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DESIGN, DEVELOPMENT, AND ASSESSMENT OF CURCUMA CAESIA HERBAL CREAM WITH AN EMPHASIS ON ITS ANALGESIC ACTIVITY

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Abstract
Herbal analgesic creams, which harness the pain-relieving properties of plants, provide a novel, potentially risk-free approach to pain relief. To make this formulation, we took a number of tried-and-true herbal analgesic cream recipes and optimized their active ingredient ratios. Important factors in their choice of turmeric were its analgesic and anti-inflammatory properties. Developing the formulations was a meticulous process that involved mixing the active ingredients with suitable excipients to guarantee skin compatibility and stability. After making the herbal extracts, the cream was made using a double boiling method. Then, the generated creams were subjected to a comprehensive analysis of their pH, stability, irritancy, spreadability, and phase separation. Since each composition was uniform in color (mustard), texture (semi-solid), and aroma (herb-like), it was clear that they were all mass-produced. After four weeks of testing, stability results showed that the

creams did not degrade noticeably. The skin could safely employ all of the formulations because their pH levels fell within the acceptable range—slightly acidic to slightly alkaline. Because they did not cause any irritation when tested topically, the creams were deemed safe for topical use. The spreadability tests revealed that it was rather easy to implement, which bodes well for its prospective usefulness. Chemical uniformity was further demonstrated by the absence of phase separation in all formulations. The study's encouraging findings highlight the potential of herbal analgesic creams as a viable substitute for traditional pain and inflammation medications, paving the way for further exploration in the realm of alternative medicine.

Keywords: Stability, micronutrients, UV radiation, Phytochemicals, Pharmaceuticals, ect.

Introduction of Phytochemistry

Plants include naturally occurring chemical compounds called phytochemicals. These substances have biological activities that improve human health beyond what is provided by macronutrients and micronutrients.[1] In addition to adding to the plant's color, scent, and flavor, they shield plants from harm and diseases. Phytochemicals are the broad terms for the chemical compounds found in plants that have the protective role of cellular defense mechanisms against environmental stresses, diseases, drought, pollution, and UV radiation. It has recently come to light that, when consumed in sufficient quantities, they have a function in safeguarding human health.[2] Approximately 4,000 phytochemicals have been classified based on their ability to prevent certain diseases. Foods that are high in phytochemicals include fruits, vegetables, legumes, nuts, seeds, fungi, spices, and whole grains. It is beneficial to have a diverse diet that includes these foods. Broccoli, cabbage, carrots, onions, garlic, tomatoes, cherries, strawberries, raspberries, beans, legumes, and soy products are all examples of supplies. Phytochemicals can be stored in many plant tissues, such as the roots, stems, leaves, flowers, fruits, and seeds.[3] The outer layers of different plant tissues tend to contain a concentration of several phytochemicals, especially color compounds. Levels differ among plants as a result of differences in variety, processing, cooking, and environmental factors.

Classification of Phytochemistry[4]

Due to their great diversity, precise phytochemical classification has not been possible up to this point. The function of phytochemicals in plant metabolism determines whether they are considered principal or secondary components in modern times.[5] Carbohydrates, proteins, amino acids, chlorophyll, nucleic acid purines and pyrimidines, and so on are the principal constituents. Secondary components include things like alkaloids, terpenes, glucosides, plant steroids, curcumines, saponins, phenolics, and flavonoids. Other plant compounds include lignans, alkaloids, and flavonoids. Phenolics are the most abundant and structurally diverse phyto constituents found in plants, according to a literature review.

