

EFFECT OF FEEDING BETEL LEAVES AND NUTMEG PODS ON FEED INTAKE, GUT HEALTH AND BLOOD BIOCHEMICAL PARAMETERS IN JAPANESE QUAIL (*Coturnix coturnix japonica*)

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ABSTRACT

A study was conducted to evaluate the effect of betel leaf (*Piper betle*) and nutmeg pod (*Myristica fragrans*) powder on feed intake, gut health and blood biochemical parameters in Japanese quails. Seventy five quails of three weeks of age with a mean body weight of 129.40 ± 5.48 g were divided to 3 treatment groups of 5 replicates each. Quail starter ration containing 22 % CP and 2950 kcal/kg ME, formed the basal diet T₁. Treatment groups T2 and T3 were fed with basal diet plus dried betel powder or nutmeg pod powder at 1per cent, respectively. The overall feed -intake, mean body weight and average daily gain (ADG) showed no significant difference among treatment groups. Serum ALT and AST was comparable among T₂ and T₃

and was significantly lowered compared to T1. Serum total cholesterol level was comparable among T₂ and T₃ and was significantly lowered compared to T1. Serum glucose level was comparable among T1 and T3 and was significantly lowered compared to T2. Serum albumin and total protein level significantly differed among different groups. Serum globulin levels were comparable among T₂ and T₃ and were significantly higher compared to T1. A: G ratio was comparable among T₂ and T₃ and was significantly lowered compared to T1. It was concluded that the supplementation of betel leaf (*Piper betle*) powder and nutmeg pod (*Myristica fragrans*) leaves in the ration improved the growth performance, ADG, FCR, Serum globulin and lowered total cholesterol, A:G ratio, ALT and AST levels without any negative effect on their feed intake.

Key words: Japanese quail, betel leaves, nutmeg pod powder, ADG, FCR, cholesterol, globulin, A: G ratio

INTRODUCTION

Quail rearing has been accepted as a potential alternative to traditional poultry farming. The indiscriminate use of conventional medicines leads to steady increase in drug resistance. This necessitates a newer alternative for antimicrobial substances. The herbs contain active substances that can improve digestion and metabolism and possess bacterial and immune stimulant activities (Ghazalah and Ali, 2008). Apart from this herbal extracts/ residues exhibits a wide range of pharmacological actions like anti-inflammatory, anti hyperglycaemic, anti-ulcer, anti-mutagenic, anti-carcinogenic and immuno modulatory (Chakrabarthy and Pal, 2012). Betel leaves and nutmeg pod powder have been described in ancient books of Ayurveda and Chinese folk medicine for treatment of various disorders and claim to have various pharmacological properties.

Limited published reports are available on the effect of betel leaves (*Piper betle*) and nutmeg pod powder (*Myristica fragrans*) as feed supplement in quails. Therefore the objective of the present study was to evaluate the effect of betel leaves and nutmeg pod

powder in growth performance of quails.

MATERIALS AND METHODS

The experiment was carried out at the Department of Animal Nutrition, CVAS Manuthy. A total of seventy five Japanese quail of 3 weeks of age with a mean body weight 129.4 ± 5.48 g were distributed among three experimental groups of five replicates each following completely randomized design (CRD). Quail starter ration containing 22 % CP and 2950 kcal/kg ME, formed the basal diet in T1; T2 and T3 being fed with basal diet plus dried betel leaves or nutmeg pod powder at 1 per cent, respectively. The birds were housed in clean cages with *adlibitum* supply of clean drinking water. Daily dry matter intake and weekly body weights among different experimental groups were recorded throughout the experimental trial period. Prior to the commencement of the experiment, each bird was weighed individually to obtain the initial body weight and at the end of experimental period to get final weight. Birds were group fed in each replicate. Pre-weighed feed were offered to the birds of different experimental groups daily at 9.00 A.M. Around twenty percent of the feed over and above the expected intake were offered to the birds daily and the residual feed were collected daily and dried to constant weight to determine the dry matter intake. The experimental period lasted

for period of 7 weeks. At the end of the experiment blood samples were collected from all the birds of the different experimental groups for blood biochemical analysis.

