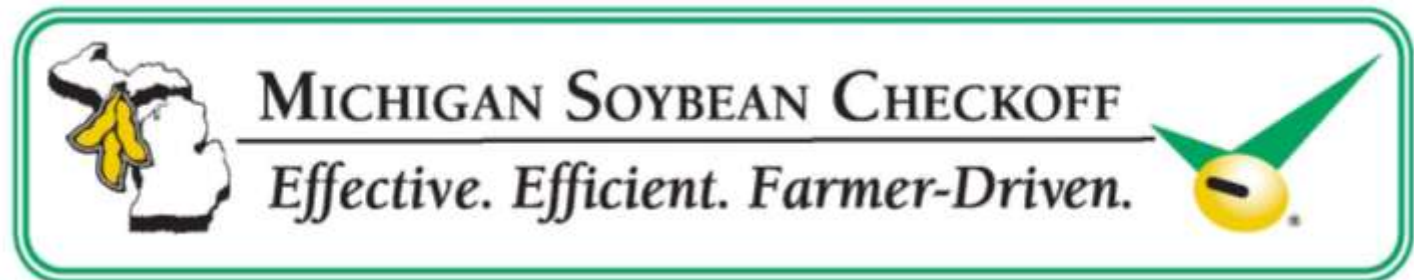


Resistance is not Futile: SBA Host Plant Resistance

Chris DiFonzo
Michigan State University

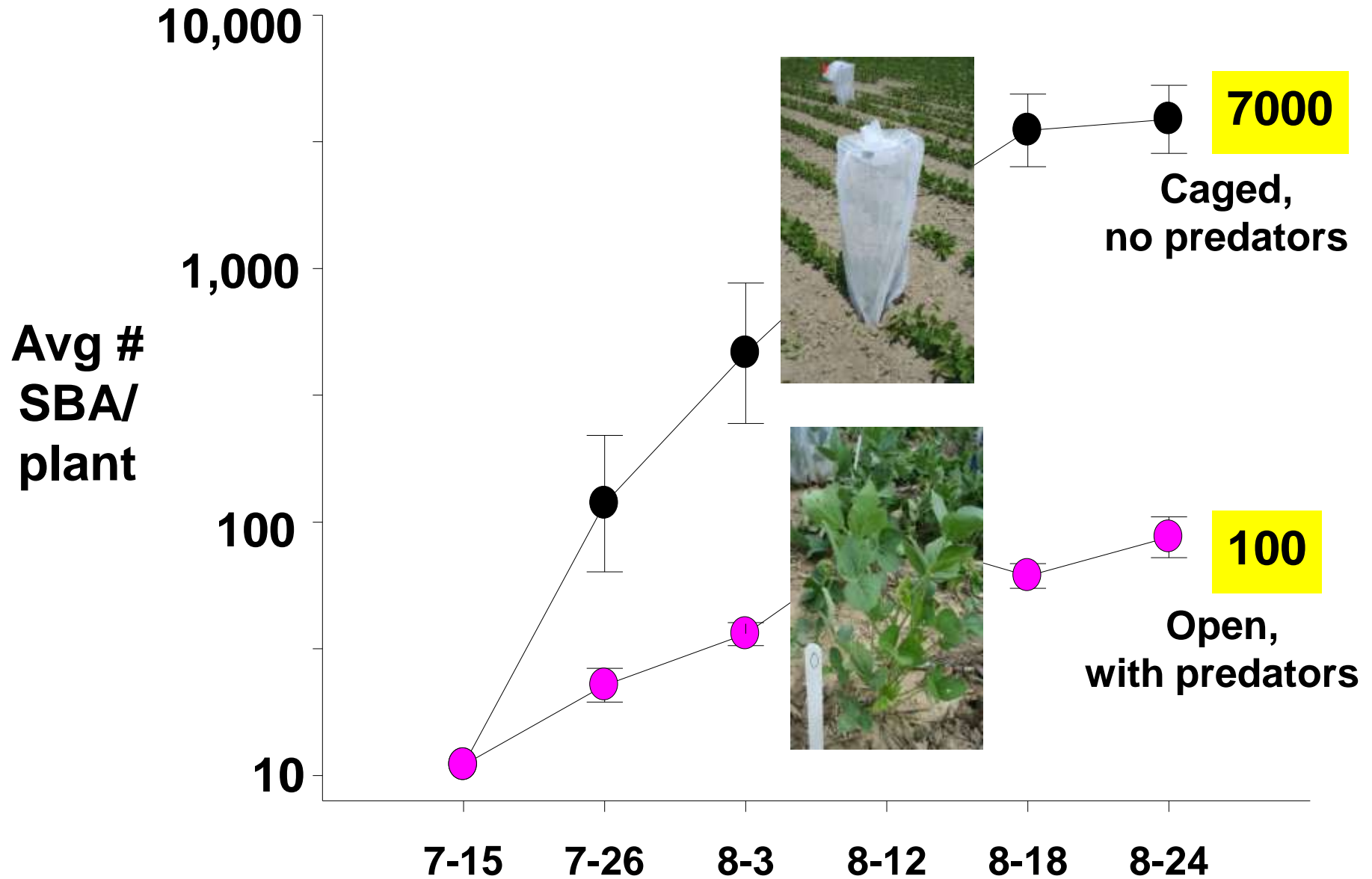


SBA Impact – yield loss, quality reduction, virus

- plant height
- leaf drop
- # nodes
- # pods
- # beans/pod
- quality



Natural Enemies reduce SBA Population Growth



Data from K. Tilmon, South Dakota State Univ., 2005

SBA management during outbreaks

Focused on insecticides

- scouting techniques
- threshold (250 SBA/plant)
- improved application technology
- foliar & seed treatments



Impact of SBA on insecticide use

NASS Pesticide Survey Data

	IL	IN	MI	MN	OH
1999	< 1%	0%	0%	0%	<1%
2005	9%	18%	42%	30%	18%



Obvious Impacts:

- increased production cost
- human/ env. exposure
- food residue
- 'insurance' applications
- potential for resistance

Other impacts of spraying for SBA

Secondary pest outbreaks



Disruption of Biocontrol



Insecticides if over Threshold

the
SBA IPM
Triangle

Host Plant
Resistance

Biological
Control



Gene

From

Source

Rag

Univ IL/USDA,

Jackson

Rag1

2004

Dowling



- Rag = **R**esistance to **A**phis **G**lycines
- single gene, antibiosis resistance
- Capital 'R' = dominant gene



Rag1 in action

From D. Ragsdale, Univ of Minnesota

<u>Gene</u>	<u>From</u>	<u>Source</u>
<i>Rag</i>	Univ IL	Jackson
<i>Rag1</i>		Dowling
<i>Rag2</i>	OSU, 2008	PI243540

- Another source of antibiotic resistance

<u>Gene</u>	<u>From</u>	<u>Source</u>
<i>Rag</i>	Univ IL	Jackson
<i>Rag1</i>		Dowling
<i>Rag2</i>	OSU	PI243540
<i>rag3/rag1b</i>	MSU, 2005	PI567598B
<i>rag4/rag1c</i>		PI567541B

