



Research Article

# Diet Preferences and General Behavior of Peafowls in Captive Environment

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## Article History

Received: August 08, 2016

Revised: March 6, 2018

Accepted: March 12, 2018

Published: March 30, 2018

## Authors' Contributions

ZP collected the data. SS contributed in data collection and wrote the manuscript. BNK conceived the research objectives and contributed in data analysis

## Keywords

Peafowl, General behaviour, Diet preferences, Animals

**Abstract** | Animals kept in captivity tend to behave differently than are kept free range mainly due to confinement. It is the responsibility of the animal keepers to provide enrichment including adequate space and food to animals for highest possible standards of welfare. At University of Veterinary and Animal Sciences (UVAS), Ravi Campus, Pakistan, a total of eighteen peafowls are housed in different enclosures including Indian, Java green and white peafowls. Additionally, there are different cross breeds of Java and Indian peafowls in these houses. The present study was conducted to observe the diet preferences and general behavior of these peafowls under captive conditions. Three different diets, based upon the availability of food items, were selected and fed to the birds over duration of one week each. During the fourth week, all three diets were combined and offered to the peafowls. The feed was pre-weighed and the leftover feed was collected and weighed the next day before offering the new feed. According to previous reports at site, the peafowls were preferred to poultry feed but in present research, the diet preference was in order of maize > millet > poultry feed. During feeding, the behavioral patterns of the captive peafowls were monitored on daily basis. Time spent in different behavioral activities was noted in seconds using the stopwatch. On average, most time spent by all species and varieties of peafowls was in walking around within the enclosure (20.6%), followed by litter pecking (13.8%), feather pecking (13.0%) and standing (12.7%). Feeding and drinking consumed approximately 4.6% and 2.1% of time, respectively.

**To cite this article:** Parveen, Z., Sidra, S. and Khan, B.N., 2018. Diet preferences and general behavior of peafowls in captive environment. *Punjab Univ. J. Zool.*, 33(1): 16-21. <http://dx.doi.org/10.17582/pujz/2018.33.1.16.21>

## Introduction

Family *Phasianidae* is the largest of order Galliformes within Class Aves with 38 genera and about 138 species. Peafowls are the largest sized members of this family (Del-Hoyo *et al.*, 2014). Famous for their spectacular colors and beautiful train of decorated feathers. Peafowls are represented by three species in the world; Indian blue peafowl (*Pavo cristatus*), Java green peafowl (*Pavo muticus*) and Congo peafowl (*Afropavo congensis*) (Dharmakumarsinhji and Lavkumar, 1981). With the exception of Congo peafowl, the rest of two species are found in Asia.

### Indian peafowl (*Pavo cristatus*)

The Indian peafowl spreads out from eastern Pakistan through Nepal and India to Sri Lanka (Ramesh and McGowan, 2009) and is easily adapted to living with humans (Forshaw, 1998). Indian peafowls are rare in wilderness areas of Pakistan. They exist around Tharparker in extreme southeastern area of Sindh province of Pakistan and along northeastern border areas of the Punjab Province (Roberts, 1991). The species is listed as least concern in the IUCN Red list (Birdlife International., 2012). White peafowl are a result of selective breeding of Indian Peafowl in captivity and are often mistaken as a mutant or albino peafowls.

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*Green peafowl (Pavo muticus)*

The Java green peafowl (*Pavo muticus*) is a protected bird species in Indonesia and the latest ICBP check-list has designated it as nationally endangered (Collar and Andrew, 1988). The species is considered more handsome than the blue peafowl but does not readily adapt to human settlements and is also difficult to maintain in captivity (Forshaw, 1998). Habitat conversion and high hunting levels have led this species to exist in fragmented habitats with negative population trends, as a result of which this bird is enlisted in IUCN redlist as endangered (Birdlife International, 2013a).

*Congo peafowl (Afropavo congensis)*

Congo peafowl is the only member of Family Phasianidae to exist outside Asia and inhabits the rainforests of eastern Zaire, Central Africa (Kimbal *et al.*, 1997). The species is considered vulnerable (Birdlife International, 2013b).

