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### FORMULATION AND OPTIMIZATION OF SEMI HERBAL ANTI ACNE COMPACT FACE POWDER BY *ALLIUM SATIVUM* AND *MYRISTICA FRAGRANS* EXTRACT

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#### ABSTRACT

The aim of this work is to formulate and test a compact herbal powder from herbal ingredients for cosmetic purposes and anti acne use. Ingredients like Gum Arabic, Glycerol, Talc, Kaolin, Titanium dioxide, Zinc stearate, Garlic and Nutmeg are purchased from local store and then passed through sieve, preparation of binder, mixed thoroughly prepared and evaluated for its organoleptic, physicochemical characters and antimicrobial evaluation. The combined-form dried powder had a passable flow property appropriate for a compact face powder. Herbal compact powders are used as a base for your entire makeup routine and anti-acne activity as it contains garlic extract which is having prominent activity against *Pseudomonas aureginosa* and *Escherichia coli*. Thus in this present work, we found good properties of herbal compact powder and find the useful benefits.

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## INTRODUCTION

Acne, meaning peak or apex, is a hereditary or acquired consequence of the pilosebaceous units from the Greek word "Akme." This is a pilosebaceous gland skin condition characterized by the development of seborrhea, comedones, inflammatory lesions and the involvement in the follicular canal and sebum production of the bacteria *Propionibacterium acnes*, *Staphylococcus epidermidis* and *Staphylococcus aureus*.

*P. acnes* are defined as an obligate anaerobic microorganism. It is involved in the production of inflammatory acne through its capacity to activate supplements and its potential to metabolize sebaceous triglycerides into fatty acids that attract neutrophils chemotactically.

By comparison, *S. Epidermidis*, an anaerobic organism, is typically involved within the sebaceous unit in superficial infections. *Staphylococcus aureus* develops, causing acne lesions, when the chemicals produced by *P. acnes* damage the cell structure of skin cells. Such variables include a possible target for therapy. *P. acnes*, *S. epidermidis*, *S. aureus* are the target sites for the anti-acne drugs. [1, 2]

Garlic (*Allium sativum* L.) is one of those plants that were seriously investigated over several years and used for centuries to fight infectious diseases. [3] Allicin (diallyl thiosulfinate or diallyldisulfide) has been the most bioactive compounds in garlic. Alliin (S-allylcysteine sulfoxide) is the most common sulphur compound in garlic and the sum in fresh and dried garlic is about 10 and 30 mg/g, respectively. [4] While allicin is known to be the key antioxidant and scavenging compound, recent studies have shown that other compounds, such as phenolic and steroidal polar compounds, give different pharmacological properties without odour and also are heat stable. Garlic has been shown to have a very beneficial effect on acne because of anti-microbial, anti-inflammatory and antioxidant activities of different chemical constituents. [5]

The compacts are mentioned in ayurveda help women to get rid of wrinkles, dark circles, pimples and acne. Natural compacts are less complicated and pretty simple to use. Applying compact powder can help in absorbing excess oil from your skin. Compact powders also give your face a long-lasting matte finish and do not cause your face to shine even after a few hours. Thus, it provides double advantages that you can apply compact powders without applying Foundations and also set the liquid foundation. [6]

## Benefits of Applying Face Pack

Based on the medicinal extracts, it aims to reduce wrinkles, pimples, cuts and marks.

These face masks give the skin a calming and soothing effect.

1. Natural face packs make the skin look young and healthy.
2. Accurately processed.
3. Effective usage.
4. Free from harmful chemical.
5. Hygienically Processed.
6. Long shelf life. [7]

## MATERIALS AND METHODS

The materials used in the present purchased from local store, powdered for further use. The descriptions of the study of plant materials and other required ingredients for the preparation of Compact face powder are below.

