Preliminary Study of Salinity Change on *Vibrio* Count and Gut – Muscle Ratio of *Penaeus monodon* Post Larvae

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Introduction

Marine shrimp farming is one of the most important aquaculture practices in the world. It showed a booming expansion since start and soon became a multimillion dollar industry (Islam et.al., 2004). However, there are many issues and challenges of the sector especially related to the culture techniques, environmental quality, biodiversity and natural brood-stocks. Natural brood stock is not enough to fulfill requirements of shrimp seed for culture practices. As a solution, farmers and other relevant stakeholders have established hatcheries which can provide shrimp seeds for stocking of shrimp farms throughout the year. Gut – Muscle Ratio (GMR) is a standard main parameter that can be used as an index to measure the quality of the post larvae in shrimp industry. GMR is defined as the microscopic examination of the relative thickness of ventral abdominal muscle and gut in the 6 th abdominal segment of the tail of post larvae stages (Madhukiran et al., 2009). Microbiological count (availability of Vibrio bacteria) is a critical factor affecting growth and survival rate of shrimp post larvae from hatching to grow- out stage. As chemical water quality parameter, salinity has a potential on changing microbial count and Gut - Muscle Ratio. Therefore, present study was conducted to find out the effect of salinity on those two factors for the quality of selected post larval stages of the *Peneaus monodon*.

Methodology

Study was carried out in King Aqua Hatchery (Pvt) Ltd, Udappuwa, Chilaw. Nine hundred and sixty post larvae (PL) were selected for the study. Four hundred and eighty post larvae were used as experimental sample and remaining 480 PL were maintained as replacement stock. PL was obtained from same brood stock. Bulk stored tank was monitored from hatching stage to the nursery stage with same condition. Randomly selected PL were transferred into 06 glass tanks (S1, S2, S3, S4, S5, S6) from nursery tank representing 20 PL in each treatment . Four replicates were used for each treatment. Temperature (30 ˚C), pH (8.2) and Dissolved Oxygen (7 mg/l) were maintained at constant levels. Salinity levels were changed in each glass tank by adding fresh water and concentrated brine solution based on final salinity level (S1 – 27 ppt, S2 – 28 ppt, S3 – 29 ppt, S4 – 30 ppt, S5 – 31 ppt, S6 – 32 ppt). S3 (29 ppt) was used as control. Gut-Muscle Ratio of the post larvae was determined under microscope (x10). Ten post larvae from each tank were observed under microscope and width of gut and 6 th ventral muscle was recorded. Water samples were collected twice per day (8.00 a.m. and 8.00 p.m.) for bacterial detection. Water samples were diluted with sterilized distilled water up to 10x1 and cultured using TCBS agar medium. After 24 hours of incubation, plates were observed by using colony counter. Recorded data was analyzed by using MINITAB 15 statistical software (Two-Way ANOVA, α – 0.05).

Results and Discussion

Results of mean Gut-Muscle Ratio and *Vibrio* count with salinity are given in Table 1. At the salinity level of 27 ppt, mean Gut Muscle Ratio shows the minimum value for all stages, while highest GMR for PL 9 and PL 10 was recorded at 30 ppt (Table 01). With increasing salinity, mean Gut Muscle Ratio for PL9 and PL 10 stages are gradually increasing up to a specific salinity level (30 ppt). At highest level of salinities (>30 ppt) there was a slight decline of Gut

Muscle Ratio for these stages, but it is closer to the maximum mean value of GMR recorded for 30 ppt level of salinity. GMR for PL 11, PL 12 and PL 13 stages had not changed at grea ter level of salinities (30, 31 and 32 ppt). Commonly highest mean value of GMR was recorded at 30 ppt. There was no significant difference for Gut Muscle ratio and PL11, PL12 and PL13 stages of *Peneaus monodon* post larvae with salinity levels of 30, 31 and 32 ppt ($p > 0.05$). Muscle gut ratio is one of the major criteria for selecting the good post larvae (*Bauman et al.*, 1990). Usually high muscle to gut ratios is preferable (FAO, 2013). According to manual of Asean Good Shrimp Farm Management Practice (n.d.), Muscle Gut Ratio of 4:1 (or >4:1) is recommended as accepted ratio for high quality PL stages. However, in practice, it was found that this measurement can always be difficult due to the unacceptable management practices. Therefore, salinity level that always records gut muscle ratio closer to recommend value (4:1) is concerned as the best salinity for shrimp hatchery practices.

Table 1. Results of mean Gut Muscle Ratio and *Vibrio* count with Salinity for each stage

	PL Stage									
	PL 09		PL 10		PL 11		PL 12		PL 13	
Salinity Ppt	GMR	*Vibrio* Count (CFU)	GMR	*Vibrio* Count (CFU)	GMR	*Vibrio* Count (CFU)	GMR	*Vibrio* Count (CFU)	GMR	*Vibrio* Count (CFU)
27.00	1.00	772.50	1.00	794.50	1.00	753.25	1.00	765.25	2.00	571.75
28.00	1.00	744.75	1.25	676.00	1.75	612.25	2.00	488.00	3.25	230.00
29.00	2.25	399.25	2.25	350.75	2.25	338	2.75	298.75	3.00	264.50
30.00	2.75	232.00	3.25	162.00	3.50	138.75	4.00	128.25	4.00	120.75
31.00	2.50	198.25	3.00	170.75	3.50	138.75	4.00	128.25	4.00	112.00
32.00	2.50	242.00	3.00	170.75	3.50	142.75	4.00	131.25	4.00	122.25

At level of 31ppt, it always recorded the minimum value of *Vibrio* count except PL 10 stage. Maximum *Vibrio* count was recorded for the salinity level of 27 ppt. At lower salinity levels, *Vibrio* bacteria were shown the considerable multiplication. There was a significant difference for *Vibrio* count and the PL stages with salinity ($p<0.05$). Shrimp aquaculture production of the world is depressed by microbial infection, so it is important to maintain minimum microbial count during hatchery operations. At higher salinity levels, growth and multiplication of *Vibrio* spp can be inhibited. There is no significant difference for *Vibrio* count at the salinity level of 30 and 31 ppt with PL11 to PL 12 stages.

According to the results, high quality post larvae can be always obtained at 30 ppt level of salinity. Also microbial count is relatively lower at salinity level of 30 ppt. So it can be concluded that S4 treatment (30 ppt) is most effective salinity for shrimp hatcheries.

Conclusions

There is an effect of salinity for the *Vibrio* count and the Gut Muscle Ratio of *Peneaus monodon* post larvae. 30 ppt salinity of the water can be recommended as optimum salinity to maintain highest GMR and relatively minimum *Vibrio* count for PL 09, PL 10, PL 11, PL 12 and PL 13 stages.

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