Peafowls are almost omnivorous and adaptable feeding on different variety of insects, plants, seeds, tender shoot, amphibians, reptiles and worms (Baker and Inglis, 1930; Ali and Ripley, 1987; Trivedi and Johnsingh, 1995). However they are mainly granivorous because in the agronomic ecosystem they mostly feed on paddy (Sathyanarayana *et al.*, 2005a). The ingestion of food is a very complex process that depends upon the sensory organs and manyfunctional processes. Acknowledgement of food and hunger are closely related with acceptance of food. Other factors may be recorded as follows; color, odor, flavor, shape, feeding time, social aspects, light, method of presentation, including quantity and frequency of feeding. Their acceptance may increase by color of diet while food preference of birds the use of taste buds also seems to be modest (Lint, 1975). Different individuals require different amount of food depending upon the aspects that meet age, sex, physical activity and state of health (Rees, 2011).

In the wild, peafowls have been observed to feed a wide variety of food items and an examination of droppings revealed the major diet to be composed of a variety of plants and animals (Arshad *et al.*, 2000). Whereas Chopra and Kumar (2014) reported that varying diet components including *Brassica compestris* (flowers, leaves), *Trifolium alexandrinum* (flowers, leaves), *Triticum aestivum* (flowers, leaves, fruits), *Oryza sativa* (flowers, leaves, fruits), *Chenopodium album* (flowers, leaves, fruits), *Parthenium hysterophorus* (flowers, leaves), *Pisum sativum* (flowers, leaves, fruits), *Cicer arietinum* (flowers, leaves, fruits), *Pyrus pyrifolia* (flowers, fruits), *Ficus benghalensis* (flowers, fruits), *Ficus rumphii* (flowers, fruits), along with these plant items, they were also observed feeding on insects and on remains of the snake bodies.

While there is a wider choice of diet in the wild, the

case is opposite in captivity where a limited number of items are offered to the animal. Moreover, the confined space is also bound to put the animal under stress affecting its behavior and diet. Peafowls, being brilliantly coloured are often confined for pleasure in zoos, parks and even houses by many people and although the feeding behavior of peafowls has been studied in the wild by many researchers, no study has been observed regarding the general and feeding behavior along with diet preferences of peafowls under captive conditions. The current study was therefore planned to document the general behavior of peafowls kept at Captive Breeding and Research Centre at University of Veterinary & Animal Sciences (UVAS) taking into account the feed being provided to the birds as well as their preference amongst the available food items.

## Materials and Methods

### Study area

University of Veterinary and Animal Sciences (UVAS), Ravi Campus, Pakistan, houses a number of avian and mammalian species in its Captive Breeding & Research Center. There are 18 peafowls (males:7 and females: 11) present at UVAS kept in different enclosures, details of which are given in Table I.

### Experimental ration

The peafowls were already been fed maize on daily basis. In order to record the diet preferences of the captive peafowls, the birds were offered three different types of food substances. On the basis of availability, diets were divided in three parts, diet a) consisted of maize, diet b) poultry feed and diet) only millet. Each diet was offered to the birds for the duration of one week. During the fourth week a combination of the three diets was provided to the birds. At the initiation of experiment and before feeding the birds every day, the food substances were weighed individually using electronic weighing balance and then offered to all the experimental birds. The ration per bird was 250 grams each. The leftover feed was weighed on daily basis to calculate the consumption of the provided food item.

