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SUMMARY

FIRST EXPERIMENT

This study was carried out to evaluate the effect of a program of artificial feeding on physical, chemical and biological dynamics in fishponds received water from different sources of water supply in three sites in Egypt. Nine fishponds, each of them was 4000m^2 area, have been chosen in the three sites, three ponds in each site, these ponds have been cultured by 10000 monosex fingerlings *Oreochromis niloticus* from the same source of fry. They were obtained from ICLARM the World Fish Center in Abbassa. The diets were commercial contained 25% protein and obtained from the same factory through this experiment. The fish in all sites were fed by 3% of fish biomass in all the period of experiment

I-Physico-chemical, Biological, Bacteriological measurements:

Physico-chemical studies:

1-Significant differences were observed between water temperatures of the experimental three sites (Abbassa, FayumG and FayumQ) at July and October, except the non-significant differences between temperatures of Abbassa and FayumQ . Temperature values of water of the three sites showed non-significant differences at August and September.

2- Secchi disk readings differences were significant in water of the three sites at the four months. The lowest values were recorded in Abbassa water and ranged between 7.0 and 11.6 cm followed by Fayum Q water (10.67 – 17.33 cm) then the highest values were recorded in Fayum G water (15.30 - 22.00 cm).

3- The differences between pH values of water were significant in the three sites at July and non-significant at September and October. The over all means of pH values at the four months were 8.68, 8.243 and 7.89 in Abbassa, Fayum G and Fayum Q water, respectively.

4-The averages values of dissolved oxygen at the four months were 5.69, 6.035 and 6.143 in Abbassa, Fayum G and Fayum Q water, respectively.

5-There were significant differences between the values of water salinity and electric conductivity of the three sites at all months. Monthly variations did not induce any significant differences between the values of salinity and electric conductivity in water of any site. Fayum G water gave the maximum values followed by Fayum Q then Abbassa water.

6- there were significant differences between the values of total water hardness in Abbassa and either Fayum G or Fayum Q water, except at October. The over all means of values throughout the four investigated months were 185.08 ± 5.45, 576.65 ± 6.65 and 572.98 ± 14.03 in Abbassa, Fayum G and Fayum Q water, respectively.

7- Significant differences were observed between the values of water alkalinity in the three sites at July and August, and between values of water alkalinity of either Abbassa or Fayum G and Fayum Q water at September and October .The over all means of water alkalinity values at the four months were 435.08 ± 8.34, 467.15 ± 1.67 and 337.50 ± 8.92 in Abbassa, Fayum G and Fayum Q water, respectively.

8-There were non-significant differences between the amounts of available phosphorus in Abbassa water at the four months of investigation. Significant differences were recorded between the values of phosphorus in water of the three sites at August, while non-significant differences were recorded between the values of phosphorus in water of the three sites at October.

9- Non-significant differences were obtained between the values of water nitrate-N in all sites at August. Significant differences were recorded between the values of NO3-N in Abbassa and either Fayum G or FayumQ water at September. Meanwhile, Significant differences were recorded between the values of NO3-N in Fayum G and either Abbassa

or FayumQ water at October. The average values of NO3-N in water fishponds at the four months of investigation were 0. 411 ± 0.041, 0.773 ± 0.227 and 1.142± 0.176 in Abbassa, FayumQ and Fayum G water, respectively.

10- there was significant differences between the values of unionized ammonia-nitrogen (NH_3 – N) in Abbassa and either Fayum G or Fayum Q water at the four months. The same response was observed in the values of ionized ammonia – nitrogen (NH_4 –N) at July and October. On the other hand, significant differences were observed between the values of ionized ammonia – nitrogen (NH_4 –N) in the three sites at September.

11- Chlorophyll "a" concentrations in water of fishponds of the three sites showed non-significant differences at July and August, but significant differences were observed at September. Also, significant differences were observed between the values of FayumQ and either Abbassa or Fayum G water at October. The over all means of values obtained in water at the four months were 356.155 ± 12.872, 303.558 ± 8.821 and 253.287 ± 16.241 in Abbassa, Fayum G and FayumQ, respectively.

II- Biological studies:

Phytoplankton organism's numbers in water fishponds of the three sites were non-significantly different at September and October. Also, the recorded numbers of Abbassa and Fayum G showed significant differences at July and August. The averages of diversity of phytoplankton were different throughout the period of experiment. Cyanobacteria were represented by 34.75, 8.218 and 45.09%. Chlorophyta were represented by 35.59, 43.5 and 38.43% bacillariophyta were represented by 2.5, 33.7 and 9.9%, and euglinophyta were represented by 26.48, 14.55 and 6.67% in Abbassa, Fayum G and Fayum Q water, respectively.

