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ARTICLE REVIEW OF SEAWEED GELATIN PROCESSING (*Gracilaria* sp.)

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Abstract

Seaweed is a potential fishery commodity in Indonesia to increase the country's foreign exchange. This article aims to review the stages of extraction of agar-agar from seaweed **(*Gracilaria* sp.) ,** its quality and application. Based on the literature review, the manufacture of agar-agar extraction from *Gracilaria* sp seaweed is the washing and cleaning of raw materials, soaking and cleansing, softening, cooking and pressing and printing. Gelatinous printing is generally in gelatin bars, sheets, and flour. The quality of agar-agar according to SNI is based on organoleptic, chemical, microbial contamination and metal contamination parameters. Application of agar-agar as a entrant, stabilizer, emulsifier, filler, purifier, gel maker, and others.

Keywords: flour, stabilizer, extraction, molding, microbial contamination, quality.

INTRODUCTION

The main metabolite products of seaweed class Rhodophycae, such as Gracilaria and Gellidium are gelatinous. Agar-agar is an ester compound of sulfuric acid from galacthane compounds, it does not dissolve in cold water, but dissolves in hot water by forming a gel. Agar-agar has the ability to form a gel or film layer, so it is widely used as an emulsifier, stabilizer, gelling, suspender, coating, and inhibitor (Suparmi, 2009).

Figure 1. Gelatin

(Source : rumahmesin.com)

Agar-agar or agrophyte is a polysaccharide that accumulates in the cell walls of seaweed. The gelatinous yield in seaweed is greatly affected by the season. The quantity of gelatinous amendments will be higher in seaweed whose harvest age is old (Syamsuar 2006). An increase in the harvest life can respond to the sulfate content. The amount of this amendment is not necessarily the same for the same seaweed when harvested at different times (Suryaningrum 1988). This article aims to review the stages of extraction of agar-agar from seaweed **(*Gracilaria* sp.) ,** its quality and application.

Taxonomic Classification of **seaweed (*Gracilaria* sp.).**

Figure 2. *Gracilaria* sp.

(Source: marinecornerundip.id)

Gracilaria sp. is seaweed that lives and grows on the water as fitobentos. This seaweed grows by sticking its talus on its subtracts, such as mollusk shells, dead or living corals, sand, mud, volcanic rocks and wood. However, seaweed is

more commonly found growing on coral reefs (Lee 2008). The classification of seaweed (*Gracilaria* sp.) according to Sudariastuty (2011) is as follows:

Divisio : Rhodophyta
Class : Rhodophyceae
Order : Gigartinales
Family : Glacilariaeceae
Genus : Gracilaria
Species : *Gracilaria* sp.

Availability of seaweed in Indonesia

Indonesia has a very long coastline that reaches 81,000 km. Generally around this coastline can be overgrown or planted seaweed. Thus Indonesia can be said to have enormous potential for the development of seaweed commodities. The Government of Indonesia through the Ministry of Marine Affairs and Fisheries, created a revitalization program for seaweed development to have a real impact on state foreign exchange revenues.

The development of the seaweed industry in Indonesia has bright prospects. This is because seaweed cultivation techniques are relatively easy to master by the community, so that the effort can be done en masse. In addition, the demand for seaweed and processed products both in the domestic and international markets always shows an increase every year (Sudariastuty 2011). The total potential of seaweed land that is still available is 769.5 thousand ha. Area planting that has been utilized which reaches almost 50% which is 384.7 thousand Ha (KKP 2013).

Seaweed is commonly traded in the form of dried seaweed, products that can be directly consumed, and hydrocolloid products (caraginan, gelatin, and alginate). Of all the world's seaweed production, 65% is the type that can be directly consumed; 15% hydrocolloid material, and 20% as fertilizer, paper, biofuel (Dahuri 2011).

