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Utilization of Jackfruit *(Artocarpus heterophyllus L.)* Seed Meal in the Growth and Survival Rate of African Catfish (*Clarias gariepinus*)

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ABSTRACT

The African Catfish (*Clarias gariepinus*) is an important commodity for aquaculture due to its high commercial value and resistant to diseases. This species can be stocked at high densities, adaptable when it comes to food availability and can tolerate to low water quality. The study was conducted to evaluate the growth characteristics and survival rate of African Catfish (*Clarias gariepinus*) using Jackfruit Seed Meal (JSM) as feed cultured in an improvised rectangular tank. The study was laid out in Randomized Complete Block Design (RCBD) with three (3) treatments namely: T_0 – Commercial Feeds, T_1 – Jackfruit Seed Meal (JSM), T_2 – Combination of Commercial Feeds and Jackfruit Seed Meal (JSM). There were 30 samples per treatment which were replicated thrice and was reared for 60 days. Mean Weight gain (MWG), Specific Growth Rate (SGR) and Survival Rate (SR) were measured. Results showed that African Catfish fed with the combination of commercial feeds and Jackfruit Seed Meal (JSM) obtained the highest MWG in terms of length, width and weight at 8.7 cm, 1.73 cm and 17.8 g respectively as well as on the SGR in terms of width and weight. Results also showed that samples got 100% survival rate across all treatments. Moreover, results showed that there was a significant difference in all treatments in terms of both length, width and weight. This implies that commercial feeds and Jackfruit Seed Meal (JSM) is a potential supplemental diet in African Catfish culture.

INTRODUCTION

Catfishes are valuable as an imperative source of animal protein, fatty acid, minerals and have greater market demand in many countries. Many potential catfishes are important for aquaculture due to high commercial value in many Asian countries (Nayak *et al*., 2000). African Catfish (*Clarias gariepinus)* is a popular aquaculture candidate in tropical areas because of its high fecundity, flexible phenotype, rapid growth, wide habitat preferences, tolerance to extreme water conditions and the ability to subsist on a wide variety of prey and can devastate indigenous fish and aquatic invertebrate populations (Bruton, 1986).

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The increasing aquaculture activities worldwide led to a more expensive feed costs, thus looking for alternative and cheaper feeds coupled with optimum feeding rate is a focus in aquaculture research field (Naorbe, 2021). The rising feed costs is one of the most important problems in aquaculture that's why it is necessary to identify cost-effective feed alternatives whose raw materials are easily obtained in our country to encourage farmers to venture fish farming. The costs of commercial aquatic feeds are currently increasing due to the growing numbers of aquaculture activities. However, feed is the most significant input for most aquaculture systems. The use of cheap animal protein ingredients and plant-based ingredients in fish feed formulation both have limitations such as high or low level of protein content and amino acid imbalance. One of the most pressing issues in the aquaculture industry is lowering feed costs and producing high-quality feed. With appropriate feeding rates, fish farmers could reduce the production cost, maximize the culture growth, and manage the water quality for a successful farming operation (Marimuthu *et al*., 2011).

Jackfruit Seed can be used to supplement animal feeds. Jackfruit are composed of several berries of yellow pulp and brown seeds encased in a hard shell and are rich in carbohydrates, complex B vitamins and minerals (Silva *et al*., 2007). Jackfruit seeds, most of the time, is considered as waste and are discarded. It is reported that every 100 grams of jackfruit seeds contains 6.6 to 7.04 grams of protein, 38 grams of carbohydrates, including 1.5 grams of fiber, but has less than 1 gram of fat. Jackfruit seeds also contain a range of beneficial bioactive compounds like lignans, isoflavones, saponins and other antioxidants (Baliga *et al*., 2011).

The utilization of locally available feedstuff sources can be a great way to improve aquaculture yield at lower production inputs. Currently, there is no research yet on the application of Jackfruit Seed in the diet of African Catfish (*Clarias gariepinus*). Thus, this study aims to evaluate the effect of Jackfruit Seed Meal (JSM) as growth enhancer and possible increased survival in the culture of African Catfish (*Clarias gariepinus*) in an improvised rectangular tanks.

MATERIALS AND METHODS

This experimental study used a single factor design laid out in Complete Randomized Design (CRD) in freshwater improvised tank with three (3) treatments: T0 – Commercial Feeds, T1 – Jackfruit Seed Meal (JSM), T2 – Combination of Commercial Feeds and Jackfruit Seed Meal (JSM) in three (3) corresponding replications. The experiment was carried out for 60 days.

Stock procurement and Tank preparation

The study used 270 fingerlings of African Catfish (*Clarias gariepinus*) obtained from BFAR-Region 7 Clarin Freshwater Fish Farm located at Caluwasan, Clarin, Bohol. Using a heavy duty tarps made from PVC with nylon as reinforcement and timber for the framing,

nine (9) rectangular improvised fish tanks were made with a dimension of 3m×1m×1m (l×w×h). African catfish fingerlings were stocked at a stocking density of 20 individuals per cubic meter and was done early in the morning with the application of proper acclimatization process to avoid environmental shock of the samples.

