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Note

Effect of probiotics on the giant tiger prawn, *Penaeus monodon*, production in pond culture at Sunderban area of West Bengal

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Abstract

The effect of probiotics supplementation with feed on the production of giant tiger prawn, *Penaeus monodon*, in pond culture was studied. Four ponds (area ranging from 527 to 1196 sq.m) were stocked with *P.monodon* PL-20 @ 10 nos./ sq m to study the effect of probiotics on production performance. In two ponds the commercial feed without probiotics (i.e. control) and in other two ponds same feed supplemented with probiotics containing *Lactobacillus* spp. and *Saccharomyces cerevisae* were given to the shrimps. In all the ponds, tidal water was used for water exchange for 3-5 consecutive days per fortnight when turbidity and dissolved oxygen were around 20 cm. and 5.2 mg/l respectively. During culture period, water temperature (°C), DO (ppm), *p*H, alkalinity (ppm) and salinity (ppt) in all the ponds were in the range of 27.5-36.9, 5.2 -11.2, 7.22-9.69, 92-164 and 8-15, respectively No aeration was given during culture period. At the end of 120 days of culture it was found that total biomass yield (kg/ha) in probiotic supplemented group was higher (1880.15±71.85) than that of non-supplemented group (1489.65±146.05). Feed conversion ratio (FCR) in probiotic supplemented and non supplemented ponds were 1.33±0.04 and 1.35±0.03, respectively. Survivability (%) of shrimps was also higher in probiotic supplemented pond (71.17±2.24). So, it can be concluded that supplementation of probiotic with feed has beneficial effect in improving survivability and yield of this species in pond culture.

Shrimp farming is now recognized as one of the lucrative aquaculture activity and has earned the status of an industry. But recent disease outbreak in shrimp farming caused mainly by bacteria, virus, fungi or a combination of these etiologic agents is attributed for inconsistent production and disturbance in the environment of pond. To combat this, different antibiotics and chemicals are being used which are reported to be not environment friendly and hence their use has been banned in the *Penaeus monodon* culture. Of late, a new and unique biotechnological product called "probiotics" is being used widely by all the shrimp farmers worldwide, which is found to be more effective in increasing the average body weight, feed conversion ratio (FCR) and total yield of *P.monodon* in pond culture and also they are environmentally safe (Sambasivam *et al.*, 2003).

The term probiotics can be defined as microbial cells that are administered in such a way as to enter the gastrointestinal tract and to be kept alive (Gatesoupe, 1999), or a live microbial feed supplement that beneficially affects the host animal by improving the intestinal microbial balance (Fuller, 1989). Direct addition of *Bacillus* S11 (BS11) into feed supplemented to *P. monodon* resulted in greater live weight gain (7.06 ± 0.48 g) and survival than non-supplemented (3.99± 0.38 g) group (Rengpipat *et al.*, 1998,2000,2001). Thus, the application of probiotics could lead to disease-free and profitable shrimp culture operations which will be helpful to shrimp farmers (Dalmin *et. al.*, 2001). Therefore, in the present experiment an attempt has been made to study the effect of addition of probiotics on growth, production and survival of *P. monodon* in pond culture.

Materials and methods

The culture trial was conducted at Kakdwip Research Centre of CIBA, Kakdwip as per Aquaculture Authority guidelines in Institute's tide fed pond. To study the effect of probiotics supplementation with feed on the production, four ponds (area ranging from 527 to 1196 sq.m) were stocked with *P.monodon* PL-20 @ 10 nos./sq m. In two ponds shrimps were fed with commercial feed (i.e. control) and in other two ponds they were fed with commercial feed supplemented with probiotics containing *Lactobacillus* spp. and *Saccharomyces cerevisae* @ 1 % of total feed offered. Just before feeding, probiotic was mixed thoroughly with feed using a commercial binder. Initially feeding was done twice-a-day at 6 am and 6 pm and after 30 days feed was given four times a day by broadcasting the feed in the feeding zone.

