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DIETARY ADMINISTRATION OF A FEED ATTRACTANT (AQUASAVOR) ON GROWTH, NUTRIENT UTILIZATION AND BIOCHEMICAL COMPOSITION OF FRESHWATER PRAWN (*MACROBRACHIUM ROSENBERGII*)

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Abstract: To maximize the feed consumption and reduction of feed wastage in aquaculture can be achieved by use of feed attractants to enhance feed intake, growth and nutrient utilization in culture practices. Against this background the present study was undertaken to evaluate the effect of feed attractants which contains combination of natural flavour extracts (choline, chloride and BHT), amino acids (alanine, valine, glycine, proline, serine and histidine), natural attractants (glutamic acid, tyrosine and betaine) and named as Aquasavor. This was incorporated at 0, 1.0, 1.5 and 2.0% levels in the diet having 30% protein and fed over a period of 120 days to the juveniles of freshwater prawn (*Macrobrachium rosenbergii*) in 25 m^2 cement cisterns. The prawns were stocked at 50 numbers per cistern. The feeding was done daily twice at the rate of 10% of the body weight during the first month and 5% during the subsequent period of rearing. Growth assessment of prawns and water sampling was carried out fortnightly. The best growth, Feed conversion ratio (FCR), specific growth rate (SGR), Protein efficiency ratio (PER) and net production of prawns were recorded with treatment feed having 1.0% attractant. The results suggested that feed attractant, Aquasavor is effective in promoting growth, survival and feed utilization in prawn. A level of 10 g/kg diet was found optimum for *M. rosenbergii* in field condition.

Keywords: *Machrobrachium rosenbergii*, Nutrient, Feed attractant, Biochemical composition.

INTRODUCTION

Aquaculture is concerned with the propagation and rearing of aquatic organisms under complete human control involving manipulation of at least one stage of an aquatic organism's life before harvest, in order to increase its production. Aquaculture is the world's fastest growing food production sector (Moriarty, 1998). Aquaculture has made encouraging

progress in the past two decades producing significant quantities of food, income and employment. particularly, shrimp like *Penaeus monodon, Penaeus japonicus, Penaeus vannamei, Penaeus indicus* fresh water prawn *Macrobrachium rosenbergii,* and various fish species has extensively been practiced all along major water sources in Asia, the major contributor. Fish catches from the marine environment have been steadily declining in many parts of the world due to over-exploitation and pollution, making many people turning to aquaculture to improve the food production and to contribute for economic development.

Feed contributes to more than 50% of the cost of production in intensive aquaculture systems. There is a need to maximize the feed consumption and reduce the feed wastage for the economic success of aquaculture. This can be achieved by use of feed attractants to enhance feed intake, growth and nutrient utilization in aquaculture practices. Feed attractants are chemicals which make animal to orient towards the source of these chemicals. Attractants are mainly used to enhance feed intake and growth in farmed aquatic animals. By enhancing feed consumption the survival can be increased, shorten the production intervals and reduce wastage of feed that deteriorate the water quality. Nitrogenous base such as trimethyl ammonium hydrochloride (TMAH) was identified as a potential attractant for *M. rosenbergii*, which imparts fecal odour to formulated feed and shown to increase pellet ingestion (Costa-Piere and Laws, 1985). Harpaz *et al.* (1987) reported that chemoattarctants such as Taurine, betaine and glycine are effective attractants for the culture of fresh water prawn *Macrobrachium rosenbergii*. Two biogenic amines (Putreseine and Cadaverine) and two sexual pheromones (crab urine and freshwater prawn green gland extracts) are proven to be major attractants compared to commercial products (Mendoza *et al*. 1997). Although, a variety of feeding stimulants and attractants have been identified for prawns and shrimps most of them belong to small groups of chemicals such as free amino acids, nucleotides, nucleosides and quaternary ammonium compounds. Against this background the present study was carried out to evaluate the efficacy of feed attractant on the culture fresh water prawn. The feed attractant used in this study contains combination of natural flavour extracts (choline, chloride and BHT), amino acids (alanine, valine, glycine, proline, serine and histidine) and natural attractants (Glutamic acid Tyrosine and Betaine) and named as Aquasavor.

