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RESEARCH ARTICLE

FORMULATION AND EVALUATION OF NOBEL HERBAL GEL CONTAINING HYDROALCOHOLIC EXTRACT OF *CYMBOPOGON CITRATES*

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ABSTRACT

Cymbopogon citrates staff is popularly known as citronella grass or lemongrass. This species belongs to the Gramineae family. The use of medicinal plants is part of a competitive market, which includes pharmaceuticals, food, cosmetics, and perfumery markets. The aim of this study is to perform phytochemical screening, formulation and evaluation of Nobel herbal gel containing Hydroalcoholic extract of *cymbopogon citrates.* The phytochemical screening, formulation and evaluation of herbal gel were performed by standard methods. The results show that the % yield was frond to be 8.24% w/w. Carbohydrates, Flavonoids, Proteins & Amino acids, Diterpenes and Saponins were found to be present. Phenol s or phenolic compounds were to absent in Hydroalcoholic extract *Cymbopogon citrates* leaves. In all formulations of gel the Spreadability and viscosity of HG5 is good was found to be 12.12±0.15 and 3650±25. Extrudability study was performed by gel formulations were filled into aluminum collapsible tubes, the formulation have average extrudability. The skin irritation test performed showed no signs of sensitivity, erythema and edema.

Key words: *Cymbopogon citrates*, phytochemical screening, and Herbal gel.

INTRODUCTION:

Herbal medicine, as a major part of traditional medicine, has been used in medical practice since antiquity and is a common element of ayurvedic, homeopathic, and naturopathic medicine. World health organization (WHO) notes that 74% of the plant derived medicines are used in modern medicine, in a way that their modern application directly correlates with their traditional use as herbal medicines by native cultures (Kumar and Parmar, 2003; Mukherjee 2002).

Cymbopogon citrates staff is popularly known as citronella grass or lemongrass. This species belongs to the Gramineae family. The use of medicinal plants is part of a competitive market, which includes pharmaceuticals, food, cosmetics, and perfumery markets. The chemical composition of the essential oil of *Cymbopogon citratus* varies according to the

geographical origin, the compounds as hydrocarbon terpenes, alcohols, ketones, esters and mainly aldehydes have constantly been registered. Lemon grass contains active ingredients like myrcene, an antibacterial and pain reliever, citronellal, citronellol and geraniol. The essential oil consists of, mainly, citral a volatile oil with strong lemon fragrance. Citral is a mixture of two stereoisomeric monoterpene aldehydes; the trans isomer geranial (40-62%) dominates over the cis isomer neral (25-38%) and is used in manufacture of perfumes, colored soaps and synthesis of Vitamin A (Carianne, 2005; www.ukessays.com).

A gel is a semisolid system of at least two interpenetrating phases: a gelling agent and a liquid. Gels that contain water are called hydrogels, while those that contain an organic liquid are called organogels. Hydrogels, 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 (Esposito et al., 1996) and other drugs for their local effects and percutaneous absorption (Nishihata et al., 1996).

A hydrogel is a three-dimensional network of hydrophilic polymer chains that could be crosslinked through either chemical or physical bonding. Because of the hydrophilic nature of polymer chains, hydrogels are capable of swelling when placed in aqueous media, i.e., they retain a significant amount of water but remain water-insoluble. When the polymers are crosslinked, the hydrophobicity of a gel is increased and the diffusion rate of the drug is diminished. These characteristics of hydrogels, as well as their biocompatibility, increased duration of action with increased therapeutical efficiency due to the viscosity of the gel matrix and soft consistency (easy and safe administration at home by nonmedical persons) (Narin, 1997; Reddy et al., 2010).

Topical application of gels at pathological sites offer great advantage in a faster release of drug directly to site of action, independent of water solubility of the drug as compared to creams and ointments (Loganathan et al., 2001; Libermann et al., 1987). The aim of this study is to perform phytochemical screening ,formulation and evaluation of nobel herbal gel containing Hydroalcoholic extract of *cymbopogon citrates.*

MATERIAL AND METHODS

Collection, Authentication Plant Drugs

The leaves of selected plant namely *Cymbopogon citrates* 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.

Extraction of Plant Drug

The plant Material (Leaves) was extracted with Hydroalcoholic solvent (methanol: water) 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 et al., 2014).

Preliminary Phytochemical Screening

Phytochemical screening:

Chemical tests were carried out using aqueous extract to identify various constitutes using standard methods (Kokate, 1994; Harborne, 1973).

Quantification of secondary metabolites

Total flavonoids content estimation

The total flavonoid content was determined using the method of Olufunmiso et al (Olufunmiso, 2011). 1 ml of 2% AlCl3 solution was added to 3 ml of extracts or standard and allowed to stand for 15 min at room temperature; the absorbance of the reaction mixture was measured at 420 nm using UV/visible spectrophotometer The content of flavonoids was calculated using standard graph of quercetin and the results were expressed as quercetin equivalent (mg/100mg).

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 (Shukla et al., 2019**)**

Measured quantity of methyl paraben, glycerine, polyethylene glycol and hydroalcoholic extract of *Cymbopogon citrates* 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 (Table 1).

Table 1: Formulation of herbal Gel

Ingredients (%)	HG1	HG2	HG3	HG4	HG5	HG6
Cymbopogon citrates 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.

Washablity

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.

