PROTOCOLS FOR MANAGING INVASIVE RUST FUNGUS AS PATHOGEN ON LEGUMINOSAE IN INDONESIA

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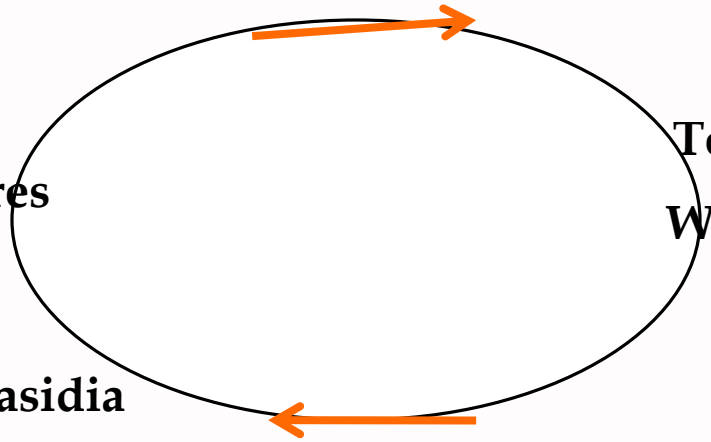
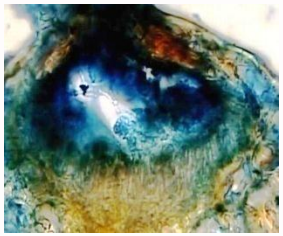
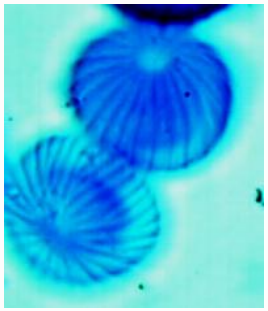
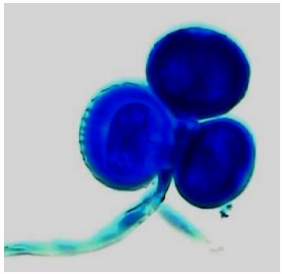
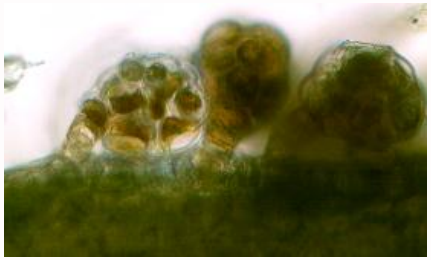
The gall forming rust fungus *Uromycladium tepperianum - U. falcatarium* is a microcyclic rust









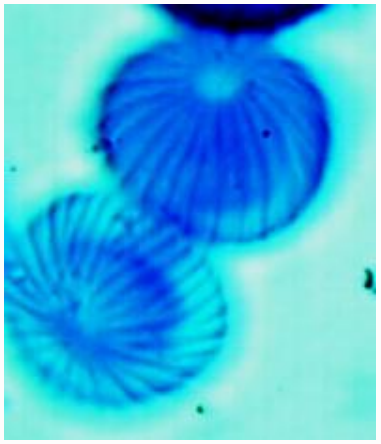


Life cycle of *Uromycladium tepperianum*
(Source: Dick, 1985)

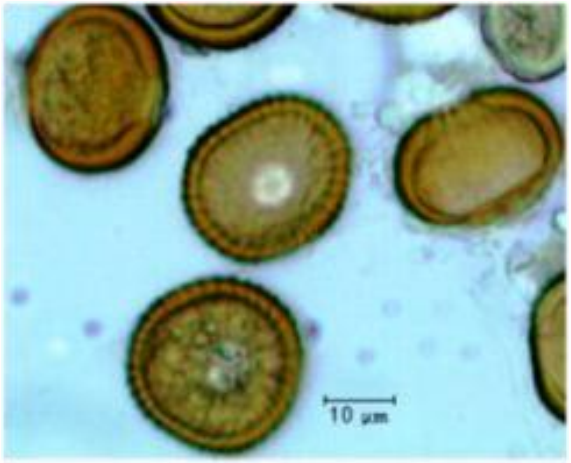
- infects more than one hundred species of *Acacia* (Gathe 1971)

- at least has 57 species of Acacia as hosts in Australia (McAlpine, 1906; Gathe, 1971; Warcup and Talbot, 1981).

