

FORMULATION AND EVALUATION OF *HYPNEA PANOSA* INCORPORATED FACE CREAM AND ITS IMPACT ON BIOACTIVE PROPERTIES

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ABSTRACT

The present study is focused to develop and assess the physicochemical, bioactive, and functional properties of the face cream incorporated with seaweed (*Hypnea panosa*) extracted using aqueous and ethanolic solvents versus its base as a control. Both the solvent extracts of *H. panosa* were examined for cytotoxicity by using an MTT assay, in vitro antioxidant activity using DPPH, and Hydroxyl radical scavenging activity. Seaweed extract showed no cytotoxic activity in the Vero cell line with an IC₅₀ value of 435.67 µg/ml found safe for the face cream formulation. The aqueous extract of *H. panosa* exhibited greater antioxidant potential with an IC₅₀ value of 26.83µg/ml and hydroxyl radical scavenging activity with an IC₅₀ value of 5.65µg/ml. The current study indicates that the aqueous extract of *H. panosa* showed potential antioxidant and free radical scavenging activity and could be a promising resource of natural antioxidants for formulating face cream. The physicochemical properties of all the creams had positive outcomes and the aqueous extract cream showed good viscosity (20360±2.00cps) and spreadability coefficient (9.33g.cm/s) indicating the cream is consistent and easily spreadable on the skin. From a cosmeceutical perspective, the FTIR analysis of aqueous cream (3855-3904) demonstrated that the cream is enriched with polyphenols.

KEYWORDS- Antioxidant activity, Aqueous seaweed extract, Cytotoxicity, Ethanol seaweed extract, Face cream.

CONCLUSION

The result indicates that the use of the aqueous seaweed extract, alone or in combination with other active ingredients, may be of interest to the cosmetic industry, because of its antioxidant property with lower IC₅₀ value and good potential for cosmetic product development. There is no cytotoxic effect exhibited by the seaweed extract on the normal cell line and thus potentially be used for the development of cosmeceuticals. Cosmeceutical seaweed face creams contain standardized seaweed aqueous extract which is found skin-friendly and physically stable. Formulation of seaweed extract incorporated cream was done by fusion technique and further evaluated by various physicochemical parameters gave reasonably good results and was consistent in quality indicating that the cream is safe and usable on the skin. Minimal negative irritation events were observed. These beneficial effects might be owing to the synergistic antioxidant properties of the seaweed. The AEC also showed better antioxidant properties. FTIR spectra showed the aqueous seaweed cream is enriched with polyphenols which, in terms of cosmeceuticals, has a major impact. The development of seaweed face cream helps to boost the local economy and increase the chance of international collaboration. Furthermore, the utilization of seaweed reduces waste generation and achieves sustainability development goals. Now - a day's herbal creams are more acceptable as compared to synthetic marketed products. In the future, seaweed-based creams will acquire the entire market.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

REFERENCES

1. Soulioti I, Diomidous M, Theodosopoulou H, Violaki N, Plessa H, Charalambidou M, Pistolis J, Plessas ST. Cosmetics: History, products, industry, legislation, regulations and implications in public health. *Clinical Pharmacology Pharmacokinetics*. 2013; (27) 5–15.
2. Pangestuti R, Shin KH, Kim SK. Anti-photoaging and potential skin health benefits of seaweeds. *Marine Drugs*. 2021;19(3):172.

