

NUTRITIONAL AND MANAGEMENT STUDIES ON THE PIGEON:

EFFECT OF PROTEIN, METABOLIZABLE ENERGY LEVEL AND/OR SEASON ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF PIGEONS.

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Received: 21/10/2009

Accepted: 05/12/2009

Abstract: *An experiment was designed to determine the effect of feeding two dietary levels of CP (16 and 14%) with two metabolizable energy levels (2800 and 2600 ME Kcal /kg of diet) on the performance of local Baladi pigeons under Egyptian conditions through four seasons during the years 2007-2008. A total number of 48 pairs of parent Baladi pigeons (24 months old) was distributed according to their consistent mating systems (sex ratio of pigeons 1:1). At the beginning, pigeons were divided randomly into equal four treatment groups containing 12 pairs, each at 3 replicates of 4 pairs each. Diets were formulated in mash form containing vitamins and minerals premix. Feed and water were given ad-libitum along the experiment.*

Results obtained are summarized as follows:

1- *Independently of the effect of dietary energy levels and seasons, final body weight (FBW) and body weight change were improved as dietary protein level increased. A significant improvement was recorded in egg number (EN), egg weight (EW), daily crude protein intake of pairs with or without squabs (g/day), daily energy intake of pairs without squabs (kcal/day). Squab production (weaning number), squabs weaning weight (g) at 28 days and body weight gain in squabs (BWG) from 1 to 28 days were enhanced with the increase in dietary protein level. Fertility, hatchability and dead embryo were not affected significantly by feeding different levels of crude protein (CP) and dietary energy levels (ME). Egg cycle (day), daily feed intake of pairs with or without squabs (gm/day), incubation period of pigeons (days) and squabs mortality rate% of low CP level were significantly higher than those of the other levels.*

2- Regardless of season effect and dietary protein levels, dietary energy levels had no effect on fertility, hatchability, dead embryo and mortality rate. Feed intake, of pairs either with or without squabs significantly decreased with increasing dietary energy levels. The increase in dietary energy level significantly improved FBW, change in body weight, EN, EW, squab production (weaning number at 28 days), squabs weaning weight (g) and body weight gain of squabs, 1-28 days (BWG).

3- Regardless of dietary protein levels and energy levels seasons had not affected squabs mortality rate. Spring and winter seasons had the highest values followed by autumn season, whereas the pattern became vice versa with summer season.

4- Dietary protein levels, dietary energy levels and season interacted significantly to affect the all productive and reproductive performance parameters

It is concluded that diet containing 2800 kcal/kg with 16 or 14% CP level was suitable requirement and satisfactory for production and reproduction of pigeons during the spring, autumn and winter seasons. While the diet containing 2600 kcal/kg with 14% CP level had a negative effect on production and reproduction of pigeons at the summer season. Additionally, these diets were economically better.

INTRODUCTION

Animals can measure photoperiod (day length) and adapt to seasonal changes in the environment by altering their physiology and behavior accordingly. Although this photoperiodic response has long been of interest, the underlying mechanism has only recently begun to be uncovered at the molecular level (**Ono et al. 2008**). Under the appropriate conditions of light, warm, and nutrition, pigeons could breed and lay year round. Pigeons may be raised under wide seasonal ranges of temperature, humidity, light, and barometric pressure, if kept in flies pens. A 12-hours light and 12 hours dark diurnal cycle is commonly provided, although 14 hours light will enhance breeding activity (**Sturtevant and Hollander 1978**). Reproductive phenology is governed by a combination of genetic and environmental factors (**Gwinner 2003 and Lambrechts et al. 1999**).

The fact that the reproductive cycle is consistent year to year suggests that breeding is being driven by either an endogenous rhythm, some factor in the environment, or a combination of both (**Gwinner, 2003**). At this point, it is unclear whether the differences in timing of breeding between the populations are due to genetically based differences between

the populations, phenotypic plasticity, or a combination of both. Seasonal reproduction in these populations is most likely occurring independent of photoperiod. It is unknown if seasonal changes in timing of dawn and dusk are important for these birds (**Borchert et al. 2005**). **Ballay and Meleg (1992)** found that the autumn and spring seasons had the highest means of fertility. Autumn and summer seasons had the highest means of hatchability, while summer and autumn seasons had the lowest means of embryonic mortality. **Sargisson et al. (2007)** reported that the weights of pigeons with free access to food, monitored over 3 calendar years in the laboratory, were found to fluctuate with season. All pigeons were at their heaviest weight in the winter and were lightest in summer.

Seasons had a significant effect on the all studied productive traits (egg number/female/season, egg weight, squab number/ female/season and squab pair weight at 28 days of age). Winter and spring seasons had the highest significant means of egg number per female. While the summer and autumn seasons had the lowest significant mean. Spring and winter seasons means were significantly higher than those in autumn and summer seasons in egg weight. **El-Hanoun et al. (2008)** and **Sailaj et al. (1988)** found that the ovaries and oviducts began to enlarge in January, were fully developed in February, and began to regress in March. During this time there was no significant change in the concentration of plasma luteinizing hormone (LH) or estradiol. **Michael et al. (1995)** reported that pigeons lived in individual chambers where instantaneous metabolic rate (MR; indirect calorimetry), body temperature (T_b), and substrate utilization (RQ) were measured 24 times (each hour) throughout the 12h:12h light: dark cycle. The amount of food consumed influenced the amplitude of the MR and T_b cycles, primarily by affecting the dark-phase segment of the cycle.

Waldie et al. (1991) reported that 16 % crude protein was sufficient for pigeons without adversely affecting egg production or number of young pigeons produced. However, **Meleg et al. (1999)** reported that dietary crude protein levels of 12,14,16,18 and 20 % at a ME concentration of 11.8 to 12.1 MJ/Kg failed to affect the length of the egg cycle, annual egg production, egg weight, hatchability of eggs laid, hatchability of fertile eggs and mortality of squabs up to weaning. **Bottcher et al. (1985)** showed that increasing CP content from 12, 14, 15, 16, to 18 % of the diet did not influence annual squab's production per breeding pair. **Abou Khashaba et al. (2008)** reported that the highest CP level of pigeon (20% CP) was the best compared with other CP levels (18, 16 and 14% CP). The diet containing 14% CP level was suggested to be suitable requirement and had no adverse effects on productive and reproductive performance of local

Baladi squabs and pigeons. **Abd El-Azeem *et al.* (2007)** showed that the highest energy level of pigeons (3200 Kcal ME/kg) was the best as compared with other energy levels (2600, 2800 and 3000 Kcal ME/kg).

In Egypt very limited information is available concerning performance of Baladi pigeons. Thus the present study aimed to study the effect of diets with different crude protein levels (14 and 16%) and different metabolizable energy levels (2600 and 2800 ME Kcal/kg diet) on the productive and reproductive performance during the laying period in winter, spring, summer and autumn under Egyptian conditions.

