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Research Article

### FORMULATION OF HERBAL GEL FOR THE EFFECTIVE TREATMENT OF TOPICAL MICROBES

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**Abstract:**

The idea that natural remedies are safer and have fewer side effects than synthetic ones makes them more acceptable. The demand for herbal formulations is rising on the global market. *Matricaria chamomilla* (synonym: *Matricaria recutita*), commonly known as chamomile (also spelled camomile), is an annual plant of the composite family Asteraceae. Chamomile is known mostly for its use against gastrointestinal problems; additionally, it can be used to treat irritation of the skin. The purpose of this study is to test the herbal gel of *Matricaria chamomilla* for effective treatment of topical microbes. The flowers of plant *Matricaria chamomilla* were collected and subjected to extraction by Maceration. The extractive value was determined in terms of percentage yield & phytochemical analysis was also performed. The prepared gel was tested for various parameters along with antimicrobial activity. The results showed that the percent yield was found to be 7.21%. Phytochemical test showed the presence of various bioactive compounds such as Carbohydrates, Flavonoids, Proteins & Amino acids, Diterpenes and Saponins. The total flavonoid content was found to be 0.832mg/100mg. The herbal gel evaluation showed that all of them have clear colour, No clogging, good homogeneity and smooth texture. In all formulations of gel the spreadability and viscosity of HG5 is good was found to be  $12.12 \pm 0.15$  and  $3650 \pm 25$ . The skin irritation test performed showed no signs of sensitivity, erythema and edema. The antimicrobial study revealed that the formed gel have zone of inhibition of  $12 \pm 0.5$  against *P. acne* at 100 mg/ml concentration. So the prepared formulations were considered to be non-irritant with appreciable antimicrobial activity.

**Keywords:** *Matricaria chamomilla*, Herbal gel, Topical microbes, anti-microbial activity**Corresponding author:****Vivekanand Katare,**

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**INTRODUCTION:**

Herbal medicine has become an item of global importance both medicinal and economical. Although usage of these herbal medicines has increased, their quality, safety and efficiency are serious concerns in industrialized and developing countries. Natural remedies are more acceptable in the belief that they are safer with fewer side effects than the synthetic ones. Herbal formulations have growing demand in the world market. Plant play a vital role in curing various ailments of the man and herbal remedies are getting increasing patient compliance as they are devoid of typical side effects of allopathic medicines. Herbal medicines encompass the combination of practices of indigenous systems of medicine and several therapeutic experiences of many previous generations. Which delivers valuable guidelines to the selection, preparation, and application of herbal formulation for the treatment, control, and management of a range of illnesses. Plant-based drugs are reported to be successfully used to cure skin diseases, tuberculosis, diabetes, jaundice, hypertension, mental disorders, cancer, AIDS, and many other infectious diseases. Countries with ancient civilizations like India, China, South America, and Egypt are still using several plant-based remedies for treating such ailments.. Phytocompounds and also their chemical analogs have provided abundant clinically useful drugs in the treatment of chronic and acute diseases. And still research is continued to search for newer therapeutic agents from medicinal plants(Khan and Ahmad,2019).

The increasing popularity and acceptability of herbal medicine is belief that all natural products are safe, cheaper, and commonly available. However, there are also some concerns are associated with herbal medicine regarding its pharmacognosy and standardization compared with conventional drugs. For the last two decades research efforts have been intensified in both developed and developing countries to scientifically evaluate using clinical and validate the herbal drugs. Hence, considering the greater future perspectives in herbal medicines, we attempted to review systematically the current status of its use in treating various diseases and associated pharmacological issues. Furthermore, need for future investigations in developing herbal drug as modern therapeutic agents is addressed (Chattopadhyay and Maurya,2016)

A gel is a semisolid system of at least two interpenetrating phases: a gelling agent and a liquid. Gels that contain water are called hydro gels, while those that contain an organic liquid are called organ

gels. Hydro gels, in the broad sense, include the matrix of water – soluble materials such as cellulose derivatives and natural gums. Gels are used pharmaceutically as lubricants and as carriers for spermicidal agents 10 and other drugs for their local effects and percutaneous absorption. Herbals are the oldest form of primary health care, which were used by all cultures throughout history. They were an integral part of the development of modern civilization (Nishihata *et al.*, 1988).

The practice of herbal medicine has existed since prehistoric times as the primary form of medicine. In this space age where the technology has very much advanced, herbal medicines still flourish and are finding exceptional acceptance in both the developing and the developed countries due to their natural origin and lesser side effects.

