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TOTAL SERUM CALCIUM AND EUMELANISM IN JUVENILE BANK MYNA, *ACRIDOTHERES GINGINIANUS* (LATHAM)

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ABSTRACT

A series of scarce minerals (Ca, Zn, Cu, Fe) obtained from the diet are known to act as critical regulatory factors in the biosynthesis of eumelanin and phaeomelanin pigments in animals. Juvenile Bank myna is dull brown in colour, whereas adult is bluish grey coloured. A link has been found between degree of eumelanism, total serum calcium and bone weight in juvenile Bank myna with increasing age. Gradual increase in total femur weight was corresponded by increasing degree of eumelanin pigment and reduction in total serum calcium level.

KEY WORDS: Bank myna, Eumelanin, Femur, Serum Calcium.

INTRODUCTION

Melanin is responsible for production of many colour patterns in animals which is under strong genetic control and very little sensitive to environment and body conditions (Hill and Brawner, 1998; Roulin and Dijkstra, 2003; Siefferman and Hill, 2005). However, Niecke *et al.* (2003) analyzed feathers in Barn Owl (*Tyto alba*) and showed that black spots are more concentrated in calcium (Ca) than neighbouring unspotted feather parts. McGraw (2003) suggested that a series of scarce macro- and micro- minerals (Ca, Zn, Cu, Fe) obtained from the diet act as critical regulatory factors in the biosynthesis of eumelanin and phaeomelanin pigmentsin animals. Thus the degree of eumelanin pigmentation can also be attributed to availability of dietary Ca, physiological ability to absorb Ca from diet, its metabolic use, deposition in bone and eumelanin (Roulin *et al*., 2006).

Juvenile Bank myna is dull brown in colour, whereas adult is bluish grey coloured. Therefore, an attempt has been made to investigate the correlation, if there is any, between degree of eumelanism, total serum calcium (Ca) and bone (Femur) weight in juvenile Bank myna, *Acridotheres ginginianus.* The bird is one of the commonest wild *Passerine* of North Indian Plains. So far none of the bird of Indian sub continent has been investigated in this context.

MATERIALS AND METHODS

Investigation was started with the appearance of juvenile Bank myna during breeding season of the bird in July and continued up to December (a period of 6 months). Juveniles are identified by dull brown colour with yellow naked skin behind the eyes and bluish grey iris, irrespective to bluish-grey adults with orange naked skin behind the eyes and orange red iris (Grimmett *et al.,* 2006; Ali and Ripley, 2007). Every month 6 juveniles were taken in account. Birds were locally captured in Sultanpur with the help of a bird catcher.

For the estimation of total serum Ca, blood samples (1.0 ml from each bird) were collected from the heart in disposable syringes by making an incision in the thoracic region after ether anaesthesia. The syringes with blood samples were kept vertically up for 4 hrs that allowed the coagulated haematocritic part to settle down, while serum separated above it. Apical part of syringe was then cut with a sharp blade and serum sample was taken for estimation by a micropipette. Total serum calcium (Ca) level was estimated by the method described by Moorehead and Biggs (1974) on Erba chem-5 plus V2 semi-automatic photometer using Erba Calcium kit.

Birds are then dissected for the inspection of gonadal appearance and status of bursa of Fabricius to assign age category i.e., juvenile or not. From each individual, entire femur (right one) was dissected out and boiled in 10% KOH solution to remove tissue present over it. The bones were then kept in an oven at 60^{o}C for 24 hrs. Their weight was then determined by using analytical monopan balance (Contech Instruments Ltd., CA- 34).

