



ORIGINAL RESEARCH ARTICLE

OPEN ACCESS

## MORPHOMETRIC, PRODUCTIVE AND REPRODUCTIVE TRAITS OF INDIAN PEAFOWL (*PAVOCRISTATUS*) IN BANGLADESH

Md. Mowdudul Hasan Talha<sup>1</sup>, Md. Mohan Mia<sup>3</sup>, Jannatul Mawa Momu<sup>2</sup>, Mamun Ur Rahman<sup>3</sup>,  
Mustaq Ahmad<sup>3</sup>, Maffuz Rahman Adnan<sup>4</sup>, Alimul Razee<sup>5</sup>, Md. Aktaruzzaman<sup>1</sup>,  
Md. Nazmul Haque<sup>3</sup> and Bashudeb Paul<sup>\*6</sup>

<sup>1</sup>Department of Pharmacology and Toxicology, Sylhet Agricultural University, Sylhet-3100, Bangladesh

<sup>2</sup>Department of Animal Nutrition, Sylhet Agricultural University, Sylhet-3100, Bangladesh

<sup>3</sup>Department of Pathology, Sylhet Agricultural University, Sylhet-3100, Bangladesh

<sup>4</sup>Department of Genetics and Animal Breeding, Sylhet Agricultural University, Sylhet-3100, Bangladesh

<sup>5</sup>Sheikh Russell Aviary and Ecopark, Chittagong, Bangladesh

<sup>6</sup>Department of Anatomy and Histology, Sylhet Agricultural University, Sylhet-3100, Bangladesh

### ARTICLE INFO

#### Article History:

Received 16<sup>th</sup> November, 2017  
Received in revised form  
20<sup>th</sup> December, 2017  
Accepted 23<sup>rd</sup> January, 2018  
Published online 28<sup>th</sup> February, 2018

#### Key Words:

Indian Peafowl,  
Morphometric Traits,  
Reproductive Performance.

### ABSTRACT

The study was aimed to know the morphometric traits, productive and reproductive performance of Indian peafowl populations in Bangladesh. The research was conducted at Sheikh Rashed Aviary and Eco-park, Rangunia, Chittagong and encompassed about 20 Indian peafowls (10 blue and 10 white birds). Least-Square Mean $\pm$ SE of body length, wingspan, shank length, beak length, head length, neck length, crown feather length, flight feather length, and tail feather length of mature peafowl were 71 $\pm$ 0.98, 102 $\pm$ 1.99, 10.94 $\pm$ 0.31, 3.99 $\pm$ 0.04, 5.545 $\pm$ 0.05, 19.29 $\pm$ 0.40, 5.79 $\pm$ 0.05, 32.29 $\pm$ 0.53 and 39.07 $\pm$ 2.99 cm, respectively. Males scored significantly ( $p < 0.01$ ) higher than their female counterparts for all morphometric traits except crown feather length. The body weight of Indian peafowl at day old, 1-week, 2-week, 6-month and 3-years of age were 61.85 $\pm$ 0.44gm, 82.40 $\pm$ 0.56gm, 105.75 $\pm$ 1.14gm, 2.19 $\pm$ 0.1 kg and 4.59 $\pm$ 0.25kg, respectively. Males were significantly ( $p < 0.01$ ) heavier than female in all age groups. Egg weight, egg length, egg width, incubation period, clutch size, and age at first egg were 104.85 $\pm$ 21.93gm, 7.34 $\pm$ 0.19cm, 5.71 $\pm$ 0.06cm, 29.4 $\pm$ 0.13 days, 9.30 $\pm$ 0.10 and 744.20 $\pm$ 0.96 days, respectively. The egg weight and egg length of Indian blue type were significantly higher ( $p < 0.01$ ) than those of Indian white type. This study provides a benchmark for the morphometric traits and performance of peafowl in Bangladesh.

Copyright © 2018, Md. Mowdudul Hasan Talha et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Md. Mowdudul Hasan Talha, Md. Mohan Mia, Jannatul Mawa Momu et al. 2018. "Morphometric, productive and reproductive traits of Indian peafowl (*Pavo cristatus*) in Bangladesh", *International Journal of Development Research*, 8, (02), 19039-19043.

