GAU Research Journal **37** (2) : 131-136 July 2012

Survival and growth performance of mullet fish using *Prosopis juliflora* pod powder incorporated feed

M. K. BHALALA[1] and K. L. JETANI[2]

Fisheries Research Station,
Junagadh Agricultural University, Okha Port-361 350 (Gujarat).

Received : 10 October, 2011

ABSTRACT

The survival and growth performance of fingerling sized mullet fish (*Mugil spp.*) using P. J. pod powder as a test ingredient at different level viz. 10 to 40 % was studied by determining growth in term of weight and survival number in sea water rearing system for the first time. The highest growth performance was found in 10% P.J. pod incorporated feed and lowest weight gain was recorded in fish fed with 40%. However, 20% was at par with 10% P.J. pod incorporated feed. The survival rate was highest in 20 % than other types at the end of each experiment. Compare to the economic of fish feed among the control, 10% and 20% P.J. pod powder incorporated feed, 20% P.J. pod containing feed was more economical than other two feed. It was proved that, 20% P.J. pod incorporated feed was better in so far as economics, survival rate and growth were concern. The advantage of using non conventional ingredient at different level with respect to growth and survival is discussed.

Key words: Pod powder, feed, mullet fish, growth and survival

At present the catch of quality sea food items from natural sea waters have been observed to be decreased during recent years. Therefore, production of economically important fishes through aquaculture is the only substitute to fulfill the international demand. Tan (1991) stated that more than 60% of the operational cost of aquaculture is shared by the feed only. Mullet fish is one of the economically important fish. It is urihaline i.e. it can survive in fresh water as well as marine water. In the years to come it may prove to be one of the most culturable fish spp. Pascual (1983) recommended some commonly available feed ingredients which could be used as good source of animal and vegetable protein in addition to vitamins and minerals. Fish meal is used as a protein source in aquafeeds, Current world production of fish meal is approximately 6–7 million tones annually and, while this level of production is expected to remain stable over the next 10 years (New and Wijkstrom, 2002), rapid expansion of aquaculture during this period will require lowering the inclusion rate of fish meal in aquafeeds and replacing it with plant-based protein sources. Watanabe (2002) stated that ideally, fish meal replacement should be less expensive than fish meal and more readily available. Plant protein sources are the only ingredients for which expanded production in future is likely (Crowder,1990). Ali (1992) indentified protein derived from terrestrial, animal and plants as being suitable alternative particularly because they were available in suitable quantities. The proximate composition of the ingredients available in local area are helpful in formulating various feed suitable for different fishes (Bhat *et al.*,2011). In the present study attempt is made to prepare cheaper feed from non conventional and locally available ingredient like *Prosopis juliflora* (P.J.) pod because its seed contain about 30.6% protein, 57.3% carbohydrate & 4.4% fat. More over, it is easily available in bulk quantity at lower cost in Gujarat and therefore it's incorporation can enhance the profit in aquaculture.

MATERIALS AND METHODS

The experimental feeds were prepared using P. J. pod powder at different level. The P. J. pods were collected manually from nearby area's plants subsequently peeled and dried. The ingredients were finally powdered using grinders and the powder was sieved to uniform size of the particles. The finely powdered

[1] Senior Research Assistant, [2] Research Officer.

Table 1 Proximate composition and cost of Ingredients used in the feed. (n=3)

Ingredients	₹/Kg.	Content (%)					
		C.P.	E.E	C.F.	Ash	Moisture	N.F.E.*
P. J. Pod	2.00	17.30±1.07	4.1±0.02	9.10±1.03	4.62±0.085	10.0±1.01	54.88
Fish Meal	8.75	63.43±2.05	6.5±0.15	0.32±0.01	17.45±1.08	10.0±1.01	2.30
Soyabean meal	8.00	40.00±2.15	4.5±0.08	6.00±0.15	1.20±0.04	9.0±0.91	39.30
Wheat bran	9.00	13.00±2.03	2.6±0.03	12.20±1.08	3.00±0.01	10.50±1.02	58.70
Cotton Seed cake	9.00	18.50±10.5	6.7±0.11	15.80±2.01	8.90±1.05	11.50±1.01	38.95

Note: C.P.= Crude protein, E. E.= Ether Extract, C.F.=Crude Fibre, N.F.E.=Nitrogen Free Extract.,

*By difference.

