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Original Article

Effect of Different Levels of Metabolizing Energy on Productive Performance of Two Grower Quail Strains

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Abstract

Two strains of Japanese quail (Coturnix coturnix japonica), including 250 birds of desert and 250 birds of white color, all one day old and unsexed, were divided into five treatment groups with 50 replicates in each group. These treatments included five levels of metabolism energy (ME) levels, including 2700, 2800, 2900, 3000, and 3100 Kcal/Kg diet. The study included one stage from day 1 to day 42 of birds' age. The results confirmed a statistically significant difference ($P \leq 0.05$) caused by ME levels in the body weight, weight gain, feed conversion ratio (feed [g]: weight gain [g]), water consumption, water conversion ratio (ml: weight gain[g]), protein conversion ratio (protein [g]: weight gain [g]), energy conversion ratio (Kcal: weight gain [g]), carcass weight, in addition to albumin and triglyceride. Therefore, the results showed significant effects ($P \leq 0.05$) of ME levels and the interaction on feed consumption, protein consumption, edible giblet percentage, tenderness, and juiciness. Significant differences ($P \leq 0.05$) were also caused by ME levels in the total cholesterol. In addition, significant differences ($P \leq 0.05$) have been found in the interaction on mortality percentage. Net return (Iraqi Dinar/live weight [Kg]) for desert quail was better than that for the white quail (2900 Kcal/Kg diet), and the interaction effect was stronger on the desert strain with 2900 Kcal than the white strain.

Keywords: Metabolism Energy, Productive Performance, Quail

1. Introduction

In poultry nutrition, energy is divided into gross energy, digestible energy, metabolism energy (ME), and net energy. The ME for feedstuff used in poultry nutrition is the basic energy (1). The main factor that affects feed intake is ME in the ration. The grower quail stops the intake of the ration when it gets the requirements of ME so that the ration is balanced in all elements and compounds. Some researchers studied the best ME levels in the Japanese quail rations. They found that there were significant differences in body weight when they used different ME levels on the grower of Japanese quail rations, while Hasanien (2), Muniz, Barreto (3), as well as Muniz, Barreto (4), did not find any significant effects on body weight when they used different ME levels on Japanese quail rations. On the other hand, some other researchers studied the effect on Japanese quail strains, such as Bughio, Jatoi (5), as well as Al-Kafajy, Al-Shuhaib (6), who found significant differences in body weight when they used different strains of Japanese quail, while Ahmad, Mehmood (7).

2. Materials and Methods

Two strains of Japanese quail (Coturnix coturnix japonica), including 250 birds of desert and 250 birds of white color, all one day old and unsexed, were divided into five treatment groups, each containing 50 replicates. This treatment included five levels of ME levels, including 2700, 2800, 2900, 3000, and 3100

Kcal/Kg diet. The study included one stage (the growth stage) from day 1 to day 42 of birds' age. It was completed at the Department of Animal Production, University of Mosul, Mosul, Iraq. Iron cages sized 50×50×50 cm were used to house the birds. The feed contained approximately 24% crude protein. The nutrient requirements of the grower quail and the chemical composition of rations used in this study were formulated according to the National Research Council (8) tabulated in table 1.

Table 1. Chemical composition of experimental diets in this research (1-42 days)

Ingredients	Energy Level (Kcal./Kg diet)				
	T1 2700	**T2 2800**	**T3 2900**	**T4 3000**	**T5 3100**
Soybean meal	28.40	29.10	30.20	31.40	32.50
Yellow corn	10	16.20	24	34	42
Wheat	46.40	40	30.70	19.30	10
Wheat bran	5.50	3.90	3	2	1
Sunflower oil	0.50	1.60	2.90	4.10	5.30
Protein concentrate	8	8	8	8	8
Limestone	0.50	0.50	0.50	0.50	0.50
Di Calcium phosphate	0.20	0.20	0.20	0.20	0.20
Vit. Min. premix	0.25	0.25	0.25	0.25	0.25
Common salt	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100
Chemical Analysis					
ME(kcal/kg diet)	2700	2801	2902	3000	3100
Crude protein %	24.06	24.01	24.02	24.01	24.04
ME / P ratio	112.2	116.7	120.8	124.9	129
Ether extract %	2.76	3.89	5.23	6.50	7.76
crude fiber %	4.45	4.23	4.09	3.95	3.81
Calcium %	0.99	0.99	1	1	1
A. phosphorus %	0.47	0.46	0.46	0.45	0.44
Lysine %	1.32	1.32	1.35	1.36	1.38
Methionine %	0.56	0.56	0.57	0.56	0.56
Linoleic acid %	1.14	1.86	2.69	3.52	4.31