- multigene antibiosis resistance
- small 'r' = recessive genes

rag3/rag1b in action



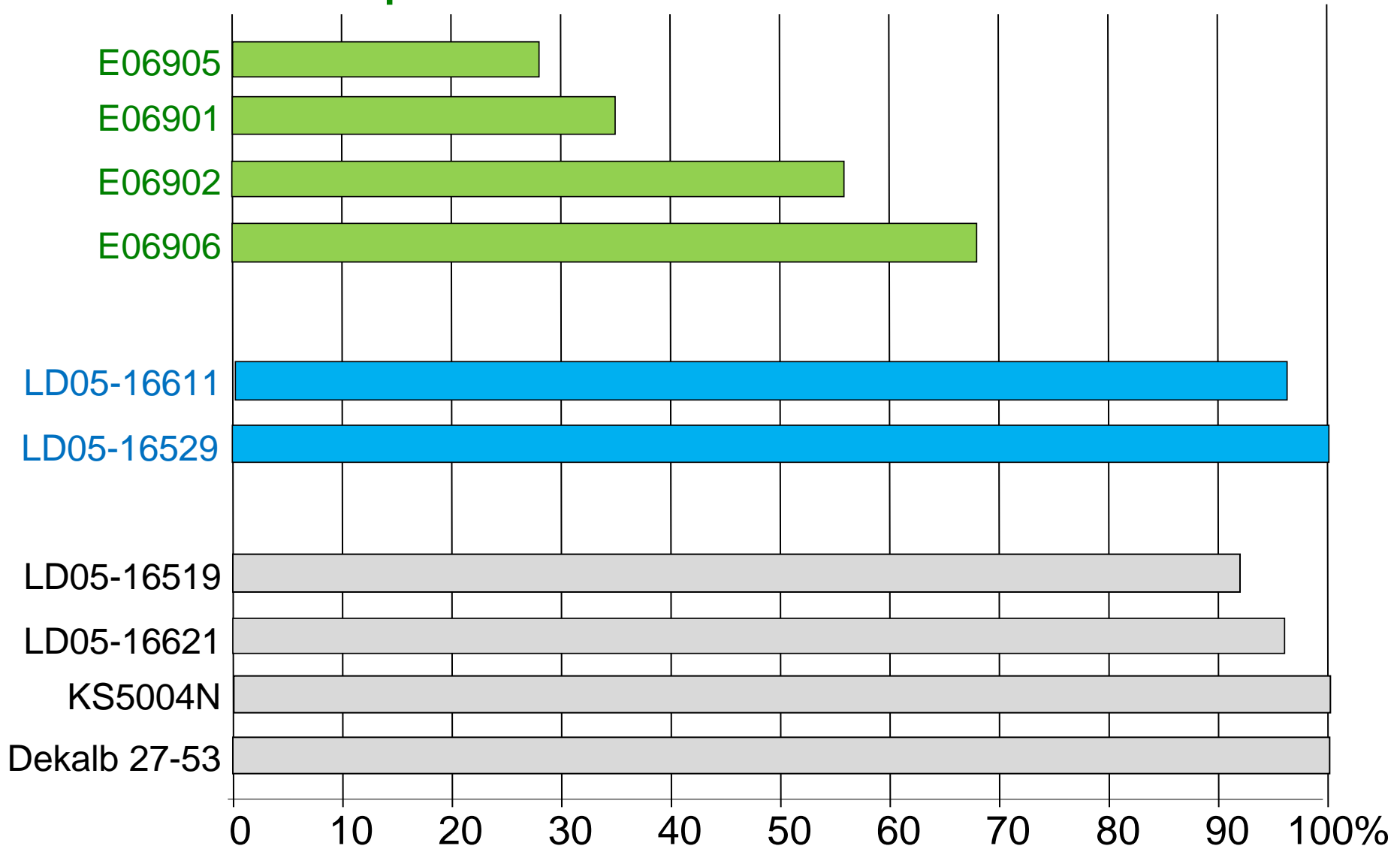
