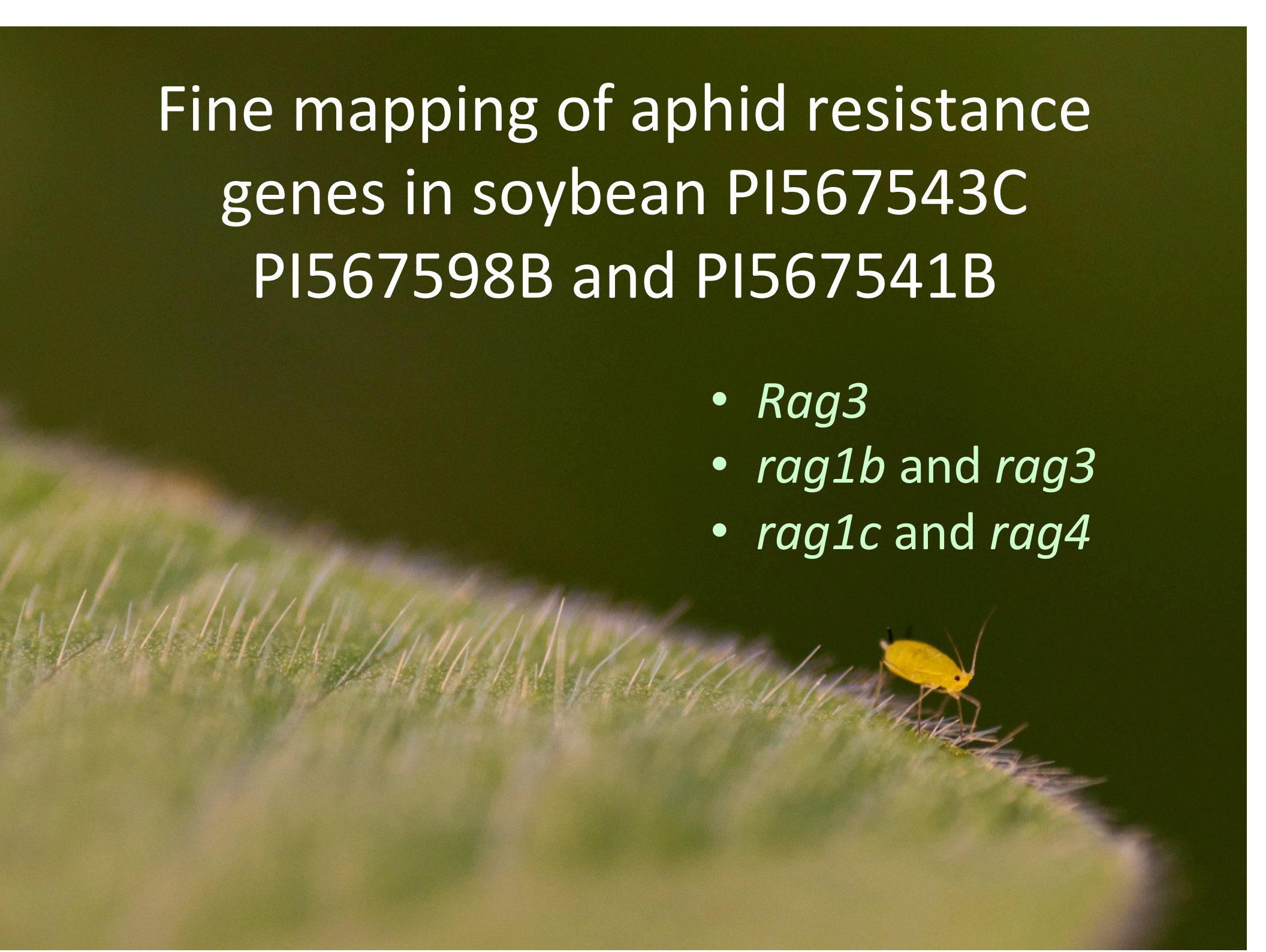
Fine mapping of aphid resistance genes in soybean PI567543C PI567598B and PI567541B

