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308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

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Chemical Composition of Crop Contents of Local Scavenging Chickens

Mahbubur Rashid, Bibek Chandra Roy and Asaduzzaman
Department of Livestock Services, Krishi Khamar Sharak, Framgate, Dhaka, Bangladesh
E-mail: rashidbd@hotmail.com

Abstract: The study assessed the chemical compositions of the crop contents of local chickens. A total of 70 local scavenging chickens (35 layers and 35 growers) were collected from rural areas of Bangladesh and were sacrificed. After dissection of the crops, the contents were dried under sunshine and ground and the ground contents of each crop were chemically analyzed. The mean weight of dried crop contents was 19.9±4.56 g for layer and 13.4±2.62 g for grower. The mean dry matter (DM) percentage of crop contents was 45.5±7.40 for layer and 48.9±7.06 for growers. The mean (% of DM) crude protein (CP), ether extract (EE), crude fibre (CF), ash, nitrogen-free-extract (NFE), calcium (Ca) and total phosphorus (P) of the crop contents were 11.7±2.53, 2.07±0.954, 6.04±2.98, 12.4±5.51, 68.3±7.80, 1.32±0.793 and 0.459±0.177, respectively for layers and were 9.89±1.59, 2.11±2.21, 6.40±4.30, 12.3±6.71, 69.3±7.95, 0.761±0.406 and 0.336±0.200, respectively for growers. The calculated metabolizable energy (ME) was 2781±336 and 2755±441 kcal/kg DM for layers and growers, respectively. Crude protein, Ca and P contents were significantly higher ($P<0.01$) in layers compared to growers, but other nutrients did not vary significantly. The concentrations of chemical components of feeds scavenged by local chickens were less than the recommended nutritional levels, which varied with type of chicken.

Key words: Crop contents, chemical composition, local chickens, nutrients, layer

Introduction

In Bangladesh, the chickens are indigenous smallholder flocks and they constitute more than 70% of the country's chicken population (Huque and Paul, 2001). The major feed sources for village chickens are earthworms, insects, seeds, green leaves and other plant materials found in household yards. The nutrients available to local scavenging chickens are generally deficient and their availability vary to some extent with the type of the bird as observed by Mwalusanya *et al.* (2002) in Ethiopia. If the capacity of the scavenging feed resource base (SFRB) and the seasonal variations are known, more efficient strategies for production of scavenging chickens can be developed. However, for better production of the local and locally adapted crossbred chickens, feed supplementation should be considered according to the probable nutrient requirements of the birds and what the birds get from the scavenging sources. Therefore, accurate estimation of the quantity of available feed and nutrients intake by the scavenging village chickens are important prerequisites for improving feeding systems and management (Ajuyah, 1999). Thus, the present study was carried out to assess the chemical composition of crop contents of scavenging local chickens.

Materials and Methods

Preparation of samples: A total of 70 layers and growers, an equal number of each, were randomly purchased from different parts of the villages of Mithapukur in Bangladesh for collection of crop contents. The hens had to go through at least one laying cycle, while growers were of mixed sex (3 to 5 months age). Thirty-five hens and thirty-five growers were collected directly from the houses at evening between 5.00 p.m. and 7.00 p.m. They were then slaughtered on the spot and were immediately carried to the Laboratory. Each bird was eviscerated, its crop opened and the feed items found in the crop of the individual bird were dried under sunshine and were ground.

Chemical analysis: The individually ground crop contents were analyzed for the proximate components-dry matter (DM), crude protein (CP), ether extract (EE), crude fibre (CF) and ash, according to AOAC (1990) procedures. Calcium (Ca) and total phosphorus (P) were determined by atomic absorption and spectrophotometry, respectively (FAO, 1980). True metabolizable energy (TME) of the crop contents was determined by using the formula of Wiseman (1987). Metabolizable energy (ME) was determined on the basis of TME contents assuming that TME was 8% higher than the ME as TME is 5-10% higher than ME (Wiseman, 1987).

Statistical analysis: Descriptive analysis was performed using mean and standard deviation for each outcome variable. The data were analyzed by General Linear Models procedure of SAS (1999), based on the following statistical model: $Y_{ij} = \mu + T_i + E_{ij}$
where Y_{ij} is an observation for a given variable; μ is the general mean common to all observations; T_i is the

Table 1: List of feed ingredients/items found in crop contents of scavenging local chickens

Categories	Feed items/Ingredients
Grains	Paddy, rice, broken rice, maize and seeds of grasses and fruits etc.
Kitchen wastes	Cooked rice, vegetable trimmings and stump, egg shell, stomach and scale of fish, cooked pulse, rich bran etc.
Green forages	Grasses, green leaves of vegetables, herbs, plant materials etc.
Others	Small snail, earthworm, ants, flies, cockroach, feather, hair, polythene, paper products, piece of glass and brick, Sand and unidentified ingredients

Table 2: Average body weight and weight of oven dried crop contents of chicken (N=35/group)

Parameters	Type of chicken	
	Layer	Grower
Average body weight (g)	1095±175	622±98
Weight of oven dried crop contents (g)	19.9±4.56	13.4±2.62

effect due to ith type of chicken (i = 1,2); E_{ij} represents random effects peculiar to each observation. A 5% significant level was used.

