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COMPARATIVE STUDY ON FISH FARMING IN EGYPT

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Abstract

The present paper aims to study the status of fish pond farming in Egypt. Four different fish farms around Alexandria with different sizes (4.2, 21, 16.38, and 617.39 hectares, respectively) and water sources (fresh and brackish) were selected to collect the information of the present investigations. The results showed the following:

1. Water quality criteria showed that temperature ranged between 14.6 °C to 29.3 °C, pH 7.6—8.9, dissolved oxygen 3.5—10.5 mg/l, and salinity 17.8—37.6 mg/l. The concentration of dissolved oxygen was related with seasonality. In the integrated fish farms with ducks, water quality was greatly affected with time of rearing ducks on the pond.
2. Growth performance of silver carp was higher than common carp or tilapia hybrid.
3. Biochemical and chemical analysis of the fish muscles showed that tilapia spp. and *Latus niloticus* contain higher protein amount, while the lower protein was found in common carp *(Cyprinus carpio L.)* flesh of different fish species grew in ponds.

Key words: Fish farming, Egypt, environment influence, carp and tilapia hybrid.
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Introduction

Fish plays an important role in providing food and employment. It can compensate for the shortage of animal protein speially during childhood. In Egypt the practice of fish farming is very old, a base relief found on an ancient Egyptian tomb shows tilapia being harvested of an artificial pond, presumably a drainable one. This base relief is an evidence that fish farming was already practised in Egypt about 2.500 B. C. The Egyptian fisheries can be grouped into three broad groups including marine, lake and inland fisheries, with a water area of about 2.5 million hectare (FAO, 1985). However, the annual rate of fish consumption per capita (4 kg) in Egypt is comparatively low when compared with that of Japan (36 kg), Ceylon (20.3 kg) and Kuwait (18.4 kg) (FAO, 1981). The annual catch of fish production is about 150 thousand tons and the amount of imported fish to Egypt reached 100 thousand tons (FAO, 1985). A great attention is now being given to fish farming for raising fish under controlled conditions and for development of the inland fishery resources in Egypt. The selected fish species for cultivation should have a rapid growth rate, successfully reproduce accept natural and cheap artificial food, proved satisfactory to be consumer, support high population density and be resistant to disease. So the scientific management aims to produce a low- coast fish by utilization of natural food specially organic and inorganic fertilizers in fish ponds (Woynarovich et al., 1963; Woynarovich, 1988; Rady, 1992) obtained an increase in growth rate of fish 1 kg/9—13 kg fertilizer.

The aim of the present work is to asses the following points:

1. The effect of integrated duck-fish farming with ducks on water quality.
2. Growth of some culture fish species in ponds.
3. Chemical composition of fish flesh.

Material and Methods

The data of this work were based on the registered records and field observations experimental information from four fish pond farms in Alexandria governorate.

The selected fish pond farms were:

1. Experimental fish farm of Alexandria University in Abis, Alexandria (Alex.).
2. Fish farm Alexandria governorate in Al-Nozha, hydrodrome drain, Alex. (Farm 400).
3. Fish farm El-Nozha, hydrodrome Lake Alex.
4. Alexandria Governorate fish farm in Maruit (306).

The total area of the four fish farms was 4.2, 21, 617.39 and 16.38 hectares, respectively, with a pond area in average of 0.42, 7.35, 839.98 and 5.04 hectares, respectively. The average depth of water in the ponds were 1.0, 3.5, 2.0 and 1.25 meter in respectively. Fresh water (salinity 250 ppm) is used in supplying feeding of 1st and and 3rd farm, however, farms 2nd and 4th were from brackish water source (salinity 3000 ppm). Water quality data were obtained from the last three farms. In the

Table 1. Growth performance of some cultivator fish species ponds

Item	Tilapia hybrid	Common carp	Silver carp
Initial length (cm)	3.0	7.8	3.0
Initial weight (g)	3.4	6.8	1.5
Final length (cm)	16.9±0.9	24.5±1.62	22.5±1.8
Final weight (g)	166.0±28.96	484.0±151.6	315.1±79.4
Experimental period days	329	329	329
Gain (g)	162.6	478.0	313.6
Average daily gain (g/day)	0.49	1.45	0.95
Specific growth rate (SGR %)	1.17	1.30	1.61
Condition factor	3.4	3.3	2.8

The values are expressed as means of ten animals.

2nd and 4th farms ducks were directly reared on the water surface with different times of production. Growth performance of some selected fish species were followed in the 4th farm in the period between 1989 and July 1990. About 1500 fingerlings of tilapia hybrid (Oreochromis niloticus×*O. aureus),* common carp *(Hypophthalmichthy molitrix)* were rared in the cages 6 m^2 cages (2 m×3 m) with 1 m depth at rate of 10 fish/m^3.

