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Research Article

Formulation and Evaluation of Dragon Fruit and Papaya Based Exfoliating Polyherbal Body Wash

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ABSTRACT

The aim of this project to formulate and evaluate an exfoliating polyherbal body wash using natural extracts of dragon fruit (*Hylocereus undatus*) and papaya (*Carica papaya*). These fruits are known for their antioxidant properties, gentle exfoliating enzymes and skin-nourishing capabilities. The goal was to develop a natural, skin-friendly alternative to conventional body washes. Dragon fruit and papaya were selected and authenticated. Pectin and papain were extracted from the respective fruits using acid extraction and maceration techniques. The presence of these bioactive compounds was confirmed through FTIR spectroscopy. Several formulations were prepared and evaluated based on physicochemical parameters including pH, viscosity, foaming ability, stability and cleansing efficiency. The final formulation was optimized by adjusting the composition for ideal skin compatibility. The optimized formulation showed satisfactory results on performing evaluation parameters tests. Organoleptic evaluation revealed a pleasant odour, red coloration and appropriate consistency. The body wash remained stable at elevated temperatures for 28 days without significant changes. Volunteer feedback supported the product's effectiveness, acceptability and overall satisfaction.

INTRODUCTION

Shower gel is a specialized liquid product used for cleaning body during showers. Not to be confused with liquid soap, in fact do not contain saponified oil. Instead, it uses herbal plant as an ingredient. Shower gel has lower pH value than the traditional soap, which is also known to feel less drying to the

skin. Shower gel have a high liquid consistency. Designed to foam when applied to the skin, many also contain foaming agents such as SLS. These ingredients produce lather when they are applied to the skin and come in contact with water, but have very different molecular structure so can affect the skin in different ways. Unlike slippery

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soap bars, shower gels have a liquid format that may find more convenient to wash with.

The main benefit of using shower gel include:

1. **Gentle Cleansing:** Bodywash is generally gentler on the skin compared to bar soap, which can sometimes be drying or irritating.
2. **Moisturization:** Many shower gel formulas contain moisturizing ingredients like oils, butters or glycerine to help keep the skin hydrated.
3. **Exfoliation:** Some shower gel contains gentle exfoliating agents like beads or scrubs to help remove dead skin cells and improve skin texture.
4. **Fragrance:** Shower gel are available in wide variety of fragrance, allowing users to choose a scent they enjoy.
5. **Convenience:** Shower gel is easy to dispense and use, making it convenient option for daily bathing.

Types of bodywash

1. **Moisturizing bodywash:** Contains ingredients like oils or shea butter to hydrate the skin. Moisturizing body wash are designed to cleanse and hydrate the skin simultaneously. They typically contain ingredients like glycerine, shea butter, or natural oils to help replenish moisture and maintain skin's hydration levels. Look for ones without harsh chemicals or sulphates if you have sensitive skin. Always patch test new products to ensure compatibility with your skin type.
2. **Exfoliating bodywash:** Contains particles like sugar or salt to remove dead skin cells and reveal smoother skin. Exfoliating body washes

typically contains small particles or chemicals like alpha hydroxy acids (AHAs) or beta hydroxy acids (BHAs) that help remove dead skin cells, leaving your skin feels smoother and looking brighter. They can be especially beneficial for prone to roughness, like elbows, knees, and feet. Just be sure not to overdo it, as excessive exfoliation can irritate the skin.

3. **Antibacterial bodywash:** Formulate to kill bacteria and prevent body odour antibacterial body washes contain ingredients like triclosan or triclocarban that help kill bacteria on the skin. However, their long-term use may lead to antibiotic resistance and disrupt the skin's natural microbiome. It's essential to use them sparingly and consult with a healthcare professional if you have concerns.
4. **Fragrance-free bodywash:** Suitable for sensitive skin or those sensitive to scents.
5. **Natural/organic bodywash:** Made with natural ingredients and free from synthetic chemicals. Natural bodywashes are typically made from plant-based ingredients and avoid harsh chemicals like sulphates, parabens, and synthetic fragrances. They often contain natural oils, such as coconut oil or olive oil, for moisturizing properties, and botanical extracts for added benefits like soothing or refreshing the skin. When choosing a natural bodywash, look for certifications like USDA organic or Ecocert, and read ingredients lists to ensure they align with your preferences and skin sensitivities.

