*Pak. J. Agri. Sci., Vol. 49(4), 447-450; 2012*
*ISSN (Print) 0552-9034, ISSN (Online) 2076-0906*
*http://www.pakjas.com.pk*

# STUDY OF BIONOMICS OF SKIRT AND BLOUSE BEETLE (*Paederus fuscipes* CURTIS), 1826 (COLEOPTERA: STAPHYLINIDAE, PAEDERINAE)

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This study on the life history, activity of larvae, pupae and adults of *Paederus fuscipes* (Staphylinidae: Paederinae) was carried out during 2009 due to its multiferous (scavenger, predator and medical importance) role. The adults were reared in glass beakers with different types of soils to know their egg lying capacity in these soils at room temperature. Little decaying vegetable material and aphids were added into these beakers on alternate days to provide a natural environment and food to insects. ANOVA and Fishers LSD posthoc test was applied to compare the results. These preffered damp soil rich in organic matter for egg laying under the laboratory conditions. A single female laid 25 to 61 eggs during March-June depending upon temperature. Oviposition period was found to be as double (12.5 days) and incubation period as half (2.5 days) in May-June than in March-April. The average duration of incubation, larval and pupal stage was 3.8, 8.1 and 3.9 days, respectively.
**Keywords:** Staphylinidae, soil type, *Paederus fuscipes*, bionomics, beetles

## INTRODUCTION

In the world, the medical important genus *Paederus* Fabricius, 1775 is represented by more over 600 species (Frank, 1988). Most species of *Paederus* contain vesicating fluids (Nikbakhtzadeh and Tergari, 2008). *Paederus fuscipes* is also well known for causing dermatitis in man, which is commonly known as "Spider lick". Toxicity of *Paederus* has been known in western medicine for over 100 years and was also known to chinese medicine 1200 years before. *Paederus fuscipes* has been found to cause dermatitis in troops (Dursteler and Nyquist, 2004; Qadir *et al*., 2006), India (Somerset, 1961), Iran (Zargari *et al*., 2003; Nikbakhtzadeh and Tirgari, 2008), Sri Lanka (Kamaladasa *et al*., 1997) and Turkey (Uslular *et al*., 2002; Şendur *et al*., 2003). This disease was first reported by Strickland (1924) in India. This disease is more frequently found from April to August (Nikbakhtzadeh and Sadeghiani, 1999; Zargari *et al*., 2003; Nikbakhtzadeh and Tirgari, 2008). The common symptoms are skin lesions as well as respiratory, eye or skin allergies that are caused by contact with beetle haemolymph and/or toxic secretions, hairs or frass of larvae (Ahmed *et al*., 1981; Alexander, 1984; Frank and Kanamitsu, 1987). Contact with human occurs mostly due to attraction of this insect towards light at night in tropics and some temperate countries. These species are well distributed in Pakistan (Shafi, 1957). Cameron (1931) recorded 43 species of this genus in the Indian subcontinent. The genus *Paederus* is widely distributed in all temperate and tropical continents. Mostly, species are found under moist conditions, some have attained their life cycle according to seasonal variations in moisture level (Manley, 1977). Species living in temperate regions may have a single breeding season only in the hot months, but in tropical areas the breeding season depends upon rainfall. They are usually multivoltine with several generations at low latitudes (Nikbakhtzadeh and Tirgari, 2008). *Paederus fuscipes* is found in Europe, North and central Africa, Asia, New Guinea, Australia, India and Pakistan. Eggs are laid on moist substrate singly and are in danger of desiccation. The species has 2 larval instars, which live predatory as do adults in moist habitats. Pupation occurs in earthen cells. Due to its predatory and medical importance, the life history of *P. fuscipes* was studied in the laboratory with the objectives to study number of eggs laid per female during different months, larval period and pupation period during different months, and egg laying capacity in different soils.

## MATERIAL AND METHODS

Live specimens of *P. fuscipes* were sampled from the horticultural experimental research area of the University of Agriculture, Faisalabad. Hand collection, sweep net collection and pitfall trapping was done to get specimens for rearing (Roeder, 2003; Garcia and Chacon de ullea, 2005; Derunkov, 2007). The collected specimens were brought to the Biodiversity Laboratory, Department of Agri-Entomology. For rearing, the collected specimens were kept in wire guage and glass boxes while killed specimens were preserved in 70% alcohol for the systematic study. The specimens were reared in glass beakers tied the open end with muslin cloth or fine mesh cloth at room temperature (24-29°C) during the months of March to June, 2009. These beakers were filled up to 2–2.5 inches with different types of

