



ISMPP International Conference on "Plant Health for Human Welfare"



(1st to 4th November, 2017)

**Department of Botany
University of Rajasthan, Jaipur (Rajasthan) India**

Certificate

This is to certify that Prof./Dr./Ms./Mr. Darnetty
of H. Manggis No. 35 D. Pures Bau, Indonesia has actively participated and presented oral paper/poster titled

'Morphological and biological - - - - - and their pathogenicity' in section Plant disease diagnostics

during the ISMPP International Conference on "Plant Health for Human Welfare" organised by Department of Botany, University of Rajasthan, Jaipur and Indian Society of Mycology & Plant Pathology, MPUAT, Udaipur from 1st to 4th November, 2017.

Dr. P. K. Chakrabarty
President, ISMPP

Dr. Pokhar Rawal
Secretary, ISMPP

Prof. Kailash Agrawal
Organizing Secretary &
Head, Department of Botany
University of Rajasthan, Jaipur

Morphological and biological characteristics of *Fusarium* species associated with ear rot disease of corn and their Pathogenicity

Darnetty ¹
Baharuddin salleh ²

¹Department of Plant Pests and Diseases, Faculty of Agriculture, Andalas University, Limau Manis 25163, Padang, Indonesia

²School of Biological Sciences, Universiti Sains Malaysia, 11800 Minden, Pulau Pinang, Malaysia.

Corresponding author: E-mail: darnetty_06@yahoo.com

I. INTRODUCTION

1. Corn is one of the important crops used as foods and feeds
2. *Fusarium* ear rot is the most common fungal disease on corn all over the world, including southeast Asia
3. The disease not only reduces the quantity and quality of corn yield but also affects animal and human health because of mycotoxin production by fungus *Fusarium* (FUM, MON, ZEN, BEA)
4. So far, the research on the disease has been done intensively in the temperate countries but not in the tropical countries, including Indonesia, Malaysia and Thailand.
5. The climate is the important factor that influences the growth and spread of *Fusarium*
6. The disease is caused by several species of *Fusarium*. *F. verticillioides* formerly known as *F. moniliforme*, is the most frequently occurring species. Others such as *F. proliferatum* and *F. subglutinans* and *F. graminearum*

II. Objectives

1. To identify *Fusarium* species from corn showing typical ear rot symptoms based on morphological characteristics (Morphological identification)
2. To determine the mating population (MPs) of *Fusarium* in Section Liseola i.e. based on their ability to produce perithecia (Biological identification)
3. to determine whether or not the identified *Fusarium* species isolated from corn showing typical ear rot symptoms are pathogenic.