Aphid-susceptible



Aphid-resistant

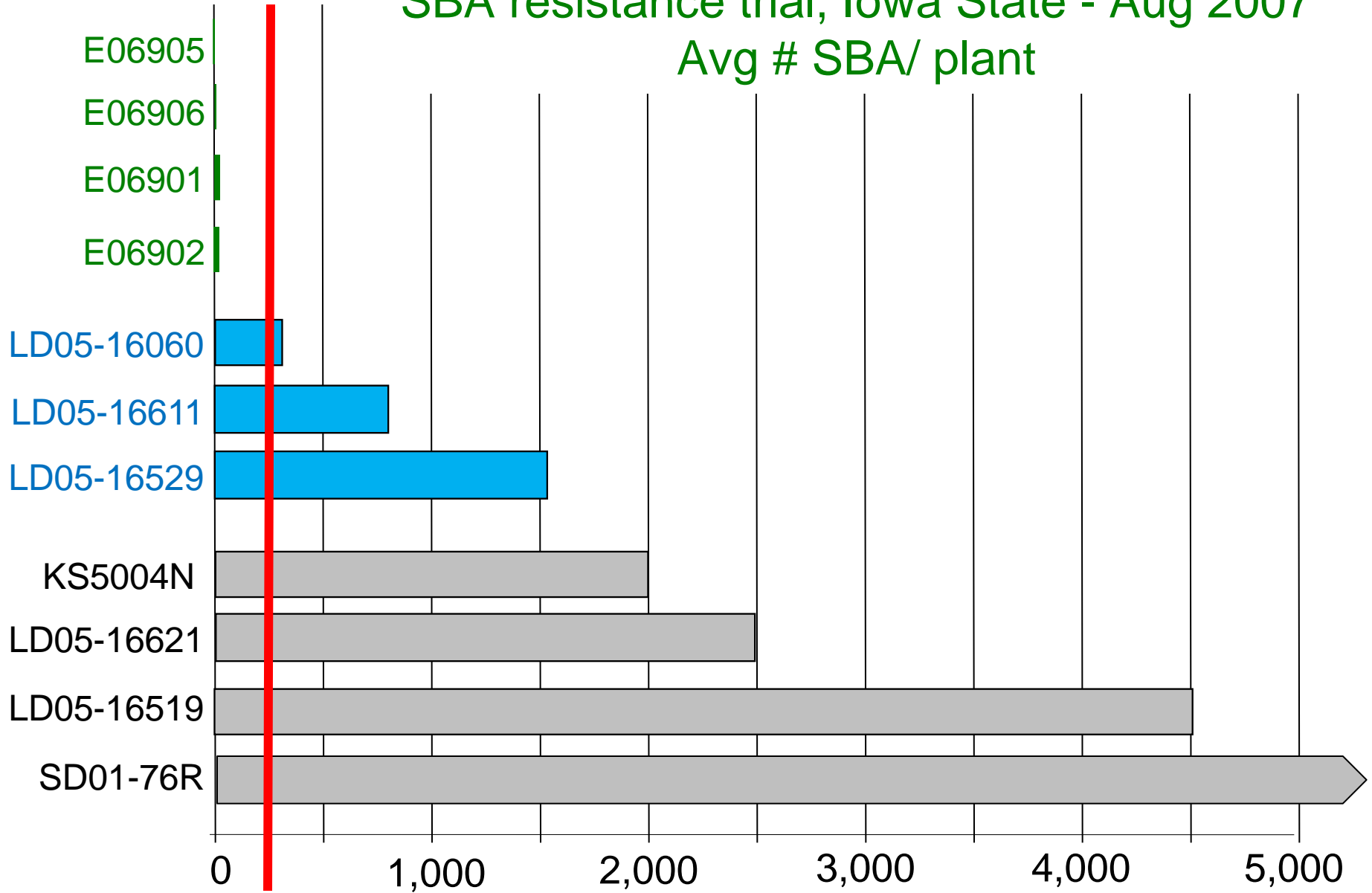
SBA resistance trial, East Lansing, MI - Aug 2007

