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THE EFFECT OF DIFFERENT HARVEST AGE AND CULTIVATION LOCATION ON QUALITY OF CARRAGENAN SEAWEED (*Euchema spinosum*)

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ABSTRACT

This research aims to analyze influence of harvest age and location of cultivation on carragenan Euchema spinosum quality . The location of research was at Punaga waters, Takalar village. Treatment given age is 25, 30, 35 and 40 days and location 500m (inside) and 1000m (outside) from the beach with three replication. Data analysis used two way Anova and quality standards of the FAO, the FCC and EEC. The results obtained by treatment were the age of 30 days and 1000 m from the beach location provides the greatest yield carragenan of 60.90% and find the quality standards set.

Keyword: *Euchema spinosum*, harvest age, location, cultivation, quality of carragenan

INTRODUCTION

Seaweed is one of the marine plants that are categorized as low-level plant that have no leaves, stem, and roots, but, all parts of his body as actually composed of stem called *thallus*. Seaweed is also commonly called algae which consist of micro-algae and macro algae that many people used ini everyday life.

Along with advances in technology, the research ini the field of seaweed are also more commonly found. The world demand for seaweed now reached 300 thousand tons per year and will increase in the future, because it seaweed culture to day continues to be impoved. For example, the export value of Itndonesian seaweed from 2001-2005 continue to increase the 27,874 tons to 63.02 tons (Ditjen Perikanan Tangkap DKP RI, 2007).

The high demand is reasonable, because seaweed has many benefits in various fields. This is evidenced by the increasing number of discovaries about the new benefits of marine algae for various purposes. The seaweed have some of the benefits, such as for food and beverages, cosmetics and pharmaceuticals, and industrial fields. One of the new benefits of red algae species found *Ptilopohora* sp recently taken apart extracts agar, this type is also useful as a producer of paper pulp or pulp.

As a follow-up of Keppres No, 23 tahun 19B2 in an effort to develop marine aquaculture, seaweed farming has been introduced and began to be developed in several Indonesian waters. To support this activity needs to be exercised-test to examine methods that can be appfied nd the necessary modifications In accordance with environmental conditions vary, so as to obtain maximum results (Direktorat Jenderal Perikanan Budidaya, 2004).

One of the largest seaweed-producing areas in South Sulawesi is Takalar. In this region the parameter oceanagraphic canditions have a high enough value compared to other waters. High salinity and low rainfall resulted in only certain types of seaweed can be cultivated. A common type is maintained by the fishermen *Euchema spinosum* seaweed. Seaweed species are resistant to high temperatue and salinity. However, Information on harvest age that produce the quantity and quality of carrageenan the best is yet unknown. So in an effort to provide scientific information to the fishermen need to do a study to seen the effect of harvesting and location of cultivation on the quantity and quality of carrageenan.

RESEARCH METHOD

Time and Location Research

This research was conducted during August to December 2009 in coastal waters Punaga Takalar Village South, the geographical position 119027'17" east longitude and 50 4'44" (Figure 1). The extraction of carrageenan from *Euchema spinosum* conducted at the Laboratory of Chemical Oceanography, Faculty of Marine Sciences and Fisheries, Hasanuddin University.

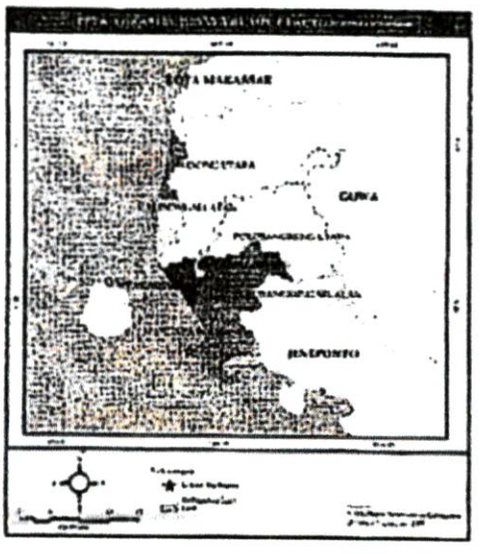

Figure 1. Research Sites Village of Punaga District Takalar

Materials and Equipment

Materials as an object of study is a red alga Euchema spinosum obtained from seaweed farmers in the village of Punaga waters. While the materials used for extracting carrageenan from *Euchema spinosum* were: KCl, KOH. Material for experimental cultivation of seaweed is *Euchema spinosum* seedlings plastic rope, weights and floats. The tools used in cultivation trials *Euchema spinosum* is digital balance, cool box (store samples) handrefractometer, thermometer, current meter.

