

HOST PLANTS OF *AMBLYPELTA* STÅL (COREIDAE: HETEROPTERA) IN PAPUA NEW GUINEA

Mark M. Ero

ABSTRACT

Most *Amblypelta* species are polyphagous feeders, including some commercial and food crops causing considerable damage of economic importance. They attack the growing tips, stem, petiole, fruits and nuts of plants by piercing and sucking the sap. Twenty species/subspecies are known to occur throughout the South Pacific and some parts of South East Asia. The host plants of *Amblypelta* in Papua New Guinea is reviewed here.

Key words: damage, symptoms, die back, salivary enzymes.

INTRODUCTION

The genus *Amblypelta* comprises a total of 20 described species and subspecies. The species are distributed throughout the Pacific and part of South East Asia. Eight species are known to occur in Papua New Guinea (PNG), four being represented by subspecies. They include *A. ardleyi* Brown, *A. bukharii* Ghauri, *A. madagana* Brown and Ghauri, *A. theobromae* Brown, *A. cocophaga cocophaga* China, *A. costalis szentivanyi* Brown, *A. gallegonis bougainvillensis* Brown and *A. lutescens papuensis* Brown. The species are widely distributed throughout the lowlands.

Amblypelta is a polyphagous pest of a wide range of plants. Several species have been recorded as serious pests of fruit, nut or tree crops, forest trees and ornamental plants in the regions where they are found (Brown 1958a; Bigger 1982; Donaldson 1983; Smith 1984 and Szent-Ivany and Catley 1960). Peng *et al.* (2002) listed *A. cocophaga*, *A. cristobalensis*, *A. theobromae*, *A. lutescens papuensis*, *A. lutescens lutescens* Distant and *A. nitida* Stål to be the most important economic species. Of these, *A. cocophaga cocophaga*, *A. theobromae* and *A. lutescens papuensis* are the most common pests in PNG. Most host plants of *Amblypelta* species in PNG are introduced and cultivated plants. *Manihot esculenta* Crantz (cassava), *Theobroma cacao* L. (cocoa), *Psidium guajava* L. (guava), *Abelmoschus manihot* (L.) Medik (aibika), *Hevea brasiliensis* Muell. Arg. (rubber), *Anacardium occidentale* L. (cashew), *Carica papaya* L. (pawpaw) and *Cocos nucifera* L. (coconut) are the most common cultivated host plants of *Amblypelta*, recording the highest number of *Amblypelta* species feeding and breeding on them.

Table 1 presents a comprehensive list of the host plants of *Amblypelta*.

Amblypelta species have piercing and sucking mouth-parts, with an elongated rostrum which is used to pierce through the plant parts and absorb the nutrients. Both adults and nymphs feed from plant parenchyma, secreting salivary enzyme which facilitates the uptake of cell contents from both the feeding site and the surrounding area (Miles 1987). They attack fruit, nuts, stems, petioles and growing shoots. The symptoms of attack by this pest are very characteristic and include wilting and dieback of growing tips, premature nut and fruit fall, and the development of sclerotic lesions in plants that survive the damage, thus reducing production and quality.

This paper reviews the host plants of *Amblypelta* in PNG, and a comprehensive list dating back to 1958 is provided.

RESULTS AND DISCUSSION

1. Nature of damage

Amblypelta spp. attack plants by damaging four distinct parts:

a. *Growing tip:* The soft tender growing tips of the host plants are most susceptible to attack by this pest. The attack to growing tips occurs at the early stages of growth. The pest habitually inserts its elongate stylet through the tender portion of the young growing tip and sucks in the nutrients from the plant. The attack in such manner results in irregular scar formation, sometimes resulting in splits

and cracks and thus reducing the quality and quantity of production.

