INTERNSHIP REPORT

AT THE ENERGY AND RESOURCES INSTITUTE GOA

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MSc PART II-ZOOLOGY

INTRODUCTION

The TERI office in Goa was set up in 1996 and aimed at policy research in the interface between environment and development. Over the years, it has gained expertise in the area of coastal and marine research, biodiversity mapping and water resource management. It promotes sustainability encompassing policy research, education, solutions at grassroots, and awareness generation. The Centre also has a small library with an excellent collection of books that is open to public.

This Centre is active in the marine and coastal sector of various states in the country, in the areas of coastal resources management, pollution monitoring, biodiversity mapping, aquaculture, education and training. Work undertaken in this sector includes ecological baseline assessment and biodiversity mapping of coastal ecosystems; assessment of fishery productivity community-based resource management by building capacity in artisanal fishery; entrepreneurship development, livelihood diversification and woman empowerment in sustainable aquaculture culture technologies through trainings and demonstrations. Educational tours for schools have also been conducted at the TERI Coastal Education Hub, Goa, to connect students to science and inspire environmental action.

Deeply committed to every aspect of sustainable development, TERI works on sustainability issues across a range of subjects like urban development, urban transport, energy, environment, climate change and poverty alleviation. TERI's emphasis has always been on bringing together multidisciplinary teams who use their knowledge and skills to carry out world class research to derive local and client-specific solutions.

The main office of TERI is located in Delhi at the India Habitat Centre (IHC), Lodhi Road, New Delhi. A dynamic and flexible organization with a global vision and a

local fucus, TERI was established in 1974. While in the initial period the focus was mainly on documentation and information dissemination activities, research activities in the fields of energy, environment and sustainable development were initiated towards the end of 1982.

OBJECTIVES

1. Formulation of fish feed using whole algae and de-oiled algae.

2. Conduction of a feeding experiment and comparison of growth of fishes with formulated fish feed and growel fish feed.

3. To set up a small Aquaponics setup.

WORK DONE

Preparation of formulated fish feed using whole algae and de-oiled algae

Fish feed was prepared by using three types of ingredients i.e., Ground nut powder, Wheat barn, and fish meal. The ingredients were sieved before use and kept for drying under the sun in order to remove any insects and other unwanted materials. The ingredients were then weighed to 1Kg and two types of diets i.e., Diet 1 and Diet 2 were prepared.

Steps for Fish Feed Preparation:

- Mix all the ingredients and make a dough by adding 100 ml of warm water at a time. So total 800 ml of warm water was added in both the diets. A dough was made.
- It was spread on the tray and kept for un drying on the terrace.
- It was flipped every 20 minutes till it was completely dried and there was no moisture.
- The feed was dried and powdered with the help of mixture and stored in the air tight container (Diet 1a Diet 2).
- Diet ‘1b’ was prepared using same ingredients with deoiled algae except wheat barn.

Maintenance of Aquarium for Fish Feed Experimentation:

- Four Aquarium tanks were cleaned and filled with clean water to house the fish fingerlings for the purpose of acclimatisation.
- Twelve tanks were cleaned and filled with water for feeding experiments and biofilters and aerators were added in order to maintain aquarium conditions.

About two hundred Tilapia fingerlings were brought from Green Lake Farm Majorda along with growel feed.

The following steps were carried out before the fishes were transported in the tanks:

1. The polythene bags containing fishes was washed externally.
2. The bucket was half filled with water followed by which the bag containing fishes was placed in bucket and opened slowly to allow the fishes to come out in the surrounding water.
3. The fishes were then weighed. A bowl filled with water was kept on weighing machine and teared. The fishes were put in the bowl and the weight was noted.
4. The fishes were segregated in three groups.
   Group 1: Fishes weighing 4-7 g.
   Group 2: Fishes weighing 3 to 4 g.
   Group 3: Fishes were 0.5 to 2.9 g.
5. We only considered fishes belonging in the range of 1.5 to 2.5 g. and the fishes that were not in this range were rejected.
6. The 6 fishes from the selected category were added in each of the 12 tanks. The rejected fishes were kept in two separate tanks.
7. The tanks were labelled according to the diet plan:
   3 tanks for diet 1b
   3 tanks for diet 2

3 tanks for diet Control (Only growel feed)

8. On day ‘0’ till day ‘2’ the fishes were only fed with growel feed.
9. The vials were filled with the prepared feed according to the diet plan for 14 days.
10. Fishes were fed according to 6% of the body weight.
11. Every day the vials were put in the tank according to the diet plan followed:
    - On day 7 each fish was weighed and its length was measured using a scale.
    - According to the increased in the weighed the amount of feed needed to give further was increased.
    - A similar procedure was carried out day 14 to measure weight and length.

