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Research Article

Formulation and evaluation of Antimicrobial activity of *Elaeocarpus Ganitrus* leaves

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ABSTRACT

The Objective of this study was to produce a Carbopol 940 based gel formula containing an leaf extract of Elaeocarpus Ganitrus family Elaeocarpiceae and evaluate its anti-acne potential. The ethanolic extract was derived from the dried leaves was subjected to a phytochemical evaluation invived presence of phytochemicals Alkaloids,phenols,terpenoids, and flavaniods Three gel formulations of Carbopol 940 containing an Elaeocarpus Ganitrus extract in three different concentrations, i.e., 1, 2, and 3% w/w were prepared. The gels were evaluated for their physical appearance, antimicrobial activity, skin irritability, pH, spreadability, and viscosity. The prepared formulas were stable, greenish and homogeneous. None of them showed irritation to the skin. The spreadability (g.cm/sec), viscosity (cps), and pH of all three formulations was 34.68, 53 270–65 400, and 7–8, respectively. Gel-C exhibited the highest antimicrobial potential against acne, the main causative organism of acne with a zone of inhibition of 15.2 ± 0.5 mm. It was revealed from the acne healing studies that the elimination time for the acne treated with Gel-C was 15 days. A formulation gel containing 3% w/w extract showed better antimicrobial activity, physicochemical characteristics, and pharmacological activity. It can be concluded that the acne healing process was faster with the gel formulation containing 3% w/w of the Rudraksh leaves extract, proposing that this formulation is a promising candidate for acne healing.

INTRODUCTION

Elaeocarpus ganitrus, also known as Rudraksha in Sanskrit or Rudraki in Hindi, is one of the most significant herbal plants used in indigenous medical systems like Ayurveda, Siddha, and Unani. The E. ganitrus plant's ripe fruit is made up of a hard, rocky endocarp known as a bead, nut, or Rudraksha. The rudraksha plant is the most well-known plant with spiritual and therapeutic uses [1]. The Rudraksha plant has historically been used to

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treat conditions including stress, anxiety, palpitations, depression, nerve pain, migraines, sleeplessness, acne, ringworm, epilepsy, asthma, poor concentration, arthritis, hypertension, and liver problems. Analgesic, antidepressant, antidiabetic, anticonvulsant, cardio-stimulator, hydrochloric, anti-aging, antiseptic, antihypertensive, hypnotic, antiepileptic, tranquilizing, anti-inflammatory, thermogenic, sedative, smooth muscle relaxant, and hydro choleretic are just a few of the pharmacological effects of the Rudraksha plant.[2]

Botanical Description: It is a large evergreen tree with large leaves. Its height ranges from 50–200 feet. Leaves are large and shining green on the sun facing side and dull stringy on earth facing side. Flowers become visible in the month of April May and are white or yellow in colour[3,4]. Fruits start appearing in June and ripen near October. Ripe fruit is fleshy and has a seed with blue shell. Inner part or bead lying in the seed is called Rudraksha[3].

Morphological & Macroscopically Description 2,4,5,6

The morphological characters of plant are shown below as follow as,

Leaves- Simple, glabrous, oblong-lanceolate, sub-entire or irregularly crenate, acute or acuminate

Flower- White or yellow colored, in dense racemes and mostly from axils of fallen leaves, fringed petals, anthers are linear, appear in April-may

Fruits- Round or oval, small, violet or blue colored and

Taste: Acidic Endocarp- Stony endocarp is hard, globular, strongly tubercule, marked with 5 to longitudinal ridges, rarely 1 to 4,

Color :reddish brown

Acne vulgaris is an extremely common disorder of the skin (pilocebaceous unit) that affects virtually all individuals at least once during life. The incidence of acne peaks of teenage, but substantial numbers of men and women between 20-30 years of age are also affected. by the disorder.[7] herbal as well as synthetic ingredients are reported to have remarkable beneficial effect on acne vulgarisThey may have different mechanisms like, (a) Control sebum secretion, (b) Antibiotics which inhibit acne, the main causative organism of acne, (c) Keratolytic which removes the keratin layer and prevents the trapping of sebum under the skin, (d) Anti-inflammatory which prevents the worsening of the condition due to inflammation or redness etc. Numbers of formulations are available in the market with a variety of active pharmaceutical ingredients for the treatment of acne.[8,9,10] Topical preparations such as gels, ointments, lotions and creams are the important drug delivery systems due to its convenience in delivering drug to a localized area of the skin. Gel is one of the semi-solid topical preparations providing quick onset of activity, long-term efficacy and high patient satisfaction.

