wjpmr, 2024, 10(9), 145-150

SJIF Impact Factor: 6.842

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.wjpmr.com

Research Article

ISSN 2455-3301

WJPMR

FORMULATION AND CHARACTERIZATION OF VITA-C GEL FROM THE EXTRACTED ORANGE PEEL WASTE

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Article Received on 02/07/2024 **Article Revised on 23/07/2024** **Article Accepted on 12/08/2024**

ABSTRACT

This study focuses on the formulation and characterization of Vita-C Gel derived from extracted orange peel waste. The utilization of orange peel waste in creating value-added products such as Vita-C Gel aligns with sustainable practices, contributing to waste reduction. The formulation process involved extracting beneficial compounds from orange peel waste and incorporating them into a gel matrix. Various characterization techniques and rheology analysis were employed to evaluate the physicochemical properties and performance of the Vita-C Gel. The results indicate that the formulated gel possesses desirable attributes, including high stability and antioxidant activity, making it a promising candidate for skincare applications. This research underscores the potential of utilizing agricultural by-products for the development of functional cosmetic products, promoting sustainability and resource efficiency in the cosmetics industry.

KEYWORDS: Orange peel waste, value-added, utilizing, Vita-C Gel, antioxidant.

INTRODUCTION

Orange peel, a byproduct of fruit processing, has been shown to be a great source of bioactive compounds. Peels from oranges and other byproducts generate a large amount of waste every year. India grows more than 25 lakh tons of oranges a year. The main Indian states that produce oranges are Punjab, Madhya Pradesh, Andhra Pradesh, Maharashtra, Rajasthan, Assam, and Karnataka. When orange juice and other orange products are produced, an excessive number of orange peels are collected, which is harmful to the environment.[01,02] It is therefore essential to become proficient in applying these peels. Because orange peels are high in nutrients and phytochemicals, they may be employed in a range of pharmaceutical and culinary products. This study aims to investigate the phytochemical composition of orange peel and extract it using conventional and aqueous extraction techniques.[03,05]

MATERIALS AND METHODS

Orange oranges were purchased in the local market in Gwalior in April of 2024. We washed the fresh oranges with tap water. The peel was divided into little pieces and then left in a shed to cure for ninety-two hours. Dried peels were pounded into a coarse powder with a pestle and mortar and packaged in zip-lock bags.[06]

Soxhlet Extraction

The orange peel powder was extracted using a Soxhlet extractor using hexane, ethanol, and acetone as the various solvents. 100 grams of powdered orange peel were extracted using the Soxhlet extraction method for five hours at 55°C using 750 milliliters of solvent (hexane, ethanol, or acetone). The extracts were refrigerated at 4°C until they were required once again.[02,03,05,07]

Figure 1: Soxhlet Extraction and Extract.

Phytochemical Analysis[03, 04, 06, 11, 12]

The phytochemical screening procedure was conducted in accordance with standard operating procedures.

- **Test for Anthraquinones**

The extract was boiled for 0.5 g in 10 ml of sulfuric acid (H2SO4), and then it was filtered while still hot. To stir the filtrate, add five milliliters of chloroform to it. One milliliter of diluted ammonia was added to the chloroform layer. We examined the final color shift solution.

- **Test for Tannin**

About 0.5 g of the extract was boiled in 10 ml of water in a test tube, and then they were filtered. After adding three or four drops of 0.1% ferric chloride, the coloring was allowed to become blue-black or brownish-green.

- **Test for Terpenoids**

Two milliliters of chloroform were applied to each 0.5 gram of extract. Three milliliters of concentrated H2S04 were cautiously injected to form a layer. The reddish-brown color of the interfae is indicative of terpenoids.

- **Test for Flavonoids**

A small amount of the filtrate was mixed with a few drops of 1% aluminum solution. A yellow tint indicates the presence of flavonoids.

- **Test for Saponins**

Twenty milliliters of water and two grams of orange peel extract were brought to a boil, and the resultant liquid was filtered. To make a stable, long-lasting foam, ten milliliters of this filtrate were mixed with five milliliters of distilled water and agitated briskly. The extract's ability to produce froth indicates the presence of saponins.

