



Formulation And Evaluation Of Compact Powder By Groundnut Shell Powder

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➤ **Abstract:**

An eco-friendly product has been the primary agenda of 21st century of the global scientists. Herbal cosmetics have growing demand in the global market. The aim of present work is to In-house preparation, development and evaluation of herbal cosmetics compact powder using various natural powders for glowing skin by using natural Ingredients. The natural powders used are shade dried commercial groundnut shell powder, rose powder, orange peel powder. Sandalwood powder. The groundnut shell is a lignocellulosic material composed of cellulose act as moisturizing agent and lignin which act as a skin whitening agent as it act as tyrosinase inhibitor and also act as SPF. There are two undertones in human that is warmer tones carry yellow color and cooler tones carry pink color so this semi herbal compact powder contains both. The evaluation parameter including macroscopical, Physiochemical, irritancy, antimicrobial tests along with stability studies. we found good flow properties, free from skin irritation and maintained proper stability storage conditions. Results of this study scientifically verified that compact powder provide an even tone with glow. The overall study is useful to substantiate product claims due to its benefits on the human being.

➤ **Keywords:** Eco-friendly, Compact Powder, Groundnut shell, lignocellulosic, Undertones.

➤ Introduction:

A "cosmetic product" shall mean any substance or mixture intended to be placed in contact with the various external parts of the human body (epidermis, hair system, nails, lips and external genital organs) or with the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them ⁽¹⁾.

According to the annual statistics of the National Pharmaceutical Regulatory Agency Malaysia (NPRA), the number of new cosmetic product applications increased by 111,820 and 4,444 respectively in 2020, an increase of 107,849 compared to 2018. This significant increase shows that the demand for beauty products is rapidly growing as times change. However, this rapid growth has led to the accumulation of a large number of cosmetic products and increased public concern about the materials used. They believed that this large amount of cosmetics could be harmful to the skin. Therefore, environmentally friendly cosmetics are introduced, where the materials used contain natural ingredients and almost no harmful chemicals. According to Bloomberg, the natural cosmetics market is expected to be worth approximately \$48 billion by 2025⁽²⁾.

Cosmetics are the products apply on skin, hairs, nails. Cosmetics are the products use to improve the appearance and odor of the body. These products are available in various forms including lotion, creams, powders, shampoo, etc. used to clean, protect and moisturized skin ⁽³⁾.

The market for herbal cosmetics is growing as a result of new ingredients being available and the financial benefits of creating profitable products and upholding quality standards. Applied to the body are products known as cosmetics ⁽⁴⁾.

Cosmetics are used to improve the appearance and beauty of skin while shielding it from external and internal damaging agents ⁽⁵⁾. Using cosmetics helps one look beautiful on the outside while also promoting long-term health by lowering the incidence of skin conditions. ⁽⁶⁾.

Cosmetics are products intended to cleanse, scent, or improve appearance, and worldwide the use of cosmetics has become part of personal daily life, especially for women.

Cosmetic products, including sunscreens, are intended to protect the human body from harmful ultraviolet (UV) rays and to prevent or minimize damage to human health caused by radiation, such as actinic aging and skin cancer ⁽⁷⁾. Sun protection factor (SPF) evaluates the effectiveness of products containing sunscreen. Sun protection factor (SPF) is the ratio of the time required for erythema to develop on sunscreen-protected and unprotected skin.

This SPF value ranges from 0 to 100, and a sunscreen that is considered good is one with a rating of 15 (SPF15) or higher, which can block approximately 94% of UVB rays ⁽⁸⁾.

Face powder is a cosmetic product used to give the skin a special touch, to control oil and reduce shine, as well as to give the skin a matte finishing effect. This mattifying effect, combined with the high transparency of powder, allows you to create a special soft she focuses effect on the skin, blurring the appearance of wrinkles and lines, reducing the visibility of discoloration and improving the appearance of the skin. improves the texture ⁽⁹⁾.

