Asian citrus psyllid, *Diaphorina citri* Kuwayama (Hemiptera: Psyllidae), and huanglongbing disease do not exist in the Stapleton Station area of the Northern Territory of Australia

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Abstract

A series of specimens of the Asian citrus psyllid, *Diaphorina citri*, collected from the Northern Territory (NT) in 1915 was recently rediscovered in the Natural History Museum, London. Surveys were conducted in 2002 on suitable hosts in the locality of the 1915 collections to see if the infestation had persisted. These failed to detect either *D. citri* or the bacterium that it transmits and that causes huanglongbing disease in citrus. It is presumed that *D. citri* was eradicated fortuitously by the removal of all citrus plants above latitude 19°S during an eradication program for citrus canker in the NT from 1916 until 1922.

Key words

Asian citrus psyllid, citrus, *Diaphorina citri*, huanglongbing, Quarantine.

INTRODUCTION


Stapleton Station 13°10.53’S 131°01.38’E was founded in the 19th century on the rail line between Pine Creek and Batchelor, about 100 km south of Darwin, Northern Territory (NT), Australia. An exotic disease of citrus, citrus canker *Xanthomonas axonopodis* pv. *citri*, was detected in an orchard of 95 citrus plants in this area in 1912. The source of the infection is believed to be plants imported into the Darwin Botanic Gardens, probably from China or Japan, and it is possible that the infestation of *D. citri* arose from a similar importation. In 1915 and 1916 prohibitions on the importation of citrus plants and fruit into Australia from canker-affected countries were implemented and in 1918 all trees on affected properties were destroyed, mostly by burning (Hill 1918). In 1922 a decision was made to eradicate all citrus trees in NT north of latitude 19°S, which lies about 700 km south of Darwin, and to prohibit the replanting of citrus trees until 1925 (Anonymous 1922; Mertin 1952).

All known host plants of *D. citri* belong to the family Rutaceae and incorporate a wide range of species including 10 from genera other than *Citrus* (Aubert 1990). Two of these, *Bergera koenigii* (curry bush) and *Murraya paniculata* (jasmine orange), are excellent hosts and are commonly grown in gardens in the NT. The latter species is also native to coastal and subcoastal vine thickets of the NT, but has not been recorded from the area around Stapleton Station (Brock 1993). The ability of *D. citri* to survive on other rutaceous plants native to the NT is unknown. It breeds on new flush with populations being higher and easier to detect on flushing trees and survival of *D. citri* is better during cool, rather than hot, humid weather (Aubert 1989).

No records exist of subsequent collections of *D. citri* in the NT, nor have there been any reported cases of HLB, despite the presence of a viable citrus industry. Additionally, surveys for exotic pests and diseases, including *D. citri* and HLB,
which are regularly conducted in Darwin by the Northern Territory Department of Business, Industry and Resource Development (NTDBIRD) and throughout coastal NT by the Northern Australia Quarantine Strategy (NAQS) of the Australian Quarantine and Inspection Service, have not thus far detected either organism (ESC Smith, pers. comm. 2003; GA Bellis unpubl. data 2003; Weinert et al. 2004). Despite this, it was possible that a population of \( D. \text{citri} \) had managed to survive undetected on native rutaceous plants in the area around Stapleton Station. The threat posed by \( D. \text{citri} \) and HLB to the Australian citrus industry was sufficiently serious to warrant investigation to determine if this infestation still existed. This paper outlines surveys of the area around Stapleton Station for \( D. \text{citri} \) and HLB.

**METHODS AND MATERIALS**

The exact site of the orchard of 95 trees at Stapleton from which the specimens of \( D. \text{citri} \) were probably collected could not be located accurately. Hill (1918) notes that it was close to a permanent creek from which it was irrigated. Five properties in the vicinity of the original Stapleton Homestead, including those containing the springs which supply Stapleton Creek, the only permanent creek in the area, were included in the surveys. Two surveys were conducted during different seasons to ensure that flushing citrus were surveyed, thereby ensuring maximal opportunity of detecting \( D. \text{citri} \). The first occurred on 24 March 2002 at the end of the hot, wet season and included the four properties Mabuhay Farm, Milton Springs, Litchfield Springs and Camp Creek Station. The second survey occurred on 7 September 2002 at the end of the cool, dry season and included the three properties Mabuhay Farm, Jim Roddy’s property (the site of the original Stapleton Homestead) and Milton Springs. Property owners indicated that no citrus or related plantings existed beyond the confines of their homesteads and searches for native rutaceous plants were confined to creek lines and springs that provided the only suitable habitat.