*Matricaria chamomilla* (synonym: *Matricaria recutita*), commonly known as chamomile (also spelled camomile), is an annual plant of the composite family Asteraceae. Commonly, the name *M. recutita* is applied to the most popular source of the herbal product chamomile, although other species are also used as chamomile. Chamomile is known mostly for its use against gastrointestinal problems; additionally, it can be used to treat irritation of the skin. Earlier plant products were used as a starting material for the preparation of semi synthetic drugs, but now a days modern herbal technology delivers medicinal plant extracts in a dosage form which can be adsorbed readily into the system using appropriate vehicle and excipients. The herbal extracts can be prepared in various formulations such as cream, lotions and gels. Safe and effective formulations deliver active substances to the desired site of action with negligible discomfort and side effects (Kolanos and Stice ,2021; Ansari *et al.*, 2006).

**MATERIAL AND METHODS:****Collection of plant:**

The flowers of selected plant namely *Matricaria chamomilla* were identified and collected from local areas of Bhopal, (M.P). The entire plant drug was authenticated by expert botanist of Department of Botany Geetanjali College Bhopal. All collected plant drug were cleaned, shade dried, pulverized into moderately coarse powder and stored in airtight container for further use.

**Pathogenic microbes used:**

The pathogenic bacteria used in the current study obtained from Microbial Culture collection, J.P.Hospital, Bhopal, Madhya Pradesh( India).

**Extraction of Plant:**

The plant Material (Flowers) was extracted with solvent (methanol) for about 24 hrs with randomly shaking. Shaking of the drug during maceration is essential in order to replace the saturated layers around the drug with fresh menstruum. The liquid extract was collected in a tarred conical flask. The solvent removed by evaporating the solvent using hot plate. The dry extract obtained was weighed to calculate the percentage yield (Pandey and Tripathi, 2014).

**Phytochemical screening:**

Preliminary phytochemical screening means to investigate the plant material in terms of its active constituents. In order to detect the various constituents present in the methanolic extracts of *Matricaria chamomilla* was subjected to the phytochemical tests as per standard methods (Kokate, 1994; Harborne, 1973)

**Total flavonoids content estimation:**

Determination of total flavonoids content was based on aluminium chloride method<sup>35</sup>. 10 mg quercetin was dissolved in 10 ml methanol, and various aliquots of 5- 25 µg/ml were prepared in methanol. 10 mg of dried extract was dissolved in 10 ml methanol and filter. Three ml (1mg/ml) of this extract was for the estimation of flavonoid. 1 ml of 2% AlCl<sub>3</sub> solution was added to 3 ml of extract or each standard and allowed to stand for 15min at room temperature;

absorbance was measured at 420 nm (Olufunmiso, *et al.*, 2011)

**Preparation of gel base:**

Carbopol 934 was dissolved slowly with stirring in 60 mL of demineralized water for 1 h to avoid agglomeration. Then disodium edentate and triethanolamine were dissolved in 10 mL of demineralized water separately and stirred for 10 min. Mixed 4.83 mL of propylene glycol in 12 mL of demineralized water with stirring for 10 min. Disodium edetate and triethanolamine solution were added to Carbopol solution and the pH was then adjusted to 7.4 by stirring the solution for 10 min. Then propylene glycol solution was added with stirring for 10 min until a clear consistent gel base was obtained.

**Preparation of Topical Gel:**

Measured quantity of methyl Paraben, glycerin, polyethylene glycol and methanolic extract of *Matricaria chamomilla* was dissolved in about 35 ml of water in beaker and were stirred at high speed using mechanical stirrer (or sonicator). Then carbopol 940 was added slowly to the beaker containing above liquid while stirring. Neutralized the solution by slowly adding triethanolamine solution with constant stirring until the gel is formed. All the samples were allowed to equilibrate for 24 hours at room temperature prior to performing rheological measurements (Shukla *et al.*, 2019).

**Table 1 Formulation of herbal Gel**

Ingredients (%)	HG1	HG2	HG3	HG4	HG5	HG6
<i>Matricaria chamomilla</i> extract	1gm	1gm	1gm	1gm	1gm	1gm
Carbopol 940	0.25mg	0.5mg	0.75mg	1.0 gm	1.25 gm	1.5 gm
Polyethylene Glycol	0.2ml	0.2ml	0.2ml	0.2ml	0.2ml	0.2ml
Methyl Paraben	0.08mg	0.08mg	0.08mg	0.08mg	0.08mg	0.08mg
Triethanolamine	1.0ml	1.0ml	1.0ml	1.0ml	1.0ml	1.0ml
Distilled Water (q.s)	100ml	100ml	100ml	100ml	100ml	100ml

**Evaluation of herbal gel:****Appearance and consistency:**

The physical appearance was visually checked for the texture of herbal gel formulations.

**Washability:**

Formulations were applied on the skin and then ease and extent of washing with water were checked manually.

**Extrudability determination of formulations:**

The herbal gel formulations were filled into collapsible metal tubes or aluminum collapsible tubes. The tubes were pressed to extrude the material and the extrudability of the formulation was checked.

**Determination of Spreadability:**

A special apparatus has been designed to study the Spreadability of the formulations. Spreadability is expressed in terms of time in seconds taken by two slides to slip off from formulation, placed between, under the application of a certain load. Lesser the

time taken for the separation of two slides, better the Spreadability.