Cosmetics are mixtures of several surfactants, oils, and other ingredients ⁽¹⁰⁾. They must be effective, durable, stable, and above all safe for human use. Most cosmetics are complex mixtures containing fragrances, preservatives, stabilizers, various lipids, higher alcohols, and other substances ⁽¹¹⁾. These 4,444 chemicals found in cosmetics can cause primary irritation reactions, allergic dermatitis, photosensitivity, and hair and nail damage. Cosmetics contain minerals or metal and non-metal additives. For example, titanium and zinc are used in sunscreens. The color of makeup is determined by the concentration and proportion of black or red iron oxide, titanium dioxide, and/or zinc oxide ⁽¹²⁾. Metallic dyes are used in nail polish, and the use and concentration of heavy metals also play an important role in the production of cosmetics ⁽¹³⁾. Like all processes that produce products that can be ingested or entered into the human body, the production of cosmetics is subject to strict regulations and laws and therefore requires continuous control and monitoring ⁽¹⁴⁾. Accurate trace element analysis is becoming increasingly important for many reasons, including process control related to cost reduction, pollution and environmental contamination minimization and control, product quality control and basic research.

The skin is the subject of intensive research by both dermatologists who treat skin problems and cosmetic chemists who develop specialized skin care products ⁽¹⁵⁾. Since cosmetics are widely used in the everyday world ⁽¹⁶⁾, the current research focuses on the health risks of overuse and skin problems caused by the daily use of his cosmetics. Face powder is chosen as a type of cosmetic product because it comes into direct contact with the face, and the negative changes caused by such powder can have negative effects on health, psychology, economy, and social life. This is because of their gender ⁽¹⁷⁾. As the daily use of cosmetics has an important impact on people's health and economy, achieving effective use and increasing public awareness of face powder use is one of our goals in this study. It's one. Analyzing the cosmetic effectiveness and performance of a wide range of products is a little difficult ⁽¹⁸⁾, but being aware of the most influential face powder brands in the Libyan market can help track the issue. It is considered. That could happen. In addition, the variable type of use of such powders at may also reflect increased use. In this research, it's important to be aware of the most common problems that can occur when applying face powder, and find out the most popular powder brands on the market and which ones are safe to use.

➤ **Anatomy of skin:**

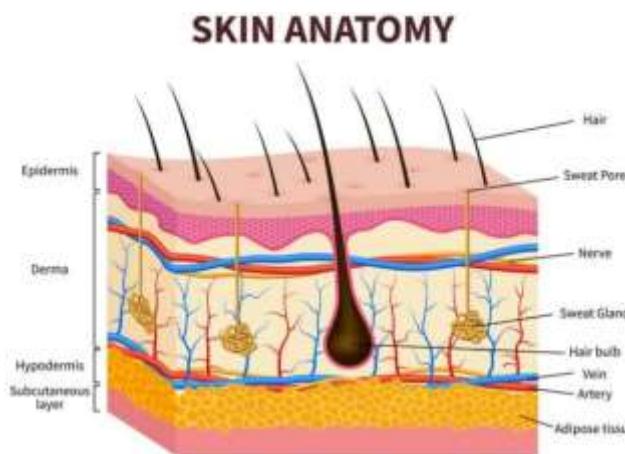


Image 1: Anatomy of Skin

The outer layer of the epidermis, the external layer of human skin, is made up primarily of corneocytes which provide a barrier function. Underlying the corneocytes are viable keratinocytes, which migrate outward and terminally differentiate to become corneocytes. The epidermis is organized into extensions called rete ridges that project between dermal papilla (pink) into the underlying connective tissue. Underlying the epidermis is the dermis, which is primarily made up of collagen, elastin fibers, and other extracellular matrix components. Collagen and elastin fibers are synthesized by fibroblasts to provide tensile strength, firmness, and elasticity to the skin. The innermost layer of the skin, the hypodermis, is composed largely of fat cells, which helps provide structure to the skin. Blood capillaries, lymph vessels, sweat glands, sebaceous glands, hair follicles and lamellar bodies lie within the dermis and hypodermis ⁽¹⁹⁾.

➤ **Different types of cosmetic powders:**

Cosmetic powders have been used since ancient times (e.g. for make-up). Such products are typically sold as loose (fluid) or compact (pressed) powders. They are used to provide adhesive, lubricious, adsorbent, smoothing, and blooming effects to the skin and hair ⁽²⁰⁾.

Many women apply face powder after applying foundation. Face powder is a valuable cosmetic product that covers skin imperfections, controls oil content, and provides a matte finish and tactile smoothness. Originally, face powder was applied over a moisturizer and acted as a type of powder foundation. As mentioned above, liquid she foundation has largely replaced powder she foundation, but for patients who want solid coverage with superior oil she controls ⁽²¹⁾.

