

Observations from Brazil on Soybean Rust Management

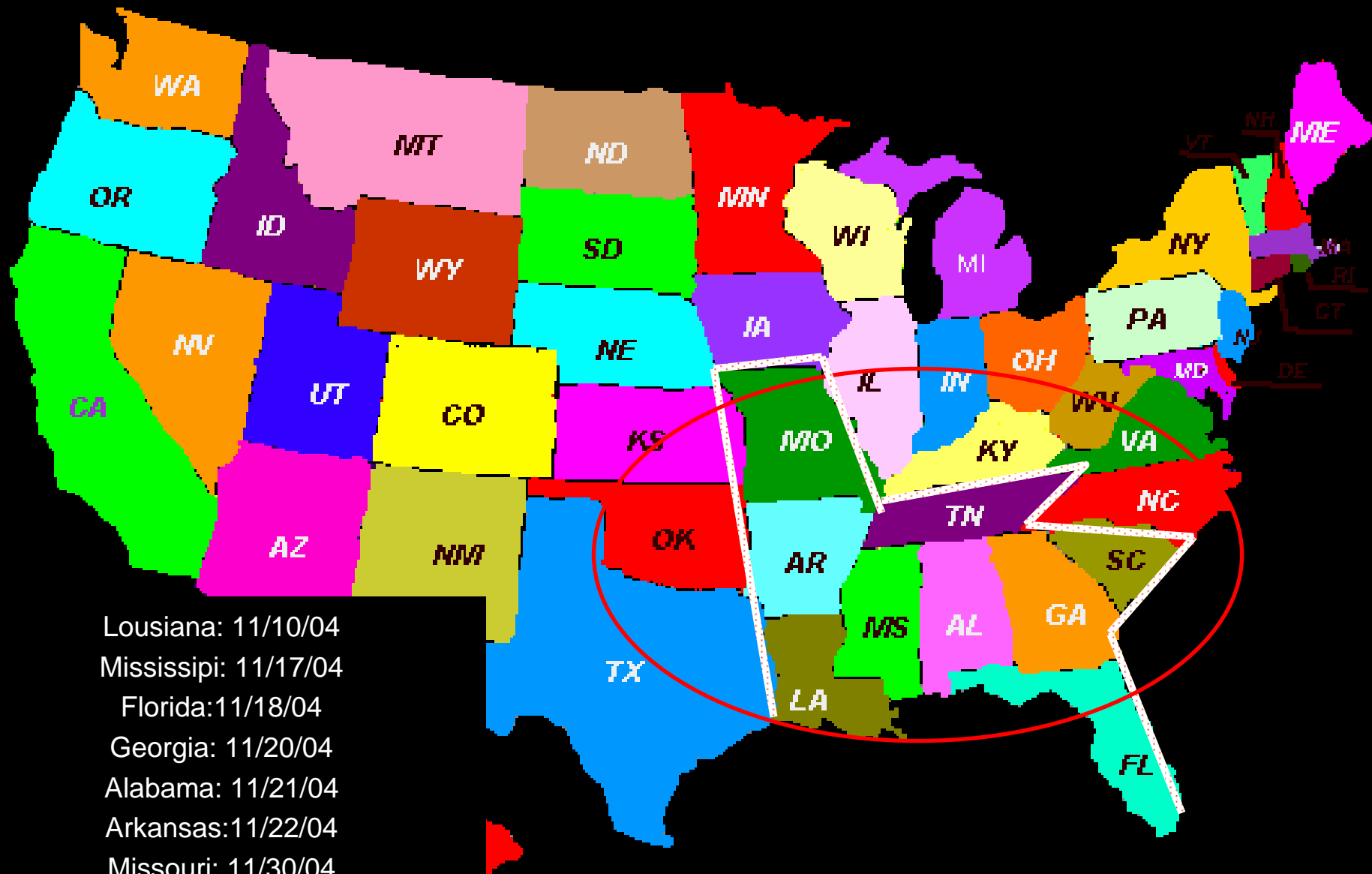
Jody Gander, Ph.D.

Tom Doerge, Ph.D.

Pioneer Hi-Bred International

March 16, 2005

Soybean Rust Detections in the United States



Lousiana: 11/10/04
Mississippi: 11/17/04
Florida:11/18/04
Georgia: 11/20/04
Alabama: 11/21/04
Arkansas:11/22/04
Missouri: 11/30/04

South Carolina and Tenessee: 12/01/04

Source: Fabiano Sequeiri, MT Foundation

Pioneer/DuPont Soybean Rust Tour to Brazil



All phytosanitary precautions used by each participant



Soybean in Brazil: 2003/04 growing season

Production:..... 50 millions of tons

Yield2.800 kg.ha⁻¹ (41.6 bu/acre)

