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FORMULATION AND ASSESSMENT OF FACE POWDER FROM *MANIHOT ESCULENTA*

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Abstract:

Herbal cosmetics are products used to enhance an individual's appearance. Cassava powder, derived from the root of the cassava plant (Manihot esculenta) has gained popularity as a natural alternative to traditional talc based face powder. It hydrates the skin, help it maintain moisture and soften the skin. Cassava powder is often considered suitable for sensitive skin type due to its gentle and non-irritating nature. Oil absorbing property is one of the key advantage of cassava face powder. Cassava face powder offers a natural and safer alternatives. It is free from harmful chemicals and typically does not contain additives or synthetic ingredients.

Keywords: Cosmetics, Face powder, Cassava, Skin, Flour, Root.

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INTRODUCTION:

Powders are the solid dosage forms. They are considered as the oldest and simplest dosage forms since supplied either in the bulk or as an individual doses in the fine state of subdivision of drugs or drugs are with or without the diluents. Usually bulk powders are supplied for externally used purposes and individual doses for internally used purposes. The pharmacist view for powders as a dosage form should be important for their state of sub-division, homogeneous mixing if contain more than one drug, their dispensing procedure depending on physical and chemical properties of the drugs and diluents, their packing and labelling[(1)].

Powders are still very commonly used dosage forms in many of the dispensaries, simply because of their simple formulation and packaging techniques. Sometimes few of the drugs for internal use are not dispensed in fine state of sub-division but rendered to a granular form using some processes. These forms of medicaments is called granules. They are usually supplied in bulk form. Now a days, powders for internal use are very conveniently replaced by tablets and capsules while powders for external use with sprays and insufflations[(2)].

Figure No: 1 Powder

ADVANTAGES OF POWDERS

- Powders are used both internally and externally
- They are more stable than liquid dosage forms.
- Powders are convenient to handle, store and carry than liquid dosage forms.
- Paediatrics and geriatrics and cannot swallow solid dosage form such as tablets and capsules but they can take the powdered drugs easily as such or dispersed in water or any other liquid.
- Some products are administered by mixing with food.

DISADVANTAGES OF POWDERS

- Not suitable for oral administration of bitter drugs.
- Dispensing of powder is the time-consuming process.
- Powders are inconvenient to handle and administer as compared to tablets and capsules.
- Less dose accuracy than that can be achieved with tablets or capsules.
- Coarse powders are friable or undergoes size reduction to further fines[(3)].

TYPES OF POWDER PRODUCTS

1) Face powder
2) Compact face powder
3) Body powder

FACE POWDER

Face powder is an indispensable article of a lady's cosmetic range. From the mask-like covering in ancient time to the natural look which is the choice of the present day. Face powders have been and still remain one of the basics of the cosmetic industry. A face powder is basically a cosmetic product which has as its prime function the ability to complement skin colour by imparting a velvet finish to it. A good face powder should produce a smooth finish to facial skin, masking visible imperfection of the face and shine due to moisture or grease from perspiration or secretion of spacious and sweat gland of form preparation used on the skin. The preparation should make the face pleasant to look and touch[(4)].

Figure No: 2 Face powder

CLASSIFICATION OF FACE POWDER

I. Depending on the nature of the skin:

a) Light type
b) Medium type
c) Heavy type

Light type: Dry skin requires light powder, a powder of slight covering power as dry skin secretes virtually no oil and little moisture.

Medium type: Medium powders having comparatively higher covering power, are applied to normal or moderately oily skins, which are shiner due to skin secretions.

Heavy type: Heavy powders have more covering power and are used for extremely oily skins which have a great deal of shine and thus require great covering power.

II. Depending on the texture:

a) Loose powder
b) Pressed powder
c) Setting powder
d) Finishing powder

Loose powder:

Leaves the skin with a refined texture and soft glow. Loose powder is the original type of face powder. It has light and soft texture. It also helps to prevent makeup transfer or runoff. Loose powder seals the moist consistency of foundation and makes it last longer.