Blood Biochemical Analysis

Blood samples were collected in clean, dry sterile centrifuge tubes during slaughter without anticoagulant and then centrifuged at 3200 rpm for 10 minutes. Serum obtained was pipetted out and stored at -20°C for the estimation of Ca, inorganic P using blood analyser (Phosphomolybdate method), total proteins (Biuret Method), total cholesterol (Enzymatic calorimetric method), HDL cholesterol (PPt. Mg. Acetate method) and triglycerides (GPO-POD method) using the kits supplied by Agappe diagnostics, Agappe Hills, Ernakulam-683562, Kerala.

Faecal microbial count

Collection and processing of samples

Fresh faecal samples were collected randomly towards the end of feeding trial from birds belonging to the four dietary treatment groups. The samples were processed and subjected to microbiological analysis on the same day of collection. Nine grams of samples were homogenized in 90 milliliter of phosphate buffered saline (PBS) and this form the initial test sample. Further tenfold serial dilution was prepared by transferring one milliliter of inoculum in nine milliliter of

the diluents. All aseptic precautions were taken during collection and processing of samples.

Total viable count

Total Viable Count (TVC) of all samples was estimated by pour plate technique, as described by Morton (2001). The inoculated plates were left at room temperature and allowed to solidify and were incubated at 37°C for 24 h. At the end of incubation, plates showing colonies between 30 and 300 were selected and counts were taken with the help of a colony counter. The number of colony forming units (CFU) per mg per ml of sample was calculated by multiplying the mean colony count in duplicate plates with the dilution factor and expressed as log₁₀cfu per g or ml.

Preparation of dried herbs

Betel leaves and Nutmeg pod powder were obtained from local market and were dried to constant weight in hot air oven (60° C) for 48 hours. The dried herbs were ground with a hammer mill (2-3 mm sieve) and stored in insulated containers for further use.

Statistical Analysis

The data were subjected to analysis of variance by completely randomised design (Snedecor and Cochran, 1994).

RESULTS AND DISCUSSION

Growth performance

The results of growth performance of birds are represented in Table 1 and figures 1, 2 and 3 respectively. The mean dry matter intake (g/day) and mean body weight (g) was similar ($P>0.05$) among all the experimental groups suggesting that the supplementation of betel leaves/nutmeg pod powder did not have any detrimental effect on the palatability and feed intake in quails. Similar observation was reported by Behnamifer *et al* (2015) and they found that feeding of quail with garlic, thyme and caraway herbal extract did not affect the body weight gain and feed intake. Feed con-

version ratio and average daily gain,g (Table-1), figures 1 and 2 among three groups did not differ significantly but improvement was seen in experimental groups T2 and T3 compared to T1 which indicated that phyto-additives present in betel leaves and nutmeg pod powder had exerted a positive effect on growth performance in quails. Improved feed conversion efficiency might be due to the stimulation of appetite and feed intake, enhanced digestive enzyme secretion, activation of immune response and antimicrobial action exerted by the herbs. Similar observations were obtained by Yalcin *et al* (2006) when added 0.5 and 1.0 gram of garlic powder with 1 kg of feed in laying hen ration.

Table 1: Weekly mean body weight of Quails maintained on three dietary treatments, g

Attributes	T1	T2	T3	SEM	P-value
Mean Initial BW (4 weeks age), g	129.4	129.8	129.0	5.48	0.95
Mean Final BW(11 weeks age),g	238.82	257.72	252.72	5.39	0.19
Mean Total Gain, g	109.42	127.92	123.72	5.99	0.25
Mean DMI,g	21.17	21.26	21.11	0.10	0.60
ADG,g	2.23	2.61	2.52	0.12	0.25
FCR	9.70	8.3142	8.78	0.45	0.26

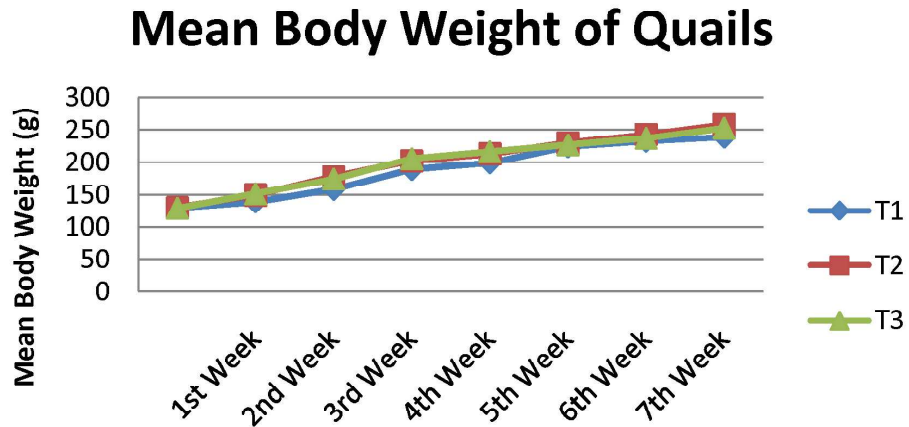


Figure 1. Mean Body Weight of Quails in different experimental groups over different weeks (n=25)