### Gum Arabic (water soluble binder)

Gum arabic (GA) or acacia gum are the exudates of *Acacia senegal* and *Acacia seyal* trees that belong to the Leguminosae family. It is a complex, branched heteropolysaccharide consisting of 1, 3-linked  $\beta$ -D-galactopyranosyl groups, either neutral or mildly acidic. As constituents of this polymer, L-arabinose, L-rhamnose and D-glucuronic acid have also been detected. The side chains consist of two to five units of 1, 3-linked  $\beta$ -D-galactopyranosyl, which are joined by 1, 6-linkages to the main chain. Some reports say that polysaccharides and glyco-proteins are a mixture of this gum. The light-orange or pale-white pieces of GA are water soluble. [8]

### Talc

Talc is a hydrous magnesium silicate having a chemical composition of  $Mg_3Si_4O_{10}(OH)_2$  or  $H_2Mg_3(SiO_3)_4$ . Although Mg can be substituted for Mn and Al, very tiny amounts of Ca can also be substituted for Mg. Si and Fe can substitute small amounts of Al or Ti. The mineral is known as minnesotaite when Mg is replaced with higher quantities of Fe, and the mineral is known as pyrophyllite when Al replaces Mg. Talc is usually green, white, grey, brown or colorless, water-insoluble and partially soluble in diluted mineral acids. On the Mohs Hardness scale of 1-10, it displays a hardness of 1. [9]

### Kaolin

Kaolin, or Chinese clay, though relatively unusual in nature, is of special significance to the potter. In the development of clean white porcelain it is fundamental. It consists of a primary mineral called kaolinite. [10]

### Zinc Stearate

Zinc stearate serves as an internal lubricant, i.e. it reduces the forces of friction between the particles and facilitates an increase in the degree of powder texture produced by the magnetic field. [11]

### Titanium dioxide

In a broad range of fields, including catalysis, photocatalysis, and antibacterial agents, titanium dioxides (TiO<sub>2</sub>) are commonly studied as nano-paint (self-cleaning) affecting the quality of life due to their interesting general properties. In terms of efficiency, TiO<sub>2</sub> and noble metal dopes are also good candidates for these applications. [12].

### Garlic Extract

Chemicals of this plant act as a natural antibiotic in the human body. These chemicals can selectively inhibit harmful bacteria without affecting useful bacterial flora. Garlic is a rich source of flavonols and organosulfur compounds. These compounds are responsible for the medicinal property of garlic. [13]

### Nutmeg

The antibacterial activity of the volatile oil obtained from the seeds of *Myristica fragrans* was tested in a study which included 25 different bacterial strains and it was observed that it was equally effective against the majority of gram positive and gram negative microbes. [14]

## METHODS OF PREPARATION

Three methods are used to prepare Compact powders. The following are:

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

### Damp Method

This technique is most frequently used for business purposes.

### General Preparation

Compact powder preparation is simple because it is simply a matter of mixing and compacting finely powdered materials. Required quantity of Kaolin, Titanium dioxide and Zinc stearate along with Garlic plus Nutmeg extract powder was taken and added required amount of perfume and kept it aside for some time. Mix the color properly with the talc variable and then added the perfume mixture to it. Mix and sieved the powder mixture using a silk mesh or an old washed nylon cloth then added binder to the above mixture and blended until desired plasticity of the product is obtained. Screening of mixture is carried out followed by compression by machine. Finally, the product was dried at elevated temperature. [15]

**Table 1: Formulation of Binder.**

Sr.No.	Name of Ingredients	Quantity
1.	Gum Arabic	1.0 gm
2.	Glycerol	5.0 gm
3.	Water	94.0 gm
4.	Preservative	q.s

**Table 2: Formulation of Compact Face Powder.**

Sr.No.	Name of Ingredients	Quantity for 100 gm
1.	Talc (slip character)	69 gm
2.	Kaolin (covering materials)	18 gm
3.	Titanium dioxide	8.0 gm
4.	Zinc stearate	5.0 gm
5.	Garlic Extract powder	0.5 gm
6.	Nutmeg Extract powder	0.5 gm
7.	Binder	q.s.
8.	Perfume (odour)	q.s.
9.	Color	q.s.



**Figure 1: Formulated semi herbal compact powder.**

## Extraction of Nutmeg and Garlic

### Nutmeg extraction

Samples of *Myristica fragrans* (Nutmeg) were collected from store. The compact powder was prepared from Ethanolic extract of *Myristica fragrans*. 15 g of the powder seed of plant were extracted with 250 ml of ethanol solution by means Soxhlet extraction for 5-6 hrs. Remove extract from RBF and filtered through Whattman filter paper and filtrate was collected and evaporated at Rotary evaporator. Finally extract powder was collected.