#### Determination of Ph:

The pH of the herbal gels was determined by digital pH meter. One gram of gel was dissolved in 25 ml of distilled water and the electrode was then dipped in to gel formulation until constant reading obtained. And constant reading was noted. The measurements of pH of each formulation were replicated two times (Barry,1983; Jain *et al.*, 2007).

#### Drug content:

The drug content was determined by taking 1gm of gel in 10 ml volumetric flask diluted with methanol. 3 ml of stock solution was mixed with 1 ml of 2 % AlCl<sub>3</sub>. The mixture was vortexed for 15s and allowed to stand for 30min at 40°C for colour development. The absorbance was measured at 420 nm using a spectrophotometer (Lachman *et al.*,1976; Schoch,1968).

#### Antimicrobial activity:

The herbal gel of *Matricaria chamomilla* was tested against the topical microbe *P.acne*. The well diffusion method was used to check the antimicrobial activity.

#### RESULTS & DISCUSSION:

The yields were found to be (7.21% w/w of crude drug) of extract methanolic extract *Matricaria chamomilla*. Results of Phytochemical test showed the presence of various bioactive compounds such as Carbohydrates, Flavonoids, Proteins & Amino acids, Diterpenes and Saponins. Phenol s or phenolic compounds were found to absent in methanolic extract of *Matricaria chamomilla* flowers. The results of phytochemical reveals that the all polar and Methanolic and aqueous soluble compound was found to be present in *Matricaria chamomilla* flowers extract. The total flavonoid content was found to be 0.832mg/100mg. The herbal gel evaluation showed that all of them have clear colour, No clogging, good homogeneity and smooth texture. In all formulations of gel the spreadability and viscosity of HG5 is good was found to be 12.12±0.15 and 3650±25. The skin irritation test performed showed no signs of sensitivity, erythema and edema. The antimicrobial study revealed that the formed gel have zone of inhibition of 12±0.5 against *P. acne* at 100 mg/ml concentration. So the prepared formulations were considered to be non-irritant with appreciable antimicrobial activity.

**Table: 2 Extractive values obtained from *Matricaria chamomilla*.**

S.N.	Solvent	% Yield
1.	Methanol	7.21%

**Table: 3 Preliminary phytochemical screening of methanolic extract *Matricaria chamomilla*.**

S.N.	Phytoconstituents	Test Name	Extract
1	Alkaloids	Wagner's Test	+(ve)
2	Carbohydrates	Fehling's Test	+(ve)
3	Flavonoids	Lead acetate	+(ve)
		Alkaline reagent test	+(ve)
4	Proteins & Amino acids	Precipitation test	+(ve)
5	Phenols	Ferric chloride test	+(ve)
6	Diterpenes	Copper acetate test	+(ve)
7	Saponins	Foam test	-(ve)

**Table: 4 Total Flavonoid content of methanolic extract *Matricaria chamomilla***

S. N.	Extracts 100µg/ml	Flavonoid content Quercetin equivalent mg/100mg
1	methanolic extract <i>Matricaria chamomilla</i> (100µg/ml)	0.832

**Table 5 Results of psycho rheological characteristics**

Formulation	Colour	Clogging	Homogeneity	Texture
HG1	Brown	Absent	Good	Smooth
HG2	Brown	Absent	Good	Smooth
HG3	Brown	Absent	Good	Smooth
HG4	Brown	Absent	Good	Smooth
HG5	Brown	Absent	Good	Smooth
HG6	Brown	Absent	Good	Smooth

**Table 6 Results of washability, extrudability, spreadability, pH, Viscosity**

Formulation	Washability	Extrudability	Spreadability (gcm/sec)	pH	Viscosity (cps)
HG1	Good	Average	14.22±0.11	6.81± 0.12	3150±10
HG2	Good	Average	13.64±0.14	6.94±0.14	3256±15
HG3	Good	Average	13.16±0.24	7.01±0.12	3365±18
HG4	Good	Average	12.64±0.34	7.04±0.11	3458±20
HG5	Good	Average	12.12±0.15	7.00±0.12	3650±25
HG6	Good	Average	12.26±0.32	7.14±0.12	3562±22

**Table 7: Antimicrobial activity of gel against selected microbes *Matricaria chamomilla***

S. No.	Name of microbes	Zone of inhibition		
		25mg/ml	50 mg/ml	100mg/ml
1.	<i>p.acne</i>			
	<i>Matricaria chamomilla</i> gel	7±0.3	11±0.5	12±0.5

**CONCLUSION:**

The present study was aimed to developed herbal gels for topical application and treatment of skin diseases (Acne) using methanolic extract *Matricaria chamomilla* flower an aqueous based Carbopol gel system and evaluated for their physicochemical properties, like pH and Spreadability. Further phytochemical studies are also required to isolate and characterize active ingredients that are responsible for its anti acne activity and to explore the existence of synergism if any, among the compounds.

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