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Formulation and Characterization of Herbal Cream Containing Bell Pepper Extract for Topical Application

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ABSTRACT

Bell Pepper is good source of vitamin C. The benefits performing from the use of natural products rich in bioactive substances have promoted the growing interest of food industriousness. Among the antioxidant phytochemicals, polyphenols earn a special citation due to their free radical scavenging. Capsaicin is used topically in the operation of postherpetic neuralgia. It has been estimated in the operation of pain from other causes, including trigeminal and diabetic neuralgia, osteoarthritis, postsurgical neuralgias and vulvar vestibulitis. The main ideal of the study is to formulate cream and determine the vitamin C content in bell pepper. The quantum of vitamin C can be estimated by a redox titration with a standardized result of iodine. The herbal cream medication was prepared by using the extracts of bell pepper with different solvent, stearic acid, cetyl alcohol, mineral oil, glycerine, triethanolamine. Test parameters for cream includes organoleptic characteristic, pH, viscosity, spreadability, extrudability, and stability test. Creams were fluently washed with plain water, spreadable, feel good. The formulation was appeared to be stable. The results of formulation I represented shows better results when compared to formulation II and formulation I was considered to be better with respect to parameters like change in pH, spreadabilty, viscosity and stability. The results encourage the herbal formulation to be stable and harmonious in appearance, which may be fluently used as herbal cream. It may be beneficial in treating skin conditions associated with inflammation, such as eczema, psoriasis, and acne, while reducing signs of aging and promoting overall skin health.

Keywords: Bell pepper extract, Vitamin C, Redox titration.

INTRODUCTION

Herbal drugs were in use since the morning of centuries to maintain good health and to treat conditions, Plant material retain numerous kinds of active constituents(photochemical) and have the capability to calm and smoothen the skin and to laboriously heal the skin and also restore and cover the skin. Skin, as an external defensive natural hedge, the veritably important component to be present in a purpose skin cream is an antioxidant and anti-inflammatory which is veritably important
demanded by the skin is vitamin C (1). The characteristics of a cream largely depend on the ratio of water to greasy components. Based on this proportion, creams may be easily washable and water-miscible or,

alternatively, more viscous and adhesive in nature. Creams are among the most frequently prescribed topical dosage forms. Due to their lower greasiness and reduced messiness, they are generally preferred by patients and considered more convenient for topical application. (2). Numerous of the factory excerpts have a wide range of vitamins and antioxidants that has proven to have numerous skin benefits (1). Vitamin C is needed for the forestalment of scurvy and conservation of healthy skin and blood vessels. Vitamin C is known as an important compound in the body, similar as collagen product, fat carrier, cholesterol controller, and vulnerable boosters (3). Vitamin C is a compound which is a water- soluble, acidic and strong reducing properties. Vitamin C occurs in numerous creatures naturally except humans. This natural vitamin exists in L- ascorbic acid form which is 90 more active than the D- isomer. It's a strong reducing agent, which carries out its reducing function and fluently converts to its oxidized form, the L- Dehydroascorbic acid, when oxidative stress is present, hence, L- ascorbic acid is used as a food-additive in food industry, functions as a protean antioxidant to protect food from deterioration by oxidation. As a potent antioxidant, vitamin C has the capacity to exclude several different free radicals (4). As an antioxidant, it also reduces the threat of atherosclerosis and some forms of cancer. Its functions in collagen conformation, immersion of inorganic iron, reduction of tube cholesterol position (5,6). C.annuum has been reported to be an excellent source of antioxidants similar as vitamin C and carotenoids (7,8) The capsaicinoids, which are responsible for the pungency of pepper, are characterized by chemo preventive antioxidant, anti-inflammatory, and weight-reducing goods (6). Capsaicin, the pungent alkaloid of red pepper(Capsicum annuum) has been considerably studied for its natural goods which are of pharmacological applicability. These include cardio defensive influence, antilithogenic effect, anti-inflammatory, and analgesia, thermogenic influence, and salutary goods on gastrointestinal system (9). The analgesic and anti-inflammatory exertion was estimated on four different coloured (green, yellow, orange and red) sweet bell peppers (Capsicum annuum L.) (10). Capsaicin cream (either 0.025 or0.075) was effective when applied topically in the operation of postherpetic neuralgia. It has been estimated in the operation of pain from other causes, including trigeminal and diabetic neuralgia, osteoarthritis, postsurgical neuralgias and vulvar vestibulitis (11). Bell Pepper is good source of vitamin C. The benefits performing from the use of natural products rich in bioactive substances has promoted the growing interest of food diligence. Among the antioxidant phytochemicals, polyphenols earn a special citation due to their free radical scavenging properties. Antioxidant composites and their antioxidant exertion in 4 different multi-coloured (green, yellow, orange, and red) sweet bell peppers (Capsicum annuum L.) were investigated (10). Vitamin C contained in red bell peppers helps to form collagen, a structural fibre that's demanded to hold everything together. Collagen is needed by your skin to remain healthy and indeed minor scarcities in vitamin C can beget skin problems. Red bell peppers are great sources of three cancer- fighting carotenoids lutein, beta- cryptoxanthin, and zeaxanthin. piecemeal from being excellent for skin, these carotenoids help in reducing swelling caused by arthritis because of their high silicon content. Red bell pepper juice is also known for its healing property. Ongoing research is evaluating whether vitamin C restricting the damaging effects of free radicals through its antioxidant property and anti-inflammatory action. The main objective of the study is to formulate cream and determine the vitamin C content in bell pepper. The amount of vitamin C can be estimated by a redox titration with a standardized solution of iodine.

