

***In vitro* biology of pigeon louse *Colpocephalum turbinatum* (Amblycera: Phthiraptera)**

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Abstract

In vitro rearing of amblyceran Phthiraptera is a challenging task. A look on the literature reveals that negligible information exists on the *in vitro* bionomics of avian Amblycera. Present report furnishes information on the *in vitro* biology of an amblyceran louse, *Colpocephalum turbinatum*, reared at $35 \pm 1^\circ\text{C}$, 75-82% Relative Humidity, at feather diet. The incubation period of the eggs of louse was determined as 5.37 ± 0.67 days. The duration of first, second and third nymphal instars remained 5.04 ± 0.65 , 5.12 ± 0.89 and 5.0 ± 0.57 days, respectively. The longevity of adult female (13.04 ± 3.67 days) was comparatively longer than that of males (9.6 ± 2.87 days). An adult female laid an average of 0.63 egg/day *in vitro* condition ($35 \pm 1^\circ\text{C}$ and 75-82% RH, at feather diet).

Keywords: Amblycera, Biting lice, *Colpocephalum turbinatum*, Pigeon louse, Phthiraptera.

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INTRODUCTION

Information on the bionomics of the parasitic insects is useful for complete understanding of its biology and its adaptation in surroundings. It further helps in realizing the impact of parasitism and determining the eradication measure. Since, it is difficult to rear single louse or its colonies on natural host, the *in vitro* rearing has emerged as tool for deriving information on the life cycle of avian lice. During last 15 years selected workers have used the incubation period of eggs, duration of nymphal instars, adult longevity and rate of egg production (derived through *in vitro* studies) to construct the life table of certain ischnoceran Phthiraptera. (Beg *et al.*, 2005; Saxena *et al.*, 2007; Gupta *et al.*, 2007; Arya *et al.*, 2009; Agarwal *et al.*, 2011; Singh *et al.*, 2012; Kumar and Hasan, 2014). *In vitro* culturing of different species belonging to genus *Bovicola* (mammalian Ischnocera, infesting goats) have been more successfully performed (Rashmi *et al.*, 2010).

Survey of literature indicates that the bionomics of only one amblyceran Phthiraptera (chicken body louse, *Menacanthus stamineus*) has been recorded *in vitro* condition (Stockdale and Raun, 1965). Another amblyceran louse, *Colpocephalum turbinatum* (infesting pigeons) has been colonized *in*

in vitro condition by Nelson (1971). However, attempt to record the data on bionomics of the amblyceran louse has yet not been made. In the present study, *C. turbinatum* has been reared to observe the incubation period of the eggs, duration of nymphal instars, adult longevity and egg production rate of the louse *in vitro* condition.

MATERIALS AND METHODS

For *in vitro* experimentation on *C. turbinatum*, the eggs (glued to feathers), different nymphal instars and healthier adults of the louse were obtained from lousy pigeons (*Columba livia*). Sixty eggs (glued to suitably trimmed feathers) were reared at $35 \pm 1^\circ\text{C}$ in glass petridishes. Thirty nymphs (each stage) and sixty adults were reared in beakers (without spout) /battery jars, containing 50-100 ml. saturated solution of Sodium Chloride and Potassium Chloride, for maintaining the Relative Humidity. After lining the culture vials with filter paper, a layer of suitably chopped feathers (belonging to popular resting sites i.e. vent wings and tail) were arranged along the sides of vials. Culture vials were reared in incubator at the intended temperature ($35 \pm 1^\circ\text{C}$) and examined daily. The number of survivors and the numbers of eggs laid were recorded daily and the mean values were determined in accordance with Saxena

et al. (2007) and Gupta et al. (2007).

RESULTS AND DISCUSSION

60 eggs of *C. turbinatum* were incubated at $35\pm 1^\circ\text{C}$ and 75-82% RH (in two batches). Fresh eggs of *C. turbinatum* are pearly white in appearance and turn yellowish brown after two days. Three eggs hatched on 4th day, 32 on 5th day, 18 on 6th day and 3 on 7th days. Eggs were incubated till 12th day and those failing to hatch were regarded as dead. Thus, the average incubation period of the eggs of *C. turbinatum* appeared to be 5.37 ± 0.67 days (range 4-7 days, $n=56$) (Fig. 1). The mortality at egg stage remained 6.7%.

Out of 30 first instars reared, 03 moulted on 4th day, 16 on 5th day, 2 on 6th day and 02 on 7th day. The mean duration of first nymphal instars was 5.04 ± 0.65 days (range, 4-7 days; $n=22$). Mortality at first instars stage was 26.7%. Likewise, out 30 second instars reared, 04 moulted on 4th day, 16 on 5th day, 02 on 6th day, one each on 7th and 8th day. Thus, the mean value of the duration of second instars was 5.12 ± 0.89 days (range, 4-8 days, $n=24$) (Fig. 1). Mortality at second instars stage was 20%. Out of 30 third instars reared, 04 moulted on 4th day, 17 on 5th day and 4 on 6th day. The mean duration of third instars was 5.0 ± 0.57 days (range 4-6 days, $n=25$). The mortality at third instars stage was 16.7%.

