

# Characterization of kudzu (*Pueraria* spp.) resistance to *Phakopsora pachyrhizi*, the causal agent of soybean rust.



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# Kudzu (*Pueraria* spp.)

- perennial, semi-woody, climbing leguminous vine with trifoliate leaves
- grows well in poor, sandy soil
- native to China and Japan
- introduced into the U.S. as an ornamental vine in 1876 at the Philadelphia Centennial Exposition
- multiple introductions, widespread propagation 1930's and 40's for soil erosion control
- was heavily planted as a forage crop and for soil erosion prevention







Sun et al. 2005

kudzu populations were genetically diverse among populations but had little diversity within populations, indicating multiple introductions with inbreeding within these populations

# Resistance

- Resistance to SBR in soybeans
  - Tan lesion (susceptible)
  - Red/brown lesion (resistant)
  - No lesion development (immune)
- Bonde et al. found resistance in kudzu sites in Mississippi, Louisiana, Kentucky, and North Carolina.  
(Plant Disease, 2009, Vol 93)

# Research questions

- Are historically disease-free patches of kudzu in Florida resistant to soybean rust?
- If so, what is the nature of resistance?
- Are there physiological differences between resistant and susceptible populations?

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<b>Lesions/cm<sup>2</sup></b>	<b>No. sites</b>	<b>Frequency</b>
0	8	0.06
1-25	67	0.48
26-50	47	0.34
51-75	14	0.10
76-100	2	0.01
101-125	1	0.01

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<b>Sporulation</b>	<b>No. sites</b>	<b>Frequency</b>
None (Immune)	25	0.18
Few (resistant)	32	0.23
Heavy (susceptible)	82	0.59

\*Soybean rust urediniospore production across 139 sampled kudzu sites.

## Flowers obs.

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## Site susceptibility

Sporulating

Non-sporulating

June 23-27

0

0

July 7-11

2

0

July 21-25

5

1

Aug. 4-7

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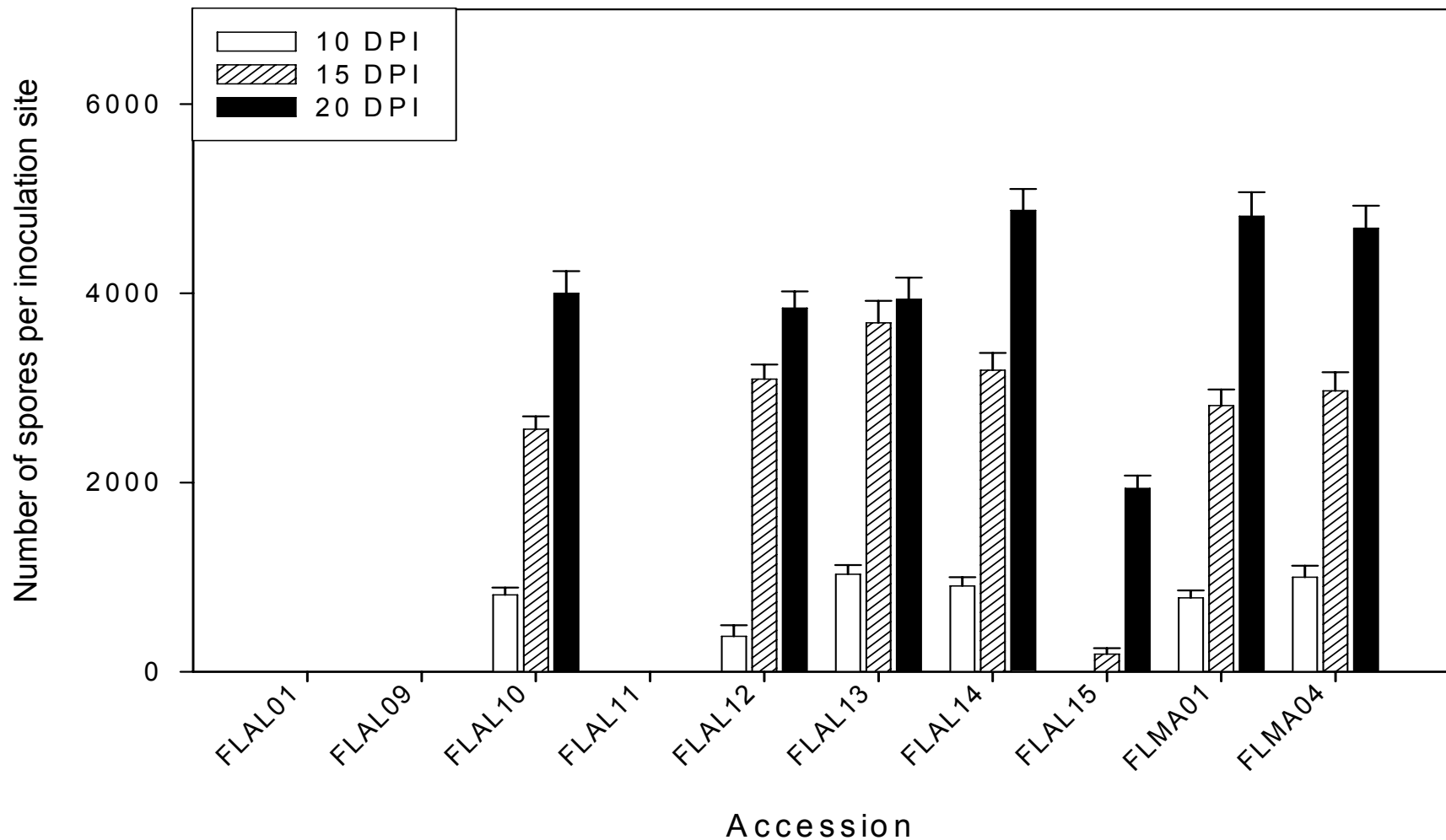
9

