

IMPACT OF QUAIL RATION SUPPLEMENTATION WITH MELATONIN ON PHYSIOLOGICAL, PRODUCTIVE PERFORMANCE AND ANTIOXIDANT STATUS

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ABSTRACT

This study designed to demonstrate the effect of adding different levels of melatonin in some productive and physiological characteristics of quail birds at the age of 35 days. Melatonin added from 7 days to 21 days age, a total 225 bird aged 7 days divided into three treatments with three replicates. The first treatment represented the control treatment (without addition). The second and third treatments Ration supplemented with melatonin at a concentration of 20 and 30 mg / Kg feed respectively. The results showed: the melatonin addition did not have significant effect on the live body weight, body weight gain, feed consumption, and the feed conversion ratio from the age of 7 to 35 days, although there was a significant decrease in the melatonin treatments body weight at 21 Day. In addition, melatonin treatment had no significant effect on the total number of red blood cells, white blood cells, PCV% and hemoglobin concentration. While the third treatment showed a significant decrease in MCV and MCH compared to control treatment. About the antioxidants status, Melatonin (20 mg/kg) reduce MDA and increase GSH significantly.

Keywords: melatonin, performance, blood qualities, antioxidants

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INTRODUCTION

The activity and ability of living organisms to grow, reproduce and sustain species are linked to alternating cycles of light and darkness, which in turn are linked to the secretions of some glands and their effect on the organism's effectiveness. Among these the pineal gland and its main hormone melatonin. Melatonin synthesis is limited to the dark part of the light-dark cycle (Mayo, 2017). Melatonin plays an important role in the neuroendocrine control of some physiological and metabolic actions, sexual maturation, reproductive activity and influence efficiency of nutrient benefit of poultry. In addition, effect on poultry body temperature, physiological actions and seasonal rhythms may be affected by melatonin (Çalışlar, 2018). Melatonin hormone and its metabolites are able to function as antioxidant by endogenous free-radical scavengers and broad-spectrum antioxidants. Which enhances the immune system and the growth of birds (Hardeland, 2014).

Since half last century, broiler chickens have usually been reared under continuous or near continuous (23L:1D) photoperiods to maximize feed consumption and growth rate. However, several studies showed that using continuous light programs induces sleep deprivation and causes severe physiological stress responses.

This research is part of M.S.E of 2nd Author.

(Campo and Davila, 2002; Kliger *et al.*, 2000). Free radicals reactive molecules can cause cells death by cellular membranes damage by reacting with polyunsaturated fatty acids, nucleotides in DNA, and critical sulfhydryl bonds in proteins. Free radicals can originate endogenously from normal metabolic reactions or exogenously. Mitochondria source of cell energy (produced 95% of ATP) and reactive oxygen species (Tzamei, 2012). Melatonin antioxidant effects include both direct as well as indirect effects. The mechanism of antioxidant effects evaluated. Melatonin administration leads to increased expression of the antioxidant enzymes superoxide dismutase and glutathione peroxidase (Mayo *et al.*, 2002).

Melatonin given with drinking water changed the behavior of quails and increased the amount of growth hormone. (Zeman *et al.*, 1999).

The aim of the current study is to evaluate effect of use of different levels of melatonin in physiological and productive performance as well as antioxidant status of quail.

MATERIALS AND METHODS

This experiment was designed to show the effect of adding melatonin to the diets of quail birds from the age of 7 days to 21 days. The aim was to study the effect of adding melatonin on the productive and physiological characteristics of the quail at the age of 35 days. To achieve this goal, 225 birds of 7 days were divided into three treatments with three replicates. The birds were treated according to the

Table (1): Composition and nutrient level of the basal diets.

the ingredients	Content (%)
yellow corn	55.95
Soybean (48%) crude protein	34
Proteins Center	5
Sun flower oil	2.3
Limestone	1
Dai Calcium	1.5
Salt	0.250
Total	100%
Computed chemical composition	
The energy represents a kilo / kg feed	3018
Crude protein%	23
Calcium%	1.10
Phosphorus%	0.61
Lysine%	1.25
Methionine%	0.49
Methionine + cysteine%	0.83
Crude fiber%	3.7

