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Protein and Energy needs for two lines of Saudi local chickens

KEYWORDS: energy , protein , local lines, Saudi Arabia

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ABSTRACT *Studies on the nutritional requirements of the local birds of Saudi Arabia have not been investigated well. There fore, this experiment was conducted to study the effect of using different levels of energy and protein on performance of newly established two lines of local birds, namely , Hajar 1 and Hajar 2.*

Three levels of protein , 14, 15 and 16 % and three levels of energy , 2650, 2750 and 2850 Kcal/Kg were used to feed the two lines of the local chickens. The study was initiated when the birds reached the sexual maturity (about 25 weeks of age) and continued till the age of 40 weeks.

Performance criteria were measured such as; Hen-day production , daily feed intake , feed conversion , egg mass, yolk weight , yolk color, yolk index , haugh unit , specific gravity of the eggs

The results of the study showed that egg production , egg mass and feed conversion of Hajar 1 were better with 14 % protein level and the higher metabolizable energy (ME), 2850 Kcal/Kg. While Production of Hajar 2 , their feed conversion and egg mass were the best when the birds were fed 2850 Kcal/Kg ME in combination with 15 % protein .

With the exception of specific gravity, effect of line of the birds , protein and energy levels had no significant effects on egg characteristics pertaining to yolk weight, yolk index, yolk color and Haugh units. Although the differences were not so great, Hajar 2 birds produced significantly ($P<0.05$) better shell eggs than Hajar 1.

The results of this study provided evidence that local chickens of Saudi Arabia may need more energy for egg performance than had previously thought and it was estimated to be about 2800 kcal/kg accompanied with 14 % protein for Hajar 1 line birds and 15 % protein for Hajar 2 line birds.

Introduction:

During the last 20 years there has been a growing interest toward improving the local chickens of Saudi Arabia. However, Very few attempts have been made to characterize and describe the local chickens of Saudi Arabia. Twenty years ago , A large project was, conducted, using large population of local birds, gathered from all around Saudi Arabia , in an attempt to study the possibilities of improving the local chickens of Saudi Arabia. In that project , (Al-Yousef et al., 1995), Saudi local chickens were characterized by their small size, different plumage colors and different comb shapes. These birds were also known for their low production rate and small egg sizes. Based on this large population, Ahmad and Alabbad (2014) established two lines of local Saudi chickens, namely Hajar 1 and Hajar 2 . Hajar 1 is characterized by black feather, small size and black shanks while Hajar 2 is numerically larger in size and brown in color. Nutritional requirements of these two lines have not been elucidated scientifically. There has been some attempts on studying the nutritional requirements of local chickens of Saudi Arabia in general but not for these specific lines. Alsobayel et al., (1991) fed local chickens of Saudi Arabia different levels of protein during the growing period ; a conventional ration , reverse protein (12 %) from 1-6 weeks, followed by 15 % crude protein up to 14 weeks and 18 % protein from 14-20 weeks , single stage low protein (15 %) and single stage low protein (12 %) from 1-20 weeks. Their results revealed evidence on the influence of protein rearing regimens on egg weight, Haugh units and shell thickness , however, hen-day egg production, feed intake and feed intake were not significantly affected by the treatments. Similarly, Attia et al. (1991), using similar regimens, reported that eggs per hen , egg weight were significantly affected by the treatments. Alsobayel (1992) provided evidence that protein level and age of the bird had significantly affected the fertility and hatchability parameters of Saudi Arabian Baladi chicken. In an attempt to study the effect of increasing protein level on the productive performance of Saudi local chickens, Najib (1994) compared 16 and 18 % protein regimens for the local layers, he found no effect of protein level on the performance of the birds. It was thought these levels might have been too high for the local birds, therefore a further study by Al-Yousef and Najib (1997) found that varying protein levels from 14 to 17 % had practically no effect on egg production parameters. They concluded that 14 % CP was optimum in the diet of Saudi local hens. Lowering protein in the local birds of Egypt an approach was followed by researchers of that country . Abdelmaksoud et al. (2001) obtained an optimum production rate from feeding 14% protein fortified with methionine and Lysine compared to 16 % protein. In the same line Zeweil et al. (2011) reported that feeding three levels of protein 12, 14 and 16 % accompanied with 4 levels of methionine to Egyptian local birds did not significantly affect performance of the birds. However when using two levels of protein 14 and 15 % and different levels of energy ; 2700, 2750 and 2850 the need of protein was increased from 14 to 15 % for best production performance of Egyptian local chickens (sina) (Hussein et al. (2010). Fifteen % protein and 2750 Kcal/Kg were the best combination for best reproductive and productive performance for that line , they further concluded.

