Comparison of dietary vitamin b_6 and niacin on fattenning performance of quails

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The present study was conducted to determine whether dietary vitamin B_6 and niacin could increase weight gain and reduce fat content of japanese quail *(Coturnix coturnix japonica)* two experiments were carried out during the experimental study.

The first experiment was performed using 60 japanese quails age of 5 weeks. The chicks were divided into 4 groups of equal number and fed experimental diets supplemented with 0, 2.53, 2.76 or 3.22 mg/kg vitamin B_6. At the end of the experiment, feed consumption, feed efficiency, carcass weight, carcass yield and abdominal fat weight were not significantly improved by B_6 supplementation (P>0.05).

In the second experiment, sixty 1-day-old japanese quails were divided into 4 groups, comprising 15 birds each and fed experimental diets supplemented with 0, 44, 48 or 56 mg/kg niacin. Dietary niacin levels did not affect body weight, body weight gain, feed consumption, feed efficiency, abdominal fat deposition and carcass weight (P>0.05).

The result of this study demonstrated that chicks receiving vitamin B_6 and niacin supplementation did not affect performance, abdominal fat deposition and carcass weight.

Key Words: Japanese Quail; Niacin; Vitamin B_6; Abdominal Fat

Introduction

Quails and poultry have similar nutrition physiology. Due to their metabolism rate, feed intake and energy requirements are high (Zucker and Groop, 1967). Feed intake is very low for quails. An adult quail consumes approx. 15-20 g. feed. Fattening quails could weight 150-160 g. between 5-6 weeks (Koçak and Özkan, 2000).

Vitamins are organic matters. The cofactor forms of pyridoxine are pyridoxal-5'-phosphate and pyridoxamine -5'-phosphate. Pyridoxal phosphate is involved as a cofactor particularly in the metabolic transformation of amino acids, including decarboxylation, transamination and racemisation. Vitamin B6 is a cofactor in the conversion of tryptophan to 5-hydroxytryptamine and of methionine to cysteine. Pyridoxine can modify the action of steroid hormones in vivo by interacting with steroid receptor complexes. Pyridoxine is essential for the manufacture of prostaglandins and for the formation of red blood cells. Pyridoxine is involved in cellular replication and antibody production. An adequate supply of pyridoxine is necessary for the function of the nervous system. The vitamin is involved in the biosynthesis of several neurotransmitters, including serotonin, gamma amino-butyric acid (GABA), dopamine and noradrenaline and so has a role in the regulation of mental processes and mood. It is also involved in sodium-potassium balance, histamine metabolism, the conversion of tryptophan to niacin, absorption of vitamin B12 and the production of hydrochloric acid in the gastrointestinal tract. (1)

Niacin is the functional factor of two important coenzymes, NAD and NADP, which activate over 200 dehydrogenases essential to electron transport and other cellular respiratory reactions. Despite

their structural similarity, NAD and NADP have quite different metabolic roles. NAD functions as an electron carrier for intracellular respiration as well as a co-factor for enzymes involved in the oxidation of fats and carbohydrates, such as glyceraldehyde 3-phosphate, lactate, pyruvate and ketoglutarate dehydrogenases. NADP functions as a hydrogen donor in reductive biosynthesis, such as in fatty acid and steroid synthesis and like NAD as a cofactor for enzymes, such as in the oxidation of glucose-6- phosphate to ribose 5-phosphate in the pentose phosphate pathway. The most common symptoms of niacin deficiency are changes in the skin, mucosa of the mouth, stomach and intestinal tract and the nervous system. Other signs and symptoms include dizziness, vomiting, constipation or diarrhoea, and inflammation of the tongue and gastric mucosa. The neurological symptoms can include fatigue, sleeplessness, depression, memory loss and visual impairment (2). Also, deficiency of niacin could cause harmful disease that is called pellegra especially when short of B_6 factors (anorin, prydoxin, asid pantotenic). For this reason, it is called PP vitamine (Ozturkcan, 1990).

Park and Marguarut (1982) states that niacin deficiency led to a marked depression in growth, closure of eyes, reduced activity and a marked atrophy of pectoral muscle.