Acreage:..... 21 millions ha

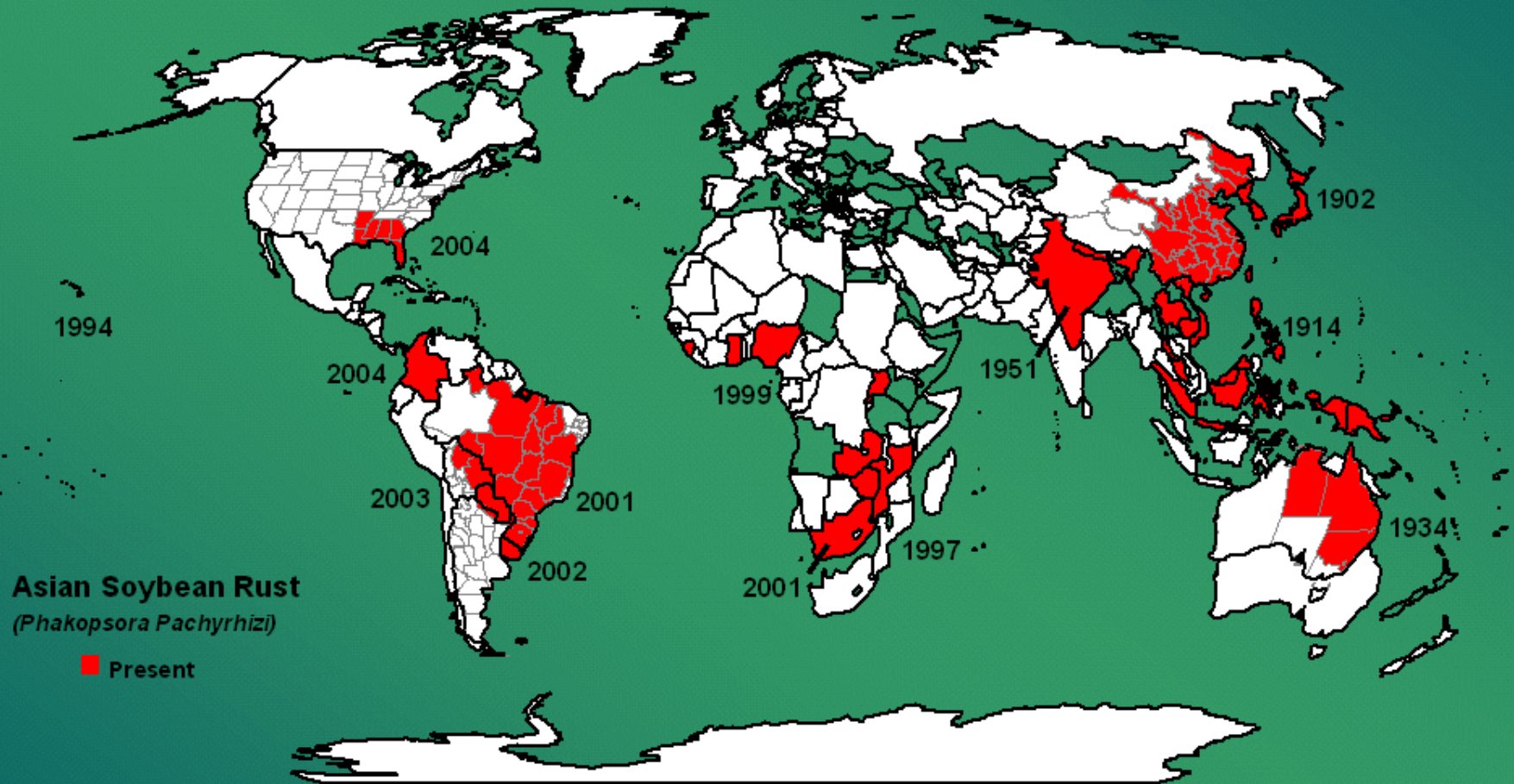
Price: US\$ 176.00/t.

Production cost:.....US\$ 270.00 /ha

Source: Conab (2004).

Soybean Rust Presence

November 29, 2004



Note: Some sources also add: Laos, Bangladesh, and Burma in Asia and Zaire, Malawi, Tanzania, Sudan, and Ethiopia in Africa, but these have not been verified.

SOURCE: APHIS, USDA

North Central Pest Management Center

Market READS

PHII Confidential

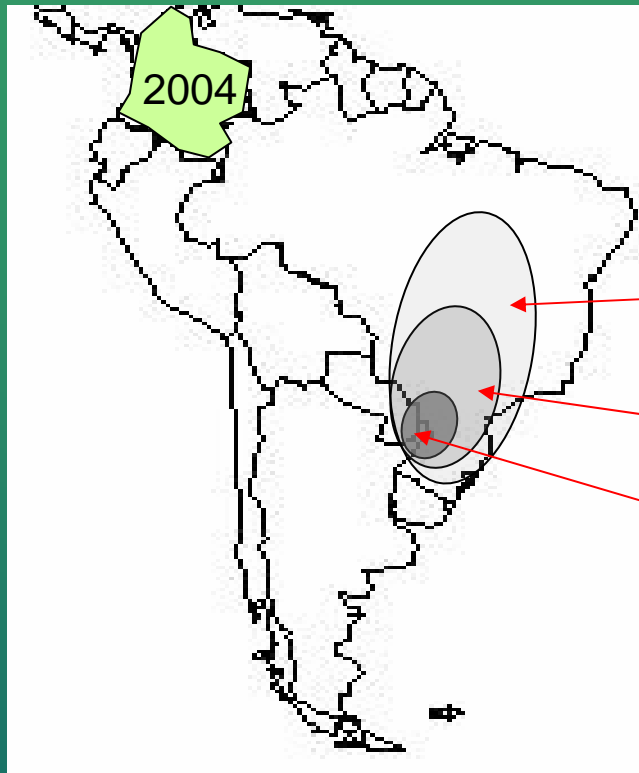
(R), TM, SM Trademarks and service marks of Pioneer Hi-Bred International, Inc. (c) 2004, PHII.

Soybean Rust WW Map_11_29_2004

November 2004

Expansion of soybean rust in South America.

Left figure shows the yearly expansion borders of the rust since it was introduced in 2001. Right figure shows the actual regions in Brazil affected by soybean rust in 2002 (red) and 2003 (green).



