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Efficacy of the Marine Yeast Debaryomyces Hansenii on Growth of the Shrimp Litopenaeus Vannamei.

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Abstract: ***Yeasts are regarded as potential feed supplements in aquaculture. A field trial was conducted to test a marine yeast Debaryomyces hansenii for its role in the growth of shrimp L.vannamei. The shrimp was fed with the diets incorporated with Debaryomyces hansenii (10[6] CFU g-1) and various growth parameters like Weight gain (WG) (g), Specific growth rate (SGR) (%), Feed conversion ratio (FCR), Average Daily Weight Gain (ADWG) (g) estimated during 30, 60, 90, 120 Days of Culture (DOC). The shrimp in test pond fed with marine yeast showed good growth compared to the control ponds. Debaryomyces hansenii would be an alternative feed supplement in the L.vannamei culture for better growth and production.***
Keywords: Debaryomyces hansenii, feed supplement, Litopenaeus vannamei, growth parameters, aquaculture.

I. INTRODUCTION

Aquaculture production has increased to a large extent from past 10 years. Penaeid shrimp is the commonly cultivated aquatic species. Shrimp has high economic value and has good export importance. Since from its introduction, shrimp production faced many problems in terms of diseases and increased production costs [1]. Disease outbreaks resulted in reduced production rate in the last decade [2]. Though high-density cultivation techniques by proper farm management practices and technical advancements resulted in the increase in the production of shrimp culture, it could not solve the problem of diseases and increased production costs. The use of probiotic microorganisms was found to be a better preventive method to fight against the disease outbreaks during recent years [3].The cost of feed production increased due to the non-abundant availability of raw materials. In aquaculture, the main economic challenge for the farmers is the feed which holds responsible for almost fifty percent of the total production cost. Fishmeal is the most important ingredient and it is the source of protein in the aquafeed [4]. Researchers are trying to find a better alternative source of the protein which can efficiently replace fish meal without compromising the nutrition requirements of shrimp [5],[6], [7],[8]. bIn such situations, Yeast is a rich source of protein repositories, important vitamins like B-Complex, lipids and other nutrients, hence it is projected to use as an ingredient in shrimp feed [9]. Some of the yeast species can make partial replacement of fishmeal or soybean protein [10]. The efficacy of live yeasts as diet compliments in aquaculture diets have been tested by many workers and reported the ability to enhance growth, achieve better FCR (Feed Conversion Ratio) and immune enhancing properties in aquaculture animals, such as shrimps [11], [12]. In the present study, *Debaryomyces hansenii* a marine yeast was incorporated in the diets of shrimp *L.vannamei* and various growth parameters were estimated during the culture period.

II. METHODOLOGY

A. Pond preparation and stocking:

Six rectangular ponds (**Fig.1)** of 0.5 hectares each located $14^0$48'42.07'' N, 80^0 03'14.57'' E of Juvvaladinne Village, Nellore District was used for this study. Three ponds were used as test ponds and other three were considered as control ponds. Pre-stocking management was done before stocking the ponds with the shrimp Post Larve (PL).The pond was prepared by ploughing and removal of the topmost soil of about 10 cm for removing black soil/sludge deposition. Source of water was creek (brackish water canal). Reservoir pond was maintained for the water storage and the water was thoroughly chlorinated at the rate of 20 ppm. Around 130 cm Water depth was upheld during the culture period. Sludge drain (shrimp toilet) that is a central sludge drainage system connected to PVC pipes was constructed in the centre of the pond. Sludge drain was operated through a sludge pump mounted on the dike of the pond which discharges the accumulated sludge present the shrimp toilet to the outlet. Crab net was installed as a part of biosecurity measures [13].

Fig.1: Ponds used for the study, Juvvaladinne Village, Nellore.

