

Field Performance of One hundred Eighteen Soybean Varieties Against the Southern Root-knot Nematode and Frogeye Leaf Spot, 2024

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A comprehensive disease screening program has been conducted by the University of Arkansas System, Division of Agriculture, Extension Plant Pathology since 1990, thanks to support by the Arkansas Soybean Promotion Board. A combination of field nurseries and greenhouse experiments are used to evaluate all varieties that are entered in the Official Variety Testing Program to major diseases of concern in Arkansas. The diseases evaluated and reported here during the 2024 cropping season was the southern root-knot nematode (*Meloidogyne incognita*) and frogeye leaf spot (caused by *Cercospora sojina*). Some 118 soybean varieties were planted on 8 June in single row, 11-ft long plots at 150,000 seeds per acre in a silt loam soil (45% sand, 51% silt, and 4% clay) field near Kerr, AR. The moderately root-knot nematode-resistant check, Pioneer P43A42X and susceptible checks, Delta Grow DG4880GIY, and DG46E30 were included in the experiment. Varieties were arranged in a randomized complete block design with three replications. Three roots were arbitrarily sampled from each plot at the R4 to R5 growth stage to determine nematode susceptibility. Susceptibility was based on the percent root system galled (1.1-4.0% = resistant (R), 4.1-9.0% = moderately resistant (MR), 9.1-20.0% = moderately susceptible (MS), 20.1-40.0% = susceptible (S), 40.1-100.0% = very susceptible (VS)). Frogeye leaf spot severity was visually assessed on 29 August at R6 to R7 growth stage based on a 0-9 index scale (0-1 = R, 2-3 = MR, 4-5 = MS, 6-7 = S, and 8-9 = VS) in the upper 1/3 of the canopy.

The final nematode population (Pf) density averaged 648 second-stage juveniles (J2)/100 cm³ soil at harvest across the experiment. This density is considered severe for soybean production in Arkansas. The post-harvest threshold for southern root-knot nematode on soybean in Arkansas is J2 60/100 cm³ soil. Weather conditions were favorable for frogeye leaf spot and disease severity was greater than previous years. Southern stem canker is also part of the comprehensive disease screen, but weather conditions did not favor disease development.

What else is important: Overall, the severity (percent of root system galled) was lower than last year, so the screen was not as good as in 2023. For example, Delta Grow ‘DG46E30’ had a gall rating of 47.6% (VS) in 2023 and 22.6% (S) in 2024. However, and overall, selecting a variety that is less susceptible will ensure a greater yield than a more susceptible variety in a nematode infested field. Progeny P4724XFS had a gall rating 3.6 in this screen and 9.0 in other screenings, so reference additional data on root-knot nematode and frogeye leaf spot varieties before making final variety selections at the following link <https://arkansascrops.uada.edu/posts/disease/2024-soybean-varieties-RKN.aspx>. Consult the cross-reference guide for soybean varieties to ensure different varieties selected are not the same genetics <https://www.uaex.uada.edu/farm-ranch/crops-commercial-horticulture/soybean/2024-soybean-cross-reference-guide.pdf#search=2024%20cross%20reference>.

Why is final nematode population density or “Pf” important? The timing for these samples would be comparable to fall nematode samples collected in commercial fields. Therefore, soybean varieties would expect to perform similarly when the nematode population density AND soil texture class (e.g., sandy loam) was similar. Overall, individual varieties will show a greater percentage of root system galled or

susceptibility when grown in soils with a greater percentage of sand and nematode densities that are similar to the final nematode densities reported here. Furthermore, and more importantly, grain yield for individual varieties will decrease with increased drought stress AND when nematode densities are similar to that reported.

Table 1. Field performance of 118 soybean varieties against the southern root-knot nematode. The final nematode density at after harvest was 693 J2/100cm³ of soil, which is a high and likely cause significant yield losses on a susceptible variety.