Pressed powder:

Compact powder or pressed powder is a loose powder that was compacted. Typically, Compact powder has been formulated with a moisturizer and oil. It makes the texture heavier than loose powder. Compact powder is recommended for dry skin. Beside brighten the face, it also moisturizes the skin.

Setting powder:

Setting powders prevent base makeup from rubbing off and reduce shine for a long-lasting, flawless complexion. Setting powder serves to eliminate oil and keeping makeup to be more durable. Typically, setting powder comes with the type of transparent powder.

Finishing powder:

It is used to lock the finished makeup. It can be used maximize the bright makeup that looks uneven, and fading the fine lines or pores in the face. Typically, finishing powder is the white powder.

IDEAL CHARACTERISTICS OF FACE POWDER

- It should produce a smooth finish to the facial skin.
- Masking small visible imperfection of the face and shine due to moisture or grease from perspiration or secretion of sebaceous and sweat gland.
- Must produce a lasting effect, so that frequent application is unnecessary.
- Should make face pleasant to look and touch[5,6].

STRUCTURE OF SKIN

The skin or cutaneous membrane is the outermost layer which covers and protects the surface of the body from external environment. It is the complex and largest organ of the body in terms of both surface area and weight which unites with mucosal lining of the respiratory, digestive and urogenital tract to form a capsule which separate internal body surface from external environment. Normally the texture of skin very smooth but becomes rough due to numerous environmental and age factors. Cosmetics are the formulations used to beautifying the skin. The functions of skin is protection, regulation of body temperature, excretion, information gathering, vitamin D production. The skin is broadly segregated into three layers such as,

- Epidermis
- Dermis
- Hypodermis

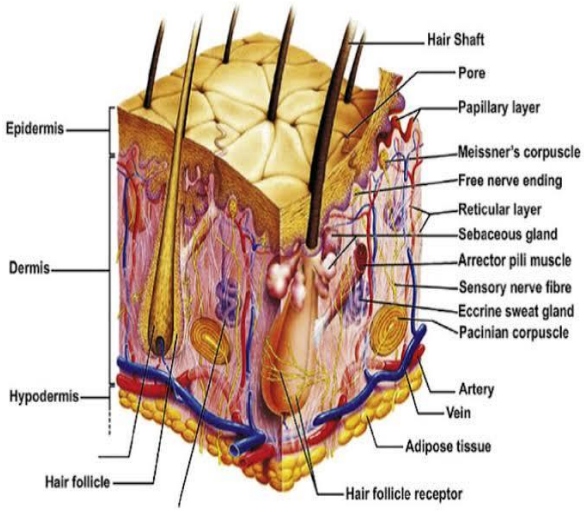

Figure No: 3 Structure of skin

TYPES OF SKIN

There are five types of healthy skin.

- Normal skin
- Oily skin
- Dry skin
- Combination skin
- Sensitive skin

Normal skin

This skin is neither too dry nor too oily. It has regular texture, no imperfections and a clean, soft appearance and does not need special care. Face powder is suitable for normal skin.

Oily skin

Oily skin has a porous, humid and bright appearance. It is caused by excessive fat production by sebaceous glands and usually determined by genetic or hormonal causes. Face powder suitable for oily skin.

Dry skin

Dry skin is caused by external factors such as the weather, low air humidity, immersion in hot water and it usually temporary. Mineral based face powder for suitable for dry skin.

Combination skin

Based on its location, it presents characteristics of both dry and oily skin. Since distribution of sebaceous and sweat gland is not homogeneous. Both mineral based face powder and normal face powder are suitable for combination skin.

Sensitive skin

Sensitive skin is more prone to react to stimuli to which normal skin has no reaction. It is a fragile skin, usually accompanied by feelings of discomfort such as heat, tightness, redness or itching. It is a delicate skin that needs more care to fight dryness, roughness and usual appearance. Face powder are suitable for sensitive skin[7].