The aim of this study was to determine protein and energy requirements of the two lines of Saudi local chickens, Hajar 1 and Hajar2

Materials and Methods:

Birds and feeding:

One hundred sixty two local birds at the age 25 weeks were used in this study, 81 of Hajar 1and 81 of Hajar 2. Each of these lines were divided in to 9 groups, each of 3 replications and each rep of 3 birds. During the brooding and growing periods, the birds were fed commercial diets as follows: from hatch to 7

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weeks , the birds were fed 18 % protein and 2850 Kcal/Kg ME, from 8 to 14 weeks of age , 16 % protein and 2750-2850 Kcal/Kg ME diet was fed to the birds, from 15 to 25 weeks of age the birds were given 14-15 % protein and 270-2800 Kcal/Kg ME diet.

Three levels of protein , 14 , 15 and 16 % and 3 levels of ME , 2650, 2750 and 2850 Kcal/Kg ME were incorporated in the experimental diets for the period from 25 weeks of age to 40 weeks of age. The dietary treatments are presented in Table 1.

During the brooding and growing periods, lighting hours were set for 23 daily for the first 3 days followed by a decrease to 22 hours per day with a gradual decrease after of 2 hours daily till reaching 8 weeks when lighting hours were fixed to 8 hours daily. As the birds started to lay , lighting hours were increased to 11 hours daily with a gradual increase of half an hour daily till reaching 16 hours when were fixed on that level to the end of the experimental period.

The birds were vaccinated against the most prevailing diseases in the area. The vaccination program was recommended by the Ministry of Agriculture.

All birds were housed in a controlled environment house with temperature maintained at comfortable range.

Eggs were collected daily; however, calculation of hen-day egg production was made on bi-weekly basis. At the end of each two-weeks period, three days of egg collection were used to determine egg weight, shell quality, Haugh Unit (albumin height) and yolk color. Specific gravity method was used to measure the shell quality of the eggs as described in North, 1980.

Haugh units were determined by calculating the logarithm of the albumen height, corrected to the egg weight of the birds (Austic and Nesheim, 1990). The following equation was used:

$HU = 100 \log (H + 7.57 - 1.7 W^{.37})$ where:

HU, is Haugh units

H, is albumen heights in mm

W, is egg weight in grams

The egg yolk color was determined visually by the usual La Roche scale , also named as DSM Yolk Color Fan (DSM, 2011) . The higher the number of color in the scale the darker the color of the yolk.

Feed was given ad-libitum daily. Feed left was weighed at the end of each week to determine feed intake and feed conversion.

Statistical analysis

A 2 (lines) X 3 (protein levels) X 3 (energy levels) factorial arrangement in a complete randomized design using the GLM procedure was adopted in this study. Differences among means were evaluated by Duncan's multiple range test (SAS Institute, 2003). The linear model used to test the effects of treatment groups on laying performance was as follows.

