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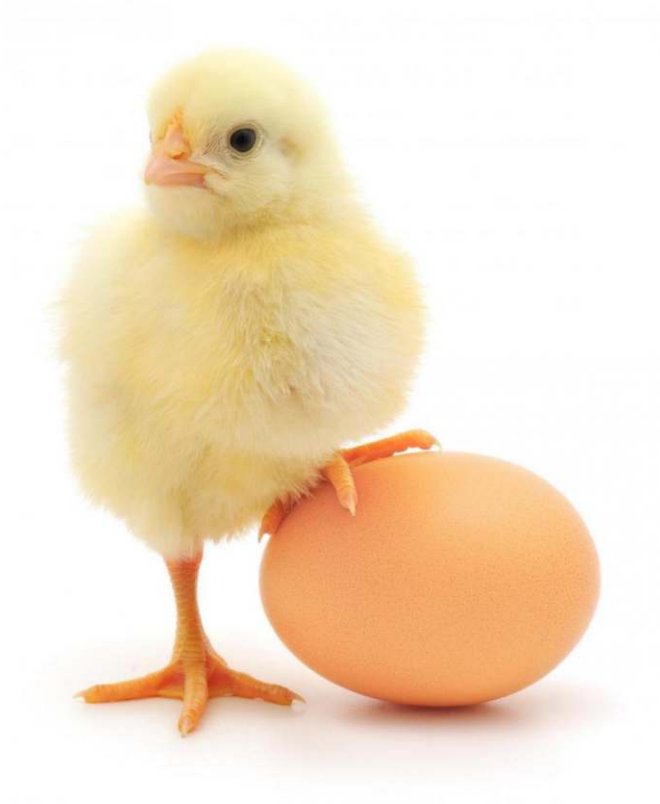

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The Effect of Crude Protein Level in Diets on Laying Performance, Nutrient Digestibility of Yellow Quails

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Abstract: Four diets with different crude protein levels 17.75%, 19.95%, 21.85%, 24.08% were used to feed 192 seven-week-old yellow quails in this experiment. During 50-day-old to 95-day-old, laying rate, feed intake and egg weight were recorded to analysis the effect of different levels of dietary protein on the performance of yellow quails. All fences were collected and analysis the effect of different levels of dietary protein on feed digestibility and Crude Protein utilizablity of yellow quails. The results showed that there was no significant difference of the average egg weight in four diets. The laying rate of diet 2 is significant high than others ($p<0.05$). The difference of the average feed intake was significant ($p<0.05$) and feed intake of the diet 1 was the highest. Feed intake/egg was significant ($p<0.05$). There was no significant difference of crude fiber digestibility ($p>0.05$) but significant of EE and total organism and the utilizability of crude protein was significant difference ($p<0.05$) in four diets. Result showed that dietary crude protein had significant effect not only on laying performance but also on nutrient digestibility and 20% dietary crude protein was optimum for yellow-feather quails.

Key words: Yellow quail, laying performance, diet protein, nutrient digestibility

INTRODUCTION

Corn and soybean meal prices are increasing greatly recent years. It is therefore important to formulate diets to efficiently meet the needs of animals. Most importantly, diets must be formulated to contain the correct amount of Crude Protein (CP) for optimum performance. Normally, the producing performance is increasing with the dietary CP increase. Otherwise, it will make the producing performance decrease and N wasted to intake excessive amounts of CP (Okumura and Tasaki, 1969). It is not only a losing in benefit but also a polluting for environment. Yellow quails were wide used in quail breeding in China. But it is not clear the CP need for Chinese yellow quail. The objective of this research was to determine the effect of different dietary CP on laying performance, nutrient digestibility and N-retention of yellow quails and to probe into which CP level is optimal for Chinese yellow quails.

MATERIALS AND METHODS

Animals and dietary treatments: In this study, one hundred and ninety two eleven-week-old Chinese yellow quails were randomly assigned to four groups by similar body weight, each of which was subdivided into four replicates of 12 quails each. The quails were housed in wire cages, on a schedule with 16 h light and 8 h darkness. The quails received diets with different crude protein levels 17.75%, 19.95%, 21.85%, 24.08% as four diets. The composition and the calculated nutrient content of the experimental diets are presented in Table 1. Feed and water were available freely. The experimental diets were designed as:

Sample collection and analyses: Live weight of the quails was recorded at the beginning and at the end of the experiment. Feed consumption was recorded on a subgroup basis at weekly intervals. Daily egg production was recorded in all groups. Eggs were collected at weekly intervals for egg weight measurements. Total collection of feces was made during the experience. Wet feces were weighed twice daily and 10% of them were transferred to an accumulative sample container and mixed with 20 ml of H_2SO_4 (10% v/v) for each animal and dried in an air-forced oven at 60°C for 48 h. All samples were dried in an oven of 105°C for 6 h for Dry Matter (DM) determination. The CP was determined by the Kjeldahl method, crude fiber and crude fat according to the AOAC (1984).

Statistical analysis: Data were analyzed by SPSS 10.00 version for Windows. The differences between groups were determined by Variance Analysis (ANOVA). When the differences were significant, Duncan's multiple range test was performed. Data were expressed as means±SEM.

