Formulation and Evaluation of Herbal Fairness Cream Comprising Hydroalcoholic Extracts of *Pleurotus ostreatus*, *Glycyrrhiza glabra* and *Camellia sinensis*

Nirmala Gupta¹, Aditi Dubey², Pushpa Prasad², Amit Roy²

¹Department of Biotechnology, Institute for Excellence in Higher Education, Bhopal-462027 (M.P.), India  
²Columbia Institute of Pharmacy, Tekari, Raipur-493111 (C.G.), India

Abstract

The present study was carried out to prepare and evaluate the herbal fairness cream comprising extracts of *Pleurotus ostreatus*, *Glycyrrhiza glabra* and *Camellia sinensis*. The various types of formulations oil in water (O/W) base namely F1 to F6 were formulated by incorporating different concentrations Stearic acid and Cetyl alcohol. The pH, viscosity, spreadibility, and stability of prepared base were investigated. The base F3 was found appropriate for the preparation of cream. The extracts of varying ratio of *Pleurotus ostreatus*, *Glycyrrhiza glabra* and *Camellia sinensis* were incorporated in base F3 for the preparation of three herbal fairness cream (HF1, HF2 and HF3). All the three herbal cream demonstrated good spreadibility, good consistency, homogeneity, appearance, pH, ease of removal and no evidence of phase separation. All the prepared herbal cream was found to be safe for skin.

1 Introduction

India’s fairness cream market is evolving at rapid speed, filled by television advertisement by the celebrities and the rapidly changing lifestyles. India’s proactive FMCG market has seen the significant growth in the cosmetic market in last two decades and fairness cream accounts for the major part of the cosmetic market with an average growth rate of 20% per annum. Indians are witnessing a paradigm shift from traditional methods of using home products to modern methods of using branded cosmetics and fairness cream to become fair. The concept of preferring the people with “fair-skin” has long been recognized socially and it has been the psychological and social impact on women to be fair. But in the recent years, men to have started giving importance on personal grooming, beginning with fair skin. The market for fairness cream was restricted to woman only till 2005; but Emami catered to men with its product Fair and Handsome. Till then fairness cream market dominates the cosmetic market covering male and female segments. It is clear from television and matrimonial advertisements that the market for fairness creams in India is huge. The growth in consumerism and the changing life style of Indian youth have led to strong demand for fairness creams. India’s swelling middle class is redefining lifestyle pattern with adoption of western values and growing brand consciousness; creating opportunity for the global players in fairness cream market¹⁻³. Novel “phytoactive” ingredients are showing expansion in cosmeaceuticals. These ingredients are derived mainly from plants and it includes vitamins, minerals, antioxidants and hormones. Usage of plant extracts for cosmetics is increased because several animal derived extracts and synthetic chemicals proved unsatisfactory results. Thus, naturally derived phytomolecules will be particularly useful for further research in cosmetology. The products which are developed for the purpose of application on the body is for cleansing, beautifying or altering the appearance and enhancing the beauty and to reduce wrinkles, fight acne and to control oil secretion. Different herbal formulations are developed also for various types of skin ailments like skin protection, sunscreen, antiacne, antiaging and antwrinkle. Inspite of using single herbal formulation its better to develop polyherbal formulations to increase the purpose of cream and for maintenance of quality standards. The plant parts used in cosmetic preparation should have properties like antioxidant, antiseptic, antikerolytic, antibacterial, etc. The herbal products have fewer side effects which are commonly seen with products containing synthetic agents⁴⁻⁸.

Keywords:  
Camellia sinensis,  
Glycyrrhiza glabra,  
Pleurotus ostreatus,  
Herbal cream

¹Corresponding Author:  
E-mail: gniru2010@gmail.com  
Mob.: +919770209725

Article Information  
Received 5 January 2015  
Received in revised form 20 June 2015  
Accepted 21 June 2015

Available at www.ukjp.com
The plant used in formulation was selected on the basis of scientifically reported property. The best cosmetic product must contain following properties antioxidant property, anti-inflammatory, antibiotic, whitening agent, moisturizing properties etc. As per this concern we select following plants material of *Pleurotus ostreatus*, *Glycyrrhiza glabra* and *Camellia sinensis* for the development of herbal fairness cream.

Literature revealed that *Pleurotus ostreatus* possesses number of therapeutic properties like anti-inflammatory, immunostimulatory, anticancer activity, antioxidant property\(^9\)\(^-\)\(^{12}\) etc. and contain several biologically active compounds such as polysaccharides, polyphenolic compounds, flavonoids, tannins, peptides, proteins, glycoproteins, lectins, lipids and many more\(^13\)\(^\)\(^-\)\(^{15}\). *Glycyrrhiza glabra* are reported to be used as sweetners, flavorings and as herbal medicine and also used for improving health, detoxification, antioxidant property and cures for injury\(^16\)\(^-\)\(^{20}\). *Camellia sinensis* commonly known as green tea reported to have anticarcinogenic, antiviral, antioxidant property, antibacterial, antigenotoxic activity etc\(^21\)\(^-\)\(^{24}\). The properties of these plant extracts will support it as a apart of ingredient in cosmetic formulation. Thus, the present study carried out to formulate and evaluate the herbal fairness cream.

