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RESEARCH ARTICLE

Biochemical Analysis on Blood and Crop Contents of Household Chickens Along With Their Production and Health Status in Bangladesh

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ABSTRACT

This study aimed to assess the biochemical parameters of household chickens at crop and blood levels and measure the body weight. For this purpose, 350 Deshi (local) and 27 Fayoumi day old chicks were reared in 2 separate brooders within a house for 15 days. Body weight, serum total protein and calcium levels of these chicks were evaluated on day 0 and 15. After control house trial, birds were distributed among the selected households. Again, body weights and certain biochemical parameters were assessed from randomly selected birds at 60, 120 and 180 days of age. Fayoumi birds gained higher weight ($P<0.001$) than at control trial, whereas Deshi birds attained better weight ($P<0.001$) at household. Crop contents were dominated by carbohydrate. The level of crude proteins and calcium in crop contents increased along with age regardless of bird types. The average phosphorous in the crop contents was 0.3% (60 days), 2.6% (120) and 0.7% (180) regardless of bird types. Both serum total protein ($P<0.05$) and calcium ($P<0.05$) were significantly difference in between bird types at control house study. In conclusion, Deshi birds attained higher weight at household. The crude protein was below standard. Calcium and Phosphorous levels in the crop contents varied with ages, regardless of bird types.

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INTRODUCTION

Chicken is an important species for human consumption as protein and also plays a major role in poverty alleviation ensuring food security and generating family income at households within substandard management facilities (Mack *et al.*, 2005; Hosseinzadeh *et al*., 2010). Household poultry production system in many developing counties is mainly based on the scavenging indigenous chickens (*Gallus domesticus*). Household poultry have no/minimal health control program; may/may not have shelters and scavenging feed resource base in order to fulfill their nutritional requirements. However, in Bangladesh, the household poultry is still a vital source of eggs and meat production though the rapid growth of commercial poultry enterprise has occupied significant spaces in the last decade (Islam and Jabbar, 2005). Household chickens are fed on kitchen waste and crop residues (Momoh *et al.*, 2010) with minimum home-made feed supplementation and allowed to scavenge around the homestead for forging insects and earth worms, contributing around 60-70% of their feed requirements (Rahman *et al.*, 1997). Household chickens yielded more eggs during crop harvesting periods (Mwalusanya *et al.*, 2002). The major problems of household poultry production include unavailability of breeds, low cost quality feedstuffs, substandard farm management systems and un-access to credit and markets (Hoque *et al.*, 2011).

Proper brooding and nutritional back up in early age of chicks could help in achieving better production. Therefore, a 15 days long control house study was conducted providing commercial balance feed and other management facilities to the trial birds. In many

developing countries household poultry is reared as an integral part of the livestock production systems and obtain most of their required feed ingredients from the environment (Sonaiya and Swan, 2004). Nutrient requirements for household chicken are still under reported though it is essential for increasing household poultry production.

A number of studies have been conducted to identify the factors associated with the production of household chickens and ducks (Sewanyana, *et al.,* 2003; Hoque *et al*., 2010). However, one of those studies has been focused on the nutritional status in crop and gizzard of dead chickens. This study was, therefore, aimed at exploring the nutritional status of live chicken at crop and biochemical composition and body weight at control and household rearing.

MATERIALS AND METHODS

A total of 136 Deshi chicken eggs were purchased from the household farmers. However, only 32 eggs were hatched successfully of which 5 died after hatching. Therefore, 27 a-day-old chicks were used for the experiment. A total of 350-day-old Fayoumi chicks were also purchased from a government poultry farm for the control house study. Both types of chicks were reared for 15 days in 2 separate brooders within a house (10'×10'). Eskavit WS® solution, (Eskayef Pharmaceuticals Ltd®) and *shuzi* (carbohydrate) were offered at *ad libitum* thrice daily (7 am, 12 and 5 pm, respectively) for the first 3 days followed by a commercial broiler starter (Kazi feed®) twice daily (7 am and 4 pm, respectively) for the rest of the rearing days. Chicks of 7-day old were vaccinated with the Baby Chick Ranikhet Disease Vaccine for Newcastle disease.