b. *Stem*: The attack to stems is often at the tender terminal end where they are softer and it is easier for the stylet to penetrate. The pest inserts its stylet through the soft skin of the terminal portion of the stem and thus absorbs the nutrients from the plant. The initial effect of feeding can result in the wilting of the shoots. Those shoots surviving the attack later develop cancerous swellings and cracks.

c. *Petiole*: Some host plants such as pawpaw and aibika have soft petioles that are susceptible to attack by certain species of *Amblypelta*. A few species attack plants in such a manner.

d. *Fruits and Nuts*: The attacks on fruits and nuts occur especially at early stages when they are soft and it is easy for the stylet to penetrate. The pests use their stylets to pierce the fruits and nuts and absorb the juices from them. Attack in such manner can result in inhibition of fruit growth and, in severe cases, result in premature fruit fall. Coconuts, cocoa pods and vanilla pods are attacked in this manner.

2. Crops attacked

Amblypelta species have been recorded to attack a number of commercial and food crops causing severe damage. The major host crops include: cocoa (*Theobroma cacao* L.), coconut (*Cocos nucifera* L.), rubber (*Hevea brasiliensis* Muell. Arg.), cassava (*Manihot esculenta* Crantz), aibika (*Abelmoschus manihot* (L.) Medik), cashew (*Anacardium occidentale* L.), pawpaw (*Carica papaya* L.) and guava (*Psidium guajava* L.). Table 1 presents a full listing of the recorded host plants of *Amblypelta* species in PNG. It also indicates the pest status of the respective species.

1.1. *Theobroma cacao* L. (cocoa)

The major species of *Amblypelta* attacking cocoa are *A. theobromae*, *A. lutescens papuensis* and *A. cocophaga cocophaga*. Both adults and nymphs attack the growing tips and the pods. They damage pods by causing circular brown scars that eventually result in malformations or inhibition of growth of fruits, especially in severe cases at early stages. The damage to the terminal shoots is often at the extreme tender tip where they are much softer. The attack results in dieback of the shoots and, in severe cases, the development of multiple terminal branches (Brown 1958b).

A. ardleyi, *A. bukharii*, *A. gallegonis bougainvillensis* and *A. madagana* are also known to attack cocoa but are not serious pests. *A. costalis szentivanyi* has

been sighted on cocoa but has not been seen feeding (Kumar 2001). Further feeding trials are required to see if this particular species is also a pest of cocoa. All species and subspecies of *Amblypelta* in PNG have been recorded on cocoa (Table 1).

1.2. *Cocos nucifera* L. (coconut)

Two species have been recorded as pests of coconut. They are *A. cocophaga cocophaga* and *A. lutescens papuensis* both causing similar characteristic damage; however, the former is regarded as causing more serious damage than the latter. These species mainly attack the nuts, resulting in premature nut fall in serious cases. Kumar (2001) highlighted *A. cocophaga cocophaga* as attacking the flowers as well. He noted that both the adults and nymphs pierce the flowers and young nuts with their long stylets, sucking in juices and injecting toxic saliva. Attacks in such manner kill flowers, cause young nuts to dry up, produce feeding scars and result in early fall of nuts. Consequently, only a few nuts are produced. Coconuts damaged in this way only produce about 65-96% of the copra that they would have produced if undamaged (Brown 1958b).

2.3. *Hevea brasiliensis* Muell. Arg. (rubber)

Three species are known to be pests of rubber. They are *A. lutescens papuensis*, *A. costalis szentivanyi* and *A. theobromae*. They attack the plant mainly by feeding on the growing tips, sometimes causing leaves near the growing tips to wilt and fall. In severe cases they cause distortion of flush tissue and proliferation of side shoots (Brown 1958b).

