

Original Research Article

<https://doi.org/10.20546/ijcmas.2026.1504.024>

Chemical Composition of Invasive Brown Sargassum Algae Collected from Three Coastal Regions of Cote d'Ivoire

Ano Ange ZINSOU^{1*} and Hermann-Desiré LALLIE²

¹Department of Plant Biology, Faculty of Biological Sciences, Peleforo GON COULIBALY University, P.O. Box 1328 Korhogo, Cote d'Ivoire

²Department of Biochemistry and Genetics, Faculty of Biological Sciences, Peleforo GON COULIBALY University, P.O. Box 1328 Korhogo, Cote d'Ivoire

*Corresponding author

ABSTRACT

This study aims to identify the chemical composition of sargassum seaweed collected from three coastal areas of Côte d'Ivoire. Specifically, it focuses on assessing the mineral and nutritional components as well as the heavy metal content of these macroalgae. Samples from the selected sites were collected and analyzed using an air-argon flame ICP-OES (Inductively Coupled Plasma Optical Emission Spectrometry), Agilent 5800 model. The results revealed that, among the mineral and nutritional components analyzed, calcium, phosphorus, and potassium were present at the highest concentrations compared to the other parameters. Regarding heavy metals, the elements investigated included arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb), and zinc (Zn). The low levels of heavy metals detected in the samples (well below the permissible limits) indicate that the collected sargassum does not pose any risk of contamination by these metals. The concentrations of mineral/nutritional components and heavy metals varied depending on the collection area, highlighting sargassum as an effective bioaccumulator that remains non-contaminating. These characteristics suggest a significant potential for its valorization in agricultural, industrial, biomedical, and biotechnological sectors.

Keywords

Sargassum, heavy metals, mineral compounds, nutritional compounds, Côte d'Ivoire.

Article Info

Received:
10 February 2026
Accepted:
28 March 2026
Available Online:
10 April 2026

Introduction

Pelagic sargassum (Sargassaceae) is a macroalgae belonging to the brown algae group. These holopelagic Atlantic algae reproduce only vegetatively, by growing and fragmenting (Anne *et al.*, 2020). Originally, from the Sargasso Sea in Central America, they appeared off the Ivorian coast in 2011 following changes in ocean current circulation due to the effects of climate change (Sankare

et al., 2016). In Ivorian marine waters, two species are present: *Sargassum natans I* and *Sargassum fluitans III*.

Sargassum fluitans III have spiny stems, a toothed thallus, and leaves that are wider with oblong floats or bladders without spines. *Sargassum natans I* are characterized by smooth stems, a thin toothed thallus, with spherical floats or bladders topped with spines. By their presence, sargassum has a negative effect both on

coastal tourism activities and on artisanal lagoon and marine fishing.

These two types of activities face the same concerns with a reduction in income during their occurrence, which could be the cause of a major social crisis for countries whose main activity is based on fishing and tourism (Aka *et al.*, 2018; Sowah *et al.*, 2022).

At the health level, the decomposition of these algae allows the release of gases: hydrogen sulfide (H₂S), a very dangerous neurotoxic gas, but they also release carbon dioxide, methane, nitrogen, and ammonia.

The nauseating smell of hydrogen sulfide (H₂S) puts coastal populations in an uncomfortable situation, potentially causing respiratory, neurological, and cardiovascular disorders that can be fatal (Aka *et al.*, 2018; Dabor *et al.*, 2021).

Despite their negative effects on the health and livelihoods of coastal communities, these algae contain a wide variety of valuable compounds that are utilized in agriculture, nutraceuticals, pharmaceuticals, and cosmetics, or even used as raw materials for the production of various biomaterials (Anne *et al.*, 2020) in some regions. In our tropical regions, little is known about the potential uses of these algae, and there is limited information on their chemical composition.

The objective of this study is to determine the chemical composition of *Sargassum* spp. in three coastal areas of Côte d'Ivoire with a view to their potential utilization.

Study Area

This study was conducted along the eastern coast of Côte d'Ivoire on the beaches of Assinie, Assouinde, and Mondoukou (Figure 2). These sites were selected based on the abundance of *Sargassum* on these beaches.

