



Seaweed Dodol (*Eucheuma Cottonii*) Processing in UKM. Cahaya Madina Nunukan and Characteristics Products Produced in Nunukan Area

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Full Paper

Article history

Received

5 August 2023

Received in revised form

5 August 2023

Accepted

11 August 2023

Published online

30 September 2023

Abstract

From a biological point of view, seaweed is a primary producer producing organic matter and oxygen in the aquatic environment. From an economic standpoint, it is a potential commodity for development, given its nutritional value. Seaweed Dodol is a diversification of processed seaweed. Seaweed dodol is a type of food that belongs to the category of semi-wet food, which has low activity. The research method used is the direct practice of data collection and the results of observations carried out at UKM Cahaya Madina. In conclusion, the process of making dodol starts with preparing tools and materials, then washing the seaweed, cutting, blending, cooking, printing, dodol, drying and packaging. Seaweed dodol is a processed product that is very popular because of its soft texture, attractive colour, sweet taste and distinctive aroma.

Keywords: - Dodol seaweed, processing

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1. Introduction

Indonesia is an archipelagic nation with a vast ocean area, accounting for 70% of its territory. In Indonesian waters, a variety of marine biota exists, including seaweed. The combination of seaweed species in Indonesian waters indicates the seaweed's potential in Indonesian seawater.

From a biological point of view, seaweed is a primary producer producing organic matter and oxygen in the aquatic environment. From an economic standpoint, it is a potential commodity to be developed, given its nutritional value. In Indonesia, seaweed is a vital fishery product, both as a source of income for fishermen/seaweed cultivators and as a foreign exchange source. Apart from being an industrial raw material, seaweed can be processed into various ready-to-eat foods such as dodol, pudding, ice cream, and sweets. The widely used seaweed is from the *Rhodophyceae* class, which contains carrageenan and agar. One of the species in the *Rhodophyceae* class,

which contains carrageenan, is *Eucheuma cottonii* (Firdarini, 2016).

Dodol is a traditional food belonging to the semi-moist food group and can be found in several Indonesian regions. Dodol has a sweet and savory flavor and a soft consistency. In addition, dodol is produced from fruits and vegetables, such as lapel dodol, soursop dodol, carrot dodol, and others, making it an agricultural product (Abdullah, 2011). Dodol has plastic and solid properties, an aw range of 0.60 to 0.90, and water content between 10% and 40%. (Haliza, 1992).

Seaweed Dodol is a diversification of processed seaweed. Seaweed dodol is a type of food that belongs to the category of semi-wet food, which has low activity. As a semi-wet food, dodol has the property of being able to preserve itself without the need for refrigeration, sterilization, and drying. Seaweed dodol is made by adding seaweed to increase the use value of seaweed. Dodol grass has good prospects for development. There are many benefits obtained from

seaweed dodol, including that it contains a lot of dietary fiber, namely dietary fiber that human digestive enzymes cannot digest. (Cokrowati, Andriani, & Marzuki, 2020; Sujana, Al Zarliani, & Hastuti, 2020).

Seaweed dodol is one of the processed varieties of seaweed made with *Eucheuma Cottoni* seaweed as the primary component. To produce high-quality seaweed dodol, high-quality raw materials are required. The ingredients that must be prepared to make seaweed dodol are essential, auxiliary, and complimentary.

Essential ingredients are the raw materials or main ingredients used in making seaweed dodol. Seaweed must be of good quality: dry, not moldy, intact, and not too much salt. The seaweed used is *Eucheuma cottoni* because there are many in traditional markets; the texture is like cartilage, so it is not too soft.

1.1 Problem Statement

So far, the harvested seaweed (*Eucheuma Cottoni*) in Nunukan Regency is only sold in dry form without having to think about the added value of seaweed such as being produced into jelly, dodol and so on. To improve the economy of Nunukan seaweed farmers, as well as develop the small and medium business sector in the Nunukan community it is necessary to develop ways to process raw seaweed into ready-to-eat processed seaweed. One of the realistic food products to be developed in the Nunukan Regency area is dodol product, for this reason, an in-depth understanding of the process of making seaweed dodol is needed so that it can produce dodol products with a consistent taste and elasticity.