**Table I: Details of species of peafowls present at UVAS along with their numbers.**

Enclosure	Size	Peafowl species	Number of peafowls
1	(32 x 32) feet	Java peafowl	6
2	(15x12) feet	Indian peafowl	3
3	(15x12) feet	White peafowl	4
4	(16x10) feet	Crossbreed of Indian and Java peafowl	3
5	(10 x 8.5) feet	Indian and white peafowl	2

**Table II: Description of behaviour parameters observed in peafowls**

Behaviour	Description
Jumping	Movement by flying with all feet off the ground
Feeding	Animal is feeding
Drinking	Animal is drinking water
Standing	Animal is still, alert and looking at stimuli
Walking	Movement without any additional behavior
Lying	Animal is lying on the ground and inactive or relaxed state
Feather flapping	Movement of feathers
Aggression	A response that delivers something unpleasant
Preening	While standing or sitting beaking at feathers
Litter pecking	Contact to litter in order to forage
Voice call	Voiced a lurid call that expressed similar to “he-on”. Usually one to four syllables cover one call power, occasionally ranging up to seven.
Displaying	Train feathers vibrate and spread by male.
Gliding	The jumping of peafowl from roosting site to ground and from ground to roosting site.
Moving	Without any activity principal method of movement of peafowl.
Resting	Without any action sitting on a tree or column of stone.

### Behavioral assessment

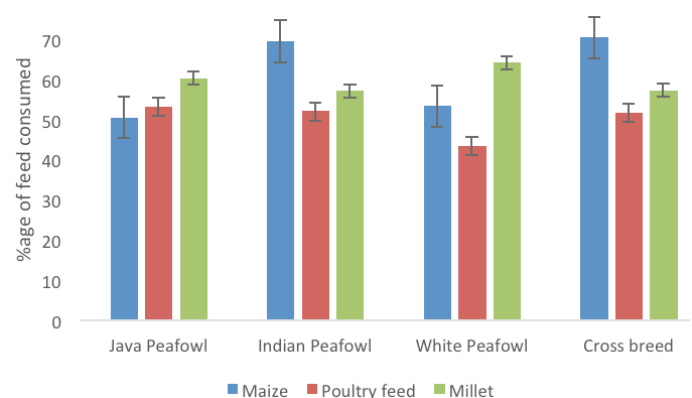
During feeding, the behavioral patterns of all the captive peafowl were monitored on daily basis. The peafowl were kept for breeding and research purposes only study tours were allowed at the site. During behavioral assessment 2 to 3 students were present therefore the disturbance due to visitors was very less. The behavioral observations were recorded through standard focal sampling. Each bird was observed for five minutes per day during morning hours (08:00 am to 10:00 am). Time spent in different behavioral activities was noted in seconds using the stopwatch. The time activity budget was calculated by principal animal sampler method (Altmann, 1974) at distance of 2 feet. The quantity of time consumed in each type of behaviors for different type of individuals was calculated on weekly basis. A brief description of the noted behavioral parameters is given in Table II.

## Results

During the current study, feed preference and behaviour of peafowls in captivity was assessed. The birds were kept in five enclosures of varying sizes. The birds in each enclosure were subjected to a four-week trial, during which the birds were fed with maize, millet and poultry feed one by one to determine the feeding preference of birds. During 1<sup>st</sup> week of the trial the peafowls were provided with maize; during 2<sup>nd</sup> week of the trial poultry feed was offered to the birds; and during the 3<sup>rd</sup> week of the trial millet was given as a diet. In the last and 4<sup>th</sup> week of trial, they were provided with all these three types of feed. The same trial was repeated for each enclosure and the left over feed was also weighed to determine which feed was consumed more

by different species of peafowls present. The results thus obtained are summarized below.

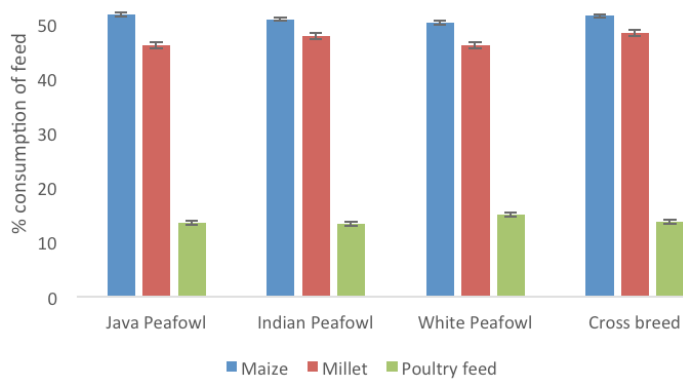
Figure 1 is explaining the comparison of different diets consumption fed to peafowls over a course of three weeks. As the study was planned to describe the general behavior of captive peafowl and to analyze the food preference it is obvious from result that Java peafowl and white peafowl consumed millet in larger amounts, the Indian peafowl and the cross breed preferred maize over other two items. These were on-site findings of current work within available resources to analyze the correlation among age and weight of experimental birds future research work may be conducted for better management practices at captive sites.



