Does Soybean Genetics Affect Soybean Aphid/Virus Management?

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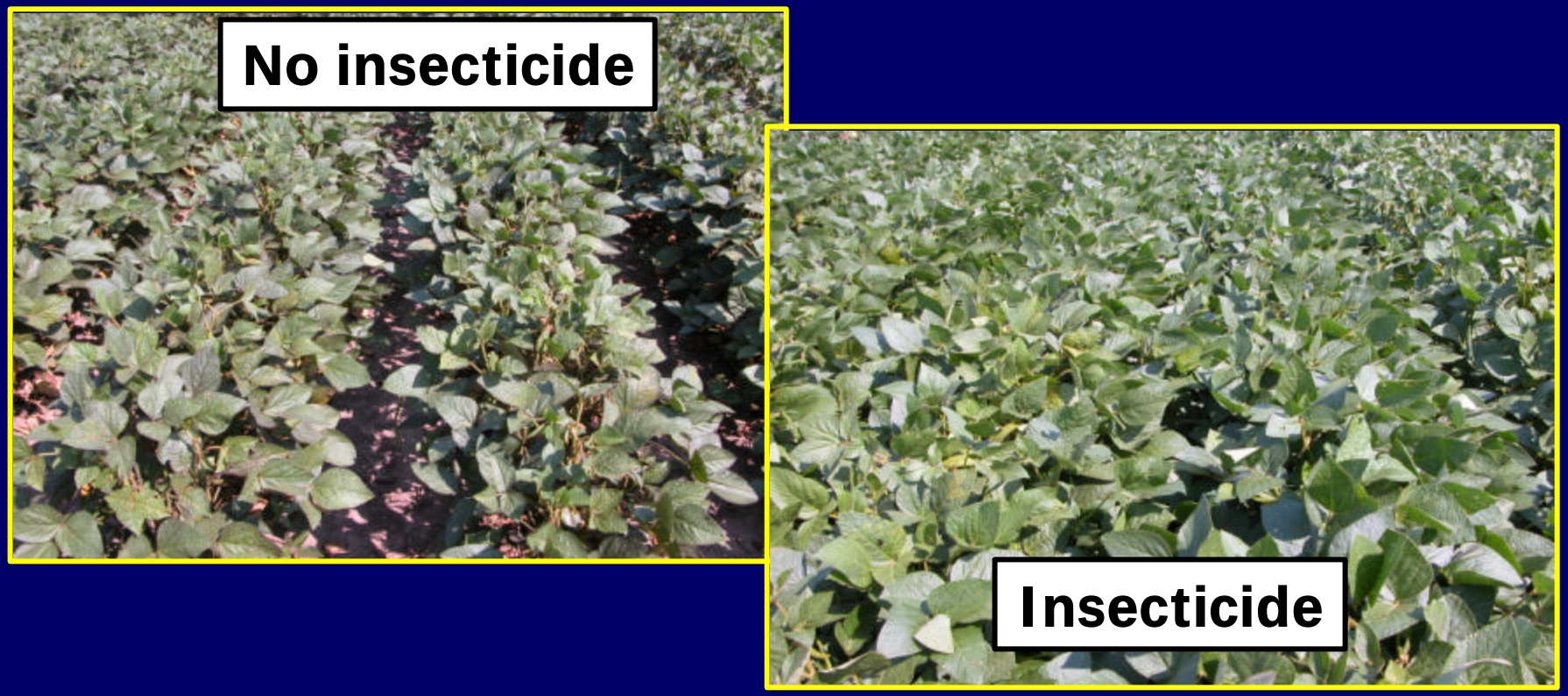
Yield Response to Insecticides
0-20 bu/a



Yield response

Proportion due to direct aphid control??

