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Preparation and Characterization of the Poly Herbal Gel for the Treatment of Psoriasis Disease

Sravanthi Yamsani[1]*, Parameshwar Aleti[2], Sravanthi.P[3], Ramyakrishna Samala[4], Manjula Katkuri[5]
S.R.R. College of Pharmaceutical Sciences, Valbhapur (v), Elkathurthy (m), Hanumakonda (D), Telangana

A B S T R A C T
The main objective of present study is to prepare and evaluate polyherbal gel for treatment of psoriasis by using the collection of plant extracts and by using the chemicals like carbopol 940 and 934, xanthangum. For quick relief in different allergic conditions and skin irritations. The main objective of present study is to prepare and evaluate a polyherbal gel of curcumin, banana, orange, neem, aloe for Psoriasis for quick relief in different pain, acne, rashes, and burning sensation. The Calibration curve of Polyherbal gel in phosphate buffer pH 6.8-7 in were plotted. Gelling agent used in poly herbal gels carbopol 940, carbopol 934 and xanthan gum. All the prepared gells were evaluated from surface pH (6.2-7.0), spreadability (4-5.8) antimicrobial activity (2-2.2cm) were studied. All the gels prepared were formed to be smooth non sticky, homogenous & transparent with no visible reticulate matter. The surface PH was found to be in the range of 6.8-7 which is close to the neutral pH which indicated that the gel may have less potential to irritate. For the Identification of spreadability of gel formulation the spreadability apparatus which contain two glass slides of (20x20cm) is used. All the formulation of gels was stored in container and they are visually observed to identify for their appearance of any type of aggregates in the gel formulations. The drug content present in the formulation was identified with the help of linear regression analysis of calibration curve. Among six formulations, the F3 formulation was released more drug content when compared to other formulations. The content of active constituent was estimated spectrophometrically by using 268 nm λmax of herbal gel.
Keywords: antimicrobial activity, curcumin, banana, orange, neem, aloe

A R T I C L E I N F O

***Corresponding Author**
Sravanthi Yamsani
S.R.R. College of Pharmaceutical Sciences,
Valbhapur (v), Elkathurthy (m),
Hanumakonda (D), Telangana

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C O N T E N T S

1. Introduction

Orange (Citrus sinensis):
Synonym: Sweet orange, sweet orange tree.
Family: Ruraceae
Biological source: These plants are often characterized as trees and shrubs, usually havingstrong scents.
Genus: Citrus
Orange peel, which is the primary waste fraction in the production of orange juice, contains flavonoids associated with antioxidant activity (Kanaze et al 2008). The glycosides hesperidin and naringin are mainly responsible for the purported antioxidant activity of citrus peel extracts (Kanaze et al 2008). Coniferin and phlorin are additional phenols in orange peels that have been found to aid in radical scavenging when administered in the form of orange peel molasses (Manthey 2004). Orange peel extract contains citrus–derived polymethoxylated flavones that have an inhibitory effect on TNF–α expression in horses. One study in exercising horses reported that 30 g orange

peel extract administered via nasogastric tube decreased IFN–γ expression at fatigue, and decreased the recovery time of cardiovascular parameters as compared to control. In a companion study, horses administered the orange peel extract one hour before exercise had significantly lower concentrations of plasma retinol compared to the control group (Smarsh et al 2010). Supplementation with hesperidin, a flavanone glycoside found in orange peel, may affect antioxidant status in animals undergoing physiological challenges.

Fig.1. Citrus peel (Orange peel)

Aloevera (Barbaloin):

Aloe vera is a herb with succulent leaves that are arranged in a rosette. The leaves are grey to green and sometimes have white spots on their surfaces. They have sharp, pinkish spines along their edges and are the source of the colourless gel found in many commercial and medicinal products.A phytoconstituents "Barbaloin" which is obtained from the plant aloe vera is used for the effective treatment of psoriasis. According to the investigation Patel DK et al., 2012 had revealed that Barbaloin shows good antiinflammatory, antimicrobial and antipsoriatic property.8 Barbaloin make use of their protective action mainly through antioxidant and antiinflammatory mechanisms. Hence, Barbaloin up-regulated TFGβ1, bFGF, and Vegf-A expression infibroblasts and increased keratinocyte proliferation and differentiation by lysosomal membrane stability. Additionally, Furthermore, Barbaloin exerted skin protection by reducing IL-8 production, DNA damage, lipid peroxidation, and ROS generation and by increasing GSH content and SOD activity.