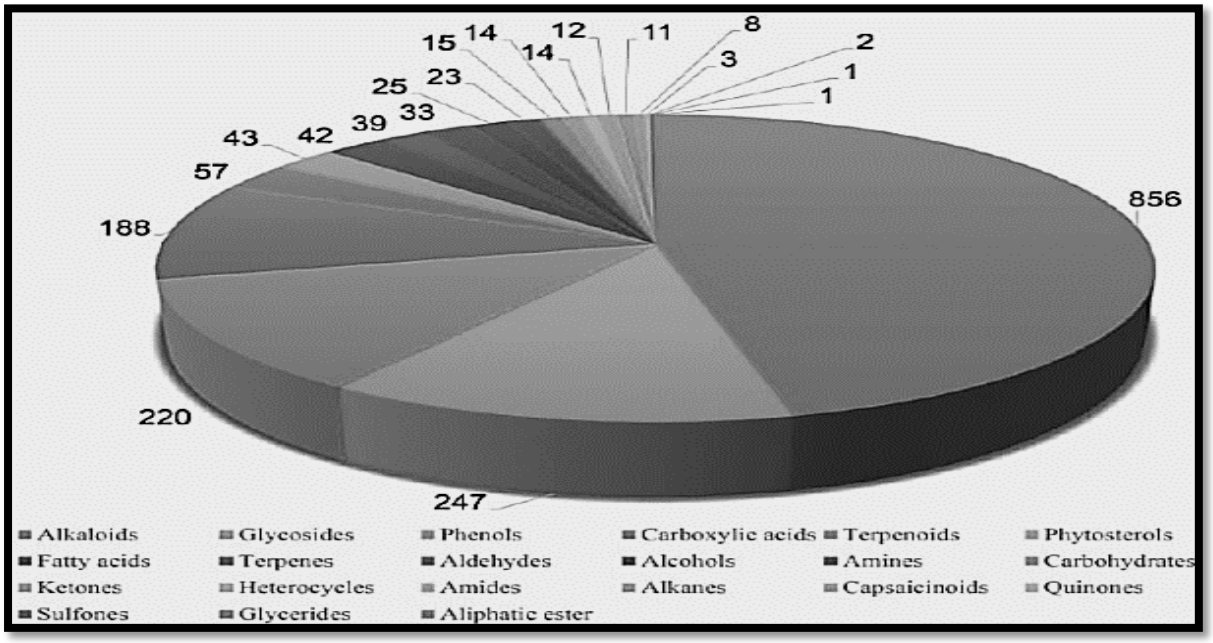
Fig.1 Demand ratio of various phytoconstituents present in plant.

Herbal medicine[6]

Medicinal uses of plants including their seeds, berries, roots, leaves, bark, and flowers are together known as "Botanical or Phytotherapy," the term for herbal medicine. Plants and plant parts that are prized for their aroma, taste, or potential medicinal uses are called botanicals. Herbal remedies, botanical remedies, or phytomedicines are other names for items derived from plants that have a healthful purpose. You can buy them in a variety of forms, including fresh or dried plants, teas, powders, capsules, tablets, and extracts.[7] In an effort to keep or improve their health, people turn to herbal remedies. This might not be accurate in all cases. Unlike pharmaceuticals, herbal remedies are exempt from animal testing. Ephedra and comfrey are two of the plants that might have devastating effects. Medications, whether they be over-the-counter or prescribed, can interact with some herbs.

A Critical Review of Herbal Remedies[8]

The study and application of plants' therapeutic qualities is also known as herbal medicine. One form of alternative medicine is the use of medicinal substances in a non-pharmaceutical manner. Herbal remedies can occasionally encompass not only plants but also minerals, shells, and even compounds made by bees and fungi. There are benefits and drawbacks to any medical treatment option. Having said that, the efficacy and purity of herbal products are not controlled. Herbal remedies may be more likely to cause side effects due to their high strength.[9] In order to make conventional therapies safer and more successful, it is important to examine the potential benefits and hazards connected with consuming herbal products. From stomach issues, the common cold, and the flu to sleeplessness, stress, and mood



disorders, herbal medications might be a self-care choice. In addition to its usage in conventional medicine, herbal remedies have a wide range of potential medical applications, including the treatment of a wide variety of diseases and ailments. It is recommended that you consult a qualified healthcare professional before taking any herbal supplements.[10]

New challenges of herbal medicines[11]

In the absence of any obligatory safety or toxicological evaluation concerning the effects of the drug, herbal medicines are put into the market. Additionally, a significant number of these nations do not possess the necessary machinery to effectively regulate the manufacturing procedures and quality standards of herbal medication. Many countries frequently encounter

and experience challenges regarding regulatory status, evaluation of safety and effectiveness, quality control, monitoring of safety, and insufficient or limited knowledge about traditional, complementary, or alternative treatments.

Difficulties that are associated with the evaluation of both safety and effectiveness [12]

The requirements for evaluating the safety and efficacy of herbal medicines are significantly more complex than those for conventional or orthodox pharmaceuticals. These requirements also include research techniques, standards, and methodologies. Nobody can deny the existence of this reality. A single herbal medication or medical plant might have hundreds or even thousands of natural constituents; similarly, a mixed herbal medicinal product may contain many times as many constituents as a single herbal medication or medicinal plant. It might be quite difficult to pinpoint specific active substances in a study of this kind, especially when a herbal product is made up of two or more different herbs.

