

**FORMULATION AND EVALUATION OF HERBAL CREAM USING PEEL EXTRACT
OF PAPAYA AND RED DRAGON FRUIT**K. Nagaraja*¹, Rashmi Bagri², Manisha Sharma², S. Sneha³ and N. Joel Paul⁴

^{1,2}Department of Pharmaceutics, Malla Reddy Pharmacy College, Maisammaguda, Hyderabad, Telangana, India.
^{2,3,4}B. Pharm (Bachelor of Pharmacy) Malla Reddy Pharmacy College, Maisammaguda, Hyderabad, Telangana, India.

***Corresponding Author: K. Nagaraja**

Department of Pharmaceutics, Malla Reddy Pharmacy College, Maisammaguda, Hyderabad, Telangana, India.

Article Received on 21/06/2023

Article Revised on 11/07/2023

Article Accepted on 31/07/2023

ABSTRACT

The aim of the study is to formulate and evaluate the herbal cream using peel extract of papaya (*Carica papaya*) and red dragon (*Hylocereus polyrhizus*). The papaya and red dragon fruit peel extract were obtained by maceration process using the ethanol as solvent. Phytochemical characteristics of ethanolic extract of papaya and red dragon was done. The formulation of herbal cream showed good spread ability, no phase separation, good consistency during this study period. Antibacterial activity of the peel extracts was observed against the *Escherichia coli* (gram negative bacteria) and *Streptococcus* (gram positive bacteria). The antibacterial activity was done by agar cup plate method also called cylinder plate method. The result shows the combination of papaya and red dragon fruit peel cream having strong antibacterial activity against the *E. coli* and *Streptococcus* bacteria.

KEYWORDS: Antibacterial, Antioxidant, Anti-inflammatory.**INTRODUCTION**

Herbal medicine or herbal drug preparation refers to the usage of any plant parts such as seeds, roots, berries, leaves, peels, bark, or flowers for medicinal purposes or treatment of medical ailments. Along with other dosage forms, herbal drugs are also formulated in the form of cream. Creams are primary application in topical skin products. Creams are preferred to ointments by many patients and physicians as they are easy to spread as well as their removal is also easy. The pharmaceutical manufacturing companies mostly manufacture topical preparations of herbal drugs both in ointment and cream bases in order to satisfy the preference of both patient and physician. The demand for herbal medicines is increasing day by day due to their skin friendliness and less side effects.^[1] The best thing of the herbal medicines is that it is purely made by the herbs and shrubs and thus is side-effects free. The natural content in the herbs does not have any side effects on the human body; instead provide the body with nutrients and other useful mineral.

In the present study the natural ingredients for preparation of herbal cream included papaya and dragon fruit peels, and the emulsion is water in oil type.

The ingredients were chosen based on the individual antimicrobial properties of red dragon fruit (*Hylocereus polyrhizus*) peel extracts.^[2]

The bioactive compounds such as polyphenol and flavonoids with antioxidants and antibacterial activities. Papaya (*papaya carica*) peels and red dragon peel (*hylocereus polyrhizus*) consists of terpenoids, tannins, alkaloids, saponins steroid, phenols, fixed oils and fats. These extract shows effective antibacterial activity against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, – *Escherichia coli* (*E-coli*).^[3,4]

MATERIAL AND METHODS

Procurement of Fruit Materials: The selected fruit parts of *Carica papaya* (papaya) and *Hylocereus polyrhizus* (Red dragon) were taken from the fruit vendor. The peels of *Carica papaya* and *Hylocereus polyrhizus* are cleaned with fresh water and are air dried for few days. Then they are powdered into fine mixture. The obtained powders are stored in air tight containers at room temperature and preserved.^[6,7]

Preparation of Extract

1. Fruit peels of both plants were powdered and the extracts were prepared by maceration process using ethanol as solvent.
2. The weigh 25 gms of coarsely powdered crude drug is soaked in conical flask using 250ml of suitable solvent (Ethanol) and is allowed to stand at room temperature for a period of 7 days with frequent agitation until the soluble matter has dissolved. The mixture after 7 days was strained and filtered using funnel.

