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Functional Anatomy of the Alimentary Canal and Salivary Glands in Leafhoppers and Planthoppers and Their Role in Pathogen Transmission

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For successful insect transmission of circulative and propagative plant viruses or mollicutes to occur, these microbes must overcome several barriers in their vectors, most notably midgut and salivary gland infection and/or escape barriers (Ammar, 1994). Stylets, foregut (precibarium, cibarium), alimentary canal and salivary gland functional anatomy is described for leafhopper and planthopper vectors (Ammar, 1985; Backus, 1985; Wayadande et al., 1997). Examples are given for the use of transmission and scanning electron microscopy, confocal laser scanning microscopy, immunolabeling and other techniques, in studying the routes, transmission barriers, and accumulation or multiplication of some circulative/ propagative plant viruses (e.g. maize streak Geminivirus and maize mosaic Rhabdovirus) and mollicutes (e.g. *Spiroplasma kunkelii* and *S. citri*) in their leafhopper or planthopper vectors (Ammar and Nault, 2002; Ammar and Hogenhout, 2005; Kwon et al., 1999). Recent studies also demonstrated the retention sites of semipersistent and non-persistent viruses in their leafhopper or aphid vectors, respectively, and the role of the helper component proteins in binding these viruses to the cuticular lining of the foregut and/or the food canal in the maxillary stylets. Maize chlorotic dwarf virus, transmitted by leafhoppers, and several potyviruses transmitted by aphids are examples of these two groups of viruses.

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