MATERIALS AND METHODS

The experimental work was carried out at El - Gimmizah Production Sector and El - Gimmizah Poultry Research Farm, Agriculture Research Center, Ministry of Agriculture; during years 2007/2008. This work aimed to study the effect of feeding pigeons on diets containing two different protein levels P1 (14%) and P2 (16%) each with two levels of metabolizable energy ME1 (2600 kcal/kg feed) and ME2 (2800 kcal/kg feed) throughout 12 consecutive months represented four seasons on productive and reproductive performance. A total number of 48 pairs of parent Baladi pigeons (24 months old) was distributed according to their consistent mating systems (sex ratio of pigeons 1:1). At the beginning, pigeons were divided randomly into equal four treatments containing 12 pairs each at (3 replicates of 4 pairs each). The birds were housed under similar environmental conditions, all pairs were randomly allocated to wire poultry cages 100 x 70 x 40 cm high, the fronts of the cage batteries were modified to suspend feed and water. Feed in mash form and water were provided to birds ad-libitum. In each breeding cage, two male and two female pigeons were allowed to form couples on a random basis. In each breeding cage, the pigeons were able to feed their squabs up to the age of 28 days, the weaning stage. At this age squabs were ready and in prime condition for slaughter or were transferred to be reared further. Throughout the year, natural light patterns were offered, with pigeons experiencing naturally long day length in four seasons. The composition of the experimental diets is shown in Table 1.

During the 4 seasons in Nile delta, Winter recorded temperature from 5.2 to 23.2°C, relative humidity ranged from 82 to 86% and day length from 10.55 to 11.33 hr. Spring recorded temperature from 10.0 to 34.0°C, relative humidity ranged from 70 to 76% and day length from 12.30 to 14.00 hr. Summer recorded temperature from 17.1 to 34.6°C, relative humidity ranged from 75 to 80% and day length from 14.03 to 12.46 hr. Autumn recorded temperature from 8.5 to 30.5°C, relative humidity ranged

from 80 to 85% and day length from 10.00 to 11.02 hr. (**Egyptian Meteorological Authority**) The following measurements were performed or calculated, initial body weight, final body weight, changes in body weight, daily feed intake per pair with or without squab, total feed intake per pair (through winter, spring, summer and autumn), egg cycle (interval between to consecutive egg laying (days)), egg number, egg weight, fertility, dead embryo. hatchability, squabs production per pair, squabs growth during 28 day, body weight gain (BWG) in squabs during 28 day, squabs mortality rate, and net return (NR) and economic efficiency (E. Ef).

A completely randomized design, with a factorial arrangement of treatments (2x2x4), was used. Data were analysis using General Linear Model (GLM) procedure of Statistical Analysis System (**SPSS 10, 1997**). Significant differences among means were separated by Duncan's multiple range test (**Duncan, 1955**).

RESULTS AND DISCUSSION

Productive performance of pigeons:

1- Body weight and change in body weight:

Effect of crude protein (CP), metabolizable energy (ME) levels or seasons on the performance of pigeon is presented in (Table 2), It is clear that, pigeons fed the lowest dietary level (14 % CP) had significantly ($P \leq 0.05$) less final body weight compared to those fed the 16% CP diet. Also, there was significant effect of dietary energy (ME) level on final body weight of pigeons during four seasons of production. Change body in weight of pigeons was affected significantly by feeding different CP and ME levels.

If weights are compared across season in (Table 2), it is clear that the final body weights of all pigeons were significantly lower in the summer and winter than in spring or autumn. While, change body weights of all pigeons were significantly lower in the summer than in the other seasons.

Dietary protein levels, dietary energy levels and season interacted significantly to influence final body weight and change in body weight (Table 2).

This result is in agreement with the work of **Clark (1979)** who found significant seasonal variation, where gain weight in the spring and autumn reached a maximum in the winter. Also, **Kangas and Branch (2006)** and **Rebecca *et al.* (2007)** found that all pigeons were at their heaviest body weight in the winter and were lightest in the summer. The

latter authors found that all pigeons gained weight in the autumn and were heaviest in the winter. However, there is some evidence of an increasing body weight trend in autumn for all pigeons, and a decreasing trend for pigeons in spring.

It could be concluded that pigeons fed the highest dietary levels of CP and ME during autumn and spring recorded heavier final body weights and body weight gain while pigeons fed the lowest dietary levels in summer season recorded the lowest final body weight and body weight gain. This may be due to heat stress in summer season that negatively affect feed intake values.

2- Egg laying cycle:

Pigeon fed low protein and low energy diets recorded the longest egg cycle (Table 2). Length of egg cycle (interval between to consecutive egg laying, days) was significantly affected by season. Winter and autumn seasons had the highest significant length of egg cycle (51.08 and 50.95 day, respectively) but the difference between them was not significant. While the summer seasons had the lowest significant length egg cycle (49.97 day) the differences between spring and autumn seasons were not significant.

Dietary protein levels, dietary energy levels and season interacted significantly to influence egg laying cycle (Table 2). The longest egg cycle was noticed in group fed 14% CP with 2600 kcal/kg diet in winter season while the shortest egg cycle was observed in group fed 16%CP with both ME levels (2800 or 2600 kcal/kg diet) followed group fed 14% CP with 2800 kcal/kg diet in summer season

The length of the egg cycle values depending on the activity of parents to rear of their squabs and times of environmental conditions (light, warm, and nutrition). This result is in agreement with that reported by **Abou Khashaba et al. (2009)** who found that the length of the egg cycle values of adult pigeons significantly increased (from 49.12 to 52.75 days) due to decreasing dietary ME levels (from 3200 to 2600 ME Kcal /kg of diet). **Abed Al-Azeem (2005)** also found that the interval between two consecutive egg laying (days) were ranged from 45.80 to 54.60.

3- Egg number (EN), Egg weight (EW):

The effects of dietary protein levels (P), dietary energy levels (ME) and seasons the year on egg number (EN) and eggs weight (EW) of Balady pigeons are presented in Table (2). Egg number and egg weight were significantly affected by increasing CP or ME levels in the diet.

According to season, the egg number (EN) and egg weight (EW) of pigeon were significantly affected by season. Winter and spring seasons had the highest EN and EW values followed by autumn and then summer season. Summer season had the lowest significant EN (3.33 eggs) and EW (13.19 g) values compared with other seasons.

The interaction of dietary protein levels, dietary energy levels and season were analyzed. Dietary protein levels, dietary energy levels and season interacted significantly to affect the EN and EW, the highest EN and EW were noticed with pigeons receiving 16% CP with 2800 kcal/ kg diet in spring, winter and autumn seasons. The lowest EN and EW were observed with the level of 14% CP plus 2600 kcal/ kg diet in summer season.

