Specimens of the psyllid, *Trioza anthrisci* (Triozidae) collected from the United Kingdom and Sweden were positive for the phloem-limited *Candidatus Liberibacter solanacearum* (Lso). Lso has only been reported in seed in the UK, and has not been reported in crop plants, weed plants or psyllids. This is the first report of Lso haplotype C in the UK and of Lso in *T. anthrisci*, a new potential vector. Haplotype C has been reported in Finland, Germany, Norway and Sweden (Munyaneza et al., 2010). Lso haplotype C is associated with disease in carrot in northern Europe. Lso haplotypes A and B are listed EPPO A1 pests and are causal agents of zebra chip disease in potato. These *T. anthrisci* specimens were the first of this species found in the UK (AFCC Greenslade, pers. comm.). Lso is yet to be found in the host plants of this psyllid species. Host plants of *T. anthrisci* include three plant species native to the UK: *Angelica sylvestris*, *Anthriscus sylvestris*, *Heraclium sphondylium*, and one introduced species, *Chaerophyllum hirsutum*, all in the Apiaceae. Adults overwinter on conifer/evergreen shrubs (Ouvrard, 2017).

*T. anthrisci* exists in a complex of eight species, which includes *T. apicalis* (carrot psyllid), previously the only species associated with haplotype C. Vectors of other Lso haplotypes include *Bactericera cockerelli* in the Americas and New Zealand and *Bactericera trigonica* in Spain. *T. anthrisci* has been reported in Scandinavia, Western and Central Europe, Turkey and Russia (Altai). Specimens were caught in 12.2m suction traps in north-east Scotland (Lat 57.644, Long -3.365) and Gotland, Sweden (Lat 57.572, Long 18.409) between 2015 and 2016. Psyllid species identification was confirmed using morphological features and DNA sequencing of COI and ITS2 regions. Voucher specimens were maintained using the DNA extraction method described in Sjölund et al. (2016).

Ten specimens of *T. anthrisci* were tested using the real-time PCR assay of Li et al. (2009). Five of six specimens from the UK and two of four specimens from Sweden tested positive (Table 1). A single *T. apicalis* specimen was caught in 2016 (AFCC Greenslade, pers. comm.) and was negative for Lso. Positive samples were sequenced at the ISR-23S rRNA intergenic spacer region using primers Lso TX 16/23F and Lso TX 16/23R. The 16S region of three specimens (160421.T.ant.4, 160421.T.ant.2, 151002.T.ant.3) was identical to KX431889 and KX431890 (Lso in carrot, Finland), and HM067833 (Lso in carrot, Finland). Additional sequences were obtained for some specimens from both countries at the 16S and 50S region and had 100% identity with sequences that were reported as haplotype C. The 16S region of three specimens (160816.T.ant.20, 161121.T.ant.1, 151002.T.ant.3) were identical to KX431889 and KX431890 (as above), and GU373048 (Lso in carrot, Finland). The 50S region of four specimens (160816.T.ant.20, 160421.T.ant.4, 160421.T.ant.2, 151002.T.ant.3) was identical to JN863093 (Lso in carrot, Sweden).

Table 1. Mean cycle threshold (Ct) values for the real-time PCR assay for *Candidatus Liberibacter solanacearum* from *Trioza anthrisci* specimens from UK and Swedish suction trap catches.

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Sex</th>
<th>Catch date</th>
<th>Trap location</th>
<th>Country</th>
<th>Mean Ct</th>
<th>GenBank Accession No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>160421.T.ant.1</td>
<td>F</td>
<td>15-16/07/2015</td>
<td>NE Scotland</td>
<td>UK</td>
<td>32</td>
<td>MF421724</td>
</tr>
<tr>
<td>160421.T.ant.2</td>
<td>M</td>
<td>15-16/08/2015</td>
<td>NE Scotland</td>
<td>UK</td>
<td>30</td>
<td>MF421725</td>
</tr>
<tr>
<td>160421.T.ant.4</td>
<td>F</td>
<td>02-03/08/2015</td>
<td>NE Scotland</td>
<td>UK</td>
<td>32</td>
<td>MF421726</td>
</tr>
<tr>
<td>160816.T.ant.20</td>
<td>F</td>
<td>11-12/07/2016</td>
<td>NE Scotland</td>
<td>UK</td>
<td>24</td>
<td>MF421727</td>
</tr>
<tr>
<td>160816.T.ant.13</td>
<td>F</td>
<td>20-21/07/2016</td>
<td>NE Scotland</td>
<td>UK</td>
<td>31</td>
<td>MF421728</td>
</tr>
<tr>
<td>161017.T.ant.14</td>
<td>F</td>
<td>27-28/09/2016</td>
<td>NE Scotland</td>
<td>UK</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>151002.T.ant.2</td>
<td>F</td>
<td>17/07/2015</td>
<td>Gotland</td>
<td>Sweden</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>151002.T.ant.3</td>
<td>F</td>
<td>17/07/2015</td>
<td>Gotland</td>
<td>Sweden</td>
<td>25</td>
<td>MF421729</td>
</tr>
<tr>
<td>161121.T.ant.1</td>
<td>M</td>
<td>29-06/2016</td>
<td>Gotland</td>
<td>Sweden</td>
<td>30</td>
<td>MF421730</td>
</tr>
<tr>
<td>161121.T.ant.2</td>
<td>F</td>
<td>11/07/2016</td>
<td>Gotland</td>
<td>Sweden</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Figure 1


First report of *'Candidatus Liberibacter solanacearum'* in the United Kingdom in the psyllid *Triozidae*

M.J. Sjölund 1*, M. Clark 1, M. Carnegie 1, A.F.C. Greenslade 2, D. Ouvrard 3, F. Hightef 1, R. Sigvald 4, J.R. Bell 2, Y.M. Arnsdorf 1, R. Cairns 1 and D.M. Kenyon 1

1 Science and Advice for Scottish Agriculture (SASA), Rodinggiaw Road, Edinburgh EH12 7FJ, UK; 2 Rothamsted Insect Survey, Rothamsted Research, West Common, Harpenden, Hertfordshire, AL5 2QJ, UK; 3 Department of Life Sciences, Natural History Museum, Cromwell Road, London SW7 5BD, UK; 4 Department of Ecology, Swedish University of Agricultural Sciences, Box 7044 750 07, Uppsala, Sweden

Received: 30 Jun 2017. Published: 03 Aug 2017. Keywords: CaLsol, jumping plant lice, Lso, Psylloidea, vector

Acknowledgements

We thank A. Nissinen, E. Back, W. Monger, and D. Percy. This work is funded by the Scottish Government [RRL/001/14].

References


