Development And Assessment of a Nutrient Rich Body Mask Using *Arius Subrostratus* Roe and *Capra Aegagrus Hircus* Blood Extract

Raslamol.K[1], Fathima Salim[2], Hana Naseer[3], Mohammed Siyad K R[4], Samiya[5]
[1]*Dean-Academics, Professor, Department of Pharmaceutics, Holy Grace Academy of Pharmacy Affliated to Kerala University of Health Sciences, Mala, Thrissur-680732 Kerala*
[2,3,4,5]*Students, Department of Pharmaceutics, Holy Grace Academy of Pharmacy Affliated to Kerala University of Health Sciences, Mala, Thrissur-680732 Kerala*

***Abstract*—The present study focuses on the development and evaluation of a nutrient-rich dermo cosmetic body mask formulated using marine and animal-derived bioactive components. The formulation incorporates roe extract obtained from the marine catfish Arius subrostrate and blood extract from domestic goat Capra aegagrus hircus as primary active ingredients due to their potential nutritional and skin-beneficial properties. Fish roe is known to contain proteins, essential fatty acids, vitamins, and minerals, while goat blood provides proteins, iron, and other bioactive compounds that may support skin nourishment and regeneration. The roe extract was prepared through homogenization followed by solvent extraction using methanol and tert-butyl methyl ether, centrifugation, solvent evaporation, and freeze-drying. Goat blood was collected aseptically and processed using centrifugation and phosphate buffer washing to obtain the cellular fraction for further analysis. Preliminary physicochemical and nutritional evaluation of fish roe included determination of protein content, emulsification capacity, foaming capacity, and water and fat absorption capacity. Goat blood samples were analysed for moisture content, ash value, crude lipid, crude fibre, and crude protein content using standard analytical methods. Six different body mask formulations (BM1–BM6) were prepared using excipients such as sodium alginate, gelatin, citric acid, glycerin, rose water, and distilled water. The prepared formulations were evaluated for various parameters including organoleptic properties, pH, moisture content, spread ability, thickness, and skin irritation using the Draize modified scoring method. In addition, antioxidant activity of the formulations was investigated to assess their potential protective effects against oxidative stress. The study aims to develop a stable and effective nutrient-rich body mask with potential dermo cosmetic applications. The results are expected to demonstrate that bioactive compounds derived from marine and animal sources can be successfully incorporated into topical formulations to enhance skin nourishment, hydration, and overall skin health.**

***Index Terms*—Nutrient-rich body mask; Dermo cosmetic formulation; Fish roe extract; Goat blood extract; Antioxidant activity; Physicochemical evaluation; Topical skincare formulation.**

I. INTRODUCTION

Topical formulations are widely used in dermo-cosmetic applications because they deliver active ingredients directly to the site of action while minimizing systemic side effects. With increasing awareness of skincare and personal grooming, cosmetics have become an essential part of daily life, and their formulations now often include biologically active ingredients that provide both aesthetic and therapeutic benefits.

In recent years, natural bioactive compounds have attracted considerable attention in the cosmetic and pharmaceutical industries. These compounds are derived from plants, animals, and marine organisms and often possess antioxidant, antimicrobial, anti-inflammatory, and skin-repairing properties. Compared with synthetic ingredients, naturally derived compounds are generally considered safer, more environmentally friendly, and more acceptable

to consumers. As a result, researchers are increasingly exploring natural resources for the development of innovative cosmetic formulations that can improve skin hydration, elasticity, and overall appearance.

Marine resources are an important source of biologically active compounds with significant potential in cosmetic applications. Marine organisms contain a wide range of nutrients such as proteins, peptides, vitamins, minerals, and essential fatty acids that contribute to skin nourishment and protection. Fish roe obtained from the marine catfish Arius subrostrate is particularly rich in proteins, omega-3 fatty acids, and micronutrients that may support skin regeneration, improve elasticity, enhance moisture retention, and protect the skin from oxidative stress. In addition to marine sources, animal-derived ingredients also play an important role in cosmetic formulations due to their nutritional and functional properties. Blood obtained from the domestic goat Capra aegagrus hircus contains proteins, iron, and other essential nutrients that may contribute to skin nourishment, tissue repair, and hydration. When properly processed and incorporated into topical formulations, these bioactive components can help improve skin texture, promote healing of damaged skin, and support overall skin health, making both marine and animal-derived ingredients valuable components in dermo-cosmetic products.