MATERIALS & METHODS

Preparation of bell pepper for extraction

Fresh bell pepper was purchased from local market in Bangalore city. Before the extraction procedure, all the samples were thoroughly clean using deionized water to remove any adhering contaminants.
Stems, seeds and inner white sections was removed; red bell peppers will slice into 1/4" strips. Slicing was done into strips so that it fit more on the tray then, it was allowed to shade dried, then it was allowed to cool completely, then dried pepper strips was allowed to get powdered in blender or coffee grinder to get fine powder.

Fig.1 Preparation of bell pepper for extraction.

Extraction of Vitamin C from Bell Pepper (1):

3.0g of powdered bell pepper was taken into a beaker and 25ml of solvent (5% Metaphosphoric acid-10% acetic acid) was added for extraction. It was allowed to swirled and left for 10 minutes under stirring conditions. It was later filtered by using a Whatman 99 filter paper and filtrate extract will be stored in refrigerator for further use.
5.0g of powdered bell pepper was macerated with 100 ml of ethanol for 24 hr and allowed to stirred occasionally and filtered, filtrate was collected and stored in refrigerator for further use.

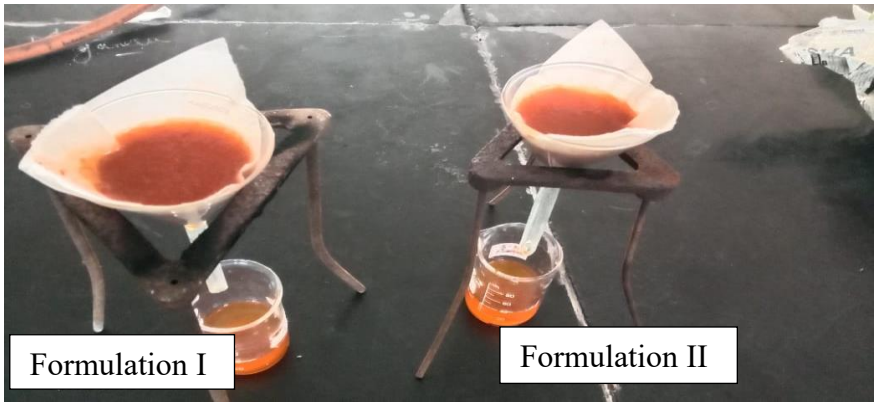

Fig .2 Extraction of Vitamin C from Bell Pepper

Phytochemical Analysis of extracts

1. Test for Tannins. 1ml of the sample was taken in a test tube and then 1ml of Potassium ferricyanide was added. After some time 1ml of Ferric Chloride containing 0.1N HCl was added. Blue-black color appeared in test tube.
2. Test for Flavonoids. 5ml of dilute ammonia solution was added to a portion of the crude extract of prepared bio adsorbent followed by addition of conc. sulphuric acid. A yellow coloration observed in the extract which disappeared on standing.