**Figure 1: Consumption of different diets offered to the peafowls**

A highly contrasting result was obtained during the fourth week when all three feed items were offered to the birds in equal proportions. Here maize was consumed in highest amounts followed by millet while poultry feed was

consumed in small proportions (Figure 2).



**Figure 2: Consumption of feed during fourth week of trial**

Time budgets (%) of all peafowls from 1<sup>st</sup> to 4<sup>th</sup> week of experiment are mentioned in Table III. During 1<sup>st</sup> to 4<sup>th</sup> week of experiment, all the peafowls spent more time in walking and minimum time in aggressiveness except Indian and White peafowl in enclosure 5, they spent more time in walking but less time in drinking. In Java peafowl the percentages of daily time budgets increased in the order of walking > standing > litter pecking > feather pecking > lying > jumping > feeding > displaying > preening > voice call > drinking > aggressiveness; in Indian peafowl the order of increasing activities was walking > standing > litter pecking > feather pecking > lying > jumping > displaying > feeding > preening > voice call > drinking > aggressiveness; in white peafowl these activities increase in the order of walking > litter pecking > standing > feather pecking > lying > jumping > feeding > displaying > preening > voice call > drinking > aggressiveness and in crossbreed of Indian blue and Java peafowl these activities increased in the following order: walking > litter pecking > feather pecking > lying > standing > displaying > preening > jumping >

feeding > voice call > drinking > aggressiveness.

From the results thus obtained, it is obvious that all peafowls spent maximum time in walking around within the enclosure (20.32%), followed by litter pecking (13.81%), standing (13.15%) and feather pecking (12.79%). Feeding and drinking consumed 4.80% and 2.06% of time budget respectively.

During present study it was noted that peafowls during feeding perform many behavioral activities. It was noted that the Java peafowl (*Pavo muticus*), Indian peafowl (*Pavo cristatus*), white peafowl, crossbreed of Indian blue and Java peafowl spent 5.05%, 5.03%, 5.09%, and 4.05% of their time in feeding respectively; 2.04%, 2.06%, 2.06%, and 2.09% in drinking; 20.06%, 21.11%, 19.09% and 21.02% in walking; 14.15%, 14.22%, 13.08%, and 11.16% in standing; 13.09%, 13.11%, 14.03%, 15.03% and 14.09% in litter pecking; 13.03%, 12.01%, 13.11% and 13.03% in feather pecking; 6.11%, 6.02%, 6.06% and 5.09% in jumping; 10.06%, 10.09%, 11.07% and 11.08% in lying; 5.03%, 5.02%, 5.12% and 5.09% in preening; 4.14%, 4.01%, 4.15% and 4.11% in voice call; 5.11%, 5.04%, 5.07% and 6.12% in displaying of train; 2.13%, 2.28%, 2.12% and 2.13% in aggressiveness.