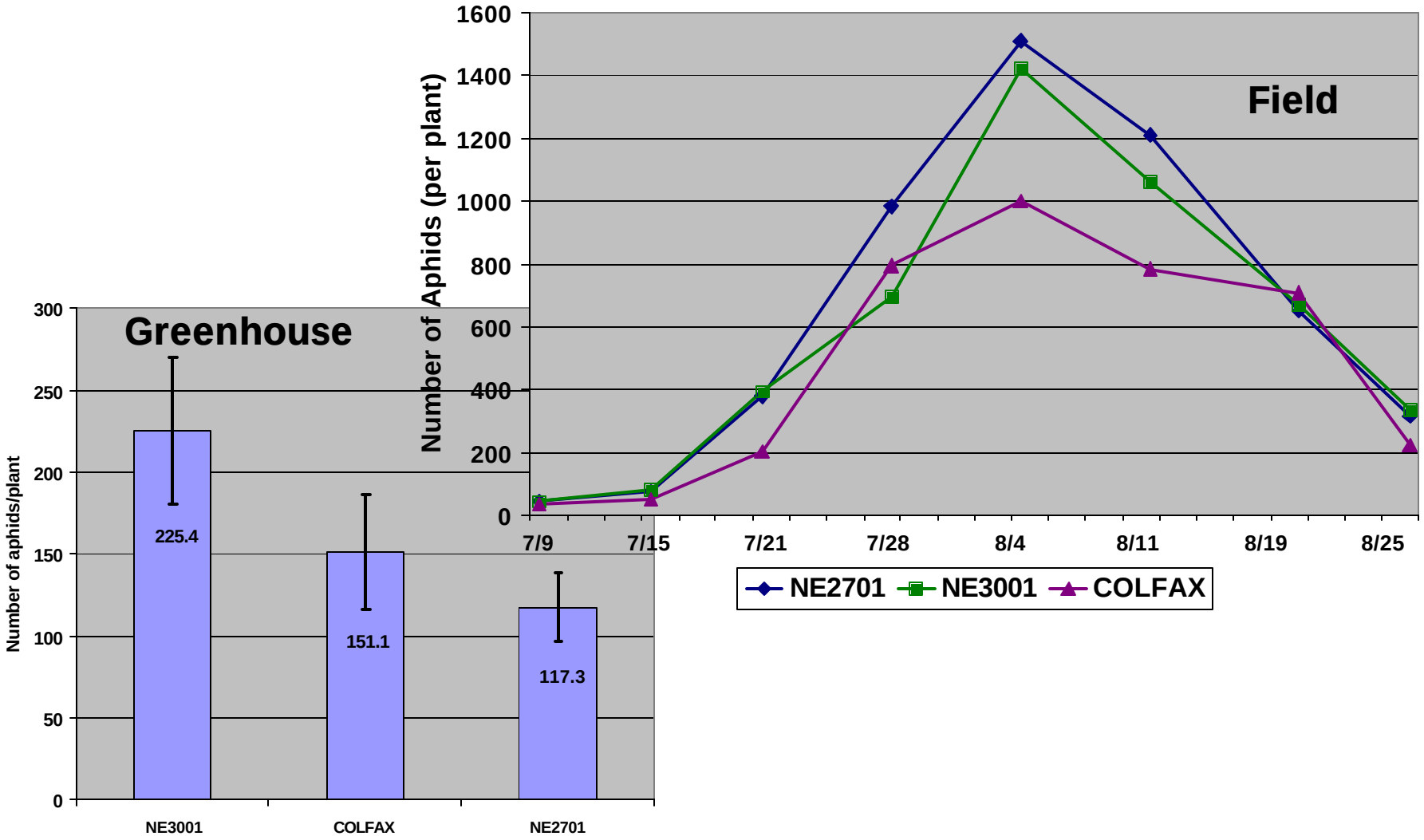
Proportion due reduced virus transmission??

Do Soybean Varieties Differ in Response to the Soybean Aphid?

