OCCURANCE OF SUGARCANE STREAK MOSAIC VIRUS IN INDONESIA

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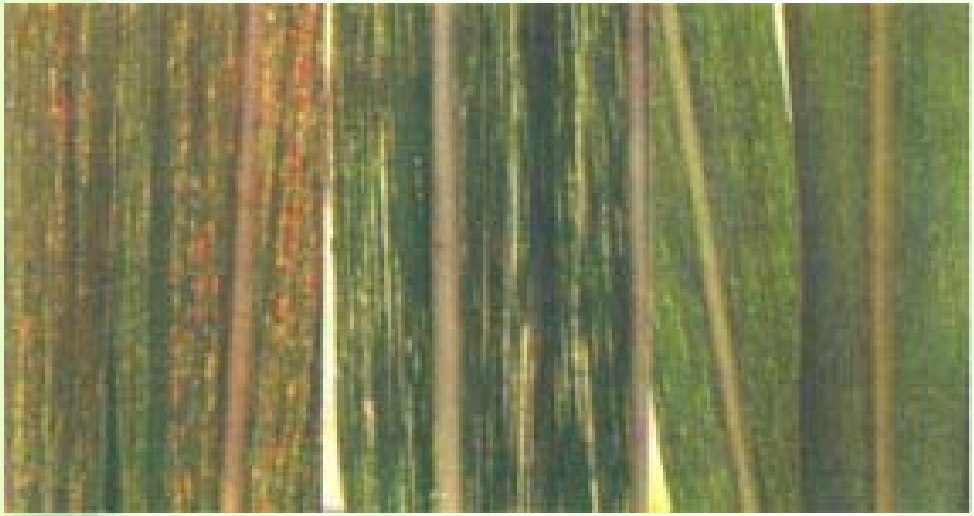
PRELIMINARY OBSERVATION



Mosaic symptom (SCMV)

Sampling of infected leaves
Java vs Outside Java
30% vs 67%

Streak mosaic symptom

Sampling of infected leaves
Java vs outside Java
60% vs 30%

?

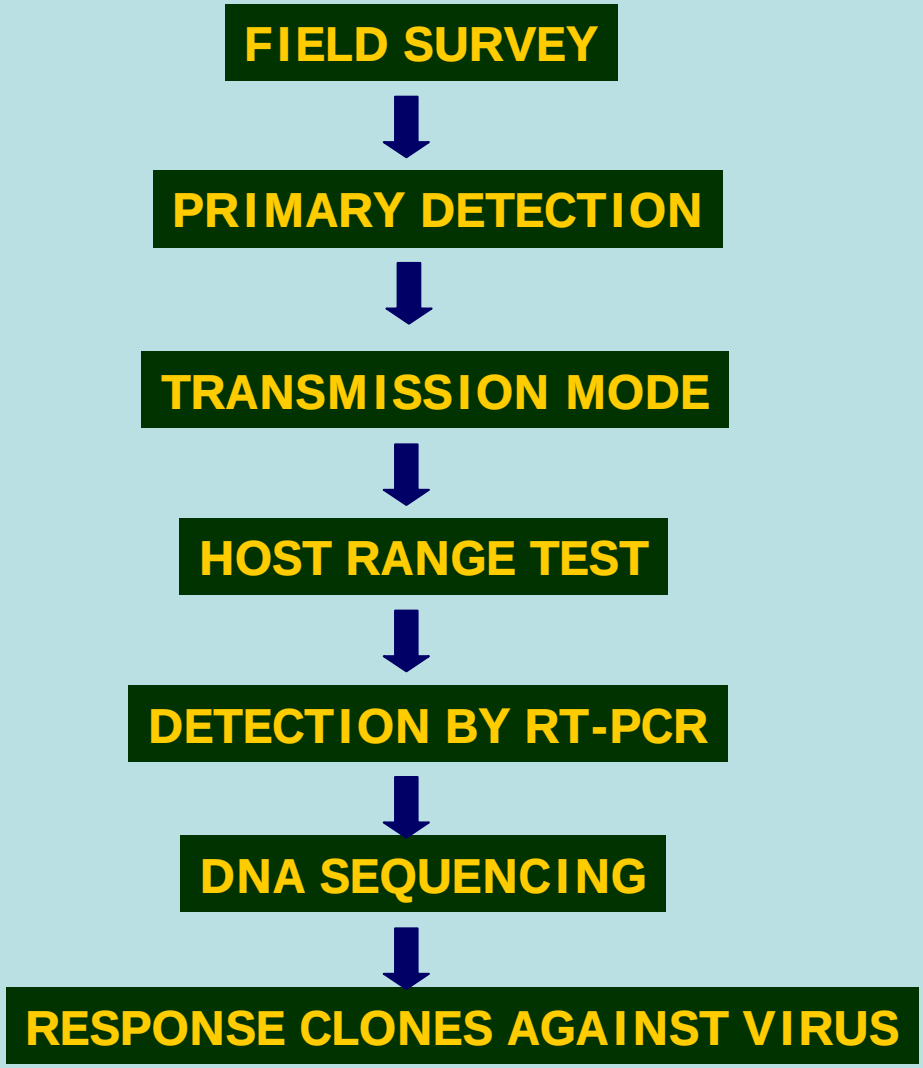
New strain of SCMV or new virus?