Aloe Vera Benefits: The nutrients found in aloe vera juice can provide some health benefits. Beta-carotene is a yellow-red pigment that's found in aloe vera plants. It acts as an antioxidant that can help support eye health, including retinal and corneal function.

Relieves heartburn: Heartburn is a painful condition that involves acid leaving the stomach and traveling up the esophagus. A recent study has shown that aloe vera juice can reduce the symptoms of heartburn without any uncomfortable side effects.

Fig.2. Aloevera plant

Neem(Azadirachta indica):

Synonyms: Neem, Nimtreee, Indian lilac

Biological Source: Neem tree

Family:- Meliceae

Neem consists of about: Neem fruit, seeds, leaves, stems, and bark contain diverse phytochemicals, some of which were first discovered in azadirachta seed extracts, such as Azadirachta established in the 1960s as an insect antifeedant, growth disruptor, and insecticide. The yield of Azadirachtin from crushing 2 kg of seeds is about 5 g.In addition to Azadirachta and relatedlimonoids, the seed oil contains Glycerides, diverse Polyphenols, nimbolide, triterpenes, and beta-sitosterol. The yellow, bitter oil has a garlic-like odor and contains about 2% of limonoids compounds.10The leaves contain quercetin, catechins, carotenes, and vitamin C. Neem leaves are dried in India and placed in cupboardsto prevent insects eating the clothes, and also in tins where rice is stored. The flowers are also used in many Indian festivals like Ugadi**,** as a vegetable**,** Traditional medicine, Insecticide, Pesticide, Neem oils for polymeric resins.

Fig.3. Neem leaves powder

Curcumin

Synonyms: Curcumin, Curcuma Longa, Turmeric Root, and Wild Curcuma.

Biological source: Curcumin is the active ingredient of the dietary spice turmeric and is extracted from the rhizomes of C. longa, a plant in the Zingiberaceae

Family: Zingiberaceae

Fig.4. Rhizomes of curcumin powder

Banana peel:

Synonym: plantain, rainiest, banana tree

Family: Musaceae

Genus: Musa

Bioactive substances found in banana peels include phlobatannins, tannins, alkaloids, flavonoids, glycosides, anthocyanins, and terpenoids, all of which have biological and medicinal properties such as antibacterial, anti-inflammatory, antidiabetic, anti-hypertensive properties. Bananas and banana peels can both offer different health

benefits depending on how ripe they are. Unripe green bananas may be more effective in treating digestive problems. While bananas are ripe, bananas have been shown to help white blood cells fight disease and infection. Here are some of the health benefits of bananas and the potential nutritional value of banana peels.

2. Methodology

Chemicals:

Analytical grade chemicals were used for the study. The solid media and broth used for microbial culture were procured from Pharmaceutical lab.Carbopol 940 (Merck Ltd), propylene glycol-400 (SD Fine Chemical Ltd), Ethanol (Merck Ltd), methyl paraben (Supreme Chemicals), propyl paraben (Supreme Chemicals), Triethanolamine (SD Fine Chemical Ltd).

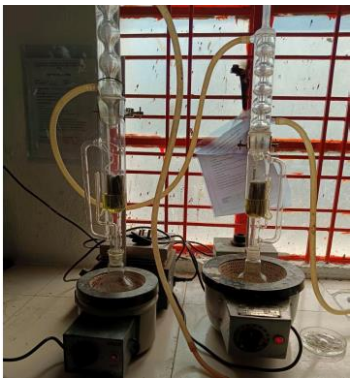

Fig.5. Extraction of Orange and Banana peels

Collection and extraction of plant parts:

Citrus sinensis (Orange) extraction: Take 5-6 fresh oranges and wash it under running tap. Then remove the peel by using graters, the peels are dried under shade (sun light) for 15 days. Take the dried peels into the mixer until the fine powder was formed.-Take the powder in the strainer and sieve. Accurately weigh the 20 grams of orange peel powder, take the 125ml of ethonal. Essential oil extraction from orange peel was done using soxhlet apparatus.

