

Evaluation of Round-Up Ready Soybean Cultivars for Resistance to *Xanthomonas axonopodis* pv. *glycines*

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Introduction

Bacterial pustule is caused by the bacterium *Xanthomonas axonopodis* pv. *glycines*. It is most prevalent in soybean growing areas, especially in countries like Australia, China, India, Japan, Korea, Sudan and the United States. *X. axonopodis* pv. *glycines* is a gram negative, aerobic rod shaped bacterium.

Bacterial pustule occurs primarily on the foliage of soybeans. The first symptoms are small, yellow-green spots with reddish-brown centers on the upper leaf surface (Figure 1) . In later stages dried, broken remnants of pustule may be seen on small necrotic areas bordered by narrow yellow halos.

A very high level of resistance to bacterial pustule disease is conferred by a recessive gene designated rxp, originally found in soybean cultivar CNS.



Figure 1. Minute, pale green spots with elevated centres appear on leaf surfaces

Objective

The objective of this study was to screen Round-up® ready soybean cultivars for resistance to *X. axonopodis* pv. *glycines*.



Method

Round-up® ready soybean cultivars (525) were grown in the greenhouse for 14-20 days in universal soil mix. Plants were sprayed with *X. axonopodis* pv. *glycines* inoculum. The culture was grown in Potato dextrose broth at 25°C for 8h. The inoculum size was adjusted to 108 viable cells/ml. The first trifoliates were damaged by a perforation needle. Inoculation was done by spraying the inoculum using an atomizer attached to compressed air-line (Figure 2). Results were recorded after 7 days by counting the number of pustules on heavily infected trifoliolate leaves (Figure 3). The susceptible varieties were tested again and the experiment was duplicated.