- (Wafi protein) contain 40% crude protein ,2150 kcal / kg, 5% crude fat,3.85% lysine, 3.70% methionine, 4.10 methionine + cysteine, 5.60% calcium, 4.65% phosphorus
- Calculation and Chemical Composition of the Ingredients by the National Research Council (N.R.C, 1994).

following:

T1: control treatment (without addition), T2: Add melatonin 20 mg / kg feed

T3: Add melatonin to 30 mg / kg feed

Chicks raised in cages made of wood and metal wire. The cage dimensions are 66,40,40 cm. Each cage is equipped with a feeder and a 1-liter liqueur. The floor is provided with a 5 cm long mattress. Water and feed were provided *ad libitum*. The room is equipped with a 15W LED light source.

In feeding birds, the growth rate was 7 days to 21 days. It was then replaced with a productivity ratio until the experiment was completed and the composition of Table 1 was shown.

To calculate body weight, birds were weighed weekly in groups of each individual weight repeater after cutting feed for 3 hours, while the Body weight gain was calculated weekly and according to the equation indicated Al-Fayad and Naji (1989) calculated the feed intake and the feed conversion ratio according to the equation referred to by Zubaidi (1986).

Blood was collected from six birds, with two birds from each replicate of the treatment at the age of 35 days. Blood was collected directly at slaughter and placed in blood collection tubes containing an EDTA anticoagulant for the purpose of performing blood tests such as PCV, Hb, TWBC, TRBC

A second part of blood was collected without anticoagulant in order to obtain serum to evaluate the antioxidant status, (Campbell, 1995).

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The blood picture traits were determined according to (Campbell, 1995).

MDA was determined according to (Guidet and Shah 1989), while GSH determined according to (Al -Zamily et al., 2001).

Statistical analysis.

The general linear models procedure of S.A.S. software was used to analyze data with one-way analysis of variance (when the effect of melatonin on production and physiological parameters was the main effect) (Anonymous, 2003). Means were separated using Duncan's multiple-range test with significance set at $P \leq 0.05$.

RESULTS AND DISCUSSION

Effect of melatonin addition in productive performance qualities.

The results of Table (2) show the effect of adding different levels of melatonin to quail diets for the period from 7 to 21 days in the production performance indicators. There was no significant difference in mean body weight at age 7, 14, 28 and 35 days, while a significant decrease ($P \leq 0.05$) was observed in the BW of the third treated birds compared with the control treatment.

In the rate of increase in weight, feed consumption and food conversion ratio, the coefficients showed no significant differences except for the significant decrease ($P \leq 0.05$) in feed consumption at 14 days for the addition of melatonin compared to the control treatment. These results correlate with what Clark and Classen (1995) found when feeding broilers on melatonin-containing diets during daytime and with the observation of Guyomarc et al. (2000) when melatonin was added to pre-maturing quail birds.

Effect of melatonin in some blood indicators.

Table (3) shows the effect of adding different levels of melatonin to quail diets for 7-21 days, in some blood indicators. There was no significant difference in the total number of red blood cells, white blood cells, hemoglobin and PCV% between the experimental parameters. A significant decrease ($P \leq 0.05$) was observed in cell size and cell hemoglobin concentration for the addition of melatonin 30 mg / kg feed compared with treatment the control

Table (2): Effect of adding different levels of melatonin for the period from 7 to 21 days in the production performance of quail birds (values represent averages \pm standard error).

