Formulation and Optimization of Semi Herbal Anti Acne Compact Face Powder by Using Methanolic Extract of *Prickly Malvastrum*

Nikita D. Gidde[1], Swati V. Patil[2], Kalyani V. Gaikwad[3], Ruksar S. Mistry[4,] Dnyaneshwari B. SAPKAL[5]

[1,2,3,4,]Adarsh College of Pharmacy, Vita.

[5]Government College of Pharmacy, Karad.

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, and *prickly malvastrum* are collected and then passed through sieve, preparation of binder, mixed thoroughly and evaluated for its organoleptic, physicochemical characters and antibacterial 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 antiacne activity as it contains prickly malvastrum extract which is having prominent activity against *stap. aurious* and *e-coli.* Thus, in this present work, we found good properties of herbal compact powder and find the useful benefits.

Keywords: Compact face powder, anti-acne, Herbal, Antibacterial

1. Introduction

The Compact face powder was demanded by many nations in the world in the beginning AD and in Asia. white skin was believed to be the sign of aristocratism, membership of the elite, and yet, white colour is the pure symbol of the internal beauty and nobility. In addition, some compact face powders are sold in varying specialty shades to suit different skin needs; for example, a face powder with a greenish tinge will minimize the appearance of redness, while a purple-tinted powder may help the appearance of sallow or yellow skin. There is a legitimate reason to use face powder, and the pharmacopeias prescribe them in the treatment of many skin affections. At all events the proper use of powder is beneficial, it lightly covers and unifies a complexion, hiding the ravages of time, improving even the beautiful face.

Compact Face powder comes in different shades to match varying skin tones, and it is a good idea to choose the skin tone that most closely matches the natural skin. This will help the

makeup appear more natural; it should be virtually unnoticeable. It may be necessary to use different face powders for summer and winter, as the skin may become tanner in the summer, or drier and in need of extra moisture in the winter. They are of benefit in acne, freckles, sunburn and red nose. Beneath their attractive aspect and odour, face powders should be made by the perfumer to combine the qualities of an elegant cosmetic and therapeutic agent; they must primarily possess adherence, lightness and be transparent; secondly, they should be detergent and delicately absorbent in order to aid the natural functions of the skin, taking up the fatty matters not easily dislodged by water; they should also tend to increase the natural elasticity and regular functions of the skin.[1]

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.[2] Sometimes chemical based compacts damage the skin after use so, here we are developing herbal compact face power. As we know herbs are not creating any side effect. it gives lots of benefits. Herbs are known for the therapeutic components they contain; all of these components are removed and added to the compact face powder, making it safer. It offers the skin a smooth texture and a gentle appearance. It also helps in the treatment of antibacterial and fungal skin diseases. It improves the lowering of skin elasticity. *Prickly malvastrum* is one of the herbs which consist various therapeutic activities.[3]

In this research project, we are going to use leaf extract of *Prickly Malvastrum*. *Prickly Malvastrum* also known as three lobes false mallow, is an annual or perennial herb or shrub. It consists of various activities like anti-inflammatory, antioxidant, antidiabetic, wound healing, antibacterial, antifungal, immunomodulatory, antipyretic, antidiarrheal, anthelmintic, and antiulcer. So, in the current study, we are going to use an aqueous extract of *Prickly Malvastrum*. By using this plant, we have formulated semi herbal compact face powder consisting of antibacterial properties.[4]

2. Material and Methods

2.1 Collection and authentication of the plant material

The plant *Prickly Malvastrum* leaves were collected from field of Balawadi (Bha), Sangli, Maharashtra, India. It was identified and authentified by Dr. Shankar M. Shendage (M.Sc., Ph.D., M.B.A., FIAAT and associate professor department botany), Balwant college, vita (Sangli).

2.2 Preformulation of plant material

The leaves of Prickly Malvastrum were dried under shade for 2-3 days. Then dried leaves were crushed, and sieved to get nearly fine amorphous powder.

2.3 Extraction

The collected plant material was washed with distilled water, shadow dried, and stored in air-tight bottles separately. The aqueous extract of plant material was prepared by soaking the powdered plant parts in distilled water and maintained in an incubator at 37^0C for 72 hours. The herbal extract was filtered using filter paper.[5]

2.4 Characterization of Extract

A. Description

Prickly Malvastrum extract was subjected for observing the general appearance, nature, colour, and odour.

