

# FORMULATION AND EVALUATION OF BLUSH PREPARATION BY USING NATURAL COLORING FROM RED BEETROOT POWDER

(BETA VULGARIS L.)

Bushra S.Sayyed<sup>1</sup> Rajeshwari B.Tungar<sup>2</sup>Laxmi S.Sarode<sup>3</sup>

<sup>1</sup>Department of Pharmaceutics, P.R.E.S.'s, College of Pharmacy (For Women), Chincholi Nashik, Maharashtra, India.

<sup>2</sup>P.R.E.S.'s, College of Pharmacy (For Women), Chincholi, Nashik, Maharashtra, India.

<sup>3</sup>P.R.E.S.'s, College of Pharmacy (For Women), Chincholi, Nashik, Maharashtra, India.

## Abstract:

Beetroot (*Beta vulgaris L.*) has compounds that can be used for body health, skincare, food additives, etc. This research was aimed to prepare the dry beetroot powder and formulate it into a loose powder of blush. This preparation was started by grating the beetroot and dry under the sunlight. Testing on color homogeneity, color stability and skin irritation was carried out to determine the quality of the product. The color stability test performed at room temperature (22-30)°C, but the loose powder showed fair stability at 8°C. The blush powder were homogeneous and could be applied easily.

**Keywords:** beetroot, beta vulgaris L., blush, loose powder, coloring agent.

---

## Introduction:

A research on the consumer buying behaviour towards cosmetic products in 2015 in Pune city showed that of 200 consumers of cosmetic products, 60% preferred to buy organic cosmetics and 42.5% used the cosmetic products for the beauty <sup>[1]</sup>. Similarly, a research regarding the consumers behavior towards the cosmetic products in Delhi <sup>[2]</sup> stated that the factors that motivate consumers to buy the cosmetic products were influenced by the culture and social life of consumers as well as their psychological condition that might be affected by the advertisement they saw about cosmetic products <sup>[2]</sup>. Cosmetics are any substances or unit doses intended to be applied on the entire exterior of the human body including teeth and the mucous membranes around the mouth <sup>[3]</sup>. Previous research showed that 73% consumers used cosmetics as protection to their skin and others used it as fashion (37%) and to attract people (19%) <sup>[4]</sup>. Another reason why consumers use cosmetics is to treat disease on their skins <sup>[5]</sup>. Based on their characteristics, the cosmetic powders can be classified into 2 types, namely loose powder, and compact powder. The particle size of the compact powder is generally greater than that of the loose powder.



**Fig1. Beetroot**

Herbal cosmetics are plant-derived-cosmetics which refer to products formulated using several types of cosmetic ingredients that are permitted to form a basis on which one or more herbal ingredients are used [8]. Previous research showed that some herbal plants were the right choice in treating various disorders on the skin such as inflammation, aging, eczema as well as irritation [9]. Beetroot (*Beta vulgaris* L.) not also can be used as a herbal treatment and a source of antioxidant but it also serves as a natural colorant in food due to the presence of betalain in the extract derived from the root and stem parts of this plant [10-12]. A betalain is a water-soluble flavonoid compound, which has two groups, namely red betacyanin and yellow betaxanthin [13-14]. Elevated temperatures and long heating time can cause decomposition and structural changes in pigment and lead to discoloration [13].



**Fig2. Beetroot Powder**

In general, natural colorants have no toxic or allergic properties and show fewer side effects. Their biodegradable properties make them safer to use than the synthetic dyes which sometimes may damage health and environment [16-17]. Natural colorants serve as antimicrobial, UV protection, deodorizing finishing, moth resistant, and food coloration. It has been classified into six classes based on application methods which are mordant dyes, vat dyes, direct dyes, acid dyes, basic dyes, and disperse

dyes <sup>[18]</sup> Anthocyanins, ones of the important compounds contained in natural colorants, are abundantly available in nature and have many biological activities such as fostering the health of eyes and improving the stability of capillary <sup>[19]</sup>

This research was aimed to prepare the dry powder of beetroot and to formulate the powder as blush in the forms of loose powder. The dry beetroot powder was obtained by grating and drying the beetroot under sunlight while maintaining the color stability of betacyanin <sup>[13]</sup>. The content of betacyanin in the beetroot can be used as a dye in blush powder. The formulation of blush in the form of loose powder was aimed to enhance the potency of the natural color by adding 45.5% of dry powder into the formula. This research was aimed to explore the potential of beetroot (*Beta vulgaris L.*) as a natural colorant agent, especially for red color, and the application when it formed as loose powder.