6

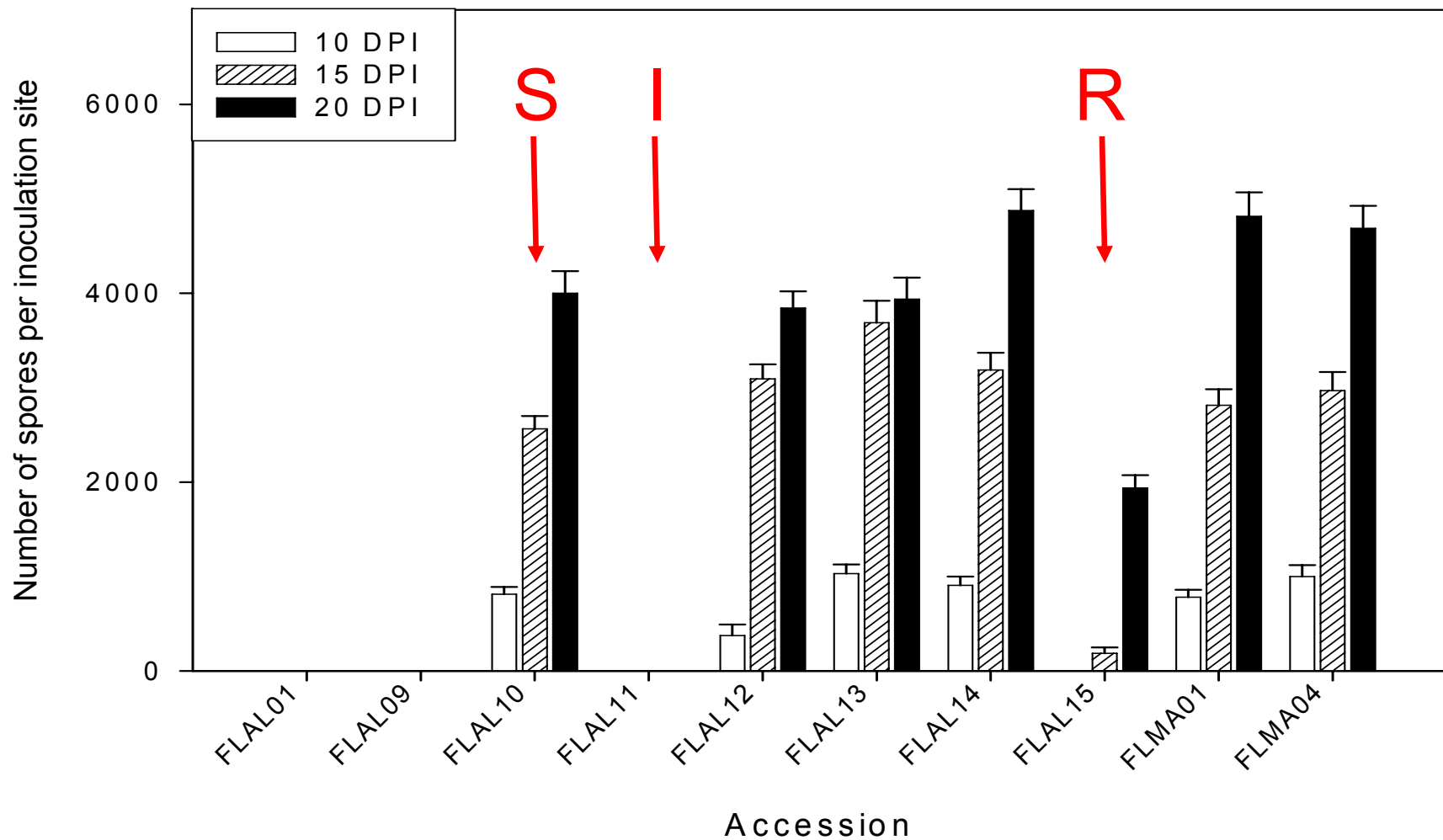
# Detached leaf assay

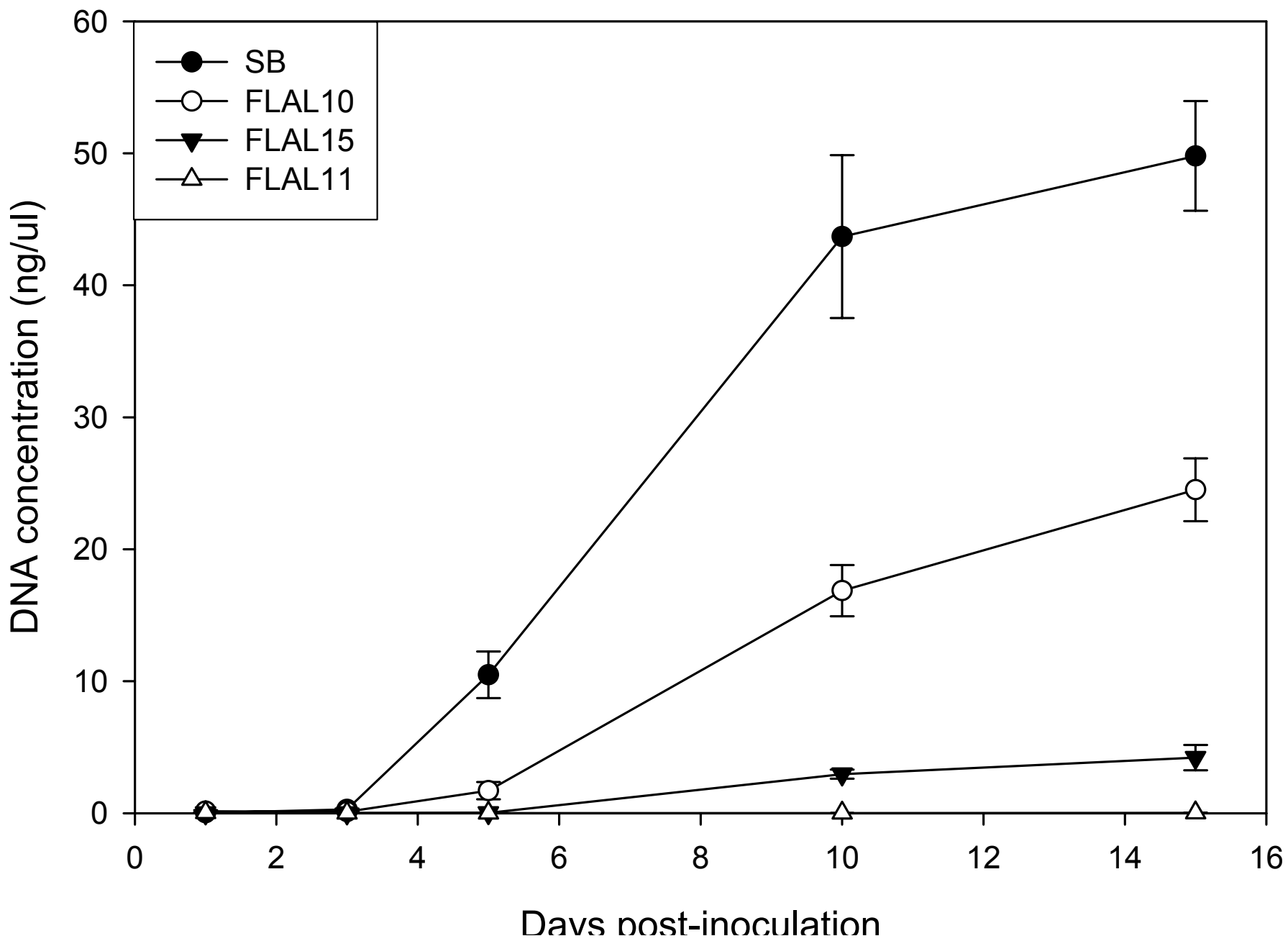
- 10 accessions of kudzu were collected from sites in North Central Florida with a history of no rust infection (4), mild rust infection (1) and severe infection (5)
- vines were maintained and clonally propagated in a greenhouse
- rust isolate FL05 was used for all infection studies
- detached leaves were spot-inoculated with 5  $\mu$ l of urediniospore suspension ( $10^4$ ) and maintained on water agar in Petri dishes