Sixty adults (30 adult males and 30 adult females) were reared (in two batches) in glass beakers (without spout/ battery jars), till the survival of last adult (at $35\pm 1^\circ\text{C}$, 75-82% RH, at a feather diet). The average longevity of adult males was recorded as 9.6 ± 2.87 days (range 1-16 days, $n=30$). The lifespan of adult females remained slightly longer than the adult males (13.04 ± 3.67 days; range 2-18 days; $n=30$). A sum of 172 eggs was laid by the females (indicating the rate of egg production as 5.7 eggs/ female during lifespan and 0.63 eggs/ female/day).

Selected workers have performed *in vitro* rearing of ischnoceran lice infesting avian and mammalian hosts. Ischnoceran phthirapteran can be comparatively easily reared as they are sluggish in nature and feed on feather derivatives or skin scrapings. On the other hand, amblyceran Phthiraptera are very active and fast running lice and pose difficulties in handling during *in vitro* experimentations. Moreover, most of them are haemetophagous in nature and can be successfully reared by fulfilling their dietary requirements. Stockdale and Raun (1965) has reared an amblyceran poultry louse, *Menacanthus stramineus* (at 35°C , 95% RH, and at feather diet) and determined the incubation period of its eggs (4.5 days), duration of three nymphal instars (3.0, 3.0 and 3.0 days, respectively) and the egg rate (1.6/female/day). In contrast, *C. turbinatum* exhibited slightly longer incubation period and duration of nymphal

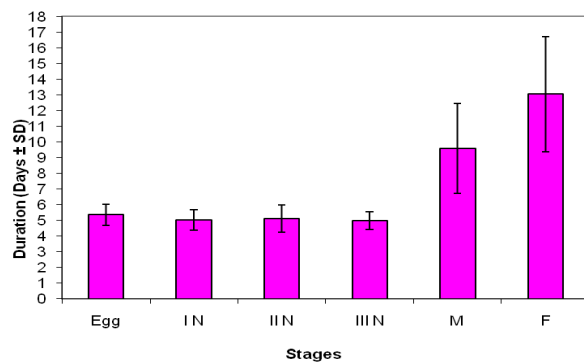


Fig.1. Showing duration of egg, nymphal instars (first, second and third) and adults (male and female) of *Colpocephalum turbinatum* reared at $35\pm 1^\circ\text{C}$, 75-82% RH, at feather diet.

instars, but exhibited lower egg rate (0.63 egg/female/day) *in vitro* condition ($35\pm 1^\circ\text{C}$, 75-82% RH, at feather diet). Maximum survival of *C. turbinatum* has been recorded as 18 days during the present study. A look on the literature reveals that the incubation period of eggs of avian Ischnocera varies from 4.2 (*Lipeurus lawrensis tropicalis*; Saxena et al. 1991) to 8.0 days (*Falcolipeurus frater*; Agarwal, 1967). The duration of nymphal instars varies from 5.7 (*Gonicocotes gallinae*; Saxena et al. 2007) to 10.7 days (*Lipeurus tropicalis*; Arora and chopra, 1959). The longevity of adults varies from 8.2 (*Philopterus lahorensis*; Beg et al. 2005) to 34.0 days (*Goniodes colchici*; Williams, 1970). Likewise, daily egg rate of avian Ischnocera varies from 0.4 (*Columbicola columbae*; Singh et al. 2001) to 2.0 per day (*Lipeurus lawrensis tropicalis*; Saxena et al. 1991). In case of mammalian Ischnocera, the incubation period of eggs varies from 6.9 (*Bovicola caprae*; Kumar et al. 1993) to 10.1 days (*Bovicola crassipes*; Hopkins and Chamberlain, 1969). Likewise, duration of nymphal instars of mammalian Ischnocera varies from 5.3 to 8.02 days (*Bovicola limbata*; Hopkins and Chamberlain, 1969). The longevity of adult mammalian Ischnocera varies from 15.2 days (*Bovicola caprae*; Kumar et al., 1993) to 49.2 days (*Bovicola ovis*; Hopkins and Chamberlain, 1972). Likewise, the daily average egg rate varies from 0.7 (*Bovicola caprae*; Kumar et al. 1993) to 1.2 per day (*Bovicola crassipes*; Hopkins and Chamberlain, 1969). Thus, the average incubation period of eggs, duration of nymphal instars, adult longevity and the egg rate of *C. turbinatum* conforms to the avian and mammalian Ischnocera studied, so far.