CASSAVA POWDER

Manihot esculenta, commonly called cassava, manioc, yuca, or tapioca is a woody shrub of the spurge family, Euphorbiaceae, native to south America, from Brazil, Paraguay and parts of the Andes. Although a perennial plant, cassava is extensively cultivated as an annual crop in tropical and subtropical regions for its edible starchy root tuber, a major source of carbohydrates. Cassava is predominantly consumed in boiled form, but substantial qualities are used to extract cassava starch, called tapioca, which is used for food, animal feed, and industrial purposes. The Brazilian farinha, and related garri of west Africa, is an edible coarse flour obtained by grating cassava roots, pressing moisture off the obtained grated pulp, and finally drying it.

Cassava is classified as either sweet or bitter. Like other roots and tubers, both bitter and sweet varieties of cassava contain anti-nutritional factors and toxins, with the bitter varieties containing much larger amounts. It must be properly prepared before consumption; as improper preparation of cassava can leave enough residual cyanide to cause acute cyanide intoxication, goiter, ataxia, partial paralysis, or death.

The cassava root tuber is usually elongated, has depressions and crevices along its length and tapers to one end. In most cases, the middle part has a fairly constant diameter. Whereas the head end has a relatively larger diameter, the tail end has a considerably smaller diameter when compared with the middle part. The head and tail ends are generally referred to as the proximal and distal ends, respectively. At its proximal end, the tuber is joined to the rest of the plant by a short woody 'neck'[8].

Figure No: 4 Cassava powder

BENEFITS OF CASSAVA FOR THE SKIN

- It hydrates the skin, help it maintain moisture and soften the skin.
- It helps to remove blemishes and scars.
- The skin complexion will smoothed and brightened.
- Cassava flour with heat effect, detoxification is very high, will quickly push the toxins accumulate in the body, reducing acne and return the skin to its original smooth.
- Cassava flour promotes the anti-aging property of skin.

APPLICATIONS OF CASSAVA STARCH IN COSMETICS AND PERSONAL CARE

Fig No: 5 Flow chart of cassava starch applications

Powers and Loose face powders:
Cassava starch is a common ingredient in face powders. Helping to create a smooth and silky texture while absorbing excess oil on the skin.

Pressed powders:
Cassava starch can be used as a binding and texturizing agent, ensuring that the powder adheres well to the skin.

Setting powders:
Cassava starch helps to set makeup, control shine, and extend makeup wear.

Baby powders:
Cassava starch contributes to a soft and gentle texture that is suitable for delicate body skin[9].

AIM AND OBJECTIVES

AIM
To formulate and assess cassava face powder.

OBJECTIVES

- Collection and preparation of cassava powder using various methodologies such as sedimentation, drying and sieving.
- To evaluate safety, efficacy and quality of cassava face powder
- They are non-irritant when applied on the skin.
- To find the useful benefits of cassava face powder on human use as cosmetic product.

MATERIALS REQUIRED:

The material required for formulation and assessment of face powder from *Manihot esculenta a*re enlisted in tables no. 1& 2.

HERBS REQUIRED

Table No 1: List of herbs used and their roles

SL.NO	HERB	USES
1.	Cassava (*Manihot esculenta*)	Antioxidant, Anti-wrinkle Activity, Hydrating the skin, Moisturizing.
2.	Corn starch	Silkiness and soothe the skin, Control excess oil production on the skin.
3.	Rose oil	Natural humectant, Fragrance.

CHEMICALS REQUIRED

Table No 2: List of chemicals used and their roles

SL.NO	LIST OF CHEMICALS	USES
1.	Kaolin powder	Unclogging of the skin pores, Absorbent, Make the skin surface smooth, Prevents acne.
2.	Benzoic acid	Anti-aging, Antioxidant, Fragrance, Moisturizer.