$Yi_{jkl} = \mu + P_i + G_j + L_k + (P \times G)_{ij} + (P \times L)_{ik} + (G \times L)_{jk} + (P \times G \times L)_{ijk} + e_{ijkl}$

where:

Y_{ijkl} = Response variable

μ = Population mean

P_i = is the effect of i^{th} protein level 1,...3

G_j = is the effect of j^{th} energy level 1,... 3

L_k = is the effect of k^{th} line , 1,...2 where:

$(P X G)_{ij}$ is the effect of i^{th} level of protein and j^{th} level of energy

$(P \times L)_{jk}$ is the effect of i^{th} level of protein and l^{th} line of the bird

$(G \times L)_{jk}$ is the effect of j^{th} level of energy and l^{th} line of the bird

$(P \times G \times L)_{ijk}$ is interaction effect of the i^{th} level of protein , j^{th} level of energy and l^{th} line of the birds

e_{ijk} = experimental error

Results

Regardless of the interaction, results in Table 2 indicate that the effect of line of the bird, energy level and protein level was significant ($P<0.05$) in most of the traits. Based on daily feed consumption, it was clear that Hajar 2 birds had consumed more feed than Hajar

1. This higher intake was reflected on the higher weigh gain of these birds (Table 2) but not on production, while Hajar 1 birds with their smaller weight gain, produced more eggs than Hajar 2. This seems to be due to the fact that larger bodies needed more feed to maintain, while smaller birds utilized the feed mainly for production and some for maintenance. Egg weight of Hajar 1 birds, incidentally, was numerically and non-significantly smaller in size which may be due to the higher production. This achievement (good production, less feed intake and optimum egg size) of Hajar 1 birds, with no doubt, has resulted into a significantly $P<0.05$ better egg mass and feed conversion (Table 2).

Line effect on performance was not independent. A significant interaction ($P<0.05$) on egg production was found with protein level (Table 3 and Fig. 1). The better egg production , egg mass and feed conversion of Hajar 1 was much better with 14 % protein level.

The interaction between line of the bird and the energy level was significant ($P<0.05$) on feed intake (Table 3, Fig 2). Hajar 2 consumed more feed of higher energy (2750 – 2850 Kcal/Kg) and produced larger eggs than Hajar 1. It is known for sometimes that larger birds produce larger eggs when fed higher energy diet.

Although these binary interaction have removed some of the ambiguity regarding the performance of the birds when independent treatments are concerned , however , ternary interaction of these treatments (Table 4) have paved the road for better recommendations on the requirements of protein and energy for local birds. This table shows a significant interaction ($P<0.05$) related to daily feed intake, hen-day production, egg weight and egg mass. Feed conversion was significant on less than 10 % probability. It is observed that performance of Hajar 1 was better with the higher metabolizable energy , 2850 Kcal/Kg, however, it's response to protein level was not harmonic. While better feed consumption , hen-day production and feed conversion were better with 16 % protein and 2850 Kcal/Kg ME, there was a good egg production, egg mass and egg weight in birds fed the 14 % protein with 2850 Kcal/Kg ME (Table 4). Since there was no clear cut controversial differences between the two levels of protein related to feed conversion and hen-day production , it is more likely to consider that the combination of 2850 Kcal/Kg ME and 14 % protein is better for Hajar 1 birds. These differences were not shown in Hajar 2 birds in-spite of their higher feed consumption. Production of these birds , their feed conversion and egg mass were the best when the birds fed 2850 Kcal/Kg ME in combination with 15 % protein . With the exception of specific gravity, effect of line of the bird , protein and energy levels had no significant effects on egg characteristics pertaining to yolk weight, yolk index, yolk color and Haugh units. Although the differences were not so great, Hajar 2 birds produced significantly ($P<0.05$) better shell eggs than Hajar 1.

Discussion:

Weight gain of the birds was not significantly affected by the protein level. This result was in agreement with Hussein (2005) and Hussein et al., (2010) who found that the final weights of Sina and Mandra chickens of Egypt were not affected by feeding different levels of protein ranging from 14 to 18 %.