Issues related to the monitoring of safety in herbal medicines[13]

Developed countries have seen an increase in the use of herbal or natural products and pharmaceuticals in recent years. Furthermore, the fact that many people living in developing countries rely primarily on plants for medical purposes, along with the fact that herbal medicines are not adequately regulated in many of these nations and that notable safety incidents frequently arise, have raised awareness of the need to monitor safety and understand the possible risks and benefits associated with the use of herbal medicines. There are a number of reasons why using herbal medicines can have negative effects. These include using the wrong plant species, adulterating herbal products, using concealed medications, contamination, overdosing, using herbal medicines improperly by consumers or healthcare professionals, and combining herbal medicines with other medications. The majority of producers of herbal remedies don't know enough about the importance of documentation, taxonomy, and botany. This makes it more difficult to recognize and gather the therapeutic plants that are used to make herbal treatments.Adopting the commonly used binomial nomenclature for medicinal plants is essential to clearing up the confusion brought about by the usage of common names. The plant known by several common names, Artemisia absinthium L., has a strong narcotic component. Thus, effective collaboration between pharmacologists, phytochemists, botanists, and other relevant parties will be necessary to guarantee the effective oversight of herbal medicine.

Plant profile of Curcuma caesia[14]

Taxonomical hierarchy

Kingdom: Viridaeplantae
Phylum: TracheophytaSinnott
Subphylum: Euphyllophytina
Class: Magnoliopsida
Order: Zingiberales
Family: Zingiberaceae
Subfamily: Zingiberoideae**Fig 2.Crude form of Curcuma caesia**
Tribe: Hedychieae
Genus: Curcuma
Species: C. caesiaRoxb

Vernacular Names in different parts of India C. caesia

Hindi: Kali Haldi, Nar Kachura Krishna Kedar
Manipuri: YaingangAmuba or Yaimu
Marathi: Kala-haldi Kannada: Kariarishina, NaruKachora
Bengali: Kala Haldi