To estimate pigment concentration in feathers, one tail and one wing quill from each bird was collected and stuck in a black-cloth lined wooden box using an adhesive tape. The box was fitted with compact fluorescent lamp (9 Watts / 220V, Anchor cool daylight). A picture of each feather was taken with a digital camera

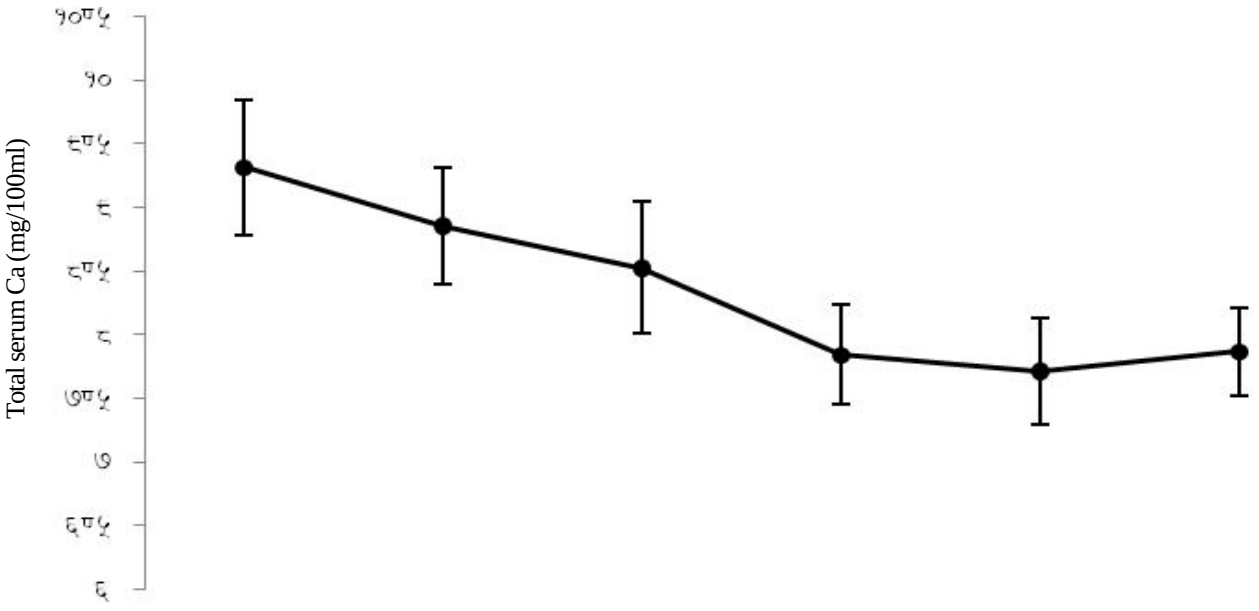

Figure 1: Total serum calcium levels of juvenile Bank myna in mg/ 100ml. Values represented are mean ± SD of 6 determinations.

