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Clay Facial Masks of Curcuma Domestica Val: Formulation and Characterisation Study

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ABSTRACT

In recent years, there has been a growing awareness of the importance of sustainable and eco-friendly skincare practices. This shift towards conscious beauty has prompted researchers and skincare enthusiasts alike to explore innovative alternatives for traditional cosmetic ingredients. Among these emerging alternatives, turmeric, a vibrant and potent spice long revered for its health benefits, has garnered significant attention. An exploration study about the formulation and characteristic of clay facial mask composed of Curcuma domestica Val. was carried out. In this study, some parameters were investigated, i.e., pH, viscosity, spreadability, drying time, antioxidant activity, TBA value, alcohol and water contents. The study was succeeded to produce clay facial mask with pH of about 6, spreadability in the range of 3-5 cm and drying time of 10-20 minutes. The role of turmeric in the clay facial mask must be studied further to optimise the antioxidant capacity.

Keywords:
Clay; facial mask; curcuma domestica

1. Introduction

It is known that facial appearance is something that everyone, especially women, really pays attention to. Among the efforts to make facial skin facial skin appear healthy range significantly, from purchasing skincare products to receiving treatments at beauty salons. However, many women do not pay attention to the type of skin they have. Without sufficient knowledge or even just taking information from social media, lead to the use of inappropriate skincare products to the type of skin they have. Acne and other skin conditions mostly resulted by these mistakes.

Skin is the largest organ and functions as a barrier to the entry of microbes into the body. It is therefore, skin health is an important aspect of personal health. In addition, skin health has psychosocial effects on people and communication [1]. Until now there is no standard classification of facial skin types. In the 1900s, Helena Rubinstein classified skin into four basic types, and this information has been used for many years by the cosmetics industry. It seems that, due to developments in the field of cosmetic products, traditional designations for skin types based only on a small portion of the skin have become inappropriate. Furthermore, Baumann [2] introduced an innovative approach to classify skin into 16 more functional types and categorized facial skin

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types based on several features such as dry or oily, sensitive or resistant, pigmented or non-pigmented, and wrinkled or non-wrinkled.

Over the life span, skin type can vary depending on variations in sebum secretion [3]. Sebum secretion is not uniform throughout the facial area. The sebum measurement area includes the forehead, nose, both cheeks and chin. The average normal skin sebum secretion for the entire face is 118.7-180.9 µg/cm2, and the acidity level is 5.6-6 due to the acid in the sebum, sweat and keratin secreted. The average sebum secretion for dry, oily, and combination skin is 97.3-147.6, 204.6-235.4, and 109.8-145.5 µg/cm2 respectively [4, 5]. Skin cosmetic ingredients are formulated according to skin type. To produce healthy skin, cosmetics must be able to moisturize the skin and remove sebum and contaminants [6, 7].

The water content of the skin (the hydration state of the stratum corneum) plays an important role in skin health, aesthetics, and glow [8]. Skin smoothness can be affected by ultraviolet (UV) exposure (sun damage), aging, dehydration, stress, medications, and type of regime. Cosmetic products must be no acnegenic, noncomedogenic, and hypoallergenic to have an effective effect on the skin [9]. Facial masks are a commodity that is easily accessible, easy to apply, and has an instant effect on the skin. Bioactive ingredients with different mechanisms are added to the mask to provide rejuvenating properties, including moisturizers, exfoliants, brightening and herbal ingredients, various types of vitamins, proteins, minerals, growth factors (GF), and other ingredients such as honey and coenzymes. The mask used is expected to moisturize the skin well and deeply, remove sebum, and rejuvenate the skin. Skin masks usually have pseudoplastic properties for practical applications. Masks are available in various forms such as gel, emulsion, sheet and paste.