Advantages

The advantages of using body wash over traditional bar soap include:



- **Moisturizing properties:** Body washes often contain moisturizing agents that help hydrate the skin, especially beneficial for dry or sensitive skin.
- **Exfoliation:** Body washes aid in exfoliating the skin, removing dead skin cells, and unclogging pores, which can be particularly helpful for acne-prone skin.
- **Hygienic:** Body washes are more hygienic than bar soaps as they come in containers that can be sealed, reducing the risk of bacteria and germs breeding on the product.
- **Aromatherapy benefits:** Many body washes offer various scents that can provide aromatherapy benefits, such as soothing essential oils that enhance the washing experience.
- **Travel-friendly:** Body washes are convenient for travel as they are often available in travel-sized bottles, making them easy to pack and carry around.

2. MATERIALS AND METHODS:

Materials

- **Dragon fruit peel:**

Synonyms of dragon fruit is pitahaya, yellow pitahaya or pitaya.

Its botanical name is *Selenicereus undatus* and it belongs to Cactaceae family.

Chemical constituents are Betacyanins, pectin and dietary fiber, along with polyphenols and flavonoids. Pectin is extracted from its peel.

Taxonomy

Kingdom: Plantae

Division: Spermatophyta

Ordo: Cactaceae

Genus: Hylocereus

Species: *Hylocereus polyrhizu*, *Hylocereus undatus*, *Hylocereus megalanthus*



Fig 1: Dragonfruit peel

- **Papaya:**

Synonyms of papaya is Papaia, pawpaw.

Its botanical name is *Carica Papaya* and it belongs to Caricaceae family.

Papaya contains a variety of chemical constituents including vitamins (A, B, C, E, K), minerals, enzymes (papain, chymopapain), carotenoids (lycopene, beta-carotene), flavonoids, phenolic acids, alkaloids, and other compounds. Papain is extracted from outer surface of raw papaya.

Taxonomy

Kingdom: Plantae

Division: Magnoliophyte

Order: Violales

Genus: *Carica* L.

Species: *Carica papaya* L.



Fig 2: Papaya

Excipients used in bodywash

- **Polyethylene glycol 400:**

It is low molecular weight polymer of ethylene oxide with an average molecular weight of about 400. It is clear, viscous, hygroscopic liquid, widely used as a solvent, humectant, plasticizer, and vehicle in pharmaceutical, cosmetic, and industrial formulations.

- **Sodium Lauryl Sulphate:**

It lowers the surface tension of water, allowing better spreading and wetting, and produces foaming cleansing. It is a surfactant commonly used in pharmaceutical, cosmetic, and cleaning formulations.

- **Glycerine:**

It is a sweet, colourless, odourless, viscous liquid that is widely used as humectant, solvent, and sweetening agent pharmaceutical, cosmetic, and food preparation.

- **Hydroxypropyl Methyl Cellulose:**

It is a semisynthetic, inert, viscoelastic polymer derived from cellulose, widely used as thickener, stabilizer, film-former, and controlled-release agent.

- **Carboxy Methyl Cellulose:**

It is a water-soluble, anionic derivative of cellulose used as a thickener, stabilizer, suspending agent, and binder in pharmaceutical, cosmetic, and food formulations.

Method of preparation:

Extraction of pectin from dragon fruit peel: ^[2]

Take dried dragon fruit peel and weighed it, add water in a beaker containing dried peel in 1:2 ratio and heat it at 60-90°C.

Add HCl to balance the pH in the range 1-3, stir it occasionally, add methanol and stir, later the formation of gelatinous mass (pectin) on the top obtain.

