

FORMULATION AND EVALUATION OF COFFEE AND TURMERIC PEEL-OFF FACE GEL MASK

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ABSTRACT

Skin care preparations are designed to exert local activity when applied over the skin mucous membrane, these skin preparations include gel, lotion, ointment, cream, peel off mask etc. Peel-Off face mask is one of the cosmetics that is used to treat skin from free radicals. It is designed to address common skin concerns and tightening of skin, moisturizing and tan removal from the skin. The aim of this study was to obtain a peel off gel facial mask preparation containing coffee and turmeric having antioxidants & anti-inflammatory properties. In this study, five formulations containing combination of coffee and turmeric with a different concentration of PVA and other excipients was prepared and evaluated for the various parameters like organoleptic, pH, spreading ability, homogeneity, viscosity, dry time, and antioxidant activity and stability studies. The test results showed that all formulas met the quality test requirements and had very strong antioxidant activity. Among all Peel of gel face mask formulations F5 have faster drying time with strong antioxidant activity (IC₅₀ 72.56 µg/ml). So when two rich sources of antioxidants (Coffee & Turmeric), when combined together, add instant radiance and glow to your skin and so can be effectively used.

KEYWORDS: HPMC, PVA, Turmeric, PEG-400, Coffee, Anti-inflammatory, Anti-oxidant.

INTRODUCTION

Skin is the largest organ in the body and covers the body's entire external surface. It is made up of three layers, the epidermis, dermis, and the hypodermis, all three of which vary significantly in their anatomy and function. The skin's structure is made up of an intricate network which serves as the body's initial barrier against pathogens, UV light, and chemicals, and mechanical injury.^[1] It also regulates temperature and the amount of water released into the environment. Skin preparations include gel lotion, ointment, cream, peel of mask, and so on. Facial cosmetics keep skin moist and remove sebum from the skin to maintain proper skin health. The use of suitable cosmetics according to the

facial skin type results in healthy skin. Facial masks are the most prevalent cosmetic products utilized for skin rejuvenation.



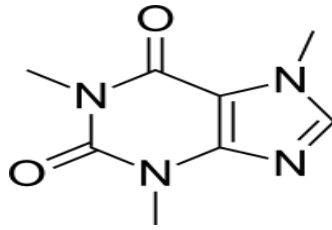
Figure No.01: Types of face mask.

Facial masks are divided into four groups: (a) sheet masks (b) peel-off masks (c) rinse-off masks and (d) hydrogels.^[2] Peel off mask is the type of dosage form which is gently applied onto the facial skin surface and is peeled off after a few minutes of its application. Peel-off facial masks are known for their unique characteristics inherent to the use of film forming polymers that, after complete drying, create a very cohesive plastic layer allowing for the manual removal of the product without leaving any residue. It is designed to address common skin concerns and tightening of skin, slight moisturizing action and enhances the effect of the active compounds on the epithelium especially as a result of the occlusive effect caused by the plastic polymeric layer. Peel off masks are a type of physical exfoliant, which means they remove the top layer of skin to slough away dead skin cells. This makes skin feel smooth & look glowy. Peel off masks work by gently removing the outermost layer of your skin to relieve dullness and dead skin. This produces a smoother skin texture and can also help balance out pigmentation. Peel off masks can assist in fading fine lines and cleansing out pores. This can eliminate acne-causing dirt and bacteria.^[3]

Here we are formulating peel off gel face mask containing Coffee and Turmeric using polyvinyl alcohol (PVA) as a Film forming agent & base of mask and Hydroxy Propyl Methyl Cellulose (HPMC) as a viscosity increasing agent and PEG 400 as plasticizer. Coffee (*Coffea arabica*) contains chlorogenic, ferulic, caffeic, and n-coumaric acids which can be useful as antioxidants. Turmeric (*Curcuma longa*) contains curcumin, which has anti-inflammatory and antioxidant properties. Turmeric adds glow to the skin, treats acne, slows down skin ageing. The aim of this study was to obtain a peel off gel mask preparation from coffee and turmeric and to determine its antioxidant activity.

Coffee – The *Caffeine* appears as odorless white powder or white glistening needles, usually melted together. It is Bitter in taste. Solutions in water are neutral to litmus. Coffee is a wonderful face scrub since it exfoliates the skin. “It gently exfoliates the skin cells and removes impurities, leaving the skin smooth and refreshed,” Moreover, it can help enhance the look of cellulite and tighten your skin. Coffee is high in antioxidants such as phenols, which help fight freeradicals and protect the skin from damage.^[4]

Molecular Formula: $C_8H_{10}N_4O_2$



Molecular Weight - 194.19 g/mol.

