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FREQUENCY ADMINISTRATION OF FERMENTED CRAB SHELL FLOUR SOLUTION USING BREAD YEAST ON POPULATION GROWTH OF *Daphnia* sp.

Administrasi Frekuensi Larutan Tepung Kepiting Fermentasi Menggunakan Ragi Roti Terhadap Pertumbuhan Penduduk *Daphnia* sp.

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ABSTRACT

Hatchery is an activity in fish farming which in its development often experiences various obstacles, including high larval mortality. This is because the larvae have very small mouth openings making it difficult to consume suitable food. Efforts that can be made to overcome this problem are by providing food that suits the larva's mouth opening. The aim of this research was to determine the effect of fermented crab shell flour on population growth of Daphnia sp. This research was carried out from March to April 2020 at km.4 Nagori Wonorejo, Pematang Bandar District, Simalungun Regency, North Sumatra Province. The design used in this research was a Completely Randomized Design (CRD) with six treatments and four replications. The treatment given is A = Frequency of administration 1 time/day at 07.00 WIB. B = Frequency of administration 2 times/day at 07.00 and 17.00 WIB. C = Frequency of administration 3 times/day at 07.00, 12.00 and 17.00 WIB. D = Frequency of administration 1 time/2 days at 07.00 WIB. E = Frequency of administration 2 times/2 days at 07.00 and 17.00 WIB. F = Frequency of administration 3 times/2 days at 07.00, 12.00 and 17.00 WIB. Observation parameters include Daphnia sp population growth, *Daphnia* sp population density, and Daphnia sp growth rate. The results of the research showed that the frequency of giving fermented crab shell flour had an effect on the population of Daphnia sp at the age of 6 DAP - 14 HST, the population density of Daphnia sp., the frequency of giving fermented crab shell flour was optimal on the population growth of Daphnia sp. is given 3 times/day at 07.00 WIB, 12.00 WIB and 17.00 WIB.

ABSTRAK

Pembenihan merupakan suatu kegiatan budidaya ikan yang dalam perkembangannya sering mengalami berbagai kendala, diantaranya adalah tingginya angka kematian larva.

Hal ini dikarenakan larva memiliki bukaan mulut yang sangat kecil sehingga sulit untuk mengonsumsi makanan yang sesuai. Upaya yang dapat dilakukan untuk mengatasi permasalahan tersebut adalah dengan memberikan makanan yang sesuai dengan bukaan mulut larva. Tujuan penelitian ini adalah untuk mengetahui pengaruh tepung cangkang rajungan yang difermentasi terhadap pertumbuhan populasi Daphnia sp. Penelitian ini dilaksanakan pada bulan Maret sampai April 2020 di km.4 Nagori Wonorejo, Kecamatan Pematang Bandar, Kabupaten Simalungun, Provinsi Sumatera Utara. Rancangan yang digunakan dalam penelitian ini adalah Rancangan Acak Lengkap (RAL) dengan enam perlakuan dan empat ulangan. Perlakuan yang diberikan A = Frekuensi pemberian 1 kali/hari pada pukul 07.00 WIB. B = Frekuensi pemberian 2 kali/hari pada pukul 07.00 dan 17.00 WIB. C = Frekuensi pemberian 3 kali/hari pada pukul 07.00, 12.00 dan 17.00 WIB. D = Frekuensi pemberian 1 kali/2 hari pada pukul 07.00 WIB. E = Frekuensi pemberian 2 kali/2 hari pada pukul 07.00 dan 17.00 WIB. F = Frekuensi pemberian 3 kali/2 hari pada pukul 07.00, 12.00 dan 17.00 WIB. Parameter pengamatan meliputi pertumbuhan populasi Daphnia sp, kepadatan populasi Daphnia sp, dan laju pertumbuhan Daphnia sp. Hasil penelitian menunjukkan bahwa frekuensi pemberian tepung cangkang rajungan fermentasi berpengaruh terhadap populasi Daphnia sp umur 6 HST – 14 HST, kepadatan populasi Daphnia sp., frekuensi pemberian tepung cangkang rajungan fermentasi. optimal terhadap pertumbuhan populasi Daphnia sp. diberikan sebanyak 3 kali/hari pada pukul 07.00 WIB, 12.00 WIB, dan 17.00 WIB.