2.4. *Manihot esculenta* Crantz (cassava)

A large number of *Amblypelta* species have been recorded attacking and breeding on cassava, second only to cocoa (Table 1). They include *A. lutescens papuensis*, *A. theobromae*, *A. costalis szentivanyi*, *A. cocophaga cocophaga* and *A. gallegonis bougainvillensis*. The pests mainly attack the tender terminal portion of the stem. They insert their long stylets through the stems and absorb the nutrients. Post attack symptoms are the wilting of shoots and later development of swellings and longitudinal cracks. In severe cases, the growing tips eventually die, sometimes causing the stem to develop multiple lateral branches. Dori (1998) reported a 40% tuber loss in cassava due to *A. lutescens papuensis* attack in the Central Province.

Despite cassava being the common host for *Amblypelta* species along with cocoa, it cannot be an ancestral host as the plant was introduced into the Pacific from South America (Brown 1958b) and it is not native to the regions where *Amblypelta*

species are found. However, the pest was readily able to colonize the plant when it was first introduced.

5.5 *Abelmoschus manihot* (L.) Medik (aibika)

A. lutescens papuensis has been recorded as a serious pest of aibika. Both the adults and nymphs cause the damage, attacking both stems and petioles. The initial sign of attack by *A. lutescens papuensis* is the development of watery lesions on the tissues surrounding the attack site that later develop into longitudinal cracks when dry. The damage can cause dieback of the growing tips. In severe cases the plant may suffer desiccation and loss of foliage resulting in stunted growth and sometimes death. Dori (1989) reported some varietal differences in resistance to the pest, where some varieties of aibika are more susceptible to *A. lutescens papuensis* attack than others.

2.6 *Carica papaya* L. (pawpaw)

Szent-Ivany and Catley (1960) recorded *A. lutescens papuensis* from pawpaw. The authors noted that the pest attacks the plant by feeding on the growing tips and the soft petioles. Attacks on the growing tips and stems are usually more serious than those on the soft petioles. Brown (1958b) further highlighted the same pest as causing young pawpaw plants to die when attacked at the stem.

2.7 *Anacardium occidentale* L. (cashew)

A. lutescens papuensis is also a serious pest of cashew (Peng *et al.* 2002). Both nymphs and adults attack the crop. Feeding sites include foliar tissue, floral growing tips and fruits. The feeding sites later develop necrotic lesions. The characteristic symptom on the growing tip following feeding is the development of an elongated, blackened and sunken lesion. The growing tip, when hardened, develops elongated depressed lesions, sometimes with cracks. Peng *et al.* (2002) further highlighted that the damage to foliar tissue and flushing shoots is much higher (10-40%) on trees without red ants (*Oecophylla smaragdina* F.). The damage is very low (1%) on trees with red ants and, Peng *et al.* (2002) further suggest that *O. smaragdina* F. can be a good biological control agent for *A. lutescens papuensis*.

8.8 *Psidium guajava* L. (guava)

Dori (1993, unpublished) reports that *A. lutescens papuensis* is also a serious pest of guava, especially in the Central Province. The species attacks both the flushing shoots and the fruits. The symptoms are characteristic on fruits, with feeding lesions appearing as round brown scars. Excessive feeding

sometimes causes the distortion of the fruits. The sites of attack are often sites for entry of pathogens and infections.

Apart from the crops listed above, several species of *Amblypelta* also feed on a wide range of other crops of unrelated families, without their pest status being known (Table 1).

