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Phytochemical Screening, Total Phenolic, Reducing Sugar Contents, and Antioxidant Activities of Gelidium spinosum (S.G. Gmelin) P.C. Silva

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Abstract
Gelidium spinosum is edible red seaweed with high economic values and potential pharmacological activities. This research aimed to evaluate phytochemicals, total phenolic content, reducing sugar content, and antioxidant properties of Gelidium spinosum methanol-aqueous extracts. Maceration with different solvent ratios of methanol-water was employed to afford various crude extracts. The standard procedures of preliminary phytoconstituents determination were employed to screen the presence of various phytochemicals. Phenolic and reducing sugar contents were determined using Folin-Ciocalteu and 3,5-dinitro salicylic acid methods. The antioxidant activities of seaweed extracts were determined through DPPH and reducing power assays. The 100% methanol extract of G. spinosum was found to be rich in alkaloids, flavonoids, glycosides, polyphenols, proteins, reducing sugar, saponins, steroids and tannins. The aqueous extract of G. spinosum contained flavonoids, glycosides, polyphenols, reducing sugars, saponins and tannins at a moderate level. The total phenolic content range was 6.43 to 49.78 mg EGA/g extract. The highest reducing sugar content was shown by 100% methanol extract (1278.20 ± 21.25 mg GE/g extract). The highest antioxidant activities were found in 100% methanol extract for reducing power assay, and 75% methanol extract of G. spinosum for DPPH method. There was a positive correlation between reducing sugar, total phenolic contents and antioxidant activities. Results further confirmed the potential use of red seaweed in various ailments, however, should further be confirmed through more appropriate similar studies.

Author Keywords
DPPH; Gelidium spinosum; phenolic content; phytochemicals; red seaweed; reducing power; reducing sugar content

Index Keywords
1,1 diphenyl 2 picrylhydrazyl, ascorbic acid, galactose, gallic acid, phenol, phytochemical, plant extract, potassium ferricyanide, trichloroacetic acid; ABTS radical scavenging assay, antioxidant activity, Article, chemical composition, controlled study, DPPH radical scavenging assay, ferric reducing antioxidant power assay, Gelidium, Gelidium spinosum extract, hydroxyl radical scavenging assay, nonhuman, physical chemistry, phytochemistry, ultraviolet spectrophotometry

Chemicals/CAS
1,1 diphenyl 2 picrylhydrazyl, 1898-66-4; ascorbic acid, 134-03-2, 15421-15-5, 50-81-7; galactose, 26566-61-0, 50855-33-9, 59-23-4; gallic acid, 149-91-7; phenol, 108-95-2, 3229-70-7; potassium ferricyanide, 13746-66-2; trichloroacetic acid, 14357-05-2, 76-03-9

Manufacturers
J.T. Baker; Merck, Germany; Sigma Aldrich, United States

References

- Wang, HMD, Li, XC, Lee, DJ, Chang, JS.
  Potential biomedical applications of marine algae
  (2017) *Bioresour Technol*, 244 (2), pp. 1407-1415.

- Zhao, C, Yang, C, Liu, B, Lin, L, Sarker, SD, Nahar, L, Yu, H, Xiao, J.
  Bioactive compounds from marine macroalgae and their hypoglycemic benefits
  (2018) *Trends Food Sci. Technol*, 72, pp. 1-12.
  (February)

- Tanna, B, Mishra, A.
Nutraceutical potential of seaweed polysaccharides: Structure, bioactivity, safety, and toxicity
(2019) *Compr. Rev. Food Sci. Food Saf*, 18 (3), pp. 817-831.

- Kasanah, N, Ulfah, M, Imania, O, Hanifah, AN, Marjan, MID.
Rhodophyta as potential sources of photoprotectants, antiphotoaging compounds, and hydrogels for cosmeceutical application
(2022) *Molecules*, 27 (22), p. 7788.

- Lu, LW, Chen, JH.
Seaweeds as ingredients to lower glycemic potency of cereal foods synergistically-a perspective
(2022) *Foods*, 11 (5), p. 714.

- Torres, P, Santos, JP, Chow, F, dos Santos, DYAC.
A comprehensive review of traditional uses, bioactivity potential, and chemical diversity of the genus Gracilaria (Gracilariales, Rhodophyta)
(2019) *Algal Res*, 37, pp. 288-306.

- Pradhan, B, Bhuyan, PP, Patra, S, Nayak, R, Behera, PK, Behera, C, Behera, AK, Jena, M.
Beneficial effects of seaweeds and seaweed-derived bioactive compounds: Current evidence and future prospective
(2022) *Biocatal. Agric. Biotechnol*, 39, p. 102242.