Conclusion

Avian Amblycera are difficult to handle during *in vitro* experimentations, due to their active habits. A look on the literature reveals that negligible information exists on the *in vitro* bionomics of amblyceran Phthiraptera. Keeping in view the lacau-

na prevailing in the field an amblyceran pigeon louse was subjected to *in vitro* experimentation. The present report provides information on the incubation period of the eggs, duration of nymphal instars, adult longevity and the egg rate of *Colpocephalum turbinatum*.

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REFERENCES

- Agarwal (1967). Studies on the bionomics and life-history of *Falcolipeurus frater* (Giebel : 1874) (Mallophaga : Ischnocera). *Indian J. Zootomy*. 8 (1): 21-40.
- Agarwal, G. P., Ahmad, A., Rashmi, A., Arya, G., Bansal, N. and Saxena, A. K. (2011). Bio-ecology of the louse, *Upupicola upupae* infesting common Hoopae, *Upupa epops*. *J. Insect Sci.* 11:1-9.
- Arora, G. L. and Chopra, N. P. (1959). Observation on life history of *Lipeurus tropicalis* Peters (Mallophaga : Ischnocera). *Res. Bull. Punjab Univ.* 10(2):179-187.
- Arya, G., Bansal, N., Ahmad, A., Rashmi, A. and Saxena, A. K. (2009). Population expansion of the Common Baya louse, *Brueelia plocea* (Lakshminarayana, 1968) (Phthiraptera: Ischnocera). *Rev. Ibero-Latinoam. Parasitol.* 68 (2):192-195.
- Beg, S., Kumar, S., Gupta, N., Khan, V. and Saxena, A. K. (2005). Life table of *Philopterus lahorensis* (Phthiraptera: Mallophaga) infesting crows. *Rivista Iber. de Parasitol.* 65 (1-4): 63-66.
- Gupta, N., Kumar, S. and Saxena, A. K. (2007). Intrinsic rate of natural increase of *Brueelia amandavae* (Ischnocera, Phthiraptera) infesting Indian Red Adavat. *Biologia*, 62 (4): 458-461.
- Hopkins, D. E. and Chamberlain, W. F. (1969). *In vitro* colonization of the goat biting lice, *Bovicola crassipes* and *B. limbata*. *Ann. Ent. Soc. Amer.* 62: 826-828.
- Hopkins, D. E. and Chamberlain, W. F. (1972). Sheep biting louse : Notes on the biology of lice reared off the host. *Ann. Ent. Soc. Amer.* 65(5):1182-1184.
- Kumar, A., Rawat, B. S. and Saxena, A. K. (1993). *In vitro* biology of goat biting louse, *Bovicola caprae* Gurtl (Phthiraptera : Ischnocera). *Bioved*, 4(2):277-282.
- Kumar, V. and Hasan, S. S. (2014). *In vitro* bionomics of an Ischnoceran louse, *Lipeurus caponis* (Phthiraptera : Insecta). *J. Parasit. Dis.* DOI 10.1007/s12639-014-01512-9
- Nelson, B. C. (1971). Successful rearing of *Colpocephalum turbinatum* (Phthiraptera). *Nature* (London), 232 (34) : 255.
- Rashmi, A., Ahmad, A., Bansal, N. and Saxena, A. K. (2010). Rate of population expansion of goat biting louse *Bovicola caprae* (Phthiraptera: Ischnocera). *Ann. Entomol.* 28(1): 21-25.
- Saxena, A. K., Trivedi, M. C., Rawat, B. S. and Kumar, A. (1991). Bionomics of poultry louse, *Lipeurus lawrensis tropicalis* Peters (Phthiraptera : Ischnocera). *J. Zool. Res.* 4(1&2) : 27-32.
- Saxena, A. K., Kumar, S., Gupta N. and Singh, R. (2007). Population expansion of poultry fluff louse, *Goniocotes gallinae* (De Geer, 1778) (Ischnocera Phthiraptera, Insecta). *Zool. Sci.* 24: 327-330.
- Singh, P., Arya, G., Ahmad, A. and Saxena, A. K. (2012). *In vitro* biology of *Columbicola bacillus* (Phthiraptera: Ischnocera). *J. Appl. & Nat. Sci.* 4 (2):234-236.
- Singh, S. K., Kumar, S. and Saxena, A. K. (2001). *In vitro* biology of a pigeon louse, *Columbicola columbae* (Phthiraptera : Ischnocera). Prof. V. N. Capoor Commem. vol., S.K. Malhotra and R.S. Chauhan (eds.). *Ankit Publications, Allahabad, India*, 54-56.
- Stockdale, H. J. and Raun, E. S. (1965). Biology of the chicken body louse, *Menacanthus stramineus*. *Ann. Entomol. Soc. Amer.* 58(6): 802-805.
- Williams (1970). *In vitro* studies on the environmental biology of *Goniodes colchici* (Denny) (Mallophago : Ischnocera). III. The effects of temperature and humidity on the uptake of water vapour. *Aust. J. Zool.* 55:553-568