academicJournals

Vol. 12(28), pp. 4530-4538, 10 July, 2013
DOI: 10.5897/AJB11.3124
ISSN 1684-5315 ©2013 Academic Journals
http://www.academicjournals.org/AJB

African Journal of Biotechnology

Full Length Research Paper

Evaluation of the diets formulation type on performance of Arian broiler breeder hens

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Accepted 19 June, 2013

A study was conducted to determine the effects of diet formulation type on broiler breeder performance of 50 to 64 weeks of age. Three hundred and thirty six (336) female and 48 male breeders in eight treatments with six replicates (seven females with a male) were used in the form of a randomized trial design 2×2×2 factorial. Eight experimental diets were formulated based on three factors: first factor included two levels of apparent and true metabolizable energy corrected for nitrogen (AMEn and TMEn) of feed, the second factor included two levels of total amino acids (TAAF) and digestible (DAAF) of feed and the third factor included two levels of broiler breeder hens requirements based on total amino acids (TAAR) and digestible (DAAR). The results show that egg weight was significantly different which was affected by diets formulation based on energy (P<0.05). Diet formulation based on amino acids of feed and requirements had no effect on egg weight (P>0.05). Treatment 3 (AMEn+DAAF+TAAR) was at the best level significantly different in egg weight 68.97 (g), egg production 62.45%, egg mass 43.1 (g/hen/day) and feed conversion ratio 3.59 (P<0.05). Hatching eggs and hatchability was significantly different, which was affected by diet formulation based on energy, amino acids of feed and requirements (P<0.05). This experiment shows that the type of formulation of diets had significant effects on broiler breeder performance.

Key words: Broiler breeders, performance, digestible amino acids, fertility.

INTRODUCTION

Current recommendation for diet formulation for broiler breeder hens are expressed as daily nutrient intakes based on apparent metabolism energy and total amino acids rather than true metabolism energy and digestible amino acids of feedstuffs. Energy and amino acids are the most important factors in broiler breeder hen's diet. There is no doubt that well-balanced supply of these factors proportionate to the daily bird requirements which will lead to improved performance. Any changes in the daily nutrients intake in broiler breeder hens must be done base on their requirements. Broiler breeder needs nutrition for four important goals which include egg production, growth, maintenance and daily activities. Each of these needs is based on age, body weight, environment temperature and type of feed. Growth, egg production and maintenance require energy and amino acid but the daily activities require only energy (Leeson and Summers, 2000). Therefore, knowing the requirements of metabolizable energy in broiler breeder in any age and phase of production and metabolizable energy value of feedstuffs in the diet is essential for their optimal production (NRC, 1994).

Absorbent and retention rate of amino acids depends on two factors: 1) digestible (protein hydrolysis and

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absorption) and 2) the rate of amino acids retention.

All amino acids are not available in the feedstuffs for maintenance and production. Part of amino acids is indigestible and can vary among different feedstuffs. So to adjust poultry diets with digestible amino acids of feedstuffs is much better and easier meets birds real requirements for maintenance and production (Leeson and Summers, 2000).

Knowledge of digestibility coefficients for individual amino acids in feedstuffs and requirements of digestible amino acids for best performance in broiler breeder therefore, enables formulation of diets closer to the requirements of the broiler breeder hens. Diets based on digestible amino acids may encourage the use of alternative protein sources, because such formulations will improve the precision of least cost diets and reduce nitrogen excretion from poultry operations. Finally, diet formulations on a digestible amino acids basis may also offer economic benefits and increase feed efficiency (Rostagno et al., 1995), improve feed conversion rate in poultry (Hoehler et al., 2006) and reduce environmental pollution, and cause better use of amino acids in the diet and reduce waste nitrogen excretion (Dari and Penz, 1996). Use of feedstuffs with low amino acids digestibility in diet formulated on the basis of total amino acids, will results to the lowest performance and feed efficiency (Fernandez et al., 1995) in this situation, and results to reduction in broiler breeder performance potential and increase production costs.

