Quality Improvement of Giant Freshwater Prawns (*Macrobrachium rosenbergii)* Postlarvae in Swamp Media with Addition of Sodium during the Acclimatization

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ABSTRACT

The purpose of this study was to improve the quality of giant freshwater prawns postlarvae with the addition of sodium during the acclimatization medium from 12 ppt until 0 ppt. This research used Completely Randomized Design with 5 treatments and 3 replicates. The treatments of addition sodium were 0 (A); 25 (B); 50 (C); 75 (D) and 100 ppm (E) by using swamp water diluent. Experiment parameters included survival rate, oxygen consumption rate, level of osmotic work and water quality. The results indicated that the survival rates of giant freshwater prawns postlarvae were not significantly different among the treatments (varied from 84-91.7%). The osmotic levels were significantly different, with treatment on D can produce level of osmotic work on postlarvae more lower with a value of 185.68 mOsm/l H_2O. Oxygen consumption rates also the best on treatment D that showed 1.378 mg $O_2.g^{-1}.h^{-1}$. These results showed that the addition or without addition of sodium did not significantly affect the survival rate of giant freshwater prawns postlarvae, whereas osmoregulation (level of osmotic work) and metabolism mechanism (oxygen consumption) can add as much as 75 ppm sodium in swamp water. Water quality during acclimatization was still in range appropriate range to survival rate of giant freshwater prawns postlarvae.

Keywords : sodium, giant freshwater prawns postlarvae, survival rate, osmotic level, oxygen consumption, swamp water, acclimatization

INTRODUCTION

Giant freshwater prawn (*Macrobrachium rosenbergii*) is a freshwater shrimp that has a fairly high economic value and potential for propagation. According Hadie *et al.,* (2001), that 84.65% of the waters in the South Sumatera has potential become aquaculture media. This is due to the characteristics of the waters in the South Sumatera meet the natural habitat of giant freshwater prawns. The main problems in aquaculture are the low rate of survival and growth in the larval stage. Increased vitality prawns could measure from oxygen consumption rate and the level of osmotic work. This is due to the larval stage is critical stadium that is affected by water quality. One of water quality affecting the survival and growth rates of prawn is changes in salinity at the migration time. The results of Charryani (2007), states that when the salinity reduction made at the prawn larvae of 29 to 49 days old, salinity of 12 ppt to 0 ppt, best survival value is 20.67%.

Therefore, it is necessary to enhance acclimatization method that can reduce mortality rate and improve the survival rate. Acclimatization obtained done by the addition of sodium during the salinity reduction. The addition of sodium is expected to increase the survival rate of prawns postlarvae phase.

MATERIALS AND METHOD

The larvae of giant freshwater prawn used were 30 days living (stadium 11^{th}) at 12 ppt salinity which fed *Artemia salina* naupli. The acclimaztization of giant freshwater postlarvae used aquarium measures 40 x 40 x 40 cm^3, totally 15 pieces. Aquarium placed randomly according to treatment. Each aquarium were aerated by using aerators for 24 hours so that the dissolved oxygen content is ideal for larvae (5-7 ppm). Swamp water used as medium salinity diluent, origin from the swamp water flood in the area of the hatchery of Aquaculture Study Program, Faculty of Agriculture. Sodium used the form of $NaCO_3$ (99,99%).

Giant freshwater prawns postlarvae had used passed initial preservation in the laboratory. Stocking densities prawns are 200 individuals per aquarium at 12 ppt salinity water as much as 4 liters. Decrease in salinity of 12 ppt to 0 ppt by adding swamp water that has been mixed with sodium ($NaCO_3$) done gradually by arrangement through the faucet drip. Decreased salinity dilution method for 10 days gradually. Decreased salinity are from 12 ppt, 10 ppt, 8 ppt, 6 ppt, 4 ppt, 3 ppt, 2 ppt, 1.5 ppt and 1 ppt. Then turn the water followed by 25% and 50% of the total volume to obtain salinity of 0 ppt periodically 24 hours. The 1st day decreases to 10 ppt salinity, next the 2nd day decreased salinity of 8 ppt and 6 ppt salinity reduction done on 3rd. The 4th day decreased salinity 4 ppt, further after reaching 3 ppt on 5th day done drop back to 2 ppt salinity on 6th day. Decreased salinity of 1.5 ppt on 7th day and 1 ppt on 8th day. Next on the salinity of 1 ppt done water changes as much as 25% of the total volume. Decreased in salinity to 0.5 ppt performed on 9th day. At the turn of the 10th day of water that was done gradually 12 liters for 24 hours and salinity gained 0.5 ppt change of water for 24 hours by 50% and gained 0 ppt. The data of survival rate and osmotic level were analyzed statistically (ANOVA), while the other parameters (oxygen consumption rate and water quality) descriptively analyzed.

