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Feed Formulation from Locally Available Cheap Sources and its Effect on the Growth of Tilapia (*Oreochromis Mossambicus)*

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Abstract--- *This study work was completed to check the effectiveness of local feed for fish growth. For this purpose, easily available feed ingredients were collected from the local market. 100 fingerlings of Oreochromis mossambicus were collected from Bahawalpur fish hatchery and these samples were kept under feeding trial in the fish laboratory of Institute of Pure and Applied Biology (Zoology Division) at Bahaudin Zakariya University, Multan. This study was prolonged for 60 days. Three feeds were prepared and fed to the 3 experimental fish groups. 15 fingerlings were analyzed for growth parameters and fish body composition. This study presented that fish growth can be increased by replacing commercial expensive feed by local easily available food sources. Non-significant ($p > 0.05$) value of feed conversion ratio was obtained and feed efficiency ratio was also documented as non-significant ($p > 0.05$). Highly significant ($p < 0.001$) value of protein efficiency ratio and specific growth rate was achieved. Different content values of water, dry weight, ash, organic matter, fat and protein were analysed.*

Keywords--- *Fish feed ingredients, Mortar and pestle, Digital balance, Mincing machine, Tanks, Tilapia (Oreochromis Mossambicus).*

I. INTRODUCTION

Tilapia is called as aquaculture chicken because of disease resistant, fast growth rate, lives in stressed condition of environment and best standard of flesh [1, 2]. Tilapia is a freshwater fish. It is a native species of Africa and also present in the regions of Middle East. It is demonstrated that *O. mossambicus* was introduced in Asia in the year of 1939 [3]. Tilapia including *O. mossambicus* is an omnivorous species [4]. In fish farming, feed cost ranges from 40 to 60 percent [5]. Globally, high price of fish feed has forced the scientists to introduce cheap sources of dietary items for fish [6, 7]. Globally, nutrient value of artificial prepared diet is researched [8]. Within shortage of time, tilapia get quick growth rate and higher mass by using artificially made diet [9]. As a choice, fat oriented items are currently using to replace fish oil with higher quantity [10]. Agar powder acts as binder during feed formulation. It helps in emulsification of fats as well as facilitates suspension. It has sugar molecule of galactose [9].

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PNM (peanut meal) is utilized in many regions of Africa as the replacement of fishmeal because its productivity is higher in these regions [11]. Now-a-days, China is using this cotton seed meal at the range of zero percent to twenty five percent in the feed of tilapia commercially [12]. Sweet potato leaf meal can be used in fish diet and it has contents of protein from 26 % to 33 %, different vitamins like vitamin A, vitamin B2 , vitamin C, vitamin E and also minerals [13, 14]. It is reported that DDG (distillers dried grain) is low cost than soybean meal [15]. Chicken waste meal is reported as the idealistic component of fish meal [16]. Blood meal is reported as inexpensive, with easier local availability, nutritive protein component and can be obtained from the waste products of animals in abattoirs [17]. Meat and bone meal has the calcium, protein and necessary amino acids, phosphorus and vitamin as supplemental content in fish diet and its quantity from 5% to 15% can replace partly or completely the fish meal [18]. Recently, milk powder of famous commercial company i.e. nestle has been used to prepare feed because it has twenty amino acids, minerals, A and D vitamins, 36% protein contents, 52% carbohydrates including 1.3 % calcium and lactose [19]. The utilization of feather meal in aqua life is less due to minimum digestion and presence of necessary amino acids is not satisfactory [20].

II. MATERIALS AND METHODS

Ingredients to make diet of fish i.e. *Oreochromis mossambicus* were purchased from local market e.g. wheat flour, Corn, Soybean, Barley, Broad beans, Oil, Vitamins, and Fishmeal. By digital balance, weight of all ingredients was measured in gram. Mortar and pestle was used to grind feed ingredients as making possible diet digestibility for fish (Figure 1).