Structure –



Figure no. 02: Coffee beans powder.

Caffeine is also used in a variety of cosmetic products and can be administered topically, orally, by inhalation, or by injection. As a result, fine lines, wrinkles, and saggy skin can be avoided. In fact, the antioxidants in coffee can help fight acne, increase collagen formation, and minimize hyper-pigmentation.^[5]

Turmeric –

Scientific name- curcuma longa

Synonym: Turmeric root, wid curcuma.

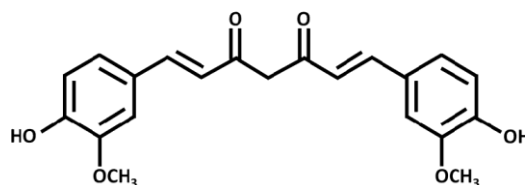
Family: Zingiberaceae.

Chemical constituents: Curcumin I, Curmumin II, III, dihydrocurcumin, 3-6% polyphenolic compounds, curcuminoid's, Demethoxy curcumin and bisdemethoxycurcumin.

Curcumin –

Molecular Formula –

$C_{21}H_{20}O_6$



Molecular Weight - 368.4 g/mol

Structure –



Figure no. 03: Turmeric powder.

Uses:

- 1) Antibacterial activity.
- 2) Antifungal activity.
- 3) Also adds glow to the skin.

Turmeric is mostly used to revitalize the skin. It reduces the appearance of wrinkles and has antibacterial, antimicrobial, and anti-inflammatory qualities. It is one of the top sources of blood purifier. It is beneficial in the treatment of acne owing to its antiseptic and antibacterial characteristics, which battle pimples and breakouts and give your skin a young look. It also reduces sebaceous gland oil output.^[14]

MATERIAL AND METHOD

Material used in the preparation – Materials used in the study had a degree of pharmaceutical-grade purity including, polyvinyl alcohol, (PVA), Hydroxyl-propyl-methyl- cellulose (HPMC), Poly ethylene glycol 400 (PEG), Methyl paraben and Ethanol were obtained from Lobachem pvt Ltd, Turmeric and Coffee was purchased from local market.

Table no. 01: Formulation composition of peel of gel mask.

| Chemicals | F1 | F2 | F3 | F4 | F5 | F6 |
|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Coffee | 1% | 1% | 1% | 1% | 1% | 1% |
| Turmeric | 2% | 2% | 2% | 2% | 2% | 2% |
| PVA | 6 | 8 | 10 | 12 | 14 | 16 |
| HPMC | 1 | 2 | 3 | 4 | 5 | 6 |
| PEG 400 | 1.5% | 1.5% | 1.5% | 1.5% | 1.5% | 1.5% |
| Methyl Paraben | Qs. | Qs. | Qs. | Qs. | Qs. | Qs. |
| Ethanol | 20 | 20 | 20 | 20 | 20 | 20 |
| Distilled water | Qs | Qs | Qs | Qs | Qs | Qs |

Procedure

1. Weight all the ingredients in a required Quantity.
2. Prepare PVA solution was prepared by dispersing it in heated water (80 °C) to produce homogeneous solution. The dispersion was constantly stirred until complete dissolution.
3. Prepare HPMC solution in another beaker by dissolving required quantity in ethanol.
4. Mixed both the solutions prepared above in same quantity and stir until homogenized.
5. To this Add 1% Coffee, 2% Turmeric and methyl paraben.
6. The solutions were mixed properly and then required quantity of PEG 400 was added.
7. Mixed the preparation for sufficient time to get homogeneous Gel.

