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A Bionomic Study of Hymenopteran Parasitoids at the Taman Beringin Landfill in Kepong and a Poultry Farm in Sungai Pelek, Selangor, Malaysia

(Kajian Bionomik Parasitoid Hymenoptera di Tapak Pelupusan Sampah, Taman Beringin, Kepong dan Ladang Penternakan Ayam, Sungai Pelek, Selangor, Malaysia)

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ABSTRACT

A four-month cross-sectional study found five species of parasitoids parasitizing puparia of filth flies breeding at the Taman Beringin landfill in Kepong and a poultry farm in Sungai Pelek, Sepang, Selangor. Effect of monthly rainfalls towards density of flies and percentage of parasitoids emerging from collected puparia were also analyzed. Spalangia sp. was the most common, consisting of Spalangia endius Walker, S. cameroni Perkins and S. gemina Boucek. Other parasitoids collected were Pachycrepoideus vindemmiae Rondani and Exoristobia phillipinensis Ashmead. The parasitized fly hosts were Musca domestica Linn. and Chrysomya megacephala Fabricius. S. endius was the most common parasitoid attacking M. domestica at both locations. M. domestica was the most common fly found at the Sg. Pelek poultry farm whereas C. megacephala was the most numerous at the Taman Beringin landfill. During heavy rainfall month of November 2003, density of flies were high whereas the emerging parasitoids were low at both landfill and poultry farm. The present study revealed the endemic presence of parasitoids especially S. endius in both poultry farm and garbage landfill and the potential of the parasitoid species in fly control in Malaysia.

Key words: Hymenopteran parasitoid, Fly control, Spalangia sp.

ABSTRAK

Kajian keratan rentas selama empat bulan ke atas tapak pelupusan sampah di Taman Beringin, Kepong dan ladang penternakan ayam di Sungai Pelek, Sepang menemui lima spesies parasitoid pada pupa lalat sampah. Dalam tempoh yang sama, kesan hujan ke atas kepadatan lalat serta peratus bilangan parasitoid yang ditemui pada pupa lalat turut dikaji. Dalam kajian ini,

Spalangia sp. merupakan spesies yang lazim ditemui dan terdiri daripada Spalangia endius Walker, S. cameroni Perkins dan S. gemina Boucek manakala parasitoid lain yang turut dikumpul ialah Pachycrepoideus vindemmiae Rondani dan Exoristobia phillipinensis Ashmead. Perumah kepada parasitoid tersebut merupakan lalat Musca domestica Linn. yang banyak ditemui di ladang penternakan Sg. Pelek manakala Chrysomya megacephala Fabricius pula lebih banyak dijumpai di tapak pelupusan sampah Taman Beringin. S. endius merupakan spesies parasitoid yang paling lazim menyerang M. domestica di kedua-dua lokasi. Selain itu, kepadatan taburan lalat adalah tinggi ketika cuaca hujan lebat yang lebih kerap pada bulan November 2003 manakala kehadiran parasitoid adalah rendah di kedua-dua lokasi berkenaan dalam tempoh yang sama. Hasil kajian membuktikan kehadiran endemik parasitoid, terutamanya S. endius, di tapak pembuangan sampah dan ladang penternakan ayam serta potensi spesies parasitoid berkenaan bagi kawalan lalat di Malaysia.

Kata kunci: Parasitoid himenoptera, Kawalan lalat, Spalangia sp.

INTRODUCTION

Filth flies have genetic capabilities in developing resistance towards insecticides (Korcisova et al. 2002). An alternative mean of fly control needs to be looked upon to and the answer might lie in biological control. Hymenopteran parasitoids, especially *Spalangia* sp. were proven to be efficient in the control of house flies in the United States of America (Rutz & Axtell 1981).

In Malaysia, Boucek (1963) reported four species belonging to genus *Spalangia* Latrielle, namely *Spalangia cameroni* Perkins, *S. gemina* Boucek, *S. obscura* and *S. simplex* Perkins. Boucek and Narendran (1981) recorded *Dirhinus himalayanus* Westwood from *Sarcophaga* sp.. Kadarsan and Jeffery (1981) found that the *Sarcophaga* laboratory colony maintained at the Department of Parasitology and Medical Entomology, Universiti Kebangsaan Malaysia, was parasitized by *Exoristobia philippinensis* Ashmead and a ptreomalid, *Pachycrepoideus vindemmiae* Rodani. Omar et al. (1988) recorded the occurrence of *Spalangia endius* Walker for the first time in Malaysia in 1988 and a new species, *Spalangia bouceki* parasitizing puparia of *M. domestica* was discovered by Omar et al. (1991).

Sulaiman et al. (1990) conducted an extensive study on the distribution of Hymenopteran parasitoids at refuse dumping sites and poultry farms in all the states in Peninsular Malaysia. Until now, no further studies on this puparia have been recorded. The objectives of our study are to identify the species of parasitoids and their biodiversity at the Taman Beringin landfill and a poultry farm in Sg. Pelek, Sepang, and climatic factor, specifically rainfall, towards their distribution.