soils (damp soil rich in decaying organic matter, dry soil rich in organic matter, damp sandy soil and dry sandy and clay soil). The beakers were kept moist by sprinkling water in them daily. Little decaying vegetable material and aphids were added into these beakers on alternate days to provide a natural environment and food to insects. Eggs were transferred to individual beakers with the help of a camel hair brush. Beakers were checked daily during egg laying stage and larval instars. Larvae were fed with decaying vegetable material and aphids on alternate days. One *Paederus fuscipes* was used per beaker and the same *Paederus fuscipes* individuals were used throughout the study. Four replicates were run for each study. To study the soil type preference for egg laying dry soil rich in organic matter (50% by volume), damp soil rich in organic matter, damp sandy and clay soil (50% by volume) and dry sandy and clay soil were tested in our experiment under controlled conditions. For this purpose, glass beakers were used and number of eggs in each soil was recorded.

## RESULTS

***Copulation*:** According to the observation, the male rides on the female inserting its aedeagus in the genital opening of the female. The copulation time in *Paederus fuscipes* ranged between 12 and 15 minutes at room temperature. The adults may repeat copulation several times with 8-10 minutes interval.

***Oviposition*:** In the rearing beakers, round and whitish eggs were singly laid in the soil at a depth up to 1 inch. A female can lay 25 to 61 eggs depending upon temperature (24-29 °C). A female might lay eggs for several days without missing and then miss several days or lay at irregular fashion. A female might lay 0-8 eggs per day as shown in the Table 1.

***Soil type for egg laying*:** *Paederus fuscipes* preferred damp porous soils rich in decaying organic matter (Table 2). In particular, dry soils were avoided even if they contain organic matter. This selection was pronounced in March and June, whereas in April and May dry soil rich in organic matter was used for egg laying to a low extent. Damp sandy and clayey soils were also used for egg laying to some extent. Dry sandy and clay soils were avoided throughout the whole egg laying season (Table 2).

***Period of oviposition*:** During this experiment, period of oviposition was recorded from March to June (Table 3). The oviposition time was more than twice as high in June than in March.

***Incubation period*:** This period varied in different seasons. During spring season (March-April), it was 5-6 days while in summer season (May-June) this stage varied from 2-2.5 days as shown in Table 3.

**Table 1. Mean and SD values of egg laying with starting and end date of different females at room temperature (24-29°C)**

| Females | Egg laying | | | |
|---|---|---|---|---|
| | Start date | End date | Eggs/day | SD |
| 1 | 05-03-2009 | 10-03-2009 | 4.16 | 0.71 |
| | 15-04-2009 | 23-04-2009 | 5.10 | 0.99 |
| | 10-05-2009 | 19-05-2009 | 5.70 | 1.34 |
| | 15-06-2009 | 25-06-2009 | 5.55 | 0.93 |
| 2 | 05-03-2009 | 11-03-2009 | 4.18 | 0.71 |
| | 16-04-2009 | 23-04-2009 | 5.11 | 1.00 |
| | 10-05-2009 | 19-05-2009 | 5.69 | 1.32 |
| | 13-06-2009 | 23-06-2009 | 5.50 | 0.92 |
| 3 | 05-03-2009 | 10-03-2009 | 4.17 | 0.70 |
| | 15-04-2009 | 23-04-2009 | 5.13 | 0.99 |
| | 11-05-2009 | 20-05-2009 | 5.71 | 1.30 |
| | 15-06-2009 | 25-06-2009 | 5.52 | 0.93 |

**Table 2. Oviposition record of *Paederus fuscipes* Curtis in different soils at room temperature (24-29°C)**

| Type of Soils | March | | April | | May | | June | |
|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Damp soil rich in organic matter | 5.25 a | 0.50 | 5.75 a | 0.50 | 6.50 a | 0.58 | 5.50 a | 0.58 |
| Dry soil rich in organic matter | 0.25 c | 0.50 | 1.25 c | 0.50 | 2.00 c | 0.82 | 0.50 c | 0.58 |
| Damp sandy soil + clay soil | 2.50 b | 0.71 | 3.25 b | 0.50 | 3.75 b | 0.50 | 3.25 b | 0.50 |
| Dry sandy soil + clay soil | 0.25 c | 0.50 | 0.75 c | 0.50 | 0.50 d | 0.58 | 0.25 c | 0.50 |

