

## FORMULATION OF CHEAP PRAWN DIETS AND THEIR BIOLOGICAL EVALUATION ON SOME PENAEID PRAWNS

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### ABSTRACT

While using the cheap locally available wastes and raw materials, two compound diets have been formulated and prepared. Three species of penaeid prawns viz. *Metapenaeus monoceros*, *M. affinis* and *Penaeus indicus* were fed on these diets in the laboratory for their biological evaluation. The essential features of a shrimp diet such as the physical stability in water and its ingestion rate at different time intervals are also discussed.

### INTRODUCTION

THE FORMULATION of cheap prawn diets is of paramount importance to the commercial venture of prawn culture. This can be achieved by utilizing and experimenting upon a variety of locally available low-priced raw materials. Goswami and Goswami (1979) had reported the good nutritive value of slaughter house waste like beef liver discarded for human use on veterinary grounds, coconut oil cake, etc. and advocated their use in formulation of compound prawn diets. The present communication deals with laboratory experiments of two such diets prepared and tested for their physical stability, ingestion rate and biological efficiency before undertaking them for field trials.

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### MATERIALS AND METHODS

Two dry pelleted diets (A and B) were prepared utilizing slaughter house waste (beef

liver discarded for human use), coconut oil cake, soya flour, mangrove leaves, wheat flour and distilled water in different amounts (Table 1). The details of methodology of forming the feed is as described elsewhere

TABLE 1. Composition (%) of different ingredients in diet A and B

Ingredient	Diet A	Diet B
Slaughter house waste	30	45
Coconut oil cake	10	15
Soya flour	20	20
Mangrove leaves	10	5
Wheat flour	35	20
Distilled Water	40	60

(Goswami and Goswami, 1979). The per cent bio chemical composition of the major nutrients are given in Table 2. The diets were labelled A and B.

Three series of experiments were designed to find out (1) the water stability of the diets in different salinities of sea water (5, 10, 20, 30 and 35‰) after 18 hours, (2) effect on the rate of ingestion after feeding intervals of 3, 5, 18 and

48 hours to the prawn *Metapenaeus monoceros* and (3) a comparative studies on growth rate and food conversion ratios in *M. monoceros*, *M. affinis* and *Penaeus indicus* fed upon the two prepared diets and the control diet C frozen fish flesh).

TABLE 2. Total (%) biochemical composition of major nutrients in the diets A and B

	Diet A	Diet B
Protein	33.58	42.241
Carbohydrates	8.73	11.64
Lipids	15.62	15.03

The general environmental conditions were kept uniform for all the experiments e.g. size of tanks (45 × 23 × 30 cm.); depth of water (12 cm), temperature (28.5 ± 1°C), aeration (30-50 bubbles) and photoperiod (12 hours). The experimental animals for series 2 and 3 (32-42 mm size) were collected from a fish farm in Old Goa. These were acclimatized for a week to the test diets and then kept without food for 24 hours prior to initiating new experiments. In both the series number of replicates (1) and animals (10/tank) were also kept the same. Experiments of series 3 lasted for 30 days. The other details of methodology and computation of data were after Balazs *et al.* (1973), Sick *et al.* (1972) and Venkataramiah *et al.* (1975) for series 1, 2 and 3 respectively.

### RESULTS

The results of our first series of experiments with diet A and B in different salinities of seawater showed that loss of dry weight after 18 hours was more for diet B and the values decreased gradually with an increase in the salinity (Table 3).

For second series of experiments pertaining to the ingestion rate after 3, 5, 18 and 48 hours, it was found that diet A showed better results

than diet B in all time intervals except for the initial 3 hours (see Table 3). However, the maximum value was noticed after 5 hours (65.6) which continuously decreased (15.0 after 48 hours).

Results of the third series of experiments conducted showed that all the animals survived till the end of the experimental period. They fed well and showed increase in length and wet weight. For all the species length gain was maximum with diet C. However, amongst the prepared diets, diet A showed better results almost approaching to that of diet C. Wet weight gain in species of *Metapenaeus* was in the order of diet C, B and A whereas with *P. indicus* diet A showed the maximum values.

TABLE 3. Dry weight loss (%) of the two diets in different salinities of sea water kept for 18 m. (200 mg of feeds were added to each salinity)

Salinities (‰)	Diet A	Diet B
5	6	16.90
10	3.5	15.15
20	2.52	13.55
30	..	8.85
35	..	..

