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EFFECT OF SPAWNING SEASON, MALE AND FEMALE BODY WEIGHT ON REPRODUCTIVE PERFORMANCE OF NILE TILAPIA, *OREOCHROMIS NILOTICUS*

By

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SUMMARY

The present experiment was carried out at the hatchery of Arab Fisheries Company at Abbassa village, Abu-hammad district, Sharkia Governorate, Egypt. The experiment aimed to study the effect of the year of hatching, male body weights and female body weights on reproductive traits of Nile tilapia fish (*Oreochromis niloticus*). The experimental period extended from 1April 2002 and lasted 29th of May 2003. Six concrete ponds (3 × 10 × 1m) were used and represented six treatments and each pond was stocked with 50 females and 17 male. Females were divided according to their body weights to three groups, 300, 400 and 500 g and males also were divided into two groups 300 and 400 g. The obtained results could be summarized as follows:

Total egg weight (g) per female (EW/F) and egg weight (g)/gm of body weight (EW/GF) did not significantly affected by the year of hatching or by the weight of male of Nile tilapia. EW/F increased gradually as female body weight increased. EW/F for the three groups 300, 400 and 500 g were 12.33, 14.64 and 21.91g, respectively and the differences were not significant and the same trend was also observed for the effect of female body weight on EW/GF.

Averages of absolute fecundity as affected by the year were 1215.39 and 1411.71 for the two years 2002 and 2003, respectively and the differences between means were significant ($p<0.001$) and the same trend was also observed for relative fecundity where the averages were 3.31 and 3.66 for the two year, respectively. The absolute fecundity were 1327.03 and 1300.07 and the relative fecundity were 3.55 and 3.41 for the two male weight groups, respectively and the differences due to male body weight on absolute or relative fecundity were not significant. Absolute fecundity were found to be 1264.73, 1376.1 and 1299.84 and relative fecundity were 4.14, 3.49 and 2.82 for the three females groups 300, 400 and 500 g, respectively and the differences in absolute fecundity were significant.

Hatchability percentage were found to be 81.44 and 82.73% ; 80.69 and 83.48% ; 82.68, 82.36 and 82.22% for the two years 2002 and 2003; male groups studied 300 and 400g and the three female weight groups, 300, 400 and 500 g, respectively and the differences in hatchability attributed to year; male or female body weight were significant ($P<0.001$).

The average fry number per fish as affected by year, male and female body weight found to be 869.73 and 1017.52 fry/fish for the two years 2002 and 2003; 950.36 and 936.89 for the two male groups studied 300 and 400 g and 896.25, 987.42 and 997.22 for the three female body weight groups 300, 400 and 500 g, respectively and the differences between averages of fry number per fish attributed to year and female weight were significant ($P<0.001$).

After 30 days the averages body weight of fry were 0.42, 0.45 for the two years 2002 and 2003; 0.44 and 0.43 g, for the two male weight groups (300 and 400g) and 0.45, 0.43 and 0.43 g for the three female body weight groups 300, 400 and 500 g, respectively and the differences between averages of fry number per fish attributed to year and female weight only were significant ($P<0.001$).

INTRODUCTION

Tilapia is an important fish in many tropical and subtropical countries. More than 20 species of tilapia have been cultured in developing countries, where animal protein is lacking. The most important tilapia species are *Oreochromis niloticus*, *O.mossambicus, O. aureus* and *O.galilae*. Among all culture tilapia species, Nile tilapia (*O. niloticus*) has emerged as the single most important species. The attributes which make Nile tilapia so suitable for fish farming are its general hardiness, ease of breeding, rapid growth rate, ability to convert efficiently organic wastes into high quality protein, and good taste **(Yi *et al.*, 1996).** Many of the problems associated with tilapia farming systems are from the exceptional mode of reproduction of *Oreochromis* species. In addition to being mouth brooders, these fish mature precociously under certain condition and energy is diverted from growth into reproduction.

A basic requirement of intensive farming of any fish species is a constant supply of good quality eggs and fry from captive broodstocks. Commercial growers should be able to program the timing and the magnitude of spawning to fit with their hatchery and grow out requirements **(Koven *et al.*, 1992).**

The fecundity of substrate breeders is generally much higher than that of mouth brooding species **(Fryer and Iles 1972)**. Fecundity of fish changed also with changes of environment, thus identical species spawn more frequently when in culture than in nature, spawning season of *O. niloticus* appears to attain a discrete peak in April–May to September **(Payne and Collinson 1983)**. Fecundity is very flexible in fish. It is responsive

to food availability and time. It is the biological item concerned with estimating and counting the more advanced groups of eggs depending on the fact that these groups are only spawned in the spawning season **(Asem, 1992).**

The aim of this experiment was to investigate effect of the year of hatching, male body and female body weights on reproductive performance of Nile tilapia (*O. niloticus*) and under the Egyptian environmental conditions during the period from April 2002 to May 2003.