WEIGHT AND LENGTH IN OBSERVATIONS FOR DIFFERENT DIETS

1. **Control**

Day 0

Fishes in the weight range of 1.5 – 2.5 g were considered.

Day 7

Tank 1		**Tank 2**		**Tank 3**	
Length	**Weight**	**Length**	**Weight**	**Length**	**Weight**
5.5cm	3.29g	6cm	2.62g	6.1cm	4.55g
6cm	3.30g	6.5cm	4.91g	6.1cm	5.02g
6.6cm	4.49g	6cm	4.2g	6.8cm	4.42g
6cm	2g	5cm	3.28g	7.2cm	5.72g
5.6cm	2.90g	6cm	3.88g	6.2cm	4.8g
5.9cm	3.35g	6cm	1.75g	5.9cm	4.12g
Average-	3.22g	**Average-**	3.44g	**Average-**	5.77g

Day 14

Tank 1		**Tank 2**		**Tank 3**	
Tank 1	**Weight**	**Length**	**Weight**	**Length**	**Weight**
6cm	3.37g	6.5cm	2.83g	6.0cm	4.15
6.4cm	4.53g	6.7cm	6.04g	6.7cm	5.83g
7.1cm	4.50g	6.5cm	5.03g	7.4cm	7.41g
6.3cm	2.4g	5.5cm	4.0g	7.3cm	4.85g
5.9cm	3.1g	6.2cm	3.98g	6.5cm	5g
6.1cm	3.7g	6.3cm	2.5g	6.2cm	4.62g
Average-	**3.6g**	**Average-**	**4.06g**	**Average-**	**5.31g**

2. **Diet 1a**

Day 0

Fishes in the weight range of 1.5g-2.5g were considered.

Day 7

Tank 1		**Tank 2**		**Tank 3**	
Length	**Weight**	**Length**	**Weight**	**Length**	**Weight**
6cm	1.61g	5.5cm	2.73g	6.5cm	4.95g
6cm	2.40g	5.8cm	3.04g	6.2cm	4.01g
6cm	3.64g	5.5cm	2.65g	5.6cm	2.84g
6.1cm	1.97g	5.4cm	2.44g	6.5cm	4.32g
6cm	1.61g	6cm	2.72g	6.6cm	5g
6cm	2.00 g	5.6cm	2.65g	5.5cm	2.68g
Average-	**2.205g**	**Average**	**2.705g**	**Average-**	**3.96g**

Day 14

Tank 1		**Tank2**		**Tank 3**	
Length	**Weight**	**Length**	**Weight**	**Length**	**Weight**
6.2cm	4.24g	6cm	3.41g	7cm	5.37g
6.5cm	4.83g	5.9cm	3.07g	7.1cm	4.55g
6.7cm	3.23g	5.5cm	5.19g	7cm	4.7g
6.3cm	5.33g	7cm	5.21g	6.9cm	4.50g
6.9cm	5.06g	6.1cm	4.5g	6.7cm	3.39g
6.7cm	4.06g	5.9cm	4.1g	7cm	3.98g
Average-	**4.51g**	**Average-**	**4.24g**	**Average-**	**4.47g**

3. **Diet 3**

Day 0

Fishes in the weight range of 1.5g -2.5g were considered.

Day 7

Tank 1		**Tank 2**		**Tank**	
Length	**Weight**	**Length**	**Weight**	**Length**	**Weight**
6.3cm	3.91g	5.5cm	2.96cm	5.9cm	3.90g
6.2cm	4.60g	5.5cm	2.75g	6cm	4.01g
5.5cm	2.66g	5cm	2.27g	6cm	3.44g
5.4cm	2.63g	5cm	2.41g	6cm	2.97g
6.3cm	3.44g	5.5cm	2.85g	5.8cm	3.24g
5.8cm	3.63g	5.5cm	2.60g	6.2cm	5.64g
Average-	**3.47g**	**Average-**	**2.64g**	**Average-**	**3.83g**

Day 14

Tank 14		**Tank 2**		**Tank 3**	
Tank 1	**Weight**	**Length**	**Weight**	**Length**	**Weight**
5.5cm	2.95g	5.6cm	3.13g	6cm	3.86g
6.3cm	4.01g	5.6cm	2.87g	6.5cm	4.48g
6.7cm	4.31g	5.3cm	2.55g	6.5cm	4.23g
5.9cm	3.83g	5.2cm	2.67g	6.2cm	3.1g
5.6cm	4.89g	5.7cm	2.97g	6cm	3.44g
6.5cm	3.1g	5.8cm	2.85g	6.4cm	5.70g
Average-	**3.84g**	**Average-**	**2.84g**	**Average-**	**4.135g**

4. **Diet 2**

Day 0

Fishes in the weight range of 1.5g -2.5g were considered.

