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The effect of different mechanisms of transmission on transferability of Tomato Mosaic Virus

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Abstract
In our country, tomato (*Lycopersicon esculentum* Mill) is cultivated throughout the year because of the favourable agroclimatic conditions in our part or another. They also prefer warm growing season. High humidity and high temperature makes the tomato plants susceptible towards foliage diseases. Mechanical transmission will occur if virus concentration in plant sap and virus stability are high. Grafting has been important in flowering research. Leaves or shoot from plants induced to flower can be grafted on to uninduceds plants and transmit a floral stimulus that induces them to flower. It is evident from the table 2 that the virus was transmitted by cleft and leaf graft showed 100 percent transmission. Virus was transmitted by cleft and leaf graft showed 100 percent transmission. And the insect transmission and virus-vector relationship in the preliminary screening, it was found that none of the above mentioned insects best M. persieae could transmit the virus.

Keywords: Tomato, Mosaic virus, transmission

1. Introduction
Tomato (*Lycopersicon esculentum* Mill) is an important annual or short lived perennial fruit vegetable. It belongs to family solanaceae. It is indigenous to the western regions of tropical south America. Tomatoes are cultivated throughout the world for it's edible fruits. Tomatoes are a good source of vitamins in addition to their endless flavouring characters for other foods.
In India, according to FAO estimates the average per hectare yield of tomatoes in India about 9316 kgs against that the world and developing countries which is about 19915 kg and 14483 kg., respectively.
Symptoms can be found during any growth stage and all plant parts are affected. Generally, infected plants have a light or dark green mottling or mosaic with distortion of younger leaves, and stunting to varying degrees. Severely affected leaves may have a "fernlike" appearance and may show raised dark green areas. Fruit set may be severely reduced in affected plants. There may be internal browning of the fruit wall, yellow blotches and necrotic spots may occur on greenor ripe fruit. Some strains can cause yellow mottling of leaves, others cause dark necrotic streaks in stems, petioles, leaves or fruit, or other symptoms to occur. Symptoms are influenced by environmental conditions such as daylength, temperature, and light intensity as well as by variety, plant age at infection, and virulence of tomato mosaic virus (ToMV) strain. On susceptible cultivars, symptoms may range from severe to none.
The virus is seed-borne. Infested tomato seeds can be the source of infection and the means by which the virus can be disseminated over large distances. Only a few seedlings need to be infected for the virus to spread rapidly. The virus can be spread by horticultural workers on contaminated hands, clothing, and tools during routine horticultural operations such as transplanting, tying, pruning, grafting, pollinating, cultivating, spraying, watering, and picking. The presence of virus in the guttation fluid of tomato plants facilitates spread by workers during horticultural operations. ToMV can also enter a tomato field through infected weed, pepper, or potato plants. Also, ToMV is spread to a lesser extent by feeding grasshoppers, small mammals, and birds. ToMV is a closely related strain of tobacco mosaic virus (TMV). The virus is quite stable under adverse environmental conditions and can persist in plant debris in dry soil for 2 years or in moist soil for 1 month or in root debris in fallow soil for 22 months. It can also persist in greenhouse structures for long periods of time. Healthy seedlings planted into contaminated soil can be infected through minor wounds caused by damage to roots. The virus may also be present in water used for irrigation. Dissemination of tiny particles of contaminated soil by wind is also possible.
Transmission studies play a significant role in the characterization of plant viruses. These organisms adopted several methods of transmission helping their spread in nature, such as mechanical, grafting, insect and seed transmission etc.

During the study this has been investigated that the ToMV is readily transmission by sap inoculation and by grafting.

Methods and materials

In polythene cage study, for common methods of transmission i.e., mechanical, graft, insect and seed transmission were conducted successfully. Sap inoculation and grafting were the most suitable methods for the transmission of tomato mosaic virus where the transmission was 100 per cent.

Mechanical transmission

The mode of transmission is essential to understand the physical properties of a virus and various invitro aspects of diversified interest, Crude sap and standard virus inoculum were used for sap transmission, which were prepared as described in materials and methods, inoculations were made on the leaves of 15 days old seedlings of test plant by gentle rubbing of the sap with the help of forefinger. Carborundum powder (800 mesh) was used as an abrasive. Control plants were inoculated with the sterilized distilled water in the same manner. In each set, ten plants were inoculated and the experiment was repeated for 10 times.

The virus is transmitted to healthy test plants with crude sap up to 80 percent. Standard virus inoculums, prepared in phosphate buffer (pH 7.0), enhanced the rate of transmission up to 100 percent and reduced the incubation period by 3-4 days.

Graft transmission

Grafting is an artificial types of transmission. Common methods of grafting viz., cleft leaf grafting was employed for the transmission of tomato mosaic virus.

The grafted plants were kept in moist chambers for a week and than were left in polythene cage at 30 ($\pm$2)°C for the observations.

Insect Transmission

Insect play an important role in the spread of virus in culture. Important insect *viz*., Aphids gossypii Glov.

A. Cracivora koch. And *Myzus persieae* sulz etc., which were collected from tomato fields, were tested during the present studies. Their culture was maintained on the healthy test plants and different experiments were conducted to study the insect transmission and virus-vector relationship in the preliminary screening, it was found that none of the above mentioned insects best *M. persieae* could transmit the virus.