- *Rag3*
- *rag1b* and *rag3*
- *rag1c* and *rag4*



SA resistant sources in the Midwest

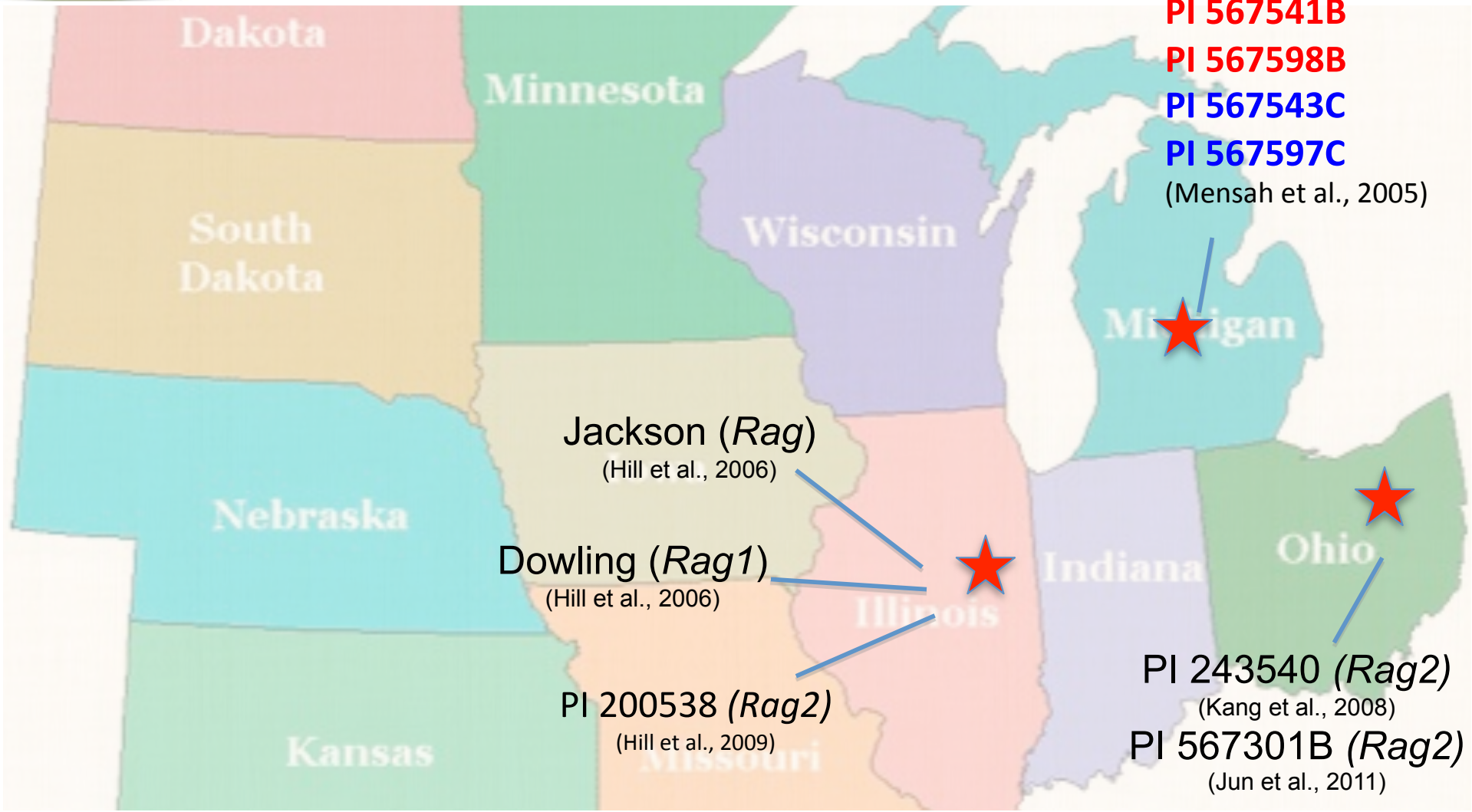
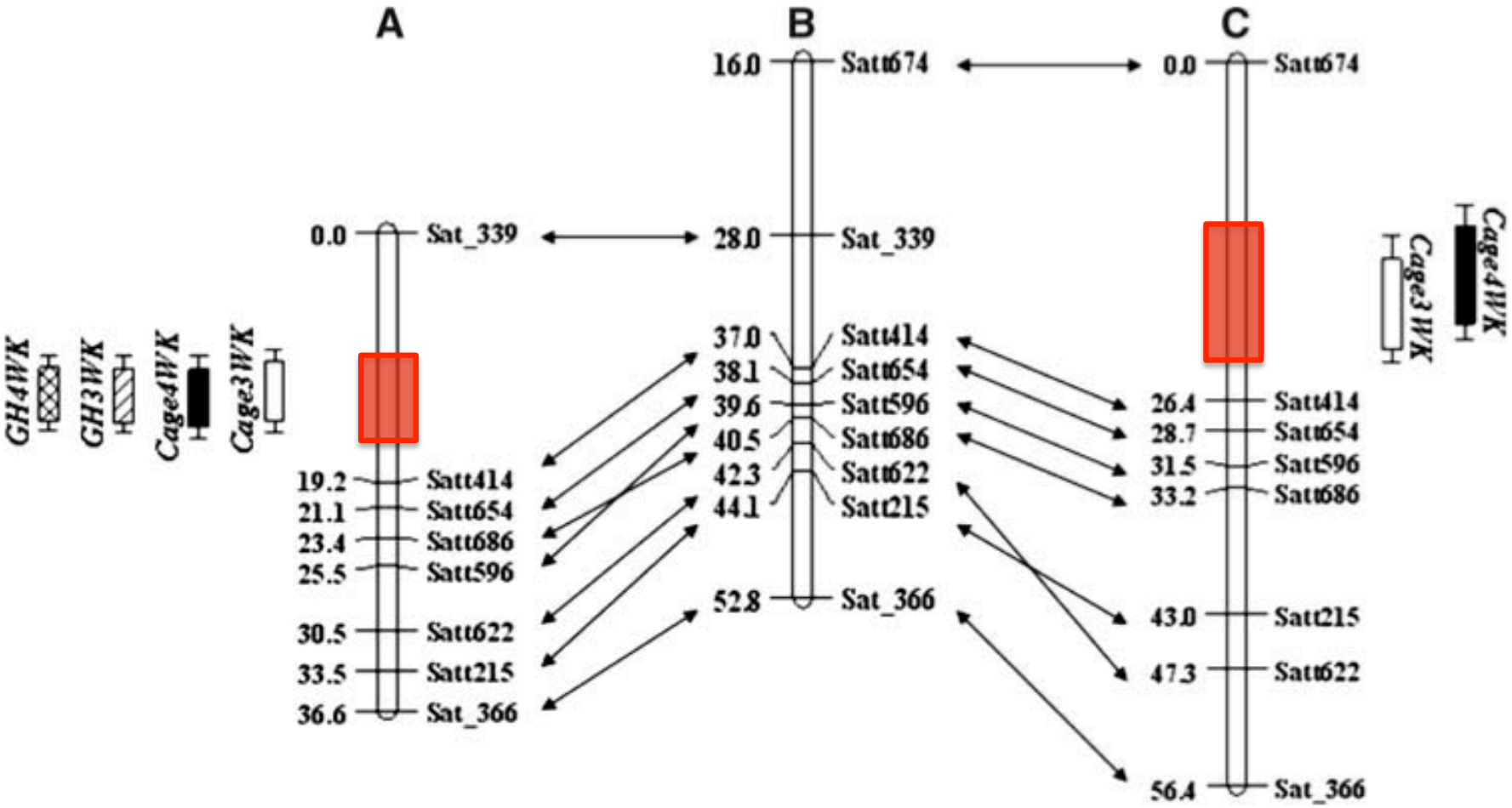


