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OPTIMUM STOCKING SIZE OF POST-LARVAE FOR REARING MARINE SHRIMP, *Penaeus semisulcatus,* IN EARTHEN PONDS DURING WINTER AND SUMMER.

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ABSTRACT

The experiment was carried out in six earthen nurseries constructed inside greenhouses with a total area of each of them 300 m^2 and the water area/earthen nursery was 250 m^2 with an average depth of 80 cm. Each nursery was equipped with inlet and outlet pipes. Three stocking sizes, namely 0.8 (PL_{4-5}). 1.3 (PL_{7-8}) and 2.6 (PL_{12-13}) mg/pce of shrimp, *Penaeus semisulcatus*, post-larvae (each in two replicates) were tested during two different seasons, winter (24° C) and summer (30° C) for 35 days. Post-larvae shrimp were fed on crumble feed containing 52 % protein at four meals /day (20 % of body weight). Water quality, survival, growth performance and feed conversion ratio (FCR) of the tested shrimp during both seasons were studied. The results showed that dissolved oxygen decreased significantly as stocking size and water temperature increased. Un-ionized ammonia increased significantly ($P < 0.05$) as stocking size and water temperature increased. Growth rates of the post-larvae were better during winter at high stoking sizes than at lower one. Whilst the opposite was observed during summer, with much better growth rates compared with those of winter for all tested sizes of shrimp. The respective FCR of shrimp were 2.24, 1.31 and 1.03 during winter and 2.82, 2.15 and 2.09 during summer, for 0.8, 1.3 and 2.6 mg/pce stocking sizes, respectively, with significant differences among stocking sizes and between seasons. Survival rates increased significantly with increasing the stocking size but without significant difference between winter and summer. Finally, it could be concluded that the minimum ideal size of shrimp, *P. semisulcatus* to be stocked in earthen nursery or grow-out ponds is at least 1.3 mg/pce.

Keywords: Marine shrimp, Stocking size, Earthen nursery ponds, Seasons, Survival and Growth performance.

INTRODUCTION

Marine shrimp, *Penaeus semisulcatus* is a very important commercial species, often known as flower shrimp when sold in Asian origins. Marine shrimp is used successfully in aquaculture. This is a strongly marked shrimp, with noticeable transverse bans that fade after capture. It looks very similar to *P. monodon,* the giant tiger prawn (Rothlisberg, 1998). The aquaculture of penaeid shrimp has grown from its experimental beginning roughly three decades ago into a major industry which, on a worldwide basis, provides not only employment to hundreds of thousands of skilled and unskilled workers, but also billions of U.S. dollars in revenue, and a high quality food product (Lightner and Redman, 1998). Shrimp farming is one of the most profitable and fast-growing segments of the aquaculture industry (Tacon, 2002). It is currently practiced in over than 50 countries worldwide (FAO, 2001). Shrimp farming, is the production of marine shrimp in impoundment, ponds, raceways and tanks under different degrees of human control (Rosenberry, 2000). Almost all the different penaeid species of commercial importance have been tried under culture conditions by groups of researchers or producers worldwide (Wickins, 1976). Culture conditions are different for each species in terms of water salinity (10 – 40 ppt) and temperature tolerance (18 – 33°C), soil substrate conditions, tolerance to high density, and protein level requirement in feeds (Aquacop, 1985)

Shrimp production includes either direct stoking of post larvae (PL) into grow-out ponds until they reach marketable size (single-phase system) or stoking of PL_S into transitional ponds (nursery ponds) followed by final transfer to grow-out ponds (Samocha and Lawrence, 1992). This culture system is defined as a two-phase culture system (Lawerance *et al.*, 1985 and Lawerance and Hunter, 1987). The three-phase culture system (Parker *et al.*, 1979) includes on additional transfer of shrimp before harvesting. This system has many advantages when shrimp are stocked at higher densities to maximize the carrying capacity of the system and to reduce the possibility of risk and diseases. Samocha and Lawerance (1992) stated that the two-phases system is more common than the three-phases system because handling and transporting of larger shrimp can be more stressful and requires more equipment and experience. So, the present study deals with nursing different stocking sizes of shrimp (*P. semisulcatus)* post-larvae during two seasons (winter and summer) in earthen nurseries in greenhouses.

MATERIALS AND METHODS

The experiment was performed during two seasons (winter and summer) at the Shrimp and Fish International Co. (SAFICO.) to study the possibility of nursing very small sizes of marine shrimp (*Penaeus semisulcatus*) at post-larvae (PL) in earthen nursery ponds. The first experiment was carried out during winter (January – February) at an average water temperature of 24 °C. While the second experiment was performed in summer (June – July) at an average water temperature of 30**°C**. The study period of each experiment was 35 days. These two experiments were achieved under the same conditions of PL quality, rearing, feeding management, fertilization, water exchange rate, aeration system and even the same ponds, except the differences in water temperatures attribute mainly to differences in climatic (season) conditions. Three tested stocking sizes, namely 0.8 (PL_{4-5}), 1.3 (PL_{7-8}) and 2.6 (PL_{12-13}) mg/pce were produced in larval rearing tanks in the hatchery of the same firm. The age of the post larvae in the parlance of the shrimp culturist, is given in terms of the number of days since the animal has been a mysis; a PL that has metamorphosed from a mysis 2 days previously called a PL_2, 10 days before makes it a PL_{10}, and so on (Landau, 1992).

Experimental Ponds

Earthen nursery ponds were constructed inside the greenhouses with a total area of 300 m^2 and the water area was 250 m^2 with average water depth of 80 cm. Greenhouses were covered with light yellow transparent plastic film (200 μm). Every nursery was equipped with 4 inches inlet and outlet pipes. Each nursery was fitted with a longitudinal partition of plastic and one submersible pump (0.75 hp) to create water circulation and improve water quality in general. Each nursery was provided with 4 large pieces of air stones coming from main plower (2 horse power). Inlet water is coming from 4500 m^3 reservoir pond using water pump (2 pistons) working with diesel and producing more than 150m^3 water/hr.

Nursery Pond Preparation

Each nursery was dried perfectly and soil was plowed manually after harvesting the previous nursing run. Nurseries were filled to a depth of 30 cm with full strength marine water (41 – 42 ppt) coming from the reservoir pond and then each pond was fertilized with 10 Kg organic fertilizer which composed of shrimp meal and soybean meal. After 2 days, 3 Kg urea (46.5 % N), ½ Kg super- phosphate and 1 Kg sodium silicate (40 % concentration) were added. Water level was increased every three days. After 7 – 10 days, the concentrations of phytoplankton and zooplankton were improved (blooming enrichment). Periodical fertilization (chemical fertilizer) was performed weekly using half the amounts of the initial fertilizer components. The actual blooming was the main way to judge the need for fertilization, i.e. without using Sechi disk.

Stocking Density and Management System

Post-larvae of *P. semisulcatus* (obtained from the same farm) were stocked at density of 180 pcs/m^2 (216 pcs/m^3) at night for each of the tested stocking sizes (0.8, 1.3 and 2.6 mg/PL) with two replications/treatment. Shrimp were fed with crumble feed (0.5 – 2.0 mm in diameter) containing 52 % protein (Table 1). All feed ingredients were bought from the local markets. The crumbles were made in the farm using a simple wet extruder with a capacity of 50 kg/hr. Feed was offered daily at a rate of 20 % of body weight for each experiment at 4 meals/day. Daily water exchange rate during both experiments was 25 – 30 % of each pond-water volume.