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Likewise, level of protein in this study had no significant effect on egg production. This result agreed with work of Hussein (2005) and Hussein et al., (2010), however, contradicted an earlier work of the author who reported an increase in production with increasing level of protein from 16 to 18% (Najib, 1994). Also Gunawardana et al., (2008) obtained a better egg production when level of protein increased from 13.8 to 17 gm daily. Similarly, Liu et al. (2005) and Wu et al., (2005) reported an improvement in egg production with increasing level of protein.

Egg weight and egg mass of this study were not significantly affected by the level of protein. Similar results were reported by Hussein (2005) , Hussein et al., (2010) when fed different levels of protein to Egyptian lines and with earlier studies of Hamilton (1978), Kovan and Ozkan (1978), Thatte et. al., (1981), Olomu and Offiong (1983) whom they found no effect on egg weight of the leghorn layers. However these results did not agree with the findings of Hussein (1999) who showed that increasing dietary protein of the Fayomi and Dendarawi (Egyptian strains) increased egg number, egg weight and egg mass.

Egg mass of Hajar 1 in this study was significantly (P<0.05) better that Hajar 2 which can be attributed to the higher production of Hajar 1. Feed consumption was significantly (P<0.05) affected by the energy level of diet, where it was higher with the highest energy level. This may seem little peculiar however it should not be interpreted as a true impact of energy since there was a significant interaction among the three factors (Table 4) which indicate that the effect of energy was dependent on protein and/or line or both.

The results of egg characteristics traits as they were affected by treatments, agreed with Hassan et al. (2000) , Yaqout (2000), Mustafa et al., (2005) , Hussein (2005) , Hussein et al., (2010) and Zewil (2011) whom they reported that level of protein had no significant effect on egg characteristics of local birds. On the contrary, line of the bird had a significant (P<0.05) effect on egg specific gravity where Hajar 2 with larger eggs had better specific gravity values than Hajar 1. This may be little surprising since it is usually known that smaller eggs have better shell quality (fixed amount of calcium carbonate distributed on larger egg). However, this may not be true with local lines of different and unknown origin. This area needs more investigation.

Based upon the results of the study, It is believed that better performance of Hajar 1 can be achieved with feeding 14 % protein and 15 % protein for Hajar 2 accompanied with 2850 Kcal/Kg ME for both lines.

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	Calculated composition								
Protein	16 %			15%			14 %		
Energy	2650	2750	2850	2650	2750	2850	2650	2750	2850
	Feed ingredients								
Yellow corn	51.0	59.9	62.4	51.0	59.9	62.4	52.6	61.5	64.0
SBM (48%)	13.0	13.5	15.0	10.9	11.4	12.9	10.9	11.4	12.9
Barley	9.4	–	–	11.5	2.1	2.1	11.5	2.1	2.1
Wheat bran	11.0	10.5	6.0	11.0	10.5	6.0	11.0	10.5	6.0
Fish meal	5.0	5.0	5.0	5.0	5.0	5.0	3.4	3.4	3.4
Soya oil	0.5	1.0	1.5	0.5	1.0	1.5	0.5	1.0	1.5
Vitamin mix[1]	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Mineral mix[1]	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Di-calcium ph.	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Limestone	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
L-Lysine	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
DL-Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Choline CL	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35

Table 1. The calculated dietary treatments and feedstuff used in the experimental trial

1The multi vitamin-minerals premix provide the following per ton of diet: 7000000 IU, vit A; 1500000 ICU, vit D3; 30000 IU, vit E; 50000 mg, vit C; 2300 mg, vit K; 1400 mg, vit B1; 5520 mg, vit B2; 2300 mg, vit B6; 12 mg, vit B12; 27600, mg Niacin; 920 mg, Folic acid; 6900 mg, PA; 92 mg, Biotin; 50000 mg, Antioxidant (BHT); 220 mg, Cobalt; 4400 mg, copper; 800 mg, Iodine; 26400 mg, Iron; 44000 mg, Manganese; 180 mg, Selenium; 44000 mg, Zinc.