EKSPOR-IMPOR-NERACA RUMPUT LAUT INDONESIA

NO	URAIAN	VOLUME (TON)				NILAI (USD 000)			
		2017	2018	2019	2020*	2017	2018	2019	2020*
1	**Ekspor**								
	Total	191.854	212.962	209.241	52.799	204.872	291.837	324.850	84.715
	Periode Jan-Apr	53.969	62.262	61.493	52.799	52.570	89.370	92.925	84.715
2	**Impor**								
	Total	805	1.163	1.427	277	7.956	14.745	16.210	3.435
	Periode Jan-Apr	208	270	352	277	1.673	3.015	4.221	3.435
3	**Neraca**								
	Total	191.048	211.798	207.814	52.522	196.916	277.092	308.640	81.280
	Periode Jan-Apr	53.761	61.992	61.142	52.522	50.897	86.355	88.704	81.280

Sumber: BPS

* Angka sementara sd April 2020

Figure 3. Export-Import-Balance sheet of Indonesian Seaweed

Seaweed cultivation will experience an increasing trend in the future. Because the development is easy and relatively no pests. Based on the results of a study conducted by the IEB Institute (*Indonesia Eximbank Institute*) as a research unit of the Indonesian Export Financing Institute (LPEI), the value of seaweed exports during the January-October 2021 period was recorded to increase by 20.42% year-on-year (yoy) reaching USD177.99 million. The cumulative export value growth was also followed by growth in export volume of 11.68% year-on-year (yoy) to 159.59 thousand tons compared to the same period in 2020 of 142.90 thousand tons. Head of IEB Institute LPEI Division Rini Satriani said that although export performance in 2020 had decreased, Indonesia was able to rank second as the world's largest seaweed exporter which was well-competitive.

The type of Indonesian seaweed that is well known in the global market is *Eucheuma cottonii* which has a portion of 71.59% of the total exports of Indonesian seaweed products in 2020. This type of seaweed is used as a raw material for making caragenan. Meanwhile, the type of *seaweed Gracilaria* sp. it is the second largest seaweed export product with a portion of 11.89% which is used as a raw material for making agar.

Tahapan ektrasi agar from *gracilaria* sp seaweed

Gelatinous extraction from ***Gracilaria* sp** seaweed has been done by many farmers. Paper gelatin products are one example of gelatinous products that are

famous for being carried out by farmers This paper gelatin product is produced in Pameumpek area, Garut Regency, West Java Province- Indonesia.

Generally, gelatin extraction is as follows:

1. Washing and Cleaning

   Seaweed is washed with fresh water until clean. Dirt that sticks such as sand, coral, mud and other types of seaweed are removed.

2. Immersion and Disbursement

   Soaking is done so that the seaweed becomes soft, so that the extraction process can run well. Seaweed is soaked in pure water as much as 20 times the weight of seaweed for 3 days. After that the custan is carried out by soaking in a 0.25% chlorine solution or a 5% tohor lime solution while stirring, after 4-6 hours, the seaweed is washed back for 3 hours to remove the smell of chlorine. Seaweed that has been clean and pale is dried for 2 days, until this stage seaweed can be stored first if not processed immediately.

3. Softening

   To further facilitate extraction, the cell wall needs to be broken down by soaking in a 10% acetic acid solution for 15 minutes. Soak seaweed in the solution to break down the cell wall, so that the agar is easy to extract, destroy and dissolve dirt so that the seaweed is cleaner. After soaking in an acidic solution then soaked in clean water for 15 minutes to neutralize.

4. Cooking

   Seaweed is cooked in water as much as 40 times the weight of seaweed. After boiling (90-100°C), we add 0.5% vinegar acid to obtain a pH of 6-7. When >7, its pH is lowered by the addition of vinegar acid and when <6, NaOH is added. PH examination can be done using pH paper. This heating is done approximately 45 minutes but can also be for 2-4 hours depending on the way the complainant is. The process after ripening depends on the desired final shape of gelatin, namely in the form of bars, sheets or flour.

Rod/Sheet Gelatin Processing Process

1. Pressing and Printing

The result of cooking is then filtered with calico cloth and pressed. The discharge that comes out is accommodated in a vessel and neutralized by the addition of a NaOH solution so that its pH becomes 7-7.5. When the pH has been reached, the liquid is then recooked while stirring. After boiling, the result is poured into a mold, approximately 6 hours so that it has cooled and frozen. The dregs of the pressing can be used again by adding water as much as 75% of the original amount of water, then the dregs are heated and filtered. The liquid that comes out can be used as a mixture in the next process, so that in the end there is dregs that cannot be used anymore. This dregs can be used as fodder.

