Effect of Gallacanthus cornutus (Insecta, Phthiraptera, Amblycera, Menoponidae s. l.) on the meat production in...

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Effect of *Gallacanthus cornutus* (Insecta, Phthiraptera, Amblycera, Menoponidae s. l.) on the meat production in chicken *Gallus gallus* forma domestica

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With 1 Figure

Summary

Lice infest wide range of livestock and incur loss of million dollars to poultry, leather and dairy industries. The parasites have also reservoir and spread pathogenic strain among host which indirectly increase the mortality and decline vitality host. The impact of chewing lice on live host confined equivocal and contradictory as cited in literature by previous phthirapterist. In the present work, impact of *Gallacanthus cornutus* (Schömmer 1913) (Menoponidae s. l.) on meat production (weight gain) of domestic fowl has been accessed at Purola (Uttarkashi), India. The 100 birds of similar age and breed were kept in two separate pens (infested and uninfested flocks). The weight gain of two groups has been recorded and statistically analysed. The weight gains in uninfested categories were much quicker than infested categories. *G. cornutus* able to reduce as much as 900 gm body weight per bird. The young chickens (2 to 4 months) were found to be severely affected as compared to adult. Two tailed paired t-test was found significant between weight gain in uninfested and infested birds (*t* (4) = 4.702, *p* = 0.005). So, it causes great loss to the poultry industry as well as the economy of any country.

Zusammenfassung

Der Einfluss des Hühnerläuslings *Gallacanthus cornutus* (Insecta, Phthiraptera, Amblycera, Menoponidae s. l.) auf die Fleischproduktion beim Haushuhn *Gallus gallus* forma domestica


Keywords: Phthiraptera, Amblycera, *Gallacanthus cornutus*, weight-gain, meat production, *Gallus gallus* forma domestica.

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**Introduction**

The members of Phthiraptera are small and much irritating to host bird. The feather feeding and haematophagous habits considerably reduces the host fitness, productivity and vitality directly or indirectly (CLAYTON 1990, BOOTH et al. 1993). Most of the parasite affects its host (bird or mammal) is the major problem in host-parasite biology (TOFT et al. 1991). Lice infest a wide range of domestic livestock including poultry, pigs, cattle, goat, sheep and cause chronic dermatitis (pediculosis) characterised by constant itching, rubbing, tagging and biting of hair or fleece. These macroparasites have reported to incur heavy loss to dairy and poultry industry by causing severest irritation, sucking blood (haematophagous) and through spreading noxious pathogenic agents (e.g. bacteria, viruses, fungus and protozoans etc.) among birds and mammals (WATERSTON 1926, KALAMARZ 1963 a, b, SEAGER et al. 1976, KIM et al. 1973, SAXENA et al. 1985, BARTLETT 1993, DURDEN 2001, 2002).

The very heavy infestation of phthirapteran ectoparasites can decline feeding efficiency, body weight and egg production (NELSON et al. 1975, 1977, ARENDS 1997). The severest irritation incurs extensive negative impact of lice on their host (SOULSBY 1982). The very heavy infestation of *Cuculotogaster heterographa* (NITZSCHE in GIEBEL) causes restlessness, reduction in vitality and seldom kills chicken (KIM et al. 1973, LOOMIS 1978). The cumbersome mallophagan lice load reported to cause hyperchronic anaemia and lameness also associated with heavy lice infestation in three species of birds (*Numidia meleagris galeata, Gallus gallus f. dom., Pavo muticus*) (JUNGMANN et al. 1970, OKAEME 1989). The diseases like diarrhoea and prostration has reduced body mass and declined laying capability in hens infested by *Eomenacanthus stramineus* (NITZSCHE) (CHENG 1964). Lice have caused 711 gms/bird weight loss in Poultry of sharikia Governorate (EL-KIFL et al. 1973). Domestic fowls and turkey with mallophagosis have documented stunted growth rate and sluggishness (FABIYI 1986). Few workers have noted 25% higher mortality in chickens having mallophagosis than to controlled group (PRELEZOV et al. 2006). The substantial increases in preening scores have been recorded with increase in population of *Gallacanthus cornutus* (SCHÖMMER) in summer which causes skin lesion and haemorrhage (KUMAR & KUMAR 2010).