Figure 1: Grinding of feed ingredients

In a bowl, all ingredients were mixed and water was added to make the dough. With the help of mincing machine, pellets were made (Figure 2). After pelleting, sun drying process was adopted to dry the fish feed by spreading on paper sheet (Figure 3).

Figure 2: Pellet formation

At the end, dried pellets were ground again in mortar and pestle and air tightly packed in plastic jars (Figure 1).

Figure 3: Sun drying process for pellets

Figure 4: Packing of pellets in jars

100 fingerlings *of Oreochromis mossambicus* were purchased from Bahawalpur hatchery. These fingerlings were brought to the fisheries laboratory of zoology division, Pure and Applied Biology Department, B.Z.U., Multan by keeping them alive in plastic polythene bag.

Figure 5: Control and experimental group.

Feeding trial was continued into two group i.e. experimental group and control group (Figure 5). In experimental group, fingerlings were added in three concrete tanks. Each tank contained 25 fingerlings and they were fed with three prepared diets including feed A, feed B, feed C. By hand, feed was given at 8.00 AM and 4.30 PM daily. 25 fingerlings of *Oreochromis mossambicus* were also placed in tank 4 as control group and control feed i.e. fishmeal was given two times per day at same period of experimental group. 15 samples of fish were obtained from tank 1, tank 2, tank 3, tank 4, and all were dried in oven at 90 degree celcius. After drying, samples were ground into powder form to carry out the chemical analysis i.e. water contents analysis, Dry weight analysis, Fat contents analysis, Protein contents analysis, Ash content analysis, carbohydrates analysis, organic contents analysis. With the help of Minitab, Software of MS office, excel 2007 and ANOVA (analysis of variance) data was evaluated in the form of graphs.

III. RESULT

Oreochromis mossambicus showed the value of weight as highly significant ($P < 0.001$). When feed A was given to the group A then candidates of this group obtained more weight as compared to other groups (Figure 6). Specific growth rate gave the calculation of highly significant difference as ($P < 0.001$) and control group obtained greater value of SGR than other three groups (Figure 7). Non- significant difference ($P > 0.05$) was shown by feed conversion ratio. Group C

shown value of FCR than group A, group B and control group (Figure 8). FER (Feed Efficiency Ratio) obtained non-significant difference ($P > 0.05$). Control group documented higher value of FER but group A and group B gave almost similar than group C (Figure 9). Significant difference ($P < 0.01$) was calculated by PE (Protein Efficiency). Control group sketched value of PE higher than all groups (Figure 10). ($P < 0.001$) that is highly significant difference value was obtained from PER. Almost similarity was present in the PER values of control group and group B than other two groups (Figure 11). Water contents gave the least significant difference value i.e. ($p < 0.05$). Water contents were greater in quantity represented by group A and C than control group and group B. Least significant difference value ($P < 0.05$) was shown by dry water contents (Figure 12). Control group contained more amount of dry weight content than all groups (Figure 13). Non-significant difference value ($p > 0.05$) was obtained by ash contents. Group B gave higher value of ash contents than other groups (Figure 14). $P < 0.05$ i.e. least significant value was obtained from organic contents. Control group contained higher value of organic contents than other groups (Figure 15). Fat contents obtained highly significant value i.e. $p < 0.001$ and group C elaborated higher value of fat contents than other groups (Figure 16). Protein contents gained highly significant ($p < 0.001$) difference value. Group A contained more protein contents than others (Figure 17).

