

**Effect of temperature and female weight on reproductive performance of two Nile tilapia (*Oreochromis niloticus*) populations**

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**ABSTRACT**

The present study aimed to investigate the effect of temperature and female weight on reproductive performance of Nile tilapia. Reproductive performances of *Oreochromis niloticus* broodstock from two populations (Kafr Elshiek and Abbassa) were examined in hapas held in concrete tanks through three months (May, June and July 2010) in one spawning season at Abbassa (CLAR). A total of 150 females (291.94, 385.68 & 455.68 g) and 75 males (300.148, 300.25 – 300.3 g) from Kafr Elshiek and 150 females (292.5, 387.280 & 456.22 g) and 75 males (300.254–300.44 g) from Abbassa farm were assigned to 6 hapas in 2 concrete ponds (75 m<sup>2</sup>) at a density of 50 females and 25 males per hapa (3x8x1m ie 24 m<sup>3</sup> water volume). Fish were exposed to different levels of water temperature ranging from 26.2 °C to 29.6 °C during the three months.

The result showed that Nile tilapia begins to give fries at water temperature of 26.2 ± 3.6 °C and the highest reproduction activity in Abbassa population was recorded at the temperature of 26.2 ± 3.6 °C. Female gave maximum average number of fries (3.03 ± 0.59 per gram body weight) in May. While, the reproductive activity was maximum in Kafer El-Shakh population at the temperature of 29.6 ± 2.65 °C. Female gave maximum average number of fries (2.99 ± 0.94 fries per gram body weight) in June. The spawning percentage increased during May in Abbassa and kafer El-Shakh (91.63 ± 0.027 & 91.34 ± 2.5% respectively) more than other months and the females (400 g) of Abbassa population gave the highest fries number (1025 ± 16.29 fries / female / month) in May at average water temperature of 26.16 °C and air humidity 44.9 %. While, females (300 g) of Kafer El-Shakh population gave the highest fries number (1021 ± 65.28 fries / female / month) in June at average water temperature 29.6 °C and air humidity 47.23%. The highest relative fecundity increased with the decrease in female body weight. Female of Kafer El-Shiek population with low body weight (300g) showed more relative fecundity (5.32±0.218 fries/g body weight) in June. Also, female of Abbassa population with low body weight (300 g) have more relative fecundity (5.24±0.0014 fries/g body weight) in May. On the other hand, female of Abbassa population with high body weight (500 g) have small relative fecundity (1.44±0.42 fries/g body weight) in July. While,

female of Kafer El-Shiek population with high body weight (500 g) have lower relative fecundity ( $2.34 \pm 0.22$  fries/g body weight) in July.

Average number of fry production per spawn was  $983.07 \pm 51.5$  fries / female for Kafer El-Shiek population in June when water temperature was  $29.6^\circ\text{C}$ . While, average number of fries production per spawn was  $979.33 \pm 50.28$  fries / female for Abbassa population in May when water temperature was  $26.16^\circ\text{C}$ . The result showed that the reproductive performance of *Oreochromis niloticus* could be maximized by holding broodstock under natural photoperiod in water temperature above  $26.16^\circ\text{C}$ , and the optimal reproductive performance occurs through summer season during May and June. Females with height body weight (400 and 500g) gave fries in first generation age 30 days with high body weight in Abbassa (0.44 & 0.43 g respectively) and females with height body weight (500g) give fries in first generation age 30 days with high body weight in Kafer El-Shiek populations (0.43 g). At the optimal water temperature range from 26 to  $29^\circ\text{C}$ , females with the 300 g body weight started to spawn first and have more relative fecundity than high body weight and water temperature affected merely spawning frequency, but not the number of fries produced per spawn.

**Key words:** Reproductive performance, relative and absolute fecundity, *Oreochromis niloticus*, water temperature, two Populations.

## INTRODUCTION

*Tilapia* species are very important either natural or cultured in Egyptian freshwater ecosystems. Economic importance of *Tilapia* is constantly increasing for their fast growth, disease resistance, different feeding habits and palatability (Dagzie, 1982). *Tilapia* researchers world-wide have concluded that one of the most important requirements for the advancement of *Tilapia* culture is the development of systems for mass production of seed (free-swimming fry, sac fry and eggs released from the female's mouth) Hughes and Behrends (1983).

