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EFFECTS OF FEEDING HIGH-NUTRIENT-DENSITY DIETS ON PERFORMANCE OF BOVANS WHITE HENS REARED UNDER SUMMER CONDITIONS IN EGYPT

Hayam M.A. Abo El-Maaty; F.S.A. Ismail; M.H. Rabie and A.Q. Aswad
Poultry Production Department, Faculty of Agriculture, Mansoura University, Egypt.

ABSTRACT

The present study was undertaken to determine the effects of feeding diets containing high nutrient concentrations on laying performance and egg quality of Bovans White laying hens during the summer season in Egypt. Two hundred hens were randomly distributed into five equal experimental groups, each composed of five replications. Hens were maintained at community cages (8 birds/cage) and subjected to similar hygienic and managerial conditions. A corn-soybean meal-based diet, containing 17.40% crude protein, 2880 kcal/kg of metabolizable energy, 4.35% calcium, 0.43% nonphytate phosphorus, 0.84% lysine, 0.41% methionine, and 0.70% methionine plus cysteine, was formulated in mash form and used as a control. The concentration of nutrients was increased to be 102.5, 105, 107.5 and 110% of those present in the control diet through some dietary manipulations, thus five mash experimental diets were formulated and fed to hens. The laying performance was evaluated in terms of egg production rate, egg weight, daily egg mass, daily feed intake and feed conversion ratio during three 28-day periods, from 44 to 56 weeks of age. An egg quality test was also performed to determine the effects of feeding the high-nutrient-density diets on egg components and some exterior and interior parameters of egg quality at the last week of study.

At the first 4-week period, feeding the high-nutrient-density diets had no significant effect on laying performance of hens but daily feed intake was inconsistently affected. At the second period, hens fed high-nutrient-density diets achieved significantly higher egg production rate (EPR) and daily egg mass (DEM) compared with the control group while egg weight (EW), daily feed intake and feed conversion ratio (FCR) were not affected. At the third period, hens fed 105 and 107.5% diets consumed significantly more feed and displayed higher EPR and DEM than those of other dietary treatments but EW and FCR were not affected. Feeding the high nutrient density diets produced significant improvements in egg weight, yolk index and Haugh units compared with their control counterparts while percentages of egg components, shell weight per unit surface area (SWUSA), egg shape index and yolk color score were not affected. It is concluded that increasing dietary nutrient density up to 110% of the recommended requirements of Bovans White laying hens can positively affect some egg quality traits but had inconsistent effect on their productive performance under Egyptian summer conditions.

Keywords: Bovans White hens, performance, egg quality, summer conditions.

INTRODUCTION

Heat stress is one of the environmental challenges affecting poultry production. High ambient temperature negatively affects the productive performance of laying hens (Daghir, 2008). The most important reason for the negative effect of heat stress on the productive performance of laying hens is the decreased feed intake. Such depressed appetite leads to reductions in body weight, feed efficiency, egg production and egg quality (Mashaly *et al*., 2004; Star *et al*., 2009; Ebeid *et al*., 2012; Deng *et al*., 2012). In addition to decreased feed intake, heat stress has been shown to reduce dietary digestibility in broiler chickens (Wallis and Balnave, 1984; Bonnet *et al*., 1997). Moreover, Wolfenson *et al*. (1987) reported that absorption of K, P and Ca was reduced due to heat stress in young turkeys. Heat-stress can also decrease plasma protein and calcium levels (Mahmoud *et al*., 1996), the retention rates of Ca, P and Mg (Kamar *et al*., 1987) and serum lipoproteins and follicle steroid hormones (Yoshida *et al*., 2011).

It is well known that laying hens, like other homeotherms, eat mainly to satisfy their energy requirements and thus their energy requirements decrease as environmental temperature increases (Daghir, 2008). This relationship holds true only within the temperate zone (18-22 ºC). At very low temperature birds increase their feed intake while at high temperature they under-eat. The use of high-energy diets during the early production phase has therefore become quite common in warm regions. This practice should be accompanied by increased density of all nutrients, particularly critical amino acids (Daghir, 2008).

Diet manipulation is one of the common nutritional strategies attempted to overcome the adverse effects of heat stress on feed and energy intakes, and productive performance of laying hens. Nutritional modifications of the poultry diet during the time of heat stress mainly include energy, protein, and other specific nutrients for heat-stressed poultry (Sahin *et al*., 2009). Additionally, to alleviate the marginal nutrient deficiencies that can increase the economic losses associated with heat stress in poultry production, Leeson (1986) recommended that nutrient density of the diet should be increased.

