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GROWTH PERFORMANCE AND SURVIVAL OF NILE TILAPIA SEEDS (*Oreochromis niloticus*) REARED IN CONCRETE TANKS DURING WINTER SEASON UNDER DIFFERENT STOCKING DENSITIES.

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ABSTRACT

The present study aimed to investigate growth performance of Nile tilapia fry (2.0g initial weight) and survival as affected with stocking density (50,75and 100 fry / m^3) when reared in concrete tanks during winter season . Twelve concrete tanks ($10m^3$ volume each) were used In this study representing the three stoking density within each uncovered or 75% of the surface was covered with polyethylene sheets. Each treatment was represented by two replicates. The study was started at the first of October 2005 and lasted to the end of March2006 (6 months duration). Results obtained are summarized in the following:

1) Both stocking density and tank cover released significant effects on final body weight and survival in favor of lower stocking density and tank covering with plastic sheets.
2) Treatments applied released significant effects on water quality parameters tested. Regardless of stoking rate, treatment groups of the covered tanks improved all parameters of water quality
3) Values of proximate analysis of whole fish bodies for moisture, protein and ash contents were decreased insignificantly by the treatment applied, however fat contents in the whole body were increased but also insignificantly.

Keywords: Over-wintering, Tanks, Nile tilapia, Growth, Survival, Water temperature, Economic efficiency.

INTRODUCTION

The influence of over wintering systems on the survival and growth of fish had been studied. Large (>1g) small (<1g) tilapia seed were over-wintered in deep hapas in ponds for comparison of their performance. The results clearly indicated that hapas in ponds are useful for reducing the risk and improving the survival of tilapia fry in the cold season .The survival rate of large mono-sex tilapia fry (54%) was significantly($P<0.05$) higher than that of smaller fry (33.4%) (Dan and Little , 2000).Evaluation of the performance of over-wintered fry in three strains (Vietnam, Gift and Thai.) of Nile tilapia were conducted at northern Vietnam .The growth performance of both mixed and mono sex fry of the three strains was 0-2.0% of body weight. No mortality was recorded during the winter, where the minimum temperature fell to 10 °C for 8 days and 11 °C for 9 days (Dan and Little , 2000[a]). Mono and mixed sex Nile tilapia fry were evaluated for winter growth performance and survival rate in outdoor earthen and concrete ponds under Egyptian winter conditions .The highest survival rate and growth performance were recorded at feeding rate 10-2% of body weight in concrete ponds, which covered with polyethylene sheet and with mixed sex tilapia (Bakeer *et al.*, 2005). Control of winter temperature and reducing mortalities rate in cold season in Egypt are very important factors in fish farm production (Abd-El Ghany, 1996; Diab *et al* ., 2002&2004 and Bakeer *et al* ., 2005).

The objective of the present study was to evaluate the effect of stocking density and covering the concrete tanks on the growth performance, survival rate, chemical composition and economical efficiency of Nile tilapia (*O. niloticus*) under overwintering conditions.

MATERIALS AND METHODS

The experimental work of the present study was carried out at the laboratory of Aquaculture Research, at Abbassa, Sharkia governorate, Egypt. Twelve concrete tanks each measuring 1× 10 m containing approximately $10m^3$ of freshwater were used in the experiment .The following six treatments (three stocking densities within covered and uncovered tanks with polyethylene sheets 200 micron) were used in the present study where each treatment was represented in two replicates .

Treatment (1)
50 fish $/m^3$ reared in tanks 75% of the surface area of the tank was covered with plastic sheets ($Co.SR_1$)
Treatment (2)
75 fish $/m^3$ reared in tanks 75% of the surface area of the tank was covered with plastic sheets ($Co.SR_2$)
Treatment (3)
100 fish $/m^3$ reared in tanks 75% of the surface area of the tank was covered with plastic sheets ($Co.SR_3$)
Treatment (4)
50 fish/m^3 reared in uncovered tanks ($Unco.SR_1$)
Treatment (5)
75 fish/m^3 reared in uncovered tanks ($Unco.SR_2$)
Treatment (6)
100 fish/m^3 reared in uncovered tanks ($Unco.SR_3$)