The water intake and the feed conversion ratio were calculated as stated in Kesab (9), with the following equations: 1) water intake (ml/bird)=the added water (ml/bird)−the remaining water (ml/bird) and 2) water conversion ratio (ml/gm weight gain)=water intake (ml/bird)/weight gain (gm/bird). At the end of the research (day 42), the birds were slaughtered, and the characteristics of their carcasses were recorded as reported previously (9). The sensory evaluation (tenderness, juiciness, flavor, and acceptability) of the Japanese quail breast meat was carried out according to Kesab (9). The economic calculations of the search parameters were calculated on day 42 to produce 1 Kg of live weight, depending on Kesab (9). The Statistical Analysis Software (SAS, 2002) was used to statistically analyze the study data for the factorial and two-factor experiment. The study followed a complete random design. The difference between the means was tested by Duncan (10) multi-range test. Finally, the standard error of each transaction was measured.

3. Results and Discussion

The results in table 2 showed significant differences ($P \leq 0.05$) caused by the strain, ME levels, and the interaction factor on body weight and weight gain. The strain factor significantly affected the body weight and weight gain of the desert quail. These results agree with the findings of Al-Fleeh (11). The most significant effects on body weight and weight gain were caused by the T3 (2900 Kcal/Kg diet) ME level. The interaction factor also caused significant differences ($P \leq 0.05$) in body weight and weight gain in T3 ME level (the

interaction between desert quail and 2900 Kcal ME). However, the three factors did not significantly affect mortality percentages.

Table 3 showed significant differences ($P \leq 0.05$) in feed conversion ratio, water intake, and water conversion ratio caused by the strain factor; however, the difference caused in feed intake was not significant. Significant differences ($P \leq 0.05$) were caused by the strain effect on the desert quail in feed conversion ratio and water intake. As for the effect of ME levels, the T1 (2700 Kcal) ME level had the strongest effect on feed intake and water intake, followed by the T2 (2880 Kcal) ME level. On the other hand, T3 (2900 Kcal), followed by T4 (3000 Kcal) ME levels had the strongest effect on the feed conversion ratio. In the interaction, significant differences ($P \leq 0.05$) in feed intake were caused by T6 and T7 ME levels, while significant differences in water intake were caused by T7 ME level. The T3 ME level recorded the best feed conversion ratio.

Table 4 shows significant effects ($P \leq 0.05$) of the three factors on protein conversion ratio and ME conversion ratio. The strain effect was the most significant on protein conversion ratio and ME conversion ratio in the desert quail. Regarding the ME levels, the strongest effect on protein intake was in T1 and T2, and on protein conversion ratio and ME conversion ratio, it was in T3. The interaction results show the best protein and ME conversion ratios for T3 ME level (desert quail with 2900 Kcal).

Table 2. Effect of treatments and interaction, effect on body weight, weight gain, growth rate, and mortality percentage in the research (1-42 days)

Treatments		Body weight (g/bird)	Weight gain (g/bird)	Growth rate (%)	Mortality (%)
Strain effect					
Desert quail		193.03 ±3.35 A	185.58 ±3.36 A	185.14 ±1.65	0.40 ±0.40
White quail		185.03 ±1.87 B	177.65 ±1.87 B	184.65 ±2.13	0.80 ±0.54
Metabolism energy levels effect (Kcal./Kg) :					
2700		186.95 ±1.63 BC	179.56 ±1.63 BC	184.79 ±1.75	0 ±0
2800		185.73 ±2.97 BC	178.31 ±2.98 BC	184.62 ±1.33	0 ±0
2900		198.60 ±6.14 A	191.20 ±6.12 A	185.63 ±2.08	0 ±0
3000		193.33 ±3.70 AB	185.92 ±3.70 AB	185.23 ±0.96	1 ±1
3100		180.53 ±4.12 C	173.11 ±4.18 C	184.20 ±1.82	2 ±1.26
Interaction: Strain × Metabolism energy levels (Kcal./Kg) :					
Desert quail	2700	186.48 ±3.02 BC	179.04 ±3 BC	184.65 ±1.27	0 ±0
	2800	188.71 ±3.51 BC	181.24 ±3.55 BC	184.77 ±0.90	0 ±0
	2900	209.67 ±7.01 A	202.22 ±7.03 A	186.27 ±3.12	0 ±0
	3000	197.55 ±3.27 AB	190.13 ±3.31 AB	185.51 ±1.88	2 ±2
	3100	182.72 ±8.46 BC	175.27 ±8.48 BC	184.32 ±1.51	0 ±0
White quail	2700	187.42 ±1.99 BC	180.07 ±2.03 BC	184.90 ±2.35	0 ±0
	2800	182.75 ±4.79 BC	175.37 ±4.81 BC	184.46 ±2.65	0 ±0
	2900	187.52 ±4.10 BC	180.17 ±4.06 BC	184.90 ±2.02	0 ±0
	3000	189.11 ±5.59 BC	181.71 ±5.60 BC	184.93 ±1.12	0 ±0
	3100	178.33 ±2.90 C	170.94 ±2.90 C	184.08 ±0.87	4 ±4