III. MATERIALS AND METHODS

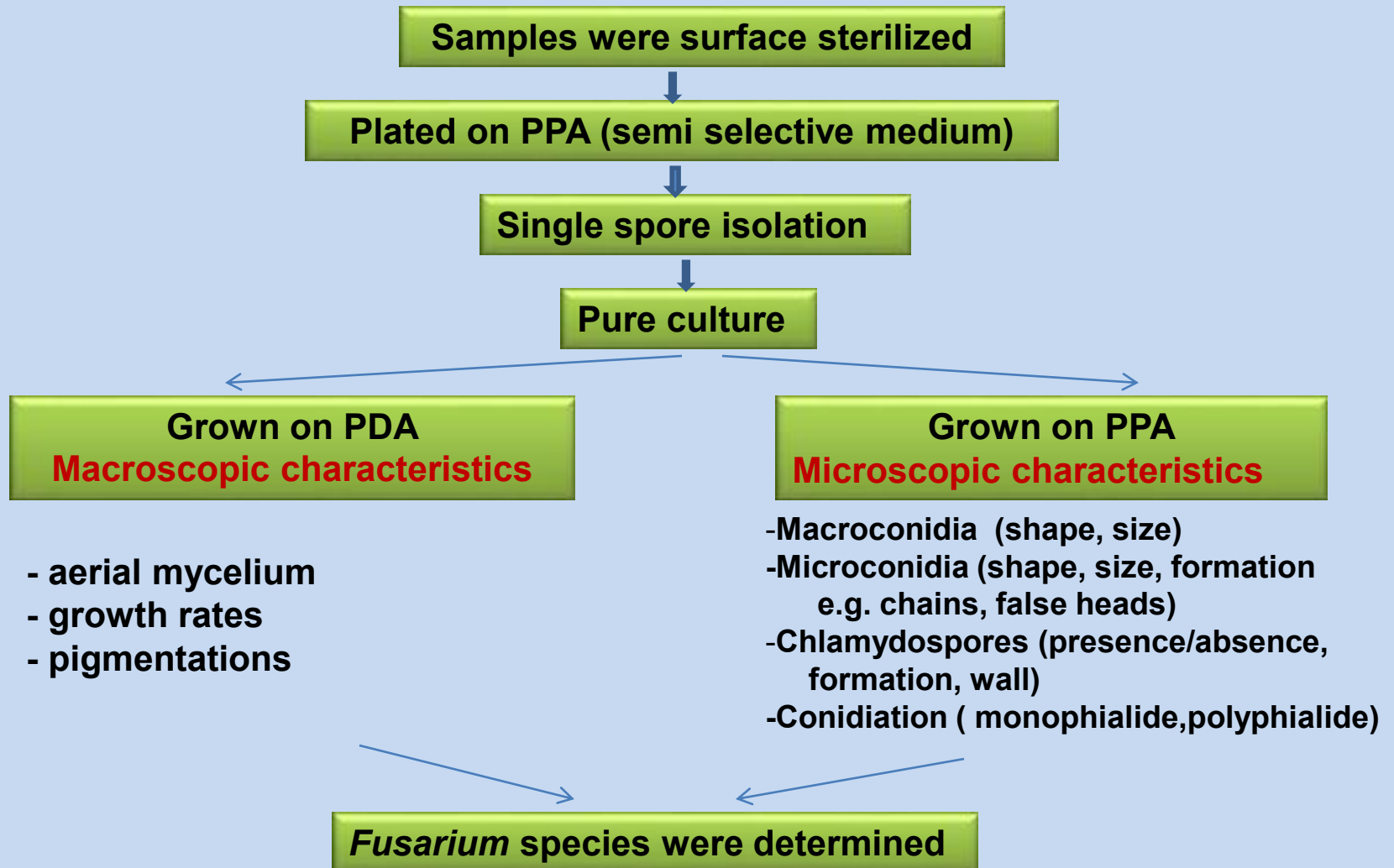
1. *Fusarium* strains

143 strains of *Fusarium* species associated with ear rot disease of corn were collected from different locations in Indonesia, Malaysia and Thailand

2. Mating Population testers

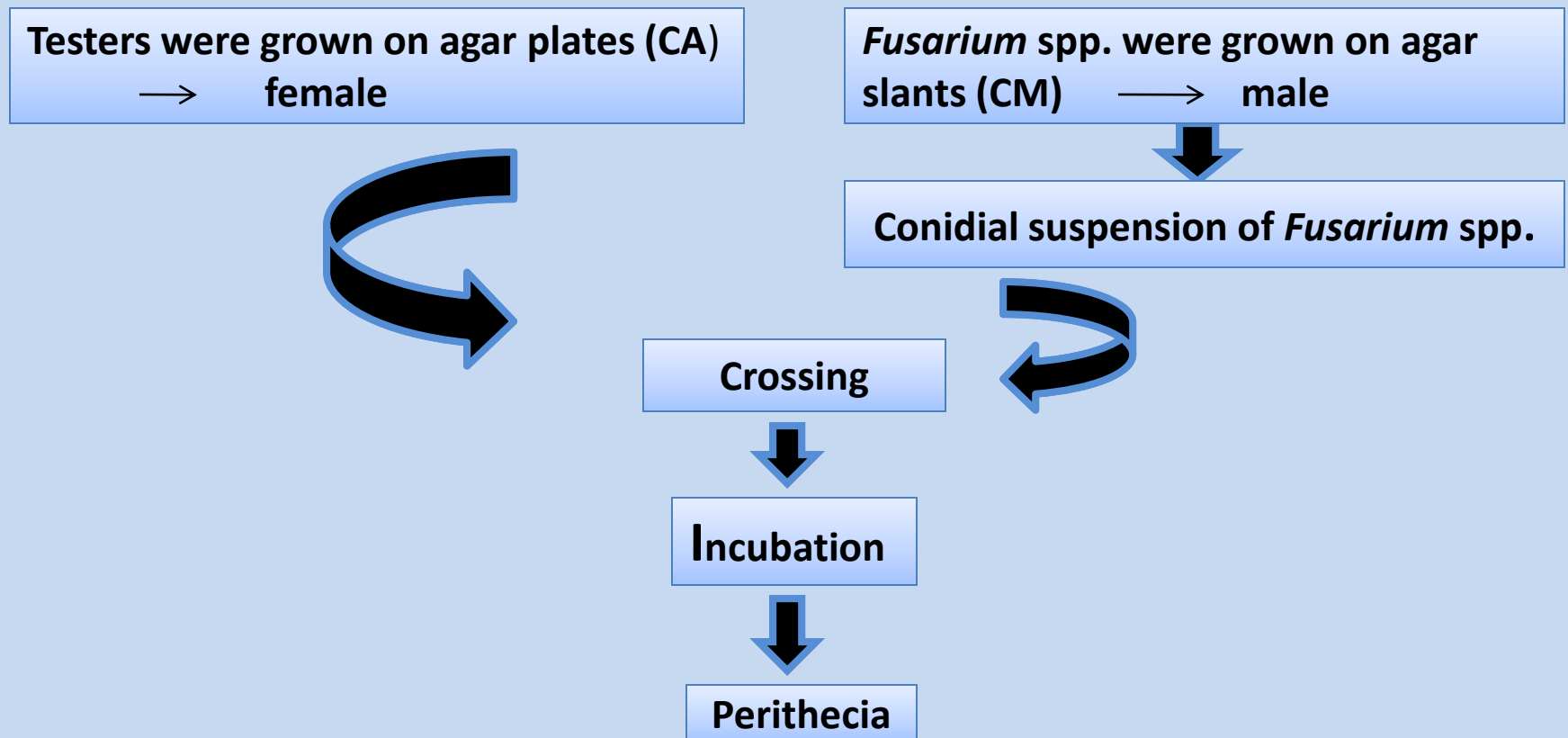
Nine Mating Population testers (MP-A to MP-I) were obtained from the *Fusarium* Stock Collection Section, School of Biological Sciences, USM