Extraction of papain from papaya: ^[3]

Take raw papaya and make longitudinal cuts on outer surface of papaya, wait for few minutes and papain will appear on the outer surface of papaya and with the help of spatula scrap the papain and collect it

Method of preparation of bodywash: ^[4]

Take 66.2ml of water and add 6.67gm of SLS

Now slowly add 1.67gm of Na CMC and 2.67gm of HPMC K 100, mix until a homogenous mixture is obtained.

In another beaker add 8.9gm glycerine, 8.9gm PEG 400, 8.9gm Papain and 16ml dragon fruit extract

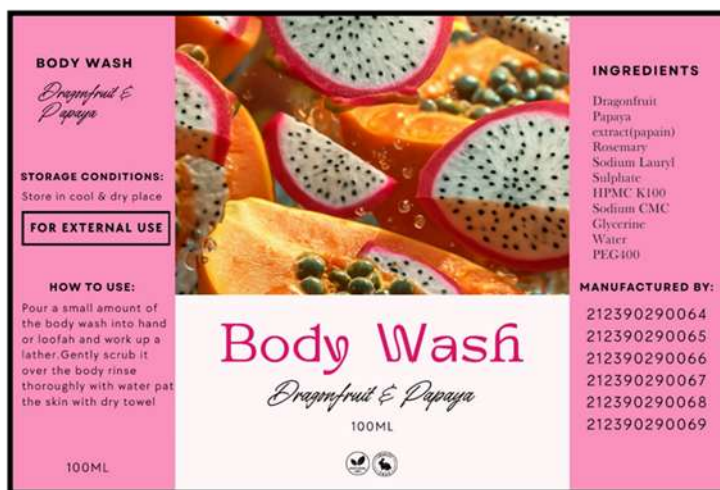
Mix both the above solution and stir it properly.

Resulting solution obtained is final mixture.

Preparation of Batches:

Table 1: Different Batches which were formulated for preparation of ideal batch

Formulations	Water (ml)	SLS (gm)	HPMC K100 (gm)	Na CMC (gm)	Dragon fruit extract (ml)	Papaya extract (ml)	PEG 400 (ml)	Glycerin (ml)	Rosemary (ml)
F1	20	2	0.4	0.4	5	2.5	2.5	2.5	q. s
F2	20	2	0.6	0.4	5	2.5	2.5	2.5	q. s
F3	20	2	0.8	0.4	5	2.5	2.5	2.5	q. s
F4	20	2	1.0	0.4	5	2.5	2.5	2.5	q. s
F5	20	2	0.4	0.5	5	2.5	2.5	2.5	q. s
F6	20	2	0.6	0.5	5	2.5	2.5	2.5	q. s
F7	20	2	0.8	0.5	5	2.5	2.5	2.5	q. s
F8	20	2	1.0	0.5	5	2.5	2.5	2.5	q. s

**Fig 3: Final Product****Fig 4: Final Product**

3. EVALUATION PARAMETERS: [5]

1. Organoleptic properties evaluation:

The bodywash was analyzed for morphological characteristics. The color of the product is red. The smell of prepared formulation is pleasant and acceptable and appearance is viscous.

2. pH test:

The pH was resolved using a computerized pH meter. The cathode was submerged in the body wash solution for ten minutes prior to getting the perusing at surrounding temperature. Start pH measurements by thoroughly rinsing the pH electrode with distilled water. Be careful not to rub the bulb as it can cause a static charge build up.

The rinse step should be performed between each sample to prevent contamination. Dip the pH electrode into a sample with stirring. The stirring speed should be the same as during calibration. Wait for the reading to become stable, which should take less than 60 s for most samples, then record the pH value.

3. Foam height test:

The foam height and stability of a body wash is tested by dispersing a sample in water, agitating it, and measuring the foam volume over time. Good foaming ability and stability are desirable properties. Take 1ml of bodywash in 10 ml of water in measuring cylinder. Measure the initial height of the foam at 0 mins. Again, measure the

foam height after 5 mins. Now calculate the foam height by given formula.

