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SHORT COMMUNICATION

Effect of Graded Levels of Broken Rice on Egg Quality of White Pekin Ducks during Second Year of laying

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ABSTRACT

A study was conducted to find out the effect of feeding different levels of broken rice (BR) replacing wheat in the diet of White pekin ducks in second year of laying on egg quality parameters. White pekin laying ducks (75; 82 weeks) were divided into five groups; and diets without (BR-0) and with BR, replacing 25 (BR-25), 50 (BR-50), 75 (BR-75) and 100 (BR-100) percent of wheat; were fed for a period of 73 days. There was no significant difference in the egg weight, albumen index, yolk index, Haugh unit, shell thickness (without membrane), percentage of albumen, yolk and shell. The egg shape index was significantly ($P<0.05$) higher in BR-100 than BR-0. The shell thickness with membrane was significantly ($P<0.05$) higher in all the groups fed broken rice than the control group. It can be concluded that wheat can be completely replaced by broken rice in the diets of white Pekin laying ducks during second year of egg production without affecting egg quality.

Key words: Ducks, Egg, Rice, Wheat, White Pekin, Quality

In India, ducks contribute next to chicken, in total egg and bird meat production. Therefore, special emphasis is being given on duck farming to meet the egg and meat requirements of the country. There are many advantages of ducks over chickens, in which laying potential in second year is one of them. White Pekin ducks are used both for egg and meat production. Wheat is used as a source of energy in duck feed (Behera *et al*., 2016). However, in rural areas, farmers prefer to keep ducks in back-yard with supplementation of locally available feed ingredients (Sahoo *et al*., 2014; Swain *et al*., 2018). Broken rice or rice kani is available throughout India and its price is usually lower to that of other cereals (Tyagi *et al.,* 2014). As the cost of wheat is increasing exorbitantly, the locally available broken rice is being preferred by the farmers for feeding their ducks. However, very little literature is available on feeding of broken rice to ducks, particularly in second year of laying. Therefore, a study was conducted to find out the effect of feeding different levels of broken rice replacing wheat on egg quality in White Pekin ducks during second year of laying.

Five iso-nitrogenous and iso-caloric diets were prepared without (BR-0) and with the inclusion of broken rice (BR), replacing 25 (BR-25), 50 (BR-50), 75 (BR-75) and 100 (BR-100), percent of wheat (Table 1). White Pekin laying ducks (n=75; 82 weeks of age) were divided into five groups; each group having three replicates with five ducks per replicate, and were allocated randomly to either of the above five diets for a period of 73 days. All the birds were reared on deep litter system and were fed the respective diets *ad lib.* during the experimental period. Standard management practices were followed and clean drinking water was made available *ad lib.* throughout the experiment. For external egg quality parameters, weight, length and width of the egg were recorded weekly and the egg shape index was calculated. For internal egg quality parameters, percent of albumen, yolk, shell, shell thickness; and length, width and height of albumen and yolk were recorded weekly; and albumen index, yolk index and Haugh unit were calculated. The external egg quality parameters were determined as per the formula of Shultz (1953); while the internal egg quality parameters were calculated as per the formula of Heiman and Carver (1936), Sharp and Powell (1930), Haugh (1937) and Funk (1948). The data were statistically analysed for the test of significance (Snedecor and Cochran 1994).

The chemical compositions of the feeds are

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presented in Table 1. All the diets were iso-nitrogenous (18.33-18.37 %CP) and iso-caloric (2614-2661kcalME/kg). The egg weight (71.33-73.33, g) was similar among the groups (Table 2). Earlier workers (Rath *et al*., 2016; Swain *et al*., 2018) have also reported similar egg weight (72.05-72.52) in White Pekin ducks. However, higher (74.61-74.79 g) and lower egg weights (59.03 g) in White Pekin ducks have also been reported by Swain *et al.* (2018) and Kavitha *et al.* (2017), respectively than the present study. In general, egg weight in ducks is heavier than the chickens; and further, egg weight in White Pekin is higher than the other breeds of ducks, that might be due to their heavier body weight. The egg shape indices in all the BR fed groups (71.03-73.44)

