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Research Article

Formulation, Development and Evaluation of Peel-off Face Mask

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Abstract:
One of the most prevalent skin conditions among teenagers, acne has a significant negative impact on people's mental well-being and leads to expensive medical expenses. Acne, dark skin, wrinkles, and other issues relating to facial skin can all be treated using peel-off masks. The skin can be cleansed and moisturized using it. The majority of peel-off masks are made using polymers in gel form, which can adhere to skin in thin layers resulting in removal of dead skin. The present work deals with the development and evaluation of the topical peel-off gel mask containing a single herbal powdered drug Sapota and other chemical reagents such as polymers, Carbopol and Sodium.
The anti-acne skincare cream was found to be safe and not caused any irritation. The study's findings imply that using the anti-acne skincare cream topically to people with mild-to-moderate acne was both safe and effective, and that it might be used as an optional addition to acne treatments.
The formulation is optimum for all the parameters. Due to high antioxidants potential of sapota, it provides an anti-aging activity by removing free radicals from the body, while the gel also showed good results for all the evaluation parameters. Therefore, this peel-off gel mask containing sapota would be a good alternative to the synthetic gels for cleansing, moisturizing and anti-acne properties.

Keywords: Sapota, peel off mask, Anti-acne, Polyvinyl alcohol, Carbopol

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1. INTRODUCTION

Individuals have long sought to influence the progression of the aging process. Indeed, aging has been shown to be adjustable; by intervening in biological systems such as nutrition sensing, cellular senescence, the systemic environment, and the gut microbiome, ageing phenotypes can be slowed enough to prevent age-related functional decline. These therapies can also delay the onset of several disabling, chronic diseases, including neurodegeneration, cardiovascular disease, and cancer [1].The outermost covering in the human body called skin which protects internal organs from exposure to external factors, biological, physical and chemical substances. Skin is exposed to various environmental factors it is necessary to take care of skin. As facial skin is the important part of skin as it is first part seen by eye, therefore to maintain and taking care for seeing healthy skin is all people desire especially women, therefore various cosmetic products available in market. Use of cosmetic on skin is to protect skin from free radical effect [2], [3].

A cosmetic is any substance or mixture intended to be placed in contact with external parts of them in good condition[4]. Cosmetic preparation for face is available in various forms and one of them is gel peel off mask. Peel off mask is a gel preparation which is applied to skin in a certain time and the mask will dry out and form a thin layer. Peel off mask gently stimulates the metabolism due to its occlusive effect. It can be used as the remedy in treatment of facial skin such as black hairs, dark spots, dead skin, white heads and mainly used to

open closed pores[5].Herbal cosmetics are defined as beauty products that contain herbal elements and provide beneficial physiological activities such as healing, soothing, appearance, boosting skin radiance, and conditioning. Ayurvedic cosmetics not only improved the appearance of the skin, but also protected the body from environmental influences[6].Peel-off masks have long been a favourite of millions of individuals in the United States and around the world. One of the reasons for their popularity is that they may be worn in every season. Peel-off masks work by reaching deep into your pores and gently eliminating the dead cells in your skin's outer layer, as well as any pollutants that may be present. To have balanced, toned, and healthier skin, it's critical to remove dirt, bacteria, debris, and other impurities [7].

Sapodilla (Manikara zapota L.) belonging to Sapotaceae family, an excellent fruit for healthy and bright skin since it contains several vitamins, antioxidants, minerals, and dietary fibres. This fruit's Vitamin E hydrates your skin, resulting in healthy, beautiful skin. It's also high in antioxidants, which work as an anti-aging ingredient by removing free radicals from the body, which speed up the ageing process [8]. Sapota seeds contain kernel oil, which aids in the reduction of skin irritation and uncomfortable disorders. This oil can be used as a poultice for painful skin conditions. In current research product formulation sapota powder is prepared by using osmo-freeze drying method [9].

