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SUBSTITUTION OF SYNTHETIC VITAMINS, PREBIOTICS AND ANTIBIOTICS BY PLANT FEED ADDITIVES IN LAYER DIET OF QUAILS REARED UNDER CHRONIC HEAT STRESS.

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ABSTRACT: This experiment was carried out to evaluate ability of some plant feed additives to replace synthetic vitamins, prebiotics and antibiotics in feeding layers Japanese quail layers reared under chronic heat stress. Two hundreds females and 80 males of Japanese quails were selected and distributed randomly into 10 experimental treatments with 4 replicates per each. Each replicate hold 5 female and 2 male. Ten experimental supplementations were added to basal diet (control treatment) to compose 10 experimental treatments. The other 9 treatments were formed by adding 0.5gm oxytetracycline (20%) /kg diet, 200mg vitamin C/kg diet, 20mg vitamin E/kg diet, 1gm pectin/kg diet, 20gm entire fresh lemon (fully grinded) /kg diet, 250 mg silymarin (Si) /kg, 250 mg curcumin (CR) /kg, 500 mg SI /kg and 500 mg CR /kg respectively. The experiment extended from 8 weeks of age up to 2 months of egg production. The results showed that:

Egg production performance of quail fed diet supplemented with fresh lemon equalized with vitamin E and recorded ($p \leq 0.05$) significantly higher egg production performance than vitamin C, pectin, antibiotics and other plant feed additives. On contrast laying quail fed diet supplemented with 500 SI mg CR/kg recorded numerically the highest fertility and hatchability percent. Similarly egg quality improved numerically with silymarin supplementation.

The results of this experiment recommend that some plant feed additives that are available with low cost may be able to substitute antibiotics, synthetic vitamins and prebiotics in diets to improve performance of laying quail reared under chronic heat stress.

Key words: plant; additives; vitamins: antibiotics; quail.

INTRODUCTION

United States Food and Drug Administration (FDA) is an agency responsible for regulating use of antibiotics and FDA (2018) approved oxytetracycline in food-producing animals. According to FDA, most common way for administrating antibiotics in poultry production applied through orally by mixing antibiotics into feed or water. Oxytetracycline is a less lipophilic so it poorly absorbed when it submitted through oral administration and it resided more in albumen than yolk (Marmulak et al., 2015).

Vitamin E and Vitamin C are an antioxidants play major role in biological systems and prevent peroxidation of lipid in cell membranes (Sahin et al, 2003). Dietary vitamin C supplementation improved egg production and hatchability (Nowaczewski and Kontecka 2005). Sahin et al (2003) reported that supplementing VC or VE increased significantly egg production and improved egg quality. Moreover supplemented quail diet with VC and VE improved hatchability for total and fertile eggs (Ipek and Dikmen, 2014).

Replacement of antibiotics in feeding poultry by plant feed additives may be applied because antibiotics increased developing resistant bacteria, transported of antibiotics through poultry products to human, and low price of plant feed additives. Righi et al, (2021) reported that plant feed additives may be used as an effective nutrient supplementation to resist oxidative stress of poultry and improve their productivity and feed efficiency. They added that plant feed additives are able to replace antioxidant synthetic vitamins partially or completely.

Lemon oil possesses antimicrobial against *Salmonella, Shigella flexineri, Saccharomyces* and *Escherichia coli*, and antifungal effects (Nsangou et al., 2021). Moreover, Hindi and Chabuck (2013) reported that Citrus fresh lemon juice has more antimicrobial effect against 8 Gram-negative and 6 Gram-positive bacterial than dried citrus and sweet lemon. There are 10 types of pectin extracted from citrus (Liu, et al., 2022). Pectin can be used as alternatives to antibiotics and stimulate broiler production (Lysko et al., 2021).

Silymarin is an antimicrobial, an anticancer and has a protect effects on cardiovascular, neuro system and skin (Wang et al., 2020). Silymarin has an antioxidant activity when inserted in quail diets and improve growth performance (Youssef et al., 2022). Similarly, adding curcumin to quail diet improved feed conversion and enhanced egg production when quail exposed to thermal stress, besides egg quality improved (Marchiori, et al., 2019).

