

## INCIDENCE OF TOMATO MOSAIC DISEASE IN SOME TOMATO VARIETIES AND THE EFFECT OF THIS DISEASE ON CERTAIN MORPHOLOGICAL PARTS OF THEM

By

SANKAR MUKHOPADHYAY AND MANIK GOPAL SOM

*Department of Plant Pathology, and Department of Horticulture,  
University of Kalyani*

Mosaic disease of tomato caused by the tomato strain of tobacco mosaic virus, can infect all the selected varieties of tomato: Sl. No. 14, Italian Red Pear, Pusha Early Dwarf, Sl. No. 206, Pusha Ruby, Sl. No. 120, Best of All, Sl. No. 47, Marglobe, Bhargar, Perfection and Sioux, in the field.

Initial infection in all the varieties except Best of All, Bhargar, Perfection and Sioux appeared during one month after transplantation. At the end of the observation period, minimum (30%) and maximum (72%) susceptibility were shown by Sl. No. 14, Pusha Ruby and Sioux respectively, the rest of the varieties showed intermediate susceptibility (40-58%). The disease substantially reduced the number of branches, inflorescences and flowers in all the varieties, although the degree of reduction varied. The ranges of reduction of those organs were, 31-47%, 22-46% and 18-45% respectively. The extent of reduction was found to be maximum in branches, intermediate in inflorescences and minimum in case of the flowers. The order of reductions in the organs concerned with respect to the varieties does not follow any definite pattern. The extent of reduction of morphological parts again is not correlated with the extent of field susceptibility.

### INTRODUCTION

Mosaic disease very often causes serious losses to tomato crops. This disease has been found to be very common in many tomato growing areas of the world (Broadbent, 1960). The virus primarily responsible for this disease has been claimed to be tomato strain of tobacco mosaic virus (Broadbent, 1962; MacNeill, 1962) and the sources of this virus in the glass house cultivation have been shown to be contaminated seeds and infected tomato root debris of previous crops (Broadbent and Fletcher, 1966).

During the last few years tomato cultivation in the farm of the University of Kalyani was suffering from mosaic disease. Tests were performed

as suggested by Broadbent(1962) and this mosaic disease was found to be due to tomato strain of TMV. As a prelude to the study for the selection of tomato variety for cultivation in this area, this investigation on the mosaic disease with special reference to its spread in the field, natural susceptibility of different tomato varieties and effect of this disease on some of their morphological parts pertinent to the crop yield, such as branches, inflorescences and flowers has been undertaken.

#### MATERIALS AND METHODS

The tomato varieties selected for this investigation are : Sl. No. 14, Italian Red Pear, Pusha Early Dwarf, Sl. No. 206, Pusha Ruby, Sl. No. 120, Best of All, Sl. No. 47, Marglobe, Bhangar, Perfection and Sioux. Seeds of this selected varieties were sown in the second week of September, 1966 in seed-beds and allowed to grow for about a month. Seedling were transplanted in the field where no tomato crop was grown previously, in the second week of October, 1966. The field was prepared in the usual way for tomato cultivation in randomized plots with three replications. Observations on the spread of the disease were taken once in every week after three weeks' growth in the field for two and half months. At the end of the observation period, relative effect of the disease on various morphological parts of the selected plants was recorded and the data obtained were statistically analysed. The presence of tobacco mosaic virus (TMV) in the plants showing mosaic symptoms was tested by extracting the infectious sap from the infected leaves and inoculating it to the middle leaves of *Nicotiana glutinosa* after diluting one million times with distilled water where small local lesions appeared within a few days. The involvement of the tomato strain was tested by inoculating tobacco and Petunia plants with the same preparations, in the leaves of which necrotic local lesions appeared and no systemic mottle developed immediately after inoculation.

#### RESULTS AND DISCUSSION

The observations on the spread of the mosaic disease and the natural susceptibility of the selected tomato varieties are presented in the Table 1. The relative effect of the disease on the morphological parts are given in the Table 2.

Table 1 shows that the number of plants of different varieties that exhibited mosaic symptoms in the field varied widely. In case of Sl. No. 14 and Pusha Ruby, 30% of the plants showed symptoms, in Italian Red pear, Sl. No. 206, Bhangar, Perfection, Sl. No. 47, Marglobe, Pusha Early Dwarf, Best of All and Sl. No. 120, 40%, 44%, 47%, 50%, 50%, 58%, 58% and 58% respectively showed symptoms at the end of the observation

Table 1. Spread of tomato mosaic disease (as percentage of infected plant) in the field through different periods of the growing season.

| Varieties         | November '66 |          |          |          |          | December '66 |          |          | January '67 |          |
|-------------------|--------------|----------|----------|----------|----------|--------------|----------|----------|-------------|----------|
|                   | 1st Week     | 2nd Week | 3rd Week | 4th Week | 1st Week | 2nd Week     | 3rd Week | 4th Week | 1st Week    | 1st Week |
| Sl. No. 14        | 3            | 3        | 3        | 14       | 14       | 14           | 19       | 30       | 30          | 30       |
| Italian Red Pear  | 3            | 3        | 8        | 8        | 14       | 25           | 28       | 40       | 40          | 40       |
| Pusha Early Dwarf | 3            | 3        | 8        | 8        | 30       | 40           | 44       | 58       | 58          | 58       |
| Sl. No. 206       | 5            | 5        | 5        | 5        | 8        | 17           | 28       | 28       | 44          | 44       |
| Pusha Ruby        | 5            | 5        | 8        | 8        | 8        | 14           | 17       | 25       | 30          | 30       |
| Sl. No. 120       | 5            | 5        | 11       | 11       | 17       | 17           | 40       | 47       | 58          | 58       |
| Best of All       | 0            | 0        | 3        | 11       | 17       | 17           | 40       | 47       | 58          | 58       |
| Sl. No. 47        | 6            | 6        | 11       | 25       | 30       | 33           | 36       | 42       | 50          | 50       |
| Marglobe          | 3            | 3        | 6        | 14       | 31       | 47           | 47       | 50       | 50          | 50       |
| Bhangar           | 0            | 0        | 0        | 0        | 3        | 6            | 17       | 22       | 47          | 47       |
| Perfection        | 0            | 0        | 8        | 8        | 16       | 25           | 28       | 39       | 47          | 47       |
| Sioux             | 0            | 0        | 6        | 17       | 36       | 44           | 55       | 72       | 72          | 72       |