Since feed intake is under control in broiler breeder flocks, the amount of availability of amino acids diets for broiler breeder depends on composition and type of amino acids of diets, and amino acids intake (Fisher, 1987). Broiler breeder amino acids requirements are under the influence of factors, which include levels of animal performance; utilization of amino acids for egg production, maintenance, and tissue growth; population structure and the variation of feed intake and the covariance between feed intake and requirements (Fisher, 1998).

Leeson and Summers (2000) reported different genetic requirements for protein and metabolizable energy in broiler breeder flocks and this difference was not the same for maintenance and production; 10 to 15% difference were in protein and amino acid require-ments of broiler breeder like Shaver, Cobb, Ross and Hybro.

Spratt and Leeson (1987) showed the less ability broiler breeder than Leghorn for energy metabolism. This difference in feed efficiency is likely due to efficiency of energy intake for maintenance requirements. The objective of this experiment was to determine the effects of types of formulation diets on broiler breeder performance. Diets were formulated based on two levels of energy (AMEn, TMEn), two levels of total and digestible amino acids of feedstuffs and two levels of broiler breeder requirements based on total and digestible amino acids.

MATERIALS AND METHODS

To determine the effects of diet formulation on the Arian broiler breeder performance, we used 336 hens and 48 males (50 to 64 week). The experimental design was a completely randomized design with a 2×2×2 factorial treatment structure with six replicate pens per treatment. The first factor included was two levels of apparent and true metabolizable energy corrected for nitrogen (AMEn and TMEn) of feed, the second factor included was two levels of total amino acids (TAAF) and digestible amino acids of feed (DAAF) and the third factor included was two levels of broiler breeder hens requirements to total amino acids (TAAR) and digestible amino acids (DAAR). At 50 weeks of age, broiler breeders were weighed, and allocated to treatment groups on the basis of mean body weight (g), female (3550 ± 25) and male (4390 ± 30). Birds were housed in 48 floor pens of 1.2×2 m with 1 bell-type drinker. Light program was provided for 16 h of light per day from 7 am to 23 pm (50 to 64 weeks). Broiler breeders were vaccinated to a standard vaccination program.

The pattern of total and digestible amino acids and also nitrogen corrected apparent and true metabolizable energy were determined for feedstuffs (Yaghobfar and Boldaji, 2002; Yaghobfar and Zahedifar, 2003). Diets were adjusted based on the requirements of Arian broiler breeder (Manual, 2002) at two levels of the total and digestible amino acids requirements. The composition and calculated contents of the diets are shown in Table 1. Feeds provided were in mash form and were milled with a 3 mm screen to obtain a similar particle size in all diets. Both males and females broiler breeder received the same diets at 8 am. Diets provided 410 Kcal metabolism energy and 21/2 g protein daily for female and 350 Kcal metabolism energy and 18.2 g protein daily for male. The only difference between the treatments were the type of metabolizable energy, amino acids of feed and broiler breeder amino acids requirements (Table 1).

During the experiment, feed intake, egg weight (g), egg production, egg mass (g/hen/day), double yolks egg, and tiny eggs (less than 50 g) were recorded daily. Incubated eggs, body weight, fertility, hatchability and number of chicks per broiler breeder hens were determined in 55 and 62 weeks. Data were analyzed by factorial (GLM procedure, An ANOVA of SAS Institute, 2001) and where significance occurred, means were compared with the Duncan multiple range tests. Output data were expressed as means with SEM.

RESULTS

The results (Table 2) indicate that egg weight (50 to 64 weeks) was significantly differently affected by diets formulation based on energy ($P<0.05$). Diets formulation based on amino acids of feed and requirements had no effect on egg weight ($P>0.05$). The egg weight was significantly heavier on treatment fed diets formulation based on AMEn to 64.67 (g) than TMEn to 67.19 (g) ($P<0.05$). The main effects of diets formulation based on energy, amino acids of feed and requirements had no effect on egg production and egg mass (Table 2).

