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EFFECT OF SALINITY DIFFERENCES ON PHYTOPLANKTON DENSITY (SKELETONEMA COSTATUM)

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ABSTRACT

This study aims to determine the effect of differences in salinity on the density of phytoplankton (Skeletonema costatum). The method in this study used a completely randomized design with 4 treatments and 3 replications. The parameters tested included the density rate of Skeletonema costatum. Data analysis uses One Way Anova to see the significance of the influence of treatment on the density of Skeletonema costatum and the density results of Skeletonema Costatum was analyzed descriptively. The highest average density of Skeletonema costatum was obtained at a salinity of 30 ppt (90,000 cells/ml), followed by a salinity of 25 ppt (Control) at (42,500 cells/ml), then a salinity of 20 ppt at (37,500 cells/ml) and the lowest at salinity 15 ppt of (32,500 cells/ml). Based on the ANOVA test, salinity had a significant effect on the density of Skeletonema costatum ($P<0.05$) with the best treatment being 30 ppt salinity. The results of analysis of Skeletonema costatum, a salinity of 30 ppt obtained the highest density

Keywords: Density; Salinity; Skeletonema costatum

Introduction

Phytoplankton are microscopic organisms that can photosynthesize because they have chlorophyll which functions to produce their own food. Skeletonema costatum is a natural feed that is widely used in fish and shrimp hatcheries that are still in the seed stage. For fish that are still fried, of course, the feed used must be appropriate, namely the size and texture according to the larvae. In other words, it must require feed that fits the fish's mouth opening, whether it's artificial feed such as pellets or live feed or natural feed such as plankton and other microscopic organisms (Rudiyanti, 2011).

Natural feed is the availability from nature. The availability of natural feed is an important factor in determining the success of a fish and shrimp hatchery because it has a major effect on the growth and survival of fish and shrimp. This is related to natural food which is a source of nutrition in meeting the needs of each growth phase of fish and shrimp, especially during the larval/seed phase (Mudlofdar et al., 2021)

Skeletonema costatum has several advantages compared to artificial feed, because it has enzyme autolysis itself so that it is easily digested by the larvae and does not contaminate the cultivation media (Ratnawati et al., 2022). S. costatum is widely used in shrimp farming because of its high nutritional content, namely 59% protein, 8% fat, and 33% carbohydrates (Rudiyanti, 2011).

The development of S. costatum is directly related to what is dissolved in the water. Therefore, water quality directly influences the health and growth of cultivated

organisms (Sambu et al., 2016). Water quality is expressed by several parameters, namely physical parameters, including temperature, salinity, turbidity, and dissolved solids. Chemical parameters: pH, dissolved oxygen, BOD, metal content. Biological parameters: the presence of plankton, and bacteria (Effendi, 2003).

Salinity is one of the factors affecting the growth of S. costatum. Most of the diatoms are very sensitive to changes in the salt content of the water. The life of various types of phytoplankton including S. costatum depends on the salinity of the waters. The salinity factor is very important because it directly affects the osmotic pressure of the body (Muhsoni, 2021).

Supriyantini's research, (2013) regarding the use of salinities of 15, 20, 25, and 30 ppt on the nutritional content of S. costatum. Regarding the results of his research, it was found that a good salinity for cultivating natural feed for S. costatum is a salinity of 15 ppt. Based on this research, it is necessary to carry out further research to determine the good salinity on the density of S. costatum phytoplankton.

Research Method

Time and Place of Research

This research was conducted in November at the Po Niang Beach Fish Seed Center (BBIP) Poniang, Poniang Hamlet, Tallu Banua Village, Sendana District, Majene Regency, West Sulawesi Province.

Data analysis

The data of the density of S. costatum that has been obtained is analyzed with the One Way Anova, which aims to find out the influence of the treatment given on the density of S. costatum, at a confidence level of 95%. If the treatment has a significant effect on the test parameters, Tukey's further test will be performed with SPSS software version 22.00.

