Available online on 15.08.2024 at http://ajprd.com

Asian Journal of Pharmaceutical Research and Development

Open Access to Pharmaceutical and Medical Research

Open Access

Research Article

Formulation and Evaluation of Phytosomal Gel With *Musa Paradisica* Peels

Rajeswari Chilka*, Sultana Ameena, Phaneendra Isnagari, Apoorva Sulega

G Pulla reddy college of pharmacy, Hyderabad, Telangana, India

A B S T R A C T

Musa paradisica (L) is typically referred to as banana belonging to the family of *Musaceae*. The dried peels of *Musa paradisica* include flavonoids which contain antioxidants. The peels of *Musa paradisica* had been extracted with methanol by maceration technique. Phytochemical screening of extract was found to contain alkaloids, carbohydrates, phenolic compounds, tannins, Proteins and aminoacids. Methanolic extract of *Musa paradisica* peels had been organized into Phytosomes and evaluated.Methanol extract gels and phytosomal gel had been organized with the aid of using incorporating the extracts in to the mixtures and gels had been evaluated for its physicochemical parameters including color, PH,Spredability and Viscosity. Six extract gels and one phytosomal gel had been prepared and investigated for the antioxidant property with the aid of using in-vitro strategies like DPPH radical scavenging properties and decreasing energy assay. Among six one formulation of methanol extract gels, method F4 as chosen as optimized formula on the basis of physiochemical parameters to prepare phytosomal gel of methanol extract of *Musa paradisica* peels . The Phytosomal gel displays better antioxidant property than methanol extract gel(F4). From the existing look it may be concluded that organized Phytosomal gel was safe, convinient and efficient carrier to deliver the herbal extract.

Keywords: *Musa Paradisica*, Phytosomal gel , Methanol, Phytosomes.

A R T I C L E I N F O: Received 04 Feb 2024; Review Complete 12 May 2024; Accepted 29 July 2024. ; Available online 15 August 2024

Cite this article as:
Chilka R, Ameena S, Isnagari P, Sulega A, Formulation and Evaluation of Phytosomal Gel With *Musa Paradisica* Peels, Asian Journal of Pharmaceutical Research and Development. 2024; 12(4):147-154, DOI: http://dx.doi.org/10.22270/ajprd.v12i4.1430

*Address for Correspondence:
Dr. Narender Boggula, Associate Professor, Department of Pharmaceutical Chemistry,Omega College of Pharmacy, Edulabad, Ghatkesar, Hyderabad, Telangana, India - 501 301.

INTRODUCTION:

In most medicinal plants, the active ingredients are polar or water soluble. Plant phytoconstituents such as flavonoids, tannins are poorly absorbed due to larger particle size or poor fat solubility, which limits their ability to cross the lipid membrane, which limits the use of this type of compound, ultimately reducing bioavailability. Poor bioavailability of herbal ingredients may be due to poor solubility or miscibility of the active ingredients or antagonistic effects of the excipient with the active phytoconstituents. A new patented technology known as Phytosomal technology has been developed to solve these problems (habbu.2013). The term phytosome means "phyto" means plant, "some" means cellular. Phytosomes form an coating around the active ingredient of the drug, by which the active ingredient in the herbal extract remains safe and stable against degradation caused by secretions and bacteria from the digestive tract. Phytosomes can effectively absorb from the water-soluble environment to the fat-soluble environment of the cell membrane and finally reach the bloodstream. The structure of the PC is as follows

PROPERTIES OF PHYTOSOMES:

- Phytosomes are polyphenol molecules attached to a phospholipid molecule. They are very small, from 50 nm to a few hundred µm.
- Phytosomes are micellar in shape and resemble liposomes when treated with water. Photon correlation spectroscopy (PCS) shows that these liposome structures are obtained by phytosomes.
- Phytosomes contain active substances that are attached to the polar end of phospholipids and become an integral part of the membrane. For example, in the case of the catechin esteroyl-PC complex, H-bonds are formed between the phenolic hydroxyl groups of the flavone part

and the phosphate ion of the PC side. Regarding the solubility of phytosomes, it can be stated that phytosome complexes are often very soluble in aprotic solvents, moderately fat soluble, insoluble in water and relatively unstable in alcohol.

