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STUDY OF PALM KERNEL MEAL (PKM) WITH AND WITHOUT ENZYME ON THE CARCASS TRAITS AND SERUM BIOCHEMISTRY OF JAPANESE QUAIL (Coturnix coturnix japonica)

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Abstract: A study was conducted to investigate the influence of palm kernel meal (PKM) inclusion with and without enzyme supplementation on carcass parameters, serum biochemistry and mortality of Japanese quail. Six experimental diets with 0, 15 and 20% PKM with and without enzyme supplementation were prepared in 3×2 factorial arrangement. A total of 180 day-old Japanese quail chicks were individually weighed and allotted randomly into six treatment groups with three replicates containing ten birds each, the birds were fed with experimental diets. Six birds from each group slaughtered and studied the carcass and serum biochemical parameters. Results indicated that the PKM inclusion with and without enzyme supplementation had no significant influence on the dressing per cent, heart, liver and gizzard weights of Japanese quail. Serum cholesterol levels were significantly increased along with increasing levels of PKM but enzyme addition reduces the serum cholesterol. Serum total protein and mortality was not significantly influenced by PKM inclusion and enzyme supplementation in diets of Japanese quail. Basing on the results PKM can be incorporated up to 20% level (as a hole replaced) in Japanese quail diets without affects the performance up to 5 weeks.

Keywords: Palm kernel meal, Japanese quail.

INTRODUCTION

Japanese quail (*Coturnix coturnix japonica*) are the domesticated farm bird variety of quails. Quail probably the smallest avian species used for production of table eggs and meat. Because of prolific egg production and meat yield it attains the status of viable commercial poultry enterprise. The quail meat is delicious and tender with unique taste having mouth-watering delicacy. Several attributes of this species like early sexual maturity, rapid growth rate, short generation interval, small body size, low space and feed requirements making it ideal for rural poultry production for creation of rural employment for solving gender issues and provide supplemental income and meet the protein requirement of rural citizens.

Japanese quail production has become more expensive because of more protein requirement. There is a lot of demand for the conventional feed ingredients due to increased competition from other livestock species and human beings. The entrenchment of agro-industrial by-

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products in poultry feeding is necessitated. The most promising one among them is palm kernel meal (PKM) which can be incorporated in the diets of commercial birds potentially to reduce the cost of feeding.

Palm kernel meal is the main by-product of the palm kernel oil extraction process. It contains moderate amounts of protein and carbohydrate. The chemical analysis of PKM showed that its nutrient content ranges widely, depending up on the oil extraction process, the species of the palm nut and the amount of the shell content remaining in the meal (O"Mara *et al.,* 1999). The chemical composition of palm kernel meal (Estimated values) obtained from local oil mill is dry matter-87.05%, organic matter-94.76%, crude protein 20.5%, ether extract 0.62%, crude fibre 18.82%, NFE-45.18%, total ash 5.23%, AIA-1.41%, Ca- 0.31% and phosphorous- 0.72%.

According to Sundu *et al*., (2006) the palm kernel meal is aflatoxin free, palatable and has considerable potential as an energy and protein source without having any anti nutritional factors. Palm kernel meal contains high level of fibre with non-starch polysaccharides (NSP) and β-mannan's which have similar properties to mannan from yeast to increase immunity.

The research reports on feeding palm kernel meal with enzymes have been shown to be beneficial in poultry diets (Soltan, 2009: Esuga *et al.,* 2008: Sundu *et al.,* 2006).

The palm kernel meal inclusion in the diets was less practiced in monogastric animals particularly in poultry due to its high fibre content. But the nutritive value of palm kernel meal can be improved through exogenous supplementation of enzymes as poultry do not produce endogenous enzymes to breakdown the non-starch polysaccharides. Information regarding utilization of Palm kernel meal with and without exogenous supplementation of enzymes in Japanese quail diets on carcass parameters, serum biochemical profile and mortality is very much scanty. Hence this study was conducted to assess the carcass parameters and serum biochemical profile and mortality of Japanese quail.