1) *Preparation of test Diet:* Feed used in this study was procured from CP Feeds (CP Aquaculture India Pvt Ltd). The test diets were prepared by incorporating cultured (ME-broth) *Debaryomyces hansenii* (10^6 CFU g-1) suspended in with PBS (phosphate buffer saline, pH 7.4). After drying the feed was stored at 4^0C until further use [13].
2) *Stocking and culture management*: Culture period was 120 days. February –June 2016 (120 days). *Litopenaeus vannamei* seed at (Post larvae) PL 15 stage was procured from BMR hatchery, Ramaterdham, Nellore. PL was free from White spot syndrome virus (WSSV) (PCR test). Stocking density was 30/m^2.Feeding was done four times daily at 6:30 am, 10:30 am, 3:30 pm and 7:30 pm respectively. Feed management was done based on the expected survival after sampling and by monitoring check trays accordingly. The water level was maintained by top up with reservoir water. After 30 DOC onwards, for every week, Sludge was pumped out through sludge drain. After 60 days water exchange was carried out at the rate of 10% every week. Water quality parameters like pH, Dissolved oxygen (DO), salinity, Total Alkalinity and Total Ammonia were monitored at regular intervals and managed accordingly.[14].
3) *Sampling and data analysis:* Sampling was done by using cast net at 30, 60, 90, and 120 DOC and growth parameters like Survival rate, Weight gain (g) (WG), Specific growth rate (%) (SGR), Feed conversion ratio (FCR) and Average Daily Weight Gain (g) (ADWG).were measured [15]. The results were statistically analysed by using ANOVA (Two-Factor Without Replication $p < 0.05$).

III.RESULTS AND DISCUSSION

Growth of shrimp *L. vannamei* was measured by sampling on 30, 60, 90 and 120 DOC (Days of Culture) the mean average values of the samples were tabulated (Table.1.) ANOVA analysis revealed that Days of culture (DOC) influenced the growth of the shrimp. There is a gradual growth in the weight of shrimp in grams as a number of days of culture increases. The weight of the shrimps corresponding to all the DOC of the Control ponds was significantly different with that of the test ponds.

The weight gain of the individual shrimp was of 19.36±0.90 in control and the weight gain of shrimp in test pond was 23.37±0.90. The specific growth rate was increased to 6.46±0.03 in the pond fed with *Debaryomyces hansenii* whereas in the control pond the specific growth rate was recorded as 6.31±0.04. Pathissery et al., (2016) used Marine yeasts as a feed supplement for Indian white prawn *Fenneropenaeus indicus* and reported the comparable growth rate increase in shrimp fed with marine yeast [16]. The FCR for control pond was 1.80±0.01 and for the test, the pond was 1.66±0.03 representing that in control pond, more feed has been spent for the production of shrimp in control pond. Deng Deng et al, 2012 used YK-6, a yeast culture as a feed supplement for *Litopenaeus vannamei* and reported similar result showing a decrease in the FCR and increase in the net weight in the shrimp fed with yeast [17].

Table.1. Growth performance of shrimp in control and Test pond.

DOC	Weight of the shrimp in Control Pond [1]	Weight of the shrimp in Test Pond [1]
30	3.17± 0.57[a]	4.35± 0.25[b]
60	9.33± 0.63[a]	11.73± 0.46[b]
90	15.33± 0.74[a]	18.23± 0.38 [b]
120	19.36± 0.90[a]	23.37± 0.90[b]

[1] Mean of 3 replicates ±SD. In the row, different letters indicate significant differences (P<0.05).

The survival rate of the shrimp inTest pond (67±0.47) is higher than in the control pond (63±0.47). (Table.2.).

Table.2. Growth parameters of the shrimp after Harvest.

Parameter	Control Pond[1]	Test Pond[1]
Survival (%)	63±0.47	67±0.47
Weight gain (WG)	19.36±0.90	23.37±0.90
Specific Growth Rate % (SGR)	6.31±0.04	6.46±0.03
Feed Conversion Ratio (FCR)	1.80±0.01	1.66±0.03
Final Biomass of Shrimp after Harvest (Kg)	1820.20±80.12	2336.30±81.76
Average Daily Weight Gain (g) (ADWG)	0.16±0.01	0.19±0.01

[1] Mean of 3 replicates ± SD

The average total biomass of the shrimp of shrimp after harvest was 1820.20±80.12 Kg and 2336.30±81.76 Kg of the control and test ponds signifying that the test pond yielded more net weight of shrimp than the control. *Debaryomyces hanseniii* improved the growth performance of the shrimp in the test pond contributing to the higher Average Daily Weight Gain (ADWG, 0.16±0.01) than control pond (ADWG,0.19±0.01g).

