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Effect of Substitution Millet Energy Instead of Yellow Corn Energy on Growth and Production Diet in Partridge

Firas Khaleel Ibrahim[1], Salim Thanon Younis[2], Shehab Mohamad Hamid[3]

[1,2,3] *(Office of Agriculture Research , Nineveh Research Department , Livestock Research Department ,Iraq)*
Emil: salemal_deleemy@yahoo.com

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Abstract: **The research was carried out in the Livestock Research Division / Nineveh Research Department using 720 birds at one-day-old, distributed on four substitution millet energy 0% (control), 20%, 30%, and 40% instead of corn energy, to study its effect on the growth and production periods for partridge. The results showed that the 30% substitution treatment was significantly superior (P ≤0.05) on control treatment in body weight, Also, in feed consumption, the three treatments were significantly superior (P ≤ 0.05) on control treatment, while there was no significant difference between the four treatments for weight gain and food conversion ratio in the starter period (1-4) weeks of age. As for the growth period (5-24) weeks, a significant decrease (P <0.05) in body weight is observed with an increase in the millet replacement percentage, the control treatment was significantly superior (P <0.05) on the 30% substitution treatment in the weight gain, whereas the control treatment, decreased significantly (P <0.05) from the substitution treatment 40% in the feed consumption and food conversion ratio. As for the egg production stage, the control treatment was significantly superior (P ≤0.05) on 20% and 40% treatments in the number and percentage of eggs, the feed consumed was not affected by the treatments under study, while there was a significant difference (P ≤0.05) between the age of 26 weeks and the age of 33 weeks in feed consumption, Control treatment decreased significantly (P ≤0.05) from substitution treatment 20% in FCR / Dozen egg. the treatment of substitution 30% increased significantly (P ≤0.05) on control treatment for hatching%, fertility% and hatching from fertilized eggs%.**

Keywords: **partridge; yellow corn energy; millet energy; groduction Diet .**

I. Introduction

The Partridge belonged to the Kingdom Animalia, Division Chordata, Class Aves, Order Galliforms, family Phasianidae, subfamily Phassianinae, genus Alectoris, type Alectoris chukar [1,2], Males are slightly larger than females, male weight ranges from 510-800 grams while females weigh 450-680 grams [3]. The chukar partridge is the only species among the 46 species belonging to the *Alectoris* genus, four of them have been recorded under the species (*A.C. Kurdistanica*, *A.C. Werae*, *A.C. Asoica*, and *A.C.Senica*) in Iraq [4], This bird can adapt to various environments (rocky, mountainous, stony, and hilly) The bird spreads and reproduces in the hills and mountains in the north and northeast of Iraq [5]. The drastic decrease in the number of wild birds due to overfishing or due to changing climatic conditions in animal living environments and the use of pesticides, led to an increase in the numbers of closed farms for breeding [6,7], partridge are raised for release in nature to use in birds hunting game as well as raised to produce eggs as a new source of protein [8,9], and it is considered one of the non-migratory birds [1].

The millet *Pennistum glaucum* is often called (nutritional grain) because of its rich nutritional content compared to other types of grains such as wheat, rice, or corn, for example. Using millet in dietary patterns to significantly improve human and animal health, millet is one of the first plants grown in Africa, sub-Saharan Africa, and Asia, it is considered by farmers as a basic and traditional crop, it is one of the species that resist and endures many crop diseases and pests and can survive under Inappropriate weather conditions [10-12], Millet contains 3000 - 3640 kcal/kg energy and 7.7 - 12.5% raw protein, millet cereal is nutritionally similar to corn and can be feed substitutes [13].

II. Materials and methods

The research was carried out in the fields of the poultry unit / Livestock Research Division / Nineveh Research Department. Using 720 birds one day old weighted 30 g distributed in four treatments, with three replications per treatment in each repeater 60 birds, the birds were fed on four different diets for the starter period until the age of four weeks, replaced by a growth diet 5 - 24 weeks, at 25 weeks of age, birds feed on production diets until the end of the egg production period. The diets were formed according to replacing millet energy with yellow corn energy, table (1), the nutrient values were calculated for each diet, as follows:

first treatment: Zero% millet energy - 100 yellow corn energy (control diet).

second treatment: 20% millet energy - 80% yellow corn energy.

third treatment: 30% millet energy - 70% yellow corn energy.

fourth treatment: 40% of the energy of millet - 60% of the energy of yellow corn.