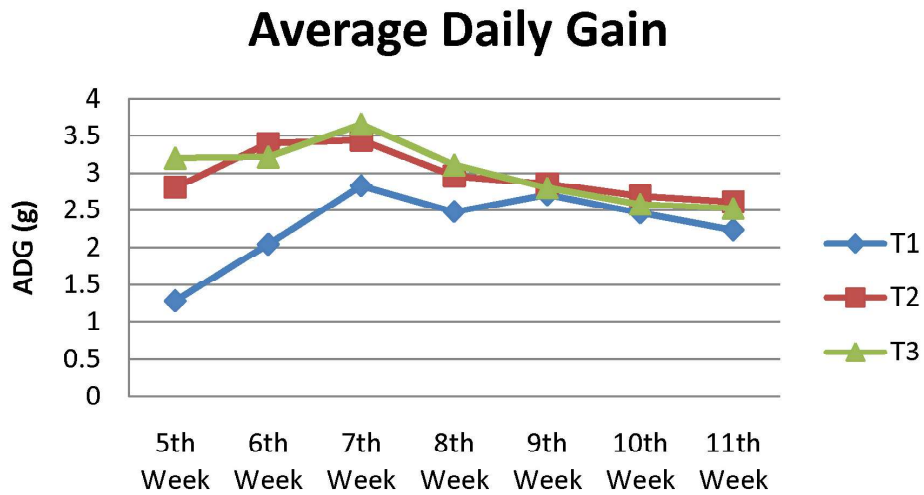


Figure 2. Average Daily Gain of Quails in experimental groups over different weeks (n=25)

FCR of quails in different experimental groups

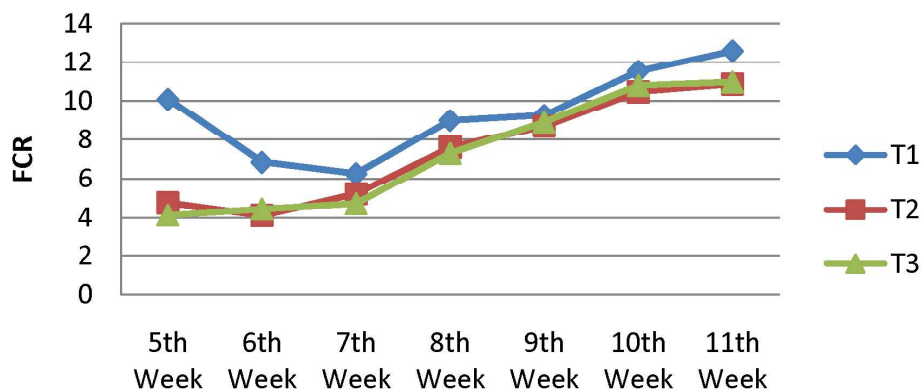


Figure 3. Cumulative Feed Conversion Ratio of Quails in Different experimental groups (n=25)

Blood biochemical parameters

The results of blood biochemical profile of quails in different groups are represented in Table 2. Serum calcium and phosphorus levels (mg/dl) were comparable among T_1 , T_2 and T_3 . Serum ALT (U/L) was comparable among T_2 and T_3 and was significantly ($P < 0.001$) lowered compared to T_1 . Serum AST (U/L) was significantly ($P < 0.001$) lowered in T_2 and T_3 compared to T_1 . Similarly Elkloub *et al.* (2015) reported that plasma ALT and AST were decreased on supplementation of different levels (0.2, 0.4 and 0.6%) of *Moringa oleifera* leaf meal in quail diet. As the low levels of liver specific enzymes viz.,