This result is in agreement with **Abou Khashaba *et al.* (2008)** who showed that egg weight significantly ($P<0.05$) increased as CP levels increased in the diet, the recorded value of egg weight ranged from 14.67 to 15.51g. **Abd El-Azeem *et al.* (2007)** found also that egg weight ranged from 13.78 to 17.38 g when dietary ME levels increased from 2600 to 3200 ME Kcal /kg of diet in local Baladi pigeon in an experimental station. **El-Hanoun *et al.* (2008)** found that seasons had a significant ($P<0.05$) effect on the egg number/female/season and egg weight. Each hen of pigeon usually lays two eggs per clutch (**Bokhari 1994**). **Abd El-Azeem (2005)** who reported that there are 7 cycles/year that mean that female pigeon can produce up to 14 eggs/year.

It could be concluded that the average egg number and egg weight of pigeons fed the highest energy diet (2800 kcal/kg diet and 16 % CP) with either spring or winter season was higher than that of the other groups. Low dietary protein level (14% CP) either with high or low energy level (2800 or 2600 kcal/kg diet) in summer season have a negative effect on average egg number and egg weight of pigeons.

4- Daily feed intake of the pigeons without or with squabs:

Data indicated that daily feed intake of pigeons with or without squabs were significantly ($P<0.05$) increased as the CP and ME levels decreased (Table 2). The amount of feed intake significantly ($P<0.05$) increased with winter season of pigeons with or without squabs followed by spring and autumn seasons. While summer season had significantly ($P<0.05$) decreased amount of feed intake of pigeons with or without squabs.

Dietary protein levels, dietary energy levels and season interacted significantly to influence feed intake (Table 2). The highest FI during the all

experimental periods was noticed in groups fed 2600 kcal/kg diet with 14 or 16% CP during all season specially in winter season of pigeons with or without squabs followed by spring and autumn seasons while the lowest FI was observed in group fed 2800 kcal with 14 or 16% CP specially in summer season. Winter season recorded the highest daily protein and energy intake values compared with the summer season which recorded the lowest values of pigeons with or without squabs, with significant differences among season.

These results agree with **Abed Al-Azeem (1998)** who found that increased level of protein diet of pigeons caused a decreased in the amount of feed consumed at different periods. **Morely (1974)** showed that the amount of feed consumption by pigeon is determined by the amount of protein consumed. On contrast to the present results, **Meleg et al. (1999)** found that increasing level of diet CP (12, 14, 18 and 20%) had increased significantly the feed and protein intakes. Pigeons consumed higher quantities of the high protein diets than of the others. **Abou Khashaba et al. (2008)** observed that the feed intake by pigeons increases at all period when the protein level increases from 14 to 20%. Also the protein intake increasing with the increases in feed intake.

Waldie et al. (1991) indicated that feed intake and protein intake decreased with the increasing of dietary energy levels in the diet. **Plavnik et al. (1997)** and **Nahashon et al. (2005)** suggested that as dietary energy levels increased birds satisfy their energy needs by decreasing feed intake. **Abd El-Azeem et al. (2007)** indicated that feed, protein and metabolizable energy intake were significantly ($P < 0.05$) decreased as the ME levels increased from 2600 to 3200 ME Kcal /kg of diet.

Reproductive performance of pigeons:

1- Incubation period of pigeons (days):

Results in Table (3) indicated that, the low protein level group recorded significantly high incubation period of pigeon's egg (17.84 days) than those of the high protein level (17.64 days). The average incubation period of pigeons fed the highest energy level (2800 kcal/kg diet) was significantly ($P \leq 0.05$) less than those fed the lowest energy diet. Also, seasons had a significant ($P \leq 0.05$) effect on the incubation period of pigeons egg, where winter season had the long incubation period (18.50 days) followed by spring (17.89 days) and autumn (17.47 days) seasons. While summer season had the short incubation period (17.18 days).

The interaction of dietary protein levels, dietary energy levels and season were analyzed. Dietary protein levels, dietary energy levels and season interacted significantly to affect the incubation period. The longest period was noticed with pigeons receiving 14 or 16% CP with both dietary ME levels in winter seasons followed lay pigeons receiving 14 % CP with 2600 kcal/ kg diet in spring seasons. The shortest incubation period was observed with the level of 14% CP plus 2600 kcal/ kg diet in summer season.,

This result is in agreement with **Silver (1978)** recorded that the duration of incubation is 18 days from laying of the first egg in pigeons, but only 15 days in doves. Hatching takes about 24 hours from first pipping of the shell. **Bokhari (1994)** who illustrated that incubation period lasted from 17 to 18 days and shared by both parents.

Fertility and hatchability:

Data showed that fertility, hatchability and dead embryo were not significantly affected by increasing the CP and ME levels in the diet (Table 3). Seasons had a significant ($P<0.05$) effect on the fertility, hatchability and dead embryo percentages. Spring season had the highest values for fertility and hatchability percentages followed by autumn and winter. However, dead embryo (%) was higher in winter, autumn and summer seasons. Moreover, the lowest values of fertility and hatchability percentages were recorded during summer.

The interaction of dietary protein levels, dietary energy levels and season were analyzed. Dietary protein levels, dietary energy levels and season interacted significantly to affect the fertility, hatchability and dead

embryo. The highest fertility and hatchability percentages were noticed with pigeons receiving 16% CP with 2800 kcal/ kg diet in spring season, winter and autumn seasons. The lowest fertility percentage was observed with the level of 14% CP plus 2800 kcal/ kg diet in summer season. While the lowest hatchability percentage was observed with the level of 16% CP plus 2800 kcal/ kg diet in summer season. The highest dead embryo percentage was observed with the level of 14% CP plus 2600 kcal/ kg diet in winter season

This result is in agreement with **Meleg et al. (1999)** and **Abou Khashaba et al. (2008)** who found that increasing level of protein (12, 14, 16, 18 and 20% CP) had no effect on fertility and hatchability. On the other hand, results of **Abed Al-Azeem (1998)** showed that fertility rates decreased by increasing level of protein in the diets. While, hatchability percentage of

pigeon eggs was not affected by increasing level of protein in the diets. Also, **Bottcher *et al.* (1985)** showed that fertility of pigeon eggs decreased when the increased protein level from 12 to 18%. **Abd El-Azeem *et al.* (2007)** and **Waldie *et al.* (1991)** indicated that fertility percentage of pigeons was not affected by the energy levels.

El-Hanoun *et al.* (2008) reported that seasons had a significant ($P<0.05$) effect on the fertility and hatchability percentages, where spring and winter seasons had the highest values followed by autumn and summer seasons, whereas the pattern became vice versa for embryonic mortality and pipped eggs percentages. Embryonic mortality percentage was not significantly affected by seasons. Moreover, **Ahmed and Mahmoud (1992)** reported that season had an effect on reproductive traits of pigeons, with a decrease in fertility and hatchability percentages during summer season.