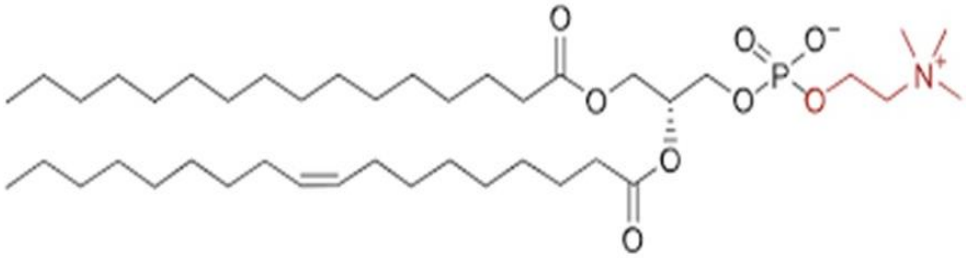

Figure 1: Structure of Phosphatidylcholine

PREPARATION OF PHYTOSOMES:

Phytosomes are prepared by reacting or natural phosphatidylcholine with plant extract in the ratio of 0.5-2.0 gm. (1:1) ratio in a suitable solvent like ethanol, dichloromethane, acetone, methanol, etc.

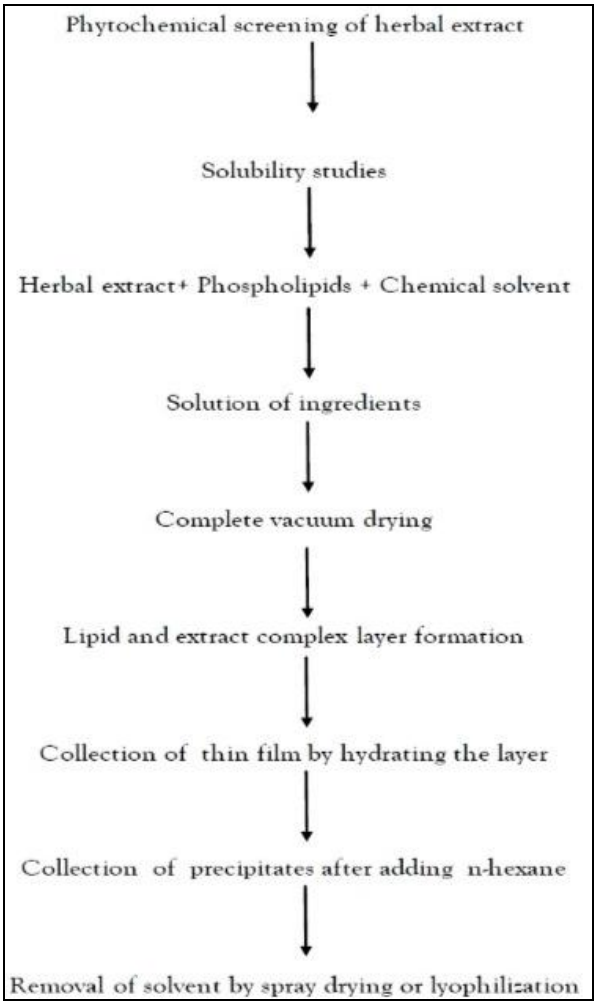

Figure 2: common stages in formulation of phytosomes

ADVANTAGES:

- It has a better stability profile due to chemical bonds between the phosphatidylcholine molecules and the phytocomponents.
- Improves the bioavailability of plant extracts, because they form complexes with phospholipids and improve intestinal absorption.
- They are used in the production of phytosomes, in addition it is a carrier and hepatoprotective, they have a synergistic effect.
- Clogging of the drug does not become a problem during preparation. Entrapment efficiency is also high and moreover predetermined; because the drug itself forms bubbles after conjugation with lipid.

- The dosage requirement is lower because the absorption of the main constituent is improved. They can be given in smaller amounts to achieve the desired results.
- Phytosome formulations are safe and all components are approved for pharmaceutical and cosmetic use.

DISADVANTAGES:

- Plant components are rapidly removed by phytosomes.
- Leaching of herbal constituents can reduce therapeutic effect and instability of phytoconstituents.

MATERIALS AND METHODS:

COLLECTION OF BANANA PEELS AND EXTRACTION:

COLLECTION:

Musa paradisica (banana) fruits were purchased from the local market of Mehdipatnam Hyderabad, Telangana state. The fruits were thoroughly washed with water to remove dirt, then peeled and dried in the shade.

EXTRACTION:

103 grams of dried powdered bark of *Musa paradisica* was extracted with petroleum ether for 3 hours at a temperature of 40-60 °C. The petroleum ether extract was then discarded and the peels were dried overnight. This cream was kept for 10 days to soak, occasionally heating. After 10 days, the contents were filtered through filter paper (Whatmann No. 1), the filtrate was concentrated under reduced pressure with a rotary high vacuum evaporator. The extract was then weighed and the percentage of the extract value was calculated as the weight of the air-dried plant material.