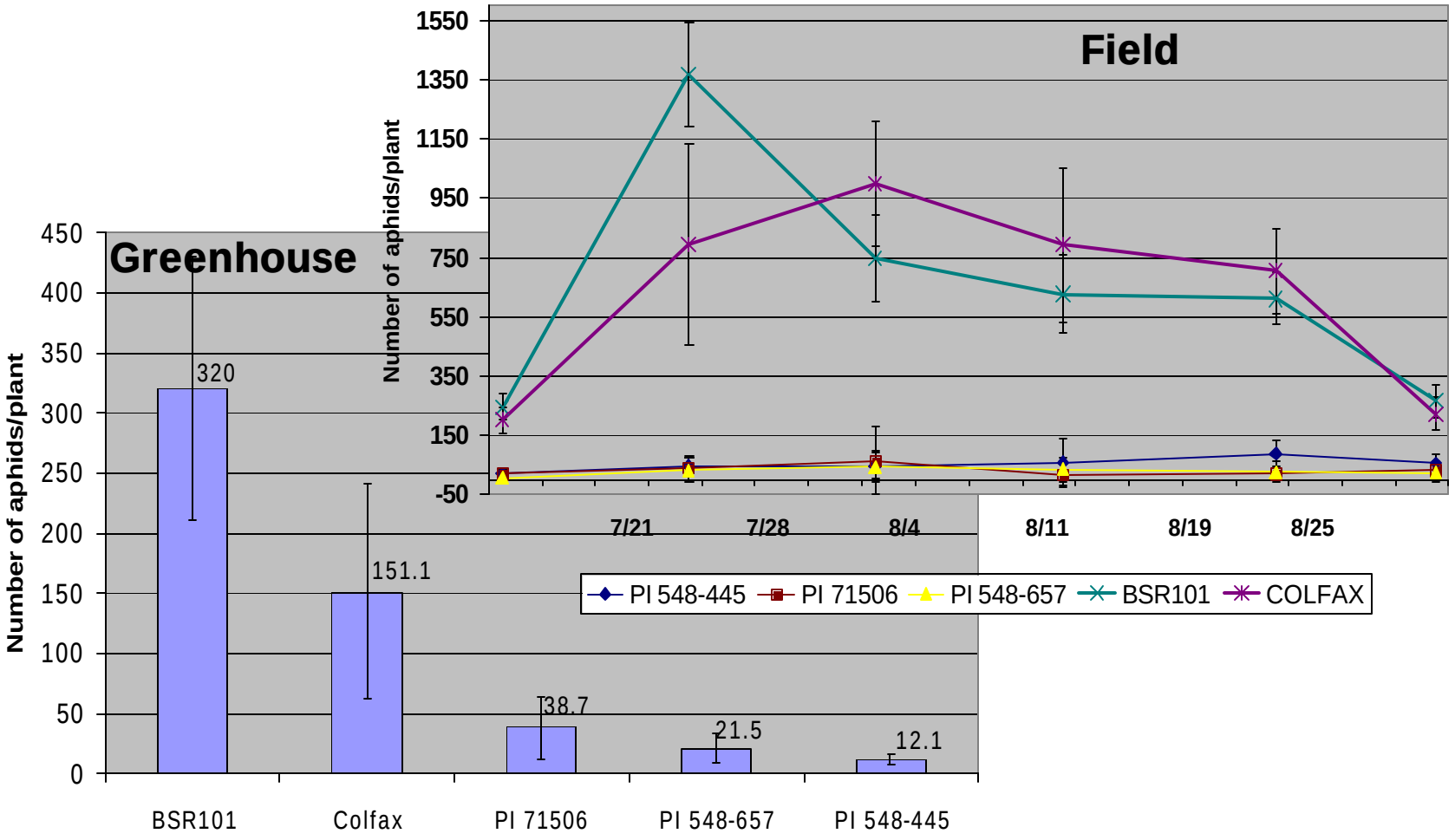
Plant Responses to Insects

- **Susceptible**
  - Support high insect reproduction
  - Severe feeding damage
- **Resistance**
- Antibiosis
  - Support none to low insect reproduction
  - Chemical toxicity
- Antixenosis (nonpreference)
  - Low numbers of insects per plant
  - Not attracted to, or avoid plant
- Tolerance
  - May have high numbers of insects per plant
  - Vegetative growth and yield less compromised

Response of Soybean Varieties to the Soybean Aphid in Greenhouse and Field Environments

