



## Formulation and Development of Skin Whitening Face Wash

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### ABSTRACT

The aim of present study was to study 'Formulation and development of skin whitening face-wash' by incorporating active "Arbutin" as skin whitening agent in the face-wash. Arbutin was validated by physical and chemical methods like colour, odour, pH, determination of loss on drying, residue on ignition and melting point.

Suitable vanishing cream Face-wash base was formulated and various concentrations of Arbutin were incorporated in it; and the formulations were evaluated for the functional parameters. Face-wash thus prepared was subjected to stability study for parameters like – colour, odour, and pH, at different temperatures like Room Temperature, Oven (45°C) and at (4°C) Refrigerator temperature. Subjective evaluation of face-wash was carried out to study the properties of face-wash like change in colour of skin, odour of face wash, irritancy on skin, foaming and cleansing ability; on panel of 20 human volunteers for 30 days. Fairness property of the face-wash was determined by visual observation and photographs of the client were taken before starting the study and at the end of 30<sup>th</sup> day (end of the study). The study showed that whitening face-wash with 2.5% Arbutin was the best formulation for cleansing and fairness of the skin.

Key words: Arbutin, Face-wash, skin whitening, fairness, cleansing

### Introduction

#### Skin colour:

Skin colour varies with race between individuals; it also varies with age, geographic location, season and part of body. In addition it is affected by health and emotions, including stress. Skin colour is generally darker in men than women, and in older than younger people. When viewed externally, colour of the skin surface reflects the pigments it contains, including melanin, melanoids, carotene, oxyhemoglobin and deoxyhemoglobin. In addition skin colour is influenced by various factors such as the thickness and water content of horny layer, blood flow, the amount of oxygen in the blood, and the state of intercellular adhesion of horny cell [1].

The most important pigment determines the skin colour in human is melanin. Melanin is synthesized by melanosome organelles in the melanocytes. Melanin is transferred to the nearby keratinocytes via the dendrites of melanocytes. In the human skin, melanocytes comprise about 1 in 7 or 8 basal cells in the epidermal basal layer, hair root and external root sheaths. While skin thickness, haemoglobin and minor pigments like carotenoids affect the perceived colour, it is the amount of melanin produced by the melanocytes that primarily governs the skin colour. The differences in skin colour of human being (fair, tan, brown or black) are due to the amount and distribution of melanin in the epidermis and rarely in dermis [2]. In dark skin, melanosomes are larger, denser, more numerous and are distributed singly in the keratinocytes. Melanin production increases on the exposure to UV-light. Melanin synthesis is genetically determined and is more in dark than in light skin [3].

The melanocytes synthesize melanin, the main factor determining the skin color, using the enzyme tyrosinase that hydroxylates tyrosine into dihydroxy phenylalanine (DOPA); this becomes the

melanin polymer through a complex chain of oxidative reaction.[4]

#### Mechanism of Depigmentation

The modern man desire skin color alteration to make dark skin lighter and light skin darker. Skin lightening or skin depigmentation mechanism can include by following ways [5]

- 1) Suppression of tyrosine formation
- 2) Inhibition of tyrosinase activity
- 3) Direct reduction of melanin

It is reported that Arbutin[6] can bring about Skin whitening by inhibiting the activity of tyrosinase.

#### Face wash:

Facial skin is delicate and ordinary soaps can cause it to lose moisture. A face wash is a mild cleanser that does the vital job of keeping skin clean, germ free smooth, and fresh and moisturizes the horny layer without any harshness to the skin. So that skin look young and energetic. The purpose of face-wash may be to impart cleansing, antiwrinkle effect, Antiacne property, moisturising effect and fairness of skin [7].

Skin whitening agents are believed to act on the production and metabolism of melanin of the skin by inhibiting melanin production in melanocytes, reducing extent of melanin. The agent which inhibit melanin production, such as Arbutin, kojic acid, vitamin C and its derivative are used in the whitening cosmetic because of their low toxicity to melanocytes.

#### Arbutin

Arbutin is a white coloured, odourless fine powder. It is soluble in water and ethanol. Its IUPAC Name is (2R, 3S, 4S, 5R, 6S)-2-hydroxyethyl-6-(4-hydroxyphenoxy)oxane-3, 4, 5-triol and Molecular Formula is C<sub>12</sub> H<sub>16</sub> O<sub>7</sub>. Its use levels are 1-3%.

