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Research Article

Formulation and Evaluation of Medicated Gummies Utilizing Golden Bloom Herb

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ABSTRACT

Golden Bloom, botanically known as Calendula officinalis, is a traditional herbal remedy known for its antimicrobial and antioxidant properties, making it an ideal ingredient for skincare formulations. The objective of this study is to formulate and evaluate the efficacy of Calendula officinalis-based skincare product aimed at improving skin health and addressing various skin condition. In this study, the flower extract was used for formulation. The objective of this study is to investigate the pharmacognostic characteristics, phytochemical profile, antioxidant potential, and antimicrobial activity of the extract for its potential use in formulation and evaluation.The required materials were collected from Trikaripur, Kasaragod, and subjected to successive solvent extraction. Subsequently, pharmacognostic studies including organoleptic, physical, chemical, and biological evaluations were carried out. An antimicrobial culture test was performed to assess the antimicrobial activity of the extract. Similarly, a DPPH assay was conducted to confirm its antioxidant properties, highlighting its ability to effectively neutralize free radicals. Gummies were formulated, followed by an evaluation study. The findings from these studies support the development of Calendula officinalis-based skincare products, particularly gummies .These products offer a natural and effective solution for promoting skin health and enhancing dermatological wellness.

INTRODUCTION

Herbal medicine is conceived from different points of view depending on the place where it is used, but its definitions have the same conception, that is, the use of plants or plant parts to treat diseases and promote health. According to the WHO, herbal medicines include herbs, herbal materials, herbal preparations, and finished herbal products

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that contain plant parts, other plant materials, or their combinations as active ingredients.

GOLDEN BLOOM

Golden Bloom, botanically known as Calendula officinalis, is a traditional herbal remedy which exhibits antimicrobial & antioxidant properties, making it an ideal ingredient for skincare formulations.Calendula officinalis, or marigold, is not only a beautiful ornamental plant but also a powerhouse of beneficial chemical compounds that contribute to its various uses in traditional medicine, skincare, and even culinary applications. Here's an overview of its chemical constituents and the diverse ways it is used:

Chemical Constituents of Calendula officinalis;

Calendula flowers contain a variety of bioactive compounds, many of which are responsible for its therapeutic properties:

1. **Flavonoids:** These are powerful antioxidants that help reduce inflammation, fight free radicals, and support overall health. Key flavonoids in calendula include quercetin, kaempferol, and rutin.
2. **Carotenoids:** Calendula is rich in carotenoids, such as lutein, zeaxanthin, and beta-carotene, which contribute to its bright orange and yellow color. Carotenoids are known for their antioxidant properties and are beneficial for eye health.
3. **Triterpenoids:** These compounds, such as oleanolic acid and ursolic acid, are known for their anti-inflammatory, antimicrobial, and skin-healing properties. They help soothe irritated skin and reduce redness.
4. **Essential Oils:** Calendula contains essential oils like flavonoid glycosides, saponins, and terpenes, which give it its characteristic fragrance and contribute to its soothing and antimicrobial properties.
5. **Polysaccharides:** These complex carbohydrates have anti-inflammatory effects and contribute to the plant's ability to enhance immune function and promote skin healing.
6. **Saponins**: Known for their ability to form foams, saponins also exhibit antimicrobial and anti-inflammatory properties, which contribute to the plant's use in wound healing.
7. **Phenolic Acids:** Calendula contains phenolic compounds like caffeic acid and ferulic acid, which have antioxidant and anti-inflammatory effects.

Uses of Calendula officinalis

1. Medicinal Uses

Calendula has a long history of use in herbal medicine, and its chemical components play a significant role in its healing properties

- **Skin Care:** Calendula is perhaps best known for its topical use. Due to its anti-inflammatory and antimicrobial effects, calendula is used in creams, oils, and ointments to treat cuts, burns, insect bites, rashes, and other skin irritations.
- **Anti-inflammatory:** The flavonoids, triterpenoids, and carotenoids in calendula help reduce inflammation, which makes it useful in treating conditions such as arthritis or muscle aches.
- **Antimicrobial and Antifungal:** Calendula's ability to fight infections is attributed to its antimicrobial compounds. It is often used in remedies for minor infections or to prevent infections in wounds.
- **Wound Healing:** Calendula has been shown to promote wound healing and tissue regeneration, making it a common ingredient

in ointments for cuts, abrasions, and even surgical wounds.

- **Digestive Health:** Calendula has been used as an herbal remedy to soothe the digestive system. It can help treat indigestion, gastric ulcers, and constipation by reducing inflammation in the gastrointestinal tract.

