J. Product. & Dev., 14(1): 223– 238 (2009)

INFLUENCE OF THREONINE SUPPLEMENTED LEVELS ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF LAYING JAPANESE QUAILS.

I.M.M. Assaf; A. M. A. Torkia, I. A. Azazi and E.E. M. EL- Sysy
Animal Production Research Institute, Agricultural Research Center, Giza, Egypt.

ABSTRACT:

This study was carried out to investigate the influence of dietary levels threonine on the productive and reproductive performance of laying Japanese quails. One hundred and sixty- two of adult Japanese quails (6 weeks of age) were divided into 9 treatments (18 in each). Each treatment group was divided into six replicates of 3 birds (one male and two females) in each treatment. Birds were fed nine experimental diets, where threonine supplementation levels were 0.0, 0.5, 0.10, 0.15, 0.20, 0.25, 0.30, 0.35 and 0.40%.

Results obtained showed that: Increasing dietary threonine level caused increase in most egg productive traits of laying Japanese quail. The supplemented threonine at level 0.15 % to the basal diet significantly ($P\leq 0.01$) showed the best results in egg weight (EW), feed intake (FI), daily egg production (DEP), feed conversion (FC), egg mass (EM), egg production (EP) and egg number (EN) of Japanese quails. However, there were significant differences ($P\leq 0.05$) among treatment in egg weight, shape index, yolk weight percentage and Haugh units, while other measurements of egg quality did not influence by dietary threonine levels. Also, no significant differences shown among treatment groups in both males or females in reproductive organs. Dietary threonine levels at 0.20% recorded the best value of hatchability per total and fertile eggs (77.82 and 80.63%, respectively). High economic efficiency and relative economic efficiency obtained for Japanese quails fed diets supplemented with threonine (Thr) at levels 0.05 and 0.15%, respectively.

Conclusively, it could be concluded that diets of laying Japanese quails determined according to NRC recommendation were not sufficient for threonine needs. It is worthy to note that diets supplemented with Thr at levels 0.05 up to 0.15% resulted improvement in egg production traits, egg quality, hatchability (%), as well as, economic efficiency and relative economic efficiency, under Egyptian environmental conditions.

Key words: Threonine levels, corn- soybean diet, egg productive and reproductive traits, Japanese quails.

INTRODUCTION

It is well known that quails have the advantages of rapid growth, small size, good reproductive potential, short life cycle, low feed requirement, good meat taste, better laying ability and short time of hatching as compared with different species of poultry, further more, quails could be considered good and economical source for animal protein (Panda and Singh, 1990).

Threonine is among the of interest amino acids in diet containing low protein levels. So, when low dietary protein levels of laying hens supplemented with threonine, feed conversion was improved, egg quality and feed intake were not differ during laying period, weight gain and egg production increased with increasing protein levels (Lund, 1991). Results of Chen- Tian *et al*., (1997) concluded that diet of ducks containing more than 0.70% Thr gave better egg production, while fertility and hatchability were not significantly differed.

In addition, (Kidd *et al*., 1996) stated that low crude protein diets contain threonine limiting ingredients may require supplemental threonine for optimal feed conversion and weight gain. On the other hand, threonine requirement, expressed as a percentage of diet and CP intake for maximum body weight gain and feed intake decreased with age and tended to increase with increasing dietary amino acid levels which were not clear (Koide and Ishibashi, 1995).

Generally, threonine levels had linear positive and negative effects on weight gain in male and female broilers and a quadratic effect on feed intake, and feed to gain ratio in both sexes (Trindae *et al*., 1999). However, threonine has been well recognized for its maintenance characteristics associated with digestive tract (Van Der Schoor *et al.,* 2002). In addition, Lemme (2001) stated that threonine serves as a component of body and feather protein, plays an important role in feather synthesis and a precursor of glycine and serine. Also, Huyghebaert and Butler (1991) studied the optimum threonine requirement of laying hens. Egg number, egg weight and feed conversion improved as threonine level (1% additions of threonine) increased above NRC recommendation (Martinez-Amezcua *et al*., 1999). Consequently, threonine requirement to optimize live performance is less than needed for complete recovery of whole carcass and its breast fillets (Dozier *et al*., 2000). Limited in formation on the effect of dietary threonine supplementation on laying Japanese quail hens.