Falcataria moluccana

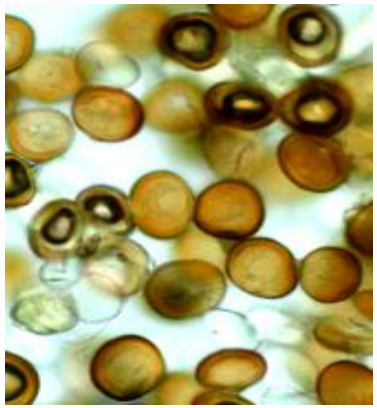


Paraserianthes lopantha



Acacia decurens

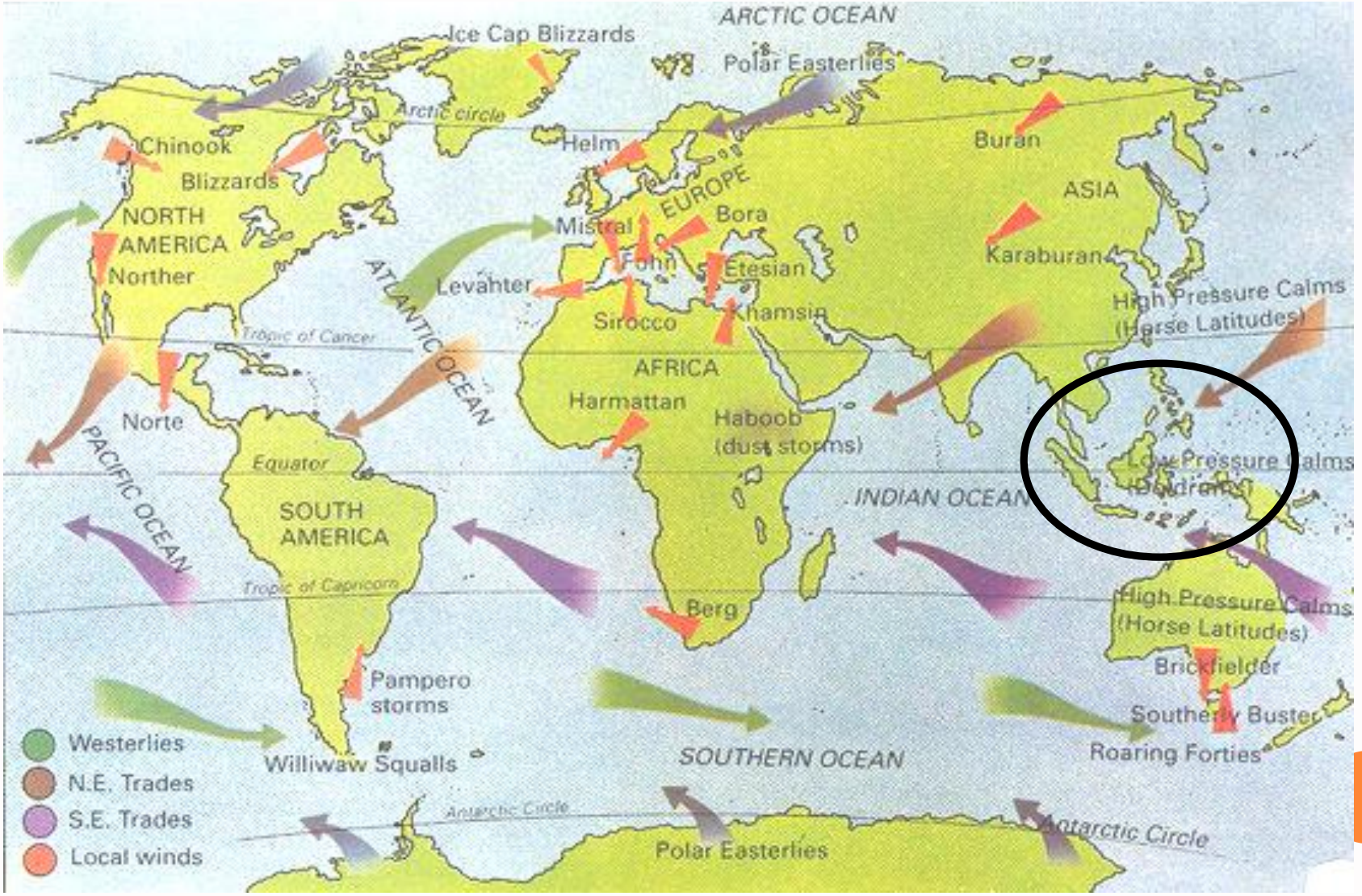
Caliandra calothyrsus



• has been proven a highly effective against *A. saligna* as weed in South Africa (Morris 1997, Wood & Morris 2007).

Known distribution at the South East Asia

IN INDONESIA




GREATER
SUNDA
ISLANDS
Java Sea
BORNEO
Microsoft MapPoint
Tambak
Sangkapura
SUNDA
INDONESIA
ISLANDS
Jakarta
Kandanghaur
Indramayu
Bogor
Jatibarang
Cirebon
Pekalongan
Kudus
Rembang
Pati
Blora
Tuban
Ambuntentimur
Cibadak
Bandung
JAWA BARAT
Kuningan
Semarang
JAWA TIMUR
Sumenep
Kawali
Bojonegoro
Surabaya
Tasikmalaya
Ajibarang
JAWA TENGAH
Purwokerto
Surakarta
Pasuruan
Probolinggo
Pameutingan
Cilacap
Yogyakarta
Klaten
Kediri
Malang
Wonosari
Keras
Jember
Pacitan
Blitar
Lumajang
JAVA
Genteng
INDIAN OCEAN
Java Trench
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108°
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114°
5°
6°
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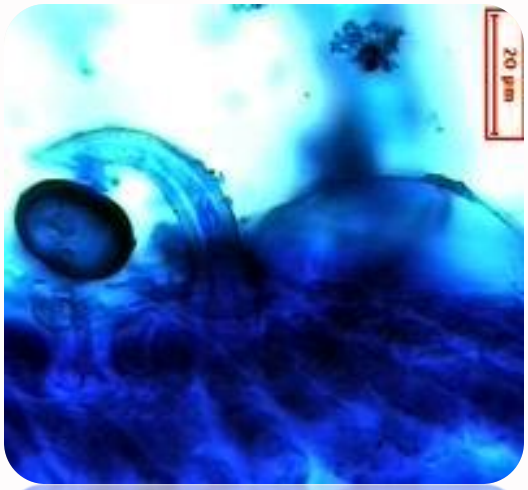
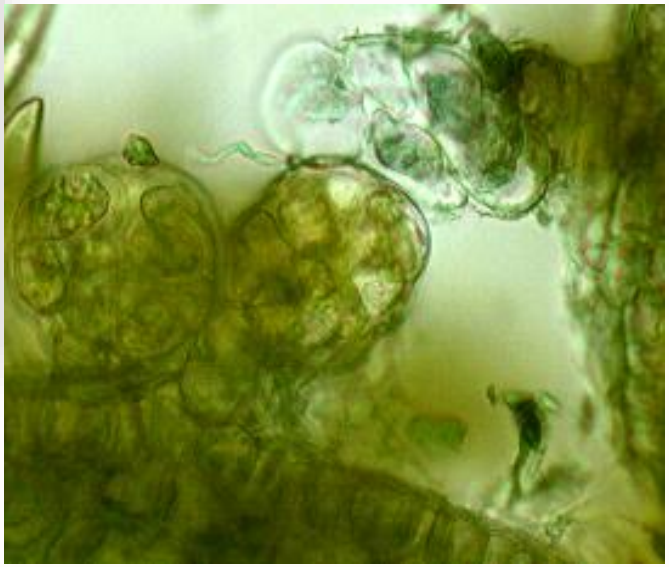
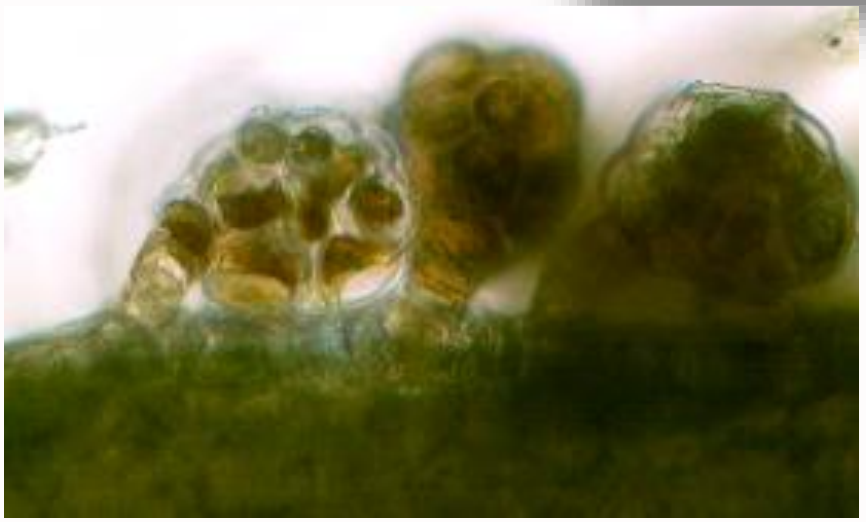
8°
9°
10°