3. Morphological characteristics

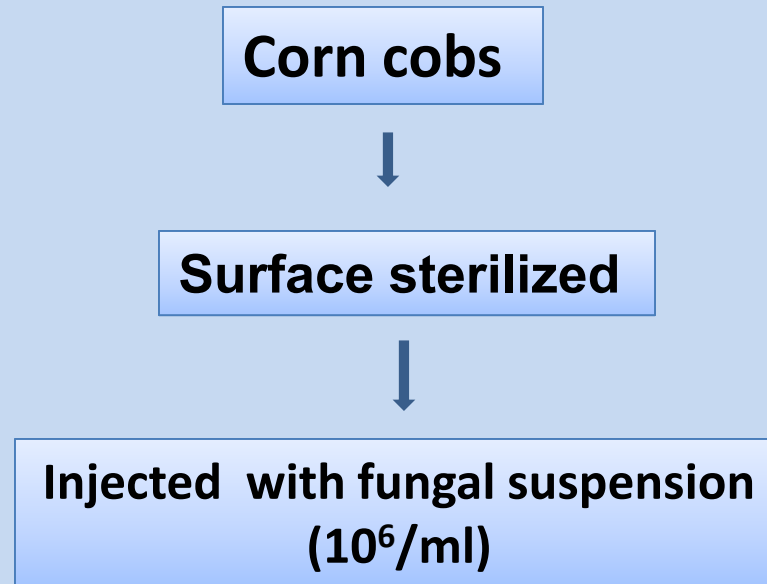


4. Mating populations (MPs)

Before crosses performed, mating type *MAT-1* and *MAT-2* of *Fusarium* strains had been diagnosed by molecular methods



4. Pathogenicity Test



IV. RESULTS

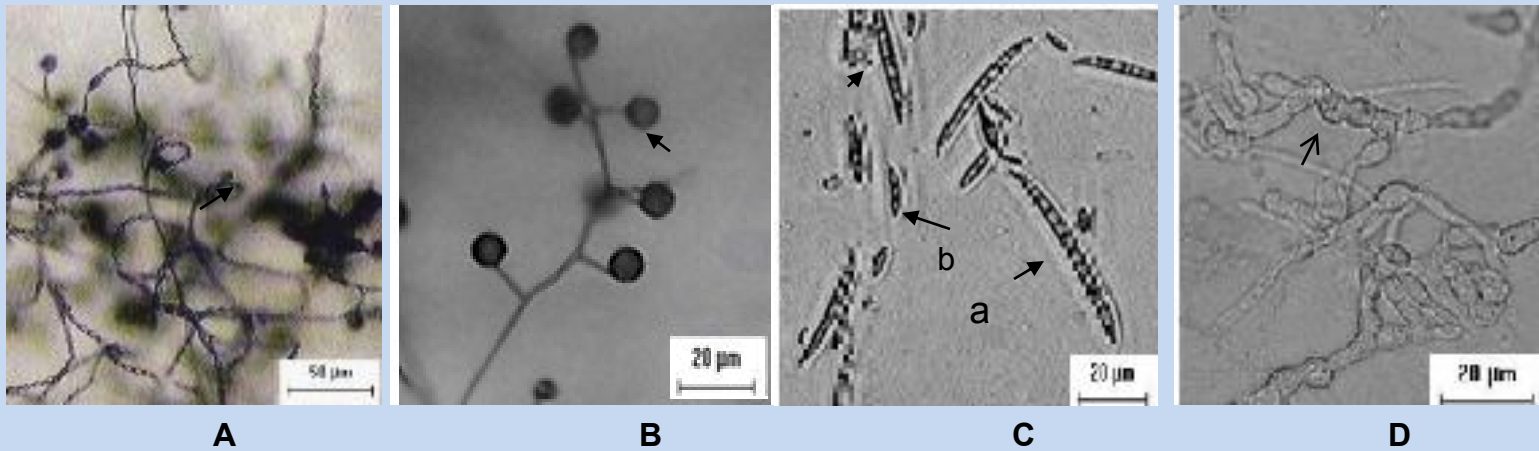
1. Morphological characteristics

143 *Fusarium* strains

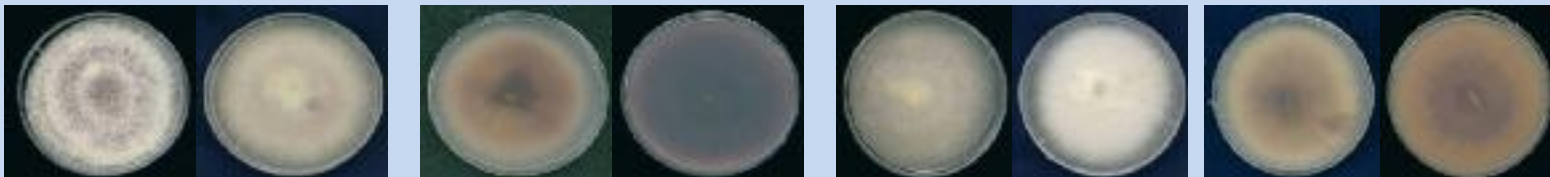
8 *Fusarium* species

1. *F. verticillioides* (79, 55.24%)
 2. *F. proliferatum* (24, 16.76%)
 3. *F. subglutinans* (3, 2.1%)
 4. *F. graminearum* (9.79%)
 5. *F. oxysporum* (5.59%)
 6. *F. solani* (0.7%)
 7. *F. semitectum* (9.09%)
 8. *F. chlamydosporum* (0.7%)
- Section Liseola (106 strains, 74.13%)