Samples Collection and Analysis

Weekly samples of experimental shrimp (60 pcs) were collected from each nursery pond to estimate the growth performance and re-adjust the quantity of feed. After 35 days, the whole shrimp in all ponds for both seasons were weighed and average final weights were calculated. Proximate chemical analysis was conducted according to AOAC (1990). Water quality parameters including dissolved oxygen, water temperatures (YSI 57 Oxygen meter), salinity (Electric conductivity), and pH (pinpoint pH meter) were measured daily, while un-ionized ammonia (NH_3) was measured using a new colorimeter (HACH DR890) every week. Data were subjected to statistical analysis according to the software program (SPSS version 10). Analysis of variance, one- way ANOVA was used to evaluate each experiment alone in order to test the effect of initial stocking size on the growth performance, survival and feed utilization. However, the interaction between initial stocking sizes and nursing season was evaluated using, the two-way ANOVA. The differences within stocking sizes were evaluated using new LSD test at 0.05 probability (Steel and Torrie, 1980).

RESULTS AND DISCUSSIONS

The proximate analysis (%) of the experimental diet used in the present experiment is shown in Table 1. The diet contained 413.39 Kcal gross energy /100 g dry matter and about 52 % crude protein. The value of protein to energy (P:E) ratio was 125.67 mg protein/Kcal gross energy.

Table (1): Feed ingredients and chemical composition of the experimental diet used for feeding marine shrimp (*P. semisulcatus*) post-larvae reared in earthen nursery ponds under greenhouses.

Ingredients	%
Fish meal (Herring 72 % CP)	50.0
Shrimp meal	15.0
Soybean meal	5.0
Wheat flour meal	20.0
Dunafat[1]	2.5
Gelatin	2.0
Yeast	1.3
Soy lecithin	1.0
De-capsulated artemia cysts-wet weight	1.0
Dried spirulina	0.5
Cod liver oil	0.5
Biogen[2]	0.3
Amino-vitasol[3]	0.4
Potassium phosphate	0.5
Chemical composition	
Moisture	9.50
Crude protein	51.95
Crude fat	9.10
Nitrogen free extract	8.39
Crude fiber	0.53
Ash	20.53
Gross energy[4] Kcal/100g dry matter	413.39
Protein to Energy Ratio (mg protein/Kcal energy)	125.67

[1] Dunafat is marine powdered lipid.
[2] Biogen is a natural non-antibiotic feed supplement comprised of: Allicin (aged garlic extract) not less than 0.247 mole/g, *Bacillus subtilis nato* (6 x 10^7-cells/g), high unit hydrolytic enzymes not less than 3690 units/g (proteolytic, amylolytic, lipolytic and cell separating enzymes), germanium (ginssieng 41.98 ppm of Ge. Element) and organic selenium.
[3] Amino-vitasol is a product composed of amino acids, vitamins and minerals.
[4] Gross energy, calculated on the basis of 5.64, 4.11 and 9.44 Kcal GE/g protein, NFE and lipid, respectively (NRC, 1993).

Water Quality:

Water quality parameters (temperature, dissolved oxygen, pH, and un-ionized ammonia) are shown in Table 2. Mean value of water temperature during the winter period was 24.26° C. Insignificant ($P > 0.05$) differences were found among the initial stocking sizes. At higher water temperatures (during the summer season), the mean value was 30.31° C. Insignificant ($P > 0.05$) differences were found among initial stocking sizes too. A significant ($P < 0.05$) difference was detected between the tested seasons. Kumlu *et al.* (2000) concluded that *P. semisulcatus* is tolerant to low, rather than to high, temperatures during the larval development. The best salinity and temperature combination for *P. semisulcatus* farming was 30 ppt and 30° C, respectively. Temperature as low as 12 – 13 ° C have been reported to be the minimum limit for the most species of penaeieds during the grow-out season cycle (Iwai, 1978). Kumlu *et al.* (2000) found that 22° C slowed the growth and delayed the larval development for *P. semisulcatus* by about 2 – 4 days than at 30° C.

Table (2): Mean values of water temperature, dissolved oxygen, pH and un-ionized ammonia (NH_3) for earthen nursery ponds of marine shrimp (*P. semisulcatus*) post-larvae under different stocking sizes during winter and summer seasons.

Season	Stocking size (mg/pce)			Average[1]
	0.8	1.3	2.6	
	Water temperature (° C)			
Winter	24.38 ± 0.23^a	24.18 ± 0.33^a	24.22 ± 0.29^a	24.26 ± 0.15^b
Summer	30.26 ± 0.08^a	30.34 ± 0.14^a	30.32 ± 0.09^a	30.31 ± 0.06^a
Mean	27.57 ± 1.07^a	27.51 ± 1.12^a	27.54 ± 0.12^a	27.54 ± 0.61
	Dissolved oxygen (ppm)			
Winter	8.46 ± 0.31^a	7.82 ± 0.27^{ab}	7.44 ± 0.40^b	7.91 ± 0.21^a
Summer	7.31 ± 0.26^a	6.97 ± 0.28^{ab}	6.74 ± 0.29^b	7.01 ± 0.16^b
Mean	7.89 ± 0.27^a	7.40 ± 0.23^{ab}	7.09 ± 0.26^b	7.46 ± 0.15
	pH			
Winter	8.46 ± 0.02^a	8.49 ± 0.03^a	8.51 ± 0.03^a	8.49 ± 0.02^b
Summer	8.55 ± 0.03^a	8.54 ± 0.02^a	8.57 ± 0.01^a	8.55 ± 0.01^a
Mean	8.51 ± 0.02^a	8.51 ± 0.02^a	8.54 ± 0.02^a	8.52 ± 0.01
	Un-ionized ammonia (NH3) ppm			
Winter	0.023 ± 0.003^b	0.037 ± 0.008^a	0.041 ± 0.009^a	0.034 ± 0.005^b
Summer	0.043 ± 0.009^b	0.061 ± 0.015^a	0.068 ± 0.016^a	0.057 ± 0.008^a
Mean	0.033 ± 0.006^b	0.049 ± 0.009^a	0.054 ± 0.010^a	0.046 ± 0.005

Means within a row having different superscripts were significantly different ($P < 0.05$).
[1]Means in this column having the same superscript are not significantly different ($P > 0.05$).

Mean values of dissolved oxygen were 7.91 and 7.01 ppm at winter and summer seasons, respectively with significant ($P < 0.05$) difference between seasons. Dissolved oxygen content decreased significantly ($P < 0.05$) with increasing stocking size in both seasons as shown in Table 2. This may be attributed to the increase in the shrimp biomass as a result of increasing stocking size. The present results are within the acceptable range. Oxygen concentration is the major limiting variable in water quality, especially in intensive shrimp culture (Boyd, 1989 and Hopkins *et al.*, 1993). The critical oxygen level for *P. japonica* has been reported between 4.5 and 5.0 ppm (Egusa, 1961), and between 4 and 4.3 ppm for *P. monodon* (Liao and Chien, 1994). Oxygen concentration below 2 ppm reduced significantly growth and survival of *P. monodon* and *P. vannamei* for small shrimp (0.2 – 0.5 gm) (Sediman and Lawrence, 1985).