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Table 1: Composition (air dry basis, %) and nutrient levels (DM basis, %) of trial diets

Items	Diets 1 (CP 17.75%)	Diets 2 (CP 19.95%)	Diets 3 (CP 21.85%)	Diets 4 (CP 24.08%)
Ingredients				
Corn	64.00	60.00	56.00	51.00
Soybean meal	27.00	30.00	30.00	31.00
Corn gluten meal	1.00	4.00	8.00	11.00
Wheat bran	2.00	0.00	0.00	0.00
Fish meal	1.00	1.00	1.00	2.00
Soybean oil	1.00	1.00	1.00	1.00
Premix 2	4.00	4.00	4.00	4.00
Total	100.00	100.00	100.00	100.00
Nutrient levels				
CP	17.75	19.95	21.85	24.08
ME/(MJ/kg)	12.08	12.15	12.18	12.16
OM	93.70	92.66	93.92	90.56
EE	3.71	3.69	3.77	3.85
CF	5.52	5.80	5.74	5.43
Ash	6.53	6.73	6.77	6.92

Nutrient levels are calculated value based on the measured values of ingredients. Per kilogram mixed additives provides: VA 120000 IU; VD3 40000 IU; VE 500 mg; VB2 70 mg; VB6 60 mg; VB5 400 mg; Folic acid; 20 mg; Pantothenic acid 300 mg; Fe 1800 mg; Cu 200 mg; Mn 1400 mg; Zn 1200 mg; Se 5 mg; Ca 20%; P 4%; NaCl 8%; Met 2.5%; Lys 1.5%

Table 2: Egg production of quails in different diets CP levels

Item	Diets 1 (CP 17.75%)	Diets 2 (CP 19.95%)	Diets 3 (CP 21.85%)	Diets 4 (CP 24.08%)
DM intake (g/d)	23.81±0.59^{b}	22.65±0.25^{ab}	21.95±0.56^{a}	21.28±0.15^{a}
Egg production (%)	0.48±0.04^{a}	0.60±0.04^{b}	0.46±0.08^{a}	0.46±0.02^{a}
Average egg weight (g)	10.53±0.48	10.48±0.16	10.49±0.16	10.77±0.08
Feed/egg (%)	4.96±0.37^{b}	3.72±0.28^{a}	4.85±0.67^{b}	4.53±0.24^{b}

^{a,b}Mean values within a row with no common superscript differ significantly ($p<0.05$)

Table 3: Nutrient digestion of quails in different diets CP levels

Item	Diets 1 (CP 17.75%)	Diets 2 (CP 19.95%)	Diets 3 (CP 21.85%)	Diets 4 (CP 24.08%)
DM intake/(g/d)	23.81±0.59^{b}	22.65±0.25^{ab}	21.95±0.56^{a}	21.28±0.15^{a}
CP utilizablity/%	23.86±4.28^{b}	27.74±2.63^{b}	10.87±1.00^{a}	12.25±3.03^{a}
OM digestibility/%	64.87±1.20^{ab}	67.09±1.46^{b}	61.99±0.50^{a}	62.49±0.37^{a}
EE digestibility/%	72.39±3.17^{a}	78.04±4.20^{ab}	82.58±1.97^{b}	75.54±1.50^{ab}
CF digestibility/%	8.82±2.96	12.18±1.15	8.80±0.85	8.43±1.89

^{a,b}Mean values within a row with no common superscript differ significantly ($p<0.05$)

RESULTS

Laying performance of quail in different dietary crude protein: The results showed that there was no significant difference of the average egg weight in four diets. The laying rate of diet 2 is significant high than others ($p<0.05$). The difference of the average feed intake between diet 1 and diet 2, 3 was significant ($p<0.05$), diet 1 and diet 4 was significantly different ($p<0.01$) and feed intake of the diet 1 was the highest; Feed intake/egg of diet 2 was very significant low than diet 1 and 3.

Nutrient digestion of different dietary by quail: The results showed that there was no significant difference of crude fiber digestibility ($p>0.05$) but significant of EE and total organism and the utilizability of crude protein of diet 1 and diet 2 was significant high than that of diet 3 and diet 4 ($p<0.05$).

DISCUSSION

The effect of dietary crude protein on laying performance of quail: Normally, the average egg weight was increasing with increased of dietary protein level (Chen *et al*., 1999; Liu *et al*., 2004), but the results in this experiment showed that the average egg weight of four diets was no significant different. Feed/egg is an indicator of feed utilizable efficiency, reflecting the digestion and absorption of feed and nutritional balance. Feed conversion ratio (Feed/egg) of diet 2 in the experiment was significantly lower than other diets. Feed conversion ratio was decreasing first and then increasing with diet protein increased, indicating energy and nitrogen in diets was balanced first then the balance was broken. Laying performance was effected by many factors, especially nutritional balance of the diets. Quail egg weight and egg production will be increased when the diet protein was increased. But egg weight and egg production will be decreased when the diet protein was too high and exceed the needed of the animal, because exceeded protein in diet was not only caused the waste of protein, but also increased the burden on the metabolism of animals and reduce animal performance (Okumura and Tasaki, 1969).

The effect of dietary crude protein on feed digestibility: Observations made during this study indicate that the

digestibility of all nutrients, for example OM, EE and CF, was first increased and then decreased with dietary crude protein level increased. It was in accordance with others research results (Ding, 2003; Ozek and Bahtiyarca, 2004). The reason was energy and nitrogen in diets was balanced first then the balance was broken. Also, the type of ingredients present in the rations is an important factor that must be taken into account when comparing nutrient digestibility of different diets, since its composition may affect crude protein quality due to differences in amino acids profile and the content of anti-nutrimental factors that the raw materials may have.

In view of these results, the conclusion is that dietary crude protein had significant effect not only on laying performance but also on nutrient digestibility and 20% dietary crude protein was optimum for yellow-feather quails.

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