Young foliage of all rutaceous plants growing on these properties was inspected visually for \( D. \text{citri} \) adults and larvae and sampled using a net. Native vegetation growing on these properties, particularly along Stapleton Creek, was examined and any rutaceous plants were inspected similarly for \( D. \text{citri} \).

Citrus plants exhibiting interveinal leaf chlorosis consistent with their having HLB were tested for the presence of the causative agent, ‘\( \text{Candidatus Liberibacter asiaticus} \)’. The mid veins of symptomatic leaves were excised, dried over calcium chloride and screened at the NAQS Mareeba laboratory (specimen #GB22), using DNA extraction techniques described by Ahrens and Seemüller (1992) and polymerase chain reaction primers described by Jagoueix et al. (1996).

**RESULTS**

The rutaceous plants growing at the six sites are listed in Table 1. No \( D. \text{citri} \) were found on any of the plants inspected at any of these sites in either survey. During the September survey, the majority of \( \text{Citrus} \) sp. trees were flushing, but few were flushing in March.

The only rutaceous plants growing in native vegetation in the area were \( \text{Melicope elleryana} \), which is not a recognised host of \( D. \text{citri} \), and no psyllids were found on the 13 plants inspected.

Only one citrus plant exhibited symptoms similar to that of HLB. Leaves from this plant tested negative for the causative organism.

**DISCUSSION**

There is no evidence that \( D. \text{citri} \) has persisted in the Stapleton Station area. No native plants known to be capable of supporting this insect were present and a number of attractive host plants were not infested either during the wet season or in the cool dry season when many of these plants were flushing.

**Table 1** Properties and plants inspected for Diaphorina citri and symptoms of huanglongbing disease in the area around Stapleton Station, Northern Territory of Australia

<table>
<thead>
<tr>
<th>Site</th>
<th>Plants inspected</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Mabuhay Farm</td>
<td>1 lemonade (( \text{Citrus limon} \times C. \text{pseudoxanthus} )); 1 pink grapefruit (( C. \text{paradisi} )); 1 kaffir lime (( C. \text{hystrix} )); 1 orange (( C. \text{sinensis} )); 2 Eureka lemons (( C. \text{limon} )); 1 Lisbon lemon (( C. \text{limon} )); 2 pomello (( C. \text{grandis} )); 3 lime (( C. \text{aurantifolia} )); 7 kumquat (( C. \text{japonica} ))</td>
<td>No native Rutaceae</td>
</tr>
<tr>
<td>Jim Roddy’s Property</td>
<td>2 ( \text{Poncirus trifoliata} ); 1 lime; 1 lemonade; 1 old kumquat; 1 small ornamental ( Murraya paniculata ); 12 ( \text{Melicope elleryana} )</td>
<td>( \text{Melicope elleryana} ) was the only native rutaceous plant growing around the natural spring at the back of the old homestead site.</td>
</tr>
<tr>
<td>Milton Springs</td>
<td>4 ornamental ( Murraya paniculata ) and 1 pommelo, all at least 20 years old; 1 ( \text{Melicope elleryana} )</td>
<td>( \text{Melicope elleryana} ) was the only native rutaceous plant growing around the natural spring at the back of the homestead.</td>
</tr>
<tr>
<td>Litchfield Springs</td>
<td>12 ( \text{Citrus} ) sp. trees</td>
<td>No native Rutaceae</td>
</tr>
<tr>
<td>Camp Creek</td>
<td>5 ( \text{Citrus} ) sp. trees</td>
<td>No native Rutaceae</td>
</tr>
</tbody>
</table>
The presence of HLB-like symptoms in the absence of the causative agent is not unusual, as the symptoms are similar to those caused by nutrient deficiency (Davis et al. 2000).

The results of the present survey coupled with those conducted by NTDBIRD and NAQS indicate that D. citri is not present in the NT. It is likely that D. citri was eradicated fortuitously along with citrus canker in 1922. Stapleton Station was well within the eradication area and had been specifically targeted during another eradication program initiated 4 years earlier. Monitoring by NTDBIRD and NAQS for D. citri will continue as part of a national quarantine initiative.

ACKNOWLEDGEMENTS

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REFERENCES


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