Data of pH value are shown also in Table 2. In general, the average of pH values was 8.49 and 8.55 for winter and summer seasons, respectively with significant ($P < 0.05$) difference between seasons. There were insignificant ($P > 0.05$) differences among stocking sizes for each season. Higher value of pH in summer than in winter was found, it could be attributed mainly to the improvement in phytoplankton production with improving photosynthesis process in summer. These data are within the best range (pH 8 – 9) for shrimp culture (Boyd, 1989 and Clifford, 1992).

The fluctuation of un-ionized ammonia value (NH3) with stocking size and seasons are shown in Table 2. The mean value of un-ionized ammonia averaged 0.034 ppm during winter and 0.057 ppm during summer. Significant ($P < 0.05$) differences were detected between seasons and among stocking sizes. The present data are very far away from the lethal limits (Wickins, 1976; Boyd, 1989 and Alcaraz *et al.*, 1999).

Growth Performance:

The results of final weight, average daily gain (ADG) and specific growth rate (SGR) of *P. semisulcatus* are presented in Table 3. Significant ($P < 0.05$) differences in final weight and ADG for shrimp were observed between 0.8 and 2.6 mg/pce in either winter or summer seasons. The highest values of final weight and ADG were recorded in 2.6 mg/pce in winter season while in summer season, the 0.8 mg/pce was the highest. There was insignificant ($P > 0.05$) difference in SGR between 0.8 and 1.3 mg/pce, while there was a significant difference between the 1st group and 2.6 mg/pce in winter. In summer, with increasing the stocking sizes, SGR decreased. Insignificant differences were observed among stocking sizes in average final weight and ADG, while the differences were significant in SGR. Final weight, ADG and SGR were significantly ($P < 0.05$) higher in summer than winter, regardless to the stocking size. Chien (1992) stated that temperature was the most important modifier of energy flow and hence growth in aquatic organisms, while salinity imposed the greatest additional load on the metabolic requirements of shrimp. Growth coincide best at around 28 – 30°C and 33 – 40 ppt salinity. O'Brien (1994) found that *P. esculentus* grew faster at 30°C compared with 24°C. Stamples and Heles (1991) reported that growth was faster at 30°C. Hennig and Andreatta (1998) estimated that the average of final weight of *P. paulensis* reared in indoor tanks increased significantly with increasing water temperature from 5.46 mg/pce at 18°C to 14.73 and 24.27 mg/pce at 23 and 28° C, respectively. Also, *P. semisulcatus* larvae grew 2 times higher at 30 ° C than at 22 ° C (Kumlu and Eroldogan, 2000) and 5 times higher at 32° C than at 20° C (Jackson *et al.*, 1992). Moreover, Davis and Arnold (2000) obtained ADG of 0.85, 0.47 and 0.10 mg/pce/day at 28, 23 and 18° C, respectively when started with PL_{10} with average weight of 3.03 mg/pce. Data on SGR of the present study could be considered good when compared with the results obtained by Ponce-Palafox *et al.* (1997), Hennig and Andreatta (1998) and Kumlu *et al.* (2000). Wyban *et al.* (1995) found that SGR of *P. vannamei* decreased from 4.5 – 5 %/day for small size (1.43 – 1.83 g/pce) to 0.62 – 1.10 %/day for bigger size (11.2 – 11.81 g/pce) with better results at 30° C compared with 27 and 23° C.The growth rates obtained in the nursery tanks for many studies were below the levels achieved on commercial farms (Hennig and Andreatta, 1998). The main reason is the possibility that the natural foods could hastened growth rate even in intensive system (Moss *et al.*, 1992).

Table (3): Effect of different stocking sizes of post-larvae on final weight, average daily gain (ADG) and specific growth rate (SGR) of marine shrimp (*P. semisulcatus*) reared in earthen nursery ponds in greenhouses during winter and summer seasons.

Season	Stocking size (mg/pce)			Average[1]
	0.8	1.3	2.6	
	Final weight (mg/pce)			
Winter	204 ± 0.021[b]	295 ± 0.030[ab]	376 ± 0.032[a]	292 ± 0.034[B]
Summer	870 ± 0.030[a]	758 ± 0.033[ab]	671 ± 0.046[b]	766 ± 0.040[A]
Mean	537 ± 0.193[a]	526 ± 0.135a	523 ± 0.088[a]	529 ± 0.076
	Average daily gain (mg/pce/day)[2]			
Winter	5.81 ± 0.60[b]	8.38 ± 0.85[ab]	10.67 ± 0.92[a]	8.28 ± 0.96[B]
Summer	24.84 ± 0.86[a]	21.60 ± 0.93[ab]	19.15 ± 1.25[b]	21.87± 1.14[A]
Mean	15.33 ± 5.51[a]	15.00 ± 3.85[a]	14.91 ± 2.53[a]	15.08 ± 2.17
	Specific growth rate (%/day)[3]			
Winter	15.82 ± 0.30[a]	15.48 ± 0.85[a]	14.21 ± 0.25[b]	15.17 ± 0.334[B]
Summer	19.99 ± 0.11[a]	18.22 ± 0.29[b]	15.90 ± 0.20[c]	18.04 ± 0.752[A]
Mean	17.91 ± 1.21[a]	16.85 ± 0.15[b]	15.06 ± 0.51[c]	16.61 ± 0.584

Means within a row having different superscripts were significantly different ($P < 0.05$).
[1] Means in this column having the same superscript are not significantly different ($P > 0.05$).
[2]ADG = Average daily gain (mg/fish/day): Total gain/experimental period.
[3]SGR = Specific growth rate (%/day): *(ln wt-ln wi/T) x 100*, where *wt* is weight of fish at time *t*, *wi* is weight of fish at time 0, and *T* is the experimental period in days.

Feed Utilization and Survival:

The results on the effect of different stocking sizes of marine shrimp (*P. semisulcatus*) post-larvae reared during winter and summer seasons on final density, survival, final biomass and feed conversion ratio are shown in Table 4. Final density, survival and feed conversion ratio (FCR) had the same trend, where the stocking sizes of 1.3 and 2.6 pce/m^2 were significantly ($P < 0.05$) better than that of 0.8 pce/m^2. Insignificant ($P > 0.05$) difference was detected between winter and summer for final density and survival. In winter, final shrimp biomass significantly ($P < 0.05$) increased with increasing the stocking size. Whilst in summer, there was a significant difference just between stocking size of 0.8 mg/pce and both of 1.3 and 2.6 mg/pce. As the stocking sizes increased, values of final density, survival and final shrimp biomass significantly ($P < 0.05$) increased. A similar trend was observed in FCR with insignificant difference between the stocking sizes of 1.3 and 2.6 mg/pce. Values of final shrimp biomass were significantly ($P < 0.05$) higher in summer than winter. Whilst, values of FCR were significantly ($P < 0.05$) better in winter than summer seasons.

Table (4). Effect of different stocking sizes of marine shrimp (*P. semisulcatus*) post-larvae reared in earthen nursery ponds in `greenhouses during winter and summer seasons on feed conversion ratio, final density, final biomass and survival.