Sapota is a tropical fruit. It is believed to be native to Yucatan and possibly other nearby parts of southern Mexico, as well as northern Belize and north-eastern Guatemala. It is believed that sapota was cultivated throughout tropical America, West Indies and southern part of Florida mainland, where it is a tall tree found in forests. Early in colonial times, it was carried to Philippines by the Span and later was adopted everywhere in the Oldworld tropics. The plant contains several phytochemical constituents belonging to categories such as alkaloids, carbohydrates, glycosides, tannins, triterpenes and flavonoids etc. The fruit is reported to contain sugars [10] ,acids [11], phenolics [12], viz., gallic acid, catechin, chlorogenic acid, leucodelphinidin, leucocyanidin and leucopelargonidin, protein, amino acids carotenoids, ascorbic acid, and minerals like copper, potassium, calcium and iron. Vitamins are also present in substantial quantity which make [13].The concentration of constituents varies in leaves, fruits, latex seeds and bark.The sapota plant’s parts have various biological activities that can be obtained from its extracts such as anti-acne [9], anti-oxidant [14], antifungal [15],antibacterial [16], antimicrobial [17], anti-inflammatory and antipyretic [18], hypoglycaemic, hypocholesterolaemia, antidiarrheal, analgesic and tyrosinase and elastase inhibitor effect [19]. The fruits and crushed seeds of sapota are used in preventing oedema due to diuretic property. They also prevent formation of kidney and bladder stones.

Cosmetic value of sapota, being rich in nutrients can be used as a herbal remedy for skin infections and particularly for beauty enhancement. The Vitamins E, A and C of the fruit, makes the skin healthy due to its moisturising effect. Presence of antioxidant like ascorbic acid, polyphenols and flavonoids help in reducing wrinkles [20]. Warts and fungal growth on the skin is cleared away by the milky sap of the sapota plant. The seed oil helps in moisturizing the scalp and softening hair. It yields beneficial results in the management of curly hair. The sapota seed oil helps in treating hair-fall due to seborrheic dermatitis [21].

The aim of this work was to study the applicability of the anti-oxidant properties of isolated fresh extract as an effective anti-aging. Topical anti acne cream loaded with polyphenol was prepared via fusion method and was evaluated for its computability with the used polymers, irritation, homogeneity, encapsulation efficiency and release, stability as well as ex vivo permeation study and application into human volunteers.

2. MATERIALS AND METHODS

2.1 Materials: Freeze dried powder of Sapota, polyvinyl alcohol(PVA) , Carbopol (940 grade), sodium salt of carboxymethylcellulose (CMC), methyl paraben, propylparaben, talcum powder, triethanolamine, distilled water.

Osmo-freeze drying of sapota slices

Freeze drying is a method of dehydrating frozen material using a sublimation process under vacuum, primarily for preservation purposes. Freeze drying sapota powder is a really fascinating way to recompose the fruit while retaining almost all of the natural qualities. The use of the osmo-freeze drying procedure to produce high-quality sapota powder is a novel concept.

The sample of osmotically dehydrated sapota slices were freeze dried at -20 and -40 ^{o}C temperatures with a constant vacuum pressure of 1 torr (1 mm Hg) maintained throughout the experiments using a freeze drier (Lyophilizer-model FDU-7003). These samples were freeze dried until they reached the necessary moisture level, which was 3 to 4% (db). During the freeze-drying process, the weight loss, moisture content, drying rate, and moisture ratio of sapota slices were determined in terms of fluctuation in weight loss, moisture content, drying rate, and moisture ratio with respect to drying time. Rangana’s method was used to determine the rehydration ratio of the osmo-freeze dried sapota slices [22]. The powder was made by crushing freeze-dried sapota slices and sieving them through a 100-mesh sieve. The osmo-freeze dry powder produced by various treatments was light creamish in colour, crisp and free flowing, crystalline in consistency, and very hygroscopic. Four elements were considered during osmo-freeze drying sapota slices. Three replications of a completely randomized design.

Polyvinyl alcoholplays a key role as binder, film former, and thickener(thickens the oil-based component of formulation) in skincare products [23]. Carbopol (934)is a carbomer that aids in the stabilization and texture enhancement of cosmetics formulae. It's utilized as an emulsifier in skincare to assist stabilizes and thickens solutions with varying component solubilities. Carbomer aids in the consistency and flow of cosmetics, as well as providing a smooth, silky texture to lotions, creams, and gels [24]. Sodium carboxy methyl cellulose (CMC) also known as cellulose gum whichwork as viscosity enhancer, modifier and thickener to stabilize the formulation in skin care products [25]. And preservative methyl and propyl paraben to increase their shelf life.Talcum powder is employed in the formulation as a softening agent and is beneficial in treating acne and greasy

skin.Triethanolamine without skin-beneficial properties, solely used in formulations to improve a product's texture and pH as well as act as emulsifier [26].