Body masks are specialized cosmetic preparations designed to deliver concentrated nutrients to the skin. These formulations are typically applied for a certain period and then removed, allowing active ingredients to penetrate and exert beneficial effects. Body masks are widely used in skincare treatments because they help detoxify the skin by removing impurities, exfoliate dead skin cells, improve skin tone, tighten and firm the skin, and provide deep hydration. They can also help soothe irritation, treat body acne, and provide relaxation similar to spa therapy. Due to these multiple benefits, body masks have become an increasingly popular cosmetic treatment.

Despite the growing interest in natural cosmetic ingredients, limited research has explored the combined use of marine and animal-derived bioactive compounds in dermo-cosmetic formulations. In particular, the potential cosmetic applications of fish roe from Arius subrostratus and goat blood from Capra aegagrus hircus have not been extensively investigated. Therefore, there is a need to study their physicochemical properties, nutritional composition, and suitability for incorporation into topical skincare products.

Despite extensive research on herbal and synthetic peel-off masks, there is a significant lack of studies exploring the use of marine and animal-derived bioresources in cosmetic formulations. In particular, the potential of Arius subrostrate roe as a rich source of proteins, omega-3 fatty acids, and antioxidants remains largely unexplored in topical applications. Similarly, Capra aegagrus hircus blood, despite its high protein and mineral content, has not been investigated for dermo-cosmetic use. Furthermore, existing studies primarily focus on facial masks, with limited attention to nutrient-rich body masks that provide deeper skin nourishment. There is also a notable absence of formulations integrating nutritional benefits with cosmetic functionality, along with insufficient data on the stability, safety, and efficacy of animal-derived bioactives in topical systems. Therefore, this study aims to bridge these gaps by developing a novel, sustainable, nutrient-rich body mask utilizing fish roe and goat blood extracts, contributing to both cosmetic innovation and waste valorization.

The present study was undertaken to develop and evaluate a nutrient-rich body mask formulated using roe extract of Arius subrostratus and blood extract of Capra aegagrus hircus. The research focuses on extraction and characterization of the bioactive components, formulation of multiple body mask preparations, and evaluation of their physicochemical properties such as pH, spread ability, moisture content, and thickness. In addition, the study investigates the skin irritation potential and antioxidant activity of the prepared formulations to determine their suitability for dermo-cosmetic applications. The findings of this research may contribute to the development of innovative cosmetic products utilizing nutrient-rich marine and animal-derived ingredients to enhance skin health and appearance.

II. MATERIALS AND METHODS

2.1 Materials

The materials used in this study included fish roe of Arius subrostratus and blood of Capra aegagrus hircus along with analytical-grade chemicals such as methanol, tert-butyl methyl ether, acetonitrile, sodium hydroxide, hydrochloric acid, potassium sulphate, mercuric oxide, trisodium citrate, petroleum ether, phosphate buffer solution, and other reagents required for physicochemical and nutritional analysis. All chemicals used were of analytical grade.

2.2 Sample Collection and Authentication

The roe of Arius subrostratus was collected from Thiruthipuram, and the blood of Capra aegagrus hircus was collected from Mala on 16th October. The collected samples were transported to the laboratory under hygienic conditions for further processing.

Authentication and identification of the fish sample were carried out by Dr. Akhilesh K. V., Senior Scientist (FF Division) and Dr. Vaisakh G., Scientist (MBEM Division) at the ICAR Central Marine Fisheries Research Institute located at West Hill, Kozhikode.

