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Short Communication

Effect of Supplementation of Papaya Seed (*Carica papaya*) on Growth Performance, Carcass Traits, and Histomorphology of Japanese Quails

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Key words
Quails, Papaya seeds, Weight gain, Feed intake, Histomorphology, FCR

ABSTRACT

This study was conducted to examine the effect of papaya seed on growth performance, gut morphometry, and economics in Japanese quail. Two hundred and twenty day-old quail chicks were used for the experimental purposes and were divided into four groups each with four replicates of 15 quails per replicate. Group 1 was CON (control) with normal feed while groups 2, 3, and 4 were provided with 1, 2, and 3g/kg papaya seed powder in feed respectively. The results showed no effect of papaya seed on overall feed intake, weight gain, feed conversion ratio, and mortality. The villus height and crypt depth were lower in the 3g/kg diet group ratio compared to CON and other groups. Villus width and the dressing percentage had a significantly higher value in the 3g/kg diet group than in the CON and other groups. It is concluded that papaya seed at the level of 3g/kg feed has a useful effect on growth performance, carcass traits, and gut morphology in quails.

Japanese quails (*Coturnix japonica*) or common quails are mainly reared for meat and egg production as well as lab animals (NRC, 2013). The Japanese quail is known for its good immunity against certain diseases, however, clinical data can be very useful to monitor the response and diagnose diseases that illustrate no visible signs (Fudge, 2019). Antibiotics have been used for a long time as growth promotors due to their growth-improving effects in poultry. The European Union stopped antibiotics in 2006 as growth promoters because of their negative effects on human health (Mounia *et al*., 2018; Fernando *et al*., 2007). The success of animal production today in the availability of large amount of low-cost food to the human population depends mainly on the use of smart and innovative food additives (Pliego *et al*., 2022). Feed additives (medical plants) play an important role in preserving animal health, improving feeding properties, and increasing performance. According to Mayer *et al*. (2014), medicinal plants contain anti-inflammatory, antiseptic, and antibacterial actions against microorganisms, treat gastrointestinal complaints, and are anthelminthic and are easily attributed to the active substances. According to Burt (2004), spices and herbs are known for their antimicrobial properties against certain

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pathogens and for supporting to replacement of growth promoters with antibiotics. There are about half a million plants worldwide and most of their medicinal activities have not yet been studied Rasool (2012). According to WHO (2013), almost 21,000 plant species can be used as medicinal plants without side effects or minimal side effects. The demand for by-products of agro-industries is increasing day by day for utilization in the poultry sector. Keeping in view the environmental aspects, the consumption of various by-products of the agro-industries as feed additives for poultry leads to a sustainable and healthy environment (Sugiharto *et al*., 2018). *Carica papaya* is a perennial herbaceous plant and its fruits are edible since long. The papaya is a very famous and economical plant worldwide (Ong *et al*., 2011). Papaya originated from southern Mexico and America and is cultivated in Brazil, Mexico, Africa, and India (Gha *et al*., 2019). Papaya is the most famous fruit in Ethiopia, which is cultivated for its popular aroma and elevated nutritional value. Ethiopia produces 54,355 tons of papaya annually (Sitarji *et al*., 2015; Saleh *et al*., 2019). The fruit pulp of the papaya is embedded with its black seed (Kadiri *et al*., 2016). Papaya contains potent antioxidants like Vit A, C, and E along with Vit B and minerals. The fiber portion of the papaya contains papain and chymopapain which are enzymes that help in digestion and cure digestive disorders. Papaya plays a therapeutics role as an analgesic, antioxidant, antimicrobial, antiulcerogenic, anti-inflammatory, and gastro-protectant effects (Rahmani and Aldebasi, 2017). Annual availability and low economic value of papaya seeds have encouraged scientists to use this product as a high-protein food as well as poultry nutrition. This study was aimed at determining the effect of papaya seed on growth performance, carcass traits, and gut morphometry in quail.

Materials and methods

The experiment was carried out at the Department of Poultry Science and samples were analyzed at the Pathology Laboratory of the College of Veterinary Science, the University of Agriculture, Peshawar. Papaya seeds were purchased from the local market and identified by the medicinal plant experts in the Department of Botany at the University of Peshawar. The method described by Myandoab and Hosseini (2012) was followed with a few modifications for the processing.