Observational data suggest that spring and autumn seasons recorded the highest values of fertility and hatchability and lowest values of dead embryo

Productive performance of squabs:

1- Squab production:

The data of squab production are presented in (Table 4). Number of squabs produced per treatment was significantly ($P<0.05$) increased by the increasing of CP and ME levels in the diet. Results indicated that the high protein level (16% CP) or high ME level (2800 ME Kcal /kg of diet) recorded significantly the highest number of weaned squabs than the low protein level (14% CP) or low ME level (2600 ME Kcal /kg of diet).

Irrespective of the effect of dietary protein levels and dietary energy levels, seasons had a significant ($P<0.05$) effect on the number of weaned squabs. The spring season recorded significantly high number of weaned squabs (3.18) than the other seasons. While, summer season recorded significantly low number of weaned squabs (2.39). No significant differences were found between winter and autumn seasons (2.91 and 2.81 respectively).

Dietary protein levels, dietary energy levels and season interacted significantly to number of squabs (Table 4). The highest squabs numbers were noticed in group fed 16%CP with 2600 or 2800 kcal/kg diet in spring season, while the lowest squabs numbers were observed in group fed 14%CP with 2800 kcal followed group fed 14%CP with 2600 kcal diet in summer season.

These results are in agreement with the findings of **Abou Khashaba et al. (2008)** who showed that the number of squabs per pair was significantly ($P < 0.05$) increased as dietary CP levels increased from 14 to 20%. **Meleg et al. (1999)** also found that increasing level of protein (12,14, 16,18 and 20% CP) had significant differences among the treatments in the number of squabs hatched and weaned squabs when pigeon fed 20% CP diet. While, **Abed Al-Azeem (1998)** showed that increasing level of protein in the diet (14, 17 and 20%) decreased the number of squabs per treatment and number per pairs in a year.

Abou Khashaba et al. (2009) showed that the number of squabs produced per treatment was significantly ($P < 0.05$) increased by the increase of ME levels in the diet. Also, **Abd El-Azeem et al. (2007)** showed that number of squabs per treatment was significantly ($P < 0.05$) increased as dietary energy levels increased from 2600 to 3200 ME Kcal/kg of diet.

El-Hanoun et al. (2008) shows that all over mean of squabs/female/season was lower in summer and autumn seasons by almost 30% compared to those in winter and spring seasons. **Fred et al. (1953)** found that squabs number was high during the spring season and low during the autumn season. The obtained result was lower than that reported in statement noted by **Abdel-Azeem (2005)**. Seasons had a significant effect on this trait whereas squab number per female per season was the same (3.03 squab) for both winter and spring seasons, which were significantly ($P < 0.05$) higher than those of the summer (2.06 squab) and autumn (2.34 squab) seasons.

2- Squabs weaning weight (SWW, g) and Body Weight Gain BWG (g) at 28 days:

The effects of dietary protein levels (CP), dietary energy levels (ME) and seasons during the year on squabs weaning weight (SWW) and body weight gain (BWG) of balady pigeons at 28 days are presented in Table (4). Significant differences were observed in the (SWW) and (BWG) of squabs which fed different levels of protein. Pigeon fed 16% CP recorded significantly the highest weight. Also significant differences were observed in the weight of weaned squabs and BWG which fed different levels of energy. Pigeon fed diet containing high energy level recorded significantly heavier weight compared with pigeon fed the low energy level.

Significant differences were observed in the weight of weaned squabs and BWG between seasons. Spring season had the highest significant ($P < 0.05$) value of SWW and BWG, while summer season had

the lowest significant ($P<0.05$) value of squab weight. All squabs weight were higher in the spring (276.93g SWW and 263.79 g BWG) and were lightest in the summer (248.80g SWW and 236.97 g BWG). While winter recorded (269.98g SWW and 256.63 g BWG) and autumn recorded (263.24g SWW and 250.34 g BWG).

Dietary protein levels, dietary energy levels and season interacted significantly to influence squabs weaning weight (SWW) and body weight gain (BWG) as shown from Table (4). The highest SWW and BWG during the experimental periods was noticed in groups fed 2600 kcal/kg diet with 16% CP during spring season while the lowest SWW and BWG were observed in group fed 2600 kcal with 14 % CP in summer season.

These results are in agreement with **Abou Khashaba *et al.* (2008)** who showed that pigeon fed diets containing the higher level of CP (20%) recorded significantly the highest body weight at 28 days of age compared with those fed the lowest CP level (14%). **Bokhari (1994)** indicated that squabs grow very rapidly until about 21 days, and then the growth continued at slower rate afterwards. **Abd El-Azeem *et al.* (2007)** showed that growth rate of squabs at 28 days of age significantly ($P<0.05$) increased when dietary energy levels increased from 2600 to 3200(ME Kcal/ kg diet). On contrast to the present results, **Abed Al-Azeem (1998)** showed that increasing level of protein in the diet decreased squabs growth.

EL-Hanoun *et al.* (2008) showed that weights of squab pair at 28 days of age were fluctuated with season. Spring season had the highest significant ($P<0.05$) mean of squab weight. The summer season had the lowest significant ($P<0.05$) mean of squab weight (365.7 g). **Sargisson *et al.* (2007)** found that the weights of pigeons with free access of food were the lightest in the summer season and the heaviest in the winter season. Also, **Ahmed and Mahmoud (1992)** found that squab weights at 28 days of age were lower in summer and autumn seasons.

It can be inferred from the average SWW and BWG at 28 days of pigeons fed the highest energy diet (2800 kcal/kg diet) with 16 or 14% CP at four seasons were higher than those of the other groups. Simultaneously, decreasing of dietary protein level (14% CP) and high or low energy levels (2800 or 2600 kcal) at four seasons, specially summer season have a negative effect on average SWW and BWG at 28 days.

3- Squabs mortality rate:

The high protein level (16%CP) had a significant effect on mortality rate compared with the low protein level (14%CP). But squab's mortality rate during the 28 days of age was not significantly affected by the increasing of ME levels in the diet. Also, seasons did not affect mortality rate during experimental period (Table 4).

The squabs mortality rate percentage of pigeon squabs influenced by the interaction of dietary protein levels, dietary energy levels and season

Net Return (NR) and Economic Efficiency (EEf):

The cost of one kg diet decreased with decreasing of dietary protein and energy levels in the diet (Table 5). The best record of economic efficiency was detected in pigeons fed the highest dietary protein level 16% CP diet. The economic efficiency for pigeons fed 2800 kcal/kg diet recorded the highest value compared to pigeons fed 2600 kcal/kg diet. Spring season recorded the highest values of NR and EEf. While winter season recorded the lowest values of NR and EEf than those of other seasons

The interaction of dietary protein levels, dietary energy levels and season affected the NR and EEf. The highest values were noticed in groups fed 16%CP with 2800 kcal/kg diet in all seasons while the lowest values were observed in groups fed 14%CP with 2600 kcal in winter, spring and autumn seasons followed lay group fed 14%CP with 2800 kcal diet in summer season.