Zooplanktons numbers were significantly different in water of the three sites at all months of investigation. The averages of diversity of copepods were 0.0, 19.35and 12.4 %, rotifers were 38.08, 78.7 and 78.1 % and cladocera were 61.9, 1.88 and 9.81 % in Abbassa, Fayum G and Fayum Q water, respectively.

The total viable counts of bacteria in water of fishponds of the three sites had significant differences at July, but the bacterial counts of Abbassa and Fayum G water showed significant differences at August. Bacterial counts of water of the sites had non-significant difference at September and October. The averages total bacterial counts at the four months were $74.24 \pm 1.721 \times 10^4$, $59.83 \pm 1.185 \times 10^4$ and $65.745 \pm 2 \times 10^4$ in Abbassa, Fayum G and Fayum Q respectively.

III- Fish production:

Growth of *Oreochromis niloticus* was positively increased by addition of commercial feed in water of all sites. There were significant differences between fish weights of the three sites .The averages fish weights were 439, 354.3 and 330.6 in Fayum G, Fayum Q and Abbassa water, respectively.

SECOND EXPERIMENT

I – Effect of formulated diets on growth parameters:

In this work, it was found that cyanobacteria were dominant, especially *Spirulina platensis*, in water fishponds of the three sites. Second experiment was carried out to study the possibility of partial replacement the fishmeal by *Spirulina platensis* in diets for juvenile tilapia (*O. niloticus*) .The diets contained 25% protein from fishmeal were supplemented by 10, 20 and 30% of *Spirulina platensis* and the substitution effect was compared with a control diet in which fishmeal was the lonely sole of protein (25% protein). The fish were fed by hand (10% of fish body weight). Four treatments were tested in five replicates

in twenty glass aquaria. These treatments were control (0.0) and treatments 1, 2 and 3 (10, 20 and 30 % of *Spirulina platensis* powder, respectively). After feeding for 12 weeks, the growth rate and protein utilization as well as different growth parameters of fish fed on the treated diets were determined. Protein efficiency ratio (PER) reached its highest value and feed conversion ratio (FCR) reached its lowest value in fish fed on diets containing 20% *S. platensis* (treatment 2). Survival of fish was increased at 10 and 20 % of *S. platensis* powder till maximum values (100 %) compared with control value, then it decreased again to a value equal to that of control (95 %) at 30 % *S. platensis* powder. Hepatosomatic indices (HIS) reached its highest and lowest values in fish fed on diets treatments 1 and 3, respectively. Condition factor values were decreased at the three treated diets compared with control.

2-A proximate composition analysis showed that fish fed on *S. platensis* powder had higher ash and lower fat values than those fed on control diets. Percentages of total moisture and crude protein were increased in fish fed on treated diets more than that fed on control diets.

II-Effect of feeding with formulated diets and infection with *Aeromonas hydrophila* on fish hematological and biochemical parameters:

1- Percentages of hematocrite (Hct) were increased in blood of non-infected fish fed on diets containing *S. platensis* powder compared with percentages of Hct of fish fed on control diets. Percentages of Hct were increased by fish infection with *A. hydrophila* in cases of fish fed on either control or treated diets compared with its respective control values.

2- Infection of *O. niloticus* by *A. hydrophila* induced non- significant increases in the values of serum glucose of fish fed on control diets compared with control values. Addition of *S. platensis* powder to the experimental diets induced non-significant differences and significant

decreases in the values of serum glucose in non-infected and infected fish; respectively, compared with its respective values.

3- The values of serum protein were increased in infected or non-infected fish fed on diets contained *S. platensis* compared with the respective control values.

4- Infection of fish by *A. hydrophila* induced a notable decreases in the values of total protein of muscles in fish fed on *S. platensis* supplemented or control diets compared with the values of the respective control of non-infected fish. In contrast, *S. platensis* powder caused clear increases in the values protein of muscles of either infected or non-infected fish compared with its respective control.

5- Infection of O. *niloticus* by *A. hydrophila* caused clear non-significant increases in the values of total lipids of muscles of fish fed on any diets compared with its respective control values. On the other hand, addition of *S. platensis* powder to the diets caused a clear decrease in total lipids values in fish fed on diets containing 10% of *S. platensis* powder, but the concentrations of 20 and 30 % of the algal powder caused a notable increases compared with the respective control.