3. 3Test for Steroids. 2ml of acetic anhydride and 2ml of sulphuric acid was added to 1ml crude extract of plant sample. Colour changed from violet to blue or green.
4. Test for Quinones. Dilute NaOH was added to the 1ml of crude extract. Appearance of blue green or red coloration in the test-tube.
5. Test for Terpenoids. 5ml of prepared extract was mixed with 2ml of chloroform. Afterwards 3ml of conc. sulphuric acid was carefully added to form layer. A layer of reddish-brown colorations obtained.

Table: 1 Phytochemical Analysis

Sr. No	Phytochemicals	Results
1	Tannis	+
2	Flavonoids	+
3	Steroids	-
4	Quinones	-
5	Terpenoids	+

A) Qualitative estimation of Vitamin C

The presence of vitamin C in bell pepper extract was confirmed by titrating the extract against 2, 6-dichlorophenol indophenols, this method is based on strong reducing power, an outstanding property of ascorbic acid and most analytical methods for its determination are based on this important property

Procedure

1. Using a 10-mL graduated cylinder, measure out 10 mL of 0.025% dichloroindophenol solution was prepare and transferred to one of the test tubes provided.
2. Using a Beral-type pipet, Vitamin C solution was added drop by drop, counting each drop was added to the test tube until the color changes from blue to the colorless/very light amber endpoint, data were recorded in table. The procedure was repeated two more times to obtained more accurate results.
3. The procedure was repeated using extract as the Vitamin C source. Intermediate pink color was observed and continued until the clear-amber color appeared. The drop counts were recorded for the extract sample in the data table.

Using the Vitamin C solution as a standard, the amount of Vitamin C in extract was calculated.

(Drops standard) (Concentration standard) = (Drops unknown) (Concentration unknown)

(28 drops) (100 mg/100 mL of Vitamin C) = (70drops) (n mg of Vitamin C/100 mL of extract)

n = 40 mg of Vitamin C

Therefore, the concentration of Vitamin C in the extract was found to be 40 mg/100 mL

Fig.3 Qualitative estimation of Vitamin C

Fig.4 Quantitative estimation of vitamin C

B) Quantitative estimation of vitamin C by redox titration using iodine solution (12).

Estimation of vitamin C content was performed by redox titration using iodine solution.

20ml of the sample solution was pipetted into a 250ml conical flask, and 150ml of distilled water was added to it, followed by a 3mL starch indicator solution. Then the sample solution was titrated with 0.005mol L^{-1} iodine solution. The titration's endpoint was identified as the first permanent trace of a dark blue-black color due to the starch-iodide complex. The titration was repeated with further aliquots of sample solution until obtained concordant results.

Calculation

Ascorbic acid + I_2 → 2 I^- + Dehydroascorbic Acid.

As iodine solution was taken as the standard solution, it was taken as 0.005mol L^{-1}.

Molar ratio of iodine = 2/1= 2

First, calculated the moles of iodine using rule, N = CV =0.005 mol/l X 2.1 ml=0.01N

Where, C = 0.005mol L^{-1}

V = Mean value of the concordant readings

Then, calculated the moles of ascorbic acid (AA) in the given sample, NAA = 2N =2X 0.01= 0.02 mole

Finally, convert the moles of AA found to mass M = NAA × MAA=0.02 mole X 176.12 g/mole=3.52 gm of vitamin C.

Where, MAA is the molecular mass of Ascorbic acid.

Formulations and Evaluation (1,2)

Formulation:

For the formulation, in one beaker the emulsifier stearic acid and cetyl alcohol, mineral oil which are oil soluble components, was dissolved in the oil phase components (Part A) and heated to about 75°C. In another beaker all the other water-soluble components, Triethanolamine and glycerin, extract of bell pepper and the preservatives were dissolved in the aqueous phase (Part B) and heated to 75°C. After heating, the oil phase components were added in small portions of the aqueous phase components with continuous trituration in porcelain mortar until a smooth cream was form.