2.3 Preparation and Extraction of Materials

The collected roe samples were initially washed thoroughly under running water to remove adhering blood, mucus, and other surface impurities. After washing, the samples were subjected to freeze drying (lyophilization). The freeze-drying process involved freezing the samples at a very low temperature followed by sublimation of ice under reduced pressure and secondary drying to remove bound moisture. The freeze-dried roe samples were then stored in airtight containers at low temperature until further use.

Blood samples from goats were collected aseptically from the jugular vein and immediately transferred into EDTA tubes to prevent coagulation.

Extraction of Fish Roe

For extraction, 3 g of freeze-dried roe was homogenized with 120 mL of ice-cold 75% methanol using an Ultra-Turrax homogenizer for 2 minutes. After homogenization, 300 mL of tert-butyl methyl ether was added and the mixture was shaken for 1 hour. Following incubation at room temperature for 1 hour, 75 mL of ultrapure water was added. After standing for 10 minutes, the samples were centrifuged at 12,000 × g for 15 minutes at 4 °C. The methanol/ultrapure water phase was collected and the organic solvent was evaporated under vacuum using a rotary evaporator at 25 °C. The remaining water was removed by freeze drying. The freeze-dried extracts were stored protected from light at −20 °C. Finally, 100 mg of freeze-dried extract was dissolved in 1 mL of acetonitrile–water mixture (1:1 v/v) and filtered through a 0.2 µm PTFE membrane filter for further analysis.

Figure No. 1: Extraction of Arius subrostratus

Extraction of Goat Blood

Blood samples were collected in a vessel containing 4% trisodium citrate as anticoagulant. Approximately 10 mL of blood was centrifuged at 3500 rpm for 5 minutes. The plasma layer was discarded and the pellet was washed three times with phosphate buffer solution (PBS, pH 7.4) by centrifugation at 3500 rpm for 5 minutes. A 3% suspension of blood cells in PBS was prepared. About 0.5 mL of this suspension was mixed with 0.5 mL of polymer samples prepared at concentrations of 0.01%, 0.03%, 0.05%, and 0.10% in PBS. The mixtures were incubated at 37 °C for 2 hours and then centrifuged at 3500 rpm for 10 minutes. The supernatant obtained was diluted by adding 2.8 mL PBS to 0.2 mL of the supernatant for further analysis.

Figure No.2: Extraction of Capra aegagrus hircus

2.4 Physicochemical Evaluation of Fish Roe

Table 1. Physicochemical Evaluation of Fish Roe

Parameter	Principle / Measurement
Protein content	Determined by Kjeldahl method based on nitrogen estimation
Emulsification capacity	Ability of roe protein to stabilize oil–water emulsion
Foam capacity and stability	Volume of foam formed and its stability over time
Water absorption capacity	Amount of water absorbed per gram of sample
Fat absorption capacity	Amount of oil retained by the sample

Table 2. Nutritional Screening Test of Fish Roe

Parameter	purpose
Moisture (%)	Total water content
Crude lipid content%	Extractible lipid present
Crude fiber (%)	crude fiber content
Crude protein %	Total protein content
Ash (%)	Mineral residue after incineration
EPA/DHA (mg/100 g)	Omega-3 fatty acids
Minerals (Zn, Fe, Mg)	Essential trace elements
Vitamins (A, B, C, D)	Fat-soluble and water-soluble vitamins
Cholesterol (mg/100 g)	Sterol content
Safety indicators	Microbial load and heavy metals

2.5 Physicochemical Evaluation of Goat Blood

Table 3. Physicochemical Evaluation of Goat Blood

Parameter	Principle / Measurement
Moisture content	Weight loss after oven drying
Ash content	Residue remaining after incineration
Crude lipid content	Determined using Soxhlet extraction
Crude fibre content	Determined after acid–alkali digestion
Crude protein content	Determined by Kjeldahl nitrogen estimation

2.6 Formulation of Body Mask

All ingredients were accurately weighed. Sodium alginate and gelatin were dissolved separately in rose water heated to about 80 °C. The gelatin solution was mixed with sodium alginate to form a uniform base. Citric acid dissolved in hot distilled water was added to the mixture with continuous stirring. Glycerin and herbal banana peel powder were then incorporated, followed by extracts of Capra aegagrus hircus blood and Arius subrostratus roe. Finally, distilled water was added to adjust the formulation to 100 % w/w. Six formulations (BM1–BM6) were prepared.