Samples of then fishes were obtained at different times in order to observe the body weight changes.

Fish were collected for chemical analysis from two ponds of experimental fish farm, Faculty of Agriculture, Alexandria University during the harvesting period (October, November, 1990). The fish samples were homogenized, by using and electrical homogenizer (20 to 30 fishes of the same species monthly). For studying the water quality (dissolved oxygen, pH, water temperature, ammonia and nitrate) of experimental ponds monthly at 7.00 a.m., Dissolved oxygen was recorded according to the Winkler's method, nitrate and ammonia described by GOLTERMANN et al., 1978. pH was measured in situ using an Orion Research (USA) digital pH meter against standard solutions. Chemical analysis of fish flesh was carried out according to the methods described by NAUMAN et al., (1976).

Results and Discussion

The data in Table 1 showed the growht performance of three cultivated fish species, tilapia hybrid (*Oreochromis niloticus*+*O. aureus)* common carp *(Cyprinus carpio* L.) and silver carp *(Hypophthalamichthys molitrix)* through the experimental period of 329 days. The initial weight of fish were 3.4, 6.8 and 1.5 g for the tested speices, respectively. The final weight was 166, 484 and 315 with an average daily gain of 0.49, 1.45 and 0.96 g/day. The specific growth rate (SRG %) of the cultivated fish species were 1.17, 1.30 and 1.61%, respectively. From the obtained results it could be concluded that common carp and silver carp grew faster than tilapia hybrid. The overall average of gain for the three tested species was around 1.0 g/fish/day through the experimental period (about 11 months). Growth performance of silver carp was higher than other tested species this could be explained on the basis of its higher turnover of energy in substance and low excretion rate (VIOLA et al., 1983). The highest value of well-being factor was recorded in tilapia followed by common carp and the lowest was silver carp. It was concluded that increase of plant protein and indigestible polysacharid in the diet of tilapia and carp resulted in non improvement of its growth performance (VIOLA et al., 1977). On the other hand, it was found that increased animal protein in the diet resulted in an increase of the body weight of fish, length and well-being factor (EL-DAHAR, 1988).

The chemical composition (%) of fish (Table 2) showed that *Tilapia niloticus* spp. contain more protein, (BARLATIN et al., 1979), as well as in common carp have more fat and bighead carp have more minerals (ash). Energy content (Kj/g) was higher in common carp as bighead carp, however, other tested species were similar energy content.

To compare the chemical composition (%) of the edible parts of fresh water fishes they contained more crude protein, fat and energy than in marine water.

Table 2. Chemical composition (%) of flesh from pond culture as compared with marine fish

Fish species	% on DM basis				
	DM %	Ash	Crude protein	Ether extract	Energy content Kj/g
1-Fresh water fishes					
A-*Tilapia* spp.					
O. nilotica	22.25	4.98	80.59	14.43	20.97
O. galilia	23.58	5.28	83.13	11.59	20.36
O. aurea	25.79	5.32	81.00	13.68	20.76
T. zillii	24.13	5.88	80.79	13.36	20.59
B-Common carp					
Cyprinus carpio	32.24	5.39	72.26	28.35	24.82
C-Chinese carp					
Chenophrynoodon indellus	23.61	7.71	79.17	13.12	20.19
Hypophthalmichthys molitrix	17.09	7.35	78.50	14.15	20.46
Aristichthys nobilis	16.00	6.80	71.10	21.50	22.02
D-*Mugil capito*	3.13	6.85	76.81	16.94	20.01
E-*Clarias lazera*	26.02	8.17	75.64	16.19	20.72
F-*Latus niloticus*	16.39	5.55	83.30	11.15	20.21
G-*Labeo niloticus*	22.58	6.08	78.63	15.29	20.93
Mean of fresh Water fish	21.98 ±3.5	6.29 ±1.07	78.45 ±3.79	15.76 ±4.79	21.00 ±1.31
2-Mean of marine water* Water fish +	26.72 ±1.2	22.13 ±6.38	68.99 ±6.38	9.74 ±2.20	17.17

* Adapted from WASSEF (1985c). The result represents the average of sic pelagic species by pusse-seine, namely: *Sardinella aurita (*Silt-ardine), *Sardina Pilchardus* (pilchard), *Boops boops* (Bugue), *Irachurus mediterranues* (Horse-mackerel), *Scomber Japonicus* (Blue maykerelior scomber) and *Engraulis encresicholus* (Anchovy).