Kata kunci	*Daphnia sp., tepung cangkang rajungan, fermentasi, ragi roti*
Keywords	*Daphnia sp., crab shell flour, fermentation, bread yeast*
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INTRODUCTION

Daphnia sp. are small crustaceans or often called water fleas that live in fresh waters. This animal is a type of natural food that has the potential to be developed for freshwater fish hatchery activities. The food given to fish larvae is generally natural food, including from the Cladocera group, namely *Daphnia* sp. *Daphnia* sp. is zooplankton which has a relatively small body size ranging from 0.3-1 mm and has quite good nutritional content (Ansaka, 2002).

Bidura (2007) in Setiawan (2017) stated that organic materials containing protein, fat and carbohydrate nutrients can be utilized by bacteria through the breakdown of organic materials in feed availability to support the growth of *Daphnia* sp. Organic materials are broken down through a probiotic bacterial fermentation process. The process of 1 2 fermentation of feed ingredients by microorganisms causes beneficial changes such as improving the quality of feed ingredients, both in terms of nutritional aspects and digestibility as well as increasing their shelf life.

One organic material that can be used as a Daphnia culture medium is crab shells. Crab shells contain beneficial chemical compounds such as protein, minerals and chitin in quite large quantities. Based on 2003 data from the Department of Maritime Affairs and Fisheries, unutilized chitin waste amounts to 56,200 metric tons per year. This waste has not been utilized properly and efficiently, in fact most of it is waste which also pollutes the environment.

Various previous studies have been carried out to replace chicken manure as a culture medium for *Daphnia* sp., starting from providing feed from various livestock manure including quail chicken manure (Gunawanti, 2000) and horse manure (Sanyoto, 2000), providing feed with baker's yeast (Sulasingkin, 2003), feeding with soaked bran (Suryaningsih, 2006 in Mubarak, et al., 2009), to using rice bran fermented using Saccharomyces cerivisae contained in baker's yeast (Sitohang et al., 2012). In his research, giving 125 mg/L of yeast fermented bran (Saccharomyces cerevisiae) resulted in population growth of Daphnia sp. the highest (peak population) occurred during the 12 day culture period at 177 individuals/L (Sitohang, et al., 2012). Based on this scientific information, it is necessary to study research regarding fermentation of crab shell flour to increase population growth of *Daphnia* sp. which is cultured.

The aim of this research was to determine the population, growth rate and density of *Daphnia* sp. The hypothesis used in this research is: H0: there is no effect of giving crab shell flour on the population, density and growth rate of Daphnia sp. H1: There is an effect of giving crab shell flour on the population, density and growth rate of *Daphnia* sp.

METODE PENELITIAN

Experimental design

The research used a completely randomized design (CRD) with 6 treatments and 4 repetitions, namely A = Frequency of administration 1 time/day at 07.00 WIB. B = Frequency of giving 2 times/day at 07.00 and 17.00 WIB C = Frequency of giving 3 times/day at 07.00, 12.00 and 17.00 WIB D = Frequency of giving 1 time/2 days at 07.00 WIB E = Frequency of giving 2 times/ 2 days at 07.00 and 17.00 WIB F = Frequency of administration 3 times/2 days at 07.00, 12.00 and 17.00 WIB.

Research procedure

Preparation of Tools and Materials

Implementation of culture begins with sterilizing culture equipment to minimize contaminants that can inhibit the productivity of *Daphnia* sp. The plastic jars and glassware used are washed with soap and left to air dry for 24 hours (Gunawanti, 2000). The crab shells are ground and filtered then placed in a tightly closed jar to avoid contamination before use. The tools used in this research were 30 5 liter plastic jars, pH meter, thermometer, DO meter, filter, plastic bag, dropper pipette, aerator, microscope, measuring cup, analytical scale, and gauze. Meanwhile, the materials needed in this research are Daphnia seeds, crab shell flour, bread yeast, and clean water.

Container Preparation

The container used in culturing *Daphnia* sp. namely using 30 5 liter jars with a volume of 3 liters of water used then aerating. The container settings and layout can be seen in the following image:

I
B
C
F
D
A
E

II
A
F
D
E
C
B

III
B
D
A
C
E
F

IV
C
A
E
B
F
D

Preparation of *Daphnia* sp. Seeds.

