

Plant bugs (Hemiptera: Miridae) associated with mango flowers in central Benin

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We undertook a survey of plant bugs associated with mango flowers in the region of Parakou, Benin during 2013-2014 and 2014-2015 dry seasons, to assess their potential as pests. Twelve plant bug species were collected over the two seasons. In 2015, Miridae represented nearly 60 % of all Heteroptera. In 2014, *Campylomma* spp. were dominant, representing nearly two thirds of all plant bugs, while in 2015, *Taylorilygus* (*T. cf. vosseleri*), was dominant. The two specimens of *Orthops* sp. collected in 2014 and 2015 did not belong to the *O. palus* species, which was thus ruled out as a potential major pest of mango in Benin. Over the two seasons, only eight adults and a third instar nymph of *Eurystylus oldi* Poppius 1912 were collected, along with an adult of *Eurystylus rubroscutellatus* Odhiambo 1958 in 2015. Mango was therefore ruled out as a major alternate host for *E. oldi* as a pest of sorghum, although this fruit tree could play a role in the pest survival during the dry season. It could also serve as an alternate host to other plant bug pests of cotton, e.g. *Taylorilygus vosseleri* (Poppius 1912) and *Campylomma* spp.

Keywords: *Campylomma*, *Eurystylus*, *Orthops*, *Taylorilygus*, alternate host.

Une étude des punaises mirides associées aux inflorescences de manguiers au centre du Bénin a été entreprise dans la région de Parakou pendant les saisons sèches 2013-2014 et 2014-2015, en vue d'estimer leur statut potentiel de ravageurs. Douze espèces de mirides ont été collectées sur les deux saisons. En 2015, la famille des Miridae a représenté 60 % de tous les Hétéroptères. En 2014, les punaises du genre *Campylomma* ont été dominantes, représentant près des deux tiers de tous les mirides, tandis qu'en 2015, *Taylorilygus* (*T. cf. vosseleri*), a été l'espèce dominante. Les deux spécimens d'*Orthops* sp. collectés en 2014 et 2015 n'appartenaient pas à l'espèce *O. palus*, qui a donc été écartée en tant que ravageur majeur potentiel du manguiers au Bénin. Sur les deux saisons, on n'a collecté que huit adultes et une larve de troisième stade d'*Eurystylus oldi* (Poppius 1912) ainsi qu'un adulte d'*Eurystylus rubroscutellatus* Odhiambo 1958 en 2015. Le manguiers a par conséquent été écarté comme hôte alternatif majeur potentiel pour *E. oldi* en tant que ravageur du sorgho, bien que cet arbre fruitier pourrait jouer un rôle dans la survie de l'insecte durant la saison sèche. Il pourrait aussi servir d'hôte alternatif à d'autres mirides ravageurs du coton, e.g. *Taylorilygus vosseleri* (Poppius 1912) et *Campylomma* spp.

Mots-clés: *Campylomma*, *Eurystylus*, *Orthops*, *Taylorilygus*, hôte alternatif.

1 INTRODUCTION

The plant bugs (Miridae) are the largest family of true bugs (Hemiptera: Heteroptera) (Wheeler, 2001). While several predatory plant bugs have been used as biological control agents for pest control, many phytophagous plant bugs are globally important pests of tropical and subtropical crops, mainly annual such

as cotton and sorghum, particularly in West Africa (Cadou, 1994; Ratnadass & Ajayi, 1995). These bugs have recently assumed the status of major crop pests, e.g. in China where the wide-scale adoption of *Bt* cotton is held responsible for plant bug outbreaks in many crops (Lu *et al.*, 2010).

Among perennial crops, cocoa and cashew are also damaged by some species of plant bugs in Africa (Yede *et al.*, 2012; Agboton *et al.*, 2014). On the other hand, in Reunion island, mango sustains heavy damage from a plant bug species, *Orthops palus* (Taylor 1947) (Atiama *et al.*, 2015).

Although not considered as pests of mango in West Africa, plant bug pests of annual crops such as sorghum or cotton could find in this fruit tree an alternate host. Actually, mango has been reported as a “refuge” for adults of the sorghum panicle-feeding bug *Eurystylus oldi* Poppius 1912, during the dry season in Nigeria (Ajayi & Ajiboye, 1997).