Pond preparation: The ponds were prepared by de-

watering, leveling and removing top layer of silt from the 10 m wide periphery i.e. feeding zone of the pond. The ponds were left for sun drying till top layer of soil cracked. Liming was done with lime stone powder @ 250 kg/ha and filled partially with tidal water filtered through bolting silk net at the pond's sluice gate. Pre-stocking chlorination was done with bleaching powder @ 600 kg/ ha. After 5 days of chlorination inorganic fertilizer (urea and single super phosphate) was applied @ 20 kg/ha each.

Seed stocking and pond management: Twenty days old hatchery-bred and PCR tested post larvae (PL-20) of *P. monodon* were stocked after one week of fertilization @ 10 nos. per sq m. area. Commercial feed was given @ 2 kg/10^5 nos. of post larvae for the first fortnight and thereafter @ 10% of biomass which gradually reduced to 2 % by estimating the pond biomass at every 15 days interval till harvest at 120 days of culture. In each pond one check tray (1 m × 1m × 0.1 m) was used for adjusting the ration and monitoring health status of shrimps. 2-3 % of total feed was given in each check tray and after 1.5-2 hr of feeding tray was checked for adjusting the next dose of feed. In tide fed ponds, keeping in mind that water exchange is the best and economic method of controlling the pollution load (Chakraborti *et al.*, 2002), tidal water passed through filtration system was allowed to exchange the metabolites load in pond water for 3-4 times per fortnight. Only lime stone powder was applied @125 kg/ha weekly after 90 days of culture to maintain water quality and pond bottom condition. Weekly sampling by cast net was done for assessing pond biomass and for removal of unwanted species, if any. Water of each pond was analyzed daily for dissolved oxygen (DO), temperature, *p*H, salinity and alkalinity. Salinity and *p*H were measured by 'ATAGO' refractometer and electronic *p*H meter respectively. Other physico-chemical parameters of water were analysed following standard methods (APHA, 1980). Commercial feed was analysed for proximate composition (AOAC, 1995).

The experimental data were subjected to analysis of variance (ANOVA) to test the significance among the treatment groups with respect to growth, feed conversion ratio (FCR), survival and total yield. All the parameters described under this experiment were analysed by using GLM procedure of SPSS (1997) software to find out the effect of probiotics on above said parameters. The method of least significant difference was applied for comparison between the treatments, following the method of Snedecor and Cochran (1973).

Results and discussion

The protein and lipid content of feed used in the present culture was sufficient enough to meet the requirement of *P. monodon* as reported by Ali, 2004. Proximate composition of feed offered to them at different stages of growth is given in Table 1. During four months culture, water temperature (°C), DO (ppm), *p*H, alkalinity (ppm) and salinity (ppt) in all the ponds were in the range of 27.5-36.9, 5.2 -11.2, 7.22-9.69, 92-164 and 8-15, respectively and did not differ significantly (Table 2). Details of the results obtained from the individual experimental pond are shown in Table 3. Due to outbreak of white spot disease the culture was discontinued and shrimps were harvested after 100 days. Total biomass yield (kg/ha) of probiotics supplemented group (1880.15 ± 71.85) was higher as compared to that of non-supplemented group (1489.65 ± 146.05) but did not differ significantly (Table 4). Rengpipat *et al.*(1998) observed significant increase in yield of *P. monodon* in pond culture with probiotic supplemented feed. Survivability (%) of shrimp was also higher in probiotics supplemented group (71.17± 2.24) than that of non-supplemented group (64.59± 1.03) but the differences were not statistically significant. But significant improvement in survivability of shrimp fed with probiotic supplemented feed was reported by Rengpipat *et al.*(2003). Uma *et al.*(1998) also reported that the growth and survival of *P. indicus* juveniles significantly improved by the addition of Lacto-sacc™(a commercial livestock probiotic feed supplement composed of *Lactobacillus acidophilus, Saccharomyces* spp. and *Streptococcus faecium* at levels ranging from 2.5 -7.5 g/ kg feed). Average body weight (g) at harvest and FCR was better in probiotics supplemented group (19.59± 2.73, 1.33± 0.05) as compared to that of non-supplemented group (17.31± 1.98, 1.35± 0.03). During most of the culture periods, the average body weight of *P.monodon* in the probiotic supplemented group was higher than that of non-supplemented group (Fig.1). The present findings corroborates well with the results of Wang *et al.*(2005) who found increased yield and FCR in *Penaeus vannamei* shrimp culture in ponds treated with probiotics. So, from the present study it may be inferred that supplementation of probiotic with feed has beneficial role in improving survivability and yield of *P. monodon* in pond culture.