## Discussion

During the current study, feed preference and activity budget of captive peafowls was assessed. The birds were kept in five enclosures of varying sizes and the birds in each enclosure were subjected to a four-week trial each. During this 4-week trial, the birds were fed with maize, millet and poultry feed one by one to determine the preference of birds. As the results of the present study indicate,

**Table III: Time budget (%) of peafowls {(n=18) total no. of peafowl in study}**

Parameters	Time spent by peafowls in different activities in percentage				
	Java peafowl	Indian peafowl	White peafowl	Cross breed of Indian and Java peafowl	Average
Feeding	5.05	5.03	5.09	4.05	4.80
Drinking	2.04	2.06	2.06	2.09	2.06
Lying	10.06	10.09	11.07	11.08	10.57
Feather pecking	13.03	12.01	13.11	13.03	12.79
Litter pecking	13.09	13.11	14.03	15.03	13.81
Walking	20.06	21.11	19.09	21.02	20.32
Standing	14.15	14.22	13.08	11.16	13.15
Jumping	6.11	6.02	6.01	5.09	5.80
Aggressiveness	2.13	2.28	2.12	2.13	2.16
Preening	5.03	5.02	5.12	5.09	5.06
Voice call	4.14	4.01	4.15	4.11	4.10
Display of train	5.11	5.04	5.07	6.12	5.33



the most preferable feed by these birds was maize and the least preferable feed was poultry feed while any reason for this preference was not observed. During mixed feed the increasing order of feed consumption by Java peafowl was 47 % maize > 41 % millet > 12 % poultry feed, In Indian peafowl the order of feed consumption was 45 % maize > 43 % millet > 12 % poultry feed, while in white peafowl the order of feed consumption was 45 % maize > 41 % millet > 14 % poultry feed and in crossbreed of Indian blue and Java peafowl feed consumed in the order of 45 % maize > 43 % millet > 12 % poultry feed. These findings may be useful to design the nutrition chart for captive peafowl to avoid leftover food and for better management for the magnificent creatures. To analyze species-specific diet preference more research is needed, as published literature in this regard is not available.

Many researchers including Johansingh and Murali (1980), Ali and Ripley (1987), and Sathyanarayana (2005b) have documented the omnivore nature of peafowls and reported consumption of variety of items from grain and green crops to insects, small reptiles and small mammals. Sathyanarayana (2005a,b) and Chakravarthy and Thyagaraj (2005) reported that although peafowls are an omnivore and adaptable feeder, they are mainly granivorous because in the agronomic ecosystem they mostly feed on paddy. The results obtained in the present study also indicate the preference of peafowls towards grains rather than other items such as poultry feed. According to bird keeper at site the preferable food of peafowl was poultry feed but as per research findings food of preference was maize and millet, this finding may be useful to cut down the budget require to purchase the poultry feed and provision of food of choice to captive birds.

Moreover a variety of food is required in captivity for birds as recommended by Central Zoo Authority (Raja, 2007) i.e. 30 g feed breeder, 30 gms onions, garlic, 100 gms spinach, and 60 gms oil seeds to be fed to peafowls per bird in captivity (Sikandar *et al.*, 2015). But in present setup these nutritional combination were not available due to limited funds and hence the animals were usually being fed the items which were available more readily and were economic. It was also estimated from the results that the birds consume feed in less quantity and a large quantity of feed remains leftover. It is recommended to provide feed to birds in less quantity to prevent the wastage of feed.

Studies on avian behavior report that the birds spend most of their time in inactive state. In whole day time observations the male spent most of the time in guarding, followed by feeding, moving, driving, standing, resting and other behavior; the female spent most of the time in feeding, moving, resting, standing, guarding and other behavior (Jones and Dawkins, 2010). In a similar study by (Jun and Lan, 1996), the percentages of daily time budget

were observed as: resting 59.53%, preening 18.11%, walking 15.11%, displaying 3.63%, feeding 3.28% and others (including calling, attacking, drinking, dusting) 0.35%. The time spending on walking, feeding and display showed significant sexual difference (P 0.05), but no significant differences present between male and female for resting and preening. Walther (2003) documented that peacocks spent 14.9% of their total time budget on maintenance behaviors and 7.2% on displaying their trains, while 25.2% of their total grooming time on preening their trains.

Comparing these observations with the results of the current study, it was observed that most of the time was spent in walking followed by standing behavior.

## Conflicts of interest

The authors declare no conflicts of interest.

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