## **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 separates internal body surface from external environment. Normally the texture of skin is very smooth but becomes rough due to numerous environmental and age factors. Cosmetics are the formulations used to beautify the skin. The functions of skin are protection, regulation of body temperature, excretion, information gathering, vitamin D production. The skin is broadly segregated into three layers such as,

Epidermis

Dermis

Hypodermis

## **Types of skin**

There are five types of healthy skin:

- 1) Normal skin
- 2) Oily skin
- 3) Dry skin
- 4) Combination skin (dry + oily)
- 5) 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. Loose powder blush 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. Loose powder blush is 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 is usually temporary. Compact blush is more suitable than loose powder blush for dry skin.

### **Combination skin (dry + oily)**

Based on its location, it presents characteristics of both dry and oily skin. Since distribution of sebaceous and sweat gland is not homogeneous. Both compact and loose powder blush 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. Mineral based loose powder blush are suitable for sensitive skin.

◆ **Loose blush powder:**

This is one of the widely used type of blushing formulations. The selection of blushing preparation is based on skin type. Loose powder generally isn't used its own, apply it after foundation, to set the makeup on your skin and make it last longer. The skin type of persons is different in each other, so the colour and type on blush wash depends.

◆ **Properties of loose blush powder:**

1. It should be homogeneous.
2. It should not cause local irritation.
3. It should adhere easily and spread uniformly.
4. It should cling to the skin on application.
5. It should have adsorptive and absorptive capacity.
6. It should be non-irritant.
7. It should free from grittiness.

◆ **Advantages of loose blush powder:**

1. Good chemical stability compared with cream blush.
2. Easy to carry.
3. Suitable for most of all type skins.
4. Easy to apply.
5. Economical as compared to other formulations.

◆ **Disadvantages of loose blush powder:**

1. Difficult to protect powder containing hygroscopic or aromatic materials from decomposition.
2. Susceptible to physical instability.
3. Loss on application is higher.

**Experimental work :-**

**Material and method:-**

**Table 1: The formula of blush**

Sr.No.	Material:-	Quantity(%)	Role of ingredients
1	Beetroot Powder	45.5%	Coloring agent
2	Green tea	2%	Antioxidant & Antimicrobial

3	Acacia	1.5%	Binding Agent
4	Citric acid	1%	Preservative
5	Talcum	50%	Talcum

**Method of preparation of loose powder:**

1. The fresh beetroot was washed using running water to remove the dust and dirt. The clean material was cut into small pieces then grated and dry under the sunlight.
2. The blush was made into 10 g dosage. The ingredients including the dry extract of beetroot LP(45.5%),Green tea(2%),Acacia(1.5%),Citric acid(1%),Talcum(50%) were weighed.
3. The weighed powder was then mixed and grinded with a portion of talcum in a clean mortar until it became homogeneous.
4. The next step was to mix the other ingredients and then grinded again until homogeneous and soft for about 15–20 min to disperse completely it, and then sieved using a sieve (85 mesh).
5. The powder was then placed in a tightly closed container.



**Fig.3 Loose Powder**

**Evaluation test:-**

**1. Color Homogeneity test:**

Homogeneity test was done by applying the sample on a piece of glass or other suitable transparent material [23]. The blushes should show a homogeneous arrangement and show no coarse grains.

The homogeneity test is important because it can determine whether the resulting blush preparation meets the aesthetic requirements or not. A good color homogeneity is indicated by the distribution of dyes evenly among the news carriers [25].The color homogeneity test was carried out on the blushes to determine whether the carrier particles or the dye could mix well to create color when applied to the skin. The homogeneity test results (Table 2) showed a homogeneous structure, and no coarse grains were found.

**Table 2. Color Homogeneity test results**

Test Name	Quantity

	<b>(Loose Powder 45.5%)</b>
<b>Homogeneity</b>	<b>Good</b>

## 2. Color stability test:

The formulation was stored at 8 °C and 30 °C were tested for the color stability on the 1st, 7<sup>th</sup>, 14<sup>th</sup>, 21<sup>st</sup>, 28<sup>th</sup> days & 3 months using the Stability Chamber [25].

Table 3. stability test result

Sr.No.	Days	Change in color	Change in physical appearance	Change in pH
1.	1 <sup>st</sup> day	No change in color	No change in physical appearance	No change in pH
2.	7 <sup>th</sup> day	No change in color	No change in physical appearance	No change in pH
3.	14 <sup>th</sup> day	No change in color	No change in physical appearance	No change in pH
4.	21 <sup>st</sup> day	No change in color	No change in physical appearance	No change in pH
5.	28 <sup>th</sup> day	No change in color	No change in physical appearance	No change in pH
6.	3 Months	No change in color	No change in physical appearance	No change in pH

## 3. Irritation test :

The dosage form apply on the fore arm of a healthy body(skin) for three times and then check irritation of the dosage form on skin. If the person feels any kind of irritation then the test is failed.