**Table 3. Effect of different temperatures on various development stages of *Paederus fuscipes* Curtis**

| Parameters | Temperature (°C) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | March 25.4 | | April 26.7 | | May 27.6 | | June 28.0 | |
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Oviposition time (days) | 6.0 a | 0.8 | 9.3 b | 1.0 | 10.5 b | 0.6 | 12.5 c | 1.3 |
| Eggs/female | 27.3 a | 5.1 | 49.3 b | 5.4 | 60.3 c | 3.8 | 65.3 c | 4.4 |
| Eggs placed/day | 4.5 a | 0.3 | 5.3 b | 0.2 | 5.7 c | 0.3 | 5.3 b | 0.3 |
| Incubation time (days) | 5.3 a | 0.5 | 4.5 b | 0.6 | 3.3 c | 0.5 | 2.0 d | 0.0 |
| Larval period (days) | 9.5 b | 0.6 | 8.8 b | 0.5 | 7.3 a | 0.5 | 6.8 a | 0.0 |
| Pupal period (days) | 4.8 a | 0.5 | 4.3 b | 0.5 | 3.8 b | 0.5 | 3.0 c | 0.0 |

***Description of Larva*:**
***1st stage larva*:** Brown and is very active, setaceous form having ten prominent abdominal segments.
**2nd stage larva:** Head yellow, abdominal segments orange-brown. Cerci on 9th abdominal segment.
***Full grown larva*:** Head dark grey, sub-orbicular, bent slightly downwards, eyes prominent, 6-segmented antennae, setaceous. Pointed mandibles, maxillary palpi 4-jointed, labial palpi 3-segmented. Legs setaceous, abdomen 10 segmented, 9th segment has a pair of cerci.
***Description of pupa*:** Without protective covering, head bent downwardly, a finger of six hairs on each side of thorax, 2 processes on last abdominal segment.
***Duration of larval stages and pupae*:** During the experiment, it was found that the stages lasted from 6-9 days. The duration was minimum during May and June due to high temperature, and was maximum during March and April due to low temperature. During study, the pupal stage was found to be comprised of the days as shown in Table 3.

## DISCUSSION

The life history of *Paederus fuscipes* was studied during 2009 under laboratory conditions due to its medical and predatory importance as many other scientists also studied its life history (Isaac, 1934; Kazuyoshi, 1958; Krakerb *et al*., 2000; Devi *et al*., 2003). Some scientists studied its life history with refrence to dermatitis (Somerset, 1961; Deneys and Zumpt, 1963; Kellner and Dettner, 1996; Nikbakhtzadeh and Tigari, 2008), others studied its life history to know its predatory potentials by using different pests as a prey (Manley, 1977; Frank and Kanamitsu, 1987; Devi *et al*., 2003; Rutledge *et al*., 2004) and some researchers studied its life history by providing artificial diets (Min, 2006). However, currently we studied its life history by providing natural conditions in the laboratory. We provided aphids as food to study the life cycle of *P. fuscipes* as did Rutledge *et al*. (2004) and Heimpel *et al*. (2004) but they studied its predatory potential in sense of amount of consumption per beetle from hatched larvae to adults and subsequently in adult stage how much aphids are consumed per day. We simply studied its life cycle by providing aphids as a diet. It could be noted that oviposition period increased as the temperature increased or time passed by. In the month of March, the oviposition period was 5-7 days of a female and it increased up to 14 days in June. As the oviposition period increased, the number of eggs laid/female also increased and hence its population reached at peak in June–July. These results are in agreement with the results of Isaac (1934), Kazuyoshi (1958), Somerset (1961), Deneys and Zumpt (1963) and Nikbakhtzadeh and Tigari (2008). As the temperature increased or the days passed then the incubation period, larval period and pupal period decreased. The duration of life stages shortened so, more generations in June and July. From the results, we could see that a female laid 5.2 eggs/day on average. The average duration of incubation, larvae and pupae was 3.7, 7.5 and 3.9 days, respectively. These results are similar to the results of Kazuyoshi (1958), Somerset (1961), Devi *et al*. (2003) and Nikbakhtzadeh and Tigari (2008). From the results, it could also be noted that a female laid more number of eggs in moist soil rich in organic matter and very few in dry sandy and clay soil. Due to this reason, its population was mostly seen in June-July after rains. These results are very likely to be similar with those of Issac (1934) and Devi *et al*. (2003).

***Acknowledgments*:** We would like to thank Higher Education Commission (HEC), Islamabad, Pakistan for supporting the PhD project through indeginous program, part of which is reported in this study. Special thanks to Prof. Dr. Ulrich Irmler, University of Kiel, Germany for his valuable help to improve the manuscript.

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