The present study was carried out to investigate the effects of feeding high-nutrient-density diets on laying performance and egg quality of Bovans White laying hens during the summer season in Egypt.

MATERIALS AND METHODS

A feeding trial was conducted at the Poultry Research Unit, Qalabsho Center of Agricultural Researches and Experiments, belonging to Faculty of Agriculture, Mansoura University, Egypt, during the period from May to July, 2014. Ambient temperature and relative humidity ranged between 19.9 and 33.5°C, and 46 and 58%, respectively, during the experimental period. Two hundred 44-week-old Bovans White laying hens were randomly distributed into five equal experimental groups, each contained five replications. Each replication was kept in a community cage measuring 80 cm width, 100 cm length and 80 cm height (with one feeder). The cages are put in an open-sided laying house and supplied with an artificial light to provide a daily photoperiod of 16 hours.

Experimental diets:

A basal diet composed mainly of yellow corn, soybean meal and corn gluten meal was formulated to meet or exceed the nutrient requirements of Bovans White laying hens, as suggested by the Bovans White Management Guide (BWMG, 2012), and served as a control. The calculated analysis of the control diet was as follows: metabolizable energy; 2880 kcal/kg, crude protein; 17.40%, calcium; 4.35%, nonphytate phosphorus; 0.43%, lysine; 0.84%, methionine; 0.41% and methionine plus cystine; 0.70%. The concentration of nutrients was increased to be 102.5, 105, 107.5 and 110% of those present in the control diet through some dietary manipulations, thus five mash experimental diets were formulated and used. These experimental diets were referred to as control, HND1, HND2, HND3 and HND4, respectively, and fed to Bovans White laying hens kept in cages under Egyptian summer conditions from 44 to 56 weeks of age. Ingredient composition and chemical analyses of these diets are presented in Table 1.

Performance and egg quality traits:

The performance of laying hens were evaluated as egg production rate, egg weight, daily egg mass, daily feed intake and feed conversion ratio during three 28-day periods. At the last week of study, an egg quality test was also performed to determine the effects of feeding the high-nutrient-density diets on egg components and certain parameters of exterior and interior egg quality. Freshly-collected eggs (30 eggs per treatment) were randomly chosen were examined to determine egg weight and its relative components (shell, yolk and albumen), egg shape index, yolk index, shell thickness, yolk color score and Haugh units (Haugh, 1937). Shell weight per unit surface area (SWUSA) was also estimated by dividing shell weight (plus adhering membranes) in milligrams by the egg surface area in cm^2 (ESA). The ESA was calculated according to the equation adopted by Carter (1975) as follows: ESA= [(3.9782 x egg weight$^{0.7056}$ (g)].

Statistical analysis:

Data obtained were statistically processed by using one-way analysis of variance of the Statistical Analysis System (SAS, 2004). Differences among means of different variables were separated by Duncan's new multiple range test (Duncan, 1955) at P≤0.05.

Table (1): Calculated composition and chemical analyses of the experimental diets‡ fed to laying hens from 44 to 56 weeks of age

Ingredients (%)	Control	HND1	HND2	HND3	HND4
Ground yellow corn	61.65	59.15	56.68	54.48	52.82
Soybean meal (44%CP)	15.76	15.39	15.21	14.56	12.90
Corn gluten meal (60% CP)	8.00	9.30	10.40	11.83	13.85
Sunflower oil	1.60	2.80	4.00	5.09	6.00
Ground limestone	10.33	10.60	10.85	11.10	11.34
Dicalcium phosphate	1.75	1.83	1.90	1.94	2.08
Vitamin and mineral Premix[3]	0.30	0.30	0.30	0.30	0.30
Common salt (NaCl)	0.30	0.30	0.30	0.30	0.30
DL-Methionine	0.08	0.08	0.08	0.08	0.07
L-Lysine-HCl	0.23	0.25	0.28	0.32	0.38
Total	100	100	100	100	100
Calculated analysis (As Fed Basis: NRC, 1994)					
Metabolizable energy (ME), kcal/kg	2880	2952	3024	3096	3168
Crude protein (CP), %	17.40	17.84	18.27	18.71	19.14
Ether extract (EE), %	4.26	5.40	6.53	7.57	8.45
Crude fiber (CF), %	2.56	2.50	2.44	2.37	2.24
Calcium, %	4.35	4.46	4.57	4.68	4.79
Nonphytate P, %	0.43	0.44	0.45	0.46	0.47
Lysine, %	0.84	0.86	0.88	0.90	0.92
Methionine, %	0.41	0.42	0.43	0.44	0.45
Methionine + Cystine, %	0.70	0.72	0.74	0.75	0.78
Determined analysis (DM Basis: AOAC, 1990)					
Dry matter (DM), %	89.45	89.66	89.53	89.84	89.45
Crude protein (CP), %	19.45	19.89	20.41	20.83	21.40
Ether extract (EE), %	4.76	6.02	7.29	8.43	9.45
Crude fiber (CF), %	2.86	2.79	2.73	2.64	2.50
Ash, %	6.95	7.24	7.53	7.67	7.87
Nitrogen-free extract (NFE), %	65.98	64.06	62.04	60.43	58.78