Qualities Treatments	Live Body Weight (g/d)				
	7 day	14 day	21 day	28 day	35 day
T1	± 0.43 24.66	± 1.44 59.13	101.70 ± 1.05 A	142.93 ± 1.23	± 1.38 173.10
T2	± 0.46 25.20	± 1.06 57.13	± 1.21 AB 97.26	139.26 ± 1.75	± 3.52 168.53
T3	± 1.16 23.93	± 1.50 56.80	96.06 ± 2.00 B	136.93 ± 2.55	± 4.82 168.20
Body Weight Gain (gm/d)					
	14 day	21 day	28 day	35 day	Total
T1	34.46 ± 1.12	42.09 ± 0.51	41.20 ± 0.41	30.17 ± 1.1 8	148.43 $\pm 1.$ 10
T2	31.93 ± 0.70	40.13 ± 0.63	42.00 ± 0.60	29.26 ± 1.8 4	143.33 $\pm 3.$ 33
T3	32.86 ± 0.33	39.26 ± 1.45	40.86 ± 0.94	31.26 ± 2.2 6	144.26 $\pm 4.$ 40
Feed consumption(gm)					
T1	92.40 ± 1.10 A	124.24 ± 5.9 9	139.96 ± 1.0 3	160.53 ± 2.5 9	517.14 $\pm 8.$ 97
T2	81.33 ± 0.29 B	121.13 ± 2.8 8	140.73 ± 3.6 6	163.93 ± 0.7 5	507.13 $\pm 6.$ 27
T3	86.93 ± 2.37 C	123.13 ± 3.5 8	138.60 ± 3.8 7	159.53 ± 3.9 2	508.00 $\pm 9.$ 60
Feed conversion ratio					
T1	2.68 ± 0.11	2.95 ± 0.13	3.39 ± 0.05	5.33 ± 0.12	3.48 ± 0.06
T2	2.55 ± 0.62	3.02 ± 0.06	3.35 ± 0.12	5.64 ± 0.31	3.54 ± 0.10
T3	2.64 ± 0.06	3.12 ± 0.12	3.39 ± 0.10	5.13 ± 0.30	3.52 ± 0.02

T1 = control treatment (without addition) T2 = addition of melatonin 20 mg / kg feed T3 = addition of melatonin 30 mg / kg.

• Different English letters within the column indicate significant differences between the mean of the transactions at the probability level ($P \leq 0.05$).

movement and heat production (Apeldorn et al., 1999), thus keeping red blood cells from deteriorating. Lewinsky, (2002); Mogulkuk and Beltasi (2003) indicated

Perhaps the decrease in blood cell volume and hemoglobin concentration is due to the role of melatonin in the preservation of red blood cells from decomposition, (Minka and Ayo, 2012). Melatonin may have reduced the rate of vital processes and energy production in the body of birds, such as reduced thyroid activity in the production of T3 and T4 hormones when treated with melatonin.

Table (3): Effect of adding different levels of melatonin for the period from 7 to 21 days in some of the puppet characteristics of quail birds. (Values represent averages \pm standard error).

Qualities	Treatments			S.L
	T1	T2	T3	
Red blood cells ($\times 10^6 / \text{mm}^3$ blood)	3.53 \pm 0.12	4.100 \pm 0.16	4.200 \pm 0.31	N.S
White blood cells ($X \times 10^3 / \text{mm}^3$ blood)	19.15 \pm 4.28	11.20 \pm 1.77	14.84 \pm 2.37	N.S
PCV%	43.83 \pm 1.22	47.16 \pm 1.90	44.50 \pm 1.33	N.S
Hemoglobin Hb (gm / 100 ml blood)	14.61 \pm 0.41	15.71 \pm 0.63	14.83 \pm 0.45	N.S
Cell size MCV (fl)	125.16 \pm 2.39A	115.75 \pm 1.49AB	108.41 \pm 6.44B	*
Hemoglobin Cell MCHC (pg)	41.73 \pm 0.79A	38.60 \pm 0.49AB	36.13 \pm 2.15B	*

T1 = control treatment (without addition) T2 = addition of melatonin 20 mg / kg feed T3 = addition of melatonin 30 mg / kg.

- The different English characters within the same row indicate significant differences between the treatments averages at the probability level ($P \leq 0.05$).
- *Indicates significant differences at the probability level ($P \leq 0.05$).
- N.S indicates that there are no significant differences between the averages at the probability level.

Effect of melatonin in the antioxidants status.

