Vet.Med.J.,Giza. Vol.52, No.3. (2004) :437-444.

EFFECT OF THE CHEMICAL PROPERTIES AND SOME POLLUTANTS IN FISH FARMS ON NURSING AND SURVIVAL PERFORMANCE OF LIZA RAMADA FRY

A. A. ABDEL-TAWAB.
National Institute of Oceanography and Fisheries, Cairo

Received: 31.5.2004.
Accepted: 5.7.2004.

SUMMARY

Nursing and survival performance of fry mullet fish (*Liza ramada*) with initial size of 1.76 cm and 0.21 gm were studied under different chemical properties and some pollutant compounds (insecticides) during a period of 90 days. The chemical analysis and insecticide compounds were measured in ponds water and fish body of each farm and had different values.

It was noticed that, the total weight gain, survival rate and specific growth rate of experimental fish reached their highest values (14.40 gm, 75% and 4.73 respectively) in the second fish farm where the water quality had its suitable values and the pollutant level was the lowest. Furthermore, the food conversion ratio and protein efficiency ratio had their optimum values (1.50 and 4.29) in the same fish farm. While, the condition factor had its maximum value (1.70) in the third fish farm and its minimum value (1.10) in the second one.

INTRODUCTION

Insecticides are recognized as serious pollutants to aquatic environment with deleterious effects on many of its biota and water quality (Aboul-Ela and Khalil, 1987). Kandil (1987) studied the effect of different environmental pollutants on physiological and biochemical properties of grass carp (*Ctenopharyngodon idella*) and noticed that by increasing of pollutant levels, the hematological parameters and enzymatic activities decreased. The influences of water quality on survival rate and physiological characters of fish species has been detected by Mazik et al. (1991) who mentioned that at optimum water quality, the survival rate of reared fish was increased. On the

other hand, Siddiqui et al. (1991) found that the rate of water exchange in fish ponds was highly affective on growth, feed utilization of fish species and water quality of ponds. Eid et al. (1991) mentioned that adequate levels of temperature and dissolved oxygen are essential for maintaining optimal fish growth and decreased mortality rate. Furthermore, Abd El-Tawab (1994) cited that, *Liza ramada* showed no mortality and best growth rate at pH values ranged between 7.6 to 8.0 and temperature from 26.4 to 26.6°C. Mourad et al. (1999) cleared the levels of bioaccumolation of some insecticides and their effects on physiological response of *Tilapia zillii* and added that, the hemoglobin concentration and other biochemical parameters were decreased by increasing of insecticide level and time of exposure.

This present work was conducted to show the effects of the chemical properties and some pollutant compounds on nursing and survival rate of *Liza ramada* in Egyptian fish farms.

MATERIALS AND METHODS

The experimental work was conducted in three fish farms (earthen ponds) at El-Fayoum Governorate (area $^1/_2$ feddan for each). The fish farms situate at different distances of Lake Quarun (Salinity is 41 ppt), the first farm at 5 kilometers of the lake (low salinity), the second farm at 2 kilometers (middle salinity) and the third farm about 500 meters of the lake (high salinity). In these ponds the water was maintained at 1.8 meters for depth and water column was drained at a rate of 1/24. The test fish was *Liza ramada* fry with an initial size of 1.76 cm total length and 0.21 gm for total weight, stocked at a rate of 20 fish /m^2 (42 000 fry /pond).

The feed used was a pellets of artificial diets contain 35 % crude protein and formation of 100 gm diet contain 25 gm fish meal represent 15% protein, 14 gm wheat bran give 1.7% protein, 13 gm rice bran give 2.2% protein, 31 gm soybean give 14.8% protein, 15 gm yellow corn give 1.3% protein, 2.5 gm oil without protein and 0.5 gm vitamins. The artificial food was added to the ponds six days every week, two times per day (9 am and 2 pm) with 3 % of average fish weight.

The water samples were collected biweekly from different examined ponds for a period of 90 days (from first March to end of May, 2003), water temperature was measured daily using simple thermometer at 9am and 2pm. Dissolved oxygen, salinity, pH value, silicate, orthophosphate, carbonate, bicarbonate, magnesium and calcium were determined according to the methods described by Arnold et al. (1980) in American public Health Association (APHA).