**Preparation of Arbutin:**

The Arbutin is derived from leaves of bearberry, cranberry, mulberry, or bluberry shrubs and it also present in most type of pears. The Arbutin exist in two conformations  $\alpha$  &  $\beta$ .  $\alpha$  conformation offers higher stability over the  $\beta$  conformation and its prepared form is used for skin lightning indication. Arbutin is safe whitening agent [8].

**Material and Methods**

**Analysis of Arbutin**

Arbutin was procured for the present study from Chemspark India, Pvt, Ltd, Mumbai, alongwith Certificate of Analysis and it was analyzed by the methods recommended by IP.

**Study of Functional Parameters of Face wash:-**

The Face wash formulations were subjected to study the functional parameters like colour, odour, consistency, texture, lathering and pH. The results are summerized in table No.3.

**Analysis of Face-wash base (o/w type)**

All the Face wash formulations were subjected to analysis of Total fatty matter percent by mass, Thermal stability, Foam height for 2% solution, and Specific gravity [9-12]. The results are summarized in table No. 4.

**Accelerated Stability Study:-**

The objective of accelerated stability studies is to predict the shelf life of a product by accelerating the rate of decomposition preferably by increasing the temperature [13]. The evaluation employs a combination of tests. This method of evaluation not only indicates stability of base formulation but also indicates the stability of functional ingredient [14]. For the Whitening face-wash containing all concentrations of Arbutin, the accelerated stability studies were carried out for 45days. The samples were kept at room temperature, fridge(4°C) and oven temperature

The procured sample was validated by performing tests, such as colour, odour, pH, Loss on drying, Residue on Ignition, Melting Point and clarity of aqueous solution. The results were noted and compared with values mentioned in Certificate of Analysis of Arbutin. The results are summarized in Table No.1.

**Formulation and Development of Face Wash**

For the incorporation of the active in the formulation, and for a proper release of the active from the formulation, base plays an important role. By taking trials, suitable face wash base (o/w) was selected. Three different concentrations of Arbutin i.e. 1.5 %, 2% and 2.5% was incorporated in face wash formulations I, II and III respectively. Table No.

(45°C), for the observation of changes in colour, odour, pH, particle size and viscosity. The results were noted.

**Subjective Evaluation**

Skin whitening face-wash containing 2.5% Arbutin was given to 20 volunteers of age group 18 - 45 years for 4 weeks to carry out the subjective evaluation on the basis of their feedback. These subjects were asked to use the face-wash twice in a day for 4 weeks & noted the changes they observed on the face before and after the use of face-wash. Subjective evaluation was carried out on the basis of the parameters like colour, odour, cleansing effect, lathering effect, drying action, irritation and whitening effect. Efficacy of the Face wash III was evaluated on the basis of Actual observation of subject's face and feedback of subjects.

**Results and Discussion**

From the analytical testing of Arbutin it was observed that procured sample of Arbutin passed all the tests as per certificate of analysis and hence was used for incorporation in face wash formulations.(Table No. 1)

**Table no. 1.** Analytical test observations of Arbutin:

S.N.	Characteristic	Requirement As Per Certificate Of Analysis Of Arbutin	Result	Inference
1.	Colour	White	White	Passes the test.
2.	Odour	Odourless	Odourless	Passes the test.
3.	pH	5-7	6	Passes the test.
4.	Loss on drying	< 0.5%	0.33%	Passes the test.
5.	Residue on Ignition	< 1%	0.082%	Passes the test.
6.	Melting point	199.5-200°C	200°C	Passes the test.
7.	Clarity of aqueous solution	solution is transparent and clear	solution is transparent and clear	Passes the test.