2 Material and Methods

2.1 Preparation of extracts

Air dried and coarsely powdered (500 gm) of *Pleurotus ostreatus*, *Glycyrrhiza glabra* root, and *Camellia sinensis* were placed in soxhlet extractor separately, using petroleum ether and then successively with ethanol (70%). The extracts were then concentrated to dryness under reduced pressure and controlled temperature, respectively and they were preserved in a refrigerator.

2.2 Preparation of cream base

Oil in water (O/W) emulsion-based cream (semisolid formulation) was formulated. The emulsifier (stearic acid) and other oil soluble components (Cetyl alcohol, almond oil) were dissolved in the oil phase (Part A) and heated to 75° C. The preservatives and other water soluble components (Methyl paraban, Propyl paraban, Triethanolamine, Propylene glycol, all extracts) were dissolved in the aqueous phase (Part B) and heated to 75° C. After heating, the aqueous phase was added in portions to the oil phase with continuous stirring until cooling of emulsifier took place.

### Table 1: Composition of cream base

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
<th>F6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stearic acid</td>
<td>13</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Cetyl alcohol</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Almond oil</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Glycerol</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Methyl paraban</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Triethanolamine</td>
<td>qs</td>
<td>qs</td>
<td>qs</td>
<td>qs</td>
<td>qs</td>
<td>qs</td>
</tr>
<tr>
<td>Water, qs, 100</td>
<td>qs</td>
<td>qs</td>
<td>qs</td>
<td>qs</td>
<td>qs</td>
<td>qs</td>
</tr>
</tbody>
</table>

2.4 Evaluation of cream

2.4.1 pH of the Cream

The pH meter was calibrated using standard buffer solution. About 0.5g of the cream was weighed and dissolved in 50.0 ml of distilled water and its pH was measured.

2.4.2 Viscosity

Viscosity of the formulation was determined by Brookfield Viscometer at 100 rpm, using spindle no 7.

2.4.3 Dye test

The scarlet red dye is mixed with the cream. Place a drop of the cream on a microscopic slide covers it with a cover slip, and examines it under a microscope. If the disperse globules appear red the ground colourless. The cream is o/w type. The reverse condition occurs in w/o type cream i.e. the disperse globules appear colourless in the red ground.

2.4.4 Homogeneity

The formulations were tested for the homogeneity by visual appearance and by touch.

2.4.5 Appearance

The appearance of the cream was judged by its color, pearlscence and roughness and graded.
2.4.6 After feel

Emolliency, slipperiness and amount of residue left after the application of fixed amount of cream was checked.

2.4.7 Type of smear

After application of cream, the type of film or smear formed on the skin were checked.

2.4.8 Removal

The ease of removal of the cream applied was examined by washing the applied part with tap water.

2.4.9 Acid value

Take 10 gm of substance dissolved in accurately weighed, in 50 ml mixture of equal volume of alcohol and solvent ether, the flask was connected to reflux condenser and slowly heated, until sample was dissolved completely, to this 1 ml of phenolphthalein added and titrated with 0.1N NaOH, until faintly pink color appears after shaking for 30 seconds.

\[
\text{Acid value} = \frac{n \times 5.61}{w}
\]

n - number of ml of NaOH required, w - weigh of substance.

2.4.10 Saponification value

Introduce about 2 gm of substance refluxed with 25 ml of 0.5 N alcoholic KOH for 30 minutes, to this 1 ml of phenolphthalein added and titrated immediately, with 0.5 N HCL.

\[
\text{Saponification value} = \frac{(b-a) \times 28.05}{w}
\]

a - volume in ml of titrant, b - volume in ml of titrant, w - weigh of substance in gm

2.4.11 Irritancy test

Mark an area (1sq.cm) on the left hand dorsal surface. The cream was applied to the specified area and time was noted. Irritancy, erythema, edema, was checked if any for regular intervals up to 24 hrs and reported.

2.4.12 Accelerated stability testing

Accelerated stability testing of prepared formulations was conducted for 2 most stable formulations at room temperature, studied for 7 days. They were formulation number 4 and 5 at 40 °C ± 1 °C for 20 days. The formulations were kept both at room and elevated temperature and observed on 0th, 5th, 10th, 15th and 20th day for the following parameters.\(^{25-30}\)

3 Results

3.1 Evaluation of base

Gupta et al. Formulation and Evaluation of Herbal Fairness Cream

3.1.1 pH of the Cream

The pH of the cream base was found to be in range of 6.2-6.9 which is good for skin pH. All the formulations of cream base were shown pH nearer to skin required (Table 2).