Experimental tanks were supplied with freshwater from Ismaelia canal. The water level was maintained at approximately 1 m and loss water was replaced whenever necessary. Mixed sex fry O. *niloticus* with an average weight of 2.0g were used from the hatchery of Abbassa station. Fish were fed a sinking pelleted formulated artificial diet containing 25% crude protein of 1 mm diameter. Feeding regime used was 2% of the total biomass per day during the sunny days only. The composition and proximate analysis of the experimental diet are presented in Table (1). The amount of feed was biweekly adjusted according to changes in body weight throughout the experimental period. The study was started at the first of October 2005 and lasted to the end of March 2006 (6 months duration)

Table (1): Composition and proximate analysis of the basal diet (as % of dry weight basis)

Ingredients	%	Analysed Components	%
Fish meal (70%)	4	Protein	25.72
Soybean meal (44%)	43	Lipids	9.70
Yellow corn (8.5%)	45	Ash	5.94
Vegetable oil	6	Fiber	4.20
Vitamin Mixture (1)	1	Carbohydrates (NFE) (3)	54.44
Mineral premix(2)	1	Moisture	7.25
		Gross Energy (kcal/ g diet) (4)	4.58

(1) Vitamins mixture contained (as g/ kg premix) : Thiamine 2.5 ; Riboflavin 2.5 , Pyridoxine 2.0 Inositol 100.0 ;Biotin 0.3; Pantothenic acid 100.0 ;Folic acid 0.75; Para-aminobenzoic acid 2.5 Choline 200.0 Nicotinic acid 10. Cyanocobalmine 0.005; Tocopherol acetate 20.1; Ascorbic acid 50.0; Menadione 2.0 . ; Retinol palmitate 100.000IU; Cholecalciferol 500.000 IU.

(2) Minerals premix (as g/ kg of premix) CaHPC-1.$2H_{28}$ 727.7775; $MgSO_4$; H_2O 127.5; KCl 50.0; NaCl 60. $FeSO_4$. $7H_2O$ 25; $ZnSO_4$. $7H_2O$ 5.5; $MnSO_4$. $4H_2O$ 2.53; $CuSO_4.5H_2O$ 0.785; $CoSO_4$. 7 H_20 0.4775; $CaCo_3.6H_2O$.295; $CrCl.6H_2O$ 0.1275

(3) NFE (Nitrogen free Extract) = 100 – (protein + lipid + fiber+ ash).

(4) Gross energy was calculated, where the energy value (Kcal/ g) for protein 5.65; for lipid 9.45 and carbohydrate 4.1 (Jobling, 1983).

At harvesting, a sample of 150 fish from each tank was taken randomly and body weight (g) and body length (cm) were measured. Temperature, dissolved oxygen and pH were measured daily using temperature and dissolved oxygen meter (YSI model 57) and pH meter (model corning 345). Determinations of phosphorous and unionized (free) ammonia were carried out every two weeks according to the method of Boyd (1990). Phytoplankton and zooplankton communities in tank's water were determined every two weeks according to the methods described by Boyd (1990). Growth performance parameters were measured using the following equations:

$$\text{Specific growth rate (SGR)} = \frac{LnW_2 - L\,nW_1}{t} \times 100$$

Where: Ln = the natural log

W1 = Initial fish weight in grams.

W2 = Final fish weight in grams

T = Period in days.

Weight gain (WG) = final weight (g) – initial weight (g)

Feed conversion ratio (FCR) = feed ingested (g) / weight gain (g) .

At the end of the experiment, five fish were randomly sampled from each tank and slaughtered. The weight of head, viscera, flesh, carcass and total by-produces were recoded .All carcass components were measured and calculated as percentages of body weight according to Lovell (1981). Another five fish were also chosen at random and exposed to the proximate analysis of whole fish body according to the methods of AOAC(1990). Economic evaluation of the experiment was done to define the most efficient treatment according to Yi *et al.* (2001).

The statistical analysis of the data was carried out by applying the computer program; SAS (1989) .The least significant difference test (Dancan, 1955) was utilized to evaluate the significance among treatment's means for all variables.

