INTERNSHIP REPORT

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MSC PART 2 ZOOLOGY

INTRODUCTION

Being students of the Aquaculture cluster, our internship was based mostly on the field of Aquaculture and fisheries. The internship was held at TERI- The Energy and Resources institute which is based in the village of Santa Cruz, Goa.

The duration of the internship was of 1 month and started from 1st December 2022 to 3rd January 2023. The work that was to be done was mainly to prepare fish feed and setup an aquaponics system. Our guides for the internship were Dr. Fraddry D'Souza and Dr. Elroy Pereira who on the first day of the internship just gave us a brief introduction on TERI and how we had to go about with the internship.

About TERI- The Energy and Resources Institute:

TERI is a research institute having its headquarters based in New Delhi that specializes in the fields of energy, environment and sustainable development. Their mission is to serve as innovators and agents of change to enable policies and practices for an equitable and sustainable future through conservation and efficient use of energy and other resources. The institution believes that resource efficiency and waste management are the keys to smart sustainable and inclusive development.

TERIs work across sectors is focused on:

- Promoting efficient use of resources
- Increasing access and uptake of sustainable inputs and practices
- Reducing negative impact on environment and climate.

TERIs research and research-based solutions have a transformative impact on industries and communities. It has fostered international collaboration on sustainability action by creating a number of platforms and fora. Research gets

translated into technology products, technical services as well as policy advisory and outreach.

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.

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 grow well (commercial) fish feed.
3. To set up a small-scale aquaponics set up

WORK DONE

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

During the initial first week of the internship, we were all assigned to prepare formulated fish feeds using whole algae and de oiled algae. Three diets were to be prepared and were labelled as Diet 1a, Diet 1b and Diet 2 which were to be later used for experimental purposes. The following ingredients were used to prepare the feeds i.e Whole algae (for Diet 2 only), De-oiled algae (for diet 1a and 1b only, fish meal, wheat bran, ground nut oil cake, vitamins and minerals, binders etc. The amount of the ingredients to be added was pre calculated on a computer software by the guide incharge. Diet 1a consisted of only de-oiled algae and other ingredients. Diet 1b also consisted of de-oiled algae except that it did not contain wheat bran, however a it had a different quantity of fish meal compared to other diets. Diet 2 consisted of only whole algae and rest all other ingredients. Each diet had ingredients weighed for preparing 1 kg of feed. All 3 diets were prepared separately by mixing in all the ingredients together. The equipment's used for preparing the fish feed are small farm scale mixer-grinder, pelletizer etc. all the ingredients had to be in powdered form before mixing them together in addition to this they also had to be sun dried so as to sterilize or disinfect them. The ingredients are pre mixed in appropriate quantities by hand before adding warm water for at least 5 mins in order ensure even distribution of ingredients within the mixture. Each mixture was made into a dough using 800 ml of water per kg to form a mash and dough like mixture. In order to crumble the feed, the dough was spread on a sterile surface such as a tray and was allowed to dry in the sun. The dried pieces were further allowed to dry in a shaded area and then powdered or crumbled using a food processor. The prepared feed was then stored into air tight containers for further use.

2. **Feeding experiment and comparison of growth of fishes with formulated fish feed and grow well (commercial) fish feed.**

   The next task was to conduct an experiment on the effect of the 3 diets prepared vs the control grow well commercial feed. For this experiment, 12 tanks were cleaned and dried and filled with fresh water and a biofilter was introduced in the tanks. 3 tanks were utilized for each diet and also for the control. The next day, the fish seeds of tilapia were brought and acclimatized before transferring them into the tanks. The fish were segregated according to their weight and 6 fishes of equal weights were introduced into the tanks. During the initial days all the fish tanks were fed with grow well feed and followed by a day of the prepared feed and again grow well in order to acclimatize the fish. For carrying out the experiment, small Vials were filled with the diets by weighing all 3 diets and control according to the feed requirement and body weight of the fishes. The fishes were fed with the respective feed on a daily basis and their weights and lengths for day 0, day 7 and day 14 were noted down and also the proximate analysis of the three diets were carried out in the lab to determine the content of proteins, carbohydrates, lipids, moisture content etc. the outcome of the experiment have been depicted in the tables below.

