Oryctes SUPPLEMENTED PELLETS AS ORNAMENTAL FISH FEED

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Oryctes rhinoceros (L) is an important pest in oil palm replanting. The adults are commonly captured via pheromone traps in oil palm plantations. These trap captures are then destroyed and disposed off by the estate management. However, it should be realized that these adult beetles offer an alternative source of protein which can be used as a supplementary diet for ornamental fish. Rather than disposing the trap captures, these beetles can be processed into a fish feed product, which could provide additional income for plantations.

PROXIMATE ANALYSIS OF *Oryctes* BEETLES

The protein, lipid, ash and moisture content in *Oryctes* beetles are comparable to the ingredients traditionally used in aquaculture (*Table 1*). The protein and lipid content in *Oryctes* is higher than the common fish meal and soyabean meal. The protein content is also higher than two of the common commercial ornamental fish feed (Brand A: 27%, Brand B: 5.5%)

AMINO ACID CONTENT

The body of the *Oryctes rhinoceros* beetles contained all the 10 amino acids generally required by the fish (*Table 2*). The content of histidine, arginine, valine, isoleucine, leucine, lysine tryptophan and phenylalanine are higher than the range required by several types of fish (*Table 2*). However, threonine is lower than the range required by those fishes.

POTENTIALS AS FISH FEED

Weight Increase Against Time

The pellet formulation (*Oryctes* powder + wheat) has feeding potentials for goldfish, *Carassius auratus* and common carp, *Cyprinus carpio*.

Goldfish. The weight of goldfish had almost tripled its initial weight, when fed with *Oryctes* + wheat (*Table 3*). The increase (295%) is

TABLE 1. PROXIMATE ANALYSIS OF *Oryctes* BEETLES IN RELATION TO CONVENTIONAL INGREDIENTS USED IN TRADITIONAL FISH FEEDS AND COMMERCIAL FISH FEEDS (Brand A and Brand B)

Parameter	*Oryctes* beetles	Common fish meal	Soyabean meal	Brand A	Brand B
Protein	72.7	69.8	54.3	27.0	5.5
Lipid	12.4	10.5	8.5	2.0	0.5
Moisture	10.5	10.6	11.2	na	92
Ash	6.6	14.2	4.3	9.0	na

Note: na - data not available.

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TABLE 2. AMINO ACID CONTENT IN *Oryctes* ADULTS COMPARED TO THE REQUIREMENTS OF AMINO ACIDS IN SEVERAL TYPES OF FISH

Amino acids	**Percent amino acids in *Oryctes* (g/100 g protein)**	**Chinook salmon (*Oncorhynchus tschawytscha*)**	**Japanese eel (*Anguilla japonica*)**	**Common carp (*Cyprinus carpio*)**	**Rainbow trout (*Oncorhynchus mykiss*)**	**Channel catfish (*Ictalrus punctatus*)**	**Tilapia (*Oreochromis mossambicus*)**
Arginine	2.84	2.4	1.7	1.5	1.4	1.0	1.13
Histidine	1.61	0.7	0.8	0.6	0.6	0.4	0.42
Isoleucine	2.36	0.9	1.5	0.9	1.0	0.6	0.80
Leucine	3.77	1.6	2.0	1.6	1.8	0.8	1.35
Lysine	2.39	2.0	2.0	2.1	2.1	1.5	1.51
Methionine	0.87	0.6	0.9	0.6	0.7	0.6	0.40
Phenylalanine	2.07	1.7	1.2	1.2	1.2	1.2	1.00
Threonine	0.30	0.9	1.5	1.3	1.4	0.5	1.17
Tryptophan	0.88	0.2	0.4	0.2	0.2	0.1	0.17
Valine	3.00	1.3	1.5	1.2	1.2	0.7	0.88
Total Protein level	72.7	40	42.0	40.0	40.0	24.0	40.0

comparable to both commercial fish feeds (205% and 345% for fish feeds A and B respectively).

Common carp. Similarly, the weight of common carp had increased by more than one-fold (169%) when fed with *Oryctes* + wheat, comparable to commercial fish feed A (79%) and much higher than commercial feed B (29%) (*Table 3*).

Fish Weight in Relation to Food Uptake

Up to 28 weeks, there were some good correlations (R^2>0.5) indicating good response between food uptake and fish weight when fed with the *Oryctes* pellet formulation (*Figure 1)*, comparable to the commercial fish feeds A and B (*Figure 2*). These show its potential to be developed for fish feed.

Feed Efficiency

This is defined by fish weight gain per unit of feed consumed. Feed efficiency is calculated with the gain in biomass (wet weight) divided by the amount of feed provided. It is also called the feed factor. The mean feed factors show no significant difference (p>0.05) between two types of fish fed with *Oryctes* + wheat and the commercial feed pellets (A and B) (*Table 4*).

ADVANTAGES

1) Free source of raw materials, in areas where there is a high beetle population (the trapped beetles are normally disposed off).

2) Planters can utilize the waste (*Oryctes* beetles) into ornamental fish feed.

TABLE 3. PERCENTAGE INCREASE IN WEIGHT OF FISHES FED WITH *Oryctes* PELLETS AND COMMERCIAL FISH FEEDS

	Mean % weight increase after 22 weeks		
	O.r. + wheat	**Commercial fish feed A**	**Commercial fish feed B**
Goldfish	295a	205a	345a
Common carp	169a	79a	29b

Note: Means in rows with the same letters are not significantly different at p=0.05.