MATERIAL AND METHODS

Hatchlings of freshwater prawn, *Macrobrachium rosenbergii* were produced in Fresh water prawn hatchery unit located at College of Fisheries, Mangalore, India and were reared up to juvenile stage by offering a 35% protein diet in cement tanks used for the study.

Experimental design and diet preparation

Experiment was carried out in 12 uniform sized cement cisterns measuring 25 m^2 having 10 cm soil base for a period of 120 days. Three test diets namely T_1, T_2 and T_3 having 35% of protein level with graded levels of feed attractant (Aquasavor) were formulated by Pearson square method (Table1).

Stocking and feeding

Uniform sized juveniles with an average weight of 1.5 g were stocked at the rate of 50 numbers per cistern (20,000 /ha) in three replicate groups. Prawns were fed at a rate of 10 % of their body weight for the first 30 days, which was reduced to 5 % till the end of the experiment. The feed was broadcasted over the surface of water twice a daily.

Prawn sampling and water analysis

Sampling (Prawn and water) was carried out fortnightly basis. Prawns collected during each sampling were measured individually for length and weight to record the growth. Water sample collected were analyzed for water quality parameters such as pH, dissolved oxygen, free carbon dioxide, NH_3 and total alkalinity. Digital portable kit (model CK 704) was used to record, pH atmospheric temperature and water temperature. Dissolved oxygen was estimated by Winkler's method (Strick and Parsons, 1972). Total alkalinity, ammonia and free carbon dioxide were determined by following Standard Methods (APHA, 1998).

Statistical analysis

Mean growth and survival of prawn achieved in response to different formulated test diets were analyzed statistically by using one way analysis of variance (ANOVA). Duncan's multiple range test was also employed to identify the significant differences between the groups of treatment.

RESULTS

Growth and survival of prawn

The mean weight and length of prawns were (Table. 2) recorded. It was observed that the best growth of *M. rosenbergii* in terms of weight was recorded in T_1 (52.58 g) followed by

T_2 (42.65 g), T_3 (38.51 g) and T_0 (23.41 g). The final average length was highest in treatment T_1 (15.16 cm) and lowest in T_0 (11.16 cm). Specific growth rate (% /day) of *M. rosenbergii* was highest in T_1 (2.964) and lowest in T_0 (2.289) (Table 3). The highest survival 80.66 % was recorded in T_1 and lowest in T_0 (52.0%) (Table 3). There were significant differences in mean weight gain and survival of prawn between different treatments and control groups.

Nutrient utilization of prawn

Best food conversion ratio (FCR) was recorded in T_1 (2.77) and poor FCR in T_0 (3.594) (Table 3). Protein efficiency ratio (PER) was highest in T_1 (0.105) and lowest in T_0 (0.082).

Biochemical composition of prawn

The effect of feed attractant on biochemical composition of prawn muscle is recorded (Table 4). Prawn fed diet T_1 had highest protein (18%), lipid (4.75%) and lowest in control groups.

DISCUSSION

The addition of feed attractant resulted in a significantly higher weight gain of prawns over the control group. The higher growth of prawn fed attractant supplemented diet could be due to increased food searching behavior, improved feed palatability, higher feed intake and also efficient activation of cephalic reflex induced by smell and taste of attractive substances in palatable foods (Fange and Grove, 1979). Very little attention was focused on use of feed attractants, in culture practices (Harpaz *et al.,* 1987). A feeding experiment conducted with juvenile freshwater prawn, *M. rosenbergii* in which betaine was added as a feeding attractant resulted in 17% increase in growth over control (Harpaz *et al*., 1997). Higher growth, feed intake, assimilation, FCR and survival in *P. monodon* were reported, when a semi purified diet containing 1.55% of taurine and amino acid mixture (Briggs *et al*. 1993). DMPT and betaine can effectively increase body weight and molting rate in *Penaeus indicus* (Jasmine *et al*. 1993). Higher SGR of *M. rosenbergii* recorded in diet T_1 indicates better utilization of the diets. Higher SGR in *M. rosenbergii* fed Nutripro-aqua (feed additives) incorporated diets recorded than in control (Jayaram, 1998).

