



FORMULATION AND EVALUATION OF ANTI-ACNE CREAM USING *SOLANUM TUBEROSUM*.

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ABSTRACT

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Acne is severe inflammatory skin disease that causes spots and pimples on multi parts of the body. Acne is caused by various factors like environmental conditions, hormonal changes, food habits, bacterial infections, and stress etc... Potato consists of an ingredient called azelaic acid which acts on skin to remove tan and to solve various skin problems such as acne. The project is aimed to formulate the potato and beet root dried powder in to cream where beet root contains betaine which acts as an anti oxidant to prevent oxidation of potato powder due to polyphenol oxidase enzyme. The anti-acne cream was prepared by using fusion method and the prepared cream was easily spreadable, shiny and was non irritant with a good consistency. The pH was within the limits and was suitable for application on skin. The cream was subjected to stability studies while storing at different conditions of room temperature, at 4°C and 45°C. Results for three weeks were obtained stating the appearance, odour, colour and various parameters of the cream. No significant change in the parameters was identified, and this confirms the stability of the product. The antioxidant activity of beetroot was performed to know the concentration and activity of beetroot by H₂O₂ method and the concentration of that beetroot scavenging was used in the formulation. This prepared anti acne cream is considered to treat acne and will be easy to apply and wash off.

INTRODUCTION

Skin plays a key role in protecting the human body against various pathogens and excessive water thrashing. Its other functions are temperature regulation, insulation, and synthesis of vitamin D, sensation, and guards vitamin B folates. Damaged skin will try to cure by the formation of scar tissue. Skin is often discolored and depigmented. Acne is a chronic, inflammatory skin condition that causes spots and pimples, especially on the face, shoulders, back, neck, chest, and upper arms. It commonly occurs during puberty, when the sebaceous glands activate, but it can occur at any age. At least 85 percent of people

Experience acne between the ages of 12 and 24 years [1]. Human skin has many pores that have connection to oil glands under the skin. Follicles attach the glands to the pores. Small sacs called follicles produce and exude liquid. The glands produce an oily liquid called sebum. Sebum carries dead skin cells through the follicles to the surface of the skin. A tiny hair grows through these follicles out of the skin and the pimples grow when a follicle gets blocked, and oil builds up under the skin. Skin cells, sebum, and hair can clump together into a plug. This plug results in swelling when infected by the bacteria. A pimple starts to develop when the plug begins to break down. *Propionibacterium acnes* (*P. acnes*) are the

name of the bacteria that live on the skin and contribute to the infection of pimples [2]. Huge number of home remedies work wonders in the treatment of acne, but the issue is the stability. Many of us are aware that potato is used to whiten the dark circles under the eye. Potato is also known to lighten the dark skin complexion; the blemishes and in many treat the skin problems. It is said that potato consists of one such ingredient called azleic acid which acts on skin to remove tan and to solve many of the skin problems [3]. In market there is no formulation available which consists of potato extract but there are creams consisting of azleic acid as azlein. Beetroot is rich in anti oxidants. Beetroot is also a promising therapeutic treatment of the conditions associated with oxidative stress and inflammation. Its constituent's betalain pigments which display potent antioxidant, anti inflammatory and chemo-preventive activity [4]. The current study is focused on formulation and evaluation of dried potato powder based cream which is combined with dried beet powder to prevent oxidation of potato powder due to ployphenol oxidase [5].

MATERIALS AND METHOD

Materials

Potato and beet root powder have been prepared in NNRESGI, white bees wax, liquid paraffin, methyl paraben, proyl paraben, ferric oxide red, ascorbic acid were obtained from S D fine chem. Limited Hyderabad.

Methods

Preparation of powders:

Preparation of potato powder: Firstly, fresh potatoes were collected, peeled and chopped. These chopped potatoes are made into fine paste. This paste was spreaded evenly on a clean surface and dried for 48 hours in a dull sunlight. After drying, it was collected and made into fine powder by grinding it in mixer grinder. This collected powder was sieved with sieve no.72. Powder was collected and used for the further formulation studies.

Preparation of beetroot powder: Firstly, fresh beetroots were collected, washed, peeled, and chopped. Then this chopped beetroot pieces were made into a paste. This paste was spreaded evenly on a clean and dry surface and kept in dull sunlight for 48 hours. This dried beetroot chips were made into a fine

powder by using motor and pestle. This powder was collected and sieved with sieve no.72. This fine powder was used for further formulation studies.

Preparation of potato and beetroot mixed powders: This powder was made by using potatoes and beetroot in 2:1 ratio. Firstly, potato and beetroot were collected, washed, peeled, and chopped into small pieces. These small pieces of potatoes were made into coarse paste and beetroot pieces were added to the potato mixture. Then this both potato and beetroot were mixed and made into fine paste by grinding in mixer grinder. This paste was spreaded evenly on a clean and dry surface and kept in the dull sunlight. After drying, this mixed paste was made into fine powder with the help of motar and pestle. Powder was collected and sieved with sieve no.72 and the fine powder was collected and used for further formulation studies.



