

Study on effect of beta-carotene rich diet on plumage pattern of captive Scarlet Ibises (*Eudocimus ruber*)

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Abstract

Scarlet-red plumage colour of the Scarlet Ibis is due to their carotene rich diet. The zoo diet poor in beta-carotene makes the bird plumage paler. In this study 22 Scarlet Ibises are supplemented with one kg of carrots daily for a period of one month. All the birds get full scarlet-red plumage after one month of beta-carotene rich diet supplement. Study shows that it is very essential to provide these birds daily with natural pigment i.e. beta-carotene to maintain their bright scarlet-red plumage colour.

Introduction

The Scarlet Ibis (*Eudocimus ruber*) is a species of ibis in the bird family Threskiornithidae. It inhabits tropical South America and Islands of Caribbean. Adult plumage is virtually all scarlet. The feathers may show various tints and shades, but only the tips of their wings deviate from their name sake colour. A small but reliable marking, these wing tips are a rich inky black and are found only on the longest primaries. Otherwise the bird colouration is vivid orange-red, almost luminous in quality. Scarlet Ibises have red bill and feet (Fig 1).

The orange-red colour of the bird is due to heavy diet of red crustaceans (Petraik 2010). In captivity Scarlet Ibis plumage will become dull over a time due to lack of natural pigment in their captive diet. The 22 Scarlet Ibises of Mysuru Zoo are provided with beta-carotene rich diet i.e. carrot along with their regular zoo diet, to study the effect on plumage colour development during the month of November and December 2015.

The major objectives of the study were to study the effect of beta-carotene rich diet (carrot) on Scarlet Ibises plumage colour development; to study the effect of new diet composition on food intake and acceptance of new diet; and to understand the pattern of plumage colour development in Scarlet Ibises.

Methodology

At present Mysuru Zoo is housing 22 Scarlet Ibises. The zoo diet of these birds includes 800gm prawns, 1250gm rice and 1750gm boiled egg per day. Since prawns are seasonal breeders it is very hard for zoo to get fresh red prawns round the year. However for these birds zoo provides sun dried prawns which lost their natural pigments during the sun drying process. All the diet components of the Scarlet Ibises are poor in any natural pigment.

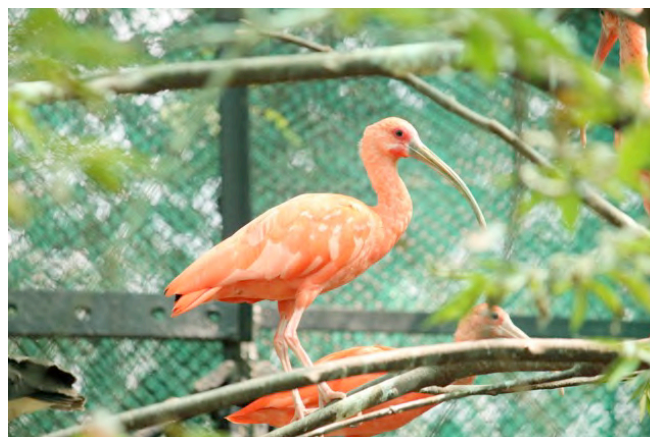


Fig 1. Scarlet Ibis having normal plumage pattern, red bill and feet



Fig 2. Carrot carvings mixed with prawns as beta-carotene supplement for Scarlet Ibises

Feeding experiments with known precursors provides insight into the metabolic capacities of birds (Brush & Power 1976). Therefore, in order to supplement beta-carotene pigments to these Scarlet Ibises carrot carvings were added to their diet. 1kg of carrots was carved and mixed with 800gm of dry prawns (Fig 2). Food intake was recorded for a month. The effect of beta-carotene rich diet on their plumage colour was recorded through photographs.

Result and Discussion

Like most birds, the ibis diet is varied. In the wild the Scarlet Ibis feeds on frogs, fish, reptiles and crustaceans. But it has a favoured food, and that favoured food is what gives the Scarlet Ibis its brilliant scarlet-red. The young Scarlet Ibis is a gray

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Fig 3. Young Scarlet Ibis

and white bird, looking very much like a young White Ibis (Fig 3).

The ingestion of red crabs gradually produces the scarlet plumage. There are some scientists who consider the Scarlet Ibis (*Eudocimus ruber*) and White Ibis (*Eudocimus albus*) to be the same species with diet making the difference. The crabs which are

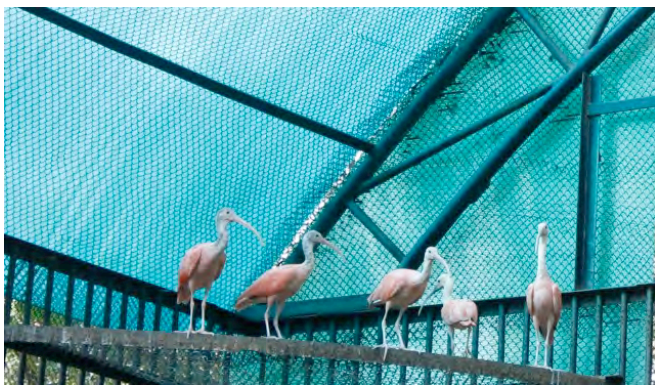


Fig 4. Scarlet Ibis of Mysuru Zoo on 7 November 2015

the favoured food of the Scarlet Ibis are rich in carotenoids; the more carotenoid-rich crabs the ibis eats, the redder it becomes (Petraik 2010). Scarlet Ibises, which have Scarlet colour feathers as well as red bill and legs have three times more circulating carotenoid pigments than individuals of their sister taxon the White Ibis, which have much less carotenoid pigments in their integument, white plumage with red legs and bill (Geoffrey 1999). As it's very hard for zoo to get continuous supply of red prawns round the year, we tried supplementing