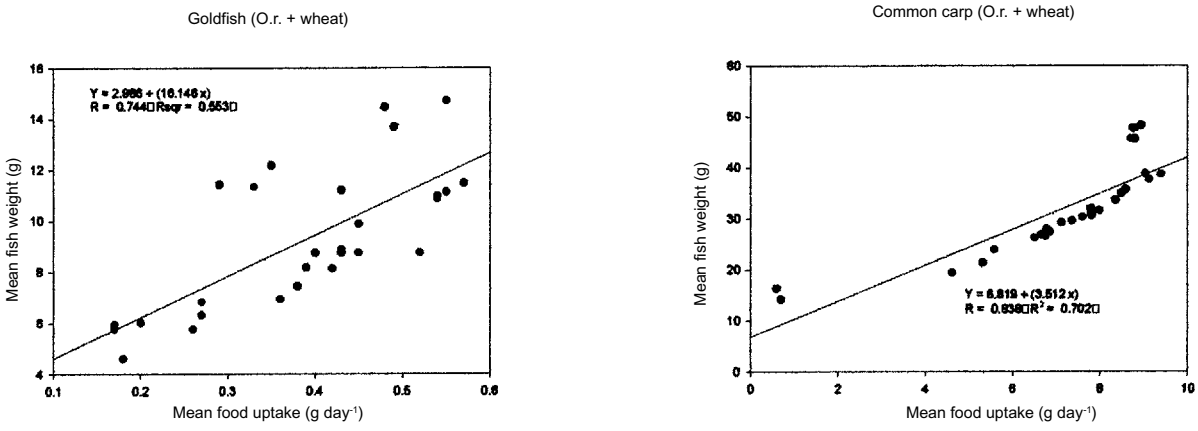

Figure 1. Correlations between mean fish weight and mean food uptake for goldfish (left) and common carp (right), fed with Oryctes + *wheat.*

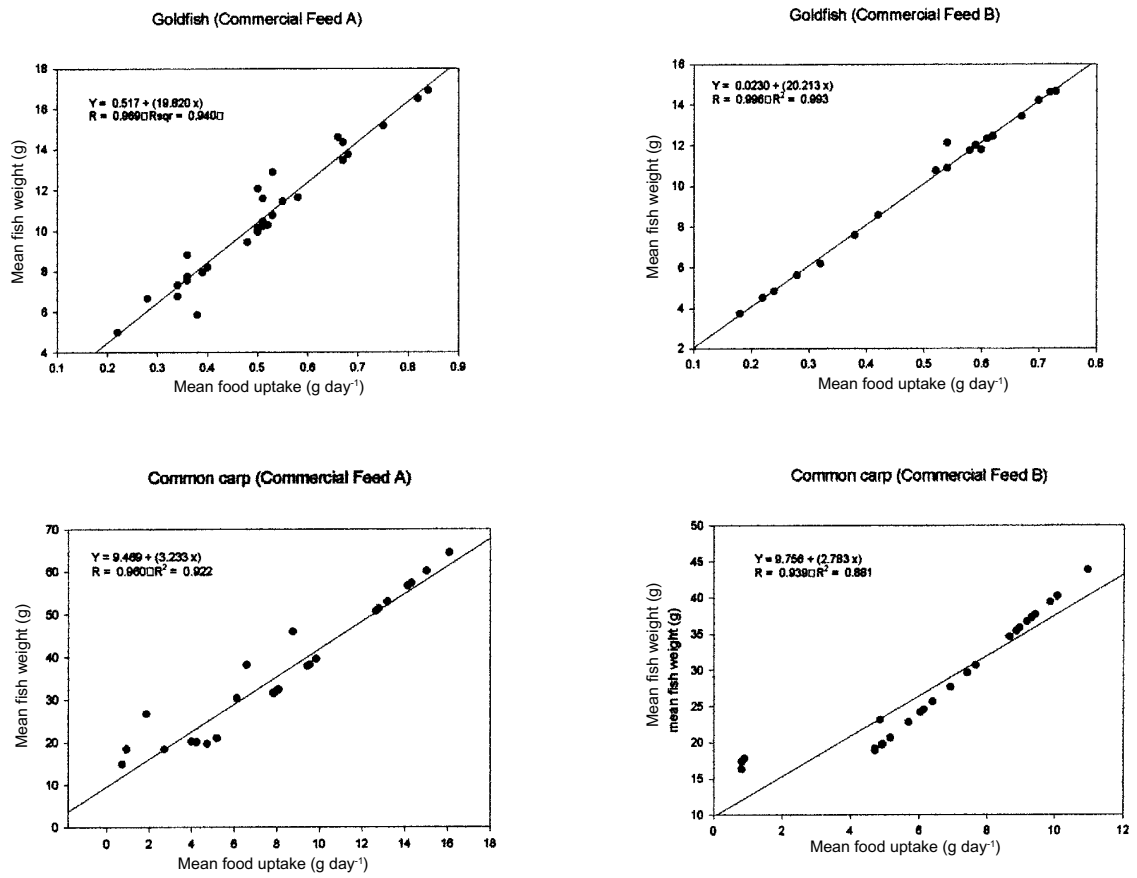

Figure 4. Correlations between mean fish weight and mean food uptake for goldfish (top), and common carp (bottom), fed with commercial feed A (left) and B (right).

TABLE 4. MEAN FEED FACTORS OF FISHES FED WITH *Oryctes* PELLETS AND COMMERCIAL FISH FEEDS

	Mean feed factors over 28 weeks		
	O.r. + wheat	**Commercial fish feed A**	**Commercial fish feed B**
Goldfish	0.92a	0.82a	1.35a
Common carp	0.29a	0.40a	0.33a

Note: Means in rows with the same letters are not significantly different at p=0.05.

3) The protein content in *Oryctes* beetles can be used as an alternative for fish meal or soyabean meal, in the conventional fish feed.

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