Land bridging
(short distance dispersal)

Brazilian Farmers' Reactions

- **The First Year = Confusion**
 - Mistrust of chemical companies and retailers
 - Lack of information
 - Lack of trained people
 - Lack of application equipment
 - Lack of sufficient products
 - Confusing recommendations
- **Management of soybean rust continues to be a learning process**
 - Limited number of years experience
 - Every year is different

Soybean Rust's Biggest Challenge

The Need for Frequent Scouting



Source: Alberto Piccinin, Agro Amazonia, Campo Verde, MT

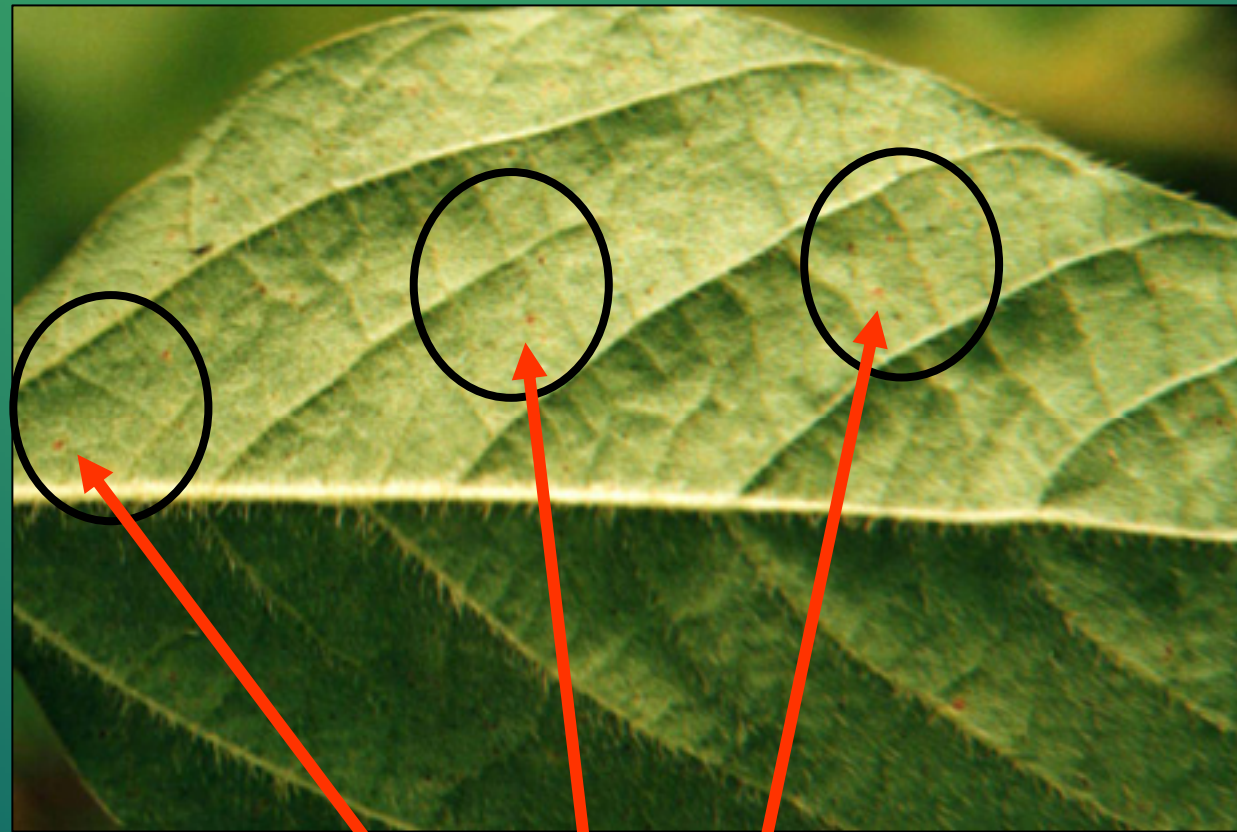
Scouting

- Start at first trifoliate leaves
- Divide fields into 100-200 ha subunits
- Sample 2-3 times per week
- 20-100 leaflets per field from the lower canopy (some recommend sampling multiple layers)
- Much patience and energy is required