PREPARATION OF PHYTOSOMES:

Phytosomes were prepared by reacting a plant extract and a phospholipid such as soy lecithin by an anti-solvent method. 0.5 g of soybean lecithin and 0.5 g of *Musa paradisica* peels methanolic extract (ratio 1:1) was dissolved in 20 ml of dichloromethane, the mixture was refluxed at 40 °C for 2 hours. The resulting clear solution evaporated. The precipitate was dried to remove residual solvent, resulting in a thin film. The thin film was then separated and stored in a desiccator for further use. The prepared phytosomes were properly dried and accurately weighed. The weight was divided by the total weight of the drug in non-volatile excipients.

Percentage yield= weight of phytosomes formed/weight of drug in nonvolatile excipients × 100.

EVALUATION OF PHYTOSOMES:

Scanning electron microscopy (SEM):

Particle size and appearance were determined using a scanning electron microscope. A sample of the dry extract was placed on the brass of the electron microscope and coated with gold in an ion sputter. Random scan of the complex at 100 µm.

Size analysis and Zeta potential:

A Malvern-zeta size instrument was used to determine the particle size and zeta size of the phytosome complex. The size of the zeta potential gives the possible stability of the colloidal dispersion. If the particles have a large positive and negative charge, they show that they repel each other and diffusivity exists.

Drug entrapment efficiency:

The capture efficiency was determined by the ultracentrifugation method. Phytosomes (100 mg) were diluted with 1 mL of methanol and centrifuged in an ultracentrifuge at 15,000 rpm for 15 min at room temperature. After centrifugation, the supernatant was separated from the residue and the supernatant was evaluated for retention at 280 nm .

Entrapment efficiency = actual amount of drug in phytosome formulation / theoretical amount of drug in phytosome formulation × 100.

Formulation of Methanol Extract Gels and Phytosomal Gel of *Musa Paradisica Peels*

The gel was prepared using Carbopol 934 as a gelling agent The gelling agent was dispersed in a small amount of water using a magnetic stirrer for proper mixing. It was then set aside for 30 minutes to ensure complete hydration. A methanolic extract of *Musa paradisica* barks was then separately added to propylene glycol. Other ingredients such as triethanolamine, methyl and propylparaben were then added with constant stirring. At the end, almond oil was added and mixed.

Table 1: Composition of Methanol Extract Gels and Phytosomal Gels Of *Musa Paradisica* Peels Has Given below.

Ingredients	F1	F2	F3	F4	F5	F6	Phytosomal Gel
Carbopol934	50mg	100mg	200mg	300mg	400mg	500mg	300mg
Extract	500mg	500mg	500mg	500mg	500mg	500mg	500mg
PEG400	3ml	3ml	3ml	3ml	3ml	3ml	3ml
Methyl paraben	0.1g	0.1g	0.1g	0.1g	0.1g	0.1g	0.1g
Propyl paraben	0.12g	0.12g	0.12g	0.12g	0.12g	0.12g	0.12g
Triethanolamine	1ml	1ml	1ml	1ml	0.7ml	0.4ml	1ml
Almond oil	0.4ml	0.4ml	0.4ml	0.4ml	0.4ml	0.4ml	0.4ml

Evaluation Studies of Methanol Extract Gels and Phytosomal Gel of *Musa Paradisica* Peels:

Physico Chemical Evaluation of Gels and Phytosomal Gel:

PH :

The pH meter was calibrated with standard buffer solution such as PH

4.5, 6.8 and 7.4. About 0.5 g of gel was taken and dissolved in 50 ml of distilled water and its pH was measured.

Viscosity:

The viscosity of the formulation was determined with a Brookfield viscometer at 100 rpm using a number 7 spindle.

Spreadability:

A small amount of sample gel was placed between two glass slides. A 100-gram weight was placed on the upper slide, so that the gel between the two slides was evenly pressed into a thin layer. The weight was removed and then attached without the slightest inconvenience to the rack so that the upper part would slide freely. The time required for the top slide to separate from the bottom is marked with a stopwatch. This parallel plate method has been widely used to determine the diffusivity using this formula

S=MXL/T

S= Spreadability

M= weight tied to the upper slide

L= length of the slide

T=Time in seconds

Homogeneity :

The formulations were tested for the homogeneity by visual appearance.