Mizo: Aihang
Telugu: Nalla

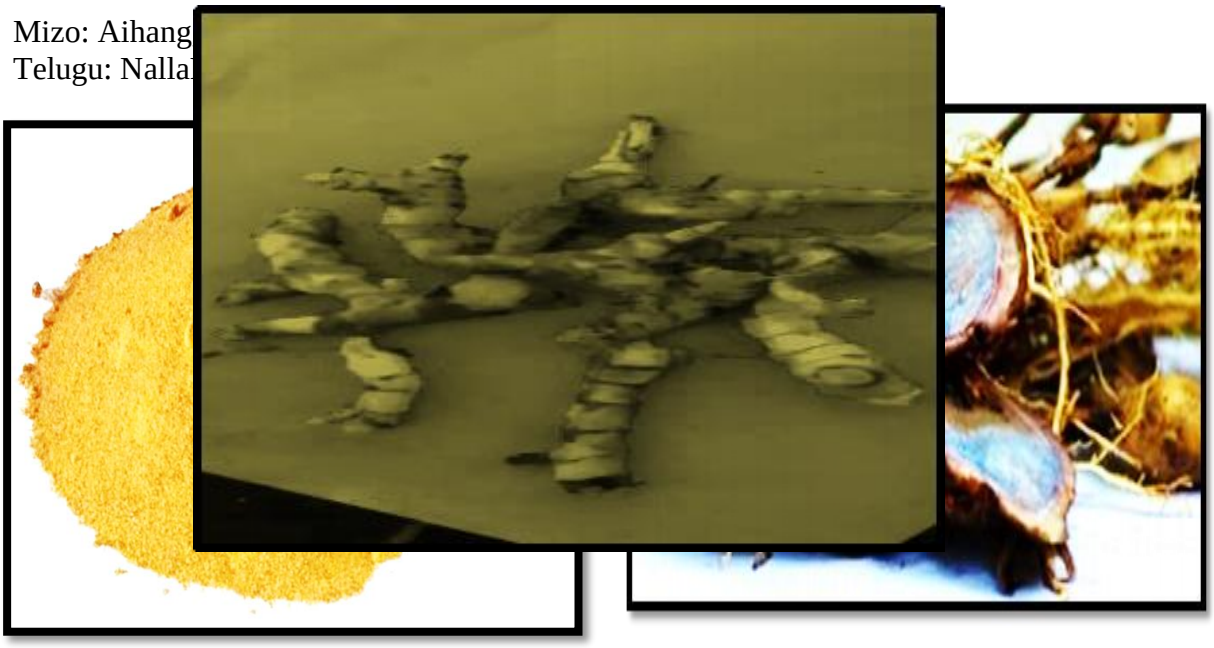


Fig.3 Rhizome part and Powder form of Curcuma caesia herb

Chemical constituents of Turmeric[15]

The substance comprises reducing sugars, proteins, anthraquinones, glycosides, cardiac glycosides, alkaloids, terpenes, amino acids, carbohydrates, tannins, flavones, and steroids.The oil of Curcuma caesia is composed of thirty compounds, which collectively

make up 97.48% of the oil. The primary components include curcumin [2.82%], ar-curcumin [6.8%], camphor [28.3%], ar-turmerone [12.3%], [Z] ocimene [8.2%], 1,8-cineole [5.3%], elemene [4.8%], borneol [4.4%], bornyl acetate [3.3%], and borneol [2.82%], and elemene [4.8%].

Experimental Section

Extraction process of Curcuma caesia[16]

(1) **Collection of plant material**

Fresh rhizome of Curcuma caesia were collected from medicinal garden of Department of Chemistry and Pharmacy Rani DurgavatiVishwavidyalaya, Jabalpur and were identified.

(2) Plant extract preparation

Curcuma caesia rhizomes were cleaned with distilled water and allowed to air dry in the shade. The dried rhizomes were extracted using Soxhlet's extractor; the dried powdered rhizomes were removed using ethanol, ground into a coarse powder in a blender, and then extracted again. Dried powder rhizome material was extracted utilizing ethanol, methanol, and aqueous solvents in a series of solvent extraction steps. The extract was dried under low pressure and at a low temperature.

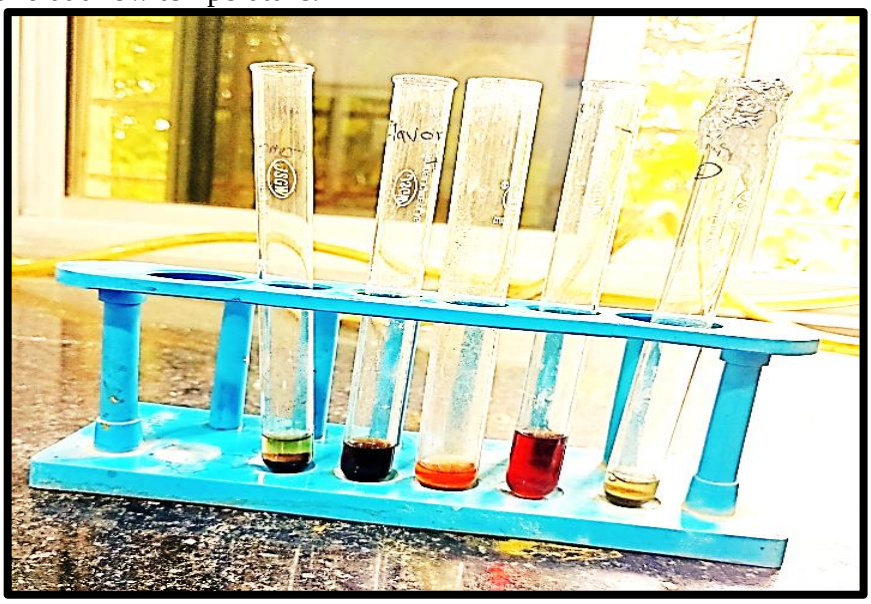


Fig.5 phytochemical investigation of C.caesia in laboratory

Formulation of Curcuma caesiaherbal cream[17]

Making the Cream Base: An emulsion-based cream with an oil in water (O/W) formulation (semisolid formulation) was created. After dissolving the emulsifier and other oil-soluble ingredients in the oil phase (PART-A), the temperature was raised to 750C.The aqueous phase (PART-B) was heated to 750C after the preservatives and other water soluble ingredients, such as methyl paraben, were dissolved in it. Following heating, parts of the oil phase were introduced to the aquous phase, which was continuously stirred until the emulsifier cooled.