Chronic heat stress is an expression used to describe slightly high temperature for extended periods (Abu-Dieyeh, 2006). Chronic heat stress retarded egg production performance and supplemented quail diets with an antioxidant alleviated its adverse effect (Sahin et al, 2003).

So the present study aimed to test the ability of some safe plant feed additives to be replaced in layer quail diets reared by synthesis vitamins, prebiotics and antibiotics under chronic heat stress condition.

MATERIALS AND METHODS

Experimental design:

Two hundreds females and eighty males from healthy Japanese quail pullets that completed 7 weeks of age were chosen and were distributed randomly into ten groups. Each group that included 20 females and 8 males were distributed randomly into 4 replicates, where each replicate composed of 5 females and 2 males. Each group constituted one experimental treatment where the first group fed control basal diet that satisfied the NRC requirements of layer Japanese quail. The treatment groups from 2 to 10 fed control basal diet supplemented with 0.5gm oxytetracycline (20%) /kg diet, 200mg vitamin C/kg diet, 20mg vitamin E/kg diet, 1 gm pectin/kg diet, 20gm entire fresh lemon (fully grinded) /kg diet, 250 mg silymarin (Si)/kg, 250 mg curcumin (CR)/kg, 500 mg SI /kg and 500 mg CR/kg respectively.

Vitamin E, C and pectin in a powder forms were gotten from Agri-vet For Manufacturing Vitamins and Feed Additives- 50 El-Gomhoreya, AR Rihani, Al Azbakeya, Cairo. Fresh lemon was obtained from a vegetable market located in Fayoum city.

Management:

Temperature humidity index:

Open-sided poultry house was used to habitat the experimental breeds. The dried ambient temperatures and relative humidity were recorded daily and the average ambient temperatures and relative humidity were calculated. The temperature humidity index was calculated from two equations reported by Thornton *et al.* (2021) suited animals and poultry when dried ambient temperatures recorded.

$THI_1 = 0.8 \times T + ((RH/100) \times (T - 14.3)) + 46.4.$

$THI_2 = (1.8 \times T + 32) - (0.55 - 0.0055 \times RH) \times (1.8 \times T - 26.8).$

Where, THI is temperature humidity index

T is ambient temperature

RH is relative humidity

The experimental pullets were housed in battery cages consists of 5 floors where each replicate that includes 5 females and 2 males were housed in one cage. The three cage diameters were (30cm high, 50cm width and 70cm tall). All birds received the same light program (16L: 8D) from 7 weeks up to the end of experiment and exposed to the same environmental conditions. Adequate amount from diets that satisfy requirements along the week were formulated to be fresh and experimental supplementation were added. Daily enough amount from each experimental diet were submitted for each replicate and at the week end residual from the diets were weighed to calculate feed consumption. Water was available continuously and adequate amount from diets were submitted daily.

Measurements:

Egg production parameters were started to measure at the beginning of 8 week of age and extended for two months. Daily producing eggs were numbered and weighed separately for each replicate. Egg production percent (EP%) were calculated by dividing daily egg number on hens number for each replicate multiplied by hundred. Daily egg mass per hen per day (EM) were calculated by divided daily egg mass for each replicate by hens number. Average egg weight (AEW) was calculated by divided egg mass by egg number for each replicate. Feed intake (FI) were calculated for each hen and feed conversion (FC) values (g feed/g egg) were easily calculated by dividing feed intake by an egg mass.

To study egg quality, forty eggs from each treatment (10 eggs from each replicate) were picked up randomly at the end of the second month. Egg breadth and width of each egg were measured in centimeters by Vernier caliper and shape index was calculated. Each egg was broken and yolk width and height were measured to calculate yolk index. Egg shells were dried for three days in room temperature then shell weight was recorded to nearest 0.1 gram. Albumen weight was calculated by subtracted total egg weight from collection of shell and yolk weight together then albumen, yolk and shell weight percent was calculated. To calculate internal quality unit (IQU), the equation reported by Kondaiah *et al.* (1983) was used.