From economic point of view, it appears that the spring season or autumn season in pigeon parents' diets is economically effective.

From the results of this experiment, it can be concluded that the crude protein and metabolizable energy content of pigeons diets play important roles on performance and reproduction of pigeon. Feeding high crude protein and metabolizable energy diets in spring season (good natural environmental conditions) increased both the number and the weight of weaned squabs. This may be due to the increase of alive squabs in treatment one with the decrease of feed cost.

Dietary CP and ME level is considered as the major factors that affect the productive performance of pigeon from economical point of view, since CP and ME costs are important items in the total feed costs of poultry feeding.

Experience has shown that the diet containing 2800 kcal/kg diets in 16 or 14% CP levels were suggested to be suitable requirement and satisfactory for production and reproduction of pigeons at the spring, autumn and winter seasons While the diet containing 2600 kcal/kg diets in 14% CP levels had a negative effect on production and reproduction of pigeons at the summer season. Such results will help to reduce the cost of the diets for these improved pigeons.

Table (1): Composition and chemical analyses of the experimental diets.

Ingredients(%)	Diet 1 14%CP+ 2600kcal	Diet 2 14%CP+ 2800kcal	Diet 3 16%CP+ 2600kcal	Diet 4 16%CP+ 2800kcal
Yellow corn	60.00	69.00	58.00	68.00
Soybean meal, 44 %CP	14.00	16.50	21.00	23.00
Wheat bran	22.00	10.00	16.70	4.70
Limestone	2.40	2.60	2.30	2.30
Di. Cal. ph	1.00	1.30	1.40	1.40
Common salt (NaCl)	0.30	0.30	0.30	0.30
Vit. & Min. mix.*	0.30	0.30	0.30	0.30
Total	100	100	100	100
Calculated values**:				
Crude protein, %	14.08	14.07	16.21	16.06
ME,Kcal/kg	2608.20	2809.45	2628.40	2852.00
Crude fiber,%	4.82	3.89	4.30	3.76
Ether Extract,%	3.27	3.15	3.04	2.95
Calcium, %	1.24	1.32	1.25	1.24
Available phosphorus, AP %	0.415	0.414	0.472	0.419
Lysine, %	0.675	0.702	0.846	0.861
Methionine,%	0.254	0.264	0.285	0.294
Methionine + cysteine %	0.506	0.510	0.567	0.569
Pries / ton (LE)	1543	1596	1636	1681

*Vit.& Min. mix (Agri-Vet Co.):. each 3kg contains: 10,000,000 IU Vit. A; 2,000,000 IU Vit D₃ 10,000 mg Vit. E;1,000mg Vit. K; 1,000mg Vit. B1; 5,000mg Vit. B2; 1,500mg Vit B6; 10mg Vit. B12; 30mg; Niacin, 20 gm ; Panatothenic acid, 1gm, Biotin;1,000mg Folic acid;250,000mg choline chloride; 80gm manganese; 40gm iron; 40gm zinc; 2gm copper; 2gm iodine; 1gm Selenium and 1gm cobalt.

** Calculated according to NRC (1994).

Table (2): Effects of dietary crude protein (CP), metabolizabol energy (ME) levels and seasons on productive performance of pigeons.

Items	Initial body weight(g)	Final body weight(g)	Change in body weight gain (g)	Egg lying cycle (day)	Egg number	Egg weight(g)	Daily feed intake of pairs without squabs (gm/day)	Daily feed intake of pairs with squabs (gm/day)during 28 days	Total FI without squabs during 90 days	Total FI with / without squabs during 90 days
% Protein CP		*	*	*	*	*	*	*	*	*
14%	367.06	370.12	3.05	51.05	3.42	13.43	81.71	120.98	7360.31	9297.49
16%	376.98	386.76	9.77	50.68	3.88	14.32	77.42	111.31	6968.43	8665.95
Energy ME (kcal ME/kg)		*	*	*	*	*	*	*	*	*
2600	368.02	371.71	3.68	50.84	3.51	13.65	81.83	120.25	7365.00	9270.52
2800	376.02	385.17	9.14	50.53	3.80	14.09	77.37	112.04	6963.75	8692.93
Season S	*	*	*	*	*	*	*	*	*	*
Winter	357.13c	373.11b	15.97a	51.08a	3.85a	14.10ab	97.16a	129.69a	8745.00a	10349.50a
Spring	373.11b	385.81a	12.69b	50.72b	3.87a	14.31a	81.45b	116.30b	7331.25b	9060.29b
Summer	385.81a	372.02b	-13.78d	49.97c	3.33c	13.19c	66.16d	107.28d	5955.00d	8029.18d
Autumn	372.02b	382.80a	10.77c	50.95ab	3.56b	13.88b	73.62c	111.32c	6626.25c	8487.93c
Interaction S x CP x ME		**	**	**	**	**	**	**	**	**
Winter x 14% x 2600 kcal	357.89	369.71f	11.82def	51.75a	3.41bcd	13.38efg	105.08a	139.66a	9457.50a	11140.89a
Winter x 14% x 2800 kcal	355.67	371.13ef	15.46cd	51.16abc	4.00a	13.86de	95.16c	126.68c	8565.00c	10118.65c
Winter x 16% x 2600 kcal	357.17	371.27ef	14.09cde	50.91bcd	3.91ab	14.41bc	100.16b	131.25b	9015.00b	10554.67b
Winter x 16% x 2800 kcal	357.81	380.34cdef	22.52a	50.50cde	4.08a	14.75ab	88.25d	121.16d	7942.50d	9583.76d
Spring x 14% x 2600 kcal	369.71	376.61def	6.90gh	51.33ab	3.66abc	13.63defg	85.84d	125.83c	7725.00d	9689.23d
Spring x 14% x 2800 kcal	371.13	383.32cde	12.18def	51.17abc	3.75ab	13.94cde	81.33e	117.35e	7320.00e	9091.90e
Spring x 16% x 2600 kcal	371.27	383.51cde	12.24def	50.41de	4.00a	14.68ab	79.41ef	113.87f	7147.50ef	8870.84f
Spring x 16% x 2800 kcal	380.34	399.80ab	19.46ab	50.00e	4.08a	15.00a	79.25ef	108.14h	7132.50ef	8589.21g
Summer x 14% x 2600 kcal	376.61	351.99g	-24.62k	50.33de	2.83e	12.74h	68.58ij	116.83e	6172.50ij	8589.39g
Summer x 14% x 2800 kcal	383.32	370.17ef	-13.15j	49.91e	3.16cde	13.16fgh	66.91jk	108.35h	6022.50jk	8116.10i
Summer x 16% x 2600 kcal	383.51	376.01def	-7.50i	49.83e	3.58abc	13.14gh	65.59kl	104.87i	5902.50kl	7889.82j
Summer x 16% x 2800 kcal	399.80	389.93bc	-9.87ij	49.83e	3.75ab	13.74def	63.58lk	99.14k	5722.50m	7521.40k
Autumn x 14% x 2600 kcal	351.99	357.89g	5.90h	51.41ab	3.00de	13.24fgh	77.41f	120.83e	6967.50f	9095.31e
Autumn x 14% x 2800 kcal	370.17	380.10cdef	9.93fg	51.33ab	3.58abc	13.48de	73.93g	112.35g	6652.50g	8538.45g
Autumn x 16% x 2600 kcal	376.01	386.64cd	10.62ef	50.75bcd	3.66abc	14.01cd	72.58gh	108.87h	6532.50gh	8333.95h
Autumn x 16% x 2800 kcal	389.93	406.57a	16.64bc	50.33de	4.00a	14.80ab	70.57hi	103.14j	6352.50hi	7983.95j
±SE	1.44	1.38	0.97	0.06	0.04	0.06	0.90	0.78	80.99	71.62