AST and ALT in blood serum indicates normal liver function (Kaplan *et al.*, 2003), this is indicative of the protective effect of betel leaf (*Piper betle*) powder and nutmeg pod (*Myristica fragrans*) on enhancing the hepatic health in quails. Serum total cholesterol level (mg/dl) was comparable among T_2 and T_3 and was significantly lowered ($P < 0.001$) compared to T_1 . Similarly Sayeed *et al.* (2016) stated that inclusion of ginger and pepper extract reduced the cholesterol level of quail's serum. Decrease in cholesterol level may be attributed to the antihypercholesterolemic activity of herbs included in the ration. The deconjugation of bile acids in small intestine can affect

the cholesterol synthesis since deconjugated acids are not capable to absorb fatty acids as conjugated acids. Serum glucose level (mg/dl) was significantly ($P < 0.001$) higher in T_2 and T_3 compared to T_1 . Serum albumin and globulin level (g/dl) were significantly ($P < 0.001$) differed among different groups. Total protein was significantly higher ($P < 0.001$) in T_2 and T_3 compared with T_1 . The A:G ratio significantly ($P < 0.001$) differed among different groups and was significantly ($P < 0.001$) lowered in T_2

and T_3 compared to T_1 . Similar results were observed by Elkloub *et al.* (2015) in broilers on supplementation of *Moringa oleifera* leaf meal in quails at 0.4% and 0.6% respectively. As the total protein status in the serum/plasma is indicative of the protein retained in the animal body (Akinola and Abiola, 1991), the higher total serum protein content in quails on supplementation of 1% dried betel leaves and nutmeg is indicative of the good protein quality of the ration containing herbs.

Table - 2. Blood biochemical parameters of Quails maintained on three dietary treatments

Attributes	T1 (control)	T2 (Betel)	T3 (Nutmeg)	SEM	P-value
Calcium (mg/dl)	10.41	10.37	10.38	0.01	0.308
Phosphorus (mg/dl)	2.32	2.37	2.25	0.02	0.079
ALT*(U/L)	47.77 ^b	41.63 ^a	41.93 ^a	0.87	0.000
AST* (U/L)	12.14 ^c	11.68 ^b	11.26 ^a	0.13	0.003
Total Cholesterol* (mg/dl)	194.94 ^b	143.25 ^a	146.40 ^a	7.16	0.000
Glucose*(mg/dl)	153.53 ^a	158.77 ^b	162.34 ^c	1.13	0.000
Albumin*(g/dl)	1.74 ^c	1.48 ^b	1.39 ^a	0.05	0.000
Globulin* (g/dl)	2.35 ^a	2.80 ^b	3.00 ^c	0.08	0.000
Total Protein* (g/dl)	4.09 ^a	4.28 ^b	4.39 ^b	0.04	0.001
A:G ratio*	0.74 ^c	0.53 ^b	0.46 ^a	0.04	0.001

Means within a row with different superscripts are significantly different ($P \leq 0.001$).

Faecal microbial count

The data on faecal microbial count is presented in Table 3. The total viable count of birds maintained on three experimental treatments T1, T2 and T3 were 7.26, 6.25 and 6.59 \log_{10} CFU per g respectively. Both T2 and T3 differ significantly than control. The

results indicate decreased microbial count on inclusion of herbal residues suggestive of anti microbial action of herbal residues. This is mediated through lipophilic action to perforate the bacterial membrane which releases cell contents to the exterior surface (Helander *et al.*, 1998).

Table 3. Faecal microbial count of birds maintained in three dietary treatments, log₁₀ CFU per g

Attributes (n=25)	T1 (control)	T2 (Betel)	T3 (Nutmeg)	SEM	P-value
Total viable count	7.26 ^c	6.25 ^a	6.59 ^b	0.11	0.000

Means within a row with different superscripts are significantly different ($P \leq 0.001$).

CONCLUSION

In conclusion the supplementation of betel leaves/nutmeg pod powder did not have any untoward effect towards palatability and feed intake in quails. Lowered cholesterol level in birds fed with betel leaves/nutmeg pod powder indicated the anti hyper cholesterolemia activity of herbs included in the ration and the lower levels of liver specific enzymes viz., AST and ALT in blood serum indicated the normal hepatic function and these results are suggestive of the protective effect of betel leaf (*Piper betle*) powder and nutmeg pod (*Myristica fragrans*) on enhancing hepatic health in quails. The lowered faecal microbial count in quails on inclusion of herbal residues was suggestive of the anti-microbial action of the dietary herbal preparations.

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