The effect of catfish and chicken cultivation waste to *Daphnia* sp. culture

N H Holy¹ and L A Sari²³

¹ Aquaculture Study Program, Faculty of Fisheries and Marine University of Airlangga, Surabaya 60115 Campus C Airlangga University, Indonesia
² Department of Fish Health Management and Aquaculture, Faculty of Fisheries and Marine University of Airlangga, Surabaya 60115 Campus C Airlangga University, Indonesia
³Corresponding author: luthfianaas@fpk.unair.ac.id

Abstract. Many factors influence the success of a cultivation business, the availability of the land, the availability of adequate fry and feed in quality and quantity to support maximum production. The study is to know the effect of catfish and chicken cultivation of waste to *Daphnia* sp. culture. Which is it does not pollute the culture medium and the high nutrient content. *Daphnia* sp. culture activity is divided into laboratory and mass scale. Culture activity started by sterilization and preparation of culture equipment and continued with *Daphnia* sp. forage provision. Stocking density that used in laboratory or semi mass scale is about ten ind/ml *Daphnia*. Duration of culture activity of *Daphnia* sp. was ten days and use water from catfish pond as media resulted from the highest density of *Daphnia* sp. with 5355 ind/liter produced during a period in laboratory scale. *Daphnia* culture in laboratory scale with molasses and plankton as a nutrient booster resulted in 1768.5 ind/liter, and it is lower than the *Daphnia* culture that uses water from catfish pond as media. The result in the spring-mass scale of *Daphnia* sp. culture was 451.400 ind/liter in 10 days period.

1. Introduction
Cultivation certainly has some of the supporting factors, one of which is the availability of good quality seeds. Hatchery and nursery stages are very vulnerable and a determinant of the sustainability of farming. The stage requires sustained availability of feed. Natural food has a high nutrient content, so often used in the cultivation process, and its role still can not be replaced by artificial feed. Natural food that is widely used is plankton which is divided into two types, phytoplankton and zooplankton [1].

Phytoplankton is cultivated as a natural food such as Chlorella, Tetraselmis, diatoms, and Spirulina [2, 3, 4, 5, 6]. Other types of natural food cultivated come from the zooplankton, including Rotifera, Artemia, and *Daphnia*. *Daphnia* is one kind of natural food from zooplankton group that is widely used in the cultivation of freshwater fish. Selection of *Daphnia* as life food because it has a high nutritional value as well as the size of the body that correspond to the fish's mouth openings, especially at larval stage or seed. In addition, the movement of *Daphnia* can attract larval fish to prey [7].

Natural feed in the provision should be concerned about the quality, quantity, and availability. It can be filled with natural food cultivation, cultivation of *Daphnia* own quite easy to do facilities have DAPNIA seed procurement. Natural food culture must be done carefully and carried out with the knowledge base capable of all aspects of biology and the environment. The study is to know the effect
of catfish and chicken cultivation of waste to *Daphnia* sp. culture.

2. Materials and methods

2.1. Preparation and sterilization equipment
Preparation tools and materials are the first steps in doing *Daphnia* culture. Preparations such as the provision of tools and materials used, such as aquariums and tubs fiber, supporting tools such as aeration hose and aeration stone and others. Materials used include water for culture media, manure, molasses (molasses) and booster plankton, and the seeds of *Daphnia* sp. Sterilization performed at the Laboratory of Natural Feed is by washing tools and containers with soap and clean water. After washing the tools and container to be used is left to dry with aerated.

2.2. Seed provision *Daphnia* sp.
Seeds used is *Daphnia* sp. the adult stage because of the increase of the density of *Daphnia* sp. can go faster in a week. According to a statement [8], *Daphnia* sp. can develop into adults within 4-6 days, and entered the 8th day become a parent and in these conditions the age of *Daphnia* sp. up to 12 days. The use of scoop net (seser) with an aperture of 1 mm or mesh size 18 due to getting an adult *Daphnia* to the size of 1-2.5 mm [9].