The residues of chlorinated and organophosphorous insecticides were measured in ponds water and fish (fry and fingerlings) according to method of multiresidue analysis (Shaaban, 1982) using

gas chromatography provided with FID and ECA. These analysis were carried out in Environmental Poison Research Unit, Ain-Shams University, Faculty of Agriculture.

The body weight (gm) and total length (cm) of *Liza ramada* were measured biweekly from each pond. The daily weight gain (DWG), survival rate (SR), specific growth rate (SGR) and condition factor (CF) were determined according to the following equations;

- DWG = Final weight-Initial weight / Period (days).
- SR = (Total fish number - Number lossed) x 100/ Total number.
- SGR = (ln Final weight - ln Initial Weight) x 100 / Period.
- CF = Total body weight x 100 / (Total length)^3.

The total food given (TFG), feed conversion ratio (FCR) and protein efficiency ratio (PER) were calculated by these formulae;

- TFG = Total weight x Number of fish x 3/ 100.
- FCR = Weight gain x Number of fish / Food given.
- PER = Weight gain x Number of fish/ Protein intake.

RESULTS AND DISCUSSION

As shown in Table (1), the chemical properties of ponds water cleared that the second pond is highly suitable to nursing the fry of *Liza ramada*, where water temperature ranged from 23.6 to 23.8°C, dissolved oxygen is 4.95 mg/L, salinity 3.75 ppt, pH value 8.3 and other compounds had its optimum values. Table (2) also cleared that, 2nd pond has lowest limit for insecticides in water or in fish body, due to its faraway of the agriculture lands which are the principle source of pesticide to these fish farms. This leads to increase in growth rate of experimental fish as summarized in table (3). This may be attributed to these optimum values of chemical analysis of ponds water and lowest values of pollutants stimulate the productivity of plankton organisms (phytoplankton and zooplankton) in the water which improve the environmental conditions of fish ponds, consequently increasing of growth performance of fish. In addition, table (2) showed also that the pesticides present in fish body not in water and soil, this mean that the reared fish was transported from pollutant localities. While its presentation in water and soil not in fish means that its level in fish is not detected (N.D) or below pollutant limit (0.001 mg/L) and thus not registed in the table. These results agree with that postulated by Ibrahim (1987) who mentioned that, the insecticide compounds has deleterious effect on the productivity of aquatic area. Aboul-Ela and Khalil (1987) reported that, the increasing of insecticides in water of fish farm caused decreasing of zooplankton organisms (*Daphnia sp, Cyclops sp and Gammarus sp*). Shephred and Bromage (1992) found that, water temperature,

Table (1): Some chemical parameters of water in three fish farms at El-Fayoum during a period from 1st March to end of May, 2003.

Parameters	1st Fish Farm		2nd Fish Farm		3rd Fish Farm	
	Range	M ± SE	Range	M ± SE	Range	M ± SE
Water temperature (°C)	18.1-19.1	18.6 ± 0.5	23.6-23.8	23.7 ± 0.1	22.4-22.6	22.5 ± 0.1
Dissolved oxygen (mg/L)	3.0-4.6	3.75 ± 0.35	4.9-5.0	4.95 ± 0.05	4.0-4.5	4.25 ± 0.25
Salinity (ppt)	1.7-1.8	1.75 ± 0.05	3.50-4.0	3.75 ± 0.25	11.7-11.9	11.8 ± 0.10
PH value	8.9-9.2	8.65 ± 0.15	8.0-8.6	8.3 ± 0.3	8.8-8.9	8.85 ± 0.05
Silicate (mg/L)	19.3-20.0	19.65 ± 0.35	20.2-220	21.00 ± 0.91	20.0-21.2	20.6 ± 0.61
Orthophosphate (mg/L)	214.0-215.0	214.5 ± 0.51	216.0-216.6	216.3 ± 0.30	215.0-216.0	215.5 ± 0.51
Total phosphate (mg/L)	720.0-730.0	725.0 ± 5.05	755.0-762.0	758.5 ± 3.54	742.0-751.0	746.5 ± 4.55
Carbonate (mg/L)	4.0-4.9	4.45 ± 0.45	4.5-5.9	5.2 ± 0.71	4.0-5.2	4.6 ± 0.61
Biocarbonate (mg/L)	441.0-448.0	444.5 ± 3.54	450.0-461.0	455.5 ± 5.56	446.0-453.0	449.5 ± 3.54
Magnesium (mg/L)	481.0-494.0	487.5 ± 6.57	460.0-473.0	466.5 ± 6.56	450.0-460.0	455.0 ± 5.05
Calcium (mg/L)	249.0-254.0	251.5 ± 2.53	245.0-262.0	253.5 ± 8.58	246.0-248.0	247.0 ± 1.01