Table :2 Ingredients of cream

Sr. No.	Ingredients	Formulation I (%w/w)	Formulation II(%w/w)
1	Extracts	Metaphosphoric acid Extract of bell pepper 0.125	Ethanolic Extract of bell pepper 0.125
2	Stearic acid	2	2
3	Cetyl alcohol	1	1
4	Mineral oil	1	1
5	Glycerin	0.75	0.75
6	Triethanolamine	0.25	0.25
7	Water	q.s	q.s

Evaluation

Organoleptic Characteristics (13,14). Formulation was tested for physical appearance, colour, texture, homogeneity, grittiness. These characteristics was evaluated by visual observation and physical touch. Homogeneity and texture for developed cream was tested for visual homogeneity inspection after the cream have been set in the container. They were also test for their appearance. Grittiness was evaluated microscopically for the presence of any appreciable particulate matter which was seen under light microscope which fulfils the requirement of freedom from particular matter and form grittiness as desired for any topical preparation.

Determining pH of the Cream (14). 1 gram of formulation was dispersed in 25 mL of deionized water, and the pH will be determined by using a pH meter. The pH meter was calibrated with standard buffer solutions (pH 4, 7, and 10) before each use.

Viscosity Measurement (14). A Brookfield viscometer was used. The tests were carried out at 21°C. The spindle will be rotated at 5, 10, 20 rpm values.

Spreadability (15). Spreadability of the formulation was determined by measuring the spreading diameter of 1 g of sample between two glass plates and a weight of 100gm is applied on the plate for 5 minutes.
Spreadability can be expressed as
S= m*l/t
Where, m = weight applied to upper slide.
l = length moved on the glass slide and t = time taken.
Extrudability (14). 20 g of the formulation cream was filled in standard collapsible aluminum tubes and sealed by crimping to the end. The weight of the tubes was recorded by weighing. The tubes were placed between two glass slides and were clamped. 500 gm was placed over the slides, and the cap was removed. The amount of the extruded gel was collected, weighed, and percentage was calculated.
Extrudability can be expressed by
Amount of cream extruded / Total amount of cream filled in tube x 100
Stability testing (1):
The formulation was tested at room and elevated temperatures at 40°C ± 1°C for 20 days, and observations was noted on the 0th, 5th, 10th, 15th, and 20 th day for various parameters.

RESULT & DISCUSSION

Fig.5 showed Bell pepper extract cream formulation I and II respectively, which are homogeneous, smooth, and have a smooth appearance, are spreadable, and are easy to wash, table no.3 shows the organoleptic characteristics, table no. 4 shows the evaluation of cream formulation labelled as Bell pepper extract cream I and II for pH, homogeneity,
appearance,spreadability,extrudability, table no.6 and 7 shows the observations shows the results of the stability testing for Bell Pepper Extract Cream I and II. The observations were as follows: All two formulations (I and II) were intact and responded to all parameters similar except that the pH of formulation II was slightly higher than formulation I.

Formulation I

Formulation II

Fig. 5 Bell pepper extract cream formulation.

Table no 3: Organoleptic characteristics.

Formulations	Physical appearance	Colour	Texture	Phase separation	Homogeneity	Grittiness
I	Opaque	Off white	Smooth	No	Homogenous	No
II	Opaque	Off orange	Smooth	No	Homogenous	No

Table no 4: Evaluation results of cream formulations.

Sr. No	Parameter	Formulation I	Formulation II
1	pH	5.3 ± 0.25	6.6 ± 0.25
2	Homogeneity	Good	Good
3	Appearance	Uniformity in color	Uniformity in color
4	Spread ability	86.48 ± 0.67	85.22 ± 0.74
5	Extrudability	84.9 ± 0.13	76.33 ± 0.13

Table no.5 Viscosity of formulations.