- Narayanan, M, Kandasamy, S, He, Z, Hemaiswarya, S, Raja, R, Carvalho, IS.
Chapter 10-Algae biotechnology for nutritional and pharmaceutical applications
(2022) *Biotechnology in Healthcare*, pp. 177-194.
D. Barh, Editor. Academic Press

- Kalasariya, HS, Pereira, L, Patel, NB.
Pioneering role of marine macroalgae in cosmeceuticals
(2022) *Phycol*, 2, pp. 172-203.

- Waghmare, VN.
Phytochemical constituents and bioactivity of extract obtained from algae Gelidium spps
(2019) *Indian J. Appl. Res*, 9 (2), pp. 42-44.

- Tuso, P, Stoll, SR, Li, WW.
A plant-based diet, atherogenesis, and coronary artery disease prevention
(2015) *Perm. J*, 19 (1), pp. 62-67.

- McMacken, M, Shah
A plant-based diet for the prevention and treatment of type 2 diabetes
(2017) *J. Geriatr. Cardiol*, 14 (5), pp. 342-354.

- Lopes, T, Zemlin, AE, Erasmus, RT, Madlala, SS, Faber, M, Kengne, AP.
Assessment of the association between plant-based dietary exposures and cardiovascular disease risk profile in sub-Saharan Africa: a systematic review
(2022) *BMC Public Health*, 22 (1), p. 361.

- Phaniendra, A, Jestadi, DB, Periyasamy, L.
Free radicals: properties, sources, targets, and their implication in various diseases
(2015) *Indian J. Clin. Biochem*, 30 (1), pp. 11-26.

- Cavaco, M, Duarte, A, Freitas, MV, Afonso, C, Bernandino, S, Pereire, L, Martins, M, Mouga, T.
Seasonal nutritional profile of Gelidium corneum (Rhodophyta, Gelidiaceae) from

the center of Portugal
(2021) *Foods*, 10 (10), p. 2394.

- Tamsir, NM, Esa, NM, Omar, SNC, Shafie, NH.
Manilkara zapota (L.) P. Royen: Potential source of natural antioxidants
(2020) *Mal. J. Med. Health Sci*, 16 (SUPP6), pp. 196-204.

- Gutiérrez-del-Río, I, López-Ibáñez, S, Magadán-Corpas, P, Fernández-Calleja, L, Pérez-Valero, Á., Tuñón-Granda, M, Miguélez, EM, Lombó, F.
Terpenoids and polyphenols as natural antioxidant agents in food preservation
(2021) *Antioxidants*, 10 (1264).

- Mahendran, S, Maheswari, P, Sasikala, V, Rubika, JJ, Pandiarajan, J.
In vitro antioxidant study of polyphenol from red seaweeds dichotomously branched gracilaria Gracilaria edulis and robust sea moss Hypnea valentiae
(2021) *Toxicol. Rep*, 8, pp. 1404-1411.

- Al-Tamimi, A, Alfarhan, A, Al-Ansari, A, Rajagopal, R
Antioxidant, enzyme inhibitory and apoptotic activities of alkaloid and flavonoid fractions of Amaranthus spinosus
(2021) *Physiol. Mol. Plant Pathol*, 116, p. 101728.

- Sinbad, OO, Folorunsho, AA, Olabisi, OL, Ayoola, OA, Temitope, E.
Vitamins as antioxidants
(2019) *J. Food Sci. Nutr. Res*, 2 (3), pp. 214-235.

- Mohy El-Din, SM, El-Ahwany, AMD.
Bioactivity and phytochemical constituents of marine red seaweeds (Jania rubens, Corallina mediterranea, and Pterocladia capillacea)
(2016) *J. Taibah Univ. Sci*, 10 (4), pp. 471-484.

- Metidji, H, Dob, T, Toumi, M, Krimat, S, Ksouri, A, Nouasri, A.
In vitro screening of secondary metabolites and evaluation of antioxidant, antimicrobial and cytotoxic properties of Gelidium sesquipedale Thuret et Bornet red seaweed from Algeria
(2015) *J. Mater. Environ. Sci*, 6 (11), pp. 3182-3196.

- Poulose, N, Sajayan, A, Ravindran, A, Chandran, A, Priyadharshini, GB, Selvin, J, Kiran, GS.
Anti-diabetic potential of a stigmasterol from the seaweed Gelidium spinosum and its application in the formulation of nanoemulsion conjugate for the development of functional biscuits
(2021) *Front. Nutr*, 8.