% plants infested - under low SBA numbers



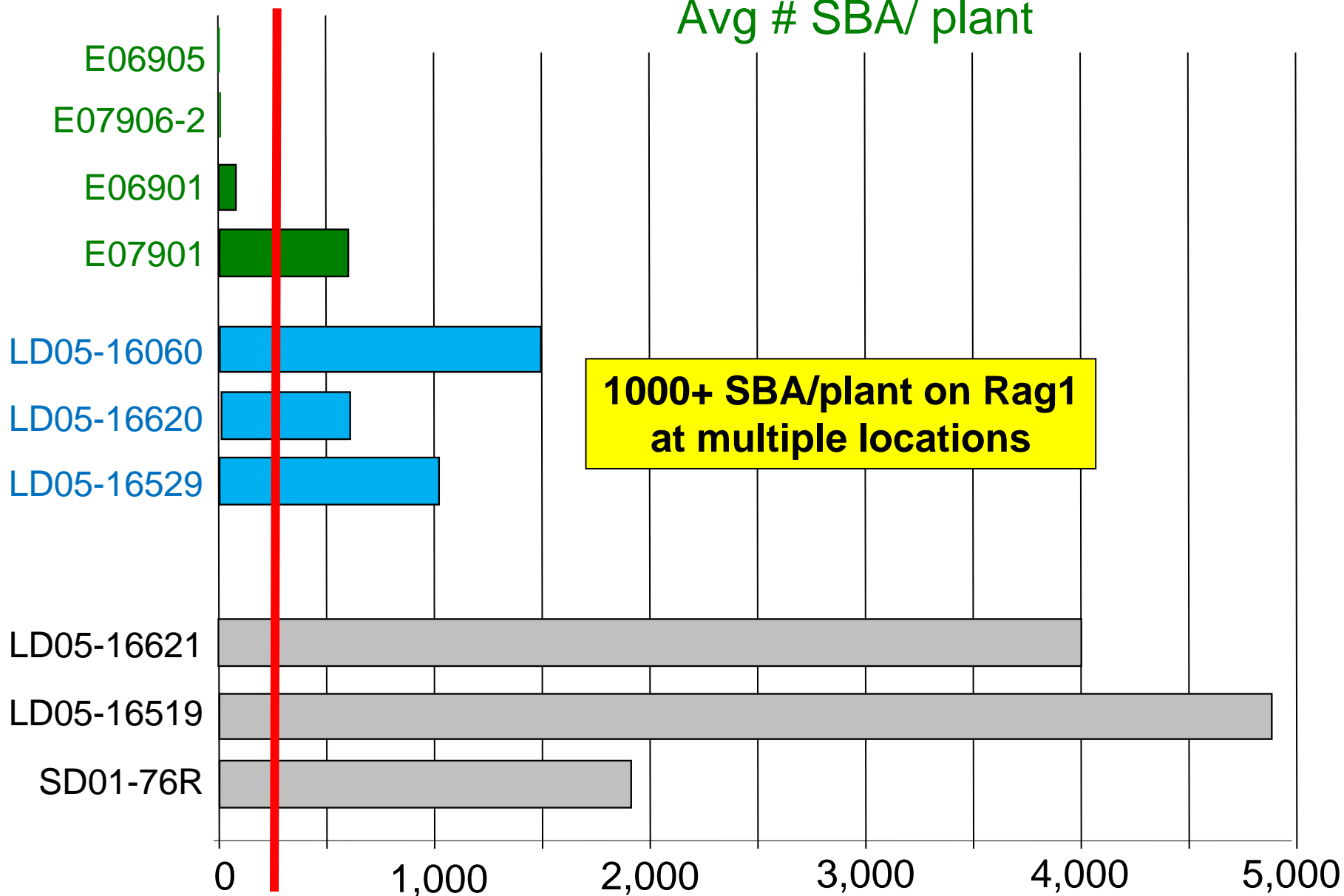
SBA resistance trial, Iowa State - Aug 2007