Table 2: Determination of pH of prepared cream base

<table>
<thead>
<tr>
<th>Formulation</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>6.4 ± 1.15</td>
</tr>
<tr>
<td>F2</td>
<td>6.2 ± 0.98</td>
</tr>
<tr>
<td>F3</td>
<td>6.9 ± 1.65</td>
</tr>
<tr>
<td>F4</td>
<td>6.6 ± 1.42</td>
</tr>
<tr>
<td>F5</td>
<td>6.8 ± 2.05</td>
</tr>
<tr>
<td>F6</td>
<td>6.7 ± 1.74</td>
</tr>
</tbody>
</table>

Values are mean ± S.D (n=3)

3.1.2 Viscosity

The viscosity of was cream was in the range of 27021-27053 cps which indicates spreadibilty of cream. In our study F2, F3 and F4 depicted easily spreadable by small amounts of shear, while F1, F5 and F6 were not easily spreadable on skin. But F3 shows good spreadable property than other formulations.

3.1.3 Acid value and saponification value

The results of acid value and saponification value of all formulation of cream base were presented in table 3, and showed satisfactorily values.

Table 3: Test applied for acid value and saponification value of cream base

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Formula</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F1</td>
<td>F2</td>
<td>F3</td>
<td>F4</td>
<td>F5</td>
<td>F6</td>
</tr>
<tr>
<td>Acid value</td>
<td>±</td>
<td>±</td>
<td>±</td>
<td>±</td>
<td>±</td>
<td>±</td>
</tr>
<tr>
<td></td>
<td>1.25</td>
<td>2.14</td>
<td>2.34</td>
<td>1.49</td>
<td>2.17</td>
<td>1.84</td>
</tr>
<tr>
<td>Saponification value</td>
<td>±</td>
<td>±</td>
<td>±</td>
<td>±</td>
<td>±</td>
<td>±</td>
</tr>
<tr>
<td></td>
<td>25.7</td>
<td>26.4</td>
<td>25.1</td>
<td>26.2</td>
<td>25.8</td>
<td>26.1</td>
</tr>
<tr>
<td></td>
<td>1.36</td>
<td>1.68</td>
<td>1.45</td>
<td>1.08</td>
<td>1.36</td>
<td>1.27</td>
</tr>
</tbody>
</table>

Values are mean ± S.D (n=3)
3.1.4 Irritancy test

The formulation F3 shows no redness, edema, Inflammation and irritation during irritancy studies. These formulations are safe to use for skin (Table 4).

Table 4: Type of Adverse effect of cream base

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Irritant</th>
<th>Erythema</th>
<th>Edema</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>F2</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>F3</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>F4</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>F5</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>F6</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
</tr>
</tbody>
</table>

3.1.5 Dye test

This dye confirms that all formulations were o/w type emulsion cream. But formulation (F3) shows more stable in o/w type emulsion. So here we select F3 cream base for further study.

3.1.6 Homogeneity

All formulations of base produce uniform distribution in cream. This was confirmed by visual appearance and by touch (Table 5).

3.1.7 Appearance

When formulation were kept for long time, it found that no change in colour of cream base (Table 5).

3.1.8 After feel

Emolliency, slipperyness and amount of residue left after the application of fixed amount of cream base was found (Table 5).

3.1.9 Type of smear

After application of cream base, the type of smear formed on the skin were non greasy (Table 5).

3.1.10 Removal

The cream applied on skin was easily removed by washing with tap water (Table 5).

3.2 Evaluation of cream

From above study, the F3 base was selected for the preparation of herbal cream. The three different cream namely HF1, HF2 and HF3 comprising of different concentration of the extracts. The composition of cream illustrated on table 6. The physical evaluation and stability of herbal is shown in table 7, and results were considerable and acceptable.

