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A preliminary survey on the use of probiotics by shrimp farmers in Nellore district, Andhra Pradesh

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1. Introduction

In the recent past shrimp production from farm and hatcheries have declined considerably due to disease out breaks and water quality problems. Farmers were able to control these problems to certain extent with the use of antibiotics and therapeutic agents. Indiscriminate use of antibiotics leads to the development of resistant strains of bacteria (Karunasagar et al., 1994). The probiotic approach can be an alternative to these problems and it has immense potential in aquaculture (Gatesoupe, 1999; Mishra et al., 2001;). Boyd (1998) through many of his studies suggested that probiotics could possibly be beneficial in aquaculture ponds but too little is known about their mode of action, conditions in which they are effective, application rates and methods for recommending their use.

Few studies have been made on the use of probiotics in shrimp aquaculture (Moriarty, 1998; Maeda, 1999; Rengpipat et al., 1998; Uma et al., 1999). These probiotic preparations include single species of bacteria or yeast or a combination of several species of both these components. The probiotic supplement is a live microbial feed, which beneficially affect the host animal by improving its intestinal microbial balance. Moriarty (1998) proposed to extend the definition to microbial "water additives". It is possible to change bacterial species composition and improve shrimp production in large water bodies (Moriarty,1998). Harianti (1998) could get a better growth rate and survival for *P.monodon* larvae using a strain BY-9 and suggested the use of probiotics as biocontrol agent in shrimp rearing systems. More over there are claims by manufactures and distributors about the efficacy of these compounds in improving growth and water quality. As all these findings could not clearly provide information regarding the application of commercial probiotics and their efficiency in farm conditions the present survey was conducted to find out the types of probiotics used, their mode of application, costs incurred, effectiveness and the farmers awareness about probiotics.

2. Materials and methods

The survey was conducted in Nellore district of Andhra Pradesh where shrimp farming is widely practiced. Eighteen farms were sampled on a random basis. All farms were using some form of probiotics. Data was collected from farmers using schedules shown in Table 1. Later the collected data was analyzed to find out total production, cost of production/kg, quantity of probiotics applied/ cycle and cost of probiotics / kg production.

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Table 1. Details collected from shrimp farmers as per schedule I and II

Schedule-I	Schedule-II
1. Name of farm a) Village b) District 2. Name of farmer/owner 3. Type of farm (imp.ext/semi intensive) 4. Species cultured 5. Period of culture 6. Source of seed 7. Stocking density 8. Water source 9. Type of feed used 10. Whether probiotics were used	1. Type of probiotic used (feed / envt) 2. Commercial name 3. Cost/kg 4. Company 5. Mode of application 6. Kg/cycle 7. Stage at which probiotics are applied 8. Expected result 9. Result observed 10. What are probiotics (farmer's concept)

3. Results

The surveyed farms were modified extensive types. *P. monodon* was the only species cultured and the seed were procured from hatcheries. The stocking density varied from 2-3/m^2. Water intake was from near by creeks and the farmers were using grower feeds available in the market. All the farms were using commercial probiotics. The farmers were using both water (bioremediators) and feed probiotics. Out of eighteen

Table 2. Cost analysis of different probiotics used by Nellore shrimp farmers and their total production cost.

Probiotics Brand	Application	Days of Culture ± sd	Production kg ± sd	Cost of Production /kg (Rs)±sd	Qty (kg) of Probiotic applied±sd	Cost of probiotics/kg production (Rs) ± sd
A Water Probiotic						
Epicin & Epizyme n=4	25 l/ha/ week (after brewing)	127±3	1452±479	165±8.8	3.06±0.78	7.8±2.54
Biogreen n=6	40-50 l /ha/20 day (after brewing)	120±7	1400±505	159±6	2.16±0.1	2.5±1.5
Wunopuo-15 n=1	Direct application 5kg/ha	132	1020	175	49.33	26.6
Environ AC n=3	Direct application 25kg/ha	123±6	1217±207	170±11	183.3±34	14.3±2.6
B Feed Probiotic						
Aqualact n=2	5g/kg feed	128±1.4	1625±35	180±3	23.6±2.7	8±1.1
Probe-la n=2	5g/kg feed	124	1130±224	172±3.5	10±0.84	4.1±0.28