Formulation of Vita-C Gel

Take 100 ml of water, mix 100 ml of extract drop by drop, and mix 2 g of carbapol. Mix 50 mg of propyl paraben.[11 to 15]

Table 1: Formulation Table.

S.No.	Chemical	Amount
01	Water	100 ml
02	Ethanolic Extract	100 ml
03	Carbapol	2 g

Figure 2: Formulation of gel.

Figure 3: Vita-C Gel.

Evaluation of Vita-C Gel[03 to 08]

Appearance/visual inspection: The prepared formulation color, odor, clarity.

pH measurement: A 10% v/v shampoo solution that was prepared in distilled water was tested using a calibrated pH meter.

Determination of viscosity: The viscosities of the gels were measured using the Brookfield Viscometer. 20 rpm RV-7 spindle type. Readings were taken after the spindle was dipped into 100 g of the gel in a beaker and rotated for around five minutes.[10]

Anti- oxidant study- By monitoring the shift in the optical density of DPPH radicals, the test's capacity to scavenge free radicals and assess its antioxidant potential is assessed.[09]

Stability Study: Three groups of the prepared Transferosomel gels were formed. These three Transferosomel gel formulation groups were placed within collapsible aluminum tubes and kept at.

- Temperature of the room(25℃)
- 40℃
- 4 ^{0}C

For three months, the Transferosomel gel formulation was kept in storage. For a duration of three months, samples were taken out each month and their drug content evaluated. They were assessed for physical parameters and product integrity at the conclusion of the third month.[13 to15]

RESULTS AND DISCUSSION

1. Pre-formulation study

1.1 Proximate Composition of Orange Peel Powder

The approximate chemical composition of orange peel powder. The powdered sample that had been shade-dried was found to have a moisture content of 9.6%. Dry weight basis (DW) measurements of protein content varied from 12% to 13%. This implies that orange peel may possibly contain necessary components. 53.90 ± 0.43 grams of carbs were different.[04,07,14, 15]

Table 2: Proximate Composition of Orange Peel Powder.

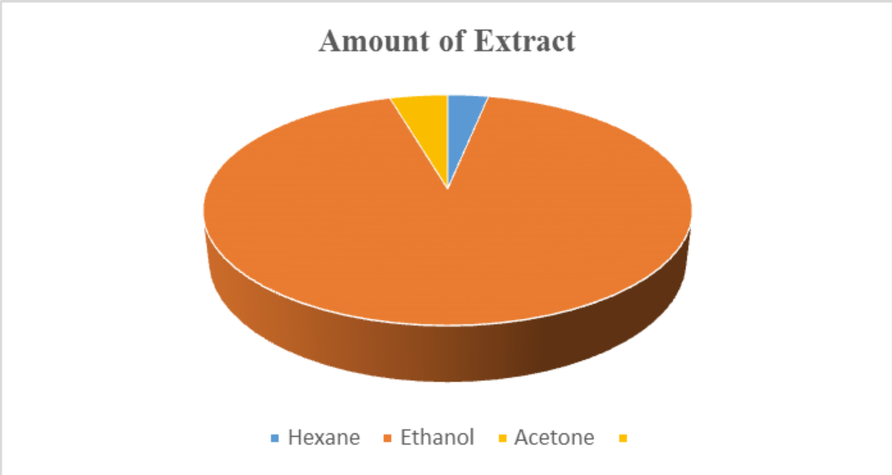
S.No.	Proximate Analysis	% Content
01	Moisture Content	9.6±0.01
02	Crude Fibre	14.37±0.36
03	Crude Protein	12.13±0.20
04	Ash Content	7±0.01
05	Carbohydrate Content	53.90±0.43

1.2 Extraction of orange peel extract by using various solvents

The yield of the orange peel's soxhlet extraction, which was conducted in this research study utilizing several solvents, varied in each session. The solvent used will determine the extract yield. The yield that we were able to get by using ethanol as a solvent was 54.6% when compared to other solvents. The yields of hexane and acetone were inadequate at 1.9% and 2.7%, respectively. 3.2% of the orange peel was removed using water.[06.08]

Table 3: Extraction of orange peel extract by using various solvents.

