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The influence of concentration liquid waste of tofu production to *Daphnia* sp cultivation biomass

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ABSTRACT

A natural feed of freshwater fish as long as it depends on worms tubifex is hard to be cultivated. *Daphnia* sp is one of the kinds of Cladocera zooplankton to be an alternative as a natural feed for seed of fish. The liquid tofu waste generally is a problem that is going on in every regional particularly around the Kedu Residency, Central Java. The liquid waste has the nutritional value that can be used for cultivation *Daphnia* sp. The right concentration of liquid waste tofu to the cultivation of *Daphnia* sp. has not been studied. This research aimed to find out the influence of concentration out over the density of waste biomass and the visibility of morphology *Daphnia* sp. The experiment used Complete Randomized Design (CRD) with three treatments and three repetitions, 25:75, 50:50, dan 75:100 (TI, T2, and T3, respectively), tofu liquid waste and water. The results concluded that T3 has repercussions for the density and biomass *Daphnia* sp. The density of *Daphnia* sp. was shown by treating 75 % of liquid tofu waste with 31.33 ind L^{-1} on average and while biomass was 4.6 g L^{-1} on average. The visibility of *Daphnia* sp morphology was cultivated with liquid tofu waste compared with *Daphnia* sp. cultivated using wastewater of catfish cultivation as a control group.

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1. Introduction

The natural feed is useful to the seed of fish because not pollute the environment cultivation. An alternative to the provision of feed seed freshwater fish can be done by cultivation daphnia sp. That is kind of the zooplankton cladocera around Indonesian waters (Retna *et al.,* 2012).

The Magelang people around the Elo river have a business of making tofu, and the amount of waste is produced abundant enough. Solid waste is used as animal feed, and liquid waste is discharged into the Elo river. The tofu liquid waste causes pollution in the Elo river Magelang since the exile directly into the river without wastewater treatment plant (Herma *et al.,* 2014). Reduce pollution in the river, then tofu liquid waste what to be used first before dumping it directly into the river. Alternative the use of tofu liquid waste can be used for culture media *Daphnia* sp.

The utilization of waste liquid organic tofu factory around the Elo river for cultivation *Daphnia* sp. is one of an alternative to decrease environment pollution as well as to overcome the problem of freshwater fish feed. The womb nutrients, the process of microorganisms, and the hydrolysis in waters cause tofu liquid can be used for cultivation *Daphnia* sp. It needs to study the best concentration of liquid tofu waste that it is applied to the cultivation of biomass *Daphnia* sp. Research has cultivation daphnia sp use fecal waste cattle, but weakness using animal waste and many cattle coarse fiber and ammonia that we need to create the process and indirect ready as the feed of *Daphnia* sp. This research aimed to find out the density of *Daphnia* sp. and biomass obtained from the cultivation of using liquid tofu waste with different concentration. Another purpose of this research also determined the content of nutrients liquid tofu waste and the visibility of morphology *Daphnia* sp (Rahayuning *et al.,* 2017).

2. Material and methods

The tofu liquid waste obtained from a tofu factory in the Magelang city then analyzed proximate to know the womb nutrient (Rahayuning *et al.,* 2017). The results of the proximate were compared to other literature. Proximate analysis testing showed liquid tofu waste that was used as the basis for cultivation. *Daphnia* sp. was prepared on the stock solution given a feed from phytoplankton. The *Daphnia* sp. preparation was cultivated in a media with Ureas. They were collected using the net with 1 mm in diameter to a uniform size (Darmawan, 2014). *Daphnia* sp next aquarium stocked in an experiment with density 12 cell L^{-1} or 300 *Daphnia* sp per 25 L container cultivation.