B. Preliminary phytochemical test

The collected plant material extract was subjected to preliminary phytochemical tests to identify chemical constituent present in the plant.

a. Test for alkaloids

Few mg of liquid extract was taken in 5 ml of 1.5% v/v hydrochloric acid and filtered. This filtrate was then used for testing alkaloids.

- **Draggendorff's test**

Draggendorff's reagent was added in 2ml of filtrate. Formation of orange-brown precipitate indicated the presence of alkaloids.

- **Mayer's reagent test**

To 1ml of test filtrate in a watch glass, a few drops of Mayer's reagent were added. If there is formation of cream-colored precipitate, then it shows the presence of alkaloids.

b. Test for tannins

The test extract was taken in water, warmed, and filtered. 5ml of filtrate was allowed to react with 1ml of 5% ferric chloride solution. If dark green or deep blue colour is obtained, tannin is present.

c. Test for saponins

- 1ml solution of extract was diluted with distilled water to 20ml and shaken in a graduated cylinder for 15 minutes. The development of stable foam suggests the presence of saponins.
- 1ml extract was treated with 1% lead acetate solution. Formation of white precipitates indicates the presence of saponins.

d. Test for protein and amino acid

Small quantity of the extract was dissolved in few ml of water and filtered. Filtrate was subjected to Millions test and Biuret test.

e. Test for sterols

10 mg of extract was dissolved in 2ml of chloroform and 2ml of concentrated sulphuric acid was added from the side of the test tube. Test tube was shaken for few minutes. The development of red color in the chloroform layer and green fluorescence by the acid layer suggests the presence of sterols.

f. Test for flavonoids

Shinoda test- The extract was dissolved in alcohol. One piece of magnesium followed by concentrated hydrochloric acid was added dropwise and heated. the appearance of magenta colour demonstrated the presence of flavonoids.

g. Test for resins

A few mg of extract was treated with caustic soda a red color was developed if resins are present.[3]

C. Antibacterial Study of Extract

Antibacterial activity against *E coli* by Well plate diffusion Method was done. The inoculum of the microorganism was prepared from the bacterial cultures. 15ml of nutrient agar (Hi media) medium was poured into clean sterilized Petri plates and allowed to cool and solidify. 100 µl of broth of bacterial strain was pipette out and spread over the medium evenly with a spreading rod till it dried properly. Wells of 6mm in diameter were bored using a sterile cork borer. Solutions of Sample A and sample B (5mg/ml and 10mg/ml) in DMSO were prepared. 100µl of plant extracts of sample A and Sample B solutions were added to the wells. The Petri plates incubated at 37^0 C for 24 streptomycins (1mg/ml) were prepared as a positive control DMSO was taken as a negative control. Antibacterial activity was evaluated by measuring the diameters of the zone of inhibitions (ZI) all determinations was performed in triplicates.[6]

2.5 Preparation of Compact Face Powder

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 *prickly malvastrum* extract powder was taken and added required amount of perfume and kept it aside for some time. Mix the colour 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.[2]

Table 1: Formulation table for binder

Sr. No.	Name of ingredients	Quantity
1	Gum Arabic	1 gm
2	Glycerol	5 gm
3	water	94 gm
4	Preservatives	q.s.

Table 2: Formulation of Compact Face powder

Sr. No.	Name of ingredients	Quantity
1	Talc	69 gm
2	Kaolin	18 gm
3	Titanium Dioxide	8 gm
4	Zinc Stearate	5 gm
5	Prickly Malvastrum Extract	1 gm
6	Binder	q.s.
7	Perfume	q.s
8	Colour	q.s

2.6 Evaluation of Compact Face 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., shelf life). Other tests are also performed. They are:

1. Physical Evaluation

Physical parameters such as colour, odour, appearance and texture were checked visually.

2. Moisture content

Weigh around 1.5 gm of the powdered medicine into a thin, flat, weighted porcelain dish. Dry at 1000C or 1050C 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.[7]

3. 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.

4. 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.

5. 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 [8]

6. 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.

7. 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.

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

8. 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.

9. 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.

10. 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.

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

Were, θ – Angle of repose,

h – Height of the heap,

r – Radius of the base [9]

11. pH

A calibrated digital pH meter was used for the determination of pH of formulation.

12. Microbial Assay

The antibacterial activities of the formulations were calculated by the method of diffusion of modified agar wells. In this process, on nutrient agar plates, 0.2 ml of 24h broth culture of Escherichia coli and S. Aureus 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^{o}C for 24 hours. Antibacterial activity was assessed by measuring the inhibition zones (in mm). [10]

13. Shade Test

In this test, the variations of colour 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 colour assessment is carried out using artificial light.