*Tilapias* were second to the carps in weight harvested from culture ponds (Lovshin, 1997). The Nile tilapia, *Oreochromis niloticus*, is the most widely cultured tilapia in the world because of its rapid growth, late age of sexual maturity and planktivorous feeding habits (Gonzalez, 1997). *Oreochromis niloticus* is considered as one of the most commercial and common freshwater fish species. It constitutes a considerable part in the annual fish production of the Northern Delta Lakes of Egypt (Shakweer and Abbas, 2006).

Rising temperature to  $20^\circ\text{C}$  or higher triggers the spawning operations of *Tilapia*, which start in April or May (Mires, 1983). In the Delta area of Egypt, spawning of *Tilapia* extends from April to November with a peak in early summer (El-Saby, 1951). *Tilapia* culture is hindered by reproductive characteristics of its main species. Excessive reproduction in culture ponds reduces the growth rate of adult fish, and reduces marketable size production.

The low fecundity of *Tilapia* can make the production of adequate numbers of fingerlings difficult. *Tilapia* can reproduce in concrete tanks, (Badawy, 1993). Also, he reported that the number of eggs per spawn may differ among species and strains, but within species the larger the female the greater the number of fry produced.

Watanable *et al.* (1995) reported that the variations in water temperatures within an ecological range can markedly influence development rates and survival of prefeeding larve. Also, El-Naggar *et al.* (2000) reported that the incubation period tended to be short with increasing water temperature. Eggs of *Oreochromis niloticus* tended to hatch after 3 to 7 days, depending on temperature and its interaction with protein level and photoperiod. They added that the average hatching period was 6, 5.4 and 3.4 days for incubation temperature of 18-19, 20-23 and 24-27, respectively. Also they said that only water temberature, out of the crude protein and photoperiod had a significant effect on the duration of yolk-sac absorbtation.

Smith (1996) studied the reproductive success and fry survival of red tilapia with genetic components from *O. niloticus*, *O. aureus* and *O. mossambicus* to pure *O. niloticus*. He reported that no significant difference was found in reproductive performance and in fry survival during sex reversal between the red tilapia and Nile tilapia. Nile tilapia females yielded 2,701 fry and red females 2,718 fry per kilogram of body weight per 13- to 19-day spawning cycle. An average of 80 % and 77% of the Nile and red tilapia fry, respectively, survived the 14- to 28-day sex reversal period. Devlin and Nagahama (2002) found that sex determination in fish is a very flexible process with respect to evolutionary patterns observed among genera and families, and within individuals is a subject to modification by external factors. These influences can affect the fate of both somatic and germ cells within the primordial gonad, and include the action of genetic, environmental (e.g. temperature), behavioural, and physiological factors.

Su *et al.* (2008) reported that the genetic correlations of reproductive traits with body weight in rainbow trout at ages prior to 252 days were not significantly different from zero, while those with body weight at ages from 252 to 364 days were significantly greater than zero and increased with increasing age. The range of estimated genetic correlations between reproductive traits and body weight at ages from 252 to 364 days was from  $0.18 \pm 0.08$  to  $0.29 \pm 0.06$ ; for egg size, for egg number, from  $0.21 \pm 0.08$  to  $0.32 \pm 0.06$ ; for egg volume, from  $0.28 \pm 0.08$  to  $0.45 \pm 0.06$  and for post-spawning weight,  $0.25 \pm 0.11$  to  $0.61 \pm 0.08$  g. As a whole, the genetic correlations between reproductive traits and body weight during the first year were favorable, allowing positive genetic improvement in both body weight and reproductive traits.

The objective of this study was to evaluate the effects of different populations origin, water temperature, female brood fish age and brood fish

weight on the production of fries in hapa held in concrete ponds in one spawning season.

## MATERIAL AND METHODS

### I- Breeding systems

Broodstock of Nile tilapia (*Orochromis niloticus*) were collected from different fish farms Sedy Salm City, Kafer El-Shiek Governorate (75 males 300.148 – 300.3 g and 150 females with three different sizes 291.94, 385.68 & 455.68 g). Also, the same numbers of Nile tilapia was collected from Abbassa farm, Sharkia Governorate (75 males 300.254 – 300.44 g and 150 females with three different sizes 292.5, 387.280 & 456.22g body weight. Fish were stocked at a sex ratio of 1 male : 2 females in 6 hapas held in 2 concert ponds (75 m<sup>2</sup>) at a density of 50 females and 25 males per hapa (3x8x1 m).