A 165 days field study was conducted on 37 randomly selected households at 18 East Bakolia, Chittagong, between March-August 2006. The total sampled households were again randomly divided into 2 groups. Group 1 and 2 were formed with 33 households and 4 households, respectively. The uneven household numbers in these groups were based on availability of number of birds prepared in control house trial. Each household belonging to group 1 was supplied with 10 Fayoumi birds, whereas individual household belonging to group 2 was provided with 6 Deshi birds. These households were monitored for 180 days to record the information of mortality, consumption, loss due to different causes, feeding and preventive measures weekly.

Body weight was measured from all chicks at day 0 and 15. Body weight of chicken was taken repeatedly during the household study at 60, 120 and 180 days. Of the chicks, in control house study, randomly selected 5 Deshi and 10 Fayoumi day-old chicks were sacrificed to collect blood samples at day 0. Wing veins were used to collect blood samples from randomly selected 10 chicks from each bird type at day 15. In the field study, blood samples were taken from 10% randomly selected chickens/household at 60, 120 and 180 days followed for measurement of body weight.

Samples obtained from the control house and field studies were brought to the Biochemistry Laboratory, Chittagong Veterinary and Animal Sciences University (CVASU) immediately after collection at control study and within 3-4 hours after collection in the field study. Blood samples were left at 25°C for 1-2 hours followed by storage at 4°C for overnight before serum separation. Serum samples were stored at -80°C until the further testing being performed. Serum samples were subjected to determine serum total protein (STP), calcium (Ca) and phosphorus (P) using a biochemical analyzer (PLD-951/951A/951B) according to the protocol of Randox Laboratories LTD, UK.

Crop contents were collected from 5% of chickens/household at 60, 120 and 180 days by surgical operation as follows. Individual bird was hold horizontally to expose the ventral part downwardly. The ventral part of the crop was washed and cleaned with the cotton soaked with 1% lugol's iodine solution. Anesthesia was performed over the incised area of crop (1″circular block) injecting 2% Lidocaine. A 1/2″ incision was then made with the scalpel to open the crop. Crop contents were collected and placed in a poly bag. The incised area was sutured with the nylon thread after collection of samples. The postoperative medication was followed applying sulphonamide over the incised area. Ciprofloxacin and vitamin AD_3E (Eskayef Pharmaceuticals Ltd) were administered thrice daily for 5 days. A booster dose of Ranikhet Disease Vaccine was injected intramuscularly on day 21 and 60, respectively during the field study.

The crop contents were classified grossly as carbohydrate, protein, mineral sources and kept at -20°C until further analysis. The obtained crop content was sun-dried and ground for chemical analysis. Atomic absorption spectrophotometric procedure was applied to determine Ca and P according to the manufacturer instructions (21 D® Spectrophotometer). The crop contents were analyzed to quantify crude protein (CP) (AOAC, 1990).

Statistical analysis: The data obtained were entered into the MS-2003 program and then exported to STATA 11.0 (STATA Corporation, USA) for data analysis. A descriptive analysis was performed. A "t" test was used to assess the level of significance of body weight, biochemical indices, between bird types.

RESULTS

Body weight: The mean body weight of day old Deshi and Fayoumi chicks were identical ($P<0.39$). The mean body weight of 15 days old chicks differed between bird types ($P<0.001$) (Table 1).The average body weight on day 60 for bird types varied ($P<0.001$). The mean body weight on day 120 for Deshi and Fayoumi chickens differed significantly ($P<0.001$) between bird types (Table 1).

Biochemical parameters of Deshi and Fayoumi day old chicks: The estimated average STP from the blood samples of Deshi was higher (42.3 gm/l) than in Fayoumi (35.5 gm/l) chicks ($P<0.04$). The estimated average Ca levels also differed between Deshi (54.3 mg/d) and Fayoumi (51.9 mg/dl) chicks in this study ($P<0.019$) (Table 2).