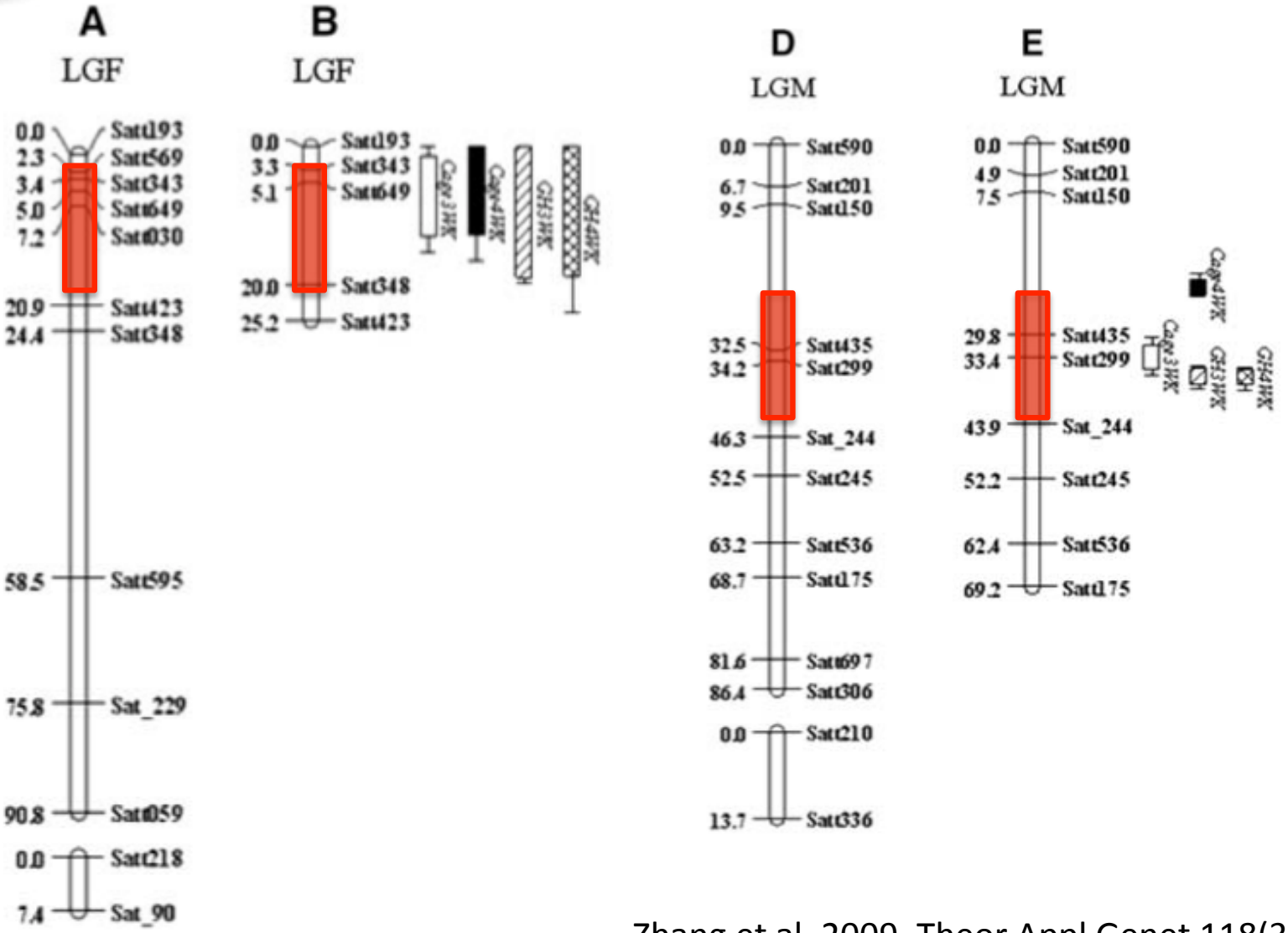
Image source: http://www.theposselist.com/wp-content/uploads/2009/04/midwest-map.jpg