Daphnia sp. used in this study came from *Daphnia* sp. which has been cultured first in a plastic bucket with a water volume of 15 liters and uses chicken manure as feed. After Daphnia sp. It grows on the 7th day of the culture period, then filtered using a filter and Daphnia sp. transferred to each container according to treatment.

Research Implementation

1. Making crab shell flour
   5 kg crab shells→ washing of dirt with running water → drying under the sun for 2 days→ smoothing using a blender → sifting → crab shell flour.
2. Fermentation procedure for crab shell flour
   100 grams of crab shell flour put in a plastic bag add 10 ml of hot water (45-650C) → weighing 8 grams of bread yeast → homogeneous → Place in a plastic container for 48 hours.
3. Harvesting Daphnia sp.
   Container for culturing Daphnia sp. Use a 5 liter jar with a volume of 3 L of water then aerate it. In each treatment, Daphnia sp. stocked at 20 ind/l. Furthermore, maintenance is carried out until the first peak population density has passed, or for approximately 18 days (Meilisa, 2015).
4. Harvesting Process of *Daphnia* sp
   Harvesting is done by harvesting all the Daphnia sp. in the culture media using a fine scope net.
5. Length of Reaching Peak Population of *Daphnia* sp.
   According to Darmawan (2014), increasing population growth of *Daphnia* sp. occurs because before reaching the peak, the feed concentration in the media is more than the maintenance requirements (amount of feed that does not affect growth) of Daphnia sp. This excess energy is then utilized by Daphnia sp. to grow and reproduce. Daphnia sp. begins to reproduce at the age of five days and will then reproduce every one and a half days.

Observation Parameters

1. Population of Daphnia sp.
   The population count was calculated manually, namely counting *Daphnia* sp. samples in each container. Calculation of Daphnia sp. manually done on a petridish.
2. Density of Daphnia sp.
   Peak population density of *Daphnia* sp. calculated in the morning during maintenance. The number of individuals was obtained by taking a 25 ml sample using a film bottle 3 times (Sanyoto, 2000). Then put it in a bowl and then count it. *Daphnia* sp. density was calculated based on Ansaka (2002).

$$\boldsymbol{K = \frac{L}{l}\ x\ A}$$

Note: K = Density of Daphnia sp. (ind/liter); L = Culture media water volume (L); l = Sampling water volume (L); A = On average Daphnia sp. Sampling calculation results (ind/liter).

3. Population Growth Rate of Daphnia sp.

According to Kusumaryanto (2008), population growth of *Daphnia* sp. calculated from the first day to the peak of the population using the formula:

$$\boldsymbol{g = \frac{Ln\ \ Nt - Ln\ No}{t}\ x\ 100\%}$$

Note: g = population growth rate of Daphnia sp (% hari-1) ; No = Number of *Daphnia* sp. at the start of maintenance (ind/liter air); Nt = Number of Daphnia sp. at the peak of population (ind/liter air); T = maintenance time (days)

Data Analysis

The data obtained is presented in the form of tables and graphs. This data includes the peak density of the first cycle, population growth rate, the length of time the peak population reached, and the physical chemistry of the water. Data on the peak density of the first cycle, the population growth rate, the length of time the peak population reached Daphnia sp. The mean is analyzed using analysis of variance, if there is a significant difference then proceed to the Least Significant Difference (BNT) test with a confidence level of 95%. The physicochemical parameters of water are presented descriptively.

HASIL DAN PEMBAHASAN

Population of *Daphnia* sp.