Materials and Methods

Materials

Plant material

The plant material consists of a mixture of two species of brown algae: *Sargassum natans I* and *Sargassum fluitans III*.

Technical equipment

Bags were used to collect *Sargassum* from the shoreline. Certain glassware and laboratory consumables were used to prepare the samples for analysis. The determination of mineral/nutritional components and heavy metals was performed using Agilent 5800 Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES).

Methodology

Collection and Preparation of Plant Material

These macroalgae were harvested in June 2025 along the Ivorian coast on the beaches of Assinie, Assouinde, and Mondoukou. The algae were sorted, washed, and rinsed several times with rainwater to desalinate them and remove any foreign matter. They were then dried at room temperature until completely dehydrated, then ground using a blender to obtain a fine powder, which was stored at room temperature in the dark and used for the remainder of our study.

Determination of the chemical components of pelagic *Sargassum*

Once at the laboratory of the Felix Houphouët Boigny Polytechnic Institute in Yamoussoukro, eighteen chemical parameters were analyzed from this powder. They were grouped into two main categories: mineral/nutritional components and heavy metals.

The mineral/nutritional components were phosphorus, potassium, magnesium, calcium, iron, manganese, aluminum, molybdenum, cobalt, and sodium.

The heavy metals were: arsenic, cadmium, mercury, lead, chromium, zinc, copper, and nickel.

Sample Preparation

The plant material was ground to a particle size of 0.1 mm. Next, 0.3 to 0.5 g of dry sample was weighed into a crucible. A 0.3 g sample was calcined at 600°C for 5 hours in an oven until a white ash was obtained. After cooling, 5 mL of nitric acid was added and then evaporated to dryness on a sand bath (or hot plate). To the residue, 5 mL of 1N hydrochloric acid was added, and the mixture was placed back in the oven at 400°C for 30 minutes. Once the calcined product (residue) was

removed from the oven, 10 mL of 0.1 N hydrochloric acid was added to the crucible to recover the product. The resulting mixture was poured directly into a 50 mL volumetric flask or a 50 mL conical flask. The procedure (washing the crucible with 10 mL of 0.1 N HCl) was repeated three times, and the flask was filled to the mark. Allow to settle, then filter the supernatant using 0.45-micrometer Whatman filter paper.

The elements contained in the solution are then quantified by ICP-OES (inductively coupled plasma optical emission spectrometry for elemental analysis).

To avoid interference from Ca and K, lanthanum chloride (5 mL of lanthanum) was added.

This analytical technique, which uses a high-temperature plasma to ionize the chemical elements in a sample and analyze the light emitted by these atoms and ions as they return to their ground state, allows for the simultaneous detection of multiple chemical elements in a single analysis.

Results and Discussion

Mineral and Nutritional Components of Sargassum

Chemical analysis of brown algae samples collected at the Assinie, Assouindé, and Mondoukou sites reveals a significant content of essential nutrients (Table I). The concentrations of calcium, phosphorus, and potassium are particularly noteworthy. Calcium levels are high, with the highest value recorded at Assinie (731.97 mg/kg), followed by Assouindé (595.86 mg/kg) and Mondoukou (579.79 mg/kg). Phosphorus is also abundant, especially in Assinie (601.31 mg/kg). Potassium reaches its highest value in Mondoukou (179.70 mg/kg), while magnesium varies between 55.16 mg/kg and 67.44 mg/kg depending on the site.

Regarding trace elements, iron is present in significant quantities, with the highest value in Assinie (111.20 mg/kg), followed by Assouindé (80.74 mg/kg) and Mondoukou (62.13 mg/kg). Manganese has lower concentrations, ranging from 1.30 mg/kg to 1.99 mg/kg. Aluminum is most concentrated in Mondoukou (53.22 mg/kg). Cobalt is undetectable in Assinie and Assouindé, with the exception of Mondoukou, where it is present at a very low level (0.0192 mg/kg). As for molybdenum, it is practically absent or undetectable in all samples.