# Urediniospore production on detached kudzu leaves



# Urediniospore production on detached kudzu leaves



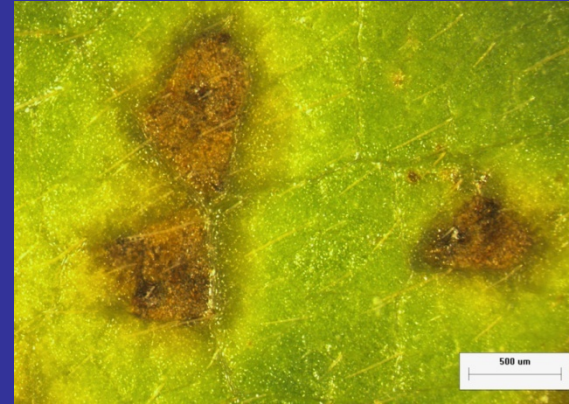
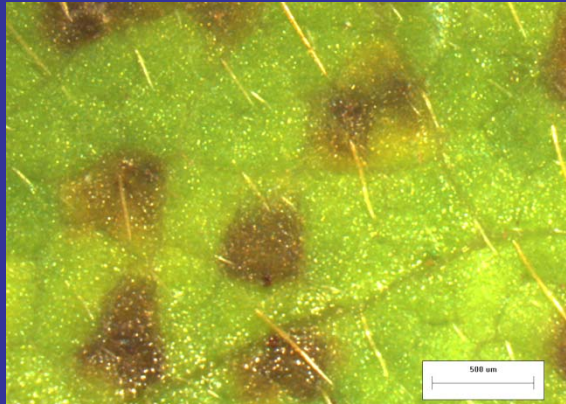


# Kudzu leaf surface

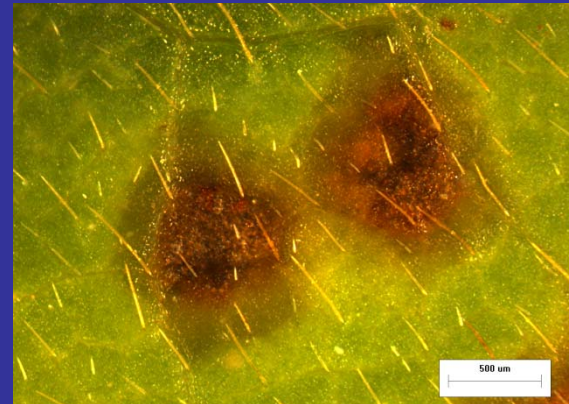
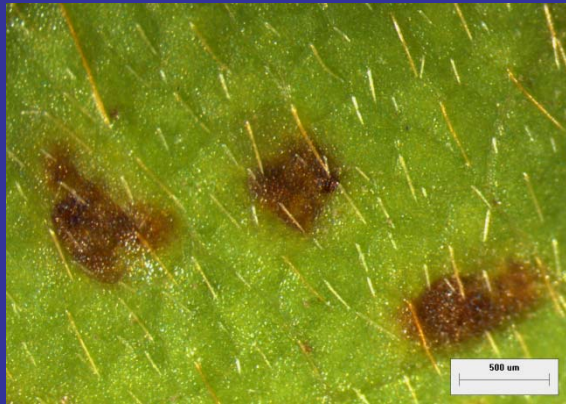
10 DPI