Day 7

Tank 1		**Tank 2**		**Tank 3**	
Length	**Weight**	**Length**	**Weight**	**Length**	**Weight**
5.8cm	3.23g	5.9cm	3.30g	6.3cm	3.94g
6cm	2.23g	6cm	3.26g	5.6cm	2.95g
5.9cm	2g	5.5cm	2.87g	6.5cm	4.46g
6.5cm	4.30g	5.9cm	3.41g	6.3cm	4.08g
5.9cm	3.30g	5.5cm	2.95g	6.2cm	3.83g
5.9cm	3.05g	5.5cm	1.60g	6.4cm	4.34g
Average-	**3.01g**	**Average-**	**2.84g**	**Average-**	**3.93g**

Day 14

Tank 1		**Tank 2**		**Tank 3**	
Length	**Weight**	**Length**	**Weight**	**Length**	**Weight**
5.9cm	3.30g	6cm	3.95g	6.5cm	4.62g
6.4cm	2.34g	5.9cm	3.5g	5.7cm	3.34g
6.2cm	3.03g	5.7cm	3.01g	5.7cm	5.24g
6.7cm	4.5g	6cm	3.60g	6.2cm	4.2g
6.1cm	3.51g	5.9cm	2.98g	6.4cm	3.98g
6cm	3.20g	5.9cm	2.1g	6.5cm	4.51g
Average-	**3.31g**	**Average-**	**3.19g**	**Average-**	**4.31g**

Analysis of the Feed

Control (Grow well):

Moisture Content: 5.01%

Carbohydrate: 0.089mg/ml

Proteins: 615.0µg/ml

Diet 1a:

Moisture Content: 2.40%

Carbohydrates: 0.090mg/ml

Proteins: 630.4µg/ml

Diet 1b

Moisture Content: 6.23%

Carbohydrate:0.091mg/ml

Proteins:600.42µg/ml

Diet 2

Moisture Content: 10.52%

Carbohydrate: 0.087mg/ml

Proteins:6.09.3µg/ml

Setting up of small-scale aquaponics set up

The setting up of an aquaponics unit was done during the last week of the internship. A rough sketch of the set up was drawn on paper which was later approved by the guide incharge. Following this, material required were purchased. These include, 4 PVC pipes of 1-meter length and 3inch diameter, hydroponics pots/vases, hi pressure pump, silicon pipe, sealants, biofilter, clay balls etc.

To make the set-up, 4 – 5 holes of 3inch diameter were drilled equidistant from each other with the help of a hole saw drill. The pipes were then installed on a metal stand and fastened with zip ties in a zig zag fashion keeping in mind the desired angle of tilt for ensuring proper flow of water. The tank containing the fish was placed right below the level of the 4th pipe. In this set up, gravity is used to create aeration and to direct flow of water through the large pipes. A high-pressure aquarium pump was placed in the tank and using a silicon pipe, the water was made to climb up and supply the top most pipe mounted on the racks. From the end of the 4th pipe, the water was made to fall via action of gravity back into the fish tank from a gradient in order to induce bubbling. The system was checked for leaks and if any, they were sealed using M seal or silicone sealant. The pots were then placed into the holes drilled into the pipes. Expandable clay balls were introduced into the pots which provided a medium for plants to grow. Finally, the fish were introduced into the tank and plants were planted into the system, the plants planted were ferns, hydrilla and crotons.

ADDITIONAL WORK DONE:

Care of Tilapia hatchlings:

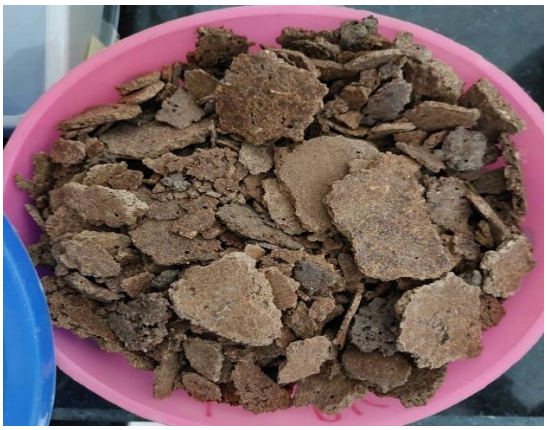
During our free time it had been noted that tiny Fry's of tilapia were continuously hatched out into the tank containing the parent fish along with other adult tilapia fish. These fry's had to be transferred into another tank so as to prevent the adult fishes from feeding on them. Two small glass tanks were cleaned and the fish fry's were carefully transferred into the tank. The fry's were fed with powdered grow well feed once a day.