So, the present study was conducted to study the effect of dietary more threonine supplementation on laying performance, egg quality, fertility and hatchability, as well as and economic efficiency of Japanese quail hens, under Egyptian environmental conditions.

MATERIALS AND METHODS

The experimental work of this study was carried out at Inshas Poultry Research Station and Poultry Nutrition Department, Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, Egypt during the year 2008.

One hundred and sixty two adult Japanese quails, 6- week old were divided into nine treatment groups (18 in each). Each group was divided into 6 replicates of three birds (one male and two females) in each treastment. All birds were housed in wire cage of laying batteries and raised in conventional open-sided houses with 16hr. of photo period (natural and artificial light). Experimental diet groups were formulated to be iso- nitrogenous (20.12% CP) and iso- caloric 2642.49 Kcal ME/Kg diet containing mainly corn- soybean during the laying period according to NRC (1994). The first treatment group was fed basal diet without threonine supplementation as the control one, while the others were supplemented with 0.05, 0.1, 0.15, 0.20, 0.25, 0.30, 0.35 and 0.40% threonine to the basal diet. The composition and calculated analysis of the control diet are shown in Table 1. Chemical composition and amino acids analysis of the basal diet of Japanese quail and eggs were determined according to A. O. A. C. (2005) as shown in Table 2. Feed and water were offered on *adlibitum* all time. All birds were kept under the same managerial, hygienic and environmental conditions. The experiment lasted for 56 laying days, threonine used in the present study was obtains from Degussa company, Germany.

Egg numbers were daily recorded for each treatment to calculate egg production percentage (Egg number/ Number of live hens x 100). Egg weight was also recorded daily. Feed intake was recorded weekly to calculate average feed intake / hen, feed conversion (g Feed/g Egg weight) and average daily egg number/ hen, egg mass (Average egg number X Average egg weight, during the experimental period (7 to 15 weeks of age).

Representative egg samples (6 eggs) for each treatment were collected throughout the experimental periods to determine egg weight and shell quality, shape index and yolk index were determined according to Romanoff and Romanoff (1949) as follows :

Shape index (%)= (Width / Length) x 100.

Yolk index (%) = (Height / Diameter of yolk) x 100.

Egg shell thickness, including shell membranes, was measured using a micrometer to the nearest 0.01 mm at the equator. Haugh unit score was applied from a special chart using egg weight end albumin height, which was measured by using a micrometer according to Haugh (1937), Kotaiah and Mohapatra (1974) and Eisen *et al*. (1962).

Eggs were collected and set in an electric forced draft incubator (every five days) that was operated at a temperature of 37.5 ºC and about 56% relative

Table 1. Composition and calculated analysis for basal diet of laying Japanese quails

Ingredients	%
Yellow corn (8.5 %)	55.00
Soybean meal (44 %)	33.30
Wheat bran	4.00
Limestone	4.50
Dicalcium phosphate	2.50
Vit. &Min. Premix*	0.30
Sodium chloride	0.25
DL-methionine	0.15
Total	**100.00**
a-Calculated analysis **:-	
ME Kcal/kg	2642.49
Crude protein %	20.12
Calcium %	2.28
Available phosphorus %	0.47
Lysine %	1.13
Methionine %	0.48
Methionine + Cystine %	0.66