On cashew and mango, plant bug damage occurs at the flowering stage. We therefore undertook a survey of plant bugs associated with mango flowers in the main mango producing region of Benin during the dry seasons of 2013-2014 and 2014-2015 notably in order to assess their potential as pests (including to find out whether *O. palus* could be a potential problem for mango in West Africa) and to assess the alternate host status of this fruit tree vis-à-vis *E. oldi* and other plant bug species pests of cotton and sorghum.

2 MATERIALS & METHODS

Both in 2014 and 2015, in late January-early February (namely during the dry season, at the time of mango flowering), we sampled early in the morning flowers of mango trees (mainly cultivar “Gouverneur”, with some “Eldon”) in the region of Parakou (central Benin: 9°21’N; 2°37’E; 392 m asl), by tapping them in canvas bags, then collecting, using a mouth-aspirator, fallen bugs before the winged adults could fly away. Each sample corresponded to 50 strokes on a tree. Six trees were sampled at Korobourou in both 2014 and 2015, with two additional trees at Tchatchou and one at Badekparou in 2015.

Collected insects were preserved in 70 % ethanol in 2014, and dried on cotton wool thin layers in 2015, for further count and identification. In 2014, all plant bug (Heteroptera: Miridae) entomofauna was counted and identified to the genus or species level, while in 2015, all true bugs (Hemiptera: Heteroptera) were identified to the family level, and plant bugs to the genus or species level (including nymphs for *E. oldi*), using keys/diagnoses by Linnavuori (1975), Cadou (1994), Ratnadass *et al.* (1994), and Stonedahl (1995).

3 RESULTS

In 2015, Miridae was the dominant true bug family, representing nearly 60 % of the 617 collected Heteroptera (**Table 1**).

Table 1: True bug (Hemiptera: Heteroptera) families collected in 2015 on mango flowers in the region of Parakou (Benin).

Family	Proportion (%) of specimens
Alydidae	0.4
Anthocoridae	1.0
Berytidae	1.3
Coreidae	4.5
Geocoridae	2.1
Lygaeidae	7.1
Miridae	59.5
Pentatomidae	1.2
Plataspidae	0.2
Pyrrhocoridae	0.2
Reduviidae	0.2
Rhopalidae	7.0

Tingidae	15.0
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Most collected representatives of Heteropteran families are herbivores, except Geocoridae, Anthocoridae and Reduviidae which are mostly predators, along with some Miridae. Twelve plant bug (Miridae) species were collected in 2014 and 2015 (**Table 2**).

Table 2: List of plant bugs (Hemiptera: Miridae) collected in 2014 and 2015 on mango flowers in the region of Parakou (Benin) and identified to the genus or species level.

Genus/Species	Subfamily	No. adults per sample (average \pm SD)	
		2014	2015
<i>Campylomma citrinella</i> (Odhiambo 1960)	Phylinae	12.8(\pm 8.0)	6.6(\pm 10.2)
<i>Campylomma leucochila</i> (Reuter 1905)	Phylinae		
<i>Campylomma plantarum</i> (Lindberg 1958)	Phylinae		
<i>Eurystylus oldi</i> Poppius 1912	Mirinae	0.7(\pm 1.2)	0.8(\pm 1.5)
<i>Eurystylus rubroscutellatus</i> Odhiambo 1958	Mirinae	0	
<i>Orthops</i> sp.	Mirinae	0.2(\pm 0.4)	0.1(\pm 0.4)
<i>Pinalitus conspurcatus</i> (Reuter 1875)	Mirinae	5.7(\pm 3.7)	27.3(\pm 32.2)
<i>Taylorilygus</i> sp.	Mirinae		
<i>Megacoelum apicale</i> Reuter 1882	Mirinae	na	4.1(\pm 1.9)
<i>Proboscidoecoris</i> sp.	Mirinae		0.1(\pm 0.4)
<i>Pseudoloxops</i> sp.	Orthotylinae		0.3(\pm 0.7)

