DEVELOPMENT OF COMMERCIAL AND FARM-MADE FEEDS FOR TILAPIA AND MACROBRACHIUM IN PAPUA NEW GUINEA AND FIJI

Introduction

The development of tilapia and freshwater prawn Macrobrachium rosenbergii culture in Papua New Guinea (PNG) and Fiji has been rather slow due to a lack of expertise and the absence of appropriate resources and technology. One of the key constraints has been the poor quality and limited availability of supplementary feeds. Although feed manufacturers in both countries have recognized that fish and prawn feeds are potential new product lines, the development of effective fish and prawn feeds has not occurred. This is due to low demand by farmers, in part because of the small size of the tilapia and prawn industries.

Since the cost of feed represents the major expense in semi-intensive tilapia culture and aquaculture, feeds and feeding must be cost-effective in order to maintain or increase profit. A limited range of formulated aquafeeds are available locally in PNG and Fiji. These have been shown to provide better tilapia growth than single-ingredient feeds but are very costly and sometimes limited in availability. Consequently, a lower-cost compound diet for semi-intensive production of tilapia and prawns, formulated from locally available ingredients, must be developed if aquaculture is to expand. Fisheries authorities in both Fiji and PNG recognize the need for cheaper compound feeds, and provided the impetus for a mini-project on the development of commercial and farm-made feeds for tilapia and Macrobrachium in PNG and Fiji.

This research is part of the larger Sustainable Aquaculture Development in the Pacific Islands Region and Northern Australia project, which receives funding support from the Australian Centre for International Agricultural Research (ACIAR). The Queensland Department of Primary Industries and Fisheries (QDPI&F), Secretariat of the Pacific Community (SPC) and the WorldFish Center are collaborators in the project. This mini-project involves Fiji’s Ministry of Fisheries and Forests and PNG’s National Fisheries Authority. Following a planning workshop held in Suva in April 2005 (see article in this issue), two experiments were designed to evaluate cheaper, formulated feeds that are produced using locally available ingredients. The experiments commenced at Naduruloulou Aquaculture Station on 3 August 2005 after two weeks of preparatory work.

Research design

Experimental objectives: to develop a better, lower cost diet for tilapia and Macrobrachium culture in Fiji.

The experiments (one for tilapia and one for Macrobrachium) are being conducted at Naduruloulou Aquaculture Station, 7 km north of Nausori town on the island of Viti Levu, Fiji.

Tilapia

Twenty hapa (9 m²) have been installed in two earthen ponds (600 m²). Each hapa was stocked with 200 tilapia fingerlings (av. wt. 1.74 g). The stocks were reduced to 100 juveniles per hapa after 42 days of rearing. (A hapa is an enclosure of fine mesh net used for breeding fish and nursing fry)

Macrobrachium

Fifteen plastic tanks (1000 L each) have been set up under a shelter (shade screen and supplied with running water and aeration). Each tank was stocked with 10 juvenile prawns (av. wt. 5 g). Both experiments will run for a period of 120 days with sampling carried out every 21 days.

Four experimental feeds were formulated, containing: 1) approximately 20% crude protein (CP) with a vitamin/mineral mix (VM); 2) 20% CP without VM; 3) 32% CP with VM; and 4) 32% CP without VM. The feeds have similar composition with varying amounts of mill mix bran, fishmeal, coconut meal, rice pollard, and wheat flour and vitamin mineral mix. The feeds have been processed into pellets (3 mm) using a mechanical mixer and extruder, then broken down into suitable sizes and dried to a moisture content of about 10%. Local tilapia feed (containing approximately 29% CP) is being used as a control feed. Each of the five feeds is being fed to tilapia in four different hapas (resulting in 20 tilapia hapas in total) and to Macrobrachium in three different tanks (15 Macrobrachium tanks in total).

Tilapia are fed twice daily, once in the morning and once in the afternoon, at a daily rate of 10% of body weight (this will be reduced to 5% by end of the experiment). At least 30% of the total number of tilapia stocked in each hapa will be sampled every 21 days to determine the average weight and adjust the feeding rates.
Macrobrachium are also fed twice daily, with 30% of the ration in the morning and 70% in the evening. The initial feeding rate is 15% of the body weight and this will be adjusted to around 5% by end of the experiment. All the prawns in each tank will be sampled every 21 days to determine the average weight and adjust the feeding rates. Feed is delivered onto feeding trays in each tank using a PVC pipe to ensure feeds get onto trays while minimizing pellet disintegration. All uneaten feed is siphoned out of each tank every morning. The feed is filtered through plankton net mesh to retain solid matter and discard water. The solid matter of each tank is kept separate and dried in an oven to calculate the amount of fed actually eaten by prawns.

Water temperature is recorded twice daily (at 0900 and 1600 hours, using a mercury thermometer) and pH, dissolved oxygen (using meters) and NH₃ (using test kits) are measured weekly.

The composition and proximate analysis of the feeds, including response variables (survival, weight gain, specific growth rate, feed intake and food conversion ration), will be calculated after the final sampling, which is due on 7 December 2005.

Results to date (after third sampling period) are presented on this page.

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Top: Shalini (left) and Shirleen (right) emptying trays of dried feed
Middle: Shalini weighing feed ingredients, feed mixer and feed grinder on the left
Bottom: Tanks under shade screen for prawn trial