MARIGOLD *Tagetes erecta* FLOWER AS A REPLACEMENT FEEDS ON THE GROWTH OF TILAPIA FINGERLINGS

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ASCENCIO, JOHN MARTIN

BIBAL, JESSA MAE G.

CALIBJO, ALBERT MATTHEW V.

FORRO, FRANZ DAVE R.

MADERO, NJ C.

MONTUYA, JOHN ZANDER A.

PANIZA, GELLOURD L.

ABSTRACT

Inflation caused the commercial feed price to rise and it reduces the profit margin in which can greatly affect local farmers. This study aimed to determine the effect of Marigold flower as a Replacement feed on the growth of Tilapia fingerlings. The Marigold flower was oven dry and finely grind using blender and pestle and mortar. A total of 180 tilapia fingerlings was utilized and was divided into nine ponds equally. A random sample of five tilapia was weighed weekly. The average weight gain(g) of tilapia fingerlings is analyzed using ANOVA. Results revealed that the average weight gain of tilapia fingerlings as affected by different treatments of Marigold flower is not significantly different to that of the commercial feed. In terms of means the different treatment of Marigold flower has a comparative result as that of the commercial feeds. Thus, it is concluded that Marigold flower has a potential as a replacement feed on the growth of Tilapia fingerlings.

CHAPTER I

THE PROBLEM AND ITS SCOPE

Background of the Study

Marigold is an abundant plant in the family of asteraceae here in the Philippines (National Plant Data Center, 2023). The flower contains 1.4241% of protein and could be a potential source of protein for tilapias (NCBI, 2023). Plant-based is one of the alternatives in promoting the organic culture and raising awareness of it. Because commercial feed prices kept on increasing due to inflation, plant-based feed can be utilized as an alternative. Because of its fast reproduction rate, Tagetes erecta-based feeds could be a sustainable alternative to commercial feeds, as well as a source of protein, Carotenoids and its high Carbohydrate for the fish. Plant-based feeds are a better alternative to commercial feeds since commercial feeds may contain harmful components that harm fish.

Inflation raises commercial feed prices, reducing profit margins and affecting fish growth and survival rates. Most fish ponds rely on commercial products to improve performance. Genetic resources and environmental conditions have a substantial impact on Nile tilapia growth, influencing aspects such as food quality, stocking density, and feeding rate (Journal of Fisheries, 2023).

Tilapia is a popular fish all around the world. Tilapia is under the genus of niloticus with certain distinct characteristics from other species, such as tolerance to low water temperatures and the production of consistent quantities of fry (Lovshin L., 2000).

Tilapia is a high salinity tolerant species and based on the information given above, the researchers wanted to test out the effect of Marigold as a plant-based feed on the growth of Tilapia fingerlings.

Statement of the Problem

Generally, this study aimed to determine the influence of Tagetes erecta flower as Replacement feeds on the growth of Tilapia fingerlings

Specifically, this study aimed to answer the following question:

1. What is the effect of Tagetes erecta flower (20% & 40%) as Replacement feeds to the growth of Tilapia fingerlings based on their average weight gain three weeks after the application?
2. Which among the treatments is the most effective on the growth of Tilapia fingerlings based on their average weight gain three weeks after the application?
3. Is there a significant effect among the different treatments of Tagetes erecta flower (20% & 40%) as Replacement feeds on Tilapia fingerlings base on their average weight gain three weeks after the application?

Hypothesis

Ho: There is no significant difference on the effect of *Tagetes erecta* flower (20% & 40%) as Replacement feeds on the growth of Tilapia fingerlings in terms of its average weight gain three weeks after the application.