RESULTS AND DISCUSSION

The osmotic work level is the result of osmotic difference of osmolarity prawns postlarvae with medium osmolarity. The activity rate regulates osmolarity osmotic haemolymph of the prawns. Figured 1 showed the survival rate of giant freshwater prawns postlarvae during the acclimatization period was not significantly different to the levels survival rate of prawns. The highest survival rate in the D treatment with the addition of sodium as much as 75 ppm. Dersjant-Lli *et al.,* (2001) states that the value of Na^+/K^+ ratio contained in the water functioned to maintain appropriate balance between the K^+ and Na^+ ion in appropriate intraseluller liquid. Survival rates were higher during the acclimatization period allegedly can cause decreased salinity less of energy use for setting the concentration of K^+ in haemolymph.

The osmotic rate shows the activity rate is the lowest osmotic on treatment D with the value of 185.68 mOsm.l H_2O^{-1}, while the highest levels of osmotic on treatment E (193.08 mOsm.l H_2O^{-1}). The addition of sodium with different treatment causes the osmotic work prawns postlarvae were significantly different during the 10 days acclimatization of reducing salinity period (based on Anova and Duncan's Test). Based on the results Abidin (2011), low levels of osmotic work associated with the level of oxygen consumption, the lower of osmotic energy use osmoregulation in prawns postlarvae can be utilized for the growth process. The water absorption ions such as Na, Ca, and Cl absorbed by the body through the gills. Ion settings generally require a lower the energy which close to isoosmotic environment, so that the energy can be used for growth enhancement (Imsland *et al,* 2003).

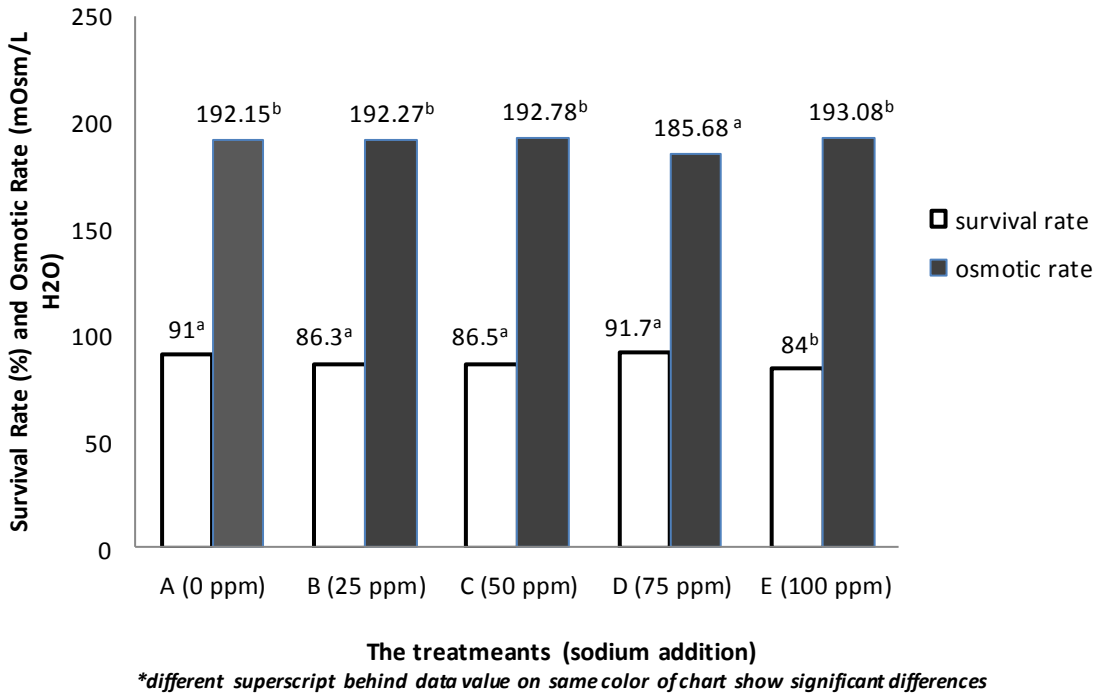

Figure 1.The graphic of survival rate and osmotic work of giant freshwater prawn postlarvae

Rate of oxygen consumption on Figure 2 can be used as a parameter to determine metabolic rate aquatic organisms. Oxygen consumption rates affect energy use. Abidin (2011) states the lower of oxygen consumption level, the energy needs of growth greater than the

energy use for the metabolism of shrimp. The lowest oxyen consumption rate on treatment D (1,378 mg $O_2.g^{-1}.h^{-1}$) shows that additon of sodium as much as 75 ppm can reduce energy using to metabolism, so growth energy of giant freshwater prawn postlarvae more higher than the other treatments.