*: Each 3 kg of Vit. And Min. premix contains 10000000 IU Vit. A; 2000000 IU Vit. D3; 10000 mg Vit. E; 1000 mg Vit. K3; 1000 mg Vit. B1; 5000 mg Vit. B2; 10 mg Vit B12; 1500 mg Vit. B6; 30000 mg Niacin; 10000 mg Pantothenic acid; 1000 mg Folic acid; 50 mg Biotin; 300000 mg Choline; 4000 mg Copper; 300 mg Iodine; 30000 mg Iron; 50000 mg Zinc; 60000 mg Manganese; 100 mg Selenium; and 100 mg Cobalt.
** Calculated according to NRC (1994).

humidity, while the hatchery had about 64.5% ones. Number of saleable chicks were determined as practiced in commercial operations (Guillou, 1996). Unhatched eggs, middle and late- dead embryo (pipped). Fertility (%) was calculated as number of fertile eggs/ number of eggs set X 100. Hatchability (%) was defined as the ratio of number of chicks hatched to either of fertile eggs or number of settable eggs X 100. At the end of the experiment, Slaughter tests were performed using 6 birds of each treatment group (3 males and 3 females). Birds were individually weighted to the nearest gram and slaughtered by sewering the jugular vien. Carcass, dressing, giblets (empty gizzard, liver and heart) were weighed and their percentages to live body weight were calculated. Reproductive system organs were weighed (tests weight, g and length, cm for males and oviduct weight, (g) length, cm; largest follicle weight (g); height cm,

Table 2. Chemical composition and amino acids analysis of basal diet and Japanese quail eggs (as dry matter bases).

Chemical analysis	Basal diet (Control)	Japanese quail eggs (Control)
Crude protein (CP%)	19.45	42.80
Moisture%	10.70	70.30
Amino acids* %		
Aspartic	1.91	4.38
Threionine	0.70	2.47
Serine	0.93	3.48
Glutamine	3.35	5.61
Proline	1.02	1.06
Glycine	0.74	1.50
Alanine	0.84	2.27
Valine	0.75	2.40
Isoleucine	0.68	1.96
Leucine	1.53	3.78
Tyrosine	0.69	1.89
Phenylalanine	0.90	1.10
Histidine	0.46	2.96
Lysine	0.92	2.48
Arginine	1.19	

*According to: A.O.A.C. (2005).

width cm and ovary weight (g) for females). Digestive tract weight and length were also measured.

Economical efficiency of egg production was calculated according to the price of the experimental diets and egg produced the values of economical efficiency were calculated as the net revenue per unit of total costs.

The present data were statistically analyzed (Completely Randomized Design) according to Snedecor and Cochran (1982 by using procedures of SAS (1998). Duncan's multiple range tested was used to detect any significant differences among the experimental means (Duncan, 1955).

RESULTS AND DISCUSSION

Egg productive traits:

Statistical evaluation of egg productive traits data revealed that feeding diets supplemented with threonine levels resulted as shown in Table 3, the highest values of egg weight (EW) which improved significantly ($P \leq 0.01$) for birds fed diets supplemented with threonine level 0.15% as compared to the other experimental groups (Table 3). Daily egg production/

hen (DEP), feed conversion (FC), egg mass (EM), egg production% (EP) and egg number (EN) were also improved with such level (0.15% Thr.).

These results are in agreement with those obtained by Beorlegui and Gonzalez (1991), Zollitsch *et al*.(1993), Ishibashi *et al*. (1998) and Martinez-Barrera *et al*., (1999). They found that increasing dietary threonine levels caused to EP, EW and FC for laying hens. In contrast, Parlat *et al.* (2003) reported that there were significant differences for egg number and egg weight and did not affect other egg production traits. Koelkebeck *et al*. (1991) reported excess intake of individual amino acids (Lysine, methionine, threonine or tryptophan) did not affect hen- day of egg production, egg yield or feed intake, indicating that considerable tolerance exists in high- producing laying hens for individual excesses of amino acids. Likewise, Martine *et al*,. (1999) reported that EP, EW and FCR improved as threonine levels increased than that recommended in NRC. Similarly, Faria *et al*., (2002), Khalifah and Abdalla (2005) and Okazaki *et al*., (1994) revealed that the performance of hens fed diets containing Lys, Met and Thr (130 and 160% of NRC in each) was slightly superior compared to that of the other groups fed on 85, 100 and 115% of NRC. However, threonine level at 0.51% supplementation to basal diet , that correspond to 515 mg/ hen day (0.423% of digestible threonine) was sufficient for layer egg production (Valerio et al., 2000). It could be concluded that as dietary threonine increased egg the productive traits of laying Japanese quail increased, specially the level of 0.15%. These results, may be due to the effect of, threonine is added to the diet of poultry in order to exactly match the dietary amino acid balance with the unique nutritional requirements of the animal. As a result of this balancing process, the animal utilizes feed more efficiently with reduced amounts of protein. This is better for the animal and better for the environment.