The interaction between energy and amino acids of feed was significantly different in egg weight, egg production and egg mass (Table 3). The diets formulation based on AMEn plus digestible amino acids of feed (AMEn+DAAF) had best performance in egg weight (68.16 g), egg production (58.75%) and egg mass (40.08 g/hen/day). This difference was significant from 50 to 64 weeks (p<0/05).

The interaction between energy and amino acid requirements shows that broiler breeder fed by diets formulation based on TMEn plus digestible amino acids

Table 1. Composition and calculated contents of the experimental diets.

MEn[1] of feed	**Apparent**				**True**			
Amino acid of feed	**Total**		**Digestible**		**Total**		**Digestible**	
Amino acid requirement	**Total**	**Digestible**	**Total**	**Digestible**	**Total**	**Digestible**	**Total**	**Digestible**
Corn, Grain	54.00	53.69	54.00	54.00	33.00	33.00	33.00	30.00
Wheat	12.00	12.00	13.00	12.00	27.00	27.00	27.00	27.00
Wheat Bran	13.00	13.00	11.20	12.15	20.00	20.00	20.33	25.00
Soybean Meal -48%	12.37	12.50	13.00	13.00	11.00	11.16	10.80	9.00
Oyster Shells	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Dical. Phos.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Common Salt	0.03	0.20	0.20	0.20	0.20	0.20	0.20	0.22
Vitamin Premix *	0.25	0.25	0.25	0.25	0.30	0.25	0.30	0.30
Mineral Premix *	0.25	0.25	0.25	0.25	0.30	0.25	0.30	0.30
DL-Methionine	0.05	0.06	0.05	0.10	0.15	0.09	0.02	0.10
L-Lysine HCl	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.08
Calculated contents								
MEn (Kcal/Kg)	2700	2700	2700	2700	2700	2700	2700	2700
Protein (g/Kg)	140	140	140	140	140	140	140	140
Ether Extract (g/Kg)	22.9	22.9	22.9	22.9	20.3	20.3	20.3	20.3
Linoleic Acid (g/Kg)	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Calcium (g/Kg)	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Avail. Phosphorus (g/Kg)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Potassium (g/Kg)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Chlorine (g/Kg)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Sodium (g/Kg)	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
ARG (g/Kg)	6.9	6.2	6.9	6.2	6.9	6.2	6.9	6.2
GLY (g/Kg)	6.4	5.1	6.4	5.1	6.4	5.1	6.4	5.1
SER (g/Kg)	7.0	6.1	7.0	6.1	7.0	6.1	7.0	6.1
HIS (g/Kg)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
ILE (g/Kg)	5.6	4.8	5.6	4.8	5.6	4.8	5.6	4.8
LEU (g/Kg)	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1
LYS (g/Kg)	6.5	5.8	6.5	5.8	6.5	5.8	6.5	5.8
MET (g/Kg)	3.0	2.8	3.0	2.8	3.0	2.8	3.0	2.8
CYS (g/Kg)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
PHE (g/Kg)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
TYR (g/Kg)	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
THR (g/Kg)	5.0	4.2	5.0	4.2	5.0	4.2	5.0	4.2
TRP (g/Kg)	1.7	1.3	1.7	1.3	1.7	1.3	1.7	1.3
VAL (g/Kg)	5.8	4.9	5.8	4.9	5.8	4.9	5.8	4.9

*Premix (kg) : 4.4g of Vitamin A, 0.72g of vitamin D3, 7.2g of vitamin E, 1g of vitamin K, 0.306g of Thiamin, 0.306g of Pyridoxine, 1g of Riboflavin, 6.08g of Pantothenic acid, 2.48g of Niacin, 0.306g of Folic acid, 1g of Biotin, 220g of Choline , 2g of Mn, 13g of Zn, 10g of Fe, 0.02g of Cu, 0.2g of I, and 0.04g of Se. [1], Metabolizable energy corrected for nitrogen of feed.