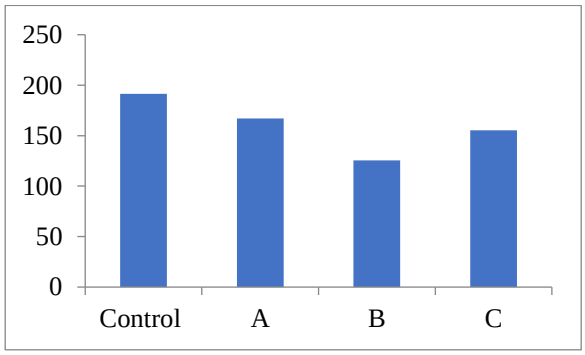

Figure 6: Comparison of weight gain

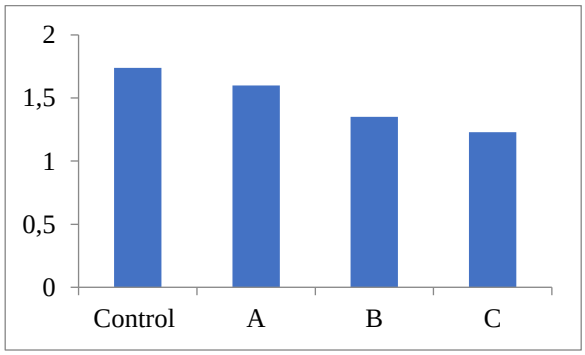

Figure 7: Comparison of specific growth rate

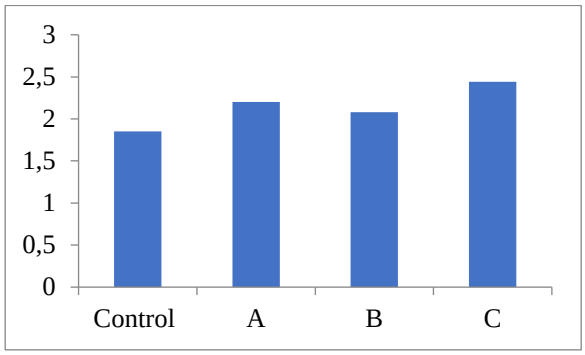

Figure 8: Comparison of feed conversion ratio

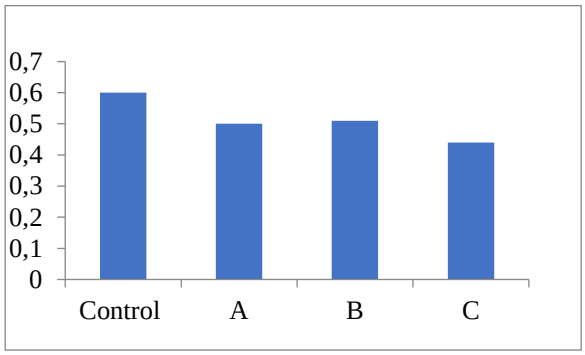

Figure 9: Comparison of feed efficiency ratio

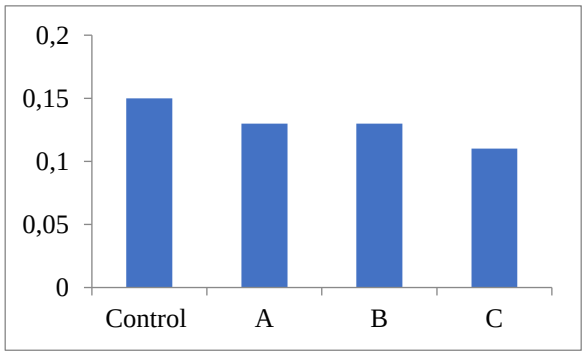

Figure 10: Comparison of protein efficiency

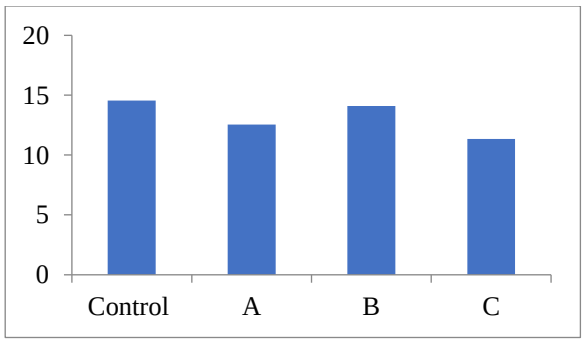

Figure11: Comparison of protein efficiency ratio

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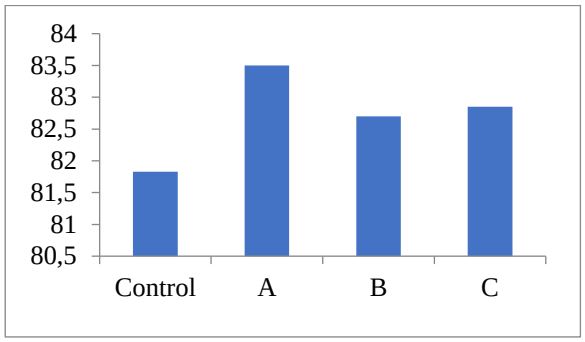