Figure 2. Inoculation of the cultivars using an atomizer

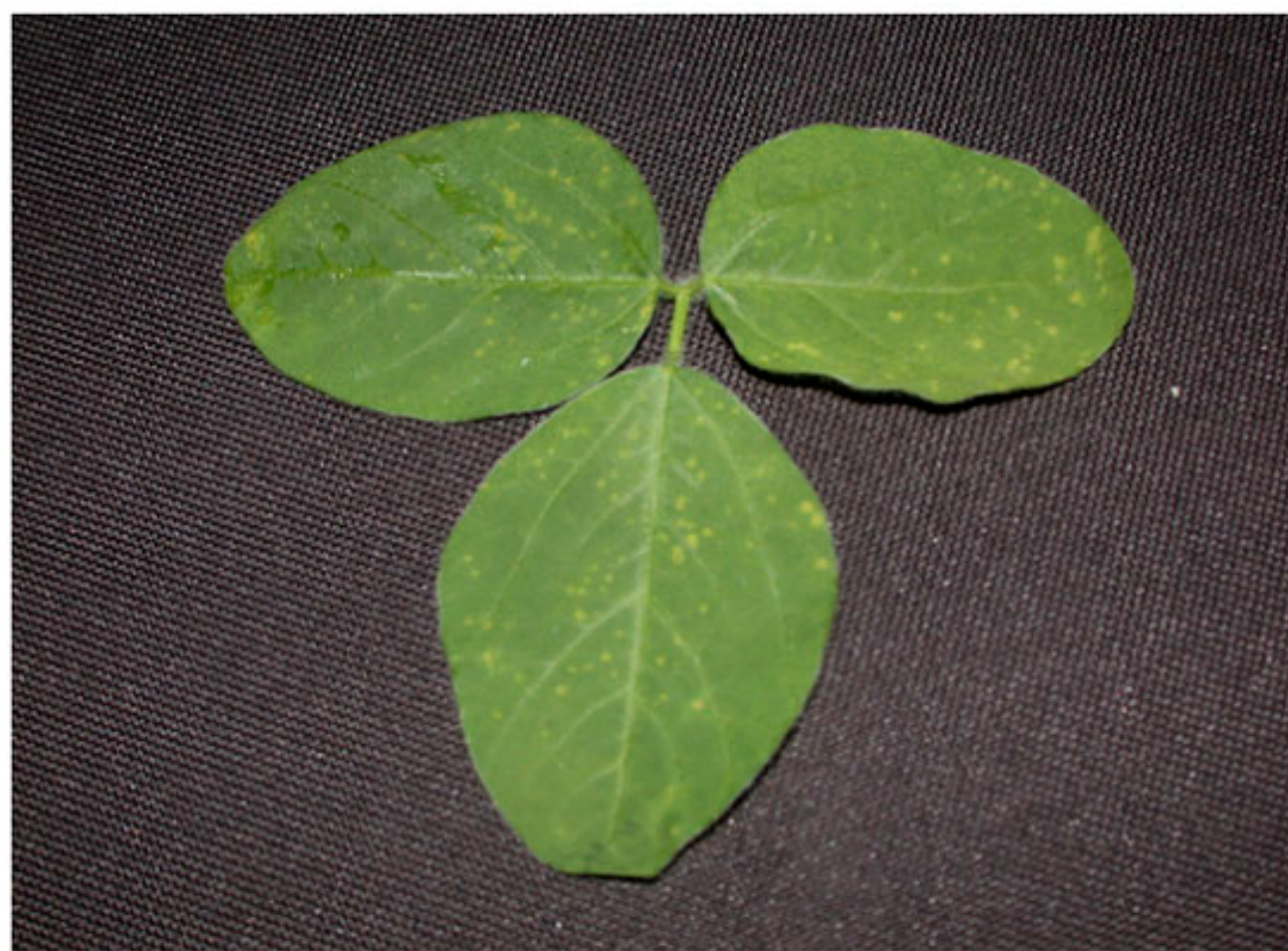


Figure 3. Heavily infected trifoliolate leaf.

Results

Of the 525 Round-up® ready soybean cultivars screened, 152 cultivars (~28%) were found to be susceptible to *X. axonopodis* pv. *glycines* and formed pustule.

Under standard greenhouse conditions, the average number of pustules per plant was 43 and 18 for susceptible control (P1 520.733) the resistant control (Williams 82), respectively

When the 152 susceptible cultivars were tested again, 66 were found to be highly susceptible, based on the observation that these cultivars averaged more pustules per plant than the susceptible control (Table1).

Table 1. Sixty-six (66) soybean cultivars were highly susceptible.

Name	Company	Average # of pustules/plant
DAIRYLAND	DST 2129 RR	160.5
WILKEN	3402 RR	104.25
ROESCHLEY	R 4268 RR	94.25
DELTA & PINE LAND	DPX 4300 RR	89.75
EXCEL	8254 RR	88
WILLCROSS	EX 292 N	87
SCHILLINGER	211.RW	85.75
SOUTHERN STATES	RT 4098	85.5
WILKEN	2582 RR	84.25
STRIKE	2801 RR	84
FS HISOY	HS 3005	76.75
DEKALB	DKB 44-51	76.25
SCHILLINGER	321.RC	76.25
SUN PRAIRIE	SP 3400 RR	76.25
DERAEDT	2820 RR	74.5
TRISLER	TRISOY 3217.RRN	71.5
BAKER	4505.CRR	70.75
UNITED SUPPLIERS	US 52709 RR	70
KRUGER	K-444 RR/SCN	69.25
SOUTHERN STATES	RT 4495 N	67.75
LATHAM	667 RR	67.5
BECK	283 RR	67
GOLDEN HARVEST	H 3983 RR	66.75
STRIKE	3101 RR	65.25
KRUGER	K-300 RR	65
FS HISOY	HS 3706	64
STINE	2463-4	64
EXCEL	8195 RR	63.5
MERSCHMAN	CHEROKEE.XRR	63.5
EXCEL	8234 RR	63
STINE	3808-4	62.5
DAIRYLAND	DSR-322 RR	61.75
BAKER	4425.CRR	61.5
DAIRYLAND	DSR-395 RR	61.5
KRUGER	K-323 RR	61.25
VIGORO	V 272.NRR	61.25
KRUGER	K-262-2 RR	59.25
BECK	437.NRR	57.75
UAP	DG 3370 RR	57.75
VIGORO	V 363.NRR	57.5
ASGROW	AG 4403	57
CROWS	C 48009.RN	57
SIEBEN	2803 RR	56.75
EXCEL	8395 RR	55.75
KALTENBERG	KB 244 RR	55.75
HUGHES	551 RR	55.5
STINE	3800-4	55.25
KRUGER	K-330 RR	54
KRUGER	K-330.RR/SCN	51.5
PIONEER	93b67	51.25
SCHILLINGER	271.RPW	51.25
VIGORO	V 442.NRR	51
FS HISOY	HS 4107	50.5
TRISLER	TRISOY 3017.RRN	49.5
GOLDEN HARVEST	H 3505 RR	48.25
HENKEL	SS 2618	48.25
MWS	285.CRR	47.75
EXCEL	8410.NRR	47.25
KRUGER	K-323 RR	46
KRUGER	K-286 RR	45.75
VIGORO	V 282 RR	45.25
LATHAM	EX-1097.RR	44.5
EXCEL	8314 RR	44.25
MERSCHMAN	RICHMOND.VIRR	43.5
KRUGER	K-282-2 RR	43
STEYER	4410.SCN	41.25
DAIRYLAND	DSR-228 RR	40.75
P1 520.733	NA	43

Forty-one (41) cultivars were found to be moderately susceptible based on the observation that the average number of pustules per plant fell between the range of susceptible and resistant controls (Table 2).

