INHERITANCE OF RESISTANCE TO MOSAIC VIRUS DISEASE IN TOMATO

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THESIS

Submitted in Partial Fulfilment of the Requirements
for the Degree of

DOCTOR OF PHILOSOPHY

in

Vegetable Crops

Faculty of Agriculture
Ain Shams University

1973

APPROVAL SHEET

INHERITANCE OF RESISTANCE TO MOSAIC

VIRUS DISEASE IN TOMATO

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Date : 10 / 12 /1973

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A C K N O W L E D G E M E N T S

The writer wishes to express his gratitude to Prof. Dr. Ahmed Kamel Abdallah Selim, Prof. of Genetics, Ain Shams University for proposing the subject and for his fruitful guidance.

Thanks also are due to Prof. Dr. Mohamed Abd El-Maksud Mohamed, Prof. of Vegetable Crops, Ain Shams University for supervision and useful guidance of this work and also for proposing the part dealing with nature of resistance.

Prof. Dr. Ahmed Labib El-Tomy, Dean of the College of Agriculture, Ain Shams University supervised the author during the last year of the study, in the absence of Dr. Mohamed Abd El-Maksud. To him, the author is greatly indebted.

Dr. Esmat Khaled Allam, Prof. of Virology, College of Agriculture, Ain Shams University, supervised the virological work and kindly furnished the isolate of tobacco mosaic virus used in this study, as well as the laboratory facilities and space. To him, the writer wishes to express his affectionate gratitude.

Dr. Ahmed Abd El-Monem Hassan, Lecturer of Vegetable Crops, College of Agriculture, Cairo University, devoted a great deal of effort to help in processing data and thesis writing. To him the writer wishes to express his sincerest gratitude and thanks.

Thanks are also due to the Ministry of Higher Education for granting the author a scholarship during the period spent in conducting this work.

Also the writer wishes to express his sincerest gratitude to the Higher Agricultural Institute of Moshtohor for providing field space and facilities for conducting field work.

Many thanks are also due to all the respective investigators (Table 1) who kindly furnished seed stocks used in this study.

The writer's sincerest gratitude is due to his wife for her patience and for accommodating the atmosphere conducive to efficient work.

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INTRODUCTION

Tomato, *Lycopersicon esculentum* Mill., is the most important vegetable crop in Egypt. About 256,000 faddans or approximately 38 % of the vegetable acreage were planted with tomato in 1972. This acreage yielded about 1,666,000 tons of tomato fruits (6).

A number of pests inflict severe losses on tomato yield annually and tobacco mosaic virus (TMV) is perhaps the most important contributing factor that affects both tomato yield and quality. No accurate survey of the losses caused by TMV has been made in Egypt, but F.S. Leaves (Kerr, 1966) has estimated that this virus has caused about 42 % yield-reduction in tomato production in Ontario, Canada.

Common methods of disease control have not been practical with this pathogen, since the virus could be easily transmitted mechanically and the sources of infection could be soil debris or workers'hands or outer clothing (Broadbent and Fletcher, 1966). Consequently, it appears that resistance to TMV is the only satisfactory method for controlling this virus. Due to the importance of TMV in tomato and the necessity of breeding for resistance for its control, it has already received more attention from tomato breeders than any other tomato disease, except, perhaps, for *Fusarium* wilt (Walter, 1967).

The objectives of this study were :

1- To screen a number of tomato lines that have been previously found abroad to be resistant to TMV for resistance to the virus under Egyptian conditions.

2- To study the inheritance of resistance present in lines from divergent origins.

3- To study the nature of resistance to TMV tomato, with emphasis on possible production of virus inhibitors following inoculation.

II. REVIEW OF LITERATURE

Before reviewing the literature on the subject, it would be helpful to the reader to define the term "resistance". According to Holmes (28), resistance is "of many different kinds, and each kind should be described as accurately as possible whenever the word resistance is used in the literature". Thus resistance to viral diseases has been classified by Björling (7) to include the following types :

1- Tolerance : The tolerant line has a much less virus concentration than that in a susceptible one. Infected plants appear to be symptomless carriers.