A. lutescens papuensis has been noted to be a serious pest of *Delonix regia* (Hook) (flame tree) (Waite and Huwer 1998). Some other plants on which *A. lutescens papuensis* has been recorded include: *Phaseolus mungo* L. (black gram), *Urena robata* L. (pink Chinese burr), *Abroma augusta* (L.) L.f (devil's cotton), *Ipomoea batatas* (L.) Lam (sweet potato), *Magnifera indica* L. (mango), *Plumeria rubra* L. (frangipani), *Sechium edule* (Jacq.) Schwartz (choko), *Artocarpus communis* Forster and Forster (breadfruit), *Dioscorea* sp. (yam), *Citrus* sp. (citrus) and *Areca catechu* (beetle nut). *A. theobromae* has been recorded from *Vigna unguiculata sesquipedalis* (L.) Verdc. (snake bean), *Vigna radiata* (L.) R. Wilcezek (mung bean), and *Psophocarpus tetragonolobus* (L.) DC (winged bean) while *A. gallegonis bougainvillensis* has been recorded from *Cocos nucifera* L. (coconut), *Pueraria phaseoloides* (Roxb.) Berth (tropical kudzu) and *Ipomoea batatas* (L.) Lam (sweet potato) as well. The pest status of these records are not known (Table 1). This author is of the view that the species concerned can be serious pests to some of the food crops mentioned here under adverse environmental conditions such as prolonged dry periods when their major host plants are scarce. These records are also of isolated cases and more thorough research is needed to fully confirm the pest status on the food crops concerned. Host plant choices by such polyphagous species may be flexible, depending on the changing quality of plants and environmental conditions (Leps *et al.* 2001).

A. lutescens papuensis and *A. theobromae* are the two most common and serious pest species on wide range of crops in PNG. They cause severe damage to this wide range of crops. The Australian species, *A. lutescens lutescens* (Distant) and *A. nitida* Stål have been recorded as serious pests of avocado (*Persea americana* Mill.) in Queensland (Waite and Huwer 1998), however, there are no records of *Amblypelta* attacking avocado in PNG. Wiles (2002, unpublished) highlighted *Amblypelta* spp. as also attacking vanilla in the East Sepik Province. None of the species of this pest have been recorded as serious pests of mango. This author was also unable to find any *Amblypelta* species feeding on mango during a mango pest survey in the Central Province, even during the dry season.

Table 1. Host plants of *Amblypelta* spp. in Papua New Guinea¹.

<i>Amblypelta</i> spp.	Host	Plants	Locality	Source
	Species	Family		
<i>A. lutescens</i> <i>papuensis</i> Brown	<i>Abelmoschus</i> <i>manihot</i> (L.) Medik (++)	Malvaceae	Boroko, NCD, Gulf Province; Oro Province, Milne Bay Province.	Szent-Ivany & Catley, 1960; Dori, 1998, Preston, 1998
	<i>Sechium edule</i> (Jacq.) Schwartz. (*)	Cucurbitaceae	Locality unknown	Szent-Ivany, 1959; Waite & Huwer, 1998
	<i>Hevea brasiliensis</i> Muell. Arg. (++)	Euphorbiaceae	Aroa & Bisianumu, Girinum Estate, Central Province.	Szent-Ivany & Catley, 1960; Bourke <i>et al.</i> , 1973
	<i>Cocos nucifera</i> L. (++)	Palmae	Petoi, Gulf Province; Goodenough Is., Milne Bay Province; Popondetta, Oro Province.	Szent-Ivany & Catley, 1960
	<i>Manihot esculenta</i> Crantz (++)	Euphorbiaceae	Laloki, Diamond Valley & Aroa Estate, Central Province.	Brown, 1958b; Present work; Szent-Ivany, 1959
	<i>Anacardium</i> <i>occidentale</i> L. (++)	Anacardiaceae	Launakalana, Central Province.	Peng, 2002 (unpublished).
	<i>Phaseolus</i> <i>mungo</i> L. (*)	Euphorbiaceae	Central Province.	Brown, 1958b
	<i>Urena lobata</i> L. (*)	Malvaceae	Central Province.	Brown, 1958b
	<i>Abroma augusta</i> (L.) L.f. (*)	Sterculiaceae	Central Province.	Szent-Ivany & Catley, 1960; Szent-Ivany 1959
	<i>Carica papaya</i> L. (+)	Caricaceae	Central Province.	Szent-Ivany & Catley, 1960
	<i>Ipomoea batatas</i> (L.) Lam. (*)	Convolvulaceae	Central Province.	Szent-Ivany & Catley, 1960; Szent-Ivany, 1959
	<i>Magnifera indica</i> L. (*)	Anacardiaceae	Central Province.	Szent-Ivany & Catley, 1960; Szent-Ivany, 1959
	<i>Plumeria rubra</i> L. (*)	Apocynaceae	Locality unknown	Waite & Huwer, 1998
	<i>Psidium guajava</i> L. (++)	Myrtaceae	Locality unknown Central Province	Waite & Huwer, 1998; Dori, 1993 (unpublished)
	<i>Artocarpus</i> <i>communis</i> Foster & Foster (*)	Moraceae	Locality unknown	Waite & Huwer, 1998
	<i>Dioscorea</i> sp. (*)	Diocoreaceae	Locality unknown	Waite & Huwer, 1998
	<i>Areca catechu</i>	Palmae	Locality unknown	Dori, 1993 (unpublished)
	<i>Delonix regia</i> (Hook) (++)	Caesalpindaceae	Locality unknown	Waite & Huwer, 1998
	<i>Theobroma cacao</i> L. (++)	Sterculiaceae	Central province.	Present work
<i>A. theobromae</i> Brown	<i>Hevea brasiliensis</i> Muell. Arg. (++)	Euphorbiaceae	Oro Province.	Brown, 1958b
	<i>Theobroma</i> <i>cacao</i> L. (++)	Euphorbiaceae	Jerarota, Sangara, Kokoda Pltn, Oro Province; Normanby & Fergusson Is.,	Brown, 1958b; Bourke <i>et al.</i> , 1973