F. verticillioides

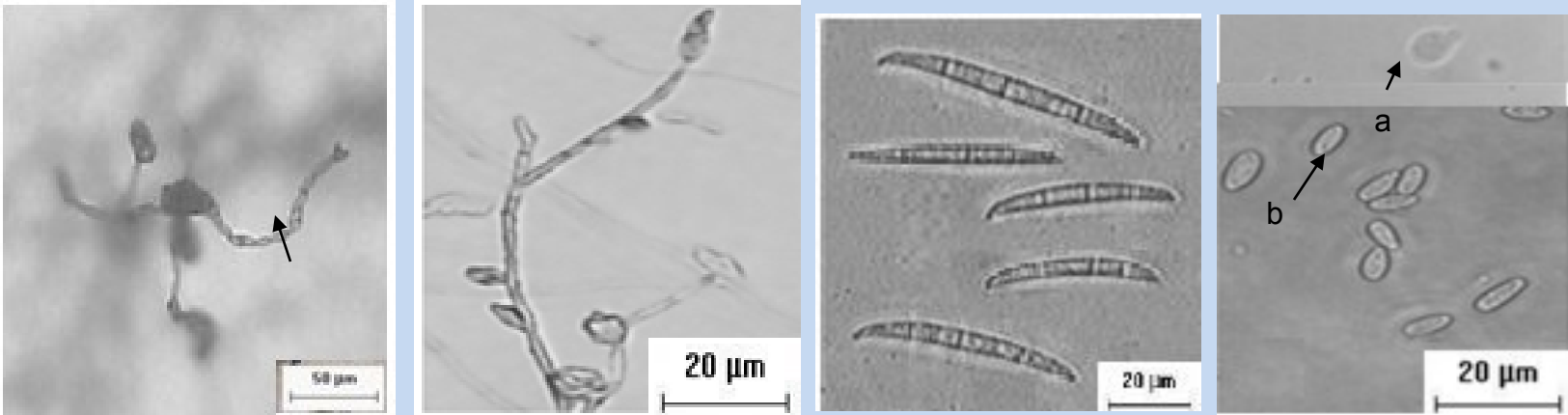


Morphological characteristics of *F. verticillioides*. A-B. Microconidia *in situ*, C. Macroconidia (a), Microconidia (b), D. Swollen hyphae



Colony features of some strains of *F. verticillioides*

F. proliferatum



A

B

C

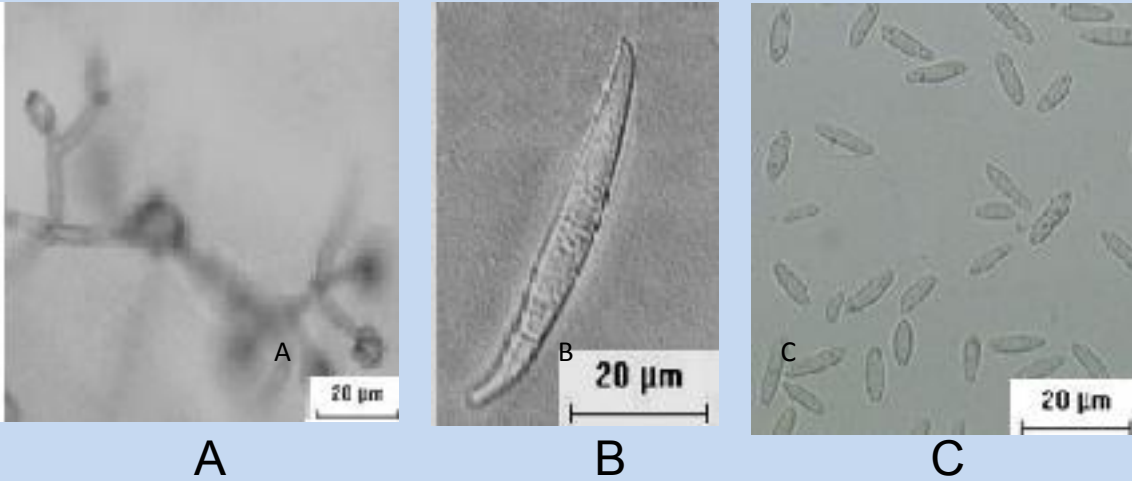
D

Morphological characteristics of *F. proliferatum*. A-B. Microconidia *in situ*, C. Macroconidia, D. Microconidia: Pear shape (a). Obovoid (b)

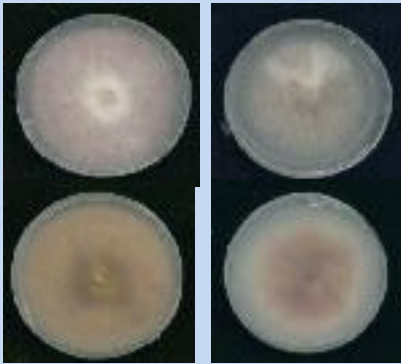


Colony features some strains of *F. proliferatum*

F. subglutinans

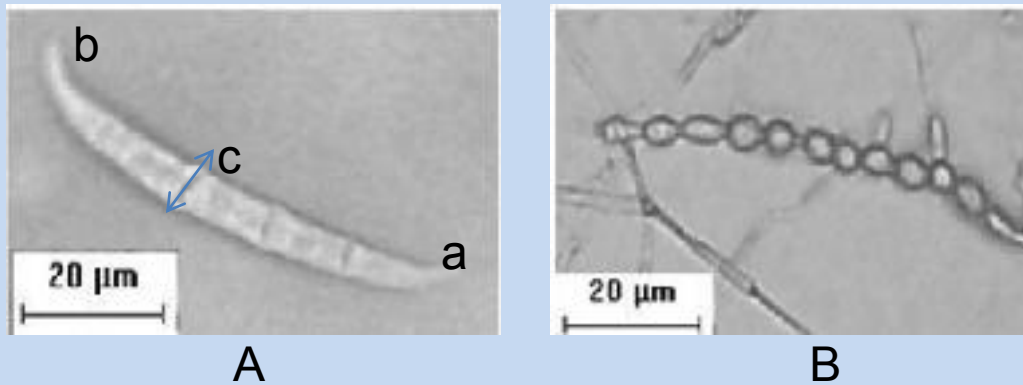


Morphological characteristics of *F. subglutinans*. A. Microconidia *in situ*, B. Macroconidia and C. Microconidia