- Individual powdered drug was subjected for Maceration process were the crude drug is dissolved in solvent (Ethanol) for 7 days, filtered and concentrated.
- And mixture of two plants were subjected for maceration for 7 days, filtered and concentrated.
- All the three extracts are subjected for Screening of photochemical test, formulation of herbal cream, and showed Anti-bacterial activity using Agar Cup Plate method.^[6,7]

Phytochemical Analysis of the Extracts

- It refers to the extraction, screening and identification of the medicinally active substances found in the fruits.
- The phytochemical screening was carried out using standard method of analysis of flavonoids, alkaloids, steroids, saponins, terpenoids, carbohydrate, tannins.^[8,9]

Table 1:

PHYTOCHEMICAL CONSTITUENT TEST	EXTRACT OF PAPAYA FRUIT PEEL	EXTRACT RED DRAGON FRUIT PEEL	EXTRACT OF COMBINATION
Flavonoids Shinoda test: - To dry powder or extract, 5 ml of 95% ethanol was added along with few drops of concentrated HCl and 0.5g of magnesium turnings	Negative	Positive	Positive
Alkaloids: Dragendorff's test: - To 2 - 3 ml extract a few drops of Dragendorff's reagent are added.	Negative	Negative	Negative
Carbohydrates Molisch's test: - Extract was shaken with 2 ml Molisch solution. To this 2 ml of concentrated H ₂ SO ₄ was added from the sides of the test tube.	Positive.	Positive.	Positive.
Steroids Liebermann-Burchard reaction: Mix 2 ml extract with chloroform. Add 1-2 ml acetic anhydride and 2 drops conc. H ₂ SO ₄ from the side of the test tube	Positive	Positive	Positive
TEST FOR TERPENOID Knollar's test: 5 mg of extract is treated with 2 ml of 0.1% anhydrous stannic chloride in pure thionyl chloride.	Positive	Positive	Positive
Phenols and Tannins: To 2-3ml extract add few drops of 5% FeCl ₃ .	Negative	Positive	Positive
TEST FOR SAPONINS (FROTHING TEST) Foam test: 1 ml solution of extract was diluted with the distilled water to 20 ml and shaken in a graduated cylinder for 15 mins. Development of stable foam suggests the presence of saponins. (OR) 1 ml extract was treated with 1% lead acetate solution.	Positive	Positive	Positive



Figure 1:

Excipients and Herbal Ingredients Used With Their Rol**Table 2:**

S. NO.	INGREDIENTS	ROLES
1	Papaya fruit peel	Anti-bacterial activity
2	Red dragon fruit peel	Anti-bacterial activity
3	Stearic acid	Emulsifier
4	Cetyl alcohol	Emulsifier, Thinking agent
5	Mineral oil	Lubricating agent
6	Triethanol amine	Emulsifier
7	Propyl parabeen	Preservative
8	Methyl parabeen	Preservative
9.	Water	Vehicle

PRE-FORMULATION STUDIES

Pre formulation test performed are as follows.

SOLUBILITY STUDIES

PROCEDURE: Accurately weighed 10mg of extract (papaya, red dragon and combination of two extracts) were taken and the extracts were dissolved in different solvents such as ethanol, methanol, water. The mixtures were shaken for 24hrs at regular intervals. The solution were filtered by using What man's filter paper. The filtered solutions were analysed at suitable nm.

FORMULATION OF CREAM

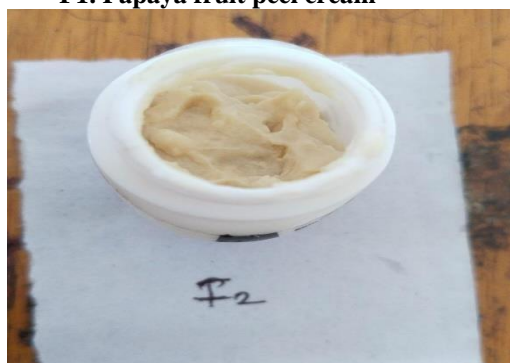
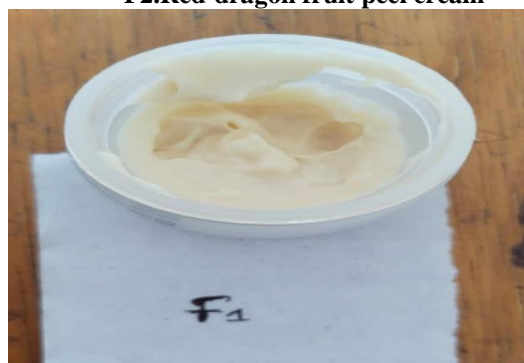
Preparation of oil phase: Oil phase of formulation was prepared by melting required quantities of stearic acid, cetyl alcohol, mineral oil at 75°C and mixing the ingredients uniformly.