2.2 Preparation of the anti-acne peel off mask loaded Polyphenols

The peel-off gel formulation was prepared according to the method mentioned, Carbopol 934was dispersed gradually into deionized water using a lab homogenizer. It was sprinkled slowly to avoid any lump formation and was left at room temperature for 24 h for completeness of Carbopol hydration. The pH was adjusted to 5.5-6.5 by dropwise addition of triethanolamine. For the formulation's opacity, talcum powder was used. Continually stirring was required after adding the whole contents until a smooth dispersion is achieved.

Table 1: Peel off mask composition

Ingredients	% Concentration								Comment
	F1	F2	F3	F4	F5	F6	F7	F8	
Sapota powder	-	1	5	10	-	1	5	10	Drug
Polyvinyl alcohol (PVA)	25	25	25	25	50	50	50	50	Film former
Carbopol (934grade)	10	10	10	10	5	5	5	5	Gelling agent
Sodium carboxymethyl cellulose (CMC)	1	1	1	1	1	1	1	1	Thickening agent
Methyl paraben	2	2	2	2	2	2	2	2	Preservative
Propyl paraben	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	Preservative
Talcum powder	20	20	20	20	20	20	20	20	Softening agent
Triethanolamine	1-2ml	1-2ml	1-2ml	1-2ml	1-2ml	1-2ml	1-2ml	1-2ml	Alkali
Water	Upto 100ml	Upto 100ml	Upto 100ml	Upto 100ml	Upto 100ml	Upto 100ml	Upto 100ml	Upto 100ml	Solvent

2.3 Organoleptic test

An organoleptic test examined the prepared peel-off gel masks for their appearance, aroma, and color.

2.4 Homogeneity test

The homogeneity of the formulated cream has been tested by visual appearance after the formation of cream. A small quantity of cream formulation pressed between the thumb and the index finger, and the consistency of the cream noticed whether homogeneous or not.

2.5 Formulation pH

The acidity of the formulation is an essential parameter for skin care products as skin pH is one of the most influential parameters for maintaining the integrity of the stratum corneum. A changes in skin pH significantly impact barrier permeability and microbiome content, leading to skin disorders and diseases. Therefore, pH formulation change was measured for 30 days using digital pH meter.

2.6 Drying time and thickness film

For evaluation formulations drying time, 2 g prepared gel on the after preparation was located on a 60 × 60 cm glass plate and spread flat. The glass plate was incubated at 37°C until the gel was dry and easily peeled off as a film layer. The formulation was checked every 2 min, and the test ended when the mask was fully dry. The outcome was an average of three tests. The drying time and final film thickness were determined using digital calliper.

2.7 Spreadability

Spreadability is a term used to describe the amount of gel that spreads easily when applied to the skin or afflicted area. A formulation's medicinal efficacy is also determined by its spreading value. Spreadability is measured by the time it takes two slides to slip off the gel when they are placed in between each other under a specific stress, is calculated by using given formula

S = M. L / T

Where M= weight tied to upper slide, L= length of glass slides, T= time taken to separate the slides.

2.8 Compatibility study

The compatibility of polymers with the sapota polyphenols can be identified by infrared Fourier Transform spectroscopy analysis (FT-IR). The physical mixture of polyphenol, polymers, polyphenol and polymers, and final optimized formula were subjected to FTIR analysis. The samples were scanned in the range from 400–4000 cm^{-1} and recorded on an FT-IR.

2.9 Skin irritation test

The skin irritation test of the formulated cream was conducted on human volunteers. Healthy human volunteers have been chosen to participate in this study within the age of 20–50 years. Volunteers were informed about the nature of the formulation before starting the experiment. The erythema scored as follows: 0 for none, 1 for a slight, 2 for well defined, 3 for moderate, and 4 for scar formation and severe erythema. Simply, 1 g of the test formulation has been applied to the back of the volunteer’s hand on an area of 2.0 cm 2.0 cm. Then, thevolunteers were observed for the appearance of edema, lesions, and or irritation.

2.10 Washability

The ease and extent of washing with water were personally examined after the formulations were applied to the skin.

2.11 Peel test

The peel-off solid film mask was evenly applied to the skin's surface and was allowed to air dry. The peel was removed from the skin surface after 30-40 minutes. It was discovered that the peel may be readily removed without breaking.

2.12 Viscosity

The viscosity was measured with a cone and plate DV-1 viscometer with a CP-41 type spindle. A sample of 2 g of peel-off mask was weighed. The sample must be ensured to be bubble-free and spread evenly on the surface of the cup. After that, the sample cup was reassembled on the viscometer. The viscometer was turned on at 4 rpm and then was left for a while until the reading was stable.