Cosmetic powder products are generally similar and standardized with respect to ingredient composition. Basically, fillers (e.g. talc, kaolin, calcium and magnesium carbonate, metal stearates, silica and silicates), colorants (e.g. pigments, varnishes, mica, bismuth oxychloride), preservatives, Contains ingredients such as

fragrances and binders (e.g. minerals), oils, fatty acid esters, lanolin and its derivatives, gums, emulsifiers). The composition of the ingredients, along with their particle size and physical properties (e.g., adhesive properties), influence the technical quality of the final powder formulation ⁽²²⁾. beads are mica-based ingredients that mainly contain titanium dioxide and colors, and are widely used as powders due to their coloring properties and visual effects. While the milling process, binder content and compaction determine the final particle size of the powder, agglomeration of such particles, often observed during manufacturing, favors increasing the final particle size of cosmetics (consumption Scientific Committee on Human Safety ⁽²³⁾).

Face powders are a cosmetic preparation used to cover up minor flaws in the skin and improve facial appearance by covering the shiny skin due to moisture or grease from the secretion of sebaceous and sweat glands or preparations used on the skin. The essential properties of face powder are to mattify oily skin and have a characteristic of smooth feeling for a long time. Therefore, the preparation must be able to adhere for a long time, so no need for frequent application ⁽²⁴⁾.

• **Loose (Floating) Powder:**

Loose (Floating) Powder includes finishing powder, foundation, scented body powder, cheek powder, eye shadow, dry shampoo, or more. As already mentioned, the composition of loose powders is generally standardized, for example dry shampoos usually contain two or other powder ingredients to absorb the sebum (oil) of the scalp. The particle size of loose powders is generally smaller than that of compact (pressed) powders, enhancing the performance of powder products ⁽²⁵⁾. To minimize potential inhalation exposure, dust-free powders are commercially available ⁽²⁶⁾.

Body powder has the ability to absorb moisture from skin surfaces, such as a baby's diaper area ⁽²⁷⁾, and is typically sold as a loose powder in a box or shaker. These are usually stored in a bathroom in a humid environment, so they are protected from moisture and other caking. B. Using a combination of absorbable and non-absorbable silica. Loose powder, unlike baby powder, is usually applied using a powder puff or makeup brush ⁽²⁸⁾.

• **Compact (Pressed) Powder:**

Compact (pressed) powder is a dry powder that is compressed into the shape of a cake. Such powders are usually applied to the body, face and eye area using a puff (fluffy sponge) or brush. Make-up is the most commonly used cosmetic product today. pressed powder has a similar composition to lose powder but contains a significantly higher proportion of binder ⁽²⁹⁾.

When creating pressed powder foundations, we recommend using the Jet Mill as it creates unique spherical particles. In contrast, a hammer mill or pulverize produces irregularly shaped and larger particles. Higher levels of binders contribute to the overall feel of the product during application and minimize the formation

of airborne particles during use ⁽³⁰⁾.

Why and what is Groundnut?



Image 2: Groundnut shell Powder

Groundnut is a rotational crop which have a high value and also it has good amount cellulose. This plant improves soil nutrients, it is because of these roots atmospheric nitrogen fixing bacteria are present. It contains fibers and which have good strength and properties ⁽³¹⁾.

Groundnut, also known as *Arachis Hypogaea*, is an important and nutritious legume oilseed crop grown under rain-fed conditions in semi-arid and subtropical regions. It is an important food crop for domestic consumption, ranking 13th among the most important oilseeds and 6th among the most important oilseeds in the world. Its composition is 48- 50% oil, 26-38% protein, 11-27 carbohydrates, minerals and vitamins ⁽³²⁾. Peanuts are also effective.

Peanuts are nutritious legumes grown throughout the world primarily for seed and oil production. Peanut shells are the remaining product made in after the peanut kernels are removed from the shells. It is an abundant agro-industrial waste with a very slow decomposition rate under natural conditions ⁽³³⁾. However, peanut shell contains various bioactive and functional components that are beneficial to humans. Commercially, it is used as a filler in raw materials, foods, fertilizers, and even as a biofilter carrier. However, most of the abandoned peanut shells are either incinerated or buried, leading to environmental pollution. Therefore, new technologies need to be developed to achieve zero- waste production and make effective use of this waste product in the food, feed, paper, and bioenergy industries ⁽³⁴⁾.

Table 1: Composition of ground nut shell.