RESULTS AND DISCUSSION

Water quality parameters:

Results of water quality parameters as affected by the treatments are presented in Table (2). Significant differences in temperature among treatments were noticed, which had ranged between 15.9 and 26.5°C in all treatments. Values for treatments T_1, T_2, T_3, T_4, T_5 and T_6 were 20.4 , 25.8 ; 26.5; 15.9; 16.2 and 18.0 °C, respectively. The highest temperature was recorded in T_3 followed by T_2, T_1, T6, T_5 and T_4, respectively. These values of water temperature for T_1, T_2 and T_3 are beneficial to fish cultivation. On the other hand, T_4, T_5 and T_6 are not. Also, significant differences in temperature were observed in tanks with different stoking densities, which may be resulted from fish crowding and low movement in tanks. The maximum averages were obtained from the highest stocking rates in both of covered and uncovered tanks, where the tanks of lowest stocking rates reflected the minimum averages of temperature. In this connection, Gannam and Phillips (1993) pointed out that the growth of tilapia fed at satiation in min-max temperature cycle 16 to 24 °C was only 41% as high as the growth in a temperature cycle 20 to 28°C. reported that both growth and feed conversion efficiency of tilapia improve as optimum water temperatures are approached (28°C) (Popma *et al.*, 1993).

Table (2): Mean variation of grand average values of some physico-chemical characteristics for water quality of the experimental tanks.

Parameters	Treatments					
	T_1	T_2	T_3	T_4	T_5	T_6
Temp. °C	24.4 a± 0.09	25.8a ± 0.23	26.5a ± 0.06	15.9c ± 0.06	16.2 c± 0.09	18.0 b± 0.06
Dissolved oxygen (mg.L)	5.14 b± 0. 38	4.15 c± 0.17	3.08 c± 0.49	7.14a± 0.38	6.81a± 0.43	5.2 b± 0.42
PH value	8.19 c± 0.01	8.10 c± 0.09	8.77 b± 0.06	8.72 b± 0.06	9.10a± 0.12	9.30 a ± 0.20
Un-ionized ammonia NH_3(mg/L)	0.58b± 1.020	0.65b± 0.040	0.88a± 1.031	0.11c± 0.0104	0.13 c± 0.0480	0.18c± 0.040
Total phosphorus mg/L)	1.83a± 0.09	1.61a± 0.10	1.00b± 0.08	0.9b± 0.04	0.64c± 0.048	0.52c± 0.182

T_1=covered tanks with stocking rate 50 fish/m³
T_2 = covered tanks with stocking rate 75 fish/m³
T_3= covered tanks with stocking rate 100 fish /m³
T_4= uncovered tanks with stocking rate 50 fish /m³
T_5= uncovered tanks with stocking rate 75 fish /m³
T_6= uncovered tanks with stocking rate 100 fish /m³
In each row, means followed by the same letter are not significantly different($P \geq 0.05$).

Also, with increasing temperature, the carrying capacity of fertilized pond increases from near 2000 kg. h^{-1} in the cold season to 2500 kg h^{-1} in the warm season (Lin *et al.*, 1999) .This may be due to the fact , at warmer temperatures near to 30 °C, increases were obtained in the fertilizers decomposition rate , as it facilitates nutrients metabolism (Knud-Hansen and Pautong, 1993). This indicates that the lowest temperature values (< 16°C) had a negative effect on the fish growth.

An average of dissolved oxygen concentrations have ranged between 3.08 to 7.14 mg/L (Table 2). These values are beneficial to fish cultivation and indicate that water dissolved oxygen slightly decreased in tanks with high stocking rates. These results indicate that dissolved oxygen was not a critical variable for Nile tilapia in this study as indicated by Boyd and Tucker (1998). Also, Liti *et al.* (2001) demonstrated that down low DO level (0.92 mg/L) did not significantly affect sex-reversed *O.niloticus* growth (1.17g^{d-1}).

An average of pH values for treatments T_1, T_2, T_3, T_4 , T_5 and T_6 were 8.19, 8.10, 8.77 ,8.72 , 9.10 and 9.30 , respectively and were within the acceptable level of tilapia . In this connection, Boyd and Tucker (1998) stated that, acid water decreases the appetite of tilapia. The pH of fresh water is ranging from 6 to 9 with daily appetite fluctuation of one or two units. Unionized ammonia values for treatments T_1, T_2, T_3, T_4, T_5, and T_6 were 0.58, 0.65, 0.88, 0.11, 0.13 and 0.18 mg/L, respectively. These results indicate that the unionized ammonia concentrations increased in the covered tanks but never surpassed 0.88 mg/L with an over all average between 0.11 and 0.88 mg/L .The significant differences in unionized ammonia values had due to the high temperature, which may be resulted from using polyethylene sheet in covering concrete tanks. In general free ammonia value (NH_3) was low to be toxic to fish, and it was <0.88 mg/L and lay in the normal rage. These values are beneficial to fish cultivation and agreed with the findings of E.I.F.A.C. (1993), Lin and Yi (2003) and Wurts (2003), who determined free ammonia and concluded that toxic levels for short time exposure usually lie between 0.6 to 2.0 mg/L for pond fish.