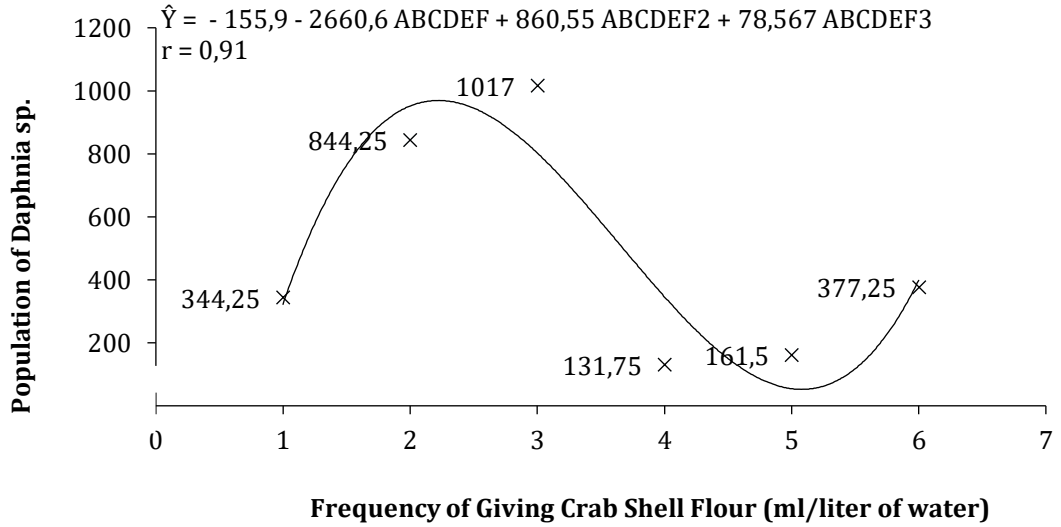
Data from observations and analysis of variance of the Daphnia sp population at 2 HST to 14 DAT can be seen in Appendix 5 – 29. From the results of the variance analysis it can be seen that the frequency of giving fermented crab shell flour has a very significant effect on the population of Daphnia sp. at the age of 6 HST – 14 HST. Meanwhile, at the age of 2 DAP – 5 DAT, the frequency of giving fermented crab shell flour did not have a significant effect on the population of Daphnia sp. Test results of differences in the average frequency of administration of fermented crab shell flour on population growth of Daphnia sp. at the age of 14 HST can be seen in Table 1.

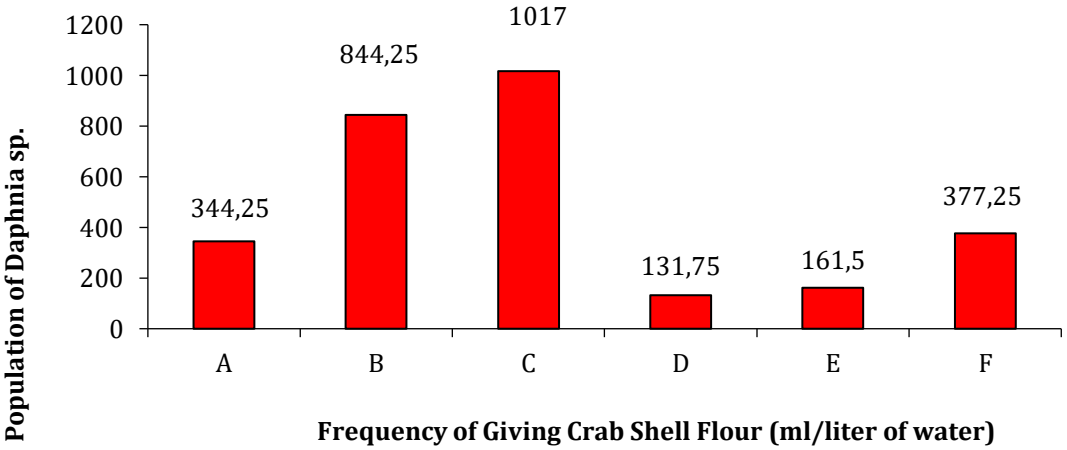
Table 1. Average Difference Test Results of Treatment on Population Growth of *Daphnia* sp. Age 14 HST

Treatment	Average
A	344,25 c
B	844,25 b
C	1017,00 a
D	131,75 e
E	161,50 d
F	377,25 c
KK	55,76%

Note: Different numbers in the same row and column show very significant differences at the 5% level using the Duncan Test

From Table 1 above, it can be seen that the frequency of giving fermented crab shell flour with treatment C (the frequency of giving 3 times per day at (07.00 WIB, 12.00 WIB and 17.00 WIB)) shows the optimal frequency in producing the highest Daphnia sp population, namely 1.017 .00. Very significantly different from treatment B, namely 844.25, A, namely 344.25, F, namely 377.25, E, namely 161.50 and D, namely 131.75, which is the lowest population. Optimizing the frequency of giving fermented crab shell flour to the Daphnia sp population can be seen in Figure 2 and Figure 3.





From the picture above, it can be seen that the optimal frequency for population growth of Daphnia sp. is treatment C, namely the frequency of administration 3 times per day at (07.00 WIB, 12.00 WIB and 17.00 WIB) namely 1.017.