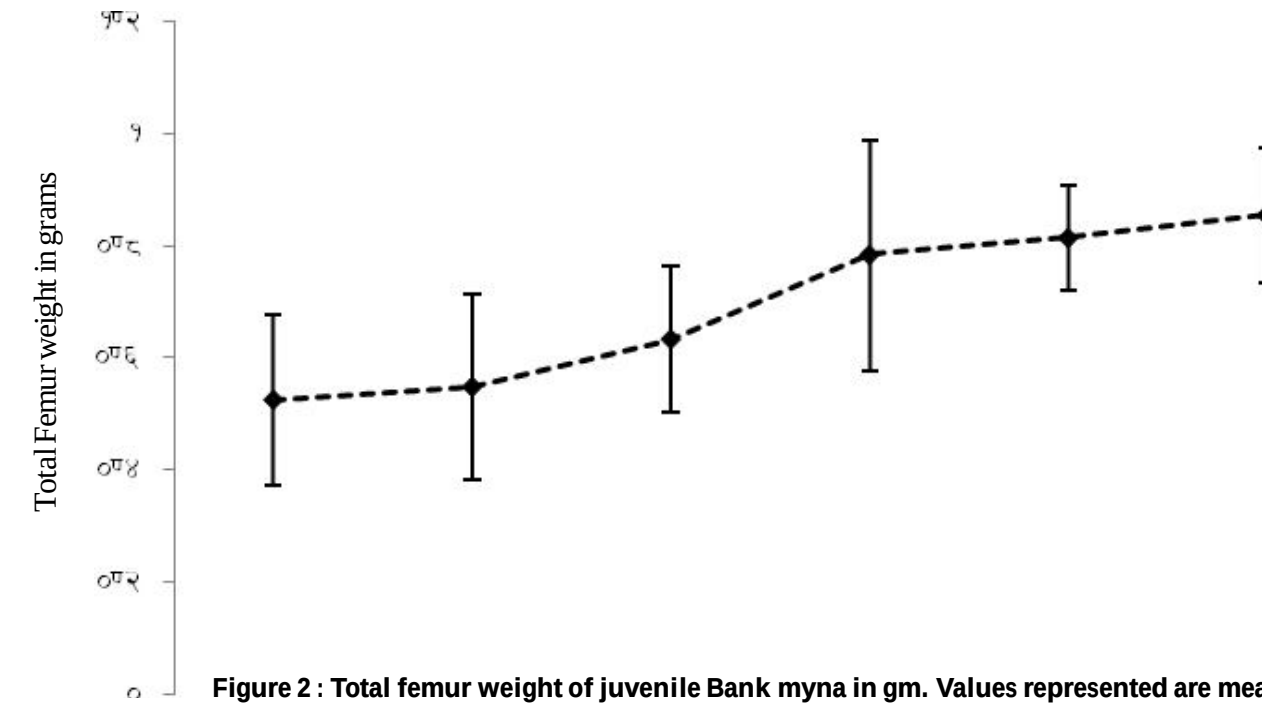

Figure 2 : Total femur weight of juvenile Bank myna in gm. Values represented are mean ± SD of 6 determinations.

(Nikon, S 8000) from a fixed distance of 27 cm. The picture was imported into Adobe Photoshop to measure the amount of light reflected i.e. brightness (Roulin *et. al*., 2006). Mean (± SD) values for feather brightness, total serum Ca and femur weight for all the months were calculated using MS Excel for Windows. Lower value signifies dark pigmentation (Siefferman and Hill, 2003).

RESULT AND DISCUSSIONS

Roulin *et al.* (2006) justified that production of eumelanin pigment is linked to Ca storage in bones of barn owls. They reported that humeri of blacker barn owl contain more Ca. In the present study, though the amount of Ca is not estimated in bone, yet a link has been found between total weight of femur and eumelanin pigments in juvenile Bank myna. With gradually