Table 4. Ingredients for Formulation of Body Mask

Ingredients	BM 1	BM 2	BM 3	BM 4	BM 5	BM 6
Sodium alginate	3 g	3 g	3 g	3 g	3 g	3 g
Gelatin	5.4 g	5.3 g	5.2 g	5.1 g	5.0 g	4.9 g
Citric acid	0.2 ml	0.2 ml	0.2 ml	0.2 ml	0.2 ml	0.2 ml
Capra aegagrus hircus blood	0.2 ml	0.4 ml	0.6 ml	0.8 ml	1.0 ml	1.2 ml
Arius subrostratus roe	0.2 g	0.4 g	0.6 g	0.8 g	1.0 g	1.2 g
Rose oil	0.5 ml	0.5 ml	0.5 ml	0.5 ml	0.5 ml	0.5 ml
Glycerin	4 ml	4 ml	4 ml	4 ml	4 ml	4 ml
Purified water	16.5 ml	16.1 ml	15.8 ml	15.5 ml	15.2 ml	14.9 ml
Amaranth solution	2 drops	2 drops	2 drops	2 drops	2 drops	2 drops

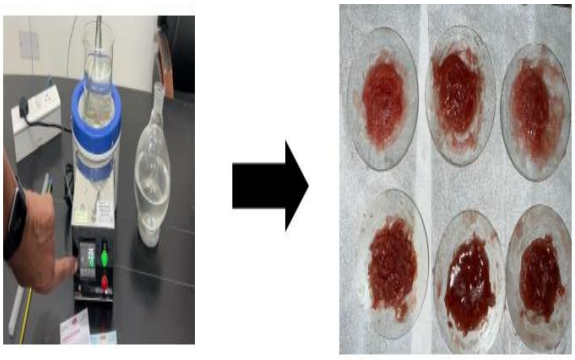

Fig no.3: Formulation of body mask

2.6 Evaluation of Body Mask

The prepared body mask formulations were evaluated for different physicochemical and dermatological parameters to determine their quality and suitability for topical application.

- Physical Appearance: The formulations were visually examined for colour, odour, consistency, and physical state.
- Measurement of pH: The pH of the formulations was determined using a digital pH meter by dissolving 1 g of body mask in 100 ml distilled water. The electrode was immersed in the solution and the pH was recorded in triplicate. The pH was also verified using pH paper by comparing the colour change with a standard pH chart.
- Skin Irritation Test: Skin irritation was evaluated using the modified Draize scoring method to determine whether the formulation produced any irritation or sensitization.
- Erythema and Edema Scoring: Skin reactions such as redness and swelling were assessed on healthy female volunteers and scored using a standard dermatological scale.
- FTIR Spectroscopy
- Homogeneity: After the gel formulation have been set in the container, all developed gels were tested for homogeneity by visual inspection. They were tested for their appearance and presence of any lumps, flocculates or aggregates
- Antimicrobial Testing: Antimicrobial testing for body masks and face masks involves validating the ability of the material to inhibit, deactivate, or kill microorganisms like bacteria, viruses, and fungi. Effective testing ensures that the antimicrobial treatment (such as nanoparticles, salt, or plant extracts) provides a high reduction in bacteria (e.g., E. coli and S. aureus) without causing skin irritation

2.7 Antioxidant Study

Antioxidant activity was determined using the DPPH radical scavenging assay. A 0.1 mM DPPH solution in methanol was mixed with the sample extract and kept in the dark for 30 minutes. The absorbance was measured at 517 nm using a spectrophotometer. The percentage radical scavenging activity was calculated as:

RSA (%) = [(Abs control − Abs sample) / Abs control] × 100.