A total of 240 days old quail chicks were obtained from the local market and were divided into four groups (CON, T2, T3, and T4), each with four replicates and fifteen quail per replicate. Group 1 was a CON (control) group with normal feed while groups 2, 3, and 4 were provided with 1, 2, and 3g/kg of papaya seed powder in feed, respectively. Based on the NRC (1994), the experimental basal diet was made to meet the requirements of quail. The feed and water were given *ad libitum* to the experimental birds from day 1 to 35. The light was provided for twenty-four hours. The duration of the experiment was five weeks (with 1st week as brooding). Biosecurity was maintained to prevent the spread of illnesses.

Weekly feed intake, body weight gain (BWG), and feed conversion ratio (FCR) were calculated according to the formulae used by Ashiq *et al*. (2023). Mortality was recorded daily. Post-mortem examinations of dead birds were performed to rule out any disease or lesions. The dressing percentage was calculated with the help of the formula e.g., Dressing percentage = dressed weight/live weight x 100. For gut morphometry, 2 birds from each replicate were randomly slaughtered on the last day of the experiment. After that, a small piece was cut from the ileum portion of the small intestine and was used for the morphological measurement as described by Ashiq *et al*. (2023).

A completely randomized design (CRD) was used to assess the experimental data. Analysis of Variance (ANOVA) was performed using software statistics 8.1. The Graph Pad Prism 8 software (San Diego, CA, USA) was used to make histograms.

Results and discussion

Table I shows the effect of the addition of papaya seed on feed intake, weight gain, and FCR. Weekly as well as overall feed intake was not affected. The weight gain during the 2nd and 5th week and overall was not affected but during the 3rd and 4th weeks, a significantly higher weight gain was observed in the 2g/kg diet group. Overall and weekly FCR was not affected except in week 2nd, where a significantly higher FCR was observed in the CON group as compared to the 1 and 3 g/kg diet groups. Mortality was not recorded during the whole experiment. Figure 1 shows the result of the papaya seed effect on dressing percentage. The dressing percentage had a significantly higher value in the 3g/kg diet group than in the CON and 1g/kg diet groups. The results related to the intestinal histomorphology are also presented in Table I. The villus height and crypt depth were ($p<0.05$) higher in the 3g/kg diet group while villus height to crypt depth ratio in the CON group than in the remaining groups. Villus width showed a significantly higher value in the 3g/kg diet group than in the 1g/kg diet group.

The current study indicated that the overall effect of papaya seed-supplemented was calculated as non-significant on feed intake, weight gain, FCR, and mortality. Similarly, Soedji *et al*. (2017) investigated the effect of graded levels of dried pawpaw in pullets and found no significant effect on weight gain and FCR. The findings of the present study is in line with Tamiru *et al*. (2021) who investigated the effects of different concentrations of dried papaya pomace

Table I. Effect of papaya seed on feed intake, weight gain, feed conversion ratio (FCR) and histomorphology of quails.

Parameter	Week	Papaya seed treatment				SEM	P. value
		Control	1g/kg	2g/kg	3g/kg		
Feed intake (g)	2nd	77.81	79.35	79.71	78.52	0.85	0.441
	3rd	106.4	105.7	107.7	107.1	1.14	0.863
	4th	137.2	140.8	139.1	139.5	0.96	0.141
	5th	163.1	159.9	163.4	165.3	0.93	0.582
	Overall	484.7	485.8	489.9	490.5	1.87	0.674
Weight gain (g)	2nd	26.70	27.49	27.48	27.21	0.49	0.671
	3rd	34.56^{b}	36.8^{ab}	37.15^{a}	37.03^{a}	2.51	0.013
	4th	45.19^{b}	47.8^{ab}	48.09^{a}	47.1^{ab}	1.77	0.001
	5th	55.73	54.47	53.79	56.10	0.75	0.181
	Overall	162.2	166.6	166.5	167.5	1.27	0.060
FCR	2nd	2.98	2.93	2.93	2.91	0.92	0.983
	3rd	2.91^{a}	2.88^{b}	2.90^{ab}	2.88^{b}	2.04	0.032
	4th	3.07	2.87	2.89	2.89	0.29	0.161
	5th	3.03	2.96	2.90	2.95	0.63	0.201
	Overall	2.92	3.02	3.03	2.94	0.89	0.072
Mortality	Overall	0.00	0.00	0.00	0.00	0.00	0.000
Histomorphology							
VH(µm)		368.71^{d}	379.6^{c}	388.9^{b}	398.5^{a}	1.19	0.021
VW (µm)		106.1^{ab}	97.12^{b}	105.1^{ab}	109.8^{a}	0.88	0.011
CD (µm		127.81^{d}	132.8^{c}	139.4^{b}	148.7^{a}	1.15	0.083
VH:CD (µm)		2.88^{a}	2.85^{b}	2.78^{c}	2.68^{d}	1.34	0.001

