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Disease Notes

First Report of the Detection of '*Candidatus* Liberibacter' Species in Zebra Chip Disease-Infected Potato Plants in the United States

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Zebra chip (ZC), an emerging disease causing economic losses to the potato chip industry, has been reported since the early 1990s in Central America and Mexico and in Texas during 2000 (4). ZC was subsequently found in Nebraska, Colorado, New Mexico, Arizona, Nevada, California, and Kansas (3). Severe losses to potato crops were reported in the last few years in Mexico, Guatemala, and Texas (4). Foliar symptoms include purple top, shortened internodes, small leaves, enlargement of the stems, swollen axillary buds, and aerial tubers. Chips made from infected tubers exhibit dark stripes that become markedly more visible upon frying, and hence, are unacceptable to manufacturers. Infected tubers may or may not produce plants when planted. The causal agent of ZC is not known and has been the subject of increased investigation. The pathogen is believed to be transmitted by the potato psyllid, *Bactericera cockerelli*, and the association of the vector with the disease is well documented (3). Following the report of a potential new liberibacter species in solanaceous crops in New Zealand, we sought to identify this liberibacter species in plants with symptoms of the ZC disease. Six potato plants (cv. Russet Norkota) exhibiting typical ZC symptoms were collected in Olton, TX in June of 2008. DNA was extracted from roots, stems, midribs, and petioles of the infected plants using a FastDNA Spin Kit and the FastPrep Instrument (Qbiogene, Inc., Carlsbad, CA). Negative controls from known healthy potato plants were included. PCR amplification was carried out with '*Candidatus* L. asiaticus' *omp* primers (1), 16S rDNA primers specific for '*Ca.* L. asiaticus', '*Ca.* L. africanus', and '*Ca*. L. americanus' (1), and 16S rDNA primers OA2

(GenBank Accession No. EU834130) and OI2c (2). Amplicons from 12 samples were directly sequenced in both orientations (McLab, San Francisco CA). PCR amplifications using species-specific primers for the citrus huanglongbing liberibacter were negative. However, 1.1- and 1.8-kb amplicons were obtained with the OA2/OI2C and *omp* primers, respectively. The sequences for the rDNA were submitted to NCBI GenBank (Accession Nos. EU884128 and EU884129). BLASTN alignment of the 16S rDNA sequences obtained with primers OA2 and OI2c revealed 99.7% identity with a new species of '*Ca*. Liberibacter' identified in New Zealand affecting potato (GenBank Accession No. EU849020) and tomato (GenBank Accession No. EU834130), 97% identity with '*Ca*. L. asiaticus', and 94% with '*Ca*. L. africanus' and '*Ca*. L. americanus'. The neighbor-joining phylogenetic tree constructed using the 16S rDNA fragments delineated four clusters corresponding to each of the liberibacter species. These results confirm that '*Ca*. Liberibacter' spp. DNA sequences were obtained from potatoes showing ZC-like symptoms, suggesting that a new species of this genus may be involved in causing ZC disease. To our knowledge, this is the first report of the detection of '*Ca*. Liberibacter' spp. in potatoes showing ZC disease in the United States.

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