### INTRODUCTION

Indian peafowl (*Pavocristatus*) belongs to the family Phasianidae (commonly called as pheasant), order Galliformes and the genus is *Pavo* (Ali and Ripley, 1989). Presently three species of peafowl are found in the world, i.e., Burmese peafowl from eastwards to Sumatra, African peafowl in Belgian Congo and Indian peafowl or blue peafowl in Indian subcontinent (Dharmakumarsinhji and Lavkumar, 1981).

\*Corresponding author: Bashudeb Paul,  
Department of Anatomy and Histology, Sylhet Agricultural University, Sylhet-3100, Bangladesh.

The Indian peafowl is the largest among all the pheasants and known as the national bird of India (Ali and Ripley, 1989). They are polygamous and generally have two to three breeding peahens in its harem (Roberts, 1992). Peafowl breeds from April through October (Mushtaq et al., 2012). Peacocks (males) are known for their highly elaborate train feathers, displayed during courtship and assessed by peahens (females) during mate choice (Dakin and Montgomerie, 2011). Males has metallic blue color on the crown, the feathers of the head are short and curled (Blanford, 1898) and iridescent blue neck and breast. There are patches of bare white skin on the face and a thin crest topped with dark blue or black tufts.

The wings are coppery or barred buff and black in color, and the tail color is brown but seldom seen except outside the breeding season. Iridescent green scale-like feathers looks bright on the upper back and these entire feathers end with an elaborate eye-spot. Some of the outer feathers lack the spot and end in a crescent shaped black tip. Underside has dark glossy green shading into blackish under the tail. Thighs are buff colored. Male has a structure called spur on the leg above the hind toe (Blanford, 1898). The adult peahen has a rufous-brown head with a crest as in the male but the tips of chestnut edge are green. The upper body is brownish in color with pale mottling. The color of primary, secondary tail feathers are dark brown. Under parts are whitish in color (Whistler and Hugh, 1949). Downy young has a pale buff color with a brown mark on the nape which connects with the eyes (Baker, 1928). Young male birds may look like females but the wings are chestnut colored (Baker, 1928). Large body size, brilliantly ornamented plumage, and long train feathers made them the most attractive birds of the subcontinent. Though their size, color and shape of crest make them unique within their distribution range, there is no published data on the morphometry of Indian peafowl.

Phenotypic and genotypic status of any species is essential to formulate the conservation and genetic improvement strategies for the given animal and for that animal characterization is important (Mbap, 2000). The future utilization of genetic resource depends on breed characterization (FAO, 2010). In essence, phenotypic and molecular characterizations of Animal Genetic Resources are used to measure and describe genetic diversity as a basis for understanding and utilizing them sustainably. To conserve these species and ensure sustainable use of their genetic diversity, it is important to evaluate their phenotypic characteristics and performance under traditional management conditions (Zarate, 1996). But unfortunately, no remarkable effort has yet been taken to characterize Indian peafowl. Considering the above facts and circumstances, the present study was designed to identify, characterize and describe the phenotypic variation of Indian peafowl populations in Bangladesh.

## MATERIALS AND METHODS

The study was conducted from July, 2016 to June 2017 at Sheikh Rashel Aviary and Eco-park, Rangunia, Chittagong under the control of Chittagong South Forest Division. The study area was selected on the basis of the availability of peafowl, as peafowl rearing in Bangladesh is privately prohibited by Governments of the People's Republic of Bangladesh (Wildlife preservation act, 1973). A total of 20 mature Indian peafowl of 3 years old (10 blue and 10 white) and 12 peachicks just after hatching (6 blue and 6 white) taking equal number from both sexes were selected in that study. Although white peafowl were not considered as a distinct species as they were only found in captive condition due to selective breeding. They can be differed from albino peafowl only at eye color, where albino peafowl has pink and white peafowl has blue colored eye, respectively. The Indian peafowl were reared in captive condition and the birds were restrained physically. The different morphological characteristics including the body weight of the peachicks were measured and recorded on day 1, 1-week, 2-week and 6-month, and the same was recorded from the mature counterpart. External marks were used to identify the peafowl.