Source: Fabiano Sequeiri, MT Foundation

Identifying Lesions Very Early



Initial lesions

Source: Alberto Piccinin, Agro Amazonia,
Campo Verde, MT



Dr. Verni, ISU graduate

Incubate samples

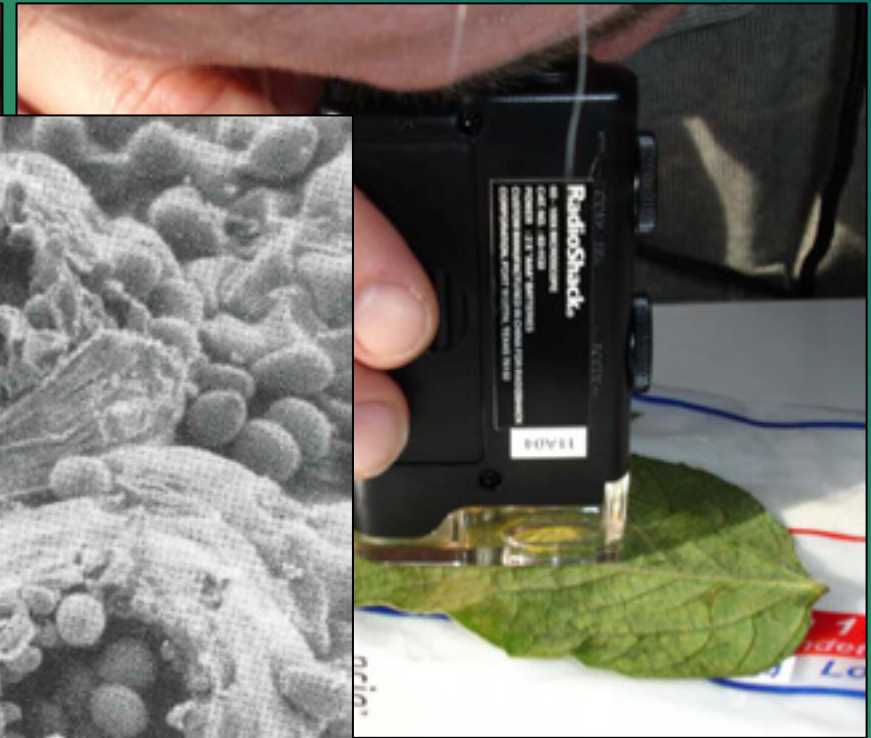
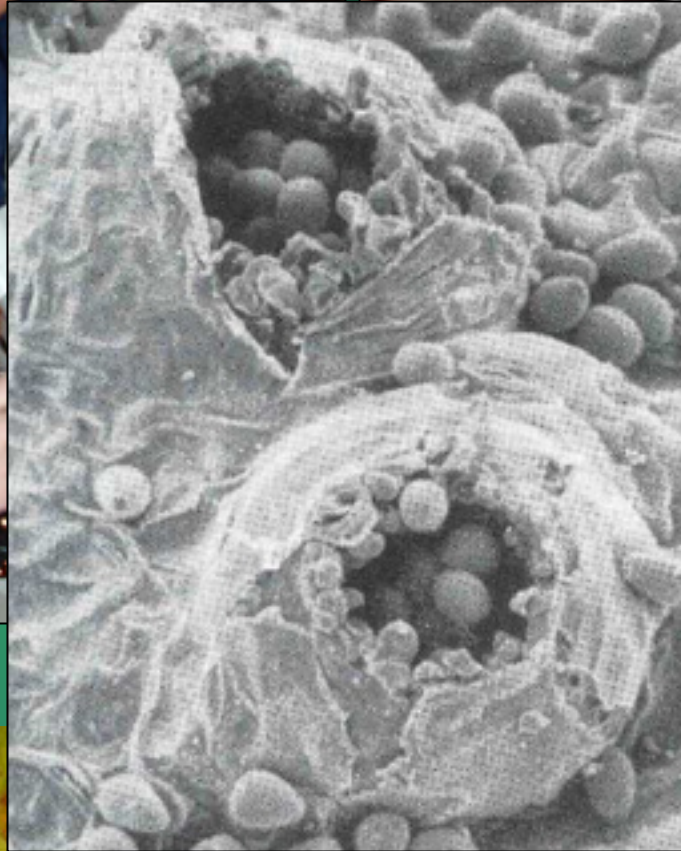


Source: Jose Tadashi Yorinori

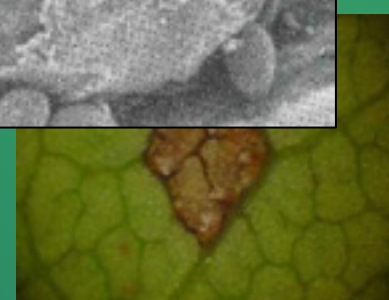
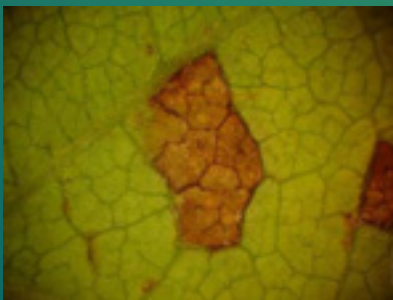
Magnification Is Essential



40-100X Stereo



d Microscope



Source: Dr. Erlei Reis, Passo Fundo University

Scouting

- Scout earliest-planted fields most aggressively
- Monitor incidence, not severity
- No good remote sensing techniques available
- Pay attention to findings in surrounding regions



Upper

Middle

Lower

Source: Fabiano Sequeri, MT Foundation

Yield Loss Expectations

- difficult to get true SXS comparisons of treated versus untreated
- yields may actually go up if rust is controlled
- 80-100% yield loss if untreated (worst-case scenario)
- cost of late spraying: 1 Sc/ha per day
- cost of missed spray: 25-40%

Comparison of the Average Yields for the 2000/01 and 2001/02 crops in Chapadão do Sul - MS, in the presence of ASR

| Grower | Farm | Sacks/ha | | % Loss |
|---------------------|---------------|-------------|-------------|-------------|
| | | 2000/01 | 2001/02 | |
| Armando Bianchessi | Bianchessi | 58 | 50 | -13,8 |
| Claudio Andrigueto | São Francisco | 54 | 47 | -13,0 |
| Ademar Nunes | Kefe | 53 | 44 | -17,0 |
| Rodolfo Schlatter | Perdiz | 53 | 48 | -9,4 |
| Valdir dos Santos | Carazinho | 52 | 44 | -15,4 |
| Claudio Bragante | Santa Olinda | 52 | 42 | -19,2 |
| Kasper | Chapadão | 52 | 40 | -23,1 |
| Günter Dush | Estiva | 49 | 40 | -18,4 |
| Fábio Sponchiado | Sponchiado | 49 | 42 | -14,3 |
| José Pompilho | Zeca Silva | 49 | 30 | -38,8 |
| Ivo de Oliveira Jr. | Chapada | 48 | 29 | -39,6 |
| Júlio Krug | Gávea | 48 | 28 | -41,7 |
| Honório Hatte | Vó Fifina | 48 | 32 | -33,3 |
| Airton Petennan | Campo Bom | 48 | 20 | -58,3 |
| Hugo Liber Lopes | São Roque | 47 | 42 | -10,6 |
| Fonte: Média | | 50,6 | 38,5 | 24,4 |