Season	Stocking size (mg/pce)			Average[1]
	0.8	1.3	2.6	
	Feed conversion ratio[2]			
Winter	2.24 ± 0.08^b	1.31 ± 0.09^a	1.03 ± 0.07^a	1.53 ± 0.25^A
Summer	2.82 ± 0.10^b	2.15 ± 0.02^a	2.09 ± 0.06^a	2.36 ± 0.17^B
Mean	2.53 ± 0.19^b	1.73 ± 0.27^a	1.55 ± 0.33^a	1.95 ± 0.20
	Final density (pcs/m²)[3]			
Winter	77.04 ± 5.59^b	131.41 ± 4.69^a	147.78 ± 3.42^a	118.74 ± 13.68^A
Summer	68.60 ± 5.60^b	120.50 ± 5.60^a	139.25 ± 4.35^a	109.45 ± 13.57^A
Mean	72.82 ± 4.04^c	125.96 ± 4.34^b	143.52 ± 3.34^a	114.10 ± 9.29
	Final shrimp biomass (g/m³)[4]			
Winter	18.72 ± 0.58^c	46.28 ± 3.00^b	66.55 ± 4.14^a	43.85 ± 8.87^B
Summer	71.41 ± 3.37^b	109.32 ± 0.42^a	111.83 ± 4.09^a	97.51 ± 8.39^A
Mean	45.06 ± 15.28^c	77.80 ± 18.24^b	89.19 ± 13.28^a	70.68 ± 9.96
	Survival (%)[5]			
Winter	42.80 ± 3.10^b	73.00 ± 2.60^a	82.10 ± 1.90^a	65.97 ± 7.60^A
Summer	38.10 ± 3.10^b	66.95 ± 3.15^a	77.35 ± 2.45^a	60.80 ± 7.54^A
Mean	40.45 ± 2.25^c	69.98 ± 2.41^b	79.73 ± 1.87^a	63.38 ± 5.16

Means within a row having different superscripts were significantly different ($P < 0.05$).
[1] Means in this column having the same superscript are not significantly different ($P > 0.05$).
[2]FCR = Feed conversion ratio: total dry diet fed (g)/total wet weight gain (g).
[3]Initial stocking density was 180 pcs/m².
[4]Final shrimp biomass = Final weight of shrimp (g) in the pond/total volume of pond water (m³).
[5]Survival = 100 (Final number of shrimp/initial number of shrimp).

Temperature had a considerable effect on the overall activity, feed consumption and growth of shrimp (*P. nannamei*) which were relatively inactive and exhibited low feed consumption at 20° C compared with hyperactive animals at 32° C (Ponce-Palafox *et al.*, 1997). Apud *et al.* (1983) stated that FCR value of 1.5 – 2.5 for artificial feed is accepted. The positive relation between water temperature and both of feed consumption and FCR for fish and shrimp in the aquaculture systems has been clarified well. The quantity of consumed feed is high in hot weather and low in cold weather. Therefore, values of FCR in the present study are higher in summer than in winter, in spite of the higher growth rates in hot weather. Otherwise, stocking bigger sizes of post-larvae will increase shrimp production. Farmers in more temperate countries, stock larger or nursery-reared PL_{20-25} in order to obtain more than one production cycle/year (Apud, *et al.*, 1981).

The results of survival concluded that the stocking sizes of 1.3 mg/pce (PL_8) is the minimum ideal size of post-larvae to be stocked in earthen nursery and/or grow-out ponds without expecting a significant rate of mortality. This conclusion was typical to what found by Clifford (1992) who observed that the minimum ideal size for *P. vannamei* is PL_8, but PL_{10} frequently resulted in higher survival. However, in the present study the best size of non-acclimated post-larvae for stocking in earthen nursery ponds would be 2.6 mg/pce (PL_{12}). Tsuzuki *et al.* (2000) recommended that the best age of *P. paulensis* would be PL_{15-20} .These authors obtained survival rate more than 65 % with an average weight of 3.5 g. Hennig and Andreatta (1998) found that the survival rate at 18° C was significantly lower (54.3 %) than that observed at 23 and 28° C (82.3 and 80.4 %, respectively). Moreover, Apud *et al.* (1983) stated that average of shrimp survival in nursery ponds varied between 50 and 90 % with more effective predators control.

Finally, it could be concluded -from the present study- that the minimum ideal size of shrimp PL_S to be stocked in earthen nursery or grow-out pond is at least 1.3 mg/pce. Also, growth rate of post-larvae in earthen nursery ponds during summer season (30°C) was 2 – 4 folds higher than in winter (24°C).

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الحجم الأمثل لتخزين الطور ما بعد اليرقي لجمبري المياه المالحة المربى داخل حضانات ترابية خلال موسمي الشتاء والصيف

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أجريت هذه التجربة في حضانات ترابية تم إنشاؤها داخل صوب زراعية، المساحة الكلية لكل حضانة ٣٠٠ م٢ ، والمساحة المائية لكل حوض ٢٥٠ م٢ بمتوسط عمق ٨٠ سم. وقد جهزت كل حضانة بفتحة رى وأخرى للصرف. وتم اختيار ثلاث أوزان أولية مختلفة من الطور بعد اليرقي للجمبري وهى ٠,٨ (PL4-5) و١,٣ (PL7-8) و٢,٦ (PL12-13) مجم/ وحدة جمبرى خلال موسمين مختلفين هما الشتاء (بمتوسط حرارة مائية ٢٤ °م) والصيف (بمتوسط حرارة مائية ٣٠ °م) وقد استمرت هذه التجربة ٣٥ يوما. تم تغذية الجمبري بعليقة متزنة تحتوى على ٥٢ % بروتين وذلك بمعدل تغذية ٢٠ % من وزن الجسم قسمت على ٤ مرات يوميا. وفى نهاية التجربة تم دراسة جودة المياه وحالة الزريعة من حيث نسبة الإعاشة والنمو ومعامل التحويل الغذائي خلال موسمي التحضين. وقد أشارت النتائج إلى أن تركيز الأكسجين الذائب يقل بزيادة وزن التخزين الأولى ودرجة الحرارة ، بينما ازداد تركيز الأمونيا الغير متأينة بزيادة كل من وزن التخزين الأولى ودرجة الحرارة. كان معدل النمو فى فصل الشتاء أفضل تحت أوزان التخزين الأولية الكبيرة مقارنة بأوزان التخزين الأولية الصغيرة، والعكس كان فى الصيف بالرغم من تحسن معدلات النمو عنه فى الشتاء. وكانت معدلات التحويل الغذائية ٢,٢٤ و ١,٣١ و١,٠٣ خلال فصل الشتاء و٢,٢٨ و ٢,١٥ و٢,٠٩ خلال فصل الصيف للأوزان الأولية ٠,٨ و١,٣ و٢,٦ محم/وحدة جمبري فى الأطوار بعد اليرقية على التوالي، وكانت الاختلافات جوهرية بين أوزان التخزين المختلفة وكذلك بين المواسم. وكان معدل الإعاشة يزيد معنويا بزيادة وزن التخزين الأولى وبدون فروق جوهرية بين فصلى الشتاء و الصيف. وأخيرا فإنه يمكن استنتاج أن أقل حجم (وزن أولى) أمثل لتخزين الجمبري فى الأحواض الترابية أو أحواض النمو هو ١,٣ مجم/وحدة جمبري على الأقل.

