PATH COEFFICIENT ANALYSIS OF CORRELATION BETWEEN BREEDING CYCLES OF THE COMMON MYNA ACRIDOTHERES TRISTIS (PASSERIFORMES: STURNIDAE) AND ITS PHTHIRAPTERAN ECTOPARASITES

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Louse population fluctuates seasonally. Several factors have been held responsible for the summer buildup of population of avian lice (Marshall A.G. 1981: The Ecology of Ectoparasitic Insects. Academic Press, London, 445 pp). It has been suspected that the breeding time of two haematophagous louse species (Ricinus picturat us and Menacanthus sp.) might be controlled by the reproductive hormones of the host bird, the orange crowned warbler (Vermivora cellalata) (Foster M.S. 1969: Ecology 50: 315–323). Furthermore, testosterone implants gave rise to an increase in number of two haematophagous lice (Machaerillaeus malleus and Myrsidea rustic a) on barn swallows (Hirudo rustica) (Saino N., Möller A.P., Bolzern A.M. 1995: Behav. Ecol. 6: 397–404).

The present studies were undertaken to record the degree of synchronisation between the breeding cycles of a semi-domestic passerine bird, the common myna Acridotheres tristis (L.) and its phthirapteran ectoparasites. Out of four phthirapteran species known to occur on Indian common myna, three species (Menacanthus eury sternus Burmeister, 1838, Brucelia sp. and Sturnidocus bannoo Ansari, 1955) were taken into consideration in the present studies.

Ten infested birds (both sexes) were weighed and deloused by lethal fumigation (Marshall 1981, op. cit.) every month during May 2000 to April 2001. The entire louse load was transferred to 70% ethanol and separated species-wise and sex-wise under stereozoom trinocular microscope. Total number of adult females of each species was specifically recorded. Feathers of the bird were plucked carefully from each region of body and placed in a glass jar. The bird was dissected in physiological saline to take out the gonads. The latter were cleaned, gently pressed between the folds of paper and weighed. Each feather was examined individually under the stereozoom trinocular microscope to record the number of fresh (unhatched) eggs of each louse species. Total number of live eggs of each louse species recorded from any bird was divided by total number of adult females of that species (subsequently averaged) to obtain the “egg index” in particular month.

To derive the idea about the degree of synchronisation between breeding cycles of the host bird and its lice, an analysis of correlation between mean monthly live egg indices and mean monthly gonadal weights (in mg/100g of body weight), along with host’s mean monthly gonadal weight (in mg/100g body weight).

Hence, path coefficient analysis was employed to obtain a clearer picture of the results. In path coefficient analysis, the correlation coefficient between the first (dependent) and second (independent) variable is decomposed into a linear combination of direct effect of independent variable (under consideration) and its indirect effect through other independent variables (third, fourth ...) with which the first is correlated (Kaliaperumal V.G., Sundaraj N. 1993: Path coefficient analysis in medicine. In: B.L. Verma, G.D. Shukla and R.N. Srivastava (Eds.), Bio-statistics: Perspective in Health Care Research and Practice. C.B.S. Publishers and Distributors, Delhi, India, 204 pp). The results of path coefficient analysis are given in Table 2.

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Correlation matrix (Table 1) clearly shows that on male birds all the three factors (testicular weight, temperature and photoperiod) had significant positive correlation with live egg index of the three louse species ($r = 0.81$ to $0.92$). On female birds, the three factors were found significantly correlated with egg index in the non-haematophagous species ($S. bannoo$) but not in the haematophagous species ($M. eurysternus$). Path coefficient analysis (Table 2) suggests that in haematophagous $M. eurysternus$, on male birds, direct effect of testicular weight (0.8324) was higher than that of temperature and photoperiod (0.350 and 0.1467, respectively), while on female birds, direct effect of photoperiod (2.20) considerably exceeded the effect of ovarian weight ($-0.6994$) and temperature ($-1.249$). In (non-haematophagous) $Brueelia sp.$ on male birds, direct effects of testicular weight and temperature were modest (0.4184 and 0.3254) but on female birds, direct effect of photoperiod (1.4215) was much higher than that of ovarian weight and temperature ($-0.6784$ and $-1.1603$, respectively). In (non-haematophagous) $Surnidoeucus bannoo$, on male birds, direct effect of testicular weight was also much higher than that of temperature and photoperiod ($-1.1603$ and $-0.5505$), while on female birds, direct effect of photoperiod was quite high (1.4215) in contrast to that of ovarian weight and temperature ($-0.6784$ and $-0.5505$, respectively).

Path coefficient analysis (Table 2) indicates that out of 0.9596, +0.8324 is the direct effect of host testicular weight and remaining values are the indirect effects of temperature and photoperiods (0.8324 + 0.2522 – 0.1250 = 0.9596).