A,c: Mean in the same column with no common superscripts differ significantly ($P<0.05$)

Table 3. Effect of treatments energy levels and interaction on feed intake, feed conversion ratio, and water intake in the research (1-42 days)

Treatments		Feed intake (g/bird)	Feed conversion ratio (gm: gm gain)	Water intake (ml/bird)	Water conversion ratio (ml: gm gain)
Strain effect					
Desert quail		688.49 ±10.37	3.71 ±0.11 B	1749.20 ±33.98 B	9.43 ±0.18 B
White quail		714.84 ±13.92	4.02 ±0.09 A	1878.26 ±32.57 A	10.57 ±0.25 A
Metabolism energy levels effect (Kcal./Kg) :					
2700		742.56 ±16.29 A	4.14 ±0.12 A	1933.84 ±59.25 A	10.77 ±0.34 A
2800		740.36 ±13.42 A	4.15 ±0.11 A	1945.71 ±45.05 A	10.91 ±0.81 A
2900		669.42 ±19.17 B	3.50 ±0.17 B	1680.80 ±31.14 B	8.79 ±0.30 B
3000		685.33 ±16 B	3.69 ±0.13 B	1770.62 ±21.91 B	9.52 ±0.25 B
3100		670.67 ±15.23 B	3.87 ±0.07 AB	1737.69 ±35.58 B	9.99 ±0.29 AB
Interaction: Strain × Metabolism energy levels (Kcal./Kg) :					
Desert quail	2700	722.88 ±13.68 AB	4.04 ±0.22 AB	1870.48 ±115.02 BC	10.45 ±0.41 AB
	2800	718.37 ±4.90 AB	3.96 ±0.06 AB	1859.13 ±32.38 C	10.26 ±0.35 AB
	2900	666.27 ±25.89 B	3.29 ±0.23 C	1620.65 ±17.22 D	8.01 ±0.16 C
	3000	680.08 ±10.52 AB	3.58 ±0.08 BC	1733.33 ±16.93 CD	9.12 ±0.23 BC
	3100	654.84 ±7.87 B	3.74 ±0.24 ABC	1662.43 ±3.58 D	9.48 ±0.33 ABC
White quail	2700	762.23 ±21.10 A	4.23 ±0.11 A	1997.20 ±19.36 AB	11.09 ±0.18 A
	2800	762.34 ±20.91 A	4.35 ±0.23 A	2032.29 ±40.06 A	11.59 ±0.18 A
	2900	672.56 ±20.19 B	3.73 ±0.22 ABC	1740.94 ±30.58 CD	9.66 ±0.18 ABC
	3000	690.58 ±29.97 AB	3.80 ±0.27 ABC	1807.90 ±26.90 C	9.95 ±0.18 ABC
	3100	686.49 ±29.12 AB	4.02 ±0.23 AB	1812.95 ±25.58 C	10.61 ±0.18 AB

a,c: Mean in the same column with no common superscripts differ significantly (P<0.05)

Table 4. Effect of treatments and interaction on Protein intake, Protein conversion ratio, ME intake, and ME conversion ratio in the research (1-42 days)

