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# NUTRITIONAL AND MANAGEMENT STUDIES ON THE PIGEON:

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

**By**

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**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. A12-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 metabolizble 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 my 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 mount 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 ($P\leq0.05$) less than those fed the lowest energy diet.Also, seasons had a significant ($P\leq0.05$) 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 allover 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 crud protein and metabolizable energy content of pigeons diets play important roles on performance and reproduction of pigeon. Feeding high crud 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 $D_3$ 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 Seleinium 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 | 118.30b | 7331.25b | 9060.29b |
| Summer | 385.81a | 372.02b | -13.76d | 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 | 13.68b | 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 | 8665.00c | 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 | 3.86abc | 13.63defg | 85.84d | 126.83c | 7725.00d | 9689.23d |
| Spring x 14% x 2800 kcal | 371.13 | 383.32cde | 12.16def | 51.17abc | 3.75ab | 13.94cde | 81.33e | 117.35e | 7320.00e | 9081.90e |
| 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 | 3.86abc | 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 ≤ 0.05)

** = P ≤ 0.01, * = P ≤ 0.05 and NS = Not significant (P ≥ 0.05)

**Table (3):** Effects of dietary crude protein (CP), metabolizabol 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 | 88.33aabcd | 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 |

**Table (4):** Effects of dietary crude protein (CP), metabolizabol 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

** = $P \le 0.01$, * = $P < 0.05$ and NS = Not significant ($P \ge 0.05$)

**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 (L E) | 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%** | 8663.95 | 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 | 1.88 | 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 ,

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# الملخص العربي

## دراسات غذائية ورعائية على الحمام

## تاثير مستوى البروتين والطاقة الممثلة والموسم على الآداء الانتاجى والتناسلى للحمام

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معهد بحوث الانتاج الحيوانى- مركز البحوث الزراعية- الجيزة – مصر.

صممت هذة التجربة لتقدير تاثير التغذية على مستويين من البروتين (١٦ و ١٤% بروتين) تحت كل مستوى بروتين مستويين من الطاقة الممثلة (٢٦٠٠ و ٢٨٠٠ كيلوكالورى/كجم عليقة) على الصفات الانتاجية والتناسلية فى الحمام البلدى تحت الظروف المصرية خلال المواسم الأربعة لعامى ٢٠٠٧ و ٢٠٠٨ . تم تقسيم عدد ٤٨ زوج حمام بالغ عمر ٢٤ شهر الى ٤ معاملات بكل معاملة ١٢ زوج حمام، قسمت المعاملة الى ٣مكررات بكل مكرر ٤ ازواج (النسبة الجنسية ١:١)، وتحتوى العلائق على الاملاح المعدنية والفيتامينات كما تم تقديم العلائق والماء بصورة حرة حتى الشبع.

**وكانت اهم النتائج كما يلى :**

١- بغض النظر عن تاثير مستوى الطاقة وكذلك تاثير المواسم فقد تحسن كلا من وزن الجسم الحى والتغير فى وزن الجسم بزيادة مستوى البروتين فى 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 ٢٨ يوما بزيادة مستوى البروتين. لم تتاثر معنويا نسبة الخصوبة ونسبة الفقس ونسبة الأجنة الميتة بمستوى كلا من البروتين والطاقة فى العليقة. وزادت معنويا فترة الراحة بين انتاج البيض و كمية الغذاء الماكول لكل زوج مع أو بدون الزغاليل وكذلك مدة التفريخ ومعدل النفوق بانخفاض مستوى البروتين فى العليقة.

٢- بصرف النظر عن تاثير الموسم ومستوى البروتين فلم يؤثر مستوى الطاقة فى نسبة الاخصاب ونسبة الفقس ونسبة الأجنة الميتة أو معدل النفوق. انخفضت معنويا كمية الغذاء المأكول والماكول من البروتين لكل زوج مع او بدون الزغاليل والمتناول من الطاقة الممثلة لكل زوج بدون الزغاليل بزيادة مستوى الطاقة فى العليقة، كما تتحسن بزيادة الطاقة المتناولة. بزيادة كمية الطاقة المأكول زاد معنويا كلا من وزن الجسم الحى والتغير فى وزن الجسم وعدد البيض الناتج ووزن البيض وعدد الزغاليل الناتجة ووزن الجسم للزغاليل ووزن الجسم المكتسب للزغاليل عند عمر ٢٨ يوما.

٣- لم يؤثر الموسم فى معدل النفوق بينما تحسنت معنويا كل القياسات المدروسة خلال موسم الربيع وموسم الشتاء حيث سجلا اعلى القيم يليهما موسم الخريف بينما كان العكس تماما مع موسم الصيف.

٤- وجد تاثير ايجابى للتداخل بين كلا من مستوى البروتين ومستوى الطاقة والموسم على جميع القياسات على الصفات الانتاجية والتناسلية فى الحمام البلدى.

نستخلص من هذة الدراسة أفضلية استخدام عليقة تحتوى على ٢٨٠٠ كيلوكالورى/كجم مع مستوى بروتين ١٤ او ١٦% للحصول على أعلى اداء انتاجى وتناسلى خلال مواسم الربيع والشتاء والخريف بينما العليق المحتوية على ٢٦٠٠ كيلوكالورى/كجم عليقة مع مستوى بروتين ١٤% كان لها تاثير عكسى على الأداء الانتاجى والتناسلى للحمام البلدى المصرى تحت الظروف المصرية، وهذة النتائج تساعد فى تقليل تكاليف العلائق وبالتالى زيادة الكفاءة الاقتصادية لتربية وانتاج للحمام.