Birds were fed ad libtum. 20 birds were weighed at the end of each week until the age of 18 weeks. The consumed feed and feed conversion ratio were calculated based on the weight gain and egg production. Egg collected, cleaning, then stored, the following was also calculated:

$$\textbf{FC /birds/week} = \frac{\textbf{weekly Food consumption/replecate}}{\textbf{No.Birds /replecate}} \times \frac{1}{7} \quad [14].$$

$$\textbf{HD} = \frac{\textbf{No.egg/ day}}{\textbf{No.female}day} \times 100 \quad [15].$$

$$\textbf{FCR / egg dozen} = \frac{\textbf{weekly FC/replecate} \times 12}{\textbf{weekly egg No./replecate}} \quad [14].$$

Table 1. The ingredients of the diets.

		The ratio of replacing millet energy instead of yellow corn energy			
		0% (control)	20%	30%	40%
Starter period	yellow corn	40	32	28	24
	Millet	-	10	15th	20
	Wheat	14	13	12	12.5
	Soy sauce	35	34	32	30
	Protein concentrate	5	5	5	5
	Yeast	2	2	3	3.5
	Oil	2	2	3	3
	Salt	0.3	0.3	0.3	0.3
	Limestone	0.7	0.7	0.7	0.7
	Premix	1	1	1	1
	ME	2863.3	2811.5	2853.55	2833.15
	CP	23.65	23.3	23.58	23.35
	Energy / protein	121.07	120.66	121.06	121.33
Growth period	yellow corn	54	43	37.5	31.5
	Millet	-	14	21	28
	Wheat	11	10	8.5	7
	Soy sauce	27	24.5	23.5	23
	Protein concentrate	5	5	5	5
	Yeast	0.5	0.5	1	1
	Oil	0.5	1	1.5	2.5
	Salt	0.3	0.3	0.3	0.3
	Limestone	0.7	0.7	0.7	0.7
	Premix	1	1	1	1
	ME	2893	2863	2856	2877
	CP	20.2	20	20.2	20.1
	Energy / protein	143.22	143.15	141.4	143.1
Egg production period	yellow corn	54	43	37.5	31.5
	Millet	-	14	21	28
	Wheat	11.5	9.5	8.5	7.5
	Soy sauce	23	21	19.5	19
	Protein concentrate	4	4	4	4
	Yeast	0.5	0.5	1	
	Oil	0.5	1.5	2	2.5
	Salt	0.5	0.5	0.5	0.5
	Limestone	2	2	2	2
	Di Calcium	3	3	3	3
	Premix	1	1	1	1

	ME	2797	2796	2795	279
	Crude protein	18.1	18	18	18.1
	Energy / protein	154.53	155.33	155.27	15.41

Statistical analysis: A complete randomized design CRD was used in analyzing the data of the starter and growth period, the factorial analysis for the same statistical design was used to analyze the production period data, Dunkin test was used to identify the significance differences between the mean of treatments at ($P \leq 0.05$).

III. Results and Discussion

1. The effect of substation millet energy instead of yellow corn energy in the starter period 1-4 weeks

Table (2) shows a significant improvement ($P \leq 0.05$) in body weight for millet substitution treatments 20% and 30% (112.89 and 115.56) g on control treatment (102.97) g, the treatment 40% (108.73) g increased numerically to control, these results were inconsistent with [13], in broiler at ages 14 and 42 days, whereas [9], agreed at four weeks of age in the partridge.

Table 2. Effect of millet substitutions instead of yellow corn on partridge in the starter period 1-4 weeks (mean ± SD).