Treatments		Protein intake (g/bird)	Protein conversion ratio (g: g gain)	ME intake (Kcal./bird)	ME conversion ratio (Kcal. : g gain)
Strain effect					
Desert quail		165.43 ±2.81	0.89 ±0.02 B	1993.54 ±26.17	10.74 ±0.29 B
White quail		171.76 ±3.43	0.97 ±0.02 A	2068.99 ±32.45	11.65 ±0.27 A
Metabolism energy levels effect (Kcal./Kg) :					
2700		178.66 ±4.24 A	1 ±0.02 A	2004.90 ±47.61	11.17 ±0.33 AB
2800		177.76 ±3.22 A	1 ±0.02 A	2073.73 ±37.13	11.63 ±0.31 A
2900		160.80 ±4.60 B	0.84 ±0.04 B	1942.65 ±55.63	10.16 ±0.51 B
3000		164.55 ±3.84 B	0.89 ±0.03 AB	2055.99 ±41.25	11.06 ±0.44 AB
3100		161.23 ±2.73 B	0.93 ±0.03 AB	2079.06 ±47.24	12.01 ±0.48 A
Interaction: Strain × Metabolism energy levels (Kcal./Kg) :					
Desert quail	2700	173.92 ±6.46 AB	0.97 ±0.05 AB	1951.78 ±72.54	10.90 ±0.59 AB
	2800	172.48 ±1.17 AB	0.95 ±0.01 ABC	2012.15 ±13.75	11.10 ±0.16 AB
	2900	160.04 ±8.84 B	0.79 ±0.06 C	1933.52 ±106.83	9.56 ±0.82 B
	3000	163.29 ±2.93 AB	0.86 ±0.02 BC	2040.24 ±36.63	10.73 ±0.23 AB
	3100	157.42 ±1.89 B	0.90 ±0.05 ABC	2030 ±24.41	11.58 ±0.68 AB
White quail	2700	183.39 ±5.07 A	1.02 ± 0.02 AB	2058.02 ±56.97	11.43 ±0.32 AB
	2800	183.04 ±5.02 A	1.04 ±0.05 A	2135.31 ±58.56	12.18 ±0.65 A
	2900	161.55 ±4.85 B	0.90 ±0.03 ABC	1951.77 ±58.60	10.83 ±0.42 AB
	3000	165.81 ±7.19 AB	0.91 ±0.06 ABC	2071.74 ±89.91	11.40 ±0.82 AB
	3100	165.03 ±5.58 AB	0.97 ±0.05 AB	2128.12 ±46.26	12.45 ±0.72 A

a,c: Mean in the same column with no common superscripts differ significantly (P<0.05)

Table 5 shows the significant effects ($P \leq 0.05$) of the three factors on carcass weight. The strain factor had the strongest effect on the desert quail in the T3 ME level, and the interaction between strain and ME levels was in the T3 group. The T5 ME level and the interaction factors had a significant effect ($P \leq 0.05$) on the edible giblet percentage. The results did not record any significant effects on dressing percentage caused by the three factors (Tables 6 and 7).

Table 8 shows the economic efficiency of producing 1 Kg live weight of grower quail in this study. The results showed that the desert quail has the best net revenue, compared to the white quail, and that T3 (2900 Kcal) had the best net revenue, compared to other ME levels, as the results of interaction for T3 (desert quail and 2900 Kcal) has best net revenue.

Table 5. Effect of treatments and interaction on carcass weight, dressing percentage, and edible giblets percentage in the research (42 days)