EVALUATION PARAMETER OF PEEL OFF FACE MASK

The physicochemical evaluation tests performed were as follows:-

- 1. Organoleptic characteristics:** Organoleptic properties were characterized on the basis of parameters as colour, Odour and consistency by visual inspection.
- 2. Homogeneity test:** The homogeneity test was observed by applying the gel on transparent glass. The developed formulations were tested for homogeneity by visual inspection after the gel had been filled in the container. They were tested for their appearance and presence of any aggregates.^[7]
- 3. Status of the peel-off film:** After drying film was able to remove from the applied site and it was soft to hard. Drying time took longer time (20-30 min). The drying time test was performed by applying a mask on the back hand evenly. The time required for the preparation to dry was counted by a stopwatch.^[15]
- 4. Determination of pH value:** 1.0 g gel was accurately weighed and dispersed in 100 ml purified water. The pH of the dispersion was measured using Auto digital pH meter, which was calibrated before use with standard buffer solution. The pH test results for the peel-off gel mask stock are made to have a pH that matches the skin pH, namely 4.5-6.5.^[8]
- 5. Viscosity:** Viscosity was measured by using Brookfield DV- II+ Pro Viscometer. Viscosity was measured by using Spindle No. 07 speed of 50 and 100 rpm.
- 6. Film drying time:** Approximately 2.0 g of each formulation was spread over a glass plate of 60×60 mm forming a uniform mask layer of 55.5 mg/cm² with a thickness of approximately 2.0 mm. The glass plate was submitted to a heated environment in the water bath (37.0 ± 2.0°C) in order to simulate skin temperature. The formulations were monitored every 5 min, and the experiment only finished after the surface of the mask had dried completely. The results were expressed as the mean of three measurements. The formulation was also applied onto the skin of hands of 3 healthy volunteers to confirm the results.^[9]
- 7. Spreadability:** The two sets of glass plate of 20×20cm dimensions were taken, 0.5gm of prepared gel formulation was applied over one of the slide. The other slide was placed over the applied gel formulation. 125gm weight was kept on the upper slide for 15 minutes. The gel forms a thin layer between the two slides. The diameter of the circle formed due to the spread of gel was measured.^[7]
- 8. Stability study:** This experiment was performed to observe the stress effect and stability on formulations at low and high temperature of prepared peel off gel mask. Refrigerator temperature (4°C) and accelerated temperature (40°C) with storage at each temperature. The stability test was performed for not less than 24 hours.^[11]
- 9. Antioxidant activity Test** - The antioxidant activity of coffee peel extract and peel off gel facial mask were tested using DPPH scavenging activity method.^[10] A total of 1 mg of DPPH was put into a 50 ml volumetric flask and dissolved with methanol p.a to a concentration of 20 ppm. The extract solution was prepared by dissolving 10 mg of the Gel in 100 ml of methanol p. a, then varying the concentration, namely 5 ppm, 10 ppm, 15 ppm, 20 ppm, and 25 ppm. As for the sample of gel peel off mask is done by taken as 1 g dosage is then extracted by the addition of 100 ml of methanol p. a so that the sample solution that is made has a concentration of 10,000 ppm.^[11] Next, shake it quickly for ±5 min. Then the results of shaking are filtered and the filtrate is collected. Sample dilution was carried out to a concentration of 5 ppm; 10 ppm, 15 ppm, 20 ppm, and 25 ppm. Samples were incubated at 37 °C for 30 min and then the absorbance was measured using a UV-Vis spectrophotometer at a wavelength of 517 nm.^[12] Free radical scavenging activity was calculated as the percentage of DPPH color reduction using the inhibition measurement equation. Then % inhibitions were plotted against the respective

concentration used and from the graph IC50 was calculated.^[13]

RESULT AND DISCUSSION

1. Organoleptic properties

Organoleptic properties for all the formulations was shown in table no. 02 given below. Organoleptic test was carried out to evaluate the preparation using the parameters like colour, odour and consistency of the preparation. It was observed that as the concentration of PVA increases, the colour of the formulation changed from being transparent to translucent. Batch F1 showed less semi-solid consistency due to lower concentration of PVA. As the concentration of PVA increase the semi-solid consistency increased as seen in batch F6.

Table no. 02: For Organoleptic properties.

| Formulation | Color | Odor | Consistency |
|-------------|--------|-------|-------------|
| F1 | Yellow | Sweet | Semi-solid |
| F2 | Yellow | Sweet | Semi-solid |
| F3 | Yellow | Sweet | Semi-solid |
| F4 | Yellow | Sweet | Semi-solid |
| F5 | Yellow | Sweet | Semi-solid |
| F6 | Yellow | Sweet | Semi-solid |

2. pH of the Formulation

pH Value for all the formulations was shown in table no. 03 given below. As the concentration of PVA increases, the pH value of the preparation was found to be decreased. The pH of peel-off mask gel formulations was found to be in the range between 5.23 - 6.34.