Media of *Daphnia* sp cultivation is water drawn from clean water. The freshwater on 25-liter of aquarium was added liquid nutrient waste tofu, 25: 75, 50: 50 and 75: 100 in range. The addition of liquid tofu waste was introduced every day with a dose of 1 mL day^{-1} in 25 L aquariums cultivation. Wastewater cultivation of catfish was used as control. Every one week conducted sampling to calculate *Daphnia* sp density. The volumetric accuracy of sampling was employed to the number of daphnia sp. The calculations *Daphnia* sp. density followed the formula, according to Rahayu and Piranti (2009).

$$a = b \times \frac{p}{q}$$

Note:

a = many individual's *Daphnia* sp. in a culture media (cell L^{-1})

b = the average number of *Daphnia* sp from Deuteronomy calculation

p = the volume of culture media (L)

q = the amount of a bottle (L)

On 30 days maintenance, total of *Daphnia* sp. were harvested by drain depleted of water cultivation and hold at the nets waring 0.1 mm in diameter. *Daphnia* sp. were collected based on each treatment and calculated biomass using formula according to Izzah *et al.* (2014), as follows:

$$W = \frac{(Wt-Wo)}{L}$$

Note:
W = Biomass (g)
W0 = Initial weight at day 0
Wt = Final weight at day 30
L = Water volume (L)

The measurement of the water quality at an aquarium experiment was DO, pH, and water temperature. They were measured a day two and a half times the day and early morning. The data of the water quality was used as the supporting data to analyze of *Daphnia* sp growth. The statistical analysis employed SPSS 16 using oneway variance (ANOVA) method followed the Tukey and polynomial orthogonal to know the concentration of liquid tofu waste what best intensities and biomass of *Daphnia* sp. The proximate data analysis of liquid tofu waste and morphology was described in the table form and figure.

3. Results and Discussion

The proximate data comparison of Tofu waste and referen was shown in Table 1:

Table 1. Result of proximate analysis

Nutritional content	Liquid tofu waste composition (%)	
	Referensi*	Result
Protein	0,42	0,39
Fat	0,13	0,11
Carbohydrat	0,11	0,14
Water content	98,87	99,12

*Mulyaningsih *et al.*, 2013

The protein of liquid tofu waste is tiny because in the process of making tofu subjected to the operation of filtering and stages of boiling until formed in the form of liquid and solid waste. The liquid tofu waste has macro and micro for soil nutrients that can be used as a growth media of microbes (Said, 1999). *Daphnia* sp growth was counted in two measurements such as density and biomass weakly (Figure 1).

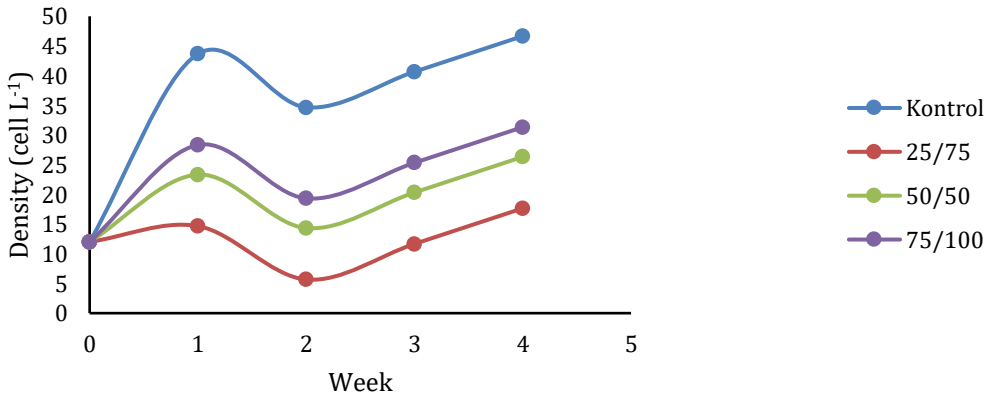

Figure 1. *Daphnia* sp growth during the experiment

On week 0, *Daphnia* sp. with 12 cell L^{-1} increased on first week because of the phase of *Daphnia* sp. maximum growth about one week. In the second week experienced, the growth of *Daphnia* sp. declined in density because the temperature was dropped dramatically due to cold weather. The temperature of the second week on the night about 16 °C was impeding breeding *Daphnia* sp. According to Cindra *et al.* (2009), the low temperatures inhibit the hatching of ephippia.