CASSAVA

Family: - Euphorbiaceae.

Biological source: - Cassava starch is obtained from the roots of the cassava plant, that mostly grows underground, traditionally *Manihot esculenta.*

Biological name: - *Manihot esculenta*.

Therapeutic uses: - Cassava starch is highly absorbent, because it can help to hydrate the skin. Cassava starch is also used as a thickener, binder, and stabilizer in different formulations.

MEDICINAL USES

Cassava is often used in traditional medicine and has a number of applications. The plant is antifungal, antiviral, mutagenic and antibacterial. The roots of bitter varieties can be used to treat scabies, diarrhoea and dysentery. The juice of the grated tubers is used to treat constipation and indigestion. A flour made from the roots can be used as a dusting powder on the skin in order to help dry weeping skin[10,11].

Figure No: 6 Cassava root rhizome

KAOLIN

- Natural clays have been used to heal skin infections. Kaolin is used in the cosmetic and skincare industry due to its beneficial properties for the skin.
- By adsorbing and absorbing moisture and impurities from the skin, the clays also serve to cleanse and refresh the skin surface and to aid in the healing of topical blemishes.
- Kaolin is useful for people with oily or acne-prone skin as it helps to control shine and reduce the appearance of pores.

Figure No: 7 Kaolin

BENZOIC ACID

- Benzoic acid is a naturally occurring and synthetically produced compound used in cosmetics for its preservative properties.
- It is commonly found in a variety for personal care and cosmetic products, such as skincare, shampoos and makeup.
- Benzoic acid acts as an antimicrobial agent, preventing the growth of bacteria and fungi, which helps extend the shelf life of these products and maintains their safety and quality[12].

Figure No: 8 Benzoic acid

CORN STRACH

- Corn starch is a flour derived from corn, a wonder ingredient, corn starch is a natural moisture-absorbing powder, which is often used as an alternate to chemically formulated talcum powders.
- Corn starch is beneficial for acne-prone skin because it absorbs excess oil from the skin, which cause acne and pimples.
- Corn starch contain vitamin A and minerals such as iron and calcium, which help erase dark black spots and pigmentation and brighten skin tone[13].

Figure No: 9 Corn starch

ROSE OIL

- Rose oil is used to improve skin tone and brightens the skin complexion.
- Rose oil helps to reduce blemishes, acne scars and dark spots. It is capable of both nourishing and disinfecting the skin.
- Rose oil, moisturizes and purifies skin by pulling toxins out of its outer layers[14].

Figure No: 10 Rose oil

METHODS OF PREPARATIONS

A) METHODS OF PREPARATION OF CASSAVA FLOUR

Step-1: Selecting roots

- Harvest or buy healthy, mature, firm, freshly harvested cassava roots. These should have no bruises.
- The flesh of the roots should be white with no cracking and few fibrous roots.

Step-2: Peeling

- Peel the roots and remove the stalk, woody tips and any fibrous roots using a sharp knife.
- Failure to peel properly will result in off-colour in the final product.
- Cassava peel (after drying) can be used for animal feed or composting.

Step-3: Washing

- Wash peeled cassava roots with clean water to remove any dirt, including sand, soil, leaves or other impurities.

Step-4: Grating

- The rhizomes chopped into approximately 1cm cubes and then ground in a fine grater or a food processor for 5 minutes.

Step-5: Filtering

- The grated cassava mash is filtered by using a muslin cloth.

Step-6: Settling

- The filtrate was allowed to stand for 2 hour for the starch to settle and the top liquid was decanted and discarded.
- Water was added to the sediment and the mixture was stirring again for 5 minutes.
- Filtration was repeated as before and the starch from filtrate was allowed to settle.

Step-7: Drying

- After decanting the top liquid, the sediment (starch) was dried in hot air oven at 55^{o}C for one hour.
- Cassava mash is also dried by spreading it in a clean black plastic sheet placed on a gentle slope in full sun.