Conceptual Framework

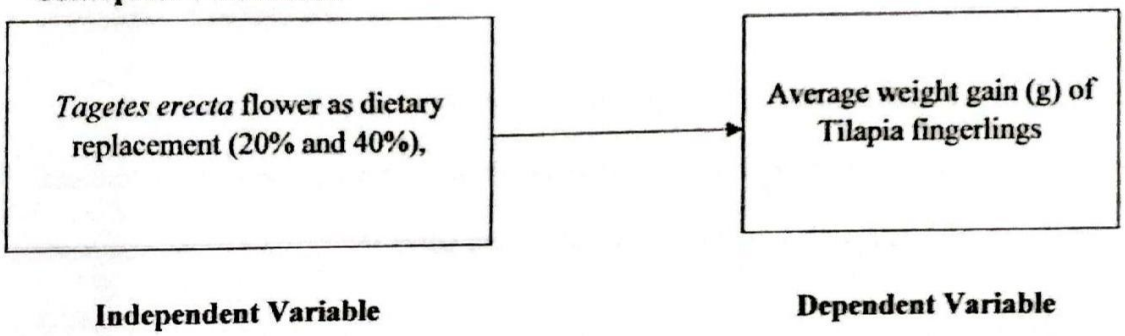

Figure 1.1: Conceptual Framework of the study

Significance of the Study

The result of the study will benefit the following:

Academic Community. This study can advance the knowledge about the plant and its uses and can advance the knowledge, promote sustainable practices, and have both practical applications for both the academic community and the aquaculture industry.

Botanists. This study could further advance the knowledge about the plant and the other uses that it may present in the future in the field of research and provide valuable insights into plant-animal interactions, biochemistry, conlogy, and potential applications of Marigold flowers, enriching their expertise and contributing to broader

discussions on sustainable practices of the said plants and it's uses on this field of study

Fish Farmers. This study can help fish farmers become less reliant on pricey

Foreign feed components. In aquaculture operations, this study enhances market competitiveness, resource efficiency, fish health, environmental stainability, and community development.

Future Researchers. Through this study, the field of fish nutrition and fired development will gain greater scientific understanding, and future researchers will harve the opportunity to contribute to the sustainability, efficiency, and welfare of aquaculture systems.

Definition of terms

For purpose of clarity, the following terms is defined in conceptual and operational meaning.

Tagetes erecta. is a member of the Astericae family and is under the genus of tagetes, it is has a yellow colored flower and has a height that spans 3 to 5 inches (Tagetes erecta Linnaeus, Sp. Pl. 887. 1753)

In the study, it refers to the plant species that was be mixed with the commercial feeds as a dietary replacement.

Tilapia. Is a fish under the genus of Oreochromis and is a hybrid of seven different species of local tilapia. (Myers P., 2020),

In this study, this refers to the fish that was be utilized in the study.

Weight. It is the amount of matter in a particular object (Meriam-webster, 2023)

In this study, this refers to the standard unit of weight that examined the heaviness of the fish

Scope and Delimitation

This study aimed to determine the Tagetes erecta flower as Replacement feed on the growth of Tilapia fingerlings. The study was conducted at Brgy. Ayong, Cabatuan, Iloilo on March to April 2024. This study is composed of three treatments, 40% as the first treatment, 20% as the second treatment and a positive control treatment and is replicated thrice. The study of Mohammad M. was used as a basis in determining the amount of marigold flower replaced on the actual amount of commercial feeds. There are a total of nine tarpaulin used and it has a diameter of Isqm^2 and has a stocking density of 20 Tilapia fingerlings. The data was gathered weekly. The average weight of Tilapia was gathered and analyzed using ANOVA and DMRT.

CHAPTER II

REVIEW OF THE RELATED LITERATURE

This review of related literature consists of three main parts. 1. Tilapia where its name, taxonomic classification, morphological structure, life stages and related studies were discussed. IL Tagetes erecta where its name, taxonomic classification, distribution and related studies were discussed. III. Related studies about replacement feeds.

Tilapia

Taxonomic classification of Tilapia. Tilapia belongs to the Class Actinopterygii, the Order Cichliformes, and the Family Cichlidae, (Myers P., 2020).

Distribution of Tilapia. Freshwater fish species known as tilapias are native to Africa and the Middle East, specifically the Jordan Valley and coastal rivers. Additionally, tilapia have been brought to and dispersed throughout other global regions (Abdel-Fattah M., 2020) Tilapia is also abundant in the Philippines, in the rivers or some aquatic fishery ponds (Guerero, R. D., 2023)

Morphological structure of Tilapia. Tilapia's body is covered in cycloid scales; the upper lateral line extends from the posterior margin of the gill cover to roughly the

last dorsal ray; the lower lateral line originates at the level of the first dorsal branched rays and terminates mid-laterally on the caudal peduncle; one or two scales of the lower lateral line extend onto the caudal fin; two scale rows separate the upper and lower lateral lines (Dunz A. R. et al, 2010).