This clearly shows the higher potentially of freshwater fish as a source of nutrients. (see Table 2)

Results in Table (3.) show some water quality criteria in different seasons for water outlet obtained from the 2nd fish farm. There were a great variation in

Table 3. Physical and chemical properties of water in fsh ponds

Item	Summer	Autumn	Winter	Spring	Mean±SE
Temp. °C	29.30	23.00	14.60	20.7	21.90±6.10
pH	8.70	8.90	8.90	9.1	8.90±0.20
O_2 (mg/l)	3.70	10.50	6.20	5.2	7.20±2.80
NH_3 (mg/l)	0.45	0.24	0.19	0.21	0.27±0.10
NO_3 (mg/l)	0.04	0.07	0.05	0.04	0.05±0.01

water temperature between summer and winter. BARLATIN et al., (1979) reported that tilapia is largely restricted to regions within the 20 °C winter isotherms. Outside of this range it is necessary to heated ponds. In Japan, MARUYAMA (1958) obtained 94.6% survival of *Sarotherodon niloticus* at a low temperature. These fish were then able to survive below 14 °–16 °C. It was noted that *S. mossambicus* failed to introduce in Egypt because the fish became inactive at low temperature. Growth stops and fish die if handled at temperature below 15 °C, and against meeting ponds during the winter months. Temperature not only affects the survival and distribution of species, but also on the fish growth rate and reproduction as well as susceptibility to diseases. BISHAI (1975) showed that a range of 17.2 °C to 19.6 °C below which tilapia decrease in growth rate. Temperature differences between spring and winter reached about 15 °C. however, variations in pH values and dissolved oxygen were not too much between the different seasons. Ammonia concentration increased during summer followed by autumn and decreased in spring, however, nitrate concentration increased in autumn followed by winter and decreased in summer and spring. The average pH value in the water pond was 8.9±0.2, however, HUET (1972) recommends a pH 7–8 as a best for fish cultivation, and the maximal acceptable pH level varies with species.

Data in Table (4.) showed that the dissolved oxygen concentration decreased from 5.4 to 3.5 in the long term duck production. This probably caused by continuous consumption of dissolved oxygen through organic matter oxidation as well as increased amount of plankton die-offs (SWINGLE, 1969) and also may be due to accumulation of toxic intermediate components formed and transportation of organic matter has become limiting factor in the process of intensivve fish production in the pond causes the cessation of fish growth (SHILO et al., 1982). The results showed that pH values increased, this was an indication of increasing

Table 4. Effect of long term duck production on water quality of ponds

Water quality criteria	Pond No.			Average±SD
	1	2	3	
A- Without ducks				
Dissolved oxygen	5.40±0.50	5.10±1.40	5.70±1.40	5.40±0.30
pH	7.30±2.00	7.80±0.70	7.20±0.70	7.40±0.26
NH_3 mg/l	0.35±0.01	0.42±0.02	0.27±0.03	0.35±0.06
NO_3 mg/l	0.06±0.02	0.08±0.03	0.04±0.02	0.06±0.02
B- With ducks				
Dissolved oxygen	3.30±1.20	3.80±1.60	3.40±1.50	3.50±0.19
pH	9.30±0.60	8.60±0.60	8.40±0.40	8.80±0.38
NH_3 mg/l	0.60±0.02	0.64±0.03	0.70±0.02	0.65±0.04
NO_3 mg/l	0.37±0.04	0.18±0.05	0.21±0.02	0.25±0.08

1,2,3: The number of ponds had 433, 434 and 471 duck/4200 meter for 217 days.

ammonia concentration in duck manure its levels reaching 0.7 mg/l in both integrated and fish ponds. However the unionized form of ammonia which is the most toxic form to fish constituted no more than 3% in the fish ponds without duck, while it reached 32% in the fish ponds with duck whereas it found that the toxic level of ammonia lies between 0.6–2 mg/l (EIFAC, 1973) for short time exposure. Nitrate content at the integrated ponds is highly variable ranging between 0.18–0.37 mg/l with an average 0.25 mg/l while another ponds contain very little amount of nitrate ranged between 0.04–0.08 mg/l. Ponds must be fertilized regularly in order to maintain rich plankton flora and fauna therefore all of the animal branches could be integrated efficiently with fish production by utilizing the manure for increasing fish production. The most advantageous, however is to integrate duck production with fish farming. Ducks may be raised in the fish ponds themselves, their manure need not be collected, transported and distributed, but it is dropping directly into the water of the fish ponds.

It could be concluded that the effect of long-term duck production on fish pond resulted in decreasing oxygen content and higher pH value, therefore, good and careful management should be followed, in order to know the suitable periods and numbers of ducks should be put on a certain area in order to keep the water quality in good conditions in order to incrase fish production.

From the observations described it could be concluded that:

1. Growth of cultivated fish species in pond is promising.
2. Integrated fish production with duck need more research because the effect of long-term production of ducks on fish ponds are great influence.
3. *Tilapia* spp and *Latus niloticus* contain higher protein content in its flesh than other tested species, respectively.

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