Characterization of the Causal of Sugarcane Streak Disease in Indonesia

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ABSTRACT

During field survey on 2007 in 59 sugarcane plantations in Java, we found a streak mosaic symptom on sugarcane in almost entire plantations. The incidence was vary, however it predominantly infected sugarcane cultivar PS 864. The virus was transmitted mechanically and cutting-cane borne (sett-borne), however it unable to transmitted by aphid *Rophaloshipum maydis* and mealy bug *Ceratovacuna lanigera*. The virus had a narrow host range limited to the graminae. Among 23 plant species belongs to 8 families, the virus systemically infected *Sorghum bicolor*, *Zea mays* and *Dactylactonium aegypticum*. The virion form was filament flexious size approximately 890 nm and SDS-PAGE of purified virion showed the size of the CP gene is a 40 Kda. RT-PCR using specific primer for SCSMV successfully amplified a DNA size 1.100 bp of the entire CP gene and partially NIb gene. DNA sequencing result of the CP gene confirmed the present of *Sugarcane streak mosaic virus* (SCSMV) as the causal of streak mosaic disease. It referred as SCSMV-Idn isolate. The CP sequences size 852 bp, and encoded 283 amino acid. Phylogenetic analysis of the CP gene showed that SCSMV-Idn had 92% sequences homology closely to SCSMV Pakistani isolate (Accession No. U75456). This is the first report of the occurrence of SCSMV on sugarcane in Indonesia .

BACKGROUND

- Sugarcane is an important crop as raw material for sugar production
- Streak mosaic is a new disease on sugarcane in Indonesia. It spread rapidly in entire sugarcane mills in Java Island (59 mills) with the incidence up to 1-62%. Predominanly, it infects superior cultivar PS 864.

PURPOSE

To identify the causal of streak mosaic disease on sugarcane

Table 1. Transmission modes of Streak Mosaic Virus

No	Transmission mode	Incidence (%)	Result
1.	Mechanical inoculation		
	a. Healthy	0	-
	b. Cutting knife	31	+
	c. Sein's method	31	+
	d. Abrasive pad rubbing	69	+
	e. Carborundum	25	+
2.	Sett/cutting cane	100	+
3.	Insect		
	a. *Rophalosiphum maydis*	0	-
	b. *Ceratovacuna lanigera*	0	-

Table 3. Sequences identity of SCSMV Idn isolate in compared with other isolates

Isolate	SCSMV ta	SCSMV-Idn	SCSMV ka	SCSMV Pktn	SCSMV AP
SCSMV-ta	ID	0,850	0,989	0,854	0,873
SCSMV-Idn	0,850	ID	0,849	0,921	0,849
SCSMV-ka	0,989	0,849	ID	0,854	0,876
SCSMV-Pktn	0,854	0,921	0,854	ID	0,856
SCSMV AP	0,873	0,849	0,876	0,856	ID

Idn - Indonesia, AP- Andra Pradesh, Pktn - Pakistan, Ka - Kartaka

Table 2. Host Range Test

Famili/Spesies	Incubation Period (day)	Symptom	Results*
AMARANTHACEAE			
Amaranthus spinosus	-	-	-
CHENOPODIACEAE			
Chenopodium amaranticolor	-	-	-
C. quinoa	-	-	-
COMPOSITAE			
Ageratum conyzoydes	-	-	-
CUCURBITACEAE			
Cucumis sativus	-	-	-
GRAMINAE			
Zea mays	**21-30**	**MM**	**+**
Sorghum bicolor	**14-21**	**SM**	**+**
LEGUMINOSAE			
Arachis hypogea	-	-	-
Phaseolus vulgaris	-	-	-
Vigna unguiculata	-	-	-
SOLANACEAE			
Lycopersicon esculentum	-	-	-
Datura stramonium	-	-	-
Physalis floridana	-	-	-
Solanum melongena	-	-	-
Nicotiana tabacum	-	-	-
N. glutinosa	-	-	-
WEED GRAMINAE			
Cynodon dactilon	-	-	-
Cynodon rotundus	-	-	-
Penisetum purpureum	-	-	-
Digitaria sp.	-	-	-
Echinochloa colonum	-	-	-
Eleucine indica	-	-	-
Dactylactonium aegypticum	**L**	**-**	**+**

L, latent symptom; SM, streak mosaic; MM, mild mosaic.* detected by RT- PCR

Fig.1. Phenotypic symptom of streak mosaic on Sugarcane clone PS 864

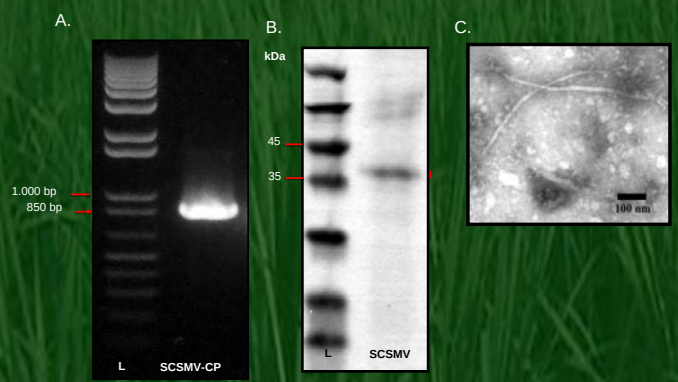

Fig.2. RT PCR of CP gene (A) , SDS-PAGE of the SCSMV virion (B) and viral particles (C)

CONCLUSION

1. SCSMV is a new emerging virus on sugarcane in Indonesia. It transmitted mechanically, and sett-borne but not successfully transmitted by maize aphid *R. maydis* and mealybug *C. lanigera.*
2. Cutting knife and sett-borne may play role in the spread of SCSMV in the fields.
3. Sorghum, maize and weed *D. aegypticum* can be infected by SCSMV.
4. The streak mosaic disease is caused by *Sugarcane Streak Mosaic Virus.* The CP gene consist of 852 bp encoding 283 amino acids. It showed that SCSMV-Idn isolate had 92% homology with SCSMV- Pakistani isolate.

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