

RECYCLING OF JAPANESE QUAIL HATCHERY WASTE ON EGG PRODUCTION PERFORMANCE OF QUAIL BREEDERS

A. Sathishkumar¹ and R. Prabakaran²

Department of Poultry Science,
Madras Veterinary College,
Chennai – 600 007.

ABSTRACT

Japanese quail hatchery waste was processed by cooking and drying. Processed Japanese Quail Hatchery Waste (PJQHW) was analysed for its proximate and chemical composition. Mean (\pm S.E.) crude protein, ether extract, crude fibre, ash and NFE contents of PJQHW were 36.24 ± 0.53 , 29.59 ± 0.52 , 0.92 ± 0.01 , 25.16 ± 0.58 and 4.39 ± 0.05 per cent respectively. PJQHW was further found to contain 10.73 ± 0.78 and 0.69 ± 0.01 per cent calcium and phosphorous respectively. Metabolizable energy content of PJQHW was calculated to be 2795.24 kcal/kg. PJQHW was also found to be a good source of amino acids as lysine and methionine were present at 2.20 and 1.03 per cent respectively. A biological experiment was also carried out to study the usefulness of PJQHW as a feed ingredient in Japanese quail breeder ration, replacing fish meal. Mean (\pm S.E.) hen-day egg production (%) in 0, 3, 6 and 9% PJQHW treatments were 90.19 ± 1.77 , 90.09 ± 1.70 , 88.65 ± 1.77 and 88.31 ± 1.89 respectively while overall mean egg weights (g) were 11.89 ± 0.07 , 12.12 ± 0.05 , 11.93 ± 0.06 and 12.09 ± 0.08 . The differences in means for both the parameters were not found to be significant. Incorporation of PJQHW in Japanese quail breeder rations in place of fish meal at different levels did not also influence daily mean feed consumption and feed efficiency per dozen eggs or per kg egg mass indicating a favourable trade-off if PJQHW is available at a comparatively cheaper cost than fish meal.

Key words: Japanese Quail hatchery waste, Recycling, Breeder Ration, Egg Production

In Japanese quail farming, comparatively higher nutritional requirement, poor feed efficiency, short supply of ingredients, increase in prices of most of the feed ingredients result in high cost of production. Fish meal which is the commonest animal protein supplement used in livestock feed could be replaced by animal by-products such as meat meal, blood meal, poultry by-products and hatchery by-product meal (Hazarika and Baruah, 1993) to save on feed cost.

With increase in Japanese quail production, large number of quail hatcheries are established. Hatchability of quail eggs ranges between 50 to 70 per cent in different hatcheries depending on the hatchery practices adopted, age of the birds, collection and storage methods and frequency and time of egg collection etc. In any case, a huge quantity of hatchery waste is discarded adding to the burning problem of environmental pollution.

1 M.V.Sc. Scholar, Department of Poultry Science, Madras Veterinary College, Chennai 600 007 and

2 Director, Centre for Animal Production Studies, Tamil Nadu Veterinary and Animal Sciences University, Madhavaram Milk Colony, Chennai – 600 051. E-Mail: karanmgk@gmail.com

Considering the factors mentioned above, Japanese quail hatchery waste was processed, analysed for proximate composition and a feeding trail was planned to study the usefulness of Processed Japanese Quail Hatchery Waste (PJQHW) as a feed ingredient for Japanese quail breeders by recycling the same.

MATERIALS AND METHODS

Japanese quail hatchery waste was collected from Poultry Research Station, Nandanam after removal of viable chicks. It included shells from hatched eggs, infertile eggs, dead-in-germs, dead-in-shells and dead chicks. It was collected, boiled for 30 mt, hand pressed and dried in hot air oven at $100^{\circ}\text{C} \pm 5^{\circ}$ for 10 h.

The samples from six different hatches were collected, processed and analysed for their proximate and chemical composition as per AOAC (1990). Amino acids composition of the samples was got analysed by oxidation method.

The processed Japanese quail hatchery waste (PJQHW) was incorporated in quail breeder diets at 0, 3, 6 and 9 per cent levels as a replacement for fish meal. The diets were adjusted to be isonitrogenous and isocaloric. For ration formulation, the energy content was calculated utilising prediction equation proposed by Pesti *et al.*, (1986).