Heavy Metals in Sargassum

Analysis of heavy metal concentrations in brown algae (*Sargassum* spp.) samples collected at Assinie, Assouindé, and Mondoukou reveals generally low levels for all elements measured (Table II). The metals analyzed include arsenic, cadmium, chromium, copper, mercury, nickel, lead, and zinc. Concentrations range from a few parts per million to a few milligrams per kilogram, with variations depending on the site.

Arsenic is present at very low levels, slightly higher in Mondoukou (0.0079 mg/kg). Cadmium is virtually absent in all samples, while chromium is present at low concentrations, with a maximum in Mondoukou (0.0056 mg/kg). Copper is highest in Assinie (0.2795 mg/kg), while mercury is completely absent. Nickel is present in moderate amounts, with a maximum value in Mondoukou (0.1039 mg/kg). Lead reaches its highest value in Assouindé (0.0865 mg/kg), but remains well below regulatory limits. Finally, zinc has the highest values among the metals analyzed, particularly in Mondoukou (1.9567 mg/kg), while remaining within the acceptable range for agricultural use.

A comparison of the sites shows that Mondoukou has the highest concentrations of several heavy metals (Arsenic, Chromium, Nickel and Zinc), while Assinie stands out for its copper concentration. Assouindé has intermediate values, with a slightly higher lead concentration.

The concentrations of minerals, nutrients, and heavy metals in our *Sargassum* spp. samples were determined using the ICP-OES (inductively coupled plasma optical emission spectrometry) method. This method corresponds to the one used by [Mallouhi et al., 2024](#), in determining the metal content of activated carbon and biochar samples derived from *Sargassum* sp.

Analyses of mineral, nutrient, and heavy metal concentrations in *Sargassum* spp. samples reveal significant variation in these concentrations across our different sampling sites.

The results of these studies are consistent with those obtained by Addico and deGraft-Johnson in 2016, whose primary objective was to identify and determine the nutritional and toxicological properties of the invasive brown algae *Sargassum* collected in 2015 along the west coast of Ghana. Nutritional and toxicological analyses conducted using a 900T atomic absorption

spectrophotometer (AAS) revealed variations in the concentrations of minerals, nutrients, and heavy metals in samples from the six sampling sites in the western region.

Seaweed harvested in Côte d'Ivoire contains very low concentrations of heavy metals, ranging from 0.001 to 1 mg/kg, which is well below acceptable limits. This contrasts with the levels found in Ghana, where concentrations are very high (ranging from tens to thousands of mg/kg) for metals such as: iron 5,910 mg/kg, cadmium: 119 mg/kg, lead: 329 mg/kg, arsenic: 53.5 mg/kg.

Furthermore, a comparison of the essential minerals in *Sargassum* spp. collected in Côte d'Ivoire with those from other regions of the world, notably the Caribbean and certain African areas (Table III), shows that the algae harvested in the Ivorian region exhibit significantly lower concentrations for the majority of elements, unlike those observed in other regions.

Given this difference, [Anne et al., \(2020\)](#) argue that the exact chemical composition and nutritional value of pelagic sargassum species are likely to vary depending on location, time of year, and environmental conditions.

Furthermore, [Mišurcová et al., \(2011\)](#), [Baltrusch et al., \(2023\)](#), and [Shek et al., \(2025\)](#) attribute this variability to several factors. Biologically, the structure of polysaccharides in the cell walls of brown algae allows them to efficiently absorb minerals and metals. The negatively charged polysaccharides facilitate the adsorption of cations and positively charged molecules in seawater.

Environmentally, factors such as geographic location, season, temperature, salinity, wave exposure time, pH, and the level of dissolved minerals also influence this variation.

