Resistance to the soybean aphid in soybean germplasm and other legumes

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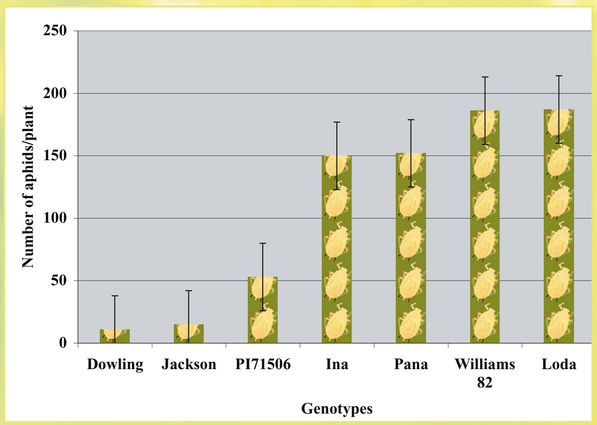
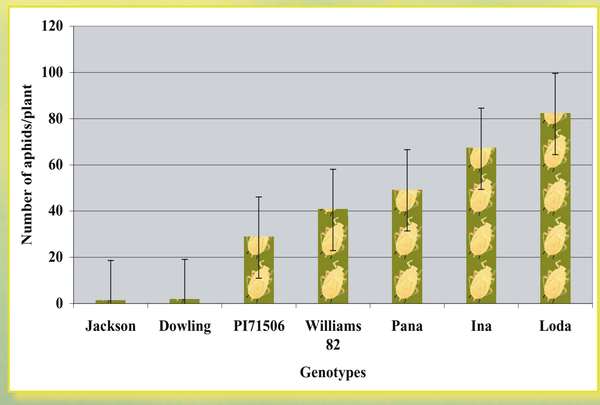
WHAT WE KNOW ABOUT IT NOW

Sources of Resistance to the Soybean Aphid

Choice-test, 9 days after aphid infestation



Non-choice test, 12 days after aphid infestation



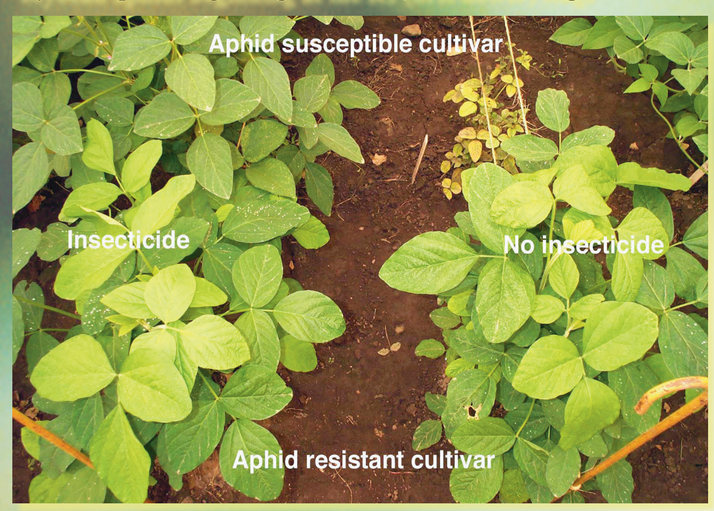
Expression of resistance in Dowling and Jackson is primarily antibiosis, while resistance in PI71506 is antixenosis.

Additional Sources of Resistance Under Study

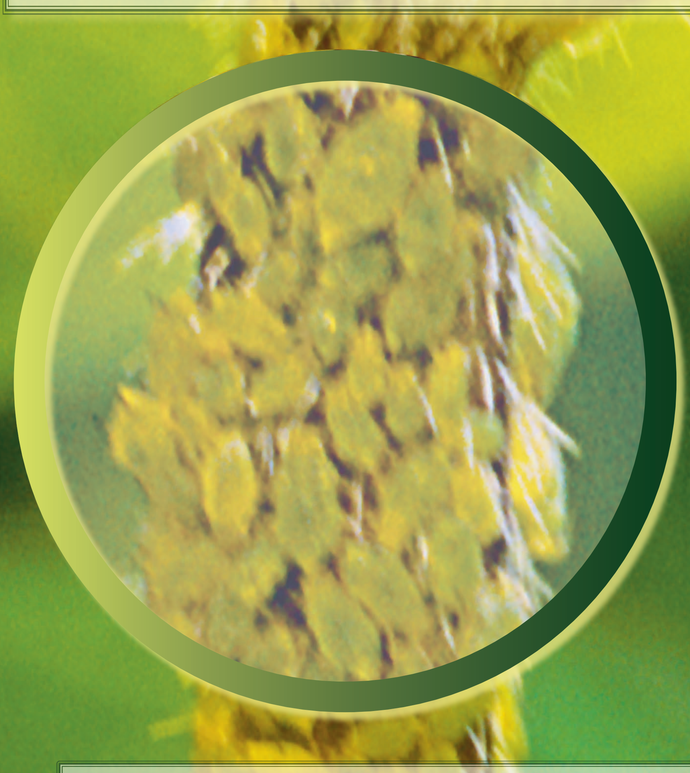
Number of aphids 14 days after infestation in a choice test