Feed Preparation and Feeding

Jackfruit seeds were collected from San Isidro, Calape, Bohol. The removal of seeds from fruits was done by hand. The seeds were washed properly after separating from the jackfruit bulb. The seeds were cooked in boiling water for 10 minutes and were manually chopped using a knife (to facilitate drying), sun dried for two (2) days (Eburuaja *et al*., 2020), and pounded using a hammer to yield a powdery form (Ravindran *et al*., 1996), pack in a clean container, properly closed and store in a room temperature until use. For the commercial feeds, tilapia starter feeds (floater) was used. For the third treatment, the JSM was added to commercial feeds at an inclusion level of 50%. The commercial feed and JSM were mixed together at a ratio 1:1 every feeding. Feeding was done twice daily using broadcasting method with the recommended feeding rate based on its average body weight (ABW).

Growth, survival and water quality monitoring

Initial weight (g) and length (mm) of the culture species were carried out prior to stocking of the samples. Sampling was done every fifteen (15) days to determine the ideal feeding rate and daily feed allocation of the cultured species. Water parameters such as temperature, pH and ammonia level were monitored twice a day, every morning and afternoon, before every feeding to check if it's still within the tolerable range of the species.

At termination period, samples were counted individually and weighed using 0.1g precision digital weighing scale and length measured using Vernier caliper. In computing the mean weight gain (MWG), specific growth rate (SGR) and survival rate (SR), the formulas used were: MWG = W2–W1, where W1 is the initial mean weight of African catfish at the beginning of the experiment and W2 is the final mean weight of the at the end of the experiment. SGR = [(ln final weight − ln initial weight)/days] x 100. Where: ln = natural logarithm of final and initial weight. FCR = weight of feeds consumed/weight gained and SR = (recovered stocks/total stocks) × 100.

Statistical analysis

All data were subjected to one-way analysis of variance (ANOVA) where differences considered significant at the $p < 0.05$ level. Tukey Post Hoc Analysis was also used to identify statistically significant result in order to determine the differences between independent factors.

RESULTS AND DISCUSSION

Growth, survival and mean water quality parameters of the cultured African catfish (*Clarias gariepinus*) are presented in Table 1. Results showed that the incorporation of Jackfruit Seed Meal (JCM) in the diet of the sample species affects its growth since weight gain and specific growth rate were usually considered as the most important measurement of the effectivity of the diet being used. Mean weight gain and specific growth rate were higher in catfish fed with combination of commercial feeds and JSM at 17.8 g and 10.36% day-1, respectively and were significantly higher compared to other treatments as shown in Table 2. In terms of length, catfish fed with combination of commercial feeds and JSM in Treatment 2 also got the highest growth increment among other treatments. Moreover, in terms of width, Treatment 2 also got the highest growth increment and specific growth rate at 1.73 grams and 1.83% day-1, respectively and is also statistically significant compared to treatment 0 and treatment 1.

Results showed that incorporation of Jackfruit Seed Meal in the diet enhanced the growth of African Catfish. This corroborated with the findings of Kharisma *et al.* (2013) stating that jackfruit seeds are excellent supplementary feed for broiler birds. Thus, the utilization of discarded nutritious food resources such as jackfruit seed can be a potential alternative, cost-effective feeds and could be helpful in facilitating better growth in fishes as aid in aquaculture production.

Table 1. Growth, Survival, Nutrient Utilization and Mean Water Quality Parameters of African Catfish (*Clarias gariepinus*) Fed with Jackfruit Seed Meal

Parameters	Treatments		
	T_0	T_1	T_2
Culture Period (days)	60	60	60
MWG (g)	12.74	12.45	17.8
SGR (% BW day-^{1})	5.26	9.6	10.36
Growth Increment L (cm)	5.5	7.37	8.7
Growth Increment W (cm)	0.83	1.44	1.73
Survival Rate (%)	100	100	100
pH (Mean)	7.7	7.7	7.9
Temperature °C (Mean)	26.5	27.1	27
Ammonia (ppm/mg/L)	0	0	0

T_0 - Commercial Feeds (100%), T_1 - Jackfruit Seed Meal (100%) and T_2 - Combination of Commercial Feeds (50%) and Jackfruit Seed Meal (50%)

All fish samples in three (3) treatments survived with no mortalities recorded until the end of the culture period. Moreover, in terms of water quality parameters, as shown in Table 1, recorded data during the experiment were within the tolerable range for African catfish culture in tanks; the pH was 7.7 to 7.9, ammonia level at 0 ppm/mg/L) and the temperature

at 26.2°C to 27.3 °C. Maintaining good water quality is very important for African catfish culture in improvised tanks.a

In conclusion, results of the study implied that the inclusion of Jackfruit Seed Meal (JSM) significantly improved the growth characteristics of African Catfish (*Clarias gariepinus*) without affecting its survival rate. This further implies that utilization of available plant sources such as Jackfruit Seed is potential for higher catfish aquaculture production at a lower cost of inputs.

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