Table 3. List of probiotic products being used by shrimp farmers in Nellore and their active ingredients, mode of application and cost

Product name	Active ingredients/organisms	Method of application	Cost (Rs)
Epicin and Epizyme	Not given	1kg Epicin and 1kg epizyme in 100 l fresh water and stored until dissolved. Brewed for 8-12 hours and applied at the rate of 25 l/ha/week	3700/kg
Biogreen	*Nitrosomonas, Cellulomonas, Bacillus Subtilis, Nitrobacter*	1 kg added in 200 l fresh water, 2 kg sugar and 250 gm bakery yeast added, and brewed for a period of 16-24 hrs and applied at the rate of 40-50 l/ha/10 days.	1000/kg
Wunopuo-15	*Bacillus acidophilus, Bacillus subtilis, B. sulphureus, B.aerogens, B.radiatus, Methenobacterium, Nitrobacteria, Nitrificans, etc.*	Applied directly. Made in to a slurry with 15 l of water with 5 kg product and applied at the rate of 5 kg/ ha/14 days up to 75 days of culture, and 10 kg /ha/14 days after 75 days	550/kg
Environ- AC	*B.licheniformis, B.subtilis, Pseudomonas aerugenosa, P.putida, Alcaligenes sp, Nitrobacter sp, Nitrosomonas, Lactobacillus lactis, L. helveticus, Saccharomyces cerevisiae, etc.*	Applied directly at the rate of 25 kg /ha/15 days.	95/kg
Aqualact	*Lactobacillus sporogenes, L. acidophilus,Bacillus subtilis, B. licheniformis, s.cerevesiae, Enzyme complex, Vitamins, Seaweed extract, etc.*	Applied at the rate of 5gm/kg feed with cod liver oil as a binder (10 ml/kg feed).	550/kg
Probe-la	*Lactobacillus sporogenes.*	Applied at the rate of 5 g/kg feed with egg as a binder (1 egg/kg feed)	435/kg

farms surveyed 77.7% were using water probiotics and 22.3% were using feed probiotics. Among water probiotics those applied after fermentation constituted 71.4% and those, which were applied directly 28.6%. Water probiotics were applied either directly or after fermentation from the beginning of culture and feed probiotics were applied along with the feed using a binder (either egg or cod liver oil) from 15 days of culture. Different types of water probiotics, feed probiotics and their cost and mode of application are given in Table 2 and 3.

Cost benefit analysis (Fig. 1) shows that when probiotics are used the cost of production increases by 0.9-15%, for an average production of 1.3 t/ha. Out of six probiotics studied water probiotics after fermentation and feed probiotics show lower