2. Culinary Uses

Calendula officinalis petals are edible and possess a mild, slightly peppery taste. They can be used in:

- **Salads:** The vibrant petals make an attractive and nutritious addition to fresh salads.
- **Herbal Tea:** Calendula petals can be brewed to make a soothing tea, often used to aid digestion and reduce inflammation.
- **Natural Food Colorant:** Calendula is sometimes used as a natural alternative to artificial colorants, adding a golden hue to foods like rice, butter, and cake

3. Cosmetic Uses

Calendula's anti-inflammatory and antimicrobial properties make it a popular ingredient in cosmetic products:

- **Facial Creams and Lotions:** Calendula is used to treat dry, sensitive skin and reduce the appearance of fine lines and wrinkles. It helps hydrate the skin and soothe irritation, making it a common addition to facial creams.
- **Shampoos and Hair Care Products:** Calendula is also used in hair care products, where it helps to promote scalp health, reduce dandruff, and enhance the shine of hair.

4. Other Therapeutic Uses

Calendula is sometimes used as a mild sedative to reduce stress and anxiety. In herbal medicine, it can be consumed as a tincture or tea to promote relaxation and help with sleep disturbances. The plant is also thought to have some potential benefits for immune support due to its polysaccharides and antioxidants. Calendula officinalis is a remarkable plant with a wide range of beneficial chemical constituents, including flavonoids, carotenoids, triterpenoids, and essential oils, all of which contribute to its healing, anti-inflammatory, antimicrobial, and antioxidant properties. Whether used in skincare, medicine, or cooking, calendula remains an enduring symbol of natural healing and beauty.

GUMMIES

Chewable gummy tablets, also known as a gummy confection or confectionery gel, consist of sucrose or syrup combined with a gelling agent such as gelatin, gum, or pectin. Other excipients can be added to this formulation, including coloring agent and flavoring agent. The chewable gummies were prepared by heating and congealing, and then their physical characteristics were analyzed using a completely randomized design. Physical charectristics includes visual appearances, weight variation, swelling ratio, dispersion time, syneresis, and texture profile such as hardness, chewiness, and gumminess etc. Gummies refers to chewable, gel like dosage forms, often containing vitamins,minerals or active ingredients, designed for easy consumption and absorption. The conventional dosage forms like tablets, capsules, syrups etc are inconvenient for paediatric patients because of difficult to swallow tablets and capsules or unpleasant taste of drug. As a result, the demand for developing new technologies has been increasing day by day. Medicated gummies is designed to improve patient compliance, acceptability and increase oral retention time. They are generally considered more convenient than syrups or tablets, especially for padeatrics. Gummies are easy to chew and swallow, whereas

syrups may require measuring and pouring which, can be messy and time consuming.

Advantages

- More convenient to paediatric patients.
- Ease in handling.
- Improve patient compliance.
- Enhanced absorption
- Masking unpleasant taste
- Pleasant appearance.

MATERIALS AND METHODS

PLANT COLLECTION

The fresh flowers of Calendula officinalis, were collected from Trikaripur,Kasaragod district, Kerala (India) in the month of November 2024. The herbarium was prepared by drying the specimens in the shade and then labeling them with the relevant information.

PLANT AUTHENTICATION

The plant material was identified and authenticated by Dr. Sonia, Professor (Entomology) Collage of Agriculture Kerala Agricultural University, Padnekkad, Kasaragod (Dt), Kerala.

PLANT PROFILE

Calendula officinalis



Taxonomic classification

Kingdom	Plantae
Subkingdom	Tracheobionta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Asteridae
Order	Asterales
Family	Asteraceae
Genus	Calendula
Species	C. officinalis

Morphological features

Features	Description
Plant type	Annual or perennial
Height	30-60 cm
Stem	Erect,branched, slightly hairy
Leaves	Simple , serrated edges
Flower type	Composite
Flower color	Bright yellow to orange
Flower size	5-7 cm in diameter
Root system	Fibrous, shallow

Synonym

Pot marigold, Garden marigold, Marigold, Scotch marigold, English marigold, Ruddles**.**

Medicinal Uses

Anti-oxidant, Anti-Microbial Agent, Anti-Inflammatory, Wound Healing, Antiseptic etc.

PREPARATION OF PLANT EXTRACT

Extraction of Calendula officinalis was carried out by maceration.Maceration is an extraction technique used to extract bioactive compounds from plant material.

Procedure:

- Crush fresh or dried Calendula flowers and place them in a beaker.
- Then add 70% ethanol.
- Seal the beaker and keep it in a dark place with occasional shaking to facilitate extraction.

