

## ***Gnetum gnemon* (Gnetaceae) : a new host plant of carambola fruit fly *Bactrocera carambolae* (Insecta: Tephritidae)**

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**Abstract** The carambola fruit fly *Bactrocera carambolae* was reared from the small variety of *Gnetum gnemon* fruit. This is a first record of a gymnosperm serving as host plant for *B. carambolae*. Another Dacine fruit fly *Bactrocera mcgregori* was reared from the large variety of *G. gnemon* fruit. The infestation rate was low. In a sample of 77 big-sized *G. gnemon* fruits from University Malaya campus, 48 larvae successfully pupated, an incidence of 0.62 fly per fruit. Sixteen adult flies emerged from the 48 pupae, indicating a pupal mortality of 66.66%. Three species of braconid wasps – *Fopius arisanus*, *Diachasmimorpha longicaudata* and *Psytallia cf makii* – parasitized different developmental stages of these fruit flies.

**Keywords** new host plant – *Bactrocera mcgregori* – braconid parasitoids – biocontrol agents – Kuala Lumpur – Penang – Malaysia

## **INTRODUCTION**

The carambola fruit fly *Bactrocera carambolae* is a member of the *Bactrocera dorsalis* species complex [1, 2]. It occurs in Malaysia and other parts of Southeast Asia, and had been introduced into Guyana, Suriname, French Guiana and Brazil [3]. It is of especial economic importance, infesting a great variety of fruit and vegetable crops. The damage may be tremendous and limit production and cultivation of affected crops.

In Asia, over 70 species in 28 families have been recorded to be host plants of *B. carambolae* [4–6]. In Peninsular Malaysia, *B. carambolae* is the predominant taxon attacking fruits of Combretaceae, Myrtaceae, Oxalidaceae, Sapindaceae and Sapotaceae [6, 7]. We report here a new host plant *Gnetum gnemon* L. (Gnetaceae) which is also a new host-plant family for *B. carambolae*.

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## MATERIALS AND METHODS

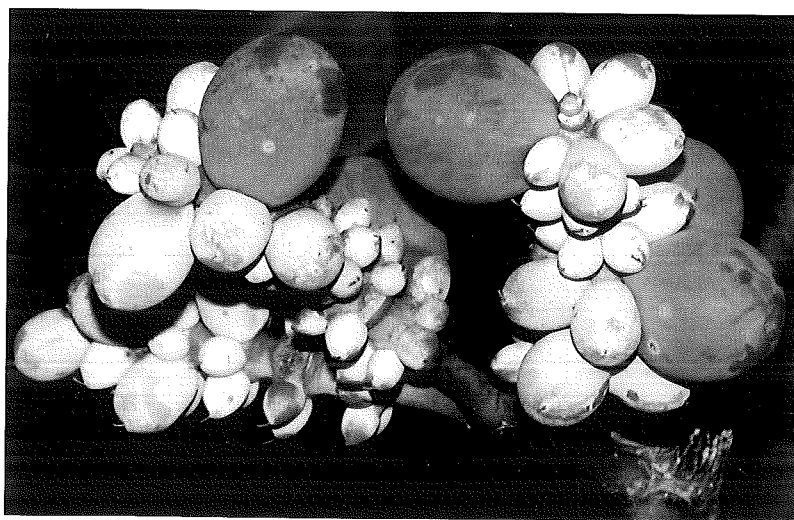
Two kinds of ripe *Gnetum gnemon* fruit (Fig. 1), small and big varieties from different trees, were collected over the years during fruiting seasons. They were brought back to the laboratory and kept in screened plastic aquaria with suitable substrate for the larvae to develop and pupate [5]. Pupae were collected and placed in small plastic tubes for development. Emerging adult fruit flies were collected and identified. Parasitoids that emerged were also recorded.