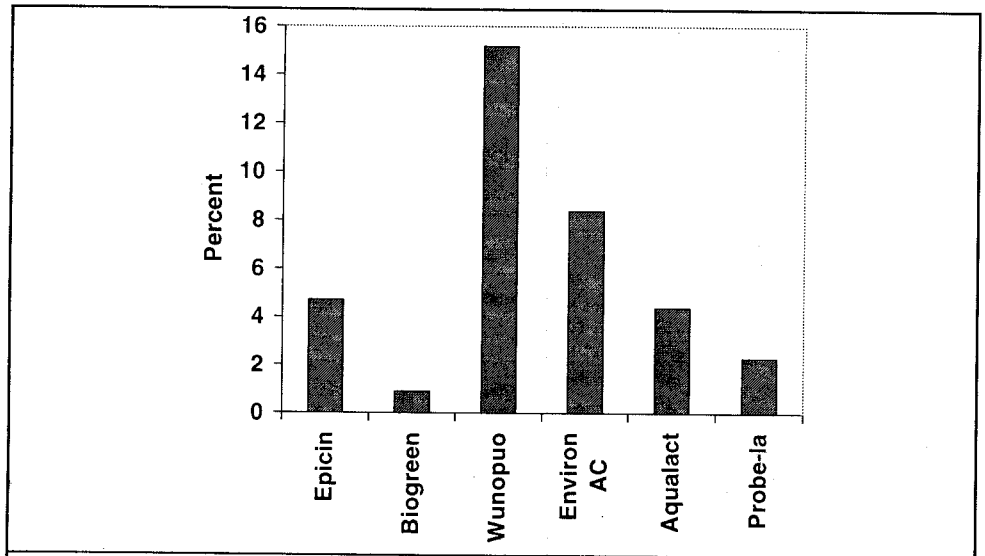

Fig.1. Percentage contribution of different probiotics used by Nellore shrimp farmers in total production cost

cost/kg production. The production cost is higher for water probiotics that are applied directly. The farmers claimed that feed probiotics seems to improve the growth of animal in the initial period up to fifty days of culture. The farmers seem to get good result as the application of probiotics apparently helps them to reduce water exchange, maintains water quality, and increase growth rate and survival. The survey showed that the farmers do not have a clear idea about microorganisms and the mode of action of probiotics. Generally, the farmers were worried about input costs, as they could not afford to use probiotics for lower production rates.

4. Discussion

There has not been any published work on the extent of the use of commercial probiotic preparations in shrimp farms in India and other countries and its techno-economic advantages. Only few studies show the effectiveness of these compounds on growth and survival of larvae and farmed shrimps (Moriarty, 1998; Uma, 1999). All the sampled shrimp farms in Nellore were using probiotics and farmers were convinced about its effectiveness. The data on production in the previous cycle were not available with farmers to compare the growth rate when probiotics were used. As per their opinion they could get a better production with probiotics during their culture period. They felt that they could control the *Vibrio* proliferation. The findings of Moriarty (1998) and Prabhu et al. (1999) showed that PondPro-VC™ and N.S.Series Super SPO™ could control *Vibrio* population in shrimp ponds. However, Nellore farmers do not use these products.

There have been many controversial findings by Boyd (1998) and McIntosh (2000) suggesting that the addition of microbial supplement may not cause measurable change in the water quality in culture ponds. Boyd's study demonstrated higher survival of

fish treated frequently with live *Bacillus* than in control ponds but no improvement in water quality was noted. McIntosh (2000) showed that the application of a bacterial probiotic (Bio Start™ HB-1 and HB-2) did not produce any improvement either in water and sediment quality or in shrimp yield over the untreated tanks. David (1998) suggested that the application of a water probiotic Wunapuo-15™ could suppress *Vibrio* population during shrimp culture operation. Prabhu et al. (1999) studied the usefulness of a probiotic N.S.Series Super SPO™ in maintaining water quality and there by enhancing growth rate and production in shrimp culture. They noticed an increase in plankton production, pH, oxygen level, fertility, and ammonia reduction in experimental ponds than in control pond. The Nellore shrimp farmers also could reduce water exchange and maintain water quality with the use of water probiotics. The farmers were worried about rising input costs, as they could not afford to use probiotics for lower production rates. The present survey is not exhaustive and a wider survey together with microbial gut sampling would have to be conducted to get a better understanding regarding the efficacy of commercial probiotic preparations.

5. Conclusion

All the surveyed shrimp farms in Nellore district, Andhra Pradesh were using commercial probiotics. Majority of the farmers were using water probiotics (with and without brewing) and only 22% were using feed probiotics. The use of probiotics in the shrimp farms increased the cost of production by 0.9-15.2% for an average production of 1.3 t/ha. All farmers claimed that they had increased survival and production on account of using the probiotics, but were unsure about the mode of action of the probiotics.

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