Figure 1: Powders

Method of preparation of cream- The cream was prepared by using fusion method:

Step 1:- Preparation of aqueous phase: The prepared powder was mixed in water and a pinch of ascorbic acid was added and heated until it reaches 70°C.

Step 2:- Preparation of organic phase: Weighed quantities of white beeswax, liquid paraffin, methyl paraben, propyl paraben Melted until it reaches 70°C.

Step 3:- Preparation of cream:

Allow both phases to reaches same 70°C temperature; the aqueous phase was mixed with organic phase and stirred continuously on ice bath until it reaches consistency of cream. In preparation of mixed powder cream instead of ascorbic acid, beetroot powder and ferric oxide were used [6].

EVALUATION

Organoleptic evaluations: The formulated cream has to be evaluated for organoleptic studies like color, odor and appearance.

pH: The pH was measured with digital pH meter. 0.5 g of the cream was weighed accurately and solubilized in 50.0 ml of distilled water and its pH was determined.

Spreadability: Cream base should spread easily on the surface of the skin without too much drag and should not produce greater friction in the rubbing process. The sample was placed between the two glass slides and 100g weight was placed on the glass slide for 1 min to compress the sample to a uniform thickness. The time in seconds required to separate the two slides was taken as a measure of Spreadability.

$$\text{Spreadability} = m \frac{L}{t}$$

m = Weight tide to upper slide

L = length moved on the glass slide

t = time taken

Irritancy test: Mark sq.cm area on dorsal surface of left hand. The cream was applied to check irritancy, edema, and erythema and the applied area was checked for any irritations for regular intervals up to 24 hrs and reported.

Determination of type of smear: It was determined by applying the cream on the skin surface of human volunteer. The type of smear formed on the skin was noted after application of cream.

Determination of emolliency: Emolliency, slipperiness and amount of residue left after the application of fixed amounts of cream was checked.

Photo patch test: It is also called as photo sensitivity test. As like irritancy test, here a some amount of cream is applied on the surface of the skin and live it for 24 hours without washing and the skin layer is exposed to the sun light and observed whether any irritancy, pain, burning sensations, or rashes are present or not. If a clear skin is observed, then they performed test is said to be passed.

Determination of type of emulsion

Dilution test

The emulsion is diluted either with oil or water. If the emulsion is o/w type and it is diluted with water, it will remain stable as water is the dispersion medium" but if it is diluted with oil, the emulsion will break as oil and water are not miscible with each other. Oil in water emulsion can easily be diluted with an aqueous solvent,

whereas water in oil emulsion can be diluted with an oily liquid.

Antioxidant Studies

The aim of this research is to determine the H₂O₂ radical scavenging and total antioxidant activity of "beet root powder" by diluting the powder in water and ethanol. Antioxidant activity was measured by H₂O₂ radical scavenging assay with UV-visible spectroscopy. The ability of beet root powder to scavenge hydrogen peroxide was estimated. A solution of hydrogen peroxide (43 mM) is prepared in phosphate buffer (1 M pH 7.4). Different concentration of sample (2-10 mg/ml) was added to a hydrogen peroxide solution. Absorbance of hydrogen peroxide at 230 nm was determined after 10 minutes against a blank solution containing phosphate buffer without hydrogen peroxide. Ascorbic acid was used as standard. The free radical scavenging activity was determined by evaluating % inhibition [7]. The percentage of hydrogen peroxide scavenging was calculated:

$$\% \text{ Scavenged [H}_2\text{O}_2] = \frac{AC - AS}{AC} \times 100$$

Where AC is the absorbance of the control and AS is the absorbance in the presence of the sample. Absorbance of control AC = 0.097

Microbial growth test

The formulated cream was inoculated on the plates of agar media by streak plate method the plates were placed in to the incubator and are incubated at 37°C for 24 hours. After the incubation period, plates were taken out and check the microbial growth.

Stability Studies

Accelerated stability studies were conducted by placing the samples at 4°C, 27°C and 40°C for 4 weeks and the following parameters are tested every week.

The following parameters are as follows:-

- Organoleptic
- p^H
- Spreadability
- Irritancy test
- Photo patch test

RESULTS AND DISCUSSION

Preparation of Cream

Potato powder cream and potato mixed beetroot powder cream was formulated

according to the ingredients mentioned in table number 1 and was prepared by fusion method. The prepared powders are represented in figure 1.

Organoleptic evaluations

The formulated cream was evaluated for organoleptic studies like color, odor and appearance.

pH

The aim of this study is to assess the p^H with potato and beetroot cream of different weeks and the p^H ranges from 6.0 -7.8

Spreadability

The time in seconds required to separate the two slides was taken as a measure of Spreadability. The result was found to be positive and the test was passed.

Type of smear

It was found that the cream produced non-greasy film on the skin surface.

Emolliency

After observation, it was found that cream not left residue on skin surface after application.