Skin that is prone to acne and lesions occurred as a result of overproduction of sebum, bacterial colonisation, and inflammation. Lesioned skin and acne are characterised by dilated pores, greasy, uneven skin, and inflammatory and noninflammatory skin lesions. One of the most prevalent dermatologic conditions, acne typically affects adolescents. Epidemiological studies, however, have revealed that a sizable proportion of female patients older than 25 years old suffer from acne, and that this number has risen over the previous ten years [10]. According to a community-based UK survey, 14% of women between the ages of 26 and 44 were reported to have facial acne [11]. For oily, acne-prone, and lesioned skin, a face mask containing clay is recommended. Clay masks' advantages mostly stem from their drying properties. This causes a significant absorptive effect that causes fluid to flow from the inside out. By binding to the clay, the metabolic waste products, cellular debris, and bacterial toxins are removed from the skin by this flow, which is known as detoxification. The tiny clay granules clear the pores, absorb excess sebum, and exfoliate the skin of contaminants. It results in better blood flow and better oxygen and nutrition delivery to the skin [10]. Clay powder can also be used topically as a dermatological protectant. The clay powder has an active ingredient that enables it to provide opacity, conceal imperfections, and reduce the skin's shine [12].

According to a study by Zaman and Akhtar [13], turmeric plant rhizome extract can be utilised in skin treatments to control excessive sebum secretion in people with acne and other related conditions. Curcumin, gives the characteristics of yellow colour and possesses anti-inflammatory and antioxidant properties, is the primary active component of turmeric. Alkaloid chemicals, flavonoids, tannins, curcumin, and essential oils compose the turmeric rhizome. Turmeric is beneficial for cosmetic products due to the antimicrobial and has antibacterial and anti-inflammatory effects [14]. This characteristic, which battle zits and breakouts as well as giving a youthful look of skin, leads to the beneficial in the treatment of acne. Moreover, the sebaceous glands' production of oil could be minimized [15], while Kartini *et al.,* [16] found that Curcuma caesia roxb consists of polyphenols, flavonoids, alkaloids, quinine, and saponins. It has antioxidant activity and has a significant α-amylase inhibitory effect.

Based on the considerations, research on the production of clay mask was carried out. The study was done to explore the formulation and properties of facial masks containing Curcuma domestica Val., commonly known as turmeric. Turmeric has long been recognized for its potential benefits in skincare, attributed to its anti-inflammatory and antioxidant properties. This research aimed to formulate clay-based facial masks that incorporate Curcuma domestica Val. as a key ingredient, investigating the optimal formulation to harness its skincare attributes effectively. The study further characterises the physical, chemical, and sensory properties of these formulated masks, providing valuable insights into their texture, stability, colour, and overall performance as potential skincare products. Ultimately, this investigation contributed to the understanding of utilizing natural ingredients like turmeric in cosmetic formulations, potentially offering consumers a safer and more sustainable alternative in the realm of skincare products. Turmeric was used as an active agent to examine some parameters, i.e., pH, viscosity, spreadability, drying time, antioxidant activity, TBA value, alcohol and water contents of the product to justify the appropriateness to that of the commercial product.

2. Methodology

2.1 Materials

Commercial grades turmeric and rice flour were obtained from local market. Distilled water was used to prepare all procedures. Cosmetic grade kaolin, bentonite, and glycerin were used to prepare the clay mask.

2.2 Procedure

2.2.1 Clay facial mask preparation

All ingredients are weighed according to a predetermined formula. Distilled water is put into the container. Subsequently, bentonite was put in a container filled with water and let it sit for 15 minutes. Rice flour is added to the mixture and stirred until homogeneous. After adding the glycerin and turmeric, the mixture is stirred again until homogeneous. Then, kaolin was added gradually to the container while continuing to stir until homogeneous. The clay facial masks were varied in 5 formulas, based on the composition as given in Table 1.

Table 1
Research design

Component (%)	F1	F2	F3	F4
Kaolin	12.5	15	17.5	20
Turmeric	15	15	15	15
Bentonite	2	2	2	2
Rice flour	12.5	12.5	12.5	12.5
Glycerine	3	3	3	3
Water	55	52.5	50	47.5

2.2.2 pH testing

As much of 1 gram of this clay mask was put into a container, then electrodes that have been calibrated using a PH 4 and PH 7 buffer solution are dipped in the container. The pH of a clay mask meets the requirements if it matches the PH of facial skin, i.e., 5-8 [17].