Mode of Infection

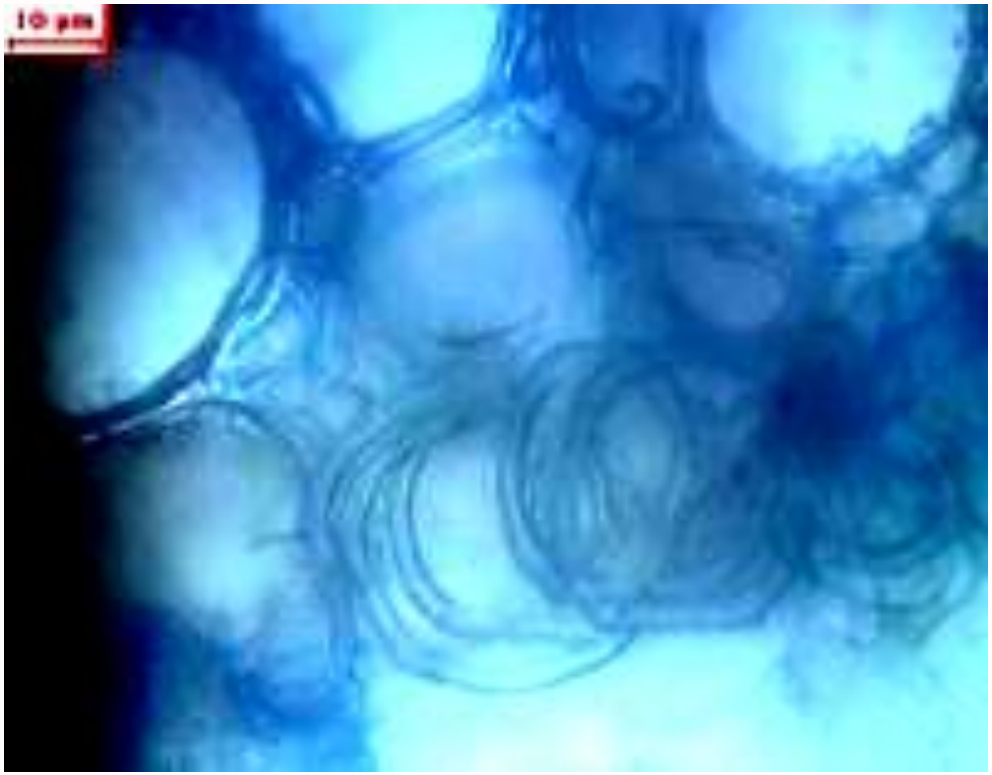




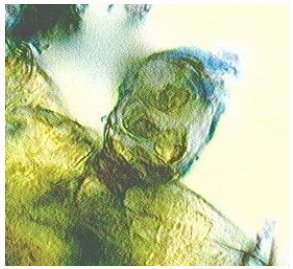


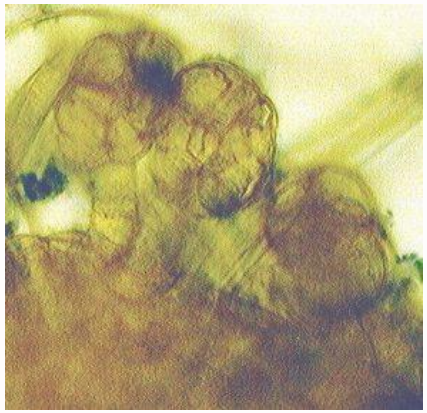
At least 1 to 3 hours

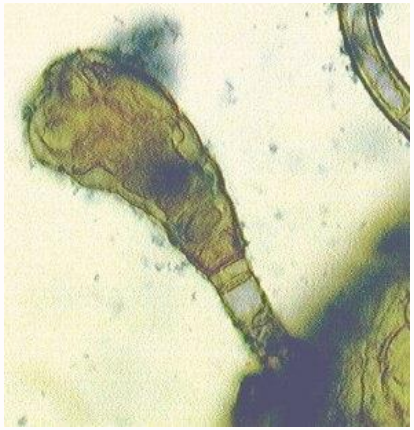

30 µm

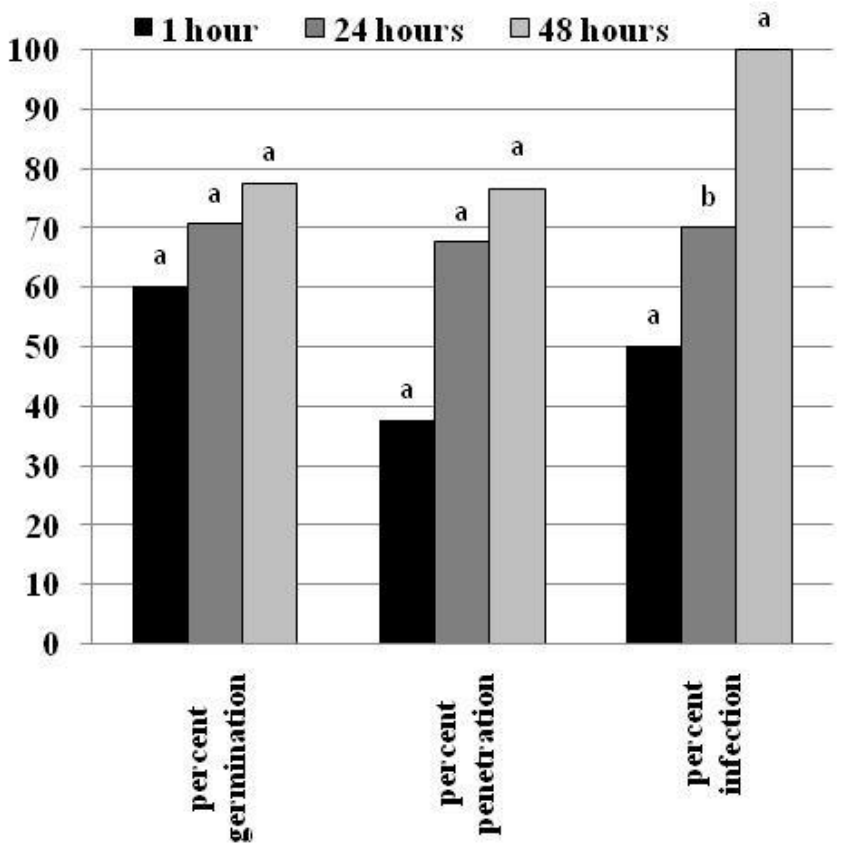

10 µm

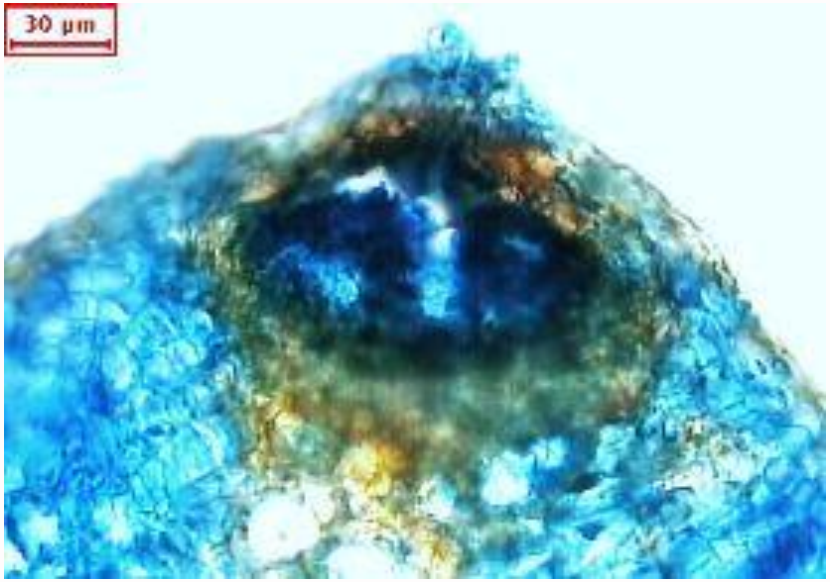
Falcataria moluccana



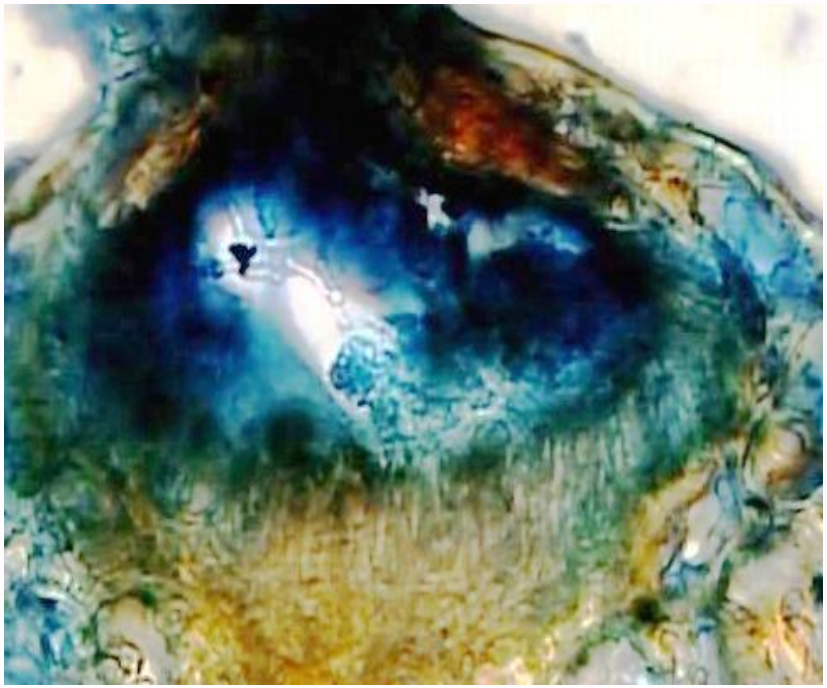