## 4. Physical characteristics:

The colour, odour, appearance of the powder is evaluated by simple visualization.

## 5. pH:

pH of human skin is usually acidic, in the range of 4–6, which has historically acted as a defence mechanism against organisms. This steep pH gradient of 2–3 units between the stratum corneum and the epidermis and dermis occur due to the influence of the body internal environment which is close to pH 7–9 (neutral). The physiological role of the skin properties has historically been regarded as a defence mechanism against organisms that attack. Age, skin site, and pigmented skin are some factors that influence the pH of the skin.

The pH test was performed at 8 and 30 °C to observe the safety on the skin and also the stability of the dosage so that the difference in the temperature will indicate whether there has been a change of pH during the preparation. The temperatures of 8 and 30 °C are the proper temperatures to observe whether the dosages remain stable in this research. The proper pH of skin plays an important role in maintaining the skin because it creates a skin barrier and skin resistance to the external physical and chemical agents after the testing, the loose powder had average pH of  $\pm 6$ . Therefore, it can be concluded that the loose powder form met the skin pH requirements and are safe to use on the skin.

A measure of the acidic or basic nature of the formulation. The pH of the loose powder blush is determined to avoid the irritation to the skin. The pH was determined by using pH meter.

#### 6. Bulk density(BD) Tapped density(TD):

The powder was passed through a no. 18 sieve into a per-weighed 25 ml graduated cylinder with 0.5ml markings. The bulk volume was measured after manually tapping the cylinder two times on a flat table top surface. The tapped volume was measured with the tap density tester after tapping in increments of 500, 750 and 1250 taps with 250 drops per minute.

Bulk density = Bulk mass/ Bulk volume

Tapped density = Mass of granules/ Volume of granules

#### 7. Angle of repose:

The flow properties of powders can be studied by measuring angle of repose. It was determined by the funnel method. The funnel was fixed in place, 4cm above the bench surface. After the cone from 5g of sample was built, height of the granules forming the cone (h) and the radius (r) of the base were measured. The angle of repose was calculated as follows: Angle of repose =  $\tan^{-1}(h/r)$

Where, h = height of the powder cone r = radius of the powder cone □

#### 8.Carr's index:

The bulk and tapped densities were used to calculate Carr's compressibility index to provide measure of the flow properties and compressibility of powders.

Carr's index =  $\frac{\text{Tap density} - \text{bulk density}}{\text{tap density}} * 100$  □

#### 9. Hausner's ratio:

It is indicative of flow properties. It is derived property from bulk and tapped density. Lower the Hausner's ratio is indicating better flow whereas higher ratio indicates poor flow of granules. Hausner's ratio is calculated by the following formula:

Hausner's ratio =  $\frac{\text{Tap density}}{\text{Bulk density}}$  □

#### 10. Moisture content:

Percentage of moisture content is calculated by using formula: % Moisture =  $\frac{\text{Initial weight} - \text{final weight}}{\text{initial weight}} * 100$ .

### Result

**Table 4: Evaluation Parameters Result**

Sr. No.	Test Parameter	Standard Evaluation
1	Appearance	Smooth
2	Color	Pink
3	Odour	Sweet, Fresh
4	Homogeneity	Good
5	pH	6 – 6.5
6	Irritation	No Irritation

7	Color Stability(1 <sup>st</sup> – 90 <sup>th</sup> day )	No change in color
8	Bulk Density & Tapped Density	65g/cm <sup>3</sup> & 100g/cm <sup>3</sup>
9	Angle of Repose	33° (Free flow / Good)
10	Carr's Index	13 (Free flow / Good)
11	Hausner's Ratio	1.20W/V (Fair)
12	Moisture Content	<1%(Good)

### Conclusion:

The dry powder of beetroot (*Beta vulgaris* L.) can be formulated into blush powder. Loose powder is in stable form. The loose powder is stable for 3 months and does not occur discoloration. It is homogeneous and could be easily applied. The formula of loose powder of 45.5% produced color when applied to the skin.

**Acknowledgement:** The authors are grateful to the Respected Principal Madam, Respected Guide, All staff and lab assistants of PRES's College of Pharmacy(Women),Chincholi for providing necessary facilities to do this research work.