Study seed *Daphnia* sp. derived from a semi-scale mass culture that has existed. *Daphnia* seedlings needed as many as 315 individuals for culture media laboratory scale by as much as 31.5 liters and stocking density of ten individuals per liter. Selection *Daphnia* sp. Decent become seedlings by direct observation with the aid of a pipette can also be filtered with a scoop net (seser) with a hole diameter of 1 mm.

2.3. Preparation of culture media *Daphnia*

2.3.1. Culture media laboratory scale
The containers used in the laboratory scale culture is made of clear glass aquarium measuring 60 x 35 x 20 cm 2 pieces filled with water until the height reached 15 cm from the bottom of the aquarium or as much as 31.5 liters. Aquarium which has been filled with water by aeration. Kultur *Daphnia* sp. laboratory scale using two different nutrients. The first aquarium catfish ponds using water media obtained from broodstock rearing ponds bumina yumina system. 2nd aquarium uses well water supplemented with molasses nutrients and plankton booster. Molasses used is a type of blackstrap molasses brown. This is consistent with the statement [10], types of molasses are good and widely used as a fertilizer is a type of blackstrap molasses because it contains nutrients that are better than other types. Plankton booster is also added as it serves to maintain the stability of the growth and density of plankton.

2.3.2. Semi-scale mass culture media
*Daphnia* culture semi-scale mass using fiber tub filled with water to a height of 37 cm from the bottom of the container or as much as 740 liters. Fertilizers used in semi-mass scale *Daphnia* culture derived from chicken manure fertilizer. Doses can be adjusted with the use of fertilizer formula fertilizer determination. Formula fertilizer dosing is 1000-1500 grams of fertilizer use for 1 m3 of container culture [11].

The initial phase of semi-scale mass culture using manure as much as 3 kg was put in a sack and provided with holes on all sides of the use of nails so that dissolved in the culture medium only saris of manure. The accounting treatment is in accordance with the statement [12], the way in cultures of *Daphnia* fertilization with chicken manure filter using sacks or other media that coarse material (bagasse) do not get into the tub or container.

2.4. Culture of *Daphnia* sp.
The first aquarium, the media used is water coming from the catfish broodstock rearing ponds. Water pools incorporated into the culture as much as 31.5 liters container or as high as 15 cm from the bottom of the aquarium, then the seeds directly stocked without waiting 24 hours of aeration. The growth of *Daphnia* sp. which increases led to a reduction of nutrients in the culture medium so must the addition of the catfish pond water every two days after the media was siphoned by volume as much as 20-25% of the total volume of media [13, 14, 15, 16]. 2nd aquarium filled with well water as high as 15 cm from the bottom of the aquarium or 31.5 liters ago by aeration. Nutrient media is added to the 10 ml molasses plankton booster about 60 ml. Media that has been given the nutrients left 3 to 5 days with further aeration seed *Daphnia* sp. put into the aquarium. Seeds are used in both the aquarium equated ie, ten individuals per liter.

The containers used in cultures of *Daphnia* sp. scale semi-mass form fiber tub with a volume of 1000 liters. Fiber-filled tub of clean water to a height of 37 cm from the bottom of the tub or the water volume of 740 liters, then by aeration. Nutrients used in a semi-mass culture that is from manure. Media that has been heavily then left for an overnight or 24 hours with aeration. Importation of seeds is done after 24 hours of infusion of fertilizers and then removal of fertilizer before the seeds added to the media. Supplementary fertilization is done three days after the initial fertilization, with a dose of 1 liter per day. The treatment is done every day in culture was limited to observing the growth of population, measuring the quality of water and the addition of fertilizer. Medium water reduction as much as 50% of the total volume of the culture media [17],

Sampling was repeated three times. According to [18], after the data was obtained, followed by calculating using the following formula:

\[
A = \frac{BXP}{q}
\]

Information:

- \(A\) = Number of individuals *Daphnia* sp. the culture medium
- \(b\) = average number of *Daphnia* sp. the replay of calculation
- \(p\) = Volume of culture medium (liters)
- \(q\) = Volume of sample bottles (liter)