IV. CONCLUSION

Debaryomyces hansenii improved survival rate and achieved lower FCR for the shrimp in the test pond than the control pond. The overall growth of the shrimp fed with marine yeast was much better than the shrimp which consumed the untreated feed in the control pond. *Debaryomyces hansenii* influenced the total growth parameters to achieve better yield. It can be concluded that *Debaryomyces hansenii* can be used as a feed supplement in the *Litopenaeus vannamei* culture for better growth and production.

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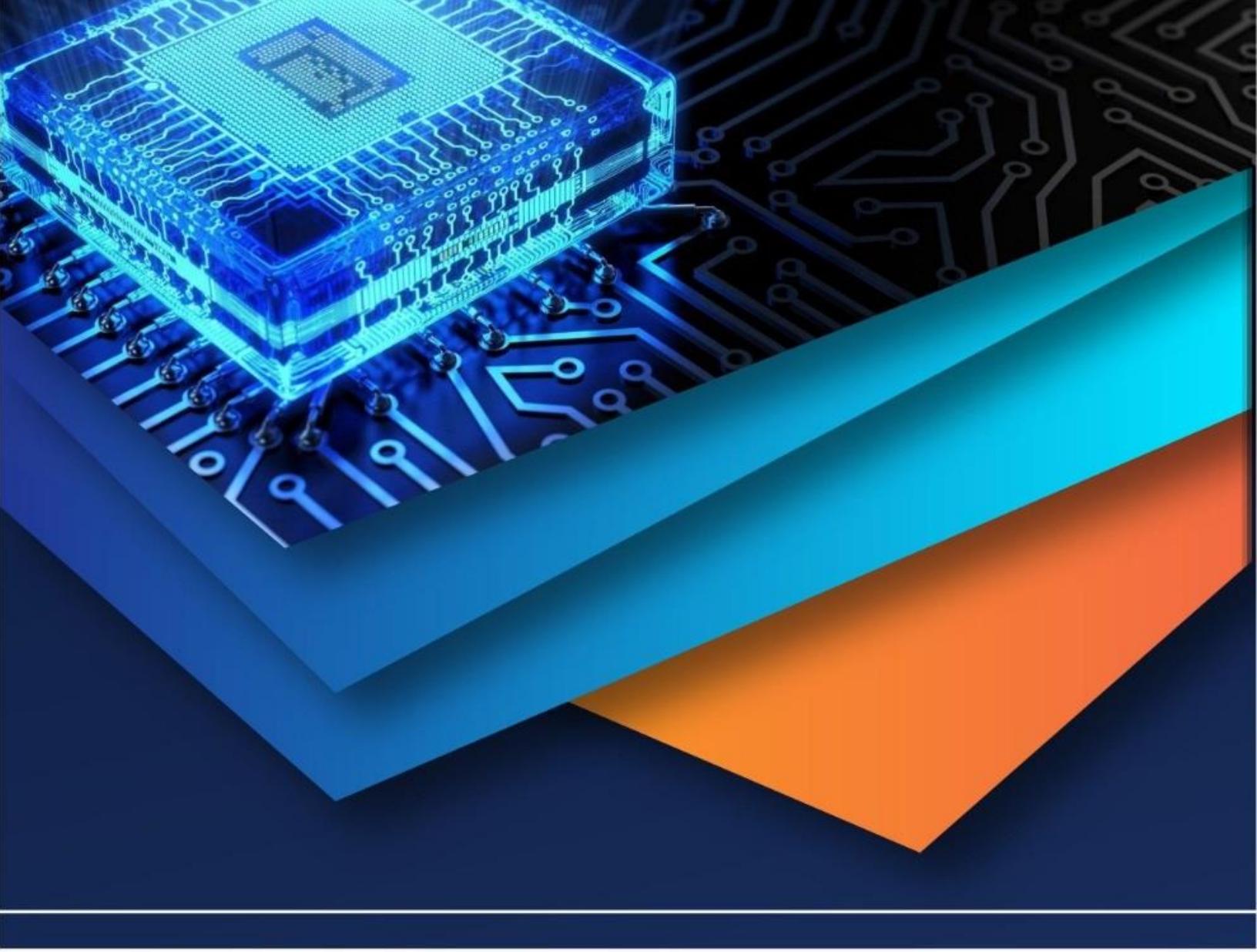

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