requirements, (TMEn+DAAR) had significantly (P<0.05) better performance in egg production (57.54%) and egg mass (38.79 g/hen/day) (Table 4). The interaction between energy, amino acids of feed and requirements (Table 6) had significant difference on egg weight, egg production and egg mass. Treatment 3 (AMEn+ DAAF+TAAR) had significantly highest level with egg weight of 68.97 g, egg production of 62.45% and egg mass of 43.1 g/hen/day. Treatment 7 (TMEn+DAAF+TAAR) had significantly lowest level with egg weight of 66.51 g, egg production of 48.21 and egg mass of 31.99 g/hen/day (P<0.05). Both treatments had different type of energy (AMEn, TMEn) and same amino acids of feed and requirements. Results indicate that the different type of metabolizable energy intake (AMEn, TMEn) had significant effects on egg weight, egg produc-

Table 2. Main effects of diets formulation based on metabolizable energy, amino acids of feed and requirements on broiler breeder performance (50 to 64 weeks).

Parameter	Egg weight (g)	Egg mass (g)	Egg production (%)	FCR[2]	Hatching eggs (%)	Fertility (%)	Hatchability (%)	Chick No. 1 (chicks/hen)
MEn								
Apparent	70.67^{a}	37.39	55.16	4.23	94.65^{b}	80.46^{a}	67.36^{a}	33.1^{a}
TRUE	67.19^{b}	36.75	54.64	4.33	96.74^{a}	66.63^{b}	56.15^{b}	27.52^{b}
P-Value	0.04	0.378	0.662	0.281	0.018	0.001	0	0.016
Amino acids (Feed)								
Total	67.36	36.45	54.05	4.34	97.4^{a}	76.37	65.13^{a}	31.44
Digestible	67.52	37.69	55.76	4.22	99.93^{b}	70.73	58.39^{b}	29.17
P-Value	0.466	0.091	0.1	0.212	0.003	0.12	0.007	29
Amino acids Requirement)								
Total	67.45	36.56	54.11	4.41^{a}	96.92^{a}	64.63^{b}	55.73^{b}	26.82^{b}
Digestible	67.44	37.58	55.69	4.16^{b}	94.47^{b}	82.47^{a}	67.78^{a}	33.79^{a}
P-Value	0.968	0.166	0.135	0.007	0.023	0	0	0.004

$^{a-c}$Means within the same column not sharing a common superscript differ significantly (P<0.05); [1]Metabolizable energy corrected for nitrogen; [2]Feed conversion ratio.

Table 3. The interaction between diets formulation based on metabolizable energy and amino acids of Feed on broiler breeder performance (50 to 64 weeks).

MEn[1]	Amino acids (feed)	Egg weight (g)	Egg mass (g)	Egg production (%)	FCR[2]	Hatching eggs (%)	Fertility (%)	(%) Hatchability	Chick No 1 (chicks/hen)
Apparent	Total	67.25^{b}	34.71^{b}	51.58^{b}	4.56^{a}	96.97^{a}	83.69	71.53	32.47
Apparent	Digestible	68.16^{a}	40.08^{a}	58.75^{a}	3.9^{b}	92.33^{c}	77.23	63.19	33.73
TRUE	Total	67.48^{b}	38.19^{a}	56.52^{a}	4.12^{b}	97.82^{a}	69.05	58.72	30.42
TRUE	Digestible	66.89^{b}	35.3^{b}	52.77^{b}	4.55^{a}	95.65^{ab}	64.22	53.59	24.62
P-Value		0.001	0	0	0	0.224	0.815	0.476	0.109
SEM		0.216	0.732	1.058	0.095	0.975	3.438	2.198	0.216

$^{a-c}$Means within the same column not sharing a common superscript differ significantly (P<0.05); [1]metabolizable energy corrected for nitrogen; [2]feed conversion ratio.

production and egg mass (P<0.05). The different type of amino acids of feed and requirements had no effects on these traits (P>0.05) (Table 3).