Mammals have also been severely affected by the lice and limit milk production in dairy cattle. 10% cattle in Northern U.S. have had heavy infestation of *Bovicola bovis* (L.), which inflicts losses of many million dollars (KUNZ et al. 1991). The estimated losses including the control cost in United State due to lice have been cited between US $ 126.3 million to US $ 130 million (DRUMMOND et al. 1981, CHALMERS & CHARLESTON 1981, MEYER & KOOP 1987). In New Zealand, the cost of the legally required annual dipping has been estimated to cost approximately NZ $ 7.5 million/annum for labour and material only for sheep lice (KETTLE 1985).

The phthirapteran ectoparasites incur heavy cost on host birds in form of time and energy. Recently, few workers have described that infested birds/mammals have increased B.M.R. (Basal Metabolic Rate) due to increase in thermal conductance (SCHMIDT-NELSON 1987, DE VANAY et al. 1988, CLAYTON et al. 1995). The parasitized birds invest their maximum time and energy available for foraging to check the population of ectoparasites via preening (BROWN 1974, COTGREAVE & CLAYTON 1994, REDPATH 1988). Increased preening and grooming also enhance risk of being killed by predators due to reason that bird becomes less vigilant during grooming. These economically important ectoparasites exert natural selection pressure on host birds (REDPATH 1988).

The lice can indirectly harm the birds and mammals by acting as a vectors or intermediate host of pathogenic strains. For instance, *Menopon gallinae* (L.) and *Eomenacanthus stramineus*...
infesting domestic fowls are serving as a vector of eastern equine encephalomyelitis and reservoir as well as transmitting bacterial strains like *Pasteurella multocida* (Lehmann & Neumann), *Escherichia coli* (Migula) and *Streptococcus* sp. among poultry birds (Olitsky & Casal 1959, Derylo 1972, 1974 a, b, Derylo & Jarosz 1972, Howitt et al. 1948). Dog louse, *Tricodectes canis* is also act as an intermediate host of tapeworm that parasitized canids (Kim et al. 1973). The severe infestation of lice can impart pathological problems as recorded by some workers (Durden 2001, Nelson et al. 1975, 1977).

Few workers have excellently reviewed the impact of lice on poultry birds, domestic mammals and wild animals (Durden 2001, Arens 1997, Price & Graham 1997). A review of literature revealed that most of the workers have selected only *Eomenacanthus stramineus* for their experimentation while they have studied the impact on productivity of host. However, another haematophagous species, *Gallacanthus cornutus* remained unstudied from this point of view. Therefore, keeping in view the haematophagous nature of amblyceran lice, an attempt has been made to access the impact of *Gallacanthus cornutus* on meat production in *Gallus gallus* f. dom.

**Materials and Methods**

The birds used in experiment were indigenous fowl, *Gallus gallus* f. dom. of similar age and breed. 100 chickens of age two month were bought from poultry farm. The birds were deparasitized by repeated dusting with pyrethrum powder and deworming by veterinary deworming drug. The birds were kept in two separate flocks with similar male and female ratio (1 : 4). They were kept in two separate house side by side and same size. Each bird of first flock was parasitized with 20 *Gallacanthus cornutus* and second flock kept control (regularly deparasitized). Both the groups were provided with similar food, hygiene and environmental condition (i.e. temperature, moisture, light etc.). Weight of all the birds (infested and uninfested) were taken weekly with the electronic balance.

**Observations**

Experiments were beginning in the month of July 2008. The starting average weights of each bird in two groups were more or less similar (0.256 kg in uninfested and 0.254 kg in infested groups). The uninfested group gain weight very rapidly. The average monthly weight of each bird in uninfested groups were 0.256, 0.374, 0.882, 1.379, 1.566 and 1.979 kg in July, August, September, October, November and December respectively (Fig. 1). Similarly, the average monthly weight gain per bird in infested group were 0.254, 0.215, 0.362, 0.479, 0.755 and 1.301 kg in July, August, September, October, November and December respectively. The weight gains in infested categories were much slower than uninfested categories (Fig. 1).