These results are also consistent with those of [Abdallah and Abdallah \(2008\)](#), [Nolwenn \(2024\)](#), and [Nunes et al., \(2024\)](#), who state that the concentration of heavy metals in marine algae is influenced not only by environmental properties but also by other biological factors specific to algae, such as age, tissue type, thallus composition, and tidal cycles. Various environmental and biological factors, such as hydrological dynamics, grazing by herbivores, and the presence of epiphytes, also play a

role. Furthermore, water quality is crucial: pollution resulting from urbanization, industrial effluents, wastewater treatment plant discharges, and mining activities contributes to the accumulation of heavy metals in macroalgae. These interactions enhance *Sargassum*'s ability to selectively absorb elements from its environment. Consequently, brown algae are major bioaccumulators of mineral salts and metals present in the surrounding waters. Essential minerals can be used in nutraceuticals to address certain deficiencies ([Mišurcová et al., 2011](#); [Lozano Muñoz and Díaz, 2020](#)). According to [Shek et al., 2025](#), minerals such as magnesium are essential for energy production and metabolic processes, participating in more than three hundred biochemical reactions, such as protein synthesis and muscle activity. In addition, in animal feed, these algae are used raw or incorporated into formulations for land-based and aquaculture farming. Certain species, such as *Sargassum polycystum* and *Sargassum thunbergii*, are traditionally added to the diet of sea cucumbers in intensive aquaculture ([Xiao et al., 2022](#)). Studies show positive zootechnical effects, such as increased milk production in Sahiwal cows fed *Sargassum wightii* ([Singh et al., 2017](#)).

In the Philippines, *Sargassum* is used for a variety of purposes: as food, a fish preservative, organic fertilizer, and a natural repellent ([Rexie, 2020](#)). Similarly, research by [Blé et al., \(2022\)](#) demonstrates the fertilizing potential of invasive algae of the genus *Sargassum* spp. as organic fertilizer, aimed at improving soil structure and fertility. Furthermore, plants require essential minerals such as copper, iron, manganese, molybdenum, nickel, and zinc. These elements support their metabolism and stimulate their growth, strengthening their defenses ([D'Oria et al., 2021](#); [Kolbert et al., 2022](#)).

Thus, producing fertilizers containing these minerals benefits agriculture. Indeed, several studies ([Anne et al., 2020](#); [Kergosien et al., 2023](#); [Nolwenn, 2024](#); [Ali et al., 2021](#); [Farghali et al., 2023](#)) demonstrate the agricultural potential of compounds derived from sargassum.

The application of macroalgae extracts to crops such as cucumber, grapevine, strawberry, lettuce, and spinach has a biostimulant effect. This improves germination, enhances plant resilience to environmental stress, and promotes root development, water and mineral uptake, photosynthetic activity, and hormonal regulation. These effects result in increased yields and improved nutritional quality of the crops.

Table.1 Concentrations of mineral/nutritional components (mg/kg) recorded in *Sargassum* spp. in the various sampling areas along the Côte d’Ivoire.

	Assinie	Assouinde	Mondoukou
Paramètres			
Aluminium	28,7806	19,9539	53,2167
Calcium	731,9660	595,8626	579,7935
Cobalt	-	-	0,0192
Iron	111,1991	80,7425	62,1261
Potassium	126,7515	169,1460	179,7042
Magnesium	67,4370	61,2043	55,1575
Manganese	1,3011	1,9898	1,8172
Molybdenum	-	-	-
Sodium	41,5419	80,2833	58,5609
Phosphorus	601,3066	514,6017	290,0344

Table.2 Heavy metal concentrations (mg/kg) recorded in *Sargassum* spp. in the various sampling areas in Côte d’Ivoire

Parameters (mg/kg)	Assinie	Assouinde	Mondoukou	Acceptable limits* (mg/kg)
Arsenic	0,0049	0,0025	0,0079	3
Cadmium	-	0,0029	-	0.5
Chromium	0,0028	-	0,0056	2
Copper	0,2795	0,0213	0,1657	200
Mercury	-	-	-	0.1
Nickel	0,0700	0,0511	0,1039	50
Lead	0,0314	0,0865	0,0544	5
zinc	1,0799	1,0716	1,9567	500