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EFFECT OF A HYPER-THYROIDISM DRUG INJECTED IN CHICK EMBRYO OR HATCHED CHICKS ON HATCHABILITY AND PRODUCTIVITY, IN TWO STRAINS OF CHICKENS

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ABSTRACT

Two experiments were carried out to evaluate the Gimmizah (G) chicks for some of their physiological characteristics related to productive efficiency compared with the Rhode Island Red (R.I.R) chicks. In addition, it was also aimed to find out the possibility of improving meat yield from the local strain (Gimmizah) by modifying their thyroid activity that was considered to be involved in energy metabolism which in turn affected productive capacity.

Exp. 1, a total number of 8700 fertile eggs were taken by random from two different populations, the Gimmizah (G.) as a local strain and the R.I.R. as a standard breed in two successive seasons; Winter and Spring.

Exp. 2, a total number of 1020 chicks in two successive seasons; Winter and Spring each of 510 chicks used in this study. Chicks of each population were randomly distributed into 5 equal groups of 51 chicks, which were divided to 3 replicate.

The eggs were injected by Hyper-Thyroidism drug (T_4) or saline solution as a control in the first experiment. The eggs and hatched chicks were injected by the same drug or saline solution as a control in the second experiment, to study the effect of such drug on hatchability and some productivity traits (Body Wt., Wt. Gain, feed consumption and feed conversion) at all periods of estimation from 0 – 14 weeks of age.

The obtained results can be summarized as follows:

Injected eggs with Eltroxin at 18^{th} day of incubation significantly ($P< 0.05$) improved hatchability and depressed embryonic mortality than those injected at 11^{th} day of incubation. The results indicated significant differences between the two population concerning the studied treatments. The chicks hatched in Winter record higher body Wt. and feed consumption than those of the Spring. While Spring significantly improved hatchability (87.38%) as compared to that of Winter (85.27%). Also, Spring had significantly better feed conversion during the experiment period (0 - 14 weeks of age) than Winter (3.22 and 3.36g feed/gain, respectively).

From the findings of this study it can be concluded that injecting incubation eggs with Eltroxin (T_4) at a level of 0.10 µg at the 18^{th} day of incubation (T_{1b}) let to improve the embryonic development during incubation period and the productive performance of the hatched chicks without affecting their physiological profile.

Keywords: strain, season, Hyper-Thyroidism, incubation, productive performance.

INTRODUCTION

The Gimmizah is a local strain of chickens, developed by the Ministry of Agriculture while R.I.R, is one of the double purpose American breeds which was found to be some suitable to the Egyptian environment and can withstand worm weather. A role for thyroid hormones in hatchability processes has been suggested (Balaban and Hill, 1971), and an increase of both triiodothyronine (T_3) and thyroxin (T_4) in plasma was found during the last days of incubation, reaching a maximum the day of piping (Decuypere *et al*,1979$_a$). The T_3/T_4 ratio in thyroid gland remains approximately the same from the 17th day of incubation until hatching (Decoyer et al,1981). However, the production or supply of thyroid hormones by the avian thyroid gland is characterized by extreme preponderance of T_4 over T_3 (Decuypere *et al*, 1979$_b$).

El-Boushy (1961) showed that the hatchability percentage increased from November to March and this effect of months in that respect was significant.

The thyroid gland and its hormonal products play an indispensable role affecting a variety of biochemical reactions at the level of the peripheral tissues which collectively control the basal metabolic activity in general and energy metabolism in particular. The most important target tissues for the action of thyroid hormones are skeletal and cardiac muscles, liver and Kidney (Eberhardt et al. 1980).

The present study was planned to investigate the effects of the population, season and Hyper-Thyroidism drug (T_4) by treating incubated eggs (first experiment) or incubated eggs and hatched chicks (second experiment) on the hatchability and productive performance of hatched chicks.

MATERIALS AND METHODS

The present study was carried out at the Poultry Research Station belonging to Agricultural Experimental and Research Center, Faculty of Agriculture, Mansoura University,Egypt.

The objective of this study was to find out the possibility of improving meat yield from the Gimmizah (G) as a local strain and the Rhode Island Red (R.I.R) as a standard breed in two successive season; Winter and Spring by modifying thyroid activity involved in energy metabolism which in turn has effects on the embryonic development during incubation period and on the productive performance of the hatched chicks. Therefore, two experiments were carried out on thyroid treatment.

The following Table shows the design of the first experiment and number of eggs.

Table 1 : Design of the first experiment

Breed	Treatment		N^0 of eggs in each replicate R_1 R_2 R_3		Hatches		Season	Total
R.I.R	5	X	(45 + 50 + 50)	X	3	X	2	= 4350
Gimmizah	5	X	(45 + 50 + 50)	X	3	X	2	= 4350
Total								= 8700

The average egg weights were 50 and 55 gram for Gimmizah and R.I.R., respectively .

Table 2: Experimental treatments of the first experiment

Treatment[1]	Injected material	T_4 level, µg	Injection time
T_0	0.9%NaCl solution	0.00	Sham treatment
T_{1B}	Eltroxin	0.10	At the11[th] day of incubation
T_{2B}	Eltroxin	0.20	At the 11[th] day of incubation
T_{3B}	Eltroxin	0.10	At the 18[th] day of incubation
T_{4B}	Eltroxin	0.20	At the 18[th] day of incubation

[1]B = Before hatch; T_0 sham treatment that served as a control, the eggs in this treatment was similarly handled as the eggs of the other treatments including injection with a solution of 0.9% Na Cl; T_{3B} and T_{4B} = injected into the embryonic allantoic blood vessel.

The following Table shows the design of the second experiment and the number of chicks.

Table.3: Design of experiment 2

Breed	Treatment		N[o] of eggs in each replicate R_1 R_2 R_3		Season	Total
R.I.R	5	×	(17 +17 +17)	×	2	=510
Gimmizah	5	×	(17 +17 +17)	×	2	=510
Total						=1020

Table 4:Experimental treatments of experimental 2

Treatment[1]	Injected material[11]	T_4 levels, µg	Injection time
T_0	0.9% NaCl Solution	0.00	Sham treatment
T_{1b}	Eltroxin	0.10	At the 18[th] day of incubation
T_{2b}	Eltroxin	0.20	At the 18[th] day of incubation
T_{3A}	Eltroxin	2/100 g B. Wt. Daily	At batch, 2 and 4 weeks of age
T_{4A}	Eltroxin	4/100 g B. Wt. Daily .	At batch, 2 and 4 weeks of age

[1]b =before hatch; to sham treatment that served as a control. The chicks were handled similarly as the chicks of T_{3A} and T_{4A} including injection with a solution of 0.9% NaCl;T_{1b} and T_{2b} = injected into embryonic allantoic blood vessel; T_{3A} and T_{4A}= injected intramuscularly.
[11]Injected Eltroxin was dissolved in 0.9%NaCl solution.

Measurements and Observations :

Exp.1:

Embryonic mortality was classified according to the time of incubation at which it occurred into the following categories.

Category[1]	Time of occurrence from incubation period (days)
D_1	1-7
D_2	8-14
D_3	15-21

[1]D_1 = dead embryos at the end of the first week of incubation; D_2 = dead embryos at the end of the second week of incubation; D_3 = dead embryos at the end of the third week of incubation.