Hatching eggs and hatchability were significant in diet formulation based on energy, amino acids of feed and requirements (Table 2), and diet formulation based on energy and amino acids of feed was significant in fertility (P<0/05). The interaction between energy and amino acids requirements (Table 4) showed that broiler breeder diets formulation based on true Metabolism Energy corrected for nitrogen plus digestible amino acids requirements (TMEn+DAAR) were significantly better in the hatching of eggs (96.93%) (P<0.05).

The interaction between energy, amino acids of feeds and requirements showed (Table 6) significant differences for three economic traits; hatching eggs, fertility and hatchability (P<0.05). Hatching eggs was significantly highest in treatment 5 (TMEn+TAAF+TAAR) (99.48%), and treat-

Table 4. The interaction between diets formulation based on metabolisable energy and amino acids requirements on broiler breeder performance (50 to 64 weeks).

MEn[1]	Amino acids (requirement)	Egg weight (g)	Egg mass (g)	Egg production (%)	FCR[2]	Hatching eggs (%)	Fertility (%)	Hatchability (%)	Chick No 1 (chicks/hen)
Apparent	Total	67.88	38.42[ab]	56.47[ab]	4.16[bc]	97.29[a]	72.05[b]	61.76[b]	31.24[a]
Apparent	Digestible	67.53	36.37[bc]	53.85[bc]	4.3[b]	92.01[b]	88.87[a]	72.96[a]	34.96[a]
TRUE	Total	67.02	34.7[c]	51.75[c]	4.66[a]	96.54[a]	57.02[c]	49.7[c]	22.41[b]
TRUE	Digestible	67.35	38.79[a]	57.54[a]	4.01[c]	96.93[a]	76.0 [ab]	62.61[b]	32.63[a]
P-Value		0.115	0	0	0	0.01	0.001	0.001	0.006
SEM		0.216	0.732	1.058	0.095	0.975	3.438	2.198	0.216

[a-c]Means within the same column not sharing a common superscript differ significantly (P<0.05); [1]metabolizable energy corrected for nitrogen; [2]feed conversion ratio.

Table 5. The interaction between diets formulation based on amino acids of feed and requirements on broiler breeder performance (50 to 64 weeks).

Amino acids (requirement)	Amino acids (feed)	Egg weight (g)	Egg mass (g)	Egg production (%)	FCR[1]	Hatching eggs (%)	Fertility (%)	Hatchability (%)	Chick No. 1 (chicks/hen)
Total	Total	67.16	35.58	52.89	4.49	99.14	66.29	55.53 [b]	25.58 [b]
Total	Digestible	67.74	37.55	55.33	4.33	94.7	62.97	55.94 [b]	28.07 [b]
Digestible	Total	67.57	37.23	55.2	4.19	95.56	86.45	74.73 [a]	37.03 [a]
Digestible	Digestible	67.31	37.84	56.19	4.12	93.28	78.48	60.84 [b]	30.28 [ab]
P-Value		0.052	0.323	0.494	0.663	0.305	0.509	0.005	0.036
SEM		0.216	0.732	1.058	0.095	0.975	3.438	2.198	0.216

[a-c], Means within the same column not sharing a common superscript differ significantly (P<0.05); [1], Feed conversion ratio.

ment 1 (AMEn+TAAF+TAAR) (98.79%). Treatment 4 (AMEn+DAAF+DAAR) was signify-cantly lowest in hatching eggs (88.87%) (P<0.05). Fertility was significantly highest in treatment 4 (91.87%) and the same level was in Duncan multiple range test in treatments 1, 2 and 6 (P<0.05).

Hatchability was significantly highest in treatment 2 (78.37%) and lowest in treatment 5 (P<0.05). Number of chickens from each broiler breeder hen (50 to 64 weeks) was significant difference. Treatment 6 had 37.83 chicks and treatments 5 and 7 respectively had 23 and 21.81 chicks. According to results from this study, it can be concluded that the diet formulation based on the AMEn had a significantly highest performance. Broiler breeder hens fed AMEn diets had a larger egg weight, fertility and hatchability. This difference was significant (P<0.05) (Table 5).