3. Pimentel FB, Alves RC, Rodrigues F, PP Oliveira MB. Macroalgae-derived ingredients for cosmetic industry—An update. *Cosmetics*. 2017;5(1):2.
4. Resende DI, Ferreira M, Magalhães C, Lobo JS, Sousa E, Almeida IF. Trends in the use of marine ingredients in anti-aging cosmetics. *Algal Research*. 2021;55:102273.
5. Aslam A, Bahadar A, Liaquat R, Saleem M, Waqas A, Zwawi M. Algae as an attractive source for cosmetics to counter environmental stress. *Science of The Total Environment*. 2021;772:144905.
6. Preetha JP, Karthika K. Cosmeceuticals—an evolution. *International Journal of Chemical Technology Research*. 2009;1(4):1217-1223.
7. Pereira L. Seaweeds as a source of bioactive substances and skin care therapy—cosmeceuticals, algotherapy, and thalassotherapy. *Cosmetics*. 2018;5(4):68.
8. Sotelo CG, Blanco M, Ramos P, Vázquez JA, Perez-Martin RI. Sustainable sources from aquatic organisms for cosmeceuticals ingredients. *Cosmetics*. 2021;8(2):48.
9. Jesumani V, Du H, Pei P, Zheng C, Cheong KL, Huang N. Unravelling property of polysaccharides from *Sargassum* sp. as an anti-wrinkle and skin whitening property. *International journal of biological macromolecules*. 2019;140:216-224.
10. Couteau C, Coiffard L. Seaweed Application in Cosmetics. In *Seaweed in Health and Disease Prevention*; Fleurence, J., Levine, I., Eds.; Elsevier Inc.: Amsterdam, The Netherlands, 2016; 423–441.
11. Kolanjinathan K, Ganesh P, Saranraj P. Pharmacological importance of seaweeds: A review. *World Journal of Fish and Marine Science*. 2014;6:1–15.
12. Kharkwal H, Joshi DD, Panthari PR, Pant MK, Kharkwal AC. Algae as future drugs. *Asian Journal of Pharmacology and Clinical Research*. 2012;5:1-4.
13. Hjerpe LS. U.S. Patent and Trademark Office. *Legal Reference Service Quarterly*. 2003;22(1):53–65.
14. Shivathaya N, Surve R, Sawant R, Khot S, Biradar K, Verma R, Gorav A. formulation and in vitro evaluation of ethanolic extract of polyherbal face cream. *International Journal of Current Pharmacology Research* 2022;14(2):41-47.
15. Morobe IC, Mthethwa NS, Bisi-Johnson MA, Vasaikar SD, Obi CL, Oyedeji AO, Kambizi L, Eloff JN, Hattori T. Cytotoxic effects and safety profiles of extracts of active medicinal plants from South Africa. *Journal of Microbiology Research*. 2012.
16. Weerapreeyakul N, Junhom C, Barusrux S, Thitimetharoch T. Induction of apoptosis in human hepatocellular carcinoma cells by extracts of *Lanea coromandelica* (Houtt.) Merr. and *Diospyros castanea* (Craib) Fletcher. *Chinese Medicine*. 2016;11(1):1-10.
17. Kumar A, Naguib YW, Shi YC, Cui Z. A method to improve the efficacy of topical eflornithine hydrochloride cream. *Drug delivery*. 2016;23(5):495-501.
18. Bissett DL, Chatterjee R, Hannon DP. Photoprotective effect of superoxide-scavenging antioxidants against ultraviolet radiation-induced chronic skin damage in the hairless mouse. *Photodermatology, Photoimmunology & Photomedicine*. 1990;7(2):56-62.
19. Rousseaux CG, Schachter H. Regulatory issues concerning the safety, efficacy and quality of herbal remedies. *Birth Defects Research Part B: Developmental and Reproductive Toxicology*. 2003;68(6):505-510.
20. Couteau C, Coiffard L. Seaweed Application in Cosmetics. In *Seaweed in Health and Disease Prevention*; Fleurence, J., Levine, I., Eds.; Elsevier Inc.: Amsterdam, The Netherlands. 2016; 423–441.
21. Cho SH, Kang SE, Cho JY, Kim AR, Park SM, Hong YK, Ahn DH. The antioxidant properties of brown seaweed (*Sargassum siliquastrum*) extracts. *Journal of medicinal food*. 2007;10(3):479-485.