The water depth was maintained at about 70 cm. Water was changed at a rate of 10% every third day. The experiment lasted 4 months during the spawning season (May, June & July 2010) in Central Laboratory for Aquaculture Research, Abbassa, Egypt. Agricultural Research center (CLAR).

Fish were exposed to water temperature naturally from 26.2 °C to 29.6 °C and air humidity ranged from 44.903 – 56.935 % and fed on a containing diet 32 % protein and 3139.5Kcal/Kg metabolizable energy (ME) for male and female twice daily at a rate of 2.5% biomass weight/day.

Female broodstock were checked for spawning after 14 day from stocking by using net mesh pore 1 mm at the edge of the hapa in the morning. After about 21 days collection of fries and numbering in nursery net enclosures (hapas) we usually made of plastic mosquito netting (mesh pore 1 mm). Hapas are very easy to manage; because fry cannot escape harvesting. For fry collection hapas sizes 1x1 m with a depth of 1 m were suspended on concert pond.

Fries of each location classified in 9 hapas (1x1x1 m) supported in concert pond (75 m<sup>2</sup>) each hapa contain 100 fries and fed diets 40% protein and 2748.5 Kcal/Kg (ME) three times daily (9.00 am, 1.00 pm and 5.00 pm) at a rate of 20% body weight/day.

The water quality parameters of the three concrete ponds showed that ponds have the same ecological conditions were in the following: -

Oxygen (ppm)	Alkalinity mg (CaCO <sub>3</sub> ) / L	NH <sub>4</sub> mg / L
10.56 ± 1.54	365.5 ± 18.5	0.075 ± 0.006

Relative fecundity was calculated in relation to total number of fries per gram body weight of females present in that hapa and the spawning percentages were calculated in relation to total number of fries in one spawn per total number of fries in season x100.

### II- Statistical analysis:

The statistical analysis of data was carried out by applying the computer program SAS (1996). The differences among means were tested for significant

according to Duncan, (1955). The following model was used in statistical analysis:

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

Where:  $X_{ijk}$  = the  $i^{\text{th}}$  observation for the  $k^{\text{th}}$  month,  $j^{\text{th}}$  female body weight and  $i^{\text{th}}$  population;  $\mu$  = overall mean;  $\alpha_i$  = the effect of  $i^{\text{th}}$  population;  $\beta_j$  = the effect of  $j^{\text{th}}$  female body weight;  $\gamma_k$  = the effect of  $k^{\text{th}}$  month;  $\alpha\beta_{ij}$  = the effect of interaction between population and female body weight;  $\alpha\gamma_{ik}$  = the effect of interaction between population and month;  $\beta\gamma_{jk}$  = the effect of interaction between female body weight and month;  $\alpha\beta\gamma_{ijk}$  = the effect of interaction between population, female body weight and month and  $e_{ijkl}$  = Random error.

## RESULTS AND DISCUSSION

In the present study, the reproductive performances of parents and growth performances of its fries were used to identify the two populations of Nile tilapia (*Oreochromis niloticus*) which collected from two locations i.e Kafer El-Shiek and Abbassa. A suitable temperature and controlled photoperiod permit a reasonably close prediction of ovulation time (Shelton, 1999). In the present study, Nile tilapia (*Oreochromis niloticus*) begins to give fries at water temperature  $26.2 \pm 3.6$  °C (Table 1).

As presented in (Table 1), averages of water temperatures were found to be 26.1; 29.6 and 29.3 °C and humidity 44.9; 47.2; 56.9% during May; June and July months respectively.

Table 1: Water temperature (°C) and air moisture (%) during spawning months.