Egg quality measurements:

Results of egg quality measurements of laying Japanese Quails fed access dietary threonine levels are presented in Table 4. There were significant effect ($P \leq 0.05$) of threonine level on yolk weight, egg shape index and Haugh unit, while, specific gravity, yolk index, shell weight (%) and albumin weight (%) showed no significant differences among treatment groups. Albumen quality measured by Haugh units showed significant effect ($P \leq 0.05$) with level 0.15% (81.17) as compared with other experimental groups. Therefore, albumen quality could be better for level 0.15%, dietary threonine supplementation, while yolk index did not affect by dietary threonine supplementation. The obtained results are in agreement with the finding of (Valerio *et al*., 2000 and Faten- Attia and Haiam Abd EL- Halim, 2008). However, there are a lot of differences in the amino acids concentration used by different researchers for laying hens. This

discrepancies may be due to factors affecting the requirements such as strain, age of hens, egg production EP rate, dietary crude protein levels, dietary amino acids levels and / or the environmental around the hens. The importance of egg quality could be used to maximize the hatching performance of Japanese quail eggs (Soliman *et al*., 1991)

Fertility and hatchability traits:

Dietary threonine levels showed no significant differences in fertility eggs % as shown in Table 5. However, there were highly significant differences ($P \leq 0.01$) in hatchability (%)per total eggs. hatchability / fertile eggs and hatched chick weight (g) for birds fed dietary supplementation of threonine at levels 0.20% as compared to other groups (Table 4). It is more reasonable to compare hatchability % on the base of fertile egg rather than settable ones. Consequently, dietary threonine level at 0.20 % recorded the best value of hatchability per fertile eggs by about 80.36%. Findings by Seuapti *et al*., (1997) that hatchability percentage based on fertile quail eggs, relation between egg quality traits and percentage of hatchability of Japanese quail eggs are very limited.

The fertility percentage results are in agreement with the findings of Bahie El. Deen (1991); Solimon *et al*., (1991), Neamat Badawy (1997) and Inal *et al*., (1999). The same trends were obtained with Bahie EL – Deen (1991), Soliman *et al*., (1991), Babu *et al*., (1995) and Neamat Badawy (1997) hatchability percentage. However, the present results were higher than the finding of Inal *et al.,* (1999) who reported that hatchability of Japanese eggs in control, low and high lines ranged from 40.00 and 61.98%.

It can observed from the present hatchability results (Table 5) that the hatchability increased as dietary threonine supplementation at level of 0.20%.

Reproductive system organs:

The females and males reproductive organs of Japanese quails at the end of the experiment are listed in Table 6. Either oviduct weight, oviduct length and the weight of the largest 3 follicles for females or tests weight, tests length for males or did not show any significant treatments refers that threonine supplementation to basal diet (control group) had no effect on male or females reproductive organs weight.

Economical evaluation:

Results of economic efficiency (EEF) for laying Japanes quails fed the experimental diets during the Laying experimental period (56 days) are summarized in Table 7.

It was clear that dietary supplementation of threonine at level 0.05 % to basal diet or 0.15% showed highly economic efficiency and relative economical efficiency, these results related with the hatching of egg number which increased

by increasing dietary threonine levels and these results may be due to lower prices of the ingredients of the experiment of die.