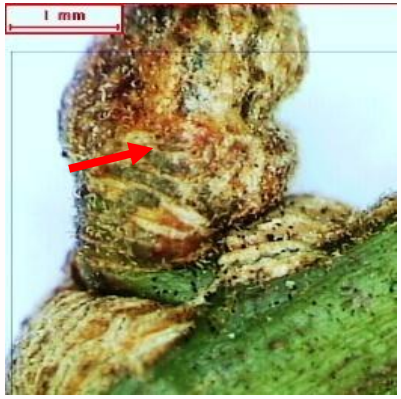




Sporulation at least 3 to 7 days after gall formation



Rahayu S, Lee SS, Shukor NAA (2010) Uromycladium tepperianum, the gall rust fungus from Falcataria moluccana in Malaysia and Indonesia. Mycoscience 51:149–153



gall forming at least 3 to 8 weeks

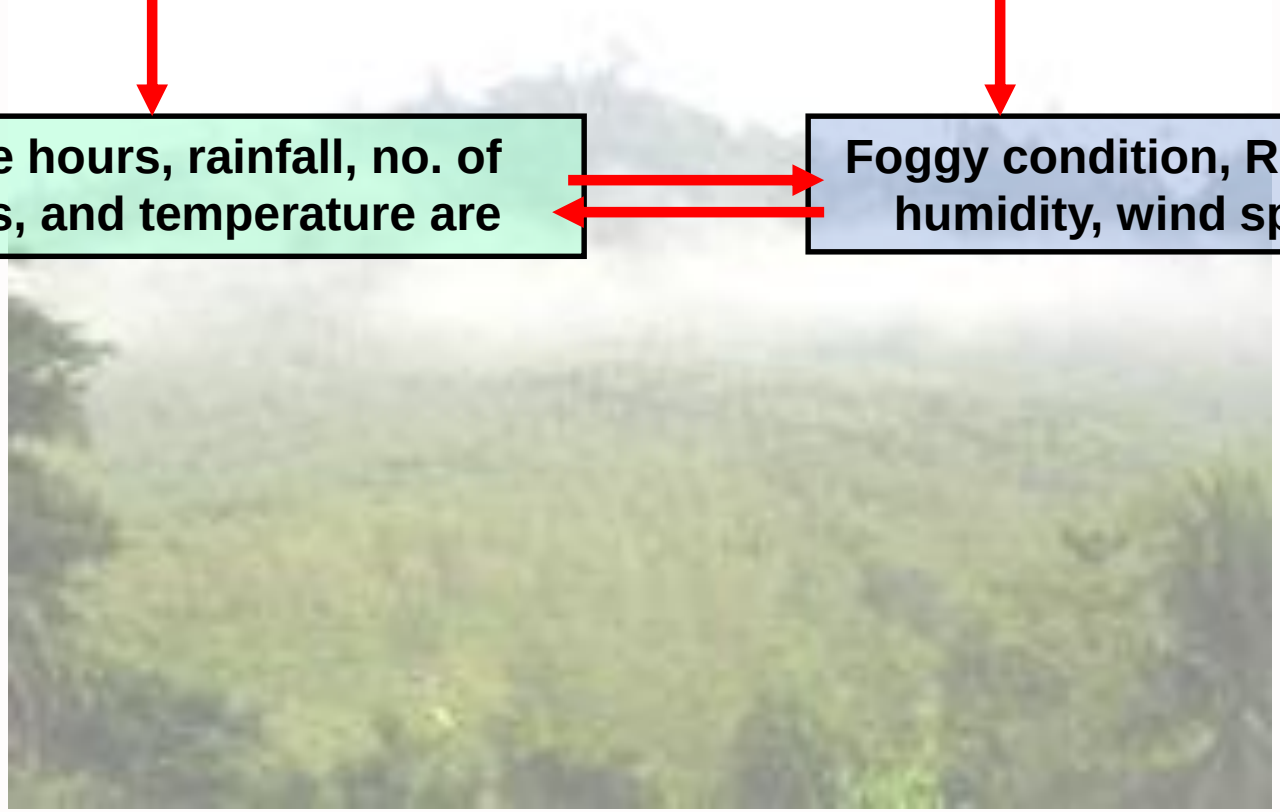
Meteorological Factors Related to Gall Rust Disease Incidence