Entry	*Glycine* species	Number of aphids	
Sato (PI548409)	*max*	15	a b
Taichung 38 (PI518282)	*soja*	19	a b c
Sugao Zarai (PI200538)	*max*	20	a b
Jackson (PI548657)	*max*	20	a b
Palmetto (PI548480)	*max*	26	b c
CNS (PI548445)	*max*	26	b c
Dowling (PI548663)	*max*	28	b c d e
Moyashimame (PI87059)	*max*	61	c d e f
Showa No. 1-4 (PI88508)	*max*	67	e f g
Taichung 37 (PI518281)	*soja*	70	f g
Ina	*max*	230	h i j k
Williams 82	*max*	269	i j k l
Pana	*max*	311	j k l
PI522212B	*soja*	337	k l
Loda	*max*	437	l
Mean		105	

Comparison of Dowling and a susceptible soybean cultivar, treated or untreated with imidacloprid, 4 weeks after exposure to soybean aphids beginning at the R1 (first flower) stage

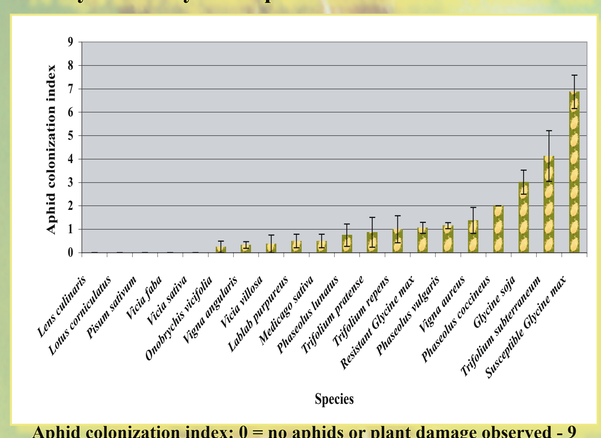


The soybean aphid, *Aphis glycines* Matsumura, invaded North America in 2000. It has since become a serious pest in the central states, prompting the spraying of millions of hectares with insecticides to control it. We began the search for genetic resistance to the aphid soon after the arrival of the pest. Using a systematic approach and taking advantage of the convenience of the USDA Soybean Germplasm Collection at our location, we screened thousands of commercial and non-commercial germplasm accessions for resistance in an air-conditioned greenhouse dedicated to this effort. We found resistance in a few ancestors of North American cultivars. Over the last couple of years, we have characterized the expression of resistance, studied the effects on aphid biology, and looked for other possible secondary soybean aphid hosts. In addition, we began to determine the genetics of resistance in the known resistance sources while continuing to search for new sources of resistance. We have also formed collaborative relationships with public and private breeding organizations to help expedite the development and release of new soybean aphid resistant cultivars.



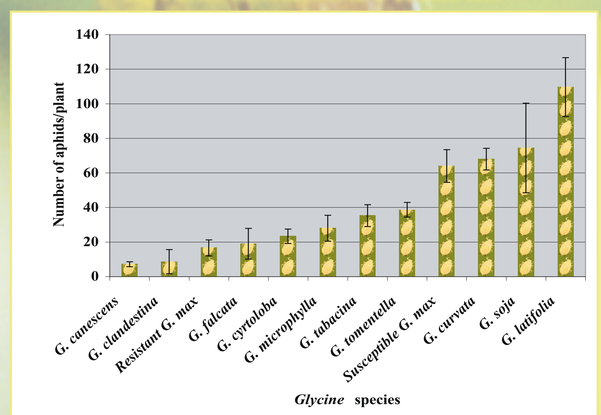
Secondary Host Range of Soybean Aphids

Colonization of soybean aphids on various legume species 14 days after soybean aphid infestation in a choice test



Aphid colonization index: 0 = no aphids or plant damage observed - 9 dense aphid population with severe plant damage, stunting, or death.