Preparation of polyherbal gels:

Formulation 1,2,3,4,5,6 were prepared which comprised of ethanolic and methanoli extract of Azadirachta indica, curcumalanga, citrus sinensis, musasp(banana), Asphodelaceae (Aloe Vera) in a concentration of 1gm, 1.5gm respectively. Carbapol- 940, propylene glycol 400, ethanol, methyl paraben, propyl paraben, and tri-ethanolamine were used to prepare 100 gm of gel by adding sufficient quantity of distilled water.Carbapol-940 was dissolved and to this solution methyl paraben, propyl paraben and was added Both of the solutions were mixed in a beaker and tri-ethanolamine was added to the mixture drop wise to obtain the gel consistency. It was stirred by using magnetic stirrer for 45 min at 1200 rpm to obtain a homogenous gel, devoid of any entrapped air bubbles. Various formulation batches were prepared . Plant extracts were excluded to make the Gel base. The prepared gel formulations and base were kept at room temperature for 24 hours

Evaluation tests for Polyherbal gel :

Effect of Gelling agents

For the formulation and characterization of herbal gel we had selected four polymers as gelling agents which include carbolpol-934, carbolpol-940, Xanthan gum. All these polymers were used in different concentration in the range of 1.0-1.5 %. Some of these are used in combination with each other and some were used as single gelling agent. The changes in each formulation help us to understand the behavior of gelling agents and also helpful to find out their effect in the formulation of hydrogels. They were further evaluated to know their appearance, spreadability, changes in viscosity, and swelling index etc.

Appearance and homogeneity: The prepared gels and control (base) were tested for physical appearance and homogeneity by visual observation.

pH: Digital pH meter (Systronics digital-DI-707) was used to determine pH of the prepared formulations and control (base). 3 gm of gel was accurately weighed and dispersed in 30 mL of distilled water and stored for two hours, then pH was measured separately.

Drug Content:

From each formulation 1 gm of gel was taken in a 100 mL volumetric flask and made up to volume by pH 6.8 phosphate buffer and shaken well to dissolve the active constituents in solvent. The solution was sonicated for few minutes and filtered it with the help of what man filter paper. After that, 0.1 mL of the filtrate was pipetted out and diluted upto10 mL with pH 6.8 buffer. The content of active constituents was estimated spectrophotometrically by using 268nm λmax of herbal gel. The drug content present in the formulation was identified with the help of linear regression analysis of calibration curve.

Swelling Index:

For the determination of swelling index we take 1gm quantity of gel and then it was filled in a clean and dry (50 mL) beaker, the beaker hold 10 mL of distilled water. The samples were retained in a beaker for period of time and then after some time kept out the gel from beaker and put into a dry or clean place for some times and weight it again to calculate and find out how much percent of the gel was swelled. We can calculate the swelling index by applying this formula:

$$SW\ (\ ) = \frac{[Wt-Wo] * 100}{W}$$

Where, (SW) % = % age swelling

Wt = Swollen gel weight after time (t)

Wo = Initial weight of gel

3. Results and Discussion

Pre formulation Study of Poly Herbal Gels

Physical Description

The poly herbal drug is obtained in Lemon yellow, light green, odour, pH, turbidity, light cream colored powder. Polyherbal gel texture is smooth. Gel formulation translucent and colour is reddish brown. Carbopol was found to be suitable candidate it gives better consistency viscous PH and in-vitro drugs diffusion. Triethanolamine was taken as a neutralizer and maintain the PH.

Determination of pH

The pH of the herbal gel was found to be 6.62-7.08.

Stability of polyherbal gel

Stability of the base and formulations (1, 2, 3, 4, 5, and 6) were studied at different storage conditions and assessed for their physical characteristics like color, appearance and odor.

Evaluation of poly herbal gel:

1. Physical analysis of the prepared polyherbal gel

It was observed that the freshly prepared formulations were off white to yellow in color. Regarding the base and formulation 1, 2, 3, 4, 5, and 6 there was no change in color, odor and appearance up to the observation period of 30 days at 80C and 40°C using different storage conditions, also the Formulations 1, 2, 3, 4, 5, and 6 were stable.

2. pH of the prepared formulations

It was found to be in the range of 6.62 to 7.08, kept at different storage conditions for 30 days. pH of the formulations and base kept at 8°C for one month did not show much change and data were significant over control (base) during one month ($p < 0.05$). Interestingly at 40°C, formulation A exhibited elevated change in pH (7.08), while the others remained slightly stable during one-month study. Data of formulations 1, 2, 3, 4, 5, and 6 at 40°C were found to be significant.

3. Spreadability

Spreadability of the base and formulations (1, 2, 3, 4, 5, and 6) were studied and found to in the range of 8.3±0.09 to 10.0±0.01. All the formulations and base were found to possess good spreadability. For the identification of spread ability of gel formulations the spreadability apparatus which contain two glass slides of (20×20 cm) is used. We take 1gm of gel and placed it on one slide. The second slide was placed over the gel and due to this the gel was pressed and spreaded between two glass slides. After that, the 100 gm of weight was placed over the top slide to press the gel freely and it will give us thin layer. The weight was removed and 20 gm weight was tied to the upper slide carefully. The total time taken by top slide and the traveled distance of slide were examined.28 the whole procedure was performed three times and the average time of three trials was used for further calculations.