Table 1. *Chemical composition of feed for different stages of* P. monodon

Parameter	Starter	Grower	Finisher
Dry matter (%)	89.89	91.23	90.56
Crude protein (%)	40.98	40.36	38.12
Lipid (%)	6.88	6.23	5.89
Crude fibre (%)	3.82	3.91	3.97
Ash (%)	12.23	13.89	13.98

Table 2. *Water quality parameters in* P. monodon *culture ponds during April-July,2005*

Parameters	Group I (without probiotics)		Group II (with probiotics)	
	Pond A	Pond B	Pond A	Pond B
Temp. (^{0}C)	36.9-27.5	36.9 - 27.5	36.9 - 27.5	36.9 - 27.5
*p*H	9.01-7.24	9.57 -7.30	9.69 - 7.22	8.98 - 7.24
T. Alk, (mg/l)	160 - 112	160 - 116	164 - 112	162 - 92
Salinity (mg/l)	15-8	15 -8	15 - 8	15 - 8
D.O. (mg/l)	8.4 - 6.0	10.0 - 5.2	9.6 - 5.2	11.2 - 5.6

Table 3. *Performance of* P. monodon *of different treatment groups in culture ponds*

Parameter	Group I (without probiotics)		Group II (with probiotics)	
	Pond A	Pond B	Pond A	Pond B
Pond area, sq m.	1196	862	527	563
No. of PL stocked	12000	9000	6000	6000
Stocking density (no./m^2)	10	10	11	11
Culture duration (days)	100	100	100	100
Survivability (%)	63.6	65.6	73.4	68.9
ABW (g) at harvest	15.5	19.3	16.9	22.3
P.monodon (kg/crop)	118.50	113.90	74.20	92.30
Other prawns (kg/crop)	42	27	21	18
Biomass produced (kg/ha/crop)	1344	1636	1808	1952
Feed used (kg)	222	186	122	151
FCR (feed/ kg biomass)	1.4	1.3	1.3	1.4

Table 4. *Effect of probiotic supplementation on yield, survivability and FCR of* P. monodon

Parameter	Group I (without probiotics)	Group II (with probiotics)	P value	SEM
Yield (kg/ha)	1489.65 ±146.05	1880.15 ± 71.85	0.14	276.13
Survivability (%)	64.59 ± 1.03	71.17 ± 2.24	0.12	4.65
FCR (feed/ kg biomass)	1.35 ± 0.03	1.33 ± 0.05	0.69	0.02
Av. Body weight (g)	17.31 ± 1.98	19.59 ± 2.73	0.57	1.61

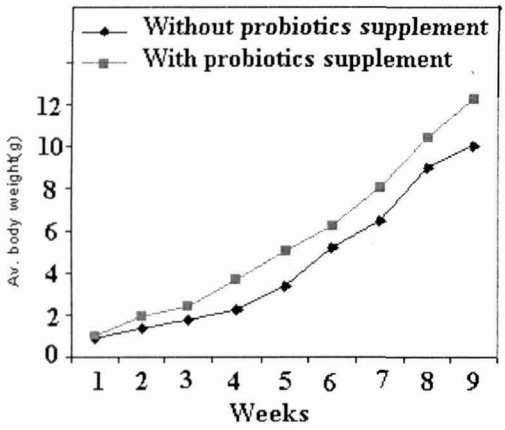

Fig. 1. Average body weight of *P. monodon* at different weeks

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