2.13 Anti-acne Screening

The media used for the analysis was nutrients agar for P*ropionibacterium acne*. Anti-acne activity of Sapota freeze dried powder and Sapota gel formulation and standard clindamycin along with solvent was done at a same time using well diffusion method and zone of inhibition was noted.Measurement of zone inhibition for all extract and gel formulation against standard clindamycin was measured. The activity(A.I) and percentage inhibition was then calculated using the following format.

A.I = Mean zone of inhibition for sample/ Zone of inhibition obtained for standard

P.I. = Activity Index×100

Fig.1. A loop full of *Propionibacteriumacne*inoculated in test tube of10 ml nutrient broth for turbidity in an aerobic candle jar.

3. RESULTS AND DISCUSSION

Sapota has been investigated using fruit part of plants have been used for the treatment of various pathological conditions such as antiinflammation, antiacne, antioxidant activity.Thus this current research studied antiacneformulation from the extract of M. sapota L. from fresh fruits.

3.1 Physiochemical characteristics of peel-off mask formula

The results of the characterization prepared formulations are summarized in Table 2, which is discussed in the following

3.2.1 Organoleptic property and homogeneity

The organoleptic outcomes from the four peel-off gel mask formulations are essentially the same, that is, creamish pink, with no odour, semi-solid form, homogeneous, and without any aggregate or sedimentation. The different viscosities are thick, very thick, barely foamy, and dilute, caused by the percentage of PVA used. All formulations had a homogeneous appearance without any sedimentation on the first day of preparations as depicted in table 2.

3.2.2 pH test

These results showed that the peel-off mask made from sapota extract has a pH level that matches the skin's pH level, which is between 5.3 and 5.8. Therefore, to ensure the pH level does not change during storage for 30 days, it is essential to check for any free fatty acids in the R. Damascena extract or other bioactive compounds that could oxidize when exposed to light or temperatures mentioned in table 2.

Table 2. Summary of assessment of physical characteristics of peel-off gel masks.

Characteristics	**Day**	**F5**	**F6**	**F7**	**F8**
Organoleptic	**1**	Creamish pink colour	Creamish pink colour	Creamish pink colour	Creamish pink colour
	30	Creamishpink colour	Creamish pink colour	Creamish pink colour	Creamish pink colour
Applicability	**1**	5	5	5	5
	30	5	5	5	5
Homogeneity	**1**	Homogenous	Homogenous	Homogenous	Homogenous
	30	Homogenous	Homogenous	Homogenous	Homogenous
pH	**1**	5.3±0.02	5.5±0.04	5.4±0.02	5.5±0.03
	30	5.7±0.05	5.8±0.03	5.8±0.02	5.7±0.01
Film thickness (mm)	**1**	0.21	0.23	0.22	0.24
	30	0.21	0.23	0.22	0.24
Drying time (min)	**1**	22:16	24:51	25:13	28:13
	30	21:56	22:41	24:45	27:34
Spreadability	**1**	5.35±0.31	5.2±0.61	4.9±0.34	5.1±0.52
	30	5.2±0.21	5.0±0.74	5.0±0.52	5.3±0.35
Sedimentation	**1**	No	No	No	No
	30	No	No	No	No
Skin irritation	**1**	Non-irritant	Non-irritant	Non-irritant	Non-irritant
	30	Non-irritant	Non-irritant	Non-irritant	Non-irritant
Viscosity	**1**	42,540±471	44,655±223	43,452±455	40,656±566
	30	41,655±154	45,565±154	42,566±355	39,464±879