Internal quality unit IQU = 100 log (H+ 4.18 – 0.8989 ^{x} $W^{0.6674}$)

Where H = albumen height in mm and

W = egg weight in g.

Shell surface area (Sa) was calculated according to **Carter (1975)** using the following equation

$Sa = 0.9109 \times L^{0.289} \times B^{0.3164} \times W^{0.488}$

Where, L Length, B Breadth, W Weight

Shell weight per unit of surface area was calculated by divided shell weight/surface area according to Hamiltton (1978).

During the penultimate week of the second month, fifteen eggs fit for hatching from each replicate (60 eggs from each treatment) were chosen. Chosen eggs were incubated at 99.5F and 45 % relative humidity for fourteen days in Chick Master Incubator. At the end of 14th day of incubation, the incubated eggs transported for hatching at 98.5 and 75% in Chick Master Hatcher. At the end of the 17th day hatched chicks from each replicate were count and un-hatched eggs were broken to distinguish unfertile eggs and dead embryos. Fertility and hatchability percent were calculated.

Statistical analysis:

Statistical package of SPSS software (SPSS, 2007) version 16 was used for statistical analysis. Drop down list of compare means (one way ANOVA) that drop down from the main list Analyze was used for data analysis according to the following statistical model.

$Yij = \mu + Ti + eij$”

Where: Yij = Observations

μ = means،

Ti = treatment effects،

eij = Error term.

According to (Duncan, 1955), Post Hoc multiple comparisons (equal variances assumed) was used to compare means at F-test ($P \leq 0.05$).

RESULTS AND DISSECTION

Production performance:

All egg production performance parameters affected significantly ($p \leq 0.001$) by experimental treatments during the 1st and 2nd months and entire experimental period (Table, 3). Supplementing layers quail diet with OTC recorded numerically the lowest egg production percent and egg mass per hen per day during the 1st month and recorded significantly ($p \leq 0.05$) the lowest values during 2nd month and during entire experimental period. In the same manner, the worst values for FC were recorded numerically during the first month and significantly ($p \leq 0.05$) during the second month and entire period when quail feed diet supplemented with such antibiotic.

These result agree with Lokapirnasari et al. (2017) who presented data demonstrated that daily egg production percent and feed conversion of quail retarded significantly ($p \leq 0.05$) when quail fed diet supplemented with antibiotic. Similar results obtained by Farghaly et al. (2017) and Zacaria and Ampode (2021) who found that supplementing antibiotics to quail diet depressed egg production performance compared with herbal medicines. Decreasing egg production performance as soon as diet supplemented with antibiotics may be due to that OTC decreased beneficial bacteria like Lactobacillus Youssef et al. (2021).

Feeding layer quail diets supplemented with VC and VE during the 1st month of egg production improved significantly ($p \leq 0.05$) EP%, EM, FI and FC compared with control basal diet and OTC supplementation. Moreover, VC supplementation recorded numerically the best values during the 1st month compared with other treatments. Regarding VC and VE, the results agree with (Sahin et al, 2003) who stated that VC supplementation improved egg production (Nowaczewski and Kontecka 2005). Sahin et al (2003) added that supplementation of VC or VE (250 mg/kg diet) increased significantly egg production.

There were no significant differences among VC, VE and fresh lemon regarding EG, EM and FC traits during the 1st month of egg production. The results of VC, VE and fresh lemon that contain VC may be due to that the current experiment was conducted during summer season. Where (Karimi et al., 2015) reported that inserting VC (300mg/kg diet) in layer quail diet possess ability to reduce harm effect of heat stress.

Supplementing layer quail diet with extracted pectin as prebiotic like that found in fresh lemon didn't present improvement in egg production traits compared with control basal diet and OTC treatment during the 1st month. The pectin manner was converted during the second month and for entire period where most egg production traits were improved significantly ($p \leq 0.05$) compared with OTC and control treatments. The unexpected results of pectin may be due to that the pectin found naturally in fresh lemon differ than synthetic pectin. Where, Srivastava and Malviya (2011) reported that 80% of carboxyl groups of galacturonic acid found naturally in pectin conjugated with methanol by esterified bound. This percentage decreased sharply during pectin extraction.