22. Razi Ullah Khan M, Hussain M, Masood Raza S, Ur Rashid Nazir S, Ahmed A, Hasnain S. Formulation design and in vitro characterization of Etoricoxib cream for the treatment of rheumatoid arthritis. *Iranian Journal of Pharmaceutical Sciences*. 2014;10(1):93-104.
23. Kumar A, Naguib YW, Shi YC, Cui Z. A method to improve the efficacy of topical eflornithine hydrochloride cream. *Drug delivery*. 2016;23(5):1495-1501.
24. Pavia DL, Lampman GM, Kriz GS, Vyvyan JA. *Introduction to spectroscopy*. Cengage learning. 2014.
25. Ahmed AA, Nath BI. Formulation and in vitro evaluation of poly-herbal anti-aging face cream of *Coriandrum sativum* and rose hip oil. *International Journal of Current Pharmacology Research*. 2017;9:75-78.
26. Indian Standard Bureau IS 6608. 1978; 5.1-6.1.
27. Mahawar VA, Patidar KA, Joshi NE. Development and evaluation of an herbal antiaging cream formulation containing *Annona squamosa* leaf extract. *Asian Journal of Pharmaceutical and Clinical Research*. 2019;12:210-214.
28. Sekar M, Sivalingam P, Mahmud A. Formulation and evaluation of novel antiaging cream containing rambutan fruits extract. *International Journal of Pharmaceutical Sciences and Research*. 2017;8(3):1056.
29. Navindgikar N, Kamalapurkar KA, Chavan PS. Formulation and evaluation of multipurpose herbal cream. *International Journal of Current Pharmaceutical Research*. 2020;12(3):25-30.
30. Sahib MN. Screening of two glucocorticoids in non-prescription skin whitening creams purchased via internet in Iraq by HPLC method. *Journal of Applied Pharmaceutical Science*. 2018;8(7):78-84.
31. Chen MX, Alexander KS, Baki G. Formulation and evaluation of antibacterial creams and gels containing metal ions for topical application. *Journal of Pharmaceutical sciences*. 2016; 1–10.
32. Shukla R, Kashav V. Development, characterization and evaluation of poly-herbal ointment and Gel formulation containing *Nerium Indicum* Mill, *Artocarpus Heterophyllus* Lam, *Murraya Koenigii* Linn, *Punica Granatum* Linn. *Journal of Drug Delivery and Therapeutics*. 2019;9(2):64-69.
33. Mosmann T. Rapid colorimetric assay for cellular growth and survival; application to proliferation and cytotoxicity assays. *Journal of Immunological Methods*. 1983;65:55-63.
34. Montoro P, Serreli G, Gil KA, D'Urso G, Kowalczyk A, Tuberoso CI. Evaluation of bioactive compounds and antioxidant capacity of edible feijoa (*Acca sellowiana* (O. Berg) Burret) flower extracts. *Journal of food science and technology*. 2020;57:2051-2060.
35. Halliwell B, Gutteridge JM. *Free radicals in biology and medicine*. Oxford university press, USA; 2015.
36. Aparajita S, Sanjar A, Shahbaaz S, Megha T, Ashu M, Chauhan S. Formulation and Evaluation of Anti-Acne cream containing *Withania Somnifera*. *Journal of Pharmaceutical and Scientific Innovation*. 2014;2277-4572.034170.
37. Maru AD, Lahoti SR. Formulation and evaluation of moisturizing cream containing sunflower wax. *International Journal of Pharmacy and Pharmaceutical Science*. 2018;10(11):54.
38. Kuntal D, Raman D, Machale MU, Ugandar RE, Lalitha BR. Evaluation for safety assessment of formulated vanishing cream containing aqueous Stevia extract for topical application. *Indian Journal of Novel Drug Delivery*. 2012;4(1):43-51.
39. Tan PL, Rajagopal M, Chinnappan S, Selvaraja M, Leong MY, Tan LF, Yap VL. Formulation and physicochemical evaluation of Green Cosmeceutical Herbal face cream containing standardized Mangosteen Peel Extract. *Cosmetics*. 2022;9(3):46.
40. Estantequeiro M, Amaral MH, Sousa Lobo JM. Comparison between the sensory and instrumental characterization of topical formulations: impact of thickening agents. *International journal of cosmetic science*. 2016 ;38(4):389-398.