¹ Present work refers to information gathered from the collection labels in the National Agricultural Insect Collection at the time of this study

Contd. from pg. 28

			Naura, Milne Bay Province.	
	<i>Manihot esculenta</i> Crantz (++)	Euphorbiaceae	Oro Province; PAU, Central Province.	Brown, 1958b
	<i>Cocos nucifera</i> L. (+)	Palmae	Locality unknown Milne Bay Province	Waite & Huwer, 1998; Smith, 1984
	<i>Vigna unguiculata sesquipedalis</i> (L.) Verdc. (*)	Fabaceae	Locality unknown	Waite & Huwer, 1998
	<i>Vigna radiata</i> (L.) R. Wilezek (*)	Fabaceae	Locality unknown	Waite & Huwer, 1998
	<i>Anacardium occidentale</i> L. (+)	Anacardiaceae	Milne Bay Province	Smith, 1984
	<i>Psophocarpus tatragnolobus</i> (L.) DC (*)	Fabaceae	Locality unknown	Waite & Huwer, 1998
<i>A. ardleyi</i> Brown	<i>Theobroma cacao</i> L. (*)	Sterculiaceae	Lae, Morobe Province; Amele Village. Pltn., Madang Province.	Present work
<i>A. costalis szentivanyi</i> Brown	<i>Manihot esculenta</i> Crantz (+)	Euphorbiaceae	Rabaul, ENBP; Pirive Village, Oro Province, Central Province.	Brown, 1958b; Present work
	<i>Hevea brasiliensis</i> Muel. Arg (*)	Euphorbiaceae	Central Province	Brown, 1958b; Szent-Ivany & Catley, 1960
	<i>Theobroma cacao</i> L. (+)	Sterculiaceae	Rabaul, ENBP; Bougainville, BP	Present work
<i>A. cocophaga cocophaga</i> China	<i>Theobroma cacao</i> L. (+)	Sterculiaceae	Keravat, ENBP; Tanaboia Pltn., BP	Present work
	<i>Cocos nucifera</i> L. (+)	Palmae	Bougainville, BP	Brown, 1958b
<i>A. gallegonis bougainvillensis</i> Brown	<i>Manihot esculenta</i> Crantz (+)	Euphorbiaceae	Bougainville, BP	Present work
	<i>Piper</i> sp. (*)	Piperaceae	Locality unknown	Brown, 1958b
	<i>Cocos nucifera</i> L. (*)	Palmae	Locality unknown	Brown, 1958b
	<i>Pueraria phaseoloides</i> (Roxb.) Berth. (*)	Leguminosae	Locality unknown	Brown, 1958b
	<i>Ipomoea batatas</i> (L.) Lam. (*)	Convolvulaceae	Locality unknown	Brown, 1958b
	<i>Theobroma cacao</i> L. (*)	Sterculiaceae	Tanaboia Pltn., Bougainville, BP	Present work
<i>A. madagana</i> Brown & Ghauri	<i>Theobroma cacao</i> L. (+)	Sterculiaceae	Magafin, Dagua, ESP; Parer Pltn., WSP; Mamoo Pltn., Oro Province; Amele Village, Bogadjim Pltn., Madang Province	Present work
<i>A. bukharii</i> Ghauri	<i>Theobroma cacao</i> L. (++)	Sterculiaceae	Brown River, Central Province.	Ghauri, 1984