na: non available data

In 2014, average values (\pm SD) of 23.2(\pm 11.6) plant bugs were collected per sampling, of which 20.2(\pm 10.6) adults. The Phylinae subfamily was largely dominant, *Campylomma* spp. representing 64 % of all plant bugs, with average values of 12.8(\pm 8.0), mainly represented by *C. plantarum*: 11.8(\pm 8.1), *C. citrinella*, and *C. leucochila* being also present. The second most represented group was the *Lygus* group (subfamily Mirinae), mainly represented by *Taylorilygus* sp. (*cf. vosseleri*) with average values of 5.7(\pm 3.7), namely 28 % of collected bugs. Non identified adult Miridae represented only 0.8(\pm 0.4) bugs.

In 2015, the subfamily Mirinae, dominated by the genus *Taylorilygus* (*T. cf. vosseleri*), followed by *Pinalitus conspurcatus*, *Megacoelum apicale*, *Eurystylus* spp., *Orthops* sp. and *Proboscidoecoris* sp., was largely dominant. Subfamily Phylinae ranked second, with the genus *Campylomma* (in decreasing order of importance *C. plantarum*, *C. leucochila* and *C. citrinella*) and subfamily Orthotylinae ranked third, with only two specimens of *Pseudoloxops* sp.

The two specimens of *Orthops* sp. (both females) collected in 2014 and 2015 could not be identified to the species, but definitely did not belong to the *O. palus* species. In 2014, a total of four *E. oldi* individuals were collected, respectively three adults (two males and one female) on one sample, and a 3rd instar nymph on another sample. In 2015, an adult female of *E. rubroscutellatus* was identified on one sample, in addition to a total of five *E. oldi* adults on two samples, of which three females and two males.

4 DISCUSSION

This is the first published report of the plant bug entomofauna of mango flowers in a Western African country. Unlike on mango in Reunion (Atiama *et al.*, 2015), or on “sister” (Anacardiaceae) cashew nut tree in Asia, Australia and Africa (Stonedahl *et al.*, 1995; Wheeler, 2001), there is no evidence of significant damage by plant bugs on mango in West Africa. *Orthops palus* was ruled out as a potential major pest of mango in Benin since the species was not found and the other *Orthops* species found was at very low levels. We did not find any *Helopeltis* plant bug either, although this genus encompasses the most damaging pests of flowering cashew in Benin (Agboton *et al.*, 2014). Actually, the two species of *Helopeltis* reported from Benin were recorded in neighboring cashew orchards, but were never found on mango trees (unpublished data).

Regarding the genus *Eurystylus*, this is the first time *E. rubroscutellatus* is reported on mango, and in Benin (although it was reported from Ghana and Nigeria in West Africa: Stonedahl, 1995). Actually, the host association of this species was so far unknown (Stonedahl, 1995). In the case of *E. oldi* however, the fact that mainly adults, in low numbers, and only one nymph were collected over the two year study period, does not plead for mango as a major alternate host, as supported by Ajayi & Ajiboye (1997), although these authors did not collect any nymph. In addition, unlike sorghum, castor bean and spider plant (Ratnadass *et al.*, 1994, 1997, 2012), mango is not native to Africa.

On the other hand, mango could play a role in survival of the pest during the dry season, particularly because the susceptible stage of the plant (namely flowering), may be extended, likely due to the “phytohormonal” effect of smoke from fire-wood in villages (Davenport, 1993). Results from Ratnadass & Butler (2003) support the fact that populations of *E. oldi* tend to be low during the dry season, contrary to those of *Campylomma* spp.

Actually, while most species/genera collected during our survey in Benin are considered as phytophagous hence potential pests, the status of the dominant genus (*Campylomma*), remains ambiguous, since it is known as omnivorous, and could partly assume a predatory function. For instance, *Campylomma leucochila* is generally considered as a predator (Cadou, 1994; Vayssières *et al.*, 2001).

On the other hand, our survey highlighted the role of alternate host for some major pests of cotton and sorghum (*T. vosseleri*, *Campylomma* spp., *M. apicale* and to some extent *E. oldi*, and possibly *Proboscidochoris fuliginosus* Reuter 1880) that could be played by flowering mango trees during the dry season in West Africa.

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