EXPERIMENTAL METHODS

The study was conducted at two locations, Taman Beringin landfill in Kepong and a poultry farm in Sungai Pelek, Sepang, Selangor. The Taman Beringin landfill covers an area approximately 8 hectares and situated approximately 6 kilometers from the Kuala Lumpur city center. Domestic rubbish from the city and Klang Valley are trucked here and then compacted by tractors. The poultry farm in Sg. Pelek, Sepang, Selangor, which is located approximately 80 kilometers to the south of Kuala Lumpur city center has rectangular 4 wire cages each measuring 25 m long × 10 m wide (2,500 bird capacity) having the chicken suspended 1 m above the ground. The floor is made of 2 wooden planks laid approximately 1 cm apart from each other.

Collections of fly puparia were made between August and November 2003, twice a month at the landfill and once a month at the poultry farm. Each location was sampled for 1 hour by two collectors who were at liberty to handpick any pupa found sticking on or under the poultry manure and rubbish heaps using forceps. Pupae were placed in plastic containers and transported to the laboratory for observation.

Fly puparia were incubated individually at room temperature (26-29°C) in plastic containers (20 mm diameter, 50 mm high) and observed daily for 4 weeks for the emergence of adult flies and parasitoids. Emerged adult flies were separated according to species and sex. Parasitoids were killed with chloroform and pinned for identification based on Boucek (1963). Meteorological data for Taman Beringin and Sg. Pelek were collected from the Malaysian Meteorological Service.

Fly density was measured using the 45 cm long × 42.5 cm wide Scudder Grill and placed at each locations for 30 seconds.

RESULTS AND DISCUSSION

Four species of parasitoid obtained from Taman Beringin landfill were *Spalangia endius, S. gemina, P. vindemmiae* and *E. philippinensis* whereas only *S. endius* and *S. cameroni* were found at the poultry farm in Sg. Pelek (Table 1). *S. endius* was the dominant parasitoid species at both locations. A study at refuse dumps and poultry farms throughout Malaysia in 1990 by Sulaiman et al. showed that *S. endius* was the common parasitoid attacking *M. domestica* and *C. megacephala*. No *P. vindemmiae* was found at the poultry farm, which differs from Sulaiman et al. study in 1990 and 1993 that *P. vindemmiae* is commonly found at the poultry farms. *E. philippinensis* was reported for the first time at the landfill and this shows *E. philippinensis* is able to colonize in an open habitat other than only insectariums as reported previously by Kadarsan & Jeffery in 1991.

TABLE 1. Flies emergence and parasitoids collected at Taman Beringin, Kepong landfill and a poultry farm at Sg. Pelek, Sepang

Location	Species	Total Pupae	% Flies Emergence	% Death	Parasitoid Species	% Parasitism
Taman Beringin Landfill	*Chrysomya megacephala*	2150	78.4 (1685)	20.8 (440)	*Pachycrepoideus vindemmiae*	1.1(2)
					Spalangia endius	1.1 (23)
	Musca domestica	207	47.8 (99)	22.7 (47)	*Exoristobia philippinensis*	0.5 (1)
					Pachycrepoideus vindemmiae	1.0 (2)
					Spalangia endius	27.5 (57)
					Spalangia gemina	0.5 (1)
	Lucilia cuprina	73	95.9 (70)	41.3 (3)	None	0
	Sarcophaga sp.	1	100 (1)	0	None	0
	Musca sp. (unknown)	2	100 (2)	0	None	0
Sg. Pelek Poultry Farm	*Musca domestica*	214	33.2 (71)	59.8 (128)	*Spalangia endius*	3.1 (13)
					Spalangia cameroni	0.9 (2)

In our study at the landfill, *C. megacephala* were the most common puparia (88.3%) collected followed by *M. domestica* (8.6%), *Lucilia cuprina* (3.0%), *Sarcophaga* sp. (0.04%) and an unknown *Musca* sp. (0.08%). However, only *M. domestica* puparia were collected at the poultry farm in Rawang by Sulaiman et al. (1993). They also showed that no *C. megacephala* puparia were collected between May 1990 to February 1991. This could be due to the changes in weather which could affect the *C. megacephala*'s seasonal population.

In November 2003 which has the greatest total rainfall (451.8 mm) during the four-month study period, no parasitoids emerged from the pupae collected at the Taman Beringin landfill (Figure 1). This result was supported by Sulaiman et al. (1991) who found that no *S. endius* emerged from puparia collected in November 1988 which also recorded the highest rainfall throughout the period of study.