Variety	Technology	Maturity	Percent root system galled ^b (1 year data)	Southern root-knot nematode susceptibility ratings ^b (1 year data)	Frogeye leaf spot severity ^c (1 year data)	Frogeye leaf spot susceptibility ratings ^c (1 year data)
Pioneer P43A42X (MR check)	Xtend	4.3	0.3 ^a	VR	6	S
Pioneer P46Z53E	Enlist E3	4.6	1.2	R	5	MS
Revere 5735XFS	XtendFlex/STS	5.7	1.7	R	6	S
Pioneer P53Z60LX	RR2 Xtend Liberty	5.3	1.8	R	0	R
Innvictis B5234E	Enlist E3	5.2	2.0	R	5	MS
AG56XF2	XtendFlex	5.6	2.6	R	0	R
DELTA GROW DG47E70STS	Enlist E3	4.7	2.7	R	3	MR
Innvictis B4574E	Enlist E3	4.5	2.9	R	3	MR
Progeny P4724XFS	XtendFlex/ STS	4.7	3.6	R	0	R
DELTA GROW DG52E30	Enlist E3	5.2	3.7	R	6	S
Pioneer P43Z44SE	Enlist E3/Bolt	4.3	4.3	MR	5	MS
Armor 54-F34	XtendFlex	5.4	5.9	MR	0	R
Innvictis B4904E	Enlist E3	4.9	6.3	MR	0	R
Delta Grow DG46E10	Enlist E3	4.6	6.4	MR	4	MS
NK56-Z6XFS	XtendFlex/STS	5.6	6.4	MR	6	S
Armor 46-F35S	XtendFlex	4.6	7.9	MR	0	R
CT5293E3	Enlist E3	5.2	8.8	MR	0	R
Progeny P4634E3	Enlist E3	4.6	8.9	MR	0	R
Innvictis A5813XF	XtendFlex	5.8	9.9	MS	5	MS
NK52-D6E3	Enlist E3	5.2	10.2	MS	0	R

DELTA GROW DG43XF65STS	XtendFlex	4.3	11.3	MS	0	R
Integra XF4914S	XtendFlex	4.9	11.3	MS	0	R
Eagle Seed ES4611XF	XtendFlex	4.6	11.6	MS	4	MS
R23PR-00055	Enlist E3	5.1	11.7	MS	5	MS
Integra XF4893S	XtendFlex	4.8	12.9	MS	0	R
Innvictis A5124XF	XtendFlex	5.1	13.4	MS	7	S
Progeny P4604XFS	XtendFlex/ STS	4.6	13.6	MS	4	MS
Integra XF4634S	XtendFlex	4.6	13.7	MS	1	R
R23PR-00068	Enlist E3	4.9	13.8	MS	4	MS
AG53XF2	XtendFlex	5.3	14.1	MS	0	R
NK42-A6E3S	Enlist E3/STS	4.2	15.3	MS	0	R
Progeny P4806XFS	XtendFlex/ STS	4.8	15.3	MS	6	S
Innvictis B4553E	Enlist E3	4.5	15.8	MS	0	R
R23PR-00100	Enlist E3	3.9	17.0	MS	5	MS
CT4413E3S	Enlist E3/STS	4.4	17.1	MS	0	R
DELTA GROW DG47XF90STS	XtendFlex	4.7	17.8	MS	0	R
NK47-G5E3S	Enlist E3/STS	4.7	18.6	MS	4	MS
Innvictis A4814XF	XtendFlex	4.8	18.7	MS	0	R
Progeny P5056XFS	XtendFlex/ STS	5.0	19.0	MS	4	MS
DELTA GROW DG48XF80	XtendFlex	4.8	19.2	MS	0	R
Innvictis A4924XF	XtendFlex	4.9	19.2	MS	5	MS
Progeny P4734XFS	XtendFlex/ STS	4.7	19.2	MS	0	R
R23PR-00089	Enlist E3	4.8	19.6	MS	2	MR
Revere 47-F77	XtendFlex/STS	4.7	19.8	MS	4	MS
R23PR-00035	Enlist E3	5.3	20.1	S	5	MS
Revere 48-F72	XtendFlex	4.8	20.3	S	0	R
Progeny P4775E3S	Enlist E3/STS	4.7	20.7	S	5	MS
Revere 53-F84	XtendFlex/STS	5.3	20.8	S	0	R