Table 1: Mean body weight of day old Fayoumi and Deshi chicks under the control study

Age (Days)	Deshi		Fayoumi		P Value
	N	Mean (95% CI)	N	Mean (95% CI)	
0	27	24.8 (23-26)	50	25.0 (24-26)	<0.001
15	22	85.7 (79-92)	100	108.0 (105-111)	<0.001
60	49	259.3 (256-262)	12	342.8 (329-356)	<0.001
120	71	525.7 (522-529)	12	812.8 (776-849)	<0.001
180	52	970.4 (629-131)	7	1025.0 (888-1162)	<0.001

Table 2: Biochemical parameters and crop contents of household chickens at different days of rearing

Parameter	Experimental Days (Mean±SD)		
	60	120	180
Serum			
SerumTotal Protein (g/l)	49.5±6.0	53.6±8.2	55.4±9.2
Calcium (mg/dl)	13.0± 3.10	10.0±3.0	10.1±3.1
Phosphorus (mg/dl)	Not evaluated	6.1±1.4	6.0±1.3
Chemical of crop contents			
Crude Protein (%)	9.0±0.7	10.9±2.2	11.9±2.9
Calcium (%)	0.4±0.1	1.7±1.3	2.5±2.1
Phosphorus (%)	0.3±0.2	2.6±0.6	0.6±0.6
Crude crop contents			
Carbohydrate	98.7±2.0	97.1±4.1	90.3±2.8
Protein	1.1±1.9	0.4±1.3	7.1±1.7
Vegetables, grit etc	0.2±0.6	2.5±4.1	2.6±1.9

Supplemental feeds, biochemical parameters and crop contents of household chickens at different days of rearing: Farmers reported chickens were provided with different cereal grains (Cooked rice, rice gruel and paddy) and their by-products (Rice polish and wheat bran) and animal proteins (Fish and poultry by products) as supplemental feeds. Gross examination of crop contents revealed grain (Paddy, boiled and uncooked rice and wheat), grain by products (Rice polish and rice husk), animal proteins (Insects, crab's legs and poultry meat) vegetable proteins (duck weed), green forages (Green grass, leaves and vegetables), minerals (grid) and others includes (Ant, poultry feathers and poultry offal). The crop contents were classified grossly into 3 groups (Table 2). On chemical evaluation percentage distribution of CP, Ca and P and biochemical parameters were shown in Table 2.

Population loss: Initial average flock size with Deshi or Fayoumi chickens /household started with 9.9 (N=37) and ended up 3.1 (N=19). Loss of chickens due to mortality was the highest (average 3.2) during 60 days of rearing followed by 3.1 during 61-120 days. Loss due to predation was average 0.5 during 60 days, 3.5 during 61-120 days and 0.5 during 121-180 days. Untimely slaughtering was 0.4 and 0.5 chickens during 60 days and 121-180 days, respectively.

DISCUSSION

Fayoumi chicks attained higher body weight as compared to Deshi chicks under the control study which could be due to adaptability of Fayoumi chicken in intensive rearing. However, Deshi chickens achieved better body weight than Fayoumi irrespective of age under the household study which coincide to the previous findings (Gunaratne *et al.,* 1993). This result could be due to adaptability of Deshi chicken with a suitable genetic back up (Malago and Baitilwake, 2009) and better utilization of nutrients.

The STP of Deshi and Fayoumi birds in the household study is higher as compared to the findings of (Mutayoba *et al.,* 2011). Among the biochemical indices Ca content in 60 days aged chicken's blood sera was higher than the older chicks. The below standard level of serum Ca in this study could be due to insufficient absorption from the intestine.

The results of crop contents in this study represent the availability of scavenging feed around the homestead (Table 2). Scavenging feed resources depend upon the availability of feeds around the homestead (Roberts, 1999). During scavenging period the birds usually scavenge on insects, earthworm, residual grain etc.

Gross analysis of crop ingredients showed that carbohydrate content decreased when age of chickens increased, whereas protein content increased along the increasing age of chickens. However, the level of protein is not the optimum level as required. Although CP is increased with the age of chicks, the level of CP is not optimum as required for growth of chicks at the early age. This result indicates that protein rich supplementary feed is necessary in growing period of chicken. The level of CP and Ca in crop contents increased with the increase of chicken age in this study. A similar CP level was reported in crop contents previously (Roberts, 1997). The Ca (0.4%) and P (0.3%), respectively were previously estimated in the crop contents which are similar to our estimated values of Ca and P. Bird loss due to different causes in this study corresponds to earlier studies (Biswas *et al.,* 2008; Hoque *et al.,* 2011).

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