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Short Communication

Effect of Feeding Graded Levels of Broken Rice on Nutrients Metabolisability in White Pekin Ducks During Second Year of Laying

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ABSTRACT

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To study the effect of feeding of different levels of broken rice (BR) replacing wheat on various nutrient metabolisability, an experiment was conducted on White Pekin ducks during the second year of laying. Seventy-five white Pekin ducks in the second year of laying (82 wks) were divided into five groups with three replicates in each group, and each replicates having five ducks. Five experimental diets without (BR-0) and with BR, replacing 25 (BR-25), 50 (BR-50), 75 (BR-75) and 100 (BR-100) per cent wheat, were prepared. The diets were offered randomly to the above groups for 73 d. There was a significant ($P<0.05$) difference in DM and OM metabolisability among the groups, being highest in BR-75 (78.87 and 79.59%) and lowest in BR-25 (76.17 and 76.54%); however, the values of all the treatment groups were similar to the control. There was no difference ($P>0.05$) in the metabolisability of CP (67.40-70.09 %) among the groups. The metabolisability of EE was higher ($P<0.05$) in BR-75 (79.41%) than in the other groups (75.22-79.41%). The CF metabolisability (59.57-62.05%) was similar among the groups. There was no difference ($P>0.05$) in the nitrogen balance (g/d), i.e. nitrogen intake (5.56-6.25 g/d); nitrogen outgo (1.74-1.87, g/d); nitrogen balance (3.76-4.38 g/d); among the groups. The nitrogen balance as a percentage of nitrogen intake (67.40-70.09%) was also similar among the groups. It is concluded that wheat can be completely replaced by broken rice in the diets of white Pekin ducks during the second year of laying without affecting the metabolisability of various nutrients.

Keywords: Ducks, Metabolisability, Nutrient, Rice, Wheat, White Pekin

INTRODUCTION

The total production of egg and poultry meat in India is 103.32 billion and 4.06 million tonnes, respectively. The egg production and poultry meat production increased by 8.5% and 7.8% over the previous year. Poultry contributes about 50% of the total

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meat production, and duck contributes 1.15% of the total egg production of the country (Anonymous, 2019). However, the contribution of ducks for egg and poultry meat production is next to the chicken. Out of various advantages of duck rearing over chickens such as large-sized eggs, early morning egg-laying, hardiness to diseases, suitable to integrated farming, survivability in moist land, suitable for backyard farming, easily tamed, etc.; the long production year, particularly laying potential of ducks in the second year is critical. Therefore, exceptional importance is being provided to duck farming. Although, white Pekin ducks can be used both for egg and meat production. Backyard farming of ducks with supplementation of locally available feed ingredients are prevalent in rural areas (Sahoo *et al.*, 2014; Swain *et al.*, 2018; Naik *et al.*, 2020a,b). Broken rice or rice kani is a predominant locally available feed ingredient in coastal areas of the country.

Further, as the cost of wheat is increasing significantly, duck farmers prefer to use locally available broken rice in place of wheat grain for feeding their birds. However, the availability of information on feeding broken rice to ducks, particularly in the second year of laying, is very scanty. Therefore, a study was conducted to determine the effect of feeding graded levels of broken rice replacing wheat on various nutrient metabolisability in white Pekin ducks during the second year of laying.

MATERIALS AND METHODS

Seventy-five numbers of white Pekin ducks in the second year of laying (82 weeks) were divided into five groups with three replicates in each group, and each replicate has five ducks. Five experimental diets without (BR-0) and with BR, replacing 25 (BR-25), 50 (BR-50), 75 (BR-75) and 100 (BR-100) per cent wheat were prepared (Table 1). The above diets were offered randomly to the above groups, as per the suggested practical levels of nutrient requirements for 73 d (Singh and Panda, 1996). During the experiment, the ducks were on deep litter system and fed the respective diets *ad libitum* during experimental period following standard management practices and availability of clean drinking water.

At the end of the feeding trial, a metabolism trial of a 4-d collection period was conducted by keeping the birds in individual cages. A known quantity of feed was offered to each bird daily, and faeces voided over 24 h periods were collected quantitatively. On a daily basis, aliquots of excreta were collected separately after mixing it well for dry matter and nitrogen estimations. For dry matter estimations, the faecal samples were dried in a hot air oven at 70°C for 72 h (Sahoo *et al.*, 2014). For faecal nitrogen estimations, samples were preserved in 25% sulphuric acid in duplicate (Pathak and Kamra, 1999). The samples of feeds, residues and faeces were analyzed for proximate principles following standard procedures (AOAC, 1995). The metabolisability of the nutrients was calculated as the difference between nutrient intake and nutrient voided. The data were statistically analyzed for the test of significance (Snedecor and Cochran, 1994).