	BW			WG			F C			FCR		
	Mean	SD		Mean	SD		Mean	SD		Mean	SD	
control	103.0	44.1	C	88.57	11.1	A	66.8	19.8	B	2.03	0.3	A
20%	112.9	47.2	AB	98.49	16.1	A	74.6	18.5	A	2.68	1.9	A
30%	115.6	44.9	A	101.16	6.02	A	80.3	31.3	A	2.22	0.7	A
40%	108.7	44.5	BC	94.33	9.59	A	74.4	17.3	A	2.19	0.4	A

Vertically different letters refer to significant differences ($P \leq 0.05$) between the means, according to Duncan test. BW=body weight ; WG=weight gain; FC=food consumption; FCR=feed conversion ratio.

There was no significant difference between control and millet substitution treatments for weight gain (33.75, 35.65, 35.94 and 34.69) g respectively, these results were agreed with [13], in broiler at 14 and 21 days old and [15], in laying hens. There was a significant increase ($P \leq 0.05$) of FC /bird/week for substitution treatment 30% on control treatment and a numerical increase on the other two millet substitution treatments, control, and substitution treatments means (66.80, 74.63, 80.27 and 74.41) g / bird/week respectively, These results were not agreed with [13], in broiler at ages 14 and 21 days and [10,15], in laying hens. There was no significant effect of millet substitution treatments 20%, 30%, and 40% in FCR, these results were agreed with [13], in broiler chicks at ages 14 and 21 days.

2. Effect of substitution millet energy instead of yellow corn energy on growth period 5-24 weeks.

The results of the growth period shown in Table 3 showed that there was a significant decrease ($P \leq 0.05$) in body weight with increasing the percentage of substitution compared to control. The mean of control and substitution treatments were (430.38, 408.99, 402.81 and 406.40) g / bird, Also, the significant difference ($P \leq 0.05$) appeared in the weight gain between control and substitution 30%, which did not differ significantly with the other two remaining substitution treatments, mean of control and millet substitution treatments was (33.94, 26.28, 25.39 and 26.23) g / bird, respectively, these results were agreed with [15], in laying hens. and [9], in the Partridge. Feed consumed in the substitution 40% increased significantly ($P \leq 0.05$) over the control treatment, whereas these two treatments did not differ significantly from substitution treatments 20% and 30% the means for control and substitution was (157.08, 174.70, 165.74 and 178.12) g. Respectively, these results disagreed with [15], in laying hens. Perhaps the increased feed intake in elevated millet substitution treatment is due to the high levels of fiber that may reduce the use of nutrients, especially energy use [16], and this leads to greater consumption of feed to meet their nutritional requirements for birds [17].

Table 3. Effect of millet substitutions instead of yellow corn on partridge in the growth period 5-24 weeks (*Mean ± SD*).

Millet substitute	BW			WG			F C			FCR		
	Mean	SD		Mean	SD		Mean	SD		Mean	SD	
Control	430.38	99.6	A	33.94	43.10	A	157.08	21.30	B	9.51	6.24	B
20%	408.99	100.1	B	26.28	18.02	AB	174.70	63.39	AB	13.06	13.97	AB
30%	402.81	93.5	C	25.39	18.92	B	165.74	74.04	AB	16.95	27.91	AB
40%	406.40	97.1	BC	26.23	18.08	AB	178.12	68.53	A	21.43	38.45	A

Vertically different letters refer to significant differences (P ≤ 0.05) between the means, according to Duncan test. BW=body weight ; WG=weight gain; FC=food consumption; FCR=feed conversion ratio.

3. Effect of substitution millet energy instead of yellow corn energy and age on production period 25-33 weeks:

The number of eggs/week and HD%: Results in Table (4) showed a significant increase (P ≤0.05) for control treatment compared to substitution 20% and 40%. The difference was numerical with a substitution 30% for the number of eggs/week, , the number of eggs (50.50, 36.00, 45.17 and 35.89) eggs / week for control and substitution treatments 20%, 30% and 40%, respectively. Age 25-33 weeks had a significant effect (P ≤0.05) on weekly egg production, as ages 25-28 weeks increased significantly over the rest of production ages and there was an increase in the production rate with age advancing to the top of production in week 27 of age (67.25) an egg/week, after which the number begins to decrease until the end of egg production at the age of 33 weeks. interaction between substitution and age treatments had the same effect in higher egg production for control and 30% substitution treatment for early ages of laying eggs 25-28 weeks of age and then the production decrease for the rest of the ages for all treatments. We found the same effect on HD%, the means for the four treatments (26.07, 18.40, 23.10, and 18.70), respectively with the same significant difference, These results were inconsistent with [15], in laying hens, while this finding was consistent with findings [8,10,15]. The decrease in the number of eggs by increasing the substitution of millet in the diet and this is likely due to the high percentage of fiber in the millet diet, which leads to an increase in the speed of food passage in the gut and less benefit from it [16]. While the best HD% for the first four weeks of production (32.90, 38.80, 34.5 and 29.5%), respectively, and then the HD% decreased with age, this result agreed with [7], which attributed the reason for the decrease in egg production with age in partridge birds to the number of hours Lighting, season and genotype.

