

RESEARCH ARTICLE

How many begomovirus copies are acquired and inoculated by its vector, whitefly (*Bemisia tabaci*) during feeding?

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Abstract

Begomoviruses are transmitted by whitefly (*Bemisia tabaci* Gennadius, Hemiptera: Aleyrodidae) in a persistent-circulative way. Once *B. tabaci* becomes viruliferous, it remains so throughout its life span. Not much is known about the copies of begomoviruses ingested and/or released by *B. tabaci* during the process of feeding. The present study reports the absolute quantification of two different begomoviruses viz. tomato leaf curl New Delhi virus (ToLCNDV, bipartite) and chilli leaf curl virus (ChiLCV, monopartite) at different exposure of active acquisition and inoculation feeding using a detached leaf assay. A million copies of both the begomoviruses were acquired by a single *B. tabaci* with only 5 min of active feeding and virus copy number increased in a logarithmic model with feeding exposure. Whereas, a single *B. tabaci* could inoculate 8.21×10^9 and 4.19×10^{11} copies of ToLCNDV and ChiLCV, respectively in detached leaves by 5 min of active feeding. Virus copies in inoculated leaves increased with an increase in feeding duration. Comparative dynamics of these two begomoviruses indicated that *B. tabaci* adult acquired around 14-fold higher copies of ChiLCV than ToLCNDV 24 hrs post feeding. Whereas, the rate of inoculation of ToLCNDV by individual *B. tabaci* was significantly higher than ChiLCV. The study provides a better understanding of begomovirus acquisition and inoculation dynamics by individual *B. tabaci* and would facilitate research on virus-vector epidemiology and screening host resistance.

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Introduction

The whitefly, *Bemisia tabaci* (Gennadius, Hemiptera: Aleyrodidae) is one of the world's top 100 invasive species (IUCN, http://www.iucngisd.org/gisd/100_worst.php), which causes severe losses to more than 900 plant species [1, 2]. The considerable genetic diversity and varying abilities to interbreed have led to the belief that *B. tabaci* represents a cryptic species complex [3–6]. To date, 45 such cryptic species of *B. tabaci* are known [7]. Besides direct damage caused by feeding, *B. tabaci* transmits begomoviruses, carlaviruses, closteroviruses, criniviruses, ipomoviruses, nepoviruses, potyviruses, torradoviruses, and a rod-shaped DNA virus [8–10]. Begomoviruses, in general, are transmitted by *B. tabaci* in a persistent-circulative manner. To date, 445 species of begomoviruses are known (ICTV, 2020) [11]. Begomoviruses are