Item	May		Jun		Jul	
	Tem.(°C)	Mos. (%)	Tem.(°C)	Mos. (%)	Tem.(°C)	Mos. (%)
Mean	26.12	44.9	29.6	47.2	29.3	56.9
±SD	3.18	9.76	2.65	8.51	1.56	5.71

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

Total egg weight per female (EWF) and egg weight per gm of body weight (EWG) as affected by population are presented in Table (2). As described in this table the averages of (EWF) were 11.55 and 13.49g and averages of (EWG) as affected with population were 0.3 and 0.04g for the two population Abbassa and Kafer El-Shiek, respectively. These results indicate the EWF for population of Kafer El-Shiek was higher than obtained in population of Abbassa. The same trend was also observed for EWG. The differences between means were significant ( $P < 0.05$ ).

With regard to the effect of body weight of females on EWF results of (Table, 2) showed that, EWF was 11.68, 13.55 and 12.1g and EWG was 0.047, 0.035 and 0.03g for the three female weight groups 300, 400 and 500g

respectively. And the differences among due to the effect of three female weights were significant ( $P<0.05$ ).

Table 2: Least squares mean and standard error for some factors affecting egg weight (g)/fish and egg weight (g)/gm of fish body weight

Variable	No.	Egg weight/Fish	Egg weight/Gm. F
<b>Population (P)</b>			
Abbassa	450	11.55±3.10b	0.03±0.01b
Kafer El-Shiek	450	13.34±3.106a	0.04±0.01a
<b>Effect of weight (W)</b>			
300	300	11.68±3.10b	0.047±0.01a
400	300	13.55±3.10a	0.035±0.001b
500	300	12.1±3.10b	0.030±0.001c
<b>Effect of month (M)</b>			
May	300	14.24±5.85a	0.041±0.02a
June	300	13.52±5.85b	0.043±0.02a
July	300	9.58±5.85c	0.029±0.02b
<b>P* W*M</b>			
P1*W1*M1	50	12.346±6.7b	0.052±0.04a
P1*W1*M2	50	14.240±6.7b	0.057±0.04a
P1*W1*M3	50	10.870 ±6.7c	0.044±0.04b
P1*W2*M1	50	16.078 ±6.7a	0.036±0.04c
P1*W2*M2	50	15.300 ±6.7a	0.045±0.04a
P1*W2*M3	50	11.630 ±6.7c	0.033 ±0.04c
P1*W3*M1	50	13.313 ±6.7ab	0.035±0.04c
P1*W3*M2	50	14.730±6.7b	0.044±0.04b
P1*W3*M3	50	11.570±6.7c	0.025±0.04d
P2*W1*M1	50	13.500 ±6.7c	0.052±0.04a
P2*W1*M2	50	11.740 ±6.7c	0.047±0.04ab
P2*W1*M3	50	7.400 ±6.7d	0.030±0.04d
P2*W2*M1	50	16.530 ±6.7a	0.036±0.04c
P2*W2*M2	50	12.890 ±6.7a	0.037 ±0.04c
P2*W2*M3	50	8.864 ±6.7d	0.025±0.04d
P2*W3*M1	50	13.650±6.7b	0.035±0.04c
P2*W3*M2	50	12.210±6.7b	0.027±0.04d
P2*W3*M3	50	7.140±6.7 d	0.015±0.04e

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

Concerning the effect of month averages of EWF and EWG for months May, June and July were found to be 14.24, 13.52 and 9.58g for EWF and 0.041, 0.042 and 0.029g for EWG, respectively (Table 2). The analysis of variance of results indicate that the highest EWF and EWG were significant ( $P<0.05$ ) in May followed by June and July. These differences may be due to the differences in

environmental conditions such as temperature, water quality and natural food availability from parent stock.

Khater (1985) found that mean production of eggs and fry per Kg/Female body weight of Ghana tilapia strain was higher than those of Egypt and Ivory Coast. This difference was due to the greater frequency of spawning per female in Ghana strain relative to Egypt and Ivory Coast strains. Shaikh and Hafeez (1993) and Ghania, (2008) revealed that long photoperiod-warm temperature accelerated gametogenic progress in the pre spawning season. Short photoperiod, warm temperature had inhibitory or regression effect in most seasons. Warm temperature in the spawning season, stimulated spawning and low temperature inhibited it regardless of photoperiod. Low temperature in long and short photoperiod initiated gonadal recrudescence in both sexes on Cyprinid fish, *Cyprinion watsoni*. The reproduction activity of *Tilapia* begins at 22°C, and the optimal temperature range is 25-29°C (Shmuel and Yoel, 1975) and Watanabe, *et al.* (1995).