Required amount niacin and pyridoxine for quails are 20 mg/kg, 2 mg/kg, respectively (W.Smith, 2000). Another study states that required amount niacin and pyridoxine for quails are 60 mg/kg, 6 mg/kg, respectively (Shrivastav and Panda, 1999). Ramchandran and Arscott (1974) states that required amount niacin for quails is 40 mg/kg.

A study done on male broiler stallions showed that adding triptofan to quails' ration decreased animals' irritating manners (Margaret et al, 1996).

The source of energy for animals organism comes from fat that stored under the skin, surrounding of visceral organs, and abdominal (Summer and Reason, 1979).

The purpose of this study is to demonstrate whether chicks receiving vitamin B_6 and niacin supplementation would affect feed consumption, feed efficiency, live weight, carcass weight, carcass yield and abdominal fat weight.

Materials and methods

The present study was conducted at Mediterranean cost of Southern Turkey which is called Adana. Adana is situated in the middle of Cukurova plain (Clician Plain). Adana is fourth largest city of Turkey, nestled in the most fertile agricultural area of whole country which is fed by the lifegiving waters of River Seyhan. This area has subtropical climatic conditions. In this region, the summer is too hot and humidity is rather high; winter is warm and rainy. The average temperature and humidity are range 22-26 °C and 70% in summer; 10-14 °C and 65% in winter respectively. One hundred and twenty, 1-day old japanese quail chicks obtained from Cukurova University Agriculture Demonstration Farm.

The present study was conducted to determine whether dietary vitamin B_6 and niacin could increase weight gain and reduce fat content of japanese quail (*Coturnix coturnix japonica*). For this purpose, two experiments were carried out during the experimental study. The first experiment was performed using 60 japanese quails that 1-day old. The chicks were divided into 4 groups of equal number and were fed experimental diets supplemented with 0, 2.53, 2.76 or 3.22 mg/kg vitamin B_6 for five weeks. In the second experiment, sixty, 1-day-old japanese quails were divided into 4 groups, comprising 15 birds each and fed experimental diets supplemented with 0, 44, 48 or 56 mg/kg niacin. Each group was housed separately in modified stainless steel cage units. These units were electrically heated, and had continuous illumination and wire ground.

In the first experiment; the quails chicks were divided into 4 groups, 1 control and 3 treatment groups. While the animals in the control group was fed a commercial basal broiler chick started ration with 2.00 mg B_6/kg feed 3240 ME/KCal and %24 crude protein, 1st group; 2.53 mg B_6 /kg feed, 2nd group; 2.76 mg B_6 /kg feed and 3rd group; 3.22 mg B_6 /kg feed, respectively, were given to animals in groups 2-4 for 5 weeks.

In the second experiment; the quails chicks were divided into 4 group, 1 control and 3 treatment groups. While the animals in the control group was fed a commercial basal broiler chick started ration with 40 mg niacin/kg feed 3240 ME/KCal and %24 crude protein, 1st group; 44 mg niacin/kg feed, 2nd

group; 48 mg B_6 /kg feed and 3rd group; 56 mg niacin/kg feed, respectively, were given to animals in groups 2-4 for 5 weeks.

Feed and water were provided ad libitum until the end of the study. Body weight and feed intake were determined at weekly intervals and body weight gain and feed efficiency of quails were calculated. For carcass evaluations, at 42 day of age, 5 male quails and 5 female quails randomly chosen from each treatment group were slaughtered. The quails were not deprived of feed before slaughter, and carcasses were cleaned by removing feathers (wet), feet and visceral organs. Warm carcass weights were calculated after slaughter. The fat was taken from abdominal cavity and from gizzard then the abdominal fat weights were determined. The data were analyzed using the GLM procedure of SAS software. Significant differences ($P< 0.05$) among the means were determined using Duncan's new multiple range test (Bek and Efe, 1988).

Result and discussion

Table 1 shows effects of supplemental vitamin B_6 on mean live weights, mean feed consumption, and feed convertion ratio Table 2 shows the effects of supplemental vitamin B6 on mean live weight of quails, , and table 3 shows effects of supplemental vitamin B6 on warm carcass parameter of control and treatment groups.