Composition	Dry weight percentage
Cellulose	35.7
Hemicellulose	18.7
Lignin	30.2
Volatile solids	68.7

➤ **Method of preparation:**

Three methods are used to prepare Compact powders.

- (a) Wet Method
- (b) Dry Method
- (c) Damp Method

Damp Method This technique is most frequently used for business purposes.

➤ **General Method of Preparation:**

Compact powder is easy as it simply involves mixing and compacting the fine powder ingredients. The required amount of kaolin, titanium dioxide and zinc stearate were taken along with groundnut shell powder, rose petal powder and orange peel powder the required amount of sandalwood powder was added and kept for some time. Mix the all powders well, then add the fragrance mixture and sieve the powder mixture through a silk net or nylon cloth, then add the binder to the above mixture and mix until the desired plasticity of the product is achieved. The mixture is sieved and compacted using a weight. Finally, the product was dried in oven at 80°C for 15 minutes.

➤ **Compact powder formulation:**

The formulation used in this study is based on components listed in Table 2.

Table 2: Formulation table

Sr.No.	Name of Ingredients	Role of Ingredients	(F1) Quantity for 20gm	(F2) Quantity for 20gm	(F3) Quantity for 20gm
1.	Groundnut shell powder	Skin whitening agent	10	10	10
2.	Sandalwood powder	Toning agent	3	2	2
3.	Rose petal powder	Pigmenting agent	1	1	1
4.	Orange peel powder	Pigmenting agent	2	1	1
5.	Talc	Slippering agent	1	2.5	2
6.	Kaolin	covering material	1	1	1
7.	Titanium dioxide	SPF	1	1	1
8.	Zinc stearate	SPF	1	1	1
9.	Gum arabic	Binder	-	0.5	1
10.	Perfume	odor	q.s	q.s	q.s



Image 3: Formulated compact powder

➤ Evaluation of Compact Powders:

Evaluation is done to determine the uniformity of the final output. Apart from the stability test, general inspections offer an evaluation of the formulation's contents. This is done to determine whether the chemical has a long shelf life (i.e., stays stable for a lengthy period of time). There are further tests conducted.

They are as follows:

1. SPF value determination:

Sample preparation

The stock solution has been prepared by using 10mg of each groundnut shell powder dissolved in 100ml of methanol to get 100 μ g/ml of concentration and filtered through Whatman filter paper to get clear solution, three dilution 40 μ g/ml, 50 μ g/ml and 60 μ g/ml were made using stock solution. All the samples were scanned thrice for specified wavelength 200 nm to 700 nm using UV Visible spectrophotometer. The base line correction has been made by using solvent used for extraction of sample material, then sample absorption has been measured by using one cm quartz cell where 80% ethanol solution were used as blank. The absorption of groundnut shell powder was recorded ⁽³⁵⁾.

2. Physical Evaluation:

Physical parameters such as color, odor, appearance and texture were checked visually.

3. Moisture content:

Weigh around 1.5 gm of the powdered compact into a thin, flat, weighted porcelain dish. Dry at 100C or 105C in the oven until two consecutive weights do not vary by more than 0.5 mg. Cool in the desiccators and weigh it. Weight loss is normally reported as moisture ⁽³⁶⁾.

4. Total Ash:

Add approximately 2 to 4 g of accurately weighed field air-dried material (usually platinum or silica) to a pre-ignited and tarred crucible. Sprinkle the ingredients in an even layer and ignite until white. Gradually increase the heat to 500-600°C to indicate lack of carbon. Let it cool and then weigh it. Cool the crucible and, if this method does not yield carbon-free ash, moisten the residue with approximately 2 mL of water or a saturated solution of ammonium nitrate. Dry on a hot plate in a warm bath and set the to continuous weight. Cool the residue in a suitable desiccator for 30 minutes and weigh immediately. Calculate the total ash in mg/g of the air-dried material.

$$\text{Total ash value} = \frac{\text{weight of ash}}{\text{weight of sample}} \times 100$$

5. Acid-insoluble ash:

Add 25 ml of hydrochloric acid (~70 g/l) TS to the ash crucible, close the watch glass and boil thoroughly for 5 minutes. Wash the watch glass with 5 ml of water and add this liquid to the crucible. Collect the insoluble material on ashless filter paper and wash with warm water until the filtrate is neutral. Transfer the filter paper to the insoluble material in the original crucible, dry on a hot plate, and ignite until constant mass. Cool the residue in a suitable desiccator for 30 minutes and weigh immediately. Calculate the concentration of acid-insoluble ash in mg per gram of air-dried contents.