Diet A when fed upon *M. monoceros*, *M. affinis* and *P. indicus* gave food conversion ratios (FCR) as 3.078, 7.19 and 1.54 respectively. Similarly, diet B showed the highest ratios in *M. affinis*, and lowest in *P. indicus* (Table 5). But diet C, showed highest to lowest values in the order of *P. indicus*, *M. affinis* and *M. monoceros*.

### DISCUSSION

Due to the intermittent feeding behaviour of the prawns, good water stability of any compound diet is a highly desirable feature (New, 1976). In the first series of experiments

TABLE 4. *Ingestion rate/hour\* of diet A and B by juvenile Metapenaeus monoceros (Values are given in mg diet on dry weight basis)*

Time (T) in hours	3		5		18		48	
	1a**	Control	2a	Control	3a	Control	4a	Control
<b>Diet A</b>								
Initial wt (M i)	106	106	329	329	650	650	850	850
Final wt (M f)	100	106	..	328	60	647	90	810
Wt loss in water (Md)	..	..	..	1	..	3	..	40
Ingestion rate/hour	2	..	65.6	..	32.6	..	15.0	..
	1b	Control	2b	Control	3b	Control	4b	Control
<b>Diet B</b>								
Initial wt (M i)	106	106	329	329	650	650	850	850
Final wt (M f)	48	100	137	319	201	609	100	734
Wt loss in water (Md)	..	6	..	10	..	41	..	116
Ingestion rate/hour	17.33	..	36.4	..	22.66	..	13.20	..

$$* \text{ Ingestion rate/hour (I)} = \frac{M_i - M_f - M_d}{T} \quad (\text{after Sick } et. al., 1973).$$

\*\* 1-4 as a & b are the number of tanks used for diet A and B respectively.

TABLE 5. *Per cent length, wet weight gain and food conversion ratios\* for Metapenaeus monoceros, M. affinis and Penaeus indicus fed upon diets A and B and C (Control). The experiment period was 30 days*

Diets	<i>M. monoceros</i>			<i>M. affinis</i>			<i>P. indicus</i>		
	Length	Weight	FCR	Length	Weight	FCR	Length	Weight	FCR
A	23.46	25.06	3.078	14.78	11.07	7.19	7.33	41.64	1.54
B	9.42	33.73	2.33	12.22	22.53	3.71	7.20	27.33	1.64
C	24.38	34.77	1.92	17.78	31.18	1.93	15.64	32.36	2.72

\* FCR=Dry food consumed/live wt gain.

the lower water stability of diet B as compared with diet A is probably due to the different composition of wheat flour and distilled water. Balazs *et al.* (1973) have explained in detail the physico-chemical reactions involved in such circumstances. The decrease in the dry weight loss with an increase in salinity suggests the use of common salt while prepa-

ring compound diets. Gunter and Venkatramiah (1975) had included a preferable concentration of sea water in a patented shrimp diet, as mentioned by New (1976).

Water stability and ingestion rate of the diet are two inter-related factors. This is further ascertained from second series of our

experiments where diet A with good stability has shown better ingestion rate after 5, 18 and 48 hours. The lowest value in the initial 3 hours is probably due to the hard texture of the diet thereby hindering in the masticatory process. New (1976) has reviewed the importance of optimum moisture content in the prawn diets.

Data on growth rates and food conversion ratios on various species of penaeid prawns have earlier been published by Andrews *et al.* (1972), Venkataramiah *et al.* (1975) and Royan *et al.* (1977). Royan *et al.* (1977) have reported FCR values ranging between 0.94-3.50 when *M. monoceros* was fed upon different levels of protein. However, the results of all these earlier workers are not directly comparable to the present case due to different diets, species, size of animals and other environmental parameters involved; each of which has a varying effect on the food conversion efficiency (New, 1976). Since high FCR values

shows the low food conversion efficiency, from third series of present experiments it can be derived that diets A and B have shown best food conversion efficiency on *P. indicus* and lowest on *M. affinis*. It further suggests that good efficiency of a diet shown on one species cannot be taken for granted to be the same in other species also. This becomes more clear as we think of the inherent differences amongst species as a natural biological phenomenon (Bishop, 1966).

In conclusion it may be said that while undertaking field trials with the diets A and B, a combination of the two given on subsequent days will probably show better results since in the traditional type of prawn culture ponds in India, the stocking is not selective, so many species grow together at the same time. Keeping in view the ingestion rate, the frequency of feeding diet A once per day and diet B twice per day will be sufficient to maintain better quality of water.

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