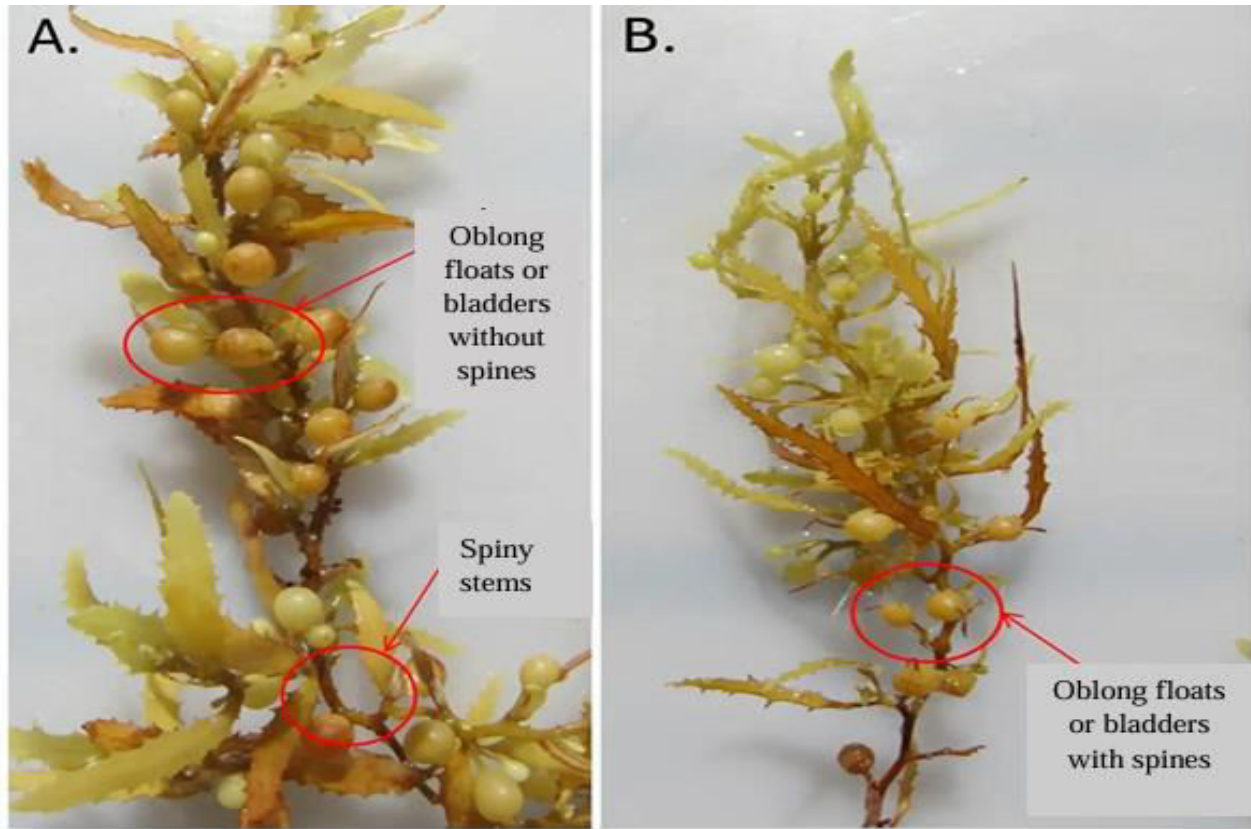
*Maximum heavy metal content (mg/kg DM) for the marketing of organic seaweed-based fertilizers, for the marketing of seaweed as feed raw materials, and for the marketing of seaweed for direct human consumption (Nolwenn, 2024)

Table.3 Summary of analyses conducted on the mineral and nutritional components of pelagic sargassum.