20 DPI

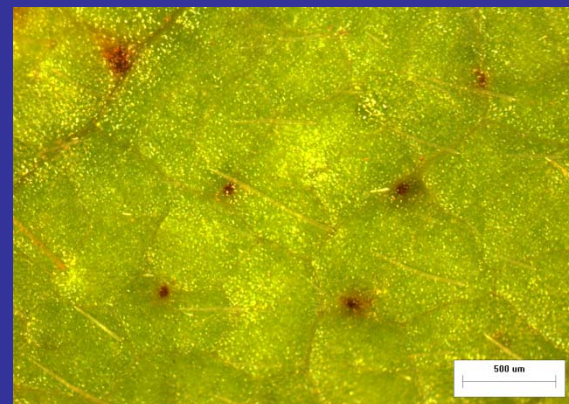
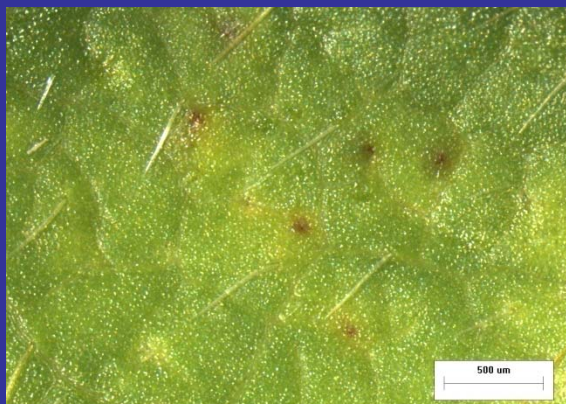
S