### 3. Results and discussion

#### 3.1. Growth and density of *Daphnia* sp.

*Daphnia* sp culture activities. It is using the density calculation to determine the amount of population density of *Daphnia* sp. every day. Density calculation is also used to determine the development of the growth of *Daphnia* sp. Method of calculating the density of *Daphnia* sp. ie, take samples using a 100 ml Erlenmeyer. Calculations are done by pouring a sample of water little by little into the container while counting the number of *Daphnia* sp. obtained. Observations growth of *Daphnia* sp. carried out for ten days of maintenance are presented in Table 1.

| Days to | The population density of *Daphnia* sp. |
|---------|----------------------------------------|
|         | Aquarium 1 (Water Swimming catfish)    | Aquarium 2 (Molasses + Plaktop) |
| 1       | 526.05                                 | 418.95                        |
| 2       | 630                                     | 630                           |
| 3       | 1039.5                                  | 733.95                        |
| 4       | 1471.05                                 | 945                           |
| 5       | 1993.95                                 | 1363.95                       |
| 6       | 2416.05                                 | 1,575                         |
Adaptation phase on day one until day four post-stocking, Daphnia growth is comparatively slow. An increasing number of individual Daphnia after the 4th day into several times an exponential phase. The highest increase in Daphnia in 5-7 days, according to [19], that the Daphnia population increase after the 4th day is because there is a process that occurs asexual reproduction (parthenogenesis) which produces individual Daphnia and takes place on the environmental conditions or the culture medium fertile up reaches a certain point.

Entering the stationary phase or lag on day 7 to 10, the rate of population growth of Daphnia declined due to the availability of nutrients in the culture medium can not meet the needs of Daphnia contained in the culture vessel. Population growth of Daphnia sp. reached the peak on day 10 in the treatment of aqueous media and media catfish ponds plankton molasses + booster as much as each 3780 and 2416.05. Based on data in Table 1, the growth of cultured Daphnia in a laboratory scale, including optimal based research [9], the optimal population growth of Daphnia in the culture medium can reach 1500-5000 individuals with an initial density of 10 individuals per liter.

Table 2. The data density of Daphnia sp. semi mass culture.

| Days to | The population density of Daphnia sp. Fiber (manure) |
|--------|---------------------------------------------------|
| 1      | 12,358                                            |
| 2      | 17,242                                            |
| 3      | 19,758                                            |
| 4      | 24,642                                            |
| 5      | 34,558                                            |
| 6      | 51,800                                            |
| 7      | 61,642                                            |
| 8      | 66,600                                            |
| 9      | 69,042                                            |
| 10     | 71,558                                            |

Exponential phase occurred on day 2 to day-to-8. Stationary phase occurred on day nine until day 10. The population is still increasing until the last day of observation, although not as strong as the day 3 to day-to-8. The decline in population density does not appear during the observations made observations for only ten days while the death phase occurred on day 14 [17]. Use of manure in the media gives good results for the growth of Daphnia sp., With the highest population of as many as 71 558 individuals per 740 liters of media. Media with organic manure has high organic matter content, which can grow food and become food for Daphnia sp., so the nutrients needed by Daphnia sp. to grow can be met.

3.2. Observation water quality

Based on the temperature data in Table 6 are known the temperature on a laboratory scale and semi-mass is still in the optimal range. According to [4], the optimum temperature for culturing Daphnia is between 20o C (68o F) and 27o C (79o F). Changes in the average temperature of the culture medium during the culture process are 240 C - 300 C, the range is still within the tolerance limits for population growth of Daphnia sp.PH range for the culture is 7-8; the condition is still within the range that is good for the growth of Daphnia sp. According to [18], a good range of pH values for Daphnia growth is 6-8.
DO value on all treatments before *Daphnia* stocked in the media is still in a good range for *Daphnia* growth at the start of culture ranging from 6 ppm - 7 ppm, while the value of DO is good for the growth of *Daphnia* is > 3.5 ppm [20]. DO value at the end of culture ranging from 3 ppm - 6 ppm, due to the *Daphnia* population density higher so the higher metabolic activity.