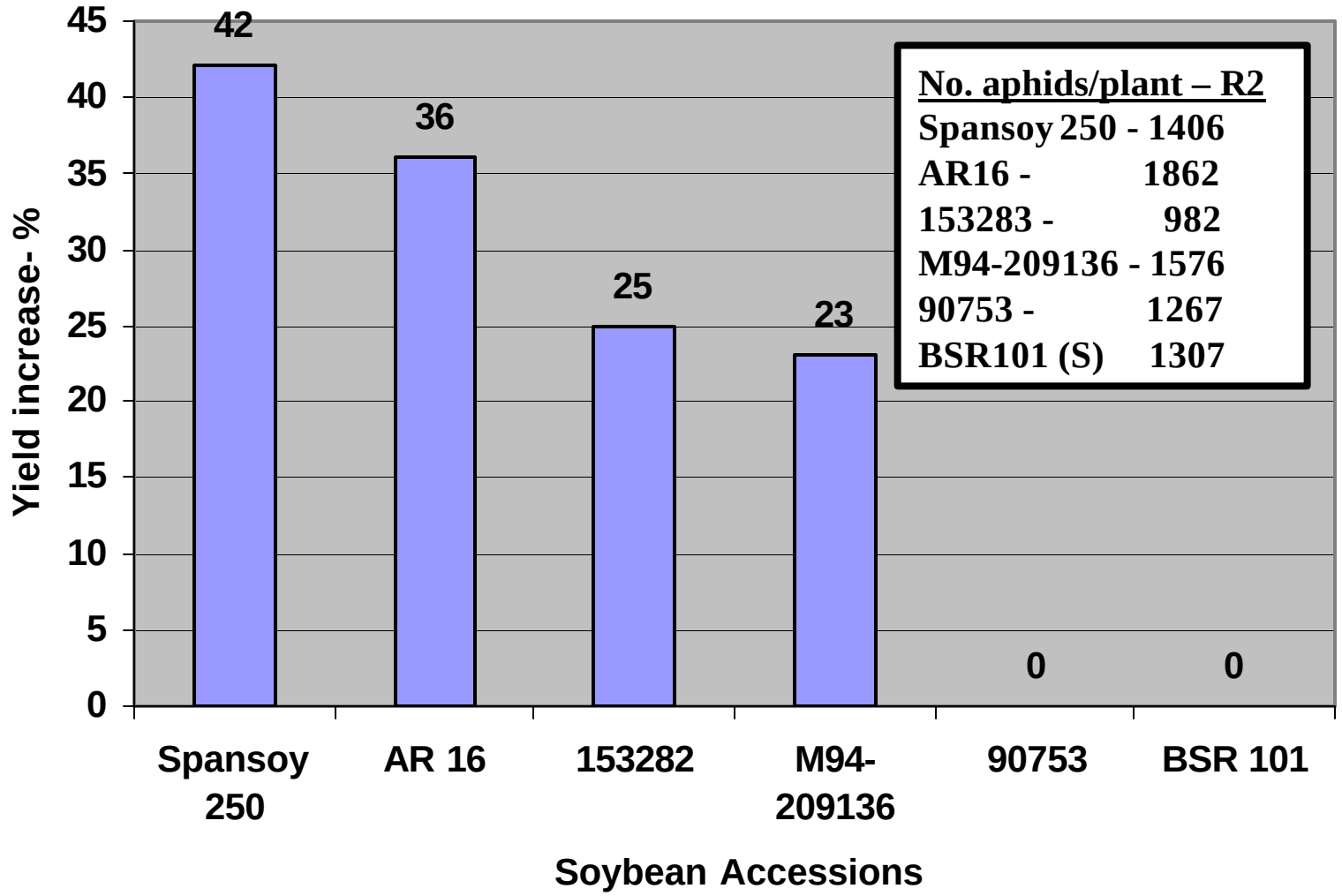


Response of Soybean Accessions to the Soybean Aphid in Biotron and Field



Soybean Lines Differ in Yield Response to Insecticides

Tolerant Soybean Lines



Arlington Ag. Research Station - 2003

Summary of Soybean Genetics and Soybean Aphid

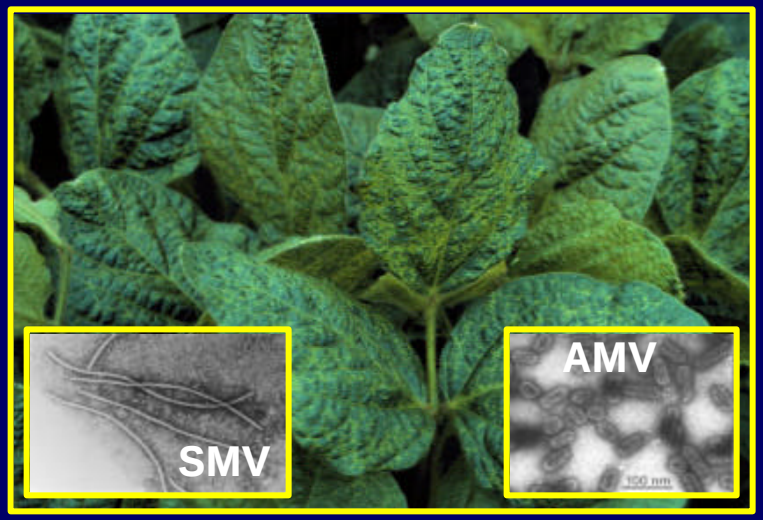
- High level of resistance discovered
  - Varieties adapted to Southern USA
  - Not found in Northern soybean germplasm
- Less susceptible varieties identified
- Tolerant varieties identified; not responsive to insecticides
- No yield response to insecticide may be related to soybean variety

Major Public and Private Soybean Breeding Programs are Attempting to Develop Varieties Resistant to the Soybean Aphid