The difference in average weight gain per bird between uninfested and infested group were found 0.02, 0.159, 0.520, 0.900, 0.811 and 0.678 kg in July, August, September, October, November and December respectively (Fig. 1). The data were not taken after December because the *Gallacanthus cornutus* population drastically decline in the winter months (due to low environmental temperature) at Purola (Uttarkashi) (altitude 1500 meters from sea level). An examination of Figure 1 demonstrated that weight gain differences were increased up to the month of October followed by decline in two succeeding months. Obviously, the *G. cornutus* affect more in young chicken as compared to older ones. Furthermore, an attempt was also made to analyze the data statistically. Two tailed paired t-test was found significant between weight gain in uninfested and infested birds (*t* (4) = 4.702, *p* = 0.005).
Discussion

Poultry or chicken are reared for the purpose of human welfare as a rich source of protein in the shortest possible time. Egg, meat and feathers are the main products which are very important for human beings. Workers of the field have studied the effect of ectoparasites on the productivity of the birds. Most of the workers have investigated the effect of *Eomenacanthus stramineus* on chicken weight gain and egg production. The poultry of Uttarkashi (India) has found infested with *Gallacanthus cornutus*. This species is very fast runner over host body, hematophagous in nature intragenus to *Eomenacanthus stramineus* (Kumar & Kumar 2010). The sharp mandibles and other mouthparts of *Gallacanthus cornutus* are well equipped for piercing and sucking the blood of host birds (Trivedi et al. 1990). So this parasite might cause severe nuisance in chicken. Thus, in the present study author has made an attempt to investigate the effect of *G. cornutus* on chicken productivity. An examination of data indicates that *G. cornutus* able to reduce as much as 900 gm body weight decrease per bird (Fig. 1). Young chicken were more affected than the older ones. Young chicken does not have skilful in lice checking behaviour (e.g. preening, grooming and dusting etc.) and they have soft skin and feathers for feeding and hiding to parasites.

There are some conflicting reports published on economic importance of chicken body louse, *Eomenacanthus stramineus*. Some workers like have found no significant difference between two groups of laying hens (Trivedi et al.1990, Stockdale & Raun 1960). While majority of workers have reported significant difference between uninfested and infested birds (Edgar & King 1950, Glees & Raun 1959, De Vaney 1976, Panda & Ahluwalia 1983). However, in the present studies, authors have made first attempt to study the effect of *Gallacanthus cornutus* on the meat production. An analysis of data obtained through experimentation indicates that *G. cornutus* significantly decreases the meat production (Fig. 1). The two tailed t-test between the uninfested and infested birds in relation to productivity of birds were found significant at 5 % level.

The combined population of Ischnoceran species *Columbicola columbae* (L.) and *Campanulotes bidentatus compar* (Burmeister) infesting rock pigeon have not shown significant loss in host fitness (Clayton & Tompkins 1995). However, *Gallacanthus cornutus* cause severe weight loss in poultry birds. Mortality has been recorded in juvenile American white pelican by hemorrhagic ulcerative stomatitis which is infested with menoponid louse, *Piagetiella peralis* (Leidy) (Samuel et al. 1982). Macroscopically multiple wounds and hemorrhages on skin surface and histologically in all cutaneous layers of muscles, liver, lungs and kidneys have also recorded in infested host body (Preleoz et al. 2006). Furthermore, tissue hyperaemia, haemorrhages, pseudoeosinophilic and lytiocytic infiltration in the hens have also been recorded having mix infestation of biting lice *Gallacanthus cornutus, Eomenacanthus stramineus, Menopon gallinae* and *Goniocotes gallinae* (De Geer). During the present experimentation, death of chicken has also been recorded but there is no manifestation of hemorrhagic condition appeared. Heavy and very heavily infested bird has been found lethargic in condition and finally such bird might die within 15 days due to anaemia. The present investigation has shown that *Gallacanthus cornutus* cause significant decrease in body weight. It means it decrease the meat production. Obviously, it causes great loss to the poultry industry as well as the economy of any country. So, poultrymen need to be careful about the infestation of *G. cornutus* and their proper control.

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**Literature**


Fig. 1. Illustrating the effect of *Gallacanthus cornatus* (Schömer) on the average weight gain in infested and uninfested chicken.