* M = Mean

* SE = Standard error

Table (2): Insecticides residues (mg/L) in water and *Liza ramada* (fry and fingerlings) in three fish farms at El-Fayoum during a period from 1st March to end of May, 2003.

Items	Water and soil			Fish (*Liza ramada*)					
				Fry			Fingerlings		
	I	II	III	I	II	III	I	II	III
Phosphorous compounds:									
Benefin	N.D.	N.D.	N.D.	0.06	N.D.	0.13	0.09	N,D.	0.12
Sumithion	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Parathion	0.330	N.D.	N.D.	0.410	0.020	0.820	N.D.	N.D.	0.080
Selicron	N.D.	N.D.	N.D.	0.201	N.D.	0.231	N.D.	0.003	N.D.
Reldan	0.920	0.04	1.010	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Chlorinated compounds:									
Alpha-HCH	N.D.	N.D.	N.D.	0.410	0.009	0.650	1.200	0.070	1.690
Beta-HCH	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Delta-HCH	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Aldrin	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Heptachlor	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Endrin	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
DDT	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

N.D. = Not detected or the residues were existed in amounts below the limit of detection of the analysed insecticide (0.001 mg/L).

Table (3): Growth rate, survival performance and condition factor of *Liza ramada* nursed in three fish farms at El-Fayoum during a period from 1st March to end of May, 2003.

Items	1st Fish Farm		2nd Fish Farm		3rd Fish Farm	
	Range	M ± SE	Range	M ± SE	Range	M ± SE
Initial weight /fish (gm)	0.10-0.30	0.20 ± 0.10	0.10-0.30	0.21 ± 0.10	0.15-0.25	0.20 ± 0.05
Final weight /fish (gm)	11.20-13.60	12.40 ± 1.20	14.50-15.50	14.86 ± 0.50	11.50-13.60	12.55 ± 1.05
Gain in weight /fish (gm)	11.10-13.30	12.20 ± 1.10	14.40-15.20	14.65 ± 0.50	11.35-13.35	12.35 ± 1.00
Daily gain in weight /fish (gm)	0.12-0.15	0.14 ± 0.02	0.16-0.17	0.16 ± 0.01	0.13-0.15	0.14 ± 0.01
Initial length /fish (cm)	1.00-2.80	1.70 ± 0.90	1.50-1.90	1.76 ± 0.20	1.50-1.90	1.67 ± 0.20
Final length /fish (cm)	9.00-9.90	9.09 ± 0.45	10.00-10.20	10.85 ± 0.10	9.00-9.30	9.01 ± 0.15
Gain in length /fish (cm)	7.00-8.10	7.39 ± 0.55	8.50-10.00	9.09 ± 0.75	8.50-10.00	8.66 ± 0.75
Number of fish/ pond	-	25000	-	25000	-	25000
Number of fish survived	-	16250	-	18750	-	17500
Survival rate (%)	-	65	-	75	-	70
Total food given (kg)	-	152.812	-	185.088	-	170.287
Protein efficiency ratio	-	3.71	-	4.29	-	3.63
Food conversion ratio	-	1.30	-	1.50	-	1.27
Specific growth rate	-	4.59	-	4.73	-	4.60
Condition factor	-	1.6	-	1.10	-	1.70

dissolved oxygen, ammonia and pH will vary considerably over fish life cycle. Abd El-Rahman (1997) found that, the pH values ranged from 8.0-8.5 were suitable for rearing of tilapia species in earthen ponds at El-Fayoum fish farms.