Table 2. Effect of feeding different levels of protein and energy on the productive performance of two line of Saudi local chickens1

Source of Variation	GBD	HD	LIVA	FC	EM	EW	WG
LINE	**	**	NS	**	*	NS	**
Hajar 1	78.27[a]	47.86[a]	98.37[a]	4.46[b]	21.58[a]	43.68[a]	208.6[b]
Hajar 2	83.68[b]	41.75[b]	99.24[a]	5.53[a]	19.75[b]	44.35[a]	289.8[a]
P =	<.0001	0.0001	0.1227	<.0001	0.0239	0.0700	0.0008
ENE	**	*	NS	NS	NS	**	NS
2650	78.70[b]	44.07[ab]	98.00[a]	4.92[a]	20.10[a]	43.02[b]	266.6[a]
2750	80.73[ab]	43.01[b]	99.26[a]	5.15[a]	19.93[a]	44.63[a]	239.5[a]
2850	82.39[a]	48.05[a]	98.98[a]	4.73[a]	22.10[a]	44.21[a]	243.6[a]
P =	0.0029	0.0260	0.2264	0.4109	0.0533	0.0002	0.634
PRT	**	NS	NS	NS	NS	NS	NS
14%	84.00[a]	47.09[a]	98.29[a]	5.10[a]	21.34[a]	44.13[a]	249.8[a]
15%	79.36[b]	43.08[a]	98.39[a]	4.75[a]	20.53[a]	44.18[a]	254.7[a]
16%	78.64[b]	45.23[a]	99.61[a]	4.92[a]	20.44[a]	43.81[a]	243.5[a]
P =	<.0001	0.1136	0.0873	0.7007	0.3996	0.3954	0.8653

GBD = g/b/d daily feed intake, HD = hen-day production (%), LIV = livability (%), FC = feed conversion (Kg feed/Kg eggs), EM = egg mas (gm/HD), EW = egg weight (gm), WG = bird's weight gain (gm), ENE = levels of energy (Kcal/Kg ME), PRT= protein level , * = significant , P<0.05, ** = significant , P<0.01

Table 3. Effect of binary interaction between line of the bird and levels of protein and energy and between energy and protein on the productive performance of two lines of Saudi local chickens1