Results:

In-Vitro Diffusion Study Of Methanol Extract Gel And Phytosomal Gel Of *Musa Paradisica* Peels :

The in vitro permeation study of the methanol extract of *Musa paradisica* barks and Phytosomal extract gels was determined using sheep ear skin as a diffusion membrane in a Franz diffusion cell. Skin penetration of both extract gels was calculated at each time point. The main purpose of the composition of the phytosome gel is to increase the accumulation of the drug in the skin. The results showed that 34% release of flavonoids was observed from *Musa paradisica* bark methanol extract gel within 24 hours and 11.5% release from *Musa paradisica* bark methanol extract phytosomal gel within 24 hours, indicating that Phytosomal gel has more skin deposition. than methanol. extraction gel. The flux of flavonoids permeating the skin at the end of 24 hours was found to be 0.05 mg/sq.cm and 0.016 mg/sq.cm.

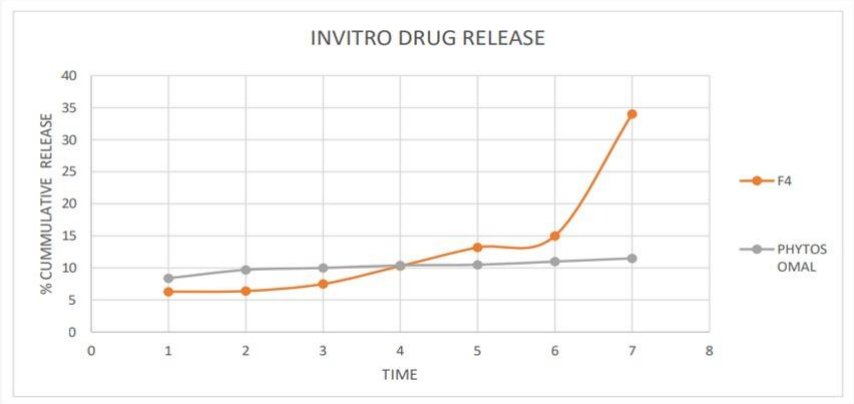

Figure 3: Invitro drug release of methanol extract gel and Phytosomal gel of *Musa paradisica* peels

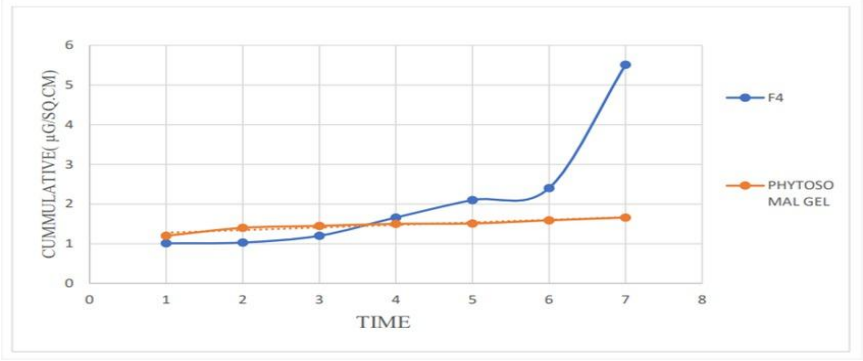

Figure 4: Cumulative amount and flux of flavonoids permeated through the skin at the end of 24hours.

Drug entrapment efficiency:

The entrapment efficiency of the drug was calculated according to the formula and found to be 74.48%.

Scanning electron microscopy:

Scanning electron microscopic view showed that the phytosomes are round. The size of phytosomes is 12 nm.

Size analysis:

Vesicle size and distribution were determined using a Malvern Zetasizer, and the results showed that increasing the phospholipid content of the extract increased on average. The vesicle size was 200 µm and the phytosomes formed by hydration were uniform in size.