The following formula was used to find out the spreadability:

Where, S = Spreadability
m = weight tied on top slides
l = length of the glass slide
t = time in sec.

4. Antimicrobial activity

It was determined by measuring the diameter of zone of inhibition. The results obtained in the evaluation of the antimicrobial activity of Formulation 1, 2, 3, 4, 5, and 6 control(base) against the selected micro-organisms.

5. Viscosity

Viscosity of gel was measured by use of Brookfield viscometer (LVDV-II+ Pro). The sufficient quantity of herbal gel was filled in sample holder separately. The height of the gel was filled in the sample holder should sufficiently allow to dip the spindle. Viscosities of the gels were recorded by adjusting the rotating speed of the spindle at 2.5 rpm.25

6. Drug Content

From each formulation 1 gm of gel was taken in a 100 mL volumetric flask and made up to volume by pH 6.8 phosphate buffer and shaken well to dissolve the active constituents in solvent. The solution was sonicated for few minutes and filtered it with the help of what man filter paper. After that, 0.1 mL of the filtrate was pipetted out and diluted upto10 mL with pH 6.8 buffer. The content of active constituents was estimated spectrophotometrically by using 268nm λmax of herbal gel. The drug content present in the formulation was identified with the help of linear regression analysis of calibration curve.

Stability of polyherbal gel:

Stability of the base and formulations (1, 2, 3, 4, 5, and 6) were studied at different storage conditions and assessed for their physical characteristics like color, appearance and odor (for 30 days).

Antimicrobial activity:

It was determined by measuring the diameter of zone of inhibition. The results obtained in the evaluation of the antimicrobial activity of Formulation 1, 2, 3, 4, 5, and 6 are control(base) against the selected micro-organisms are shown in Table . Base showed zone of inhibition in the range of 2.0±1.5 to 2.2±1.0 against *E.coli.* Formulation 1, 3, and 5 showed better zone of inhibition as compared to formulation 1, 2, 3, 4,5, and 6. Thus, formulation 3 exhibited maximum activity against selected strains due to high amount of herbal extracts in comparison to others.

Discussion:

Plants are considered to be a vital source of potentially useful constituents for the development of new therapeutic agents, as most of them are safe with less or no side effect(s). Topical application of gels at pathological sites offer great advantages in a faster release of a drug directly to site of action as compared to cream and ointment . Nowadays, gels have been widely used as a vehicle for topical delivery of drugs. Extracts of plants and herbs with specific medicinal properties can be incorporated in this dosage form as active ingredients in order to additional benefits *E. coli*, are amongst the commonest pathogens that can cause skin infections.

The antimicrobial properties of *Azadirachta indica, Curcuma langa, Citrus sinensis, Musaceae sp, and Aloe vera* plants have been previously investigated on some plant and human pathogens. However, their application and use in the raw form on to the skin surface is difficult therefore the extracts of these plants were developed in the form of gel formulation.

Cosmetically, the chemical constituents of *Azadirachta indica, Curcuma langa, Citrus sinensis, Musaceae sp, and Aloe Vera* are considered to be antiseptic and natural preservatives. Herbal cosmetic products are asumed to be safe for longer periods of time. However, quality control for efficacy and safety of herbal cosmetic products is of paramount importance; and quality control tests must therefore be carried out for these preparations. Stability studies and patch test are well known methods which will prove its efficacy and efficiency of the cosmetic herbal formulations. Short term stability studies as per ICH guidelines, revealed that the pH of all the formulations and base indicated variability at different storage conditions. Viscosity, Rheological studies, Spreadability, Acid Value,

Peroxide Value showed minimal variations in the results which proved that all the prepared formulations are stable for upto one month. Applicability of the herbal formulation was proved to be satisfactory from the results of viscosity and spreadability. In our studies it was observed that the prepared formulations readily spread on application to the skin or affected part and homogeneity confirmed no lumps, respectively. Also, the physicochemical parameters applied in the testing of stability of cosmetics formulations made apparent consequences that formulations 1, 3, and 5 is much better than formulations 2, 4, and 6 and base due to its relatively higher concentration of active constituents.