Supplementing low level from SI and CR (250mg/kg diet) didn't achieve significant improvement in production traits during the 1st month compared with control and OTC treatments. In contrast, high level from SI and CR (500mg/kg diet) improved significantly production traits compared with OTC. In contrast, during the 2nd month, low and high levels from SI and CR improved numerically egg production traits compared with control treatment and significantly ($p \leq 0.05$) compared with OTC.

Reproduction performance:

The experimental supplementation didn't affect significantly fertility and hatchability percent (Table, 4). Quail fed diet supplemented with 500 mg SI /kg diet recorded the highest numerically fertility and hatchability percent. In contrast, quail that fed diet supplemented with OTC recorded numerically the lowest hatchability percent.

The results of OTC agree with Damron et al. (1972) who reported that fertility was reduced for Leghorn and broiler breeder hens fed diets contained oxytetracycline. Nevertheless, supplementation of 500mg SI/kg diet recorded numerically the highest fertility percent compared with other treatments. The results of SI agree with Erisir et al. (2016) who found numerical improvement in fertility and hatchability of quails fed diet supplemented with SI compared with control treatment. This result may be due to silymarin may be hold antioxidant effect and so can improve the capability of sperm antioxidant system (Eskandari and Momeni, 2016). This may be due to that treating with SI improved motility and sperm viability by encouraging antioxidant enzyme capacity and scavenging free radicals (Zarif-Yeganeh and Rastegarpanah, 2019).

The results in Table, 4 showed that VC supplementation improved hatchability percent compared with control and OTC treatments and this result agree with Nowaczewski and Kontecka (2005). Similarly, VE supplementation improved numerically hatchability percent compared with control and OTC treatments. Generally, the results of synthetic vitamins agree with Ipek and Dikmen (2014) who reported that supplemented quail diet with 240 mg VC and VE/kg diet improved hatchability for total and fertile egg.

The results of dead embryo percent show that the highest numerical values recorded when quail hens fed diet supplemented with OTC, this result could not be explained. In contrast, the lowest numerical values of dead embryo percent had been recorded for quail hens fed diet supplemented with different levels from CR and SI.

Egg quality:

Except for shell weight per unit of surface area all egg quality parameters didn’t affect significantly by experimental treatments (Table, 5). The results of silymarin agree with Erisir et al. (2016) who found no difference between SI and control treatments. In this connection, Sahin, (2003) reported that supplementation of VC or VE (250 mg/kg diet) increased significantly egg production and improved egg quality. Moreover, supplemented quail diet with 240 mg VC and VE/kg diet improved hatchability for total and fertile egg (Ipek and Dikmen, 2014). Shell weight per unit of surface area affected significantly by experimental treatments. The result directions were not clear and We couldn't explain this result.

It can be recommend that plant feed additives may be replaced by antibiotics, synthetic vitamins and prebiotics in diets of quail laying hens to decrease risk of using antibiotics. Moreover, plant feed additives are available and less expensive than synthetic vitamins and prebiotics

plant; additives; vitamins: antibiotics; quail.

Table (1): ambient temperature, relative humidity and temperature humidity index

Items / weeks	Ambient temperature	Relative humidity	THI_1	THI_2
1	39.29	47.86	89.77	90.11
2	37.57	47.86	87.62	87.95
3	37.29	50.71	87.90	88.20
4	36.00	50.00	86.05	86.35
5	36.00	44.29	84.85	85.19
6	34.00	45.00	82.47	82.79
7	32.86	44.29	80.90	81.22
8	30.00	45.71	77.59	77.89
last 5 day	29.00	29.60	45.00	76.98
Entire period	34.90	46.80	84.01	84.33

THI: temperature humidity index.