2.2.3 Spreadability test

Testing the spreadability of clay masks was carried out by placing 1 gram of the mask on a watch glass. The treatment is carried out for 1-2 minutes, then the diameter was measured.

2.2.4 Viscosity test

The viscosity test of the preparations was carried out using a Brookfield viscometer. A sufficient amount of the clay facial mask was carefully load onto the viscometer spindle. The sample must cover the entire length of the spindle without overflowing. After setting the speed and time of viscometer, the instrument was led to run. As the spindle rotates, real-time data of the viscosity of the clay mask was provided in the viscometer. This data can be observed on the instrument's display or recorded for further analysis.

2.2.5 Drying time test

The drying test was carried out by spreading over about 2.0 g of each formulation on a glass plate of 60 × 60 mm. A uniform mask layer of 55.5 mg/cm2 with a thickness of approximately 2.0 mm was formed. Skin temperature was simulated by submitting the glass plate to a heated environment in the oven (37.0 ± 2.0°C). The processes were monitored every 5 min. After the surface of the mask had dried completely, the experiment was defined as finished.

2.2.6 Antioxidant test

A total of 10 mg of sample of each formula was dissolved using ethanol to get 10 ml, where the obtained concentration was 1000 µg/mL. The obtained sample solution was then diluted to obtain the concentration series of samples (100, 250, 500, 750 and 1000 µg/mL). As much of 2 ml of each preparation solution was mixed with 2 ml of DPPH 100 µg/mL and incubated for 30 minutes. After that, the absorption was measured using a UV-Visible spectrophotometer at a wavelength of 516 nm [18].

2.2.7 TBA value test

The TBA value test was done by adding the sample with HCl and distilled water. The mixture was then distilled at 300-600 watt for 10 min. The obtained distillate was transferred into a test tube and added with TBA reagent. The process was continued at covered test tube and heated in boiling water 75°C for 35 min. Flowing water was exposed to the test tube to cool it. The absorbance was measured at a wavelength of 528 nm using a blank solution.

2.2.8 Alcohol content test

Well-mixed and homogenous sample was prepared. The sample was then diluted with distilled water. To measure the alcohol content, the alcohol meter was immersed into the clay mask sample. The alcohol meter was allowed to float freely and wait until it stabilizes. The reading on the scale where the surface of the liquid intersects the meter was recorded. This reading represents the alcohol content as a percentage by volume.

2.2.9 Water content test

Well-mixed and homogenous sample was prepared. An empty, clean, and dry glass or aluminium dish was weighed on an analytical balance and its weight was recorded as "W_1." The clay mask sample was spread evenly in the dish, then it was placed in an oven set at a specific temperature, typically around 105°C to 110°C. This temperature was maintained throughout the drying process. The sample was allowed to dry in the oven until it reaches a constant weight. This means that the weight of the dish and dried sample no longer decreases, indicating that all the water has been removed. Once the sample has cooled to room temperature, the dish with the dried sample on the analytical balance was weighed and its weight was recorded as "W_2." The water content was determined using Eq. (1).

$$\text{Water Content (\%)} = \left(\frac{(W_1 - W_2)}{W_1}\right) x\ 100\% \tag{1}$$

where W_1 is the initial weight of the dish and W_2 is the weight of the dish with the dried sample.

3. Results

3.1 pH of Clay Facial Mask

Clay facial masks must take pH into consideration because it is crucial to ensuring the safety and efficacy of these skincare products [19]. The compatibility of a facial mask with the skin's natural pH, which normally ranges from 4.5 to 5.5 and is slightly acidic, depends on the pH level of the mask. The skin's protective acid mantle, a thin film that serves as a barrier against dangerous bacteria and environmental stressors, must be preserved by maintaining a pH level within this range. This delicate balance can be upset by a facial mask with an improper pH, which could result in a variety of problems, such as skin irritability, dryness, excessive oiliness, and even imposed skin barrier.

Each preparation's pH testing yielded a different set of results. This is due to the fact that kaolin's naturally alkaline pH ranges from 6.0 to 8.0, while the concentration of the kaolin base fluctuates. Even if the pH of each formula varies, all results meet the standards for solutions used on the skin on the face. Table 2 describes the results of clay facial mask pH for each formula. Based on the table, all formula provided the acceptable pH of 5-8.