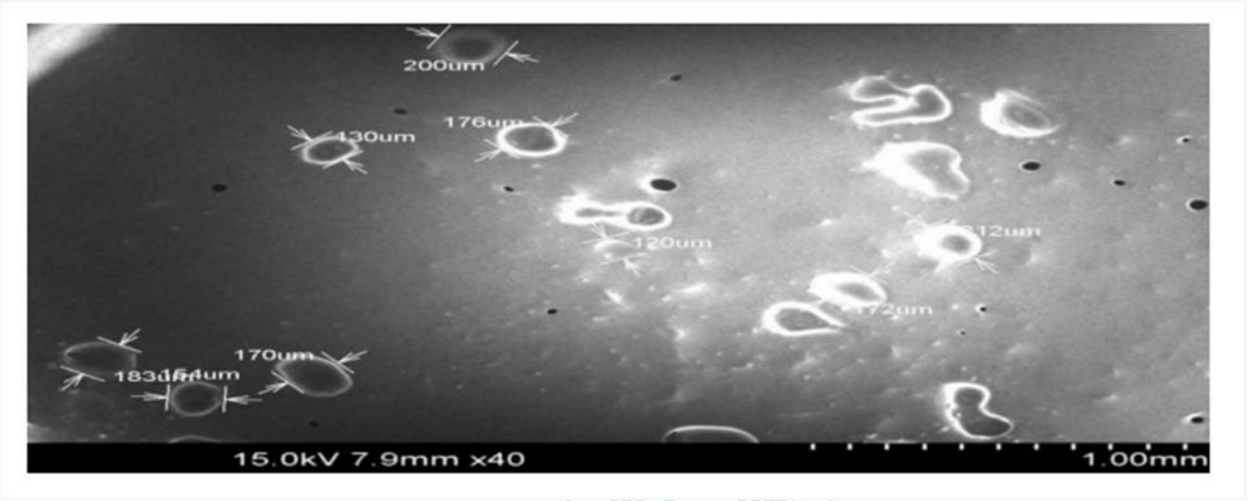

Figure 5: Size analysis of phytosomes of methanol extract of *Musa paradisica* peels.

Zeta potential determination :

The size of the zeta potential gives the possible stability of the colloidal dispersion. If the particles have a large positive and negative charge, they repel each other and diffusivity exists.

The zeta potential of the optimized formulation was found to be -32.8, indicating that the prepared formulation was stable, which is shown in Figure 4.6. It was manufactured by Sura Labs in Hyderabad.

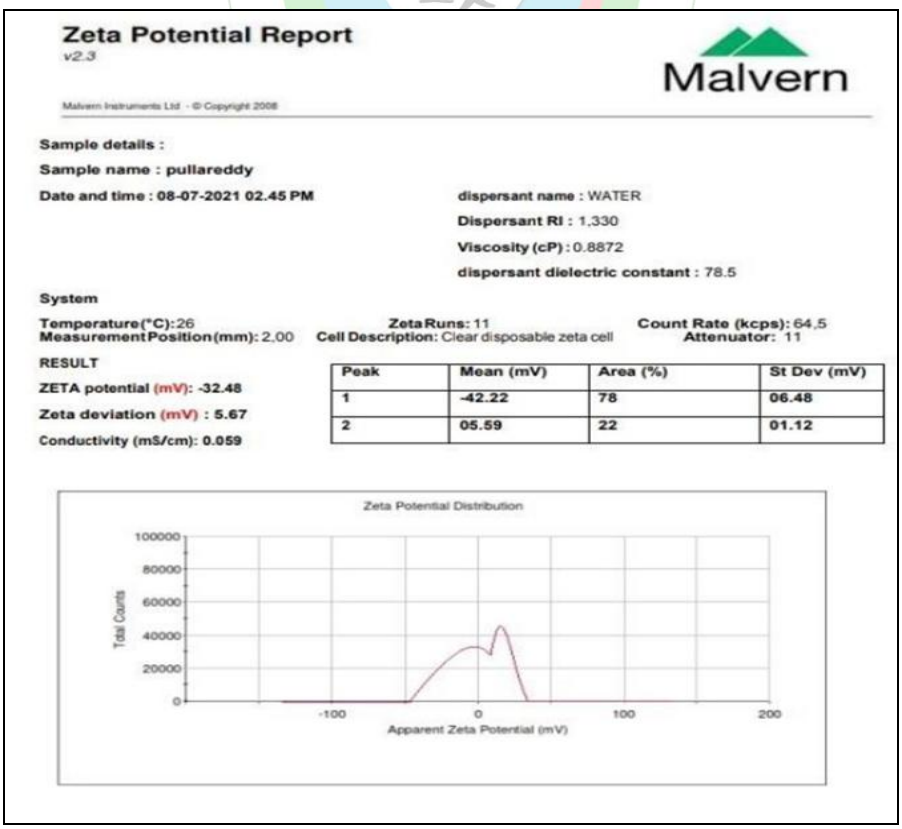

Figure 6: zeta potential of phytosomes of methanol extract of *Musa paradisica* peels.