Literature surveys revealed that individually all extracts has potentially been known for their antimicrobial activity. However, no literature is available related to the formulation of a polyherbal formulation containing the extracts of *Azadirachta indica, Curcuma langa, Citrussinensis, Musaceae sp, and Aloe Vera* depicts the results of the patch test, which exhibited no irritation, redness on underarm after application of formulations 1, 2, 3, 4, 5 and 6 as reported by volunteers. Also, the results of washability test proved non-greasy properties of all prepared formulations. This study clearly indicated that formulation 1, 2, 3, 4, 5, and 6 which possessed plant extracts were more potent than the base. The possible explanation for this is the presence of active constituents of plants which exhibit antimicrobial activity. But as compared with other formulations the potency of formulation 3 was found to be greater.

Table.1. Formulation and Evaluation of Polyherbal Gel

S.NO.	EXCIPIENTS (%w/w)	F1*	F2	F3**	F4	F5*	F6	FUNCTION
1.	**Aloe Vera**	1.5	2.0	2.5	3.0	2.0	2.0	**API**
2.	**Neem Extract**	1.1	2.0	3.0	4.0	2.0	2.0	**API**
3.	**Orange peel Extract**	1.5	2.0	2.5	3.0	3.5	3.5	**API**
4.	**Curcumin Extract**	1.5	2.0	2.5	3.0	1.5	1.5	**API**
5.	**Banana peel Extract**	1.5	2.0	2.5	3.0	2.5	2.5	**API**
6.	**Carbopol 940**	1.0	1.5	--	--	--	--	**Gelling agent**
7.	**Carbopol 934**	--	--	1.0	1.5	--	--	**Gelling agent**
8.	**Xanthan gum & Carbopol 940**	--	--	--	--	1.0	1.5	**Gelling agent**
9.	**Triethanolamine**	0.2	0.2	0.2	0.2	0.2	0.2	**pH**
10.	**Methylparaben**	0.2	0.2	0.2	0.2	0.2	0.2	**Preservative**
11.	**Propylparaben**	0.1	0.1	0.1	0.1	0.1	0.1	**Preservative**
12.	**Glycerine**	5	5	5	5	5	5	**Co-solvent**
13.	**Propylene glycol**	5	5	5	5	5	5	**Co-solvent**
14.	**Dist.H_2O**	Q.S.	Q.S.	Q.S.	Q.S.	Q.S.	Q.S.	**Vehicle**

Table.2. Evaluation Parameters of Polyherbal Gel

Formulation Code	Appearance	Homogeneity	Spreading diameter after 1min	Values of pH	Diameter of zone of inhibition	Drug content	Viscosity	Swelling Index
F1	Light green	Good	48	6.84±0.07	2.1cm	95.56±0.65	47248	89
F2	Light green	Good	45	6.15±0.06	2.0cm	94.23±0.57	44116	80
F3*	Light green	Good	55	7.01±0.08	2.2cm	98.07±0.98	49582	90
F4	Light green	Good	44	7.63±0.08	2.0cm	92.78±0.59	45257	78
F5	Light green	Good	48	6.20±0.06	2.1cm	95.76±0.61	46241	85
F6	Light green	Good	40	6.66±0.07	2.0cm	93.01±0.53	43523	81

4. Conclusion

Psoriasis is a chronic inflammatory skin condition and immune mediated ailment. The prevalence of psoriasis occurs worldwide. In the treatment of skin diseases the best method for the delivery of drugs is through topical route. Herbal gel formulations of Citrus fruit, Banana Peel, and Aloe Vera, Neem, Curcumin *extract* were prepared with an

objective of increasing the skin permeation of drugs and effective to improve the efficacy of topical application for psoriasis. Multiple polymers in single and with combination were used to prepare the formulations of herbal gel. Herbal gels composed of carbopol 934, Xanthan gum, carbopol 940 and glycerin, propylene glycol, ethanol, and triethanolamine were prepared desirable gel characteristics good efficacy of the topical delivery of herbal drugs. The prepared formulations were evaluating for their physical appearance, pH, spreadability, grittiness, homogeneity, swelling index and drug content. In our study we find that formulation F1, F3 and F5 show good gelling properties.By comparing the all formulations of herbal gel they are further evaluated for in vitro drug release study, in which the formulation F3 showed highest release in 8hr's. The kinetics of invitro drug release showed that, the F1, F3and F5 formulations had good release kinetics and showed non fickian drug release as the n value was between 0.8-0.9. From these release parameters, formulations F3 showed highest release of herbal drugs in 8hr's. These results suggest the improvement of efficacy of topical gel for the treatment of psoriasis. The enhanced efficacy of herbal gel is due to increased penetration of drugs from hydrogel than conventional formulations.

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