2. Literature Review

2.1 The Classification of Seaweed (*Eucheuma Cottoni*)

Seaweed can be used as the main ingredient for making agar-agar, carrageenan, and alginate. The reason is that the carrageenophyte in seaweed contains many of the main ingredients, carrageenan polysaccharides. The kagarophyte is the main ingredient of polysaccharides, and both are red seaweed or Rhodophyceae. Alginophytes are brown seaweeds or Phaeophyceae, which contain many main ingredients, polysaccharide alginate. The scientific classification that exists in this seaweed plant is shown in Table 1.

Table 1. Seaweed classification

Kingdom	Plantae
Division	Rhodophyta
Class	Rhodophyceae
Ordo	Gigartinales
Familia	Solanaceae



Fig. 1. Seaweed (*Eucheumacottoni*)

Seaweed is a low-level plant because it needs roots, stems, and leaves. Consequently, these plants are typically attached to the substrate via a thallus. Additionally, seaweed is a collection of non-vascular, chlorophyll-containing plants that carry out photosynthesis (Abdurrahman, Rosdarni, & Sugireng, 2021).

In contrast, the structure of vegetative propagation in seaweed differs from that of higher-level plants. It is not possible to distinguish between the leaves, stems, and roots of seaweed. This indistinguishable structure is known as the thallus.

The thallus of seaweed, for instance, is multi cellular and composed of various shapes and sizes. The thallus is subdivided into two broad categories: filament and siphon. Variation of the two thallus forms will result in a more complex form. These range from compact filaments to more giant filament forms, distinguishable by attachment heads, strips, and laminae (Setha, Arfah, & Pattipeilohy, 2019).

2.2 Seaweed Morphology

The morphological characteristics that exist in seaweed including (Yuliasih & Wendrawan, 2014).

a) Filaments

The cells that compose filaments are arranged and separated by sister walls. There are two distinct types of filaments: uniseriate and multiseriate. Uniseriate filaments consist of cells arranged in a single series, whereas multiseriate filaments contain cells arranged in multiple series.

The filaments in the seaweed material are obtained through a cell division process that can produce branching areas. Four types can be produced through this branching process: thallus filaments, which can branch easily, heterotric, parenchyma, and pseudoparenchyma.

b) Chiffon

The characteristics of Chiffon can be observed in green algae that do not produce a dividing wall or septum in order to form a multinucleated body. On the other hand, this septum is only present during the formation of the reproductive organs. For instance, algae with siphon characteristics, such as Caulerpa and

Codium, belong to the Siphonales division.

2.3 The Benefit of Seaweed

The use of seaweed in human life in everyday life, among others (Suparmi & Sahri, 2009; Syafitri, Hafiludin, & Chandra, 2022).

a) Lose Weight

Some types of seaweed, such as brown seaweed, contain the pigment fucoxanthin, which can help the body's metabolism so that fat can be turned into energy.

b) Accelerates Wound Recovery

The second advantage of seaweed is its ability to promote wound healing. Vitamin K is abundant in seaweed, and this vitamin can collaborate with platelets or cell types capable of clotting or blood clotting processes. Vitamin K can send chemical signals to platelets, causing them to collect blood and clots so that when the person is injured, the bleeding stops quickly.

c) Strengthens Bones and Teeth

Seaweed also contains a lot of calcium. If a person is allergic to cow's milk, he should consider foods containing lots of calcium. In seaweed and wakame there are more than 60 mg of calcium or approximately 6% of the human daily calcium requirement. Lack of calcium can harm the formation of muscles and cells that work with the nervous system.

d) Increasing Energy

Another content that exists in seaweed is iron. The benefits that can be obtained from iron are as a tool for producing the energy needed for the combustion process in the body when carrying out various daily activities.

2.4 Seaweed Cultivation Techniques

Cultivation processes in seaweed plants that need attention include the following.

a) Seaweed Breeding

Seaweed usually reproduces by producing microscopic spores from apparent breeding organs. The tissue structure for this breeding process can help group specimens because they can be seen with the naked eye.