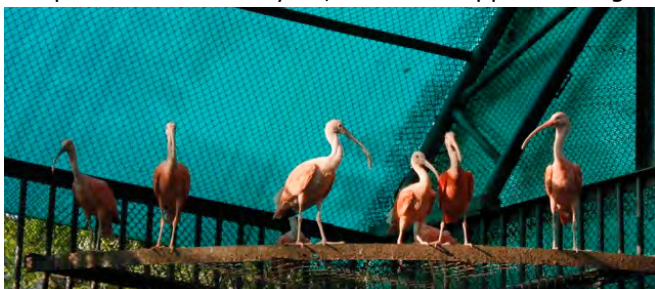


Fig 5. Scarlet Ibis of Mysuru Zoo on 23 November 2015



Fig 6. Scarlet Ibis of Mysuru Zoo on 8 December 2015

these Scarlet Ibises with beta-carotene using carrots. Around 1kg of carrots was added to the diet of 22 Scarlet ibises. One kilo gram of carrot contains 82,850 mcg of beta-carotene, which provides adequate beta-carotenoids for the maintenance of normal plumage colour of Scarlet ibises.

The Scarlet Ibis have long, narrow, decurved bill which is very useful to probe for food in soft mud or under plants. This bill structure is not suitable for feeding on vegetables like carrots and as they are carnivore birds they may not feed on carrots, therefore carrot carvings were mixed with prawns. The food intake was recorded to check the acceptance of new diet composition-carrot as well as to check whether there is reduction in food intake due to addition of carrot. Throughout the study period of one month there is no reduction in food intake and it was about 85-90%. The new diet carrot was accepted by these birds.

On 17th day of beta-carotene rich diet supplement, it was noticed that most of the birds having dark scarlet-red pin feathers replacing their molted pale feathers (Fig 5). After a month of beta-carotene rich diet supplement all the Scarlet Ibises are with full scarlet-red plumage except five young birds having both scarlet as well as grey feathers. (Fig 6 & 7).



Fig 7. Young Scarlet ibises having both Scarlet as well as grey feathers



Fig 8. Scarlet Ibis of Mysuru Zoo on 26 January 2016

A similar experiment was done on house finches in 1976 by Brush and Power and they found that House finches without an adequate source of suitable carotenoids in the diet regenerate feathers that are abnormal (usually yellow). A diet of seed and water supplemented with Canthaxanthin or beta-carotene produced feathers that appeared normal or nearly so.

Carotenoid pigments contribute to colour of feathers and thought to be important for communication in many bird species. Colouration of feathers can arise from light scattering by nano structures or from the presence of pigments that absorb light in particular region of the electromagnetic spectrum. Carotenoids give rise to yellow, orange and red colouration. (Maria *et al* 2012). In case of Scarlet Ibis the Scarlet

plumage colouration is due to presence of carotenoids. Birds cannot synthesis carotenoids metabolically, but can modify extensively those obtained in the diet. Inadequate dietary precursor is a prime cause of colour loss in captive birds. A source of dietary carotenoids in sufficient quantity allows normal appearing plumage to be maintained. (Brush and Power 1976). Therefore it is very essential to provide captive Scarlet Ibises with adequate suitable carotene source to maintain the normal Scarlet colour plumage.

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Announcement

National Seminar on Recent Challenges in Biodiversity Conservation, 22-23 March 2016, Thiruvananthapuram



National Seminar is mainly aimed at bringing together the young researchers and scientists of the nation, who are actively pursuing research in this area so that we can update and deepen our knowledge on the major thrust areas of Biodiversity Conservation. In this Seminar, it is proposed to deliberate for three days on the following major themes:

1. Aquatic and Terrestrial Biodiversity, 2. Conservation Methods, 3. Sustainable Development, 4. Inventory, Taxonomy and Biology of Species, 5. Environmental Pollution and Conservation issues, 6. Wetland Degradation and Management, 7. Man-Wildlife Conflicts, 8. Wildlife Diseases, 9. Climate Change and Conservation issues, 10. Molecular methods in conservation, 11. Species invasion and Conservation issues

Papers are invited on the above themes for oral presentation sessions or poster session. The registration fee is Rs. 1250/- for Faculty and Scientists and Rs. 750/- for Students and Research Scholars.

Abstract of scientific papers on various themes not exceeding 300 words must be submitted on or before 15th March 2016 as e-mail attachment as MS word file and named according to the speaker's surname, followed by underline and his/her initials (e.g. Amitabh_b.doc). Please send e-mail to: probios1@gmail.com or bioconserv2016@gmail.com

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