Fungicide Resistance



- no confirmed resistance in Brazil after 4 years
- no one recommends more than 2 applications of the leading fungicide per year
- some growers think they may be seeing resistance. Why? need for more sprays and/or higher rates of fungicides
- may be seeing a new, more aggressive strain of ASR
- the IRM strategies that chemical companies promote depend on the products they sell

Rust Management Strategies

- **The foundation for a rust management program is based upon three “pillars”**
 - **Correct fungicide application timing**
 - dependent on scouting and identification
 - **Product efficacy**
 - **Application quality**
- **All of the “pillars” are equally important**

Fungicide Application Principles

- **The first applications are the most important.**



Cost of One Missed Spray

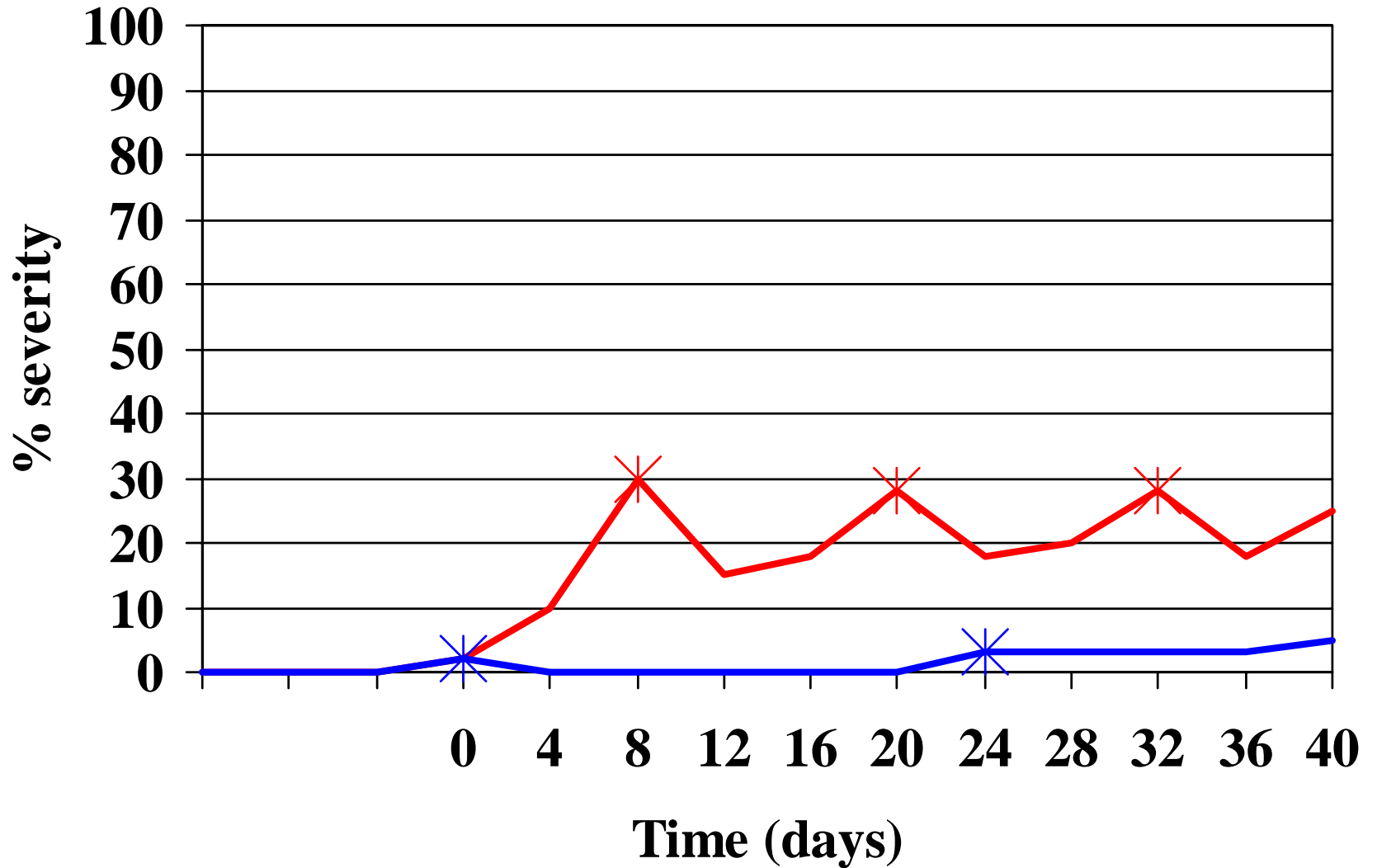
Defoliation of Lower Canopy

Poor Pod Set



Estimated Yield Loss = 25-40%

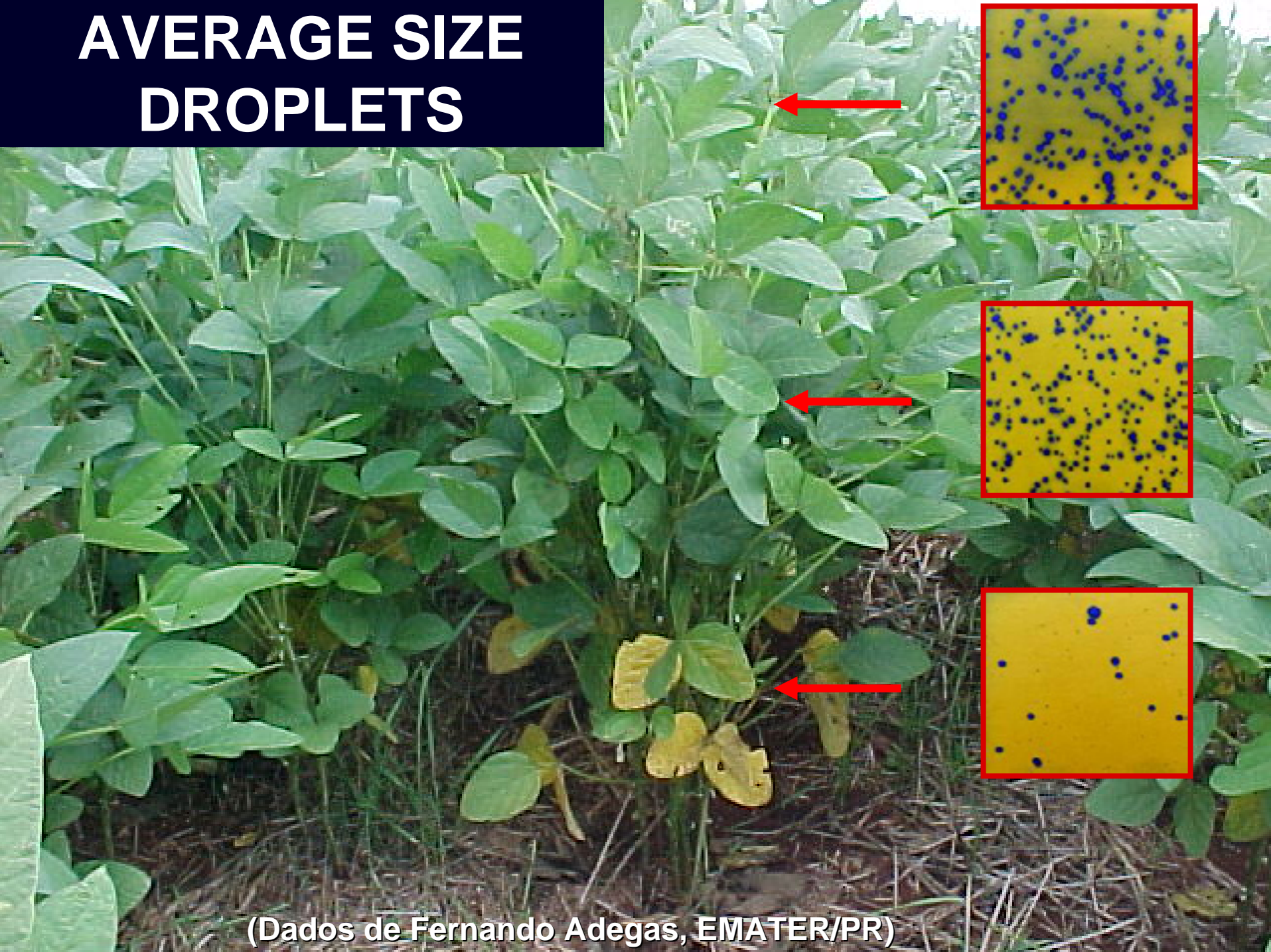
Effect of Timing on Application Frequency



Fungicide Application Principles

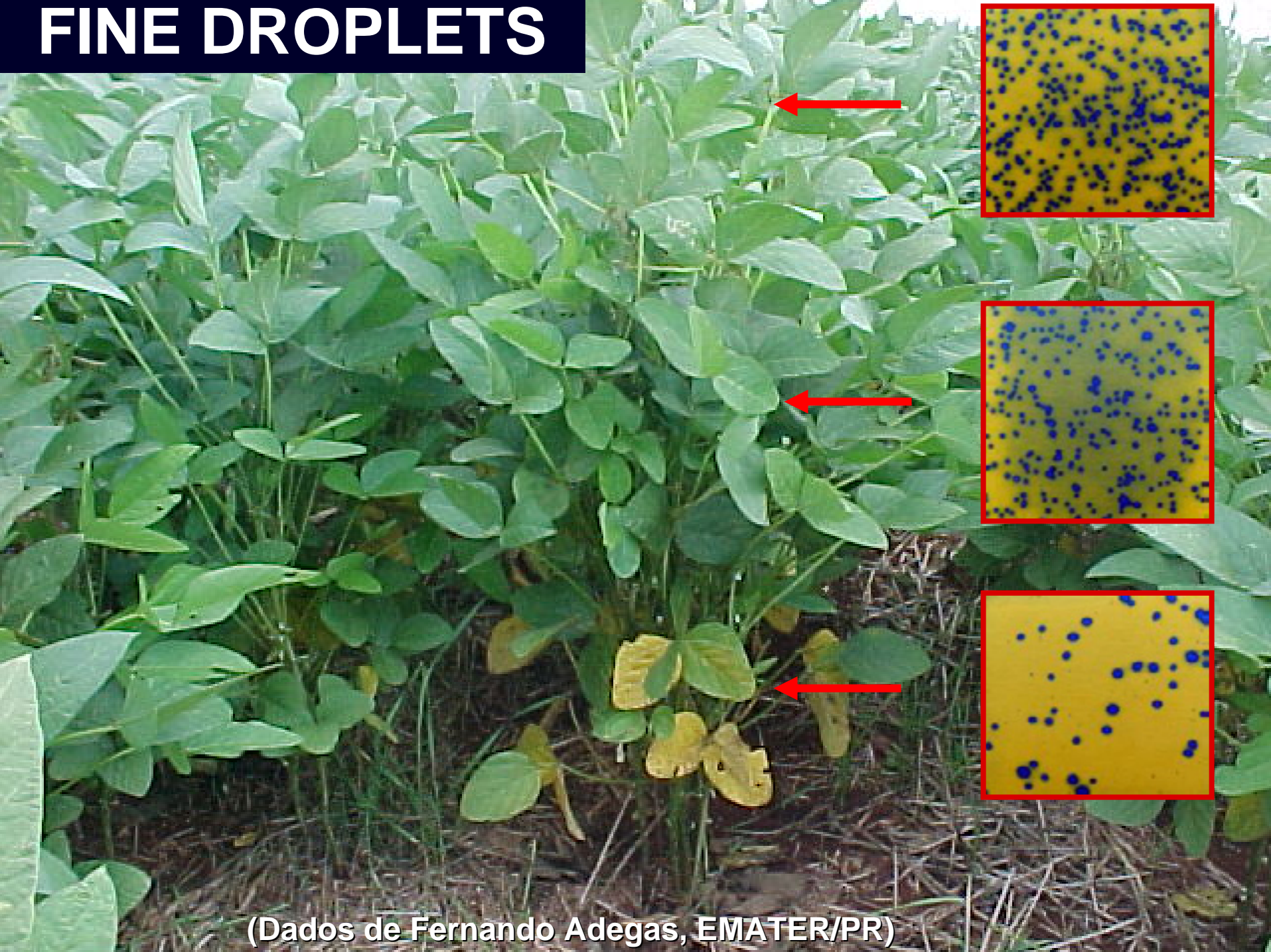
- The first applications are the most important.
- Since rust starts in the lower part of the canopy, it is essential that the spray reach that target area.

