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ORIGINAL ARTICLE

Effects of host plants on aphid feeding behavior, fitness, and *Buchnera aphidicola* titer

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Abstract Aphids are sap-feeding plant pests that depend on their symbiotic relationships with the primary endosymbiont *Buchnera aphidicola* to adapt to impoverished diets. However, how the host plant affects the aphid primary symbiont and aphid adaptation to host plant transfer are poorly known. In this study, aphid symbiont screening and genotype identification were used to establish 2 aphid strains (*Rhopalosiphum maidis* [Rm] and *Rhopalosiphum padi* [Rp] strains) containing only *Buchnera* without any secondary symbionts for both wheat aphid species (*R. maidis* and *R. padi*). Aphid fitness and *Buchnera* titers were unstable on some of these host plants after transferring to novel host plants (G1–G5), which were influenced by host plant species and generations; however, they stabilized after prolonged feeding on the same plants for 10 generations. The electropenetrography (EPG) records showed that the allocation of aphid feeding time was significantly distinct in the 6 host plants; aphids had more intracellular punctures and spent more nonprobing time on green bristlegrass which was not conducive to its growth compared with other plants. The content of soluble sugar, soluble protein, and amino acid in the leaves of the 6 host plants were also clearly separated. The correlation coefficient analysis showed that the nutrient contents of host plants had significant correlations with aphid feeding behaviors, fitness, and *Buchnera* titers. In the meantime, aphid fitness, and *Buchnera* titers were also affected by aphid feeding behaviors. Also, *Buchnera* titers of aphid natural populations on 6 host plants showed a visible difference. Our study deepened our understanding of the interaction among aphids, endosymbionts, and host plants, indicating that the host plant nutrient content is a predominant factor affecting aphid adaptation to their diet, initially affecting aphid feeding behaviors, and further affecting aphid fitness and *Buchnera* titers, which would further contribute to exploiting new available strategies for aphid control.