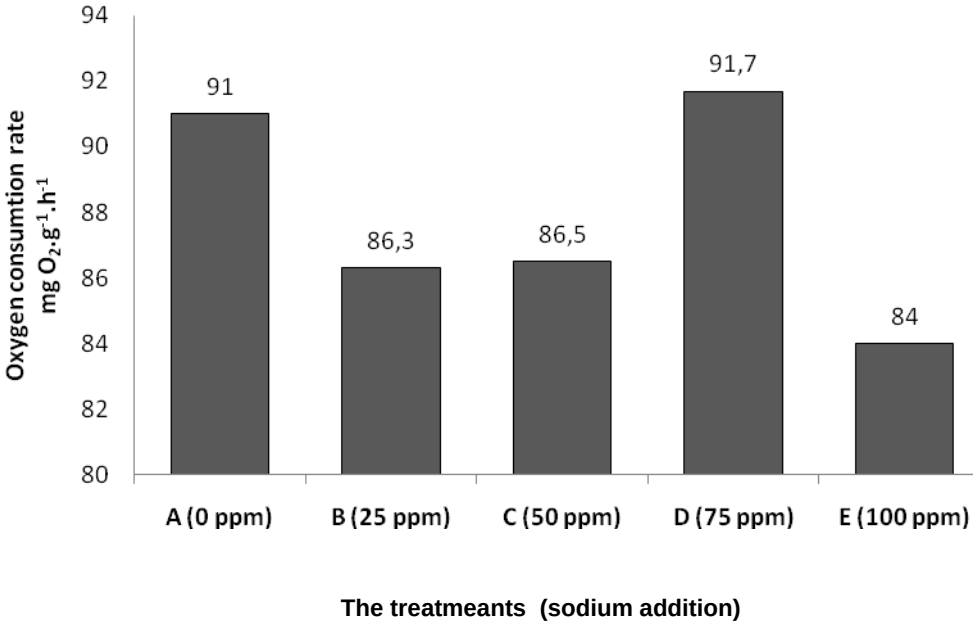

Figure 2. Oxygen consumption rate of giant freshwater prawn postlarvae

Based on Table 1, shows the temperature of all treatments during the study ranged from 26-30^{0}C. According Hirono (1982) in Abidin (2011), the optimal temperature for growth of freshwater prawn between 28-32^{0}C. Temperature affects the rate of metabolism in animal waters. The degree of acidity (pH) during the study ranged from 6.4-6.8. According Syafe'i (2006), the optimal pH is in the range 7.0-8.5, while based on this study under the range of optimal pH range of prawns, it is alleged by the addition of diluents swamp water causes a decrease in pH during acclimatization period of prawns postlarvae.

Alkalinity value during acclimatization prawns at the beginning of period on all treatments, are 82 mg.l^{-1}, at the end of the period the value of alkalinity in treatment A, B, and C are 26 mg.l^{-1}, 44 mg.l^{-1}, and 80 mg.l^{-1}, while in treatment D and E worth 108 mg.l^{-1} and 130 mg.l^{-1}.

Value for ammonia measurements showed decreased during the study. The high ammonia value can cause death in prawns (Syafe'i, 2006). Dissolved oxygen during the study is still in the range of optimal care of giant freshwater prawn. Syafe'i (2006) said that for rearing, the optimal range of dissolved oxygen for prawns is range 5-8 $mg.l^{-1}$. Wynne (2000) and Cheyada *et al*. (2001) states that the optimal conditions for breeding prawns are : water temperature between 28-32^{0}C, pH 7.2-8.4, dissolved oxygen at least 3 $mg.l^{-1}$. Ahmad (2005) states that giant freshwater prawns will be able to grow well if it is cared in medium temperature of 28-31^{0}C, dissolved oxygen above 3 $mg.l^{-1}$, pH 6.5 to 8.8 and ammonia content below 1 $mg.l^{-1}$.

Table 1. The measurements of water quality on acclimatization media

Treatment (Sodium Addition)	temperature (^{o}C)	Salinity (ppt)	Dissolved Oxyegn ($mg.l^{-1}$)	pH (unit pH)	Amonnia ($mg.l^{-1}$)	Alkalinity ($mg.l^{-1}$)
A (0 ppm)	26-30	0-12	6.06-6.70	6,7-7,4	0.364-0.73	26-82
B (25 ppm)	26-30	0-12	6.11-6.69	6,7-7,4	0.364-0.061	44-82
C (50 ppm)	26-30	0-12	6.01-6.74	6,7-7,5	0.364-0.243	80-82
D (75 ppm)	26-30	0-12	6.06-6.97	6,7-7,4	0.364-0.033	82-108
E (100 ppm)	26-30	0-12	6.07-6-98	6,7-7,5	0.364-0.066	82-130

CONCLUSION

The addition of sodium did not significantly affect the survival rate of giant freshwater prawns postlarvae, but it could produce the best performance of postlarvae on swamp water media. The better quality of postlarvae based on measurements of the level of osmotic work and oxygen consumption rate that more efficiency with sodium addition on swamp water diluent as much as as 75 ppm.

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