ISSN 0254-380 X

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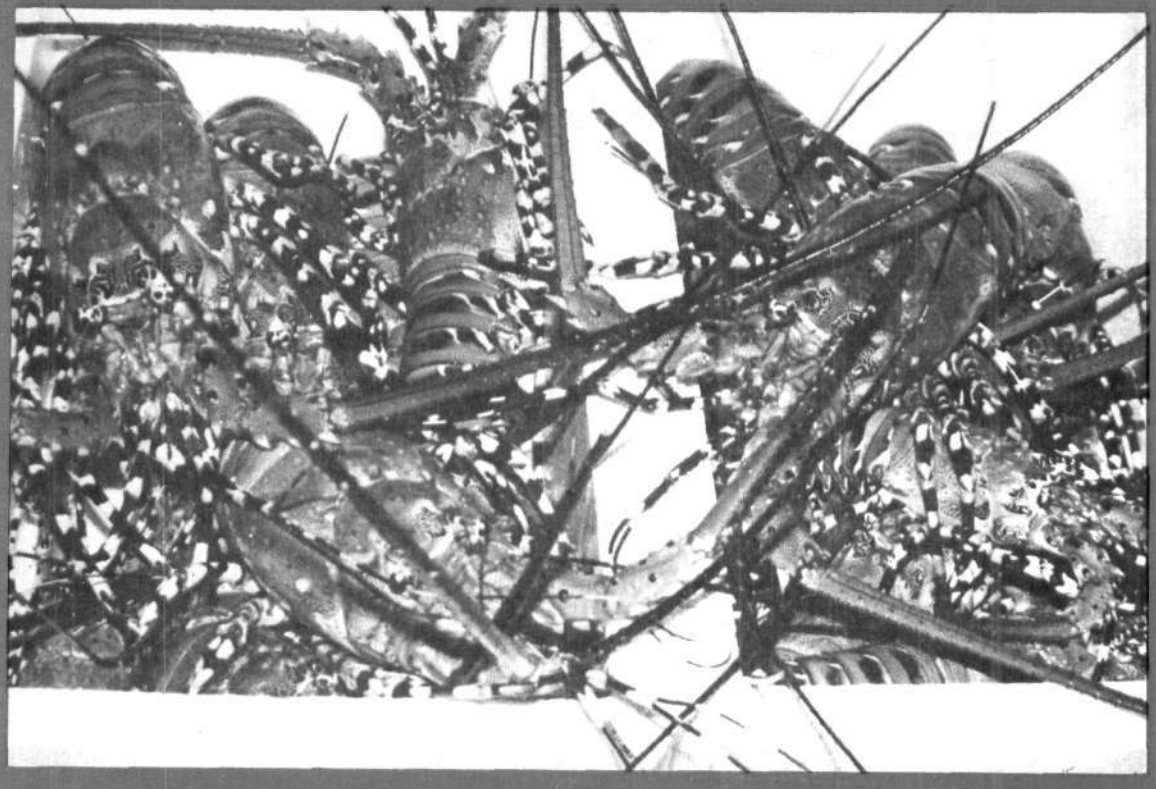
समुद्री मात्स्यिकी सूचना सेवा
MARINE FISHERIES INFORMATION SERVICE

No. 123 OCTOBER 1993



तकनीकी एवं विस्तार अंकावली
TECHNICAL AND EXTENSION SERIES

केन्द्रीय समुद्री मात्स्यिकी अनुसंधान संस्थान कोचिन, भारत
CENTRAL MARINE FISHERIES RESEARCH INSTITUTE COCHIN, INDIA

भारतीय कृषि अनुसंधान परिषद
INDIAN COUNCIL OF AGRICULTURAL RESEARCH

FIELD TRIALS WITH COMPOUNDED FEED DEVELOPED BY C. M. F. R. I. FOR *P. INDICUS*

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Introduction

The Central Marine Fisheries Research Insitute, for the past few years has been engaged in the evolvement of feed formulations for the culture of *P. indicus*. Voluminous data is present regarding the performance of these feeds under laboratory conditions but their performance under field conditions remained unknown. The present study was therefore, taken up under the institute's extension programme to understand under research conditions the relative cost effectiveness of growing *P. indicus* in small ponds in monoculture using compounded feed. The study was carried out with the following specific objectives :

1. Maximum use of indigenous raw materials for feed making.
2. The feed formulation should be for use in semi-intensive culture of *P. indicus* under farming systems traditionally evolved and practiced by small fish farmers.
3. Feed to be water stable and capable of production using household machinery, preferably at the farm site.
4. Evaluation of shrimp growth and performance using the pelleted feed without fertilizers.
5. An economic evaluation of shrimp production with reference to the feed.