### References:

- [1] Anute, N.B., Deshmukh, A., and Khandagale, A., 2015, Consumer buying behavior towards cosmetic products, IJMSS, 3 (07), 25–34.
- [2] Oberoi, P., and Oberoi, P., 2018, Consumer behaviour towards cosmetic products: a case of Delhi NCR, J. Emerg. Technol. Innov. Res., 5 (11), 10–31.
- [3] National Pharmaceutical Regulatory Agency, 2017, Guidelines for control of cosmetic products in Malaysia, Ministry of Health, Malaysia, 1–13.
- [4] Tejal, P., Nishan, D., Amisha, J., Umesh, G., Desai, K.T., and Bansal, R.K., 2013, Cosmetics and health: Usage, perceptions and awareness, Bangladesh J. Med. Sci., 12 (4), 392–397.
- [5] Mukul, S., Surabhi, K., and Atul, N., 2011, Cosmeceuticals for the skin: An overview, Asian J. Pharm. Clin. Res., 4 (2), 1–6.
- [6] Steiling, W., Almeida, J.F., Vandecasteele, H.A., Gilpin, S., Kawamoto, T., O'Keeffe, L., Pappa, G., rettinger, K., Rothe, H., and Bowden, A.M., 2018, Principles for the safety evaluation of cosmetic powders, Toxicol. Lett., 297, 8–18.
- [7] Bennett, J., 2021, Loose face powders – Cosmetics and skin, <http://cosmeticsandskin.com/aba/loose-facepowders.php>.
- [8] Kumar, D., Rajora, G., Parkash, O., Antil, M., and Kumar, V., 2016, Herbal cosmetics: An overview, Int. J. Adv. Sci. Res., 1 (4), 36–41.
- [9] Arora, R., Aggarwal, G., Dhingra, G.A., and Nagpal, M., 2019, Herbal active ingredients used in skin cosmetics, Asian J. Pharm. Clin. Res., 12 (9), 7–15.
- [10] Bahadoran, Z., Mirmiran, P., Kabir, A., Azizi, F., and Ghasemi, A., 2017, The nitrate-independent blood pressure-lowering effect of beetroot juice: A systematic review and meta-analysis, Adv. Nutr., 8 (6), 830–838.
- [11] Masih, D., Singh, N., and Singh, A., 2019, Red beetroot: A source of natural colourant and antioxidants: A review, J. Pharmacogn. Phytochem., 8 (4), 162–166.
- [12] Koubaier, H.B.H., Snoussi, A., Essaidi, I., Chaabouni, M.M., Thonart, P., and Bouzouita, N., 2014, Betalain and phenolic compositions, antioxidant activity of Tunisian red beet (*Beta vulgaris* L. *conditiva*) roots and stems extracts, Int. J. Food Prop., 17 (9), 1934–1945.