Treatments		Carcass weight (g/bird)	Dressing (%)	Breast (%)	Edible giblets (%)
Strain effect					
Desert quail		130.65 ±2.63 A	71.10 ±0.63	31.82 ±1.39	5.77 ±0.20
White quail		118.57 ±2.03 B	68.89 ±0.80	31.51 ±1.17	5.50 ±0.15
Metabolism energy levels effect (Kcal./Kg) :					
2700		121.92 ±3.44 B	69.17 ±1.45	31.59 ±1.35	5.16 ±0.35 B
2800		122.42 ±3.62 B	69.65 ±0.78	31.63 ±2.47	5.61±0.16 AB
2900		134.48 ±5.24 A	71.46 ±1.27	32.04 ±1.06	5.57 ±0.13 AB
3000		125.65 ±3.88 AB	69.93 ±1.48	31.94 ±0.97	5.74 ±0.35 AB
3100		118.59 ±3.43 B	69.77 ±0.95	31.14 ±0.77	6.12 ±0.30 A
Interaction : Strain × Metabolism energy levels(Kcal./Kg) :					
Desert quail	2700	127.54 ±5.83 B	70.24 ±1.20	31.95 ±2.23	5.25 ± 0.57 AB
	2800	128.27 ±10.40 B	70.85 ±1.02	31.88 ±1.51	5.52 ±0.25 AB
	2900	144.87 ±9.29 A	72.85 ±1.55	32.19 ±1.06	5.70 ±0.25 AB
	3000	131.89 ±7.64 AB	71.61 ±0.25	32.03 ±0.97	5.88 ±0.44 AB
	3100	120.68 ±8.36 B	69.93 ±1.73	31.07 ±1.25	6.49 ±0.25 A
White quail	2700	116.30 ±10.43 B	68.10 ±2.87	31.22 ±0.38	5.06 ±0.46 B
	2800	116.57 ±10.99 B	68.44 ±3.64	31.37 ±1.47	5.69 ±0.25 AB
	2900	124.08 ±3.83 B	70.07 ±0.53	31.90 ±0.67	5.43 ±0.22 AB
	3000	119.39 ±8.13 B	68.25 ±1.70	31.85 ±1.11	5.59 ±0.54 AB
	3100	116.50 ±4.17 B	69.60 ±1.76	31.20 ±0.85	5.75 ±0.30 AB

a,c: Mean in the same column with no common superscripts differ significantly ($P<0.05$)

Table 6. Effect of treatments and interaction on some sensory meat tastes in the research (42 days)

Treatments		Tenderness	Juiciness	Flavor	Acceptability
Strain effect					
Desert quail		2.76 ±0.05	2.66 ±0.06	2.73 ±0.07	2.71 ±0.09
White quail		2.83 ±0.08	2.76 ±0.08	2.80 ±0.08	2.80 ±0.06
Metabolism energy levels effect (Kcal./Kg) :					
2700		2.91 ±0.08	2.81 ±0.10	2.88 ±0.10	2.94 ±0.11
2800		2.94 ±0.09	2.91 ±0.06	2.82 ±0.06	2.88 ±0.09
2900		2.85 ±0.07	2.72 ±0.14	2.78 ±0.06	2.75 ±0.11
3000		2.72 ±0.11	2.60 ±0.06	2.72 ±0.07	2.63 ±0.07
3100		2.66 ±0.06	2.54 ±0.04	2.63 ±0.06	2.60 ±0.08
Interaction: Strain × Metabolism energy levels (Kcal./Kg) :					
Desert quail	2700	2.88 ±0.09	2.81 ±0.07	2.81 ±0.09	2.94 ±0.10
	2800	2.94 ±0.10	2.81 ±0.12	2.69 ±0.12	2.81 ±0.09
	2900	2.81 ±0.08	2.69 ±0.09	2.75 ±0.07	2.69 ±0.07
	3000	2.69 ±0.09	2.56 ±0.07	2.75 ±0.07	2.56 ±0.06
	3100	2.50 ±0.07	2.44 ±0.05	2.63 ±0.06	2.56 ±0.05
White quail	2700	2.94 ±0.12	2.81 ±0.13	2.94 ±0.10	2.94 ±0.10
	2800	2.94 ±0.12	3.00 ±0.11	2.94 ±0.10	2.94 ±0.10
	2900	2.88 ±0.13	2.75 ±0.10	2.81 ±0.09	2.81 ±0.07
	3000	2.75 ±0.11	2.63 ±0.09	2.69 ±0.08	2.69 ±0.09
	3100	2.63 ±0.10	2.63 ±0.09	2.63 ±0.05	2.63 ±0.07

Table 7. Effect of treatments and interaction on some biochemical traits of blood in the research (1-42 days)