Elements	Côte d’Ivoire (mg/kg)	*Caribbean (mg/kg)	*Africa (Ghana/Nigeria) (mg/kg)
Calcium	579,8-731,9	23723-133400	-
Iron	62-111,2	685-3811	87- 5910
Potassium	179,7-126,7	1990-69359	0,72-280
Magnesium	55-67	2915-18241	427,5
Sodium	41,5-80	34000-78094	-
Phosphorus	290-601	228-1460	965

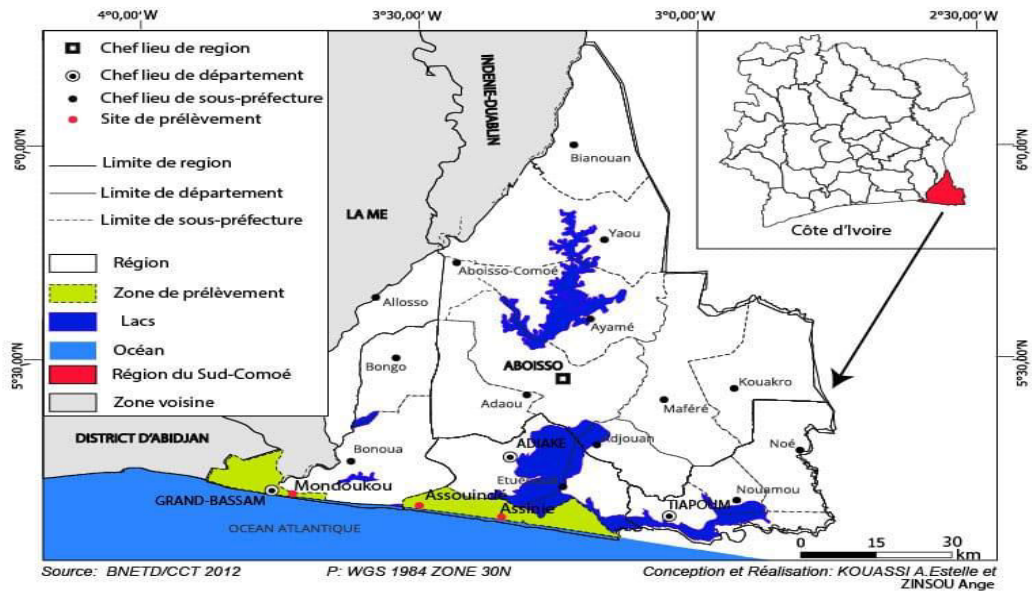
* Anne et al., 2020

Figure.1 Morphological differences between pelagic sargassum species (Govindarajan *et al.*, 2019).



(A): *Sargassum fluitans* III; (B): *Sargassum natans* I

Figure.2 Map showing the Sargassum sampling areas



In conclusion, the objective of this study was to determine the chemical composition of Sargassum species proliferating at three sites along the Ivorian coast. Overall, the study shows that Sargassum species are effective bioaccumulators and non-contaminants, with considerable potential for utilization in the agricultural, industrial, biomedical, and biotechnological sectors. Furthermore, variability in the chemical composition of the area, as well as other internal and external factors, can lead to variations in the composition of the algae. For their utilization, however, it would be necessary to conduct further studies to examine the stability of mineral elements and active compounds during processing and to refine sustainable value chains in our regions.

Author Contributions

Ano Ange ZINSOU: Investigation, formal analysis, writing—original draft. Hermann-Desiré LALLIE: Validation, methodology, writing—reviewing.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

References

- Abdallah, M.A.M. and Abdallah, A.M.A. (2008). Biomonitoring Study of Heavy Metals in Biota and Sediments in South Eastern Coast of Mediterranean Sea, Egypt. *Environmental Monitoring and Assessment*, 146, 139-145. <https://doi.org/10.1007/s10661-007-0066-8>
- Addico, G.N.D. and DeGraft-Johnson, K.A.A. (2016). Preliminary Investigation into the Chemical Composition of the Invasive Brown Seaweed