S.No.	Solvent	Yield per 100 gm
01	Hexane	1.9
02	Ethanol	54.6
03	Acetone	2.7



1.3 Phytochemical screening of the orange peel extract

Following a phytochemical screening, terpenoids, flavanoids, tannins, and saponins were found in the different solvent extracts.

Table 4: Phytochemical screening of the orange peel extract.

S.No.	Extract	Anthroquinones	Tannis	Terpenoids	Saponins	Flavanoids
01	Hexane	-	+	+	-	+
02	Ethanol	-	+	+	-	+
03	Acetone	-	+	-	+	-

2. Evaluation of Vita-C Gel

2.1 Appearance

Visual inspection.

Table 5: Visual inspection.

S.No.	Test	Result
01	Color	yellow
02	Odor	Orange
03	Clarity	Not clear

2.2 pH measurement

Table 6: pH measurement.

S.No	pH test	Result
01	Test-01	6.8
02	Test-02	6.6
03	Test-03	6.8

2.3 Determination of viscosity

Table 7: Determination of viscosity.

S.No	Viscosity Test	Result
01	Test-01	48502
02	Test-02	48503
03	Test-03	48502

2.4 Anti- oxidant study

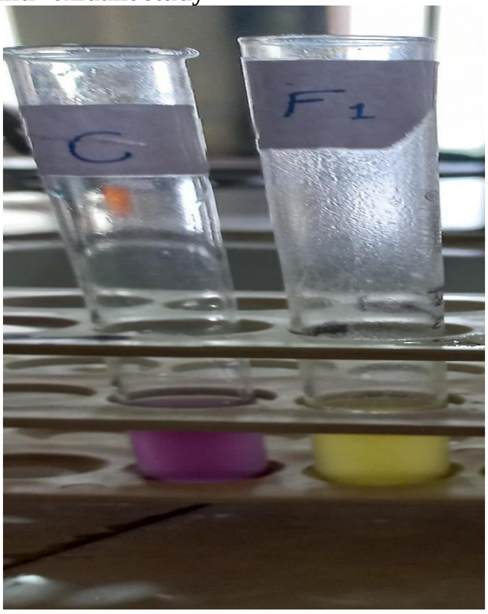


Figure 4: Anti- oxidant study.

Table 8: Anti- oxidant study.

S. No.	Sample Name	Colour	Result
01	C (Blank)	Purple	---
02	F- 01	Yellow	++

2.5 Stability Study

Table 9: Stability Study.

PARAMETER	ROOM TEMPERATURE (25°C)	40^0C	4 ^{0}C
Visual Appearance			
• Initial	Yellow colour gel	Yellow colour gel	Yellow colour gel
• 1 month	Yellow colour gel	Yellow colour gel	Yellow colour gel
pH			
• Initial	6.7	6.8	6.7
• 1 month	6.8	6.9	6.7
Viscosity			
• Initial	48,502	48,500	48,508
• 1 month	48,502	48,500	48,508
Extrudability			
• Initial	Satisfactory	Satisfactory	Satisfactory
• 1 month	Satisfactory	Satisfactory	Satisfactory
Phase Separation			
• Initial	Not found	Not found	Not found
• 1 month	Not found	Not found	Not found
Texture			
• Initial	Smooth	Smooth	Smooth
• 1 month	Smooth	Smooth	Smooth

CONCLUSION

The formulation and characterization of Vita-C Gel derived from extracted orange peel waste present a promising avenue for sustainable utilization of agricultural by-products. Through a systematic approach, the research successfully developed a gel rich in Vitamin C, harnessing the potential of orange peel waste. The comprehensive characterization revealed its stability, efficacy, and potential applications in the cosmetic and pharmaceutical industries. This study underscores the importance of valorizing food waste and highlights the feasibility of creating value-added products with environmental benefits. Moving forward, further research can explore optimization techniques and scalability for commercial production, contributing to both economic and environmental sustainability.

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