Treatments		Total Protein (gm/100ml)	Albumin (gm/100ml)	Globulin (gm/100ml)	Triglycerides (mg/100ml)	Total cholesterol (mg/100ml)
Strain effect						
Desert quail		4.38 ±0.08	2.52 ±0.05 A	1.86 ±0.02	625.20 ±7.05 A	182.23±3.49
White quail		4.26 ±0.09	2.30 ±0.04 B	1.96 ±0.02	608.28 ±5.95 B	175.01±2.67
Metabolism energy levels effect(Kcal./Kg) :						
2700		4.26 ±0.04	2.33 ±0.03 BC	1.93 ±0.03	587.50 ±5.15 C	171.32±3.83 B
2800		4.24 ±0.08	2.27 ±0.06 C	1.97 ±0.03	595.34± 5.18 C	172.66 ±4.22 AB
2900		4.29 ±0.15	2.37 ±0.07 BC	1.92 ±0.05	614.17± 5.90 B	177.45± 4.15 AB
3000		4.35 ±0.06	2.46 ±0.07 B	1.89 ±0.04	627.91± 5.46 B	184.07± 5.77 AB
3100		4.46 ±0.23	2.62 ±0.07 A	1.84±0.03	658.77± 7.03 A	187.60±5.33 A
Interaction : Strain × Metabolism energy levels(Kcal./Kg) :						
Desert quail	2700	4.32 ±0.07	2.38 ±0.04 BCD	1.94 ±0.05	594.19 ±6.94 A	173.22 ±6.78
	2800	4.17 ±0.14	2.43 ±0.04 BCD	1.74 ±0.05	598.92 ±9.17 DE	175.62 ±4.84
	2900	4.45 ±0.06	2.49 ±0.08 BC	1.96 ±0.06	625.42 ±5.19 BC	181.15 ±7.34
	3000	4.41 ±0.10	2.58 ±0.08 AB	1.83 ±0.06	635.65 ±6.51 BC	189.81 ±7.94
	3100	4.55 ±0.09	2.73 ±0.11 A	1.82 ±0.06	671.80 ±7.66 A	191.37 ±4.54
White quail	2700	4.20 ±0.05	2.28 ±0.04 DE	1.92 ±0.05	580.81 ±6.79 E	169.42 ±4.47
	2800	4.30 ±0.06	2.11 ±0.04 E	2.19 ±0.04	591.76 ±5.69 E	169.70 ±7.36
	2900	4.12 ±0.15	2.25 ±0.06 DE	1.87 ±0.08	602.92 ±9.31 DE	173.75 ±4.25
	3000	4.29 ±0.05	2.34 ±0.07 CD	1.95 ±0.07	620.17 ±7.56 CD	178.33 ±8.46
	3100	4.37 ±0.36	2.50 ±0.06 BC	1.87 ±0.03	645.74 ± 7.68 B	183.83 ±3.46

a,c: Mean in the same column with no common superscripts differ significantly (P<0.05)

Table 8. Effect of treatments and interaction on economic efficiency in the research (1-42 days)

Treatments		Feed intake cost•	Other cost•	Total cost•	Revenue•	Net Revenue•	%Net revenue: Total costs
Strain effect :							
Desert quail		2437	2628	5065	9000	3935	77.69
White quail		2472	2652	5124	9000	3876	75.64
Metabolism energy levels effect (Kcal./Kg) :							
2700		2649	2766	5415	9000	3585	66.20
2800		2522	2666	5188	9000	3812	73.48
2900		2235	2501	4736	9000	4264	90.03
3000		2396	2588	4984	9000	4016	80.58
3100		2472	2682	5154	9000	3846	74.62
Interaction: Strain × Metabolism energy levels (Kcal./Kg) :							
Desert quail	2700	2833	2891	5724	9000	3276	57.23
	2800	2410	2623	5033	9000	3967	78.82
	2900	2081	2361	4442	9000	4558	102.61
	3000	2225	2557	4782	9000	4218	88.21
	3100	2638	2709	5347	9000	3653	68.32
White quail	2700	2465	2641	5106	9000	3894	76.26
	2800	2634	2709	5343	9000	3657	68.44
	2900	2389	2640	5029	9000	3971	78.96
	3000	2567	2618	5185	9000	3815	73.58
	3100	2306	2654	4960	9000	4040	81.45

Iraqi Dinar/Kg live weight

The desert quail strain recorded the best net revenue and better performance traits, compared to the white quail. In addition, the T3 ME level recorded the best net revenue and better performance traits than other ME levels, and the interaction T3 has the best net revenue and best performance traits in this study.

Authors' Contribution

Study concept and design: Y. G. K.
Acquisition of data: R. N. W.
Analysis and interpretation of data: M. M. K.
Drafting of the manuscript: R. N. W.
Critical revision of the manuscript for important intellectual content: R. N. W.
Statistical analysis: Y. G. K.
Administrative, technical, and material support: M. M. K.

Ethics

All the ethical procedures were approved by the ethics committee of the University of Mosul, Mosul, Iraq.

Conflict of Interest

The authors declare that they have no conflict of interest.

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