Evaluation Of Effects Of Some Selected Probiotics On Sediment Characteristics Of L. Vannamei Culture Ponds

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Abstract: The present study was carried out over a period of 120 days to estimate the major sediment characteristics such as pH, sedimentary organic carbon, sedimentary total nitrogen, available phosphorus, alkalinity and presumptive vibrio. For this study we have selected two shrimp culture ponds of which one is control and other is experimental pond (probiotic treated pond). The commercial brand probiotics was used for the entire study period. It is evident from the present results that probiotic treated ponds showed better performance in terms of sediment characteristics than control ponds.

Keywords: Sediment Characteristics, L. vannamei, Probiotics.

1. INTRODUCTION

Pond soil plays a significant role in regulating the nutrients in the pond water. The most important function of the soil is for the retention of water. The quality of the soil is an important factor in determining the productivity of the ponds. Soil of the culture pond controls pond bottom stability, pH and salinity. Shrimps generally live at the bottom of the pond and were exposed to conditions on the pond bottom. Knowledge about the nature and properties of pond soil can help a culturist to develop efficient management practices that will enhance the production. The chemical properties of soil at the bottom of pond influence the nutrient management practices of ponds. The nature of a particular soil is depends on its physical and chemical properties as described by George et al., [1]. Water quality management has been considered one of the prime aspects of shrimp culture system for many decades, but less attention has been allocated to the management of pond bottom soil quality. According to Boyd [2] there is a potential evident that, condition of pond bottoms and the exchange of substances between soil and water strongly influence water quality. Keeping in view of this scenario more attention being devoted to study of pond soils in shrimp culture ponds. The purpose of the present study is to estimate the major sediment characteristics such as pH, sedimentary organic carbon, sedimentary total nitrogen, available phosphorous, alkalinity and presumptive vibrio in L. vannamei culture ponds at Ravivaripalem.

2. MATERIALS AND METHODS

The present research work is carried out in the commercial shrimp culture farms located at Ravivaripalem, Prakasam District of Andhra Pradesh, India. The experiments were performed during the year 2018 in both summer and winter seasons for two crops in the control and experimental ponds. For studies on sediment characteristics samples were collected from two shrimp farms with the help of grab and brought to the laboratory of Department of Zoology and Aquaculture, Acharya Nagarjuna University, Guntur in the polythene bags.

Unwanted material present in the sediment was removed. The sediment samples were dried at room temperature for a period of 24 hours according to the protocol of Hall [3] and prepared powder form by using mortar. Subsequently dried sediment samples were sieved with plastic sieve having below 250 µm pore size and collected the fine fraction of the sediment for analysis. The sediment samples were analyzed by following standard methods of [4], [5], [6], [7]. The pH was determined by using Elco pH meter, the sedimentary organic carbon was analyzed by chromic acid oxidation method [8]. The sedimentary total nitrogen was estimated by Kjeldahl method [9]. Total alkalinity was estimated by following titrimetric method as per APHA [10]. Available phosphorus was determined by adopting Bray method [11]. For studies on bacterial population of sample such as presumptive vibrio counts were determined by serial dilution and spread plate method [10]. All the data recorded and presented in the form of tables and statistical analysis performed.

3. RESULTS AND DISCUSSION

It is evident from the present results of control pond of summer crop at Ravivaripalem in the year 2018, the mean values of pH varied from 7.23±1.27 to 8.26±1.43, sedimentary organic carbon ranged from 0.57±0.12 to 2.37±1.22, sedimentary total nitrogen varied from 0.05±0.010 to 0.22±0.023, available phosphorous ranged from 27.14±13.11 to 36.22±17.27, alkalinity varied from 26.16±1.24 to 41.24±2.22 and presumptive vibrio counts ranged from 0.11×10^2±0.06 to 2.17×10^2±0.22 respectively. Whereas in the experimental pond, the mean values of pH varied from 7.16±1.22 to 7.57±1.34, sedimentary organic carbon ranged from 0.43±0.06 to 0.98±0.25, sedimentary total nitrogen varied from 0.03±0.010 to 0.17±0.025, similarly available phosphorous ranged from 25.13±11.07 to 34.19±14.23, alkalinity varied from 23.14±1.22 to 36.21±2.17 and presumptive vibrio counts ranged from 0.09×10^2±0.04 to 1.29×10^2±0.21 respectively. Similarly in the winter crop of control pond the mean values of pH varied from 7.22±1.28 to 7.56±1.29, sedimentary organic carbon ranged from 0.58±0.02 to 1.65±0.22, sedimentary total nitrogen varied from 0.06±0.010 to 0.20±0.025, available phosphorous ranged from 31.22±11.15 to 42.24±15.22, alkalinity varied from 26.12±1.22 to 39.32±1.19 and presumptive vibrio counts ranged from 0.12×10^2±0.05 to 2.19×10^2±0.20 respectively. Whereas in the experimental...
pond, the mean values of pH varied from 7.35±1.21 to 8.23±1.15, sedimentary organic carbon ranged from 0.38±0.07 to 0.71±0.25, sedimentary total nitrogen varied from 0.06±0.011 to 0.18±0.023, similarly available phosphorous ranged from 28.12±14.10 to 37.45±19.26, alkalinity varied from 25.12±1.13 to 42.26±1.23 and presumptive vibrio counts ranged from 0.07×10^2±0.05 to 1.17×10^2±0.21 respectively (Figures 1-6).

Pond bottom soil pH can range from less than 4 to more than 9, but the suitable pH for pond soil is considered to be about neutral as reported by Boyd [2]. Maximum level of soil phosphorus generally occurs at about pH 7. Most of soil microorganisms and soil bacteria can be active at pH 7 to 8. In the present study the mean values of organic carbon were ranged from 0.57±0.12 to 2.37±1.22 during the study period. In the present findings the average total sedimentary nitrogen concentration in shrimp culture ponds soil at the beginning of the culture period was 0.03±0.01. The mean values of sedimentary nitrogen were found to be 0.22±0.023 at the end of the crops. Average concentration of available phosphorus in the present study was 25.13±11.07 ppm at starting of the crop and 42.24±15.22 ppm at the end of the culture. Another important and significant aspect of present study is bacterial population in pond sediment, for this presumptive vibrio counts were estimated from both probiotic treated and control ponds.
Vibrio species are members of bacterial flora of the shrimp and marine environments and act as opportunistic pathogens, and they are responsible for the mortality in shrimp culture [12]. In the present study vibrio count of sediment was gradually increased with increased culture period. Similarly Dalmin et al., [13] also observed high population density of Vibrio parahaemolyticus in water, shrimps and sediment as 3.7x10^3 cfu/ml, 5.5x103/gr and 1.9x 10^2 cfu/gr respectively. In the present study the minimum vibrio counts were recorded at 30 days of culture. This is because of the application of lime during the pond preparation and low level of organic matter at beginning of the culture. The maximum vibrio counts were recorded at 120 days of culture. This may be accumulation of organic wastes in the shrimp ponds due to application of organic manure and fertilizers, left over feed, fecal matter and dead algae [14], [15], [16]. In the present findings higher vibrio counts at the end of culture and agrees with the results of Dalmin et al., [13]

4. REFERENCES