Foam height = Final height – Initial height

Dirt dispersion:

- Two drops of formulation were added in a large test tube contain 10 ml of distilled water. 1 drop of India ink was added; the test tube was stoppered and shakes it ten times. The amount of ink in the foam was estimated as None, Light, Moderate, or Heavy.
- The body wash should allow the ink to be easily rinsed off with water, indicating that the formulation is soluble and won't leave residues that could irritate or clog pores.

Cleaning test:

- The ability of bodywash to remove dirt can be evaluated by washing dirt hand with the formulated sample which results in a clean hand having no dirt particles.

Viscosity test:

- Viscosities of formulated gels were determined using Brookfield viscometer at 25°C. The corresponding dial reading on the viscometer was noted. Viscosity of formulation was determined at 20 rpm, using spindle number S94.
- The sufficient quantity of polyherbal gel was filled in beaker. The height of the gel was filled in the beaker should sufficiently allow to dip the spindle. Viscosities of the gels were recorded by adjusting the rotating speed of the spindle at 20 rpm.

Stability:

- The formulation remains stable at an elevated temperature of 36-40 Celsius for 28 days, with no significant changes in appearance, pH, viscosity, or fragrance.

Acid value:

- The acid value is a measure of the free fatty acid content in a substance, expressed as the amount of potassium hydroxide (KOH) in milligrams required to neutralize the free fatty acids.

$$\text{Acid value} = \frac{56.1 \times V \times N}{W}$$

Flow rate:

- To determine flowrate the funnel flow method is used which involves qualitative assessment of the formulation.
1. Place a clean, dry funnel on a stand so the tip points downward vertically.
 2. Block the bottom of the funnel with a finger or stopper.
 3. Pour 50ml of the bodywash sample into the funnel.
 4. Quickly remove the stopper and simultaneously start the stopwatch.
 5. Record the time taken for the entire 50ml of bodywash to flow out.
 6. Repeat 3 times and take the average value.

Drug and Excipient compatibility test:

Bodywash was made by combining the enzymes with polymers. There is a possibility of chemical interaction, which might lead to degradation and skin irritation. Hence the FTIR method was used



to test enzyme compatibility with each other. FTIR was performed in the centre of excellence laboratory.