a-k: For each criterion, means in the same column bearing different superscripts differ significantly ($P \leq 0.05$)

** = $P \leq 0.01$, * = $P \leq 0.05$ and NS = Not significant ($P \geq 0.05$)

Table (3): Effects of dietary crude protein (CP), metabolizable energy (ME) levels and seasons on reproductive performance of pigeons.

Items	Incubation period (days)	Fertility%	Hatchability%	Dead embryo %
% Protein CP	*	NS	NS	NS
14%	17.84	88.24	83.21	5.29
16%	17.64	90.50	84.51	6.33
Energy ME (kcal ME/kg)	*	NS	NS	NS
2600	17.85	88.59	81.99	6.85
2800	17.63	90.15	85.72	4.77
Season S	*	*	*	*
Winter	18.50a	90.52a	82.36b	8.33a
Spring	17.89b	94.58a	91.45a	3.12b
Summer	17.10d	79.86b	74.82c	5.73ab
Autumn	17.47c	92.53a	86.80ab	6.07ab
Interaction S x CP x ME	**	**	**	**
Winter x 14% x 2600 kcal	18.75a	87.50abc	75.69def	12.49a
Winter x 14% x 2800 kcal	18.58a	90.41ab	82.08abcdef	8.33ab
Winter x 16% x 2600 kcal	18.50ab	92.50a	84.16abcde	8.33ab
Winter x 16% x 2800 kcal	18.16abc	91.66a	87.50abcd	4.16ab
Spring x 14% x 2600 kcal	18.16abc	92.50a	88.33abcd	4.17ab
Spring x 14% x 2800 kcal	17.91bc	94.58a	90.41abc	4.16ab
Spring x 16% x 2600 kcal	17.91bc	94.58a	92.50ab	2.08ab
Spring x 16% x 2800 kcal	17.58cde	96.66a	94.58a	2.08ab
Summer x 14% x 2600 kcal	17.25ef	79.16bc	73.61ef	5.55ab
Summer x 14% x 2800 kcal	16.91f	77.08c	77.08cdef	0.00b
Summer x 16% x 2600 kcal	17.08ef	77.77c	69.44h	9.72ab
Summer x 16% x 2800 kcal	17.66de	85.41abc	79.16bcdef	7.63ab
Autumn x 14% x 2600 kcal	17.66cde	93.05a	93.05a	0.00b
Autumn x 14% x 2800 kcal	17.50def	91.66a	85.41abcde	7.63ab
Autumn x 16% x 2600 kcal	17.41def	91.66a	79.16bcdef	12..50a
Autumn x 16% x 2800 kcal	17.33def	93.75a	89.58abc	4.16ab
±SE	0.06	1.01	1.12	0.83

a-f: For each criterion, means in the same column bearing different superscripts differ significantly.

** = $P \leq 0.01$, * = $P \leq 0.05$ and NS = Not significant ($P \geq 0.05$)

Table (4): Effects of dietary crude protein (CP), metabolizable energy (ME) levels and seasons on productive performance of squabs.

Items	Squab number at 28 days	weaning weight (g) at 28 days	Weight Gain (1-28 days)	Squabs mortality rate%*
% Protein CP	*	*	*	*
14%	2.60	248.37	236.11	12.23
16%	3.05	280.81	267.77	6.51
Energy ME (kcal ME/kg)	*	*	*	NS
2600	2.72	257.61	245.20	10.41
2800	2.92	271.57	258.68	8.33
Season S	*	*	*	NS
Winter	2.91b	269.38b	256.65b	9.20
Spring	3.18a	276.93a	263.79a	9.54
Summer	2.39c	248.80d	236.97d	7.63
Autumn	2.81b	263.24c	250.34c	11.11
Interaction S x CP x ME	*	*	*	*
Winter x 14% x 2600 kcal	2.25f	245.14gh	233.28gh	18.74ab
Winter x 14% x 2800 kcal	2.91bcd	262.01f	249.76f	11.80abcd
Winter x 16% x 2600 kcal	3.16abc	271.10e	258.08e	6.25bcd
Winter x 16% x 2800 kcal	3.33ab	299.29b	285.48a	00.00d
Spring x 14% x 2600 kcal	2.75cde	248.71g	236.21g	16.66abc
Spring x 14% x 2800 kcal	3.08abc	271.42e	258.27e	6.94bcd
Spring x 16% x 2600 kcal	3.41a	281.35cd	268.19cd	8.33abcd
Spring x 16% x 2800 kcal	3.50a	306.24a	292.52a	6.25bcd
Summer x 14% x 2600 kcal	2.33ef	230.39i	218.98i	2.77d
Summer x 14% x 2800 kcal	2.25f	242.17h	230.39h	11.11abcd
Summer x 16% x 2600 kcal	2.50def	259.66f	247.83f	5.55cd
Summer x 16% x 2800 kcal	2.50def	262.98f	250.69f	11.11abcd
Autumn x 14% x 2600 kcal	2.50def	244.23gh	231.94gh	20.13a
Autumn x 14% x 2800 kcal	2.75cde	242.89h	230.06h	9.72abcd
Autumn x 16% x 2600 kcal	2.91cde	280.27d	267.10d	4.86cd
Autumn x 16% x 2800 kcal	3.08bc	285.57c	272.26c	9.72abcd
±SE	0.04	1.58	1.54	1.01

a-i: For each criterion, means in the same column bearing different superscripts differ significantly

** = $P \leq 0.01$, * = $P \leq 0.05$ and NS = Not significant ($P \geq 0.05$)

a-f: For each criterion, means in the same column bearing different superscripts differ significantly.