Food Consumed /week: From Table (5), the millet substituted treatments did not have a significant effect on the consumption / week (7.53, 7.62, 7.14 and 6.45) kg/week, the results of this study differed with its findings [10], in Lehmann chicken, While significant differences (P ≤0.0.5) appeared between the last two weeks of production (32 and 33) weeks on the one hand and the rest of the ages (25-31) weeks, there was also no significant difference in the FC between treatments within the same age, While FC increased significantly (P ≤0.05) between ages at the beginning and the end of the production season in the same treatment, as for the same treatment, an increase in FC is observed with increasing age, then the FC will decrease, the reason for this result may be due to the increased nutritional needs of the bird upon entering the egg production period.

Table 4. Effect of millet substitutions instead of yellow corn and age on egg no. and HD% in partridge at 25-33 weeks age(*Mean ± SD*).

		Control			substitute 20 % of the yellow maize			substitute 30 % of the yellow maize			substitute 40 % of the yellow maize			Age effect		
		$\bar{x}$	SD		$\bar{x}$	SD		$\bar{x}$	SD		$\bar{x}$	SD		$\bar{x}$	SD	
Egg Number/ week	25	65.5	0.71	AD	65.5	12	AD	61	14.1	AE	65	21.21	AE	64.25	10.9	A
	26	90.5	23.3	A	74.5	20.5	AB	73.5	3.54	AB	64.5	20.51	AE	75.75	17.3	A
	27	79.0	22.6	AB	62	12.7	AE	76	12.7	AB	52	16.97	AG	67.25	17.2	A
	28	61.0	39.6	AE	53.5	21.9	AF	69	15.6	AC	46	24.04	AI	57.38	22.2	AB

	29	67.0	9.9	BI	23	2.83	DI	51	36.8	AH	46	16.97	AI	40	26.3	BC
	30	37.5	17.7	BI	12.5	6.36	FI	26	25.5	CI	28	12.73	CI	26	16	CD
	31	54.5	16.3	AF	20.5	20.5	DI	25.5	4.95	CI	8	2.83	GI	27.13	20.8	CD
	32	20.0	8.49	EI	7.5	7.78	GI	14	0	FI	6	4.24	HI	11.88	7.55	D
	33	6.5	3.54	HI	5	4.24	I	10.5	3.54	FI	7.5	4.95	GI	7.38	3.78	D
Treatments Effect		53 .50	30.1	A	36	28.6	B	45.17	28.4	AB	35.89	26.09	B	42.64	28.7	
HD%	25	33.42	0.36	AE	33.4	6.14	AE	31.1	7.21	AE	33.5	11.3	AE	32.9	5.69	A
	26	46.18	11.9	A	38	10.5	AB	37.5	1.81	AC	33.7	11.5	AE	38.8	8.89	A
	27	40.31	11.5	AB	31.6	6.49	AE	38.8	6.5	AB	27.1	9.51	AH	34.5	8.76	A
	28	31.60	19.5	AE	27.3	11.2	AG	35.2	7.94	AD	24.1	13.1	AJ	29.5	11.2	AB
	29	35.36	3.38	BJ	11.7	1.45	EJ	26	18.8	AI	24	9.43	AJ	24.3	3.02	BC
	30	19.63	8.32	BJ	6.45	3.15	FJ	13.3	13	DJ	14.6	6.99	CJ	13.5	8.23	CD
	31	28.65	7.1	AE	10.5	10.4	EJ	13.1	2.38	DJ	4.18	1.43	HJ	14.1	10.8	CD
	32	10.72	5.06	EJ	3.85	3.94	IJ	7.28	0.19	FJ	3.18	2.24	IJ	6.25	4.12	D
	33	3.50	2.06	IJ	2.57	2.14	J	5.43	1.7	GJ	3.97	2.62	IJ	3.87	1.97	D
Treatments Effect		27.71	15.2	A	18.4	14.6	B	23.1	14.5	AB	18.7	13.7	B	24.29	12.1	