Objective

- Identify the streak mosaic causal, and its distribution in Java
- Response commercial sugarcane clones against streak mosaic disease

  → symptom variation

WORK STEPS


FIELD SURVEY
PRIMARY DETECTION
TRANSMISSION MODE
HOST RANGE TEST
DETECTION BY RT-PCR
DNA SEQUENCING
RESPONSE CLONES AGAINST VIRUS

FIELD SURVEY

PEKALONGAN

59 plantations

YOGJAKARTA

SRAGEN

JAWA TIMUR

SURVEY RESULTS

SRAGI MILL (PEKALONGAN)			MOJO MILL (SRAGEN)		
Location (Status/ST)	clone	I (%)	Location (Status/ST)	Clone	I (%)
Pesantren (PC/S)	PS 921	7.69	Klandungan I (PC/T)*	PS 864	4.09
Tegal Suruh (PC/S)	PS 921	1.55	Klandungan II (PC/T)*	PS 862	0.00
Krasak Ageng (PC/S)	BL	0.00	Klandungan III (PC/T)*	SS-57	0.00
Sijeruk B1 (R/S)	PSCO 90-2411	0.00	Jambangan(R/S)	PS 864	23.38
Sijeruk B2 (R/S)	PS 864	11.80	Pilang(R/S)	PS 864	19.34
Sumub Kidul (PC/S)	PS 864	5.22	Purwosuman (R/S)	PS 864	11.97
Sabar Wangi (PC/T)	SS-57	0.00	Kedungupit(R/S)	PS 864	13.66
Karang Tengah (PC/S)	PS 851	0.00	Singopadu (PC/T)	BL	1.31
Ampel Gading (PC/S)	PS 851	0.00	Puro (R/T)	PS 851	0.00
Kebagusan B (PC/S)	BL	0.00	Karangudi (R/T)	PS 864	4.95
Jatirejo (PC/S)	PS 864	7.29	Tanggulangin (R/T)	PS 864	2.59
Karangbrai (PC/S)	PS 864	12.77			
Payung (PC/S)	PS 864	13.38			
Ujung Gede I (PC/S)*	PS 851	0.00			
Ujung Gede II (PC/S)	PS 951	0.00			

I: incidence; S: paddy field; T: rain fed field; PC: plant cane; R: ratoon; *: mother seed cane nursery

SURVEY RESULTS

MADUKISMO MILL (YOGJAKARTA)			TULANGAN MILL (SIDOARJO)		
Location (Status/ST)	Clone	I (%)	Location (Status/ST)	Clone	I (%)
Masahan I (PC/S)*	PS 864	62.18	Beringin I (PC/S)	PS 864	3.28
Masahan II(PC/S)*	PS 891	21.03	Beringin II (PC/S)	PSCO 91-787	0.98
Masahan III (PC/S)*	PS 862	5.88	Jiken I (PC/S)*	PS 864PS 864	2.97
Masahan IV (R/S)*	PSCO 90-2411	0.00	Jiken II (PC/S)*	BM 96-05	1.45
Tempel (R/S)	PS 864	25.33	Candipari (PC/S)	PS 864	18.60
Ngaran (PC/S)	PS 864	1.15	Kebaron (R/S)	PS 864	2.51
Nggejik(PC/S)	PA 198	0.00	Telasih (PC/S)	PS 864	6.59
Menjangan (PC/S)	PS 851	0.00	Jedong 1 (R/T)	PS 851	0.87
Pulutan(PC/S)	BL	0.00	Gempol (PC/T)	BL	1.43
Jowilayan (PC/S)	PS 862	0.00	Malangbong (R/T)	BL	1.20
Turi (PC/T)	PA 198	0.00			

