SCIENTIFIC NOTES ON *Coptosoma variegatum* HERRICH-SCHAEFFER, 1838 (HEMIPTERA: PLATASPIDAE): A POTENTIAL PEST OF MANGO FLOWER IN MALAYSIA

Nurul Huda, A.[1, 2]*, Che Salmah, M.R.[2], Hamdan, A.[2] & Abdul Razak, M.N.[3]
[1]Department of Plant Science, Kulliyyah of Science,
International Islamic University Malaysia, 25200 Kuantan, Pahang, Malaysia.
[2]School of Biological Sciences, Universiti Sains Malaysia, 11800 Penang, Malaysia.
[3]Faculty of Plantation and Agro-technology, Universiti Teknologi MARA,
02600 Arau, Perlis, Malaysia.
Corresponding author email: anhuda@iium.edu.my*

ABSTRACT

The incidence of infestation by a black stink bug *Coptosoma variegatum* (Hemiptera: Plataspidae) on mango *Mangifera indica* L. (Anacardiaceae) tree was scientifically reported for the first time in Malaysia. This insect is commonly known as home invader and legume pest. Abundance of this insect was monitored on mango panicles by 15 minutes hourly collection from 0800 h until 1500 h at 4-day interval from the beginning of flowering until all flowers dried up (12-28 February 2013 and 28 January 2014 – 7 March 2014). Five hundred twenty-six individuals collected during the study period with drastic increase observed in second season. However, their infestation on mango flowers was not fully evident therefore was suggested as a potential pest for mango flower in Malaysia solely due to their appearance on mango panicles. Nevertheless, co-occurrence of this sap-sucking insect with other secondary pests may pose a serious economic implication on the productivity of the crop. Thus, more research regarding this insect biology is required so that control requirement can be identified to maximize mango production in Malaysia.

Keywords: *Coptosoma variegatum*, Plataspidae, mango, legume, pest

ABSTRAK

Kejadian infestasi oleh kepinding busuk hitam *Coptosoma variegatum* (Hemiptera: Plataspidae) pada pokok mangga *Mangifera indica* L. (Anacardiaceae) dilaporkan secara saintifik buat kali pertama di Malaysia. Serangga ini sering dikenali sebagai penceroboh rumah dan perosak kekacang. Kelimpahan serangga ini telah dipantau melalui 15 minit pungutan dalam setiap jam dari 0800 am sehingga 1500 pm, pada selang 4 hari bermula dari awal berbunga sehingga semua bunga telah kering (12-28 Februari 2013 dan 28 Januari 2014 – 7 Mac 2014). Lima ratus dua puluh enam individu telah dipungut dalam tempoh kajian dengan peningkatan drastik diperhatikan pada musim kedua. Walau bagaimanapun, serangan serangga ini terhadap bunga mangga adalah tidak jelas, oleh itu hanya disarankan sebagai perosak berpotensi untuk bunga mangga di Malaysia semata-mata kerana kepadatannya pada tangkai

bunga manga. Namun begitu, kehadiran serangga penyedut sap ini bersama dengan perosak sekunder yang lain dijangka boleh menyebabkan implikasi yang serius terhadap produktiviti tanaman. Oleh itu, lebih banyak kajian tentang biologi serangga ini diperlukan agar keperluan kawalan dapat dikenal pasti untuk memaksimumkan pengeluaran mangga di Malaysia.

Kata kunci: *Coptosoma variegatum*, Plataspidae, manga, kekacang, perosak

INTRODUCTION

Family Plataspidae contains a reported 560 species and 59 genera (Henry 2009). Insects from this family are known as home invaders and legume pests. Among all plataspids, *Megacopta cribraria* is the most common species studied due to their potential as bio-control of invasive plant species. This insect is native to Asia and feed primarily on leguminous plants such as kudzu *Pueraria montana* (Lour.) Merr. and soybean *Glycine max* Merrill by sucking sap from stems, petioles and leaves, but also listed as a pest of Chinese fruit trees including peach, plum and jujube (Zhang et al. 2012).

According to Candan et al. (2012), all members of Plataspidae are phytophagous. Adult and nymphs are recorded to feed on crops, especially Fabaceae, but these insects are very rarely seen in nature. Both nymphs and adults feed on tender stems or leaves resulting in purple spots on leaves. Heavy feeding can result in some defoliation of leaves and flowers and improperly developed pods. Excretions of platspids caused growing of sooty mold as it also covers leaves and stems thus reducing photosynthesis (Zhang et al. 2012).