Method: Two glass slides of standard dimensions (6×2) were selected. The anti-acne gel formulation whose Spreadability had to be determined was placed over one of the slides. The second slide was placed over the slide in such a way that the formulation was sandwiched between them across a length of 6 cms along the slide. 100 grams of weight was placed up on the upper slide so that the herbal gel formulation between the two slides was traced uniformly to form a thin layer. The weight was removed and the excess of the antiacne gel formulation adhering to the slides was scrapped off. The lower slide was fixed on the board of the apparatus and one end of the upper slide was tied to a string to which 20 gram load could be applied 50with the help of a simple pulley. The time taken for the upper slide to travel the distance of 6 cms and separate away from lower slide under the direction of the weight was noted. The experiment was repeated and the average of 6 such determinations was calculated for each herbal gel formulation

$$\textbf{Spredability} = \frac{\mathbf{m.l}}{\mathbf{t}}$$

Where, S=Spreadability (gcm/sec), m = weight tied to the upper slide (20 grams), l= length of glass slide (6cms), t = time taken is seconds.

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.

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 % AlCl3. 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 (Barry, 1983; Jain et al., 2007; Lachman et al., 1994; Schoch et al., 1968).

RESULTS AND DISCUSSION

The plant drug (100g) was subjected to extraction by (maceration) using Hydroalcohol (methanol: water) in the ratio of 20: 80 as solvent for about 24 hrs. The liquid extracts were collected in a tarred conical flask. The solvent removed from the extract by evaporation method using hot plate. The extracts obtained with each solvent were weighed to a constant weight and percentage w/w basis was calculated. The yields were found to be (8.24% w/w of crude drug) of Hydroalcoholic extract *Cymbopogon citrates* leaves. Obtained results were recorded in (Table 2).

Observations

Table 2: Extractive values obtained from *Cymbopogon citrates*

S.No.	Solvent	% Yield
1.	Methanol+water (20:80)	8.24%

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 Hydroalcoholic extract *Cymbopogon citrates* leaves. The results of phytochemical revels that the all polar and Methanolic and aqueous soluble compound was found to be present in *Cymbopogon citrates* leaves extract. The results were shown in the (Table 3).

Table 3: Preliminary phytochemical screening of *Cymbopogon citrates*

S.No.	Phytoconstituents	Test Name	Hydroalcoholic 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)**

Estimation of total flavonoids content

Flavonoid content was calculated from the regression equation of the standard plot (y = 0.021x + 0.005 R^2 = 0.996) and is expressed as quercetin equivalents (QE) (fig.). Total Flavonoid content was 0.823mg/100mg quercetin equivalent in Hydroalcoholic extract *Cymbopogon citrates***.** Flavonoids are the most common and widely distributed group of plant's phenolic compounds. The results were shown in (Table 5 and fig 1).

Table 4: Absorbance of standard Compound at 415nm

S. No	Concentration of Quercetin (µg/ml)	Mean absorbance
1	10	0.214
2	20	0.417
3	30	0.677
4	40	0.874
5	50	1.055

n=3, values are given in SEM

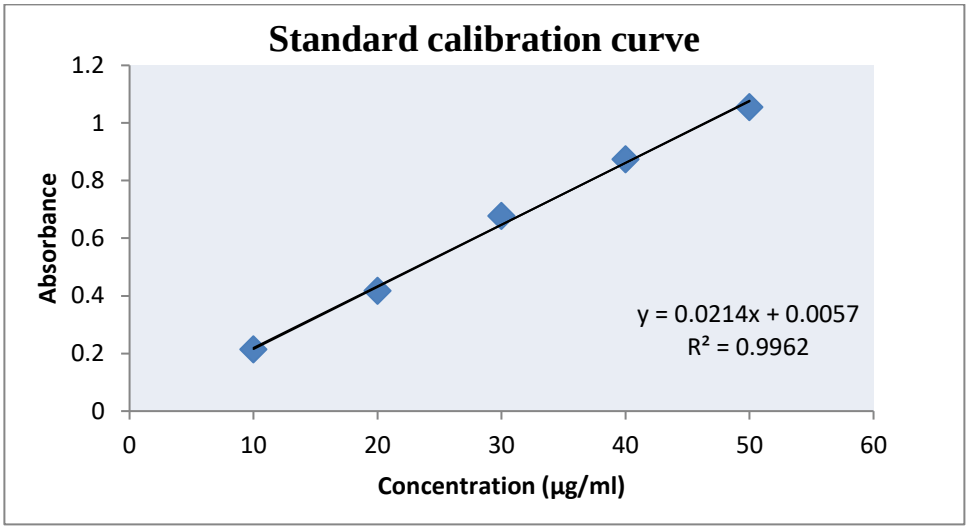

Figure 1: Standard (Quercetin) Calibration curves

Table 5: Total Flavonoid content of Hydroalcoholic extract *Cymbopogon citrates*

S. No.	Extracts 100µg/ml	Flavonoid content Quercetin equivalent mg/100mg
1	Hydroalcoholic extract (100µg/ml)	0.832

n=3, values are given in SEM

Evaluation of Herbal gel

From the psychorheological characteristics studies of formulation showed that all of them have clear colour, No clogging, good homogeneity and smooth texture Table 6. The results of washablity, extrudability, Spreadability, pH, viscosity were given in Table 7.

In all formulations of gel the Spreadability and viscosity of HG5 is good was found to be 12.12±0.15 and 3650±25. Extrudability study was performed by gel formulations were filled into aluminum collapsible tubes, the formulation have average extrudability. The skin irritation test performed showed no signs of sensitivity, erythema and edema. So the

prepared formulations were considered to be non-irritant.

Table 6: 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 7: 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

Conclusion

The present study was aimed to developed herbal gels for topical application and treatment of skin diseases using Hydroalcoholic extracts of *Cymbopogon citrates* leaves 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 topical application for skin diseases and to explore the existence of synergism if any, among the compounds.

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