The Processing of Seaweed Products (Kappapycus Alvarezii) Based on a Quality of Nata De Seaweed

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Keywords: Product, Seaweed, Nata.

Abstract: Seaweed is directly consumed in Asia, parts of South America, and the Pacific Islands, where there is increasing interest in supporting human health as a dietary supplement and functional food, used as a thickening agent. Gelling agent for the pharmaceutical and food industries. Indonesia is a major contributor to global algae production, particularly the red algae Kappaphycus alvarezii and Eucheuma denticulatum, which are used to produce carrageenan, and the Gracilaria species, which are used to produce agar. This study aimed to test and analyze the content of seaweed products, namely Nata de seaweed from different harvest ages. This research consists of two stages, namely the first stage of seaweed cultivation, the second stage is the process of making seaweed Nata de seaweed. This study is designed using a completely randomized design (CRD) with three treatments and three replications at each stage. The results of testing Nata de seaweed from Kappaphycus alvarezii seaweed obtained the results of a maintenance period of 40-50 days which is a reasonable length of maintenance because the results of the analysis of the thickness and elasticity of Nata de seaweed are obtained at a maintenance period of 40 and 50 days.

1 INTRODUCTION

Seaweed is directly consumed in Asia, parts of South America, and the Pacific Islands, where there is increasing interest in supporting human health as a dietary supplement and functional food, used as a thickening agent. Gelling agent for the pharmaceutical and food industries. Indonesia is a major contributor to global algae production, particularly the red algae Kappaphycus alvarezii and Eucheuma denticulatum, which are used to produce carrageenan, and the Gracilaria species, which are used to produce agar. In 2015, Indonesia produced 65% of the world's Kappaficus and 56% of the world's Euchuma. At the national political level, aquaculture is expected to play a key role in supporting the economy and supporting the country's food and nutrition security (Atmanisa et al., 2020).

Data from the Ministry of Maritime Affairs and Fisheries (KKP) shows that Indonesia's seaweed production will reach 9.12 million tons in 2021. That number decreased by 5.87% compared to 9.68 million tons in the previous year. Meanwhile, the value of seaweed production was Rp. 28.48 trillion last year. This value increased 6.89% compared to 2020 which amounted to Rp26.65 trillion. Looking at the trend, the volume of seaweed production tends to decrease from 2016-2021. However, the production value fluctuated throughout the period. In detail, seaweed production from cultivation was recorded at 9.06 million tons with a value of Rp. 28.45 trillion last year. Meanwhile, seaweed production from marine catches is 56,356.86 tons with a value of IDR 34.19 billion. (KKP, 2021)

Generally, the maintenance time for seaweed for seed is 25-30 days, for consumption 25-35 days, and industry 25-45 days (Runtuboy, 2014). Study five different harvest periods of seaweed were used to test the quality of the carrageenan produced. The harvest time tested was 35, 40, 45, 50, and 55 days, with the experimental parameters for growth, water quality, yield, and organoleptic. The optimum yield obtained from harvesting seaweed is harvesting at the age of 45 days.

Quality processed food continues to be pursued to develop nutritional improvements in Indonesia. One of the natural resources that have the potential to be developed from the fisheries sector is seaweed. Seaweed can be processed in various forms of food processing, such as nata de seaweed, by utilizing the natural nutrients contained in it because the nutritional composition is complete. Chemically,

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seaweed consists of water (27.8%), protein (5.4%), carbohydrates (33.3%), fat (8.6%), crude fiber (3%), and ash (22%). In addition to carbohydrates, protein, fat, and fiber, seaweed also contains enzymes, nucleic acids, amino acids, vitamins (A, B, C, D, E, and K), and macro minerals such as nitrogen, oxygen, calcium, and selenium. as micro minerals such as iron, magnesium, and sodium. The content of amino acids, vitamins, and minerals in seaweed reaches 10 -20 times that of land plants (Sudariastuty, 2011).