Hatchability % = (Number of health hatch chicks / number of fertile eggs)×100.

Exp. 2:

All hatched chicks were wing banded, individually weighed, vaccinated and kept under the similar and standard conditions of management, hygiene and nutrition. Chicks were individually weighed to the nearest gram at hatch and then at 4 weeks intervals up to the 12^{th} weeks of age and then at 14^{th} weeks of age. Weight gain was measured every four weeks up to the 12^{th} weeks of age and then at 14^{th} weeks of age. Feed consumed by all chicks of each treatment was weighed weekly, it was then averaged and expressed in gram/chick at all the studied periods. Feed conversion was then calculated as a ratio between feed intake (g) and weight gain (g).

Statistical analyses:

Data were analyzed by the analysis of variance according to Snedecor and Cochran (1982). Significant differences among means were detected by the method of Duncan (1955).The following model was used:-

$Y_{ijkl} = U + B_i + T_j + S_k + (BT)_{ij} + (BS)_{ik} + (TS)_{jk} + (BTS)_{ijk} + e_{ijkl}$

Where:

Y_{ijkl} = individual record;
U = overall mean;
B_i = effect of the breed;
T_j = effect of the treatment;
S_k = effect the seasons;
$(BT)_{ij}$ = effect of interaction i the breed and j the treatment;
$(BS)_{ik}$ = effect of interaction between i the breed and k the season;
$(TS)_{jk}$ = effect of interaction between j the treatment and k the season;
$(BTS)_{ijk}$ = effect of interaction between i the breed and j the treatment and k the seasons;
e_{ijkl} = residual error.

RESULTS AND DISCUSSION

1- Hatchability percentage:

Data presented in (table 5) shows that the hatchability percent of fertile eggs as affected by breed, season or treatments applied. It could be stated that R.I.R. eggs had significant (p<0.01) higher hatchability (87.28%)when compared with Gimmizah (85.36%)ones .Similar results were reported by Rizkalla (1996). Injected eggs with Eltroxin at a level of 0. 10 or 0.20 µg at the 18^{th} day of incubation significantly (p<0.01) improved hatchability percent (91.10 and 89.23 %, respectively)when compared with those injected at the 11^{th} day of incubation (87.09 and 85.48 %, respectively). This may be attributed to the role of thyroid hormones in hatching process as suggested by (Balaban and Hill, 1971), and an increase of both triiodothyronine (T_3) and thyroxine (T_4) in plasma which was found during the last days of incubation, reaching a maximum at the day of piping (Decuypere rt al.,1979a).

Table 5 : Means ± Standard errors of hatchability % of fertile eggs for different experimental groups as affected by breed, Eltroxin in treatment and season.

Breed	Season	Experimental treatments[a]										Overall mean	
		T_0		T_{1B}		T_{2B}		T_{3B}		T_{4B}			
		No[b]	Mean ± SE	No	Mean ± SE	No	Mean ± SE	No	Mean ± SE	No	Mean ± SE	No	Mean ± SE
G.	Winter	435	76.35 ± 0.43	435	85.38 ± 0.88	435	83.28 ± 0.66	435	89.51 ± 0.74	435	88.67 ± 0.74	2175	84.64 ± 0.77
	Spring	435	79.83 ± 0.80	435	86.54 ± 0.97	435	85.36 ± 0.68	435	90.74 ± 0.71	435	87.98 ± 0.63	2175	86.09 ± 0.64
	Mean	870	78.09 ± 0.61	870	85.96 ± 0.65	870	84.32 ± 0.52	870	90.12 ± 0.52	870	88.32 ± 0.48	4350	85.36 ±0.50[b]
R.I.R.	Winter	435	77.51 ± 0.44	435	87.19 ± 0.58	435	85.14 ± 0.87	435	90.64 ± 0.66	435	88.98 ± 1.00	2175	85.91 ± 0.79
	Spring	435	81.21 ±0.63	435	89.26 ± o.61	435	88.12 ± 0.67	435	93.51 ± 0.61	435	91.32 ± 0.51	2175	88.66 ± 0.68
	Mean	870	79.36 ± 0.58	870	88.22 ± 0.48	870	86.63 ± 0.64	870	92.07 ± 056	870	90.15 ± 0.62	4350	87.29 ± 0.53[a]
	Winter	870	76.93 ± 0.33	870	86.28 ± 055	870	84.21 ± 0.57	870	90.07 ± 050	870	88.88 ± 0.61	4350	85.27 ± 0.54*b*
	Spring	870	80.52 ± 0.52	870	87.90 ± 0.65	870	86.74 ± 0.57	870	92.12 ± 0.57	870	89.59 ± 0.56	4350	87.38 ± 0.48*a*
Overall mean		1740	78.72 ± 0.43[B]	1740	87.09 ± 0.44[C]	1740	85.48 ± 0.45[D]	1740	91.10 ± 0.41[A]	1740	89.23 ± 0.41[B]	8700	86.32 ± 0.37

[a] T_{1B} and T_{2B} were injected at day 11, but T_{3B} and T_{4B} were injected at day 18 of incubation.
[b] No of fertile eggs.
A-B:Means in the some row haing different superscripts are significantly different at $P<0.05$.

Similar results were obtained by Hassan (1997) who reported that the treatment of eggs with either Eltroxin or growth hormone had highly significant (P<0.01) effect on hatchability.

Eggs injected in Spring had significant (P<0.01) higher hatchability percentage (87.38 %) as compared to that of Winter (85.27%). El-Boushy (1961) showed that the hatchability percent increased from November to March and that the effect of months in that respect was significant.

2-Body weight and weight gain:

Data in tables (6 and 7) showed that there were significant (p<0.05) increase in either body weight at 4 weeks of age or weight gain during rearing period from o to 8 weeks of age by R.I.R. chicks than Gimmizah ones.

Table 6:Means ± standard errors for body weight (g) of different experimental groups affected by studied factors at different ages.

Factors	No.	Age in weeks			
		4	8	12	14
Breed:					
Gimmizah	495	397.2^{B}	902.44^{B}	1415.0^{B}	1614.5^{B}
Rhode Island Red	488	422.02^{A}	991.17^{A}	1496.5^{a}	1688.3^{A}
Season:					
Winter	496	439.37^{A}	1028.8^{A}	1512.5^{A}	1699.8^{A}
Spring	487	379.85^{B}	864.78^{B}	1399.0^{B}	1603.0^{B}
Treatments:					
T_0 (control)	193	359.59^{d}	832.8^{d}	1352.5^{c}	1557.3^{c}
T_{1b}	202	442.9^{a}	983.36^{ab}	1478.6^{ab}	1688.4^{ab}
T_{2b}	195	418.49^{bc}	949.61^{c}	1451.2^{b}	1643.4^{b}
T_{3A}	199	422.63^{b}	999.04^{a}	1509.2^{a}	1709.5^{a}
T_{4A}	194	404.43^{c}	969.19^{bc}	1487.2^{ab}	1658.4^{ab}
Overall mean	983	409.61	936.8	1455.7	1651.4

A,B or a-d means having different superscripts in the some column in each factor are significantly different at P< 0.05.