‡: Diets termed as HND1 to HND4 have 102.5, 105, 107.5 and 110% of nutrient contents present in the control diet, respectively.

[1]: Each 3 kg of premix contained: vit A, 12,000,000 IU; vit D_3, 3,500,000 IU; vit. E, 20 g; vit. K_3, 3 g; vit. B_1, 3 g; vit. B_2, 8 g; vit. B_6, 3 g; vit. B_{12}, 15 mg; Ca pantothenate, 12 g; Niacin, 40 g; Folic acid, 1.5 g; Biotin, 50 mg; Choline chloride, 600 g; Mn, 80 g; Zn, 75 g; Fe, 40 g; Cu, 10 g; I, 2 g; Se, 0.3 g; Co, 0.25 g and CaCo3 as a carrier.

RESULTS AND DISCUSSION

Performance of laying hens:

Data on productive performance of laying hens, kept under the summer season conditions in Egypt, and fed high-nutrients-density diets from 44 to 48 weeks of age, are presented in Table 2. Analysis of variance of these data proved that egg production rate (EPR), egg weight (EW), daily egg mass (DEM) and feed conversion ratio (FCR) were not affected by dietary treatments during the first 28-day period of the experiment but daily feed intake (DFI) was significantly ($P<0.01$) affected (Table 2). It was observed that hens fed HND2 and HND4 diets consumed less feed per day than did the control group while DFI of hens fed HND1 and HND3 diets was not significantly different from their control counterparts.

Table (2): Performance of Bovans White laying hens fed high-nutrient-density diets from 44 to 48 weeks of age

Experimental diets‡	EPR (%)	EW (g)	DEM (g)	DFI (g)	FCR (g : g)
Control	75.09	65.31	48.95	137.50[a]	2.82
HND1	75.18	65.80	49.43	135.18[ab]	2.79
HND2	82.23	65.85	54.10	131.38[bc]	2.46
HND3	78.57	67.69	53.19	133.26[ab]	2.51
HND4	72.41	65.78	47.57	127.50[c]	2.70
SEM	3.92	0.686	2.428	1.617	0.139
Significance level	NS	NS	NS	**	NS

‡: Diets referred to as HND1 to HND4 have 102.5, 105, 107.5 and 110% of nutrient contents present in the control diet, respectively.
a-c: Means in the same column having different superscripts differ significantly at P≤0.05.
SEM: Standard error of the means, EPR: Egg production rate, EW: Egg weight, DEM: Daily egg mass, DFI: Daily feed intake and FCR: Feed conversion ratio.

During the first 4-week period, it was observed that DFI of hens was inconsistently affected by feeding high-nutrient-density diets; hens fed HND2 and HND4 consumed significantly less feed as compared to the other experimental groups. But dietary treatments had no positive effects on EPR, EW, DEM or FCR. The lack of positive effect of feeding high-nutrient-density diets on the productive performance of Bovans White laying hens, reported herein, is in accordance with the findings of Panda *et al.* (2012), who found that egg production, egg weight and egg mass were not affected by increasing the dietary nutrient density to 107.5% as compared to that of the control group. In addition, Zhang and Kim (2013) evaluated the effects of feeding two dietary energy levels (2700 vs. 2800 kcal/kg) and two nutrient densities (high and low-nutrient-density diets) on productive performance of laying hens, and found that egg production was not affected by dietary treatments but hens fed high-energy and high-nutrient-density diets had significantly less daily feed intake than those fed low-energy and low-nutrient-density diets. Moreover, Rama Rao *et al*. (2014) studied the effects of feeding graded concentrations of ME (10.04, 10.67 and 11.30 MJ/kg) and CP (150, 165 and 180 g/kg) on the performance of layers, and found that egg production, egg weight and egg mass were unaffected by dietary variation in concentrations of ME and CP, but the feed efficiency improved and feed intake reduced with increasing concentrations of these nutrients, during the post-peak production phase.