MATERIALS AND METHODS

The present experiment was carried out at the hatchery of Arab Fisheries Company at Abbassa village, Abu-hammad district, Sharkia Governorate, Egypt. The duration of this experiment was (425 days) from the 1st April 2002 and lasted 29th of May 2003. Six concrete ponds (3 × 10 × 1 m) were used. The water depth for each pond was maintained approximately 70 cm.

Preparation of concrete ponds:

At start of the experiment ponds were dried and cleaned by potassium permanganate (3 g / m^3) to kill parasites, fungi and any other infections. Thereafter the ponds were cleaned by pure water. Great care was under taken to screen the water inlets to prevent as possible wild fish, their eggs and larvae from entering the ponds. The females and males were stocked in these ponds. The experimental ponds represent six treatments and each pond was stocked by 50 females and 17 male. Females were divided according to their body weights to three groups, 300, 400 and 500 g and males also were divided into two groups 300 and 400 g.

Preparation of diets and feeding practices:

The diets were formulated to contain 32 % crude protein and 3139.5 Kcal ME/Kg for males and females. While the diets used for fry were formulated to contain 40 % crude protein and 2748.5 Kcal / Kg (ME) (Table 1). Fish fed the diet at a daily rate of 5% of total biomass for 6 days / week (twice daily at 9.00 am and 3.00 pm). The larvae produced were

abandoned to complete absorption of yolk-sac. After 2 days from hatching, the fry were stocked in the ponds corresponding to weight of females (each pond 3 × 10 × 1 m) and the fry granules diet (40% crude protein) was offered at a daily rate 20% of total biomass put on floating dishes (three times 9.00 am, 1.00 pm and 5.00 pm) for 30 days. Every 10 days, groups of fry randomly obtained from each pond then weighted and amount of feed was adjusted according to the changes in body weight throughout the experimental period.

Egg collection:

Egg were collected from the mouth of females after fertilization, weighted, counted and then put on jars (one jar per female) until hatching and allocated in its ponds of fry until end of treatment (30 days). Female production of eggs collected by decreasing the water column of each pond about 50 cm after that, females were transported via small scoop into small plate containing water. As a consequence to the fright stress, each mother threw its eggs into the plate. Then, the eggs of each female were collected, and their measurements were recorded.

Average egg weight spawned / female (EW/F) was determined in gram. Number of eggs in one gram eggs weight (NE/G) was determined by weighting one gram of eggs then all eggs presented in this gram weight were counted. Weight of eggs in gram per kg live body weight was calculated by dividing the weight of eggs spawned per female on its live body weight. The absolute and relative fecundity was determined according to **Bhujel (2000)** as follows:

Absolute fecundity (ABS) = total weight of eggs per female (g) × number of eggs in one gram.

Relative fecundity (REL) = absolute fecundity / body weight (g).

Hatchability was determined by counting the number of fry obtained and number of fertilized eggs as follows:

Hatchability (HAT) =(Number of obtained fry / number of fertilized eggs) × 100

Records of individual fry live body weight (g) were measured in 15 fish for each aquarium and registered every 14 day (two weeks) in the experiment. Growth performance parameters were measured by using the following equations:

Total weight gain = final weight (g) – initial weight (g)

Table (1): Composition of broodstock and fry diets used during the experimental period.