2- Resistance to virus inoculation : Plants possessing this type of resistance are harder to inoculate than susceptible ones. In the literature, workers used either the term "infection-resistance", "klendusity", or "tendency to escape infection" to describe this type of resistance, which frequently appeared to be an integral important part of the total resistance, i.e., field resistance, to plant viruses.

- Resistance to virus increase and spread : This type of resistance operates in case of systemic infection. It is characterized by the formation of necrotic or chlorotic local lesions following inoculation. After an initial multiplication, the virus will be restricted to these lesions and cells immediately adjacent to them.

- Immunity : A cultivar is immune when it does not respond to virus multiplication with visible symptoms and does not sustain measurable virus propagation.

a- Screening for Resistance :

Pelham (51) mentioned that most of the original sources of resistance to TMV in tomato was derived from wild species in the sub-genus Eriopersicon. According to Laterrot (37), C.H. Muller classifies this sub-genus to include *L. peruvianum* var *humifusum* C.H. Mull., *L. peruvianum* var *dentatum* Dun, *L. hirsutum* Hum et Bonple., *L. hirsutum* f. *glabratum* C.H. Mull. and *L. glandulosum* C.H. Mull.

Screening tests performed by Alexander and Hoover (3 , 4) indicated that *L. peruvianum*, *L. glandulosum*, and *L. hirsutum* are valuable sources of TMV resistance. From a cross between *L. esculentum* and *L. peruvianum*, McRitchie nd Alexander (45) were able to select a line immune to four hio strains of TMV from the accessions of L. peruvianum P.I. 28650. Also, Milinkó (46) reported that one strain of L. eruvianum was immune to TMV.

A type of masked symptoms was also obtained as a esult of a cross between L. hirsutum and L. esculentum (17, 8, 58). Multiple crosses involving L. peruvianum, L. pimpi-ellifolium, L. hirsutum and L. chilense were performed by razier and Dennette (19) and it was possible to obtain some ighly tolerant lines from crosses between the first three species. Also, Milinkó (46) stated that three strains of L. hirsutum were tolerant to TMV.

Earlier, Holmes (21) reported that L. chilense appeared to be a promising source of TMV resistance. Subsequently, Holmes (22, 23, 24) found that some derivatives from the hy-brid L. esculentum X L. chilense possessed a heritable tend-ency to escape TMV infection and a klendusic derivative was obtained from this cross.

)– Inheritance of Resistance :

Several investigators studied the inheritance of resistance to TMV in tomato. Kikuta and Frazier (33) found that a symptomless infection with TMV in L. hirsutum is not

ompletely dominant in F_1 hybrids with *L. esculentum*. On the
her hand, Watson and Heinrich (75) reported that tolerance
f *L. hirsutum* under glasshouse conditions was controlled by
vo recessive genes. Further work performed by Watson et al.
76) indicated that tolerance of *L. hirsutum* under field
onditions is controlled by two dominant genes. A fourth
tudy conducted by Walter (72) led him to conclude that the
on-symptomatic tolerance of *L. hirsutum* P.L. 126445 is con-
rolled by three recessive genes. Seed stocks homozygous
or these three genes were released and used by many investi-
ators (16, 46, 49).

It was found that the hybrid between *L. chilense* and
L. *esculentum* is not so readily infected with TMV (22, 23).
ater, Holmes (25) found that tolerance is controlled by a
ompletely dominant gene, which he gave the symbol *Tm-1*, and
eleased a TMV-resistant stock that was heterozygous at the
m-1 locus. Still later Holmes (26,27) incorporated the
m-1 gene in a homozygous condition in a tomato line that
as given the P.I. number 235673 when deposited at the North
entral Regional seed storage station. The symbol *Tm* was
iven to this gene when it was reported in the gene-list
ublished by The Tomato Genetics Cooperative (5).