Factors are not significantly related

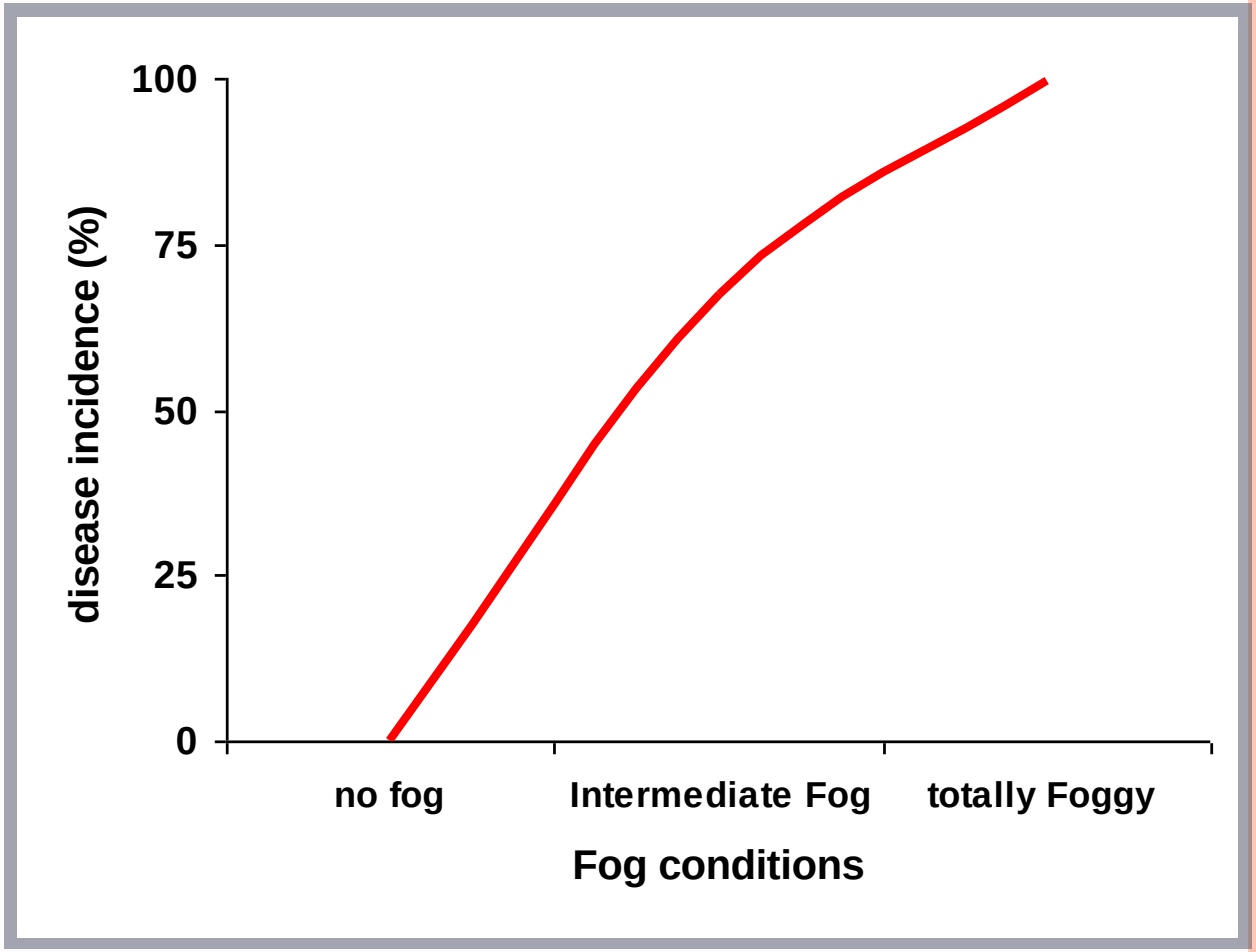
Factors are highly significantly related