QTL mapping of *Rag3* using 249 F_4-derived lines in PI 567543C



Zhang et al.. 2010. Theor Appl Genet 120(6): 1183–1191.

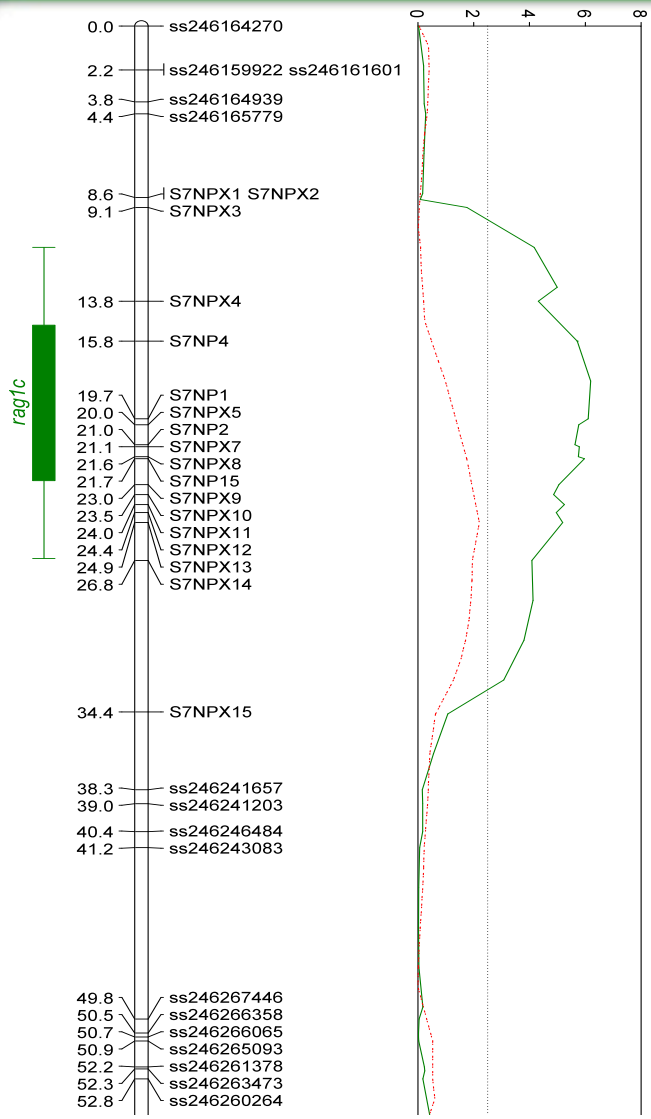
QTL mapping of *rag1c* and *rag4* using 228 F_3-derived lines in PI 567541B



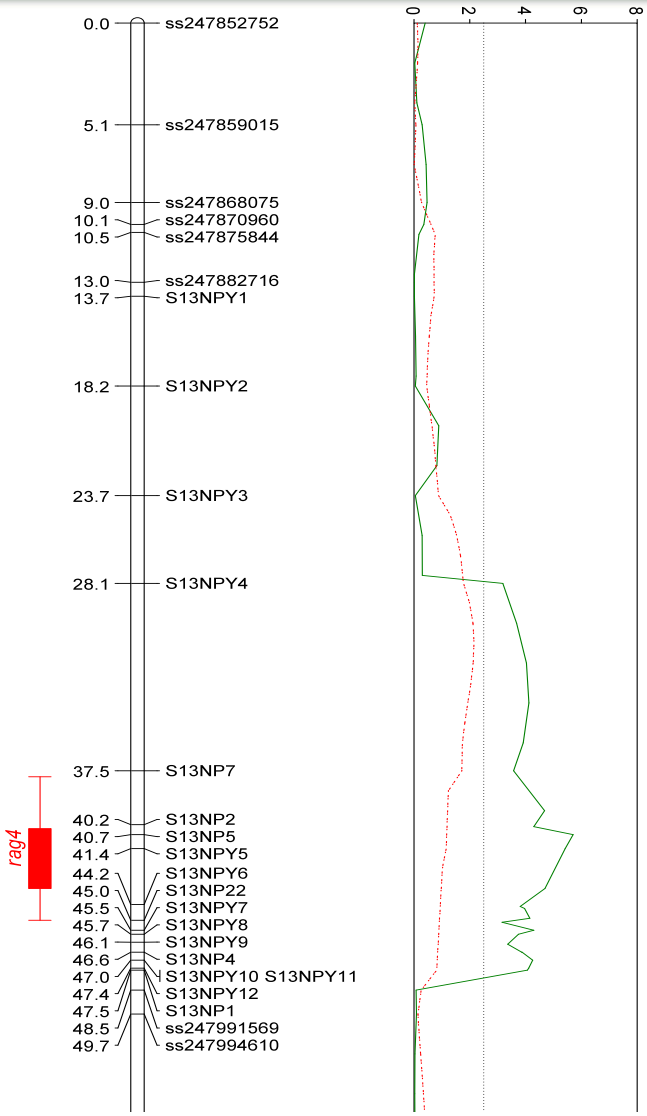
Zhang et al. 2009. Theor Appl Genet 118(3): 473–482.