Conclusively, for there results, it can be concluded from the present data that threonine supplementation at levels (0.05 or 0.15%) showed the highest (EEF and REEF) , While, the worst one at level 0.30% this may be due to some management factors or the mortality occurs suddenly as a result of an accident, and the lowest egg number with highest feed intake, under Egyptian environmental conditions.

REFERENCES

A. O. A. C. (2005). Association of Official Analytical Chemists. *Official Methods of Analysis*. 18th Edition, Washington, D.C. , USA.

Babu, M.; Prabakaram, R.; Than gavel, K.; Mujeer, K.A. and sundarasu, V. (1995). Effect of age on fertility and hatchability of Japanese quail. *Animal of Breeding Abstract*, **63:** 334.

Bahie EL- Dean, M . (1991). Selection and correlated response for dressing percentage in Japanese quail. M. SC. Thesis, faculty of Agriculture, Aexandria. University., Egypt.

Beorlegui, C.; and Gonzalez, G. (1991). *Nutrition alimenation de gallinas ponedoras*, Mundi- Prensa, Madrid, Spain cited by Martinez *et al.;* 1999).

Chen- Tian F. W. U.; Li- Yutsai; TF. Chen and Li- YT (1997) Threonine requirement of laying tsaiya ducks. Journal. of Taiwan *Livestock- Research*, **30**(4): 387- 394; 20 ret

Dozier, W.A.; Moran, E. T. and Kidd, M. T. (2000). Threonine requirement of broiler males from 42 to 56 days in a summer environment. *Journal. Applied. Poultry Research,* **9**: 496- 500.

Duncan, D. R. (1955). Multiple range and multiple F tests. *Biometrics*, **11:** 1- 42.

Eisen, E. J.; Bohren, B. B.; and Mckean (1962). The Haugh Unit as a measure of egg albumin quality. *Poultry Science*, **41:** 1461.

Faria, D. E.; Harms, R. H.; and Russel, G.B. (2002). Threonine requirement of commercial laying hens fed a corn- soybean meal diet. *Poultry. Science*, **81:** 809- 814.

Faten A. M. Attia and Haiam S. Abd El Halim, (2008). The effect of dietary total sulfur amino acids, lysine, valine and threonine supplementation levels on laying hen performance and egg quality measurements. *Egyptian Poultry Science*, **28** (1): 103- 124.

Guillou, M. (1996). *Incubation Artificielle*. Center de frmation protessionelle et de promotion sociate. Avicole- Plou Fragan, France.

Haugh, R.R. (1937). The Haugh Unit for measuring egg quality. U. S. *Egg. Poultry Mnry*, **43**: 553.

Huygebaert. G.; E. A. Butler, (1991). Optimum threonine requirement of laying hens. *British Poultry. Science*. **32** (3): 575- 582.

Inal, S.; Dere, S.; Kurukeu, K. and Tepeli, C. (1999). The effect of selection for body weight of Japanese quail on egg production, egg weight, fertility, hatchability and survivability, *Animal of Breeding Abstract*, **67**: 3137.

Ishibashi, T.; Ogawa, Y.; Itoh, T.; Fujimura, s.; Koide, K.; and Watanabe, R. (1998). Threonine requirement of laying hens. *Poultry Science* , **77** (7): 998-1002.

Khalifah, M. M; and Abdalla, A.A. (2005). Effect of graded levels of threonine on Gimmizah layer hens performance. *Egyptian of. Poultry. Science*, **25** (1): 187- 194.

Kidd, M. T.;. Kerr, B. J. Firman J. D, and. Boling, S.D (1996). Growth and carcass characteristics of broilers fed low- protein, threonine supplemented diets, *Journal of Applied Poultry Science,* **5**: 180- 190.

Kidd, M. T.; C. D. Zumwalt; S. J. Barber; W. A. A. Dozicr; D. W. Chamblee and C. Wiernusz (2003). Threanine response of female cobb 500 broilers fram days 42 to 56. *Journal. Applied. Poultry Research,* **12**: 130- 136.