Table 2. Effect of tomato mosaic disease on some morphological character of selected tomato varieties grown in the field. (Data recorded during the second week of December, 1966.)

| Variety           | Reduction in number of branches per plant (in percent) |             | Reduction in number of inflorescences per plant (in percent) |             | Reduction in number of flowers per inflorescence (in percent) |             |
|-------------------|--------------------------------------------------------|-------------|--------------------------------------------------------------|-------------|---------------------------------------------------------------|-------------|
|                   | Original                                               | Transformed | Original                                                     | Transformed | Original                                                      | Transformed |
| SI.No.14          | 41                                                     | 29.85       | 37                                                           | 28.12       | 45                                                            | 31.60       |
| Italian Red Pear  | 40                                                     | 29.42       | 41                                                           | 29.85       | 34                                                            | 26.77       |
| Pusha Early Dwarf | 36                                                     | 27.67       | 28                                                           | 23.95       | 24                                                            | 22.30       |
| SI.No.206         | 38                                                     | 28.55       | 31                                                           | 25.35       | 33                                                            | 26.30       |
| Pusha Ruby        | 42                                                     | 30.30       | 33                                                           | 26.30       | 29                                                            | 24.42       |
| SI.No.120         | 47                                                     | 32.47       | 46                                                           | 32.25       | 43                                                            | 30.75       |
| Best of All       | 43                                                     | 30.75       | 29                                                           | 24.42       | 19                                                            | 19.37       |
| SI.No.47          | 40                                                     | 29.40       | 32                                                           | 25.67       | 37                                                            | 28.12       |
| Marglobe          | 44                                                     | 31.17       | 22                                                           | 21.00       | 22                                                            | 20.97       |
| Bhangar           | 39                                                     | 28.97       | 44                                                           | 31.17       | 25                                                            | 22.50       |
| Perfection        | 43                                                     | 30.75       | 36                                                           | 27.67       | 39                                                            | 28.97       |
| Sioux             | 31                                                     | 25.35       | 35                                                           | 27.22       | 28                                                            | 24.45       |
| S.E.m.            |                                                        | ± 0.55      |                                                              | ± 0.42      |                                                               | ± 0.49      |
| C.D. at 5% level  |                                                        | 1.14        |                                                              | 0.85        |                                                               | 1.01        |

period. Sioux showed maximum susceptibility where 72% plants got infected during the same period. Except Best of All, Bhanger, Perfection and Sioux, initial infection in the field was observed in all other varieties. Best of All, Perfection and Sioux remained symptomless till the second week of November while Bhanger remained so till the fourth week of the same month. This initial difference at the beginning of the observation period does not seem to contribute in the ultimate spread of the disease. The rate of increase in the spread again has been found to be low till the end of the third week of December when it became very high in all the varieties.

The Table 2 showed that the mosaic infection caused reduction in the number of branches, inflorescences and flowers. The extent of reduction was found to be maximum in branches, intermediate in inflorescences and minimum in case of the flowers. The percentages of reductions in these organs ranged between 31-47, 22-46 and 18-45 respectively. Reduction in the number of branches was maximum in Sl. No. 120 and minimum in Sioux. The maximum and minimum reductions in cases of the inflorescences and flowers were Sl. No. 120 and Marglobe, Sl. No. 14 and Best of All respectively. It also appears from this table that the order of reduction in the organs concerned with respect to varieties does not follow any definite pattern. If the varieties be serially arranged according to the order of reduction for one particular organ, the same set of varieties can not be placed in the same order when other organs are considered. Except for Sl. No. 120 some varieties again, when high degree of reduction was observed for one organ similar degree of reduction was not observed for other organs. As for example, reduction in the number of flowers in Best of All is very low, whereas reduction in the number of branches for the same variety is very high.

Comparing the Table 1 and 2 it appears that the extent of the number of infected plants in the field, does not correspond to the extent of reduction in the number of the morphological parts. With Sioux, maximum number of plants got infected during the observation period but reduction in the number of the morphological parts concerned was not very high. Thus the extent of the spread of the mosaic disease in the field and the subsequent reduction in branches, inflorescences and flowers may be different phenomena.

#### ACKNOWLEDGMENTS

The authors wish to express their deep gratitude to Dr. S. B. Chattopadhyay, Professor of Plant Pathology and the Dean, Faculty of Agriculture, University of Kalyani, for his helpful suggestion and advice.

## REFERENCES

- Broadbent, L. (1960). The epidemiology of tomato mosaic. I. A review of the literature. *Rep. Glass house Corps Res. Inst.*
- (1962). The epidemiology of tomato mosaic II. Smoking tobacco as a source of virus. *Ann. appl. Biol.* 53, 461.
- and Fletcher, I. T. (1966). The epidemiology of tomato mosaic XII. Sources of TMV in commercial tomato crops under glass. *Ann. appl. Biol.* 57, 113
- Mac Neill, B.H. (1962). A specialized tomato form of the tobacco mosaic virus in Canada. *Can. J. Bot.*, 40, 49.

( Accepted for publication 8th August 1969 )