Antioxidant Evaluation Studies:

A. DPPH radical scavenging activity of methanol extract gel and phytosome gel of Musa paradisica peels.

The effect of antioxidants on the DPPH radical may be due to their ability to donate hydrogen. DPPH is a free radical that is stable and can accept an electron or hydrogen to become a stable diamagnetic molecule. The reducing power of the DPPH radical is determined by the decrease in its absorbance at 517 nm. In this study, DPPH radical activity was used to evaluate the free radical scavenging of *Musa paradisica* bark methanol extracts and phytosome gel preparations at concentrations of 20-100 µg/ml. All formulations showed a significant increase in radical scavenging capacity with a decrease in absorbance measured at 517 nm. *Musa paradisica* bark extract and phytosome extract were found to have significant antioxidant activity in vitro in a concentration-dependent manner. The results presented in Tables 2 and 3 and Figure .7 show an increase in radical scavenging capacity.

Table 2: Absorbance of ascorbic acid, methanol extract gels and Phytosomal gel of Musa paradisica peels.

Concentration (µg/ml)	Standard ascorbic acid	F3	F4	F5	F6	Phytosomal Gel
20	0.301	0.342	0.303	0.353	0.303	0.366
40	0.203	0.328	0.292	0.307	0.370	0.287
60	0.103	0.298	0.235	0.218	0.211	0.252
80	0.072	0.218	0.174	0.197	0.193	0.198
100	0.038	0.246	0.163	0.190	0.160	0.182

Table 3: Percentage DPPH radical scavenging activity of methanol extract and phytosomal extract gels of Musa paradisica peels

Concentration (µg/ml)	Standard ascorbic acid	F3	F4	F5	F6	Phytosomal gel
20	11.20	0.88	1.86	4.12	7.6	10.60
40	40.11	3.24	15.92	9.43	11.2	22.71
60	67.20	8.84	25.66	35.69	30.95	30.95
80	77.96	11.50	43.05	41.88	48.67	48.67
100	88.79	20.05	49.95	46.31	51.91	51.91
IC50	52.86	70.02	96.82	93.46	98.53	92.82

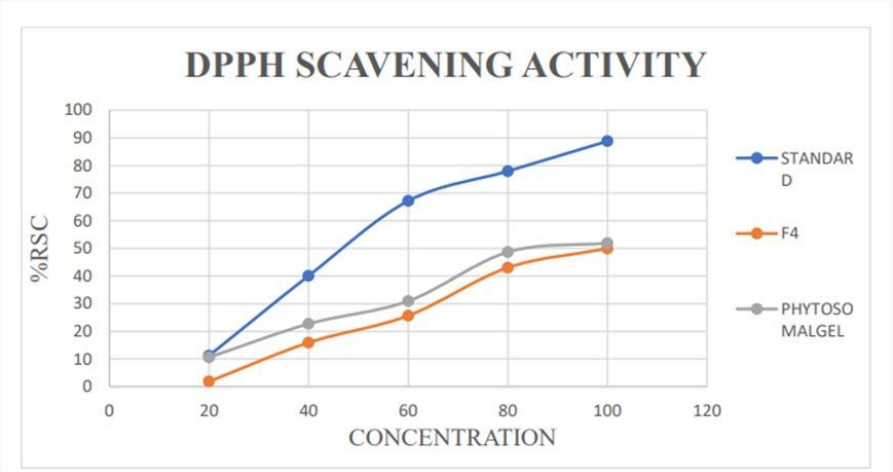

Figure 7: Percentage DPPH radical scavenging activity of ascorbic acid, extract gels and Phytosomal gel formulations.