Table 1.Effects of supplemental vitamin B_6 on Mean Live Weights, Mean Feed Consumption, and Feed Convertion Ratio (kg feed/ kg live weight gain) of Groups (n=15)

Parameter	Week	Groups			
		Control	1	2	3
Mean Live Weights (g)	1	28.04±1.47	32.25±1.30	30.70±1.14	32.28±1.11
	2	76.69±3.00	84.37±2.91	76.90±2.55	82.14±2.21
	3	132.94±5.46	142.29±3.90	138.93±3.59	145.52±4.09
	4	185.51±5.56	192.44±6.14	194.91±5.37	199.49±3.90
	5	241.27±6.82	239.44±7.60	251.40±7.40	250.87±6.10
M.F.C. (g)	1	43.5	55.0	56.5	53.5
	2	136.8	140.0	151.8	142.2
	3	156.2	160.7	161.7	150.0
	4	165.6	178.5	176.4	176.4
	5	193.7	200.0	191.1	188.2
M.C.F.C. (g)	1	43.5	55.0	56.5	53.5
	2	180.3	195.0	208.3	195.7
	3	336.5	355.7	370.0	345.7
	4	502.1	534.2	546.4	522.1
	5	695.8	734.2	737.5	710.3
F.C.R.	1	1.55	1.70	1.84	1.65
	2	2.35	2.31	2.71	2.38
	3	2.53	2.50	2.66	2.38
	4	2.71	2.78	2.80	2.62
	5	2.88	3.07	2.93	2.83

M.F.C.: Mean Feed Consumption (g/quail per week).
M.C.F.C.: Mean Cumulative Feed Consumption (g/guail per week).
F.C.R.: Feed Convertion Ratio
FCR= M.C.F.C / Mean Live Weights

In general, it has been realized that the rate of feed convertion has increased each week. This means that as quails get older, the rate of feed convertion to meat has started decreasing.

Table 2. Effects of supplemental vitamin B_6 on Mean Live Weights of Groups, (g) *

Week/Group	Levels of vitamin B_6			
	Control n=15	1 N=15	2 n=15	3 n=15
LW	8.25±0.20	8.06±0.18	8.86±0.31	8.87±0.19
1	28.04±1.47 b	32.25±1.30 a	30.70±1.14 ab	32.28±1.11 a
2	76.69±3.00 a	84.37±2.91 a	76.90±2.55 a	82.14±2.21 a
3	132.94±5.46 a	142.29±3.90 a	138.93±3.59 a	145.52±4.09 a
4	185.51±5.56 a	192.44±6.14 a	194.91±5.37 a	199.49±3.90 a
5	241.27±6.82 a	239.44±7.60 a	251.40±7.40 a	250.87±6.10 a

(*) Means in a row superscripts without a common letter differ, (P < 0.05). LW: Live Weight

Table 3. Effects of supplemental vitamin B6 on warm carcass parameter of Groups (*)

Parameter	Levels of vitamin B_6			
	Control n=15	1 n=15	2 n=15	3 n=15
Slaughter live weight (g)	263.04±8.30a	271.30±7.89a	270.70±7.34a	270.71±10.45a
Carcass weight (g)	176.50±3.74a	183.78±5.10a	184.92±5.03a	179.87±4.12a
Carcass Yield (%)	67.34±1.01a	67.85±1.14a	68.39±1.04a	66.77±1.03a
Abdominal Fat (g)	4.34±0.41a	5.29±0.47a	4.96±0.66a	4.05±0.51a
Abdominal Fat (%)	2.48±0.24a	2.85±0.21a	2.62±0.29a	2.20±0.22a

(*)Means in a row superscripts without a common letter non significant(P>0.05)

Table 4 shows the effects of supplemental niacin on mean live weight of quails, table 5 shows effects of supplemental niacin on mean live weights, mean feed consumption, and feed convertion ratio, and table 6 shows effects of supplemental niacin on warm carcass parameter of control and treatment groups.