MATERIALS AND METHODS

One hundred and eighty day-old Japanese quail chicks were weighed individually, wing banded and randomly divided into 6 equal groups of 3 replicates each with 10 chicks per replicate. Each group of quail was allotted to one of the dietary treatments at random. Six experimental diets with 0, 15 and 20% PKM with and without enzyme supplementation were prepared in 3×2 factorial arrangement. The experiment was conducted from 0-5 weeks of age. All the Quail chicks were housed in 5-tier battery cages throughout the experiment. Feed and water were provided *adlibitum*. Blood samples were collected from two birds/ replicate at

the end of the experiment into clot activating tubes and allowed to clot so that the serum got separated. The separated serum was then made clear by centrifuging at 3000 Rpm for 10 minutes and stored in a refrigerator for estimation of serum parameters. Serum cholesterol was estimated calorimetrically by using diagnostic kit (M/s. ERBA) by enzymatic method of Allian *et al.,* (1974) for *in vitro* estimation. Serum total proteins were estimated by using diagnostic kit (M/s. ERBA Diagnostics Private Limited) following modified Biuret method. At the end of trial period (5^{th}week), two birds per replicate and thus a total of six birds per treatment were randomly selected, weighed and slaughtered. Individual weights of eviscerated carcass (i.e., carcass yield) and edible organs like liver, heart and gizzard were collected and weighed. Thus relative weights (% of live body weight at slaughter) of carcass yield plus total edible organs were calculated. Mortality among the birds during the entire experimental study was recorded and the causes there off were ascertained by detailed autopsy. Statistical analysis of the data was carried out according to the procedures suggested by Snedecor and Cochran (1989).

RESULTS AND DISCUSSION

Palm kernel meal inclusion not influence the dressing per cent among the treatment groups of Japanese quail in this study. This result was in line with the observations of Ojewola *et al.,* (2003), Iyayi and Davies (2005) and Okeudo *et al.,* (2006) in broilers. Makinde *et al.,* (2013) also found no significant difference in Japanese quail regarding the dressing percentage. But Abidah and Nooraida (2017) observed that the dressing per cent was decreased along with increasing level of PKM in diets of broilers. Similarly enzyme supplementation also not influenced the dressing per cent of Japanese quail. This observation was in line with Ojewola *et al.,* (2003) in turkey poults, Iyayi and Davies (2005), Shakila *et a*l., (2012) in broilers.

Birds fed with PKM in diets at 0, 15 and 20% level did not influence the heart weight of Japanese quail. This observation was line with the findings of Ojewola *et al.,* (2003) in turkey poults up to 20%, Okeudo *et al.,* (2006) up to 45%, Anaeto *et al.,* (2009) up to 30% level in broiler and Makinde *et al.,* (2013) up to 30% in Japanese quail. The fact that enzyme supplementation had no effect on heart weight. These findings were inconsonance with the observations of Ojewola *et al.,* (2003) in turkey poults and Shakila *et a*l., (2012) in broilers.

Japanese quail fed diets with Palm kernel meal at 0, 15, 20% levels did not influence the liver weight. Similar findings were observed by Ojewola *et al.,* (2003) in turkey poults up to 20%, Iyayi and Davies (2005) up to 30%, Okeudo *et al.,* (2006) up to 45% in broilers and Makinde

et al., (2013) up to 30% in Japanese quail. In contrary Anaeto *et al.,* (2009) observed significantly high liver weight at 20% PKM in broiler finisher.

Gizzard weight of Japanese quail fed with PKM inclusion diet at 0, 15, 20% level was not significantly affected. These results were inconsonance with the observations of Iyayi and Davies (2005) up to 30%, in broilers. In contrary Okeudo *et al.,* (2006) at 15%, Anaeto *et al.,* (2009) at 20% level in broiler and Makinde *et al.,* (2013) at 15% level in Japanese quail observed significantly high gizzard weight.

The serum cholesterol values were significantly increased along with increasing levels of PKM from 0 to 20% in this study. In contrary Adesehinwa (2007) in pigs and Ajaonuma*et al.,* (2013) in turkey poults observed no significant difference in serum cholesterol at 20% PKM fed dietary groups. Similarly Olorede *et al.,* (1996) reported that the serum cholesterol levels were not affected by PKM inclusion up to 15% in diets of broiler. Enzyme supplementation significantly decreased the serum cholesterol of Japanese quail in this study.

Total serum protein in Japanese quail fed with palm kernel meal at 0, 15 and 20% levels were not significantly affected. This might be due to adequate protein levels in the diets that were able to support normal reserve of the proteins in the body as explained by Shakila *et al.,* (2012) in broilers and Adesehinwa (2007) in pigs. Similar findings were reported by Oleredo *et al.*, (1996). Enzyme supplementation did not influences the serum protein in this study and this observation was in line with the findings of Balachander *et al.*, (2007) in broilers.

