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Assessment of Plasma Prolactin and Nest Defense Behaviour During Breeding Cycle of Pigeon (*Columba livia domestica*)

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Abstract: Pigeons have been accepted as an ideal animal model for analysing the differences between stages of breeding cycle. The objective of this study was to assess plasma prolactin and nest defense behaviour during breeding cycle of pigeon. Five pairs of white king pigeon ***(Columba livia domestica)*** were randomly selected from a colony kept in a tower. The birds were at least 12- 18 months old and all had bred successfully. Results showed significant ($P \leq 0.05$) differences in circulating prolactin at different stages of pigeon breeding cycle. However, the highest level was observed during the stage of egg incubation followed by squabs brooding and then courtship. On the other hand, the nest defense behaviour during courtship, egg incubation, and after egg hatch (squabs brooding) was mainly in form of avoidance (69 and 71 %), defense (74 and 83 %), and aggression (71 and 77 %) in both male and female respectively. The study concluded that prolactin plays a critical role in proper egg incubation, hatching and rearing of squabs and both male and female become more aggressive after egg hatch to protect their squabs.

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1. Introduction

In Egypt, domestic pigeons are reared in tours as a kind of poultry and have a wide market for their delicious taste and abundant nutrients such as proteins, vitamins, calcium and iron (Bhuyan et al., 1999). In a reproductive context, prolactin is considered a major hormone facilitating incubation behaviour and the associated events in a wide range of vertebrates. Particularly in birds, peaks in prolactin were associated with egg incubation and/or chick brooding (Angelier et al., 2016, El Halawani et al. 2002). Furthermore, in pigeon, prolactin was found to play an important role in the activation of incubation behaviour and squabs rearing (Schmid et al. 2011, Lea et al. 1986). Pigeon breeding cycle included non-breeding, courtship and mating, nest-site selection and nest building, incubation and feeding the young (Gayathri and Hegde, 1994). The differences could be observed between courtship, egg incubation, and brooding and rearing of the squabs. So, Pigeons have been accepted as an ideal animal model for analysing such differences. It mainly because of the control of well-timed breeding cycle and bi-parental care of the eggs and squabs by both male and female (Fattah, 2015, Silver et al. 1985). The behaviour of both male and female pigeon differs from stage to stage during the breeding cycle. Therefore, the objective of this study was to assess plasma prolactin and nest defense behaviour during breeding cycle of pigeon.

2. Materials and Methods

Five pairs of white king pigeon were randomly selected from a colony kept in a tower. The birds were at least 12- 18 months old and all had bred successfully. Each pair was housed in a wooden breeding cage measuring 60 × 40 × 30 cm. A nest bowl with straw was supplied for each cage. Food and water were available ad *libitum*. Blood samples were taken from each male and female during court ship, 7 days after egg laying, and 4 days after egg hatching.

Table 1. Circulating plasma prolactin hormone (ng/ml) in male and female pigeon during breeding cycles.

	Breeding cycle			
	Courtship	Egg incubation	Squabs brooding	*P* -value
Male	14.780 [b] ± 0.993	44.640 [a] ± 0.503	14.780 [b] ± 0.856	0.001
Female	8.400 [c] ± 0.846	52.120 [a] ± 0.988	23.800 [b] ± 0.406	0.001

Means with different letters are significantly different at $P \leq 0.05$.

Blood samples (0.75 ml.) were aspirated aseptically from wing vein by disposable needle and transferred to heparinized vacuum tubes without delay. Plasma was separated by centrifugation 3000 rpm for 10 m and stored at -20 Ċ until assayed for prolactin hormone using radioimmunoassay (Cherel et al. 1994).

The nest defense behavior was measured through the response of the birds toward a model spider, which was divided into three basic classes. 1- Avoidance, which involved fleeing, escaping and leaning away. 2- Defense, which was recorded as feather erection, sometimes accompanied by wing rising. 3- Aggression, seen as pecking and / or wing slapping. Each test consisted of challenging the bird 4 times with a model spider every day and repeated 6 times throughout the breeding cycle (Lea et al. 1986).

Data were tested for distribution normality and homogeneity using statistical package Minitab software version 16. Data were reported as means and standard deviations of the means (SD). The differences in parameters between groups were compared using one way ANOVA. The significance of difference among the different groups was evaluated by Tukey test. The significance level was set at $P < 0.05$.