sunshine hours, rainfall, no. of rain days, and temperature are

Foggy condition, Relative humidity, wind speed

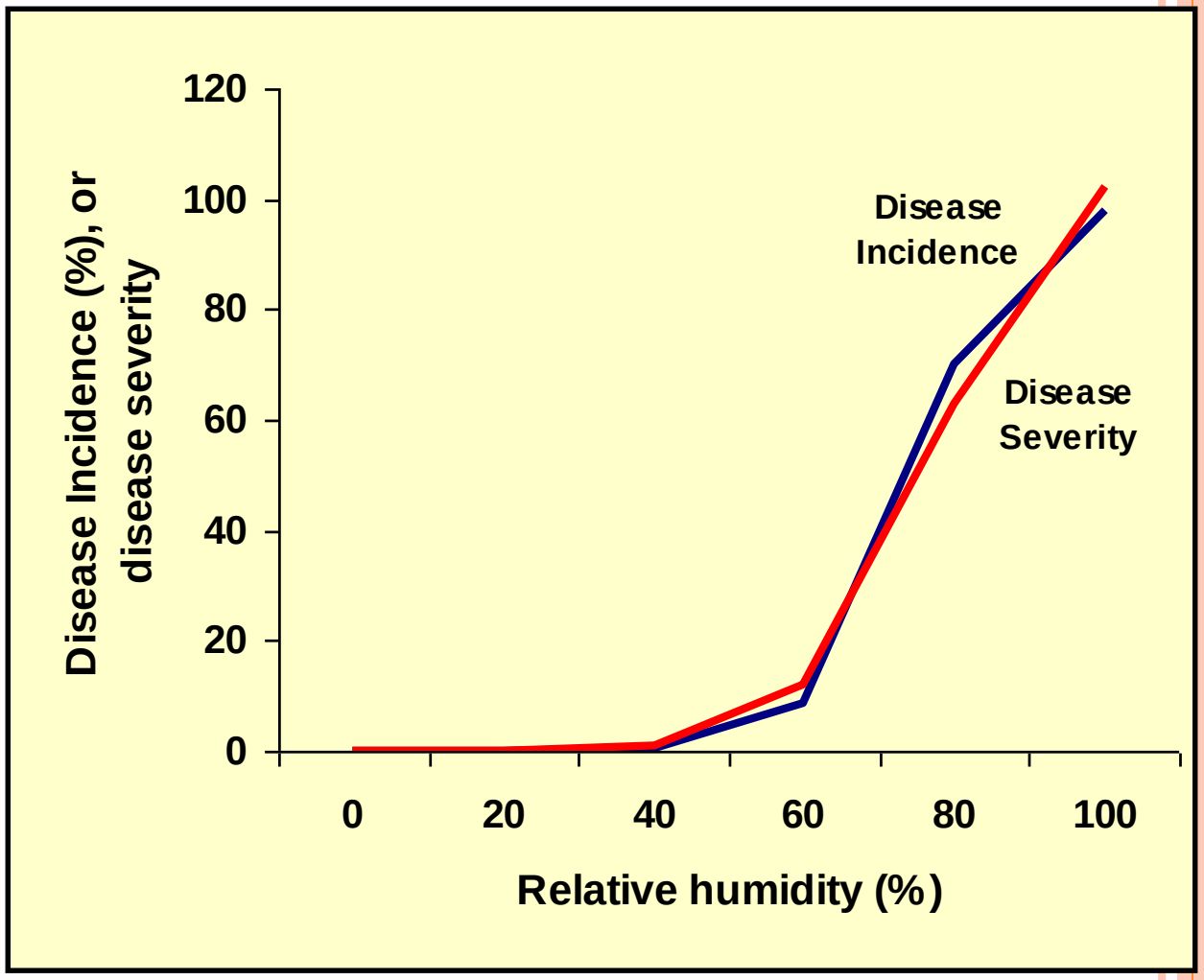


Fog Condition



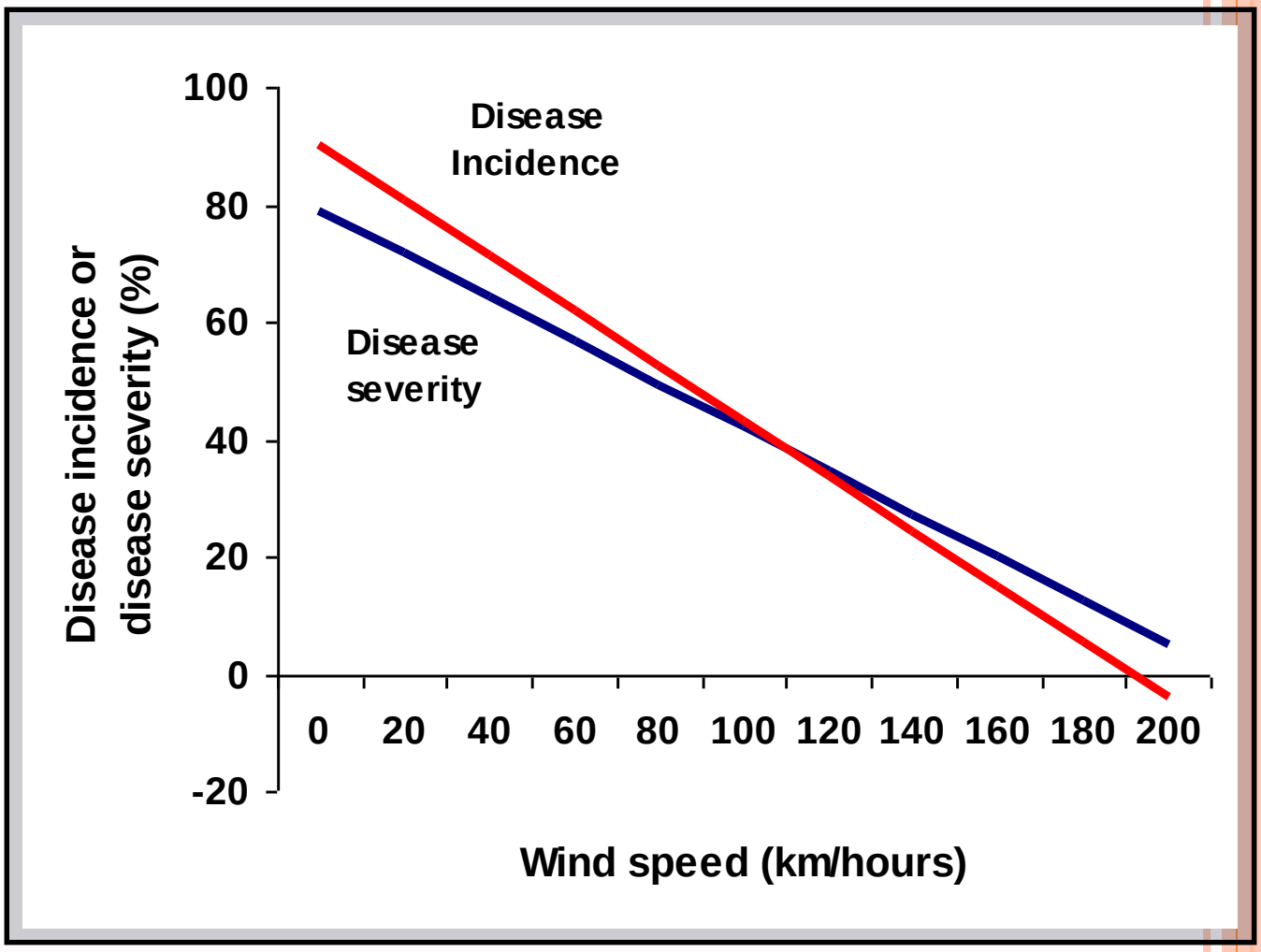
- Under foggy or misty condition, a "wetting period" occurs where the site is continuously wet with mist, fog, dew or rain.
- *U.tepperianum* requires fog as well as a wet period to ensure to ensure their infection and development process in the host.