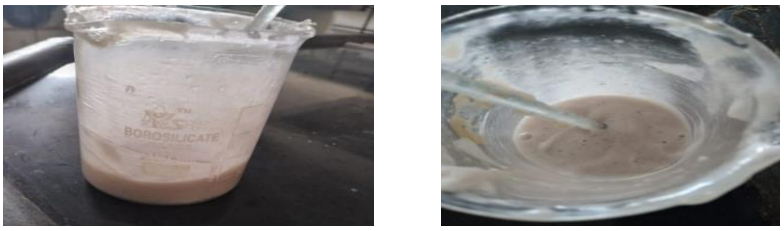

Fig.2. Formulation of peel off mask

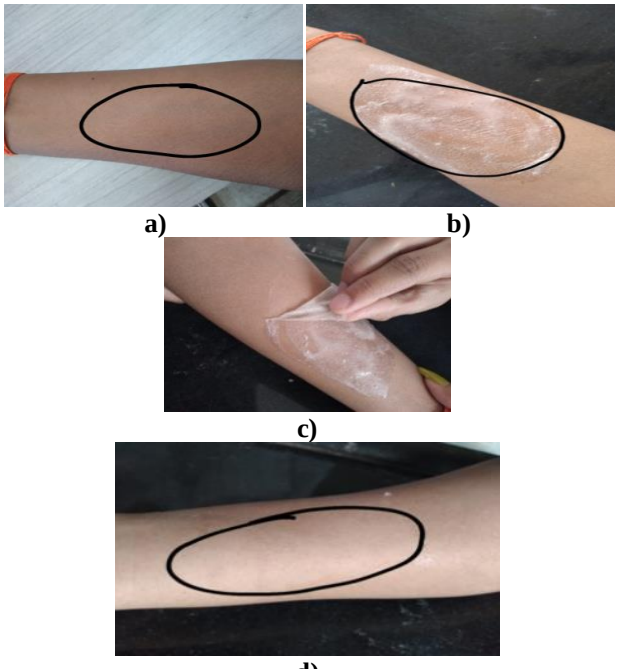

Fig.3. Preparation of formulation a) Hand skin before application. (b) Hand skin during application. (c) Hand skin during peeling off mask. (d) Hand skin after removal of film.

3.2 Anti-acne screening

Table 4 Clinical and Laboratory Standards Institute standards. [27]

Antimicrobial Agent	**Test Culture Zona Diameters (in mm)**		
Clindamycin	Resistant	Intermediate	Susceptible
	≤ 14 mm	15 – 20 mm	≥ 21 mm

Table 5 Inhibition zone measurement for clindamycin and sapota extract

Sample	**Concentration %**	**Zone of inhibition in (mm)**			**Mean**	**Growth Inhibition Response**
		I	**II**	**III**		
Clindamycin	1	40.4	40.9	41.5	40.9	Susceptible
	5	43.5	44.2	43.1	43.6	Susceptible
	10	46.2	47.5	46.5	46.7	Susceptible
Sapota extract	1	14.7	14.9	15.2	14.9	Resistant
	5	16.3	16.9	16.1	16.4	Intermediate
	10	17.7	17.9	17.8	17.8	Intermediate

Table 6 The results of the positive control clindamycin gel and peel off mask inhibition test.

Sample		**Zone of inhibition in (mm)**			**Mean**	**Activity Index**	**% inhibition**	**Growth Inhibition Response**
		I	**II**	**III**				
Positive Control	**Clindamycin gel**	18.5	18.1	18.3	18.3	1	100	Intermediate
Formulation of Peel off mask	F1	-	-	-	-	-	-	
	F2	15.1	14.8	14.9	14.9	0.81	81	Intermediate
	F3	16.8	17.1	16.9	16.9	0.92	92	Intermediate
	F4	17	17.2	17.1	17.1	0.93	93	Intermediate
	F5	-	-	-	-	-	-	
	F6	14.9	14.9	15.1	15.1	0.82	82	Intermediate
	F7	16	16.2	16.6	16.3	0.89	89	Intermediate
	F8	17.6	17.6	17.1	17	0.92	92	Intermediate

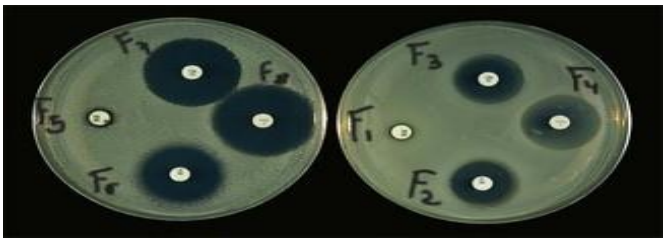

Fig. 5. Zone of inhibition of formulation a P*ropionibacteriumacne*

4. CONCLUSION

Topical peel-off gel formulation was prepared by using Sapota powder as the main drug, which was already known to have Anti-Oxidant, Anti-aging, activity and also this fruit's Vitamin E hydrates the skin, resulting in healthy, beautiful skin. The peel off mask showed a good spreadability. A good peel off property is shown by the formulation on human skin without causing skin edema or irritation. Also the prepared formulation has showed antiacne activity and the peel-off mask when applied it show no irritation and it is safer to use.

Thus, this peel-off gel formulation could be the safe and efficacious remedy for treating this dermatological disorders and could be the safe alternative to synthetic gels.

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