Among all Plataspidae, *Coptosoma* is the largest genus which caused various economic damages to the crops (Schaefer et al. 2000). Here, *Coptosoma variegatum* Herrich-Schaeffer 1838, commonly called the black stink bug is the subject of this paper. This species is also known with other few synonyms which were *Thyreocoris variegatus* Herrich-Schaeffer (1838), *Coptosoma pygmaeum* Montandon (1896), Jensen-Haarup (1926) and recently suggested name *Coptosoma jensonhaarupi* Rider (2010). Up to now, not many literatures reported about this genus. *Coptosoma* is a widespread plataspid known from India, China and Southeast Asia through Indonesia to New Guinea (Rider 2010). A very good literature on *Coptosoma* biology and taxonomy was given by Beardsley and Flucker (1967), Linnavuori (1977), Davidova-Vilimova and Stys (1980) and Doganlar et al. (2007). Nothing on the ecology of *C. variegatum* was found in published literature in Malaysia, and relatively little information is available on other members of the family Plataspidae. Their infestations on tropical fruit trees also have never been reported. The present study describes the incidence of *C. variegatum* infestation on mango flowers panicles in mango orchard Perlis, Malaysia, together with description on morphology of adult and their behavior.

MATERIALS AND METHODS

The study was conducted at Universiti Teknologi MARA (UiTM) Perlis orchard during two main flowering seasons (February 2013 and January 2014) in a 6.8 acre of 10 years old Sala cultivar @ Perlis Sunshine (MA 164) and Chok Anan (MA 224) planted at the distance of 420 cm x 420 cm. The orchard was maintained following standard agronomic practices as recommended by the Department of Agriculture, Malaysia. No pesticides were used during this study. Since weeds around the orchard could serve as refuges and regulate the diversity and abundance of pest, the experimental plots were divided into control and treated plots (78 m^2 per plot) for each cultivar. Each plot consists of 40 trees. In control plot, the weeds were

regularly controlled manually using a grass mower but herbicide (with active ingredient glufosinate-ammonium 200 g/L) was applied once in every three months in treated plot with dose of 25mL/100L. Insects were collected using quick bagging method (Aliakbarpour 2011) by randomly covering and shaking the flower panicles into a plastic bag (width 40cm x length 50cm) followed by immobilizing them with carbon dioxide (CO_2) for 30 s. Approximately 15-20 panicles were shaking per session. Fifteen minutes of hourly collection has been conducted from 0800 h until 1500 h within 4 days interval from the beginning of flowering until all flowers dried up. Abundance data of insect meet the assumption of normality and homogeneity of variance thus was subjected to parametric Independent Sample T test.

RESULTS AND DISCUSSION

A total of 33 individuals of *C. variegatum* has been collected on mango panicles during flowering season 1 (Table 1). In season 2, almost 15% increase (493 individuals) of abundance recorded with more male compared to female in both cultivars. However, abundance was not significantly different between sexes throughout the study. Separation of *C. variegatum* according to sex was easily done using differentiation in their secondary sexual characteristics. In males their terminal sternites is rounded whereas in females it is V-shape with distinct suture. Only adult of *C. variegatum* was recorded during this study (Figure 1) implied that biological development of this insect does not occur on the mango panicles. Availability of *C. variegatum* on mango panicles probably due to abundance of food sources such as pollen and nectarines on flowers during flowering season. The adult bugs can be seen hiding between mango flowers or in copulation on peduncles. They often drop from the panicles when disturbed but frequently take flight before reaching the ground to nearest branches or weeds. There was a significant different of insect abundance between mango cultivars at $P = 0.001$ ($t=-3.377$, $df=264$) where 320 individuals recorded on Chok Anan and 206 individuals on Sala. Preference showed by this insect to certain cultivars may due to different level of attractiveness among the plants including the availability of food sources.

Table 1. Total numbers of *Coptosoma variegatum* collected on flower panicles of Sala and Chok Anan according to sex ratio.

Mango cultivar	Male	Female	Total
Season 1			
Sala	5	4	9
Chok anan	6	18	24
Total	**11**	**22**	**33**
Season 2			
Sala	107	90	197
Chok anan	170	126	296
Total	**277**	**216**	**493**

Figure 1. Adult of *Coptosoma variegatum* collected from mango panicle.

The abundance of *C. variegatum* recorded in control and treated plots were not significantly different in general. However, drastic increase in numbers of individuals in season 2 (Table 2) may resulted from successful establishment of this insect in control plot during season 1 as only single individual recorded in treated plot and others were found in control plot. This situation suggested that at the beginning of *C. variegatum* establishment in the orchard, abundant vegetation (weed) in control area are most likely provide stable and safer habitat for development of this insect compared to treated plot with application of herbicide. According to Candan et al. (2012), *Coptosoma* females deposit their eggs on leaves or stems of Fabaceae between 3 to 16 eggs per batch. Native legumes such as *Centrosema pubescens* and *Calopogonium mucunoides* which can be found around the orchard might become the host for development of these bugs but no detail study was done to support this statement.

Table 2. Total numbers of *Coptosoma variegatum* collected on flower panicles according flowering seasons and practices.