Based on the results of analysis of variance, it shows that the frequency of giving crab shell flour has an effect on the population of Daphnia sp. The observation results show that the population of *Daphnia* sp. The highest was shown in treatment C (Frequency of administration 3 times/day at 07.00, 12.00 and 17.00 WIB) amounting to 1017.00. This is followed by treatment B, namely 844.25, treatment A, namely 344.25, treatment F, namely 377.25, treatment E, namely 161.50, treatment D, namely 131.75.

The results of the diversity coefficient significance test show that the level of diversity is above 55.76%, this shows that the population of *Daphnia* sp. that have developed are very diverse. Based on the results of the observations that have been made, it can also be seen that the Daphnia population in each treatment can be seen clearly on the graph. In the graph it can be seen that every day the population of *Daphnia* sp. in each treatment has increased starting from day 6 onwards until the peak population on day 14. The graph shows that every day *Daphnia* sp. has experienced an increase in population both those using the treatment and control,

This is because the reproduction period for *Daphnia* is 4 days after planting, and on days 6 to 13 many of the eggs from the parents have hatched, resulting in a high increase in population numbers. At the beginning of stocking, the parent *Daphnia* sp. are at the stage of adapting to the cultivation media and then preparing to reproduce themselves. This stage is known as the lag phase and occurs until the 4th day after the parent stocking. On the 4th to the 11th day the population growth of Daphnia sp. Is in log or exponential phase. According to Darmawan (2014), Daphnia sp. in the log phase they have adapted to the media, and reproduce themselves asexually or parthenogenesis which will produce female individuals continuously until they reach a certain point known as the stationary phase. Population of *Daphnia* sp. It increases every day until it reaches the peak population that occurred in this study, namely on the 14th day for all treatments. However, during this research, the stationary phase did not occur because after the peak population of *Daphnia* sp. growth pattern of *Daphnia* sp. immediately experienced a drastic decline. Population of *Daphnia* sp. It increased every day until it reached the peak population which occurred on the 14th day for all treatments. Even though the peak population occurred on the 14th day for all treatments, the peak population density of *Daphnia* sp. different. Next, the final phase is the death phase which is marked by a decrease in the population of *Daphnia* sp. drastically in a short time which illustrates the mass death of Daphnia sp. in cultivation media. This death occurred as a result of the high density of *Daphnia* sp. In cultivation media, this results in competition to continue to survive.

Population Density of Daphnia sp.

From the results of the variance analysis, it can be seen that the frequency of administration of fermented crab shell flour has a significant effect on the population density of Daphnia sp at the peak population age of 14 HST. Test results of differences in

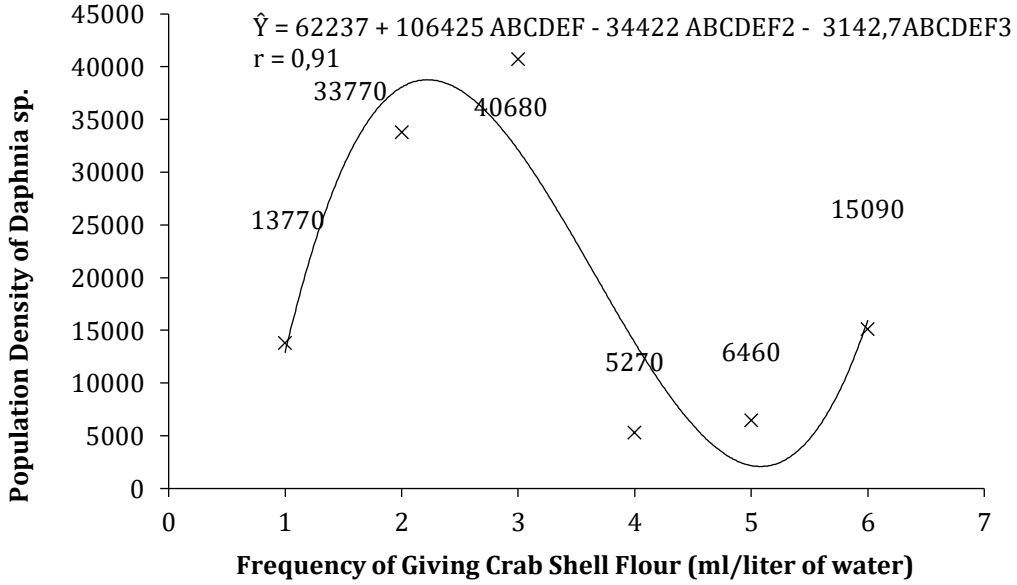
the average frequency of administration of fermented crab shell flour on the population density of Daphnia sp. age 14 HST can be seen in Table 2.

