

# Biological, Biochemical and Serological Studies on Hollyhock Leaf Crumple Virus (HLCrV): A Newly Discovered Whitefly Transmitted Geminivirus

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## ABSTRACT

A newly discovered geminivirus [Family Geminiviridae] *geminivirus* infects hollyhock (*Althaea rosea*) plants is reported in this study for the first time in Egypt. The name hollyhock leaf crumple virus (HLCrV) was given to this virus due to crumpling of the leaf blades of infected *A. rosea*. Additional symptoms included small vein thickening (SVT), epinasty, and cupping of leaves. HLCrV was transmitted by the silverleaf whitefly *Bemisia argentifolii* after acquisition and inoculation access periods of 30 and 15 min., respectively. Only one viruliferous whitefly insect could elicit disease syndrome. Host-range studies of HLCrV were restricted in the Malvaceae, viz. cheeseweed, cotton, and okra. HLCrV migrated in sucrose density gradients forming two peaks with  $A_{max}$  and  $A_{min}$  of 259, 240 nm (peak 1) and 258, 240 nm (peak 2), respectively. Purified HLCrV coat protein was separated in SDS-polyacrylamide gel electrophoresis into two components (25 kDa and 27 kDa). Gamma-globulin fraction of HLCrV-induced antiserum was prepared and used through direct ELISA to detect the virus in infected tissues. HLCrV-induced antiserum had a titer of 1/4000 when measured with indirect ELISA. Indirect ELISA failed to measure any serologic relatedness between HLCrV and the following geminiviruses: African cassava mosaic virus (ACMV), beet curly top virus (BCTV), cotton leaf curl virus (CLCuV), maize streak virus (MSV), squash leaf curl virus (SLCV), and tomato yellow leaf curl virus (TYLCV). On the otherhand, dot blot immunobinding assay (DBIA) detected positive relatedness between HLCrV, ACMV, and CLCuV; but not with BCTV, MSV, and SLCV. Ultrathin sections of infected *A. rosea* leaves indicated the restriction of HLCrV into the phloem tissues. Geminivirus-like particles in paracrystalline arrays were observed in the nucleus and the cytoplasm of parenchyma cells of the phloem.

**Key words:** Geminiviruses, hollyhock, *Bemisia argentifolii*, ELISA, dot blot immunobinding assay.

## INTRODUCTION

Plant viruses transmitted by the whitefly insects have been said to cause over 40 plant diseases to vegetable and fiber crops (Brown and Bird, 1992), e.g. in Cucurbitaceae (Flock and

Mayhew, 1981; Brown and Nelson, 1989; Abdel-Salam *et al.*, 1997), Leguminosae (Morales *et al.*, 1990; Brown and Bird, 1992), Malvaceae, (Brown *et al.*, 1983; Abouzid and Jeske, 1986), and Solanaceae (Costa, 1969; Brown *et al.*, 1986; Abdel-Salam, 1991).