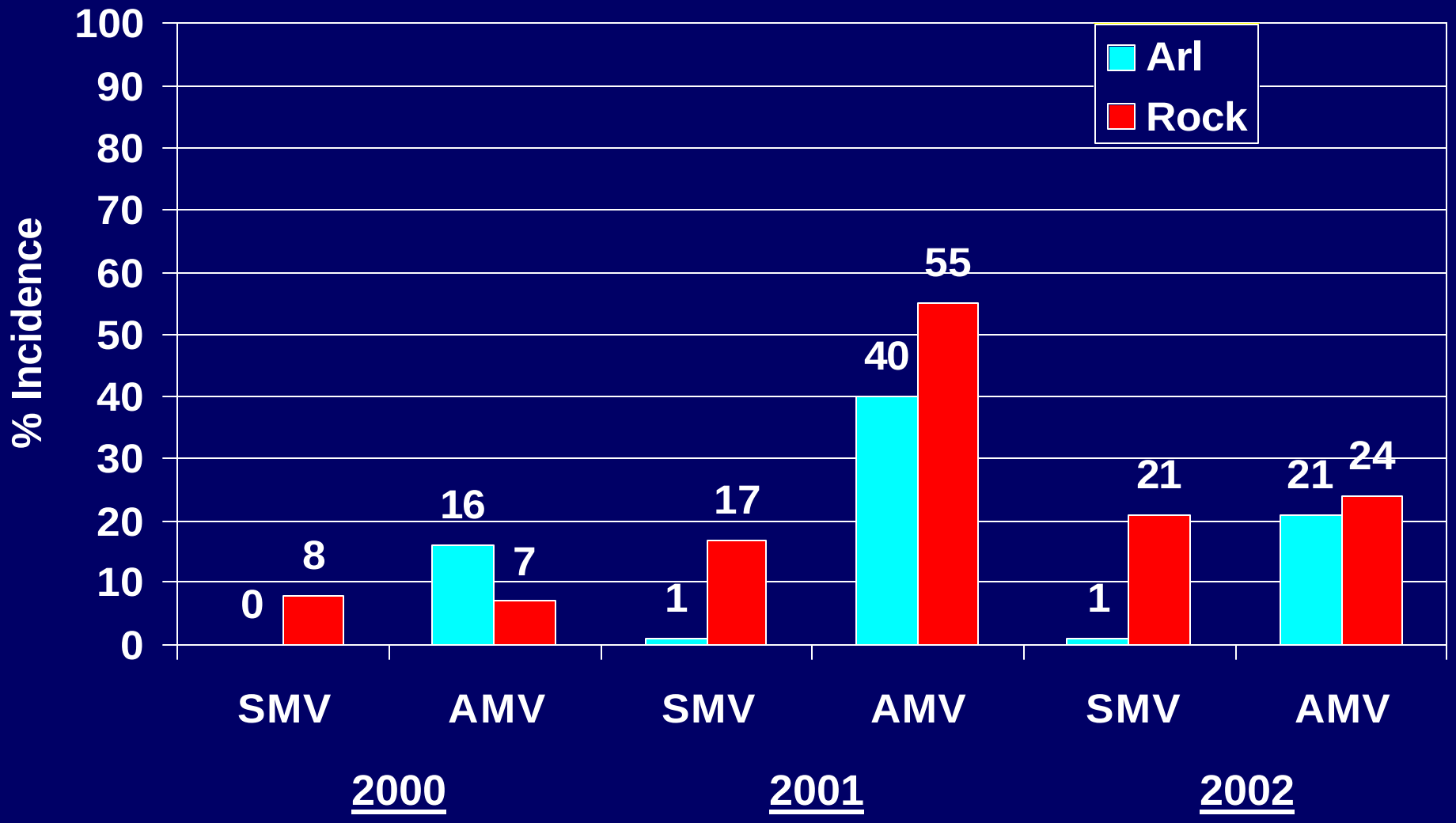
Experimental Line

Experimental Line

Soybean Aphid and Transmitted Viruses
Soybean mosaic virus, *Alfalfa mosaic virus*



Incidence of *Soybean mosaic virus* and *Alfalfa mosaic virus* by Location and Year



Control of Soybean Viruses

- Genetic resistance to viruses