- Sargassum along the West Coast of Ghana. *African Journal of Biotechnology*, 15, 2184-2191. <https://doi.org/10.5897/AJB2015.15177>
- Aka, K. S., Sankare Y., Komoe, K. et N'cho, A. J. (2018). « Influence des algues sargasses (*sargassum fluitans*, *sargassum natans*, *sargassum natans*) sur les activités socio-économiques le long du littoral ivoirien (Côte d'Ivoire – Afrique de l'ouest) ». *Revue canadienne de géographie tropicale/Canadian journal of tropical geography*, Vol. (5) 2. pp. 10-15.
- Ali, O., Ramsubhag, A., Jayaraman, J. (2021). Biostimulant Properties of Seaweed Extracts in Plants: Implications towards Sustainable Crop Production. *Plants (Basel)*. Mar 12; 10(3): 531. <https://doi.org/10.3390/plants10030531>. PMID: 33808954; PMCID: PMC8000310.
- Anne, D., Shelly-Ann, C., Hazel A. O. et Brigitta van T. (2020). Guide de la valorisation des sargasses: Une ressource pour les chercheurs, les entrepreneurs et les responsables politiques des Caraïbes. le Centre pour la gestion des ressources et d'études environnementales (CERMES) University of West Indies, Campus de Cave Hill, Barbade. 202 P
- Baltrusch, K., Flórez-Fernández, N., Illera, M. (2023). Potential use of *Sargassum muticum* as source of plant biostimulants after three different drying methods. *J Appl Phycol* 35, 921–933 <https://doi.org/10.1007/s10811-023-02907-2>
- Blé, A.T. K., N'Guessan, R.L., Koffi, K., Kouadio, E. Y. (2022). Valorization of invasive Sargassum spp. algal residues into compost in Côte d'Ivoire, *International Journal of Innovation and Scientific Research*, volume 60, pages 1-7
- D'Oria, A., Courbet, G., Lornac, A., Pluchon, S., Arkoun, M., Maillard, A., Etienne, P., Diquélou, S., and Ourry, A. (2021). Specificity and Plasticity of the Functional Ionome of Brassica napus and Triticum aestivum Exposed to Micronutrient or Beneficial Nutrient Deprivation and Predictive Sensitivity of the Ionomeric Signatures. *Front. Plant Sci.* 12:641678. <https://doi.org/10.3389/fpls.2021.641678>
- Dabor, R., Hossein, M., Rishika, B., Jonathan, F., Hatem, K., Rémi, N. et Bruno M. (2021). Effets sanitaires de la décomposition des algues sargasses échouées sur les rivages des Antilles françaises. *Toxicologie analytique et clinique*. vol 33. Issue 3. Pp 216-221. <https://doi.org/10.1016/j.toxac.2021.05.003>
- Farghali, M., Mohamed, I.M.A., Osman, A.I. (2023). Seaweed for climate mitigation, wastewater treatment, bioenergy, bioplastic, biochar, food, pharmaceuticals, and cosmetics: a review. *Environ Chem Lett* 21, 97–152. <https://doi.org/10.1007/s10311-022-01520-y>