III. RESULT AND DISCUSSION

3.1 Physicochemical Evaluation of Fish Roe

Table 5. Result of Physicochemical Evaluation of Fish Roe

Parameters	Result
Protein	31.52 %
Emulsification capacity	90 ml/g
Foam measurement	45.5 %
Water and fat absorption capacity	3.2 g/g

The physicochemical analysis of Arius subrostratus roe revealed a high protein content (31.52%), indicating its potential as a rich source of bioactive peptides beneficial for skin nourishment and repair. The emulsification capacity (90 ml/g) suggests that the roe proteins possess good surface-active properties, which help in stabilizing formulations by reducing interfacial tension.

The foam measurement (45.5%) indicates moderate foaming ability, reflecting the presence of flexible protein structures capable of forming films. Additionally, the water and fat absorption capacity (3.2 g/g) demonstrates the roe's ability to retain moisture and lipids, which is advantageous for maintaining skin hydration and enhancing emollient properties in topical formulations.

These properties confirm that fish roe is a multifunctional ingredient suitable for cosmetic formulations, contributing to stability, hydration, and skin conditioning.

3.2 Nutritional Screening Test

Table 6. Result of Nutritional Screening Test

Parameter	Measurement
Moisture (%)	74.20 %
Crude protein (%)	22 %
Crude fat (%)	4.8 %
Ash (%)	1.40 %
EPA/DHA (mg/100 g)	EPA: 260 mg / DHA: 500 mg
Minerals (Fe, Zn, Mg)	Fe: 4.2 mg, Zn: 2.1 mg, Mg: 35 mg

Vitamins	Vit A: 150 IU; Vit B12: 1.5 mcg; Vit D: High
Cholesterol (mg/100 g)	400 mg
Safety indicator	Negative for heavy metals

The nutritional analysis showed high moisture content (74.20%), indicating freshness and suitability for biological applications. The presence of crude protein (22%) and crude fat (4.8%) highlights its role as a nutrient-dense material.

Importantly, the presence of Omega-3 fatty acids (EPA: 260 mg, DHA: 500 mg) suggests strong antioxidant and anti-inflammatory potential, which can help in skin repair and anti-aging effects. The mineral content (Fe, Zn, Mg) supports cell regeneration and enzymatic activities, while vitamins such as Vitamin A, B12, and D contribute to skin health and immunity.

Although the cholesterol content is relatively high (400 mg/100 g), its topical application does not pose systemic risks. The absence of heavy metals confirms the safety and purity of the material.

Fish roe acts as a bioactive nutrient reservoir, enhancing the functional and therapeutic value of the body mask.

3.3 Physicochemical Evaluation of Goat Blood

Table 7. Results of Physicochemical Evaluation of Goat Blood

Parameters	Measurement
Moisture content	81.10 %
Ash content	1.10 %
Crude lipid content	0.3 %
Crude protein content	17.50 %

The goat blood exhibited high moisture content (81.10%), indicating fluidity and ease of incorporation into formulations. The crude protein content (17.50%) confirms its richness in amino acids, which are essential for skin repair, collagen synthesis, and regeneration.

The low lipid content (0.3%) suggests minimal greasiness, making it suitable for topical use without causing excessive oiliness. The ash content (1.10%) indicates the presence of essential minerals.

Goat blood serves as a protein-rich bioactive component, enhancing the nutritional and regenerative properties of the formulation.

3.4 Evaluation of Body Mask

- Physical Appearance

Table 8. Evaluation Parameters of Body Mask Formulations

Parameters	BM 1	BM 2	BM 3	BM 4	BM 5	BM 6
Colour	Pinkish Red	Slight Red	Red	Dark Red	Reddish Brown	Brown
Odour	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant
Consistency	Smooth	Smooth	Smooth	Smooth	Very Smooth	Very Smooth

All formulations exhibited pleasant odour and smooth consistency, indicating good patient acceptability. A gradual change in colour from pinkish red to brown was observed from BM1 to BM6, which correlates with the increasing concentration of roe and blood extract.

The improvement in consistency from smooth to very smooth in BM5 and BM6 indicates better matrix formation and uniform dispersion of ingredients at higher concentrations.