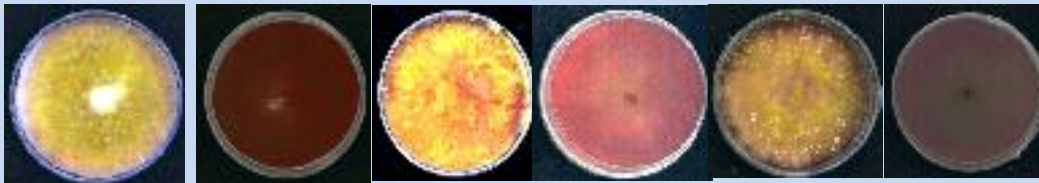


Colony features of some strains *F. subglutinans*

F. graminearum

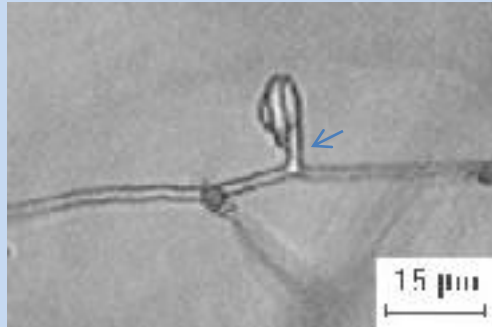


Morphological characteristics of *F. graminearum*. A. Macroconidium: (a) food-shaped basal cell, (b) tapered apical cell, (c) widest part of macroconidia at the upper region B. Chlamydospores in chain (arrow)

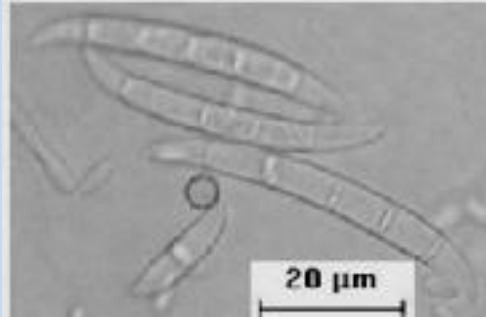


Colony features some strains of *F. graminearum*

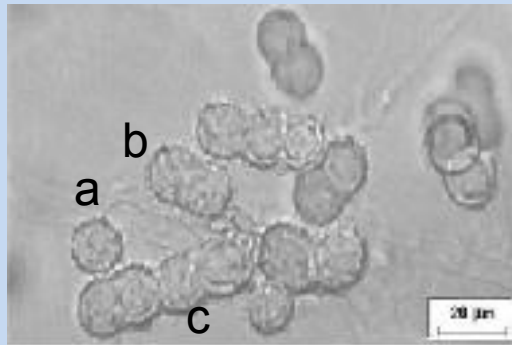
F. oxysporum



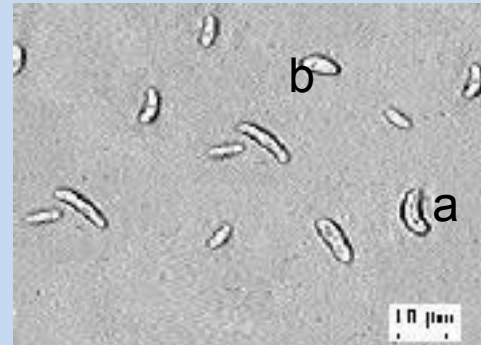
A



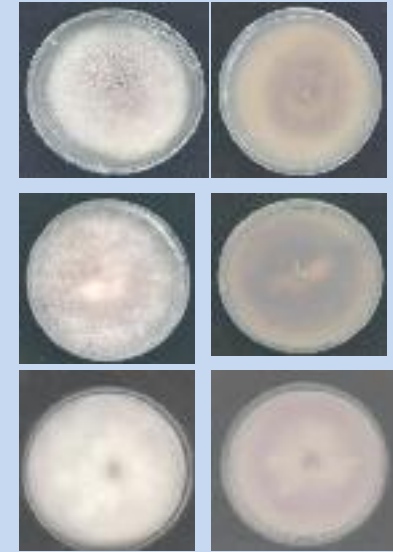
B



C



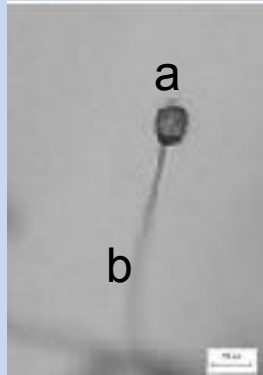
D



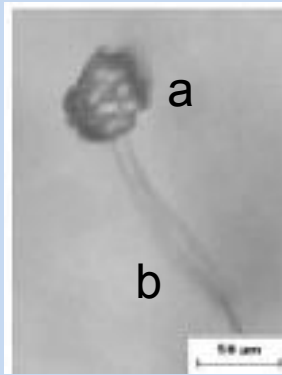
Colony features some strains of *F. oxysporum*