Table 2
pH of clay facial mask

Formulation	pH
F1	6.8
F2	6.5
F3	6.8
F4	6.5

The stability and activity of an ingredient in a clay facial mask can be impacted by the pH of the mask [20]. In formulations with pH values that are too high or too low, some active components, such as antioxidants or specific botanical extracts, may degrade or lose some of their effectiveness. Since these vital ingredients must remain active and provide the skin with their intended advantages, the pH formulation must be carefully examined and regulated.

Additionally, in overall, clay facial masks perform better when their pH is at an ideal level. For instance, clays work well in somewhat acidic settings and are frequently utilised in these masks for their cleansing and purifying characteristics. Clay masks can successfully remove toxins, excess oil, and pollutants from the skin while leaving it with a balanced pH to get rejuvenated and refreshed skin.

Therefore, taking pH into account in the production of clay facial masks is crucial to preserving skin health, maximising component effectiveness, and ensuring a great user experience [17]. It emphasises the necessity for careful formulation and testing to produce skincare products that not only provide the required skincare benefits but also preserving the skin's natural harmony and balance.

3.2 Spreadability of Clay Facial Mask

Spreadability refers to how easily and evenly the mask can be applied to the skin. Obviously, spreadability refers to the degree to which the mask easily spreads over a surface when applied [21]. In the context of clay masks, which are known for their purifying and detoxifying properties, achieving the right level of spreadability is crucial. If a clay mask is too thick or lacks the ability to spread smoothly, it can be challenging to apply, leading to uneven coverage and potentially missing key areas of the face. This not only reduces the mask's effectiveness in drawing out impurities but also makes it less user-friendly. On the other hand, a clay mask with optimal spreadability ensures effortless and even application, allowing the user to achieve thorough coverage. This not only enhances the mask's effectiveness but also provides a more pleasant and comfortable application experience. Consequently, considering and optimizing spreadability in clay facial masks is essential for delivering consistent results and ensuring user satisfaction, ultimately contributing to the overall success of the product in the skincare market.

Spreadability and viscosity are opposites parameters of clay facial mask. The viscosity of a mask product can impact its spreadability, the release of active chemicals, and the consistency of the mask. Higher viscosity leads to the decrease of facial mask spreadability [22]. In this research glycerine plays an important role in mask spreadability. Glycerine has a thick, syrupy texture that can act as a binder or thickening agent in the mask formulation. Glycerine could help hold the ingredients together and create a more cohesive and creamy texture, making the mask easier to spread evenly across the skin. Moreover, glycerine promotes the even distribution of the mask on the skin's surface. This is essential for ensuring that the mask covers all areas of the face uniformly, maximizing its efficacy in addressing impurities and achieving a consistent, thorough treatment.

The addition of glycerine can significantly improve the overall user experience of applying a clay facial mask. It reduces the effort required to spread the mask, making it feel smoother and more comfortable on the skin. This can contribute to a more enjoyable skincare routine, encouraging users to incorporate the mask into their regimen regularly. The results of clay facial mask spreadability is shown in Table 3.

Table 3
Spreadability of clay facial mask

Formulation	Spreadability (cm)
F1	4.5
F2	4
F3	3.5
F4	3

It is seen in Table 3 that the spreadability was affected by water percentage in the clay mask. The study generated acceptable spreadability of clay facial mask which is in the range of 2-5 cm [23]. Previous study of Maulidia *et al.,* [24] found about the same spreadability, which was in the range of 3.8-5.4 cm. Lower water percentage resulted in smaller spreadability. Water is used in the formulation of clay masks to adjust their texture and consistency. When mixed with dry clay ingredients, water hydrates and softens the clay particles, transforming them into a smooth and creamy texture. This hydrated clay mixture is easier to spread on the skin compared to dry, powdery clay.