Updated QTL mapping of *rag1c* and *rag4* in PI 567541B

R^2 19.9



Chromosome 7

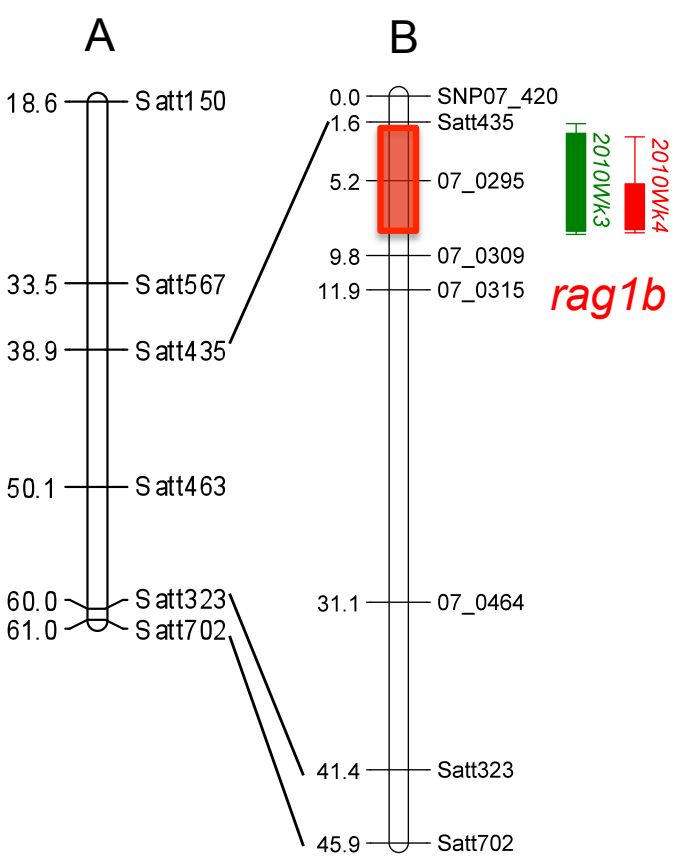


Chromosome 13

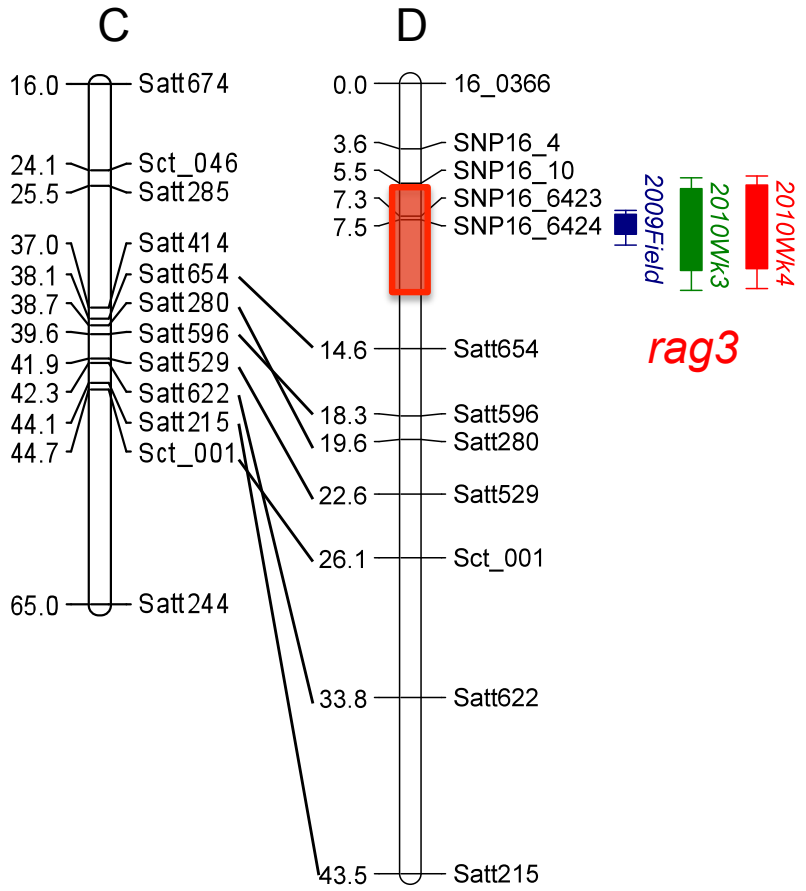
$R^2$17.2

(unpublished data)

QTL mapping of *rag1b* and *rag3* using 282 F_4-derived lines



Chromosome 7



Chromosome 16

(unpublished data)

Phenotyping Methods

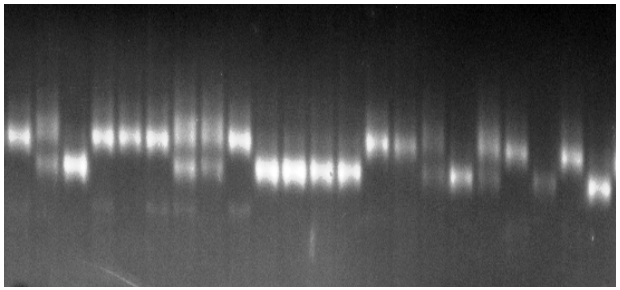