Table 1. Ingredient composition (%) of feeds

Attributes	Diets				
	BR-0	**BR-25**	**BR-50**	**BR-75**	**BR-100**
			Ingredients		
Wheat	55	41	27.5	14	0
Broken rice	0	14	27.5	41	55
Soybean meal	25	26	27.5	29	31
De-oiled rice bran	07	06	4.5	3.0	01
Oyster shell	10	10	10	10	10
Di-calcium phosphate	02	02	02	02	02
Calcite	01	01	01	01	01
Trace minerals	0.5	0.5	0.5	0.5	0.5
DL-methionine	0.2	0.2	0.2	0.2	0.2
Lysine	0.1	0.1	0.1	0.1	0.1
Vitamin AD3B2K	0.025	0.025	0.025	0.025	0.025
Vitamin E and Se	0.03	0.03	0.03	0.03	0.03
Vitamin B Complex	0.025	0.025	0.025	0.025	0.025
Toxin binder	0.15	0.15	0.15	0.15	0.15
Choline chloride	0.15	0.15	0.15	0.15	0.15
Dry matter and nutrient content (%DM)					
Dry Matter	96.63	97.37	98.20	97.84	98.70
Organic Matter	87.63	87.64	87.81	87.79	87.95
Crude Protein	18.36	18.37	18.36	18.33	18.37
Ether Extract	1.45	1.60	1.61	1.57	1.44
Crude Fibre	9.75	9.82	9.67	9.72	9.65
NFE	58.07	57.85	58.17	58.17	58.49
Total Ash	12.37	12.36	12.19	12.21	12.05
Calculated nutrient supply					
Energy (ME, kcal/kg)	2614	2620	2661	2638	2650
Lysine (%)	1.03	1.05	1.07	1.10	1.13
Methionine (%)	0.52	0.53	0.54	0.54	0.55
Ca (%)	4.64	4.64	4.63	4.62	4.61
Available P (%)	0.59	0.59	0.58	0.58	0.58

NFE, nitrogen free extract; ME metabolizable energy

Table 2. Effect of feeding graded levels of broken rice, by replacing wheat on egg quality

Parameters	Treatments					SEM
	BR-0	BR-25	BR-50	BR-75	BR-100	
External egg quality						
Egg weight (g)	71.53	72.51	73.33	72.47	71.33	0.30
Egg shape index	68.97[a]	71.03[ab]	71.16[ab]	71.36[ab]	73.44[b]	0.46
Internal egg quality						
Albumen index	0.12	0.12	0.13	0.13	0.14	<0.01
Yolk index	0.41	0.42	0.43	0.43	0.46	0.01
Haugh Unit	94.15	94.13	94.99	95.34	96.00	0.30
% Albumen weight	51.51	51.33	51.09	51.33	51.21	0.27
% Yolk weight	33.52	33.71	33.97	33.72	33.75	0.12
% Shell weight	14.97	14.96	14.94	14.95	15.03	0.21
Shell thickness with membrane (mm)	0.50[a]	0.52[b]	0.53[b]	0.53[b]	0.53[b]	<0.01
Shell thickness without membrane (mm)	0.43	0.43	0.44	0.44	0.44	<0.01

[a,b]Mean with different superscript in a row differ significantly

were similar; however, the egg shape index in BR-100 group was higher (P<0.05) than the BR-0 (68.97). Egg shape index of 74.36-77.63 (Rath *et al*., 2016); 75.63 (Kavitha *et al*., 2017); and 71.12-72.69 (Swain *et al.*, 2018) have been reported by the earlier workers in White Pekin ducks. There was no difference (P>0.05) in albumen index (0.12-0.14), yolk index (0.41-0.46), and Haugh unit ((94.13-96.00) among the groups. Our findings corroborate well with those of the earlier workers in White Pekin ducks (Rath *et al*., 2016; Kavitha *et al*., 2017; Swain *et al.*, 2018). The egg contents *viz.* percentage of albumen (51.09-51.51), yolk (33.52-33.97) and shell weights (14.94-15.03) were similar among the groups. However, similar albumen weight (50.32-55.10%), but higher yolk weight (34.53-36.87%) and lower shell weight (9.07-13.63%) have been reported by the earlier workers (Rath *et al*., 2016; Swain *et al*., 2018). The CP content of wheat is higher (10.30%) than BR (7.9%) and the comparative amino acid profile of the two cereals reveals that wheat contains higher amount of lysine than BR (0.47 vs 0.42 %) (Singh and Panda, 1996; Panda, 2013). In spite of these, no adverse impact on egg quality parameters was observed, when wheat was replaced completely with BR. It could be explained on the basis that the absolute contribution of cereal grains to the CP (23.68-30.88 %), lysine (20.35-25.24%) and methionine (21.82-23.08%) supply is rather low. Moreover, the rations were balanced to be iso-nitrogenous by adjusting the amount of soybean meal in the ration. The shell thickness (mm) with membrane was higher (P>0.05) in all the groups fed broken rice (0.52-0.53, mm) than the control group (0.50); however, the shell thickness without membrane (0.43-0.44, mm) were similar (P>0.05) among the groups. Lower (0.35-0.47, mm) and higher (0.55-0.56, mm) egg shell thickness have also been recorded in White Pekin ducks (Palanivel and Harikrishnan, 2011; Rath *et al*., 2016; Kavitha *et al*., 2017; Swain *et al.*, 2018). However, egg shell thickness without membrane of 0.46-0.48 mm have been observed by Swain *et al*. (2018), which are very much close to the findings of the present study. The similar shell thickness (without membrane) among the groups indicates that shell thickness was not affected by substitution of wheat with BR, even though wheat contains higher (0.18%) Ca than BR (0.11%); as the contribution of the cereals to total Ca supply was only 1.30-2.2% (Singh and Panda, 1996). Thus, the reduction in absolute Ca supply due to substitution of

wheat was rather meagre to cause any adverse impact on shell formation.

It can be concluded that wheat can be completely replaced by broken rice in the diets of white Pekin laying ducks during second year of egg production without affecting egg quality.

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