The addition of water improves the spreadability of the clay mask by making it more malleable and pliable. It allows the mask to glide smoothly across the skin's surface without dragging or pulling, making the application process comfortable and even. Water helps ensure that the mask can be applied evenly across the face. It distributes the clay mixture uniformly, ensuring that all areas of the skin receive consistent coverage. This is crucial for the mask to perform effectively, as it allows for uniform absorption of impurities and provides an even treatment. Water in the mask formulation contributes to skin hydration during the application process. As the mask is spread over the skin, water helps maintain a moist environment, preventing the mask from drying too quickly. This is especially important in preventing discomfort and tightness during the mask's drying phase.

Moreover, the presence of water in the mask makes it easier to apply with fingers or brushes. It encourages a more effortless and controlled application, reducing the likelihood of uneven or patchy coverage. Water helps maintain the consistency of the mask throughout its shelf life. Without adequate water content, clay masks may become overly dry and stiff over time, making them less spreadable and less effective when used.

3.3 Viscosity of Clay Facial Mask

In clay facial mask, viscosity significantly influences the application, performance, and overall user experience of these skincare products. Viscosity, which refers to the thickness or flow resistance of a substance, plays a crucial role in ensuring that the mask is easy to apply evenly on the skin. When formulating a clay mask, achieving the right viscosity is essential to strike a balance between ease of application and effective coverage. A mask that is too thin may run off the face or fail to adhere properly, leading to uneven distribution and potentially reduced efficacy. Conversely, a mask that is overly thick can be challenging to spread, making it less user-friendly and potentially uncomfortable to wear. Table 4 provides experimental results of clay facial mask viscosity. Syamsidi *et al.,* [25] reported that the standard viscosity of semi-solid preparation was about 4,000-40,000 cps.

Table 4
Viscosity of clay facial mask

Formulation	Viscosity (centipoise)
F1	5360
F2	3960
F3	4130
F4	7220

In this research, the viscosity of the clay facial mask was influenced by the combination of clay minerals (kaolin and bentonite), rice flour, glycerine, water, and their interactions. Adjusting the proportions of these ingredients can be used to control the mask's viscosity to achieve the desired texture and application properties. Table 4 revealed that F4, sample with the highest kaolin content and the lowest water percentage provided the most viscous product. The formulation of clay facial mask can control the viscosity; however, a heavier-consistency mask is typically desired [25]. In clay facial mask, viscosity also impacts the mask's ability to dry properly. Clay masks typically rely on the drying process to draw out impurities, excess oil, and toxins from the skin. If the viscosity is too high, the mask may take an extended time to dry, inconveniencing users and potentially causing discomfort. On the other hand, if the viscosity is too low, the mask may dry too quickly, potentially leading to excessive tightening and skin discomfort. It was revealed that all formula in this research provided the good viscosity, within the acceptable range of viscosity.

Furthermore, the choice of viscosity affects the sensory experience of using the mask. A well-balanced viscosity can create a luxurious and pleasant texture, enhancing the overall user satisfaction. The mask should feel smooth upon application and maintain its consistency while drying, ensuring a comfortable and enjoyable skincare ritual.

Viscosity consideration in clay facial masks is of important for optimizing application, drying, and user experience. Achieving the right viscosity is essential to ensure that the mask effectively delivers its purifying and detoxifying benefits while being user-friendly and comfortable to use, ultimately contributing to its effectiveness as a skincare product.

3.4 Drying Time of Clay Facial Mask

Drying time directly influences both the effectiveness of the mask and the user experience. The drying time refers to the duration it takes for the mask to dry and harden on the skin's surface after application. Striking the right balance in drying time is crucial because it determines when the mask is ready for removal. If the mask dries too quickly, it may not have sufficient time to draw out impurities and toxins from the skin effectively, potentially leading to suboptimal results. Conversely, if the drying time is excessively prolonged, it can cause discomfort and tightness, which may deter users from using the product regularly. Therefore, achieving an optimal drying time ensures that the mask has enough time to perform its purifying and detoxifying functions while maintaining user comfort. Moreover, a well-timed drying process allows users to easily identify when the mask is ready for removal, contributing to a more straightforward and satisfying skincare routine. Results of drying time study is given in Table 5. It is revealed that higher water content resulted in the longer drying time.