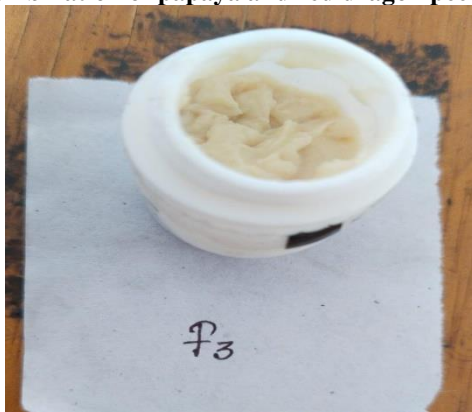
Preparation of aqueous phase: Aqueous phase of formulation was prepared by dissolving the require quantities of water soluble ingredients such as tri ethanol amine, propyl paraben, methyl paraben in deionized water. The water phase warmed to 75°C until all ingredients were dissolved.

Addition of aqueous phase to oil phase: After heating both the phases i.e. oil phase and aqueous phase at 70°C. When the oil phase and aqueous phase were at same temperature, the aqueous phase is slowly added to the oil phase with moderate agitation and was kept stirred until the temperature dropped to 40°C. The emulsion was cooled to room temperature to form a semisolid cream base. Papaya peel extract and red dragon peel extract were dissolved in warmed deionized water, and the solution were added to the cream base using an overhead stirrer. The mixture was stirred for 15 min until the formulation became uniform.^[10,11]

Formula for preparation of cream**Table 3:**

S.NO	INGREDIENTS	F1	F2	F3
1	Papaya fruit peel	0.5 mg	-	0.25 mg
2	Red dragon fruit peel	-	0.5 mg	0.25 mg
3	Stearic acid	1.2 mg	1.2 mg	1.2 mg
4	cetyl alcohol	0.3mg	0.3mg	0.3mg
5	Mineral oil	0.4ml	0.4ml	0.4ml
6	Triethanol amine	0.36gm	0.36gm	0.36gm
7	Propyl parabeen	0.0025ml	0.0025ml	0.0025ml
8	Methyl parabeen	0.0025ml	0.0025ml	0.0025ml
9	Water	Q.S	Q.S	Q.S

F1. Papaya fruit peel cream**Figure-2****F2.Red dragon fruit peel cream****Figure-3**

F3. Combination of papaya and red dragon peel cream**Figure-4****EVALUATION TEST FOR HERBAL CREAM
PH OF CREAM**

- pH of prepared herbal cream is measured by using digital pH meter. The solution of the cream was prepared by adding 1mg of cream in 10ml of distilled water and set aside for 2 hours. pH is determined in three times for solution and the average value was calculated.^[12]

VISCOSITY

- Viscosity of cream is done by using brooke field viscometer at temperature of 25 degrees Celsius using spindle number 65 at rpm. .^[12]

SPREADABILITY

- Spread ability of formulated cream is measured by placing sample in between two slides then compressed to uniform thickness by placing a definite weight for defined time. The specified time required to separate the two slides was measured as spread ability. Lesser the time taken for separation of two slides results showed better spread ability.

Spread ability = $m.l/t$

Where, m = Standard weight which is tied to or placed over the upper slide l = length of a glass slide t = time taken in seconds.^[12]

WASH ABILITY

- The formulation was applied on the skin and then ease extends of washing with water was checked.^[12]

NON-IRRITANCY TEST

- Herbal cream formulation is evaluated for the non-irritancy test. Preparation should show no redness and irritancy. Observation of the state is done for 24 to 28 hours.^[12]

PHASE SEPARATION

- The prepared cream is transferred in a suitable wide mouth container. Set aside for storage the oil phase and aqueous phase separation were visualizing after 24 hours.^[12]

CONSISTENCY: The formulation is examined by rubbing cream on hand manually. The cream should have smooth consistency.^[12]

ANTIMICROBIAL METHOD CUP AND PLATE METHOD

Culture of microorganism The following bacterial strains were used to study the antibacterial activity. Streptococcus - Gram positive bacteria Escherichia coli - Gram negative bacteria. Standard – Azithromycin.

Preparation of the medium: Agar-20gm

Purified water-100ml

PH-7.2+0.2 34

The medium was prepared by dissolving the specific quantity of the agar in purified water by heating on a water bath and were dispensed in 100ml volumetric conical flask. The conical flasks were closed with cotton plugs and were sterilized by autoclaving at 121° C for 15min. The contents of the conical flasks were poured aseptically into sterile Petri dish is allowed to solidify. These sterilized medias were used to subculture the bacterial culture.

