Effect of Different Stocking Densities on the MBV Infected Seeds of Black Tiger Shrimp, *Penaeus monodon* (Fabricius)

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**Abstract:** A three and half month study was undertaken to evaluate the effect of different stocking densities on the MBV infected *Penaeus monodon* seeds. The stocking densities of 6 PL/m², 10 PL/m² and 15 PL/m² were considered as D1, D2 and D3 respectively. All the experimental ponds were supplied with commercial pelleted feed of different grades and the amount was based on the age and growth of shrimps. The water quality parameters and microbial population was properly maintained by the application of probiotic for all the experimental ponds. A significant higher production, survival and profit were noticed from the pond D1. From the results of the present study it could be confirm that low stocking (6 PL/m²) density with MBV infected seeds can be successfully cultured by proper water quality and feed management.

**Key words:** Do, *Monodon baculovirus*, *Penaeus monodon*, pH and salinity

**INTRODUCTION**

Maintaining a healthy shrimp population in a culture system requires a basic understanding of the etiology of the diseases that occur in the system. Unfortunately, limited information is available on shrimp diseases in Asia as a whole. This has frequently resulted in misdiagnosis and subsequent mistreatment and rampant abuse of antibiotics and other therapeutics. The indiscriminate use of antibacterial drugs has resulted in the development of resistant strains of bacteria, making the problems even worse.

*Monodon baculovirus* (MBV) was first described by Lightner and Redman (1981) in *P. monodon* from Taiwan. Since then it has been identified and reported in *P. merguiensis*, *P. semisulcatus* and *P. kerathurus* (Johnson and Lighter, 1988; Lightner, 1988), *P. vannamei* (Lightner et al., 1990), *P. esculentus*, *P. penicillatus* and *P. plebejus*. This appears to be enzootic in South East Asia, though there have been no reports from the Indian subcontinent except a preliminary record by Alavandi et al. (1995).

Shrimp, *P. monodon* plays a significant role to the export earning and income generation in Asia. Shrimp culture has become a fast-growing industry in India during the past decade. Shrimp is more popular source of protein food which commands high prices in the national and international markets. The aquaculture industry is growing at an alarming rate surprising some major hurdles (disease out break and pollution) during its development (Ravindranath, 2001). The present study was undertaken to evaluate the effect of different stocking densities on the MBV infected *P. monodon* seeds.

**MATERIALS AND METHODS**

The experimental farm located in the southern side of Kollidam back water. The study was conducted for a three and half month (1st March to 16th June) in three culture ponds each of 0.5ha size. The ponds were prepared by complete dewatering and drying in the month of February. Repairing of pond dykes, inlets and outlets, and removing of black soil was done by manual. The pond bottom was ploughed horizontally and vertically a depth of 30 cm to remove the obnoxious gases and oxygenate the bottom soil also completed by February month. Liming (CaCO₃) was done at the rate of 300kg/ha. The water was allowed to enter the ponds through feeder canal slowly upto 1.2m depth in 3 days. Required amount of organic fertilizer such as rice bran; groundnut oil cake, dry cow dung and yeast were soaked over night and applied the extract to all the ponds. The same procedure was continued for three days. After three days the water color turned to light green then added urea and super phosphate to improve the primary production.

**Stocking:** Hatchery produced *P. monodon* (PL 18) seeds were collected and acclimatized properly before releasing to the ponds. Three stocking densities such as 6, 10 and 15 PL/m² denoting as D1, D2 and D3 respectively were compared. Commercial pelleted feeds (CP Aquaculture India Pvt Ltd) were used entire culture period for all ponds. Shrimps were started to feed four times per day. Estimation of biomass and feeding were done following the methods as described by Chakraborty et al. (1997). As required, water was exchanged to about 20 to 30 %, once in every ten days depends upon the water quality. And
average water depth was maintained one meter upto first 30th days of culture and upto 1.2 meters for rest of the days, but not less than one meter. There was no water exchange during the initial culture days to allow natural food organisms to grow. Aerator were operated from 3 to 15 hours daily based on density, age, shrimp growth and length of the culture period. The aerators were placed in such a way that could privilege maximum wastes out during water exchange and kept the culture environment friendly.

**Analysis and data recording:** Cast net was used to measure the growth rate of shrimp. The first sampling was taken after 40th day of culture and the number of individuals and the average body weight were recorded in each sampling. The sampling was done regularly for every ten days until harvest. The water level was measured by using a standard scale with cm marking. The water salinity, pH, temperature, dissolved oxygen and transparency was measured by using a hand refractometer, pH pen, thermometer, dissolved oxygen and secchi disc, respectively.

**RESULTS**

The values of different water quality parameters in the experimental ponds are presented in Table 1. The water salinity during the study period ranged from a minimum of 18ppt to a maximum of 25ppt. The water temperature was recorded maximum 31°C and minimum was recorded in the month of March 29°C. The daily water temperature and salinity were found almost similar to all experimental ponds.