The reproductive traits were recorded from peahens. Body length, wing span, beak length, head length, shank length and egg size (length and width) were measured with measuring scale and slide calipers. Egg weight was measured with digital balance. Incubation period was calculated from the day of setting into incubator to hatching. The incubator temperature was 100.5°F. During the time of setting (0-26 days) humidity was 58-62% which raised to 66-75% during hatching. The color of the feather at different regions of the body, beak, skin, shank, eye, eyelid and eggs were recorded carefully. The data generated from this experiment were entered in Microsoft Excel worksheet, organized and processed for further analysis. Mean, standard errors (SE) and correlations were estimated with the help of Statistical Analysis System (SAS, 1998).

## RESULTS AND DISCUSSION

### Morphometric characteristics

Least-squares means with standard errors (LSMean±SE) of body length (without tail part), wing span, shank length, beak length, head length, neck length, crown feather length, flight feather length, and tail feather length of mature Indian peafowl were presented in Table 1. Males were significantly higher ( $p<0.01$ ) compared with their female counterparts in all parameters except the crown feather. No significant difference was found between blue and white.

### Productive performance

LSMean±SE of the body weight of day old, 1-week, 2-week, 6-month and 3-year (mature weight) old peafowl are shown in Table 2. Males were significantly heavier ( $p<0.01$ ) than females in all age groups.

### Reproductive performance

LSM±SE of egg weight, egg length, egg width, incubation period, clutch size and age at first egg of Indian peafowl are given in Table 3.

### Phenotypic correlation

The phenotypic correlation among body length, wing span, shank length, beak length, head length and body weight of mature Indian peafowl are provided in Table 4. The highest correlation was found between wing span and body weight. The lowest correlation was found between shank length and beak length. All of the correlations were positive and low to high in magnitude. The phenotypic correlation among body weights at different ages of Indian peafowl are set out in Table 5. Phenotypic correlations among body weights at different ages were positive and moderate to high in magnitude. The larger relationships were found between chronologically adjacent weights. The phenotypic correlation of body weight of day old peachicks with the body weights at subsequent ages ranged from medium to high positive. The magnitude of this correlation declined with age. The phenotypic correlation of body weight at 6-month of age with the body weights at subsequent ages ranged from medium to high positive. The phenotypic correlation among egg weight, egg length, egg width and incubation period of Indian peafowl are summarized in Table 6. The phenotypic correlation among egg weight, egg length, egg width and incubation period ranged from slightly positive to high positive.

**Table 1. LS Mean±SE of morphometric characteristics of mature Indian Peafowl according to sex and color type**

Factors		BDL (cm)	WS (cm)	SL (cm)	BL (cm)	HL (cm)	N L (cm)	CFL (cm)	FFL (cm)	TFL (cm)
SEX	MALE	80.27±0.87	110.84±0.59	12.27±0.12	3.41±0.20	5.62±0.10	20.41±0.12	5.60±0.04	34.45±0.05	140.7±0.03
	FEMALE	62.85±0.87	93.82±0.59	9.61±0.12	3.08±0.10	5.47±0.20	18.17±0.13	5.98±0.30	30.14±0.04	39.39±0.03
Level of significance		**	**	**	*	**	*	*	*	**
TYPE	BLUE	71.67±0.87	102.40±0.59	10.98±0.12	3.35±0.60	5.54±0.82	19.33±0.60	5.77±0.06	32.32±0.77	90.18±16.88
	WHITE	71.45±0.87	102.26±0.59	10.90±0.12	3.30±0.60	5.51±0.82	19.25±0.58	5.81±0.07	32.27±0.76	89.27±16.95
Level of significance		NS	NS	NS	NS	NS	NS	NS	NS	NS

BDL, body length; WS, wing span; SL, shank length; BL, beak length; HL, head length; NC, neck length; CFL, crown feather length; FFL, flight feather length; TFL, Tail feather length. NS, not significant; \*\*, p<0.01.; \*, p<0.05.