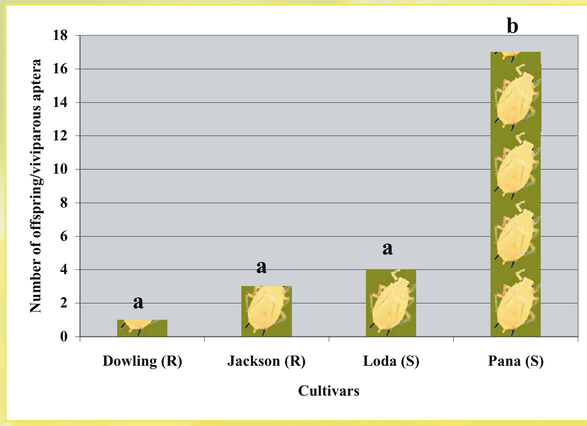
Colonization of soybean aphids on Glycine species 9 days after infestation in a choice test



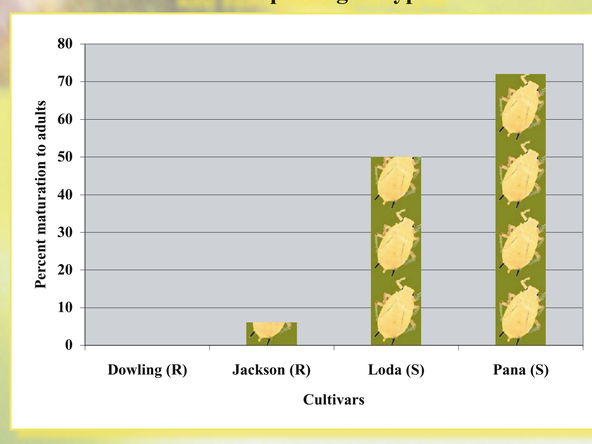
Susceptible *Glycine* genotypes appeared to be better secondary hosts for the soybean aphid than other legume species.

Effects of antibiosis on soybean aphids

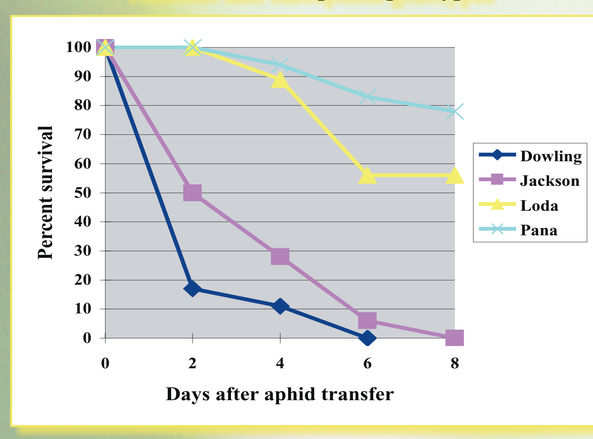
Fecundity of soybean aphids over 10 days on resistant and susceptible genotypes



Percent of 1st instars that matured to adults on resistant and susceptible genotypes



Percent survival of 1st instar soybean aphid nymphs on resistant and susceptible genotypes



Fecundity, maturation, and survival of soybean aphids was significantly reduced on resistant genotypes.

Inheritance of Resistance

Cross	F_1 phenotype	Observed F_2 segregation: Resistant	Susceptible	χ^2 (3R:1S)	P
Dowling (R) x Loda (S)	R	128	44	0.03	0.86
Dowling (R) x Pana (S)	R	17	6	0.01	0.90
Dowling (R) x Williams 82 (S)	R	131	46	0.09	0.76

R = no aphid colonization; S = aphid colonization, 14 days after infestation in a choice test.

Resistance in Dowling is conditioned by a single dominant gene.

References

Hill, C.B., Y. Li, and G.L. Hartman. 2004. Resistance to the soybean aphid in soybean germplasm. Crop Science 44: 98-106.

Hill, C.B., Y. Li, and G.L. Hartman. 2004. Resistance of *Glycine* species and various cultivated legumes to the soybean aphid (Homoptera: Aphididae). J. Economic Entomology: *in press*.

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