On third week, temperature fluctuations started well for *Daphnia* sp breeding. On week third and fourth increased the number of *Daphnia* sp (cell L^{-1}) because the temperature beginning to stable. According to Darmawan (2014), *Daphnia* sp. can grow at a temperature of 24-28 °C. Last week at the end of maintenance, showed the difference between treatment. It revealed that the more significant concentration of liquid tofu waste increased the density of *Daphnia* sp (cell L^{-1}) (Table 2).

Table 2. Density and Biomass *Daphnia* sp.

Treatment	Control	25:75	50:50	75:25
Density (Cell L^{-1})	46.66^{c}	17.66^{a}	26.33^{b}	31.33^{b}
Biomassa (g L^{-1})	6.86^{c}	2.58^{a}	3.86^{b}	4.60^{b}

The results of the *Daphnia* sp. density showed that the best concentration to increase the density of *Daphnia* sp. was control treatment. On the other hand, The higher level of liquid tofu waste showed higher growth of *Daphnia* sp. (cell L^{-1}). The data were analyzed using Tukey testing to show a significant effect of the liquid tofu waste on biomass *Daphnia* sp. Based on the Tukey test, the control group showed the highest biomass of treatments. According to Darmawan (2014), wastewater of catfish cultivation contained kind of microorganisms such as Bacillariophyceae, phytoplankton, Chlorophyceae, Cyanophyceae and other unknown. They, a natural feed, are suitable for the development of *Daphnia* sp. In treatment by liquid tofu, waste indicated that increasing of liquid tofu waste concentration enlarged biomass of *Daphnia* sp. That was showing the womb nutrients on waste tofu liquid was low. According to Mulyaningsih *et al.* (2013), liquid tofu waste has protein 0.42 %, fat 0.13 %, carbohydrates 0.11 % and the water level 98.87 % and the moisture content of content that ranged 98.87 % suggests the low level of the womb nutrients on the waste of tofu liquid.

The control group showed better results than the treatment group. It was expected nutrients content from tofu waste lower than control that used wastewater of catfish cultivation, although the growing of *Daphnia* sp. kept well. Based on it, need to increase the concentration of liquid tofu waste to improve the result of the advancement of the *Daphnia* sp. The data of water quality can be seen in Table 3. The fluctuations of temperature went down drastically in the second week which inhibited the growth of *Daphnia* sp. While DO and pH data weekly were stable and could support to the cultivation of *Daphnia* sp.

The result of research, liquid tofu waste and control (green wastewater of catfish cultivation) showed a significant difference in the color of *Daphnia* sp. body. *Daphnia* sp. body was presented paler cultivated using liquid tofu waste than used green wastewater of catfish cultivation. *Daphnia* sp. had the red color when it was developed using green wastewater of catfish cultivation. We assumed *Daphnia* sp. has hemoglobin, ate phytoplankton and organic matter as *filter feeder*.

Table 3. Water quality results

Week cultivation	DO (mg L^{-1})		pH		Temperature (°C)	
	at day	at night	at day	at night	at day	at night
1	3.4	3.1	7	7	26	22
2	3.1	2.9	7	7	25	16
3	3.0	2.9	7	7	25	18
4	3.2	2.8	7	6.5	25	20

According to Fajriyani *et al.* (2017), the low level of hemoglobin indicates the anemia. The pale of *Daphnia* sp was caused by anemia because the womb nutrients of liquid tofu waste were too limited. The differences color body of *Daphnia* sp could be identified in Figure 2.