  - Few varieties available; high resistance
  - Tolerant varieties likely exist
- Control virus transmitting aphids
  - By insecticides?
  - By genetic resistance to aphids?

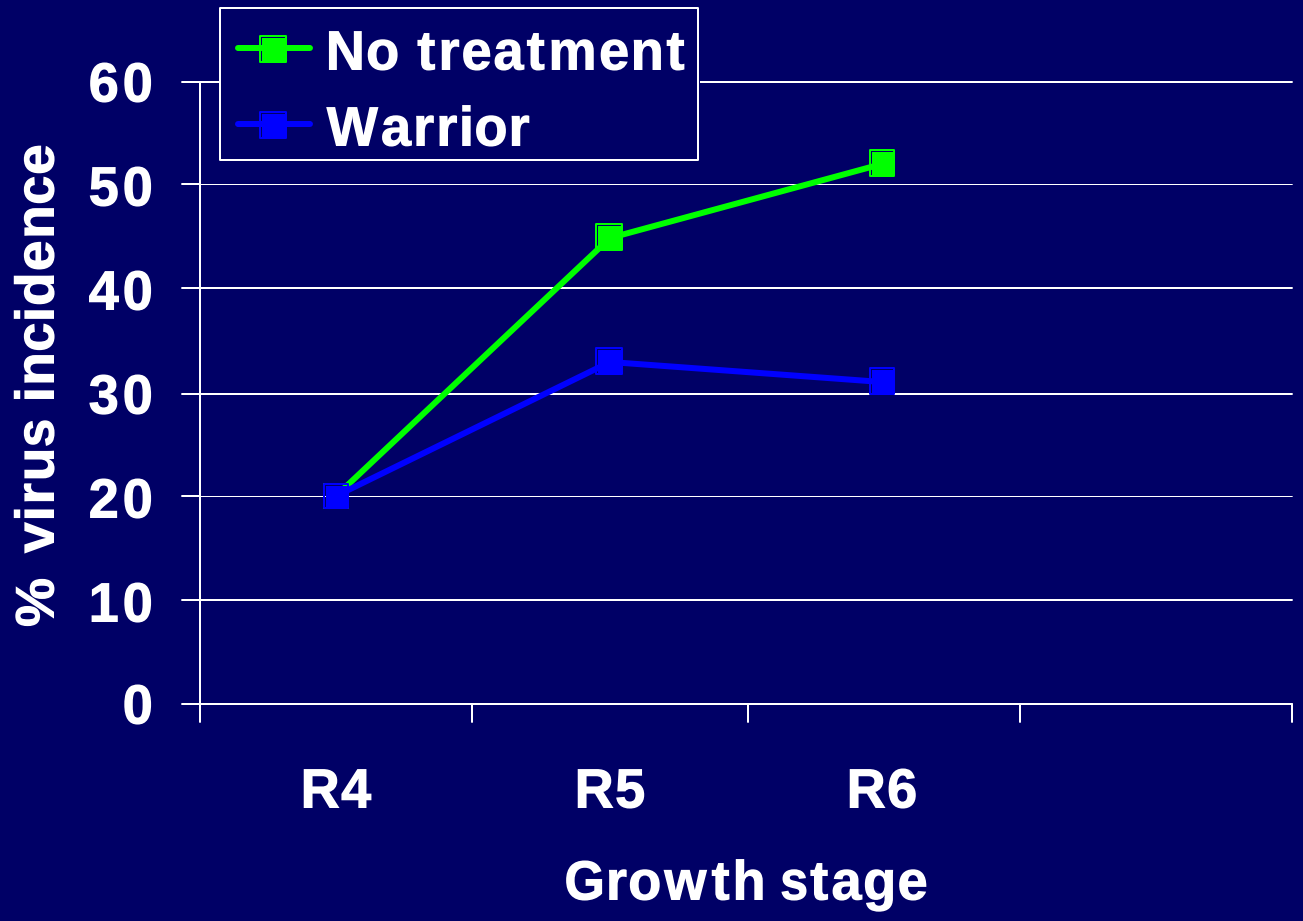
Performance of Soybean Varieties in the Presence of Soybean Aphids and Viruses Wisconsin - 2003