Procedure: Each Petri dish was filled to a depth of 4-5 mm with a nutrient agar medium that was previously inoculated with suitable inoculums of suitable test organism, and then allowed to solidify. The Petri dish were specially selected with flat bottom and were placed on level surface so as to ensure that the layer of medium in uniform thickness. To each portion one cylindrical cavity was made in medium with the help of sterile borer. One cavity for test compounds and one cavity for standard. The Petri dishes 55 were incubated at 37°C for 24hrs. Diameter of the zone of inhibition was measured and the average diameter for each sample was calculated. The diameter obtained by the test sample was compared with that produced by standard azithromycin. ^[13,14,15]

Zone of inhibition of papaya cream with standard drug

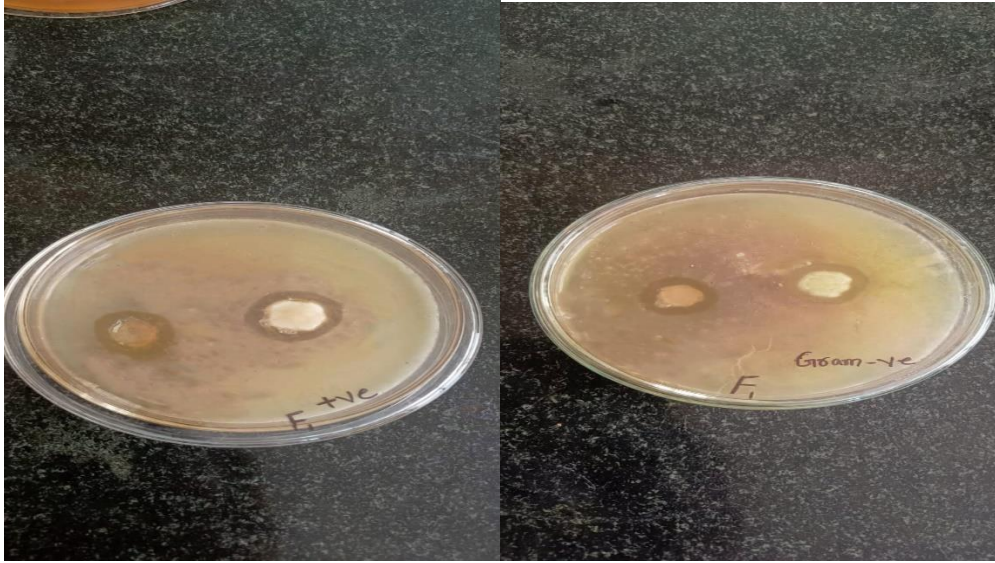


Figure 5:

Zone of inhibition of red dragon cream with standard drug

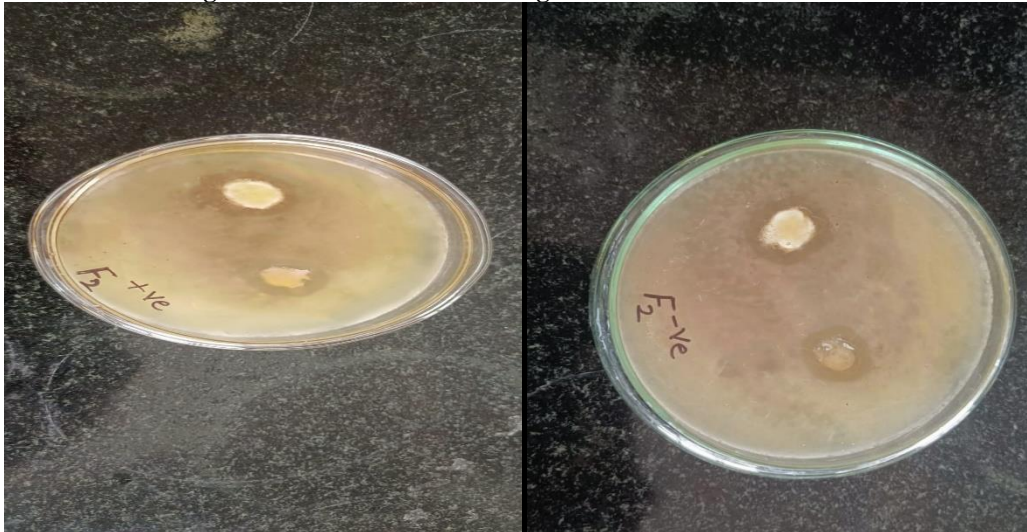


Figure 6:

Zone of inhibition of combination cream (papaya and red dragon) with standard drug



Figure 7:

RESULTS AND DISCUSSIONS❖ **Percentage yield of Ethanolic extracts of Individual Plants****Table 4:**

S.no	Ethanolic extract	Method of extraction	colour	Wt of plant material	Wt of pant extract	% yield
1	Papaya fruit peel	Maceration	Pale yellow colour	25gms	2.82	9.12
2.	Red dragon fruit peel	Maceration	Red colour	25gms	3.24	12.9
3.	Papaya fruit peel+ Red dragon fruit peel	Maceration	Brownish red colour	25	3.85	15.4

Pre-Formulation Studeis**I. Solubility studies of papaya peel****Table 5: Solubility studies values of papaya peel**

S.no	SOLVENT	SOLUBILITY
1	Ethanol	0.512±0.02
2	Methanol	0.432±0.01
3	Water	0.092±0.01

II. Solubility studies of red dragon peel

Solubility studies values of red dragon peel

S.no	SOLVENT	SOLUBILITY
1	Ethanol	0.541±0.02
2	Methanol	0.416±0.01
3	Water	0.089±0.03

III. Solubility studies of combination**Table 7: Solubility studies values of combination (papaya and red dragon peel)**

S.no	SOLVENT	SOLUBILITY
1	Ethanol	0.616±0.01
2	Methanol	0.516±0.02
3	Water	0.097±0.02

EVALUATION OF HERBAL CREAM**PH OF CREAM****Table 8:**

S.no	FORMULATION	pH OF THE CREAM
1	F1	5.7
2	F2	5.6
3	F3	6.1

SPREADABILITY**Table 9:**

S.no	FORMULATION	SPREADABILITY (g.cm/sec)
1	F1	4.61
2	F2	4.76
3	F3	5.08

WASHABILITY**Table 10:**

S.no	FORMULATION	WASHABILITY
1	F1	Easily washable
2	F2	Easily washable
3	F3	Easily washable

NON-IRRITANCY**Table 11:**

S.no	FORMULATION	NON IRRITANCY
1	F1	Nil
2	F2	Nil
3	F3	Nil

PHASE SEPAR**Table 12:**

S.no	FORMULATION	PHASE SEPARATION
1	F1	No phase separation
2	F2	No phase separation
3	F3	No phase separation

CONSISTENCY**Table 13:**

S.no	FORMULATION	CONSISTENCY
1	F1	Smooth
2	F2	Smooth
3	F3	Smooth

Zone Of Inhibition (Against Streptococcus Gram+Ve Bacteria**Table 14: Zone of inhibition.**

Test compound	µg/ml	Standard compound	µg/ml	Zone of inhibition for test	Zone of inhibition for standard
F1	10	Azithromycin	10	1.5mm	2 mm
F2	10	Azithromycin	10	3 mm	3.5 mm
F3	10	Azithromycin	10	3.5 mm	4 mm

Zone of inhibition (against e. Coli gram –ve bacteria)**Table 15: Zone of inhibition.**

Test compound	µg/ml	Standard compound	µg/ml	Zone of inhibition for test	Zone of inhibition for standard
F1	10	Azithromycin	10	1.5mm	1.5 mm
F2	10	Azithromycin	10	2 mm	3 mm
F3	10	Azithromycin	10	3 mm	3.5 mm

CONCLUSION

As herbal products are safe in use and has less side effects their demand in the market is increasing. Our aim is to formulate and evaluate a herbal cream using peel extract of papaya and red dragon fruit. The formulations are optimized and important parameters like pH, spread ability, viscosity, phase separation and non irritancy. A topical herbal cream with antibacterial activity were shown in this formulation. The determination of the zone of inhibition, a widely accepted method to assess antibacterial activity of substance, was also performed. This test involves measuring the area around a sample where bacterial growth is inhibited. The larger the zone of inhibition, the stronger the antibacterial effect. Based on the above results and discussions, the formulations F1, F2, and F3 were stable at room temperature and can be safely used on the skin. However, the F3 formulation showed best results against the gram positive (streptococcus) and gram negative (E. coli) bacteria when compared to the individual formulations F1 and F2.

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