Increasing bioactive concentration improves texture and aesthetic appeal of the formulation.

- Measurement of pH

Table 9. Measurement of pH of Body Mask

Body Mask	pH
BM1	4.7
BM2	5.0
BM3	5.2
BM4	5.4
BM5	5.5
BM6	5.7

The pH of formulations ranged from 4.7 to 5.7, which falls within the physiological skin pH range

(4.5–6.5). A slight increase in pH with higher concentrations of bioactives was observed.
All formulations are skin-compatible and safe, with no risk of irritation due to pH imbalance.

- Skin Irritation Study

Table 10. Evaluation of Primary Skin Irritation Index

Evaluation Category	Score Range
Non-irritant	0.0
Negligible irritant	0.1 – 0.4
Slight irritant	0.41 – 1.9
Moderate irritant	2.0 – 4.9
Severe irritant	5.0 – 8.0

The irritation score was found to be 0 (non-irritant) for all formulations. This indicates that the ingredients used are biocompatible and safe for topical application. The formulation is dermatologically safe.

- Erythema and Edema Scoring Method

Table 11. Erythema and Edema Scoring Method for Skin Reaction

Skin Reaction		Score
Erythema & Eschar Formation	Edema Formation	
No erythema	No edema	0
Very slight erythema	Very slight edema	1
Well-defined erythema	Slight edema	2
Moderate to severe erythema	Moderate edema	3
Severe erythema with eschar formation	Severe edema	4

No erythema or edema was observed, with a score of 0, confirming the absence of inflammatory reactions.
The formulation does not induce skin inflammation or allergic responses.

- FTIR Spectral Analysis of Formulated Body Mask

The FTIR analysis revealed characteristic peaks corresponding to:

- O–H group (3287 cm^{-1}) → alcohols/phenols
- C–H groups (2943 & 2882 cm^{-1}) → lipids/fatty acids
- Amide I (1648 cm^{-1}) → proteins
- C–O groups (1212 & 1033 cm^{-1}) → carbohydrates/polysaccharides

These peaks confirm the presence of proteins, lipids, and polysaccharides, indicating successful incorporation of bioactive components from both fish roe and goat blood.
The FTIR spectrum confirmed the presence of proteins, lipids, and polysaccharides, suggesting successful incorporation of biologically active ingredients in the formulated cosmetic body mask.