Ingredients	Broodstock diet (32% CP)	Fry diet (40% CP)
Fishmeal	20	36
Soy bean meal	16.3	12.3
Yellow corn	23	12
wheat flour	9	8
Shrimp meal	9.9	9.9
Corn oil	5	5
Wheat bran	14	14
Bone meal	2	2
Vitamins & minerals mixture*	0.5	0.5
Ascorbic acid	0.3	0.3
Sum	100	100
Protein %	32.06	40.06
Metabolizable energy / Kg	3139.5	2748.5

* Each 40g contains vit A 200000 IU, vit D_3 30000 IU; vit E 250 mg ; vit K_3 50 mg; vit B_1 15 mg ; vit B_2 12mg; vit B_{12} 250 mg; Niacin 15 mg; Zn 1800 mg ; Folic Acid 2 mg; vit B_6 20 mg; Fe 1200mg; Bantothonic 80 mg; Mn. 2400 mg; Copper 200 mg; Biotin 100 mg; Selenium 10 mg; Sodium 100 mg; Phosphorus 1000 mg

Statistical analysis:

The statistical analysis of data carried out by applying the computer program **SAS (1996)**. Differences among means were tested for significance according to **Duncan (1955)**. The following model was used in statistical analysis:

$$Xijkl = \mu + \alpha_i + \beta_j + \gamma_k + (\alpha\beta)_{ij} + (\alpha\gamma)_{ik} + (\beta\gamma)_{jk} + (\alpha\beta\gamma)_{ijk} + e_{ijkl}.$$

Where : X_{ijkl} = the1th observation for the kth female body weight, jth male body weight and ith year; μ = Overall mean; α_i = the effect of ith year; βj = the effect of jth male body weight; γk = the effect of kth female body weight; $\alpha\beta ij$ = the effect of interaction between ith year and jth male body weight; $\alpha\gamma ik$ = the effect of interaction between ith year and kth female body weight; $\beta\gamma jk$ = the effect of interaction between jth male body weight and kth

female body weight; αβγijk=the effect of interaction between i^{th} year, j^{th} male body weight and k^{th} female body weight and e_{ijkl} = Random error.

RESULTS AND DISCUSSION

Total egg weight per female (g) and egg weight (g) per gm of body weight:

Total egg weight (g) per female (EW/F) and egg weight (g)/gm of body weight (EW/GF) as affected by the year of hatching are presented in Table (2). The averages of EWF were13.35 and 19.24 g and the averages of EW/GF (Table 2) were 0.038 and 0.035 g for the two years 2002 and 2003, respectively. These results indicate that, EW/F for year 2003 were higher than that obtained in year 2002 but EW/G for 2002 were higher than that obtained in the year 2003 and the differences among the means of each of EW/F and EWG were not significant (Table 2).

Table (2): Least squares means and standard error for some factors affecting on egg weight (g)/fish EW/F and egg weight (g)/g of fish body weight (EW/GF) of tilapia broodstock.

Variable	No.	EW/F	EW/GF
Year			
2002	300	13.35±3.87	0.038±0.001
2003	300	19.24±3.87	0.035±0.001
Male			
300 g	300	13.33±3.87	0.038±0.001
400 g	300	19.26±3.87	0.035±0.001
Female			
300 g	200	12.33±4.74	0.045±0.002a
400 g	200	14.64±4.74	0.040±0.002b
500 g	200	21.91±4.74	0.038±0.002b

+ Means with the same letter in each column are not significantly differences ($P < 0.05$).

With regard to effect of male body weights, Table (2) show that, EW/F were 13.33 and 19.26g and EW/GF were 0.038 and 0.35 g for the two male groups 300 and 400 g, respectively, and the differences among averages due to the effect of the two male weights were not significant.

With regard to the effect of female body weight on EW/F, Table (2) shows that EW/F increased gradually as female body weight increased. EW/F for the three groups 300, 400 and 500 g were 12.33, 14.64 and 21.91g, respectively and the differences among EW/F means for to the effect of female body weights were not significant. These results are in accordance with those obtained by **Rana (1988)**. **Watanabe and Kuo (1985)** speculated about the increase of egg weight produced by large and old tilapia. **Rana (1988)** found that, egg number produced by a fish was more related to body weight, while **De Silva,** (**1986**) claimed that the increase was related to body length. On the other hand, **Cisse (1988)** found no significant correlation between spawner weight and number of spawning.

Averages weight of egg per gm of fish (EW/GF) as affected by female body weight were 0.045, 0.040 and 0.038 g for the three female body weight groups 300, 400 and 500g, respectively and the differences between means of this trait were not significant. As shown in (Table 2) EW/GF decreased with the increase in body weight of female. These results are in agreement with those found by **Mostafa (1988),** who found that, average weights of egg per kg of live weight increased from 158 to 200 and 227 g as body weight of common carp increased from 3 to 4 and 5 kg, respectively, then decreased gradually from 198 to 195 and 173 as body weights increased from 6 to 7 and 8 kg, respectively. **Morsy (2001)** found that, average weight of egg per kg of live weight increased from 59.84 and 103.03 g as body weight of black carp increased from 5-6 and 6.5-7.5 kg, respectively, then decreased gradually from 103.03 to 95.23 as body weight increased from 6.5-7.5 to 8-9 kg, respectively.