Nata is a fermented product that uses Acetobacter xylinum as a starter. Acetobacter xylinum produces acetic acid and a white layer on the surface of liquid media when cultured in sugar-containing liquid media. This white layer is known as nata (Sumiya, 2009). An advantage of Nata de Algae over other Natas is the abundant availability of algal feedstock of 6,067,000 tons per year. Nata de coco has a better nutritional profile than nata de coco because it contains more fat, fiber, and protein than nata de coco. In nata, seaweed fat content reaches 0.23%, protein 0.57% and fiber 4.5% (Adhistiana, 2005).

2 LITERATURE REVIEWS

2.1 *Kappaphycusalvarezii* Seaweed

Kappaphycus alvarezii (Doty) seaweed is a type of red algae (*Rhodophyta*) which is estimated to have 6,200 species that live in the sea as a producer of kappa carrageenan. A lot of kappa carrageenan hydrocolloids used in various industries such as food and beverage, pharmaceutical, cosmetic,and others. The need for carrageenan products and K.alvarezii raw materials is predicted increase in the future.

2.2 The Development of *Kappaphycusalvarezii* Seaweed

Seaweed contains algae, protein, low fat, good ash mostly contain sodium and potassium salts, and can be a good source of food. In addition, seaweed also contains Vitamins A, B1,B2, B6, B12, C, beta-carotene, Minerals such as potassium, calcium, phosphorus, Sodium, iron, iodine and content carbohydrate (Sya Ghaya, 2020)

The main biological factors that limit seaweed productivity are competition and predators from herbivores. Besides that, it can also be inhibited by seaweed's morbidity and mortality factors. Morbidity can be caused by diseases caused by infection with microorganisms, poor environmental pressures (physics and chemistry of waters), and the growth of attached plants (parasites). Meanwhile, mortality can be caused by the predation of herbivorous animals (Anggadiredja et al., 2010). Seaweed is a nutritious food, and the fiber content (dytarifiber) in seaweed is very high. The fiber in food, or dietary fiber, generally comes from fruit and vegetable fiber or seeds and cereals. Dietary fiber consists of crude fiber and dietary fiber. The crude fiber in the laboratory can withstand strong acids (acids) or strong bases (alkalis).

In contrast, dietary fiber is part of food that digestive enzymes cannot digest. There are two types of fiber: insoluble in water and soluble in water. The insoluble fibers are setuiose, hemicellulose, and lignin. Water-soluble fiber is pectin, gum, mucitage, glycan, and algae. Lemongrass contained in carrageenan is a part, and lemongrass gum is a type of lemongrass soluble in water (Wisnu, 2010).

2.3 Seaweed Culture

Kappaphycusalvarezii culture was carried out using a long line system through which the seeds were tied to a point rope 25-30 cm apart and weighed 10 grams, each point tied with a ribbon knot and slightly loose. If the binding process is complete, the next stage is controlling the development of the condition of the planted seeds from pests and diseases. It is done to determine whether it is necessary to do embroidery in the first week if seeds fall out or are released (SNI, 2010).

2.4 Post Harvest Seaweed

Post-harvest handling of seaweed is carried out to clean or remove sand, salt, or other adhering impurities by washing with fresh water. Kappaphycusalvarezii seaweed was harvested in five different periods, namely 35, 40, 45, 50, and 55 days. The seaweed harvesting process is carried out by releasing the span release rope from the main rope; then, the seaweed is released from the ris rope by removing the ties before or after total drying. The minimum harvest size is 500 g/clump (SNI, 2010).

3 RESEARCH METHOD

This research consists of two stages, namely the first stage of seaweed cultivation, the second stage is the manufacture of Nata de seaweed. This study will be designed using a completely randomized design (CRD) with three treatments and three replications at each stage. The cultivation method is based on the habits and experiences of the people in Nunukan Regency with the long line or surface rope system. The second stage is making Nata de seaweed.

4 RESULT AND DISCUSSION

4.1 Insoluble Fiber Content

The average water-insoluble fiber content of Nata de seaweed obtained from this study is 1.24% to 1.95%. The highest fiber content was obtained at 50 days of harvest, and the lowest was obtained at ten days. The longer the harvest age of seaweed, the higher the fiber content obtained, namely 1.95%. The results of the Tukey test showed that the ash content of carrageenan flour in the 10-day treatment was not different from the 30, 40, and 50day treatments but was different from the 20-day harvest age treatment. Based on the figure, it can be seen that the older the harvest, the ash content of carrageenan flour will decrease, and the salt and mineral content influence the ash content of carrageenan flour in water.