Results

The feed ingredients found in crop contents have been shown in Table 1. The main components of the crop contents were categorized visually into cereal grains, kitchen wastes, green forages and others. These categories of crop contents varied considerably between the individual birds. The cooked rice formed higher proportion of the kitchen wastes of the chicken crops and the whole paddy was observed as a major grain in the chicken crops. The mean weight of dried crop contents was 19.9±4.56 g for layer and 13.4±2.62 g for grower (Table 2).

The chemical composition of crop contents varied with type of chicken (Table 3). The mean DM of crop contents was 47.2%. The overall mean chemical compositions (% of DM) of the crop contents were 10.8, 2.09, 6.22, 12.4, 68.8, 1.04 and 0.40 for CP, EE, CF, ash, NFE, Ca and P, respectively and the calculated metabolizable energy content was 2768 kcal/kg DM. The CP, Ca and P contents were significantly higher in layer crop contents compared to grower crop contents. However, the type of chicken had no significant influence on other variables.

Discussion

From visual observation of chicken crop contents, it was evident that scavenged feed was dependent on the availability of feed from surrounding environment and household refuse. The mean weight of dried crop contents of layer and grower were similar to the crop content weight of 20.5 and 14.5 g, respectively, reported by Mwalusanya *et al.* (2002).

The main reason for numerically higher DM content in grower crops might be attributed to the greater content of grains in grower crop contents. In addition, the laying hens generally take more water compared to growers, which may also cause lesser DM percentage in layer crops. The higher content of CP, Ca and P in the layer crop contents could be explained by the information that layers seemed to follow selective feeding, which depends upon nutritional requirements of a particular age group of chickens and their production stage. Since laying hens have higher requirement of CP and Ca than growers to retain egg production (Payne, 1990; NRC, 1994), they are more likely to pick up Ca and protein rich feedstuffs compared to growers to support egg production (Leeson and Summers, 1997).

In this study, the obtained DM, CP, CF, NFE, Ca and P content of layer crop contents were relatively higher to the 43.2, 9.73, 5.52, 65.5, 0.75 and 0.37%, respectively, reported by Mwalusanya *et al.* (2002) in Tanzania, but EE and ash contents were lower in the present study than the results by Mwalusanya *et al.* (2002). Consistent findings to our study with respect to CF, ash, Ca and P in grower crop contents were found by Mwalusanya *et al.* (2002). In Bangladesh, Huque (1999) reported the findings with regard to ash and P in layer crop contents, similar to our results, but CP and EE were lower and CF and Ca content were higher compared to this study.

Similar CP (11.3%) and Ca (1.38%) in layer crop contents and similar CP (9.71%) and CF (6.56%) in grower (6 months of age) crop contents were obtained by Prawirokusumo (1988), when compared with the current results. Dessie (1996) observed moderately consistent results to our study with respect to EE (1.9%). Gunaratne *et al.* (1993) reported the lower CP and higher EE content when compared to the present study. Lower Ca and higher P content were observed by Gunaratne *et al.* (1993) and Dessie (1996). The calculated ME of layer crop contents was similar to the 2844 kcal/kg DM, reported by Dessie (1996), but higher than 2555 and 2280 kcal/kg DM found by Ukil (1992) and Gunaratne *et al.* (1993), respectively.

From the above results, it can be assumed that the feed resource was deficient of CP, Ca and P when taking into consideration the recommended level for chicken diets. The energy of crop contents was lower than NRC (1994) recommended level for both layers and growers, but slightly lower than the recommended level of Payne (1990). It could be concluded that the concentration of the nutrients (except CF) available to the indigenous scavenging chickens under rural environment was

Table 3: Mean chemical composition (dry matter basis) of chicken crop contents summarised by type of chicken (N=35/group)

Chemical composition (%)	Type of chicken		P- value
	Layer	Grower	
Dry matter	45.5 ± 7.40	48.9 ± 7.06	0.0503
Crude protein	11.7 ± 2.53	9.89 ± 1.59	<0.001
Ether extract	2.07 ± 0.954	2.11 ± 2.21	0.927
Crude fibre	6.04 ± 2.98	6.40 ± 4.30	0.686
Ash	12.4 ± 5.51	12.3 ± 6.71	0.972
Nitrogen-free-extract	68.3 ± 7.80	69.3 ± 7.95	0.615
Calcium	1.32 ± 0.793	0.761 ± 0.406	<0.001
Total Phosphorus	0.460 ± 0.178	0.336 ± 0.200	0.008
ME (kcal/kg)	2781 ± 336	2755 ± 441	0.786

below the requirements of grower and layer for optimum performance. Thus, supplementary feeding needs to be required for better performance from local chickens.

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