I: incidence; S: paddy field; T: rain fed field; PC: plant cane; R: ratoon;
*: mother seed cane nursery

SURVEY RESULTS

KEBON AGUNG MILL (MALANG)		
Location (Status/ST)	Clone	I (%)
Wadung (R/S)	PS 921	3.40
Bumiayu (R/S)	BL	2.49
Wajak I (R/S)	PS 921	1.47
Wajak II (R/S)	PS 864	2.76
Kuwolu (PC/T)	BL	0.00
Sambigede (PC/S)	PS 864	1.88
Pakishaji (PC/S)	BL	0.62
Kebon Agung (PC/T)	CO 617	0.00
Sitirejo I(PC/S)	PSCO 90-2411	0.00
Sitirejo II (PC/S)	PA 198	0.28
Sitirejo III (PC/S)	VMC 71-39	0.60
Sempalwadak (R/S)	PS 864	0.00

I: incidence; S: paddy field; T: rain fed field; PC: plant cane; R: ratoon;
*: mother seed cane nursery

- Streak mosaic disease occurred in many sugarcane plantations in Central and East Java
- The incidence was dominant in irrigated field/ paddy field than rain fed field
- Streak mosaic disease is most prevalent infecting clone PS 864

PRIMARY DETECTION

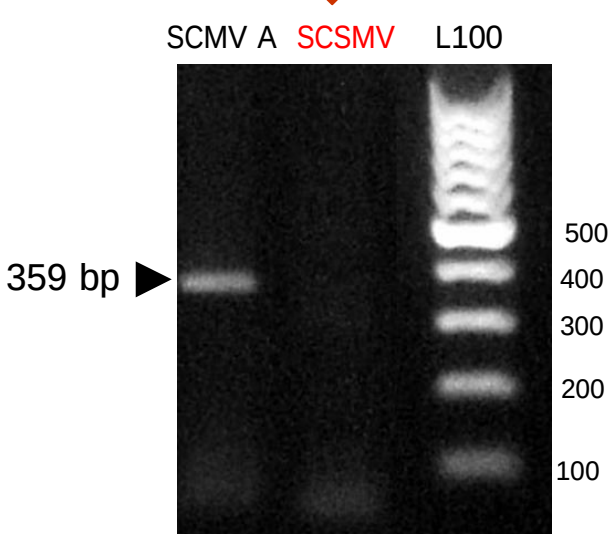
SEROLOGICAL

GENERAL POTYVIRUS
Antiserum (DSMZ)

SCMV (DSMZ)

RT- PCR

RT-PCR Using SCMV universal primer S400-551 & S400-910



NEGATIVE

TRANSMISSION MODES

INOCULUM (SAP)

Via Cutting knife

Pad rubbing Inoculation

Sein's Inoculation Method

GREENHOUSE TRIAL

Symptom by mechanical inoculation

TRANSMISSION MODES

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	-

HOST RANGE TEST

Sein's Method

Abrasive pad rubbing

HOST RANGE TEST ON NON-GRAMINAE PLANTS

OBSERVATION & SAMPLING

Famili / Spesies	Incubation Period (day)	Symptom	Results*
AMARANTHACEACE			
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			
Lycopersicone 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	-	+