2. Cooling

   Frozen liquids are cooled in a cooling room at -20°C for 4-5 days. This cooling is done so that compaction really happens perfectly.

3. Drying

   Agar is removed from the mold. The result obtained is gelatinous bars. When cooled sheet-shaped gelatine, the bar gelatine is cut 0.5 cm thick. As a cutting tool can be used fine wire of steel, gelatin bars or sheets are then dried in the sun.

Flour Gelatin Processing Process

1. Filtering and Grinding

   Cooked gelatine is filtered with a press filtrate fillet. The discharge that comes out is accommodated and cooled for 7 hours. Frozen gelatin is crushed and pressed with a cloth. The result is in the form of sheets that are then aerated. Dry sheets are cut about 3x5 mm, then put in a grinder or grinder. The result of grinding is flour gelatin.

2. Packing

   Gelatin flour is included in glasin paper coated with wax or can also be inserted plastic then wrapped in paper.

Quality and Application of Agar Products

Agar is an exported commodity and some entrepreneurs are already working on an industrial scale. In Indonesia agar has begun to be produced in

1930 and now there are several industries producing agar. To export gelatin powder, the quality of the product must meet the requirements of the gelatin quality standard. For gelatin sources in Indonesia are generally used *type Gracilaria* sp. Agar quality standards according to Poncomulyo *et al.* (2006) asfound in Table 1, while according to Indonesian National Standards there is Table 2.

Table 1. Agar Product Quality Standards

Component	Specifications
Particle Size	80-100 mesh
Water Content	<18%
Ash Content	<6.99%
Heavy Metals	<10 ppm
Arsenic	<3 ppm
Ph	6,8-7,0
Solubility	Solution at a temperature of 100°C

Table 2. Agar Quality Standards According to SNI

Parameter uji	Satuan	Persyaratan
a Organoleptik	-	Min. 7 (Skor 1-9)**
b Kimia		
- Kadar air	%	Maks. 22
- Kadar abu*	%	Maks. 6,5
- Abu tak larut asam*	%	Maks. 0,5
- Pati*	-	Negatif
- Gelatin dan protein*	-	Negatif
c Cemaran mikroba		
- ALT	koloni/g	Maks. 5000
- *Escherichia coli*	APM/g	<3
- *Salmonella*	per 25 g	Negatif
- Kapang dan khamir	koloni/g	Maks. 300
d Cemaran logam*		
- Arsen (As)	mg/kg	Maks. 3
- Kadmium (Cd)	mg/kg	Maks. 1
- Merkuri (Hg)	mg/kg	Maks. 1
- Timbal (Pb)	mg/kg	Maks. 3
- Timah	mg/kg	Maks. 40
e Fisika*		
- Absorpsi air	-	Min. 5 kali
- Benda asing tak larut	%	Maks. 1
- Kehalusan (lolos saringan 60 mesh)	%	Min. 80
CATATAN : * Bila diperlukan ** Untuk setiap parameter		

Agar products can be applied in various fields, namely as a consuming material, stabilizer, emulsifier, filler, purifier, gel maker, and others. Some industries that utilize the ability to form gels from gelatin are the food industry, pharmaceuticals, cosmetics, skin, photography and as a medium for growing microbes. The gelatin production industry in Indonesia uses a method that involves the extraction of seaweed with acid solvents at high temperatures (Anggadiredja *et al.* 2002).

Conclusion

Based on the literature study as mentioned above, the manufacture of extraction of agar-agar from *Gracilaria* sp seaweed is washing and cleaning raw materials, soaking and ucasing, softening, cooking and pressing and printing. Gelatin printing is generally in gelatin bars, sheets and flour. The quality of gelatin according to SNI is based on organoleptic, chemical, microbial and metal spruce parameters. Gelatin application as a settling material, stabilizer, emulsifier, filler, purifier, gel maker, and others.

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