14. 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.

15. 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.

16. Breakage Test

Compact face 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.

17. 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.[11]

18. Irritancy Test

The subject was selected for the skin irritancy test and Redness, Swelling was checked for regular intervals for 24 hrs. [12]

3. Result and Discussion

3.1 Collection and authentication of plant

The plant *Prickly Malvastrum* leaves were collected from local area of Balawadi (Bha), Maharashtra. The *Prickly Malvastrum* plant was authenticated at Balwant college, vita. In authentication of plant, it is observed that the *Prickly Malvastrum* belongs to *Malvaceae* family and its botanical name is *Malvastrum Coromandelianum*.

3.2 Preparation of powder

Prickly Malvastrum plant leaves were converted into powder.

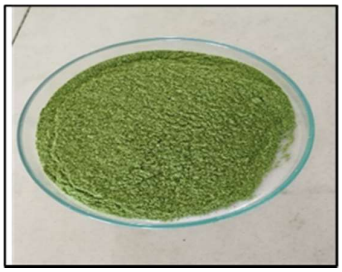

Fig. 1: Powder of *Prickly Malvastrum*

3.3 Extraction

Prickly Malvastrum powder was subjected for maceration process in the presence of appropriate solvent and resultant extract was collected.

Fig. 2: Maceration of Prickly Malvastrum

3.4 Characterization of Extract

1. Description

The general appearance of an extract, its nature, color, odor was found to be as follows:

Table 3: General Appearance of Extract

Parameter	Observation
Nature	aqueous
Color	Brownish Green
Odor	Characteristic

2. Preliminary phytochemical screening of extract

The preliminary phytochemical investigation was carried out for extracts of *Prickly Malvastrum* for the detection for various Phyto-constituents by using standard procedure to identify the constituents the results were recorded and detailed in Table 4

Table 4: Preliminary Phytochemical Screening of Extract

Sr. No.	Chemical Constituents	Observation
1.	Alkaloid	Present
2.	Saponin	Present
3.	Phenolic	Present
4.	Tannins	Present
5.	Proteins and Amino acids	Present
6.	Sterols	Present

3. Antibacterial activity

The antibacterial activity was tested by well plate diffusion method against bacteria *E. coli* and recorded results are as followed in Table 5

Table 5: Antibacterial Activity of Extracts against *Escherichia coli*

Sr.No.	Samples	Concentration (mg/ml)	Zone in diameter (mm)
1.	Control	-	0
2.	Standard (Streptomycin)	1	25
3.	Plant extract	5 mg/ml	05
4		10 mg/ml	10

Fig. 3: Antibacterial Activity of *Prickly Malvastrum* Extract

4. Formulation of Compact Face powder

The formulation of Compact powder was prepared successfully and subjected for the further evaluation.

5. Evaluation of Compact face powder

a. Organoleptic evaluation

These evaluation parameters include its Nature, odor, Colour, Texture of compact face powder which were evaluated visually or manually.

Table 6: Organoleptic evaluation

Sr. No.	Evaluation test	Observation
1	Nature	Powder
2	Odour	Perfumed
3	Colour	Natural Shell
4	Texture	Soft and smooth

b. 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 7: Physicochemical Evaluation

Sr. No.	Evaluation test	Observation
1	Total Ash	2.8%
2	Water Soluble Ash	1.5
3	Acid insoluble Ash	0.59
4	Moisture Content	2.4%w/w
5	pH	6.5

c. 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.

Table 8: Powder Characteristics

Sr. No.	Evaluation test	Observation
1	Particle Size	25-30um
2	Bulk Density	0.78g/ml
3	Tapped Density	0.71g/ml
4	Angle of Repose	36

d. Antimicrobial Evaluation of compact face powder containing *Prickly Malvastrum* Extract

Antimicrobial evaluation was performed against Escherichia coli and Stap. Aureus bacteria and the zone of inhibition for both the bacteria was evaluated.