The values of the dissolved oxygen content ranged from a minimum of 3.8 ppm to a maximum of 4.0 ppm. The pH value of the pond water was alkaline range during the study period with a minimum of 7.5 to a maximum of 8.0. The highest average value of pH was recorded in the ponds D2 and D3 in the month of May. Negligible amount of un-ionized ammonia was reported from all study ponds (0.01 to 0.02ppm) respectively. Growth performances of shrimps (MBV infected seeds) obtained in different experimental ponds during the study period are shown in Table 2. The mean weight gain of the shrimps in pond D1 was higher compared to other ponds (D2 and D3). The significant difference in the specific growth was found in the MBV infected seed pond of D1. On the other hand, the food conversion ratio (FCR) was 1.1 in the D1 was comparatively lower then other ponds D2-1.2 and D3-1.25 (Table 3). The maximum survival rate was recorded in pond D1 (76%) and the lowest survival was recorded in pond D3 (52%). Average body weights of the ponds D1, D2 and D3 were 26, 17.92 and 14.24 grams. Respectively maximum production was reported in pond D1 (592.8 kg) and minimum was in the pond D2 (537.6 kg). The maximum net profit was obtained from the pond D1 (Rs 60,934) and the loss was recorded in the pond D3 Rs -696 (Table 3). The highest microbial load recorded in the D2 and D3 (Table 4).

**DISCUSSION**

The MONODON-type BACULOVIRUS (MBV) has been prevalent in shrimp farms and hatcheries since 1983. The tiger shrimps can withstand MBV infections as long as the pond environmental conditions are good. MBV infected shrimps may acquire secondary bacterial infections and may succumb to the disease. Mortalities may be high when the environmental conditions are hostile. Several pathogens of Penaeid have been implicated in disease of juvenile and sub adult populations in Southeast Asia. Penaeus monodon baculo virus (MBV) is a wide distribution and is known to be present in India (Lightner, 1985). In the present study the MBV affected seeds stocked in three different stocking densities (ponds D1/6m², D2/10m² and D3/15m²). The values of water quality parameters reveal that all these are in the acceptable range for shrimp culture without any variation. The variation in water temperature of 29 to 31 °C in the shrimp ponds during the study period was associated with normal climatic change of the experimental area (Roy, 1992). The temperature was
found quite suitable for *P. monodon* growth as described by Chiu (1988) and Nakra (1994). The salinity of the present study was maintained 18-25ppt in all ponds.

Muthu (1980) and Karthikeyan (1994) recommended a salinity range of 10-35 ppt was ideal for *P. monodon* culture. Chen opined that salinity ranges of 15-20 ppt are optimal for culture of *P. monodon*. The optimal range of pH 6.8 to 8.7 should be maintained for maximum growth and production (Ramanathan, 2005). In the present study pH was ranging between 7.5 to 8.0 for all culture ponds. Ramakrishna Reddy (2000) was recommended pH of 7.5 to 8.5 for *P. monodon* culture. Dissolved oxygen plays a major role and its affects the feed consumption and maturation. Lack of dissolved oxygen can be directly harmful to shrimp and cause a substantial increase in the level of toxic metabolites. Low level of oxygen tension hampers metabolic performances in shrimp and can reduce growth and moulting and cause mortality (Gilles le molluac, 2001). The dissolved oxygen in all the culture ponds in the present study was ranging between 3.8 to 4.0 ppm.

The microbial population plays on important role in the shrimp growth and health. Once the microbial load increase in the water column automatically the shrimp will get the bacterial infection (Alavandi, *et al.*, 1995). In the present study the highest green colony counted in D3 pond (600). The lowest green colony counted in D1 pond (310). Periodic sampling is very vital for successful shrimp culture. It is recommended to do weekly or fortnightly sampling to check the health condition as well as to estimate the growth of shrimps. Sampling also helps to know the average weight and this would help to estimate the total biomass in the pond for better feed management. Growth of shrimp depends mainly on pond water quality and effective management of feeding. It is observed that growth rate of shrimp in the present study is rapidly increasing after 40th DOC in all ponds due to the accurate feed manipulation by sampling.

Though an inverse relation was observed in individual shrimp growth (weight) with the rate of stocking, but no significant variation was observed in specific growth rate of shrimps within the treatments. Similar observations were also reported by Wyban et al. (1987) for *P. monodon* culture. Therefore, a growth difference was found between the stocking densities. But in the case of survival, the rate was found to vary inversely with stocking density. An ideal FCR value for shrimp culture was recommended as not more than 2.0 by Chanratchakool *et al.* (1995). In the present study the higher FCR value was observed in the pond D3. Though a significantly lower value regarded for D1, the average values obtained from different ponds are in agreement with the recommended value for *P. monodon* growth. Among the three ponds highest production rate of shrimp (592.8 kg) was obtained in pond D1 followed by pond D3 (555.36 kg) and pond D2 (537.6 kg) respectively. Among three ponds the lowest survival was recorded in D3 (52%) pond and maximum survival was obtained from pond D1 (76%). Krantz and Norris (1975) stated that survival rates of 60 to 80% are to be expected for *P. monodon* under suitable rearing conditions. Ahmed *et al.* (1998) showed that in well managed traditional shrimp farming of Bangladesh where stocking density varies from 0.75 to 1.5 shrimp PL/m², after 120 days of culture, shrimp attain about 44g weight with more than 50% survival. Presence of high organic load in the pond due to high stocking rate and feed application affecting water quality and putting the cultured animal physiologically in a stressed condition. In addition, flash flood and heavy rain fall sometimes suddenly changes the physical-chemical parameters such as salinity and reduces the buffering capacity of pond water and cause stress to the shrimp and they become more susceptible to pathogenic. The susceptibility of shrimp towards pathogen depends on general health condition of juveniles, biological and other aqua ecological stresses caused due to farm management problems. But in the present study is attributed that MBV infected *P. monodon* seeds can grow without any problem, if the stocking density of the pond is 6/m², proper water quality and feed management.

**REFERENCES**