These results agreed with those obtained by Rizkalla (1996) who found highly significant differences among Fayoumi Dandarawi and R.I.R. breeds for body weight at 4 and 8 weeks of age, regardless of treatments (with either Eltroxin or Neo-mercazole) and bird's sex.

Treatments applied had significant higher body weight at 4 and 8 weeks of age and weight gain during the experimental periods 0 - 4 and 4 – 8 weeks of age as compared with control. It could be noticed that the T_{1b} the heaviest either body weight and weight gain up to 8 weeks of age followed by T_{3A} and T_{2b}, respectively. The higher either body weight or weight gain was noticed for chicks treated by T_{4A}. These results agreed with those obtained by Van Tienhoven *et al.*,(1966); Gomaa (1990) and Hassan (1997).

Table 7:Means ± standard errors for body weight gain (g) of different experimental groups as affected by studied factors at different intervals in weeks.

Factors	No.	Age in weeks			
		0 - 4	O - 8	8 -12	0 - 14
Breed:					
Gimmizah	495	397.2^{B}	863.98^{b}	712.03	1576^{B}
Rhode Island Red	488	422.02^{A}	951.91^{A}	697.12	1649^{A}
Season:					
Winter	496	439.37^{A}	990.31^{A}	670.95^{A}	1661^{A}
Spring	487	379.85^{B}	825.57^{b}	738.20^{B}	1564^{B}
Treatments:					
T_0 (control)	193	359.59^{d}	794.44^{d}	724.45	1519^{c}
T_{1b}	202	442.9^{a}	943.18^{ab}	705.01	1948^{ab}
T_{2b}	195	418.49^{bc}	910.10^{c}	693.80	1604^{b}
T_{3A}	199	422.63^{b}	960.96^{a}	710.16	1671^{a}
T_{4A}	194	404.43^{c}	931.03^{bc}	689.16	1620^{ab}
Overall mean	983	409.61	907.94	704.57	1613

A, B or a – d means having different superscripts in the same column in each factor are significantly different at P< 0.05.

It was obviously clear that treating incubated eggs as well as hatched chicks with thyroid hormone had significant effect on either embryonic development (which is reflected on body weight at hatch) or rate of growth of hatched chicks.

Irrespective of breed or season perusal of the data during the entire rearing period from 0 to 8 weeks of age, showed that the best body weight and weight gain was achieved with the chicks of T_{3A} followed by T_{1b}, but the highest body weight gain was recorded for the chicks of T_{2b}.

Regardless of treatment and breed , body weight gain of chicks hatched in Winter significantly ($p<0.05$) increased than that of the Spring during all studied intervals between day–old and 8 weeks of age.

During the entire growing period (8 -14wks), regardless the effect of treatment and season, the average body weight at either 12 or 14 wks for R.I.R. chicks significantly ($p<0.05$) increased than Gimmizah ones. These results agreed with those obtained by Rizkalla (1996).

Results showed that, all treated groups had significantly heavier body weight at either 12 or 14 weeks of age than the control group. It was observed that chicks treated by T_{3A} had the heaviest body weight followed by T_{4A} and T_{1b}. The lighter body weight was noticed for chicks treated by T_{2b}. Similar results were obtained by Parker (1943) who found that growth was greatest from eight to twelve weeks of age in Rhode Island Red chicks receiving 0.025 % thyroactive iodocasein.

Regardless of treatment and breed, highly significant effect due to season was observed on body weight either at 12 or 14 weeks of age. The present results agree with those obtained by El-Turky *et al.*, (1980) and El-Turky,(1981).

Regardless the effect of treatment and season of the year, there were no significant differences in body weight between the two breeds during the growing period (8 – 14 weeks of age).

Generally, the differences in body weight gain during the growing period (8 – 14 weeks of age) due to the effect of treatments were insignificant.

Irrespective of the treatment and season of the year, body weight or weight gain at experimental period (0 - 14) weeks for R.I.R. chicks was significantly heavier than Gimmizah ones.

Regardless the effect of breed and season of the year, the overall mean for all treated groups had heavier body weight gain at 14 weeks of age than the control. It could be noticed that the T_{3A} had the heaviest body weight and weight gain followed by T_{1b}, the lightest body weight was noticed for groups of treated chicks by T_{4A} followed by T_{2b}.

The present results agree with those obtained by Van-Tienhoven *et al.*, (1966), Drominey *et al.*, (1973) and Gomaa, (1990) who found that injecting Hubbard broiler eggs with either 0.5 or 1.0 µg Eltroxin resulted in heavier body weight when compared with control.

The effect of season in body weight and weight gain at 14 weeks of age was significantly higher in Winter as compared with Spring.

3- Feed consumption and conversion:

Data presented in Tables (8 and 9) show averages of feed consumption (g/bird) and feed conversion (g feed/g gain) for experimental groups of Gimmizah chicks and R.I.R. ones.

Table 8: Mean ± standard errors for feed consumption (g) of different experimental groups as affected by studied factors at different intervals in weeks.

Factors	No.	Age in weeks			
		0 - 4	0 - 8	8 -12	0 - 14
Breed:					
Gimmizah	30	833.59^B	2164	3249^A	5413^A
Rhode Island Red	30	869.71^A	2178	3003^B	5178^B
Seasons:					
Winter	30	905.79^A	2311^A	3248^A	5557^A
Spring	30	797/50^A	2031^B	3004^B	5035^B
Treatments:					
T_o (control)	12	734.24^d	1877^d	2848^c	4721^e
T_{1b}	12	796.09^c	2040^c	2906^c	4945^d
T_{2b}	12	858.91^b	2192^b	3145^b	5337^c
T_{3A}	12	914.25^a	2293^b	3256^b	5549^b
T_{4A}	12	954.75^a	2453^a	3475^a	5928^a
Overall mean	60	851.65	2171	3126	5296

A,B or a-e means with different superscripts in the same column in each factor are significantly different at p<0.05.

Table 9: Mean ± standard errors for feed conversion of different experimental groups as affected by studied factors at different intervals in weeks.

Factors	No.	Age in weeks			
		0 - 4	0 - 8	8 - 12	0 - 14
Breed:					
Gimmizah	30	2.34^{A}	2.56	4.66^{A}	3.43^{A}
Rhode Island Red	30	2.29^{B}	2.30	4.36^{B}	3.15^{B}
Season:					
Winter	30	2.27^{B}	2.38^{B}	4.92^{A}	3.36^{A}
Spring	30	2.36^{A}	2.47^{A}	4.11^{B}	3.22^{B}
Treatments:					
T_0 (control)	12	2.29^{c}	2.47^{b}	3.97^{d}	3.12^{c}
T_{1b}	12	1.99^{d}	2.18^{d}	4.21^{c}	3.00^{d}
T_{2b}	12	2.27^{c}	2.43^{bc}	4.57^{b}	3.33^{b}
T_{3A}	12	2.40^{b}	2.41^{c}	4.68^{b}	3.33^{b}
T_{4A}	12	2.62^{a}	2.66^{a}	5.13^{a}	3.67^{a}
Overall mean	60	2.31	2.43	4.51	3.67

A,B or a –d means with different superscripts in the same column in each factor are significantly different at $p < 0.05$.