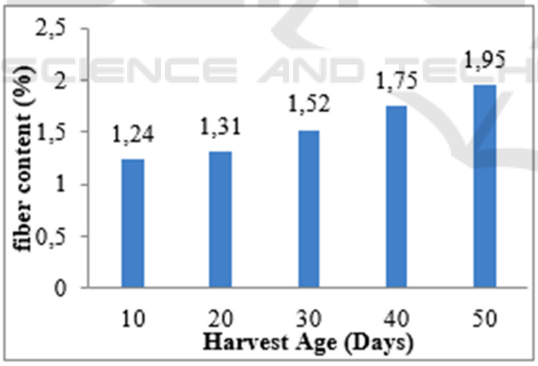

Figure 1: Nata de seaweed fiber content chart.

The analysis of variance showed that different harvesting age treatments significantly affected the fiber content of Kappaphycus alvarezii nata ($P<0.05$). The results of Duncan's further test showed that the fiber content of nata in the 10-day harvest treatment was not significantly different from the 20-day harvest treatment but was significantly different from the other harvesting age treatments ($P<0.01$). The 30-day harvest treatment differed significantly from other treatments ($P<0.01$).

It is influenced by the high sucrose content of palm sugar resulting in a reasonably high water insoluble fiber because the sucrose will be transformed into cellulose by Acetobacter xylinum. One of the functions of sucrose is as a source of nutrition for the activity of nata-forming bacteria, so the higher the sucrose concentration, the higher the water insoluble fiber content (Syukroni Ikbal, 2013).

4.2 Elasticity of Nata De Seaweed

The elasticity of Nata de seaweed in this study ranged from 445.45 gf – 591.78 gf (Figure 2). The treatment with the highest average value was obtained at the 50-day harvest age treatment, and the treatment with the lowest average value was obtained at the 10-day harvest age treatment.

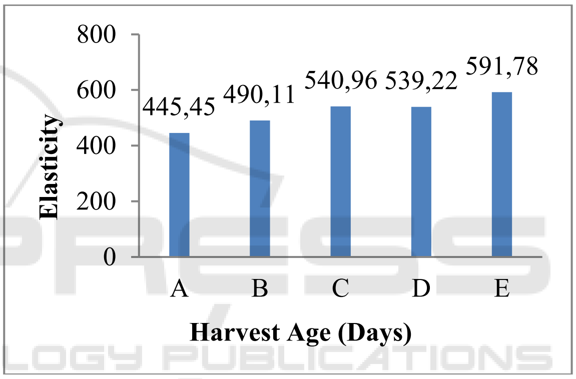

Figure 2: Grafik nilai rata-rata kekenyalan nata rumput laut.

The results of the analysis of variance showed that the treatment at harvest had a very significant effect on the elasticity of Nata de seaweed ($P<0.05$). The results of Duncan's follow-up test showed that the elasticity of Nata at the 10-day harvest treatment was significantly different from other treatments ($P<0.01$), and the 30-day harvest treatment was not significantly different from the 40-day-harvest treatment ($P<0.01$).

Nata de seaweed produced (Figure 16) shows that the higher the harvest age of seaweed, the higher the elasticity of the Nata produced, this is due to the long harvesting age and the high concentration of palm sugar added. It is suspected that the ratio of palm sugar and seaweed to which 1500 ml of water is added affects the number of polysaccharides in the Nata media, so it also affects the elasticity of the Nata.

4.3 Elasticity of Nata De Seaweed

4.3.1 Color Hedonic

The average assessment of the panelists on the color of Nata de seaweed got a score of 4.00 (like it very much). The highest color parameter values were produced in all harvest age treatments. The analysis of variance showed that the treatment at harvest significantly affected the color of Nata de seaweed ($P<0.05$). The results of Duncan's follow-up test showed that the elasticity of Nata at the 10-day harvest treatment was significantly different from other treatments ($P<0.01$), and the 30-day harvest treatment was not significantly different from the 40-day-harvest treatment ($P<0.01$).