## RESULTS AND DISCUSSION

The small and big varieties of *G. gnemon* fruit were attacked by different species of *Bactrocera* fruit flies (Table 1). *Bactrocera carambolae* (Fig. 2) was the only

**Table 1.** *Bactrocera* fruit flies and parasitoids from two varieties of *Gnetum gnemon* fruit.

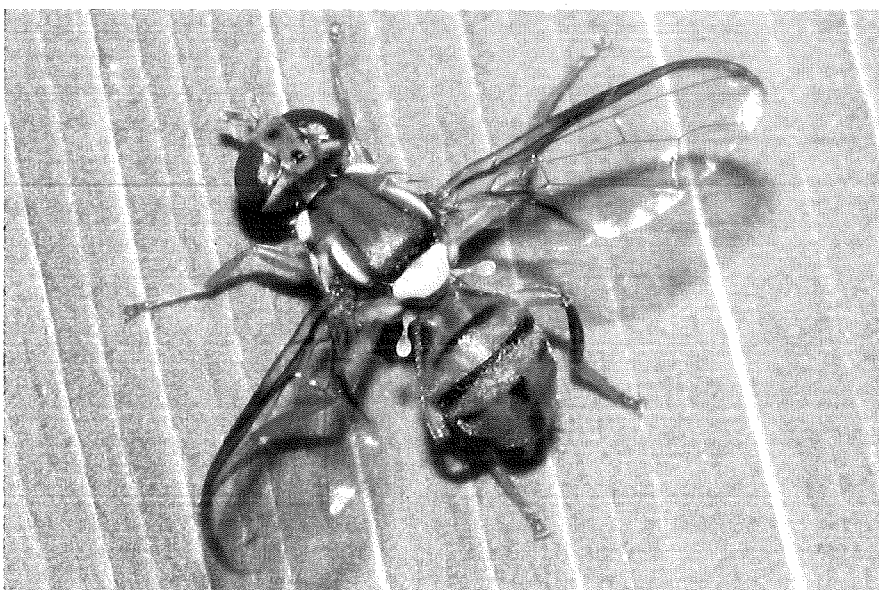
Fruit variety	Location	Fruit flies	Parasitoids
Small	UM, Kuala Lumpur	<i>B. carambolae</i> (10♂♂, 22♀♀)	<i>Fopius arisanus</i> (1♂, 2♀♀)
Big	UM, Kuala Lumpur	<i>B. mcgregori</i> (8♂♂, 8♀♀)	None
Big	Penang	<i>B. mcgregori</i> (1♀)	<i>F. arisanus</i> (6♂♂, 5♀♀) <i>Diachasmimorpha longicaudata</i> (1♀), <i>Psytallia cf makii</i> (1♂)



**Figure 1.** Small variety of *Gnetum gnemon* fruit. (photo: H. S. Yong)



**Figure 2.** *Bactrocera carambolae*. (photo: H. S. Yong)



**Figure 3.** *Bactrocera mcgregori*. (photo: H. S. Yong)

fruit fly species recovered from fruits of the small variety of *G. gnemon* fruit collected in the University of Malaya campus from March 2010 to January 2013 (Table 1). This is a new host species record and also a new plant family record for *B. carambolae*. Interestingly *G. gnemon* is a gymnosperm; hitherto only

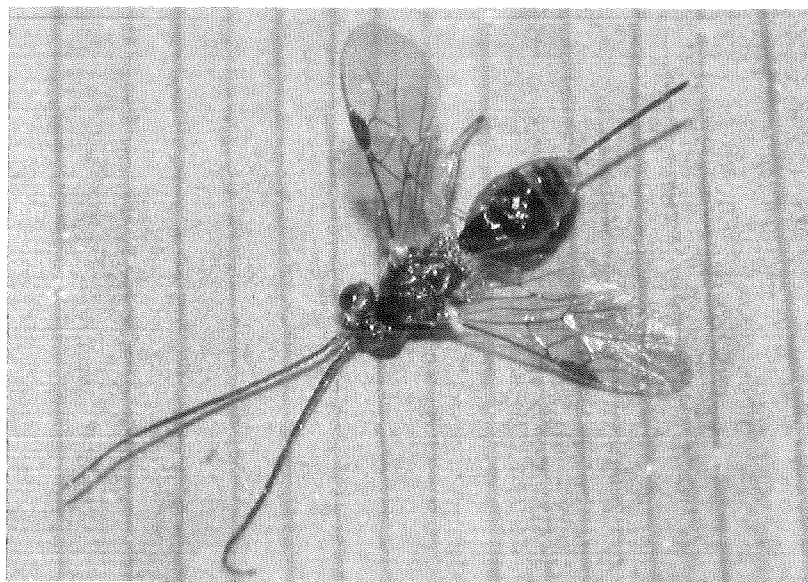
angiosperms have been recorded as host plants of *B. carambolae*. Most of the fruits were however not attacked by this fruit fly.