A pattern showing the relationship between the total rainfall and mean density of flies at the landfill and poultry farm was evident as shown in Figure 2 and Figure 3 respectively. As the total rainfall increases, the mean density of flies increases. A study by Nazni et al. in 2003 at a poultry farm in Kundang indicated that heavy rainfall correlated with the high density of flies. This is supported by WHO (1986) that the development of *M. domestica* larvae requires a relatively high humidity.

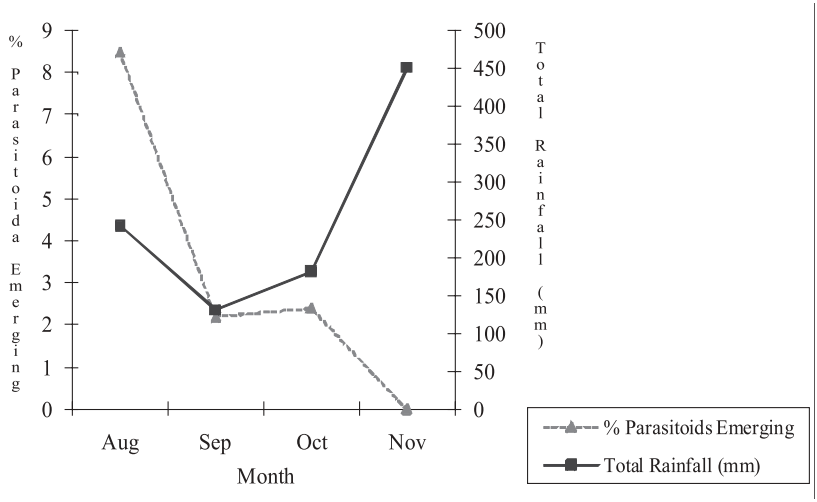

FIGURE 1. Relationship between monthly rainfall and the percentage of parasitoids emerging at Taman Beringin landfill.

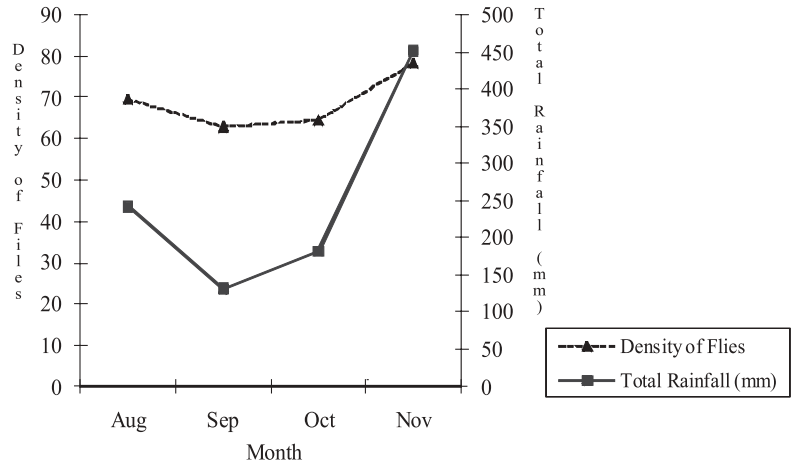

FIGURE 2. Relationship between monthly rainfall and mean density of flies at Taman Beringin landfill

As a conclusion, the data obtained from this study plays an important role in our understanding of the distribution of parasitoids and flies, and factors affecting its survival in the environment. This information could be useful in organizing a strategy in fly control programs. *S. endius* is seen as the most likely choice for an agent in a parasitoid releasing program to control fly population, though such program has yet to be implemented in Malaysia.

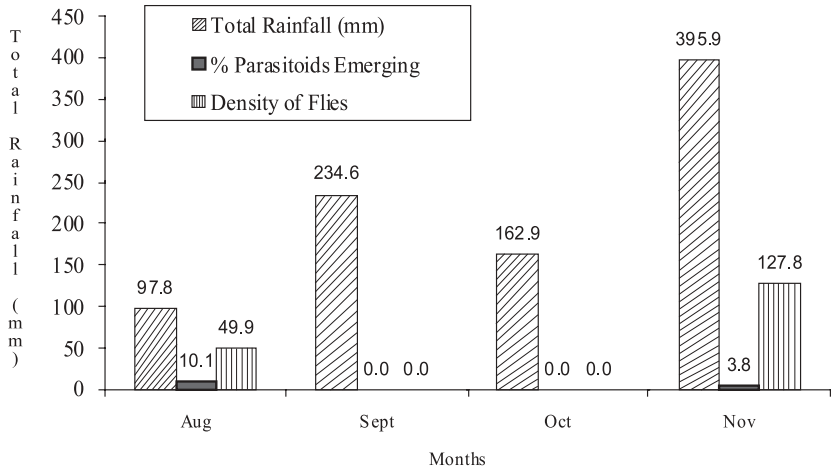

FIGURE 3. Relationship between total rainfall, percentage of parasitoids emerging and mean density of flies at Sg. Pelek poultry farm

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