
Original Article

CHARACTERIZATION OF PLANT PATHOGENIC VIRUS CAUSING MOSAIC SYMPTOM ON TOMATO PLANT (*Lycopersicon esculentum* MILL.)

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Abstract

A virus obtained from mosaic symptom of leaves of tomato plant (*Lycopersicon esculentum* Mill.) planted at Dau district, Malang regency, East Java province, was identified as a strain of cucumber mosaic virus. The virus infected plants of 5 species, including 3 species of legumes and 2 species of Solanaceae. It tolerated for 6 hours aging and 1:100 dilution. Broadbean, *Dolichos lab-lab*, soybean, tomato, and pepper, are useful in distinguishing this virus from others. The last two plant species showed spesific symptoms. There was no symptom observed on soybean and *D. lab-lab*.

Keywords: Cucumber mosaic virus; *Lycopersicon esculentum*; Symptom

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INTRODUCTION

Tomato plant, a member of Solanaceae family, is widely planted in Indonesia. tomato (*Lycopersicum esculentum* L) plant is important horticultural plant for nutrition needs and for cosmetic product. One of biotic factors which could reduce the production of tomato is the damage caused by plant disease

On May 1995, we found mosaic disease of tomato plant in experiment field in Dau district Malang regency. The mosaic symptom was also found in other tomato plant fields in Malang Malang regency. It seems that the disease was already widely spread but the causal agent is still unknown. From initial investigation in Laboratory of Virology, Faculty of Agriculture, Brawijaya University, the disease was easy to be

transmitted by mechanical manner (Tjaturianti, 1995). It has been reported that various plant pathogenic virus could produce mosaic on tomato as well as several species of Solanaceae family and the the fect of the disease are not well known (Semangoen, 1987).

In this study we described the characters of mosaic virus which infected the tomato plants in tomato field at Malang regency.

MATERIALS AND METHODS

Several virus isolates used in this study are Tobacco Mosaic Virus (TMV) and Soybean Mosaic Virus (SMV), the collection of Plant Pathology Laboratory of Faculty of Agriculture, Brawijaya University. Mechanical transmission was done by using 500 mesh carborundum on several indicator plants i.e. broadbean,

Dolichos lab-lab, soybean, tomato, and chili plants. Descriptive experiment was done to describe the causal agent of tomato mosaic disease (MOS) by inoculation on several assay host plants which were arranged as shown in Table 1.

Table 1. Inoculation Treatment on Various Assay Plants

Host Plant	Virus Isolates		
	TMV	SMV	MOS
Tomato	T1I1	T1I2	T1I3
Soybean	T2I1	T2I2	T2I3
Broadbean	T3I1	T3I2	T3I3
<i>Dolichos lab-lab</i>	T4I1	T4I2	T4I3
Chili	T5I1	T5I2	T5I3

Notes: TMV = Tobacco Mosaic Virus; SMV = Soybean Mosaic Virus; MOS = Tomato Mosaic Symptom

Pot experiment was conducted in greenhouse and each treatment was replicated 5 times. Each 5 kg pot filled with soil, sand and compost (1:1:1=w/w/w). Inoculation of each isolate was done mechanically on assay plants 15 days after planting.

The assay for physical traits (persistence) of three isolates was done by treatment as shown in Table 2.

Table 2. The Persistence of Tomato Mosaic Virus in Several Length of Keeping Time and Dilution

Keeping Time (day)	Dilution
	10 ^{-x}
1	10 ⁻¹
2	10 ⁻²
3	10 ⁻³
4	10 ⁻⁴
5	10 ⁻⁵
6	10 ⁻⁶

RESULTS AND DISCUSSION

Host range assay. The causal agent of the mosaic disease of tomato could be re-transmitted by mechanical manner on tomato and chili plants, but could not be transmitted on soybean and *Dolichos lab-lab*. On broadbean the disease showed

weak symptom with mottle pattern (Table 3 and 5)

Virus Persistence. The persistence of virus isolates causing mosaic disease on tomato showed that the virus could be active up to 6 days on the virus dilution at 1:100. The result of persistence assay was shown in Table 4.