The results of the trial are excepted to throw some light on the potentialities of indigenous feeds in shrimp culture.

The study

Field trials were carried out with compounded feed at a shrimp farm adopted by CMFRI under its extension programme at South Chellanam, Cochin. The coconut grove pond aggregating around 10 cents of water area having a depth of about 1 metre was stocked with 3,000 Nos of *P.indicus* seed. Since the collection was from the wild there was wide variation in the initial length & weight of the animals. The average length and weight at stocking were 6.0 mm and 6.9 mg respectively. The feed was manufactured in the C.M.F.R.I. nutrition laboratory according to the specifications given in Tables 1, 2 and 3. The same feed was given in the semi-intensive culture of *P.indicus* from the post-larval to the marketable stage. The feed was not fortified with minerals and vitamins.

TABLE 1. *Formulation of the feed used for the farm trial*

Raw material	% incorporation
Fish meal	10
Prawn head waste	20
Groundnut oil cake	15
Squid waste	10
Soya flour	10
Oil*	06
Tapioca powder	29
Total	100

*A combination of % crude sardine oil and 3% Soya oil.

TABLE 2. *Proximate composition of the feed raw materials*

Ingredients	Dry matter	Crude protein	Ether extract	Crude fibre	Ash	NFE
Fish meal	90.00	49.40	2.80	04.20	16.20	27.40
Prawn head meal	91.00	38.10	6.60	14.10	23.90	17.30
Soya flour	89.00	45.00	1.25	07.60	05.20	40.95
Squid waste	83.72	69.23	6.92	—	02.40	21.45
Tapioca	93.36	02.00	1.25	02.85	01.71	92.19
Groundnut oil cake	92.00	49.00	1.30	09.20	05.60	34.90

NFE *(Nitrogen Free Extract) - calculated by difference.

TABLE 3. *Chemical composition of the compounded feed*

Dry matter	93.86
Crude protein	34.80
Ether extract	6.42
Crude fibre	3.00
Ash	13.12
NFE*	42.66
Calcium	2.10
Phosphorus (available)	0.92

NFE* Nitrogen Free Extract - Calculated by difference.

The ingredients were thoroughly homogenised after pulverising. Tapioca powder was gelatinized and rest of the ingredients were blended with sufficient water to form a soft dough which was extruded through a hand operated mincer to make into 3 mm diameter strands. After thorough sun drying the feed was stored at room temperature in air tight polyethylene bags. Feeding was initiated at the rate of 25 per cent of body weight. Fortnightly samples were taken and feeding rate adjusted accordingly so that towards the end of the experiment the animals were fed at 5 per cent of the body weight. The enviormental parameters were also monitored throughout the experimental period.