Step-8: Milling

- Once the starch is completely dry, transfer it to a mortar and pestle, grinder, or a food processor. Mill the dried cassava mash to produce flour.

Step-9: Sifting

- Using a simple home-made sieve, sift the milled flour to remove fibrous materials and any lumps. This is important to obtain high-quality free-flowing flour, free of fibre with a good particle size.

Step-10: Packaging and storing

- Pack sifted cassava flour in airtight moisture-proof black plastic bags.
- Seal the bag using a burning candle and label with date of manufacture and expiry date (after six months).
- Pack bags in a carton to protect them from light.
- Store the cartons in a well-ventilated, cool, dry place.
- The packaged flour will keep for about six months.

B) METHODS OF PREPARATION OF CASSAVA FACE POWDER

- Gather the ingredients needed cassava powder, kaolin, corn starch, benzoic acid and rose oil.
- In a clean bowl, combine equal parts cassava powder, kaolin clay and corn starch. These ingredients will form the base of the powder and provide a smooth and matte finish.
- Adding benzoic acid as preservative to the mixture. Benzoic acid has preservatives and adds subtle antimicrobial properties to the face powder.
- Mix well to ensure even distribution by using motor and pestle for obtaining adequate particle size, put the mixture in fine mesh sieve and sieve it. Add a few drops of rose oil to the mixture. Rose oil provide a pleasant fragrance and can enhance the sensory experience of using the face powder. Start with small amounts of each and adjust according to your desired fragrance.
- Hence small amount and adjust based on our preference. Mix thoroughly to distribute the fragrance evenly.
- Again, mix well to ensure even distribution by using motor and pestle for obtaining adequate particle size. Put the mixture in fine mesh sieve using 8,12,25,60.
- Before finalizing the mixture, test the face powder on a small area of your skin to ensure it matches your complexion and does not cause any adverse reactions. Adjust the colour or scent if needed. Transfer the prepared face powder into a clean, airtight container for storage.
- Use a jar with a sifter lid or any container for storage or any container that keeps the powder dry and allows for easy application.

To apply the cassava, face powder, use a clean makeup brush or a powder puff. Dip the brush or puff into the powder and tap off any excess[15,16].

Table No 3: Formulation table

SL.NO	INGREDIENTS	FORMULATION CODE		
		F1CFP	F2CFP	F3CFP
1.	Cassava powder	10gm	10gm	10gm
2.	Kaolin	3.5gm	4.4gm	5gm
3.	Corn-starch	5.4gm	4.5gm	3.9gm
4.	Benzoic acid	0.1gm	0.1gm	0.1gm
5.	Rose oil	1ml	1ml	1ml

Figure No: 11 Formulation

EVALUATIONS FOR CASSAVA FACE POWDER

I. ORGANOLEPTIC EVALUTION
PHYSICAL PROPERTIES
The physical properties such as appearance, odour, colour and texture were checked visually.

II. PHYSICOCHEMICAL EVALUATION
pH
A Calibrated digital pH meter at constant pH was used to calculate the pH of 1% of the aqueous solution in the formulation.

MOISTURE CONTENT
Weigh around 1.5 gm of the powder in to a thin film flat weighted porcelain dish. Dry at 100°C in the oven until two consecutive weights do not vary by more than 0.5mg. Cool in the desiccators and weight loss is naturally reported as moisture[17,18].

Figure No: 12 Drying of powder in hot air oven

III. PHYSICAL EVALUATION

PARTICLE SIZE DETERMINATION

The particle size of cassava powder affects its texture; feel and application powder affects its texture, feel and application on the skin. The powder is typically milled to achieve a fine particle size, ensuring smooth and even coverage. The particle size is an aspect that influences different properties such as spreading ability, grittiness, etc. The particle size was calculated by the method of optical microscopy.

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. 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.