**Table no. 2:** Formulation of Whitening Face wash with varying concentrations of Arbutin

SR. NO.	INGREDIENTS	Uses of Ingredients	QUANTITY FOR 100 %		
			I	II	III
			Base+1.5% Arbutin	Base+2% Arbutin	Base+2.5% Arbutin
PART-A					
1.	Stearic acid	emulsifying agent	12 gm	12 gm	12 gm
2.	Glyceryl mono-stearate	emulsifying agent	3 gm	3 gm	3 gm
3.	Isopropyl myristate	emollient	3 ml	3 ml	3 ml
4.	Propyl paraben	Pre servative	o.1 gm	o.1 ml	o.1 ml
PART- B					
5.	Propylene glycol	Humectant	6.5 ml	6.5 ml	6.5 ml
6.	Potassium Hydroxide	Emulsifier	0.06 gm	0.06 gm	0.06 gm
7.	Sodium Lauryl Sulphate		15 gm	15 gm	15 gm
8.	Cocomonoeethanol amide	Conditioning agent	5 gm	5 gm	5 gm
9.	Methyl paraben	Pre servative	0.1 gm	0.1 gm	0.1 gm
10.	Water	Vehicle	55.5 ml	55 ml	54.5 ml
11..	Arbutin	Skin white ning agent	1.5 gm	2 gm	2.5 gm

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PART-A					
1.	Stearic acid	emulsifying agent	12 gm	12 gm	12 gm
2.	Glyceryl mono-stearate	emulsifying agent	3 gm	3 gm	3 gm
3.	Isopropyl myristate	emollient	3 ml	3 ml	3 ml
4.	Propyl paraben	Pre servative	o.1 gm	o.1 ml	o.1 ml
PART- B					
5.	Propylene glycol	Humectant	6.5 ml	6.5 ml	6.5 ml
6.	Potassium Hydroxide	Emulsifier	0.06 gm	0.06 gm	0.06 gm
7.	Sodium Lauryl Sulphate		15 gm	15 gm	15 gm
8.	Cocomonoeethanol amide	Conditioning agent	5 gm	5 gm	5 gm
9.	Methyl paraben	Pre servative	0.1 gm	0.1 gm	0.1 gm
10.	Water	Vehicle	55.5 ml	55 ml	54.5 ml
11..	Arbutin	Skin white ning agent	1.5 gm	2 gm	2.5 gm

The functional parameters of face wash formulations like colour, odour, consistency, texture, lathering and pH were studied, they were found to be satisfactory; and the results are summarized in table No.3.

S. N.	Parameters	Base	Formulation I	Formulation II	Formulation III
			Base+1.5% Arbutin	Base+2% Arbutin	Base+2.5% Arbutin
1.	Colour	White	White	White	White
2.	Consistency	Good	Good	Good	Good
3.	Texture	Fine	Fine	Fine	Fine
4.	Lathering	Good	Good	Good	Good
5.	pH	6.44	6.43	6.42	6.42

The pH, Total fatty matter present by mass, Thermal stability, Foam height for 2% solution, and Specific gravity[62-66] of all the Face wash formulations was analysed and the results showed that all the formulations passes the test. The results are summarized in table No. 4.

S.N.	Characteristic	Requirement	Observation for 1.5 %	Observations for 2 %	Observations for 2.5 %	Inference
1..	pH	5.0 – 9.0	6.43	6.45	6.45	Passes the test.
2.	Total fatty matter present by mass, min	15 % by mass	16.9 % by mass	17 % by mass	17.1 % by mass	Passes the test.
3.	The rmal stability	To pass the test	Passes the test	Passes the test	Passes the test	Passes the test.
4.	Foam height for 2% solution; min	150 mm	167 mm	166 mm	167 mm	Passes the test.
5.	Specific gravity	0.82-0.95	0.9215gm/ml	0.9175gm/ml	0.9301gm/ml	Passes the test.
6.	Microbial analysis	To pass the test	Passes the test	Passes the test	Passes the test	Passes the test.

From the results of stability study it was observed that all the formulations of face wash I, II and III were stable with respect to Colour, odour, pH, Viscosity and particle size.

From the results of subjective evaluation it was observed that face-wash with 1.5% Arbutin was well appreciated. It caused no irritation on regular application. It also showed skin whitening effects along with excellence in terms of appearance, spread ability and foaming property. Face-wash with 2% Arbutin gave the slight stinging effect on application, but was accepted by subjects. It showed higher skin lightning effect than 1.5% Arbutin face-wash along with softness and cleansing effect.

The face-wash with 2.5% Arbutin showed maximum skin lightning property. It reduced the intensity of hyper pigmented spots. It also had excellent skin cleansing and softening properties. It showed good cleansing effect.

**Conclusion**

From the above study it can be concluded that the Skin whitening Face-wash III (containing 2.5% Arbutin) is good (o/w cream base) whitening face-wash formulation in terms of appearance, odour, cleansing, spreadability and foaming property. It did not give harshness and skin irritation. It gives excellent fairness of skin.

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