**Table 2. LS Mean± SE of body weights of Indian peafowl according to sex and color type**

Factors		Day old (gm)	1-week (gm)	2-week (gm)	6-month (kg)	Matured (kg)
Sex	Male	62.90±0.24	84.50±0.10	110.50±0.50	2.67±0.04	5.66±0.34
	Female	60.80±0.24	80.30±0.10	101.00±0.50	1.70±0.03	3.52±0.34
Level of significance		**	**	**	**	**
Type	Blue	62.20±0.52	83.1±0.36	105.8±0.53	2.19±0.02	4.61±0.08
	White	61.00±0.52	81.7±0.36	105.7±0.53	2.16±0.02	4.58±0.08
Level of significance		NS	NS	NS	NS	NS

NS, not significant

\*\* , p<0.01.

**Table 3. LS Mean± SE of reproductive characteristics according to color type**

Parameters	Blue type	White type	Level of significance
EWT (cm)	115.2±2.0	94.10±0.95	**
EL (cm)	7.75±0.21	6.94±0.21	**
EW (cm)	5.69±0.02	5.74±0.02	NS
IP (days)	29.30±0.15	29.50±0.15	NS
CS (no.)	9.40±0.10	9.20±0.10	NS
AFE (days)	739.30±2.05	749.10±2.00	NS

EWT, egg weight; EL, egg length; EW, egg width; IP, incubation period; CS, clutch size;

AFE, age at first egg.

NS, not significant; \*\*, p<0.01.; \*, p<0.05.

**Table 4. Phenotypic correlation among body length, wing span, shank length, beak length, head length and body weight of mature Indian peafowl**

Parameters	BDL	WS	SL	BL	HL	BW
BDL						
WS	0.94					
SL	0.92	0.95				
BL	0.62	0.58	0.42			
HL	0.82	0.82	0.85	0.43		
BW	0.93	0.97	0.96	0.53	0.80	

BDL, body length; WS, wing span; SL, shank length; BL, beak length; HL, head length; BW, body weight.

**Table 5. Phenotypic correlation among body weights at different ages of Indian peafowl**

Body weights	Day old	1-week	2-week	6-month	Matured
Day old					
1-week	0.40				
2-week	0.62	0.72			
6-month	0.47	0.86	0.92		
Matured	0.51	0.84	0.95	0.96	

Lowest negligible correlation was found between egg weight and incubation period. Very high phenotypic correlation was observed in egg weight and egg length.

**DISCUSSION**

The body length of Indian peafowl obtained in this study was lower than the findings of Ali and Ripley (1983). This may be due to differences in breed and agro ecological area (Islam *et al*, 2016). The wing span of peafowl obtained in this study was more closely related to the findings of Ramesh and McGowan (2009) where they found wing span ranges from 110-120 cm.

There are a number of biological factors influencing wing span which also influence the feather length, e.g. sex, age, population, abrasion of the feathers, moult and differences between years (Pienkowski and Minton, 1973). The crest length obtained in this study was closely related to the findings of Dakin (2011). The shank and beak length of blue and white peafowl obtained in this study were 10.98±0.12, 10.90±0.12, 4.16±0.060 and 4.15±0.60 cm, respectively, where blue type is larger than the white type. The weight (matured) obtained in this study was in accordance with the findings of Ali and Ripley (1983).

**Table 6. Phenotypic correlations among egg weight, egg length, egg width and incubation period of Indian peafowl**

Parameters	EWT	EL	EW	IP
EWT				
EL	0.92			
EW	0.20	0.31		
IP	0.05	0.10	0.12	

EWT, egg weight; EL, egg length; EW, egg width; IP, incubation period.

**Table 7. The color and shape of different body parts of the peafowl are presented**

Parameters	Blue Male	Blue Female	White Peafowl
Crown feather color	Blue with long bare shafts	Brownish	White
Beak color	Grey with white spot at base	Grey with white spot at base	White
Eye color	Dark Brown	Dark Brown	Light blue
Eyelid color	Black	Black	White
Skin color	White	White	White
Head feather color	Metallic blue	Rufus-Brown	White
Neck feather color	Blue	Metallic green	White
Back feather color	Brownish white barbs	Grayish	White
Wing feather color	Orange brown with black latitudinal stripes	Brownish	White
Flight feather color	Primary : Black Secondary: Orange brown	Primary : Black Secondary: Orange brown	White
Tail feather color	Grayish brown, green & dark brown, Metallic green	Brownish black	White
Down feather color	White fluffy	White fluffy	White
Shank color	Grayish brown	Grayish brown	Yellowish white
Egg color	Dingy buff white/Brownish white		White
Beak shape	Long slightly curved and pointed		Long, slightly curved and pointed
Body shape	Large, Broad with long train feather		Large, Broad with long train feather
Egg shape	Oval		Oval