Table 5: Physical parameter of F3 cream base on room and accelerated temperature

<table>
<thead>
<tr>
<th>Days</th>
<th>Temp</th>
<th>pH</th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
<th>X5</th>
<th>X6</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>RT</td>
<td>6.7±1.19</td>
<td>**</td>
<td>NCC</td>
<td>**</td>
<td>E</td>
<td>NG</td>
<td>ES</td>
</tr>
<tr>
<td>5</td>
<td>40 °C±1 °C</td>
<td>6.6±2.09</td>
<td>**</td>
<td>NCC</td>
<td>**</td>
<td>E</td>
<td>NG</td>
<td>ES</td>
</tr>
<tr>
<td>10</td>
<td>RT</td>
<td>6.7±1.72</td>
<td>**</td>
<td>NCC</td>
<td>**</td>
<td>E</td>
<td>NG</td>
<td>ES</td>
</tr>
<tr>
<td>15</td>
<td>40 °C±1 °C</td>
<td>6.9±1.64</td>
<td>**</td>
<td>NCC</td>
<td>**</td>
<td>E</td>
<td>NG</td>
<td>ES</td>
</tr>
<tr>
<td>20</td>
<td>RT</td>
<td>6.5±1.53</td>
<td>**</td>
<td>NCC</td>
<td>**</td>
<td>E</td>
<td>NG</td>
<td>ES</td>
</tr>
</tbody>
</table>

Values are mean ± S.D (n=3), X1-Homogenity, X2-Appearance, X3-Spreadibility, X4-After feel, X5-Type of smear, X6-Removal, **: Good, *: Satisfactory, E: Emollient, NG: Non greasy, ES: Easy, NCC: Not change in colour

Table 6: Composition of hydroalcoholic extract of herbal cream

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Formulation (% w/w)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF1</td>
<td>HF2</td>
</tr>
<tr>
<td>Hydroalcoholic extract of P. ostreatus</td>
<td>1.5</td>
</tr>
<tr>
<td>Hydroalcoholic extract of G. glabra</td>
<td>1.0</td>
</tr>
<tr>
<td>Hydroalcoholic extract of C. sinensis</td>
<td>0.5</td>
</tr>
<tr>
<td>Stearic acid</td>
<td>11</td>
</tr>
<tr>
<td>Cetyl alcohol</td>
<td>4</td>
</tr>
<tr>
<td>Almond oil</td>
<td>4</td>
</tr>
<tr>
<td>Glycerol</td>
<td>3</td>
</tr>
<tr>
<td>Methyl paraban</td>
<td>0.02</td>
</tr>
<tr>
<td>Triethanolamine</td>
<td>qs</td>
</tr>
<tr>
<td>Water, qs, 100</td>
<td>qs</td>
</tr>
</tbody>
</table>
4 Discussions

Fairness cream has emerged in the last 50 years to improve complexion. Fairness is considered equal to attractiveness. Melanin is one of the reasons for dark complexion. Melanin is primary determinant of "melanocytes" that are located in the epidermis. The increased production of melanin in human skin is called "melanogenesis". Fairness cream blocks sun rays and prevent secretion of melanin, which gives dark color to skin. Herbal medicine are being used by about 80% of the world population primarily in the developing countries for primary health care. They have stood the test of time for their safety, efficacy, cultural acceptability and lesser side effect. Hence keeping this mind we planned to prepare herbal cream which produce fairness property with minimum side effects.

_Pleurotus ostreatus, Glycyrrhiza glabra and Camellia sinensis_ were selected for the preparation of herbal cream. These plant materials are containing polyphenol organic substance which imparts potent antioxidant activity. The antioxidant substance scavenges the reactive oxygen species and inhibits the production of melanin in the human skin. Moreover it also absorbs the UV rays and prevents the formation free radicals in the skin. This can also monitor the production of melanin in the human skin. Therefore, we tried to make an herbal fairness cream containing the extract of _Pleurotus ostreatus_, _Glycyrrhiza glabra_ and _Camellia sinensis_ in different concentration along with almond oil. Our study indicated that the base F3 found to be more stable, while remaining base were not stable and resulted in breakdown of the emulsion when stored for long time. So that base F3 was appropriate for development of herbal cream comprising of different ratio of extracts (HF1, HF2 and HF3), hence we prepared herbal cream by mixing all the extract in this base. The pH of prepared cream was nearer skin pH, and cream produces homogeneous, emollient, non-greasy and easily removed properties after the application. The herbal creams (HF1, HF2 and HF3) were safe in respect to skin irritation and allergic sensitization. The prepared herbal fairness cream is intended for cosmetics use rather than as other cosmetic. These studies suggest that herbal fairness creams are more stable and also it may produce synergistic action.

5 Conclusions

The findings of present investigation exhibited that the prepared herbal creams (HF1, HF2 and HF3) containing extracts of _Pleurotus ostreatus, Glycyrrhiza glabra and Camellia sinensis_ were safe to use in skin. Further study required to check synergistic potency of the prepared herbal cream in experimental animals.

6 Acknowledgements

Author thanks to Columbia Institute of Pharmacy, Raipur, (CG), India for providing Lab facility to carry out the research work.

7 Conflict of interests

The authors declare that they have no competing interests.

8 Author’s contributions

NG, AD, PP and AR carried out research work and draft the manuscript. All authors read and approved the final manuscript.

9 References