Design Research

In this study, seaweed cultivation method used is long line (floating method). Seeds seaweed tied to a long rope stretched further in the waters of this research was

conducted four treatments 25 days of age, 30 days, 35 days and 40 days with repeated 3 times and two locations treatment are inside (500 m) and outside (1000 m) from the mainland. Each treatment *Euchema spinosum* seaweed that has been harvested later in the extraction to get a yield of carrageenan. Oceanographic parameters are measured is the current velocity, turbidity, temperature, salinity, dissolved oxygen nitrate, phosphate, total organic matter (BOT), Mg, metal content of Pb, Cu, Zn and As. To determine the quality of carrageenan produced from extraction *Euchema spinosum* are cultured on a variety of harvesting. Carrageenan quality tested include ash, sulfate, heavy metal content of Pb, Cu, As and Zn.

Data Analysis

To determine the quality of carrageenan yield was analyzed using Table 1.

Table 1. Carrageenan quality specifications

Specifications	FAO	FCC	EEC
The Ash content (%)	15-40	Max 35	15-40
Sulfat (%)	15-40	18-40	15-40
Heavy metal : Pb (ppm)	Max 10	Max 10	Max 10
Cu (ppm)	-	-	Max 50
Zn (ppm)	-	-	Max 25
As (ppm)	Max 3	Max 3	Max 3

While to know the difference in the treatment of harvesting age and locations of cultivation on the quality of carrageenan yield *Euchema spinosum* were analyzed using Two-way ANOVA. Significantly different if followed by Tukey test with SPSS program ver 12.

RESULTS AND DISCUSSION

Oceanographic conditions

Oceanographic conditions that have direct impact to marine life especially *Euchema spinosum* are temperature, salinity, turbidity, dissolved oxygen, nitrate, phosphate, total organic matter, heavy metals. Of all parameters measured showed oceanographic conditions suitable for growth of seaweed *Euchema spinosum* Tables 2 and 3.

Table 2. Condition parameters of surface temperature, salinity, turbidity, dissolved oxygen, at two locations cultivation

Location	Tem (℃)	Salinity (‰)	pH	Turbidity (NTU)	Dissolved Oxygen (mg/L)
Outside	27,6	37,3	7,9	2,3	5,8
Inside	27,9	36,7	7,9	4,0	5,0

Table 3. Condition parameters of nitrate, phosphate, total organic matter, heavy metals at two locations cultivation

Location	Nitrate (mg/L)	Orthophosphate (mg/L)	BOT (mg/L)	Mg (mg/L)	Pb (mg/L)	Cu (mg/L)	As (mg/L)	Zn (mg/L)
Outside	0,1	2,9	49,3	3759,5	0,6993	0,0545	<0,0001	0,0551
Inside	0,1	2,7	58,2	3630,1	0,7960	0,0622	<0,0001	0,0599

Rendement carrageenan

The average yield of carrageenan value generated in this study ranged from 30.32 ± 1.54 to 60.89 ± 1.81%. The highest yield value obtained from the treatment 30 days of harvesting, cultivation in the waters outside. While the value of the lowest yield at harvest age of 25 days of treatment, maintenance in deep water. Sucrose content generated in this study is still higher than the standard minimum requirements carrageenan yield set by the Department of Commerce (1989), namely by 25%.

Results Two-way ANOVA analysis showed that the age of harvesting and location of cultivation significantly affected the yield of carrageenan seaweed. There is interaction between treatment harvesting age and location of cultivation *Euchema spinosum* significantly affected the yield of carrageenan.