- Strain out the flowers and filter the liquid extract to remove impurities.
- Collect the extract and store in a dessiccator for further studies.

PRELIMINARY PHYTOCHEMICAL SCREENING

The extracts were subjected to preliminary phytochemical screening to detect the various phytoconstituents such as alkaloids,glycosides, carbohydrate,flavonoids, saponins, tannins and phenols.

INVITRO-ANTIMICROBIAL ACTIVITY

Antibacterial activity was determined by agar well diffusion method, activity of extract was tested against lactobacillus.

Procedure:

- Preparation of pre-inoculum: The bacteria lactobacillus is prepared from curd. The curd is filtered and the broth is incubated at 25^0C for 24 hrs.
- Preparation of pour plates: A sabouraud dextrose agar (150 ml) is autoclaved and poured to the already autoclaved plate and cooled to room temperature and allowed to solidify. The culture was spread on the agar surface aseptically by using sterilized cotton.
- Making wells on agar plates: Wells of 6mm in diameter were made aseptically on the agar plate by using a sterilized well digger. The extract is aseptically added in to the well by using a micropipette. The petri plates are kept in a refrigerator (1hr) for the diffusion of substances from well in to surrounding medium. During this time the growth of the organism is reduced: After 1 hour, the plates were incubated in inverted condition at 37°C for 48 hours.
- Measurement of the zone of inhibition: After 48 hours, the plates were observed for the presence of inhibition of bacterial growth, and it was indicated in the form of a clear zone of inhibition around each well containing the extract.The size of the inhibitory zone was measured in 'mm'.

ANTIOXIDANT ACTIVITY

- The free radical scavenging capacity of extracts were determined using DPPH. DPPH solution was prepared in 90% methanol.
- Extract (Calendula officinalis) was mixed with 95% ethanol to prepare the stock solution (5mg/ml).
- 150 ml of freshly prepared DPPH solution was taken in test tubes and 75 ml of varying concentration of extract was added to every test tube and the final volume was made to 3ml with methanol.
- After 10 min, the absorbance was measured at 517 nm using a spectrophotometer.
- Ascorbic acid was used as reference standard and dissolved in methanol to make the stock solution with the same concentration (5mg/ml)
- Control sample was prepared containing the same volume without any extract and reference (ascorbic acid).
- 95% methanol was used as blank.
- % scavenging of the free radical was measured using the following equatio

% RSA = Abs control - Abs sample/Abs control *100

Where,
RSA=Radical Scavenging Activity;
Abs control=absorbance of DPPH radical + methanol;
Abs sample=absorbance of DPPH radical + extract.

FORMULATION OF GUMMIES

Sr. No	Name of ingredients	Quantity to be taken		
		F1	F2	F3
1	Calendula extract	5gm	5gm	5gm
2	Orange juice	5ml	5ml	5ml
3	Honey	25gm	25gm	25gm
4	Agar-agar	5gm	7gm	3gm
5	Gelatin	6gm	10gm	5gm
6	Sodium benzoate	0.25gm	0.25gm	0.25gm
7	Purified water	Upto 100ml	Upto 100ml	Upto 100ml

Procedure :

- Take 100 ml purified water and mixed with 5ml of orange juice in a beaker and add agar-agar, honey, gelatin to it.Heat at 70-75^{0}C and stir well.
- Add sodium benzoate and calendula extract with continuous stirring to make a uniform mixture.
- Transfer the mixture into a silicon mould and cool it for 30 min.
- Place it in the refrigerator for 24 hrs.

EVALUATION OF GUMMIES

F1, F2, F3 was prepared and subjected to following evaluation method.

1. **Organoleptic evaluation:** The medicated gummy can be examined physically for appearance like colour, odour, transparency, etc.

2. **Stickiness:** Texture of the medicated gummy in terms of stickiness can be determined by mildly rubbing the gummy between fingers.

3. **Grittiness**

- Microscopic analysis: A small gummy sample is observed under microscope to detect undissolved particles.

- Rub test: The gummy is rubbed between the fingers, and the presence of particles is noted.

4. **pH Test:** 1g gummy was weighed and then crushed in a mortar and pestle and diluted with 10 ml water. Then pH is measured using digital pH meter.

5. **Weight variation:** The weight variation was conducted by weighing 10 gummies individually and average weight and standard deviation were calculated.

6. **Moisture content:** One gummy was weighed and then crushed in a mortar and pestle. From it,1g of the sample was weighed and dried for 24hrs in dessicator. The sample is weighed after 24hr.