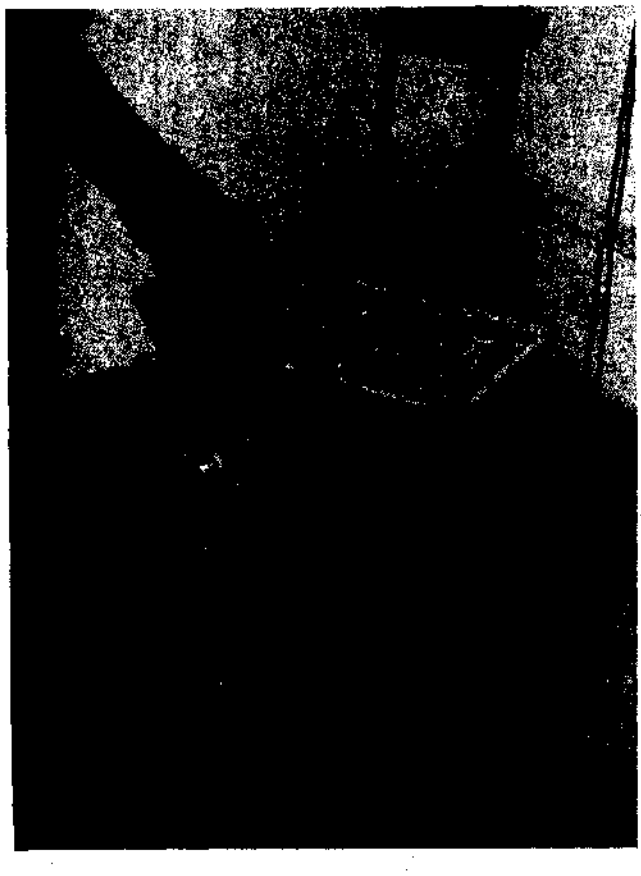

Fig. 1. Grinding of the dry feed ingredients is carried out by the help of a laboratory model pulverizer.

Fig. 2. Manual mixing of the pre-weighed powdered feed ingredients in a plastic trough.

The cultured shrimps were harvested after a 90 day growth period on 3rd April 1993. The main findings from the harvest data are as follows (Table 4).

TABLE 4. *Shrimp performance data from the feeding trial with C. P.*

Culture period	90 days(30-12-92 to 3-4-93
Pond size	404.68 m^2 or 10 cents
Stocking density	3000 animals
Survival %	98%
Total yield (kg)	30.0
Average daily live weight gain*	0.101 g
** AFCR (Apparent Feed Conversion Ratio)	0.90 :1

* Average daily live weight gain was calculated from sample data at harvest.

** AFCR = Feed intake/Weight gain.

Nutritional performance

1. The feeding of shrimp in this experiment was entrusted with the farmer and the resultant production was 30 kg from an input of 27 kg of feed over a 90 day grow-out period. The AFCR (Apparent Feed

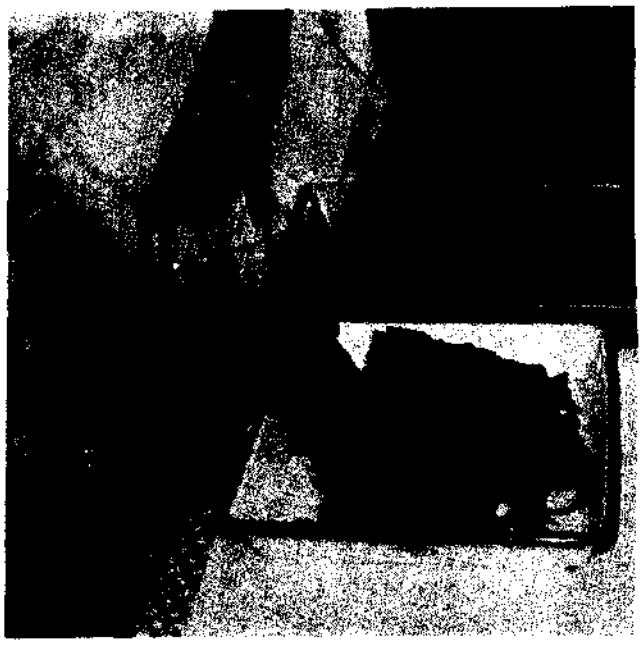

Fig. 3. The feed made into a dough and steamed is made into strands by extruding through a mincer.