Table (2): The composition and calculated analysis of diets.

Ingredient	%	Calculated values	
Yellow corn	60.24	CP%	20
Soybean meal 44 %	22.57	ME .KCal/Kg	2900
Corn gluten	8.5	Ca %	2.5
Soya oil	0.76	Avail. P%	0.35
Dicalcium phosphate	1.46	Methionine %	0.40
Limestone	5.55	Lysine%	1.05
NaCl	0.39	Meth.+cyst.%	0.70
Premix*(V&M.)	0.30	Na. %	0.17
DL. Methionine	0.03		
L. Lysine	0.2		
Total	100		

Each 1 kg Premix contains

Vitamins : Vit A: 5000000 IU, Vit. D_3:1400000 IU, Vit. E:17000 mg, Vit. K_3:1400 mg, Vit. B_1:1000 mg, Vit. B_2:2700 mg, Vit. B_6:1700 mg, pantothenic acid:5500 mg, Vit. B_{12}:10 mg, folic acid:700 mg, niacin:1500 mg, biotin:70 mg, choline chloride:170000 mg,

Minerals: Zinc:2500 mg, Copper:5000 mg, Cobalt:50 mg, Iodine:400 mg, Selenium:50 mg, Manganese:34000 mg, Iron:10000 mg, Zinc:2500 mg,

Carrier $caco_3$ add to1 kg

Table (3): Egg production performance of layer Japanese quail fed diets with experimental supplementations.

Month	**1st month**					**2nd month**					**Entire period**				
Treatments	**EP%**	**EM (gm)**	**AEW**	**FI**	**FC**	**EP%**	**EM (gm)**	**AEW**	**FI**	**FC**	**EP%**	**EM (gm)**	**AEW**	**FI**	**FC**
Control	41.61^{cd}	4.31^{cde}	12.36^{b}	28.12^{c}	6.04^{ab}	56.94^{de}	6.39^{de}	13.39^{bcd}	28.68^{d}	4.26^{bc}	49.27^{c}	6.42^{c}	13.06^{bcd}	28.39^{cd}	5.29^{bc}
OTC	36.61^{d}	3.80^{e}	12.36^{b}	28.00^{d}	6.55^{a}	43.06^{f}	4.88^{f}	13.69^{b}	28.81^{a}	5.85^{a}	39.84^{d}	5.21^{d}	13.14^{bc}	28.40^{bc}	6.65^{a}
Vit. C	56.13^{a}	5.70^{a}	12.21^{b}	27.84^{e}	4.30^{d}	54.19^{e}	5.97^{e}	13.26^{cd}	28.81^{a}	4.54^{b}	55.16^{ab}	7.00^{bc}	12.76^{de}	28.32^{f}	4.57^{cde}
Vit. E	53.23^{a}	5.33^{ab}	12.01^{b}	28.02^{d}	4.82^{cd}	64.84^{abc}	7.05^{bc}	13.06^{d}	28.62^{f}	3.74^{cd}	59.03^{a}	7.43^{ab}	12.59^{e}	28.31^{f}	4.47^{de}
Pectin	41.94^{cd}	4.26^{de}	12.14^{b}	28.36^{a}	6.17^{ab}	60.97^{cd}	6.84^{cd}	13.29^{cd}	28.73^{c}	4.11^{bc}	51.45^{bc}	6.66^{c}	12.86^{cde}	28.55^{a}	5.38^{b}
Fresh lem	52.26^{ab}	5.32^{ab}	12.16^{b}	28.11^{c}	4.91^{cd}	66.29^{ab}	7.41^{ab}	13.47^{bc}	28.76^{bc}	3.40^{d}	59.27^{a}	7.64^{a}	12.91^{cde}	28.44^{b}	4.06^{e}
SI 250	41.45^{cd}	4.15^{de}	11.86^{b}	27.89^{e}	6.18^{ab}	61.77^{bcd}	6.71^{cd}	13.08^{d}	28.74^{c}	4.05^{bc}	51.61^{bc}	6.51^{c}	12.61^{e}	28.31^{f}	4.98^{bcd}
CR 250	42.74^{cd}	4.33^{cde}	12.06^{b}	28.03^{d}	5.30^{bcd}	58.06^{de}	6.67^{cd}	14.04^{a}	28.69^{d}	4.00^{c}	50.40^{c}	6.60^{c}	13.32^{b}	28.36^{de}	4.97^{bcd}
SI 500	46.45^{bc}	4.77^{bcd}	12.30^{b}	28.26^{b}	5.42^{bc}	68.39^{a}	7.69^{a}	13.52^{bc}	28.77^{b}	3.27^{d}	57.42^{a}	7.48^{ab}	13.08^{bc}	28.52^{a}	4.15^{e}
CR 500	46.29^{bc}	5.02^{abc}	12.98^{a}	28.03^{d}	4.75^{cd}	55.32^{e}	6.55^{cd}	14.19^{a}	28.64^{e}	3.92^{c}	50.81^{bc}	6.94^{bc}	13.67^{a}	28.34^{ef}	4.48^{de}
± SE.	±0.733	±0.077	±0.052	±0.008	±0.009	±0.546	±0.062	±.039	±0.003	±0.113	±0.488	±0.063	±0.033	±.004	±0.058
Sig.	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