On the contrary, Pell and Polkinghorne (1986) found that hens fed high nutrient concentration diet (19% CP and 12.6 MJ ME/kg) had significantly higher intakes of ME and other nutrients than did those given the medium nutrient concentration diet (18% CP and 11.7 MJ ME/kg) or the low nutrient concentration diet (16% CP and 11.4 MJ ME/kg). They also reported that egg production, egg weight, egg mass and feed efficiency were higher for hens fed high nutrient concentration diet than those of hens received lower nutrient concentration diets. Similar results were obtained by Wu *et al.* (2007), who found that as nutrient density increased, hens linearly adjusted feed intake to achieve similar energy intakes, egg mass linearly increased, and feed conversion linearly improved. In addition, Marie *et al.* (2009) found that feed intake decreased, nutrient intake increased and egg production, egg weight, egg mass and feed conversion were improved due to increasing nutrient density of the diet. Recently, De Persio *et al*. (2015) fed laying hens on diets containing 85 to 105% of energy and other nutrients and found that increasing energy and nutrient density increased egg production, egg weight, egg mass, feed efficiency, energy intake and body weight.

Data on the effects of feeding high-nutrients-density diets on productive performance of laying hens, kept under the summer season conditions in Egypt from 48 to 52 weeks of age, are given in Table 3. Analysis of variance of these data revealed that EW, DFI and FCR were not affected by feeding the high-nutrient-density diets during the second 28-day period of the experiment but EPR and DEM were significantly (P<0.01) affected (Table 3). It was surprising that hens fed high-nutrient-density diets produced significantly more eggs and achieved significantly higher DEM than did the control hens, although dietary treatments did not significantly affect DFI or FCR. The perusal of data presented in Table 3, one can realize that hens fed high-nutrient-density diets had insignificantly better means of FCR as compared to the control hens. This observation is undoubtedly related to the significantly higher means of EPR and DEM of hens fed high-nutrient-density diets compared with the control ones.

Table (3): Performance of Bovans White laying hens fed high-nutrient-density diets from 48 to 52 weeks of age

Experimental diets‡	EPR (%)	EW (g)	DEM (g)	DFI (g)	FCR (g : g)
Control	71.88^{b}	66.72	47.97^{b}	130.45	2.75
HND1	81.70^{a}	67.02	54.81^{a}	132.14	2.43
HND2	83.04^{a}	66.20	54.96^{a}	131.65	2.40
HND3	83.03^{a}	68.01	56.48^{a}	136.52	2.42
HND4	80.98^{a}	66.31	53.67^{a}	133.26	2.49
SEM	2.588	0.697	1.896	1.955	0.097
Significance level	*	NS	*	NS	NS

‡: Diets referred to as HND1 to HND4 have 102.5, 105, 107.5 and 110% of nutrient contents present in the control diet, respectively.
a-b: Means in the same column having different superscripts differ significantly at P≤0.05.
SEM: Standard error of the means, EPR: Egg production rate, EW: Egg weight, DEM: Daily egg mass, DFI: Daily feed intake and FCR: Feed conversion ratio.