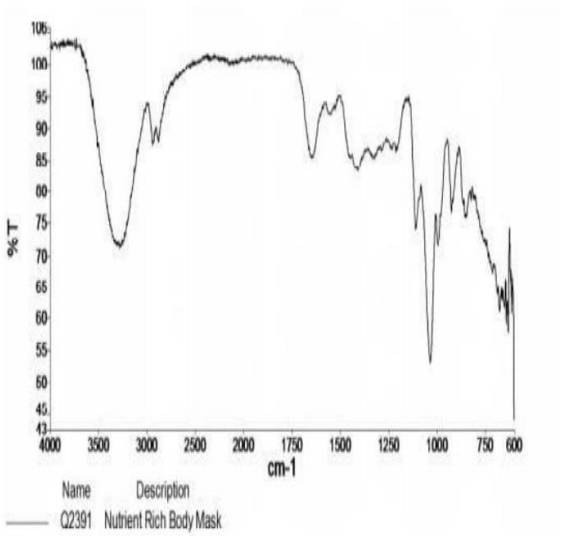

Fig no 4: FTIR Spectral Analysis

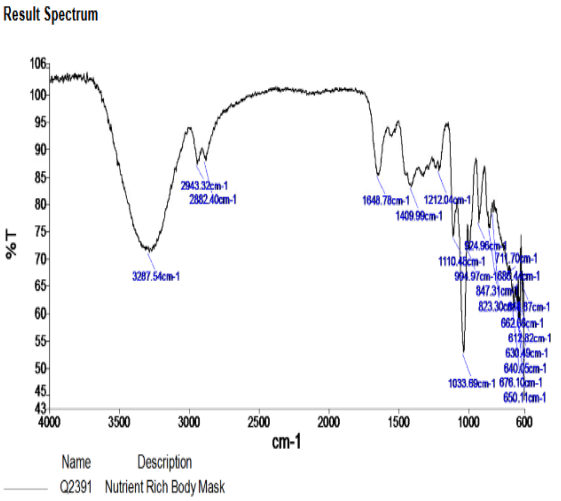

Fig no. 5: FTIR Spectral Analysis

- Homogeneity

Table 13: Homogeneity of Body Mask

Body Mask	Result
BM1	Very poor
BM2	Poor
BM3	Average
BM4	Good
BM5	Excellent
BM6	Excellent

A progressive improvement in homogeneity was observed:

- BM1–BM2 → poor
- BM3 → average
- BM4 → good
- BM5–BM6 → excellent

This trend indicates that higher concentrations of bioactive ingredients enhance uniform distribution and matrix stability.

BM5 and BM6 are optimized formulations in terms of homogeneity.

- Antimicrobial Activity

Table 14: Antimicrobial Activity of Extract and Formulated Body Mask

Test Organism	Sample (mm)	Standard Drug (Streptomycin 1000 ppm) (mm)	Test Method
Staphylococcus aureus (NCIM 2127)	11 mm	36 mm	CKL/MB/MOA-044

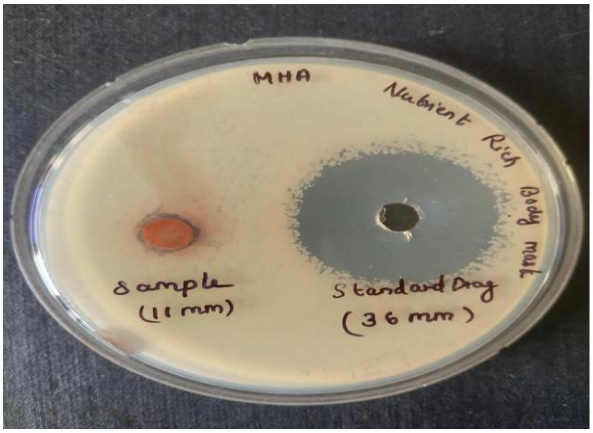

Fig no. 5: Antimicrobial Activity

The formulation showed a zone of inhibition of 11 mm against Staphylococcus aureus, indicating moderate antibacterial activity. The standard drug (Streptomycin) showed a higher zone (36 mm), as expected.

The antimicrobial activity may be attributed to:

Bioactive peptides from blood

Omega-3 fatty acids from roe

The formulation possesses natural antibacterial properties, suitable for skin protection.

- Antioxidant Study

Table 15: Antioxidant Study of Extract (Goat Blood)

Conc. (mg/ml)	Absorbance
1	0.369
2	0.625
3	0.780
4	1.32
Control	0.7

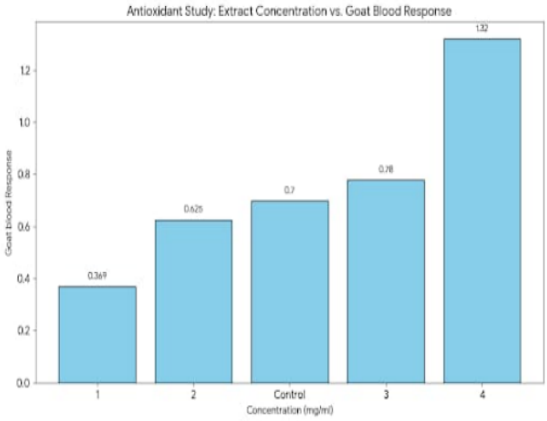

Fig no 6: Antioxidant Study

The antioxidant study showed a concentration-dependent increase in absorbance:

- Lower concentration → lower activity
- Higher concentration → higher activity (1.32)

Compared to control (0.7), higher concentrations exhibited enhanced antioxidant potential, indicating effective free radical scavenging ability.