Life Stages of Tilapia. Fingerlings of tilapia weighs at around 0 to 5-6 grams where as if it grows to 6 to 100 grams it can be considered as a juvenile tilapia. Adult tilapia weighs between 100 to 500 grams and some specie may weigh more than the optimum range of their growth (Frontiers, nd).

Related studies about Tilapia. Aquaculture production methods may benefit from the widespread use of probiotic microbial feed supplements used in animal production. The goal of the current study was to evaluate the replacement of probiotics in the diet of Nile tilapia, Tilapia nilotica (L.). There were 240 Nile tilapia fingerlings in all, which were split among five experimental groups and weighed between 22.96 and 26.40 g. The duration of this investigation is 120 days. For the experiment, five isonitrogenous (30% crude protein) and isocaloric (4.4 kcal of the manufacturer, China Way Mmol g1), B. subtilis N (not less than 0.247 g1) meals were created (Table 1). The fishmeal, soybean meal, wheat bran, and yellow maize were purchased from the Islamic company (APICO, Dokki-El-Giza, Egypt). The Biogen was obtained from the El-Zahra Veterinary Trading (exclusive agent Corporation, Taiwan). The Biogen constants were as follows: Allicin (not less than 0.247 Mmol g1), and B. subtil. The diets were processed by blending the dry ingredients into a homogeneous mixture, and then passing the mixed feed through a laboratory pellet mill in National Institute of Oceanography and Fisheries, Cairo Governorate, Egypt (a California

Pellet Mill, San Francisco, CA, USA) Nile tilapia from ponds treated with different levels of probiotic as growth promoters showed a significantly higher (P 0.01) WG (227.06 6.41g), SGR (1.98 0.10% day 1), FCR (1.77 0.1), PER (1.92 0.17), PPV (29.28 1.31) and ER (19.33 1.11) than the control ponds. This study is entitled Effect of dietary probiotic Biogen supplementation as a growth promoter on growth performance and feed utilization of Nile tilapia Tilapia nilotica (L.) and was conducted by Haroun E. et al in 2006.

Tagetes erecta

Tagetes erecta or also known as Mexican marigold, went by its tagalog name Amarillo and a local name of Ahito (Wan S. J., May 2016). Due to the powerful scent of the essential oil, a water extract of the plants was sometimes used in Honduras to wash corpses. Thus, Tagetes erecta's Spanish common name, "flor de muerto," or "flower of the dead," is used across Mexico and Central America. The etymology of the term "cravo de defuntos," or "carnation of the dead," is the same (Sethoggo M. P., 2005).

Taxonomic classification of Tagetes erecta. Taxonomic classification of Tagetes erecta is as follow: kingdom of plantae, phylum of Anthophyta, class of Dicotyledonae, order of Asteraceae, genus of Tagetes and a species of erecta (PLANTS Database, October 2016). This information would provide the researchers with general information and traits of the said plant.

Distribution of Tagetes erecta. Neither Europe nor Africa are the native habitats of the genus Tagetes. Its natural range in the Americas extends from southern South

America 315 to the southwest United States. Most of the about 40 Tagetes species are found in south-central Mexico, where they have a history of being used for medicinal, culinary, and ornamental purposes (Kaplan L. et al, 2010). Tagetes erecta, which we used in this study, can also be found in the Philippines, this type of flowering plant prefer living in warm places (Wan S. J., May 2016).