Morphological characteristics of *F. oxysporum*. A. Microconidia in false head from short monophialide (arrow), B. Macroconidia (arrow), C. Chlamydospores: (a) single, (b) in pair (c) in chain, and D. Microconidia: (a) Kidney shape, (b) Oval shape

F. solani



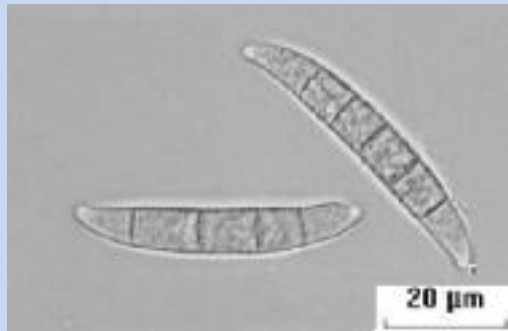
A



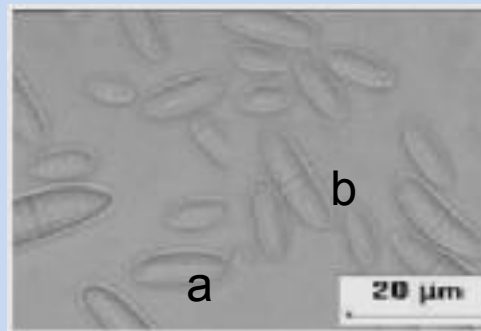
B



C



D



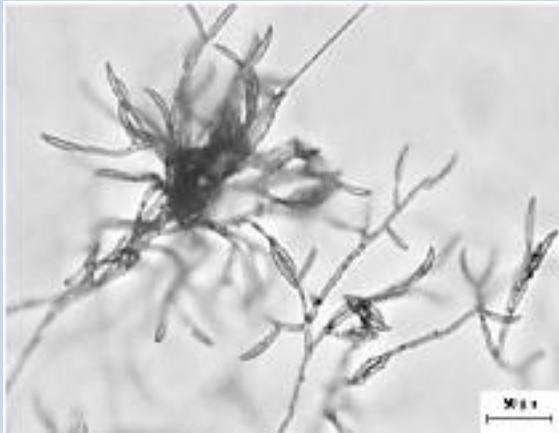
E



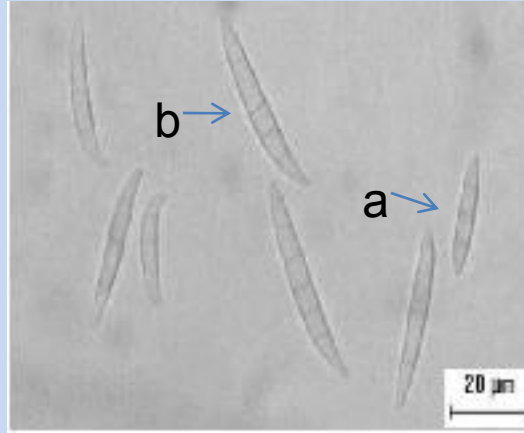
Colony features some strains of *F. solani*

Morphological characteristics of *F. solani*. (A-B) Microconidia in false head (a) with long monophialide (b), C. Chlamydo-spore in chain, D. Macroconidia and E. Microconidia; (a) 1 cell, (b) 2 cells.

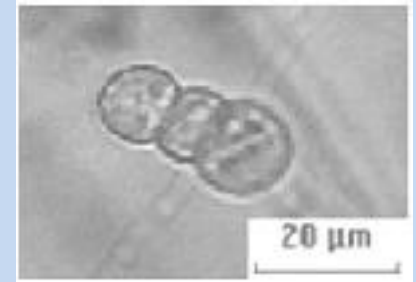
F. semitectum



A

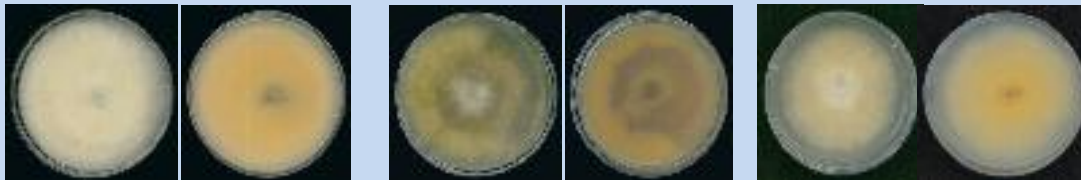


B



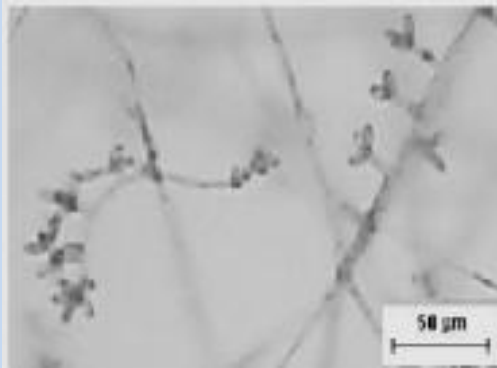
C

Morphological characteristics of *F. semiectum*. A. Mesoconidia *in situ*, B. Macroconidia (a). Mesoconidia (b), C. chlamydospores (arrow)

