

EXTERNAL AND INTERNAL EGG QUALITY OF JAPANESE QUAILS (*Coturnix coturnix japonica*) FED DIETS CONTAINING RAW AND BOILED RUBBER (*Hevea brasiliensis*) SEED MEAL

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ABSTRACT

One hundred and eighty, 6 weeks old Japanese quail (*Coturnix coturnix japonica*) hens were used to evaluate the effect of diets containing rubber (*Hevea brasiliensis*) seed meal boiled at varying durations on egg quality characteristics of laying birds. The birds were divided into six dietary treatments of 30 birds, each replicated thrice with 10 birds per replicate in a Completely Randomized Design. The birds were raised in cages measuring 75cm×75cm×60cm and were fed the six dietary treatments formulated to be isonitrogenous and isocaloric (20 % CP, 2700 ME kcal/kg DM). Rubber seed meal was included in the diets at 0 and 20% of raw and those boiled for 30, 40, 50 and 60 minutes representing treatments one to six respectively. The experiment lasted for twenty-one weeks. Feed and water were provided ad libitum. The results showed that diets containing raw seed meal (RSM) and RSM boiled at varying durations had significant ($P<0.05$) effects on egg weight, egg length, egg width, shell percentage, albumen length, albumen height, albumen weight, yolk height, yolk width and yolk percentage across the dietary treatments. It is concluded that diets containing raw RSM and RSM boiled at varying durations had significant ($P<0.05$) effect on the egg quality characteristics of laying quails.

Keywords: Rubber seed, Boiled, Quail hens, Egg quality characteristics

INTRODUCTION

Livestock and poultry farmers, especially those in Nigeria and neighbouring countries are faced with the problems of continual inadequacy of feedstuffs. This has been blamed on the rising needs of man for the same livestock/poultry feedstuffs for his food and industrial raw materials (Duruma *et al.*, 2006). This has led to escalating cost of conventional feedstuffs (maize, soya bean, groundnut, etc.) resulting in feed cost being 70–80 % of the total cost of production and scarce (Akinmutimi, 2007). The result of high demand and rising costs is scarcity; thus, farmers are unable to meet the feed requirements of livestock/poultry. Consequently, they are forced to close their farms or run at a very low capacity (Duruma *et al.*, 2006). The overall effect of the above is shortage of animal production and hence shortage of animal protein intake due to scarcity and high cost of animal products (Akinmutimi, 2007). There is therefore the need to source for an alternative feedstuff that is cheap, readily available and less competed for by man and industry (Akinmutimi, 2004). One of the envisaged alternative feed-stuff is rubber seed (*Hevea brasiliensis*) (Delabarre and Serier, 2000; Sovanno 2002; Iyayi *et al.*, 2008). The rubber tree is cultivated in Nigeria on an estimated 185,000 ha with seed collection of about 10,175 tonnes/year (Njwe *et al.*, 1988). The rubber seed is rich in oil which contributes up to 41.2 % of the total weight (Njwe *et al.*, 1988). Traditionally, rubber seeds were used primarily as planting materials. The present trend towards propagating or selected clones by grafting, however, has led to surplus of

rubber seeds (Agunbiade *et al.*, 1995). Japanese quails are small sized, early maturing, hardy and prolific birds (Robbins, 1981). They come into egg production between the 5th and 6th week of life, but adult plumage is not attained until 12th week of age (Martins *et al.*, 1998). Rubber seed grows abundantly in some states in Nigeria and can be obtained at low cost. It has protein content ranging from 23 to 30 % hence, can be a good alternative protein source. More effort is needed towards the utilization of this novel feedstuff in the Nigerian livestock industry. However, few studies have been found in literature regarding its utilization in poultry diets in Nigeria. This study may help to promote the potential of rubber seed in Nigeria and enhance its utilization in poultry nutrition. This study was therefore, undertaken to assess the dietary effect of raw and rubber seeds boiled at varying durations on egg quality characteristics of laying birds

MATERIALS AND METHODS

Experimental site

The experiment was carried out in the Poultry Unit of the Teaching and Research farm of the Department of Animal Science, Ahmadu Bello University, Zaria. The Departmental farm is located on latitude 11° 11' 06" N and longitude 7° 38' 55" E, at an altitude of 706m above sea level. The temperature of the area ranges between 26-32°C depending on the season while the relative humidity during the dry and wet seasons are 21 and 72% respectively. The wet periods in Zaria are between May and October with annual rainfall of about 1500mm (IAR, 2016).

Collection and processing of rubber seed meal

Rubber seeds (*H. brasiliensis*) Pb 260, Pb 235, GT 1, RRIC 100, Ircw 41, Irca 18, Irca 217 and Irca 230 varieties were collected from Rubber Estate of Nigeria Limited (RENL), AraromiObu rubber plantation in Odigbo Local Government Area of Ondo State and Ovia South-West Local Government Area of Edo State, Nigeria.

Processing of rubber seed samples

Raw rubber seeds

Raw rubber seeds were washed to remove dirty materials and sun dried. It was then dehulled and the nuts sun dried for seven days and stored for four months and subsequently milled to obtain raw rubber seed meal.