Related studies about Tagetes erecta. Nuraini, Mirzah and Ade Djulardi conducted a study entitled Marigold Flower Extract (MFE) as a Feed additive in the poultry diet: effects on laying quail performance and egg quality. Their study was conducted to determine the effect of Marigold Flower Extract (MFE) as feed additive on production performances and egg quality of quail. Coturnix japonica laying quail that were 237 weeks old were utilized in a Completely Randomized Design (CRD) study with four nutritional treatments: 0, 5, 10, and 15 ppm MFE in the diets, with five replicates for each. Feed intake, egg production per hen per day, egg 4/5 weight, egg weightproduction, feed conversion, egg cholesterol, egg fat, and yolk colour were the variables tracked. It was found that adding more MFE to the diet had a significant (p0.05) impact on feed intake, egg production, feed conversion, egg cholesterol, and yolk colour. The diet containing 15 ppm MFE produced the greatest results for feed intake, hen-day egg output, and yolk colour while lowering egg cholesterol and feed conversion.

Related studies about Replacement Feeds. The study of Mohamed M. (January 30, 2023) evaluates the use of fresh green azolla (FGA) as a fish feed ingredient for Nile tilapia. Five experimental groups with different FGA replacement rates were tested over 70 days. Results show that a 20% replacement ratio resulted in the best growth

performance, feed conversion ratio, protein efficiency ratio, and fish whole body protein content. It also led to optimal levels of digestive enzymes, hematological parameters, intestinal histology, antioxidant response, body composition, and flesh quality. Higher replacement rates negatively impacted intestinal morphology but did not affect serum biochemical parameters significantly. Increasing FGA replacement levels up to 20% improved hepatic antioxidant capacity while decreasing malonaldehyde activity. Moreover, higher FGA replacements reduced muscular pH, stored loss, and frozen leakage rate. Overall, replacing up to 20% of commercial feed with FGA is recommended for high fish growth, quality, and sustainability in tilapia production.

The literature cited mentions three major topics. It thoroughly examines Tilapia nilotica, focusing on its taxonomy, distribution, morphology, and studies exploring the use of probiotics in its diet to enhance growth. Another segment centers on Tagetes erecta, detailing its taxonomy, distribution, and research involving Marigold Flower Extract in poultry diets, assessing its impact on quail performance and egg quality. Lastly, the review addresses the pressing issue of fish waste by presenting a study that converts it into high-quality dry fish feed pellets, offering a sustainable solution for animal feed production while mitigating environmental concerns linked to fish waste disposal.

CHAPTER III

Methodology

This chapter presents the materials used and procedures employed in the study.