Study of Beringhs [26] used this parameter into consideration because it is important that the formulation dries relatively quickly, allowing its fast removal. They found that cereal alcohol (EtOH) is a key component of their research since it has the potential to reduce the drying time of the formulation when present in sufficient amounts.

Table 5
Drying time of clay facial mask

Formulation	Drying time (minutes)
F1	20
F2	17.3
F3	13.67
F4	10.3

Water plays a pivotal role in determining the drying time of a clay facial mask. The presence and proportion of water in the mask formulation significantly impact how quickly the mask dries on the skin. Water content acts as a carrier for the active clay ingredients, and it begins to evaporate once the mask is applied. As water evaporates, it initiates the drying process by gradually removing moisture from the mask. The rate of evaporation largely depends on factors like humidity, temperature, and the initial water-to-clay ratio in the formulation. A higher water content will generally extend the drying time, providing a more prolonged period for the mask to work its magic by absorbing impurities and excess oil from the skin. Conversely, a lower water content may lead to a quicker drying time, which can be desirable for users seeking a faster application process. Striking the right balance between water content and drying time is essential to ensure that the clay facial mask delivers its intended benefits effectively while maintaining user comfort and convenience.

3.5 Antioxidant Activity of Clay Facial Mask

In a clay facial mask, antioxidant activity is of important due to its significant impact on skin health and overall skincare effectiveness. Antioxidants play a crucial role in combating free radicals, which are unstable molecules that can cause oxidative damage to skin cells. The antioxidants content in Turmeric provides protection against premature aging, UV radiation, pollution, and other environmental stressors that contribute to skin damage. Furthermore, antioxidants help maintain the skin's natural balance, prevent collagen degradation, and promote a more youthful, radiant complexion. The applied clay mask with antioxidant activity, provides immediate benefits of impurity removal and improved skin texture but also long-term advantages, such as enhanced skin resilience and a reduction in fine lines and wrinkles. Therefore, the consideration of antioxidant activity in a clay facial mask elevates it from a mere cleansing product to a comprehensive skincare solution, addressing both immediate and long-term skin health concerns. Study of antioxidant activity is described in Table 6.

Table 6
Antioxidant activity of clay facial mask

Formulation	Antioxidant activity (%)
F1	46.5426
F2	53.8564
F3	56.5159
F4	58.5106

Curcuminoids in turmeric refer to a mixture of active compounds known as curcumin. Curcuminoids have been recognized as being able to neutralize toxins and function as antioxidant agents against free radicals. Curcuminoid concentration is positively related to antioxidant activity. In addition to curcumin, the phenolic compounds and essential oils present in turmeric also contribute to its antioxidant activity, as they are able to scavenge free radicals and peroxide radicals, thereby effectively reducing lipid oxidation. Phenolic compounds can bind oxygen, which makes it unavailable for oxidation, and form complexes with metals that are responsible for catalysing the oxidation process. Apart from that, the presence of anthocyanins in rice flour in the clay mask provides antioxidant activity.

3.6 TBA Value of Clay Facial Mask

The TBA (Thiobarbituric Acid) value is crucial as it provides valuable insights into the product's potential oxidative stability and, by extension, its shelf life and effectiveness. TBA value is commonly used as a measure of lipid peroxidation, which occurs when the lipids (fats) in a product or on the skin's surface react with oxygen and become rancid, leading to the generation of harmful free radicals. Monitoring the TBA value helps assess the mask's susceptibility to oxidative degradation over time, which is vital in maintaining its quality and preventing the formation of irritating or harmful substances. A low TBA value indicates that the mask is less prone to lipid peroxidation, ensuring its longevity and effectiveness. Additionally, this consideration underscores the importance of product preservation and packaging techniques to safeguard the mask's stability and maintain its skincare benefits for consumers. In essence, monitoring the TBA value of a clay facial mask is a key quality control measure that ensures users receive a safe and efficacious product for their skincare needs. Study of effect of clay facial mask composition to the TBA value is presented in Table 7.