Koelkebeck- KW.; Baker D. H;. How Y and. Parsons. C. M, (1991). Research note: Effect of excess lysine, methionine, threonine, or tryptophan on production performance of laying hens. *Poultry Science;* **70**(7): 1651- 1653.

Koide and. Ishibashi T, (1995). Threonine requirement in female broilers as affected by age and dietary amino acid levels. *Japanese Poultry. Science*, **32** (5): 329- 336.

Lemme, A. (2001). Responses of broilers to dietary threonine: *A survey of the International Literature, Amino News*, 2(1):1-6, De gussa Corporation.

Lund. S. (1991). Low protein diets and threonine supplement to chick and laying hens. *Norsk- Landbruks Forsking*, **5**: (4) 343- 353.

Martine, A. C.; Laparra, V. J.; Avila, G. E; Fuente. B.; Jinez. T. and Kidd, M. (1999). Dietary L- threonine responses in laying hens. *Journal of Applied Poultry Research.* , **2:** 236 – 241.

Martinez- Amezcua- C.; Laparra - Vega J. L;. Avila- Gonzalez, E. E; B. Fuente, and. Jinez T. (1999). Dietary L. threonine responses in laying hens. *Journal of Applied Poultry Research,* **8(**2): 236- 241.

Morales- Barrera, E.;. Avila- Gonzalez, E and, Laparra- vega, J.L. (1992). Effect of threonine supplementation on practical broiler diets with different levels of arginine. *Veterinaria- Mexico*, **23(**3):.223- 226; 12 ret.

NRC(1994): National Research Council. *Nutrient Requirements of Poultry*. 9th ed. National Academy Press, Washington, DC.

Neamet A. Badawy (1997). Influence of dietary oils on performance blood lipids and immune response of Japanese quail. Egyptian. *Poultry. Science*, **17** (2): 53- 75.

Okazaki, Y.; Fukasa wa, A.; Adachi, S.; Ohishi, R.; and Ishibashi, T. (1994). Amino acid requirements and timing for shift of diets for effective phase feeding of laying hens. *Japanese Poultry Science*, **31** (1):.28- 37.

Panda, B. and Singh, R. P. (1990). Developments in processing quails. *World's Poultry Science Journal*, **46:** 219- 234.

Parlat, S.S.; Yldz, A. O. and yazgan, O. (2003). Effects on performance traits of laying Japanese quails (*Coturnix coturnix Japonica*) of threonine supplementation to diets containing protein. *Hayvanclk- Arastirma- Dergisi*, **13** (1/2): 9-12.

Rangel- Lugo, M.; Su- C. L; Austic, R. E. (1994). Threonine requirement and threonine imbalance in broiler chickens *Poultry Science*, **73(**5): 670- 681..

Romanoff, A. L.. and Romanoff , A. (1949). *The Avian Egg*. John. Wiley and Sons, Inc., New York.

Rotaiah, T.; and Mohapatra, S.C. (1974). Measurement of Albumin quality. *India Poultry Ganzelte*, **59**: 121.

SAS (1998). SAS Institute. *User "Guide" Statistics*. Version 12 Edition. SAS Institute Inc., Cary, NC., USA.

Seuapti, P.K.; Das, K.; Mondaf, K. G. and chatterjee, A. K. (1997). Relation ship between egg weight, shape index and fertility and hatchability of Japanese quail. Animal. Breeding. Abstract; 65: 2527.

Soliman, F. N. K; Sharaf, M. M. and Mandour, M.A. (1991). Effect of storage and egg color on some reproductive traits in Japanese quail. *Egyptian Poultry. Science,* **11**: 287- 300.

Snedecor, G. W.; and Cochran, W. C. (1982). *Statistical Methods.* 7th Edition, Iowa State Univ. Press Ames, Iowa.