Boiling at different time durations

Twenty kilogrammes (20 kg) of raw rubber seeds was poured into a pot containing 50 litres of water at boiling temperature (100 °C) using fire wood as the source of heat. The contents were allowed to boil for 30, 40, 50 and 60 minutes respectively. Each batch of the seeds was drained and each batch of the boiled seeds was sun -dried separately for seven days and stored for four months to further reduce anti-nutrients after which they were milled and used as boiled rubber seed meal for the different boiling durations respectively.

Experimental diets

Quail birds diets were formulated to meet the nutrient requirement of the quails as recommended by NRC (1994). The test ingredient meal were not included in diet of quails in the control treatment (T₁), while raw rubber seed meal was included at 20 % level in treatment (T₂). The rubber seed meal boiled for different durations of 30, 40, 50 and 60 minutes were included at 20 %level represented as T₃, T₄, T₅ and T₆ respectively.



RESULTS AND DISCUSSION

The result of this study is presented in Tables 1 and 2. The result showed a significant ($P < 0.05$) differences in egg weight, egg length, egg width and shell percentage measured across the dietary treatments for the external egg quality parameters evaluated. The significant ($P < 0.05$) differences observed in the external egg quality characteristics of birds agrees with the findings of (Tuleum *et al.*, 2013) who reported that egg mass or weight can be used as criterion in assessment of nutritional quality especially if they are obtained from birds of the same age, breed and health status. The internal egg quality parameters evaluated albumen length, albumen height, albumen weight, yolk height, yolk width and yolk percentage also showed significant ($P < 0.05$) difference across the dietary treatments.

Table 1: External egg characteristics of laying Japanese quails (7-22 weeks) fed diets containing rubber seed meal (RSM) boiled at varying durations

Parameters	T1 (0)	T2 (Raw)	T3 (30mins)	T4 (40mins)	T5 (50mins)	T6 (60mins)	SEM
Egg weight (g)	10.75 ^a	10.05 ^c	10.29 ^b	10.03 ^c	10.19 ^b	10.46 ^b	0.08
Egg length (mm)	20.93 ^a	20.87 ^b	20.88 ^b	20.87 ^b	20.86 ^b	20.90 ^a	0.02
Egg width (mm)	20.25 ^a	20.10 ^b	20.24 ^a	20.18 ^a	20.20 ^a	20.22 ^a	0.05
Shell weight (g)	1.90	1.44	1.55	1.44	1.88	1.88	0.82
Shell thickness (mm)	2.80	2.80	2.80	3.10	3.00	2.90	0.10
Shell Percentage	17.67 ^b	14.33 ^b	15.06 ^b	14.36 ^b	18.45 ^b	27.72 ^a	3.33
Egg shape index (%)	96.75	96.31	96.93	96.69	96.83	96.75	2.62

^{a,b,c} Means along the same row with different superscripts are significantly ($P < 0.05$) different SEM = Standard Error of Means

Table 2: Internal egg characteristics of laying Japanese quails (7-22 weeks) fed diets containing rubber seed meal (RSM) boiled at varying durations

Parameters	T1 (0 RSM)	T2 (Raw RSM)	T3 (30mins)	T4 (40mins)	T5 (50mins)	T6 (60mins)	SEM
Albumen length (mm)	40.10 ^b	38.20 ^c	40.70 ^a	39.90 ^b	40.50 ^b	40.30 ^b	2.80
Albumen height (mm)	2.40 ^a	1.50 ^b	1.60 ^b	1.70 ^b	1.60 ^b	1.60 ^b	0.06
Albumen weight (g)	4.38 ^b	4.82 ^a	4.91 ^a	4.61 ^b	4.73 ^a	4.03 ^c	0.10

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Yolk height (mm)	6.80 ^{ab}	6.60 ^b	6.80 ^{ab}	6.90 ^{ab}	7.10 ^a	6.90 ^{ab}	0.16
Yolk width (mm)	20.06 ^a	10.97 ^b	20.00 ^a	20.02 ^a	20.02 ^a	20.06 ^a	4.14
Yolk weight (g)	3.21	3.08	3.24	3.23	3.23	3.25	0.33
Yolk index	0.87	0.81	0.90	0.94	0.69	0.92	0.28
Yolk percentage (%)	32.00 ^b	32.00 ^b	34.00 ^a	33.00 ^a	33.00 ^a	33.00 ^a	0.10
Haugh unit	75.98	87.13	69.24	70.11	69.93	69.62	4.06

^{a,b,c} = Means along the same row with different superscripts are significantly ($P < 0.05$) different from each other. SEM= Standard error of the mean

However, the result also indicated that inclusion of RSM showed better egg quality characteristics in most of the egg quality parameters measured and this may indicate influenced bioavailability and utilization of nutrients and the diets had no negative effect on the external and internal egg quality characteristics of the quails.

CONCLUSION

From the result of this study, it can be concluded that inclusion of raw RSM and RSM boiled at varying durations in the diets of laying quails had significant effect on their egg quality characteristics. In addition, it is concluded that diets containing raw RSM and RSM boiled at varying durations had significant ($P < 0.05$) effect on the egg quality characteristics of laying quails.

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