Phenotyping Methods

- Inoculation: two aphids/plant at the V1 stage;
- Resistance level scale:
  - 0; 0.5; 1.0; 1.5; 2.0; 2.5; 3.0; 3.5; 4.0

Mensah et al., 2005

Genotyping Methods

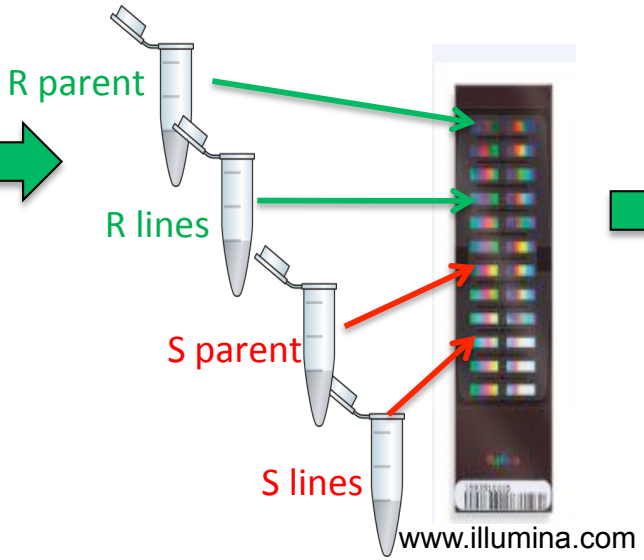
SSR markers



1,015 markers(Song et al., 2004)
33,065 markers(Song et al., 2010)

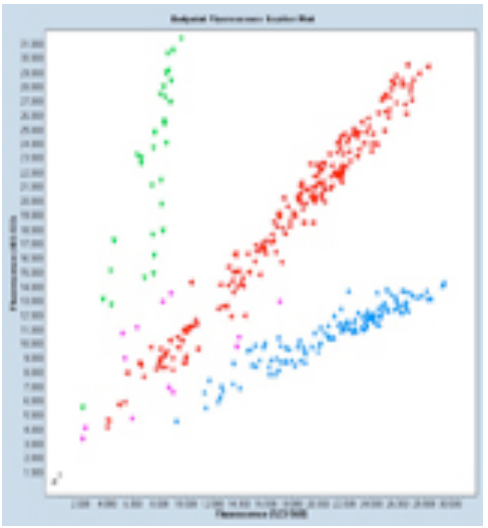
- Bulk segregant analysis
- QTL mapping using RILs