Avg # SBA/ plant

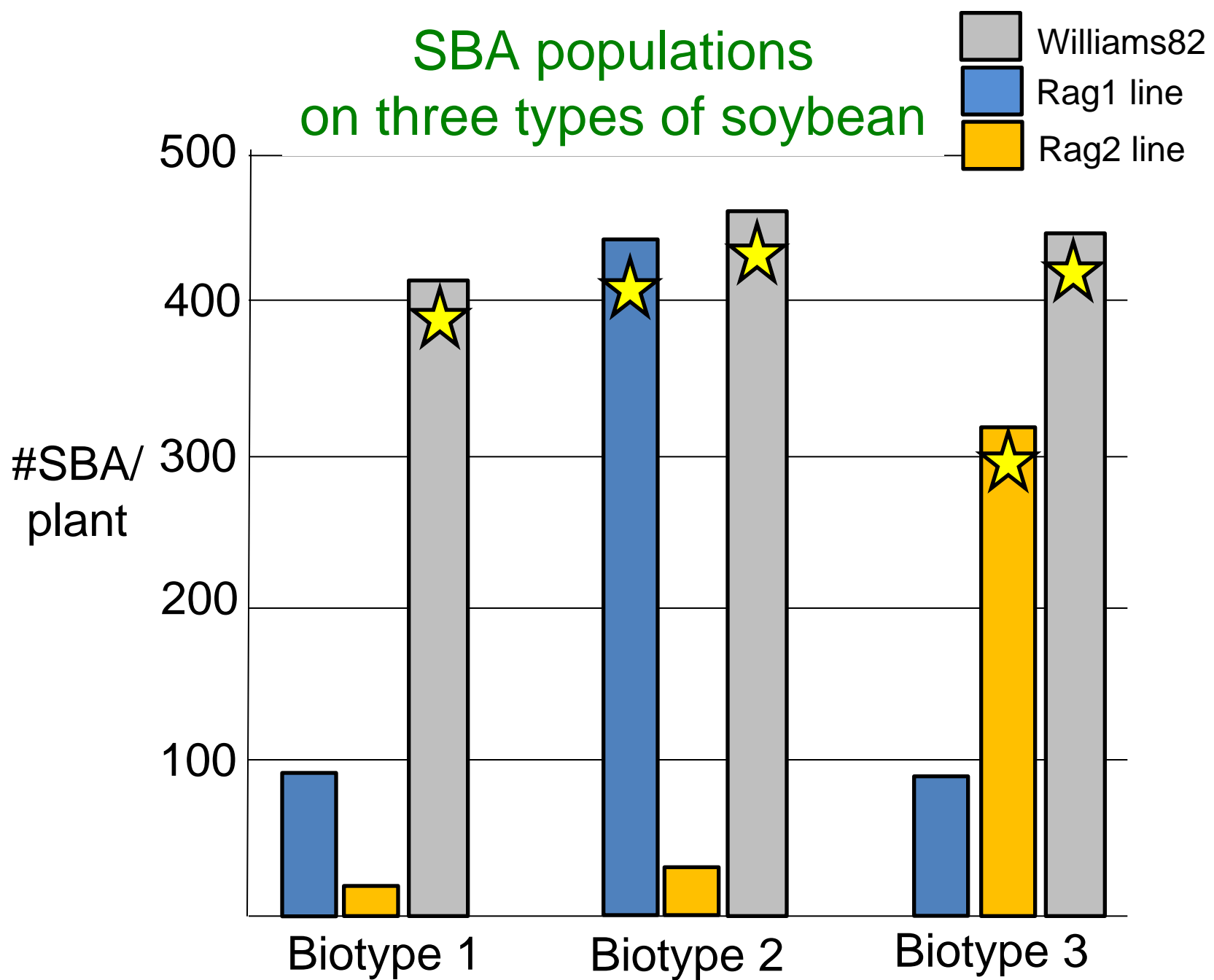


SBA resistance trial, Aurora SD - Aug 2008

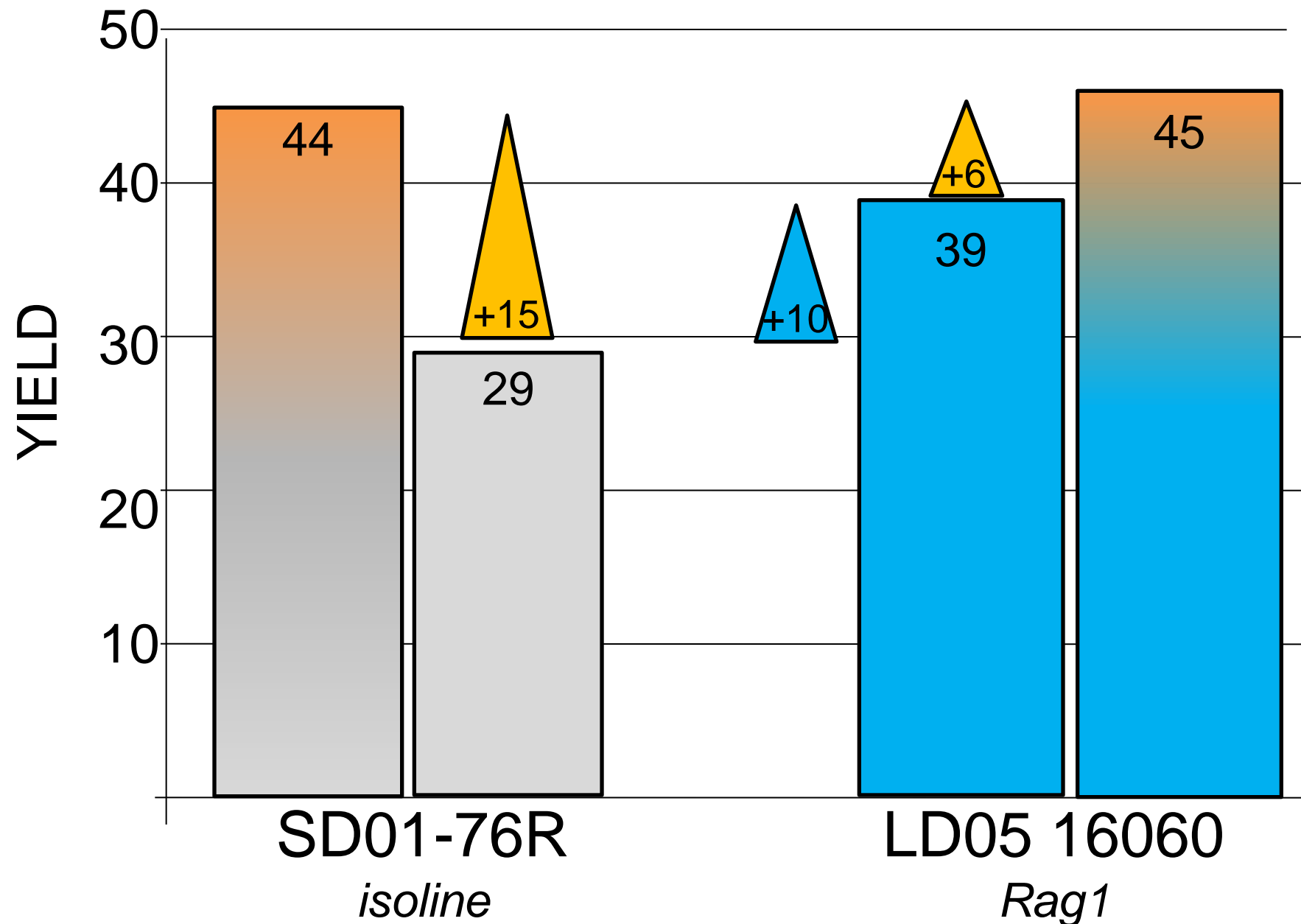
Avg # SBA/ plant



SBA populations on three types of soybean



Rag1 may benefit from insecticide application



Rag1 may benefit from biological control



Soybean Line	Aphid resistance gene	# SBA/plant after only two weeks	
		Caged plants	
SD01-76R	none	2568	
LD16060	Rag1	61	
E06902	rag1b/rag3	6	

**Impact of HPR:
Rag genes are effective**

Rag1 may benefit from biological control



Soybean line	Aphid resistance gene	# SBA/plant after only two weeks		% reduction due to biocontrol
		Caged plants	Open plants	
SD01-76R	none	2568	40	99%
LD16060	Rag1	61	17	not significant