- Alhakmani, F, Kumar, S, Khan, SA.
Estimation of total phenolic content, in-vitro antioxidant and anti-inflammatory activity of flowers of Moringa oleifera
(2013) *Asian Pac. J. Trop. Biomed*, 3 (8), p. 623.
7; discussion 6-7

- Balachandran, P, Maroky, AS, Kumar, TVA, Parthasarathy, V.
Preliminary phytochemical analysis of the ethanolic extract of brown seaweed Sargassum wightii
(2016) *Int. J. Res. Pharm. Sci*, 7 (2), pp. 154-156.

- Chandra, S, Khan, S, Avula, B, Lata, H, Yang, MH, Elsohly, MA, Khan, IA
Assessment of total phenolic and flavonoid content, antioxidant properties, and yield of aeroponically and conventionally grown leafy vegetables and fruit crops: a comparative study
(2014) *Evid. Based Complement Alternat. Med*, 2014, p. 253875.

- Perumal, V, Khatib, A, Qamar, UA, Fathamah, UB, Abas, F, Murugesu, S, Saiman, MZ, El-Seedi
  Antioxidants profile of Momordica charantia fruit extract analyzed using LC-MS-QTOF-based metabolomics
  (2021) *Food Chem. Mol. Sci*, 2, p. 100012.

- Quitério, E, Grosso, C, Ferraz, R, Delerue-Matos, C, Soares, C.
  A critical comparison of the advanced extraction techniques applied to obtain health-promoting compounds from seaweeds
  (2022) *Mar. Drugs*, 20 (11).

- Che Sulaiman, IS, Basri, M, Fard Masoumi, HR, Chee, WJ, Ashari, SE, Ismail, M.
  Effects of temperature, time, and solvent ratio on the extraction of phenolic compounds and the anti-radical activity of Clinacanthus nutans Lindau leaves by response surface methodology
  (2017) *Chem. Cent. J*, 11 (1), p. 54.

- Khatulistiani, TS, Noviendri, D, Munifah, I, Melanie, S.
  Bioactivities of red seaweed extracts from Banten, Indonesia
  (2020) *IOP Conference Series: Earth Environ. Sci*, 404 (1), p. 012065.

- Agbor, GA, Joe, AV, Patrick, ED.
  Folin-Ciocalteau reagent for polyphenolic assay
  (2014) *Int. J. Food Sci. Nutr. Diet. (IJFS)*, 3 (8), pp. 147-156.

- Hodges, DM, Toivonen, PMA.
  Quality of fresh-cut fruits and vegetables as affected by exposure to abiotic stress
  (2008) *Postharvest Biol. Technol*, 48 (2), pp. 155-162.

- Khatri, D, Chhetri, SBB.
  Reducing sugar, total phenolic content, and antioxidant potential of nepalese plants
  (2020) *Biomed. Res. Int*, 2020, p. 7296859.

- Scrob, T, Varodi, SM, Vintilă, GA, Casoni, D, Cimpoiu, C.
  Estimation of degradation kinetics of bioactive compounds in several lingonberry jams as affected by different sweeteners and storage conditions
  (2022) *Food Chem*, 16, p. 100471.

- Zeng, Z, Li, Y, Yang, R, Liu, C, Hu, X, Luo, S
  The relationship between reducing sugars and phenolic retention of brown rice after enzymatic extrusion
  (2017) *J. Cereal Sci*, 74, pp. 244-249.

- Makhafola, TJ, Elgorashi, EE, McGaw, LJ, Verschaeve, L, Eloff, JN.
  The correlation between antimutagenic activity and total phenolic content of extracts of 31 plant species with high antioxidant activity
  (2016) *BMC Complement Altern. Med*, 16 (1), p. 490.

- Zhang, Y, Li, Y, Ren, X, Zhang, X, Wu, Z, Liu, L.
  The positive correlation of antioxidant activity and prebiotic effect about oat phenolic compounds
  (2023) *Food Chem*, 402, p. 134231.

- Dobrinas, S, Soceanu, A, Popescu, V, Popovici, IC, Jitariu, D.
  Relationship between total phenolic content, antioxidant capacity, Fe and Cu content from tea plant samples at different brewing times
  (2021) *Process*, 9, p. 1311.

- Dobrinas, S, Soceanu, A, Popescu, V, Carazeanu Popovici, I, Jitariu, D.
  Relationship between total phenolic content, antioxidant capacity, Fe and Cu

content from tea plant samples at different brewing times
(2021) *Process*, 9 (8).

- Muflihah, YM, Gollavelli, G, Ling, Y-C.
Correlation study of antioxidant activity with phenolic and flavonoid compounds in 12 Indonesian indigenous herbs
(2021) *Antioxidants (Basel)*, 10 (10), p. 1530.

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