Table 2 Proportion and cost of used ingredients in experimental feed.

Ingredients	Type of Feed									
	CF		F1		F2		F3		F4	
	%	cost/kg	%	cost/kg	%	cost/kg	%	cost/kg	%	cost/kg
Pod powder	0	0	10	0.2	20	0.4	30	0.6	40	0.8
Fish Meal	10	0.875	10	0.875	10	0.875	10	0.875	10	0.875
Soybean meal	40	3.2	40	3.2	40	3.2	40	3.2	40	3.2
Wheat Bran	27	2.43	20	1.8	15	1.35	10	0.9	5	0.45
Cotton Seed Oil Cake	23	2.07	20	1.8	15	1.35	10	0.9	5	0.45
Total	100	8.575	100	7.875	100	7.175	100	6.475	100	5.775

Proximate composition(as % dry matter)

	CF	F1	F2	F3	F4
Crude protein	30.11	30.37	30.53	30.68	30.84
Ether Extract	4.69	4.72	4.67	4.61	4.56
Crude Fibre	9.36	8.94	8.45	7.96	7.47
Ash	5.08	5.07	4.93	4.80	4.67
Moisture	10.08	10.00	9.90	9.80	9.70
Nitrogen Free	40.76	40.97	41.57	42.18	42.78
Estimated ME*(Kcal.g^{-1})	307.53	309.63	311.89	314.14	316.40

*Metabolizable energy (ME) was estimated based on the physiological values of fish: Protein- 4.5 Kcal.g^{-1}, Carbohydrate-3.3 Kcal.g^{-1}, Fat - 8.0 Kcal.g^{-1} (Brett & Groves, 1979)

ingredients were thoroughly mixed in required proportion and added water at the rate of 800ml. for making 1.0kg of feed (1:0.8 feed to water by weight). The dough prepared by hand kneading; and dough so obtained was steamed in pressure cooker at 105°C for 30 min (Jayaram and Shetty,1981). The cooked dough was than allowed to cool to room temp. by spreading in an Aluminium tray, minerals and vitamins were added into dough by through mixing. Finally the dough was extruded through the manual pelletizer having 1.8 mm. dia. The pellets were dried in hot air oven at 90 to 100°C for four hours. Five isonitrogenous (30%) feeds were prepared. The P.J. Pod powder was used in required level as per experiment. The dried pellets were packed in air tight polyethene bags for further use. The proximate composition and cost of the ingredients used in feed CF(control feed) to F4 are shown in Table 1 and 2.The nutritive values all used ingredients and feeds were tested as per AOAC (2006).

Seed of Mullet fish were collected from Rupen Creek, Dwarka and transported to the laboratory and acclimatized to laboratory atmosphere over a period of two weeks. Fish seeds of uniform size having weight of 2.5±0.3 g were randomly stocked at the rate 10 fish per 90 lit fiber tank, each in 5 replication and reared for 120 days. The aeration was supplied through air stones to all rearing tanks. The temp, pH and dissolved oxygen were maintained at 25-27°C, 7.5-8.2 and 4.0-4.5ppm respectively throughout experiment(APHA,1995).Initially the fish were fed twice in a day (9.00 & 17.00h) @ 10% of the body weight per day followed by 8 %; 6 % and 5% in succeeding months. Fish in each tank were weighed once in two week and the quantity of feed was adjusted. Mortality if any, was recorded every day and the amount of feed was adjusted accordingly. The data obtained were analyzed statistically by one – way analysis of variance (ANOVA) and a multiple range test at 5% level of significance (Snedecor and Cochran, 1968).

RESULTS AND DISCUSSION

Fish of each tank were weighed and live fish were counted every 30 days for statistical analysis. The experiment was repeated consequently for 3 years. The observed weight gain data are shown in Table 3. The survival data are shown in Table 6.