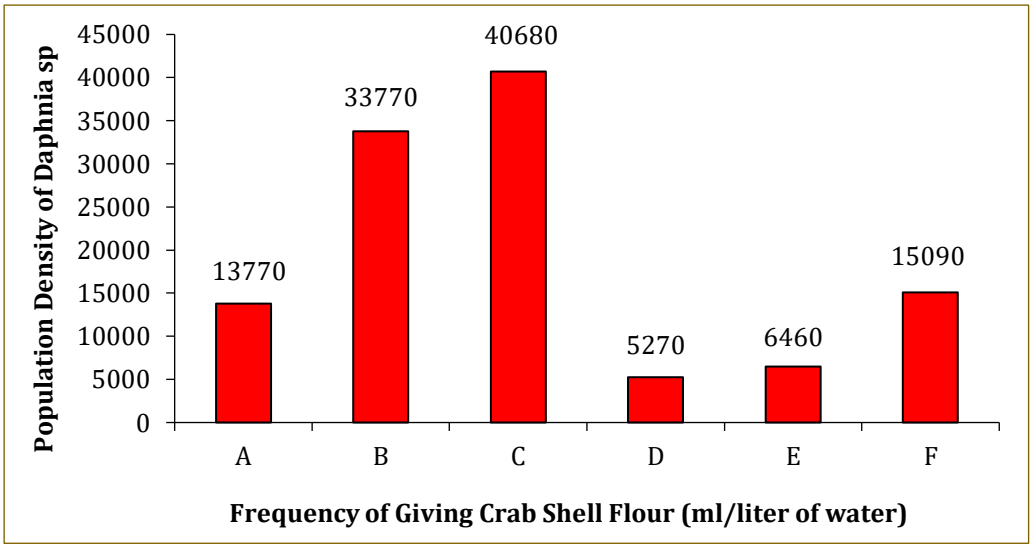
Tabel 2. Hasil Uji Beda Rata-rata Optimalisasi Frekuensi Pemberian Tepung Cangkang Rajungan terhadap Kepadatan Populasi *Daphnia* sp pada Populasi Puncak Umur 14 HST

Treatment	Average
A	13770,00 d
B	33770,00 b
C	400680,00 a
D	5270,00 f
E	6460,00 e
F	15090,00 c
KK	55,76%

Note : Different numbers in the same row and column show very significant differences at the 5% level using the Duncan Test

From Table 2 above, it can be seen that the frequency of giving fermented crab shell flour with treatment C (the frequency of giving 3 times per day at (07.00 WIB, 12.00 WIB and 17.00 WIB)) shows the optimal frequency in producing population density of Daphnia sp. the highest was 40,680. Very significantly different from treatment B, namely 33,770, F, namely 15,090, A, namely 13,770, E, namely 6,460, and D, namely 5,270, which is the lowest population density. Optimizing the frequency of fermented crab shell flour on the population density of Daphnia sp can be seen in Figure 4 and Figure 5.





From the picture above, it can be seen that the optimal frequency for population growth of Daphnia sp is treatment C, namely the frequency of administration 3 times per day at (07.00 WIB, 12.00 WIB and 17.00 WIB) namely 40,680.

Based on the results of analysis of variance, it shows that the frequency of giving crab shell flour has an effect on the population density of Daphnia sp. The observation results show that the population density of Daphnia sp. The highest was shown in treatment C, namely the frequency of administration 3 times/day at 07.00, 12.00 and 17.00 WIB.

Even though the peak population occurred on the 14th day for all treatments, the peak population density of Daphnia sp was significantly different, namely the analysis of variance showed that the administration of crab shell flour fermented with baker's yeast with a frequency of 3 times per day was given every day (treatment C) produced the highest peak population density of Daphnia sp. and was significantly different from the other treatments. Meanwhile, giving fermented crab shell flour extract with baker's yeast with a frequency of 1 time per day given every 2 days (treatment D) produced the peak population of Daphnia sp. lowest but not significantly different from giving fermented crab shell flour extract with baker's yeast with a frequency of administration once per day given every day (treatment A) and giving fermented crab shell flour extract with baker's yeast with a frequency of giving 2 times per day given every 2 day (treatment E).

