatment of local inflammation. The findings of this study suggest that the formulated polyherbal gel can be a promising alternative to conventional anti-inflammatory drugs for the management of inflammatory conditions.

Future Scope

There are several potential avenues for future research based on the results of this study. One possibility is to further investigate the mechanism of action of the individual plant extracts and the polyherbal formulation to gain a better understanding of how they exert their anti-inflammatory effects. Additionally, it may be worthwhile to investigate the long-term safety and efficacy of these formulations, including any potential adverse effects or drug interactions.

Another area of future research could be to investigate the potential use of these formulations for the treatment of other inflammatory conditions, such as rheumatoid arthritis or inflammatory bowel disease. Furthermore, the potential for scaling up the production of these formulations for commercial use could be explored, as well as the development of alternative delivery systems, such as transdermal patches or sustained-release formulations. Overall, the promising results of this study warrant further exploration of these plant extracts and their potential for use as anti-inflammatory agents.

Plan of Work

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