

Matrimony vine/Goji berries – Potential overwintering host for potato psyllids in the Pacific Northwest

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Zebra Chip (ZC) disease of potato was first reported in the US from Southern Texas, and is transmitted by the potato psyllid, *Bactericera cockerelli* (Munyaneza et al. 2007a, b). Although *B. cockerelli* is reported primarily as a pest of solanaceous plants in the US as early as 1929 (Binkley 1929, Pletch 1947, Wallis 1955), it was thought to be rare in the Pacific Northwest (PNW) until ZC disease was first reported in 2011 (Crosslin et al. 2012a, b). ‘*Candidatus Liberibacter solanacearum*’ (Lso) is the bacterial pathogen responsible for causing ZC (Hansen et al. 2008). Following the ZC outbreak in the PNW, researchers have identified several distinct genetic forms (haplotypes) of potato psyllids (Swisher et al. 2014). Western and Central haplotypes appear in potato fields in PNW from mid- to late-summer and do not appear to readily overwinter in this region. The Northwestern haplotype has only been collected in the PNW, and readily overwinters on bittersweet nightshade (BSNS), *Solanum dulcamara* (Swisher et al. 2013) and migrates to potato before the arrival of the Western and Central haplotypes (Swisher et al. 2014). Although BSNS is known to support overwintering populations of potato psyllids, we have observed early-season psyllids entering potato plots with no proximity to BSNS (Munyaneza, unpublished). These observations suggest that non-crop hosts other than BSNS may support overwintering *B. cockerelli* populations and be sources of early-season migration to potato.

Matrimony vine (*Lycium* spp.) is reported as a potential breeding host for migrating *B. cockerelli* populations in Southwestern US (Romney 1939), but the presence of these plants in the PNW has been overlooked by ZC researchers. *B. cockerelli* adults were first collected from matrimony vine near Selah, WA in June of 2014.



Figure 1. Matrimony vine near Gap Road, Prosser, WA during August 2014



Figure 2. Matrimony vine near Gap Road Prosser, WA during November 2014

Since then we sampled matrimony vine stands regularly to determine the importance of this plant as a host of potato psyllids. Seven locations of matrimony vine stands were identified in Washington State (Prosser – two locations, Selah, Kahlotus, Overturf, Pullman, and George), and one location in Idaho (Eagle) which were sampled on a regular basis using beat trays and D-Vac sampling methods. We collected potato psyllids from all locations except George, WA in spite

that this location was right in the middle of potato cultivation. During winter months the vines completely dropped their leaves (**Figure 2**) but, *B. cockerelli* adults were collected in low numbers in Prosser and Selah (this site is far away from potato fields) throughout the winter. The collection sites thus varied dramatically in their proximity to neighboring potato fields and the big question is “where do the psyllids come from?” Horton et al. (2015) developed a hypothetical model to demonstrate the importance of non-potato host plants such as BSNS and matrimony vine (wolfberry, Goji berry), *Lycium* spp., in colonization of potato fields by *B. cockerelli* in the PNW. According to Horton et al. (2015) wintering populations of *B. cockerelli* could be present close to the soil surface or hiding in plant debris beneath the dormant vines. Eggs of *B. cockerelli* were observed in early March 2015 when the dormant buds of matrimony vine began to sprout. A similar phenomenon was reported for BSNS, with egg laying again coinciding with production of new flush (Horton et al. 2015).

Matrimony vine is a shrub with elongated wire-like stems and tiny purple flowers produced throughout the summer months. During winter the plant loses all its leaves and appears as a dry bush, which then rejuvenates each year in early spring. The plant is thought to have initially arrived in the region with early settlers. Wolfberry and matrimony vine are also known as Goji berry, which is grown commercially and in back-yard gardens for its fruit. The berries are sweet, dark red colored fruit, which are known for their health properties in Chinese medicine (John Trumbo, Tri-city Herald, October 18, 2004). The plants are commonly seen in patches along fence lines. These patches increase in size by growth and spread of underground stolons. Soft wood cuttings can be used to propagate the vine (Figure 3).



Figure 3. Soft wood cuttings of matrimony vine sprouting in greenhouse

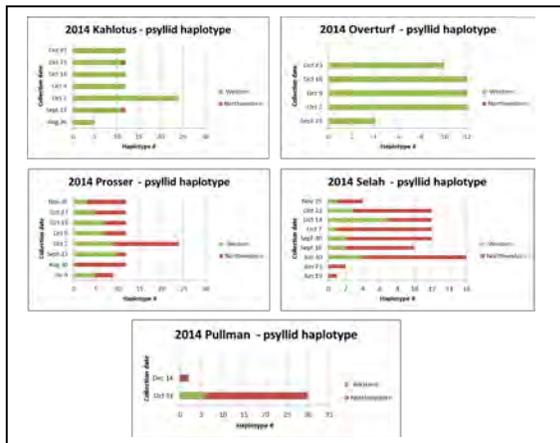


Figure 4. Haplotyping results of *B. cockerelli* sampled from five locations (date-wise)



Figure 5. Matrimony vine planted in field cages at Moxee farm, WA

Psyllids were haplotyped according to their locations and date of collection. Haplotyping results revealed a mixture of Western and Northwestern haplotypes, which varied in proportion in different locations (Figure 4). Psyllids collected from Kahlotus and Overturf were predominately of the Western haplotype whereas psyllids from Selah were predominately of the Northwestern haplotype. All psyllids were found to be free of Lso. The psyllids also were dissected to record egg development, but those data have not yet been analyzed.

Cuttings of matrimony vine were also planted at the Moxee farm, WA, inside field cages to study psyllid development under controlled conditions (Figure 5). Laboratory cultures of three haplotypes (Central, Western, and Northwestern) were released into the cages to monitor overwintering survival of psyllids. The survival data are currently being collected.

Scope for future research. With the recent spread of ZC disease in the Pacific Northwest, it is important to consider the potential role of matrimony vine in the transmission of Lso to potato plants. A recent study conducted by Thinakaran et al. (2015) demonstrated that silverleaf nightshade, *Solanum elaeagnifolium*, a woody solanaceous perennial weed in the Lower Rio Grande Valley of Texas, serves as reservoir host for Lso bridging potato crop cycles. Similar studies are warranted for matrimony vine to determine if this species can be a potential carrier of the pathogen in the event that this species is a common overwintering host for the potato psyllid.

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