Table 2. Forty-one (41) soybean cultivars were moderately susceptible.

Name	Company	Average # of pustules/plant
P1 520.733	NA	43
PIONEER	94B23	39.75
UAP	DG 3484.NRR	39.5
PIONEER	91BB5	39.25
BERGMANN-TAYLOR	BT 400.CR	39
SUN PRAIRIE	SP 3702.NRR	39
HORIZON	H 328.NRR	38.75
PRAIRIE BRAND	PB-2841.RR	38.25
KRUGER	K-443-3.RR/SCN	37.5
UAP	DG 3278.RR	37
LATHAM	EX-787.RR	36.5
WILKEN	2583.RR	35.75
KRUGER	K-289.RR	35.5
DAIRYLAND	DSR-232.RR	35
WILKEN	2691.NRR	34.75
GOLDEN HARVEST	H 2871.RR	34.25
KRUGER	K-388+.RR	32.75
GREAT LAKES	GL 3409.RR	32.5
FS HISOY	HS 2906	31.75
UAP	DG 3468.NRR	31.5
SCHILLINGER	250.RPB	31.25
WILLCROSS	RR 2242	31.25
WILKEN	3461.NRR	30.75
DEKALB	DKB 26-51	30
WILKEN	2568.RR	30
SCHILLINGER	331.RCP	29.75
SCHILLINGER	281.RIP	29.25
KRUGER	K-262.RR/SCN	28.5
WILKEN	WE 944.RR	28
PRAIRIE BRAND	PB-2861.RR	27.75
WILLCROSS	RR 2331.N	27.5
BERGMANN-TAYLOR	BT 351.R	26
BIO GENE	BG 4401.NRR	24.75
KRUGER	K-222+.RR	24.75
DELTA KING	XT1 174.RR	24.25
DEKALB	DKB 23-51	23.75
DELTA KING	4965.RR	23.5
DEKALB	DKB 28-51	22.5
STINE	4202-4	22.25
FS HISOY	RT 4585	21.25
MERSCHMAN	CHICKASAW.VIIRR	20.75
STINE	2736-4	20.75
KRUGER	K-255.RR	21.75
Williams 82	NA	18.5

Forty-four (44) cultivars were found to be less susceptible, based on the observation that these cultivars averaged less pustules per plant than the resistant control (Table 3).

Table 3. Forty-four (44) soybean cultivars were less susceptible.

Name	Company	Average # of pustules/plant
Williams 82	NA	18.5
WILLCROSS	RR 2321.N	19.5
WILKEN	2318.RR	18.25
ASGROW	AG 2703	18
WILLCROSS	RR 2392.N	17.5
DEKALB	DKB 40-51	17.25
DELTA KING	4762.RR	17.25
WILKEN	3498.RR	17.25
SUN PRAIRIE	XP 3132.RR	15.75
DAIRYLAND	DSR-272.RR	15.25
EXCEL	8484.RR	15
KRUGER	K-444-4.RR/SCN	15
SCHILLINGER	310.RP	14.5
VIGORO	V 393.NRR	14.5
DAIRYLAND	DSR-290.RR	14.25
LATHAM	EX-747.RRN	14.25
FS HISOY	X 2815	13.5
FS HISOY	RT 3585	13
DEKALB	DKB 45-51	12.75
MERSCHMAN	ROOSEVELT.VIIRR	12
WILKEN	3403.RR	12
UNITED SUPPLIERS	US E3802.RR	11.75
UNITED SUPPLIERS	US S2101.RR	10.5
HORIZON	H 379.RR	8.75
KITCHEN	KSC 3926.CRR	8.75
WILLCROSS	RR 2350	8.75
EXCEL	8306.RR	8.25
KRUGER	K-255-5.RR	7.75
PRAIRIE BRAND	PB-3404.RR	7.25
BECK	367.NRR	6.5
MERSCHMAN	KENNEDY.VIRR	6.25
RENK	RS 310.RR	6
DAIRYLAND	DSR-268.RR	5
FS HISOY	X 2515	4.75
KRUGER	K-250-1.RR	4.75
GOLDEN HARVEST	H 3960.RR	4.5
AGRINETICS	EXCEL 8274.RRN	3.75
WILKEN	3471.NRR	3.5
ASGROW	AG 2402	3
WILKEN	3551.NRR	2.5
MERSCHMAN	SHAWNEE.VIIRR	2.25
KRUGER	K-252+.RR	1.75
DELTA KING	5366.RR	1.5
MIDWEST SEED GEN	GR 3331	1.5
DEKALB	DKB 32-52	1.75

Conclusions

These results suggest that resistance is not being maintained in commercial soybean cultivars which may lead to an increased incidence of bacterial pustule in the field, thus impacting soybean yields.

Further research calls for detecting if the rxp gene is inserted in these soybean cultivars.

References

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