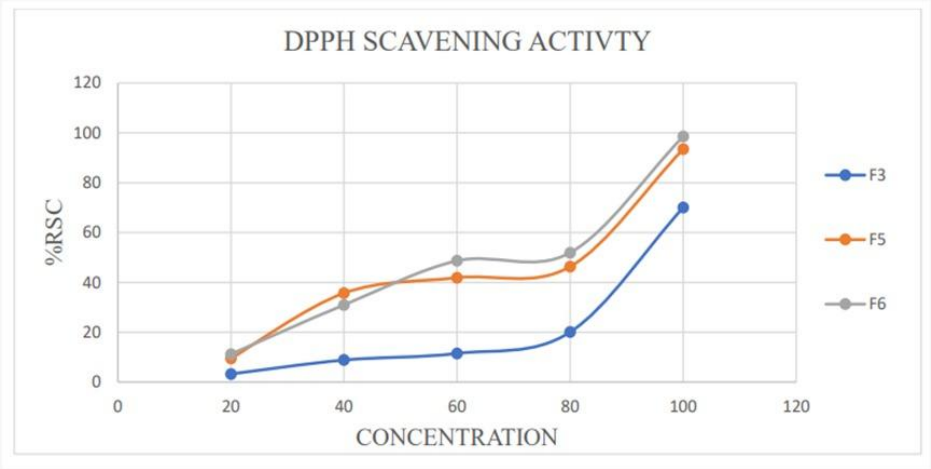

Figure 8: However, the phytosome gel had more DPPH radical scavenging activity than the gel preparations of the extract. The strength of the scavenging effect of the preparations and standard ascorbic acid at a concentration of 100 µg/ml DPPH radical in the following order Ascorbic acid > Phytosome gel > Formulation. These results clearly indicate that all formulations have detectable free radical scavenging activity.

B. DETERMINATION OF REDUCING POWER ASSAY:

In this assay, the color of the reaction changes from yellow to various shades of green and blue depending on the reducing power of each compound. These compounds convert the Fe3+/ferricyanide complex to the iron form. Results related to reducing power of Musa paradisica bark methanol and phytosomal gel are presented in the reducing properties of *Musa paradisica* bark methanol and Phytosomal gel preparations compared to standard curcumin**.**

Table 4: The results presented in the above tables and figures show an increase in reduction efficiency

CONCENTRATION	STANDARD	F3	F4	F5	F6	PHYTOSOMAL GEL
100	0.203	0.192	0.006	0.12	0.194	0.078
200	0.216	0.209	0.096	0.219	0.206	0.146
300	0.3	0.218	0.239	0.221	0.247	0.248
400	0.326	0.22	0.248	0.234	0.26	0.268
500	0.401	0.236	0.25	0.236	0.268	0.277
600	0.5	0.237	0.262	0.245	0.296	0.311
700	0.551	0.247	0.311	0.255	0.299	0.314
800	0.643	0.242	0.312	0.274	0.304	0.317
900	0.754	0.269	0.329	0.31	0.321	0.319
1000	0.82	0.305	0.347	0.285	0.413	0.374

The reducing power of the preparations and standard ascorbic acid at a concentration of 100 µg/ml with the reducing power in the following order. Ascorbic acid > Phytosomal gel > Formulation (F4) respectively.

CONCLUSION:

Flavonoids, which are natural antioxidant molecules, play an important role in the detoxification of free radicals or reactive oxygen species in the natural defense mechanism. They have a wide range of health-promoting effects and are important components in various medical and cosmetic applications.Since the literature review shows that banana peels are a good source of flavonoids, the aim of this study is to prepare and evaluate gels containing methanol extract of banana peel.The total phenolic and flavonoid content was determined in the methanol extract of *Musa paradisica* bark and the phytosomes of the methanol extract of *Musa paradisica* bark to detect the phenolic and flavonoid content.Six different formulations of extract gel and phytosome gel were prepared.Phytosome evaluation studies such as particle size, zeta potential, percent yield, drug entrapment efficiency and SEM were conducted and found to be optimal. In vitro antioxidant studies were performed with extract gels and phytosome gel.Among all formulations, phytosome gel had good antioxidant activity compared to other gels. Physico-chemical parameters such as PH, viscosity and dispersibility were performed and formulation F4 and phytosome gel showed good results.In vitro penetration studies showed more flavonoid deposit on the skin in banana peel phytosome gel than extract gel. The results showed that the prepared banana peel phytosome gel has significant antioxidant activity in the skin. Therefore, the produced Phytosomal gel is non-toxic, safe and can be an effective alternative to conventional cosmetic formulations on the market.

REFERENCES:

1. A.A.S. Silvaa, S.M. Morais, M.J.C. Falcão, I.G.P. Vieira B,.M. Ribeiro, S.M. Viana, M.J. Teixeira, F.S. Barreto, C.A. Carvalho, R.P.A. Cardoso, H.F. Andrade . Activity of cycloartane-type triterpenes and sterols isolated from Musa paradisiaca fruit peel against leishmania infantum chagasi, phytomedicine 21l 2014l1419-1423
2. Akinsanmi A. Oduje, Oboh G., Akinyemi J. Ayodele, And Adefegha A. Stephen. assessment of the nutritional, antinutritional and antioxidant capacity of uripe, ripe, and over ripe plantain (Musa paradisiaca) peels.
3. Alisi C. S., Nwanyanwu C. E, Akujobi C. and Ibegbulem C. Inhibition of dehydrogenase activity in pathogenic bacteria isolates by aqueous extracts of Musa paradisiaca (var sapientum) african journal of biotechnology,2008; 7(12):1821-1825.
4. Amel M Kamal, Mona E El-Tantawy, Eman G Haggag, Marwa H Shukr, Amany M Gad El-Garhy And Rasha M Lithy. Chemical and biological analysis of essential oils and pectins of banana, cantaloupe peels, guava pulp and formulation of banana pectin gel, journal of pharmacognosy and phytochemistry 2019; 8(4):1808-1816.
5. Anisha Mazumder, Anupma Dwivedi, Jan Du Preez, Jeanetta Du Plessis. In vitro wound healing and cytotoxic effects of sinigrin–phytosome complex, international journal of pharmaceutics, 2016; 498:283–293.
6. Arun Kumar, Bimlesh Kumar, Sachin Kumar Singh, Barinder Kaur, Saurabh Singh. A review on phytosomes: novel approach for herbal phytochemicals, 2017; 10 (10).
7. Asoso O. S., Akharaiyi F. C. And Animba L. S., Cholars. Antibacterial activities of plantain (Musa paradisiaca) peel and fruit research libraryder pharmacia lettre, 2016; 8(5):5-11.
8. Bashir Ado Ahmad, Khamsah Suryati Mohd, Muhammad Abdurrazak, U. S Mahadeva Rao, Thant Zin. Phytochemical screening, antioxidant activity of pure syringin in comparison to various solvents extracts of Musa paradisiaca (banana) (fruit and flower) and total phenolic contents Int J Pharm Pharm Sci, 2015;7(5):242-247.
9. Battacharya S Phytosome: emerging strategy in delivery of herbal drugs and nutraceuticals. Pharmtimes 2009; 41:3.
10. Ben E. Ehigiator, Ndidi C. Offonry, Elias Adikwu, and Ben O. Inemesit. Safety, antiinflammatory and analgesic assessments of methanolic extract of Musa paradisiaca peel in sprague dawley rats, afr. J. Pharmacol. Ther. 2018;7(2):46-52.
11. Bharathi Prakash, Sumangala C.H , Govindappa Melappa, Chidanand Gavimat. Evaluation of antifungal activity of banana peel against scalp fungi, materials today: proceedings, 2017; 4:11977–11983.
12. Bhupen Kalita and Malay K. Das. Rutin–phospholipid complex in polymer matrix for longterm delivery of rutin via skin for the treatment of inflammatory diseases, artificial cells, nanomedicine, and biotechnology 2018;46 S1, s41–s56.
13. C.U.B. Andrade, F.F. Perazzo and E. Maistro. Mutagenicity of the musa paradisiaca (musaceae) fruit peel extract in mouse peripheral blood cells in vivo. Genetics and molecular research, 2008; 7(3): 725-732.
14. Claudine Valérie Passo Tsamo, Marie-France Herent, Kodjo Tomekpe, Thomas Happi Emaga, Joëlle Quetin-Leclercq, Hervé Rogez, Yvan Larondelle, Christelle Andre. Phenolic profiling in the pulp and peel of nine plantain cultivars (musa sp.), food chemistry, 2015;167:197–204.
15. Barnabas Oluwatomide Oyeyinka and Anthony Jide Afolayan. Comparative evaluation of the nutritive, mineral, and antinutritive composition of Musa sinensis l. (banana) and Musa paradisiaca l. (plantain) fruit compartments.
16. Dennis B. Gogola. Phytochemical screening, antioxidant and gastro-protective activity studies on the fruit peels of selected varieties of banana.
17. Edet Okon Akpanyun, Itoro Joseph Archibon, Idiongo Okon Umoh and Utibe-Evans Bassey. Effect of methanol extract of the ripe fruit peels of Musa Paradisiaca on some hematological and biochemical indices in male wistar rats. Adv pharmacol clin trials 2019; 4(1):000154.
18. Elizabeth A Ainsworth and Kelly M Gillespie. Estimation of total phenolic content and other oxidation substrates in plant tissues using folin–ciocalteu reagent.
19. Ezekwesili Chinwe N., Ghasi, S., Adindu Chukwuemeka S. and Mefoh Nneka. Evaluation of the anti-ulcer property of aqueous extract of unripe Musa paradisiaca linn. Peel in wistar rats.
20. Gaikwad Abhijeet, Ahire Komal, Gosavi Aachal, Salunkhe K, Khalkar Aditi. Phytosome as a novel drug delivery system for bioavailability enhancement of phytoconstituents and its applications: a review ,journal of drug delivery & therapeutics. 2021; 11(3):138-152.