

Seabass Feed Technology - CIBA Bhetkiahar

Under ICAR Outreach Activity on Fish Feeds



February 2012

केन्द्रीय खारा जलजीव पालन अनुसंधान संस्थान

(भारतीय कृषि अनुसंधान परिषद्)

75, सन्थोम हाई रोड, राजा अण्णामलैपुरम्, चेन्नई - 600 028.

CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE

(Indian Council of Agricultural Research)

No. 75, Santhome High Road, R.A. Puram, Chennai - 600 028.



Cover page photographs (starting from top left clockwise)

1. Pilot scale twin screw extruder
2. Ring-Die pellet mill
3. Sinking and floating pellet feeds for seabass
4. Harvest of seabass cultured with sinking pellet feed

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*Syed Ahamad Ali, K. Ambasankar, J. Syama Dayal,
A.R. Thirunavukkarasu, M. Kailasam,
J.K. Sundaray & A.G. Ponniah*

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Published by : **Dr. A.G. Ponniah**
Director, CIBA

Edited by : **Dr. S.M. Pillai**
Mrs. K. Jacqueline

Background

Availability of formulated feed has become the centrally important aspect for the propagation of Asian seabass *Lates calcarifer* culture. At present there is no feed available in the Indian market. Attempts have been made to import or produce feed with overseas technologies. Some of these feeds have been tested in some farmers' ponds and the performance is reported to be not successful in few cases. However, the imported feeds cost quite high and hence it is not economical to farm seabass using imported feed. Against this background the successful development of indigenous feed '**CIBA BHETKIAHAR**' by the Central Institute of Brackishwater Aquaculture has come as boon to the farmers. The excellent performance of the indigenous feed with a FCR of 1.6 to 1.7 in pond trials makes it possible for profitable farming of seabass using this cost effective feed and will go a long way in promoting large scale farming of this popular fish.

Nutritional requirements of Asian seabass

Extensive discrepancy in the dietary requirements of Asian seabass have been reported earlier by different researchers and this could be narrowed down by CIBA by concerted research efforts to determine the exact requirements by developing the indigenous feed '**CIBA BHETKIAHAR**'. Investigations on the nutritional requirements of Asian seabass (barramundi) (also known as bhetki in West Bengal) carried out at CIBA have been mainly on protein, fat, carbohydrate, vitamin mixture and mineral mixture in the diet depending on cost and customized.

Protein

Seabass being a highly carnivorous fish showed higher dietary protein requirement of 43%, when experiments conducted with different protein level feeds on the young-ones. Generally the protein quality in the feed influences the requirement. Most of the finfish have essential requirements for the same ten amino acids (arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine). The protein source used in the feed therefore should have balanced essential amino acids needed by the fish.

Lipid

The quantitative dietary lipid requirement of seabass is estimated to be 10-12%. The highly unsaturated fatty acids (HUFA) of n-3 series are essential for seabass and its requirement is determined in the diet as 1.72% which can be met by using fish oil rich in HUFA. Phospholipid at 1-2% in diet is found to improve the growth and survival of seabass.

Energy

Being carnivorous, seabass utilizes less dietary carbohydrate at 10 -16 % level. At 43% and 10% lipid a protein: energy ratio of 128 mg protein/kcal is determined optimum for juveniles of *L. calcarifer* in terms of growth, good feed conversion ratio (FCR) and protein efficiency ratio (PER).

Dietary requirements of different stages of seabass

Nutrient	Requirement in diet
Protein (%)	40- 45
Lipid (%)	10 – 12
Fatty acids (n-3 HUFA) (%)	1.72
Carbohydrate (%)	10 -16
Protein : Energy ratio (mg protein/kcal)	128

Inclusion of vitamin C in the diet is beneficial for improving growth and FCR in seabass and it is required in the range of 1.0 to 1.5% in the diet.