6- Infection of O. *niloticus* by *A. hydrophila* caused a clear significant (at treatments 1 and 2) and non-significant (at control and treatment 3) increases in the values of total lipids in liver tissues of fish compared with its respective control values. Addition of *S. platensis* powder to the diets caused a clear decrease in the values of total lipids of liver in non-infected fish fed on diets containing 10% of *S. platensis* powder, but the concentrations of 20 and 30 % of the alga powder caused a notable increases compared with the respective control. In infected fish, *S. platensis* powder induced clear decreases in the values of total lipids of liver compared with the control value.

7-The amounts of serum aspartate transferase (AST) were non-significantly increased by increasing of *S. platensis* powder concentrations in the diets till a maximum significant increase in non-infected fish fed on treatment 2 diets (20 % algal powder) followed by a non-significant increase in non-infected fish fed on treatment 3 diets compared with the control values. The same response was obtained in case of infected fish, but significant increases were obtained. Meanwhile, infection of fish by *A. hydrophila* caused non-significant increases in the values of serum AST in fish fed on treated diets and significant increases in fish fed on control diets compared with the non-infected control fish.

8-The feeding of infected and non-infected *O. niloticus* on treated diets containing *S. platensis* caused significant increases in the amounts of serum alanine transferase (ALT) compared with the respective control. Infection of fish by *A. hydrophila* induced non-significant increases in serum ALT in fish fed on any experimental diets compared with its control values.

9- Infection of fish by *A. hydrophila* caused non-significant decreases in the amounts of liver ALT of fish fed on all diets, except the significant decreases obtained in fish fed on treatment 1 diets compared with the respective control. Treated diets (containing *S. platensis)* enhanced a remarkable decreases at treatment 1 and increases at treatments 2 and 3 in liver ALT of either infected or non-infected fish compared with the respective control values.

10- Infection of fish by *A. hydrophila* induced a clear significant decrease, non-significant increase, significant decrease and non-significant increase in the amounts of liver AST in fish fed on control, treatment 1, 2 and 3; respectively, compared with the respective control.

induced significant increases in liver AST values of fish fed on treated diets compared with control diets.

11- Addition of *S. platensis* powder to diets caused gradual significant decreases in the values of serum uric acid in infected fish compared with the control value, but in non-infected fish, the decreases were non-significant, significant and significant at 10, 20 and 30% of *S. platensis* powder; respectively, compared with the control value. On the other hand, infection of fish induced significant increases in the values of serum uric acid, except at control diets (non-significant increase) and treatment 3 diets (significant decrease) compared with the values of non-infected fish.

12-In general, significant increases were recorded in the values of serum creatinine in infected fish fed on control and treatment 3 diets compared with the non-infected respective values, but the other diets treatments showed non-significant increase. Also, addition of *S. platensis* powder to diets induced a notable increases in the values of serum creatinine in both infected (non- significant) and non-infected (significant) fish fed on treatment 1 diets compared with control value. However, non- significant increase and non-significant decrease were recorded in the values of serum creatinine in non-infected fish fed on diets of treatments 2 and 3; respectively, compared with the non-infected control value. In infected fish fed on diets of treatments 2 and 3, significant decreases were obtained, compared with the value of infected control.

CONCLUSION AND RECOMMENDATIONS

1-The different sources of water (fresh water and brackish water up to 15-mg/l salinity) can be used for culture of *Tilapia nilotica.*

2- Water drainage agriculture channels of adequate physico-chemical, biological and bacteriological characters are suitable for optimum growth of fish and plankton.

3-The water fishponds contain many non-toxic species of cyanobacteria that are useful and may be used to replace fishmeal in commercial cultures

4- *Spirulina platensis* can be used to replace fishmeal protein up to 30% replacement.

5-*Spirulina platensis* can improve the quality of fish (carcass quality).

6 - *Spirulina platensis* can enhance the immunity of fish for resistance of the pathogenic bacteria as *Aeromonas hydrophila.*

7-The study of physico-chemical characters for water fishponds is useful to know the characters for fish health and fish production.

8- Hematological and biochemical parameters are important to know health of fish.

9-Fishponds resemble a very complicated ecosystems and they must be investigated to increase its productivity.

10- The biomass of both phytoplankton and zooplankton play an important role in fish production.

11- Artificial feeds can be used for fish production (3% offish weight) and without any adverse effect on physico-chemical characters of water.