



PUBLISHED WORKS SUBMITTED BY E.M. HUTTON M.Sc.

FOR THE DEGREE OF DOCTOR OF SCIENCE (ADELAIDE)

SUBJECTS

Major - Virus reactions in the potato (Solanum tuberosum L.) with particular reference to resistance.

Minor - Some observations on disease resistance in the tomato (Lycopersicon esculentum Mill).

Miscellaneous - "Increasing the infectivity of the spotted wilt virus", "The relationship between colour and necrosis to potato virus X in Amaranthus gangeticus L.", and "A new method for tomato and cucumber seed extraction".

PREFACE

With the exception of the paper, "Some effects of leaf-roll virus on the development and growth of the potato plant" written in conjunction with Dr. J.G. Bald, all the work presented under the various headings has been thought out by me, and much of it has resulted in original scientific contributions. The main theme of the work is virus resistance in the potato and tomato, although research has been done on allied problems. Thus the original discovery that tomato seed, and also potato seed, could be extracted rapidly from the mucilaginous materials in the respective fruits by the addition of hydrochloric acid has made the handling of the hybrid seed used in these studies more efficient, as well as providing an important method for the production of tomato seed commercially. The work on *Fusarium* wilt resistance in the tomato, although applying American results to Australian conditions, does contain a new approach to the assessment of resistance for genetical studies.

The successful development of the concept that potato seedlings with a localised reaction to virus Y could be developed from common potato varieties without recourse to wild Solanum species has perhaps been the most significant original contribution I have made to the problem of virus resistance in the potato. This work has been substantiated overseas, as at the Scottish Society for Research in Plant Breeding, Edinburgh, and at the U.S.D.A. Bureau of Plant Industry, Beltsville, Maryland. Certain new principles have been elucidated from this study, notably that a seedling can give a localised reaction to one strain of virus Y and not to another. I am indebted to F.C. Bawden F.R.S., Head of the Plant Pathology Department, Rothamsted Experimental Station for making available his strains of virus Y which made this aspect of the research possible. I am also indebted to Dr. J.G. Bald (formerly of the Division of Plant Industry, C.S.I.R.O., and now at the University of California, Los Angeles, U.S.A.) for his help in the initial stages of this work by instructing me in modern virus techniques and indicating the necessity for Australian research on virus resistance.

That strains of virus X differing in virulence can be separated from a complex by passage through potato seedlings has been demonstrated for the first time in one paper, and the research on leaf-roll reactions in potato seedlings presents a new approach to this important problem and may lead to the ultimate development of hybrids highly resistant in the field. With respect to spotted wilt resistance in both the potato and tomato, the preliminary results presented are a positive contribution to this problem. The observation that the reaction to virus X in Amaranthus gangeticus is influenced by leaf colour is original, and could assist in a clearer understanding of the reactions of plants to viruses.

The research outlined has been done by me as an officer of the Division of Plant Industry, C.S.I.R.O., Canberra and as such I have received technical assistance in the growing and inoculating of the large numbers of plants involved as well as in the examination of the reactions of the seedlings in hybrid progenies. All hybridisations, and measurements and observations of a critical nature I have done myself. Full credit has been given in all papers wherever cooperation or assistance has been received.

INDEX OF RESEARCH PAPERS

<u>Major Subject</u>		<u>Pages</u>
	<u>Virus reactions in the potato (<i>Solanum tuberosum</i> L.) with particular reference to resistance.</u>	
Hutton, E.M. and Bald, J.G. (1945). The relationship between necrosis and resistance to virus Y in the potato. I. Greenhouse results. J. Coun. Sci. Industr. Res. Aust. 18 : 48-52		1-8
Hutton, E.M. (1945). Id. II. Some genetical aspects. Ibid. 18 : 219-24		9-14
Hutton, E.M. (1946). Id. III. Interrelation with virus C. Ibid. 19 : 273-82		15-27
Hutton, E.M. (1948). Some factors affecting localized and systemic necrotic reactions to virus Y in the potato. Aust. J. Sci. Res. B1: 416-38		28-52
Hutton, E.M. (1948). The separation of strains from a virus X complex by passage through potato seedlings. Ibid. B1 : 439-451		53-69
Bald, J.G. and Hutton, E.M. (1950). Some effects of leaf-roll virus on the development and growth of the potato plant. Aust. J. Agric. Res. 1 : 3-17		70-84
Hutton, E.M. (1949). The significance of the necrotic phloem reaction in the potato to the leaf-roll virus. Aust. J. Sci. Res. B2 : 249-270.		85-108
Hutton, E.M. (1947). Resistance in the potato to the spotted wilt virus. J. Aust. Inst. Agric. Sci. 13 : 190-192.		109-111
Hutton, E.M. and Oldaker, C.E.W. (1949). Rosette, a virus disease of the potato in Tasmania. J. Aust. Inst. Agric. Sci. 15 : 25-31		112-11

- Minor Subject Some observations on disease resistance in the tomato (*Lycopersicon esculentum* Mill.)
- Mills, Margaret and Hutton, E.M. (1946). Fusarium wilt of tomato in Australia. I. The relationship between different isolates of the pathogen and resistance in varieties of *Lycopersicon esculentum* Mill. and other *Lycopersicon* species. J. Coun. Sci. Industr. Res. Aust. 19 : 376-386 119-130
- Hutton, E.M., Mills, Margaret, and Giles, J.E. (1947). Id. II. Inheritance of field immunity to fusarium wilt in the tomato (*Lycopersicon esculentum*). Ibid. 20 : 468-474. 131-137
- Hutton, E.M., and Wark, D.C. (1947). Tomato big bud. J. Aust. Inst. Agric. Sci. 13 : 188-190 138-140
- Hutton, E.M., and Peak, A.R. (1949). Spotted wilt resistance in the tomato. Ibid. 15 : 32-36 141-145

Miscellaneous

- Hutton, E.M. (1949). Increasing the infectivity of the spotted wilt virus. J. Aust. Inst. Agric. Sci. 15 : 43-44 146-147
- Hutton, E.M. (1949). The relationship between colour and necrosis to potato virus X in *Amaranthus gangeticus* L. Ibid. 15 : 131-134 148-151
- Hutton, E.M. (1943). A new method for tomato and cucumber seed extraction. J. Coun. Sci. Industr. Res. Aust. 16 : 97-103. 152-159