41. Mishra AP, Saklani S, Milella L, Tiwari P. Formulation and evaluation of herbal antioxidant face cream of *Nardostachys jatamansi* collected from Indian Himalayan region. *Asian Pacific Journal of Tropical Biomedicine*. 2014;4:679-682.
42. Chatur VM, Ansari NM, Joshi SK, Walode SG. Formulation and Evaluation of Polyherbal Cream. *Journal of Drug Delivery and Therapeutics*. 2022;12(4):112-5.
43. Abdalla EO, Shigidi MT. Phytochemical Screening, Antioxidant Activity and Cytotoxicity of Methanolic Extracts of Selected Red Sea Macroalgae Exhibited Antimicrobial Activities. *Haya: The Saudi Journal of Life Sciences*. 2019;4(1):39-44.
44. Subramaniam D, Hanna LE, Maheshkumar K, Ponnurugan K, Al-Dhabi NA, Murugan P. Immune stimulatory and anti-HIV-1 potential of extracts derived from marine brown algae *Padina tetraströmatica*. *Journal of Complementary and Integrative Medicine*. 2020;17(2).
45. Alghazeer R, Enaeli M, Howell NK. Anticancer and antioxidant activities of some algae from the western Libyan coast. 2016:090018.
46. Kanatt SR, Lahare P, Chawla SP, Sharma A. *Kappaphycus alvarezii*: Its antioxidant potential and use in bioactive packaging films. *Journal of Microbiology, Biotechnology and Food Sciences*. 2021:1-6.
47. Siriwardhana N, Lee KW, Jeon YJ, Kim SH, Haw JW. Antioxidant activity of *Hizikia fusiformis* on reactive oxygen species scavenging and lipid peroxidation inhibition. *Food Science and Technology International*. 2003;9(5):339-46.
48. López A, Rico M, Rivero A and De Tangil MS: The effects of solvents on the phenolic contents and antioxidant activity of *Stypocaulon scoparium* (algae) extracts. *Food Chemistry*. 2011;125:1104-1109
49. Falleh H, Ksouri R, Chaieb K, Karray-Bouraoui N, Trabelsi N, Boulaaba M and Abdelly C. Phenolic composition of *Cynara cardunculus* L. Organs, and their biological activities. *Comptes Rendus Biologies* 2008;331: 372-379.
50. Hanaa H, El-Baky A, El Baz FK and El Baroty GS. Evaluation of Marine Alga *Ulva Lactuca* L. As a source of natural preservative ingredient. *Journal of Agricultural and Environment Science*. 2008; 3: 434-444.
51. Mounir M and Salma LI. Evaluation of antioxidant capacity of methanol extract and its solvent fractions obtained from four Moroccan macro algae species. *European Scientific Journal*.2014;10:10-15.
52. Heo SJ, Park PJ, Park EJ, Kim SK and Jeon YJ. Antioxidant activity of enzymatic extracts from a brown seaweed *Ecklonia cava* by electron spin resonance spectrometry and comet assay. *European Food Research and Technology*.2005;221: 41-47.
53. Mellouk Z, Benammar I, Krouf D, Goudjil M, Okbi M, Malaisse W. Antioxidant properties of the red alga *Asparagopsis taxiformis* collected on the North West Algerian coast. *Experimental and therapeutic medicine*. 2017;13(6):3281-3290.
54. Lingegowda DC, Kumar JK, Prasad AD, Zarei M, and Gopal S. FTIR spectroscopic studies on *Cleome gynandra*—comparative analysis of functional group before and after extraction. *Romanian Journal of Biophysics*. 2012; 22(3-4):137-143.