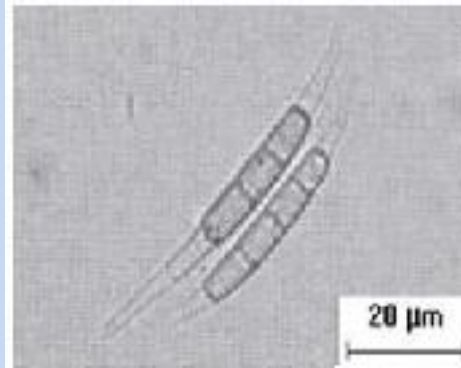


Colony features some strains of *F. solani*

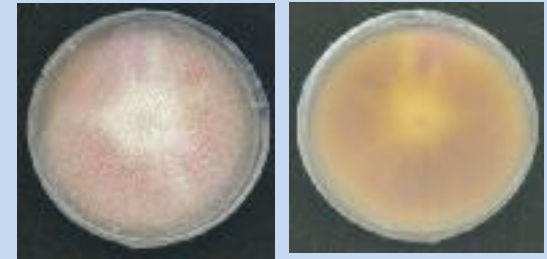
F. chlamydosporum



A



B



Colony features some strains of *F. chlamydosporum*



C



D

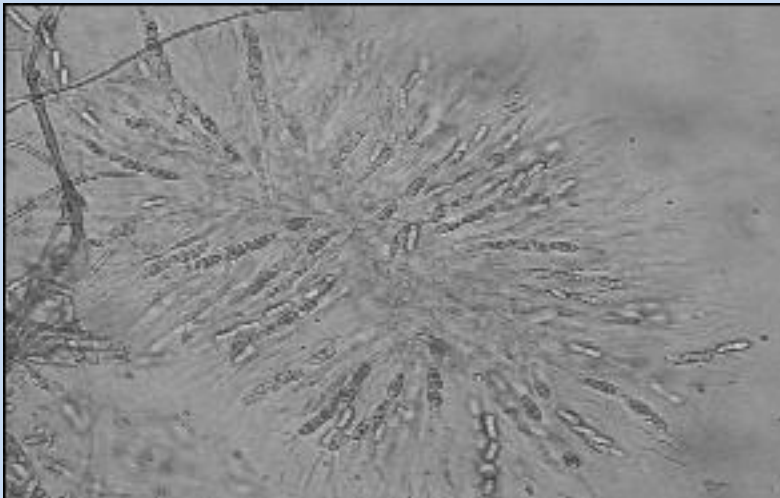
Morphological characteristics of *F. chlamydosporum*. A. Microconidia *in situ* (arrow), B. Macroconidia, C. Oval microconidia; (a) 1 cell, (b) 2 cells and D. Chlamydozoospores in pair

2. Mating Populations (MPs)

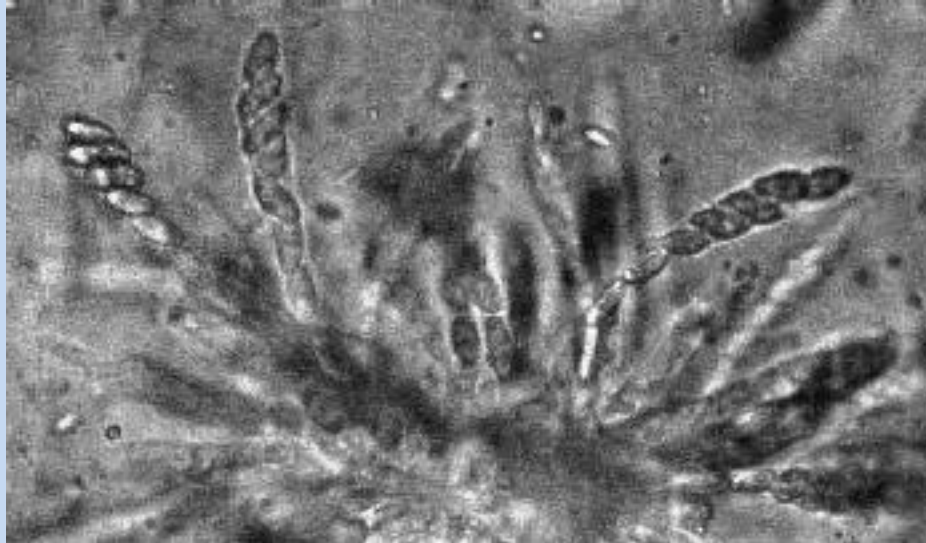
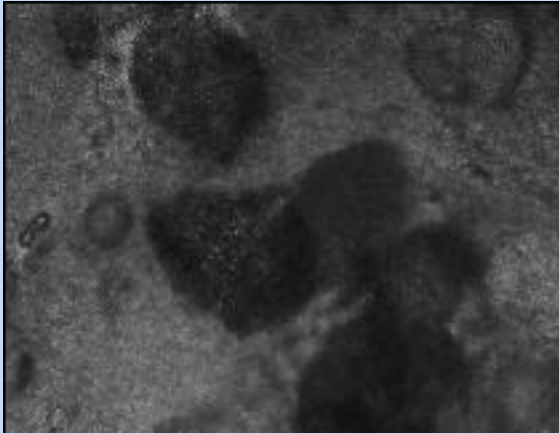
<i>Fusarium</i> spp	MP-A	MP-D	MP-E	ND
<i>F. verticillioides</i> (78 strains)	68			10
<i>F. proliferatum</i> (25 strains)		19		6
<i>F. subglutinans</i> (3 strains)			3	0