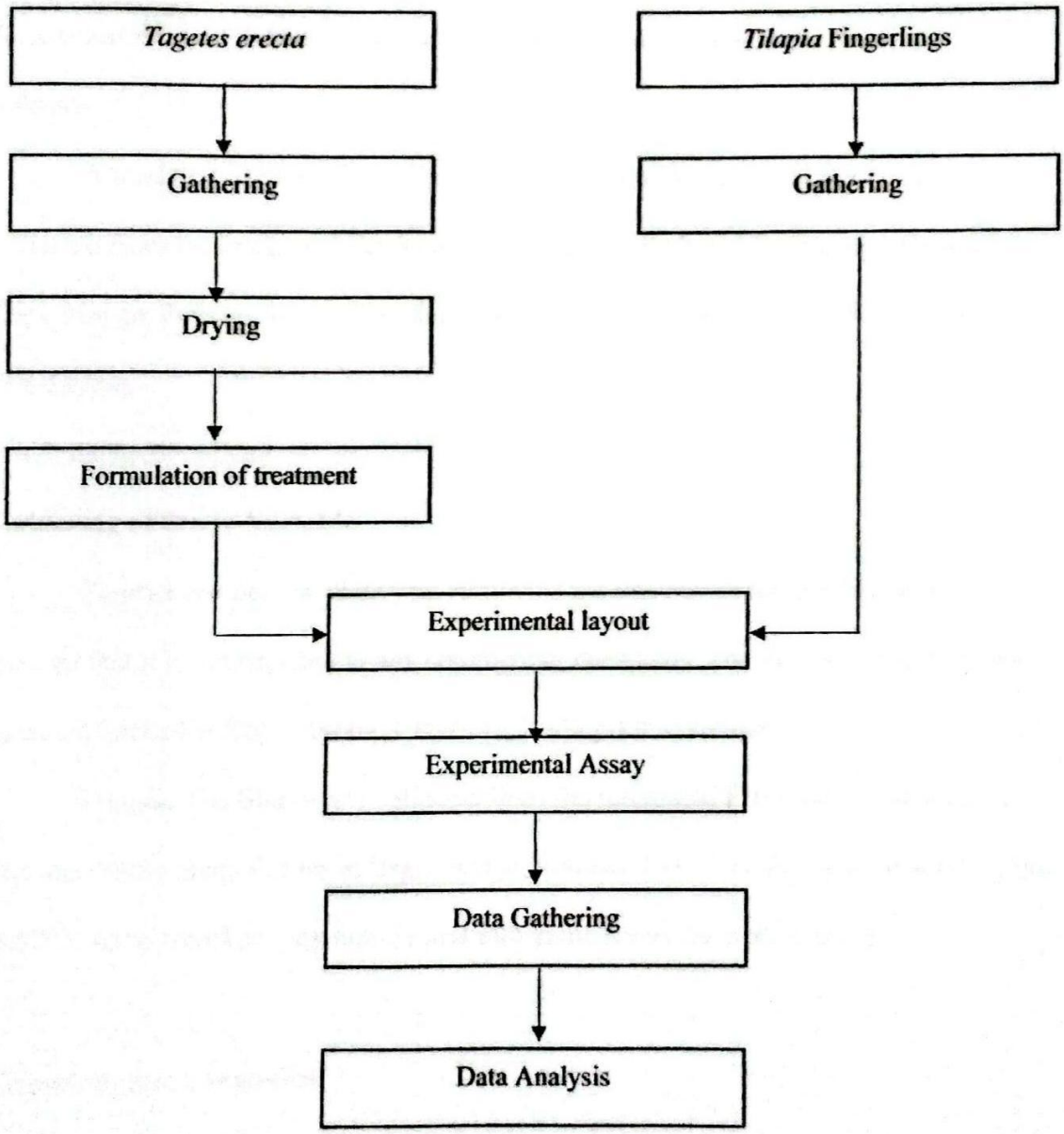

Figure 3.1: Schematic Diagram

Description of the Study Variables

Tagetes erecta flower. Fresh and fully bloomed flower of Tagetes erecta was used in this study. The flower was ensured to be free from arty insecticidal and bacterial infections.

Tilapia. A total of 200 tilapia fingerlings with its weight ranging from 0.9±0.5g was collected from the Integrated Freshwater Aquaculture Park and Technology Center in Brgy. Nanga, Pototan, Iloilo. The tilapia was ensured to be not affected by any type of fish disease.

Gathering of Study Variable

Tagetes erecta. The plant was cultivated months before the conduct and is ensured that it is not exposed to any commercial chemicals. The flower of the plant was manually picked at Brgy. Ayong, Cabatuan, Iloilo prior to sunrise.

Tilapia. The tilapia was collected from the Integrated Freshwater Aquaculture Park and Technology Center in Brgy. Nanga, Pototan Iloilo. The fish was ensured by the IFAPTC to be free from any disease and infections before they provided it.

Formulation of Treatment

Four-hundred grams freshly picked flowers of Tagetes erecta was rinsed in distilled water and dried at 60° in a drying oven for 120 minutes. The dried flower was then finely ground using a blender. The two experimental treatment was designed

as quantity replacement rate of 20% & 40% of marigold flower. The replacement level was adopted from the study of Mohammad M., the replacement percentage is the actual number of commercial feeds that needed to be replaced with marigold flower. The feeds that were feed to the tilapia per day is as follows, The Treatment A contains 40% marigold flower and 60% commercial feeds. The Treatment B contains 20% marigold flower and 80% commercial feeds. The control treatment contained 0% of marigold and 100% commercial feeds. five grams of feeds were given in each treatment in the span of three-weeks.

Experimental Layout

This study has two treatments and was replicated thrice. Randomized Complete Block Design (RCBD) was used as the experimental layout design. The lottery method was used to randomize the treatment per set up.