During the second 4-week period, feeding high-nutrient-density diets positively affected EPR and DEM compared with those of the control hens, but EW, DFI and FCR were not affected. The increased EPR and DEM due to feeding high-nutrient-density diets, observed in the present study, are in harmony with the findings of Marie *et al.* (2009), who found that egg production, egg weight, egg mass and feed conversion were improved due to increasing nutrient density of the diet. The present results are partially in agreement with those of Rama Rao *et al.* (2011), who evaluated the effect of dietary concentrations of energy (2350 and 2600 kcal/kg of ME), crude protein (15, 16.5 and 18% CP), lysine (0.65, 0.70, 0.75 and 0.80%), and methionine (0.31, 0.34, 0.37 and 0.40%) on the performance of White Leghorn layers in the tropics. They found that dietary protein level had no effect on egg production, feed intake, feed conversion, egg weight and egg mass. They also observed higher egg production rate, feed conversion and egg mass in hens fed 2,600 kcal of ME compared with those fed the 2,350 kcal of ME/kg. Dietary lysine level had no effect on egg production, feed intake and feed conversion. Dietary methionine level had no influence on egg production or egg mass but feed intake decreased linearly while egg weight and feed conversion improved nonlinearly with increasing dietary concentrations of methionine. More recently, De Persio *et al*. (2015) fed laying hens on diets containing 85 to 105% of the energy and other nutrients and found that increasing energy and nutrient density increased egg production, egg weight, egg mass, feed efficiency and energy intake of hens.

The absence of significant differences in EW, DFI and FCR in response to feeding the high-nutrient-density diets in the present study harmonizes with the results obtained by Jalal *et al.* (2006), who determined the effects of varying cage spaces on a commercial laying hen strain fed differing levels of dietary metabolizable energy (2,800, 2,850, and 2,900 kcal of ME/kg), and observed no significant effect of dietary ME level on feed intake or egg weight. However, Chan-Colli *et al.* (2007) evaluated the effect of dietary energy (2600, 2700 and 2800 kcal/kg of ME) and level of total sulphur amino acids (TSAA; 0.65 and 0.71%) on productive performance of laying hens, in the tropics from 28 to 37 weeks of age. They found that increasing the dietary energy level increased egg weight but feed intake, energy intake, egg production, egg mass and feed conversion were not affected by dietary energy level. They also indicated that dietary level of TSAA had no effect on feed intake, energy intake, egg production, egg mass or feed conversion but hens fed higher level of TSAA (0.71%) gave heavier eggs than those of hens fed lower level of TSAA (0.65%).

Data on the effects of feeding high-nutrients-density diets on productive performance of laying hens, kept under the summer season conditions in Egypt from 52 to 56 weeks of age, are presented in Table 4. Analysis of variance of these results revealed that EPR ($P<0.05$), DEM ($P<0.05$) and DFI ($P<0.01$) were significantly affected by feeding the high-nutrient-density diets during the third 28-day period of the experiment but EW and FCR were not significantly ($P>0.05$) affected (Table 4).

It was observed that EPR and DEM of hens fed HND2 and HND3 diets were significantly higher than those of the control group. On the other hand, means of EPR of hens fed HND1 and HND4 diets were comparable to that of the control birds, with no significant differences among them. In addition, means of DEM of hens fed HND1 and HND4 were approximately similar to those of the control and the other experimental groups. Moreover, means of

DFI of hens fed the HND2 and HND3 diets were significantly higher than those of the control group while means of DFI of hens fed HND1 and HND4 diets were not significantly different from that of the control hens. Although dietary treatments had no significant effect on FCR of laying hens during the third 28-day period of the present study, it should be noted that hens fed high-nutrient-density diets exhibited insignificantly better means of FCR as compared to their control counterparts; the best mean of FCR (2.08) was achieved by hens fed HND2 diet and the poorest one (2.39) was attained by the control hens.

Table (4): Performance of Bovans White laying hens fed high-nutrient-density diets from 52 to 56 weeks of age

Experimental diets‡	EPR (%)	EW (g)	DEM (g)	DFI (g)	FCR (g : g)
Control	72.50^{b}	64.90	47.08^{b}	112.25^{b}	2.39
HND1	75.36^{b}	66.57	50.26^{ab}	108.12^{b}	2.21
HND2	85.89^{a}	66.35	57.00^{a}	118.41^{a}	2.08
HND3	85.45^{a}	67.26	57.49^{a}	121.50^{a}	2.12
HND4	75.00^{b}	66.97	50.23^{ab}	110.88^{b}	2.22
SEM	3.319	0.631	2.407	1.811	0.089
Significance level	*	NS	*	**	NS

‡: Diets referred to as HND1 to HND4 have 102.5, 105, 107.5 and 110% of nutrient contents present in the control diet, respectively. $^{a-b}$: Means in the same column having different superscripts differ significantly at P≤0.05.

SEM: Standard error of the means, EPR: Egg production rate, EW: Egg weight, DEM: Daily egg mass, DFI: Daily feed intake and FCR: Feed conversion ratio.