The averages of total water phosphorus for treatments T_1, T_2, T_3, T_4, T_5, and T_6 were 1.83, 1.61, 1.00, 0.90, 0.64 and 0.52 mg/l, respectively. Total phosphorus level was higher in T_1 followed by T_2, T_3, T_4, T_5, and T_6, respectively. Also, these results revealed that the total phosphorus increased with the decrease in the stocking rate. These results partially agreed with those obtained by Bakeer *et al.* (2005), who cultured Nile tilapia fry in concrete tanks at stoking rate of 50 fish/ m^3, and with Yasser (2005), who studied mixed sex tilapia (1.3 g on average) with stocking rate of 6000 fish /feddan and pointed out similar results for water quality .

In general all water quality parameters for all treatments in the present study were within the permissible levels for normal fish growth, however treatments T_1, T_2 and T_3 (covered tanks) improved physico - chemical characteristics of water quality.

Phytoplankton and Zooplankton

As shown in Table (3), the average number of phytoplankton organism per liter were higher in water samples collected from T_4, T_5 and T_6 (un covered tanks) and the differences were significant than the covered treatments. The same trend was noticed in the average number of zooplankton organisms per liter. The increase in number of phytoplankton and zooplankton in water samples of uncovered tank's groups may be due to the fish in uncovered tanks did not consume the planktonic organism due to low water temperature in their tanks. These results were confirmed by those reported by Ojaveer *et al.* (1996), and Abdel -Hakim *et al.* (2001, 2001[a] and 2004)

Table (3): Means ±S.E. of chlorophyll-a concentration (μ g/L) and zooplankton concentration (organism/L)of the treatments applied.

Treatments	Chlorophyll-a ((μ g/L)
T_1	119.57 c ± 54.71
T_2	116.46c± 35.8
T_3	134.53b±10.70
T_4	386.12a± 25.1
T_5	202.15a±12.10
T_6	143.75 b± 31.2
	Zooplankton (organism/L)
T_1	1360.22ab ±13.1
T_2	1237.15c ±78.8
T_3	1215.70c ±118.0
T_4	1470.25b ±35.4
T_5	1530.71a ±18.22
T_6	1514.82 a±35.5

Means followed by the same letter are not significantly different (P≥0.05).

Growth traits

As illustrated in Table (4), the average initial body weight of Nile tilapia for the experimental groups ranged between 2.70 to 2.99g and differences among the experimental groups in body weight were insignificant indicating that the distribution of the fish into the groups was completely random .After six months from start, averages of final body weight of groups T_1, T_2 and T_3 were significantly ($P<0.05$) higher than that of the other groups. These results may indicate that covering the tanks with polyethylene sheets are required for faster growth and increased the water temperature for Nile tilapia seed reared in concrete tank in cold weather. These results are in complete agreement with those reported by Nour *et al.* (1996) and Bakeer *et al.* (2005).

Also, results of Table (4) show that averages of body weigh at all experimental treatments decreased significantly ($P<0.05$) as the fish stocking rate increased from 50 to 100 fish/m^3 .The same trend was observed with body length .The body weight gain depression of fish stocked at higher densities may attribute to crowding social interactions .The results presented in Table (4) are in a accordance with those reported by Coache (1976), Moar (1977) , Nour *et al* . (1996) and Beeker *et al* . (2005). These authors came to the conclusion that the higher tilapia stocking densities released negative effects on its body weights and length, where body weight and length decreased as the stocking rate increased .

Results of specific growth rate (SGR) as affected by the performed treatments in the present experiment are illustrated in Table (4). As described in this Table, SGR values decreased from 1.34 to 1.23 with increasing the stocking rate from 50 to 100 fish/m^3.