** = $P \leq 0.01$, * = $P \leq 0.05$ and NS = Not significant ($P \geq 0.05$)

Table (5): Effects of dietary crude protein (CP), metabolizabol energy (ME) levels and seasons on economic efficiency

Items	Feed intake of pairs (g) during 90 day)	Price of ton (LE)	Price of feed cost during 90 day	Number of squabs /pair	Sale price of squabs/ pair (LE)	Net return*	Economic efficiency (%)**
% Protein CP							
14%	9297.49	1570	14.59	2.60	15.60	1.01	6.92
16%	8665.95	1659	14.37	3.05	18.30	3.93	27.34
Energy ME (kcal ME/kg)							
2600	9270.52	1590	14.74	2.72	16.32	1.58	10.71
2800	8692.93	1639	14.24	2.92	17.52	3.28	23.03
Season S							
Winter	10349.50	1614	16.70	2.91	17.46	0.76	4.55
Spring	9060.29	1614	14.62	3.18	19.08	4.46	30.50
Summer	8029.18	1614	12.95	2.39	14.34	1.39	10.73
Autumn	8487.93	1614	13.69	2.81	16.86	3.17	23.15
Winter x 14% x 2600 kcal	11140.89	1543	17.19	2.25	13.50	-3.69	-21.46
Winter x 14% x 2800 kcal	10118.65	1596	16.14	2.91	17.46	1.32	8.17
Winter x 16% x 2600 kcal	10554.67	1636	17.26	3.16	18.96	1.70	9.84
Winter x 16% x 2800 kcal	9583.76	1681	16.11	3.33	19.98	3.87	24.02
Spring x 14% x 2600 kcal	9689.23	1543	14.95	2.75	16.50	1.55	10.36
Spring x 14% x 2800 kcal	9091.90	1596	14.51	3.08	18.48	3.97	27.36
Spring x 16% x 2600 kcal	8870.84	1636	14.51	3.41	20.46	5.95	41.00
Spring x 16% x 2800 kcal	8589.21	1681	14.43	3.50	21.00	6.57	45.53
Summer x 14% x 2600 kcal	8589.39	1543	13.25	2.33	13.98	0.73	5.50
Summer x 14% x 2800 kcal	8116.10	1596	12.95	2.25	13.50	0.55	4.24
Summer x 16% x 2600 kcal	7889.82	1636	12.90	2.50	15.00	2.10	16.27
Summer x 16% x 2800 kcal	7521.40	1681	12.64	2.50	15.00	2.36	18.67
Autumn x 14% x 2600 kcal	9095.31	1543	14.03	2.50	15.00	0.97	6.91
Autumn x 14% x 2800 kcal	8538.45	1596	13.62	2.75	16.50	2.88	21.14
Autumn x 16% x 2600 kcal	8333.95	1636	13.63	2.91	17.46	3.83	28.09
Autumn x 16% x 2800 kcal	7983.95	1681	13.42	3.08	18.48	5.06	37.70

During the course of study the sale price per squab was 6 L.E

* Net return = Price of squabs of pair during 180 day - Price of feed cost during 180 day

** Economic efficiency = (Net return / Price of feed cost during 180 day) X100

REFERENCES

- Abd El-Azeem, F.A, A.A El-shafei and E. A Abdullah (2007)** *Studies on the effect of different dietary metabolizable energy levels on some performance of local baladi pigeons* *Egypt Poult. Sci. Vol (27) (III): (595-611)*
- Abdel-Azeem, F.A. (1998).** *Effect of protein levels on some nutritional and physiological parameters in pigeon. MSc., Faculty of Agriculture, Al-Azhar University, Egypt.*
- Abed Al-Azeem, F.A.M. (2005)** *Social life, reproductive behavior and squab growth of local Egyptian baladi pigeon. Egypt poultry Sci.vol. 25 (1):13-28.*
- Abou Khashaba H.A., M. A. M., Sayed Y.A. Mariey, and M. A. Ibrahim (2009).** *Nutritional and management studies on the pigeon: Estimate of metabolizable energy requirements. Egypt Poultry Sci. 29 (11):481-501.*
- Abou Khashaba H.A., Y.A. Mariey, M. A. M., Sayed and Hoda E. Elgabry (2008).** *Nutritional and management studies on the pigeon: Estimate of protein requirements. J.Agric. Sci. Mansoura Univ., 33 (12):8447-8461.*
- Ahmed, M.I. and Mahmoud, Z.S. (1992).** *Effect of season on the variance in reproductive organs weight on Wild Pigeon. Poultry Middle East & North Africa, 105: 57-60. (In Arabic).*
- Ballay, A. and Meleg, I.(1992).** *Hatchability of commercial squab breeders affected by seasons. XIX Worlds Poultry Congress. Amsterdam. The Netherlands 20-24 September.*
- Bokhari, S. A. (1994):** *Commercial squab production. Monogamous couples grow delicious product .World Poultry, 10, 30-33.*
- Borchert R, Renner SS, Calle Z, Navarrete D, Tye A, Gautler L, Spichiger R, von Hildebrand P, (2005)** *Photoperiodic induction of synchronous flowering near the Equator. Nature 433:627–629*
- Bottcher, J., Wegener, R. M. Petersen, J. and M. Gerken, (1985)** *Untersuchungen zur reproductions, Mast – und Schlachtleistung von Masttauben II.Mitteilung: Einfflub des Rohproteingehaltes im Futter und Schlachalters der Jungtauben.Archiv fur Geflugelkunde, 49:63-72.*
- Clark, G.A. (1979)** *Body weights of birds: A review. Condor. 81:193–202.*

Duncan, D. B. (1955). *Multiple range and multiple F-test. Biometrics 11: 1 – 42.*

El-Hanoun A.M; M.N.F. Hassanein and Z.A.M. Sabra (2008)
studies on native pigeons under egyptian village nile delta conditions. Egypt. Poult. Sci. Vol (28) (III): (883-900)

Fred, T.; Shultz, C.R. Grau and Phyllis, A.Zweigart (1953).
Vitamin supplements and squab production. Poultry Sci., 32:762-768. Geflugelkunde, 49:63-72.