Figure 12: Comparison of % water contents

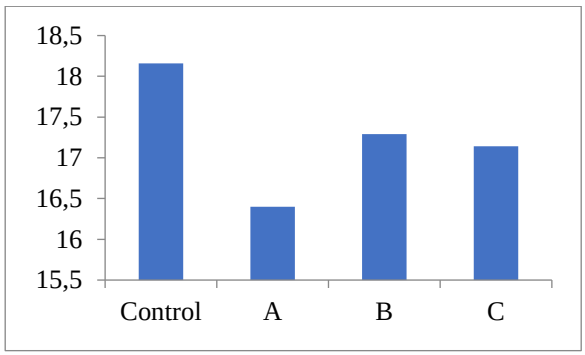

Figure 13: Comparison of % dry contents

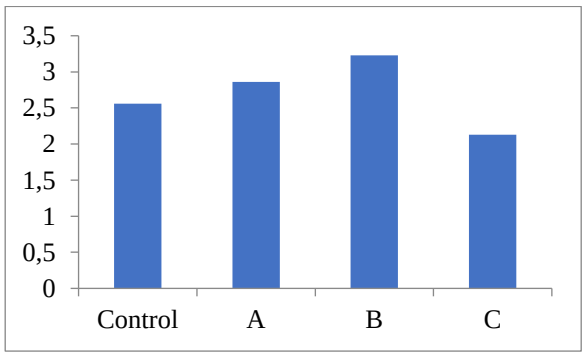

Figure 14: Comparison of % ash contents

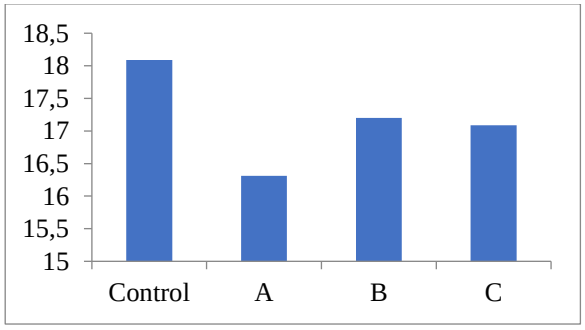

Figure 15: Comparison of % organic contents

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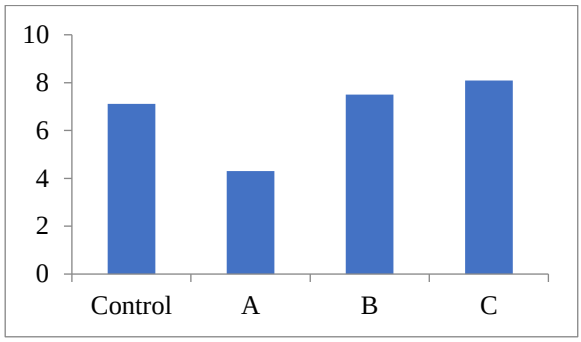