As presented in Table (4), covering the tanks with polyethylene sheet (T1, T_2 and T_3) had significantly increased the fish SGR values compared to the other treatments (T_4, T_5 and T_6). In general results of Table (4) revealed that rearing Nile tilapia fry during winter months in polyethylene covered tanks to 75% of the tank area at lower density (50 fish/m^3) favored significantly (P<0.05) the growth performance of fish compared to the higher stocking densities in uncovered tanks. These results are in agreement with the findings of Abdel -Hakim *et al.* (2000), who study the effect of stocking rates on the growth performance of Nile tilapia cultured in tanks.

Table (4): Growth performance and feed utilization of Nile tilapia as affected by the treatments.

Variable	Body weight (g)		Body length(cm)		Weight gain (g)/fish	Specific growth rate(% day)	Feed intake (g) fish	FCR
	Initial	Final	Initial	Final				
Control the cold temperature								
covered tank	2.94a	30.80a	1.58a	11.65a	27.87a	1.30a	46.81a	1.68a
uncovered tank	2.93a	21.12b	1.50a	10.42b	18.19b	1.09b	45.35b	2.51b
Stocking rate								
50 fish/m^3(SR_1)	2.93a	32.70a	1.92a	12.08a	29.77 a	1.34a	49.40a	1.6a
75 fish/m^3 (SR_2)	270a	28.01b	1.81a	10.53b	25.31b	1.24b	46.00a	1.82b
100fish/m^3(SR_3)	2.87a	26.20c	1.90a	10.02b	23.33 c	1.23b	43.50b	1.86c
Covered ×SR_1	2.94a	35.33a	1.96a	12.12a	30.39a	1.38a	47.60a	1.47a
Covered ×SR_2	2.96a	30.01a	1.90a	11.05b	27.05a	1.29b	46.00 a	1.70b
Covered ×SR_3	2.70a	26.93b	1.91a	10.10c	24.23c	1.28b	44.04b	1.82b
Uncovered ×SR_1	2.86a	24.12bc	1.85a	9.59d	21.26b	1.33a	46.34a	2.18c
uncovered × SR_2	2.99a	21.17b	1.80a	9.48d	18.18b	1.09c	45.50b	2.50d
uncovered × SR_3	2.89a	18.02d	1.80a	9.00d	15.13c	1.01c	42.18c	2.69e
Stander error	0.15	0.80	0.07	0.15	0.006	0.005	0.01	0.002
Probability	0.9778	0.0001	0.1191	0.001	0.0001	0.0001	0.0001	0.0013

Means with the same letter in each column are not significantly different (P≥0.05).

Table (4), shows the averages of feed conversion ratio (FCR) for fish fed diet 25% crude protein at three stoking densities(50, 75 and 100 fish/m^3) in covered and uncovered tanks .Average FCR values for T_1, T_2, T_3, T_4, T_5 and T_6 were 1.47, 1.70 , 1.82 , 2.18 , 2.50 and 2.69 kg diet required for each kg gain in weight, respectively. These results indicate that, FCR values improved in the treatment groups (T_1, T_2 and T_3), where fish were reared in covered tanks than the other treatments.

Results of Table (4) revealed that, in both covered and uncovered tanks FCR of fish improved significantly (P<0.05) with each decrease in the stocking density and the improvement in FCR was more pronounced in the covered tanks (1.68) compared to uncovered tanks (2.51) Similar results were observed by Lovell and Sirkul (1974), Nour *et al* . (1996), Abdel-Hakim *et al.* (2001) and Bakeer *et al.* (2005) , who concluded that FCR was improved when fish reared at lower stocking density and they reported that FCR values of Nile tilapia improved significantly, where reared in covered tanks compared to uncovered ones.

Carcass and whole body proximate analysis

Concerning carcass parameters, results of Table (5) revealed that covering of the overwintering tanks with plastic sheets had no significant effects on dress out, flesh , viscera and carcass by ˙ products percentages as compared with those of fish reared in uncovered tanks, regardless of stocking density. On the hand, dress out, flesh and viscera decreased (P<0.05) with each increase in the stocking density , while the percentage of by-products increased (P<0.05) with each increase in stocking density, regardless of tank cover. These results are in agreement with those obtained by Soltan *et al.* (1999) and Abdel-Hakim *et al.* (2001), who showed that dressing percentages of Nile tilapia decreased significantly with each increase in stocking density.

Table (5): Carcass and proximate analysis of Nile tilapia as affected by the treatments .