6. Water Soluble Ash:

Add 25 ml of water to the pot containing all the ash and boil for 5 minutes. Collect insoluble material in a sintered glass crucible or on ashless filter paper. Rinse for 15 minutes in a saucepan with warm water and heat to a temperature not exceeding 450 degrees. The weight (mg) of this residue is subtracted from the total ash weight. Calculate the water-soluble ash content in mg per g of air-dried material⁽³⁷⁾.

7. Particle size determination:

Particle size is a factor that influences various properties such as malleability, grain size, etc. The particle size is I. P. Measured by sieving method. calculated. Mechanically shake a regular sieve for 10 minutes.

8. Angle of Repose:

The maximum possible angle between the surface of the powder pile and the horizontal flow is called the angle of repose.

Open Cylinder Method

Place an appropriate amount of dry powder on the surface of each end of an open cylindrical tube. Next, you need to lift the funnel to form a mountain. Specify and record the height and radius of the stockpile base. The angle of repose can be determined using the following formula in the method above.

$$\theta = \tan^{-1}(h/r)$$

where θ – angle of repose, h – height of pile,

r – radius of base

9. Bulk density:

Bulk density is the ratio of its bulk volume to its bulk volume. Dry the appropriate amount of powder and fill into a 50 ml graduated cylinder up to 50 ml. Then lower the cylinder from a height of 1 inch onto a hard wood surface at 2 second intervals.

Measure the volume of the powder. The powder is then measured. Repeat this process to obtain the average value.

Bulk density is calculated using the following formula.

$$\text{Bulk Density} = \text{Mass}/\text{Volume}$$

10. Tap Density:

Tapped density is the ratio of its tapped volume to its tapped volume. Dry the appropriate amount of powder and fill into a 50 ml graduated cylinder up to 50 ml. Then tap the cylinder for 1000 times. Measure the volume of the powder. The powder is then measured. Repeat this process to obtain the average value ⁽³⁸⁾.

11. PH:

A digital pH meter calibrated at a constant pH was used to calculate the pH of a 1% aqueous solution in the formulation.

12. Tone Test:

This test determines and controls tonal changes. Spread the powder sample on white paper and perform to observe the appearance compared to normal. Another method is to apply the powder and standard sample to the skin using a puff and compare. The final product also uses the puffs used to perform this test. Color evaluation is performed using artificial light.

13. Payoff Test:

This test is performed to check the adhesive properties of puff powder. This test is primarily performed on compacted powders.

14. Pressure Test:

Pressure required for compaction purposes of compacted powder. Uniform loading is required to avoid the formation of air pockets. This causes the compacted powder to break or crack. This is because when using a penetrometer to test cake hardness uniformity at high pressure, the pressure drop softens the Compact powder. This is done by recording and calculating the measurements of the compact powder at different stages ⁽³⁹⁾.

15. Destructive Test:

In this test, compressed powder is dropped onto a wooden surface from a height of approximately 20- 25 cm. After repeating this several times, inspect the compressed powder for damage. When left unbroken, the compact powder exhibits user resilience to travel and normal handling.

16. Abrasive Properties:

The abrasive properties of a powder can be measured by rubbing the powder onto a smooth surface of the skin. The powder impacts are then examined using a microscope ⁽⁴⁰⁾.

17. Irritation Test:

Subjects were selected for the skin irritation test and checked for redness and swelling regularly over a 24-hour period ⁽⁴¹⁾.

➤ Results and Discussion:

Compact powder formulations were prepared and evaluated in terms of organoleptic and physicochemical parameters (see Table 3 and Table 4, respectively). The color of the formulation was F1-Natural being, F2-Caramel, F3-Spice. The odor of the prepared formulation was judged to be desirable and satisfying for a cosmetic formulation. The pH values of all formulations were close to the neutral value of, i.e. in the range of pH 6–7. The total content of ash, water-soluble ash, acid- insoluble ash, and moisture was within the limits (Table 4). Flow property parameters showed good flow properties. The particle size of the formulations ranged from 30 to 33 μm (Table 5). Other basic tests were conducted to evaluate the final formulation.