Seed Transmission

The seeds were collected from diseased tomato plants during 2009, 2010 and 2011. They were stored in glass bottles. At the time of growing season seeds in 8th earthen pots filled with sterilized soil at the rate of 5 seeds per pots. 50 pots were used in each successive years. They were also tested by cross inoculation on C. amaranticolor L. for symptom less infection the results are presented in the table 8.

Results and discussion

Transmission studies play a significant role in the characterization of plant viruses. These organisms adopted several methods of transmission helping their spread in nature, such as mechanical, grafting, insect and seed transmission etc. During the study this has been investigated that the ToMV is readily transmission by sap inoculation and by grafting.

Mechanical transmission is synonymous with contact, juice, sap, hand and manual transmission and plant to plant when their leaves rub together. Mechanical transmission will occur if virus concentration in plant sap and virus stability are high. Mechanical transmission is the most useful one in experimental work and also of moderate occurrence in nature. It is evident from table 1 that the virus is transmitted to healthy test plants with crude sap up to 80 per cent. Standard virus inoculum, prepared in phosphate buffer (pH 7.0), enhanced the rate of transmission up to 100 percent and reduced the incubation period by 3-4 days. the present study corroborated with the findings of Mandal *et al.* 2001 [8].

Grafting is another important methods of virus transmission. It becomes more important when other methods of transmission fail. In the present investigation some of the graft technique i.e., cleft graft, leaf graft, and natural graft described by Boss (1967) have been employed. Grafting has been important in flowering research. Leaves or shoot from plants induced to flower can be grafted on to uninduceds plants and transmit a floral stimulus that induces them to flower. It is evident from the table 2 that the virus was transmitted by cleft and leaf graft showed 100 percent transmission. It is evident from the table 2 that the virus was transmitted by cleft and leaf graft showed 100 percent transmission.

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Table 1: Transmission of the tomato mosaic virus by crude sap and standard virus inoculum to test plant (*Lycopersicon esculentum* Mill.)

Methods of inoculations	Serial number	Number of plant		Incubation periods (in days)	Percentage Transmission
		Inoculated	Infected		
Crude sap	Control	10	0	0	00
	1	10	7	15	70
	2	10	6	14	60
	3	10	7	15	70
	4	10	5	14	50
	5	10	6	13	60
	6	10	5	12	50

	7	10	7	12	70
	8	10	6	13	60
	9	10	7	12	70
	10	10	6	13	60
	Mean	10	6.2	13.3	62.00
Standard virus incoulum	Control	10	10	12	100
	1	10	10	12	100
	2	10	10	13	100
	3	10	10	12	100
	4	10	10	13	100
	5	10	10	12	100
	6	10	10	12	100
	7	10	10	12	100
	8	10	10	13	100
	9	10	10	12	100
	10	10	10	13	100
	Mean	10	10	12.4	100

Table 2: Transmission of tomato mosaic virus off grafting.

Serial No.	Kinde of graft	No. of plants		Incubation periods (in days)	Percentage transmission
		Grafted	Infected		
1.	Cleft graft				
	Healthy scion (control)	10	0	0	00
	Diseased scion	10	10	10	100
2.	Leaf graft				
	Healthy scion (control)	10	0	0	00
	Diseased scion	10	10	10	100

Table 3: Seed transmission.

Year	No. of seeds		No. of seeding died after germination	Nature of seeding		Cross inoculation on C. amaranticolor	Percentage Transmission
	Sown	Germination		Diseased	Healthy		
2009	251	243	16	0	238	-	Nil
2010	250	235	13	0	225	-	Nil
2011	20	239	16	0	225	-	Nil

References

1. Bradly RHE. Studies on aphid transmission of strain of henbow mosaic virus. Ann. Appl. Boil. 1952; 39:79-97.
2. Chatizivarrilion EK, Nagala T, Katis NI, Peters D. Transmission of tomato spotted wilt tospovirus by Thribs tabaci populations originating from leek. Plant Pathology, 1999; 48(C):700-706.
3. Miller PW. Relation of a fast period of the aphid transmission of the crinkle virus of strawberry Plant. Dis. 1952; 36:92-93.
4. Quacquarelli A. Transmission of plant viruses. Informators fittopaphologica, 1986; 36(3):15-23.
5. Sylverter ES. Transmission of Brassica nigra virus by the green patch aphids, phytopath, 1950; 40:743-746.
6. Watson MA. Factors affecting the amount of infection obtained by aphid transmission of the virus. Hy. III: Phil. Trans, Roy, Soc, Ser, B. 1936; 226:457-489.
7. Crowley NC. The effect of seed extracts on the infectivity of plant virusus an its bearing on seed transmission. Austr. J. Biol. Sci. 1955; 8:56-67.
8. Mandal B, Pappu HR, Culbreath AK. Factors affecting mechanical transmission of tomato spotted wilt virus to peanut (*Arachis hypogaea*). Plant disease, 2001; 85(12):1259-1263.
9. Paliwal YC. Some properties and thrip transmission of tomato spotted wilt virus in Canada. Canadian Journal of Botany. 1974; 52(6):117-1182.
10. Reddy DVR, Whightman JA. Tomato spotted wilt virus: Thirps transmission and Control. Advances in Disease Vecter Research, 1988; 5:203-220.