Table 3. The Reaction of Assay Plant against Virus Infection

Host Plant	Virus Isolates		
	TMV	SMV	MOS
Tomato	++	-	+++
Soybean	-	+++	-
Broadbean	-	+	+
<i>Dolichos lab-lab</i>	-	++	-
Chili	+	-	++

Notes : + mosaic symptom on leaves; - no reaction

Table 4. The Persistence of Virus Causing Mosaic Symptom on Tomato Plant

Keeping Time (Day)	Dilution 10 ^{-x}					
	1	2	3	4	5	6
1	+	+	+	+	+	±
2	+	+	+	+	±	-
3	+	+	±	±	±	-
4	+	+	±	-	-	-
5	+	±	-	-	-	-
6	+	±	-	-	-	-

Notes: + strong reaction; ± weak reaction; - no reaction

Based on two assays i.e. assay plant reaction and virus persistence assay, it indicates that the causal agent of mosaic symptom on tomato plant found in Dau, Malang regency is a strain of Cucumber Mosaic Virus (CMV). Smith (1986) stated that CMV is one of the causal agents of mosaic disease which could infect several plant species with mosaic symptom. Various plants which could be infected by CMV are species from Solanaceae family. Some of the strains have been found before (Price, 1958; Sulyo, 1989).

Anderson (1987) stated that of 10 virus types causing mosaic symptom, CMV is the widest spread on various plant

species. Beside Cucurbitaceae plants this virus could infect on Solanaceae plants. The sources of CMV inoculum could be found not only on tomato plant on the experiment but also found on chili plant. The incubation period of the virus was relatively fast (Figure 1).

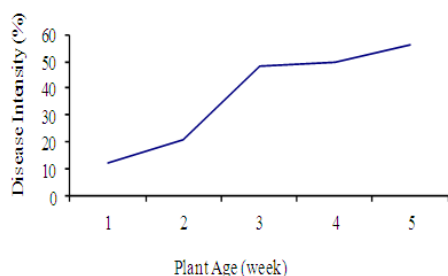


Figure 1. The development of Disease Symptom up to 5 weeks after inoculation

Figure 1 showed that at 1 week after inoculation, the symptom has already shown with the disease intensity of 10 percent. The development of symptom continued up to 5 weeks after inoculation with the disease intensity of 58 percent.

Mosaic virus has been found in several tomatoes planting area in Malang regency. The mosaic symptom found on the fully expanded leaves along with malformation, and sometimes dwarf symptom. This study showed that the mosaic disease on tomato has to be considered due to its significance. Bos (1983) stated that generally mosaic disease caused by virus are easy to spread and has relatively wide host range and affect the growth and the production of plants.

Table 5. Reaction of various Indicator Plants against Mosaic Disease (MOS) and Three Virus Isolates (TMV, SMV, and CMV)

Host plants	Virus Isolates *)			
	TMV	SMV	CMV	MOS
<i>Lycopersicon esculentum</i> Mill				
Ratna	YMC	-	YMot	YM
New Kingkong	YMC	-	YM	YM
Lokal	YMC	-	YM	YM
Apel	YMC	-	YM	YM
<i>Glycine max</i> L.Merr.				
Wilis	-	MC	-	-
Orba	-	MC	-	-
Galunggung	-	MC	-	-
Rinjani	-	MC	-	-
<i>Visia faba</i> L.	-	Mot	YMot	YMot
<i>Dolichus lab-lab</i> L	-	MN	-	-
<i>Capsicum annum</i> L				
Teropong	MC	-	M	YM
Tia Chai	MC	-	M	M
<i>Capsicum frustecens</i> L				
Lokal	MCN	-	M	M
Tia Chai	MCN	-	M	MC

*) Data were revealed from 12 plants of each indicator host. Virus isolates: Tobacco Mosaic Virus (TMV), Soybean Mosaic Virus (SMV) are collection of Plant Pathology laboratory, Department of Plant Pest and Disease, Faculty of Agriculture, Brawijaya University. Cucumber Mosaic Virus (CMV) was isolated from Lembang, West Java. Mosaic disease (MOS) was isolated from Dau, Malang, East Java. Y = Yellow; M= Mosaic; C= Curl; Mot= Mottle; N = Necrotic, - = no symptom (no positive reasion)

CONCLUSION

Based on the result and discussion it can be concluded that mosaic disease on tomato plant is caused by a strain of Cucumber Mosaic Virus (CMV). Besides infecting tomato plant, it can also infect chili plant. The incubation period of the CMV on tomato plant is 1 week after inoculation. The persistence of the causal agent of mosaic virus on sap is 6 days in the keeping period with the dilution of 1:100.

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