3. Results and Discussion

A significant ($P < 0.05$) increase in circulating prolactin in male pigeon was observed during the stage of egg incubation compared to courtship and squabs brooding. On the other hand, there was no significance ($P > 0.05$) difference in circulating plasma prolactin between courtship and squabs brooding during the breeding cycle of male pigeon (table 1). In female pigeon, there were significant ($P < 0.05$) differences in circulating prolactin between the different stages of pigeon breeding cycle. However, the highest level was observed during the stage of egg incubation followed by squabs brooding and then courtship (Table 1). From the aforementioned results, it was found that, the level of prolactin hormone was slightly around the normal level during courtship. Seven days after egg laying, there was a rise in the level of prolactin hormone till the time of hatch, after egg hatching by 4 days the level of prolactin hormone gradually fell till return to normal level in male and still significantly higher in female. These changes in circulating prolactin could be attributed to the tactile and visual stimuli provided by eggs and nest during egg incubation (Hall and Goldsmith, 1983, Buntin et al. 1996, Schmid et al. 2011, Mohamed et al. 2013) and increased expression of prolactin in pituitary gland (Wilkanowska et al., 2014, Zhang et al., 2012) in both male and female. On the other hand, this high level of prolactin fall in male after egg hatching and remained for female due to stimuli provided by squabs and nest especially during feeding of squabs (Lea et al. 1986). These records were similar to observations of Goldsmith et al. (1981). Therefore, the level of prolactin hormone during the breeding cycle of pigeon plays a critical role in proper egg incubation, hatching and rearing of squabs.

Results in Figures 1 and 2 reflected that, the most predominant form of nest defense behaviour in male and female pigeon during courtship was avoidance (69 and 71 %) respectively. On the other hand, defense (74 and 83 %) was observed to be the most power form of nest defense behaviour during egg incubation in male and female pigeon respectively. During the stage of squabs brooding, Aggression (71 and 77 %) was observed to be the most common form of nest defense behaviour in male and female pigeon respectively. the nest defense behavior during courtship, egg incubation, and after egg hatch was mainly in form of avoidance, defense, and aggression respectively.

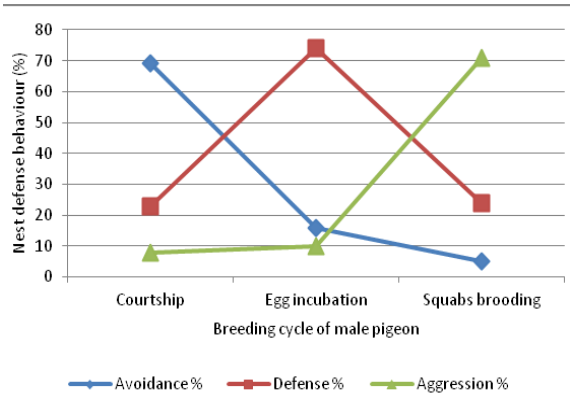

Fig. 1. Nest defense behavior along the breeding cycle of male pigeon.

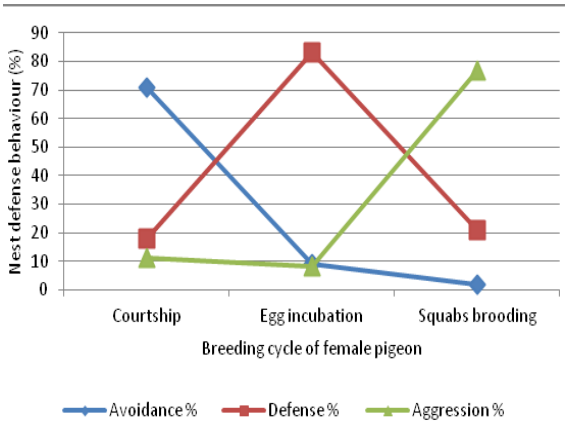

Fig. 2. Nest defense behavior along the breeding cycle of female pigeon.

The differences in the nest defense behavior were occurred under the effect of changes in prolactin hormonal profile during breeding cycle in both male and female (Lea *et al.* 1986). The possible explanation of increased avoidance during courtship was the freedom of the birds from egg incubation or squabs rearing. On the other hand, the bird was stacked with nest and set on their eggs during egg incubation, giving it the chance to make defense. As well as, after egg hatching and during squabs rearing, it provided the parents willing to defend their nest more aggressively. The obtained results agree with those obtained by Andersson *et al.* (1980) and Oniki and Willis, (2000) and disagree with Lea *et al.* (1985) who observed that both male and female of ring dove shown significant but dissimilar aggressive behavior towards a model predator during eggs incubation in the nest. In addition, Knight and Temple (1986) reported that stage of the nesting cycle had only a weak influence on nest defense intensity. These results indicate that, the pigeon males and females become more aggressive after egg hatch to protect their squabs.

4. Conclusion

Prolactin plays a critical role during the breeding cycle of pigeon especially during egg incubation, hatching and rearing of squabs. Both male and female pigeon become more aggressive after egg hatch to protect their squabs.

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