### Garlic Extraction

Samples of *Allium Sativum* (Garlic) were collected from store. The compact powder was prepared from Hydro-alcoholic extract of *Allium Sativum*. 15 g of the powder bulb of plant were extracted with 200 ml of ethanol and 50 ml of water diluted mixture by means Soxhlet extraction for 2-3 days. Further remained procedure is as same as Nutmeg extraction. [16]

## Evaluation of Compact powders

In order to know the consistency of the finished product, evaluation is carried out. In addition to the stability test, general checks provide the assessment of the contents in the formulation. This is done in order to know whether the substance stays stable for an extended period of time (i.e.1 shelf life). Other tests are also performed. They are:

### Physical Evaluation

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

### Moisture content

Weigh around 1.5 gm of the powdered medicine into a thin, flat, weighted porcelain dish. Dry at 100<sup>0</sup>C or 105<sup>0</sup>C 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. [17]

### Total ash

Place in a previously ignited and tarred crucible about 2-4g of the field air-dried material, precisely weighed (usually of platinum or silica). In an even layer, scatter the material and ignite it until it is white, illustrating the lack of carbon by steadily raising the heat to 500-6000C. Cool it and weigh it. Cool the crucible and moisten the residue with around 2 ml of water or a saturated solution of ammonium nitrate R if carbon-free ash cannot be obtained in this manner. Dry on a hot-bath, then on a hot-plate, and turn to continuous weight. Enable the residue to cool for 30 minutes in a suitable desiccator and then weigh it immediately. Calculate the total ash content of air-dried material, in mg per gm.

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

### Acid-insoluble ash

To the ash-containing crucible, add 25 ml of hydrochloric acid (~70g/l) TS, close the watch glass and boil thoroughly for 5 minutes. Wash the watch-glass with 5 ml of water and transfer this liquid to the crucible. On an ashless filter paper, gather the insoluble matter and wash until the filtrate is neutral with warm water. Move the filter-paper to the insoluble matter comprising the original crucible, dry it on a hot-plate and ignite it to a constant mass. Enable the residue in a suitable desiccator to cool for 30 minutes and then weigh it without delay. Calculate the acid-insoluble ash concentration in mg per g of air-dried content.

**Water-soluble ash**

Add 25 ml of water to a crucible that included the complete ash and boil for 5 min. Collect insoluble matter in a sintered-glass crucible or on ashless filter-paper. Clean in a crucible for 15 minutes with warm water and heat up at a temperature not exceeding 450°C. In mg, the weight of this residue is subtracted from the total ash weight. Calculate the water-soluble ash content per g of air-dried material in mg. [18]

**Particle Size Determination**

Particle size is an aspect that influences different properties such as spreading ability, grittiness, etc. The particle size was calculated by the method of sieving using I.P. Mechanical shaking of regular sieves for 10 minutes.

**Angle of repose**

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

**Open - ended cylinder method**

The appropriate quantity of dried powder is put in an open cylindrical tube on a surface at both ends. Then, to form a heap, the funnel should be lifted. It states and records the height and radius of the heap. The angle of repose can be determined for the above method by using the formula.

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

Where,  $\theta$  – Angle of repose,  
h – Height of the heap,  
r – Radius of the base

**Bulk density**

Bulk Density is the ratio of a powder's given mass to its bulk volume. The appropriate quantity of powder is dried and filled into a 50 ml measuring cylinder with a maximum of 50 ml. Then, from a height of 1 inch at 2 second intervals, the cylinder is lowered onto a hard wood surface. Measure the volume of the powder. The powder is then measured. To get average values, this is repeated. The bulk density is determined using the formula given below.