RESULTS AND DISCUSSION

Preparation of plant extract

Extraction of Calendula officinalis was carried out by maceration. The extract obtained after the maceration process was then used for phytochemical studies.



Preliminary phytochemical screening

Sr.No	Chemical constituents	Calendula officinalis
1	Alkaloids	-
2	Carbohydrate	-
3	Glycosides	+
4	Saponins	+
5	Flavonoids	+
6	Tannins	+
7	Phenols	+

Invitro-Antimicrobial activity.

The extract showed antibacterial activity against lactobacillus produced better zone of inhibition

SR.NO	Bacteria	Diameter of zone of inhibition (mm)	
1	Lactobacillus	Without extract	With extract
		0	8

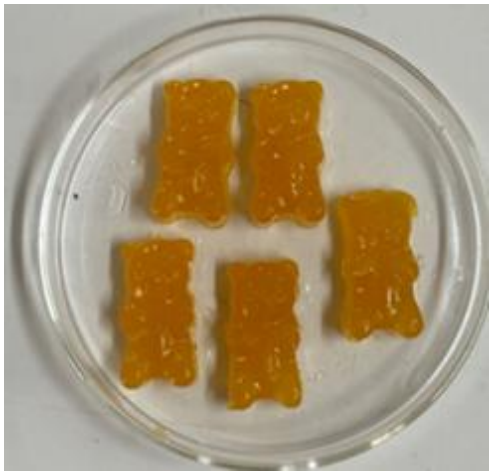
Antioxidant activity

The antioxidant activity was calculated in terms of % inhibition and the following table was formulated.

GROUP	CONCENTRATION (mg/ml)	ABSORBANCE	% INHIBITION
Sample	10	0.168	29.11
	20	0.143	49.38
	30	0.137	52.12
	40	0.121	59.30
	50	0.102	69.69

Formulation of Gummies

Calendula officinalis gummies were prepared and transferred to a suitable container.



Evaluation of gummies

SR NO	PARAMETERS	FORMULATION		
		F1	F2	F3
1	Colour	Yellow-orange	Yellow-orange	Yellow-orange
2	Odour	Fruity	Fruity	Fruity
3	Taste	Sweet	Sweet	Sweet
4	Texture	Smooth	Smooth	Smooth
5	Weight variation	0.79	0.80	0.83
6	pH test	7.10	7.8	5.27
7	Moisture content	7.52	13.63	17.64
8	Grittiness	Slightly gritty	Slightly gritty	Non-gritty
9	Stickiness	Slightly sticky	Slightly sticky	Non-sticky



Determination of pH



Moisture content

DISCUSSION

The current study was undertaken to explore the cosmetic potential of Calendula officinalis, commonly known as Golden Bloom or Pot Marigold, in the development of effective herbal skincare formulations. The herb was selected based on its well-documented therapeutic profile, which includes anti-inflammatory, antimicrobial, antioxidant, wound healing, and soothing properties-attributes that make it an ideal candidate for skincare products. Calendula flowers were collected from Kasaragod district, Kerala, during November 2024. The plant material was authenticated by a qualified botanist to ensure identity and purity. The flowers were shade-dried and subjected to extraction using the maceration method with 70% ethanol, which effectively preserves a broad range of polar and semi-polar phytoconstituents.The preliminary phytochemical screening of the extract confirmed the presence of several key secondary metabolites such as flavonoids, saponins, glycosides, phenols, and tannins. Calendula-based gummies were developed as a nutraceutical approach to enhance skin health from within. Among the three gummy formulations, F3 showed the best performance, exhibiting optimal pH, smooth texture, and absence of undesirable features like grittiness or stickiness.These findings highlight the potential of gummies as a palatable and functional supplement enriched with herbal actives. The antioxidant potential of the Calendula extract was confirmed by the DPPH assay, with a maximum free radical scavenging activity of 69.69% at 50 mg/mL, indicating strong antioxidant capacity that can help in preventing oxidative skin damage and premature aging. Additionally, the antimicrobial activity of the extract against Lactobacillus was notable, with a zone of inhibition of 8mm supporting its potential role in protecting the skin from microbial infections. In conclusion, this study successfully demonstrates that Calendula officinalis is a powerful herbal agent for skin

health, offering both external protection and internal support through gummies. The formulations showed promising antioxidant and antimicrobial properties, reinforcing the value of incorporating Calendula in modern phyto-cosmetic products. Further research, including clinical trials, could broaden its applications and establish its efficacy in larger populations.

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