The high peak density in the first cycle of the Daphnia sp population. in treatment C compared to other treatments, it is suspected that giving fermented bran juice with a frequency of 3 times per day given every day has met the nutritional needs of Daphnia sp. The nutritional content in the culture media influences the availability of the amount of feed needed for reproduction. According to Zahidah (2012), adequate food conditions for Daphnia sp. young can affect the growth and molting of Daphnia sp. Becoming an adult individual and able to reproduce by parthenogenesis, resulting in an increase in individuals several times over.

The difference in population density at the peak of the population is thought to be

due to differences in the frequency of crab shell flour used, and differences in the amount of nutrients contained in each treatment. Apart from that, there were also differences in the initial stocking density of each treatment. When the population of Daphnia sp. reaches the peak, then the individual density level of Daphnia sp. reaches climax, so that the nutrients available in the culture medium decrease. Environmental factors that determine the abundance of Daphnia populations include factors that depend on population stocking density, such as lack of feed, oxygen and space due to the rapid increase in population.

Population Growth Rate of Daphnia sp.

From the results of the analysis of variance, it can be seen that the frequency of administration of fermented crab shell flour has no significant effect on the growth rate of Daphnia sp. Test results of differences in the average frequency of administration of fermented crab shell flour on the growth rate of Daphnia sp. can be seen in Table 3.

Table 3. Average Difference Test Results for Optimizing the Frequency of Giving Crab Shell Flour on the Growth Rate of Daphnia sp

Treatment	Average
A	18,00
B	45,75
C	55,25
D	22,50
E	8,75
F	19,75
KK	72,63%

From Table 3 above, it can be seen that the frequency of giving fermented crab shell flour with treatment C (the frequency of giving 3 times per day at (07.00 WIB, 12.00 WIB and 17.00 WIB)) shows the optimal frequency in accelerating the growth rate of Daphnia sp, namely 55 .25. This is followed by treatment B, namely 45.75, D, namely 22.50, F, namely 19.75, A, namely 18.00, and E, namely 8.75, which is the slowest growth rate.

Based on the results of analysis of variance, it shows that the frequency of giving crab shell flour has no effect on the growth rate of Daphnia sp. The observation results show that the growth rate of Daphnia sp. The highest was shown in treatment C, namely the frequency of administration 3 times/day at 07.00, 12.00 and 17.00 WIB, the growth rate of Daphnia sp. 55.25.

According to Zahidah et al. (2012), that the high population density of Daphnia spp when it reaches its peak population indicates that the population has a growth rate that is higher than its mortality rate. Meanwhile, the growth rate and mortality of Daphnia cannot be separated from the function of feed. Feed for cultured Daphnia is nutrition added to the culture medium. Therefore, based on the results above, it shows that the treatment in the form of differences in the frequency of giving crab shell flour causes an influence on the growth rate and total density at the peak of the population.

Entering the stationary phase, the population growth rate of Daphnia sp. Starting to

experience a decline due to the availability of feed in the cultivation media not being able to meet the needs of Daphnia sp. contained in the cultivation container to grow optimally. The stationary phase lasts a short time and occurs on the 14th day. The stationary phase generally describes the peak of population growth until a drastic decline in population numbers is caused by mass deaths (Darmawan, 2014).

There was no effect of shellfish flour on the growth rate of Daphnia sp. This is because when it reaches peak population, Daphnia is in the process of maturation on day 13. This is in accordance with the opinion of Kusumaryanto (2001) who states that Daphnia sp. become adults at the age of fourteen days and die at the age of twelve days.

Apart from that, the absence of influence of crab shell flour on growth rate was due to environmental conditions. Daphnia can grow and develop quickly, this is because the environmental conditions are suitable for their life. An environment that suits Daphnia's living needs will cause Daphnia's lifespan to be longer, apart from that, food is one of the main factors causing an increase in the population rate of Daphnia sp.

Water Quality

Based on research, water quality measurements have been carried out, namely temperature, pH and DO. Water quality observations can be seen based on Table 4.

