CELL RUPTURE FEEDING BY *EMPOASCA* AND *LYGUS* SPP. AND THE CAUSES OF THEIR PLANT DAMAGE

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Empoasca spp. leafhoppers (Cicadellidae: Typhlocybinae) and *Lygus* spp. bugs (Miridae) are the most-studied model species for the hemipteran feeding strategy formerly termed lacerate-and-flush feeding, recently re-named cell rupture feeding. Research using electrical penetration graph (EPG) monitoring, plant histology, and salivary biochemistry is summarized on the feeding biology of *E. fabae*, *E. kraemeri*, and *L. hesperus*. Cell rupture damage is caused by a dynamic interaction between insect stimuli and plant responses. *Empoasca* leafhoppers demonstrate a degree of behavioral plasticity not seen in other hemipterans. *E. fabae* and *E. kraemeri* can perform three tactics of cell rupture feeding, varying the mixture and durations of tactics on different host plants. In addition, each tactic triggers different local and systemic responses in the plant that lead to different, host-specific symptoms. Lacerate-and-sip, the most damaging tactic, consists of brief intracellular probes with secretion of watery saliva but very little or no sheath saliva. Stylets rapidly puncture multiple columns of stem phloem cells, causing much wounding laced with saliva. Phloem cell necrosis and abnormal meristematic development ultimately cause stunting and chorosis above the point of feeding. In the lacerate-and-flush tactic, stylets make longer intracellular probes to slowly puncture, salivate into, and drain mesophyll/parenchyma cells in the abaxial leaf surface, causing entry of air and tissue collapse. In the lance-and-ingest tactic, stylets puncture a phloem sieve element that briefly leaks phloem sap, which is ingested while stylets remain motionless. Saliva is released as stylets withdraw, leading to cellular hypertrophy of the adaxial leaf surface. The latter two tactics, together, cause leaf curling and necrosis. *Lygus* bugs are not so behaviorally plastic, and use only a fourth tactic, macerate-and-flush. *L. hesperus* makes brief probes to inject large amounts of watery saliva that contains highly active cell-wall degrading enzymes. After a period of non-probing quiescence, *L. hesperus* makes long probes to ingest macerated plant contents, leading to severe collapse and necrosis of plant tissues.

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