Treatments	Carcass analysis %				Proximate analysis of whole fish %			
	Dress out	Flesh	viscera	By-product	Moisture	Protein	Fat	Ash
Control the cold temperature								
covered tank	50.12a	40.18a	7.80a	60.88a	78.50a	57.55a	11.26a	17.55a
uncovered tank	49.73a	39.90a	7.55a	61.81a	76.82a	54.35a	13.90a	15.88a
Stocking rate								
50 fish/m^3(SR$_1$)	51.31a	40.12	10.71a	58.13a	75.11a	50.10a	14.32a	15.35a
75 fish/m^3(SR$_2$)	45.81b	38.01b	8.00b	60.22b	77.50a	51.81a	12.15a	16.36a
100fish/m^3 (SR$_3$)	43.11c	34.20c	7.03c	62.18c	78.10a	53.60a	11.20a	18.28a
Covered ×SR$_1$	51.81a	39.21a	11.51a	58.14c	97.00c	56.83a	18.60a	15.90a
Covered ×SR$_2$	49.12a	38.90a	10.82a	59.15b	79.15b	59.10a	15.90b	16.25a
Covered ×SR$_3$	50.13a	39.10a	9.94a.	60.81ab	81.22ab	58.88a	15.14b	16.90a
uncovered ×SR$_1$	46.35b	36.18b	8.19b	60.88ab	79.61b	54.92a	13.81ab	17.92a
uncovered ×SR$_2$	45.90b	35.70b	2.21b	61.90 a	80.60a	57.18a	16.50a	18.02a
uncovered ×SR$_3$	42.84c	33.70c	7.00c	62.80a	81.80a	57.13a	13.58a	18.33a

Means with the same letter in each column are not significantly different (P≥0.05).

Concerning whole body proximate analysis , results of Table (5), revealed that covering overwintering tanks with plastic sheets had no significant effects on moisture , portion, fat and ash percentages as compared with those of fish reared in uncovered tanks , regardless of stocking density . On the other hand , moisture , protein and ash decreased (P<0.05) with each increase in the stocking density , while the percentage of fat increased (P<0.05) with each increase in stocking density regardless of tank cover. These results agree with those obtained by Abdel Hakim *et al.* (2001), who studied the effect of protein level and stocking density on the chemical composition of whole fish body and flesh.

Survival rate

Results of Table (6) revealed that regardless of stocking density , covering the rearing tanks with polyethylene sheets during winter season improved significantly the survival rate of Nile tilapia fry (80.10%) compared to the uncovered tanks (42.90%). Also, survival rate increased significantly ($P<0.05$) almost in a liner manner with each increase in stocking density of Nile tilapia from 50 to 75 or 100 fish/ m^3.These results are in agreements with the findings of Abd-El- Ghany (1996), Nour *et al.*(1996) and Bakeer *et al.* (2005) who studied the positive benefits of winter feeding of Nile tilapia. They reported that winter feeding resulted in poor feed conversion efficiency, reduced growth rates and survival rates were good .Also they concluded that covered tanks resulted in good survival rates.

Table (6): The effect of treatments on survival rate of Nile tilapia fish during winter months .

Items	No.of tanks	Survival%
Control the cold temperature		
Covered tanks(co.)	6	80.10a
Un covered tanks (unco.)	6	42.90b
Stocking rate		
50 fish/m^3 (SR_1)	4	73.12a
75 fish/m^3 (SR_3)	4	68.31b
100 fish/m^3 (SR_3)	4	45.18c
T_1 (Co.SR_1)	2	82.42a
T_2 (Co.SR_2)	2	70.00b
T_3 (Co.SR_3)	2	62.32c
T_4 (Unco.SR_1)	2	53.11 d
T_5 (Unco.SR_2)	2	43.25 e
T_6 (Unco.SR_3)	2	32.40 f

Means with different letter are significantly different ($P< 0.05$)

Economic efficiency (L.E /100m^3)

Results presented in Table (7), show the effect of Nile tilapia fry stocking density and application of tank cover on the economic efficiency including costs and returns of the applied treatments. The results indicate that the total costs of the treatments T_1,T_2,T_3,T_4,T_5 and were 735.7, 904.43, 1075.46, 498.45, 617.94 and 755.87 L.E for 100m^3, respectively. These results revealed that the total cost of T_1 (covered tank with stocking rate 50 fish/m^3) were the lowest than the other ones. On the other hand, the total costs of T_3 and T_6 (covered and uncovered tanks with stocking rate 100fish/m^3) were the highest due to the increasing input costs in feeding.