	GBD	HD	LIVA	FC	EM	EW
ENE X PRT	NS	*	NS	NS	NS	NS
2650 14%	82.78±8.21	47.74±23.08	97.92±7.5	5.16±3.0	21.06±10.7	43.04±3.1
2650 15%	75.96±12.1	45.39±18.15	96.01±12.1	4.35±2.5	21.03±10.2	42.37±3.8
2650 16%	77.19±11.4	39.06±15.34	100.00±0.0	5.20±2.8	18.10±7.11	43.64±4.2
2750 14%	83.60±10.1	45.30±21.02	98.35±6.87	5.10±3.2	21.03±9.66	44.56±4.8
2750 15%	78.82±12.5	36.02±14.20	99.37±4.72	5.48±3.2	16.98±7.28	45.42±4.30
2750 16%	80.03±12.9	48.00±25.43	100.00±0.0	4.89±2.7	21.72±11.4	43.92±4.72
2850 14%	85.40±10.1	48.00±21.76	98.56±6.70	5.06±3.0	21.82±10.3	44.76±4.01
2850 15%	82.81±11.6	47.79±17.29	99.52±3.68	4.41±2.2	23.14±13.5	44.53±3.72
2850 16%	78.64±12.2	48.37±21.50	98.87±5.01	4.71±3.0	21.22±9.22	43.27±3.46
P =	0.1720	0.0129	0.1835	0.5008	0.0520	0.1886
LINE X LVL	NS	**	NS	NS	**	NS
Hajar 1, 14%	80.74±9.06	53.11±23.87	97.88±7.96	4.39±3.1	24.12±10.7	43.91±3.91
Hajar 1, 15%	76.83±10.2	41.33±16.01	97.86±9.40	4.71±2.0	18.70±8.44	43.83±3.61
Hajar 1, 16%	77.47±11.6	49.63±21.81	99.33±3.88	4.27±2.1	22.18±9.84	43.33±3.73
Hajar 2, 14%	87.50±8.83	40.63±17.46	98.72±5.74	5.85±2.8	18.46±8.75	44.36±4.25
Hajar 2, 15%	82.76±14.1	45.43±18.71	99.10±4.47	4.80±3.5	23.14±13.6	44.69±4.72
Hajar 2, 16%	80.21±12.8	39.30±17.75	100.00±0.0	5.85±3.4	17.96±8.55	44.01±4.64
P =	0.2672	0.0003	0.9381	0.0799	0.0001	0.9578
LINE X ENE	**	NS	NS	NS	NS	*
Hajar 1, 2650	77.79±10.1	48.05±19.82	97.37±10.0	4.13±2.0	22.19±9.89	43.35±3.35
Hajar 1, 2750	78.67±11.6	44.04±22.45	99.04±5.51	5.04±2.8	19.86±10.4	43.91±4.17
Hajar 1, 2850	78.31±9.58	51.48±10.76	98.60±6.32	4.17±2.2	22.78±9.20	43.75±3.62
Hajar 2, 2650	79.77±12.0	39.38±17.92	98.74±5.46	5.87±3.3	17.61±8.59	42.62±4.10
Hajar 2, 2750	83.68±12.1	41.54±17.20	99.57±3.46	5.33±3.3	20.00±8.73	45.76±5.10
Hajar 2, 2850	87.17±12.0	44.02±18.81	99.42±3.74	5.39±3.1	21.38±13.0	44.75±3.91
P =	0.0071	0.1998	0.8422	0.0683	0.0745	0.0125