Result And Discussion

Cell Density*Skeletonema costatum*

The results of this study are to find out how the influence of salinity on density*S. cost* which is the ratio between the density level of each treatment with the control density level. Density*S. costed* displayed on table 1 following:

Table 1. Average Cell Density of Skeletonema costatum

Treatment	Connected			Rerata±SD
	1	2	3	
15 ppt	10.000	10.000	12.500	10.833±1443,38[a]
20 ppt	10.000	12.500	15.000	12.500±2500,00[a]
25 ppt (Control)	12.500	15.000	15.000	14.1667±1443,38[a]
30 ppt	25.000	30.000	35.000	30.0000±5000,00[b]

Results Analysis Anova variances show that different salinities have a significant effect on density*St. costum* (P<0.05). The results from the observation of the treatment can be seen that the level of density *St. costum* highest during the study in treatment D with a salinity of 30 ppt, namely (90,000 cells/ml) with a mean ± SD (30.0000±5000,00[b]) followed by treatment C with a salinity of 25 ppt (Control) of (42,500 cells/ml) Mean ± SD (14.167±1443,38[a]), in treatment B with a salinity of 20 ppt (37,500 cells/ml) Mean±SD (12,500±2500,00[a]), and for treatment A with a salinity of 15 ppt showed the lowest value of (32,500 cells/ml) Mean ± SD (10.833±1443,38[a]).

Based on the Tukey test, the results of this study (Appendix 7) show that the salinity is different from the density. *custom*. Where treatment A (salinity 15 ppt), treatment B (salinity 20 ppt), and Treatment C (salinity 25 ppt or control) were not significantly different. While treatment A (15 ppt), B (20 ppt), and C (25 ppt or control), was significantly different from treatment D (salinity 30 ppt).

To see the density. *cost* i.e. using tools *Haemocytometer* with the help of a microscope. To count and observe plankton in sections fourth side of the tool *Haemocytometer* which consists of A1, A2, A3, and A4 up to density. *cost* can be seen on a microscope. On observation, *S*. *cost* at 30 ppt salinity can increase the density, this increase is assisted by the availability of sufficient nutrients and environmental factors such as temperature and light intensity. This occurs in treatment D because the range of salinity has a positive effect, namely an increase in density because a salinity of 30 ppt is the optimal range of salinity for density.*S*. *cost* (Arbit, 2021). Based on the observations made during the study, the best treatment to produce cell density*St. costum* is treatment D at a salinity of 30 ppt. This also fits the view (Waspodo & Setyono, 2020) that cell*S*. *cost* can adapt well to sharp cell decline with changes in medium quality at 32 ppt salinity, so cells can grow quickly.

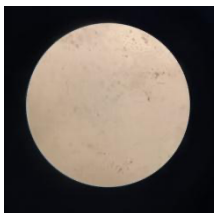
Treatment C showed stable growth with a salinity of 25 ppt (control), this is in accordance with the study that treatment C or control has stable population growth both increasing and decreasing the cell population. Cells can grow well because cells no longer have to adapt to changes in environmental salinity. *St. custom* can adapt to salinity and media conditions and can grow well if supported by sufficient nutrients and environmental factors such as temperature, light intensity, and pH (Hasim et al., 2022)

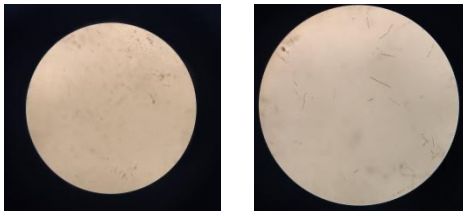
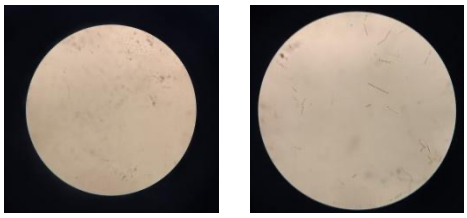
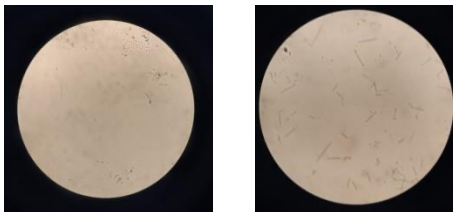
In contrast to Treatments A and B in this study, it had the lowest average value, as was the opinion of Rudiyanti (2011) that cells could not adapt or die due to insufficient media salinity. In contrast, Apriliyanti researcher *al*. (2008), states that the best growth and nutrient content *costume* at a salinity of 15 ppt. Research results from Suprianto (2013), stated that the water content. *custom* ranging from 7.78% - 12.68% salinity 25 ppt with the highest water content of 12.68%. According to(Material & Relevance, 2021)Water is the main component of protoplasm and plays an important role in cell metabolism.