On the basis of above observation and statistical analysis it can be concluded that the highest weight gain was recorded for the fish fed with 10% P.J. Pod powder incorporated feed (F1) & the lowest weight gain was recorded in fish fed with 40% *P.J.* Pod level (F4) shown in Table 4 , 5 and Fig. 1.

The survival rate was highest in treatment F2 and lowest in treatment F4 at the end of the experiment shown in Table 6 & 7. Mullet fish fed with 10 % and 20% P.J. pod incorporated feed exhibited significantly ($P< 0.05$) higher net weight gain and survival rate than the fish fed with control feed. Weight gain of fish fed on feed F1 & F2 (10% & 20% P.J. Pod) were at par with or slightly higher than those given in the control feed (CF).The feed F3 & F4 having higher level (30-40%) of P.J.pod either reduced the growth or did not improve it. Compared to the economics of feeds among the CF, F1 and F2, F2 is more economical than other two feeds (Table 2).

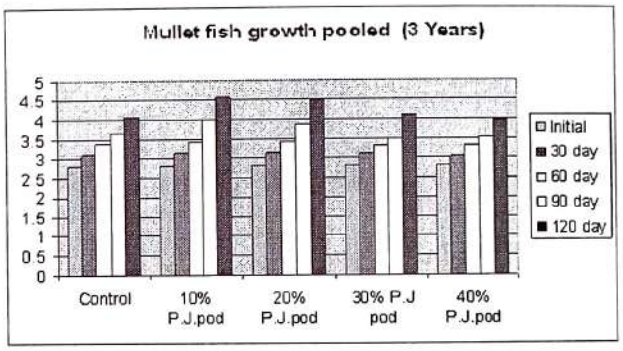

Fig. 1 : Mullet fish growth in term of weight(g/fish) pooled.

From statistical point of view, the results for increment in growth in terms of body weight (g) and survival rate (in number) showed significant ($P< 0.05$) result individually and interaction also showed significant ($P< 0.05$) results year wise as well as in pooled analysis. (Table 4 & 6). The present investigation revealed that dietary P.J. pod incorporation to the level of 10-20% had positive impact on the growth and survival performance of mullet fish fry (advanced).

CONCLUSION

From the observation and statistical analysis, it is evident that as compared to other feeds, 10% P. J. Pod incorporated feed (F1) is found to be better in so far as growth is concerned and 20% P.J. Pod incorporated feed (F2) has been found better so far as economic, survival and growth are concerned in compare to control feed and 10 % P. J. Pod incorporated feed.

Table 3 Growth in term of increment in body weight (g/fish)

Period	Treatment	Replicate					Average
		I	II	III	IV	V	
Initial	CF	2.82	2.80	2.84	2.80	2.84	2.82
	F1	2.80	2.80	2.83	2.82	2.83	2.82
	F2	2.80	2.80	2.80	2.82	2.84	2.79
	F3	2.81	2.80	2.82	2.83	2.80	2.81
	F4	2.83	2.81	2.80	2.80	2.80	2.81
30 Day	CF	3.03	3.01	3.04	3.01	3.01	3.02
	F1	3.17	3.12	3.13	3.15	3.15	3.14
	F2	3.15	3.13	3.07	3.15	3.12	3.20
	F3	3.10	3.08	3.05	3.07	3.14	3.09
	F4	3.00	3.00	3.10	3.03	3.00	3.03
60 Day	CF	3.38	3.35	3.34	3.36	3.30	3.35
	F1	3.49	3.49	3.40	3.33	3.38	3.42
	F2	3.43	3.41	3.44	3.38	3.33	3.40
	F3	3.30	3.30	3.24	3.30	3.39	3.31
	F4	3.30	3.24	3.30	3.30	3.35	3.30
90 Day	CF	3.72	3.73	3.71	3.72	3.55	3.69
	F1	4.00	3.99	4.08	4.01	4.05	4.03
	F2	3.99	3.40	3.95	3.90	3.80	3.91
	F3	3.47	3.50	3.40	3.60	3.60	3.51
	F4	3.40	3.42	3.40	3.50	3.60	3.47
120 Day	CF	4.00	4.00	4.07	4.10	4.20	4.07
	F1	4.52	4.53	4.60	4.57	4.56	4.55
	F2	4.50	4.50	4.55	4.51	4.52	4.52
	F3	4.10	4.09	4.05	3.50	4.30	4.11
	F4	4.00	3.99	4.00	3.90	3.92	3.96