Formulations	RPM	Spindle no.	Torque % initial	Viscosity cps initial	Torque % (after 20 days)	Viscosity cps (after 20 days)
I	5	64	35.4 %	42,480	35.4%	42,321
	10	64	60.2%	36,120	58.2%	36,108
	20	64	70.1%	21,030	69.3%	21,024
II	5	64	17.4%	69,600	17.7%	69,542
	10	64	22.2 %	53,280	21.4%	53,242
	20	64	29.7 %	35,640	27.4%	35,624

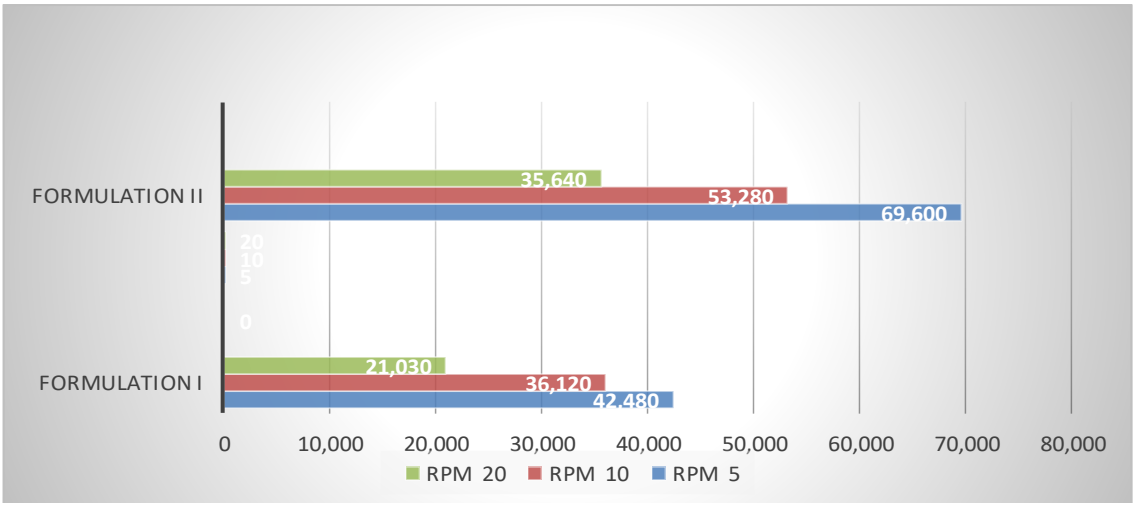

Fig 6. Viscosity of formulations.

Table no 6: Stability studies data for cream formulations at RT 27 ºC.

Day	Formulations	pH	Various parameters				
			X1	X2	X3	X4	X5
0	I	5.3	G	NCC	G	G	G
	II	5.6	G	NCC	G	G	G
5	I	5.4	G	NCC	G	G	G
	II	5.6	G	NCC	G	G	G
10	I	5.4	G	NCC	G	G	G
	II	5.5	G	NCC	G	G	G
15	I	5.4	G	NCC	G	G	G
	II	5.6	G	NCC	G	G	G
20	I	5.4	G	NCC	G	G	G
	II	5.6	G	NCC	G	G	G

X1: Homogeneity, X2: Appearance, X3: Spreadability, X4: Extrudability, X5: Viscosity
G: Good, S: Satisfactory, NCC: No change in colour.

Table 7: Stability studies data for cream formulations at accelerated temperature 40ºC.

Days	Formulations	pH	Various parameters				
			X1	X2	X3	X4	X5
0	I	5.4	G	NCC	G	G	G
	II	5.9	G	NCC	G	G	G
5	I	5.4	G	NCC	G	G	G
	II	5.9	G	NCC	G	G	G
10	I	5.4	G	NCC	G	G	G
	II	5.7	G	NCC	G	G	G
15	I	5.4	G	NCC	G	G	G
	II	5.8	G	NCC	G	G	G
20	I	5.5	G	NCC	G	G	G
	II	5.8	G	NCC	G	G	G

X1: Homogeneity, X2: Appearance, X3: Spreadability, X4: Extrudability, X5: Viscosity,G: Good, S: Satisfactory, NCC: No change in color.

Extraction of Vitamin C was extract and incorporated into cream bases to form formulation. The cream formulations of bell pepper extract were tested for the preliminary testing parameters like the pH, homogeneity, appearance, spreadability, extrudability test and further it was check for the formulation stability.

CONCLUSION

The overall conclusion was that the herbal formulation was stable and consistent, and could easily be used as an herbal cream. The cream was visually evaluated and found to be within the limits.

Declaration by Authors

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Conflict of Interest: No conflicts of interest declared.

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