Horizontally different litters for treatments mean and vertically ages mean and the interaction between them, refers to significant differences ($P \leq 0.05$) between the means, according to the Dunkin test.

FCR / egg dozen: Table (5) shows a numerical and significant increase ($P \leq 0.05$) for substitution treatments on the control treatment in the amount of feed required to produce one egg dozen (2.46, 5.99, 3.41 and 5.13) kg/egg dozen Respectively, this finding was consistent with [10], a significantly higher FCR / dozen egg with increased the level of millet in laying hens diets, The reason for the increase may be due to the impact of FCR/ Dozen egg by the number of eggs produced in the same period, as the correlation coefficient between them was (0.69 **) as well because FCR/dozen egg was affected by the FC, this relationship also agreed with the findings of [7], which showed that the high values of FCR/dozen egg were in the treatment that consumed more feed, as well as the decrease in egg production in the same treatments, also, the FCR/egg dozen was affected by the age, where an increase in the FCR was observed with increasing age, which was inversely proportional to the number of eggs/week, Whereas, the FCR/dozen eggs were not affected by the treatments within the same age.

Table 5. Effect of millet substitutions instead of yellow corn and age on egg no. and HD% in partridge at 25-33 weeks age (*Mean ± SD*).

		Control			**substitute 20 % of the yellow maize**			**substitute 30 % of the yellow maize**			**substitute 40 % of the yellow maize**			**Age effect**		
		$\bar{x}$	*SD*		$\bar{x}$	*SD*		$\bar{x}$	*SD*		$\bar{x}$	*SD*		$\bar{x}$	*SD*	
Consumed /	25	8.42	0.70	AC	8.76	0.78	AB	7.45	0.07	AE	7.11	1.13	AE	7.93	0.93	AB
	26	9.62	0.54	A	9.55	0.29	A	8.92	0.67	AB	7.91	0.88	AC	9.00	0.87	A

	27	9.32	0.97	AB	8.92	0.34	AB	8.05	0.12	AC	7.41	0.59	AD	8.42	0.91	AB
	28	7.73	3.22	AD	8.46	0.35	AC	8.31	0.44	AC	5.37	5.19	AE	7.47	2.67	AB
	29	7.99	1.67	AC	5.87	0.28	AE	6.44	2.97	AE	8.14	1.58	AC	7.11	1.77	AB
	30	9.15	0.37	AB	9.34	0.94	A	6.29	3.25	AE	5.38	0.77	AE	7.54	2.28	AB
	31	6.41	1.99	AE	8.09	0.83	AC	7.57	0.20	AD	6.93	1.07	AE	7.25	1.14	AB
	32	4.64	0.28	BE	3.83	1.66	CE	3.23	0.41	DE	2.83	0.90	E	3.63	1.04	C
	33	4.54	5.00	BE	5.75	4.38	AE	8.05	0.77	AC	6.98	1.15	AE	6.33	2.93	B
Treatments Effect		7.53	2.47	A	7.62	2.27	A	7.14	1.98	A	6.45	2.17	A	7.19	2.23	
FCR / dozen egg	25	1.54	0.14	C	1.62	0.16	C	1.51	0.36	C	1.35	0.23	C	1.50	0.21	D
	26	1.31	0.27	C	1.61	0.49	C	1.46	0.18	C	1.53	0.32	C	1.48	0.27	D
	27	1.45	0.27	C	1.76	0.29	C	1.29	0.19	C	1.79	0.45	C	1.59	0.32	D
	28	1.67	0.45	C	2.09	0.93	C	1.49	0.41	C	2.03	2.42	C	1.82	1.04	D
	29	1.43	0.09	C	3.08	0.23	BC	1.71	0.53	C	2.20	0.40	BC	2.10	0.72	CD
	30	3.26	1.41	BC	10.03	4.20	AC	6.99	8.34	AC	2.49	0.80	BC	5.69	4.80	BD
	31	1.55	0.90	C	8.99	8.50	AC	3.65	0.80	BC	11.40	5.64	AB	6.39	5.74	B
	32	3.02	1.12	BC	10.25	7.95	AC	2.77	0.35	BC	8.38	7.72	AC	6.10	5.48	BC
	33	6.88	5.49	AC	14.57	1.85	A	9.91	4.22	AC	15.05	11.75	A	11.60	6.33	A
Treatments Effect		2.46	2.26	B	5.99	4.99	A	3.41	3.73	AB	5.13	6.23	AB	10.81	12.91	