[1] ± = Standard deviation, GBD = g/b/d daily feed intake, HD = hen-day production (%), LIV = livability (%), FC = feed conversion (Kg feed/Kg eggs), EM = egg mas (gm/HD), EW = egg weight (gm), WG = bird's weight gain (gm), ENE = levels of energy (Kcal/Kg ME), PRT= protein level. * = significant , P<0.05, ** = significant , P<0.01

Table 4. Effect of Ternary interaction between line of the bird , levels of protein and energy levels on the productive performance of two lines of Saudi local chickens1

Source of Variation	GBD	HD	LIVA	FC	EM	EW
Line x prt x ene	**	**	NS	NS	**	*
Hajar1 2650 14%	81.81±7.5	54.97±24.8	97.61±8.1	4.22±2.7	24.5±10.9	2.6±43.23
Hajar1 2650 15%	77.92±11.2	51.92±17.6	94.80±14.5	3.74±1.5	23.8 ±11.0	3.7±42.35
Hajar1 2650 16%	74.45±9.9	38.72±14.0	100.00±0.0	4.53±1.7	18.60±6.4	44.63±3.1
Hajar1 2750 14%	81.12±10.2	47.91±23.0	98.26±7.1	4.98±3.5	21.8±10.6	4.7±43.25
Hajar1 2750 15%	74.09±9.9	31.76±9.5	98.84±6.4	5.49±2.0	14.48±4.4	3.0±45.05
Hajar1 2750 16%	80.53±13.4	51.73±26.0	100.00±0.0	4.68±2.6	23.0±12.3	4.3±43.45
Hajar1 2850 14%	79.50±9.0	57.21±21.8	97.09±8.9	3.91±2.7	26.2 ±10.5	3.6±45.14
Hajar1 2850 15%	78.32±9.1	40.18±13.4	100.00±0.0	4.93±2.0	17.93±5.8	3.6±44.11
Hajar1 2850 16%	77.18±10.0	57.43±19.5	96.05±6.5	3.66±1.6	24.32±8.8	3.1±42.14
Hajar2 2650 14%	83.53±8.8	42.13±20.4	98.15±7.1	5.89±3.0	18.52±8.9	3.5±42.88
Hajar2 2650 15%	72.58±13.2	34.78±14.1	98.52±5.8	5.59±3.5	16.06±6.4	42.42±4.0
Hajar2 2650 16%	80.63±12.4	39.48±17.2	100.00±0.0	6.07±3.7	17.47±8.1	42.38±5.0
Hajar2 2750 14%	87.90±8.5	40.77±16.7	98.49±6.6	5.29±2.4	19.75±7.8	46.88±4.2
Hajar2 2750 15%	84.46±13.2	41.11±17.1	100.00±0.0	5.47±4.4	20.43±8.9	5.6±45.94
Hajar2 2750 16%	79.33±12.4	42.65±18.8	100.00±0.0	5.22±2.7	19.76±9.6	5.2±44.67
Hajar2 2850 14%	91.11±7.61	39.08±15.2	99.40±3.4	6.53±2.8	17.67±8.2	4.3±44.40
Hajar2 2850 15%	88.10±12.0	57.09±17.2	98.94±5.5	3.79±2.1	29.5 ±17.0	3.8±45.02
Hajar2 2850 16%	80.64±14.1	35.91±17.8	100.00±0.0	6.22±3.7	16.77±8.0	44.90±3.5
P =	0.0020	<.0001	0.3594	0.0537	<.0001	0.0091