Higher survival (86%) of the prawns that received attractant was not significantly different from that of the control (86%) in juvenile freshwater prawn (Sheenan Harpaz, 1997). Hartati and Briggs (1976) recorded that the survival of 60 % and 80 % in *P.monodon*

fed different diets containing 1.5% each amino acid mixture and taurine respectively. Results of the present study, were comparable to result obtained by using mixture of different attractive substances by earlier workers. Better food conversion ratio and efficiency could be due to increased digestive enzyme activity (Srinivas, 2000). Protein efficiency provides better indication of the nutritional status of fish with respect to dietary protein than FCR (Jauncey, 1982).

The biochemical composition of an animal is known to be influenced by the factors like geographical location, sex, age, maturity and feeding condition among them sexual maturity and the type of feed ingested are probably the most important factors for the biochemical changes in prawns (Remers and Maske, 1977; Srikar *et al.,* 1979). Form this study we can conclude that the feed attractant such as aquasavor was effective in promoting growth, survival and feed utilization in freshwater prawn *M. rosenbergii.* The water quality parameters were monitored in the different cisterns of the treatments throughout the experimental period and were within the tolerable range for prawn. Hence, use of feed attractant incorporated diets does not have any effect on water quality. A level of 10 g aquasavor /kg diet was found optimum in the present study.

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Table 1. Proportion of ingredients (%) used in the experimental diets

Treatment	Fish meal	Ground nut oil cake	Rice bran	Tapioca flour	Vitamin mineral mix	Feed attractant
T_0	24	60	9	6	1	0
T_1	24	60	8	6	1	1
T_2	24	60	7.5	6	1	1.5
T_3	24	60	7	6	1	2

Table 2. Mean weight (g) and length (cm) of *M. rosenbergii*

Treatment	Mean weight (g)	Mean length(cm)
T_0	23.41^a	11.16 (0.55)
T_1	52.58^d	15.16 (0.25)
T_2	42.65^c	14.30 (0.52)
T_3	38.51^b	12.73 (0.55)

Data in the column with different superscripts are significantly different ($p < 0.05$) and values within the parentheses indicate standard deviation

Table 3. Survival, food conversion rate (FCR), protein efficiency ratio (PER) and specific growth rate (SGR%/day) of *M. rosenbergii* in different treatments

Treatment	Survival (%)	SGR (% per day)	FCR	PER
T_0	52.00^{a}	2.289	3.59	0.082
T_1	80.66^{d}	2.964	2.77	0.105
T_2	67.33^{c}	2.784	2.94	0.097
T_3	64.66^{bc}	2.704	2.96	0.099

Data in the column with different superscripts are significantly different ($p < 0.05$)

Table 4. Biochemical composition (%) of prawn muscle at the end of the experiment

Treatment	Moisture	Crude protein	Crude fat	Ash	NFE
T_0	76.15 (0.45)	16.00 0.10	3.15 (0.15)	2.75 (0.10)	1.95 (0.80)
T_1	73.90 (0.56)	18.00 (0.25)	4.75 (0.35)	2.10 (0.45)	1.25 (0.55)
T_2	74.35 (0.35)	17.65 (0.20)	4.55 (0.65)	2.18 (0.15)	1.27 (0.25)
T_3	75.20 (0.15)	17.01 (0.45)	4.25 (0.35)	2.25 (0.10)	1.29 0.15)

Values in parentheses indicate standard deviation.

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