The breeding cells produced from this breeding organ are fertile. Seaweed reproduces by sexual and asexual means. Breeding seaweed is quite complex.

b) Sexual Breeding

In sexual reproduction, two different seaweed individuals can release two gametes each. These gametes can form a new generation that contains the genetic traits

of both parents. The gametes produced for reproduction consist of several features.

Isogamy is the mixing of two gametes that are similar in size and shape. If the two gametes differ in shape and size, mixing the large ovum with the tiny moving sperm will mix, which is also called oogamy.

c) Asexual Reproduction

For many seaweed species, asexual reproduction is more common than sexual reproduction. A small part of the thallus, namely thallus granules, can grow and develop to form a new individual. Seaweed can produce various types of spores as a breeding tool. These spores have relatively high resistance to conditions that can cause the spores to spread far from the original parent and germinate in a new growing environment. The characteristics of the spore can cause the spore to have a reasonably high resistance, namely the form of a barrier wall that functions as a protective barrier for the spore. Some spores have a flagellum for movement and are known as zoospores. Spores that do not have a flagellum are known as aplanospores.

2.5 Seaweed Habitat

The habitat of seaweed is in coastal waters and on the seafloor. Therefore, seaweed can also grow in rocky, muddy, and sandy environments, on the surface of shells, wood, and trawls, and as epiphytes on other seaweed.

Seaweed attaches to the substrate when strong currents and waves strike it. Depending on the type of adhesive the seaweed uses, the substrate contains both living and nonliving things.

Substrates include marine plants, animals, rocks, and seafloors like mud and sand. Numerous factors, including sunlight, salinity, temperature, animal-plant interactions, and waves and currents, can influence the distribution of seaweed within a habitat.

2.6 Diversification of Processed Products

Several types of Seaweed products consist of (Safitri, Widiada, Swiyajaya, & Sofiyatin, 2018):

1. Seaweed Syrup is a diversification of processed seaweed products that mix Seaweed extract with fruit juice and sugar. This product is one of the innovations in seaweed processing. Various Flavors can be used to add to the taste because seaweed has no taste (plain).
2. Seaweed Crackers are snacks made from a mixture of tapioca flour and wheat flour with additional ingredients in the form of seaweed and the addition of spices as flavorings. The advantages of seaweed crackers are that they have a distinctive taste, are crunchy, and also have benefits for the health of the human body. Seaweed Crackers are marketed as ready-to-eat (cooked) or semi-finished (raw) food.

3. Seaweed jelly candy is made from fruit or plant extract and a gelling agent with a clear, transparent appearance and specific chewy texture. Seaweed jelly candy is made from extracted seaweed and accompanied by the addition of other ingredients.
4. Seaweed Stick is a diversification of the processing of seaweed culture results, where the method of making is relatively easy with ingredients that are easy to obtain at low prices and through mixing seaweed with fish meat and glutinous rice flour and other ingredients.
5. Seaweed Dodol is a diversification of processed seaweed. It is a type of food that belongs to the category of semi-wet food, which has low water activity. As a semi-wet food, dodol has the property of being able to preserve itself without the need for refrigeration, sterilization, and drying (Idrus, 1994). Seaweed dodol is made by adding seaweed to increase the use value of seaweed.

3. Methodology

3.1 Location and Time

This research was written based on the results of observations and a direct follow-up, which was carried out from 19 to 20 August 2022, located at UKM.CAHAYA MADINA, South Nunukan.

3.2 Method of Collecting Data

The types of data obtained based on the results of direct observation and research are as follows:

1. Observation is the type of data carried out by direct observation by researchers of the object to be studied directly in the field for further research recorded, noting existing events, and collecting those related to all conditions and behavior in the field. The author also participates in production directly and is involved in activities carried out at UKM CAHAYA MADINA.
2. Documentation. In addition to interview and observation data types, documentation is of equal importance, specifically the collection of documents in the form of photographs, audio recordings, and videos, as well as data sources, which are then used to interpret and corroborate data obtained in the field.