El-Naggar *et al.* (2000) reported that spawning percentage for *Oreochromis niloticus* averaged 10 and 34% for natural photoperiod treatments when water temperature increased to 19-21°C. The most reproductive period coincided with a rise in water temperature from 22 to 27 °C. Farag (2003) observed that female body weight play an important role in the beginning of spawning.

Results of Table (2) show that interaction among populations, female weight and months were significant ( $P < 0.05$ ) thus the females of Abbassa population at weight (400g) at May and June recorded the highest EWF and EWG.

#### **Absolute and relative fecundity:**

Concerning the effect of population, regardless of female body weights and months of absolute and relative fecundity for population Abbassa and Kafer El-Shiek were found to be 1042.59, and 1223.78 for absolute fecundity and 82.26 and 85.67 for relative fecundity, respectively (Table 3) for two populations Abbassa and Kafer El-Shiek. The differences between means were significant ( $P < 0.05$ ).

With regard to effect of body weight of females on absolute and relative fecundity were 1089.58, 1201.25 and 1108.73 and the relative fecundity were 4.34, 3.33 and 2.43 for three weight females 300, 400 and 500g, respectively. Analyses of variance show that body weight of females had a significant effect on both absolute and relative fecundity.

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 increase by using large and old tilapia Bhujel (2006) indicated that, absolute fecundity is related to body weight, while De Silva (1986) found that, absolute fecundity is related to body length.

With regard to the effect of month on absolute and relative fecundity, Table (3) showed that, absolute fecundity was 1245.98, 1274.08 and 879.5 for three months. The relative fecundity in the same table was 3.62, 3.82 and 2.67 for three months May, June and July, respectively.

Table 3: Least squares mean and standard deviation for some factors affecting absolute and relative fecundity.

Variable	No.	Absolute fecundity	Relative fecundity
<b>Population (P)</b>			
Abbassa	450	1042.59±18.67b	3.16±0.06b
Kafer El-Shiek	450	1223.78±18.76a	3.37±0.06a
<b>Effect of weight (W)</b>			
300	300	1089.58±18.67b	4.34±0.06a
400	300	1201.25±18.67a	3.33±0.06b
500	300	1108.73±18.67b	2.43±0.06c
<b>Effect of month (M)</b>			
May	300	1245.98±22.18a	3.62±0.07b
June	300	1274.08±22.18a	3.82±0.07a
July	300	879.5±22.18b	2.67±0.07c
<b>P* W*M</b>			
P1*W1*M1	50	1192.660±42.47 c	4.151±0.14 a
P1*W1*M2	50	1330.000±42.47 a	5.320±0.14 a
P1*W1*M3	50	1035.000±42.47 c	4.158 ±0.14 a
P1*W2*M1	50	1321.840±42.47 a	3.483±0.14 b
P1*W2*M2	50	1409.200 ±42.47 a	4.030 ±0.14 a
P1*W2*M3	50	1090.0±42.47 cd	3.120±0.14 bc
P1*W3*M1	50	1236.500±42.47 b	2.675±0.14 c
P1*W3*M2	50	1353.800±42.47 a	2.880±0.14 c
P1*W3*M3	50	1043.000±42.47 c	2.340 ±0.14 c
P2*W1*M1	50	1183.620±42.47 c	5.240±0.14 a
P2*W1*M2	50	1128.200±42.47c	4.520 ±0.14 a
P2*W1*M3	50	668.000±42.47 e	2.670±0.14 c
P2*W2*M1	50	1322.840±42.47 a	3.476±0.14 b
P2*W2*M2	50	1265.600±42.47 b	3.620±0.14 b
P2*W2*M3	50	796.000±42.47 e	2.270±0.14 c
P2*W3*M1	50	1218.400 ±42.47b	2.673±0.14 c
P2*W3*M2	50	1155.68±42.47 c	2.570±0.14 c
P2*W3*M3	50	645.000±42.47 e	1.440±0.14 d

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



**Hatchability percentage:**

Concerning the effect of population, regardless of female body weights and month, averages of hatchability percentage for population Abbassa and Kafer El-Shiek were found 82.26 and 85.67% for two population, 85.46, 82.64 and 83.8% for three weight of females 300, 400 and 500g and 90.83, 82.48 and 78.59 for three months May, June and July, respectively, Table (4). These results indicated that, were found to be, and. And the differences in hatchability percentage attributed to populations, female weights and months were significant ( $P<0.05$ ). These results are in agreement with those obtained by Gunasekera *et al.*, (2006) who found that, hatchability percentage decreased with increasing female body weight. Morsy (2001) found that, hatchability percentage increased with increase in body weight.