Based on information Tukey test, showed that the average harvest age of 30 days to provide the highest carrageenan yield and significantly different compared with harvest age 25, 35 and 40 days. Treatment locations cultivation in the waters outside gives a different effect on the yield of carrageenan.

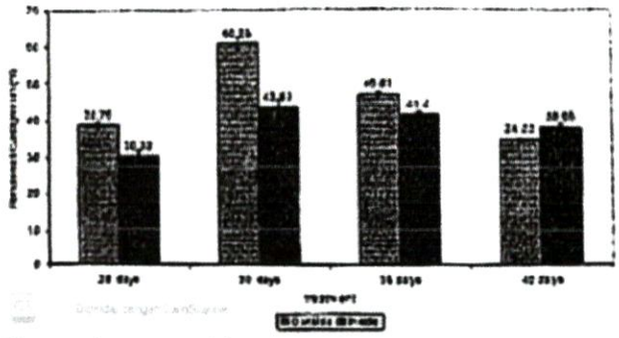

Figure 2. Effect of harvesting age and location cultivation on carrageenan seaweed Eucheuma spinosum

As Figure 2 shows that the age of 30 days of treatment and care locations in the waters outside the carrageenan yield was higher than other treatments. Content carrageenan yield decreased with increasing age of the seaweed *Eucheuma spinosum.* This is different to that found in the seaweed *Eucheuma cottoni* the older the age the higher the yield of carrageenan content.

Quality carrageenan

The Ash content

The value of ash obtained from the yield of carrageenan in the treatment of harvesting and farming area ranged from 40.83 0.37 to 49.12 + 0.80%. The lowest ash content obtained from the treatment 25 days of harvesting, cultivation in the waters outside (Figure 3). While the highest level of treatment 35 days of harvesting, maintenance in deep water. These results indicate that the ash content obtained carrageenan not meet quality standards set by the FAO of 15-40% and the FCC set a maximum of 35%.

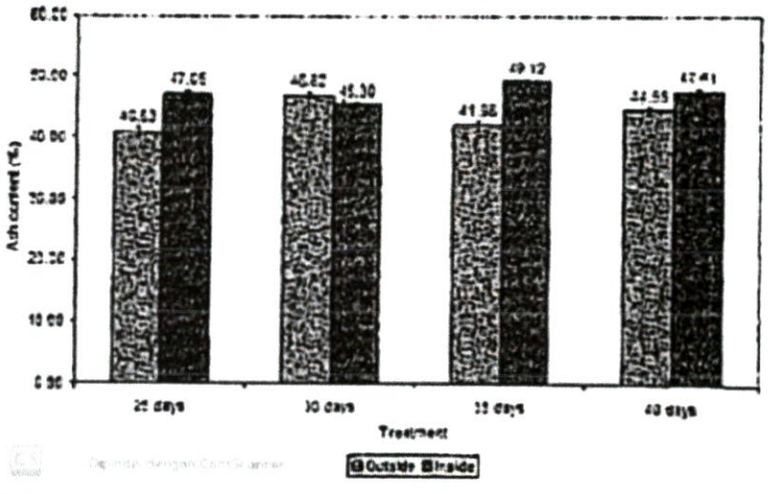

Figure 3. Effect of harvesting age and location cultivation on ash content seaweed Eucheuma spinosum

Sulfate Content

The extract of seaweed used to distinguish based on sulfate content. Sulfate levels obtained in the yield of carrageenan seaweed *Eucheuma spinosum* ranged from 16.13 ± 0.42 to 30.70 ± 0.75%. Levels of sulfate produced from *Eucheuma spinosum*

carrageenan still meet quality specifications standards carrageenan sulfate levels set by the EEC and the FAO and it ranged between 15-40%, while the FCC set 18-40%.

The Results of Two-way ANOVA analysis showed that age significantly affected crop sulphate content of carrageenan *Euchema spinosum*. While the treatment sites did not significantly affect carrageenan sulfate content *Euchema spinosum* seaweed. There is interaction between treatment harvesting age and location of cultivation and significantly affected the ash content of carrageenan.