3.3 Types and Source of Data

This study's data collection method is founded on the results of observations conducted at UKM CAHAYA MADINA, which is involved in processing marine products. The various data collection approaches employed includes:

a) Primary Data

Primary data collection was obtained by carrying out and directly following observation activities from the beginning to the final process obtained from UKM Cahaya Madina. It was done through active participation, observation, and direct communication (interviews).

b) Secondary Data

Secondary data collection was obtained through a literature study, collecting data from the internet related to the processing of fishery products, especially the processing of seaweed dodol, magazines, newspapers, books, documentation data, and parties related to the processing of seaweed dodol (*Eucheuma cottoni*).

3.4 Tools and Materials

a) Tools

The tools used in Seaweed Dodol Processing are:

Table 2. Seaweed dodol processing tool

No	Tools
1	Knife
2	Basin
3	Cutting board
4	Sieve
5	Stainless Wok
6	Wooden Spoon
7	Measuring cup
8	Scales
9	Mold container
10	Blender

b) Materials

The materials used in the processing of Seaweed Dodol are:

Table 3. Seaweed dodol processing materials

No	Materials
1	Seaweed
2	Glutinous rice flour
3	Sugar
4	Coconut Milk
5	Flavoring
6	Water

4. Finding and Analysis

The results of the seaweed dodol processing can be seen in Fig. 2. Research conducted on dodol this time uses seaweed as the main ingredient with a 1:1 ratio between seaweed and sugar used, adding vanilla, salt, colouring, coconut milk and water. Making dodol includes preparing materials and tools, washing seaweed, cutting, blending, cooking, printing, cutting

dodol, drying and packaging. Seaweed contains components such as fucoidan, alginates and polyphenols. Fucoidan, the most significant component in seaweed, has been scientifically proven to produce immune cells. It helps fight viruses, bacteria and allergies and inhibits blood clots, reducing stroke risk.



Fig. 2. Seaweed product

Apart from that, other benefits include lowering cholesterol levels, high blood pressure and stabilizing blood sugar levels, relieving digestive disorders, improving liver function, maintaining skin moisture and firmness, and helping the formation of the lunkhead that is produced. The sugar solution is then added to the thick coconut milk, which has previously been boiled until the water evaporates and oil formation.

The purpose of adding sugar to making dodol is to give it a sweet taste, and pleasing aroma, as a preservative and to help the texture of dodol harden very quickly. Therefore, dodol printing has to be done very quickly. If not, the shape of the dodol will not harden evenly, and this is due to the sugar content in the dodol dough. Drying dodol is to preserve dodol to make it last longer, reduce the water content in dodol and make the resulting dodol brighter and more attractive.

The things that need to be considered in making dodol so that the dodol produced is good are as follows; namely the quality of the essential ingredients and additional ingredients, the correct processing method, the proper drying process (not too long and not too fast), the concentration of the ingredients used and molding the dough is good and as desired.

5. Conclusion

Based on the results of observations at UKM Cahaya Madina, it can be concluded that:

1. Good quality dodol has a texture that is soft enough. The outside is shiny due to the sugar coating or glazing, has a distinctive taste, and if it contains oil, it does not taste rancid.
2. The process of making dodol starts with preparing tools and materials, then washing the seaweed, cutting, blending, cooking, printing, cutting dodol, drying and packaging.
3. Seaweed dodol is a processed product that is very popular because of its soft texture, attractive colour, sweet taste and distinctive aroma.

4. The use of sugar in making seaweed dodol functions as a sweetener as well as a thickener, as well as a preservative in dodol.
5. The function of drying dodol is to preserve dodol so that it lasts longer, reduce the water content in dodol and make the resulting dodol brighter and more attractive.

Acknowledgement

The authors would like to thanks Mr. Arkas Viddy, Ph.D. the director of Politeknik Negeri Nunukan, Dr. Besse Asniwaty, M.Si, the first vice director of Politeknik Negeri Nunukan and Dr. Raqifoh, M.M., the second vice director of Politeknik Negeri Nunukan for supporting this study until it is published in Borneo Engineering & Advanced Multidisciplinary International Journal.

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