Results obtained showed that the breed had a significant effect on feed consumption allover the rearing period (0 – 8) weeks. However, its effect was found to be significant during the period from (0 – 4) wks. of age only R.I.R. chicks had the better feed conversion (2.30) allover the rearing period compared by Gimmizah all studied age intervals from 0 to 8 wks and the differences between them were significant($p<0.01$). It was observed that the chicks treated by T_{4A} had the highest value in feed consumption followed by T_{3A}. The lowest value of feed consumption was recorded for the chicks treated by T_{2b} followed by T_{1b}. ones (2.56).

All treated groups consumed more feed as compared to the control at all studied age intervals from 0 – 8 wks and the differences between them were significant (0<0.01). It was observed that the chicks treated by T_{4A} had the highest value in feed consumption followed by T_{3A}. The lowest value of feed consumption was recorded for the chicks treated by T_{2b} followed by T_{1b}. However, the best feed conversion was found with the group of treated chicks by T_{1b} followed by T_{3A}, while those treated by T_{4A} converted food less efficiently.

At the same time, and regardless the effect of treatment and breed, the chicks hatched in the Winter had the higher feed consumption (2311g) and the better feed conversion (2.38) allover the rearing period compared with those hatched in the Spring (2031 and 2.47) for feed consumption and conversion, respectively.

R.I.R. chicks had significant lower feed consumption (3003g) and the best feed conversion (4.36) allover the growing period (8 – 14 weeks of age) compared with Gimmizah ones (3249g and 4.66) for feed consumption and feed conversion, respectively. This may be attributed to thyroid activity as related to strain differences in growing chickens (Glazener and Shaffener, 1948). Applied treatments had highly significant ($p<0.01$) effect on average feed consumption during growing period (8 – 14 weeks of age). Generally, all treated groups consumed more feed and decreased feed utilization as compared to the control, while T_{1b} recorded the best feed conversion.

These results agreed with those reported by Samak (1996) and Hassan (1997) who found that injecting birds with thyroxin significantly increased feed consumption. However, thyroid hormones play a major part in regulating oxidative metabolism of birds (Ringer, 1976). Any pronounced alteration in thyroid function, i.e., hyperthyroidism or hypothyroidism was reflected in an altered metabolic rate goitrogens reduce, whereas thyroid hormones stimulate, metabolic rate (Ringer, 1965). However, May (1979) found that broiler chicks fed 1.0 ppm T_3 (3,5,3 triiodthyronine)had consistently lower feed efficiency than controls, while feeding them T_4 (thyroxin) at the same dosage did not affect this trial.

It was noticed that chicks in the Spring had better feed conversion at growing period (4.11 gm feed/gm gain) than that of the Winter (4.92 gm feed/gm gain). This may be attributed to the greater thyroid weight and activity in the Spring than in the cold months of Winter.

Regardless, the effect of treatment and season of the year, R.I.R. chicks had the higher feed consumption (5178g) and the better feed conversion (3.15) allover the experimental period (0 -14wks) compared with Gimmizah ones (5413 and 3.43) for feed consumption and conversion, respectively.

Treatments applied had highly significant ($p<0.01$) effect on feed consumption and conversion allover the experimental period. It was noticed that chicks treated by T_{4A} had the highest value of feed consumption followed by $T_{3A.}$ The lowest value of feed consumption were recorded for the chicks treated by T_{2b} followed by $T_{1b.}$ However, it was observed that the chicks treated by T_{1b} had better feed conversion during the experimental period (o – 14weeks of age) compared with those of other treatments applied. These results agreed with those obtained by Bruke *et al.*,(1987) and Vasilatos *et al.*,(1988).

CONCLUSION

From the finding of this study it can be concluded that injecting incubation eggs with Eltroxin (T_4) at a level of 0.10 µg at the 18th day 18th day of incubation (T_{1b}) let to improve the embryonic development during incubation period and the productive performance of the hatched chicks without affecting their physiological profile

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تأثير حقن مستخلص الثيروكسين في البيض المفرخ أو الكتاكيت الفاقسه على نسبة الفقس والإنتاجيه في سلالتين من الدجاج

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أجريت تجربتان لتقييم دجاج الجميزه من حيث صفاته الفسيولوجية المرتبطه بالكفاءه الإنتاجيه وذلك بمقارنته بدجاج الرودأيلند الاحمر كنوع اجنبى. كما هدفت الدراسه إلى بحث إمكانية تحسين محصول اللحم من السلالة المحلية بواسطة تعديل نشاط الغدة الدرقية والتي يقع عليها عبء تمثيل الطاقة في الجسم حيث يتوقف عليها درجة الكفاءه الانتاجيه.

ففي التجربة الأولي أخذ ٨٧٠٠ بيضة مخصبة عشوائياً من عشيرتين مختلفتين من الجميزة كسلالة محلية والرودأيلند الأحمر – كنوع قياسي في موسمين متتاليين الشتاء والربيع. أما في التجربة الثانية فقد استخدم ١٠٢٠ كتكوت سن يوم في مجموعتين (٥١٠كتكوت في الشتاء , ٥١٠ كتكوت في الربيع) ووزعت كتاكيت كل عشيرة عشوائيا في خمس معاملات متساوية (٥١ كتكوت/معاملة/موسم) ثم قسمت كتاكيت كل معامله في ثلاثة مكررات(١٧كتكوت/مكررة).حقن البيض بمستحضر الثيروكسين ومحلول ملحي كمجموعة مقارنه في التجربة الأولي أما في التجربة الثانية حقن البيض والكتاكيت الفاقسه بنفس المستحضر ومحلول فسيولوجي كمجموعة مقارنه, وذلك لدراسة تأثير المستحضر على نسبة الفقس وبعض الصفات الانتاجيه(وزن الجسم – الزياده المكتسبه في وزن الجسم – استهلاك العلف – كفاءة التحويل الغذائي) في جميع الفترات المحسوبه من الفقس حتى عمر ١٤ أسبوع.

ويمكن تلخيص النتائج المتحصل عليها فيما يلى :-

حقن البيض في اليوم ال ١٨ من التفريخ حسن معنوياً من نسبة الفقس وخفض من معدل النفوق الجنيني عن حقن البيض في اليوم ال ١١ من التفريخ. كما ان النتائج قد أشارت إلي الاختلافات المعنويه بين العشيرتين وكذلك بالنسبة للمعاملات المستخدمة. وسجلت الكتاكيت الفاقسه في الشتاء أعلي معدل في وزن الجسم واستهلاك العلف عن الأخرى الفاقسه في الربيع. بينما حسن الربيع معنوياً من نسبة الفقس(٨٧,٣٨ %) عن الشتاء (٨٥,٢٧ %) أيضا كان الربيع أفضل معنوية في كفاءة تحويل الغذاء خلال فترة التجربة (صفر- ١٤اسبوع من العمر) عن الشتاء (٣٢٢, ٣٣٦, جم غذاء/جم زياده مكتسبه علي الترتيب).

اعتمادا علي نتائج هذه الدراسه يمكن استنتاج أن حقن البيض بالألتروكسين (T4) عند مستوى١٠,.ميكروجرام في اليوم ال ١٨من التفريخ قد أدى إلي تحسين في النمو الجنيني خلال فترة التفريخ وكذلك في الأداء الأنتاحي للكتاكيت الفاقسة بدون تأثير علي الحاله الفسيولوجية للطيور.