Trindade, R.N.; Alloino, L.; Rostagno, H. S.; Gomes, P.C. and Datrindade, R. N. (1999). Requirement of threonine for broilers from 22 to 42 days of age period. *Revista- Brasileira- de- Zootecnia*, **28:** 127- 131.

Valerio, S. R.; Soares, P. R.; Rostago, H.S.; Almeida E. Silva, M. de; Z. F. T. Albino; Lana, G. R. Q.; C. de. C.; Kill, J. L., (2000). Determination of threonine nutritional requirement for white- egg and brown egg laying hens. *Revista- Brasileira- de- Zooteenia*, **29** (2): 518: 524.

Van Der Schoor, S.R.; Reeds, P.J.; Stoll, B.; Henry, J.F.; Rosen berger, J.R.; Burrin, D. G.; and Van Goudoever, J.B. (2002). The high metabolic cost of a functional gut. Gastroeenterology, **123:** 1931- 1940.

Zollitsch W.; Jevne, C.; Leske, K.; and coon, C. (1993). Utilization de amino acids cristalinos en dietas de gallinas pone doras- pages, 85- 121 in: Quinto ciclo de conferencias sobre amino acidos sintoticos. *Feermex, Mexico D.F.; Mexico* (Cited by Martinez *et al*.; 1999).

تأثير إضافة مستويات من الثريونين على معدل الأداء الإنتاجي والتناسلي للسمان البياض

إبراهيم محمد معوض عساف - عبد الباقي محمود أحمد تركيا -إبراهيم عاطف عزازي -السيد السيد محمد السيسي.

معهد بحوث الإنتاج الحيواني- مركز البحوث الزراعية- الجيزة- مصر.

أجريت هذه الدراسة بغرض دراسة تأثير الثريونين المضاف للعليقة على الأداء الإنتاجي والتناسلي في السمان الياباني. وفي هذا البحث استخدام ١٦٢ طائر سمان عمر (٦ أسابيع) قسمت إلى ٩ معاملات (١٨ طائر/ معاملة) وبكل معاملة ٦ مكررات وبكل مكررة عدد ٢ أنثي وذكر في قفص واحد في بطاريات معدنية للسمان البياض. وتم تكوين ٩ معاملات مختلفة في مستوي الثريونين المضاف (بدون، ٠.٠٥، ٠.١٠، ٠.١٥، ٠.٢٠، ٠.٣٠، ٠.٣٥، ٠.٤٠ %) إلى العليقة الاساسية

وتتخلص النتائج المتحصل عليها فيما يلي:

١- مستوي ٠.١٥% (معاملة ٤) من الثريونين المضاف أظهرت أحسن خواص للمظاهر الإنتاجية مثل وزن البيض والغذاء المأكول ومستوي الإنتاج اليومي للبيض ومعامل التحويل الغذائي وكتلة البيض وإنتاج البيض وعدد البيض الصالح للتفريخ ثم تلاها مستوي (٠.٠٥%) (معاملة٢)

٢- أحسن مستوي للفقس عند مستوي (٠.٢٠% ثريونين مضاف) (معاملة ٥) التي حققت ٨٠.٣٦% نسبة فقس بينما المعاملة ٤ (٠.١٥% ثريونين مضاف) حققت أعلى وزن للكتكوت الفاقس.

٣- وبالنسبة لخواص البيض فإن خواص البيض تحسنت عند مستوى ٠.١٥% ثريونين مضاف (معاملة ٤).

٤- كذلك فإن معاملة ٢، ٤ (٠.٠٥%، ٠.١٥% ثريونين مضاف) أعطت أعلى كفاءة اقتصادية وكذلك الكفاءة الاقتصادية النسبية.

التوصية: نستنتج من هذه الدراسة إن إضافة ٠.٠٥ % أو٠.١٥ % ثريونين للعليقة الأساسية حسن من الأداء الإنتاجي وخواص البيضة ونسبة الفقس وكذلك أعطي أحسن كفاءة اقتصادية تحت الظروف المصرية .