1. SPF value determination:

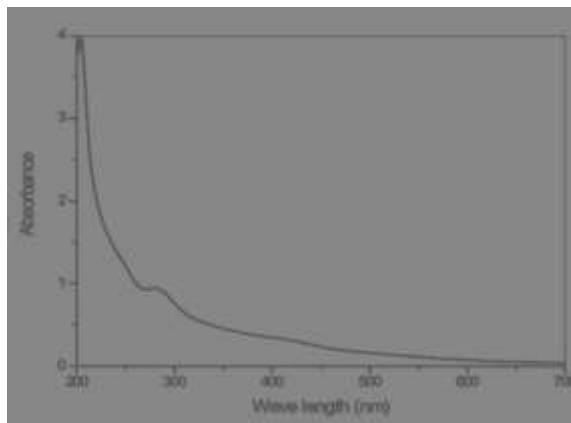


Figure 1: Uv visible spectra of groundnut shell powder

The absorption spectrum is shows from 200nm to 700 nm. The high absorption in the range 200- 220nm. Result shows that groundnut shell powder have ability to absorb UV radiation so it protects from sun damage.

2. Organoleptic evaluation:

These evaluation parameters include its Nature, odor, Color, Texture of compact face powder (Table: 3) which were evaluated visually or manually.

Table 3: Organoleptic evaluation.

Sr.no.	Evaluation Test	Observation
1.	Nature	Powder
2.	Oduor	Perfumed
3.	Color	Natural spice
4.	Texture	Smooth

3. Physicochemical Evaluation:

Total Ash content, Water soluble ash, Acid insoluble ash was performed, pH was found by using pH meter and Moisture content was also performed for their physicochemical parameters.

Table 4: Physicochemical tests.

Sr.no.	Evaluation Test	Observation
1.	Total Ash	2.6%
2.	Water soluble ash	1.3
3.	Acid insoluble ash	0.55
4.	Moisture content	2.6% w/w
5.	PH	6.4

4. General powder Characteristics:

The size of particles was evaluated by microscopy method. The flow property of the powder was evaluated by performing Tapped density, Bulk density, Angle of Repose by funnel method (Table: 5).

Table 5: Powder Characteristics.

Sr.no.	Evaluation Test	Observation
1.	Particle size	30-33 μ m
2.	Angle of repose	35
3.	Bulk density	0.80gm/ml
4.	Tapped density	0.72gm/ml

4. Evaluation of final formulation:

Various tests for compact face powder was performed such as Shade test, Pay-off test, Pressure test, Breakage test, and Abrasive test and further evaluated (Table: 6).

Table 6: Other evaluation tests

Sr.no.	Evaluation Test	Observation
1.	Shade test	Passed
2.	Pay-off test	Passed
3.	Pressure test	Passed
4.	Breakage test	Passed
5.	Abrasive test	Passed

5. Irritancy test Choose and mark the area of hands.

Sufficient quantity of prepared semi herbal compact face powder was applied to the area of hand and time was noted down. Irritancy, Redness, Swelling was checked for regular intervals up to 24 hrs. and noted down (Table: 7)

Table 7: Irritancy test.

Sr.no.	Evaluation Test	Observation
1.	Irritation	no
2.	Redness	no
3.	Swelling	no

➤ **Conclusion:**

Natural remedies are considered safer and have fewer side effects and are therefore more accepted. Herbal preparations are in increasing demand in the global market. This is a very good attempt to establish the mattifying effect of semi-herbal facial compact powder with groundnut shell powder. Therefore, in this study, we have discovered the excellent properties of compact powder for the face. This study requires further optimization studies to find out the beneficial benefits of compact powder for humans.

The groundnut shell is a lignocellulosic material composed of cellulose act as moisturizing agent and lignin which act as an skin whitening agent as it act as tyrosinase inhibitor and also act as SPF. There are two undertones in human that is warmer tones carry yellow color and cooler tones carry pink color so this semi herbal compact powder contains both shades.

➤ **Future prospective**

The development of new derma cosmetics has rapidly increase due to consumers demand for non-invasive product with lower adverse effect. Sun protection remains a key area of new product development and has been growing in importance rapidly as consumers become more and more aware of how they are perceived in and outside the workplace. Consumers want to look good and mask imperfection as long as possible which can be seen by the upcoming trend in use of cosmetic products and sun protection demands. The groundnut shell is a lignocellulosic material composed of cellulose act as moisturizing agent and lignin which act as skin whitening agent as it act as tyrosinase inhibitor and also act as SPF. The novelty of this research is use of more herbal ingredient to make semi herbal compact powder formulation so one can use it on daily basis.

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