During the third 4-week period, it was interesting to note that hens fed HND2 and HND3 diets consumed significantly more feed and displayed higher EPR and DEM than other dietary treatments but EW and FCR were not affected. There is no clear explanation for the enhanced appetite in these two experimental groups, leading to higher means of EPR and DEM compared with the control hens and other experimental groups.

Egg quality traits:

Data on the effects of feeding high-nutrient-density diets on certain traits of egg quality of Bovans White laying hens at 56 weeks of age are given in Table 5. Analysis of variance revealed that increasing nutrient density of the diet from 100% in the control diet to 110% had no significant (P>0.05) effect on relative weights of egg components, shell weight per unit surface area (SWUSA), egg shape index or yolk color score of laying hens (Table 5). But feeding high-nutrient-density diets positively affected egg weight (P<0.05), yolk index (P<0.05) and Haugh units (P<0.01) compared with their control counterparts. In addition, hens fed HND3 and HND4 diets produced eggs with thicker shells (P<0.05) than those of the control group and other experimental groups (Table 5).

Table (5): Egg components and some egg quality parameters of laying hens fed high-nutrient-density diets, examined at 56 weeks of age

Parameters	Experimental diets‡					SEM	Sign.
	Control	HND1	HND2	HND3	HND4		
Egg weight, g	66.42^{b}	68.54^{a}	69.44^{a}	69.65^{a}	69.57^{a}	0.683	*
Shell weight, %	12.31	12.31	12.33	12.39	12.37	0.084	NS
Yolk weight, %	26.45	25.82	25.71	25.79	25.81	0.156	NS
Albumen weight, %	61.24	61.87	62.04	61.84	61.82	0.289	NS
Shell thickness, mm	0.340^{b}	0.354^{b}	0.356^{b}	0.366^{a}	0.368^{a}	0.005	*
SWUSA, mg/cm^2	65.98	65.67	65.46	65.81	65.93	0.351	NS
Egg shape index, %	85.25	86.11	86.17	85.89	86.19	0.473	NS
Yolk index, %	35.11^{b}	36.08^{a}	36.35^{a}	36.88^{a}	36.78^{a}	0.397	*
Yolk color score	7.67	7.68	7.56	7.62	7.75	0.123	NS
Haugh units	72.58^{c}	75.85^{b}	76.97^{b}	78.52^{a}	77.89^{a}	0.979	**

‡: Diets referred to as HND1 to HND4 have 102.5, 105, 107.5 and 110% of nutrient contents present in the control diet, respectively.
a-c: Means in the same row having different superscripts differ significantly at P≤0.05.
SEM: Standard error of the means. SWUSA: Shell weight per unit surface area.
NS: Not significant, *: Significant at P≤0.05, and **: Significant at P≤0.01.

The positive effect of feeding high nutrient density diets on egg weight, yolk index and Haugh units, reported herein, harmonizes with the results obtained by Marie *et al*. (2009), who observed significant improvements in egg weight, yolk index and Haugh units in response to increasing dietary nutrient density for laying hens reared in temperate climate. In partial accordance with the present results, other investigators reported that feeding diets with high nutrient concentration had no beneficial effects on egg quality parameters in laying hens (Roland *et al*., 1996; Panda *et al.*, 2012; Zhang and Kim, 2013). In this respect, Roland *et al*. (1996) evaluated the response of laying hens housed at two environmental temperature (15.6 to 23.3 and 21.1 to 28.9ºC) to feeding diets differing in calcium concentrations (2.5 to 5.0%), and found that increasing dietary calcium level increased egg specific gravity and had no adverse effect on egg weight. In a later study, Panda *et al.* (2012) reported that increasing nutrient density up to 107.5% of that contained in the control diet had no effect on the percentages of egg components or on Haugh unit, yolk color score and shell thickness. In addition, Zhang and Kim (2013) found that feeding high-energy and high-nutrient-density diets had no significant effect on egg quality of hens compared with those fed low-energy and low-nutrient-density diets. On the other hand, De Persio *et al*. (2015) observed no consistent responses in egg quality measurements examined due to feeding high energy and high nutrient density diets.

CONCLUSION

It is concluded that increasing dietary nutrient density up to 110% of the recommended requirements of Bovans White laying hens can positively affect some egg quality traits but had inconsistent effect on their productive performance under Egyptian summer conditions.