S.No.	**Aqueous phase**	**Quantities**
01	Water	35.5ml
02	Methylparaben	0.2ml
03	Extract	2.8ml
040	Glycerin	3gm
05	**Oilphase**	**Quantities**

06	Cetyl alcohol	8.5ml
07	Potassium Hydroxide	0.25ml
08	SodiumCarbonate	0.25ml

Table.2 Formula for Curcuma caesia herbal cream[18]

Fig.6 Curcumacaesia extract contain herbal Formulation

Evaluation parameter of Herbal Cream[19]

observed under physical evaluation

Organoleptic evaluation: Color, smell, texture, and condition were noted during the physical assessment. Spreadability: Cream was put between two glass slides that were taken. They were subjected to a constant pressure, and the time it took for a slide to separate from the other was recorded. After that, the weight was removed, and any extra product that had adhered to the slides was scraped off. It easily fell off thanks to the weight force related to the upper slide. Where l is the length of a glass slide (5 cm), t is the time measured in seconds, and m is the standard weight (30 grams) that is tied to or put over the upper slide.

Irritancy: On the dorsal surface of the slaughtered rabbit that was rescued, mark a 1 square centimeter region. The sacrificed area was covered with the cream, and the time was recorded. For up to 24 hours, irritability, erythema, and edema were monitored and reported at regular intervals.

Washability:A minimal amount of cream was administered to the hand and subsequently rinsed with tap water to assess its capacity to be washed away.

Penetration: Topical formulation penetration was assessed on a group of three rabbits following irritancy tests on rabbits. An exact quantity of the medication (1g) was equally distributed on the back surface of rabbits. After a duration of 12 hours, the topical treatment was removed by scraping and its weight was measured. This weight was then subtracted from the initial quantity. The discrepancy is guaranteed to be identified and documented.

Grittiness: Formulated and marketed cream was observed under a microscope to find out any gritty particles.

Stability Studies

Globule Size: 10 ml of glycerine are added to 1 ml of cream. A small amount of this was put on a glass slide and examined under a microscope. 200 particle diameters are randomly estimated using an ocularmicrometer.

Phase Separation: The cream was stored in a closed container at a temperature range of 25–30°C, protected from light. The process of phase separation was carefully observed every 24 hours for a period of 30 days. Each alteration to phase separation was thoroughly investigated.

Studies on Moisture Absorption: A 50 mg dose of cream was placed on a watch glass. We grab a beaker and fill it with water. Beaker was allowed to become saturated while being housed in a desiccator chamber devoid of absorbents. A cream-colored watch glass was added to the desiccator. It is kept for a full day.

Standard Herbal Cream Evaluation [20]

The physical characteristics, such as color and fragrance, were checked visually. Consistency: There are no signs of greed and a smooth consistency.

Alcohol, chloroform, and ether are all miscible and soluble in boiling water.

PH: The pH of the herbal ointment was measured with a digital pH monitor. The ointment solution was made using 100 milliliters of distilled water and allowed to settle for two hours. The pH of the solution was measured three times, and the average was found.

Table No.3 Evaluation parameters of herbal cream Formulation

Evaluation parameters	**Observation &Results**
Organoleptic characters	
Colour	Cream
Odour	Aromatic
State	Semisolid
Spreadability	Good
Irritancy	No
Washability	Easily Washable
Grittiness	No
Absorbance	Good

