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ORIGINAL ARTICLE

Microflora in the crop of adult Dusky-billed Parrotlets (*Forpus modestus*)

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Abstract We isolated aerobic and anaerobic facultative bacteria inhabiting the crop of adult Dusky-billed Parrotlets (*Forpus modestus*). We looked for bacteria capable of hydrolyzing starch, the most abundant polysaccharide in seeds. We compared our results with bacteria isolated from the crop of three species of doves with granivorous–frugivorous diet and three carnivore birds. *Forpus modestus* has 10^7–10^8 of colony formation units (CFU); these values were higher by one to three orders of magnitude compared with those observed in the other species studied. *Bacillus pumilus*, one of the most abundant bacteria isolated in *F. modestus* (6.03×10^6 CFU), was capable of hydrolyzing starch. We found higher diversity and abundance of bacteria in granivorous than in carnivorous birds or birds without a developed crop. Additionally, we found yeasts in the three species of doves. These findings suggest microbial activity in the crop, although its importance in food digestion needs to be determined.

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Keywords Crop microflora · Starch hydrolysis · *Forpus modestus* · Dove · Carnivore bird

Introduction

In some birds, food passage can be delayed and stored in an expandable, non-differentiated portion of the esophagus called the crop. The crop is well developed in granivores, vultures (Cathartidae) and falcons (Falconidae); it enables birds to consume more food than the stomach could handle efficiently and thereby minimize the frequency of feeding (Klasing 1998; Robbins 1993). Overall, the crop functions are food storage, and softening and swelling of hard food particles by water absorption. In addition, it plays an important role in nourishing the young of many species (Klasing 1998).

Food digestion in the crop is considered negligible in most birds since there is no secretion of digestive enzymes. For example, salivary amylase has been found only in chicken crops (Bolton 1965) and it is either minimal or absent in other birds that have been examined (Robbins 1993). Partial food digestion in the crop, however, could take place through microbial fermentation. The best documented case is the Hoatzin (*Opisthocomus hoazin*); this folivorous bird has a well-developed crop and caudal esophagus, where high levels of volatile fatty acids generated by microbial fermentation have been detected (Grajal et al. 1989; Dominguez-Bello et al. 1993). Another example is the Speckled Mousebird (*Colius striatus*). This bird, endemic to sub-Saharan Africa, is not an obligate folivorous, but, like the Hoatzin, it has high concentrations of volatile fatty acids in its well-developed proventriculus and ventriculus, which are produced by the various bacteria found there (Downs et al. 2000). Although a limited