HOST RANGE

Narrow

L : latent symptom
SM : streak mosaic
MM : mild mosaic
* : detected by RT-PCR

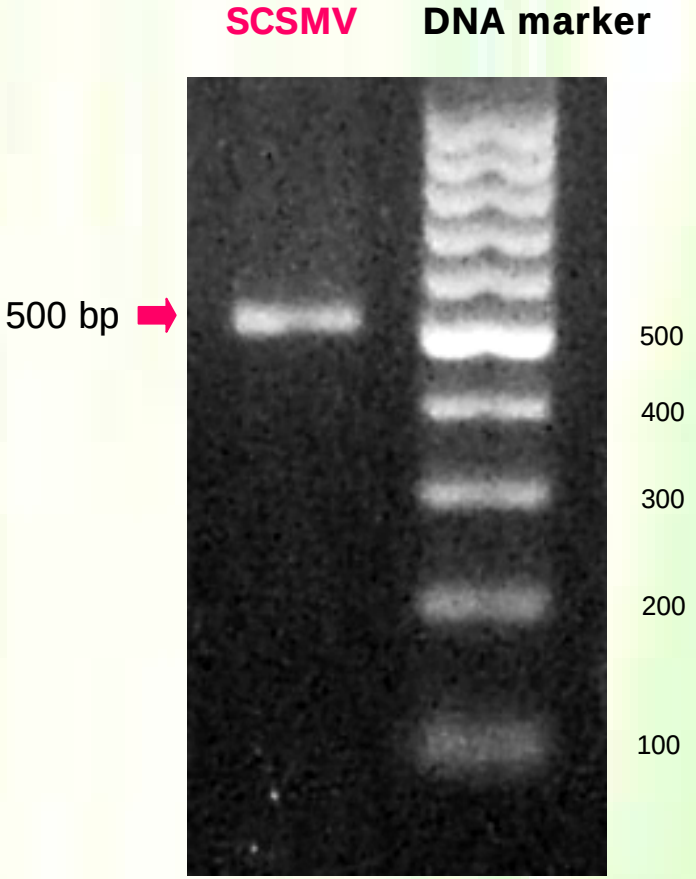
DETECTION BY RT-PCR

Leaf samples

Total RNA extraction

cDNA Construction (*reverse transcriptase*)