In poultry, the weight of the newly hatched depends primarily on the weight of the egg from which it is hatched, a trait greatly determined by the genotype of the female; females that lay larger eggs may possess superior genetic profiles for size, growth or aggressiveness in competing for feed. Thus their offspring would receive a similar superior genetic endowment for these traits (Skogland and Seagar, 1952). The egg weight of peafowl in this study was in agreement with Anon (2002). Egg weight is influenced by the total egg production per year, sequence of egg in the clutch, level of protein in ration, feed and drinking water, ambient temperature, stable type and disease (Darwati *et al.*, 2010). The egg length and egg width of blue and white peafowl obtained in this study were  $7.75 \pm 0.21$ ,  $6.94 \pm 0.21$ ,  $5.69 \pm 0.02$  and  $5.74 \pm 0.02$  cm, respectively. They also found a strong positive and significant relationship existed between egg length and width. Egg size varies with female age, year, seasonal variations and laying order (Murphy, 1994).

The incubation period obtained in this study was in agreement with the observations of Anon (2002) and Blanford (1898). The overall clutch size of the peafowl in this study was similar to the findings of Anon (2002). Anon (2002) reported that in captivity the peahen lays 8-20 eggs and the incubation period is about 28-30 days. The age at first egg of peafowl assessed in this study was similar to the values reported by Anon (2002). Peafowl will start to lay their eggs when they are reached to 2-2.5 years of age (Sharma, 1973). The positive and significant correlation between body weight with body length, wing span, shank length and head length suggests that selection for any of these body parameters will cause direct improvement in body weight (Bhowmik *et al.*, 2014). All of the productive characteristics had high phenotypic correlations with each other.

If the positive phenotypic correlations translate into positive genetic correlations, selection for one will improve the other as a correlated response (Muhiuddin, 1993). Egg weight was significantly correlated with egg length and egg width. Egg length was significantly correlated with egg width. Proudfoot and Hulan (1981) reported positive correlation between size of hatching egg and body weight of chick in broilers and in other chicks. The feather color of crest, head, neck, back, wing, flight, and tail feather obtained in this study was in agreement with the Monalisa (2015). According to sexual selection theory male with highly ornamented feather have greater reproductive success (Kodric-Brown and Brown, 1984). In peacock blue neck color changes to green as it move towards the nape. Flight feathers are lightly textured and associated with sustained flight. The feathers develop thicker calamus and thus enabling the bird to support the body weight during short flight. All these structural adaptation help the bird for flight (Butler *et al.*, 2008). Flight feathers are associated with the flight efficiency and in maintaining thermoregulation of the body (Jenni and Winkler, 1994). The egg color observed in this study was brownish white and white color for blue and white type, respectively. Egg color is influenced by genetic effect, housing system etc reported by Samiullah *et al.* (2015).

## REFERENCES

- Ali S, Ripley SD. 1983. Handbook of the birds of India and Pakistan. Compact Edition, Oxford University Press, Mumbai, P: 456.
- Ali S, Ripley SD. 1989. The compact handbook of the birds of India and Pakistan. Oxford University Press, Bombay, P: 567.
- Anon 2002. Wildlife of the Punjab. Punjab Wildlife and Parks Department, 25: 13-14.