- [13] Antigo, J.L.D., Bergamasco, R.C., and Madrona, G.S., 2018, Effect of pH on the stability of red beet extract (*Beta vulgaris* L.) microcapsules produced by spray drying or freeze drying, *Food Sci. Technol.*, 38 (1), 72–77.
- [14] Kezi, J., and Sumathi, J.H., 2014, Betalain – a boon to the food industry, *Discovery*, 20 (63), 51–58.
- [15] Singh, R., and Srivastava, S., 2017, A critical review on extraction of natural dyes from leaves, *Int. J. Home Sci.*, 3 (2), 100–103.
- [16] Verma, S., and Gupta, G., 2017, Natural dyes and its applications: A brief review, *Int. J. Res. Anal. Rev.*, 4 (4), 57–60.
- [17] Miraj, S., 2016, Chemistry and pharmacological effect of *Beta vulgaris*: A systematic review, *Pharm. Lett.*, 8, (19), 404–409
- [18] Yusuf, M., Shabbir, M., and Mohammad, F., 2017, Natural colorants: Historical, processing and sustainable prospects, *Nat. Prod. Bioprospect.*, 7 (1), 123–145.
- [19] Mansour, R., 2018, Natural dyes and pigments: Extraction and applications, in *Handbook of Renewable Materials for Coloration and Finishing*, Eds. Yusuf, M., John Wiley & Sons, Hoboken, USA, 75–102.
- [20] Sabarudin, N.A., Abdul Munaim, M.S., and Ab. Wahid, Z., 2016, Effect of pH on natural pigment betacyanin extraction from *Bougainvillea* Bracts, *The Proceeding of National Conference for Postgraduate Research, University Malaysia Pahang*, 559–563.
- [21] Djamil, R., and Anelia, T., 2009, Penapisan fitokimia uji BSLT dan uji antioksidan ekstrak metanol beberapa spesies *Papilionaceae*, *JIFI*, 7 (2), 65–71.
- [22] Banu, K.S., and Cathrine, L., 2015, General Techniques Involved in Phytochemical Analysis, *Int. J. Adv. Res. Chem. Sci.*, 2 (4), 25–32.
- [23] Butler, H., 2000, *Poucher's Perfumes, Cosmetics, and Soaps*, 10th Ed., Springer, Netherlands.
- [24] Sharma, G., Gadhiya, J., and Dhanawat, M., 2018, “Creams” in *Textbook of Cosmetic Formulations*, Pothi.com, India, 51–66.
- [25] Yuliana, A., Nurdianti, L., Fitriani, F., and Amin, S., 2020, Formulasi dan evaluasi kosmetik dekoratif perona pipi dari ekstrak angkak (*Monascus purpureus*) sebagai pewarna dengan menggunakan lesitin sebagai pelembab kulit, *Fitofarmaka Jurnal Ilmiah Farmasi*, 10 (1), 1–11.
- [26] Lembong, E., Utama, G.L., and Saputra, R.A., 2019, Phytochemical test, vitamin C content and antioxidant activities beet root (*Beta vulgaris* Linn.) extracts as food coloring agent from some areas in Java Island, *IOP Conf. Ser.: Earth Environ. Sci.*, 306, 012010.
- [27] Ekwueme, F.N., Nwodo O.F.C., Joshua, P.E., Nkwocha, C., and Eluca, P.E., 2015, Qualitative and quantitative phytochemical screening of the aqueous leaf extract of *Senna mimosoides*: Its effect in *in vivo* Leukocyte mobilization induced by inflammatory stimulus, *Int. J. Curr. Microbiol. Appl. Sci.*, 4 (5), 1176–1188.
- [28] Onuminya, T.O., Shodiya, O.E., and Olubiyi, O.O., 2017, Comparative proximate and phytochemical of leafy vegetables in Lagos state, *Niger. J. Pure Appl. Sci.*, 30 (3), 3097–3103.
- [29] Ali, S.M., and Yosipovitch, G., 2013, Skin pH: From basic science to basic skin care, *Acta Derm. Venereol.*, 93 (3), 261–267.
- [30] Nieradko-Iwanicka, B., Chrobok, K., Skolarczyk, J., and Pekar, J., 2018, What is the pH, Fe and Cl<sub>2</sub> content of cosmetics we use? – A pilot study on safety of skin care products, *Pol. J. Public Health*, 127 (2), 78–81.
- [31] Alamsyah, N., Djamil, R., and Rahmat, D., 2016, Antioxidant activity of combination banana peel (*Musa paradisiaca*) and watermelon rind (*Citrullus vulgaris*) extract in lotion dosage form, *Asian J. Pharm. Clin. Res.*, 9 (Suppl. 3), 300–304.
- [32] Suket, N., Srisook, E., and Hrimpeng, K., 2014, Antimicrobial activity of the anthocyanins isolated from purple field corn (*Zea mays* L.) cob against *Candida* spp., *IOSR J. Pharm. Biol. Sci.*, 9 (4), 40–44.

- [33] Setyawaty, R., Dwiyantri, M., and Dewanto, D., 2020, Production of compact powder blush on from secang wood (*Caesalpinia sappan* L.) extract, *Majalah Farmaseutik*, 16 (2), 125–130.
- [34] Sari, Y., 2018 Pengaruh pemanasan terhadap kestabilan pigmen betalain dari buah naga merah (*Hylocereus polyrhizus*), *Orbital: Jurnal Pendidikan Kimia*, 2 (1), 37–42.
- [35] Azeredo, H.M.C., 2009, Betalains: Properties, sources, applications, and stability - A review, *Int. J. Food Sci. Technol.*, 44 (12), 2365–2376.
- [36] Agne, E.B.P., Hastuti, R., and Khabibi, K., 2010, Ekstraksi dan uji kestabilan zat warna betasianin dari kulit buah naga (*Hylocereus polyrhizus*) serta aplikasinya sebagai pewarna alami pangan, *J. Kim. Sains Apl.*, 13 (2), 51–56.
- [37] Mosquera Tayupanta, T.Á., Espadero, M., Mancheno, M., Peña, S., Uguña, A., Álvarez, S., and Vega, M.A., 2018, Sensory analysis of cosmetic formulations made with essential oils of *Aristeguetia glutinosa* (matico) and *Ocotea quixos* (ishpingo), *Int. J. Phytocos. Nat. Ingrid.*, 5, 5.