Table no. 03: For pH Determination.

| Formulation | F1 | F2 | F3 | F4 | F5 | F6 |
|-------------|------|------|------|------|------|------|
| pH | 5.34 | 5.30 | 5.23 | 5.53 | 5.89 | 6.34 |

3. Homogeneity

Absence of grittiness in the formulations indicated that homogeneity was achieved. No phase separation was observed between coffee and peel-off mask gel base on storage at room temperature and refrigerator conditions. No aggregates or gritty particles were observed.

Table no. 04: Homogeneity.

| Formulation | F1 | F2 | F3 | F4 | F5 | F6 |
|-------------|------|------|------|------|------|------|
| Homogeneity | Homo | Homo | Homo | Homo | Homo | Homo |

4. Drying Time

Drying time for all the formulations was shown in table no. 05 given below. As the concentration of poly vinyl alcohol increases drying time was found to be decreased. The optimum drying time was observed for the batches F4, F5 and F6. Three healthy volunteers who applied the formulations on the skin of hand commented that the formulation with high concentration of PVA (i.e., F5 and F6) were easy to peel off as compared to the batches which contained low concentration of PVA. Also, the peeled mask showed signs of cracking and tearing during peeling in case of batches F1, F2 and F3 due to low film integrity. However, these issues were not observed in batch F5 and F6 as they have high film integrity.



Figure no. 04: Film Drying.

Table no. 05: Drying Time.

| Formulation | F1 | F2 | F3 | F4 | F5 | F6 |
|------------------|----|----|----|----|----|----|
| Drying time(min) | 32 | 29 | 25 | 22 | 19 | 16 |

5. Viscosity test

The viscosity was determined using Brookfield viscometer. It was found that the viscosity increases with decreasing rpm. The result of Viscosity is shown in table 5 given below. As the concentration of PVA is increased viscosity is also found to be increased.

Table no. 05: Viscosity Study.

| S.N. | RPM | F1 | F2 | F3 | F4 | F5 | F6 |
|------|-----|-----|------|------|------|------|------|
| 1 | 100 | 737 | 1200 | 1689 | 1821 | 2124 | 2278 |
| 2 | 50 | 867 | 987 | 1098 | 1234 | 1960 | 2398 |

6. Spread ability

The extent of spreading ability of the formulated peel off mask gel formulations is shown in Table 6 The results indicate that batches F3, F4 and F5 have optimum spreading ability on skin.

Table no. 06: Spread ability test.

| Formulation | F1 | F2 | F3 | F4 | F5 | F6 |
|-------------------|----|-----|-----|-----|----|-----|
| Spreadability(cm) | 7 | 6.8 | 6.6 | 5.7 | 5 | 4.6 |

7. Stability Study

This experiment was performed to observe the stress effect and stability on formulations at low and high temperature of prepared peel off gel mask. Refrigerator temperature (4°C) and accelerated temperature (40°C) with storage at each temperature. During this all the preparations was evaluated for organoleptic, pH, spreading ability, homogeneity, viscosity, dry time, and antioxidant activity all the formulations was stable on 4°C - 40°C.

Table No. 07: Thermodynamic stability study.

| Formulation | F1 | F2 | F3 | F4 | F5 | F6 |
|-------------|--------|--------|--------|--------|--------|--------|
| At 4°C | Stable | Stable | Stable | Stable | Stable | Stable |
| At 40°C | Stable | Stable | Stable | Stable | Stable | Stable |

8. Antioxidant Activity

The concentration of coffee and turmeric powder was same in all the formulations, so the IC50 value of all the formulations was found to be approximately same.

Table no.08: Antioxidant activity study.

| Formulation | IC50 (µg/ml) |
|-------------|--------------|
| F1 | 72.34 |
| F2 | 72.23 |
| F3 | 71.43 |
| F4 | 71.68 |
| F5 | 71.98 |
| F6 | 72.56 |

CONCLUSION

This peel off mask gel are believed as a sustaining and productive way to advance the appearance of skin. Thus in the present work study, formulation shows a good attempt to formulate the herbal peel off mask containing naturally available ingredients Turmeric and Coffee which are very good for skin problems like tanning, oily skin, Inflammation. This peel off mask showed good spread ability also which helps to make people comfortable during application. All formulas met the evaluation requirements coffee & Turmeric peel off gel mask preparation F5 and F6 have good film forming and strong antioxidant activity. It was found that the formulation was much more stable at room temperature. Thus, this peel-off gel formulation could be the safe and efficacious remedy for treating these dermatological disorders and could be the safe alternative to synthetic anti-acne gels.

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