DISCUSSION

There are no report of interactions between the effects diets formulation based on energy and amino acids of feed and requirements as they influence reproductive performance of broiler breeders. Results indicate that the main effects of type of metabolizable energy intake (AMEn, TMEn) had significant effect on egg weight, egg production and egg mass (P<0.05) and amino acids type had no effects on these traits. These results agree with those of Leeson and Summers (2000) that showed that increased energy intake had significantly positive effects on egg weight and egg production (Table 6). The results of this experiment were the same with the report of Zhirong (1999); feed conversion rate was better in diet formulation based on digestible amino acids than total amino acids, due to the intake of amino acid requirements of the birds.

Waldroup et al. (1976) reported the same proteins

Table 6. The interaction between diets formulation based on metabolizable energy, amino acids of feed and requirements on broiler breeder performance (50 to 64 weeks).

MEn[1]	Amino acids (feed)	Amino acids (Requirement)	T[2]	Egg weight (g)	Egg mass (g)	FCR [3]	Egg production (%)	Hatching eggs (%)	Fertility (%)	Hatchability (%)	Chick No 1 (chicks/hen)
Apparent	Total	Total	T1	66.79[bc]	33.74[de]	4.73[ab]	50.50[de]	98.79[a]	81.51[a]	64.69[bc]	28.16[bc]
Apparent	Total	Digestible	T2	67.71[b]	35.67[cd]	4.39[bc]	52.65[cd]	95.15[ab]	85.87[a]	78.37[a]	36.78[ab]
Apparent	Digestible	Total	T3	68.97[a]	43.1[a]	3.59[d]	62.45[a]	95.79[ab]	62.59[b]	58.84[cd]	34.32[ab]
Apparent	Digestible	Digestible	T4	67.35[bc]	37.06[bc]	4.21[c]	55.05[bc]	88.87[c]	91.87[a]	67.54[bc]	33.14[ab]
TRUE	Total	Total	T5	67.53[b]	37.41[bc]	4.25[c]	55.28[bc]	99.48[a]	51.06[b]	46.36[e]	23[c]
TRUE	Total	Digestible	T6	67.44[bc]	38.97[b]	3.99[c]	57.75[bc]	96.16[ab]	87.03[a]	71.08[ab]	37.83[a]
TRUE	Digestible	Total	T7	66.51[c]	31. 99[e]	5.07[a]	48.21[e]	93.6[b]	63.34[b]	53.04[de]	21.81[c]
TRUE	Digestible	Digestible	T8	67.27[bc]	38.61[bc]	4.02[c]	57.32[bc]	97.7[ab]	65.1[b]	54.13[de]	27.42[bc]
P-Value				0	0	0	0	0.014	0.001	0	0.007
SEM				0.312	1.036	1.036	1.497	1.379	4.268	3.109	2.945

[a-c]Means within the same column not sharing a common superscript differ significantly (P<0.05); [1]Metabolizable energy corrected for nitrogen; [2]Treatments; [3]Feed conversion ratio.

required for egg weight and egg production for broiler breeder females, while the others reported broiler breeder protein requirements of 19 g/bird/day to achieve optimum egg production and 25 gram/bird/day to achieve maximum egg weight (Spratt and Leeson, 1987; Pearson and Herron, 1982; McDaniel et al., 1981). Bowmaker and Gous (1991) showed that for decrease in amino acid and protein consumption, broiler breeder hens adjust first, egg production and then egg weight, however, these letter showed that diet formulation based on amino acids of feed did not have significant effect on egg weight, egg production and egg mass.

Several factors are effective on the size of eggs of broiler breeder, including: genetics (Chamber et al., 1974), chronological age (Pearson and Herron, 1981; Spratt and Leeson, 1987; Gharahveysi et al., 2012), photoperiod (Payne, 1975; Brock et al., 1989), and sexual maturity (Blair et al., 1976; Leeson and Summers, 1983). But other studies reported body weight (McDaniel et al., 1981) and diet as factors affecting egg weight (Ingram and Wilson, 1987; Wilson and Harms, 1986; Pearson and Herron, 1981 and 1982; Spratt and Leeson, 1987; Brock et al., 1989; Silva et al., 2012). This experiment shows the effects of diets formulation types on egg weight.