Figure 16: Comparison of % fat contents

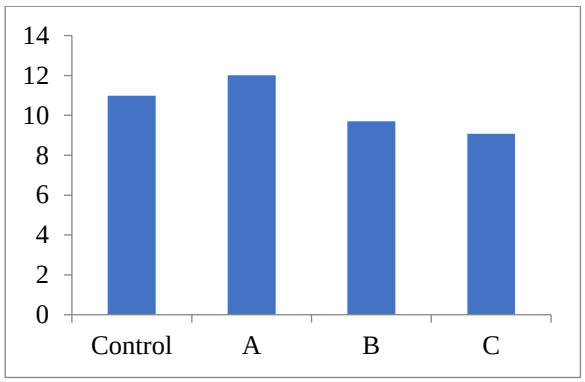

Figure 17: Comparison of % protein contents

IV. DISCUSSION

During experiment, fish candidates were fed with diet of local based ingredients i.e. wheat flour, ground corn, oil, vitamins, barley, broad beans, soybean. One group of fish specimens was also kept on feeding trial as control group by giving fishmeal as sole diet. 16 g corn was also used in the diet including soybean. Corn is considered as grain product due to the presence of limited tryptophan and lysine [21]. In present study, the group of fish that was fed with fishmeal showed the greater gained weight as compared to other groups. It is confirmed that tilapia increases its weight by giving only animal based diet [22]. When diet A (20g fishmeal and 15g soybean) and feed B (15g fishmeal and 20g soybean), feed C (10g fish meal and 25g soybean) was fed to each respective group i.e. A, B, C then group A showed 167.08 g weight which was higher than group B and group C. It means that greater quantity of soybean does not affect on the weight of fish. It agrees that need of essential amino acids cannot be accomplished by the soybean than fishmeal and due to this reason tilapia fish does not obtain higher growth [23]. The group A obtained more weight in the presence of more quantity of fishmeal as compared to others. It differs that inclusion of soya bean in fish diet can replace fishmeal and tilapia species can get higher growth rate [24]. Group C showed greater FCR than all other groups and this group contained more soya bean i.e. 30 gram as compared to other groups. Non significant value ($p > 0.05$) was obtained by FCR. It differs the researched work that FCR decreases by the use of great protein source [25]. This study does not follow the concept that higher the quantity of soybean in fish diet increases the SGR value [26]. Many nutritional sources must have appropriate dietary components e.g. carbohydrates, lipid, protein due to which fish shows effective growth. In the fish diet, 18 g wheat flour, barley 11.5 g and corn as 16 g to check the rate of growth in tilapia. Low quantity of protein integrates less growth of fish as compared to greater amount of protein [24]. During chemical analysis of dry matter, presence of fat components plays an important role to provide essential amino acids and helps

the utilization of fat-soluble vitamins [27]. It is reported that composition of body of fish can be evaluated by the analytical measurements of water, protein, lipid and ash contents [28]. In this experimental work, fish specimens of group A contained more percentage of water content than other groups and least significant ($p < 0.05$) value was obtained. Control group showed greater percentage of dry weight as compared to other groups and least significant ($p < 0.05$) amount was documented. Group B showed more value of dry matter in which feed contained more soya bean as compared to group C. It differs that greater amount of soybean decreases the weight of dry contents [29]. Specimens of group C obtained higher value of fat contents than all other specimens of group A, C and control group due to greater amount of soybean and fat contents were highly significant ($p < 0.001$) in the group C. It agrees that due to higher quantity of soya bean, lipid contents increase [30]. Comparatively, fish specimens of controlled group showed best gain of weight, SGR, FER, PE and PER than other groups due to the presence of 100% fishmeal because fishmeal is a rich source of protein. It is confirmed by this work that the need of protein in fish only completes by the fishmeal [31]. It agrees that plant based proteins are not rich content of nutrition as compared to fish meal and due to greater amount of plant oriented protein limits the feed utilization and rate of growth [32]. 18g wheat flour was mixed in diet of fish as binder and for energy purpose. It is similar to the result of one expert research that inclusion of wheat flour in the diet of fish provides energy as well as act as binding agent [33].

V. CONCLUSION

It is concluded that alternatives of commercial fish feed e.g. soybean, barley, broad beans; ground corn etc can be utilized in the diet of tilapia (Oreochromis *mossambicus*). These local dietary sources can replace cost and unavailability of fishmeal, but animal-based fish feed shows better result as compared to plant based diet.

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