Demonstration of pelletizer:

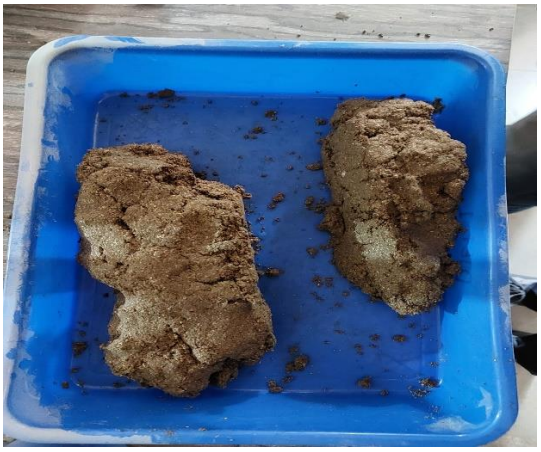
As a demonstration as to how the pelletizer had to be used. Under the guidance of our guide, a plain dough was made using waste powdered ingredients. The dough was then introduced into the pelletizer and pellets of different sizes using different mesh sizes were made for a demonstration purpose.

IMAGES:

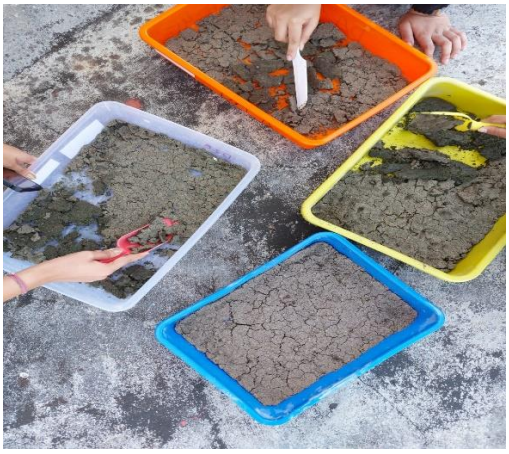
Fish meal



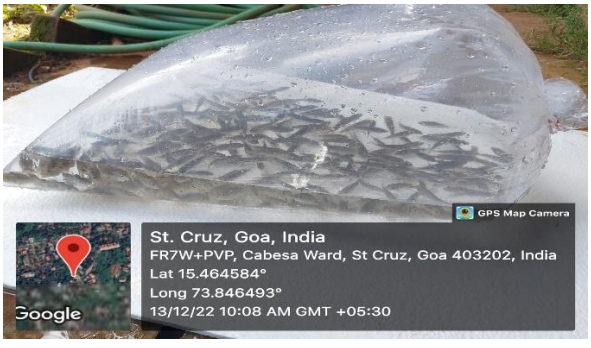
Ground nut oil cake



Dough of all ingredients

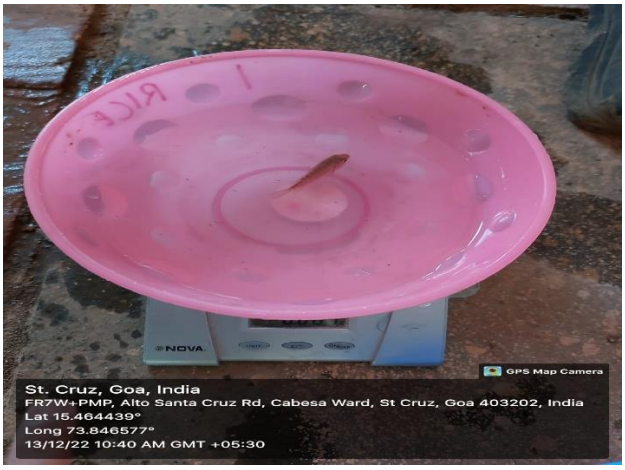


Sun drying the Dough

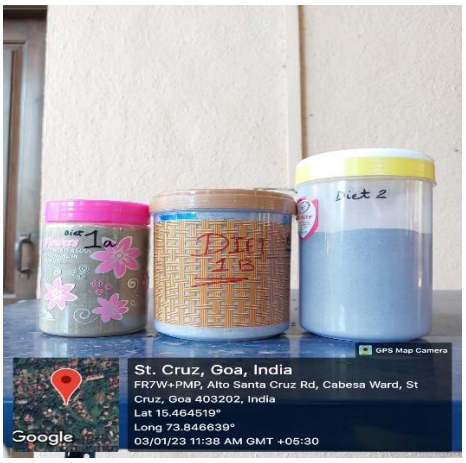


Fish Fingerlings

Measuring length of fish



Weighing the fish



Prepared diets

Picture of group members with guide

CONCLUSION

In the feeding experiment conducted, it was found that fishes fed with Grow well feed showed a higher growth rate (weight and length) as compared to fishes with the experimental diet consisting of de-oiled algae and whole algae. A small-scale aquaponics set up was built using easily available materials

LEARNING OUTCOMES

In this 1-month internship program

1. We learnt to formulate fish feed.
2. We attained skill on maintenance of tank, fingerlings and measurement of weight and length.
3. We also gained an experience on setting up of small-scale aquaponics system.