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

**Tapped density**

Clean with hot water in a crucible for 15 minutes and ignite at a temperature not exceeding 450 °C. In mg, the weight is subtracted from the total ash weight of this residue. Calculate the water soluble ash content per g of air-dried material, in mg. [19]

**pH**

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

**Microbial Assay**

The antibacterial activities of the various formulations were calculated by the method of diffusion of modified agar wells. In this process, on nutrient agar plates, 0.2 ml of 24 h broth culture of *Escherichia coli* and *Pseudomonas aureginosa* acausative organism for *acne vulgaris* were planted. The agar plates have been allowed to solidify. To cut wells of equidistance in each of the plates, a sterile 8 mm borer was used. 0.5 ml of formulations was randomly injected into the wells with herbal extracts. The plates were incubated at 37°C for 24 hours. Antibacterial activity was assessed by measuring the inhibition zones (in mm). The results of evaluation are shown in Table. [20]

**Shade Test**

In this test, the variations of color shade is determined and controlled. By spreading the powder sample on a white paper, it is carried out and the appearance is observed compared to the normal one. Another procedure involves adding powder and standard samples to the skin with the aid of puff and then comparing them. For the final product, the puff used to conduct this test is also used. The color assessment is carried out using artificial light.

**Pay-off Test**

This test is performed to verify the adhesive properties of the puff powder. This test is carried out primarily on compact powders.

**Pressure Test**

The pressure needed for compaction purposes in compact powders. Uniform strain, leading to either breakage or cracking of compressed powder, should be applied to avoid the creation of air pockets. This is because the pressure drop will allow the compact powder to be soft, while the uniformity of the hardness of the cake will be tested by high pressure with the help of the penetrometer. This is done by taking and then calculating the reading on compact powder at different stages.

### Breakage Test

Compact powders are allowed to fall from a height of around 8-10 inches on a wood surface in this test. This is done several times and then the compact powder is tested to see if any breakage has occurred. If the compact powder stays unbroken, it reveals users' resistance to travel and regular handling.

### Abrasive Character

It is possible to determine the abrasive quality of the powder by rubbing the powder on the smooth surface of the skin. The impacts of powder are then examined with the aid of a microscope. [21]

### Irritancy Test

The subject was selected for the skin irritancy test and Redness, Swelling was checked for regular intervals for 24 hrs. [22]

## RESULT AND DISCUSSION

The formulation of Compact powder was prepared and evaluated for Organoleptic and physicochemical parameters showed in the Table 3 and Table 4 respectively. The color of formulation was Natural shell. The odor of prepared formulation, which is desirable as cosmetic formulations, was fined satisfactory and perfumed. The pH of all formulations was similar to the neutral level, that is, in the 6 to 7 pH range. The Total Ash, Water soluble Ash, Acid insoluble ash, moisture content was within limit (Table 4). The flow property parameter showed good flowing property. The particle size of formulations was in the range of 30-33 $\mu$ m (Table 5). Antimicrobial test was carried out and evaluation of final formulation.

### 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	Odor	Perfumed
3	Color	Natural Shell
4	Texture	smooth

### 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.**

Ash Values		
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

### 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 $\mu$ m
2	Angle of Repose	35
3	Bulk density	0.80 gm/ml
4	Tapped density	0.72 gm/ml

### Antimicrobial Evaluation of Garlic Extract and Compact face powder containing Garlic and Nutmeg

Antimicrobial evaluation was performed against Escherichia coli and Pseudomonas aureginosa bacteria the zone of inhibition for both the bacteria was evaluated (Table: 6).

**Table 6: Antimicrobial evaluation test.**

Sr.No.	Bacteria	Zone of Inhibition (mm)	
		Garlic Extract	Garlic Nutmeg Compact
1	Escherichia coli	40	33
2	Pseudomonas aureginosa	36	30

### 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: 7).

**Table 7: 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

### 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: 8)

**Table 8: Irritancy test.**

Sr.No.	Evaluation Test	Observation
1	Irritation	NIL
2	Redness	NIL
3	Swelling	NIL



**Before**



**After**

**Figure 2: Skin irritancy test.**

**CONCLUSION**

Natural remedies are more acceptable in the belief that they are safer with fewer side effects. Herbal formulations have growing demand in the world market. It is a very good attempt to establish the semi herbal face compact powder containing garlic and nutmeg extract powder as anti acne property. Thus in the present work, we found good properties for the face compact powder and further optimization studies are required on this study to find the useful benefits of compact powder on human.

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**Conflict of Interest**

The authors do not report any conflict of interest.



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