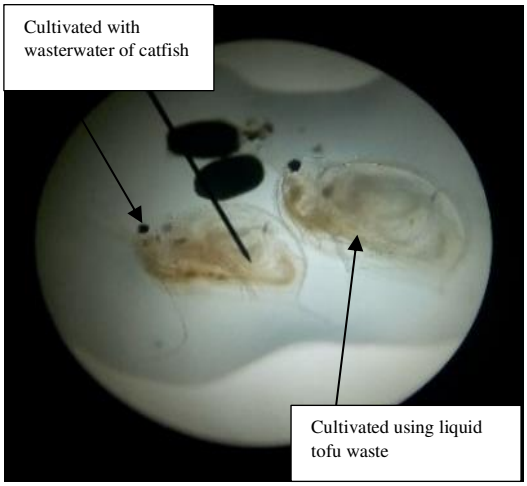

Figure 2. The differences color body of *Daphnia* sp

4. Conclusion.

The result of this research could be concluded that the concentration of tofu waste exerted an influence of density and biomass of *Daphnia* sp. The highest density of *Daphnia* sp. was showed by 75 % of liquid tofu waste with the average yield 31.33 cell L^{-1}. While the biomass *Daphnia* sp was the average yield of 4.6 g L^{-1}. Even though the results of control better than treatment, but the study showed a positive effect with the increase in the concentration of liquid tofu waste would increase the density and biomass of *Daphnia* sp. The visibility of *Daphnia* sp. cultivated with liquid tofu waste could be paler compared to *Daphnia* sp. grown with wastewater of catfish cultivation.

References

Cindra YEP, Rahardja BS, Cahyoko Y. 2009. Pengaruh suhu dan kepadatan ephippia yang berbeda terhadap penetasan ephippia *Daphnia magna*. *Jurnal Ilmiah Perikanan dan Kelautan*. 1(1): 31–35.

Darmawan J. 2014. Pertumbuhan populasi Daphnia sp. pada media budidaya dengan penambahan air buangan budidaya ikan lele dumbo (*Clarias gariepinus* Burchell, 1822). *Berita Biologi.* 13(1): 57–63.

Fajriyani A, Hastuti S, Sarjito. Pengaruh serbuk jahe pada pakan terhadap profil darah, pertumbuhan dan kelulushidupan ikan patin (*Pangasius* sp.). *Journal of Aquaculture Management and Technology*. 6(4): 39–48.

Herma AGRW, Hutabarat S, Ain C. 2014. Pengaruh limbah cair tahu terhadap kelimpahan makrobenthos di sungai elo Magelang. *Journal of Maquares Management of Aquatic Resourse*. 3(4): 1–8.

Izzah N, Suminto, Herawati VE. 2014. Pengaruh bahan organik kotoran ayam, bekatul, dan bungkil kelapa melalui proses fermentasi bakteri probiotik terhadap pola pertumbuhan dan produksi biomassa *Daphnia* sp. *Journal of Aquaculture Management and Technology.* 3(2): 44–52.

Mulyaningsih R, Sunarto W, Prasetya AT. 2013. Peningkatan NPK Pupuk Organik Cair dengan Penambahan Tepung Tulang Ayam. *Jurnal Sainteknol*. 11(1): 73–82.

Rahayu DRUS, Piranti AS. 2009. Pemanfaatan limbah cair tahu untuk produksi ephipium *Daphnia* sp. Makalah Prosiding Seminar Nasional Biologi "Peran Biosistematika dalam Pengelolaan Sumberdaya Hayati Indonesia".

Rahayuning S, Pinandoyo A, Herawati VE. 2017. Pengaruh waktu fermentasi limbah bahan organik (kotoran burung puyuh, roti afkir dan ampas tahu) sebagai pupuk untuk pertumbuhan dan kandungan lemak *Daphnia* sp. *Jurnal Rekayasa dan Teknologi Budidaya Perairan.* 6(1): 653–668.

Retna DU, Carmudi SR, Kusbiyanto. 2012. Pertumbuhan populasi *Daphnia* Sp pada media kombinasi kotoran puyuh dan ayam dengan padat tebar awal berbeda. Prosiding Seminar Nasional Pengembangan Sumber Daya Pedesaan dan Kearifan Lokal Berkelanjutan. pp: 46–52.

Said IN. 1999. Teknologi pengolahan air limbah tahu dan tempe dengan proses biofilter anaerob dan aerob. Jakarta: Direktorat Teknologi Lingkungan.