Tukey test, showed that the average harvest age of 25 days to provide the lowest ash content of carrageenan was significantly different compared with harvest age 30, 35 and 40 days. The treatment of locations of cultivation in outside waters gives a different effect on ash content carrageenan.

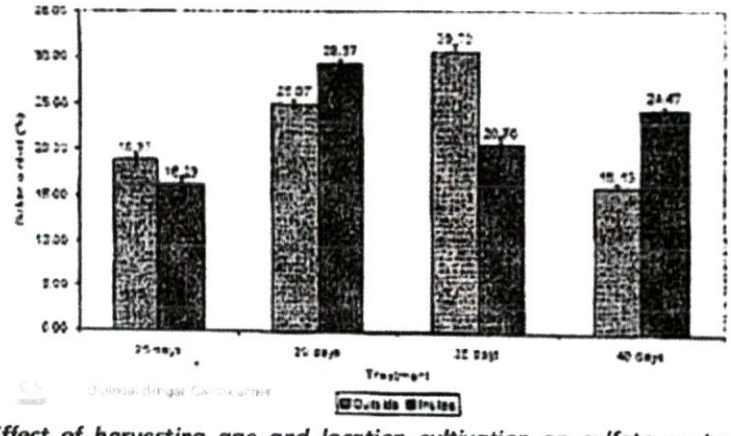

Figure 4. Effect of harvesting age and location cultivation on sulfate content seaweed Eucheuma spinosum

High or low content of sulfate in carrageenan yield is influenced by harvesting age and location of cultivation. The value of commercial carrageenan sulfate content amounted to 15.64%. Thus the yield of sulfate content in carrageenan is still quite high.

Heavy Metal Content

Analysis of heavy metal for products such as carrageenan seaweed *Eucheuma spinosum* very important, among others, to determine whether carrageenan is safe to be used or consumed for pharmaceutical products (medicines) and food products. Heavy metal content in the carrageenan *Eucheuma spinosum* can be seen in Table 4.

Table 4. Metal content on the carrageenan yield of Eucheuma spinosum

Treatment		Pb (mg/kg)	Cu (mg/kg)	Zu (mg/kg)	As (mg/kg)
Cultivation In outside waters	25 days	<0,0001	4,48	21,940	<0,0001
	30 days	<0,0001	8,64	14,841	<0,0001
	35 days	<0,0001	11,74	13,873	<0,0001
	40 days	<0,0001	5,47	11,067	<0,0001
Cultivation in In side waters	25 days	<0,0001	28,93	20,119	<0,0001
	30 days	<0,0001	42,79	8,735	<0,0001
	35 days	<0,0001	31,78	14,786	<0,0001
	40 days	<0,0001	54,66	20,292	<0,0001

From table 4 shows that the heavy metal content of Cu and Zn was found high on carrageenan seaweed *Eucheuma spinosum* which cultivation close to the mainland. But in general, heavy metal content in the carrageenan seaweed *Eucheuma spinosum* which are cultivated under the standard of quality that has been recognized carrageenan issued by the Food Agriculture Organization (FAO), the Food Chemicals Codex (FCC) and the European Economic Community (EEC).

Carrageenan from different harvesting age and location of cultivation treatment does not contain Pb and As, although Pb was found quite high in cultivation sites waters. While the content of Cu and Zn in carrageenan quite high. Both types of metals are included in the type of essential, so that entry through ion exchange. Zn is an element or a mineral needed by the seaweed. Heavy metal Zn entered into the seaweed through the cell wall of seaweed, which is then fused with proteins and polysaccharides. Carrageenan in this study contain Zn and Pb, but relatively few in number and meet the standards set by the EEC for Zn at 50 ppm and Cu is 25 ppm.

CONCLUSION

From the results of the discussion can be summarized as follows: the cultivation of seaweed *Eucheuma spinosum* harvesting age that produced the highest amount of carrageenan yield was the age of 30 days and cultivated in the waters far from shore (outside). In general, the quality of carrageenan produced remained at the quality standards of the Food Agriculture Organization (FAO), the Food Chemicals Codex (FCC) and the European Economic Community (EEC).

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