SoySNP50 iSelect SNP Chip (Song et al., 2011)



- Bulk segregant analysis
- Fine mapping using identified recombinants

TaqMan® Assay (Endpoint Genotyping)



Lightcycler 480®, Roche Applied Science

- Screening for recombinants
- QTL mapping

Rag3 Fine Mapping Populations

090089

[E07048 x E10902]

1,889 F_2

Quick extracted DNA

SNP 1
SNP 5
SNP 20

65 Lines with recombination events

$F_{2:3}$ plants for SA test in greenhouse 2011

27 Recombinants to Infinium assay

1 Segregating line for SA test of $F_{3:4}$ plants in Spring 2012

090104

[E10905 x E07048]

1,913 F_2

Quick extracted DNA

SNP 16-4
SNP 16-10
SNP 16_6424

37 Lines with recombination events

$F_{2:3}$ plants for SA test in greenhouse 2011

33 Recombinants to Infinium assay

1 Segregating line for SA test of $F_{3:4}$ plants in Spring 2012

rag3 Fine Mapping Populations

090004

[E00003 x (E00003 x PI98B)]

2,184 BC_1F_2

Quick extracted DNA

SNP 16-4
SNP 16-10
SNP 16_6424

107 Lines with recombination events

$F_{2:3}$ plants for SA test in field 2011

34 Recombinants to Infinium assay

3 Segregating lines for SA test of $F_{3:4}$ plants in Spring 2012

090068

[Skylla x (Skylla x PI98B)]

1,784 BC_1F_2

Quick extracted DNA

SNP 16-4
SNP 16-10
SNP 16_6424

94 Lines with recombination events

$F_{2:3}$ plants for SA test in field 2011

21 Recombinants to Infinium assay

3 Segregating lines for SA test of $F_{3:4}$ plants in Spring 2012

070063

[IA2070 x (Titan x PI98B)]

282 $F_{4:6}$

Initial mapping markers

13 Lines with recombination events

SA resistance testing of progenies

Infinium assay

SNP Markers from SoySNP50 iSelect Infinium Assay

Lines	Gen	Phenotype	SNP 1	SNP 2	SNP 3	SNP 4	SNP 5	SNP 6	SNP 7	SNP 8	SNP 9	SNP 10	SNP 11	SNP 12	SNP 13	SNP 14	SNP 15	SNP 16	SNP 17	SNP 18	SNP 19	SNP 20
2-499-2	$F_{2:3}$	Resistant	S	S	S	S	S	S	S	S	S	S	S	S	S	R	R	R	R	R	R	R
2-277-6	$F_{2:3}$	Resistant	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S	S	S
																Rag3						
04-2-653	$F_{2:3}$	Segregating	S	S	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
63-5-64	$F_{4:7}$	Susceptible	R	R	R	R	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
04-2-229	$F_{2:3}$	Segregating	R	R	R	R	R	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
04-2-471	$F_{2:3}$	Resistant	H	H	H	H	H	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S
04-2-742	$F_{2:3}$	Resistant	H	H	H	H	H	R	R	R	R	R	R	R	R	R	R	R	R	R	R	S
63-4-29	$F_{4:7}$	Resistant	S	S	S	S	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
63-1-18	$F_{4:7}$	Susceptible	R	R	R	R	R	R	R	S	S	S	S	S	S	S	S	S	S	S	S	S
04-2-466	$F_{2:3}$	Resistant	H	H	H	H	H	H	H	H	H	R	R	R	R	R	R	R	R	R	R	S
68-1rem-39	$F_{2:3}$	Segregating	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	R	R	R
68-1rem-168	$F_{2:3}$	Resistant	H	H	H	H	H	H	H	H	H	H	H	R	R	R	R	R	R	R	R	R
68-5-146	$F_{2:3}$	Segregating	R	R	R	R	R	R	R	R	R	R	R	H	H	H	H	H	H	H	H	H

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