AVERAGE SIZE DROPLETS



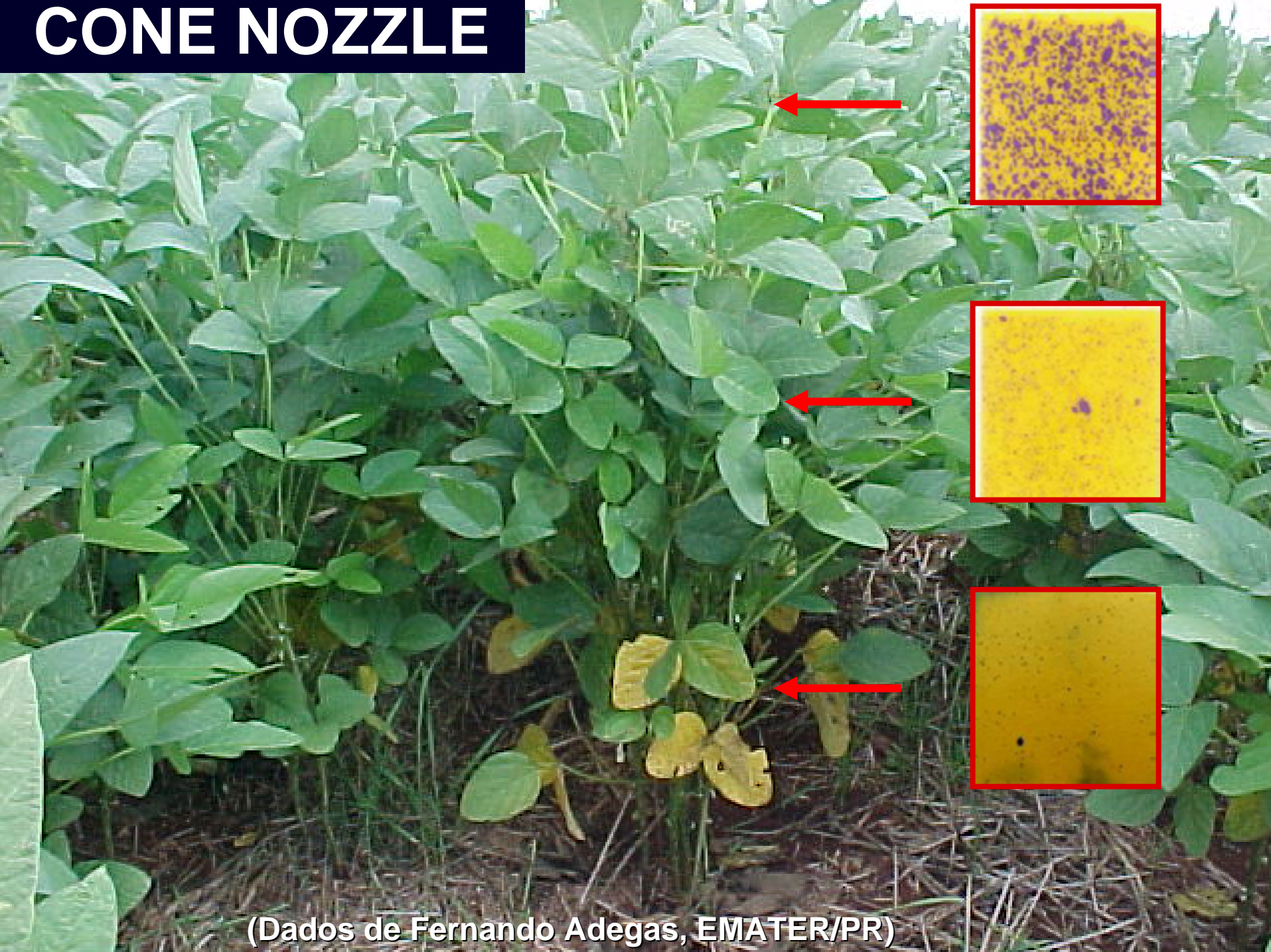
(Dados de Fernando Adegas, EMATER/PR)