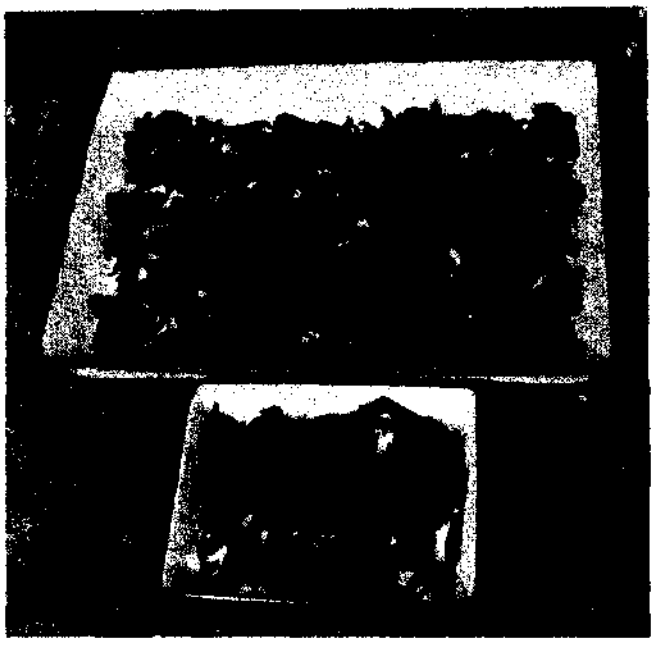

Fig. 4. The extruded strands of feed kept for sun drying.

Conversion Ratio) was 0.9 : 1, implying that 0.9 kg of the compounded feed yielded one kg of shrimp. This clearly depicted the good quality of the feed in terms of its conversion ratio, and the AFCR of less than one was attributed to some of the inherent difficulties in conducting the trials *viz.*

i) Errors in the assessment of survival rates of shrimp during grow out period.

ii) Subsequent errors in calculation of feeding rates.

iii) Intermittent under-feeding periods (due to deterioration of water quality caused by oxygen depletion)

iv) Natural food availability in the culture system which could not be quantified.

2. A very high survival rate of 98% was obtained.

3. Animals were healthy throughout the growing period and no diseased condition was observed.

Enviormental impact

1. Wide fluctuations were observed in dissolved oxygen levels in the pond throughout the feeding trial. During February the very low oxygen level (1.5 ml/l) and extremely high rates of photosynthetic production indicated over fertilization of the pond due to supply of artificial feed. The high photosynthetic activity replenished the water with increase in oxygen value in a week's time. Excess feeding by organic/inorganic ingredients created eutrophication, resulting in O_2 depletion in the system. This increased the physiologic stress and affected growth of prawns and hence feed supply at that stage was regulated to improve the water quantity, optimum primary productivity and normal O_2 level in the pond to promote the growth of shrimp. However, the dissolved oxygen levels of the pond water rarely exceeded 6 ml/l throughout the experiment.

2. Salinity ranged from 4.81 ppt at the start of the feeding trial to 18 ppt towards the end of March and did not seem to affect the growth of shrimp.

3. pH of water in the pond ranged from 7.20 at the start of the experiment to 8.5 towards the end of the experiment.

4. The use of a sluice gate at the pond entrance from the main canal prevented the entry of the prawn and fish from the wild and the shrimps in the pond was protected.

Financial appraisal

Various economic efficiency measures were worked out on the basis of cost and earnings data and are given in Table 5.

TABLE 5. Economics of compounded feed used in the study

Item	
Expenditure on feed (Rs.)	386.00
Total feed production (kg)	27.00
Unit cost of feed (Rs.)	14.40
Total shrimp yield (kg)	30.00
Value of the yield (Rs.)	1762.00
Apparent feed conversion* efficiency	1.12
Returns to feed in terms of money (Rs.)	4.51
Returns to feed (Total revenue minus costs other than feed divided by number of kilograms of feed)	42.80

* Conversion efficiency = Weight gain/Feed intake.

The feed proved highly efficient in terms of production and profitability. The price of one kilogram of feed worked out to Rs. 14.40 and a feed conversion efficiency of 1.12 implies that with an expenditure of Rs. 14.40 there was an increase in income by Rs.42.80.

Conclusion

The results of the study indicate that contrary to present belief, feeds of high nutrient specifications fortified with minerals and vitamins are not required for feeding shrimp under the prevailing culture practices. However, in order to reduce pond pollution and feed wastage and to maximize feed ingestion, it is essential that feeds be prepared in water stable forms (in this study tapioca was used because of its local availability, low price and effectiveness as binder). The potential lower nutrient requirement for shrimp feeds for use in small-scale shrimp culture should enable the production of feeds at a competitively low price at the farm site itself using household machinery.

The authors thank Mr. K. K. P. Panicker for economic evaluation of the data and Dr. V. K. Pillai and Mr. G. S. Daniel Selvaraj for assistance in monitoring of the enviormental parameters. The technical services rendered by Mrs. K. P. Salini and Mr. A. M. Mohanan are gratefully acknowledged.