++ major pest, + minor pest and * pest status not known.

Abbreviations: NCD, National Capital District
PAU, Pacific Adventist University
ENBP, East New Britain Province

BP, Bougainville Province
ESP, East Sepik Province
WSP, West Sepik Province

The extent of damage has been seen to vary between the nymphs and the adults. Preston (1998) has noted that nymphs cause more damage than the adults as they are wingless and concentrate their feeding on the same fruits, petioles, shoots or lateral branches for longer periods. The adults are good fliers and change sites while the nymphs fall to the ground when they are disturbed (Preston 1998).

The degree of damage varies from plant to plant and also from species to species. The most serious damage is caused by *A. lutescens papuensis*, especially within the Central Province. The non-economic species are *A. ardleyi* and *A. gallegonis bougainvillensis* which cause no serious damage to crops on which they feed. The other species rank in between with the degree of damage varying among the crops.

A number of reasons contribute towards *A. lutescens papuensis* being a serious pest in Central Province. The obvious one is that it is mostly dry throughout the year in this region, accompanied by continuous burning of dry vegetation by humans. This promotes the occurrence of damage to crops since when bushes are burned, pests aggregate in places with fresh, young, planted crops and feed on the young tissue, thus causing the damage. For instance, this author observed the species to be a very serious pest of cassava during the dry season in Port Moresby, in serious cases killing whole plants. The species is also prevalent in most parts of Central Province. In most other parts of the country where *Amblypelta* is found, it is often humid whole the year around and the pest thrives in the forests and abandoned gardens. Indeed, the pest is found everywhere, but relatively in low abundance and does not often cause major damage.

The genus is generally confined to lower altitudes about of 300 - 400 m above sea level. There are no species recorded from the highlands. Specific species are restricted to certain areas with only a few species overlapping. *A. lutescens papuensis* is confined to Central, Gulf, Oro and Milne Bay provinces, *A. theobromae* to Central, Oro, Milne Bay and Morobe (Smith 1984) provinces, *A. ardleyi* to Morobe and Madang provinces, *A. costalis szentivanyi* to Central, East New Britain, Bougainville and Oro provinces, *A. cocophaga cocophaga* to East New Britain and Bougainville provinces. *A. gallegonis bougainvillensis* is restricted to the Bougainville Province, *A. madagana* to East Sepik, West Sepik and Madang provinces, while *A. bukharii* is restricted to the Central Province.

This author is doubtful concerning the absence of records from the West New Britain and New Ireland provinces since a number of species are available in the neighboring East New Britain Province. It is

therefore recommended that further surveys be conducted to confirm their absence or otherwise.

SUMMARY

Amblypelta is a polyphagous pest and attacks wide range of crops causing characteristic damage. This paper presents a comprehensive list of host plants of *Amblypelta* species in PNG. No specific effective control measures have been developed so far; however, Integrated Pest Management (IPM) is seen as the ideal approach.

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