- Baker ECS. 1928. The Fauna of British Indian, Including Ceylon and Burma, Birds. Volume 5 (2 ed.). Taylor and Francis, London. P: 282-284.
- Bhowmik N, Mia MM, Rahman MA. 2014. Morphometric measurements, productive and reproductive performance of Jalali pigeon. *Int. J. Dev. Res.*, 4: 908-911.
- Blanford WT 1898. The Fauna of British Indian, Including Ceylon and Burma. Birds 4. Taylor and Francis, London. P: 432-468.
- Butler LK, Rohwer S, Speidel MG. 2008. Quantifying structural variation in contour feathers to address functional variation and life history trade-offs. *J. Avian Biol.*, 39: 629-639.
- Dakin R, Montgomerie R. 2013. Eye for an eyespot: how iridescent ocelli influence peacock mating success. *Behavior Ecology.*, 24: 1048-1057.
- Darwati S, Martojo H, Sumantri C, Sihombing DTH, Mardiasuti A. 2010. Productivity, Repeatability of Productive and Reproductive traits of local Pigeon. *J. Indonesian Trop. Anim. Agric.*, 35(4): 268-274.
- Dharmakumarsinhji RS, Lavkumar KS (1981). Indian peafowl, sixteen Indian birds Publication division, Ministry of information and broadcasting, Government of India. P: 24-28.
- FAO (Food and Agricultural Organization) 2010. Draft guidelines for molecular characterization of animal genetic resources for food and agriculture. Rome: FAO.
- Islam MF, Mia MM, Rahman MA, Bhowmik N 2016. Morphometric, productive and reproductive traits of indigenous goose of Bangladesh. *Ani. Genetic Res.*, 59: 37-45.
- Jenni L, Winkler R 1994. Moulting and ageing of European passerines. London; Academic Press. P: 224.
- Kodric-Brown A, Brown JH. 1984. Truth in advertising: the kind of traits favored by sexual selection, 124: 309-323.
- Mbap ST, Zakar H. 2000. Characterization of local chickens in Yobe state, Nigeria. In: The Role of Agriculture in poultry in poverty Alleviation. Proceedings of the 34th Annual Conference of Agricultural society of Nigeria. 15-19 Oct, Bauchi. P: 126-131.
- Monalisa M. 2015. Structural Variations in Feather Morphology and its Predicted Function in Indian Peacock (*Pavocristatus*), 1(2): 21-30.
- Muhiuddin G. 1993. Estimates of genetic and phenotypic parameters of some Performance traits in beef cattle. *Animal Breeding Abstracts.* 66: 495-522.
- Murphy TM. 1994. Breeding patterns of Eastern Phoebesin Kanas: adaptive strategies or physiological constraints? *Auk*, 111: 617-633.
- Mushtaq-ul-Hassan M, Arshad Z, Mahmood MIS, Mahmood-ul-Hassan M. 2012. Effect of matting sex ratios in Indian peafowl (*Pavocristatus*) on production performance at Wildlife Research Institute, Faisalabad (Pakistan). *Iranian J. Vet. Res.*, Vol. 13(2): 143-146.
- Pienkowski MW, Minton CDT. 1973. Wing length changes of the Knot with age and time Since moult. *Bird Studies.*, 20: 63-68.
- Proudfoot FG, Hulan HW. 1981. The influence of hatching egg size on the subsequent performance of broiler chickens. *Poult. Sci. J.*, 60: 2530-2541.
- Ramesh K, McGowan P. 2009. On the current status of Indian peafowl (*Pavocristatus*) (Aves: Galliformes: Phasianidae): keeping the common species common. *J. Threat. Taxa*, P: 106108.
- Roberts TJ 1992. The birds of Pakistan. Vol 1, Non passeriformes. Karachi, Pakistan, Oxford University Press. Elite Publications limited. P: 617.
- Samiullah S, Roberts JR. 2015. Eggshell color in brown egg laying hens. *Poultry Science.* 94(10): 2566-2575.
- Sharma IK. 1973. Ecological studies of biomass of the Peafowl (*Pavo cristatus*). *Tori.* 22(93-94):25-29.
- Skogland WC, Seagar KC. 1952. Growth of broiler chicks hatched from various eggs when reared in competition with each other. *Poult. Sci.*, 31: 796-799.
- Whistler HF, Hugh L. 1949. Popular handbook of Indian birds (4th ed.). Gurney and Jackson, London. P: 401-410.
- Zarate AV 1996. Breeding strategies for marginal regions in the tropics and subtropics. *Anim. Res. Dev.*, 43: 99-118.

\*\*\*\*\*