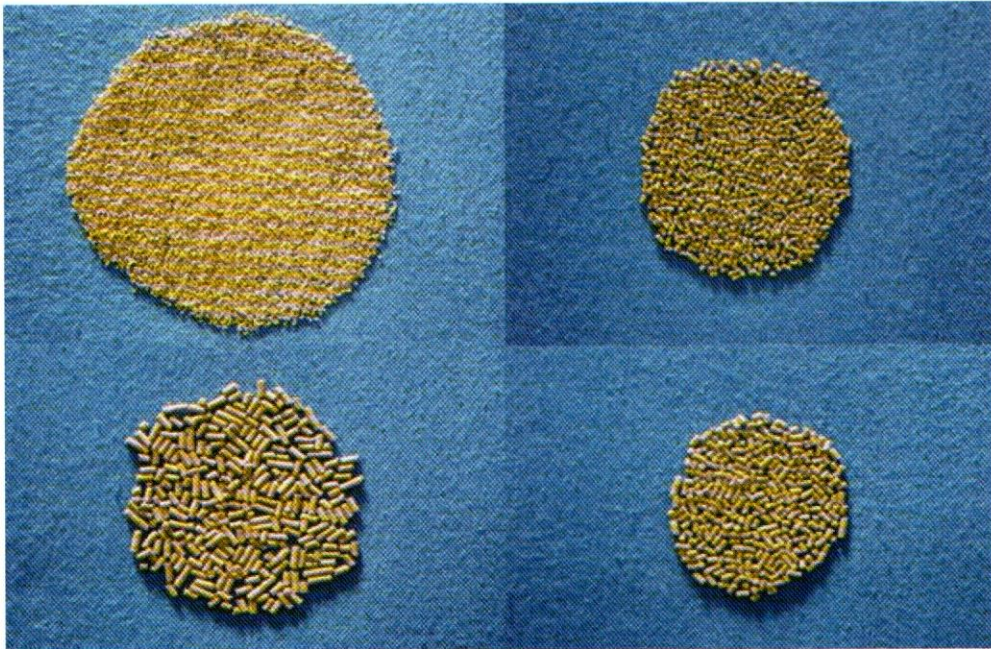
Feed processing and production technology

Fish feed in dry pellet form is processed and produced using two different processing technologies in CIBA pilot-scale feed mill at Muttukadu. One is using the **Ring-Die** pellet mill technology and other is the **Extruder** pellet technology. In the Ring- Die pellet mill technology the feed is processed at 15-16% moisture and temperature of 90-100°C under steam conditioning. A suitable binder is used to get the desirable water stability to feed pellets as starch gelatinization is minimum under these conditions and the feed pellets processed in Ring-Die pellet mill are compact and quickly sink in water. Feeding trays are needed for feeding fish, monitoring and feed management. In the Extruder pellet technology the feed is processed at higher pressure and temperature of 120-130°C for short duration, the feed is well cooked and full gelatinization of starch occurs imparting very good water stability. The feed has high digestibility and gives good feed conversion. Slow sinking and floating pellet feed can be produced in Extruder pellet mill which are ideal for feeding finfish. This feed helps in efficient feed management and feed monitoring. The cost of feed production is relatively higher (3-4%) in extruder processing over the ring-die pellet mill.

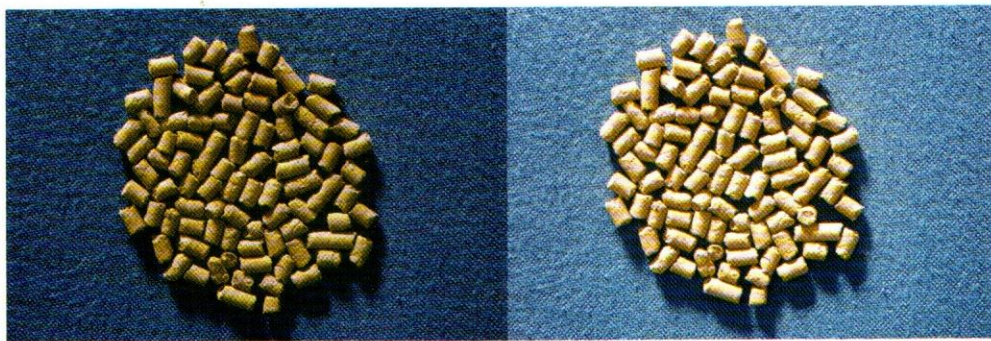
CIBA - Bhetkiahar tested and validated

The feeds were extensively tested in the institute facilities and also in selected farmers' fields in

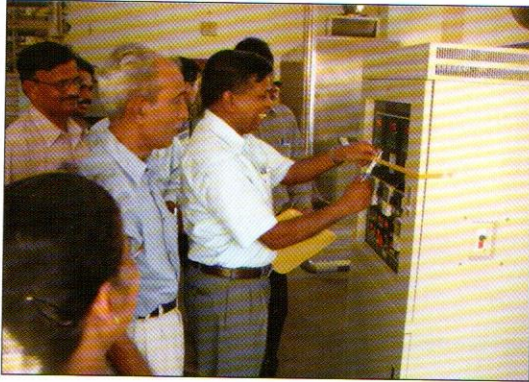
the states of Andhra Pradesh, Maharashtra and Tamil Nadu with funding support from National Fisheries Development Board. **CIBA BHETKIAHAR** resulted in excellent growth and survival of fry in nursery and grow-out systems in these field trials. The fish was successfully grown to 1.0 kg in 8-9 months with an impressive FCR of 1.8 in indoor FRP tanks and a FCR of 1.6-1.7 in ponds.