Table 9: Antibacterial activity of formulated herbal Compact Face Powder using *E coli* and *S. Aureus*

Sr.no	Samples	Concentration (mg/ml)	Zone in diameter (mm)
1	Control	-	-
Stap. Aureus			
2	Standard (marketed preparation)	100µL	24
3	Sample A (Formulated Herbal Compact face powder)	100µL	19
E. coli			
4	Standard (marketed preparation)	100µL	21
5	Sample A (Formulated Herbal Compact face powder)	100µL	17

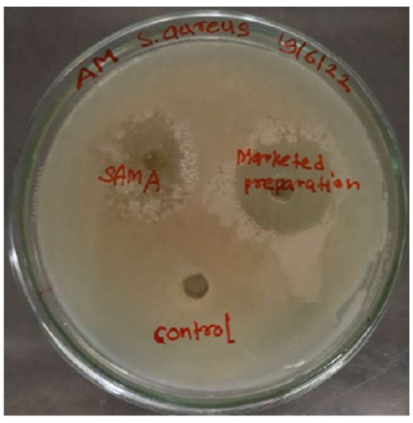

Fig 4: Antibacterial activity of formulated herbal Compact Face Powder using *E coli* and *S. Aureus*

e. Evaluation of final formulation

Various tests for compact face powder were performed such as Shade test, Pay-off test, Pressure test, Breakage test, and Abrasive test and further evaluated

Table 10: Other Evaluation Test

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	Passes

f. 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 result was tabulated bellow

Table 11: Irritancy Test

Sr. No.	Evaluation test	Observation
1	Irritancy	Nil
2	Redness	Nil
3	Sweeling	Nil

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 Prickly malvastrum extract powder as anti-acne/antibacterial property. In the present study, active constituents (Alkaloids, Tannins, and Flavonoids) were present in the aqueous extract of *Prickly Malvastrum* leaves shown superior inhibition against skin pathogens. Therefore, these compounds could be extracted and incorporated in compact face powder base in order to prepare semi herbal Compact face powder with significant activity which having less or no side effects.

The formulated semi herbal Compact face powder shows the better result of physical and chemical parameters as well as good antibacterial activity. This preliminary *in-vitro* study demonstrated that Semi-herbal Compact face powder was as effective against pathogenic bacteria. It is an attempt made to establish the Semi-herbal Compact face powder containing *Prickly Malvastrum* extract. From the result we can say that the formulation is good in appearance, stable and acceptable. Finally, it is concluded that this Formulation gives an effective results and safe alternative to existing marketed Compact face powders.

Reference

1. Abdul Kader Mohiuddin (2019) An Extensive Review of Face Powder Formulation Considerations, J.Dermatology and Dermatitis.4(3);DOI:10.31579/2578-8949/058
2. Pradnya Shinde et al. Formulation and Optimization of Semi Herbal Anti Acne Compact Face Powder by Allium Sativum and Myristica Fragrans Extract. Indo American Journal of Pharmaceutical Research.2021:11(04).
3. Shashwati A. Jadhav, Aniket D. Mohite, Snehal J. Patil, Aishwarya A. Varude, Sarika R. Yelmar, Nikita D. Gidde, “Formulation and Evaluation of Antibacterial Herbal Handwash Containing Natural Extract of Prickly Malvastrum” Zeichen Journal, Volume 8, Issue 08, 2022: 419-434
4. http://www.stuartxchange.org/Babara.htm
5. Akshay R Yadav, Shrinivas K Mohite, Screening of In-vitro anti-inflammatory and antibacterial assay of Malvastrumum coromandelianum, international journal of pharma sciences and research; 2020, 11(4):68-70.

6. D. Moonmun, Quantitative Phytochemical estimate, on and Evaluation of antioxidant and antibacterial activity of methanol and ethanol extracts of Heliconiarostrata, Indian journal of pharmaceutical sciences;2017, 79(1):79-90.
7. Dr. K. R. Khandelwal, Dr Vrunda Sethi. Practical pharmacognosy techniques and experiments practical, pharmacognosy. published by nirali prakashan; 2012; 23.8-23.10, 25.5
8. Quality control methods for medicinal plant materials World Health Organization Geneva.
9. C.V.S. Subrahmanyam. Text Book of Physical Pharamcy. Vallabh Prakashan; 2, 2000, 221-224.
10. Joshan R.S, Nagarauk R, Anuradha P. Antibacterial properties of extracts of Indianmedicinal plants: Syzygium alternifolium,Phyllanthus niruri and Rubia cordifolia. Biomedical and Pharmacology Journal. 2011; 3:1: 123-128.
11. Gaurav Kumar Sharma, Jayesh Gadhiya, Meenakshi Dhanawat. Textbook of Cosmetic Formulations. 2018; 38-40.
12. Sowmya KV, Darsika CX, Grace F, Shanmuganathan S. Formulation & Evaluation of Poly-herbal Face wash gel. World J Pharm Pharm Sci 2015; 4(6): 585-588.