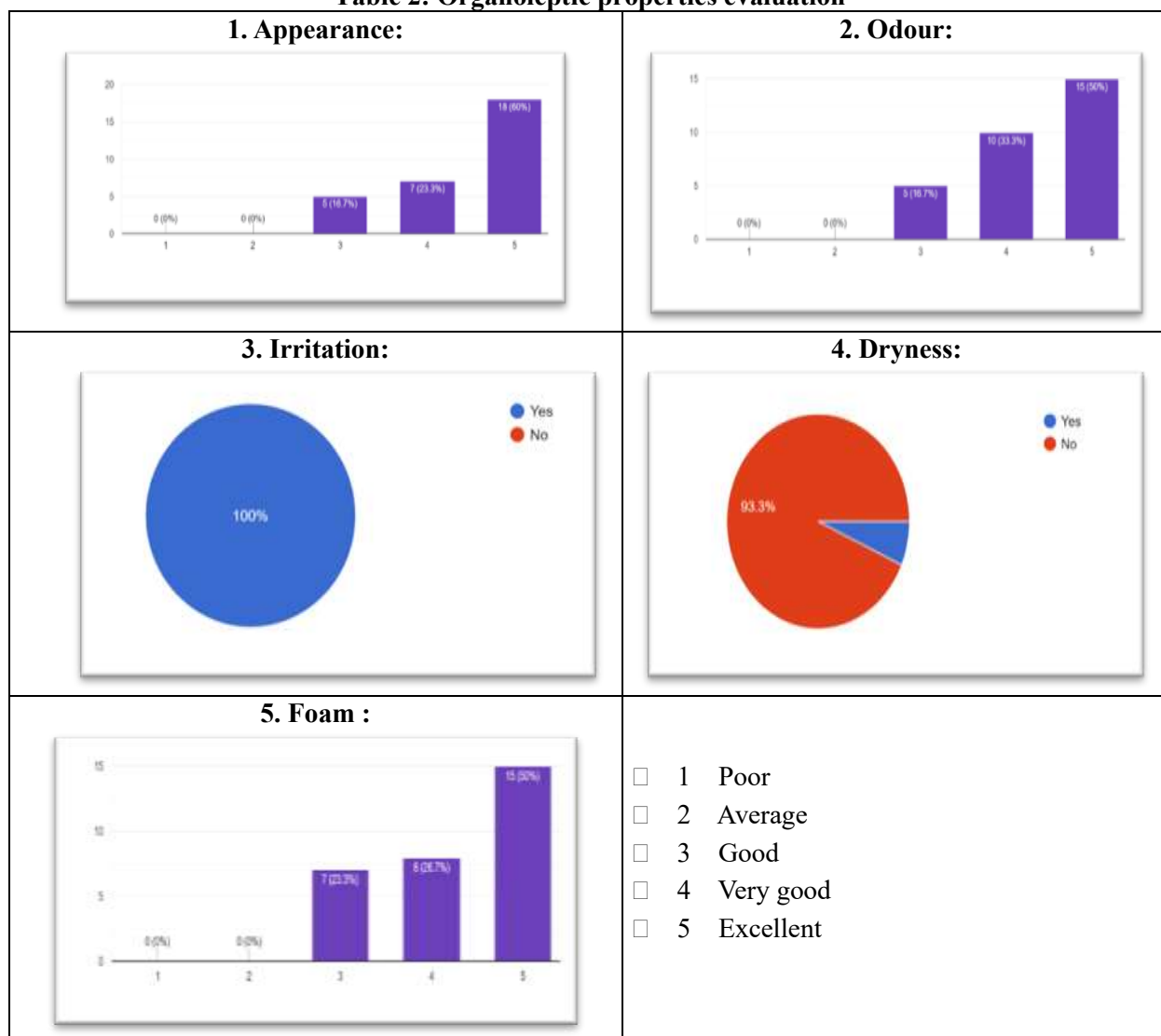
using the below google form link in order to evaluate the organoleptic properties of polyherbal bodywash.

4. RESULT:

1 Organoleptic Properties Evaluation: A survey was conducted among the volunteers

https://docs.google.com/forms/d/e/1FAIpQLScHzSHopZntLoyNvaSB0pnIIfpw5J5OLze6RXRP_yLqYEVOg/viewform?usp=sharing

Table 2: Organoleptic properties evaluation



Foam height:

Table 4: Foam height

Sr. No.	Initial(cm)	Final(cm)
1.	9.7	7.4
2.	9.5	7.6
3.	8.5	6.2

- The foam height of the optimized batch was found to be 6.2cm.

Viscosity and pH:



Table 5: Viscosity and pH

Formulation	Viscosity	pH
F1	3114	5.62
F2	3816	5.42
F3	4246	5.70
F4	4337	5.91
F5	3512	5.67
F6	3912	5.71
F7	4664	5.82
F8	4984	6.10

- The viscosity of the optimized batch was found to be 4664 $\pm$ 100
- pH of optimized batch = 5.82 $\pm$ 0.1

Stability:**Table 6: Stability**

Days	Viscosity(cp)	pH
7	4662	5.82
14	4634	5.80
21	4701	5.80

Acid Value:

$$\text{Acid value} = \frac{56.1 \times V \times N}{W} = 4.69 \pm 0.1$$

where, V = Volume of KOH solution used (ml)

N = Normality of KOH solution (mole/L)