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

Where

θ- Angle of repose
h - Height of the heap
r - Radius of the base

BULK DENSITY

The bulk density is the ratio of powders given mass to its bulk volume. The appropriate quantity of powder is dried and filled into a 50ml measuring cylinder with maximum of 50ml then, from a height of 1 inch at 2 second internals; the cylinder is lowered into a hardwood surface. Measuring the volume of the powder is then measured. To get average values, this repeated. The bulk density is determined using the formula given below[19].

Bulk Density = Mass/Volume

IV.ABRASIVE CHARACTER

It is possible to determine the abrasive quality of the powder by rubbing powder on the smooth surface of the skin.

V.IRRITANCY TEST

The subject was selected for the skin irritancy test and redness, swelling was checked for regular intervals for 23 hrs[20].

Figure No: 13 Irritancy test

RESULTS AND DISCUSSION:

- **ORGANOLEPTIC EVALUTION**

These evaluation parameters include its appearance, odor, color, and texture of face powder, which were content, was performed for their physicochemical parameters shown in table no: 4.

Table No 4: Organoleptic evaluation

SL.NO	FORMULATION	EVALUATION PARAMETER			
		APPEARANCE	ODOR	COLOR	TEXTURE
1.	F1CFP	Fine powder	Perfumed	Creamish white	Smooth
2.	F2CFP	Fine powder	Perfumed	Pale creamish white	Smooth
3.	F3CFP	Fine powder	Perfumed	White	Smooth

- **PHYSICOCHEMICAL EVALUATION**

DETERMINATION OF pH

Table No 5: Determination of pH

SL.NO	FORMULATION	pH
1.	F1CFP	6.1
2.	F2CFP	6
3.	F3CFP	6

DETERMINATION OF MOISTURE CONTENT

Table No 6: Determination of moisture content

SL.NO	FORMULATION	MOISTURE CONTENT
1.	F1CFP	2.06%W/W
2.	F2CFP	2%W/W
3.	F3CFP	1.93%W/W

- **PHYSICAL EVALUATION**

The size of particle was evaluated by optical microscopy. The flow property of the powder was evaluated by performing bulk density, angle of repose by funnel method.

Table No 7: Physical evaluation

SL.NO	FORMULATION	EVALUATION PARAMETERS		
		PARTICLE SIZE	ANGLE OF REPOSE	BULK DENSITY
1.	F1CFP	42.7µm	28.51	0.43gm/m
2.	F2CFP	41.3µm	25.97	0.41gm/m
3.	F3CFP	40.8µm	22.98	0.39gm/m

- **ABRASIVE CHARACTER**

Table No 8: Abrasive character

SL.NO	FORMULATION	ABRASIVE CHARACTER
1.	F1CFP	No Grittiness
2.	F2CFP	No Grittiness
3.	F3CFP	No Grittiness

- **IRRITANCY TEST**

Table No 9: Irritancy test

SL.NO	PARAMETER	OBSERVATION
1.	Redness	No
2.	Irritation	No
3.	Swelling	No

CONCLUSION:

Various batches of cassava face powder were formulated in trial (F1CFP, F2CFP, F3CFP) using cassava, kaolin, benzoic acid, corn starch and rose oil. Based on the results we can say that formulation F3CFP is better formulation than F1CFP and F2CFP, since it has better flow property, white in color, having a lesser moisture content as compared to other formulations. The use of cosmetics has increased many times over in personal care system. The use of bioactive ingredients in cosmetics affects the biological functions of skin and provides the necessary nutrients for healthy skin.

Cassava face powder is a promising cosmetic product that offers several benefits for individuals seeking a natural and mattifying solution for their skin. The demand for herbs is rising on the global market. The current study discovered beneficial qualities for face powder used by humans as cosmetics. Cassava flour with heat effect, detoxification is very high, will quickly push the toxins accumulate in the body,

reducing acne and return the skin to its original smooth. Cassava with its high concentration of antioxidant, dietary fiber, vitamins and minerals, is essential for maintaining good skin.

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