Relative humidity



A relative humidity of between 89 and 100 percent for four or more hours can promote teliospore germination

Wind speed



Gall rust disease incidence were likely increased by the slower wind speed. Teliospores need to germinate and produce basidiospores.

When wind speed is higher, the basidiospores are more easily removed from the host surfaces and unsuccessful infecting host cells

General protocol for management control

- Seed
- Nursery
- Young trees
- Mature trees

✓ PREVENTION
✓ CONTROL
✓ SANITATION
✓ ERADICATION

SEED

Used healthy and un infected seed (seed sertification is needed

U. falcatarium **is seed transmitted but not seed born**

80% of seedling, which the seed collected from infected seed production area were shown gall symptom in one month old seedling

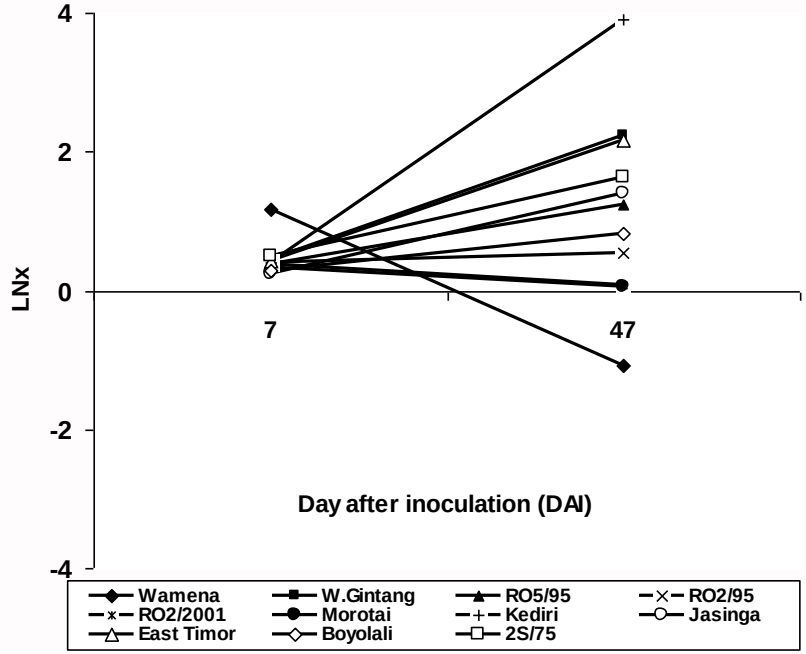
Early detection of infected seed and its control practice is still conducting


cm 1 2
0.5 mm


cm 1
0.5 mm


cm 1 2
0.5 mm

Used the selected seed material from resistant or moderately resistant seed sources



Rahayu, S., Lee, S.S., Nor Aini, A.S., Ghizan, Saleh. 2009. Responses of *Falcataria moluccana* seedlings of different seed sources to inoculation with *Uromycladium tepperianum*. Journal of Silvae Genetica . Vol: 58, 1-2: 62-68

Broad sense heritability = 23 – 47%

Genetic correlation of gall rust incidence and height is negative = 2 – 85%

Nurseries management

1. Early detection

Initial symptoms are some times indistinct and easily being overlooked

early detection under nursery conditions should be conducted regularly at least every 6 days, starting from when the seedlings are placed in the nursery until seedlings being transferred to the field

Removed infected seedlings from the nurseries

Reduce the very high humidity in the nursery

Avoid too old and too dense seedling placed in the nursery

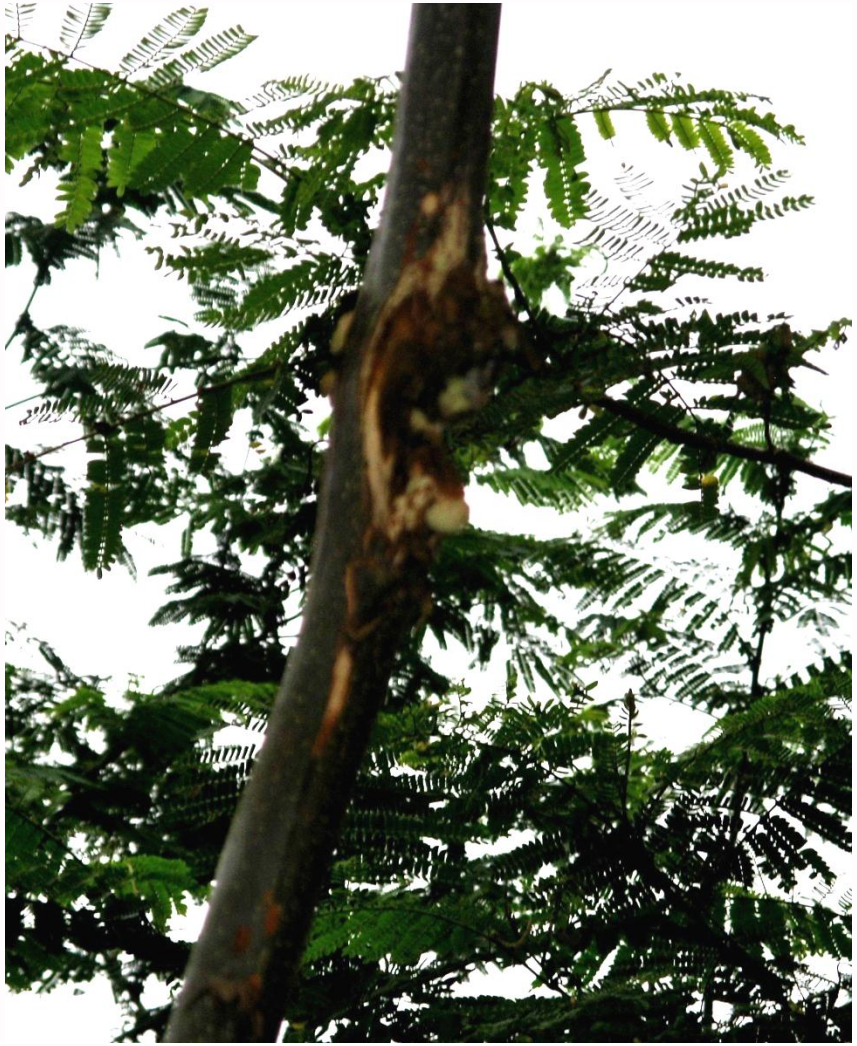
Falcataria nurseries have to established in the low elevation where foggy condition is not occurred

