

ABSTRACT

The Etiology of Viruses Affecting Pepper (*Capsicum spp*) in Jamaica

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In Jamaica the cultivated *Capsicum spp* have been affected by a 'mosaic' disease syndrome of viral origin since the first reported case in 1956. The 'mosaic' disease was first reported on hot pepper (*Capsicum chinense*) var. Scotch Bonnet and has since been reported on sweet pepper (*C. annuum*). During the past 40 years only three surveys were conducted in Jamaica to determine the virus incidence on a few vegetable crops including peppers. Potato virus Y (PVY) and tobacco etch virus (TEV) were the viruses predominantly found on pepper from these surveys. They were detected in single and mixed infections on pepper samples tested. However the role of the two viruses or any other, in the 'mosaic' disease syndrome was not investigated, neither were control measures implemented. The 'mosaic' disease has been allowed to go unchecked and is now found island wide. The 'mosaic' disease has led to a decline in the productivity of pepper plants and hence they are no longer grown as perennials but as annuals.

This work sought to (1) identify the specific viruses involved in the 'mosaic' disease complex on pepper (2) recover them from pepper sources and (3) separate them and isolate them from any mixtures present. This was followed by the determination of the role of each isolate in the etiology of the disease. In order to grasp the complexity of this virus-host interaction in the etiology of the disease other factors were also investigated, such as, the role of aphids, weeds and alternate hosts in the spread of these viruses.

Due to the high economic cost and accessibility of molecular biological tools in developing countries, the need arose, to develop and utilize more readily available diagnostic tools which could meet similar objectives in virus detection.

This thesis presents methods in light microscopy, electron microscopy, virus transmission and serology, with special emphasis on the use of indicator plants in virus detection, recovery and isolation. These tools were useful (1) in the detection of viral induced inclusions, (2) in particle and inclusion morphology (3) in the determination of the mode of virus transmission, (4) in the determination of serological relationships to known pepper viruses and (5) in investigating the biological properties of the viruses recovered from infected pepper.

This work demonstrated that tobacco etch virus (TEV) and potato virus Y (PVY) played an important role in the 'mosaic' disease syndrome on pepper. Also the interaction between both viruses on Scotch Bonnet pepper resulted in the suppression of PVY by TEV. Three strains of TEV were biologically differentiated from the reactions of Yolo Wonder, Scotch Bonnet and *Nicandra physaloides* test plants. A tobamovirus that was serologically related to tobacco mosaic virus (TMV) and pepper mild mottle virus (PMMV) was also detected and isolated from Scotch Bonnet pepper and it too contributed to the 'mosaic' disease syndrome when found in mixed infections with TEV or PVY. Scotch Bonnet pepper appeared to be viriphilic due to its affinity to viruses with different biological and physical properties and to its ability to support mixed infections. *Aphis gossypii* played an important role in the epidemiology of the disease due to its ability to transmit both TEV and PVY.

This work also demonstrated the importance of alternate hosts and wild plants such as the wild *Capsicum* species, bird pepper (*C. baccatum*), as reservoirs of virus and as sources of new virus introductions on to pepper. This investigation reported on the first incidence of an unidentified potyviral isolate from *Catharanthus roseus* (periwinkle) in Jamaica, which was infectious on pepper.