From Table (5), show effect of adding different levels of melatonin to quail diets for the period 7-21 days. Significant improvement in antioxidants status by significant decrease ($P \leq 0.05$) MDA level compared to the treatment of control, melatonin significantly an improvement in glutathione level when compared to the third treatment of control and recorded only a difference in arithmetic If the second transaction is compared to control.

Although no significant differences in production and blood characteristics, but melatonin had positive effect in antioxidants status, as indicated by the results of Table (4), we note a significant decrease in the levels of MDA compared to the treatment of control. The role of melatonin in preserving cell membranes and their cytoplasmic organelles from damage, due to the nature of its structure, which gives it solubility in water or fat (Menendez and Reiter, 1993).

As for the high level of glutathione in the control treatments and the second compared to the third treatment, it may be due to the stimulation of melatonin to other antioxidants as well as to act as an anti-oxidant (Chen, 1994). Sahin et al. (2004) noted that the addition of melatonin led to a significant increase in some antioxidants such as vitamins A, C, E, iron, zinc, copper and chromium.

Table (4): Effect of adding different levels of melatonin for the period of 7 to 21 days in the antioxidants status for quail birds. (Values represent averages \pm standard error).

Qualities	Treatments			S.L
	T1	T2	T3	
MDA micromole / MOL	5.97 \pm 0.16A	3.23 \pm 0.07C	5.11 \pm 0.13B	*
GSH micromole / MOL	2.45 \pm 0.13A	2.60 \pm 0.13A	2.01 \pm 0.08B	*

- T1 = control treatment (without addition) T2 = addition of melatonin 20 mg / kg feed T3 = addition of melatonin 30 mg / kg feed
- Different English characters within the same row indicate significant differences between the average treatments
- Indicates significant differences at the probability level ($P \leq 0.05$).

CONCLUSIONS

The addition of melatonin from the age of 7_21 days did not show any significant effect on the performance and physiological indicators of the quail birds fed to the age of 35 days, despite the improvement of antioxidants status for those birds.

تأثير إضافة الميلاتونين في بعض المؤشرات الإنتاجية والفسلجية وحالة مضادات الأكسدة لطيور السمان

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صممت هذه الدراسة لبيان اثر إضافة مستويات مختلفة من الميلاتونين في بعض الصفات الإنتاجية والفسلجية لطيور السمان عند عمر 35 يوم . حيث جرى اضافة الميلاتونين من عمر 7 ايام ولغاية 21 يوم ، حيث جرى تقسيم 225 طير بعمر 7 ايام الى ثلاثة معاملات بواقع ثلاث مكررات ، حيث مثلت المعاملة الاولى معاملة السيطرة (بدون اضافة) اما المعاملتين الثاني والثالثة فقد اضيف الى علاقتها الميلاتونين بتركيز 20 و30 ملغم/كغم علف على التوالي، وقد تم التوصل الى النتائج الاتية :

لم تؤدي إضافة الميلاتونين الى اي اثر معنوي في معدل وزن الجسم الحي والزيادة الوزنية ومعدل استهلاك العلف وكفاءة التحويل الغذائي لطيور السمان المرباة من عمر 7 الى 35 يوم بالرغم من وجود انخفاض معنوي وحسابي لمعاملتي إضافة الميلاتونين في معدل وزن الجسم الحي مقارنة بمعاملة السيطرة عند عمر 21 يوم. وفيما يخص الصفات الدمية لم يكن لإضافة الميلاتونين تأثير معنوي في العدد الكلي لخلايا الدم الأحمر والبيض والنسبة المؤيه لمكداس الدم وتركيز الهيموغلوبين. في حين سجلت المعاملة الثالثة انخفاض معنوي في معدل حجم الخلية وتركيزها من الهيموغلوبين مقارنة بمعاملة السيطرة. وبالنسبة لحالة مضادات الاكسدة فقد اشارت النتائج الى تحسن معنوي في حالة مضادات الاكسدة تمثل في انخفاض مستوى MDA وارتفاع مستوى GSH في المعاملة الثانية

الكلمات المفتاحية: الميلاتونين، الاداء الإنتاجي، الصفات الدمية، مضادات الأكسدة

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