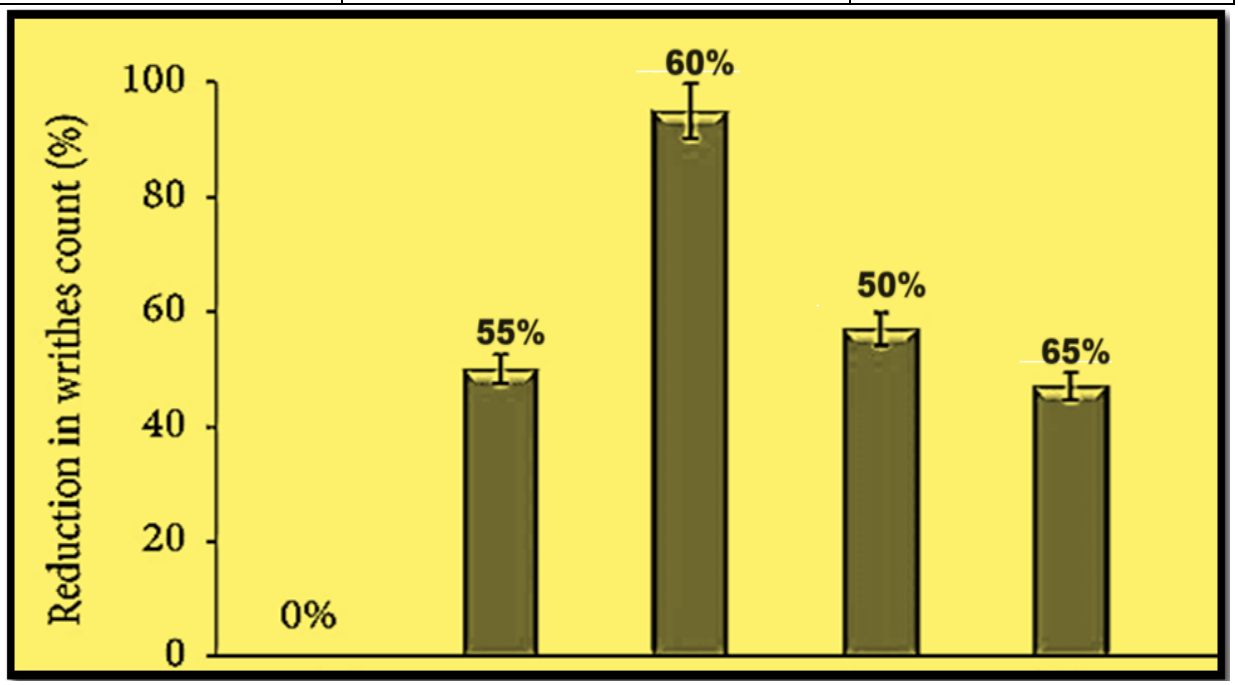
Biological activity of Curcuma caesia herbalcream[21,22]

Analgesic Effect

Analgesic activity functions as a painkiller or pain reliever, primarily employed in the management of a wide range of illnesses. Through a variety of mechanisms, analgesic drugs influence both the peripheral and central neural systems without impairing consciousness. According to Sawant et al.'s study, the hebal formulation of C. caesia may operate as a peripherally and centrally acting analgesic. The cream shown considerable ($p < 0.001$) action in both the hot plate and the acetic acid-induced writhing mice paradigm.Curcumin, an investigational medication, provides a steady time length of 17.37+-24 seconds, while Diclofenac sodium topical formulation, the usual treatment, gives a stable duration of 14.13+- 65 seconds. In comparison to the control group, 0.56 milliliters of curcumin are present in every 10 grams of the topical formulation. According to their observations, the application of the herbal cream raised the pain latency time in a manner that was dependent on the heat stimulation process. Alkaloids, flavonoids, phenols, saponins, and tannins are examples of phytochemical substances that may be present in the extract and contribute to the observed activity.

Table.4 Analgesic activity of a substance was tested using the acetic acid induced writhing method in mice

Group	**Number of writhes (mean ± SEM)**	**Reduction in writhes count (%)**
Control (acetic acid 1%)	58.3 ± 7.5	0%
Diclofenac 10 mg/kg	28.5** ± 4.1	55%
BTC 100 mg/kg (prior 30 min)	27.3** ± 4	60%
BTC 100 mg/kg (prior 3 hrs)	41.5** ± 3	50%
Naloxone + PLE (prior 30 min)	33.5** ± 3.4	65%



Results and Discussion

For millennia, individuals across the globe have utilized herbal remedies to address a range of ailments and improve their overall well-being. These remedies have been passed down to future generations.A large number of today's drugs come from plants. This is because herbal medicine is more widely used than other forms of treatment based on chemicals because it is easily accessible, highly effective, and has less side effects. This is because herbal therapy has greater benefits than other forms of chemically based treatment. Curcuma caesia extract was used in the development of an analgesic herbal cream, with consideration given to the cream's physical properties. All of the values were within the allowed range, according to the preliminary phytochemical screening of the extract and the physical parameter of the herbal cream. For both parameters, this was the situation.Herbs are used to manufacture the analgesic cream that is effective when applied topically. The evaluation parameters that were previously discussed lead to the conclusion that, according to the batch, every parameter is within an acceptable range. It is thought to be an effective formulation as this is the case.

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