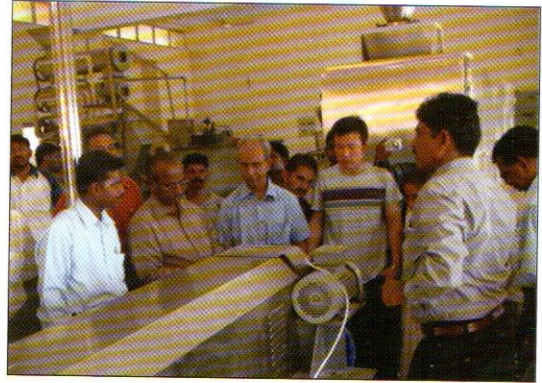
Nursery and pre grow-out sinking pellet feeds



Grow-out sinking pellet feed



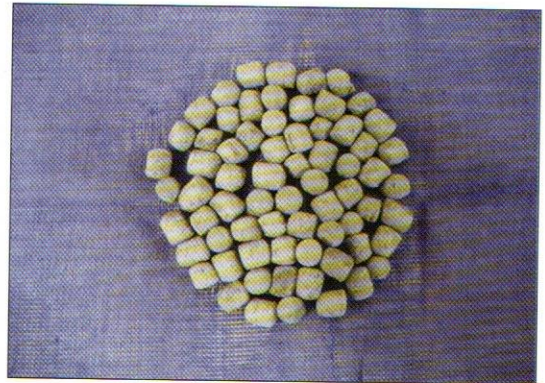
Inauguration of Pilot-scale Extruder at
MES Muttukadu



Trial run of Pilot-scale extruder



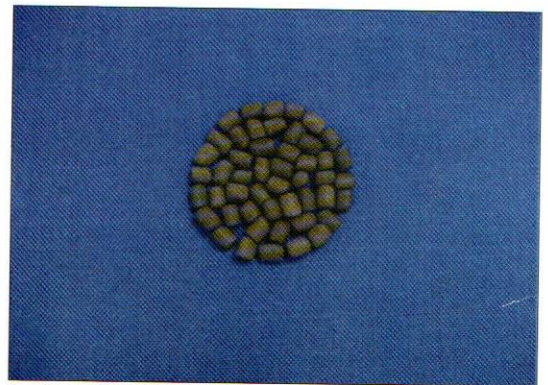
Extruder feed pellets with oil coating



Extruder feed pellets without oil coating



Improved oil coated extruded pellet feeds

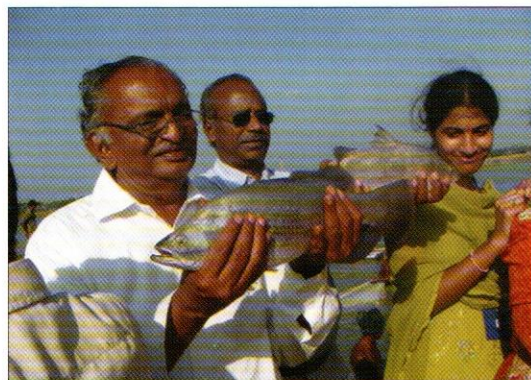


Extruder and floating pellet feeds

The results of these field demonstrations in farmer's fields are given below.

Summary of field trials with sinking pellet feeds

Culture phase	Duration (months)	Average body weight (g)	Survival (%)	Feed Conversion Ratio
Nursery	2	3-5	60-75	0.9-1.0
Pre grow-out	2	50-60	70	1.0-1.2
Grow-out	6-7	1000-1100	95	1.6-1.7



Seabass farming with CIBA sinking pellet feeds at Nellore in Andhra Pradesh



Seabass farming with CIBA sinking pellet feeds at Mahendrapalli in Tamil Nadu

Merits of different types of feeds for seabass

Seabass seems to prefer slow sinking type of pellet feed and sinking pellets are equally well accepted by the fish. If the fish is trained for feeding floating pellets from the beginning it would easily adopt to the floating feed pellets. A comparison of sinking and floating pellet feeds indicate that there are two interacting factors to be considered namely, the cost and skills required for feed management.

The sinking pellet feeds used in the field have resulted in desired growth, production and good FCR and also cost-effective as they are produced in less expensive Ring-die pellet mill, but it has been observed that feed management plays a vital role. If the sinking pellet is excessive there is a fear of settling at the bottom affecting the soil and water quality of the pond. It is advantageous to use slow sinking and floating type of feeds in order to monitor the consumption and feeding rates, but there is every likelihood that the pellets settling at the sides and bottom of the pond resulting in contaminating the soil and water. So skilled feed management is required to overcome this and

floating feed retention bamboo frame is used to place the feed in it and can easily be monitored. In conclusion irrespective of the type of pellet used, if sound feed management and good feeding strategies are adopted seabass can be successfully cultured.