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تأثير التغذية على علائق ذات محتوى عالي من العناصر الغذائية على المظاهر الإنتاجية لدجاج البوفانز الأبيض تحت ظروف الصيف المصرية

هيام محمد عبده أبوالمعاطي ، فوزي صديق عبد الفتاح إسماعيل ، محمود حسن محمود ربيع و عبد الله قاسم أسود
قسم إنتاج الدواجن، كلية الزراعة، جامعة المنصورة، مصر

أجريت الدراسة الحالية لتقييم تأثيرات تغذية دجاج البوفانز الأبيض على علائق ذات تركيزات عالية من العناصر الغذائية على الأداء الإنتاجي وجودة البيض. تم تقسيم ٢٠٠ دجاجة عشوائيا إلى خمسة مجموعات تجريبية متساوية بكل منها ٥ مكررات متساوية وتم تسكين الطيور في بطاريات ذات أقفاص جماعية (٨/قفص) وتعرضت جميع الطيور لنفس الظروف الصحية والرعائية. تم تكوين عليقة قاعدية (في شكل مجروش) بالدرجة الأولى من الذرة الصفراء وكسب فول الصويا إحتوت على ١٧.٤% بروتين خام، ٢٨٨٠ كيلو كالوري/كجم طاقة قابلة للتمثيل، ٤.٣٥% كالسيوم، ٠.٤٣% فوسفور غير فيتيني، ٠.٨٤% ليسين، ٠.٤١% مثيونين، ٠.٧٠% مثيونين + سيستين، وتم استخدامها كعليقة ضابطة. تم تكوين أربعة علائق أخرى عن طريق رفع محتوى العناصر الغذائية بالعليقة من ١٠٠% (عليقة الضبط) إلى ١٠٢.٥ أو ١٠٥ أو ١٠٧.٥ أو ١١٠%، من خلال إجراء بعض التعديلات في نسب مكونات العليقة. تم تقييم الأداء الإنتاجي بقياس كل من معدل إنتاج البيض ووزن البيضة وكتلة البيض اليومية واستهلاك الغذاء اليومي ومعامل التحويل الغذائي خلال ٣ فترات زمنية تتضمن كل فترة ٤ أسابيع أثناء مدة التجربة (٤٤-٥٦ أسبوعا من عمر الدجاج). كما تم عمل إختبار لقياس جودة البيض في الأسبوع الأخير من الدراسة لتقدير تأثير المعاملات الغذائية على مكونات البيضة وبعض مقاييس الجودة الخارجية والداخلية للبيض.

ففي فترة الأربعة أسابيع الأولى: لم يكن للتغذية على العلائق ذات الكثافة العالية من العناصر الغذائية تأثير معنوي على الأداء الإنتاجي للدجاج بينما تأثر استهلاك الغذاء اليومي بشكل غير متناغم. وفي الفترة الثانية: حققت التغذية على العلائق ذات الكثافة العالية من العناصر الغذائية متوسطات أعلى معنويا في معدل إنتاج البيض وكتلة البيض اليومية بالمقارنة بعليقة الضبط، بينما لم يتأثر وزن البيضة واستهلاك الغذاء اليومي ومعامل التحويل الغذائي. وفي الفترة الثالثة: نتج عن التغذية على العليقتين ذات الكثافة ١٠٥% و ذات الكثافة ١٠٧.٥% تحقيق متوسطات أعلى معنويا في معدل إنتاج البيض وكتلة البيض اليومية متزامنة مع استهلاك غذاء يومي أعلى معنويا بالمقارنة بعليقة الضبط، بينما لم يتأثر وزن البيضة ومعامل التحويل الغذائي بالمعاملات الغذائية. كما أدت التغذية على العلائق ذات الكثافة العالية من العناصر الغذائية إلى تحسن معنوي في وزن البيضة ومعامل الصفار ووحدات هوف بالمقارنة بعليقة الضبط، بينما لم تتأثر باقي قياسات جودة البيض.

نستنتج من نتائج هذه الدراسة أن زيادة محتوى العليقة من العناصر الغذائية حتى ١١٠% من الإحتياجات الموصى بها لدجاج البوفانز الأبيض يمكن أن تؤثر إيجابيا على بعض صفات جودة البيض بينما كان تأثيرها غير واضحا على الأداء الإنتاجي للدجاج تحت ظروف الصيف المصرية.