Table 4. Data on average results of Water Quality measurements

Parameters	Treatment	Value Range
Temperatur (^{0}C)	A	29-30
	B	26-27
	C	24-29
	D	25-30
	E	24-27
	F	26-28
pH	A	6,7-7,0
	B	6,9-7,4
	C	7,0-7,6
	D	6,9-7,2
	E	6,8-7,9
	F	6,7-7,0
DO	A	3,51-4,36
	B	3,17-4,61
	C	3,87-4,95
	D	3,90-4,95
	E	4,02-4,90
	F	3,50-4,36
Amoniak	A	0,01-0,02
	B	0,01-0,02
	C	0,01-0,02
	D	0,01-0,02
	E	0,01-0,02
	F	0,01-0,02

Temperatur

The media temperature range is 24ºC - 30ºC, this is in accordance with the opinion of Mudjiman in Kusumaryanto (2001), who states that Daphnia sp. will grow and develop well in a circle with a temperature of 21ºC - 31ºC and Daphnia sp. become adults in 4 – 6 days. Outside this range Daphnia sp. will tend to be in a dormant condition. Khan and Khan (2008) also explained that when the temperature was increased to 6ºC, Daphnia sp became more active, there was an increase in heart rate and breathing, as well as adapting to a smaller size and mass. Sanyoto (2000) also stated that Daphnia sp. requires an environment with a temperature of 21ºC.

Dissolved Oxygen

In this study, dissolved oxygen (DO) measurements were carried out on each sample. To get the results from the DO measurements, each repetition is summed after which the results are averaged. DO that has been measured ranges from 3.17 – 4.95. Mokoginta (2003) stated that the value of DO in culturing Daphnia sp. ranged from 3.93 – 4.23 ppm, so it can be concluded that the DO content in each treatment during the study was the optimum DO range for Daphnia sp culture. Apart from that, Daphnia sp also requires a dissolved oxygen content with a minimum concentration of 3.5 mg/l and concentrations below 1 mg/l can cause the death of Daphnia sp.

According to Homer and Waller in Darmawan (2014), the concentration of dissolved oxygen in the cultivation media influences the filtering level and hemoglobin function of Daphnia sp. At a minimum concentration (<3.5 mg/l), dissolved oxygen will have a real impact on the reproductive system of Daphnia sp, both the number of offspring and the time it first produces offspring.

pH

The pH value in each treatment showed 6.7 – 7.6. If you compare it with the research results of Prastya, et al (2016) which stated that the pH range during the research was between 8.7 – 9.2. Daphnia sp still grows well at this pH. However, according to Leung (2009) the optimum pH for Daphnia growth is 7.0 – 8.2. High pH values can substantially reduce the viability of Daphnia sp eggs. The pH in each treatment has a different value. However, the optimum pH range for the survival of Daphnia sp. the observation results ranged from 7.0 – 7.6 (in treatment C which showed the highest population number). According to Sanyoto (2000) states that Daphnia sp requires an environment that has a pH of 6.5 – 8.5.

Amoniak (NH_3)

Based on the water quality parameter measurement data contained in the table above, it shows that ammonia ranges between 0.01 – 0.02. Low levels of ammonia in water are caused by Daphnia sp. still use crab shell meal as feed. Ammonia comes from the decomposition of organic materials. The ammonia content in this study was still relatively low and safe for Daphnia sp culture. According to Mokoginta (2003) the ammonia tolerated for maintaining Daphnia sp. namely less than 0.2 mg/l. Ammonia in maintaining Daphnia sp. This itself usually comes from urine, feces, and food that is not consumed by

Daphnia sp. Sihotang, et al. (2012) stated that if ammonia tolerance exceeds the tolerance threshold, there will be an inhibition of the absorption capacity of hemoglobin in the blood, thus disrupting the respiratory system.

CONCLUSION

1. Frekuansi pemberian tepung cangkang rajungan hasil fermentasi berpengaruh terhadap populasi Daphnia sp pada umur 6 HST – 14 HST, kepadatan populasi Daphnia sp,
2. Frekuensi pemberian tepung cangkang rajungan hasil fermentasi optimal terhadap pertumbuhan populasi Daphnia sp adalah pemberian 3 kali/hari pada pukul 07.00 WIB, 12.00 WIB dan 17.00 WIB.

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