Season	**Practices**		**Total**
	Treated	**Control**	
Season 1	1	32	33
Season 2	258	235	493
Total	259	267	526

The *C. variegatum* is a piercing-sucking herbivore usually feeding on sap of legumes. It has bright red compound eyes. Head is small and strongly declivous. The adult bugs are 2.5 mm to 3.5 mm in length (tip of clypeus to the tip of abdomen), body roundly ovate to suborbicular, flattened ventrally and convex above. Body beetle-like and shield-like scutellum shining black with creamy-white colored of narrow stripes around the sides and it posterior part and scutellum covering the whole abdomen. This stripe is slightly narrow at both sides of scutellum as shown in Figure 2. Creamy-white colored transverse dash marks also can be seen clearly on each side of the anterior margin of the scutellum (Figure 1). The legs and antennae are mostly light brown. Some characteristics of *C. variegatum* were described by Ruckes (1963) and Linnavuori (1977). Meanwhile, similar species; *C. xanthogramma* was described by Beardsley and Flucker (1967) but slightly larger in size (4.5 mm to 5.0 mm in length) and

scutellum stripe almost of same width in every part. Other *Coptosoma* species also was described by Linnavuori (1977).

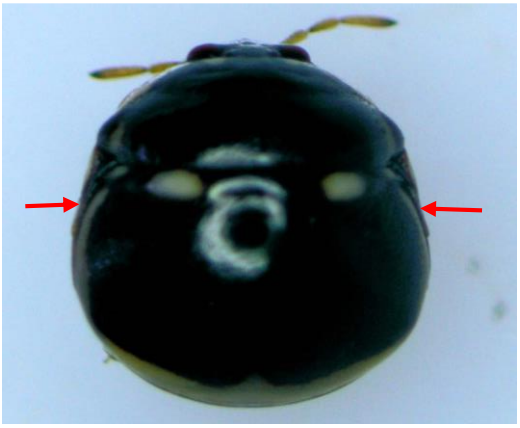

Figure 2. Dorsal view of *Coptosoma variegatum*. Red arrows pointed at narrow parts of the stripe on the scutellum.

Beardsley and Fluker (1967) also have noted that insect from family Plataspidae are potentially serious pest for cultivated beans and certain ornamental vines. Waterhouse (1993) in his monograph had listed *Coptosoma japonicum* as pest of corkwood tree and nominated since 1990 as major Southeast Asian pests by the plant protection specialists of the various Southeast Asian countries. However, no plataspid has been reported as pest for mango in his study. Survey by Fauziah and Kamarulnizam (2008) on insect pests of *Mangifera indica* plantation in Chuping, Perlis recorded no Plataspidae in their study even though diurnal and nocturnal sampling has been done. Study by Sung et al. (2006) on mango flowers in Southern Taiwan recorded only one individual of *Megacopta cribraria* collected among other anthophiles. Studies solely on Plataspidae are very scarce and records of species from this family are mostly accidental. Single individual of *Megacopta cribraria* was recorded in Gunung Benom, Pahang by Fauziah and Suwati (2011) which collected using light trap. However, this species has been misplaced into Family Thyreocaridae. This insect apparently is not normally attracted to light (Beardsley and Flucker 1967), and it is believed that the specimen may have accidentally flown into the light trap from an adjacent area.

Gregarious feeding appears to be a common occurrence for both nymphs and adults of species from family Plataspidae. Akin to other *Coptosoma* species, *C. variegatum* may cause some loss of leaves, blossom-drop and reduction in fruitset, and deformation and occasionally die-back of young shoots and flower panicles. It was believed that well established population (high abundance) of *C. variegatum* in mango orchard can cause serious destruction to flower panicles probably as severe as destruction by *Idioscopus* species. Recently, we have reported about field infestation of *Alcidodes* sp. (Coleoptera: Curculionidae) on mango shoots and flowers at the same study site in Nurul Huda et al. (2019). Just like *C. variegatum*, this beetle was previously considered as a secondary pest but now their severity was found to cause serious damage on mango production. Although both species (i.e *C. variegatum* and *Alcidodes* sp.) may exist in low abundance compared to other pest like *Idioscopus* and thrips, their increase in occurrence may raise the risk and severity of damage received by mango tree. Therefore, to estimate the destruction caused by this insects, more detail data on flower and fruit production is very much needed.

CONCLUSION

Due to their phytophagous feeding behaviour, *C. variegatum* was regard as a potential pest for many plant species. However, their infestation on tropical fruit tree particularly mango has never been reported. Our results showed that there was a drastic increase in abundance of this insect recorded on mango tree. Although, there was no study conducted to measure their damage on mango flowers currently, their successful establishment in mango orchard may lead to serious threat to mango industry in the future. Therefore, detailed study on biology and potential hosts of this pest is currently needed. Hopefully, this record may serve as a beneficial reference on pest distribution and foundation for more extensive research regarding the pest management in mango orchard.

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