Also, Table (7) shows that returns were 1442.35, 1575.00, 1550.00, 700.00, 583.87 and 583.2 for T_1, T_2, T_3, T_4, T_5 and T_6, respectively. These results revealed that the return of T_3 (covered tanks with stocking rate of 100 fish/m^3) was the highest than the other groups .On the other hand , the return of T_5 (uncovered tank with stocking rate 75 fish/m^3) was the lowest due to the cost of feeding and decreasing final body weight , which had lowe price .Net returns in L.E per 100m^3 were 706.65,670.57, 474.54, 201.55,-34.07, and 172.67 L.E per 100m^3 for T_1, T_2, T_3 , T_4 ; T_5 and T_6 , respectively. These results indicate that T_1 was the best in net retune followed by T_2, T_3, andT_4.

Table (7): Effect stocking rate and covered and uncovered tanks on the economic efficiency of Nile tilapia (L.E /100m³)*

Treatments	T_1	T_2	T_3	T_4	T_5	T_6
Stocking rates	**5000**	**7500**	**10000**	**5000**	**7500**	**10000**
Inputs :						
Price of fry	250	375	500	250	375	500
Price of feed	260.70	304.43	350.46	123.45	117.94	130.87
Price of polyethylene sheets	100	100	100	-	-	-
Labor	75.00	75.00	75.00	75.00	75.00	75.00
Equipment	50.00	50.00	50.00	50.00	50.00	50.00
Total cost	**735.7**	**904.43**	**1075.46**	**498.45**	**617.94**	**755.87**
Outputs						
Returns (soled fingerlings)**	1442. 35	1575.00	1550.00	700.00	583.87	583.20
Net returns Outputs-Inputs	**706.65**	**670.57**	**474.54**	**201.55**	**-34.07**	**-172.67**

*The economical evaluation results was carried out according to market prices 2005-2006 in L.E

** The price of fish fingerlings sale was carried out according to fish size (350-300-250-200-180-150-L.E/1000 fingerling).

Conclusion

Based on the results obtained in this study and on the economical evaluation, it could be concluded that mixed sex tilapia seed (50 fish/m³) can be cultured in partially covered concrete tanks in wintering season for faster growth and good survival rate.

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أداء النمو و الإعاشة لزريعة أسماك البلطى النيلى المرباه بكثافات مختلفة فى أحواض خرسانية خلال فصل الشتاء

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تهدف الدراسة الحالية للتعرف على أداء النمو ومعدل الإعاشة لزريعة أسماك البلطى النيلى (بمتوسط وزن ابتدائى ٢ جرام) والمرباه تحت تأثير كثافات مختلفة (٥٠ – ٧٥ – ١٠٠ سمكة للمتر المكعب) فى أحواض خرسانية خلال فصل الشتاء ، تم استخدام ١٢ حوض خرسانى مساحة كل منهم ١٠ متر مكعب، استخدم بها ثلاث كثافات مختلفة ، هذا بالإضافة إلى تغطية ٧٥% من مساحة سطح الحوض بمادة البولى ايثيلين وكذلك عدم التغطية . تم تكرار كل معاملة مرتين وقد بدأت فترة التربية من أول أكتوبر ٢٠٠٥م وانتهت فى نهاية شهر مارس ٢٠٠٦م (مدة ٦ شهور)، ويمكن تلخيص النتائج التى تم الحصول عليها كالآتي :

١- كانت هناك تأثيرات ملحوظة لكل من معدل الكثافة وتغطية الأحواض على الوزن النهائى لجسم الأسماك ومعدل الإعاشة، وخصوصا فى معدل الكثافة الأقل والأحواض المغطاة بمادة البولى ايثيلين .
٢- وبغض النظر عن معدلات التخزين فإن مجموعة الأحواض المغطاة جزئيا (٧٥%) بالبولى ايثيلين أدت إلى تحسين جميع قياسات خواص البيئة المائية وكانت للمعاملات تأثير معنوى على جميع القياسات .
٣- أوضح التحليل الكيماوى لمكونات أجسام الأسماك أن هناك نقص غير معنوى لتقديرات نسب الرطوبة والبروتين والرماد، أما تقديرات نسب الدهون أظهرت زيادة غير معنوية بتأثير المعاملات.