I	II	III
A	C	B
C	B	C
B	A	A

Legends:

A – Dietary Replacement of 40% *Tagetes erecta* flower

B – Dietary Replacement of 20% *Tagetes erecta* flower

C – Control (+)

I - 1st Replication

II - 2nd Replication

III - 3rd Replication

Experiment Proper

Nine tarpaulins with a stocking density of 20 per 1sqm was used in the study. The Tilapia fingerlings that were requested is around three weeks old. The treatment A was fed by a dietary replacement of 40% Tagetes erecta flower. Treatment B was fed by a dietary replacement of 20% Tagetes erecta flower. The treatment C was fed by the control treatment (Mohammad M. et al, 2023). The feeding was done for three weeks and the amount of feed that was fed per day was seven-percent of the tilapia's body weight and the feeding rate was thrice a day, first is before sunrise, the second was at noon, and the third was before sunset as based on the IFAPTC's Tilapia culture booklet. The commercial feed was fed before sunrise and after sunset and the Marigold flower was feed at noon.

Description of Study Site

The study was conducted at Sitio Tinambian, Brgy. Ayong, Cabatuan, Iloilo. The tarpaulin that was used in the study have a stocking density of 20 per 1sqm and the height of the water was approximated to be 60cm. The water was changed weekly, one-fourth of the water was drained and replaced by clean water.

Data Gathering Procedure

The growth of Tilapia fingerlings was consistently monitored for the next three weeks. Five out of twenty tilapia fingerlings were randomly pick and were measured to get an average weight. The monitoring of its growth was done weekly by weighing the five that were randomly caught.

The methods utilized in collecting data for the growth performance of Tilapia was adapted from the study of Opiyo M. et al. The data gathered is the Weight Gain (MG).

MG final weight - initial weight

Statistical Analysis

Using Microsoft Excel, the following statistical tools were used in summarizing and analyzing data.

Mean. The average growth performance of Tilapia fingerlings was summarized using this tool.

Standard Deviation. This was used to determine the homogeneity of results per treatment.

One-Way ANOVA. This was used to determine the significant difference among the treatments on Tilapia nilotica.

Duncan's Multiple Range Test. If ANOVA yields significant difference, this determine which treatment was significantly different from the rest of the treatment.

Disposal Procedure.

The Tilapia fingerlings were released in a pond having a dimension 10m by 3m and will be fed every day to promote its growth until it can properly be commercially disposed.

CHAPTER IV

RESULTS AND DISCUSSION

This chapter presents result of this study on the effect of Marigold flower as a Replacement feed on the growth of tilapia fingerlings.

Marigold flower as a Replacement Feed

The table below revealed that Treatment A has the highest mean in terms of weight gain followed by Treatment B and the commercial feed (+) that both yields the same mean.

Table 4.1 Means of Average Weight gain (g) three weeks after the application of treatments

Treatments	Replication			Total	Mean	S.D.
	I	II	III			
A.) 40% Marigold Flower	0.8	1	1.3	3.1	1.0	0.3
B.) 20% Marigold Flower	0.9	0.6	0.9	2.4	0.8	0.2
C.) Commercial Feed	0.7	0.8	0.9	2.4	0.8	0.1
Grand Total				7.9		
Grand Mean					0.9	

Table 4.1 shows that Treatment A that contains 40% Marigold flower had a mean and standard deviation higher than the other two treatment, Treatment B has the same mean but has higher standard deviation as that of the Commercial feeds. The Table above

showed that the different treatment of Marigold flower had a comparative result as that of the Commercial feed.

Table 4.2 shows that there is no significant difference on the effect of Marigold flower as a replacement feed on the growth of Tilapia fingerlings. The p value (p=0.280920746) is greater than the α which was set at 0.05. It implies that there is no significant difference among different dietary replacement of Marigold flower and the commercial feed (+) in the growth of Tilapia fingerlings three weeks after the application of treatment.

Table 4.2 Analysis of Variance (ANOVA) for the Average weight gain of Tilapia fingerlings three weeks after the application of treatment.

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*p-value*	*F crit*
Between Groups	0.108888889	2	0.054444	1.580645	0.280921	5.143253
Within Groups	0.206666667	6	0.034444			
Total	0.315555556	8				

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter presents a comprehensive summary, conclusion and recommendations.