MATERIALS AND METHODS

Plant Materials and Preparation of Extract: *Rudraksh leaves* leaves were collected from Himalaya, cleaned from foreign material, washed with distilled water, dried in the shade for 72 hours, coarsely grinded, weighed, and stored in airtight jars. One liter of ethanol (95% v/v) was added to 250 g of powdered *Rudraksh leaves* for 3 to 4 days. The mixture was stirred with a sterile glass rod after 12 h and was filtered with Whatman filter paper No. 1. In a rotary evaporator, the solvent was removed under reduced pressure at a temperature of less than 50 °C, leaving a dark green residue stored in the airtight glass jars. The extract's weight was recorded and the percentage yield was 10.6%. Carbopol 940, Propylene glycol, Sodium hydroxide and Methyl paraben .

The phytochemical screening of the alcoholic extracts:

The leaf of rudraksh leaves was carried out for the presence alkaloids, cardiac glucosides,

flavonoids phenols, resins, saponins, tannins, terpenes and steroids using standard phytochemical methods. The phytochemical screening of the ethanolic extracts of the plant was carried out in order to elucidate the chemical constituents (bioactive agents) responsible for their antimicrobial and therapeutic activities

Preparation of Gel Formulations :

Distilled water was added to the Carbopol 940 and mixed mechanically by high-speed mixer. To this mixture, sodium hydroxide 10% was added vigorously. In water bath with a temperature not exceeding 50 °C, the extracts in a concentration of 1, 2, and 3 g were added to prepare three formulations, Gel-A (1% w/w), Gel-B (2% w/w) and Gel-C (3% w/w), respectively. Separately dissolved methyl paraben in propylene glycol were also added to this gel. The remaining quantity of purified water was added,

Evaluation of Gel Formulations

Physical appearance

The gel formulations were evaluated for their physical parameters like color, odor, consistency, transparency, and homogeneity.

Spreadability of Gel Formulations

A glass slide with standard dimensions was used, where 0.5 g of the gel was placed in a circle 1 cm in diameter on the glass slide, over which another glass slide was placed. A weight of 125 g was set for 5 min so that the gel was sandwiched between the two slides to form a thin layer. Then, the weight was removed and the extra gel was removed. Then the slides were adjusted so that the upper slide was fixed with a weight of about 20 g. The time was noted fonoted the slides to separate from each other.

The spreadability was recorded using the following formula.

$S = M / T$

Where:

S – Spreadability in grams/seconds;

M – Mass in grams;

T – Time in seconds.

Viscosity.

A Brookfield DV-E viscometer (RVDVE) was used to determine the viscosity of the gels. Spindle No. 07 was inserted in each formulation and was sheared at 3.3, 9.9, and 16.5 g at 24 ± 1 °C.

Ingredients percentage	Gel A	Gel B	Gel C
***Rudraksh leaves extract* (w/w)**	1	2	3
Carbopol 940	3	3	3
Propylene Glycol	10	10	10
Methyl Paraben	0.3	0.3	0.3
Sodium Hydroxide 10%	Q.S. N.	Q.S.N.	Q.S.N.
Distilled Water	Q.S.P	Q.S.P.	Q.S.P.

The gel formulations were prepared in distilled water

PH Determination

The pH of the gels was detected with a digital pH meter. An amount of 0.5 g of gel was dissolved in 50 ml of distilled water and stored for two hours. Each formulation's pH was measured in triplicate and the average values were taken.

