CHARACTERISTICS OF TRANSMISSION OF VELVET TOBACCO MOTLE
VIRUS BY THE MIRID, CYNOPELTIS HICOPTIANAE (KONINGS)

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Summary

Some characteristics of the transmission of velvet tobacco mottle virus (VTMOV) by the mirid, *Clytomyza nicotianae* (amblings) have been determined using feeding experiments. Assay of virus concentration and distribution within the vector have been determined by the enzyme linked immunosorbent assay (ELISA) and the horse-radish peroxidase (HRP) dot-immunobinding assay.

*C. nicotianae* was not specific for VTMOV, as it also transmitted solanum nodiflorum mottle, sowbane mosaic and southern bean mosaic viruses, but not subterranea clover mottle, lucerne transient streak, tobacco ringspot, galinsoga mosaic, nor nicotiana velutina mosaic viruses. Tomato bushy stunt virus was transmitted to 1/50 test plants.

The acquisition threshold of VTMOV by *C. nicotianae* was shorter than 1 min, with an increase in the rate of transmission for acquisition periods of up to 1000 min. The inoculation threshold was between 1 and 2 h following an acquisition access period of 2 days, and the rate of transmission increased with increasing inoculation time. When the acquisition access period was 1 h, or if mirids were fasted after the 2 day acquisition, the inoculation threshold increased to between 4 and 8 h and between 2 and 4 h respectively. The minimum time from commencement of access to inoculation was 10 h, and any latent period would have been shorter than this.

Following access to VTMOV for 24 h, mirids which were transferred sequentially each day to a separate healthy test plant, transmitted intermittently for up to 10 days. Up to 50% of mirids transmitted after a moult, and this transstadial transmission was not
due to the mirids probing the shed cuticles or exudates of "infective" insects.

Ten percent of non-infective mirids given access to virus through a parafilm membrane transmitted VTMoV. Twenty-three percent of non-infective mirids injected with purified virus transmitted VTMoV. Transmission through a wound or after injection with virus was taken as evidence that VTMoV circulates in the mirid vector.

In experiments to test how long mirids can transmit VTMoV, mirids stopped transmitting the virus between 5 and 9 days after acquisition was completed. VTMoV was detected in nymphs by ELISA up to 8 days after acquisition was completed, however, no antigen was detected in nymphs 9 and 10 days after acquisition. These results indicate that VTMoV does not propagate in C. nicotianae.

Following acquisition by feeding, virus was detected in the gut, haemolymph and faeces of mirids but not in the salivary glands. Infective virus was detected in the faeces of nymphs for 6 days, but was not detected after 7 days. Patterns of defecation, monitored in nymphs fed the insoluble dye nigrosin, showed that it was eliminated intermittently from the gut up to 6 days after ingestion, thus matching the loss of virus infectivity.

Non-infective nymphs inoculated plants on which had been placed 1 μl deposits of infectious plant sap to simulate infective faecal deposits. Thus, nymphs may be able to transmit VTMoV by probing through faeces or other secretions containing VTMoV which have been deposited on the leaf surface.

The acquisition threshold of VTMoV by C. nicotianae is characteristic of a nonpersisitent association, and the inoculation threshold and retention of infectivity for up to 10 days are
characteristic of either a semipersistent or circulative association. Transstadial transmission and inoculation after injection with virus are characteristic of a circulative association.

In general, circulative viruses are detected in the haemolymph and salivary glands of insect vectors (Sylvestre, 1980). Although virus was detected in the haemolymph, it was not detected in the mirids' salivary glands. Thus, the ingestion-salivation mechanism proposed for circulative associations (Harris, 1981b), does not adequately explain transmission of VIMoV by mirids.

Some of the intermittent transmission observed over long inoculation periods may thus be explained by contamination of stylets from faecal deposits (an ingestion-defecation mechanism). It is not known whether mirids do this by ingesting infectious pieces and then regurgitating them during inoculation, or by contaminating the stylets while probini. Moreover, contamination of leaf surfaces by regurgitation is another possible route of infection, and this was yet to be investigated.

The VIMoV-mirid association has characteristics of both a non-circulative and circulative mechanism of transmission and is best explained by the ingestion-egestion (Harris, 1977) and ingestion-defecation models of transmission.