Feed processing technology and financial analysis

The details of financial analysis of both ring-die pellet mill and extruder technologies are given below.

A. Feed mill unit with Extruder Technology.

Details of machinery and approximate cost of feed mill machinery for 2 ton per hour feed production capacity (8 hour working per day can produce 16 tons of feed). The annual feed production target shall be a minimum of 2000 tons.

Description of item/requirements	Approximate cost (₹ in Lakhs)
Premises for housing feed mill (Industrial type of shed) (300 m ²)	10.0
Micro-pulveriser (500 kg /hr.)	4.0
Mixer (Homogenizer) (500 kg/batch)	3.0
Sieve assembly	1.5
Fish mincer, deboner	2.5
Extruder (win screw) 2 ton/hr.	100.0
Dryer (optional)	3.0
Ancillaries	3.0
Conveyor system	3.0
Installation charges	3.0
Power requirements (110 KVA)	15.0
Cost towards acquiring feed technology	5.0
Total	153.0

B. Feed mill unit with Ring-Die pellet mill Technology

Details of machinery and approximate cost of feed mill machinery for 2 ton feed production per

hour capacity (8 hour working per day can produce 16 tons of feed). The annual production target shall be a minimum of 2000 tons of feed.

Description of item/requirements	Approximate cost (₹ in Lakhs)
Premises for housing feed mill (Industrial type of shed) (300 m ²)	10.0
Hammer mill (500 kg/hr.)	2.5
Micro-pulveriser (500 kg/hr.)	4.0
Mixer (Homogenizer) (500 kg/batch)	3.0
Sieve assembly	1.5
Fish mincer, deboner	2.5
Steam boiler	5.0
Ring-die pellet mill (2 ton/hr.)	10.0
Dryer - Cooler	4.0
Pellet crumbler	2.0
Ancillaries	2.5
Conveyor system	3.0
Installation charges	3.0
Power requirements (110 KVA)	15.0
Cost towards acquiring feed technology	5.0
Total	73.0

A. Financial analysis of feed production and sale:

Manpower requirements

Designation	No. of persons
Supervisor	1
Technician (Mechanical)*	1
Technician (Electrical)	1
Skilled workers**	10

* Salary per month for technician ₹ 10,000/-

** Salary per month for skilled worker ₹ 5,000/-

Cost of feed production

Cost of feed production	₹ in lakhs
Cost of feed raw materials for producing 2000 tons of feed (@ ₹ 38,000/- per ton)*	760.00
Salary (for 12 months)	8.40
Electricity and water charges	15.00
Interest on capital investment (@ 18% per annum) for Extruder technology	27.00
Depreciation on machinery (@ 10%)	15.00
Packing cost	7.68
Maintenance cost	4.00
Contingencies	2.00
Total (X)	839.08
Say	840.00

* These values are arrived at the prevailing market rates of the raw materials and are likely to change with time and from region to region.

Returns

Sale price of feed	₹ 50,000 per ton
Sale proceeds of 2000 tonnes of feed	₹ 1000.00 lakhs (Y)
Gross Profit (Y-X) (1000-840)	₹ 160.00 lakhs
Gross annual returns on variable costs	19.0%

Transfer of feed formulation and feed processing technology

The feed formulations and the feed processing technology can be provided by the Central Institute of Brackishwater Aquaculture (CIBA) as per the ICAR Guidelines for technology transfer. Feed formulations will be customized depending upon the locally available ingredients.

The following services are also provided by the Institute

1. Feed mill machinery sourcing
2. Raw materials sourcing
3. Analytical services to monitor quality of ingredients and finished feeds
4. Advisory services in technical matters

For details please contact

Director

CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE

(Indian Council of Agricultural Research)

75, Santhome High Road, R.A.Puram, Chennai – 600 028

Phone : 91-44-24617523 (Direct) 24616948, 24610565, 24610311

Fax No: 91-44-24610311 E- mail: director@ciba.res.in

Website: www.ciba.res.in

Headquarters

Central Institute of Brackishwater Aquaculture
75 Santhome High Road, Raja Annamalaipuram
Chennai - 600 028

Telephones : 91-44-24617523 (Director)
91-44-24616948, 24618817, 24610565

Telegram : MONODON

Fax : 91-44-24610311

E-mail : director@ciba.res.in

Web site : www.ciba.tn.nic.in

Research Centres

Kakdwip

Kakdwip Research Centre
Kakdwip 743 347, West Bengal
Telephone : 03210-255072

Muttukadu

Muttukadu Experimental Station
Kovalam Post, Muttukadu 603 112, Tamil Nadu
Telephone : 91-44-27472425