E06902	rag1b+rag3	6	1	not significant

Impact of biocontrol



SBA resistance in commercial breeding



Rag1
+
Cruiser

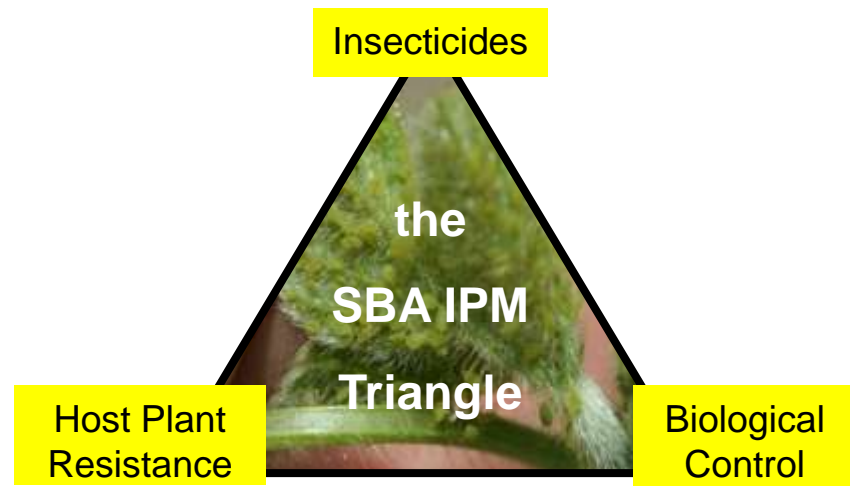
already available
good resistance
+Warrior if needed
biotype present
throughout region



rag1b/rag3

broadly licensed
good-excellent
resistance
biotype not yet identified

Resistance
is not
futile...



- Multiple forms of SBA resistance identified
- Non-GMO
- Complement biological control
- NOT bullet-proof....don't expect zero aphids
- May need to be treated under heavy pressure
- Biotypes overcome Rag1 & Rag2 (rag1b/rag3?)
- Resistance genes will be likely be pyramided



UNIVERSITY
OF MINNESOTA



IOWA STATE
UNIVERSITY



MICHIGAN STATE
UNIVERSITY



T · H · E
OHIO
STATE
UNIVERSITY