Horizontally different litters for treatments mean and vertically ages mean and the interaction between them, refers to significant differences ($P \leq 0.05$) between the means, according to the Dunkin test.

4. The effect of millet energy substitution instead of yellow corn energy on hatching% and fertility%:

Table (6) shows a significant improvement effect ($P \leq 0.05$) for a substitution 30% on a control and 20% substitution, while the control treatment did not differ significantly with the 20% and 40% substitution, the average (94.00, 92.00, 97.5 and 96.00)% respectively for the control, 20%, 30% and 40% substitution of millet energy instead yellow corn, The 30% substitution treatment was significantly superior ($P \leq 0.05$) to the rest of the treatments in the fertility% the control treatment had the lowest fertility % (76.50, 78.50, 86.00 and 81.50)% for control, 20%, 30 %, and 40%, respectively, , also, the control treatment decreased significantly ($P \leq 0.05$) from substitution treatments in hatching% from fertilized eggs, and treatment 30% increased significantly ($P \leq 0.05$) over substitution 20% and 40%, which did not differ between them morally. These results were consistent with the findings of [7,18], in the partridge and did not agree with [15] in laying hens, The reason for the improvement in the fertility% in millet substitutions instead maize is due to what mentioned by [19], the high concentration of selenium in millet, which directly affects fertility%, and the high concentration of linoleic acid in millet, as well as good proportions of the saturated and unsaturated fatty acids, led to a reduction in late fetal death, which in turn led to an improvement in hatching%.

Table 6. Effect of millet substitutions instead of yellow corn on Hatching% and fertility% in partridge (*Mean ± SD*).

Millet substitute	Hatching%			Fertility%			Hatching from fertilized egg		
	$\bar{x}$	*SD*		$\bar{x}$	*SD*		$\bar{x}$	*SD*	
Control	76.50	2.50	C	94.00	2.00	BC	81.36	0.93	C
20%	78.50	1.50	BC	92.00	0.50	C	84.88	2.08	B
30%	86.00	1.00	A	97.50	1.50	A	88.21	0.33	A
40%	81.50	1.00	B	96.00	0.05	AB	84.89	1.56	B

vertically different litters refers to significant differences ($P \leq 0.05$) between the means, according to the Dunkin test.

Conclusion

The results from current research, we conclude that the millet crop can be used as a substitute for yellow corn in poultry diets, especially in the countries that produce millet, as the cost of its production will be low comparing to the yellow corn crop and thus reflected in the low cost of production in poultry projects.