In culturing. *cost* using a different salinity with a salinity of 25 ppt and 30 ppt, to get maximum results on growth, it is better to harvest on the 2nd and 3rd day to get maximum results (Husma, 2017). The salinity factor is very important because it direct influence osmotic pressure.*S*. *cost* can grow in a wide range of salinity, namely 15-34 ppt and the best salinity for growth is 20-30 ppt (Putri, 2023)

Here is a picture. *custom* before and after the experiment can be seen in Table 4 below:

Table 2 Skeletonema costatum before and after the experiment (Personal Doc.)

Treatment	Preliminary observational sample	Final observation sample	Information
15 ppt			1. The first observations under the chain microscope. *costum* short and underdeveloped. 2. Observation after 24 hours. *costum* changes,

		namely the chain begins to elongate and enlarge even though it is not solid.
20 ppt		1. The first observations under the chain microscope*St. costum* short and underdeveloped. 2. Observation after 24 hours,*S. experienced* a chain change that begins to lengthen and grow even though it is not too dense.
25 ppt (Control)		1. The first observations under the chain microscope. *costum* short and underdeveloped. 2. Observation after 24 hours, *St. custom* undergoes long chain changes and is well developed and dense.
30 ppt		1. The first observations under the chain microscope. *costum* short and underdeveloped. 2. Observation after 24 hours. *custom* long chain can grow and develop well and is very dense.

Water quality

The results of water quality measurements showed that the water temperature during the study was still a strangely decent temperature. Water quality measurements are carried out at the beginning and at the end. The range of water quality during the study is presented in the following table:

Table 3 Water Quality Range

Water Quality Parameters	Treatment			
	15 ppt	20 ppt	25 ppt (Control)	30 ppt
DO	4,6-,6,9	4,1-6,2	5,0-6,5	5,3-5,9
pH	7-8	7-8	7-8	7-8
Temperature	31,3-31,8	31,9-32,2	31,6-32,2	31,2-31,5

Water temperature measurements during the study varied between 31.2 and 32.2 °C respectively (Syafruddin et al., 2014) and the optimal temperature for plankton growth is 25-32 °C. The rise in water temperature is caused by the heat of the sun, so the temperature rises. To maintain ecological survival and reproduction, changes in temperature result in differences in composition and abundance. *cost* (Nur & Fitriah, 2021). Temperature directly affects the development and growth of phytoplankton, with the optimum temperature to support plankton growth is 20-30°C (Soliha & Rahayu, 2018). changes in temperature can affect the salinity in the rearing vessel, as said (Andi & Akhmad, 2008), temperature has a significant effect on chemical and biological processes.

Dissolved oxygen values during the research process ranged from 4.1 to 6.9 ppm. The results obtained for density. *cost is* still good, as mentioned by (Kadim et al., 2017), where it is stated that the amount of dissolved oxygen is good for growth media. *cost* is between 3-7 ppm varies. The process of breathing requires DO, which is oxygen dissolved in water. In general, the presence of DO in water is influenced by changes in temperature, pressure, and the concentration of various ions that enter the water, the higher the temperature, the lower the DO concentration and vice versa. (Sidaningrat et al., 2018)

The results of measuring acidity or pH during the research process varied between 7-8. From these results, it can be said to be good for density. *cost*, (Barus, 2004), mentioning the ideal pH for living organisms is usually between 7 to 8.5. Water conditions that are very acidic or very alkaline endanger the survival of organisms because they cause metabolic and respiratory diseases. Simanjuntak (2012) states that changes in the pH of water bodies affect the life of organisms because each organism has certain limits for different pH levels.

Conclusion

Based on the results of the research that has been done, it can be concluded that: Different levels of salinity in the treatment show a significant effect on density. *cost*., good range of salinity to density. *the cost* in this study is the salinity of 30 ppt.

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