Table 1. Ingredient composition (%) of feeds

Feed ingredient	Diets†				
	BR-0	BR-25	BR-50	BR-75	BR-100
Wheat	55	41	27.5	14	0
Broken rice	0	14	27.5	41	55
Soybean meal	25	26	27.5	29	31
Deoiled 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 A D_3 B_2 K	0.025	0.025	0.025	0.025	0.025
Vitamin E-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

†Diets formulated to contain broken rice at 0 (BR-0), 25 (BR-25), 50 (BR-50), 75 (BR-75) and 100 (BR-100) per cent of wheat in the basal diet

RESULTS AND DISCUSSION

The chemical compositions of the feeds are presented in Table 2. All the diets were iso-nitrogenous (18.33-18.37% CP) and iso-caloric (2614-2661 kcal ME /kg). There was a significant ($P<0.05$) difference in DM and OM metabolisability among the groups (Table 3); being highest in BR-75 (78.87 and 79.59) and lowest in BR-25 (76.17 and 76.54); however, the values of all the treatment groups (76.17-78.87 and 79.59-76.54) were similar to the control (76.36 and 76.45). Earlier workers (Joshi *et al.*, 2015) reported similar DM metabolisability (75.46-79.38) in Khaki Campbell ducks. However, lower DM metabolisability of 72.99-75.38 and 74.91-75.78 in white Pekin and Khaki Campbell have also been reported by Sahoo *et al.* (2014) and Mohanty *et al.* (2015), respectively. The OM metabolisability observed in this experiment was similar to the findings of Sahoo *et al.* (2014) (77.29-80.78) and Mohanty *et al.* (2015) (78.50-79.88); however, the values were lower than the observations (80.67-83.79) of Joshi *et al.* (2015). There was no difference ($P>0.05$) in the metabolisability of CP (67.40-70.09) among the groups, which are close to the findings (67.26-70.73) of earlier workers (Sahoo *et al.*, 2014). The metabolisability of EE was higher ($P<0.05$) in BR-75 (79.41) than in the other groups (75.22-79.41), which were similar. Sahoo *et al.* (2014) and Joshi *et al.* (2015) observed lower EE metabolisability (50.66-61.18), and Mohanty *et al.* (2015) observed higher EE metabolisability (76.74-83.78) than the findings of the present study. The CF

Table 2. Chemical composition (on % DM basis) of feeds

Feed ingredient	Diets†				
	BR-0	BR-25	BR-50	BR-75	BR-100
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
Nitrogen-free extract	58.07	57.85	58.17	58.17	58.49
Total ash	12.37	12.36	12.19	12.21	12.05
Calculated					
ME (kcal/kg)	2614	2620	2661	2638	2650
Lysine	1.06	1.07	1.09	1.11	1.14
Methionine	0.46	0.48	0.51	0.54	0.57

†Diets formulated to contain broken rice at 0 (BR-0), 25 (BR-25), 50 (BR-50), 75 (BR-75) and 100 (BR-100) per cent of wheat in the basal diet

Table 3. Effect of feeding different levels of broken rice replacing wheat on metabolisability of various nutrients and nitrogen balance

Parameters	Dietary groups†					SEM
	BR-0	BR-25	BR-50	BR-75	BR-100	
Metabolisability of nutrients						
Dry matter	76.36^{ab}	76.17^{a}	76.96^{ab}	78.87^{b}	77.15^{ab}	0.39
Organic matter	76.45^{a}	76.54^{a}	77.76^{ab}	79.59^{b}	77.84^{ab}	0.40
Crude protein	67.64	67.40	68.23	70.09	68.77	0.50
Ether extract	75.22^{a}	77.21^{ab}	75.67^{a}	79.41^{b}	75.72^{a}	0.46
Crude fibre	59.58	59.57	61.03	62.05	60.29	0.60
Nitrogen balance						
N intake (g/d)	5.59	5.56	5.70	6.25	5.60	0.10
N out go (g/d)	1.81	1.80	1.80	1.87	1.74	0.02
N Balance (g/d)	3.78	3.76	3.90	4.38	3.86	0.09
N balance as % of N intake	67.64	67.40	68.23	70.09	68.77	0.50

†Diets formulated to contain broken rice at 0 (BR-0), 25 (BR-25), 50 (BR-50), 75 (BR-75) and 100 (BR-100) per cent of wheat in the basal diet

metabolisability (59.57-62.05) was similar among the groups and was higher than the findings (41.57-51.23) of the earlier workers (Sahoo *et al.*, 2014; Joshi *et al.*, 2015).There was no difference ($P>0.05$) in the nitrogen balance (g/d) i.e. nitrogen intake (5.56-6.25, g/d); nitrogen outgo (1.74-1.87, g/d); nitrogen balance (3.76-4.38, g/d); among the groups. The nitrogen balance as a percentage of nitrogen intake (67.40-70.09) was also similar among the groups. Earlier workers (Sahoo *et al.*, 2014; Joshi *et al.*, 2015) have reported nitrogen balance as g/d and percent of N intake as 2.35-

4.22 g/d and 74.45-79.16, respectively, in ducks. Earlier, it was reported that the complete replacement of wheat by broken rice in the diets of white Pekin ducks during the second year of egg production had no effect on the egg quality and blood biochemical parameters (Naik *et al.*, 2020a,b).

It is concluded that wheat can be entirely replaced by broken rice in the diets of white Pekin ducks during the second year of laying without affecting the metabolisability of various nutrients.

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