Different superscripts along the row indicate significant difference ($p < 0.05$). VH, Villus height; CD, Crypt depth; VW, Villus width.

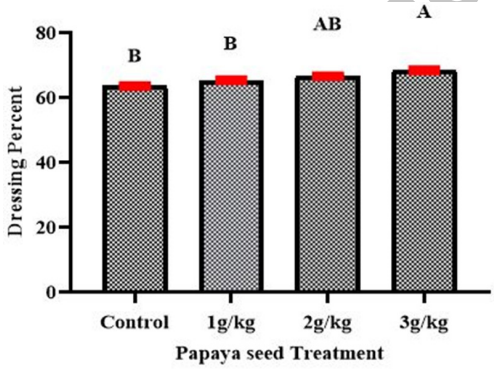

Fig. 1. Effect of papaya seed (*Carica papaya*) in feed on dressing percentage in quails.

meal on different parameters of laying hens and results suggested no significant effect on the feed intake. Similarly, Nideou *et al*. (2017) used different levels of papaya seed to determine its effect on different performance parameters of broilers and the results showed no significant effect on the feed intake. Omidiwura *et al*. (2020) tested the combine effect of *Chromolaena odorata* and pawpaw in broilers and the results suggested no significant effect on the feed conversion ratio. Muazu *et al*. (2020) determined the effect of papaya seed powder at different concentrations on growth performance and serum biochemistry in broilers and found no effect on these parameters. Adegbeye *et al*. (2020) studied the effect of papaya and other herbal plants in different levels on broilers and found no significant effect on performance parameters. Rahimsari *et al*. (2021) performed a study to evaluate the effects of incorporating papaya seed on the quail performance and the result did not show any effect on the FCR. Kusbiyantari *et al*. (2017) also conducted a study to find the effect of papaya leaf extract on the antimicrobial effect and performance parameters of quail and found no effect on egg weight, feed intake, and death rate. Rahmani and Aldebasi (2017) stated that *C.papaya* plays a therapeutic role as an analgesic, antioxidant, antimicrobial, antiulcerogenic, anti-inflammatory, and gastro-protectant effects. The dressing percentage had a significantly higher value in the 3g/kg diet group than in the CON and 1g/kg diet groups and this results are in line with the findings of Bolu *et al*. (2009) who used different concentrations of dried pawpaw levels in broilers and found significant increase in the dressing percentage. Omidiwura *et al*. (2020) also used the combination of *Chromolaena odorata* and pawpaw in broilers and the results suggested a positive response on the gut morphology. Result of the current study on histomorphology coincide with the findings of Adegbeye *et al*. (2020). Similarly, Panzarini *et al*. (2014) described that papaya seed acts as a free radical scavenger protecting the internal mucosa from oxidative stress. Saleh *et al*. (2019) also reported that papaya seed contains different vitamins that act as good antioxidants enhancing the bird's efficiency in preventing oxidative stress.

Conclusion

It is concluded from the current study that papaya seed powder at the level of 3g/Kg in feed does not affect the feed intake, weight gain, FCR, and mortality and enhances significantly the dressing percentage and ileum morphology.

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IRB approval

The experimental work was approved by the Board of Studies (September 2021) conducted at the Department of Poultry Science, The University of Agriculture Peshawar, KP, Pakistan.

Ethical statement

The experiments were approved by the Ethical Committee of the Faculty of Animal Husbandry and Veterinary Sciences, The University of Agriculture Peshawar.

Statement of conflict of interest

The authors have declared no conflict of interest.

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