Table 4 Year wise Mean table for growth in weight (g/fish)

Treatment	Year Mean			Pooled
	1st year	2nd year	3rd year	
CF	3.3736	3.4308	3.3892	3.3979
F1	3.5724	3.5888	3.5920	**3.5844**
F2	3.5152	3.5312	3.5428	**3.5297**
F3	3.3508	3.3528	3.3656	3.3564
F4	3.3004	3.3700	3.3136	3.328
S. Em.±	0.032	0.028	0.014	0.015
C.D. at 5%	0.089	0.080	0.040	0.041
C.V.%	4.6182	4.0965	2.0929	3.7611

ACKNOWLEDGEMENTS

The author wish to extend their sincere appreciation to the Vice- Chancellor and Director of Research & Dean P.G. Studies, Junagadh Agricultural University, Junagadh for his constant encouragement and support to carry out the experiment. They also wish to thank the technical and supporting staff for their help in collecting test material and rendering assistance in maintaining the experiment tanks.

Table 5 Mullet fish growth in term of weight (g/fish)-pooled data (3 years)

Treatment	Initial	30 day	60 day	90 day	120 day
Control feed	2.792	3.083	3.361	3.659	4.092
10% P.J.pod	2.794	3.141	3.418	4.002	**4.566**
20% P.J.pod	2.791	3.120	3.395	3.877	**4.464**
30% P.J pod	2.790	3.084	3.306	3.487	4.110
40% P.J.pod	2.798	3.047	3.302	3.519	3.972

Table 6 Mullet fish survival rate during experiment (In number).

Period	Treatment	Replicate					Average
		I	II	III	IV	V	
Initial	CF	10	10	10	10	10	10.0
	F1	10	10	10	10	10	10.0
	F2	10	10	10	10	10	10.0
	F3	10	10	10	10	10	10.0
	F4	10	10	10	10	10	10.0
30 Day	CF	8	9	10	10	9	9.2
	F1	10	9	10	10	10	9.8
	F2	10	10	9	9	10	9.6
	F3	10	8	10	8	8	8.8
	F4	10	9	9	8	9	9.0
60 Day	CF	8	8	9	10	8	8.6
	F1	10	9	8	10	10	9.4
	F2	9	10	8	9	10	9.2
	F3	10	8	8	7	8	8.2
	F4	9	9	8	8	9	8.6
90 Day	CF	8	8	8	9	8	8.2
	F1	9	8	8	10	9	8.8
	F2	9	9	8	9	10	9.0
	F3	9	8	8	7	6	7.6
	F4	8	8	7	6	8	7.4
120 Day	CF	8	8	8	8	7	7.8
	F1	8	7	8	10	9	8.4
	F2	8	8	8	9	9	8.4
	F3	9	6	8	7	6	7.2
	F4	7	8	7	6	6	6.8

Table 7 Year wise mean table for survival rate of mullet fish (In number).

Treatment	Year Mean			Pooled
	1st year	2nd year	3rd year	
CF	2.962(8.773)	2.976(8.856)	2.955(8.732)	2.964(8.785)
F1	3.042(9.253)	3.029(9.174)	3.042(9.253)	3.038(9.229)
F2	3.076(9.469)	3.056(9.302)	3.037(9.223)	**3.054(9.326)**
F3	2.867(8.220)	2.881(8.300)	2.881(8.300)	2.876(8.271)
F4	2.903(8.427)	2.910(8.468)	2.882(8.305)	2.898(8.398)
S. Em.±	0.027	0.025	0.026	0.015
C.D. at 5%	0.076	0.069	0.074	0.142
C.V.%	4.52	4.15	4.47	4.38

Note: Square root transformation is used, figures in parenthesis are retransferred.

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