Goat blood extract contributes significantly to antioxidant activity, supporting anti-aging and skin protection effects.

IV. CONCLUSION

The present study successfully developed and evaluated a nutrient-rich body mask formulated using roe extract of Arius subrostratus and blood extract of Capra aegagrus hircus for dermo-cosmetic applications. Physicochemical and nutritional evaluation of the fish roe demonstrated the presence of important functional properties such as protein content, emulsification capacity, foaming ability, and water and fat absorption capacity. Nutritional screening further confirmed that the roe contains valuable nutrients including proteins, lipids, essential fatty acids, minerals, and vitamins, which are beneficial for skin nourishment and protection. Similarly, the physicochemical analysis of goat blood indicated the presence of moisture, proteins, lipids, and ash content, highlighting its potential as a nutrient-rich biological ingredient for cosmetic formulations.

The antioxidant study demonstrated that both the extracts and the formulated body mask exhibited noticeable antioxidant activity when compared with the standard control. The presence of bioactive compounds such as proteins, essential fatty acids, and micronutrients may contribute to the observed antioxidant potential. Antioxidant activity plays an important role in protecting the skin from oxidative stress, premature aging, and environmental damage, thereby enhancing the value of the formulation as a cosmetic product.

Overall, the study confirms that the combination of marine-derived roe from Arius subrostratus and animal-derived blood extract from Capra aegagrus hircus can be effectively utilized to develop a nutrient-rich body mask with promising dermo-cosmetic benefits. The formulation showed good physicochemical stability, safety, and antioxidant potential, indicating its suitability for cosmetic skincare applications.

However, further research is required to explore the long-term stability of the formulation, detailed phytochemical and biochemical characterization of the active compounds, and large-scale clinical studies to confirm its efficacy and safety in human subjects. Future studies may also focus on optimizing the formulation, improving shelf life, and investigating additional biological activities such as anti-aging, antimicrobial, and skin-brightening effects to expand its potential in the cosmetic and cosmeceutical industries.

REFERENCES

[1] Bhowmik D. Topical drug delivery system. ResearchGate. 2013;1(9):12–27.

[2] Walters KA, Roberts MS. The structure and function of skin. ResearchGate. 2002;4(6):33–54.

[3] Kulkarni SV, Gupta AK, Bhawsar S. Formulation and evaluation of activated charcoal peel-off mask. Int J Pharm Res Technol. 2019;9(2):44–48.

[4] Tanjung YP, Julianti AI, Isnayanti I, Agustin R. Formulation and evaluation of peel-off gel facial mask from Coffea arabica fruit peel extract. Int J Appl Pharm. 2021;13(Suppl 4):148–151.

[5] Jire PB, Mali MV, Khairnar MV, Patil SG, Patil AN. Formulation and evaluation of peel-off mask. Int J Res Appl Sci Eng Technol. 2023;11(5):175–181.

[6] Anvari M, Smith B, Sannito C, Fong Q. Characterization of rheological and physicochemical properties of Alaska walleye pollock (Gadus chalcogrammus) roe. J Food Sci Technol. 2018;55(9):3616–3624.

[7] Rao GN. Physicochemical, functional and antioxidant properties of roe protein concentrate from Cyprinus carpio and Epinephelus tauvina. J Food Pharm Sci. 2013; 1:81–88.

[8] Kandyliari A, Mallouchos A, Papandroulakis N, Golla JP, Lam TKT, Sakellari A, et al. Nutrient composition and fatty acid and protein profiles of selected fish by-products. Foods. 2020;9(2):190.

[9] Ekwumemgbo PA, Omoniyi KI, Yerima EA. Apparent nutritional composition of locally sourced blood meal from Bos primigenius and Ovis aries for poultry applications. Chem Sci Rev Lett. 2015;4(13):395–404.

[10] Roy SC, Uddin MZ, Hamid SA, Rahman M, Gofur MR, Kamruzzaman SM. Effects of anticoagulant (EDTA and heparin) on blood of goat. Res Agric Livest Fish. 2024;11(1):1–10.