Variety	Yield Bu/a	Symptom Severity %	Seed Mottle %
Colfax (R)	60.0	5	2
NE3001 (R)	49.9	5	8
IA2008R (S)	37.2	40	65
LSD p=10%	8	27	24

R = resistant; S = Susceptible to *Soybean mosaic virus*

Insecticides and SMV Transmission 2002: Low Aphid Populations

Yield: insecticide 54.4 bu/a
no insecticide 47.9 bu/a



Does Soybean Aphid Density Associated with Varieties Relate to Virus Transmission?

Susceptible to soybean aphid
Greater virus infection??

Partial resistance to soybean aphid
Less virus infection??

Performance of Soybean Lines in the Presence of Soybean Aphids and Viruses

UW-Line	Aphid Rating 0-5	Virus Severity %	Seed Mottle %
W02-176	1	2	1
W02-552	1.5	75	65
W02-152	4.5	65	60
W02-120	5	10	80

Aphid Rating: 0 = no aphids; 3 = moderate aphids; 5 = high aphids and symptoms

Summary of Soybean Virus Control

- Genetic resistance to viruses most effective
- Control of soybean aphid
  - Insecticides slow virus epidemics if aphid populations are low
  - Soybean lines; aphid population densities not consistently related to virus infection
    - High aphid; high virus
    - Low aphid; both high and low virus symptoms
    - Possible to select low aphid and low virus lines
      - Must be co-selected

Conclusions

- Soybean lines differ in response to soybean aphid
  - Reproduction and symptoms (resistance)
  - Yield response to insecticides (tolerance)
  - Commercial varieties to be evaluated

- Soybean lines differ in response to viruses transmitted by soybean aphid (resistance to virus)
  - Incidence of infected plants
  - Symptoms caused by viruses
    - Leaves
    - Mottled seed

Aphid Density Associated with Soybean Lines not Consistently Related to Virus Symptoms

Susceptible to aphid
Usually severe virus

Partial Resistance to aphid
High and low virus severity

Soybean response to viruses

- Virus resistance genes most effective
- Less consistent virus control associated with aphid population densities
- Breeding issues

Conclusions

- **No yield response to insecticide**
  - **may be related to aphid tolerant soybean variety**
  - **high incidence of virus infection negating benefit of aphid control by insecticides**

Research Funding

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- College of Agriculture & Life Sciences UW-Madison