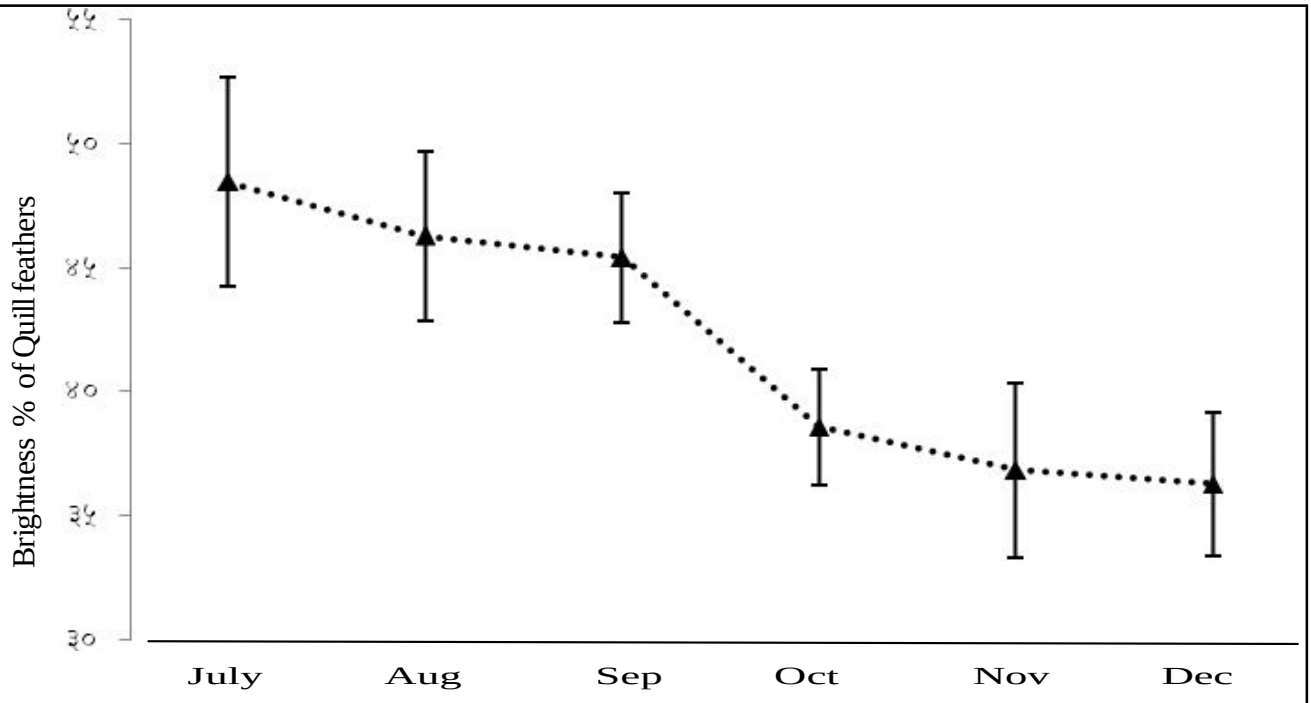

Figure 3: Brightness % of Quill feathers of juvenile Bank myna. Values represented are mean ± SD of 6 determinations.

increasing femur weight from July to December (figure 2), corresponding reduction in feather brightness was recorded (feagure 3). Niecke *et al.* (2003) chemically analyzed black spots in feather of barn owl and showed that they are 5.4 times more concentrated in Ca than neighbouring unspotted feather parts, and that large spots are more concentrated in Ca than small spots. These observations suggest that melanin based colouration is associated with Ca regulation in birds. The juvenile Bank myna has considerably higher values of total serum Ca (9.32 ± 0.532 mg/ 100ml in July) in early life than in later dates (7.87 ± 0.351 mg/ 100ml in December). This is probably because they use more Ca for metabolic processes at the expense of Ca storage in bones and eumelanin in early life (July to September). With increasing age, a gradual increase in femur weight, reduction in total serum Ca level and feather brightness were recorded (figures 1, 2 and 3). Moreover, in the same month, individuals with relatively more femur weight had lower serum Ca levels and less feather brightness. These observations justifies that Ca is actively stored in bone and eumelanin pigments in juvenile Bank myna with increasing age. Recently, Meunier *et al.* (2011) reported that degree of melanin-based colouration is not significant in non-sexually dimorphic birds and monomorphic species. Adult Bank myna do not show any sexual dimorphism (Grimmett *et al.,* 2006; Ali and Ripley, 2007), however juveniles considerably differ in melanin pigmentation which gradually approaches the colour of adults with increasing age.

The degree of eumelanin pigmentation also depends upon availability of dietary Ca, physiological ability to absorb Ca from diet, its metabolic use, deposition in bone and eumelanin (Roulin *et al.,* 2006). Bank myna feeds on kitchen scraps and dumped refuses of food, but prefers insect diet the most when available. Between September and mid-November they predominantly feed upon insects (Bose and Das, 2012). A remarkable change was recorded in femur weight and feather brightness in the month of October (figures 2 and 3). This may be related to dietary availability of certain insects in those months.

The study was not continued beyond December, because by the time serum Ca level, feather brightness and femur weight of juveniles closely approximated that of adults (unpublished data). Moreover, rudiments of gonads were evident in the following month. Gonadal steroids are known to affect largely the serum Ca level, weight and Ca concentration of bones in birds (El-Ghalid, 2009).

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