References

[1] Efstathios, H. (2013). Breedig Chukar Partridges (*Alectoris chukar*) in Cyprus. Ph. D thesis, Faculty of Veterinary Sciences , Budapest.
[2] Khoshnaw , Z. O. I and Abdullah , S. M. A. (2013). Study on the parasites of chukar partridge Alectoris chukar from Shaqlawa district, Kurdistan region, Iraq. Tikrit Journal of Pure Science 18 (3): 26– 30.
[3] Ahmad, B. ; Nabi, G. ; Hayat, M.; and Muhammad, J. (2017). Habitat study of Chukar partridge (*Alectorus chukar*) in district Malakand: A case study of town Thana, Pakistan. J. Bio. Envi. Sci. 11(4): 11-17.
[4] Lahony , S. R. and AL-Rawy, A.M. (2010). New sub-species of ckukar partridge *Alectoris chukar* (gray 1830) (phasianidae galliforms) from north east of Iraq with biological observantion Bull. Iraq nat. Hist. Mus., 11 (1): 57-67.
[5] Salim , M. A.; Al-Sheikhly, O. F. ; Majeed , K. A. and Porter , R. f. (2012). An annotated checklist of the birds of Iraq. 34.
[6] Gaudioso, V. R. ; Alonso, M. E. ; Robles, R. ; Garrido, J. A. and Olmedo, J. A. (2002). Effects of Housing Type and Breeding System on the Reproductive Capacity of the Red-Legged Partridge (Alectoris rufa). Poult. Sci. 81:169-172.
[7] Yamak , U. S. (2015). Artificial breeding of wild birds in Turkey: Partridge breeding case. Indian J. Anim. Res. 49 (2): 258-261.
[8] Hashemipour , H.; Khaksar , V. and Kermanshahi, H. (2011). Application of probiotic on egg production and egg quality of chukar partridge. African Journal of Biotechnology 10(82) :19244-19248.
[9] Pourghanbari , Gh. H.; Nili , H.; Habibi, H.; Morovati, M.; Salehi, E. and Sadoughifar, R. (2016). Response of Chukar Partridge Performance and Blood Parameters to Different Dietary Crude protein. Adv. Biores., 7 (2):162-169.
[10] Filardi, R.S. ; Junqeira, O.M. ; Casartelli, E. M. ; Laurentiz, A. C. ; Duarte, K. F. and Assuena, V. (2005). Pearl Millet Utilization in Commercial Laying Hen Diets Formulated on a Total or Digestible Amino Acid. Basis. Brazilian Journal of Poultry Science, 7 (2) : 99-105.
[11] Abakar, Ahmed Abakar (2008). The Feeding Value Of Millet Processing By-product On Broiler Chick Performance. MSC. University of Khartoum, Sudan.
[12] FAO (2018). Food and Agriculture Organization. ([http://www.fao.org/fileadmin/user_upload/bodies/COAG_Sessions/COAG_26/MX753_7/MX753_Rev1__COAG_2018_17_REV1_ar.pdf) Posted October 1-5.
[13] Bueno, J. P. R. ; Nascimento, M. R. B. ; Carvalho, C. M. C.; Fernandes, E. A.; Silva, M. C. A. ; JMartins, . M. S. and Litz , F. He. (2015). Millet and corn oil in sorghum-based diets for broilers Ciência Rural, Santa Maria, 45 (12):.2233-2238.
[14] Ahmad, F. ; Ul-Haq, A. ; Ashraf, M. ; Hussain, J. and Siddiqui , M. Z. (2010). Production Performance of White Leghorn Hens Under Different Lighting Regimes. Pakistan Vet. J., 30 (1): 21-24.
[15] Tadele, Y. ; Negesse, T.; Amha, N. and Yadav, K.R. (2018). Effect of Dietary Replacement of Maize with Finger Millet (*Eleusine coracana*) Grain on Production Performance and Egg Quality of White Leghorn Hens. Int. J. Poult. Sci., 17 (1): 40-50.
[16] Mehri, M.; Pourreza, J. and Sadeghi, G. (2010). Replacing maize with pearl millet in laying hens' diets. Trop Anim Health Prod 42:439–444
[17] Koivunen, E. ; Tuunainen, P. ; Valkonen, E. ; Rossow, L. and Valaja, J. Use of Faba (Vicia faba) in diets of laying hens, Agricutural and Food Science. 2014 , 23 : 165-172.
[18] Yilmaz, A. and Tepeli, C. (2009). Breeding Performance of a Captive Chukar Partridge (*Alectoris chukar*) Flock. J. Anim. Vet. Adv. , 8(8) : 1584-1588.
[19] Eljack , Badr Hassab El Rasoul (2004). The Effects of Feeding Millet on Growth, Laying and Hatching Performance of Pure Fayoumi Breed. PhD thesis, University of Khartoum, Sudan.