Table 7
TBA value of clay facial mask

Formulation	TBA value (%)
F1	1.9191
F2	1.8776
F3	1.7377
F4	1.4707

Based on Table 7, the best formula is F4 due to the lowest TBA value, indicating the longer shelf life of the product. The TBA test is used to determine the occurrence of fat damage causes a rancid odour which is called the rancidity process, the rancidity process is greatly influenced by the presence of prooxidants and antioxidants, prooxidants will accelerate oxidation while antioxidants will inhibit it. If the TBA value is high, then the quality of the clay mask decreases or the rancidity level increases.

3.7 Alcohol Content of Clay Facial Mask

The consideration of alcohol content in a clay facial mask is of significant importance, as it can have both positive and negative implications for the product's performance and its impact on the skin. Alcohol, often included in skincare products, serves several purposes. On the positive side, it can act as a solvent, helping to dissolve and stabilize certain ingredients, ensuring even distribution and shelf stability. It can also function as a preservative, extending the product's shelf life by inhibiting the growth of harmful microorganisms. Additionally, alcohol can contribute to a lighter texture, making the mask feel more refreshing and quick-drying upon application.

However, the inclusion of alcohol can be a double-edged sword. High concentrations of alcohol may lead to skin dryness, irritation, and increased sensitivity, especially for individuals with dry or sensitive skin types. It can strip the skin of its natural oils, potentially causing discomfort and exacerbating existing skin concerns. Therefore, finding the right balance of alcohol content in a clay facial mask is essential. A carefully formulated mask with a moderate alcohol content can harness its benefits for texture and preservation while minimizing the risk of adverse effects on the skin. Ultimately, the consideration of alcohol content is pivotal for ensuring that the mask not only performs effectively but also maintains skin health and user comfort, catering to a wide range of skincare needs and preferences. Results of alcohol content of each formula are given in Table 8.

Table 8
Alcohol content of clay facial mask

Formulation	Alcohol content (%)
F1	0.0494
F2	0.0143
F3	0.0723
F4	0.0957

In this research, none of the ingredients inherently determine the alcohol content. Alcohol content in cosmetic products is typically introduced intentionally as a separate ingredient, such as ethanol or isopropyl alcohol. Alcohol may be included in skincare products for various reasons, such as a solvent, preservative, or as part of a specific formulation. It is therefore, there is no significant difference of alcohol content in each formula.

3.8 Water Content of Clay Facial Mask

Water content in a clay facial mask holds paramount importance in determining the product's texture, application, and overall effectiveness. Water serves as a key component in the mask formulation, impacting various aspects of the product. A well-balanced water content ensures that the mask has the right consistency for easy spreading and application, preventing it from being overly thick or drying too quickly on the skin. Additionally, water in the mask keeps it pliable and hydrating, contributing to a comfortable user experience. It also aids in maintaining the mask's integrity throughout its shelf life, preventing it from becoming too dry and unusable over time. Furthermore, water plays a role in creating a moist environment, which allows the mask to perform its deep cleansing and purifying actions effectively. Ultimately, the careful consideration of water content in a clay facial mask ensures that it not only delivers its intended skincare benefits but also provides a seamless, user-friendly application, promoting overall skin health and satisfaction. The result of water content study is presented in Table 9.

Table 9
Water content of clay facial mask

Formulation	Water content (%)
F1	0.45
F2	0.29
F3	0.20
F4	0.30

It is revealed from Table 9 that the decrease of water percentage in clay facial mask generated lower water content. Water as explicitly listed as an ingredient; its quantity is controlled during the formulation of the product. The water content is determined by the amount of water added to the formulation, and it can vary based on the desired texture and consistency of the mask.

4. Conclusions

Study on the production and characterisation of clay facial mask has been done. The clay facial mask used turmeric as active agent that possessing anti-inflammatory and antioxidant properties thus potential for lesioned skin. Based on the examined parameters, it was found that the produced clay facial mask met all qualifications. The pH of clay facial masks was about 6, the spreadability was in the range of 3-5 cm and drying time of 10-20 minutes. TBA value and antioxidant activity are additional parameters to indicate the shelf life of the mask and the potential of the mask for lesioned skin care. Further study about clay facial mask needs to be done to optimise the role of turmeric as antioxidant.

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