Gwinner E, (2003) *Circannual rhythms in birds. Curr Opin Neurobiol 13:770–778.*

Kangas, B.D and Branch, M.N(2006). *Stability of pigeon body weight under free-feeding conditions. Journal of the Experimental Analysis of Behavior 86:393–396.*

Lambrechts MM, Perret P, Maistre M, Blondel J, (1999) *Do experiments with captive non-domesticated animals make sense without population field studies? A case study with blue tits' breeding time. Proc R Soc Lond B 266:1311–1315.*

Meleg, I., Dublecz, K.; L. Vincze, and Horn, P. (1999): *Effect of dietary metabolizable energy requirement of hand –fed squabs from hatching to 28 days of age. Poultry Science, 78:2017-2023.*

Michael E. Rashotte, Patrick S. Basco and Ross P. Henderson (1995) *Daily cycles in body temperature, metabolic rate, and substrate utilization in pigeons: influence of amount and timing of food consumption. Physiology & Behavior, Volume 57 (4): 731-746*

Morely, A. Jull, (1974): *Raising Turkeys Ducks ,Geese And Game.*

Nahashon,S.N.;N.Adefope,A.Amenyenu and D.Wright (2005): *Effect of dietary metabolizable energy and crude protein concentration on growth performance and carcass characteristics of French Guinea broilers. Poultry Sci.,84:337-334.*

National Research Council NRC(1994). *Nutrient requirement of poultry. 9th rev.ed. National Academy Press Washington D.C., USA.*

- Ono H, Nakao N and T. Yoshimura (2008)** *Identification of the photoperiodic signaling pathway regulating seasonal reproduction using the functional genomics approach. Gen Comp Endocrinol. 2008 Dec 3. pigeons. Poultry Sci., 87:1206-1212.*
- Plavnik,I.;E.Wax,D.Sklan,I.Bartov and S.Hurwitz(1997):** *The response of broiler chickens and turkeys poults to dietary energy supplies either by fat or charbohydratte. Poultry Sci., 76:1000-1005*
- Rebecca J Sargisson, Ian G McLean, Glenn S Brown, and K Geoffrey White (2007)** *Seasonal Variation in Pigeon Body Weight and Delayed Matching-to-sample Performance. J Exp Anal Behav. 88(3): 395–404.*
- Sailaj R, Kotak VC, Sharp PJ, Schmedemann R and E Haase(1988)** *Environmental, dietary, and hormonal factors in the regulation of seasonal breeding in free-living female Indian rose-ringed parakeets (Psittacula krameri). Horm Behav. Dec;22(4):518-27.*
- Sargisson, R.J; Mclean, I.G.; Brown, G.S. and White, K.G.(2007).** *Seasonal variation in pigeon body weight and delayed matching-to-sample performance. J. Exp. Anal Behav. Nov, 88 (3): 395-404.*
- Silver, R.(1978)** *The parental behavior of ring doves. Am. Sci. 66: 209.*
- SPSS (1997).** *SPSS user's guide statistics Version 10. Copyright SPSS Inc., USA.*
- Sturtevant, J. and W.F. Hollander (1978)** *Breeding pigeons at the laboratory. Pigeon Science and Genetics Newsletter 8 (suppl.): 7.*
- Waldie, G. A., J. M. Olomu., K. M. Cheng and J. Sim, (1991):** *Effects of two feeding system,two protein levels ,and different dietary energy sources and levels on performance of squabbling pigeons. Poultry Sci., 70:1206-1212.*

الملخص العربي

دراسات غذائية ورعاية على الحمام

تأثير مستوى البروتين والطاقة الممثلة والموسم على الأداء الانتاجي والتناسلي للحمام

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صممت هذه التجربة لتقدير تأثير التغذية على مستويين من البروتين (16 و 14% بروتين) تحت كل مستوى بروتين مستويين من الطاقة الممثلة (2600 و 2800 كيلو كالوري/كجم عليقة) على الصفات الانتاجية والتناسلية في الحمام البلدي تحت الظروف المصرية خلال المواسم الأربعة لعامي 2007 و 2008. تم تقسيم عدد 48 زوج حمام بالغ عمر 24 شهر الى 4 معاملات بكل معاملة 12 زوج حمام، قسمت المعاملة الى 3 مكررات بكل مكرر 4 ازواج (النسبة الجنسية 1:1)، وتحتوي العلائق على الاملاح المعدنية والفيتامينات كما تم تقديم العلائق والماء بصورة حرة حتى الشبع.

وكانت اهم النتائج كما يلي :

1- بغض النظر عن تأثير مستوى الطاقة وكذلك تأثير المواسم فقد تحسنا من وزن الجسم الحي والتغير في وزن الجسم بزيادة مستوى البروتين في العليقة. كما تحسن معنويا كلا من عدد البيض الناتج ووزن البيض والمستهلك من البروتين والطاقة الممثلة لكل زوج بدون الزغاليل وقد زاد كل من وزن الجسم ووزن الجسم المكتسب للزغاليل عند عمر 28 يوما بزيادة مستوى البروتين لم تتأثر معنويا نسبة الخصوبة ونسبة الفقس ونسبة الأجنة الميتة بمستوى كلا من البروتين والطاقة في العليقة. وزادت معنويا فترة الراحة بين انتاج البيض و كمية الغذاء المأكل لكل زوج مع أو بدون الزغاليل وكذلك مدة التفريخ ومعدل النفوق بانخفاض مستوى البروتين في العليقة.

2- بصرف النظر عن تأثير الموسم ومستوى البروتين فلوثر مستوى الطاقة في نسبة الاخصاب ونسبة الفقس ونسبة الأجنة الميتة أو معدل النفوق انخفضت معنويا كمية الغذاء المأكل والمأكل من البروتين لكل زوج مع أو بدون الزغاليل والمتناول من الطاقة الممثلة لكل زوج بدون الزغاليل بزيادة مستوى الطاقة في العليقة، كما تتحسن بزيادة الطاقة المتناولة. بزيادة كمية الطاقة المأكل زاد معنويا كلا من وزن الجسم الحي والتغير في وزن الجسم وعدد البيض الناتج ووزن البيض وعدد الزغاليل الناتجة ووزن الجسم للزغاليل ووزن الجسم المكتسب للزغاليل عند عمر 28 يوما.

3- لم يؤثر الموسم في معدل النفوق بينما تحسنت معنويا كل القياسات المدروسة خلال موسم الربيع وموسم الشتاء حيث سجلا أعلى القيم يليهما موسم الخريف بينما كان العكس تماما مع موسم الصيف

4- وجد تأثير ايجابي للتداخل بين كلا من مستوى البروتين ومستوى الطاقة والموسم على جميع القياسات على الصفات الانتاجية والتناسلية في الحمام البلدي.

نستخلص من هذه الدراسة أفضلية استخدام عليقة تحتوي على 2800 كيلو كالوري/كجم مع مستوى بروتين 14 او 16% للحصول على أعلى اداء انتاجي وتناسلي خلال مواسم الربيع والشتاء والخريف بينما العليق المحتوية على 2600 كيلو كالوري/كجم عليقة مع مستوى بروتين 14% كان لها تأثير عكسي على الأداء الانتاجي والتناسلي للحمام البلدي المصري تحت الظروف المصرية، وهذه النتائج تساعد في تقليل تكاليف العلائق وبالتالي زيادة الكفاءة الاقتصادية لتربية وانتاج للحمام.