The biological trial of six weeks duration was carried out with 384 adult Japanese quails (128 males and 256 females in 1:2 ratio) belonging to the same age (12 weeks), randomly and equally divided into four treatment groups and four replicates within each treatment. The per cent ingredient and nutrient composition of the diets for four treatment groups are furnished in table 1.

The breeders were housed in multi-tier Japanese quail breeder cages and standard feeding and other management practices were followed.

Data on hen-day egg production (%), egg weight (g), feed consumption (g), feed efficiency per dozen eggs and per kg egg mass and livability (%) were collected from 15-20 weeks of age and subjected to analysis of variance as per Snedecor and Cochran (1989).

RESULTS AND DISCUSSION

Proximate and chemical composition of PJQHW is given in table 2. Crude protein content for PJQHW was found to be higher than many other earlier reports on poultry hatchery waste (Panda *et al.*, 1967 and Khan and Bhatti, 2002). As the mean hatchability (%) remains comparatively lower in Japanese quail (about 55% compared to above 85% in chicken), proportionately lower shell percentage and higher levels of infertiles, dead early and late embryos and dead-in-shells might have contributed to higher crude protein level in PJQHW.

Mean ether extract (%) in PJQHW observed in this study was almost equal to those reported by Deshmukh and Patterson (1997) and Rasool *et al.* (1999).

While Kundu *et al.*, (1986) reported comparatively very low total ash content in poultry hatchery waste, Khan and Bhatti (2002) obtained relatively higher values. As the proportion of shell determines total ash content of hatchery waste, variations in per cent hatchability witnessed in those hatcheries might have contributed to the difference.

Most of the earlier reports available on calcium content of poultry hatchery waste (Lilburn *et al.*, 1997 and Khan and Bhatti, 2002) were higher than the mean calcium value of PJQHW obtained in the present study. Relatively poor hatching performance of Japanese quail eggs and consequent lesser shell proportion in hatchery waste might have led to the lower calcium content of PJQHW. Mean phosphorous content of PJQHW was found to be almost similar to those reported in poultry hatchery waste by Khan and Bhatti (2002).

Metabolizable energy content of PJQHW was calculated to be 2795.24 kcal/kg in the present study employing prediction equation of Pesti *et al.*, (1986). As ether extract content of PJQHW was comparatively higher, metabolizable energy content of the same was found to be higher than other protein sources like fish meal and soybean meal.

Amino acid composition (table 3) obtained for PJQHW indicated that the same contained sufficient quantity of all essential amino acids as claimed by Khan and Bhatti (2001) for cooked hatchery waste.

However, lysine and methionine contents of PJQHW were higher than most of the earlier reports for differently processed poultry hatchery waste (Dhaliwal *et al.*, 1998; Rasool *et al.*, 1999 and Khan and Bhatti, 2001).

Mean performance of Japanese quail breeders fed four different experimental diets are given in table 4. Overall mean hen-day egg production (%) for the four dietary treatments indicated that breeder diets with PJQHW upto even 9% (replacing 100% fish meal) did not result in any significant reduction in egg production. Several other authors also made similar observations employing poultry hatchery waste (Dufloth *et al.*, 1987 and Tadtianant *et al.*, 1993) in chicken layers. The findings of this study might also be attributed to the fact that PJQHW had a comparatively good amino acid make-up.

Overall mean egg weight of Japanese quail was found to vary from 11.89 g in 0% PJQHW group to 12.12 g in 3% PJQHW group with the dietary treatments showing no significant influence on the parameters. The finding agreed with those of Tadtianant *et al.* (1993).

Incorporation of PJQHW even upto 9% in Japanese quail breeder rations in place of fish meal

was not found to significantly influence feed consumption. The results showed that PJQHW did not affect palatability. The findings agreed well with Ilian and Salman (1986) while Vandepopuliere *et al.*, (1977) observed that incorporation of broiler hatchery waste resulted in lower feed intake.

Overall mean feed efficiency per dozen eggs and per kg egg mass worked out for different treatments also revealed that inclusion of PJQHW at different levels has not influenced their efficiency of feed conversion. However, it became numerically poorer with increasing levels of PJQHW. Wisman and Beane (1965) and Ilian and Salman (1986) could not observe any significant difference in feed efficiency while incorporating poultry hatchery waste in layer rations at different levels.