- Govindarajan A. F., L. Cooney., K. Whittaker., D. Bloch., R. M. Burdorf., S. Canning., C. Carter. (2019). The distribution and mitochondrial genotype of the hydroid *Aglaophenia latecarinata* is correlated 186 with its pelagic *Sargassum* substrate type in the tropical and subtropical western Atlantic Ocean. <https://doi.org/10.7717/peerj.7814>.
- Kergosien, N., Pouvreau, V. S., Connan, S., Hennequart, F., and Brébion, J. (2023). Mini review. Brown macroalgae as a promising raw material to produce biostimulants for the agriculture sector. *Frontiers in Agronomy*, 5, 1109989. <https://doi.org/10.3389/fagro.2023.1109989>
- Kolbert, Z., Cuypers, A., and Verbruggen, N. (2022). Essential trace metals: Micronutrients with large impact. *Journal of Experimental Botany*, 73(6), 1685–1687. <https://doi.org/10.1093/jxb/erac025>
- Lozano Muñoz, I., and Díaz, N. F. (2020). Minerals in edible seaweed: health benefits and food safety issues. *Critical Reviews in Food Science and Nutrition*, 62(6), 1592–1607. <https://doi.org/10.1080/10408398.2020.1844637>
- Mallouhi, J., Varga, M., Sikora, E., Gráczner, K., Bánhidi, O., Gaspard, S., Goudou, F., Viskolcz, B., SzoriDorogházi, E., Fiser, B. (2024). Charbon actif et biochar dérivé de *Sargassum* sp. Application au développement de matériaux à base de polyuréthane. *Polymers* 16, 2914. <https://doi.org/10.3390/polym16202914>
- Mišurcová, L., Machů, L., and Orsavová, J. (2011). Seaweed minerals as nutraceuticals. In S. Kim (Ed.), *Advances in Food and Nutrition Research* (Vol. 64, pp. 371–390). Academic Press. <https://doi.org/10.1016/B978-0-12-387669-0.00029-6>
- Nolwenn K. (2024). Valorisation comparative de macroalgues brunes proliférantes du genre *Sargassum* de l’Océan Atlantique avec des espèces industriellement exploitées, pour les domaines de l’agriculture, de la santé et du bien-être humain. *Biotechnologies*. Université de Bretagne occidentale-Brest. Français. NNT: 2024BRES0072. tel-05058326
- Nunes, N., Ferraz, S., Venuleo, M. (2024). From a heavy metal perspective, is macroalgal biomass from Madeira Archipelago and Gran Canaria Island of eastern Atlantic safe for the development of blue bioeconomy products?. *J Appl Phycol* 36, <https://doi.org/10.1007/s10811-023-03146-1>
- Rexie, M. (2020). Marine seaweeds with economic importance in the philippines: Valuation of six specie *Caulerpa racemosa* (Forsskål), *Ulva fasciata* (Delile), *Sargassum polycystum* (C. Agardh), *Sargassum ilicifolium* (Turner) C. Agardh, *Halymenia durvillei* (Bory de Saint-Vincent), and *Halymenia dilatata* (Zanardini) from the Philippines. *Agricultural sciences*. Université de Bretagne Sud,
- Sankare, Y., Koffi, K., Koffi, S. A., N'guessan B. Y. F., Abou B. (2016). Répartition et abondance des sargasses *Sargassum natans* et *Sargassum fluitans* (Sargassaceae, Fucales) dans les eaux marines ivoiriennes (Afrique de l’Ouest) *Int. J. Biol. Chem. Sci.* 10(4): 1853-1864 <https://doi.org/10.4314/ijbcs.v10i4.33>
- Shek, M. I., Majumder, A., Suhail, H. R. (2025). Seaweed minerals: unlocking functional food potential from an Indian perspective. *Discov Oceans* 2, 38. <https://doi.org/10.1007/s44289-025-00077-2>
- Singh, B.K., Chopra, R.C., Rai, S.N., Verma, M.P., Mohanta, R.K. (2017). Évaluation nutritionnelle des algues sur la digestibilité des nutriments, le bilan azoté, la production et la composition du lait chez les vaches Sahiwal. *Proc. Natl. Acad. Sci. India Sect. B Biol. Sci.* 87, 437–443. <https://doi.org/10.1007/s40011-015-0616-8>
- Sowah, N. A. W., Jayson-Quashigah, P.-N., Atiglo, Y. D., and Appeaning, K. A., 2022. Socio-economic impact of *Sargassum* influx events on artisanal fishing in Ghana. *Research Square*, 1–12. <https://doi.org/10.21203/rs.3.rs-1861970/v1>
- Xiao, L., Ying, W., Xiaodong, J., Hongyan, L., Tianhong, L., Lei, J., Yuanqin, S., 2022. Utilisation de différentes algues (*Sargassum polycystum*, *Sargassum thunbergii*, *Sargassum horneri*, *Enteromorpha prolifera*, *Macrocystis pyrifera* et les résidus de *M. pyrifera*) dans l'alimentation de l'holothurie *Apostichopus japonicus* (Selenka, 1867). *Algal Research*, Volume 1, 2022, 102591, ISSN22119264, <https://doi.org/10.1016/j.algal.2021.102591>.

How to cite this article:

Ano Ange ZINSOU and Hermann-Desiré LALLIE. 2026. Chemical Composition of Invasive Brown *Sargassum* Algae Collected from Three Coastal Regions of Cote d’Ivoire. *Int.J.Curr.Microbiol.App.Sci.* 15(4): 196-203. doi: <https://doi.org/10.20546/ijcmas.2026.1504.024>