R



I



# Kudzu leaf underside

10 DPI

20 DPI

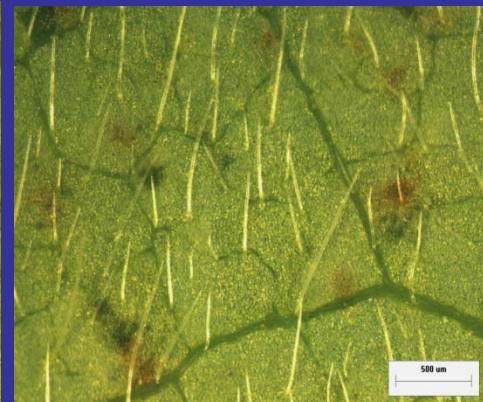
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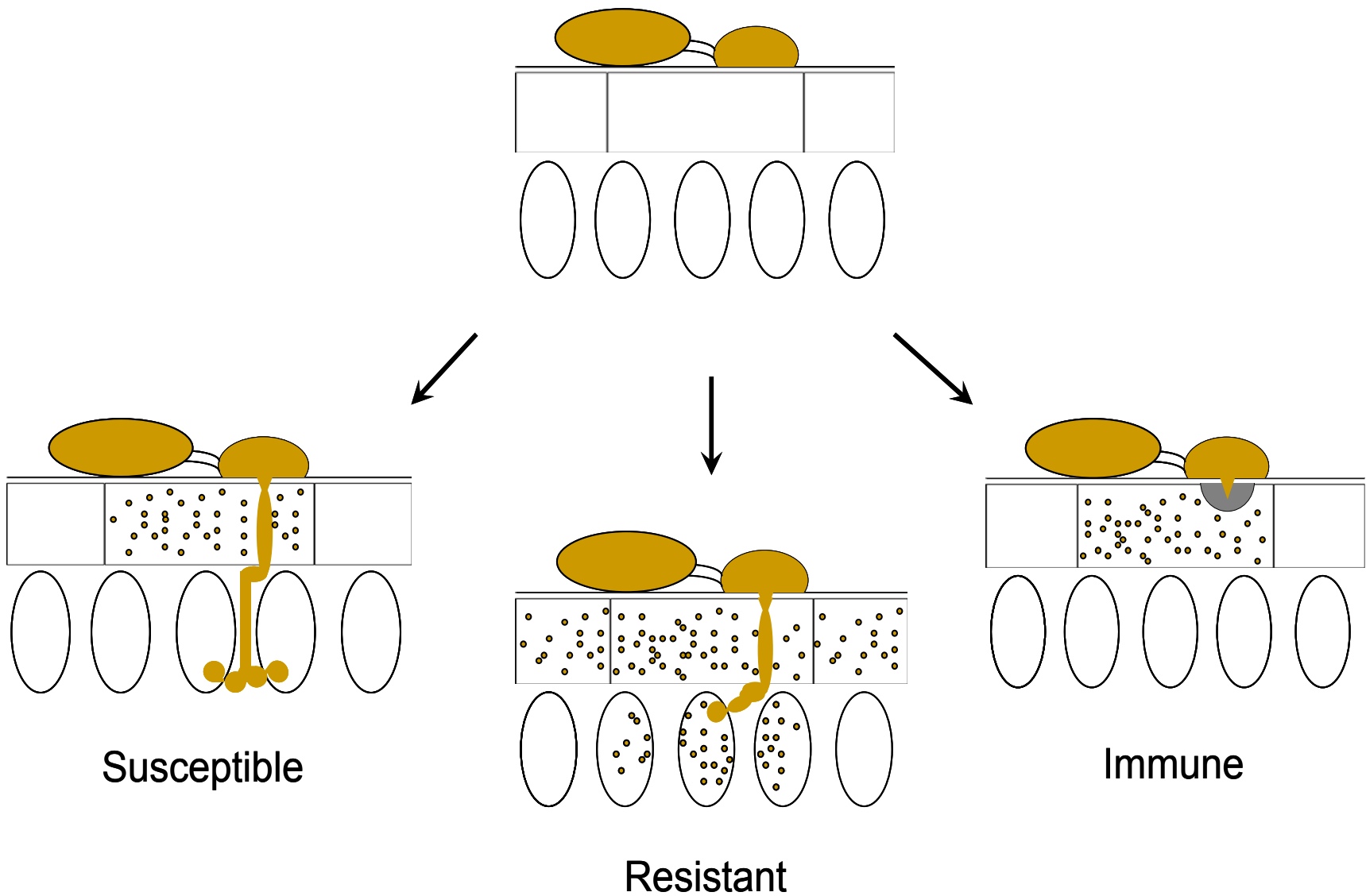
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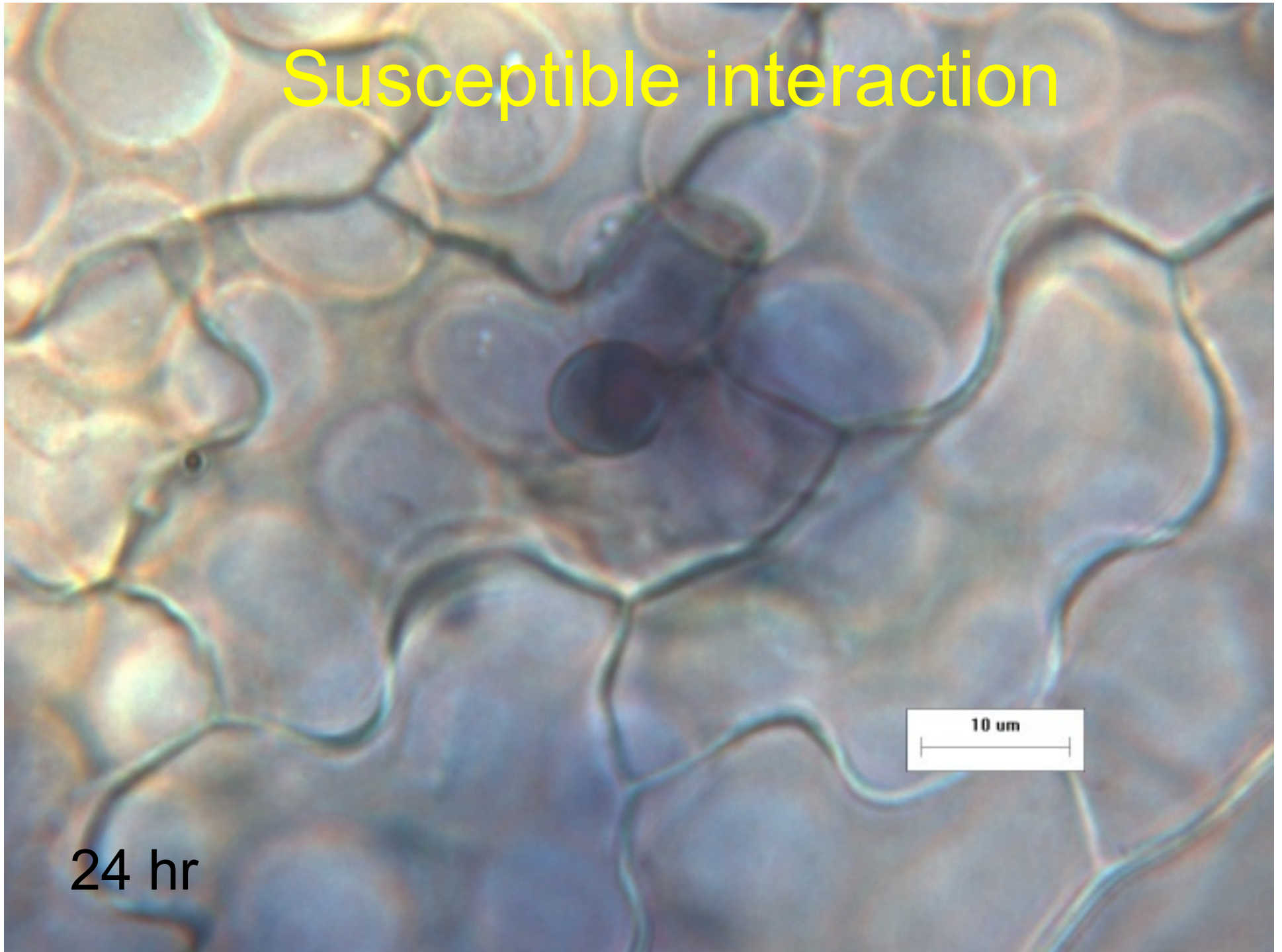
# Cytological examination of infection