Livability (%) was also not influenced by incorporation of PJQHW and infact only one bird died in each of 0, 6 and 9% PJQHW treatment groups during the course of the experiment. The finding reiterated that cooking served as an effective technique for processing of Japanese quail hatchery waste and possibly destroyed all pathogenic microbes in hatchery waste. Chrappa *et al.*, (1986) also observed that mortality was not affected while feeding hatchery waste upto 4 per cent level.

The results indicated that the nutrient composition of PJQHW adequately compensated that of fish meal and hence incorporation of PJQHW in place of fish meal even upto 100% replacement did not influence egg number, egg weight, feed efficiency and per cent livability among Japanese quail breeders.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the facilities provided by the Tamil Nadu Veterinary and Animal Sciences University, Chennai to carry out the study.

Table 1
Composition of the experimental diets

	Treatment			
	0% PJQHW	3% PJQHW	6% PJQHW	9% PJQHW
Ingredient				
Maize	54	53	52	51
Deoiled Rice Bran	6	7	8	9
Soybean Oil Meal	16	16.5	17.0	17.5
Sunflower Oil Cake	8	8	8	8
Fish Meal	9	6	3	0
Hatchery Waste	0	3	6	9
Dicalcium Phosphate	0.25	0.6	0.9	1.3
Shell grit	6.75	5.9	5.1	4.2
Nutrient				
CP* (g/kg)	191.0	190.8	190.6	190.1
ME** (MJ/kg)	11.30	11.33	11.37	11.40
Calcium* (g/kg)	29.90	30.10	30.30	30.60
Available phosphorus ** (g/kg)	4.60	4.5	4.5	4.50
Lysine** (g/kg)	10	9.7	9.3	9.0
Methionine** (g/kg)	3.7	3.6	3.5	3.4

* Analysed values

** Calculated Values

Table 2

Proximate and chemical composition (% Air-dry basis) of processed Japanese quail hatchery waste (PJQHW)

Sl. No.	Nutrient	Percentage
1.	Moisture	3.70 ± 0.07
2.	Crude protein	36.24 ± 0.53
3.	Ether extract	29.59 ± 0.52
4.	Crude fibre	0.92 ± 0.01
5.	Ash	25.16 ± 0.58
6.	NFE	4.39 ± 0.52
7.	Calcium	10.73 ± 0.78
8.	Phosphorous	0.69 ± 0.01
9.	Metabolizable energy* kcal/kg	2795.24

* Calculated

Table 3
Amino acid composition of PJQHW*

Sl. No.	Amino acid	AA % in DM	AA % in CP
1.	Alanine	1.72	5.07
2.	Arginine	1.96	5.78
3.	Aspartic acid	3.26	9.62
4.	Cystine	0.82	2.42
5.	Glutamic acid	4.37	12.89
6.	Glycine	1.46	4.29
7.	Histidine	1.06	3.11
8.	Isoleucine	1.55	4.58
9.	Leucine	2.74	8.09
10.	Lysine	2.20	6.49
11.	Methionine	1.03	3.03
12.	Phenylalanine	1.59	4.69
13.	Proline	1.58	4.65
14.	Serine	2.38	7.02
15.	Threonine	1.81	5.34
16.	Valine	2.00	5.89

* Analytical report obtained from Degussa AG, Feed additives, Applied technologies, D-63403 Hanau, Germany

Table 4
Effect of replacement of fish meal with PJQHW in breeder diets on mean performance (\pm S.E.)

Parameter	Treatment			
	0% PJQHW	3% PJQHW	6% PJQHW	9% PJQHW
Hen-day egg production ^{NS} (%)	90.19 \pm 1.77	90.09 \pm 1.70	88.65 \pm 1.77	88.31 \pm 1.89
Egg weight ^{NS} (g)	11.98 \pm 0.07	12.12 \pm 0.05	11.93 \pm 0.06	12.09 \pm 0.08
Feed consumption ^{NS} (g)	28.75 \pm 0.29	28.79 \pm 0.31	28.90 \pm 0.31	29.08 \pm 0.28
Feed efficiency per dozen eggs ^{NS}	0.383 \pm 0.005	0.389 \pm 0.006	0.390 \pm 0.005	0.396 \pm 0.005
Feed efficiency per kg egg mass ^{NS}	2.69 \pm 0.05	2.65 \pm 0.04	2.73 \pm 0.04	2.74 \pm 0.05

NS : Not Significant (P > 0.05)

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