4.3.2 Scent

The average assessment of the panelists on the color of Nata de seaweed got a score of 4.00 (like it very much). The highest color parameter values were produced in all harvest age treatments. The analysis of variance showed that the treatment at harvest significantly affected the color of Nata de seaweed ($P<0.05$). The results of Duncan's follow-up test showed that the elasticity of Nata at the 10-day harvest treatment was significantly different from other treatments ($P<0.01$), and the 30-day harvest treatment was not significantly different from the 40-day-harvest treatment ($P<0.01$).

4.3.3 Texture

The average assessment of the panelists on the color of Nata de seaweed got a score of 4.00 (like it very much). The highest color parameter values were produced in all harvest age treatments. The analysis of variance showed that the treatment at harvest significantly affected the color of Nata de seaweed ($P<0.05$). The results of Duncan's follow-up test showed that the elasticity of Nata at the 10-day harvest treatment was significantly different from other treatments ($P<0.01$), and the 30-day harvest treatment was not significantly different from the 40-day-harvest treatment ($P<0.01$).

5 CONCLUSION

Nata de seaweed, preferred by the panelists, had the following characteristics: 1.26 cm thick, 591.78 g/mm elasticity, 1.95% fiber, 4.0 color (liked very much), aroma 3.0 (liked), texture 4.0 (like it very much). Based on these results, Nata de seaweed can be used as a food source of fiber according to the quality standard of Nata in packaging, which is a maximum of 4.5%.

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REFERENCES

Adhistiana Resty, Rahayu, Ambarwati. 2008. Pemanfaatan Tepung Wortel Dalam Pembuatan Brownis Sebagai Upaya Diversifikasi Pangan. Bogor. IPB.

Atmanisa Andi, Mustarin Amira, Taufieq Nur. 2020. Analisis Kualitas Air pada Kawasan Budidaya Rumput Laut *Euchema cottoni* di Kabupaten Jeneponto

Anggadiredja, J. T., Ahmad Zatnika, HeriPurwanto Dan Sri Istini. 2010. RumputLaut. PenerbitSwadaya. Jakarta.

KKP (Kementerian Kelautan dan Perikanan). (2021). Produktivitas Perikanan Indonesia. Jakarta: KKP

PandelakiL.(2012). Strategi Pengembangan Rumput Laut di Pulau Nain Kabupaten Minahasa Utara. Jurnal Perikanan dan Kelautan Tropis, 8(2)

Runtuboy N. 2014. Komunikasi Pribadi Mengenai Waktu Pemeliharaan Rumput Laut di Balai Besar Pengembangan Budidaya Laut (BBPBL) Lampung.

SNI 2010.ProduksiRumputLautKotonii (*Euchemacottonii*) Bagian 2 :Metode Long Line Bandung. BSN

Sudariastuty, E. 2011. Pengolahan Ikan Tengiri. Jakarta: Pusat PenyuluhanKelautan dan Perikanan.

Sumiyati. 2009. *Kualitas Nata de Cassava Limbah Cair Tapioka dengan Penambahan Gula Pasir dan Lama Fermentasi yang Berbeda*. (Skripsi) .Surakarta .Universitas Muhammadiyah.

Sya Ghayah Fattaah, Permadi Aef, Adi Catur Pramono 2020, Perbedaan Pengaruh Penggunaan Ekstraksi

Nanas dan Diamonium Fosfat Terhadap Mutu *Nata de Seaweed* (*Gracilaria sp*.) Jurnal IPTEK Terapan Perikanan dan Kelautan Vol.1 No.1: 1-10

Syukroni Ikbal, Yuliati Kiki, Baehaki Ace. Karakteristik (2013) *Nata de Seaweed* (*Euchema cottoni*) Dengan Perbedaan Konsentrasi Rumput Laut Gula Aren. Jurnal FishtecH Universitas Sriwijaya. Vol II, Nomor 01.

Wisnu R. A., 2010. Analisa Komposisi Nutrisi Rumput Laut (*Eucheuma cottonii*) dengan Proses Pengeringan Berbeda. Fakultas TeknologiP ertanian, IPB.