WEIGHT AND LENGTH OBSERVATIONS FOR DIFFERENT DIETS

1. Control

Day 0:

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

Day 7:

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

Day 14

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

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(cm)	**Weight(g)**	**Length(cm)**	**Weight (g)**	**Length(cm)**	**Weight(g)**
6	1.61	5.5	2.73	6.5	4.95
6	2.40	5.8	3.04	6.2	4.01
6	3.64	5.5	2.65	5.6	2.84
6.1	1.97	5.4	2.44	6.5	4.32
6	1.61	6	2.72	6.6	5
6	2.00	5.6	2.65	5.5	2.68
Avg.	2.205g	Avg	2.705g	Avg	3.96g

Day 14

Tank 1		Tank 2		Tank 3	
Length(cm)	**Weight(g)**	**Length(cm)**	**Weight (g)**	**Length(cm)**	**Weight(g)**
6.2	4.24	6	3.41	7	5.73
6.5	4.83	5.9	3.07	7.1	4.55
6.7	3.23	5.5	5.19	7	4.7
6.3	5.33	7	5.21	6.9	4.50
6.9	5.06	6.1	4.5	6.7	3.39
6.7	4.06	5.9	4.1	7	3.98
Avg	4.51g	Avg	4.24g	Avg	4.47g

Diet 1b

Day 0

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

Day 7

Tank 1		Tank 2		Tank 3	
Length(cm)	**Weight(g)**	**Length(cm)**	**Weight (g)**	**Length(cm)**	**Weight(g)**
6.3	3.91	5.5	2.96	5.9	3.90
6.2	4.60	5.5	2.75	6	4.01
5.5	2.66	5	2.27	6	3.44
5.4	2.63	5	2.41	6	2.97
6.3	3.44	5.5	2.85	5.8	3.24
5.8	3.63	5.5	2.60	6.2	5.64
Avg	3.47g	Avg	2.64g	Avg	3.83g

Day 14

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

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(cm)	**Weight(g)**	**Length(cm)**	**Weight (g)**	**Length(cm)**	**Weight(g)**
5.8	3.23	5.9	3.30	6.3	3.94
6	2.23	6	3.26	5.6	2.95
5.9	2	5.5	2.87	6.5	4.46
6.5	4.30	5.9	3.41	6.3	4.08
5.9	3.30	5.5	2.95	6.2	3.83
5.9	3.05	5.5	1.60	6.4	4.34
Avg	3.01g	Avg	2,84g	Avg	3.93g

Day 14

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

Analysis of the feed

Control (grow well):

Moisture Content: 5.01%

Carbohydrates: 0.089 mg/ml

Proteins: 615.9ug/ml

Diet 1a:

Moisture Content: 2.40%

Carbohydrates: 0.090 mg/ml

Proteins: 630.4ug/ml

Diet 1b

Moisture Content: 6.23%

Carbohydrates: 0.091 mg/ml

Proteins: 600.42ug/ml

Diet 2

Moisture Content: 10.52%

Carbohydrates: 0.087 mg/ml

Proteins: 609.3ug/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 3 inch diameter, hydroponics pots/vases, hi pressure pump, silicon pipe, sealants, biofilter, clay balls etc.

To make the set-up, 4 – 5 holes of 3 inch 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 4^{th} 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 4^{th} 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.

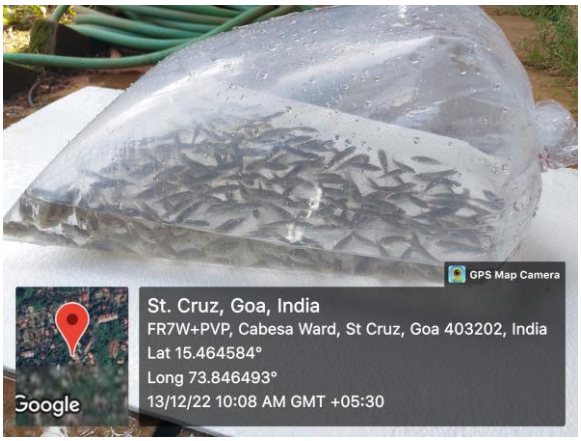
IMAGES:

Fish Meal

Ground nut oil cake

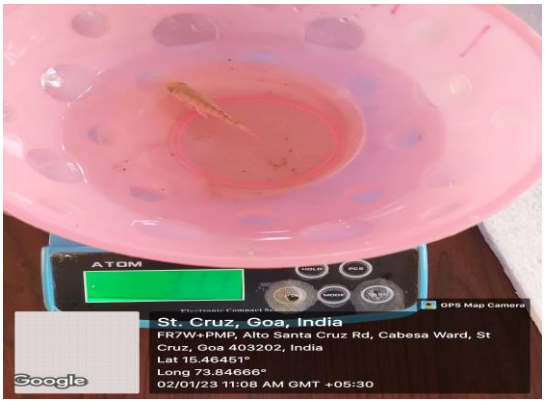
Dough of all ingredients

Sun drying the dough



Fish Fingerlings

Measuring length of fish



Weighing the fish

Prepared diets

Feed vials

Cleaning tanks

Pic of group members with guides

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.