The differences between averages of hatchability percentage duo to the effect of the interaction among the three factors were significant ( $P<0.05$ ).

**Fry number per fish (FN/F):**

Concerning the effect of population, regardless of female body weights and month, averages of fry number per fish were found to be 695.7 and 810.29 fry/fish for two population Abbssa and Kafer El-Shiek, 738.66, 776.48 and 743.86 fry/fish for three weight of females 300, 400 and 500 and 932, 853.03 and 473.4 fry/fish for three months May, June and July, respectively. three weight of females and months were found to be g. These results indicated that, fry number increased by increasing in body weight, Table (4). And the differences between means were significant ( $P<0.005$ ). Thorp (2004) found that, larger eggs produce significantly larger swim-up fry of tilapia. Morsy (2001) reported that, by increasing in body weight black carp increase in the fry number produced by females of black carp.

The differences between averages of fry number per fish duo to the effect of the interaction among the three factors were significant ( $P<0.05$ ).

**Fry body weight:**

Concerning the effect of population, regardless of female body weights and month, averages of fry body weight after 2 days were 0.02g for three factors affecting. After 10 days the averages of body weight of fry were 0.035 and 0.036g for two populations, 0.036, 0.035 and 0.034g for three weights off females and, 0.036, 0.035 and 0.035g for three months. After 20days averages of body weight of fry were 0.126 and 0.125g for two populations Abbassa and Kafer El-Shiek, 0.126, 0.125 and 0.125g for three weights off females and 0.126, 0.126 and 0.123g for three months. Table (5) also showed that, the averages of body weight of fry after 30 days were 0.41 and 0.39g for two populations, 0.42, 0.4 and 0.39g for three weights off females and 0.43, 0.42 and 0.4g for three months.

The differences between averages of fry body weight duo to the effect of the interaction among the three factors were significant ( $P < 0.05$ ).

Table 4: Least squares mean and standard deviation for some factors affecting Fry number/fish and Hatchability percentage.

Variable	No.	Fry number/fish	Hatchability%
Population (P)			
Abbassa	450	695.71±14.46b	82.26±0.19b
Kafer El-Shiek	450	810.29±14.46a	85.67±0.19a
Effect of weight (W)			
300	300	738.66±18.12a	85.46±0.23a
400	300	776.48±18.12a	82.64±0.23c
500	300	743.86±18.12a	83.8±0.23b
Effect of month (M)			
May	300	932.83±18.12a	90.83±0.24a
June	300	853.03±18.12b	82.48±0.24b
July	300	473.4±18.12c	78.59±0.24c
P* W*M			
P1*W1*M1	50	823.980±43.7 b	90.240±0.42 b
P1*W1*M2	50	1021.000 ±43.7a	89.120±0.42 b
P1*W1*M3	50	586.000 ±43.7d	79.850±0.42 e
P1*W2*M1	50	936.280 ±43.7a	90.360 ±0.42b
P1*W2*M2	50	981.000 ±43.7a	83.020 ±0.42bc
P1*W2*M3	50	514.000 ±43.7d	80.450 ±0.42c
P1*W3*M1	50	897.160 ±43.7b	91.340±0.42a
P1*W3*M2	50	947.000 ±43.7a	84.938 ±0.42b
P1*W3*M3	50	586.000±43.7d	81.730 ±0.42bc
P2*W1*M1	50	911.000±43.7ab	91.240±0.42a
P2*W1*M2	50	725.000 ±43.7c	82.160 ±0.42bc
P2*W1*M3	50	365.000 ±43.7e	80.150 ±0.42bc
P2*W2*M1	50	1025.000 ±43.7a	91.630 ±0.42a
P2*W2*M2	50	749.000 ±43.7c	75.480 ±0.42d
P2*W2*M3	50	453.400 ±43.7e	74.872 ±0.42e
P2*W3*M1	50	1002.000 ±43.7a	90.160 ±0.42b
P2*W3*M2	50	695.000 ±43.7c	80.140 ±0.42d
P2*W3*M3	50	336.000±43.7e	74.504±0.42e

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

Table 5: Least squares mean and standard deviation for some factors affecting body weight of Nile tilapia fry.