*Bactrocera mcgregori* (Fig. 3) was recovered from the big variety of *G. gnemon* fruit; *G. gnemon* has been recorded as host of this fruit fly in the Philippines and Singapore [8], Peninsular Malaysia [9] and Car Nicobar Island [10]. However in Fiji, *G. gnemon* is the host of *Bactrocera gnetum* [11]. In Suriname, no fruit flies were recovered from *Gnetum nodiflorum* [12]. The factor(s) influencing the selection of big-sized *G. gnemon* fruit by *B. mcgregori* need to be investigated.

For the big-sized *G. gnemon* fruits collected in University Malaya campus in December 2012, 48 pupae resulted from 77 fruits, i.e. an average of 0.62 fly per fruit. The emergence rate was 33.33% (16/48 pupae), indicating high pupal mortality.

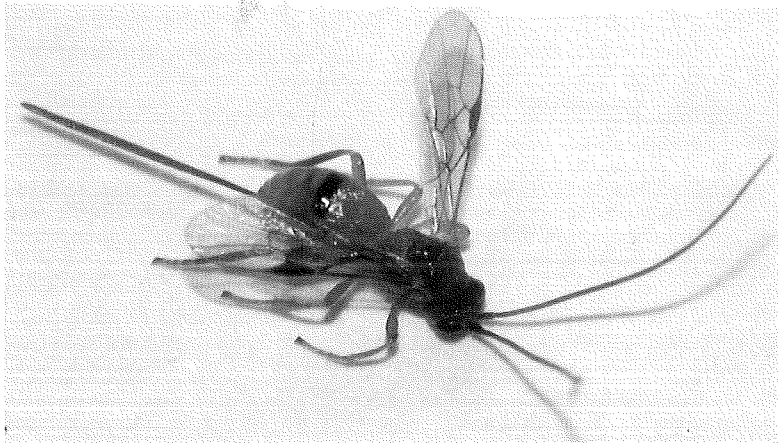
Braconid parasitoids were recovered from the pupae of the fruit flies infesting both the small- and big-sized *G. gnemon* fruits (Table 1). Of these braconid wasps, *Fopius arisanus* (Fig. 4) has short ovipositor and parasitises the egg stage of fruit fly, while *Dichasmimorpha longicaudata* (Fig. 5) has long ovipositor and parasitises the later instar of the fruit fly larvae. *Psytallia* cf *makii* (Fig. 6) and another common species *Fopius vandenboschi* have ovipositor of intermediate length and parasitise the early instars of the fruit fly larvae. These braconid parasitoids together act as effective biocontrol agents of tephritid fruit flies.

In summary, *G. gnemon* constitutes a new host plant as well as a new host plant family for the carambola fruit fly *B. carambolae*. Only small-sized *G. gnemon* fruits appeared to serve as host for *B. carambolae*. The big-sized *G. gnemon* fruits



**Figure 4.** *Fopius arisanus* female. (photo: H. S. Yong)

were host to *B. mcgregori*. Three species of braconid wasps – *F. arisanus*, *D. longicaudata* and *P. cf makii* – parasitized different development stages of these fruit flies.



**Figure 5.** *Diachasmimorpha longicaudata* female. (photo: H. S. Yong)



**Figure 6.** *Psytallia cf makii* male. (photo: H. S. Yong)

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