Antibacterial Activity of Gel Formulations

Each formulation was assessed for its antimicrobial effects against the microorganisms on a nutrient agar using a suitable diffusion method. About 0.2 ml of the bacterial test strain was inoculated over a nutrient agar plate with a sterile cotton swab and was allowed to dry. With the help of a cork borer, 6 mm diameter wells were created. Half a milliliter of the Rudraksh leaves extract was introduced into the wells. The plates were placed at room temperature for about one hour. Then the plates were placed in an incubator at 37 °C for 24 hours. Then, the zone of inhibition was checked and recorded. Clindamycin was used as standard

Acne Healing Activity of Gel Formulations

Adults aged from 17 to 22-year-old were divided into three groups, having 4 adults each. Group A, B, and C received Gel-A containing 1% w/w of the Rudraksh *leaves* extract, Gel-B containing 2%

w/w of the *leaves extract* and Gel-C containing 3% w/w of the extract. No other medicine was given to the adults during the entire study. The study was evaluated for 15 days

RESULT AND COCLUSION:

This study evaluated the anti-acne potential of herbal gels. Three different concentrations of an *Rudraksh leaves* extract were used to prepare gel formulations with Carbopol 940. The formulations were evaluated for the physical parameters like the pH, viscosity, and spreadability.

A pharmacological evaluation:, like a skin irritation test, revealed that the herbal gels were safe to apply on the skin. The antibacterial activity of these gels against *acne* bacteria was also tested and confirmed. An anti-acne study was carried out to show that the herbal gels can heal the acne without severe adverse effects.

Phytochemical Analysis of gel

Many phytochemicals were found in the ethanolic extract. Different tests were performed according to the standard methods to check for the presence of phytoconstituents such as alkaloids, flavonoids, tannins, reducing sugars, saponins, triterpenes and glycosides in the ethanolic extract of the Rudraksh leaves The observations were recorded .

Phytochemical Constituents of Ethanolic Extract of *Rudraksh leaves.*

Serial No.	Constituents	Test Name	Outcome
1	Glycoside	Legal's test	+
2	Alkaloids	Mayer's reagent test	+
3	Triterpenoids and steroids	Libermann test	–
4	Flavonoids	Alkaline reagent test	+
5	Reducing sugars	Fehling's test	+
6	Carbohydrates	Molish's test	+
7	Tannins	Ferric chloride test	+
8	Saponins	Froth test	+
9	Proteins and amino acids	Ninhydrin test	–

Evaluation of Gel Formulations

All the formulations were green a/c to percentage

The spreadability :.

The bioavailability efficiency of a gel formulation also depends on its spreading value. pH: alkaline which was compatible with normal skin physiology. The results of the viscosity are also shown below in table.

Skin Irritation Test

All the gel formulations were found to be safe while being applied on the skin and there was no irritation or sensitivity to the skin.

Antibacterial Activity of Gel Formulations

The antibacterial activity showed Table that the zone of inhibition increased with an increase in the concentration of the herbal extract. It indicates that the *Rudraksh* leaf extract possesses an antibacterial activity, helps maintain a sterile acne area, and promotes the acne healing process. Gel-C was found to be more effective in the acne healing when compared to other herbal gels. These gels showed better activity against *acne* bacteria.

Formulation	Color	Appearance	pH	Spreadability (g.cm/sec)	Viscosity (cps)	Homogeneity

Gel-A	Green	Greasy Transparent	7.78	36	55 400	Homogenous
Gel-B	Dark Green	Greasy Translucent	7.69	33	60 200	Homogenous
Gel-C	Dark Green	Greasy Translucent	7.81	31	64 300	Homogenous

The antimicrobial activity against various microorganisms like *S. aureus E. coli and Bacillus subtilis* bacteria was evaluated. It was reported that the *rudraksh leaves* extract was effective against all microorganisms when compared to other plant extracts and the standard ofloxacin. Priadarshini et al. (2013) studied the antibacterial activity of an extract (200, 150, 100, 50, and 25 mg/ml concentrations) obtained from leaves of herbs like Rudraksh leaves and against microorganisms. The results were compared with the standard drug, gentamycin. Both plants' extracts showed activity against microorganisms like *Escherichia coli, Klebsiella pneumonia, Proteus vulgaris, Bacillus subtilis,* and *Pseudomonas aeruginosa* in ascending order.

CONCLUSION

According to the present study, the acne elimination improves with the increasing concentration of the herbal extract. Among these formulations, gels containing an *Rudraksh leaves* extract in the concentration of 1, 2, and 3% w/w, a formulation gel containing 3% w/w extract of *Rudraksh* showed better wound healing and antimicrobial effects. It can be concluded that the extract of *Rudraksh leaves* (3% w/w) was a better candidate for acne spots healing

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