Absolute and relative fecundity (ABS) and (REL):

Results presented in Table (3) showed that, averages of absolute fecundity were 1215.39 and 1411.71 for the two years 2002 and 2003, respectively, and the differences between means were significant ($p<0.001$) and the same trend was also observed for relative

fecundity, where the averages were 3.31 and 3.66 for the two year 2002 and 2003, respectively.

The values of absolute fecundity were 1327.03 and 1300.07 and the relative fecundity were 3.55 and 3.41 and the differences due to male body weight on absolute and relative fecundity were not significant. Absolute fecundity for the body weights of female groups were 1264.73, 1376.1 and 1299.84 for the three females groups 300, 400 and 500 g, respectively and the differences in absolute fecundity were significant.

The obtained results indicated that, absolute fecundity increased from 1264.73 to 1376.1 as body weight increased from 300 to 400g and then decreased from 1376.1 to 1299.84 as female body weight increased from 400 to 500 g. These results indicated that, the best absolute fecundity was recorded with the second size group (400 g) of female compared to the first and the third size groups (300 and 500 g), respectively. In this respect, **Hashem and El-Agamy (1977)**, revealed that, fecundity is a function related to length, weight and age of different fish species and it increased with increase in these parameters. **Watanabe and Kuo (1985)** reported that, absolute fecundity increased by using large and old tilapia. **Rana (1988) and Bhujel (2000)** indicated that, absolute fecundity is related to body weight, while **De Silva (1986)** found that, absolute fecundity is related to body length.

Table (3): Least squares means and standard error for some factors affecting on absolute and relative fecundity of tilapia broodstock.

Variable	No.	Absolute fecundity	Relative fecundity
Year			
2002	300	1215.39±18.67b	3.31±0.06b
2003	300	1411.71±18.67a	3.66±0.06a
Male			
300 g	300	1327.03±18.67	3.55±0.06
400 g	300	1300.07±18.67	3.41±0.06
Female			
300 g	200	1264.73±22.87b	4.14±0.07a
400 g	200	1376.10±22.87a	3.49±0.07b
500 g	200	1299.84±22.87b	2.82±0.07c

+ Means with the same letter in each column are not significantly differences ($P < 0.05$).

With concern to the effect of body weight of female on the relative fecundity, table (3) showed that, the averages relative fecundity were 4.14, 3.49 and 2.82 for the three females groups 300, 400 and 500g, respectively. These results indicate that, increasing in female body weight lead to significant ($P<0.001$) decrease in relative fecundity. These results are in agreement with **Estay *et al.*, (1997)** who found that, the relative fecundity decreased with increasing of female body weight. On the other hand, **Rana (1986)** and **Bhujel (2000)** stated that, relative fecundity decreased with the decrease in age, body weight and body length of female Nile tilapia

Hatchability percentage:

Results presented in table (4) indicated that, hatchability percentage were found to be 81.44 and 82.73% ; 80.69 and 83.48% ; 82.68, 82.36 and 82.22% for the two years 2002 and 2003; the two male weight groups 300 and 400g and the three female weight groups, 300, 400 and 500 g, respectively and the differences in hatchability attributed to year; male or female body weight were significant ($P<0.001$) and these results are in agreement

with those obtained by **(Gunasekera *et al.,* 1996)** who stated that, hatchability decreased with increasing females body weight. On the other hand, **Morsy (2001)** found that, averages of hatchability percentages in black carp females were 49.76, 58.44 and 88.69% for the weight groups 5-6, 6.5-7.5 and 8-9 kg respectively, these results indicated that, hatchability percentage increased with the increase in body weight of female.

Fry number per fish (FN/F):

The average fry number per fish as affected by year, male and female body weight found to be 869.73 and 1017.52 fry/fish (Table 4) for the two years 2002 and 2003; 950.36 and 936.89 for the two male groups studied 300 and 400 g and 896.25, 987.42 and 997.22 for the three female body weight groups 300, 400 and 500 g, respectively and the differences between averages of fry number per fish attributed to year and female weight were significant ($P<0.001$). **Thorpe (1984)** found that, larger eggs produce significantly larger swim-up fry of tilapia**. Springate and Bromage, (1985)** indicated that, there is no relationship between egg size and survival rates of the eggs, hatched fry and swim-up. **Morsy (2001)** reported that, as black carp female body weight increased, egg weight /fish, absolute fecundity, relative fecundity, larvae number/fish and hatchability percentage increased and this may be followed by increase in the fry number produced by females of black carp.