RT-PCR



VIRAL PARTICLES

Leaf Samples

↓

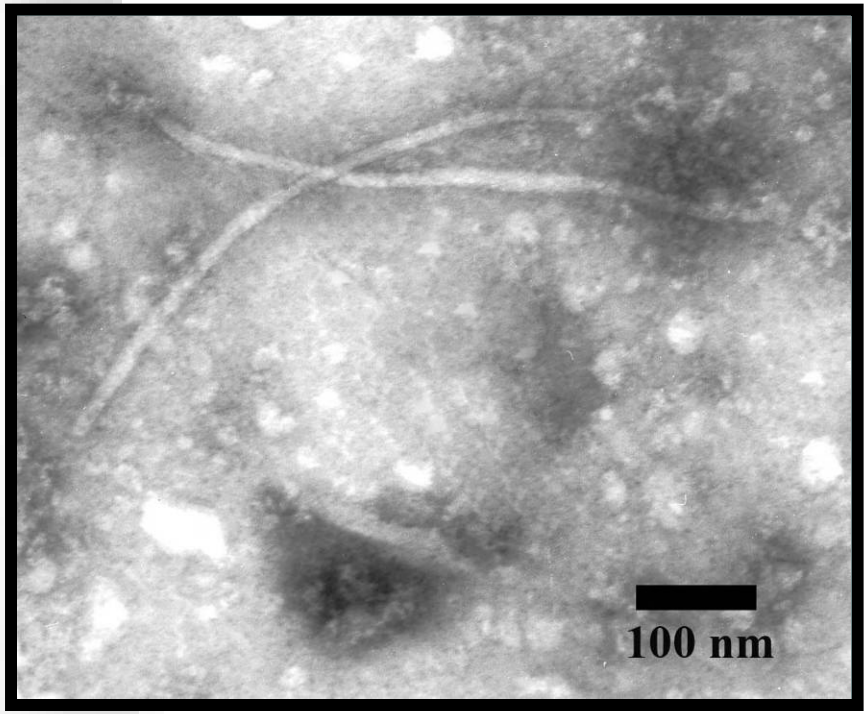
Purification

↓

Virion

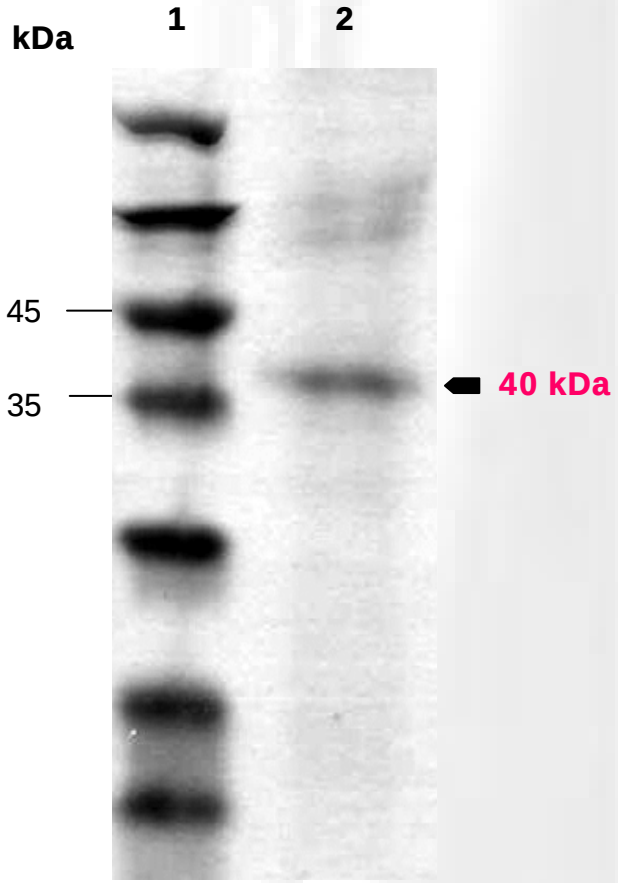
↓

TEM



Size 800-890 nm

PROTEIN ANALYSIS SDS-PAGE



1. Unstained protein marker
2. SCSMV coat protein

DNA SEQUENCES

nt 547

GTGGGTTCAGTTCTCGGTTCGTAGCGGGAAACCCATAATACCACACAATGCAGTGAAGGCAGGATTGACCACACCAG
AGTTTTATCCTTGCTGCATTGATTTCGTGATGGTGAATATCCTCTCACCAGCAGAAATTGACGTGCGTAACCAGGTGAT
TAACGCACGTACACCCCGGATGGGAAAGCCTTTATTCCGTCATGCTCTTAGAGCCGGGGGAGATGAGGACACGGACC
TGCGTAGGGAAGATGATGCAAACTATGGAAGGACGCAGATCGGTGGCGCTCATTTTGGGCGCGCCCAGCACTGATTT
TCAGTGCAGTTATCCATATATTATCGTATCTACGTATCAACTGGTTCTCTTGGATAGGCTGATGGTAGTTGCCTGACCG
CTTAGACGATCATCAGGAGCTACTAGTGGATCATTCGGAGATTGCTCACCCTGTTTCCAGACCAGTGAGATTCTGCCG
-AACCCACAATCAACCTGCCCCGTGAGGAGGA

nt 1045

The half 3'- CP gene had 98% homology with SCSMV-Pakistani (Hall *et al*, 1998), 93.7% with -AP, 94.2% with –tn, and 94% with -ta and –ka isolates.

Response commercial clones against SCSMV-Idn Isolate

Trial at experimental field belongs to ISRI Pasuruan, East Java

Symptom variation

A.

Clearly Streak
(PS 864, SS 57, PS 921)

B.

Moderate Streak
(PSBM 88-113, PSCO 90-2411, PS 951, PS 851)

C.

Mild Streak
(BL, PS 862, PSJT 94-33)

RESPONSE CLONES AGAINST SCSMV-Idn INFECTION

No	Clones	I (%)*
1.	PS 851	9.02
2.	PS 862	5.44
3.	PS 864	40.50
4.	PS 921	15.05
5.	PS 951	9.57
6.	BL	7.21
7.	PSJT 94-33	16.94
8.	PSCO 90-2411	4.72
9.	PSBM 88-113	30.77
10.	SS-57	23.30

0%	Highly resistant	
0.1-5%	Resistant	(PSCO-90-2411)
5.1-10%	Moderate	(PS 851, PS 862, PS 951, BL)
10.1-40%	Susceptible	(PS 921, PSJT 94-33, PSBM 88-113, SS 57)
>40%	Highly Susceptible	(PS 864)

* Total I from 4 replicates

(Scale adopted from SCMV)

CONCLUSION

1. The streak mosaic ⇨ *Sugarcane Streak Mosaic Virus.* Partially alignment of CP gene showed that SCSMV-Idn isolate had 98% homology with SCSMV- Pkstn isolate.

2. SCSMV-Idn transmitted mechanically, and sett-borne but not successfully transmitted by maize aphid *R. maydis* and mealybug *C. lanigera*.

3. Cutting knife and sett-borne may play role in the spread of SCSMV in the field.

4. Sorghum, maize and weed *D. aegypticum* can be infected by SCSMV

5. All clones can be infected by SCSMV-Idn with three different symptom such clearly, moderate and mild streak. It depend on the type of clones

6. PSCO 90-2411 was resistant, PS 851, PS862, PS 951, BL was moderate, while PSJT 94-33, PSBM 88-113, PS 921 and SS 57 was susceptible, and PS 864 was highly susceptible against SCSMV infection.

Acknowledgement

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TERIMA KASIH

Thank you