[1]± = Standard deviation, GBD = g/b/d daily feed intake, HD = hen-day production (%), LIV = livability (%), FC = feed conversion (Kg feed/Kg eggs), EM = egg mas (gm/HD), EW = egg weight (gm), WG = bird's weight gain (gm), ENE = levels of energy (Kcal/Kg ME), PRT= protein level

REFERENCE

(1) Abd El-Maksoud, A., S. E. M. El-Sheikh, A. A. Salama and R. E., Khidr, 2011. performance of local laying hens as affected by low protein diets and amino acids supplementation. Egypt. Poult. Sci. Vol (31) (II): (249-258). || (2) Ahmed, A. S. and A. H. Alabbad, 2014. First report about growth, partial record egg production and morphological characters of a newly characterized native Saudi chicken lines Hajar1 and Hajar2, In. Biotechnology and conservation of species from arid regions. Volume 1, Chapter 10. Nova Science publisher, Inc. , USA.|| (3) Alsobayel, A.A., 1992. Effect of protein rearing diet and age on fertility and hatchability parameters of Saudi Arabian Baladi chickens. J. King Saud Univ., Vol. 4, Agri. Sci., 1: 47-54.|| (4) Alsobayel, A.A., F.M. Atteia and M.A. El-Badry. 1991. Influence of protein rearing regimen and age on egg quality characteristics of Saudi Arabian Baladi hens. J. King Saud Univ., Vol. 3, Agri. Sci., 2: 201-211.|| (5) Al-Yousef, Y. and H. Najib. 1997. Further studies on the response of Saudi Baladi (local) chickens to different levels of protein. J. Appli. Anim. Res. 12:169-172|| (6) Al-Yousef, Y., Huthail Najib and Fahad Al-Mulhim. 1995. Studying the productivity of native chickens and the possibilities of their genetic improvement in the Kingdom of Saudi Arabia. Final report of project No. AP-12-72, submitted to King AbdulAziz for Science and Technology.|| (7) Attia, F.M., A.A. Alsobayel, M.S. Bayoumi and M.A. El-Badry. 1991. Effect of rearing regimen and age of bird on egg weight and weight of the component parts of Saudi Arabian Baladi chicken eggs. J. King Saud Univ., Vol. 3, Coll. Agri. Sci., 1: 43-55.|| (8) Austic, R. E. and M. C. Nesheim. 1990. Poultry Production. 13th edition, Lea & Febiger, Malvern, PA, USA|| (9) DSM. 2011. http//www.dsm.com/en_US/html/dnp/prod_caro beta|| (10) Gunawardana, P., D. A. Sr. Roland, and M. M. Bryant. 2008. Effect of energy and protein on performance, egg components, egg solids, egg quality, and profits in molted HyLine W-36 Hens. J. Appl. Poult. Res.17:432-439.|| (11) Hamilton, R. M. G. 1978. The effect of dietary protein level on productive performance and egg quality of four strains of the White Leghorn hens, Poult Sci., 57 :1355- 1364.|| (12) Hassan, G. M., M. Farghaly., F. N. K. Soliman, and H. A. Hussain. 2000. The influence of strain and dietary protein level on egg production traits for different local chicken strain. Egypt. Poult. Sci., 20: 49-63.|| (13) Hussein , H. A. 1999. The influence of size, strain and strain by protein level interaction of economic traits in chickens . Ph. D thesis , Fac, Of Agric . Alexandria Univ.|| (14) Hussein, M. A. A. 2005. An adequate dietary crude protein level for local Mamourah laying hens. J. Agric. Sci. Mansoura Univ., 30 (12):7535-7546.|| (15) Hussein; M. A. A, M. Kout El-Kloub, M. K. Gad El-hak , and A. M. Abbas. 2010. Optimal Metabolizable energy and crude protein levels for Sinai laying hens. Egypt. Poult. Sci. Vol (30) (IV): (1073-1095).|| (16) Kovan, O. and K. Ozkan. 1978. Effect of amount of protein in the diet yield of eggs . Nut. Abst and Rev , 50(5):220.|| (17) Liu Z, G. Wu, M. M. Bryant, D. A. Sr. Roland. 2005. Influence of added synthetic lysine in low-protein diets with the methionine plus cysteine to lysine ratio maintained at 0.75. Journal of Applied Poultry Research, 14 : 174-182.|| (18) Moustafa, Kout EL-Kloulb, M. A. A. Hussein and M. K. Gad EL-hak. 2005. A study on the energy and protein requirement of Mamoura local strain chickens during laying period. Egypt. Poult. Sci., 25: 637-651.|| (19) Najib, H. 1994. Effect on Feeding Different levels of protein Production Traits of Saudi Baladi chicken Raised in Confinement. J. Appl. Anim. Res. 6:177-181|| (20) North, M. O. 1984. Commercial Chicken Production Manual. AVI Publishing Company, Inc. Westport, Connecticut.|| (21) Olomu, J. M. and S. A. Offiong. 1983. The performance of brown egg type layer fed different protein and energy levels in the tropics. Poultry science 345 - 352. || (22) SAS Institute Inc, 2002-2003. SAS Users Guide: Statistics. Version 9.1.3. SAS Institute, Cary, NC.|| (23) Thatte, V. R., R.T Desai and W. Dkhire. 1981. Energy and protein requirements of the laying hen . Indian J. Poult. Sci 16:222-228.|| (24) Wu G, M. M. Bryant, R. A. Voitle and D. A. Sr. Roland (2005). Effect of dietary energy on performance and egg composition of Bovans White and Dekalb White hens during phase 1. Poultry Science, 84 : 1610-1615.|| (25) Yakout, H. M. 2000. Response of laying hens to practical and low protein diets with ideal TSAA: lysine ratios: Effects on egg production component, nitrogen and nitrogen excretion. Ph.D. Thesis. Alexandria University.|| (26) Yakout, H. M. , M. E. Omara Y. Marie and R. A. Hassan, (2004). Effect of incorporating growth promoters and different dietary protein level into Mandarah hens layers diets. Egypt. Poult. Sci., 24: 977-994.|| (27) Zeweil, H. S., A. A. Abdalah, M. H. Ahmed. 2011. Effect of different levels of protein and methionine on performance of baheij laying hens and environmental pollution. Egypt. Poult. Sci. Vol. (31) (II): (621-639).