- detached leaves misted with a spore suspension ( $10^4$ ) and maintained on water agar
- leaf sections were harvested every 24 hrs
- 1 cm<sup>2</sup> pieces were boiled in a trypan blue:lactophenol:ethanol stain followed by destaining with saturated chloral hydrate
- interactions between the rust spores and the kudzu were analyzed using a light microscope

# Potential host responses



# Susceptible interaction

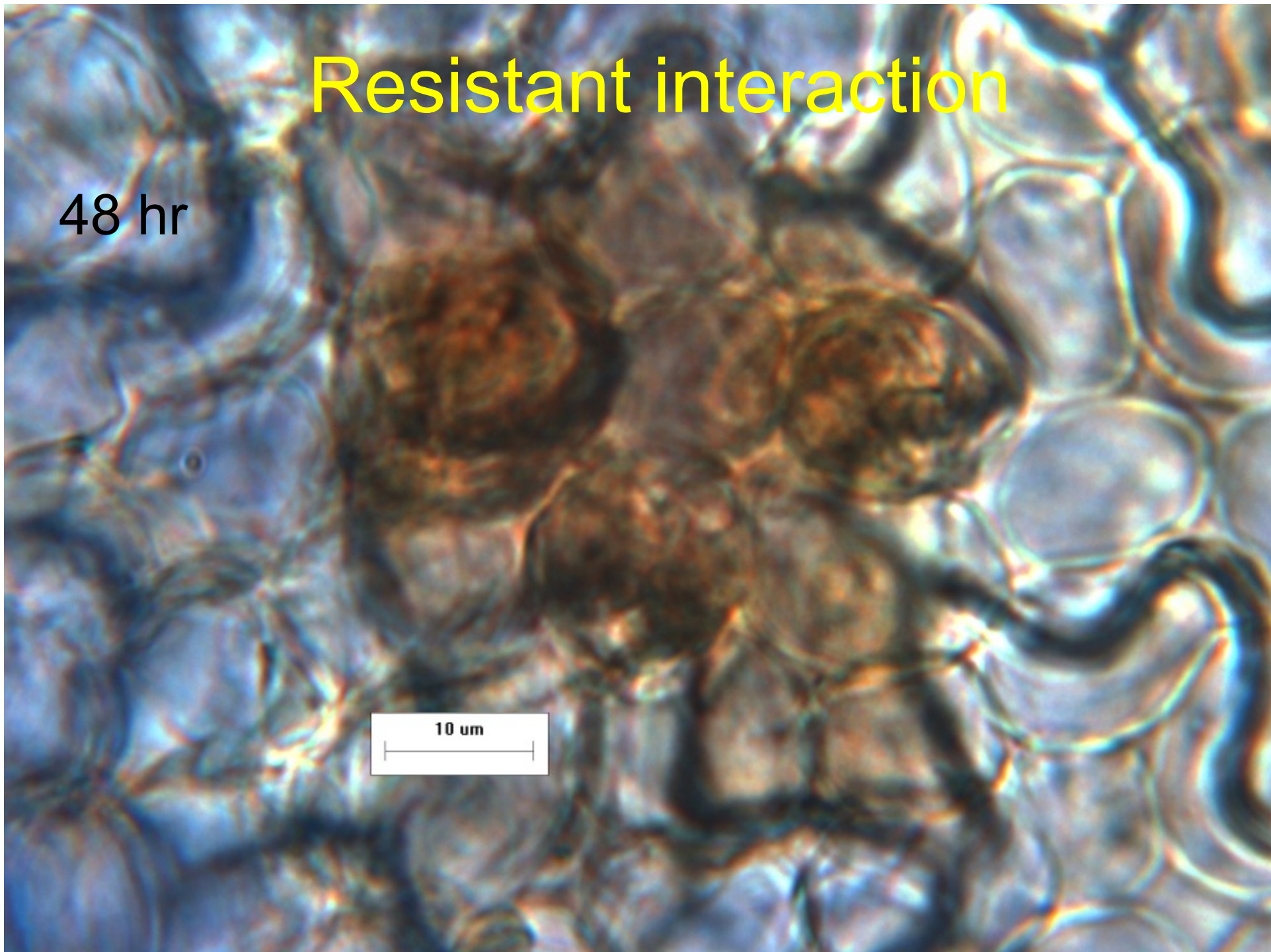


24 hr

10  $\mu\text{m}$

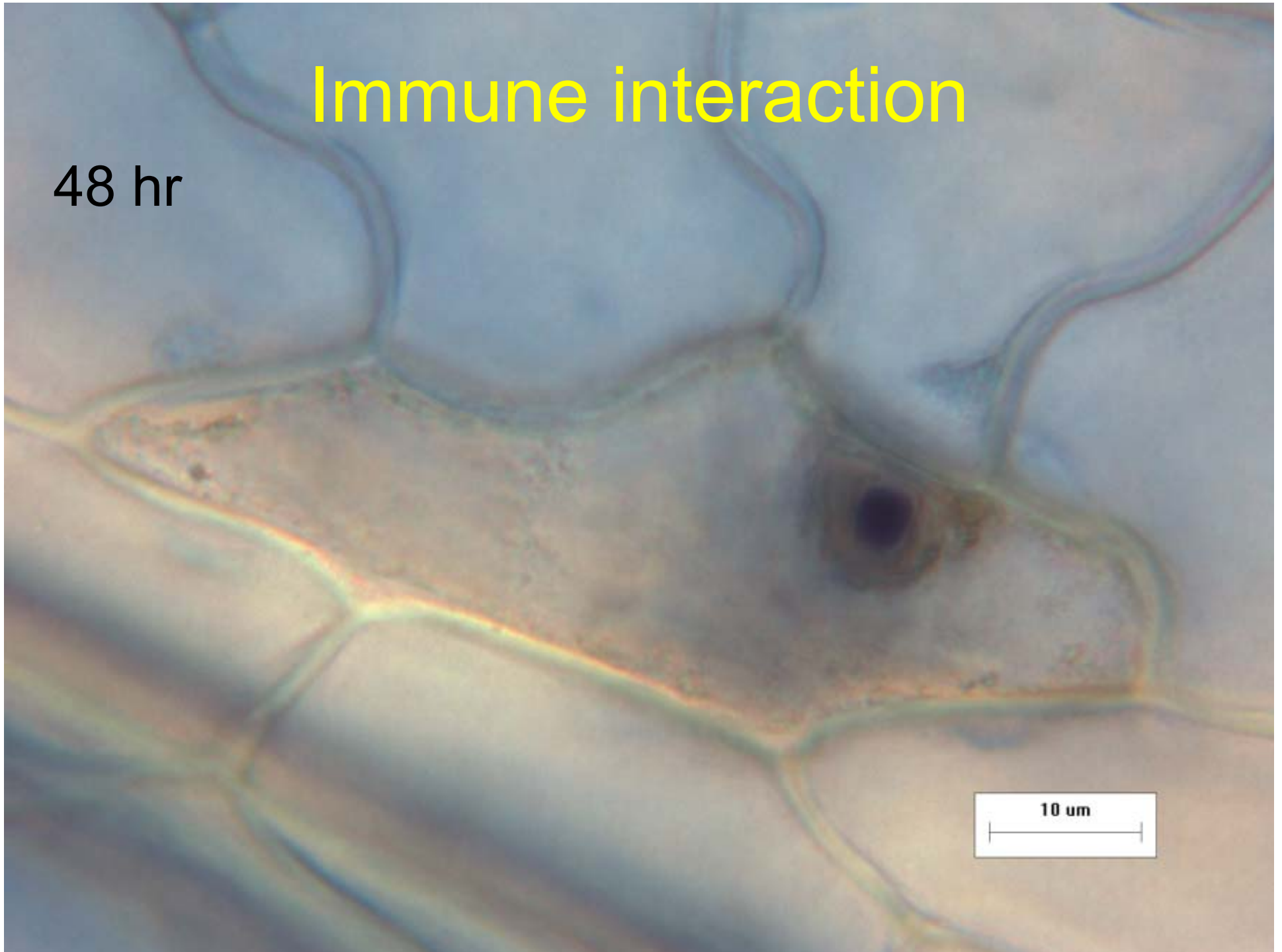
# Resistant interaction

48 hr



# Immune interaction

48 hr



10 μm

# Implications

- because not all kudzu is equally susceptible to SBR, we need to re-evaluate the inoculum potential of kudzu in the southeastern and southern US
- kudzu may also provide a new source of resistance genes for further study and incorporation into soybean
- Resistant kudzu accessions may serve as differentials to help monitor rust population change over time

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