^{a,b},.. Means within the same column with different superscripts are significantly differ ($P \leq 0.05$). SE=Standard Error of Means
OTC =Oxytetracycline Vit. C= vitamin C Vit. E= vitamin E Fresh lem= Fresh lemon SI= silymarin CR=curcumin EP%= egg production percent
EM= egg mass per hen per day (gm) AEW= average egg weight FI= feed intake (gm) FC= feed conversion (gm feed/gm diet)

plant; additives; vitamins: antibiotics; quail.

Table (4): Fertility and hatchability percent of layer Japanese quail fed diet with experimental supplementations.

Items / Treatments	Fertility percent	Hatchability percent	Unfertile egg percent	Dead percent
Control	84.55	75.38	15.45	9.17
OTC	90.23	67.77	9.77	22.46
Vit. C	89.82	77.49	10.18	12.33
Vit. E	92.98	86.07	7.03	6.91
Pectin	85.04	68.60	14.96	16.44
Fresh lemon	88.98	77.87	11.02	11.11
SI 250 (mg/kg diet)	90.46	83.41	9.55	7.05
CR 250 (mg/kg diet)	87.29	84.79	12.71	2.50
SI 500 (mg/kg diet)	95.00	90.83	5.00	4.17
CR 500 (mg/kg diet)	85.31	79.46	14.69	5.85
± SE	1.415	2.096	1.415	1.520
Significant	0.837	0.254	0.837	0.088

SE=Standard Error of Means
OTC =Oxytetracycline Vit. C= vitamin C Vit. E= vitamin E Fresh lem= Fresh lemon
SI= silymarin CR=curcumin

Table (5): egg quality of layer Japanese quail fed diet with experimental supplementations.

Items / Treatments	Shape index	Yolk index	IQU	Yolk wt%	Alb wtt%	Shell characters: Shell weight%	Shell thickness	Sa (cm2)	Sw/Sa (mg/cm2)
Control	79.60	43.54	66.51	33.35	55.62	11.03	24.30	24.29	55.74[c]
OTC	79.29	44.57	64.83	31.52	57.66	10.82	25.40	25.51	57.90[bc]
Vit. C	78.72	45.45	64.47	33.54	55.48	10.99	25.80	25.68	58.46[abc]
Vit. E	79.76	45.25	64.73	33.63	55.46	10.90	24.70	24.99	56.78[bc]
Pectin	78.96	45.88	57.55	33.18	54.49	12.32	25.60	24.52	64.04[ab]
Fresh lem	79.36	44.36	59.41	33.19	55.16	11.64	25.30	25.80	62.04[abc]
SI 250	81.22	44.32	62.41	31.52	56.29	12.19	25.80	25.50	64.21[ab]
CR 250	80.87	46.80	67.37	32.84	54.42	12.74	23.80	24.82	66.38[a]
SI 500	79.67	43.13	65.54	32.17	55.30	12.52	25.60	24.40	64.47[ab]
CR 500	77.69	46.77	65.72	33.31	55.03	11.66	25.10	25.23	61.01[abc]
± SE.	±0.314	±0.342	±0.740	±0.246	±0.293	±0.171	±0.249	±0.161	±0.820
Significant	0.419	0.208	0.052	0.394	0.429	0.053	0.698	0.305	0.025