FINE DROPLETS



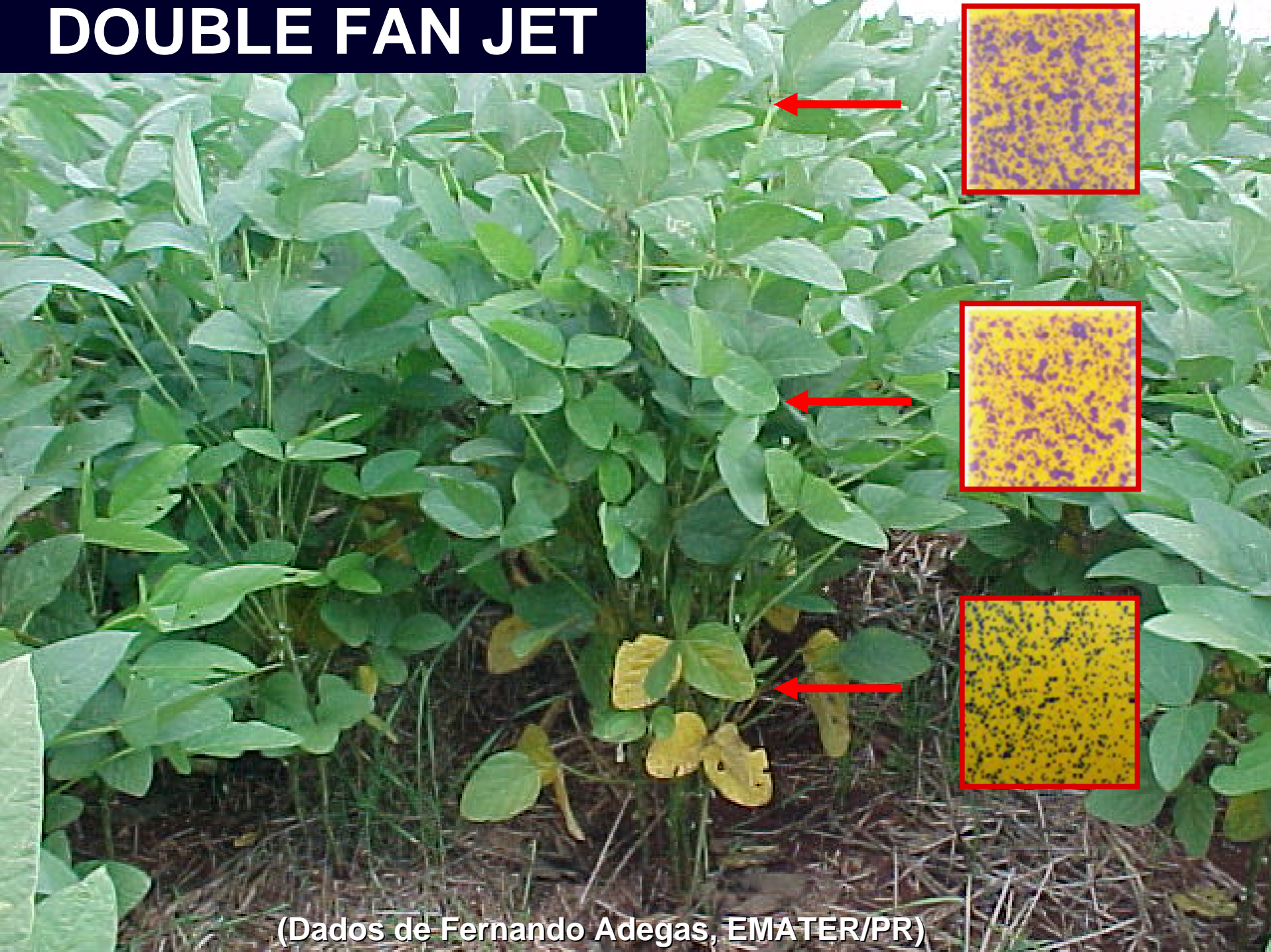
(Dados de Fernando Adegas, EMATER/PR)

CONE NOZZLE



(Dados de Fernando Adegas, EMATER/PR)

DOUBLE FAN JET



(Dados de Fernando Adegas, EMATER/PR)

Fungicide Application Principles

- The first applications are the most important.
- Since the rust starts in the lower part of the canopy, it is essential that the spray reach that target area.
- Coverage is key.





Fungicide Application Principles

- **Application Methods:**
 - Predominantly ground applied
 - Aerial applied is perceived to be just as effective.
- **Application Volumes:**
 - 15-30 GPA by ground
 - 4-5 GPA by air
 - Some ultra-low volume applications

Fungicide Application Principles

- **Nozzle Types:**
 - Conical or double flat fan
- **Adjuvants:**
 - As recommended
- **Avoid applications when:**
 - The temperature is $>30^{\circ}\text{C}$ (86°F)
 - The relative humidity is $<50\%$
 - Days that are calm or with high winds.

Fungicide Choices in Brazil

- **Triazoles**
 - Comprise most of the fungicide market
 - Are both preventative and curative
- **Strobilurins**
 - Preventative only
 - Mostly applied in combination with triazoles
- **Chloronitriles**
 - Preventative only
 - Small portion of the market

Using Cultural Practices to Manage Soybean Rust

- eliminate alternate hosts, such as volunteer SB
- adhere to the planting window for your area
- avoid a prolonged planting season
- very few are changing row width, variety, population
- use up to 20% earlier-maturing varieties
- no resistant varieties yet on market
- no effect of tillage (not residue-borne)
- worse with over-head irrigation
- rotate fungicides if more than one application needed

Brazil vs. USA: Other Considerations

- **Different climatic conditions**
 - Brazil is a more tropical environment which may be more suitable for rust
- **Overwintering of inoculum**
 - Inoculum may be present year-round in Brazil
- **Fungicide performance**
 - No data under U.S. conditions
- **Soybean Growth Habits**
 - Determinate soybeans in Brazil (7 to 9 RM)

Muito Obrigado!





QUESTIONS?

Source: Dr. Erlei Reis, Passo Fundo University
Juliano Stella