Irritancy test

Skin irritancy test is formed by applying some amount of cream on the skin and leaving it for 24 hours. After 24 hours it is observed the skin is showing no rashes, redness, irritation, swelling, or inflammation on the skin and the test was passed.

Photo patch test

Some amount of cream was applied and the skin layer is exposed to the sun light and no irritancy, pain, burning sensations, or rashes were observed.

Type of emulsion The cream was found to be of the W/O type emulsion by dilution test.

Antioxidant activity

The major problem of keeping the potato extract for longer time is oxidation. The potato extract, upon oxidation becomes dark colored which changes the complete appearance of the cream. To solve this problem of potato, beetroot extract was used as anti-oxidant in the formulation. A solution of hydrogen peroxide (40mM) was prepared in phosphate buffer (pH 7.4). Extracts (100µg/ml) in distilled water were added to a hydrogen peroxide solution (0.6 ml, 40mM). Absorbance of hydrogen peroxide at 230 nm was determined 10 minutes later against a blank solution containing the phosphate buffer without hydrogen peroxide. Results are shown in table 02, and values are represented graphically in figure 02.

Microbial growth test

There were no signs of microbial growth after incubation period of 24 hours at 37°C.

Stability Studies

Accelerated stability studies were conducted by placing the samples at 4°C, 27°C and 40°C for 4 weeks and the following parameters are tested every week.

- Organoleptic
- pH
- Spreadability
- Irritancy test
- Photo patch test

The results are enclosed in the tabular column 03 and it is clear that no significant change in the parameters was identified, and this confirms the stability of the product.

Table 1: Formulation

S.no	Types	Potato %	White beeswax	Liquid paraffin	Methyl paraben	Propyl paraben	Ascorbic acid	Ferric oxide red	Water
01.	Potato cream	7%	1%	0.1%	0.8	0.8	0.8	-	q.s
02.	Potato and beetroot mixed powder cream	7%	1%	0.1%	0.8	0.8	-	0.1	q.s

Table 2: Percentage Hydrogen peroxide scavenged

S.No.	Concentration (µg/ml)	Absorbance	% Scavenged
1	2	0.0912	6 %
2	4	0.0862	12 %
3	6	0.0678	43.06 %
4	8	0.0521	86.97 %
5	10	0.0486	99 %

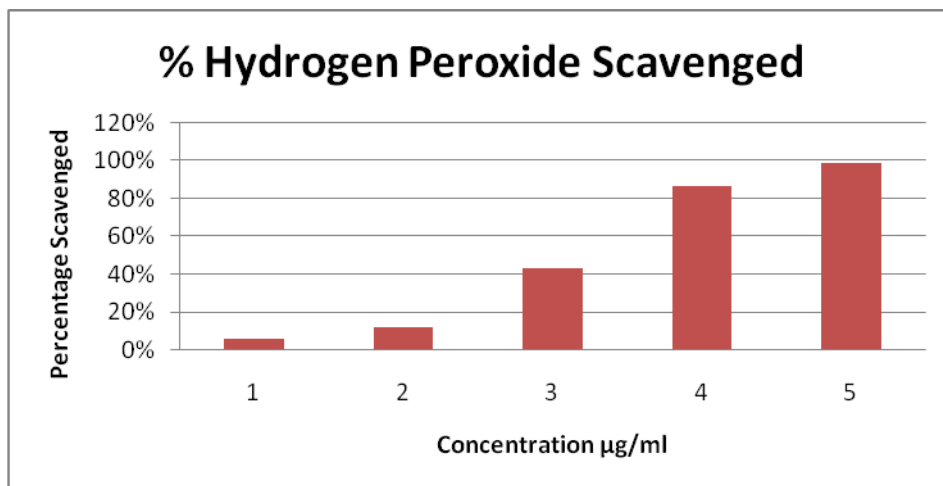


Figure 2: Antioxidant activity

Table 3: Stability Studies

S. No	Test Parameters	Week 0			Week 2			Week 3		
		4°C	27°C	45°C	4°C	27°C	45°C	4°C	27°C	45°C
1	pH	7.1	7.1	7.1	6.7	6.8	6.8	6.6	6.8	6.8
2	Color	Red	Red	Red	Red	Red	Red	Red	Red	Red
3	Odor	Odorless	Odorless	Odorless	Odorless	Odorless	Odorless	Odorless	Odorless	Odorless
4	Sensitivity	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve
5	Spreadability	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve
6	Photo patch test	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve

CONCLUSION

From above discussion it is concluded that the prepared formulation showed good spreadability, no evidence of phase separation and good consistency during the study period. From the above study it can be concluded that it is possible to develop creams with potato powder. The cream was nonirritant and photo sensitivity was found to be positive and no irritation was found on the surface of the skin. It was also stable at varied temperature and did not show oxidation. Natural remedies are more acceptable in the belief that they are safer with fewer side effects than the synthetic ones. So, the cream which is prepared is non-toxic, safe, and effective and improves patient compliance by the utilization natural ingredients. Hence, this prepared anti acne cream was suitable to treat acne and was easy to apply and wash off.

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