Chemical Control

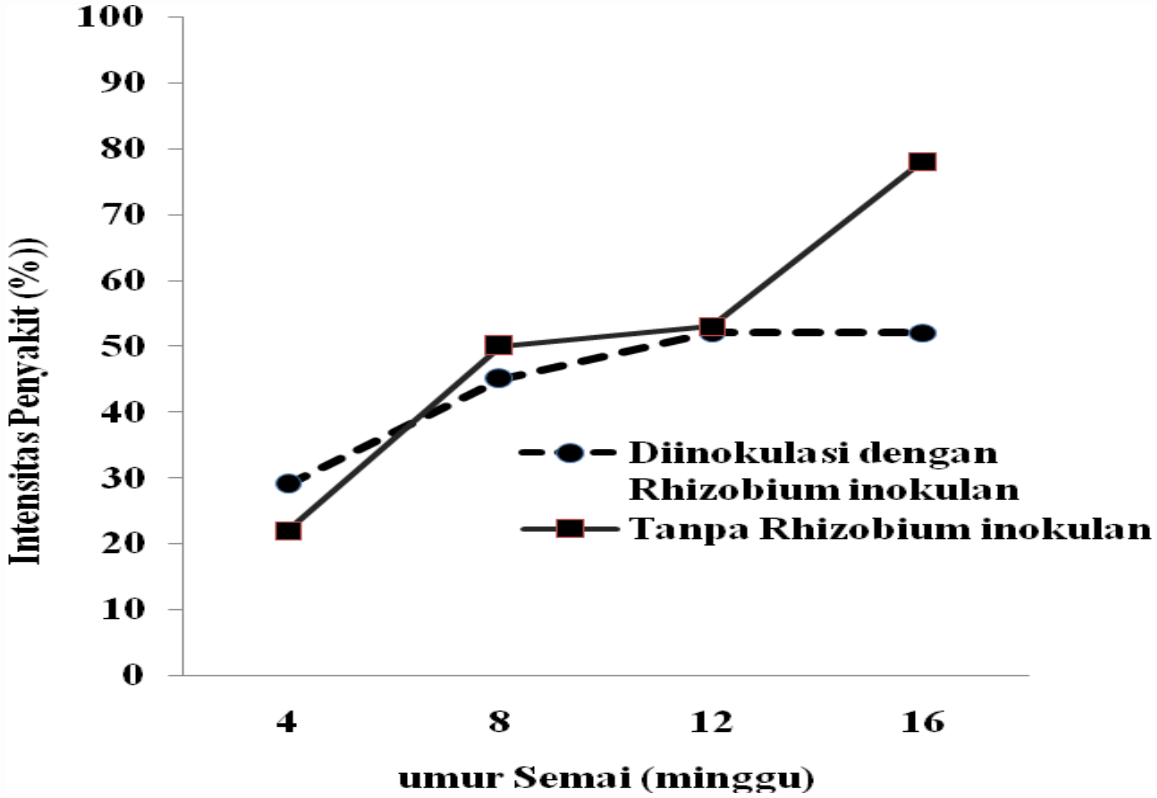
control using fungicide is one of the best options for preventing gall rust disease in the nursery, using chemical compounds with rapid action.

Regular spraying with protectant fungicide for rust fungus, with active material contents of copper compounds such as Anveel, Mancozeb or Planvax should be conducted every six days, starting from the first day the seedlings are placed in the nursery.

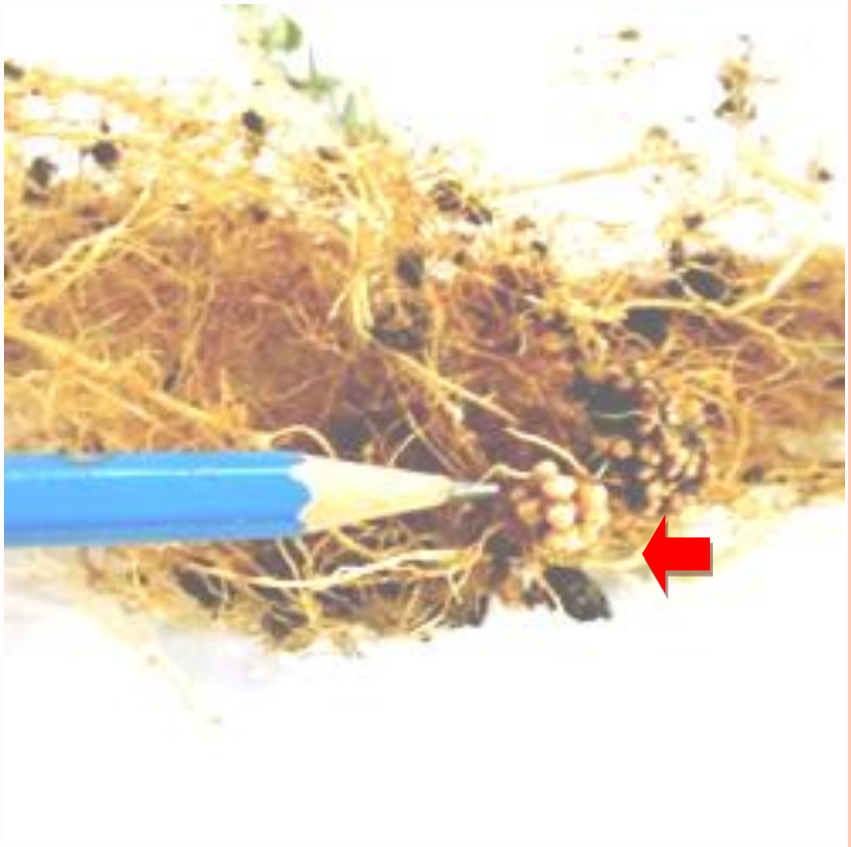
Sanitation,including pruning, thinning



TAR APPLICATION



Applying Endopytic induce the resistance



Choose the proper area for avidance the infection

flat topography, in more open areas, at low elevation (preferably below 300 m a.s.l), and in areas without fog or with less foggy conditions, can prevent the development of gall rust disease on *F. moluccana*

regularly and intensive Monitoring

Gall rust disease monitoring

In the nursery

In the field

Altitude	< 1 year	1 – 3 years	> 3 years
< 300 m ASL	-	-	-
300 – 600 m ASL	1 x/ month	1 x/ 2 month	1 x/ 3-4 month
600 -1200 m ASL	2 x/month	1 x/ month	1 x/2 month
> 1200 m ASL	4 x/ month	2 x/ month	1 x/ month

REMARKS

- Capacity building
- Colaboration among the affected countries
- Monitoring the path way and spreading among the countries
- Mapping the aggressiveness
- Sitting together in order to write up protocol
- Looking for biological control and other promising control, available among the country.

THANK YOU