

SUMMARY

I KETUT SUMANDIARSA. Spatial Diversity, Morphometric Characteristics and Metabolites Content in *Sargassum polycystum* grows in Bintan, Sebesi, and Tidung Island Waters. Supervised by DIETRICH G BENGEN, JOKO SANTOSO, HEDI INDRA JANUAR.

Seaweed is a fishery product with high economic value, in line with the increasing number of world demand and increasingly diverse use types. There are three types of seaweed classified based on the pigments contained, i.e., Rhodophyta (red), Chlorophyta (green), and Phaeophyta (brown). A kind of brown seaweed with vast potential use in the tropical area is *Sargassum* and commonly found in all Indonesian waters with varying biomass. The condition of the coastal environment affects its distribution and productivity, which can be proven by the diversity of species grow in one zone. Therefore, approaching the influence of environmental and seasonal variation can optimize the utilization of macroalgae. The spatial-temporal variation impacts the pressure on the presence of seaweed and forces the adaptation process. Variations in distribution, morphology, and the production of metabolites to survive, grow and develop. It underlies research on spatial diversity and morphometric characters. The metabolite content of *Sargassum polycystum* grows on the coast of Tidung, Sebesi, and Bintan Islands.

We researched two different seasons: the first changing season (I) from March to April and the second changing season (II) between August and September 2019. The data were collected using the quadratic transect method and distribution analysis using MS Excel software and PAST statistics. Morphometric analysis of *S. polycystum* based on the size of the sections of the thallus. Extract alginate via an acid pathway with Na_2CO_3 solvent and M / G ratio determination using Proton Nuclear Magnetic resonance ($^1\text{H-NMR}$). Extraction of fucoxanthin using acetone solvent with the Ultra-Sound Assisted Extraction (UEA) method. Principal Component Analysis (PCA) is used to determine the environmental characteristics that dominate the location and season. Furthermore, we used discriminant analysis to obtain the relationship between various factors, i.e., environment, distribution, morphometrics character, and metabolic characteristics. The environmental parameters studied included temperature, dissolved oxygen (DO), salinity, pH, brightness, and trace element content of seawater. We used a Multi-parameter water quality meter for seawater quality analysis and Atomic Absorption Spectrophotometry (AAS) for trace elements content analysis.

The results showed that the Nitrate, Ammonia, and salinity parameters were significantly different between islands ($p < 0.05$). At the same time, the season had a significant effect on DO, temperature, salinity, Selenium (Se), and Iron (Fe) ($p < 0.05$). The concentrations of DO, Nitrate (NO_3^-), and Ammonia (NH_3^-), as well as iron (Fe) are characteristic of Bintan Island. Variations in salinity and the presence of the element zinc (Zn) characterize Tidung Island. Sebesi Island shows identical variations in temperature, DO, Copper (Cu), and Manganese (Mn). Furthermore, *S. polycystum* is a characteristic of the Sebesi and Bintan islands waters with the highest ecological index and important value index. The existence

of variations of Barium, Copper, Manganese, DO, and nitrate on the two islands is closely related to the dominance of this species.

The results of this study also show that different environmental variables between locations and seasons affect the morphometric diversity of thallus length, total length, primary stipe diameter, holdfast diameter, blade size, thallus diameter, air bladder size, and the distance of first and second branches. We obtained the maximum size of the talus from Tidung waters. In contrast, the size of the branching distance, holdfast diameter, and the most oversized talus stem found from Sebesi waters, especially from the dry season. However, blade variation is evenly distributed between waters and seasons. The diversity that occurs is correlated with variations in trace elements of manganese (Mn), iron (Fe), and zinc (Zn), as well as variations in nitrate, ammonia, DO, and water temperature. The most remarkable diversity based on habitat is found in *S. polycystum*, which grows in Sebesi Island's waters.

The characteristics of raw materials quality from the highest to the lowest percentage are as follows: ash > water > crude fiber > protein > fat. The alginate quality obtained was in the form of yield 10.96-22%, ash 27.7-36.57%, moisture content 9.47-17.83%, pH 8.14-8.36, and viscosity 284.71- 499.1 Cps. The M / G ratio variation was 0.35-0.84, with G Block dominant in all islands and seasons. Furthermore, the fucoxanthin content was 0.155-0.587 mg / g, with a significant seasonal effect ($p < 0.05$), although the quantity between locations varied. Besides, location and season were significantly influenced the alginate characteristics in yield, moisture content, ash, and M / G ratio. Viscosity and M / G ratio have a relationship with nitrate, ammonia, and high DO concentrations and salinity. Simultaneously, the variation of fucoxanthin is related to temperature, pH, and copper in the water.

This study proves that the environmental conditions of an island's waters with different types and different seasons affect the ecological index, IVI, size of the thallus (morphometrics), and the quantity of metabolites of *S. polycystum*. The finding can be a reference for more optimal utilization of hydrocolloid and bioactive products. It can trigger more exploratory activities, such as the cultivation of this type of seaweed. The main water quality variables can be used as a standard in cultivation development. The availability of raw materials and the sustainability of the community in nature can be maintained appropriately.

Keywords: *Sargassum polycystum*, morfometrics diversity, metabolites, water quality.