5. SUMMARY

The present study was carried out at the Laboratory of Fish Nutrition Faculty of Agriculture at Moshtohor, Benha University. Two experiments were conducted in the present study. The aim of the first experiment is investigated the effect of incorporation of increasing levels of biogen in tilapia diets while the second experiment aimed to study the effect of replacing the soybean meal by sunflower meal to reduce feed costs of Nile tilapia (*Oreochromis niloticus*) .

The basal diets of the first experiment were formulated and biogen added. Diets of the first experiment were prepared to confirm the control diet of the second experiment and biogen was incorporated in five different doses, 0, 0.1, 0.2, 0.3 and 0.4% for the diets D1, D2, D3, D4 and D5, respectively.

Another five experimental diets were formulated for the second experiment. Soybean meal protein in the basal diets was replaced by sunflower meal protein at an increased levels 25, 50, 75 or 100%. Therefore, five experimental diets were prepared and tested in the second experiment in ten glass aquaria (two replicates for each treatment). The experimental period lasted after 90 days (for each experiment).

5.1. First experiment:

- At experiment termination (90 days) the highest average BW (13.11 g) was recorded for fish group 3 which fed on diet supplemented with 2 g of biogen/kg feed followed in descending order by those in groups 4 (12.49 g), 2 (11.58 g), 5

(10.39 g) and control group 1 (9.46 g). Analysis of variance indicated that final average BW of Nile tilapia significantly ($P<0.001$) affected by the biogen concentration in the experimental diets.

- At the end of the experimental period, the longest BL (8.90 cm) was recorded in group 3 which was fed on diet supplemented with 3 g of biogen/kg feed followed by those in group 3 (8.89 cm) which was fed on diet supplemented with 20 g of biogen/kg feed. The succession of decreasing length in other groups; 2 (8.57 cm) which was fed on diet supplemented with 1 g of biogen/ kg feed and group 5 (8.31 cm) diet supplemented with 4 g of biogen/ kg feed. The bottom length was related to group 1 (7.98 cm) which was fed on basal diet (control).
- After 90 days from the experimental start the highest K values were recorded by the fish in both group 1 and 3 which was fed on basal diet and 2 g of biogen/kg feed followed by those in group 2 (1.84), 5 (1.81) and group 4 (1.77), respectively. Analysis of variance indicated that K values at the start and the end of the experiment did not significantly affected by the incorporation of different biogen doses in the experimental diets.
- The highest average body weight gain (10.9 g) was recorded in group 3 which fed on diet supplemented enriched by 2 g of biogen/kg feed followed in a descending order by those in group 4 (10.23 g), 2(9.35 g), 5 (8.15 g) and control group 1(7.23 g) which was fed on basal diet. Analysis of variance indicating a significant ($P<0.001$) difference among the

different experimental fish groups fed the diets enriched by different concentrations of biogen.

- Average values of SGR found to be 1.6, 1.83, 1.98, 1.90 and 1.71% for fish groups fed the experimental diets contained 0, 1, 2, 3, 4 and 5 g biogen/kg diets, respectively. Analysis of variance showed that the differences in SGR values among the different experimental treatments were significant ($P<0.001$). The highest SGR value was recorded for T3 in which fish received the experimental diet supplemented with 2g biogen/kg diet.
- Feed intake during the entire period (90 days) found to be 28.15, 32.30, 26.33, 27.49 and 26.93 g for the diet enriched by, 0, 1, 2, 3, and 5 g biogen/kg diet, respectively and the differences between the obtained FI values were significant ($P<0.05$) .
- Averages feed conversion ratio (calculated as g of diet require for each g gain in weight) for fish fed diets contained 0, 1, 2, 3 and 4 g biogen/kg diet. Average FCR during the experimental period found to be 3.91, 3.46, 2.42, 2.71 and 3.30 with significant ($P<0.05$) differences ($P<0.01$) among these means.
- Protein efficiency ratio (PER) during the entire period (90 days) found to be 0.86, 0.97, 1.39, 1.24 and 1.01 g for the diet enriched by, 0, 1, 2, 3, and 5 g/kg diet, respectively and the differences between the obtained FI values were significant ($P<0.001$).
- Fish group fed control diet had the lowest dry matter content (DM) compared to the other groups. Crude protein content in whole fish body was significantly ($P<0.05$) decreased with the increasing

levels of biogen and the highest protein content was obtained in control (45.45%). The lowest EE content was obtained in the control fish group (34.29%). Ash content in the whole fish body was significantly increased with diets containing 0.2 and 0.4% biogen (15.05 and 13.90%, respectively) where the least one was observed in control group (10.14%).

5.2. Second experiment

- At the end of the experimented period, the highest average body weight (16.76 g) was recorded in group 1 which was fed on basal diet followed in a descending order by those fed the diet D3 (15.25 g), D2 (14.89 g), D4 (14.73 g) and D5 (12.62 g), respectively and the differences between these means were significant indicating the possibility of partial replacement of soybean meal by sunflower meal up to 75% without adverse effect on final body weight of Nile tilapia.
- At the experiment termination, complete replacement of soybean meal by sunflower meal released the lower BL while fish fed the basal diet gained the higher BL (10.12 cm) and the differences in BL between the different treatment were significant ($P<0.05$).
- At experimental termination, fish group fed the diet D5 showed the highest (2.17) K value and this value significantly different ($P<0.05$) from those recorded for the other fish groups fed the basal diet (1.72), D2(1.82), D3, (1.76), and D4 (1.74).
- Aerages of weight gain (WG) were found to be 10.64, 8.74, 9.20, 8.70 and 6.42 g for different experimental diets D1, D2, D3, D4 and D5, respectively and the differences in WG

between the different experimental treatments were significant ($P<0.05$).

- Average values of SGR found to be 1.12, 0.98, 1.03, 0.99 and 0.79 for the different experimental diets D1, D2, D3, D4 and D5, respectively. Analysis of variance showed that the differences in SGR values between the different experimental treatments were significant ($P<0.05$).
- The final feed conversion ratio (FCR) at the end of the experimental period were ranged from 2.44 for fish fed the basal diet (D1) to 4.05 for fish fed the diet D5(complete replacement of soybean meal) and the differences in FCR for the different treatment were significant.
- PER ranged from 0.80 (for D5 to 1.36% for the basal diet, D1). Analysis of variance indicated that PER for fish fed the basal diet significantly different ($P<0.01$) from those recorded for the other treatments. PER for fish group fed the basal diet released the highest PER and the increasing inclusion levels of sunflower meal in tilapia diets flowed by significantly decrease in the values of PER.
- Dry matter of whole fish lie in three groups the first group included fish fed the diet D2 and the second group included fish fed the diet D3 while the third one included fish groups fed the diets D1, D4 and D5. The differences between fish groups for DM content were significant ($P<0.05$). The complete substitution of soybean by sunflower meal showed the highest protein content of whole fish followed in a descending order by those fed the diets D1, D4, D3 and D2, and the differences were significant ($P<0.01$). Ether extract and ash content did not

significantly affected by the increased level of sunflower meal in tilapia diets.

- Increasing substitution level of soybean meal by sunflower meal at 25, 50, 75 and 100% decreased feed costs by 5.04, 10.08, 15.13 and 20.17, respectively. Compared to the control diet, feed costs decreased for all substitution levels of soybean meal by sunflower meal and the experimental diet D5 released the lowest feed costs while the control diet released the highest one. In conclusion, replacing 75% of soybean meal by sunflower meal reduced feeding costs by 15.13%.