Fry body weight

With regard to the effect of female body weight on fry body weight, results in Table (5) indicate that, the averages of fry body weight after 2 days were 0.02 g for the three weight groups, 300, 400 and 500 g, respectively. After 10 days the averages body weight of fry were 0.034, 0.036 and 0.035g and the differences between fry body weights attributed to female body weight were significant ($P<0.001$). After 20 days the averages body weight of fry were 0.11, 0.12 and 0.12 g, respectively. Table (3) also showed that, the averages of body weight of fry after 30 days were 0.45, 0.43 and 0.43 g, respectively. These results indicate that, the increase in female body weight leads to decrease in fry body weight.
Gisbert et al., (2000) found that, there was a positive correlation between egg size and total body weight and yolk-sac volume of newly hatched larvae.

Table (4): Least squares means and standard error for some factors affecting on hatchability and fry number of female.

Variable	No.	Hatchability %	FN/F
Year			
Y1 2002	300	81.44±0.19 b	869.73±13.35b
Y2 2003	300	82.73±0.19 a	1017.52±13.35a
Male			
300 g	300	80.69±0.19 b	950.36±13.35
400 g	300	83.48±0.19 a	936.89±13.35
Female			
300 g	200	82.68±0.24a	896.25±16.35b
400 g	200	82.36±0.24a	987.42±16.35a
500 g	200	82.22±0.24b	997.22±16.35a

+ Means with the same letter in each column are not significantly differences (P < 0.05).

Table (5): Least squares means and standard error for some factors affecting on fry body weight of Nile tilapia.

Variable	No.	2 days	10 days	20 days	30 days
Year					
Y1 2002	300	0.020±0.005	0.036±0.005a	0.125±0.005a	0.42±0.005b
Y2 2003	300	0.020±0.005	0.034±0.005b	0.110±0.005b	0.45±0.005a
Male					
M1 300 g	300	0.020±0.007	0.035±0.007	0.12±0.007	0.44±0.007
M2 400 g	300	0.020±0.007	0.035±0.007	0.12±0.007	0.43±0.007
Female					
F1 300 g	200	0.020±0.007	0.034±0.007c	0.11±0.007b	0.45±0.007a
F2 400 g	200	0.020±0.007	0.036±0.007a	0.12±0.007a	0.43±0.007b
F3 500 g	200	0.020±0.007	0.035±0.007b	0.12±0.007a	0.43±0.007b

+ Means with the same letter in each column are not significantly differences (P < 0.05).

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تأثير موسم التناسل ووزن جسم الذكور والإناث على الأداء التناسلى لأسماك البلطى النيلى

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سعيد محمد مرسى الليثى[٣] **أحمد فاروق فتح الباب[٤]**

أجريت هذه الدراسة في مفرخ الشركةِ العربيةِ لمصائد الأسماك التابع لجامعة الدول العربية بقريةِ العباسة، مركز أبو حماد، محافظة الشرقية، مصر. وكانت تهدف هذه التجربةِ دراسة تأثيرِ موسم التفريخ ، وزن مجموعاتِ مِنْ الذكور ووزنِ مجموعاتِ مِنْ الأناث على الصفات التناسلية مِنْ اسماك البلطى النيلى. وقد أستمرت هذه التجربةِ ٤٢٥ يوم (مِنْ الأولِ مِنْ أبريل ٢٠٠٢ حتى التاسع والعشرونِ مِنْ مايو ٢٠٠٣. أستخدمت فى هذه التجربة ٦ أحواض خرسانية أبعاد كل منها (٣ × ١٠ × ١م) . وفى بداية التجربة تم تخزين ٥٠ أنثى و١٧ ذكرِ بكل حوض حيث قُسّمت الإناثَ طبقاً لأوزانها إلى ثلاث مجموعاتِ، ٣٠٠، ٤٠٠ و٥٠٠ جرام والذكور أيضاً قُسّمت إلى مجموعتين ٣٠٠و ٤٠٠ جرام. ويمكن تلخيص النَتائِج في التالي:

- لم يتأثر وزن البيضِ الكليِّ لكلّ أنثى وكذلك وزن بيضِ بالجرام لكلّ جرام مِنْ وزنِ الجسمِ بموسم التفريخ وكذلك وزن الذكور المستخدمة فى التفريخ كما وجد أن وزن البيضِ الكليِّ لكلّ أنثى لمجموعاتِ الأناث الثلاثة ٣٠٠، ٤٠٠ و٥٠٠ جرام كَانت ١٢,٣٣، ١٤,٦٤ و٢١,٩١ جرام على التوالى. وكانت الإختلافات في وزن البيضِ الكليِّ لكلّ أنثىِ وزنِ الجسمِ كَانت غير معنوية.
- كان عدد البيض الناتج من كل انثى كَانتْ ١٢١٥,٣٩ و١٤١١,٧١ لعامى التفريخِ ٢٠٠٢ و ٢٠٠٣كما وصل عدد البيض الناتج لكل أنثى إلى ١٣٢٧,٠٣ و ١٣٠٠,٠٧ عند إستخدام مجموعتى الذكور ذات متوسطات الأوزان ٣٠٠ و٤٠٠ جرام. وكانت ١٢٦٤,٧٣، ١٣٧٦,١ و١٢٩٩,٨٤ لمجموعاتِ الأناث الثلاثة ٣٠٠، ٤٠٠ و٥٠٠ جرام والإختلافات بين هذه المجموعاتِ كَانتْ معنوية جدا لمجموعاتِ الإناث الثلاث.
- وصل عدد البيض لكل جرام من وزن السمكة إلى٣,٣١ و ٣,٦٦ للعامينِ ٢٠٠٢و ٢٠٠٣ ، ٣,٥٥ و ٣,٤١ لمجموعتى الذكور ٣٠٠ و٤٠٠ جرام. أما عدد البيض لكل جرام من وزن السمكة لمجموعاتِ الإناث الثلاث ٣٠٠، ٤٠٠ و٥٠٠ جرام فكان ٤,١٤، ٣,٤٩ و٢,٨٢. وكانت الفروق بين هذه المتوسطات فروقاً معنوية.
- وصلت نسبة الفقس إلى٨١,٤٤ و٨٢,٧٣ % للعامينِ ٢٠٠٢ و ٢٠٠٣ كما وصلت معدلات الفقس إلى ٨٠,٦٩ و٨٣,٤٨ % لمجموعتى الذكور التى كان متوسط وزنها ٣٠٠ و٤٠٠ جرام علي الترتيب . أما تأثيرَ وزنِ الإناث على معدلات الفقس كَانتْ ٨٢,٦٨، ٨٢,٣٦ و٨٢,٢٢ % لمجموعاتِ الإناث الثلاث ٣٠٠، ٤٠٠ و٥٠٠ جرام علي الترتيب وكَانتْ الفروق بين هذه المتوسطات فروقاً معنوية .
- عدد الزريعة الناتجة لكلّ سمكة للعامينِ كانت ٨٦٩,٧٣ ، ١٠١٧,٥٢ لعامى التفريخ ٢٠٠٢، ٢٠٠٣ و ٩٥٠,٣٦ و٩٣٦,٨٩ لمجموعتى الذكور المستخدمتين (٣٠٠ و ٤٠٠ جرام) كما وصل إلى ٨٩٦,٢٥، ٩٨٧,٤٢ و٩٩٧,٢٢ لمجموعاتِ الإناث الثلاث ٣٠٠، ٤٠٠ و٥٠٠ جرام. وكَانتْ الفروق بين هذه المتوسطات فروقاً معنوية .
- بعد ٣٠ يومِ كَانتْ ٠,٤٢ و٠,٤٥ جرامِ لعامى التفريخ ٢٠٠٢، ٢٠٠٣ كَانتْ ٠,٤٤ و٠,٤٣ جرام لمجموعتى الذكور ٣٠٠ و٤٠٠ جرام كما وصلت إلى ٠,٤٥، ٠,٤٣ و٠,٤٣ لمجموعاتِ الإناث الثلاث ٣٠٠، ٤٠٠ و٥٠٠ جرام على التوالى وكَانتْ الفروق بين هذه المتوسطات فروقاً معنوية .

من نتائج هذه الدراسة يمكن التوصية بإستخدام ذكور وإناث والتى يصل وزنها إلى ٣٠٠ جرام فى عمليات التفريخ حيث أنها تعطى أفضل متوسطات للصفات التناسلية المختلفة فى أسماك البلطى النيلى.