ND: Not Detected

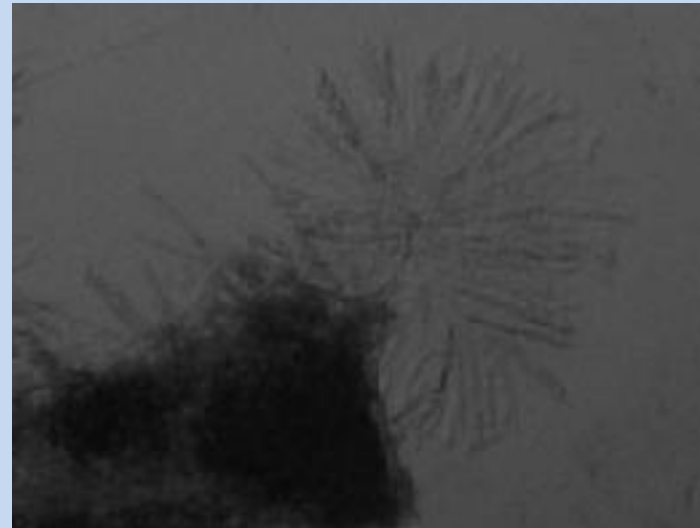
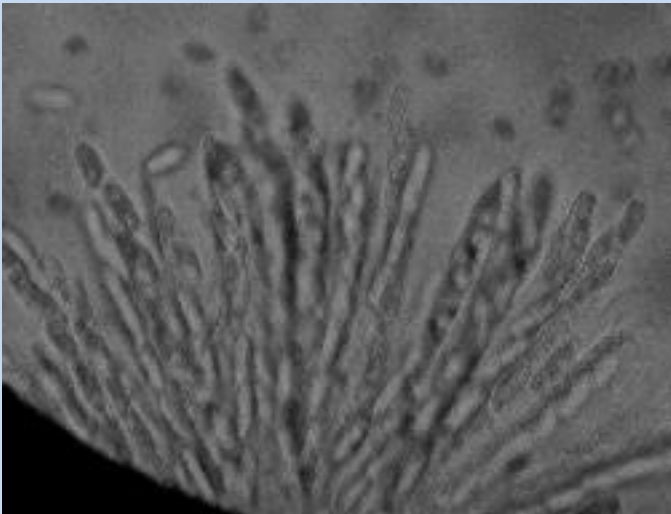
MP- A
G. moniliformis



MP- D
G. intermedia



MP-E
G. subglutinans



3. Pathogenicity Test

Disease severity (DS) of corn ear rot at two weeks after inoculation with strains of *Fusarium* spp.

<i>Fusarium</i> species	Strain	Location	DS (%)	
<i>F. verticillioides</i>	Q5569O	Sarawak, Malaysia	18.57	ef
	OLN0200O	East Java, Indonesia	20.03	def
	OLN0215O*	West Sumatra, Indonesia	22.00	de
	OLN0229O	North Sumatra, Indonesia	29.13	c
	HLN0155O	Tak Fa, Thailand	17.30	efg
	OLN0282O	West Sumatra, Indonesia	25.17	cd
<i>F. proliferatum</i>	S5273O	Sabah, Malaysia	11.43	hij
	HLN0151O*	Buri, Thailand	17.20	efg
	OLN0295O	West Sumatra, Indonesia	15.20	fgh
	OLN0280O	North Sumatra, Indonesia	9.17	ij
<i>F. subglutinans</i>	S4895O*	Sabah, Malaysia	7.33	jk
	OLN0319O	West Sumatra, Indonesia	13.20	ghi
	OLN0339O	West Sumatra, Indonesia	15.63	fgh
<i>F. graminearum</i>	OLN0301O	West Sumatra, Indonesia	98.67	a
	OLN0305O	West Sumatra, Indonesia	96.83	a
	OLN0311O	West Sumatra, Indonesia	94.27	a
	OLN0312O	West Sumatra, Indonesia	97.50	a
	OLN0313O	West Sumatra, Indonesia	96.60	a
<i>F. oxysporum</i>	R473O	Perlis, Malaysia	2.07	l
	OLN0382O	Aceh, Indonesia	1.57	l
<i>F. solani</i>	HLN0069O*	Takhli, Thailand	1.23	l
	OLN0228O	North Sumatra, Indonesia	0.93	l
<i>F. semitectum</i>	OLN0294O	West Sumatra, Indonesia	3.33	l
<i>F. chlamydosporum</i>	OLN0283O	West Sumatra, Indonesia	79.23	b NO
Control	OLN0320O	West Sumatra, Indonesia	0.00	l



Ear rot symptom on corn cobs at 2 weeks after inoculation with *F. raminearum*

V. CONCLUSSIONS

1. Ear rot disease on corn have been distributed in Indonesia, Malaysia and Thailand
2. **Eight** Seven species of *Fusarium* with ear rot disease on corn were identified
(*F. verticillioides*, *F. proliferatum*, *F. subglutinans*, *F. graminearum*, *F. oxysporum*, *F. solani*, *F. semitectum*, ***F. chlamydosporum***).
3. Three mating population (MP-A, MP-D and MP-E) were discovered in Section Liseola
4. MP-A (*F. verticillioides*) was the most dominant species associated with ear rot disease of corn
5. *F. graminearum* is the most virulent and followed by ***F. chlamydosporum*** and ***F. Verticillioides***

Thank you