[a,b,..] Means within the same row with different superscripts are significantly differ ($P \leq 0.05$).
SE=Standard Error of Means IQU = Internal quality unit 100 log (H+ 4,18 - 0,8989*W^0.6674)
OTC =Oxytetracycline Vit. C= vitamin C Vit. E= vitamin E Fresh lem= Fresh
SI= silymarin CR=curcumin

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الملخص العربي

استبدال الفيتامينات المخلقة، البريبيوتيك، والمضادات الحيوية بإضافات غذائية نباتية في علائق السمان البياض المربى تحت ظروف الاجهاد المزمن

صبّاح فاروق يوسف[1]، محمد حامد عبدالفتاح محمد[1] هشام احمد عبد اللطيف[1] ، منال سعودي محمد حسن عبد الكريم حسن عبد الحليم[1]، حنان صابر محمد[1]، هدى السيد الجابري[1]، هبه بدر[2]، رشا محمود حمزة سيد الأهل[2] و السيد محفوظ عبد الكافي[1]

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اجريت التجربة الحالية لتقييم مقدرة بعض اضافات الاعلاف النباتية على استبدال بعض الفيتامينات المخلقة والبريبيوتيك والمضادات الحيوية في علائق السمان الياباني البياض المربى تحت ظروف الاجهاد الحراري. ولاختبار فرضية التجربة تم اختيار 200 انثى و 80 ذكر سمان ياباني ووزعت عشوائياً الى10 معاملات تجريبية تحتوي كل واحدة على 4 مكررات بكل مكرر 5 اناث و ذكرين. تم اضافة 9 اضافات غذائية الى العليقة القاعدية التي شكلت عليقة المقارنة ليكتمل عدد المعاملات الى 10 معاملات. وتكونت الـ 9 معاملات الباقية بإضافة 5و0 جم اوكسي تتراسيكلين(20٪)/كجم علف، 200مجم فيتامين ج/كجم علف ، 20مجم فيتامين هـ /كجم علف ، 1جم بكتين/كجم علف،20جم ليمون مطحون بالكامل /كجم علف، 250مجم سيليمارين/كجم علف،250مجم كركمين/كجم علف،/، 500مجم سيليمارين/كجم علف،500مجم كركمين/كجم علف على الترتيب. وامتدت التجربة من عمر 8 اسبوع وحتى نهاية الشهر الثاني من انتاج البيض. تم الحصول على النتائج التالية:
لم يكن هناك فروق واضحة في الاداء الانتاجي للسمان المغذى على عليقة تحتوي على الليمون الجاف والتي تحتوي على فيتامين هـ و كلاهما تفوق معنوياً عن العلائق المضاف اليها فيتامين ج، والبكتين، المضاد الحيوي والاضافات النباتية الاخرى. على النقيض لم يكن هناك فروق معنوية في مقاييس التناسل وقد سجلت رقمياً معاملة 500 مجم سيليمارين/كجم علف اعلى نسبة مئوية للخصوبة وتفريخ كما سجلت نفس المعاملة رقمياً افضل صفات جودة للبيض.
لذلك توصي النتائج المتحصل عليها من التجربة بإضافة الاضافات النباتية المتوفرة والاقل تكلفة كبديل آمن للمضادات الحيوية والفيتامينات المخلقة والبريبيوتيك لتحسين الاداء الانتاجي للسمان البياض المربى تحت ظروف الاجهاد الحراري.

الكلمات الدالة: نباتية، اضافات، فيتامينات، مضادات حيوية، سمان.