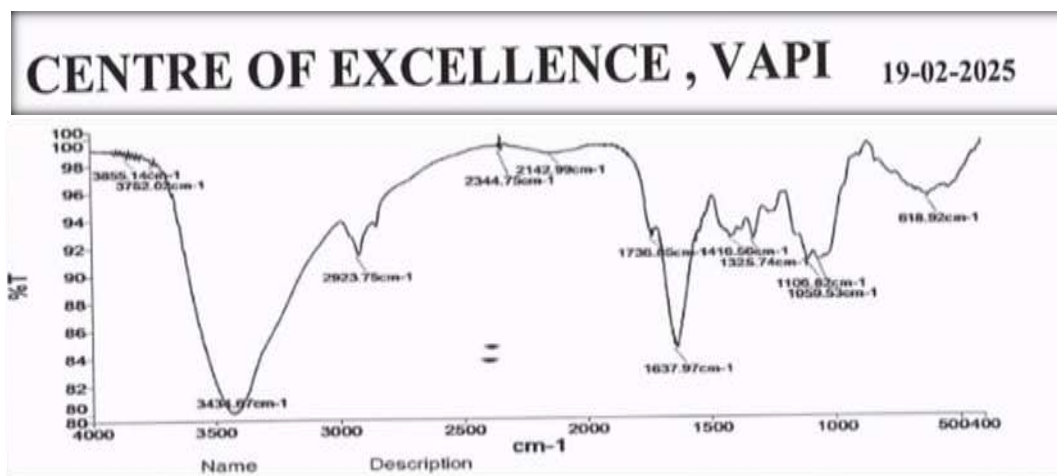
W = Weight of the sample (gm)

56.1 = Molecular weight of KOH

- The Acid value of optimized batch was found to be 4.69

Flow Rate:

- Rate of Flow was found to be 4.61ml/sec $\pm$ 0.1

Drug and Excipient compatibility test:**Fig 1: FTIR result of Pectin**

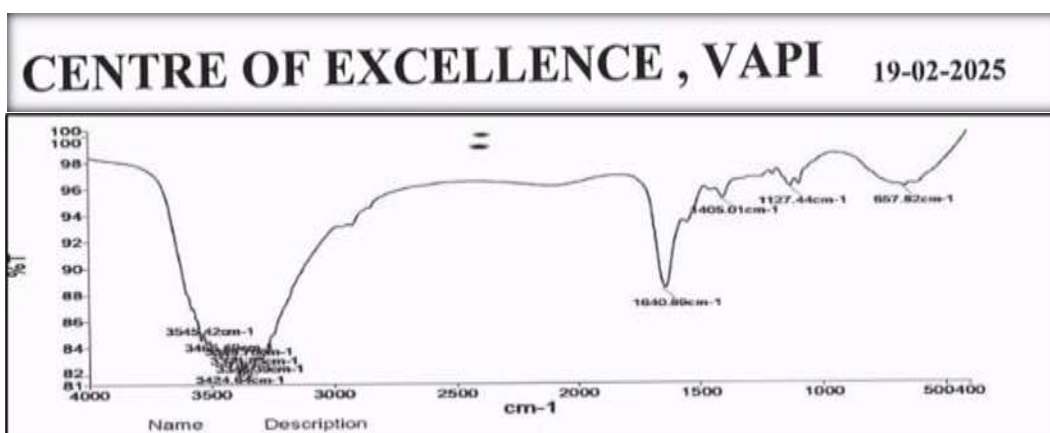


Fig 2: FTIR result of Papain

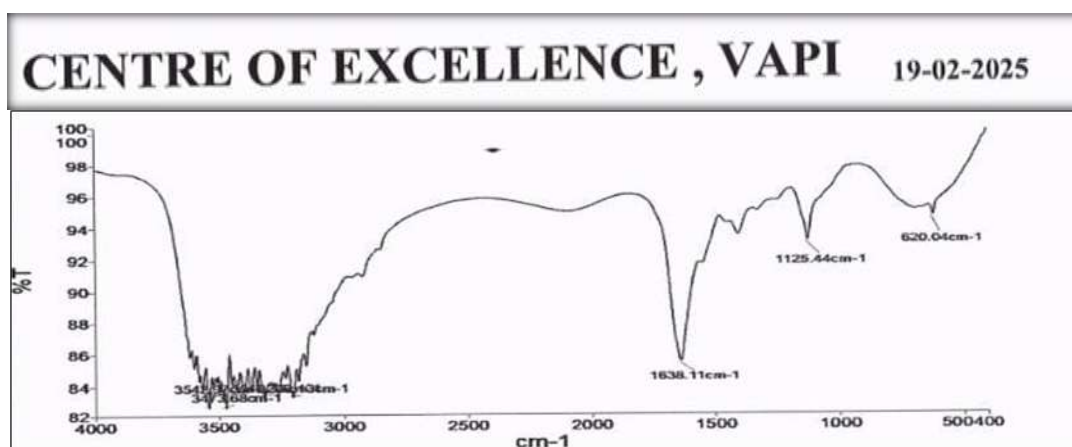


Fig 3: FTIR result of Pectin and Papain

Table 7: FTIR value of pectin

Sr. No	Functional Group	Observed Value	Standard Value
1	N-H Stretch	3434.67	3300-3500
2	-COOH, hydrogen bonded alcohol	2923.75	2500-3000
3	Acids, >C=O	1736.85	1600-1760
4	R-O-R, Ethers	1059.53	1000-1300
5	-C-C-	618.92	600-1500

Table 9: FTIR value of Pectin and Papain

Sr. No	Functional Group	Observed Value	Standard Value
1	-C=O	3542.97	3300-3600
2	-NH2	3473.68	3300-3500
3	-COOH, hydrogen bonded alcohol	3206.13	1620-1680
4	Ethers, Alcohol	1125.44	1000-1300
5	-C-C-	620.04	600-1500

Table 8: FTIR value of papain

Sr. No	Functional Group	Observed Value	Standard Value
1	-OH	3545.42	3000-3700
2	-NH2	3446.49	3300-3500
3	Acids, >C=O	1640.89	1600-1760
4	Aromatic ring	1405.01	1500-1600
5	-C-C-	657.82	600-1500

Through this FTIR study, presence of functional groups within the range specified indicated that Pectin and Papain are compatible and are present.

CONCLUSION

The study demonstrated that both HPMC K100 and Sodium CMC significantly influenced the viscosity and pH of the polyherbal bodywash formulations. Increasing concentrations of HPMC

resulted in a progressive increase in viscosity, suggesting its strong thickening and gel-forming capacity. Similarly, a slight increase in viscosity was observed with higher concentrations of Sodium CMC, likely due to its water-binding and stabilizing properties.

The pH of all formulations remained within the acceptable skin-compatible range (5.4–5.9), ensuring product safety and mildness. Importantly, the incorporation of pectin and papain, derived from natural sources, added potential antioxidant, exfoliating, and moisturizing benefits to the formulation, aligning with the rising demand for natural and herbal cosmetics.

After testing, we conclude that the best prepared batch is F7. The result of evaluation test of body wash preparation was stable at room temperature, with its viscosity 4664cPwds, flow rate 4.61ml/sec and pH 5.82 which falls within the ideal range.