Table 4. Effects of supplemental Niacin on Mean Live Weights of Groups, (g) *

Week/Group	Levels of Niacin			
	Control n=15	1 n=15	2 n=15	3 n=15
LW	8.56±0.16	8.44±0.22	8.57±0.23	8.64±0.31
1	28.95±1.31 ab	28.57±1.25 b	32.47±1.31 a	32.15±0.95 ab
2	69.25±1.98 b	53.15±2.29 c	58.31±1.90 c	75.97±2.49 a
3	136.10±3.04 a	122.03±4.07 b	131.83±2.77 a	136.23±2.77 a
4	191.13±3.95 ab	180.35±4.86 b	195.60±2.96 a	194.07±3.85 a
5	233.82±5.65 ab	223.61±7.08 b	134.77±3.90 ab	242.57±6.45 a

(*) Means in a row superscripts without a common letter differ, (P < 0.05). LW: Live Weight

Table 5.Effects of supplemental Niacin on Mean Live Weights, Mean Feed Consumption, and Feed Convertion Ratio (kg feed/ kg live weight gain) of Groups (n=15)

Parameter	Week	Groups			
		Control	1	2	3
Mean Live Weights (g)	1	28.95±1.31	28.57±1.25	32.47±1.31	32.15±0.95
	2	69.25±1.98	53.15±2.29	58.31±1.90	75.97±2.49
	3	136.10±3.04	122.03±4.07	131.83±2.77	136.23±2.77
	4	191.13±3.95	180.35±4.86	195.60±2.96	194.07±3.85
	5	233.82±5.65	223.61±7.08	134.77±3.90	242.57±6.45
M.F.C. (g)	1	70.0	71.6	77.6	78.5
	2	140.4	138.0	138.0	138.4
	3	162.0	169.4	171.4	160.7
	4	187.5	192.5	192.5	175.0
	5	197.2	197.5	205.2	188.5
M.C.F.C. (g)	1	70.0	71.6	77.6	78.5
	2	210.4	209.6	215.6	216.9
	3	372.4	379.0	387.0	377.6
	4	559.9	571.5	579.5	552.6
	5	757.1	769.0	784.7	741.1
F.C.R.	1	2.41	2.50	2.38	2.44
	2	3.04	3.94	3.70	2.86
	3	2.74	3.11	2.94	2.77
	4	2.93	3.17	2.96	2.85
	5	3.24	3.44	3.34	3.06

M.F.C.: Mean Feed Consumption (g/quail per week).
M.C.F.C.: Mean Cumulative Feed Consumption (g/guail per week).
F.C.R.: Feed Convertion Ratio
FCR= M.C.F.C / Mean Live Weights

Table 6. Effects of supplemental Niacin on warm carcass parameter of Groups (*)

Parameter	Levels of Niacin			
	Control n=15	1 n=15	2 n=15	3 n=15
Slaughter live weight (g)	266.70± 6.68ab	252.28±9.04b	261.82±5.93ab	273.21±9.32a
Carcass weight (g)	182.32±4.23a	163.75±3.32b	171.57±5.20ab	178.13±4.02a
Carcass Yield (%)	68.46±1.12a	65.28±1.23a	65.76±1.05a	65.40±0.62a
Abdominal Fat (g)	4.64±0.47a	3.93±0.31a	4.17±0.36a	4.03±0.46a
Abdominal Fat (%)	2.53±0.19a	2.40±0.13a	2.43±0.17a	2.24±0.16a

(*)Means in a row superscripts without a common letter non significant(P>0.05)

Dietary niacin levels and vitamin B_6 did not affect body weight, body weight gain, feed consumption, feed efficiency, abdominal fat deposition and carcass weight (P>0.05).

The result of this study demonstrated that chicks receiving vitamin B_6 and niacin supplementation did not affect performance, abdominal fat deposition and carcass weight. But in addition to their rations, adding 3.22 mg/kg vitamin B_6 or 56 mg/kg niacin might help to increase the performance of quails breeding, feed efficiency, decrease abdominal fat weight. These amounts supplement vitamin B_6 and niacin were not observed any side effects on quails.

Nowadays consumers prefer light fatted white meat. For this reason, breeding light fatted quails become more important. The factors that have effects on fattening such as amino acid including cholin, folic acid, lecithin, and betaine should be investigated in a broad sense. But, when investigated, economical analysis should be given necessary attention.

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