Pearson and Herron (1981) observed a significantly decrease in fertility associated with consumption of 450 kcal of energy/bird/day in the last laying period. But it is difficult to differentiate decreased fertility due to high energy from weight gain of broiler breeder, because both could have negative effects on fertility. The results of this experiment agrees with those of Burke and Jensen study (1994) that showed positive effects of increased energy in broiler breeder hens (21 to 61 weeks) in egg production, fertility and number of chicks produced. Attia et al. (1995), Wauldroup and Hazen (1976), Bornstein et al. (1979) and Bornstein and Lev (1982) observed that the broiler breeder hens (21 to 61 weeks) had a significant positive correlation between energy intake (396, 423 and 450) and egg production from 41 weeks and no significant positive correlation between energy intake and fertility, hatchability and body weight. This effect increases linearly with the number of chicks produced. In this experiment, the treatment fed diets formulation based on the AMEn was better in egg production, egg weight, egg mass, fertility, hatchability and the number of chickens produced than treatment fed diets formulation based on TMEn. This difference was statistically significant (P<0.05). No reports describe the effects of diet formulation based on AMEn and amino acids of feed on fertility and hatchability. Only very few reports have described interactions of energy and protein on hatchability. Pearson and Herron (1982b) reported low hatchability in 26 to 36 weeks in broiler breeder hens fed high protein (27g/hen/day) and low energy (363 kcal/hen/day); the cause of which increase the percentage of dead embryos in second week of incubation and increasing the number of pipped eggs end of incubation period. They showed that the embryo mortality in this age, is likely due to deficiency of nutrition in the egg.

Fertility and hatchability are the major economical traits in broiler breeder performance. Fertility and hatchability can be affected by many factors. The effects of each factor in hatchability and fertility are important. Fertility of broiler breeder is affected primarily by the performance of male (Wilson and Partners, 1979 1987; Harris et al., 1984; Hocking, 1989; Hocking et al., 1989; Ansah et al., 1977); the qualities of the shell have also been related to low fertility (McDaniel and et al., 1979 and 1981). However, the effects of high energy intake resulting in body weight have been reported as the main cause of low fertility in broiler breeder hens (McDaniel et al., 1979, 1981; Morris and Gous, 1988; Harms and Wilson, 1984).

Changes in hatchability in broiler breeder females have been reported to be related to many factors, such as storage time (Mather and Laughlin, 1979; Kirk et al., 1980), incubation position, incubation conditions (Kirk et al., 1980; Tullett and Burton, 1982), and shell quality (McDaniel et al., a, b1981 and 1979; Bell and Brock, 1985; Bennett, 1992). Other researchers have found that bird age (Mather and Laughlin, 1979; Fasenko et al., 2009), egg size (Morris et al., 1968) and nutrition (Calini et al., 2007) also affect hatchability but this experiment showed that broiler breeders hens fed AMEn diets had a maximum egg weight, fertility and hatchability. This difference was significant (P<0.05).

Conclusions

This experiment showed that the type of formulation of diets had significant effects on broiler breeder performance. According to the results from this study, it can be concluded that the type of diet formulation based on AMEn of feedstuffs had significant on egg weight, hatching eggs, fertility, hatchability and number of chickens per hen (chicks/hen). Feeding broiler breeders AMEn diets increased significantly egg weight, fertility, hatchability and number of chickens per hen (chicks/hen) by 3.48 g, 13.83%, 11.21% and. 5.58 more than broiler breeders fed TMEn diets respectively. Dietary AMEn+DAAF+TAAR affected egg weight, egg production, feed conversion ratio and fertility. The interaction between AMEn and digestible amino acids of feedstuffs and total amino acids of requirements allows the full expression of the genetic potential for production traits in Arian broiler breeders.

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