REFERENCES

1. Ismail N.S.M., Ramli N., Hani N.M., Meon Z., 2012, Extraction and characterization of pectin from dragon fruit (*Hylocereus polyrhizus*) using various extraction conditions, *Malaysiana Science (In Malay)* 41 (1), 41-45
2. Margarita M, Andrade-Mahecha, Olga M, Hugo A (Study of the extraction process of papain from latex of papaya (*Carica papaya* L.) fruits) Wiley-VCH Verlag GmbH C, 2011; 1-8.
3. Pounikar YO, Jain PU, Khurana NA, Omray LK, Patil S, Gajbhiye A. Formulation and characterization of Aloe vera cosmetic herbal hydrogel. *International Journal of Pharmacy and Pharmaceutical Sciences*. 2012; 4(4):85-86.
4. Sayali P. Ingulkar, Ragini Salunke, Herbal Body Wash, *Int. J. of Pharm. Sci.*, 2024, Vol 2, Issue 5, 1360-1366, <https://doi.org/10.5281/zenodo.1131383>.
5. Packianathan, N., and Kandasamy, R. (2011). Skin care with herbal exfoliants. *Functional Plant Science and Biotechnology*, 5(1): 94-97.
6. Harry's Cosmeticology (by Meyer R. Rosen) – Covers formulation principles, stability testing, and ingredient selection.
7. Margarita M, Andrade-Mahecha, Olga M, Hugo A (Study of the extraction process of papain from latex of papaya (*Carica papaya* L.) fruits) Wiley-VCH Verlag GmbH C, 2011; 1-8.
8. Chanchal D, Swarnlata S (2008). Novel approaches in herbal cosmetics. *Journal of Cosmetic Dermatology* 7:89-95.
9. M. S. Showell, *Handbook of Detergents. Part D: Formulations*, Taylor & Francis Group, Boca Raton, FL, USA, 2006.
10. Anne Waugh, Alison Grant Ross and Wilson *Anatomy and Physiology in health and illness* tenth edition Pg. No: 358-367
11. <https://doi.org/10.5281/zenodo.15184150>
12. Talreja, Shreya & Tiwari, Dr. (2023), Formulation and evaluation of herbal soap by using moringa oleifera as main active constituents, *European Chemical Bulletin*.2023; 12: 2121-2141.
13. Datta D, Debnath S, Srisha P, Nagasree T, Swetha D, Babu MN, Formulation and evaluation of multipurpose Herbal Wash. *Research journal of topical and Cosmetic Sciences*. 2013;4(2):48-53.
14. Sharma RM, Shah K, Patel J, Evaluation of prepared herbal shampoo formulations and to compare formulated shampoo with marketed shampoos. In *J Pharm Sci*. 2011;3(4):402-405.
15. Terker N, Sharma A, Tekawade J, Momin T, Sayyad E, Formulation and evaluation of Polyherbal Hand Wash(Gel), In *J Sci & Research(IJSR)*. 2021;10(8):7-14



16. Gbasker, SRB Priyadarshini, Department of pharmaceuticals, Dhayanada college of pharmacy formulation and evaluation of polyherbal anti-acne gel.2009;5(19):93-99
17. Shital GS, Aishwarya JJ, Amar ZG, Ravindra SB, A review on oils used in herbal cosmetics. Research journal of topical and cosmetic sciences.2013;4(2):61.
18. https://ijppr.humanjournals.com/wp-content/uploads/2024/01/6.Mrs_.-Blessy-Jacob-Akhil-Dev-Jouharshan-K-Naveen-S-Shamini-S.pdf
19. Ruckmani K, Krishnamoorthy R, Samuel S, Kumari HL. Formulation of herbal bath soap from Vitex negundo leaf extract. J Chem Pharm Sci. 2014;2115(2):974.
20. Alam MN, Bristi NJ, Rafiquzzaman M. Review on in vivo and in vitro methods evaluation of an antioxidant activity. Saudi Pharm J. 2013;21(2):143-52. doi: 10.1016/j.jsps.2012.05.002, PMID 24936134
21. Kolarsick PAJ, Kolarsick MA, Goodwin C. Anatomy and physiology of the skin. J Dermatol Nurs Assoc. 2011;3(4):203- 13. doi: 10.1097/JDN.0b013e3182274a98.
22. Dewi, N. P. B. T., Singapurwa, N. M. A. S. & Mangku, I G. P. (2020). Extraction and stability of natural dyes from the skin of red dragon fruit. SEAS, 4(2), 130–141.
23. Aili Hamzah, A. F., Hamzah, M. H., Che Man, H., Jamali, N. S., Siajam, S. I., and Ismail, M. H. (2021). Recent updates on the conversion of pineapple waste (Ananas comosus) to value-added products, future perspectives and challenges. Agronomy, 11(11): 2221

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