In general mortality was low irrespective of the dietary treatments in this experiment. The causes of mortality among the experimental birds were not related with the dietary treatments. Similar findings were observed by Anaeto *et al.,* (2009), Abdollahi *et al.,* (2016), Hossain and Soleimani, (2017) and Yaophakdee *et al.,* (2018) in broilers.

CONCLUSION

Either dietary PKM level or the enzyme did not affect the carcass characteristics like dressing percentage and weight of giblets. The serum cholesterol values were significantly increased along with increasing levels of PKM from 0 to 20%. Enzyme supplementation decreases the serum cholesterol significantly.

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Table: 1. Ingredient composition of Japanese quail experimental diets

Ingredients (kg)	No PKM + No enzyme	No PKM + enzyme	15%PKM + no enzyme	15%PKM + Enzyme	20%PKM + No enzyme	20%PKM + enzyme	Cost/Kg (Rs)
Maize	60	60	46	46	41.5	41.5	14.67
Soybean meal	28	28	24	24	23	23	40.5
Fish meal	10	10	10	10	10	10	50.00
PKM	0	0	15	15	20	20	8.00
Animal fat	1	1	3.5	3.5	4.3	4.3	25.00
Stone grit	0.8	0.8	0.8	0.8	0.8	0.8	3.00
Salt	0.1	0.1	0.1	0.1	0.1	0.1	3.50
L-Lysine	0.12	0.12	0.12	0.12	0.12	0.12	110.00
DL-Methionine	0.12	0.12	0.12	0.12	0.12	0.12	246.00
Trace minerals*	0.01	0.01	0.01	0.01	0.01	0.01	60.00
Vitamins	0.03	0.03	0.03	0.03	0.03	0.03	880.00
Enzyme#	-	0.05	-	0.05	-	0.05	640.00
Total	100.18	100.23	99.68	99.73	99.98	100.03	
ME kcal/kg	2900.30	2900.30	2900.19	2900.19	2900.09	2900.09	
Crude protein (%)	23.99	23.99	24.01	24.01	24.00	24.00	

*@ 0.1kg/ton feed- manganese sulphate 55000 mg, Ferrous sulphate 50000mg, zinc sulphate 50000mg, cobalt sulphate 500 mg, copper sulphate 3000mg, potassium Iodide 3000 mg, sodium selenite 500 mg in 1 Kg.

#at 0.5 kg/ton feed- multi-protease, cellulose, alpha amylase, β glucanase, mannanase, lipase and lysophospholipids. In 1Kg.

Table2. Effect of PKM with and without enzyme on carcass parameters and serum bio-chemicals

Treatments		Dressing %	Heart weight(g)	Liver weight (g)	Gizzard weight (g)	Serum total protein (g/dl)	Serum cholesterol (mg/dl)
0% PKM	-	67.12	2.17	5.17	3.67	4.34	175.80^{bc}
	+	66.66	2.00	4.17	3.83	4.25	170.36^{b}
15% PKM	-	68.15	2.00	4.00	3.83	4.32	180.68^{a}
	+	66.27	2.17	4.17	4.33	4.21	176.79^{c}
20% PKM	-	66.14	2.00	3.67	4.17	4.14	$189.53b^{c}$
	+	67.33	1.83	3.67	3.83	4.23	181.97^{b}
SEM[1]		1.087	0.190	0.680	0.380	0.245	2.205
Main effects							
PKM inclusion							
0% PKM		66.89	2.08	4.67	3.75	4.30	173.08^{c}
15% PKM		67.21	2.08	4.08	4.08	4.26	178.74^{b}

20% PKM		66.73	1.92	3.67	4.00	4.19	185.75[a]
Enzyme addition							
-		67.14	2.06	4.28	3.89	4.27	182.00[a]
+		66.75	2.00	4.00	4.00	4.23	176.37[b]
Probabilities							
Effect of PKM		0.906	0.604	0.348	0.663	0.902	0.000
Effect of enzyme		0.670	0.723	0.620	0.723	0.856	0.04
PKM × Enzyme		0.378	0.604	0.654	0.550	0.899	0.708

1 pooled standard error mean

Means in a column sharing different letter ([a,b,c]) are significantly different (P<0.01)