Summary

This study was conducted to determine the effect of Marigold (Tagetes erecta) flower as Replacement feeds on the growth of Tilapia fingerlings. This study was conducted from March 24, 2024 to April 15, 2024 at Sitio Tinambian, Brgy. Ayong, Cabatuan, Iloilo.

Marigold flowers were gathered at Sitio Tinambian, Brgy. Ayong, Cabatuan, Iloilo and was authenticated at The Department of Agriculture - Cabatuan, Iloilo. The Tilapia fingerlings was provided by the Integrated Freshwater Aquaculture Park and Technology Center at Brgy. Nanga, Pototan, Iloilo. The Marigold flower was rinsed in distilled water and oven dry for 120 minutes, then it was powdered using blender and pestle and mortar to obtain the same consistency as that of the commercial feeds. There were three treatments used in this study: 40% marigold, 20% marigold and a commercial feed (+). Three replication was made in each of the treatments. Each tilapia was weighed individually to determine their average weight prior to the conduct of the study and a random sample of five fish per treatment was weighed weekly and the feed were adjusted accordingly. The results were analyzed using ANOVA.

Results showed that Marigold flower doesn't have a significant difference on the growth of Tilapia fingerlings as compared to that of the commercial feed as

analyzed by ANOVA. The different treatment of Marigold flower has a comparative result in terms of the average weight gain (g) as compared to that of Commercial feeds and has a potential as a Replacement feed.

Conclusion

Different treatment of Marigold flower has no significant difference in terms of average weight gain as compared to commercial feed but different treatment of Marigold Flower has a potential as Replacement feeds in terms of the mean weight it has a higher value as compared to that of commercial feeds after a three-week application of treatment

Recommendations

Based on the findings and conclusions of the study, the following are recommended:

The researcher recommends the use of Marigold flower as a replacement feed on Tilapia fingerlings, as Marigold is also an abundant plant species in the local community.

The researchers recommend conducting a study using a different plant part as Replacement feed. It is also recommended to conduct a study using another plant/flower as Replacement feed.

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APPENDIXES

MARCH

				1	2 Collecting and Oven Drying of Marigold Flower	3
4	5	6	7	8	9	10
11	12	13	14 Blending and powdering of Marigold flowers	15	16	17 Water refilling in the pond
18	19	20 Initial Weighing of Tilapia and transfer to pond	21 Formulation of Treatments	22	23	24

25 Start of Feeding	26	27	28	29	30	31 Water refilling in the pond

APRIL

1 Weighing and Formulation of Treatment	2	3 Water refilling in the pond	4	5	6	7 Water refilling in the pond
8 Weighing and Formulation of Treatment	9	10	11 Water refilling	12	13	14 Water refilling in the pond
15 Final Weighing	16	17	18	19	20	21
22	23	24	25	26	27	28

29	30					

APPENDIX B **EXPENDITURES**

Sieve & Tupperware	P80
Sako-line (Tarapal)	P810
Gasoline	P300
Labor	P500
Commercial Feed	P20
Ice Wrapper	P30

Total: P1740

AVERAGE INITIAL AND FINAL WEIGHT (g) OF TILAPIA FINGERLINGS

Initial

TREATMENTS	I	II	III
40% Marigold Flower	0.8	1.0	0.9
20% Marigold Flower	0.9	1.0	0.9
Commercial Feed	1.0	0.9	0.9

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APPENDIX D

PICTORIALS

Plate 1. Receiving of Tilapia fingerlings from the IFAPTC in Brgy. Nanga, Pototan, Iloilo

Plate 2. Initial Weighing of the Tilapia fingerlings.

Plate 3. Setting up of Ponds

Plate 4. Gathering of Marigold flower

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FINAL

TREATMENTS	I	II	III
40% Marigold Flower	1.6	2.0	2.2
20% Marigold Flower	1.8	1.6	1.8
Commercial Feed	1.7	1.7	1.8

Plate 5. Oven drying of Marigold flower

Plate 6. Blending of Marigold Flower