| Scale               | Media                  | Temperature | Week 1 pH | DO  | Temperature | Week 2 pH | DO    |
|---------------------|------------------------|-------------|-----------|-----|-------------|-----------|-------|
| Laboratory scale    | Catfish pond water     | 27          | 7         | 6   | 26          | 7         | 4.6   |
| Booster             | plankton + molasses    | 27          | 7         | 6.5 | 26          | 6         | 6     |
| Semi-scale mass     | Manure                 | 27.3        | 7.5       | 6.7 | 27          | 6         | 5.3   |

3.3. *Harvesting Daphnia* sp.

Harvesting *Daphnia* sp. can be done by two different methods, namely the harvesting method of partial and total harvesting methods. There are two different steps in harvesting is using seser with mesh size <1000 microns and also plankton net mesh size 25, *Daphnia* filtered laid sized bucket containing 5 liters of clean water. The second way is by taking *Daphnia* sp. directly from the culture vessel using one liter-sized container.

Harvesting is usually done on a partial semi-scale mass culture that is used as a fish larvae feed as larvae catfish, cork, tilapia, and carp. Harvesting partial semi-scale mass culture can be done on day 4 post-stocking of seedlings. One partial harvesting less than 20% of the total volume of the culture medium [21]. The results can be used for the harvesting of fish larvae feed two times, namely for the morning and afternoon.

Total Harvesting can be done in two conditions, namely when the highest density and the current density decreases *Daphnia*, so it must be harvested [22]. The process of harvesting the total in cultures of laboratory scale can be a way siphon using hoses flowed into a large container and then transferred to the culture scale advanced or directly fed to the fish, it can also be done filtering by putting seser or plankton net at the end of the hose to accommodate *Daphnia*. Two harvesting techniques can be done in the morning or late afternoon, the morning the range at 8 to 10 pm and afternoon at the range of 15 to 16 pm.

3.4. *Natural feeding Daphnia* sp. the seeds cultured fish

There are various ways in the provision of *Daphnia* on the seed fish, and one way is giving directions on the seed catfish. *Daphnia* is harvested with the help of plankton net no 25 with a capacity of 100 ml bottle container, and retrieval performed three times when population density and high culture can be up to 10 times the current density of the low culture.

*Daphnia* award at an F4 that seed goldfish pond is done with the addition of molasses. *Daphnia* obtained from semi-scale mass culture by making direct use of the container capacity of 5 liters. Besides *Daphnia*, it also used as much as 500 ml molasses diluted with water up to 1 liter. Spreading is done when the pond in a condition has been nurtured and being filled with water. *Daphnia* sp. stocked near the water input is also stocked near fertilizers that are on the edges of the pond.

*Daphnia* natural feeding larval carp can also be done with the addition of spirulina. Carp larvae aged five days of being placed on a concrete pool 1x0.6x1 m size and stocking density of 100 tail. Frequency of feeding twice a day, with feed 1 liter *Daphnia* sp. and 3 liters of Spirulina sp. derived from semi-scale mass culture.

4. Conclusion

*Daphnia* sp culture activities include the preparation and sterilization of tools and materials, seed
supply, manufacture of culture media, the culture, harvesting and monitoring water quality. On a laboratory scale, media use well water are added nutrients such as molasses + booster plankton, and media catfish pond water. Semi-scale mass culture using well water with the addition of manure nutrients. Population density peaks at laboratory scale culture, the media molasses + booster plankton and media catfish pond water for each 3780 and 2416.05 ind/liter on the 10th day. While on spring scale mass culture, the population peak on day 10 with a density of population of 71 558 ind/liter. The use of *Daphnia* as natural feed on larvae or fry can be administered either directly or with the addition of spirulina or molasses.

5. References

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