Variable	No.	2days	10days	20days	30days
Population (P)					
Abbassa	450	0.02±0.04	0.035±0.06b	0.126±0.05a	0.41±0.06a
Kafer El-Shiek	450	0.02±0.04	0.036±0.06a	0.125±0.05b	0.39±0.06b
Effect of weight (W)					
300	300	0.02±0.05	0.036±0.07a	0.126±0.07a	0.42±0.07a
400	300	0.02±0.05	0.035±0.07b	0.125±0.07b	0.4±0.071b
500	300	0.02±0.05	0.035±0.07b	0.125±0.07b	0.39±0.07c
Effect of month (M)					
May	300	0.02±0.05	0.036±0.07a	0.126±0.07b	0.43±0.07a
June	300	0.02±0.05	0.035±0.07b	0.126±0.07b	0.42±0.07b
July	300	0.02±0.05	0.034±0.07c	0.130±0.07a	0.40±0.07c
P* W*M					
P1*W1*M1	50	0.02±0.13	0.036±0.14a	0.130±0.14a	0.46±0.13a
P1*W1*M2	50	0.02±0.13	0.035±0.14b	0.130±0.14a	0.40±0.13c
P1*W1*M3	50	0.02±0.13	0.033±0.14c	0.122±0.14e	0.44±0.13a
P1*W2*M1	50	0.02±0.13	0.033±0.14c	0.125±0.14c	0.42±0.13b
P1*W2*M2	50	0.02±0.13	0.035±0.14b	0.123±0.14d	0.43±0.13b
P1*W2*M3	50	0.02±0.13	0.034±0.14bc	0.126±0.14bc	0.40±0.13c
P1*W3*M1	50	0.02±0.13	0.033±0.14c	0.127±0.14b	0.39±0.13d
P1*W3*M2	50	0.02±0.13	0.036±0.14a	0.130±0.14a	0.41±0.13bc
P1*W3*M3	50	0.02±0.13	0.032±0.14d	0.126±0.14bc	0.38±0.13e
P2*W1*M1	50	0.02±0.13	0.036±0.14a	0.126±0.14bc	0.44±0.13a
P2*W1*M2	50	0.02±0.13	0.035±0.14b	0.124±0.14c	0.41±0.13bc
P2*W1*M3	50	0.02±0.13	0.036±0.14a	0.125±0.14c	0.45±0.13a
P2*W2*M1	50	0.02±0.13	0.034±0.14bc	0.129±0.14a	0.43±0.13b
P2*W2*M2	50	0.02±0.13	0.035±0.14b	0.128±0.14a	0.37±0.13d
P2*W2*M3	50	0.02±0.13	0.036±0.14a	0.121±0.14e	0.41±0.13bc
P2*W3*M1	50	0.02±0.13	0.034±0.14b	0.130±0.14a	0.39±0.13d
P2*W3*M2	50	0.02±0.13	0.037±0.14a	0.125±0.14c	0.42±0.13b
P2*W3*M3	50	0.02±0.13	0.034±0.14bc	0.127±0.14b	0.41±0.13bc

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

### CONCLUSION

Based on the obtained results, it could be concluded that, Kafer El-Shiek population were better than of Abbassa population for traits, egg weight per fish, egg weight per gm fish, absolute and relative fecundity, hatchability% and fry number per fish. But the population of Abbassa was better from body weight of Nile tilapia fry.

Female weights 300g were better than female weight 400 and 500g for traits, egg weight per gm fish, relative fecundity, hatchability % and body weight of fry. Female weight 400g is better than female weight 300 and 500g in traits egg weight per fish, absolute fecundity fry number per fish.

May was better than June and July for traits, egg weight per fish, fry number per fish, hatchability % and body weight of fry. But June is a better month than May and July in traits egg weight per gm fish, absolute and relative fecundity.

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