CHARACTERISATION AND DETECTION OF DASHEEN MOSAIC POTYVIRUS IN *ZANTEDESCHIA*

A thesis presented in partial fulfilment of the requirements for the degree of Master of Horticultural Science in Plant Health at Massey University, Palmerston North, New Zealand.

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1995

ERRATA

Page 11	line 21: "a period of three months with which" should read " a period of three months in which"
Page 14	line 14: "Hendon" should read "Herndon" line 23: "Shawl" should read "Shaw". line 25: "Shukla and Ward, 1989" should read "Shukla and Ward, 1989a".
Page 15	Table 1.1: The first protein should be "P1" not "P3"
Page 20	line 1: "wide geographical" should read "widely separated geographical"
Page 22	line 22: "Dichlorovos®" should read "dichlorvos"
Page 39	line 7: "at 160,800g" should read "at 160,800g for 90 minutes"
Page 40	line 16: "200ul" should read "200ml".
Page 58	Table 3.1, column four, bottom line: "stuntimg" should read "stunting"
Page 67	line 3: "using two virus other isolates" should read "using two other virus isolates".
Page 73	line 18: "Enrlich" should read "Ehrlich"
Page 83	line 10: "feathery mottle potyvirus" should read "taro feathery mottle potyvirus".
Page 84	line 2: "numerable" should read "numerous" line 11: "not unlikely" should read "likely" line 13: "other" should read "some other" line 19: "would clarify whether" should read "would help confirm" line 19: "virus" should read "potyvirus"
Page 113	line 1: should read "Until this study no other potyvirus except DsMV has been ..."
Page 116	line 4: "infection should read "virus infection".
Page 126	Addition to the bibliography: Saiki (1989). The design and optimization of the PCR. In: PCR Technology. Ed. Ehrlich, G.D. M. Stockton Press. p7-16.

ABSTRACT

Four potyvirus isolates believed to be dasheen mosaic potyvirus, the most frequently occurring virus to infect members of the *Araceae*, were obtained from *Caladium*, *Colocasia*, *Xanthosoma* and *Zantedeschia* in world-wide locations. Properties of these isolates such as particle length, serological relatedness, electrophoretic mobility of coat proteins and genomic characteristics were compared.

Serologically distinct strains of dasheen mosaic potyvirus were apparent amongst the isolates. The difference in the serological relationship was coupled with a variation in symptom expression. An isolate from *Colocasia esculenta* (L.) Schott was not serologically related to the other isolates. Further isolates from *C. esculenta* also exhibited no relationship. The modal length was different as well as the ability of complementary deoxyribonucleic acid, produced to the viral ribonucleic acid, to bind with some of the primers used in the polymerase chain reaction. This evidence led to the proposal that the isolate from *C. esculenta* was not dasheen mosaic potyvirus; this virus is tentatively named taro feathery mottle potyvirus.

Cytoplasmic inclusion protein aggregates of dasheen mosaic potyvirus were purified from infected leaf tissue. SDS-polyacrylamide gel electrophoretic analysis of samples revealed a major band with an estimated molecular weight of 68,000 daltons. Such a band was absent from healthy tissue samples.

The ATPase activity in samples from each purification step was determined by measuring the amount of [^{32}P] released from the [γ-^{32}P]ATP during incubation with the cytoplasmic inclusion protein. The level of ATPase activity in each sample showed a strong correlation with the amount of protein that was present.

In a limited survey of commercial plantings twenty nine tubers grown for cutflower or tuber export were obtained from seven properties at different locations in New Zealand and grown on in a greenhouse. Each plant was indexed for virus infection.

Electron microscopy revealed that plants from three of the properties contained 720nm flexuous rods. Samples from all but two plants tested positive to a potyvirus group antiserum using the enzyme-linked immunosorbent assay. The remaining two plants tested positive in microprecipitin and rapid immune electron microscopy tests to an antiserum prepared to a member of the carlavirus group. Particles from these plants were mechanically transmitted to *Nicotiana tabacum* 'Havana'.

Rod-shaped particles of 300nm were observed in plants from four properties and tested positive to tobacco mosaic tobamovirus antiserum using a microprecipitin test. While inoculations to herbaceous indicators resulted in no symptoms, 300nm particles were observed in samples from the indicator plants.

Tomato spotted wilt tospovirus, potato X potexvirus and cucumber mosaic cucumovirus, reported to infect *Zantedeschia* spp, were not detected.

ACKNOWLEDGEMENTS

I wish to thank my supervisors; Professor K.S. Milne for his support and encouragement, Dr R.L.S. Forster for his inspiration and enthusiasm that kept me going in the later stages of this study and Mr H.F. Neilson for his technical assistance and attempts to answer my numerous questions.

Thanks are also due to Doug Hopcroft and Raymond Bennett of the Electron Microscope Unit, Horticulture and Food Research Institute of New Zealand, Palmerston North for their assistance. It was a pleasure to work in such a well run laboratory.

The advice of Eddie Welsh and Alison Duffy on the culture of zantedeschias was of great value. Mrs K. Hill also assisted by supplying *Zantedeschia* sp seedlings and advised on their care.

George Ionas and Carolyn Young, Department of Microbiology and Genetics, Massey University, willingly advised on some of the molecular biology techniques used. George Ionas' help with the PCR technique was of significant value and his support and encouragement was greatly appreciated.

Assistance was also given by Robin Eagles, Dave Beck and Davin Voot, Horticulture and Food Research Institute of New Zealand, Auckland. Their willingness to teach me some of the laboratory techniques used in this study was appreciated.

Thanks are due to Dr W. Zettler and Dr R. Fullerton for the supply of virus isolates.

I would also like to thank the staff of the Small Animal Production Unit, the Plant Growth Unit and the Central Photographic Unit at Massey University for their help.

Financial assistance was provided by the Leonard Condell Farming Trust Scholarship, Helen E. Akers Scholarship, Massey University Research Fund, Massey University Research Awards, and the NZ Nurserymen's Association Incorporated. This study could not have taken place without such assistance.

The friendship and encouragement of fellow postgraduates in the department was appreciated.

Finally, my greatest debt belongs to my family. Thank you to my husband Murray who has been willing to assist at home and has given the support necessary to ensure I completed this thesis. My children Janetta and Timothy have been very understanding as I have attempted to juggle my study and family commitments.

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