On the other hand, table (3) showed also that, the total weight gain of *Liza ramada* reached its highest value (14.65 gm) in 2nd pond after a period of 90 days. The maximum survival rate (75%) of nursing fish was obtained also from the same pond. Similarly, the specific growth rate, feed conversion ratio and protein efficiency ratio had its highest values (4.73, 1.50 and 4.29) in second pond, while condition factor decreased to 1.10 in this pond. The same trends were also detected by Eid et al. (1991) whose mentioned that by increasing of water temperature from 16 to 27 °C in fish ponds, the growth rate and protein efficiency ratio increased, while mortality rate decreased. Nawaduke (1995) showed also that, when water salinity increased to 23.25 ppt, water temperature to 29°C, pH value to 6.90 and dissolved oxygen to 4.63 mg/L, the weight gain and survival rate of cultured fish reached to its maximum values.

Furthermore, Mourad et al. (1999) studied the effects of some insecticides on biological aspects of *Tilapia zillii* and noticed that, the heamatological parameters and liver metabolites were decreased by increasing of these pollutant compounds in fish ponds. Sweilum (2000) reported that, the specific growth rate and survival performance of Nile tilapia were decreased with increasing of pollutant compounds in fish ponds, while the condition factor increased.

REFERENCES

Abd El-Rahman, A.A. (1997): Nutritional studies on Nile tilapia (*O. niloticus*). Reared in earthen ponds. Dep. of Animal Prod., Fact of Agri., Cairo Univ. (El-Fayoum Branch).

Abd El-Tawab, A.A. (1994): Some studies on some mineral elements on productive performance of Mugilidae family reared in Egyptian fish farms. M.Sc. Thesis, Dep. of Animal Prod. Fact of Agri., El-Azhar Univ.

Aboul-Ela, I.A. and Khalil, M.T. (1987): The chronic toxicity of three pollutants upon the freshwater snail (*Helisoma trivolvis*). Proc. Zool. Soc. Egypt, 13: 17-29.

Arnold, E.O.; Joseph, J.C. and David, J. (1980): Standard Methods for the examination of water and waste water. Fifteenth edn. American Public Health Association Washington, DC, 2005.

Eid, A. H.; Khuraiba, M. and Osman, M.M. (1991): Effect of protein source and temperature on growth performance of Nile tilapia (*O. niloticus*) J. Appl. Sci., 6: 579-587.

Ibrahim, E.A. (1987): Effect of bayluscide on growth and metabolic activities of some freshwater phytoplankton. Bull. Inst. Ocean & Fish, 13: 89-101.

Kandil, A.E. (1987): Physiological studies on the grass carp (*Ctenopharyngodon idella*) under different environmental pollutants. Ph.D. Thesis, Fac. of Sci., Cairo Univ., 186 pp.

Mazik, P.M.; Simco, B.A. and Parker, N.O. (1991): Influence of water hardness and salts on survival and physiological characteristics of striped bass during and after transport TRANS. AM. RSH. SOC, 120: 121-126.

Mourad, M.; Abdallah, M. and Abd-Allah, A. (1999): Occurrence of Lindane and its effects on some hematological and histological aspects of*89*, Bull. Nat. Inst. of Oceano & Fish., 25: 237-251.

Nawaduke, F.O. (1995): Nigerian Ins. Oceano and Mar. Res., Port Horcourt, Nigeria Environ Ecol., 13: 155-159.

Shaaban, S.E. (1982): Separation and identification of some pesticides residues. M.Sc. Thesis. Chemistry of Pesticides. Fac. Agri., Alexandaria Univ.

Shephred, C.J. and Bromage, N.R. (1992): Intensive fish farming. BSP Professional Books Oxford London Edinbourgh Boston Palolate Melbourne.

Siddiqui, A.Q.; Howlader, M.S. and Adam, A.E. (1991): Effects of water exchange on *Oreochromis niloticus* growth and water quality in outdoor concrete tanks. Aquaculture, 95: 67-74.

Sweilum, M.A. (2000): Effect of different percentages of sewage water on growth performance, survival rate and food conversion of Nile tilapia (*O. niloticus*) Vet. Med. J., Giza, 48: 179-184.