NK44-Q5E3S	Enlist E3/STS	4.4	20.9	S	0	R
DELTA GROW DG49XF85STS	XtendFlex	4.9	20.9	S	5	MS
Inn victis A5994XF	XtendFlex	5.9	20.9	S	0	R
DONMARIO DM47F44S	XtendFlex	4.7	21.4	S	0	R
R23PR-00037	Enlist E3	4.9	21.6	S	5	MS
Eagle Seed ES4120XF	XtendFlex	4.1	22.3	S	6	S
Progeny P4623XF	XtendFlex	4.6	22.3	S	5	MS
AG52XF0	XtendFlex	5.2	22.6	S	6	S
USG 7495XFS	XtendFlex/STS	4.9	22.6	S	0	R
Delta Grow DG46E30 (S check)	Enlist E3	4.6	22.6	S	0	R
NK48-A8XFS	XtendFlex/STS	4.8	23.0	S	6	S
Axis 4815XFS	XtendFlex/STS	4.8	23.1	S	0	R
DELTA GROW DG46XF54STS	XtendFlex	4.6	23.3	S	0	R
DONMARIO DM48F53	XtendFlex	4.8	23.3	S	0	R
AG42XF4	XtendFlex	4.2	23.4	S	4	MS
Integra XF4745S	XtendFlex	4.7	23.9	S	5	MS
DELTA GROW DG53XF95STS	XtendFlex	5.3	24.3	S	4	MS
Progeny P4691XFS	XtendFlex/ STS	4.6	24.4	S	5	MS
Progeny P4798XF	XtendFlex	4.7	24.7	S	4	MS
R23PR-00043	Enlist E3	4.4	25.0	S	5	MS
AG49XF4	XtendFlex	4.9	25.9	S	0	R
Pioneer P45Z75E	Enlist E3	4.5	26.7	S	0	R
DELTA GROW DG52XF90STS	XtendFlex	5.2	26.7	S	0	R
USG 7543XF	XtendFlex	5.4	26.9	S	0	R
Dyna-Gro S49XF43S	XtendFlex	4.9	27.8	S	0	R
Pioneer P48Z70BLX	RR2 Xtend Liberty/Bolt	4.8	28.3	S	3	MR
DELTA GROW DG48XF33STS	XtendFlex	4.8	28.3	S	0	R
NK54-J9XFS	XtendFlex/STS	5.4	28.6	S	0	R

AG47XF2	XtendFlex	4.7	28.8	S	0	R
Innvictis A4642XF	XtendFlex	4.6	29.0	S	6	S
Revere 46-E67	Enlist E3	4.6	29.4	S	0	R
AE4950	Enlist E3	4.9	29.8	S	0	R
AG45XF3	XtendFlex	4.5	30.6	S	6	S
DELTA GROW DG48XF70STS	XtendFlex	4.8	30.6	S	0	R
Progeny P4524XFS	XtendFlex/ STS	4.5	30.6	S	0	R
Integra XF4585S	XtendFlex	4.5	31.9	S	0	R
Innvictis A4503XF	XtendFlex	4.5	32.2	S	4	MS
Dyna-Gro S43XF85S	XtendFlex	4.3	32.3	S	0	R
Axis 4625XFS	XtendFlex/STS	4.6	32.8	S	1	R
USG 7474XFS	XtendFlex/STS	4.7	32.8	S	5	MS
DELTA GROW DG55XF23	XtendFlex	5.5	33.4	S	3	MR
DONMARIO DM46F54S	XtendFlex	4.6	33.9	S	5	MS
Pioneer P46A90LX	RR2 Xtend Liberty	4.6	35.0	S	0	R
Armor 49-F05	XtendFlex	4.9	35.9	S	0	R
AG44XF4	XtendFlex	4.4	36.6	S	0	R
Integra XF4454S	XtendFlex	4.4	36.7	S	3	MR
Delta Grow DG4880GLY (S check)	RR2	4.8	36.7	S	0	R
Pioneer P49Z02E	Enlist E3	4.9	37.2	S	4	MS
Progeny P4842XFS	XtendFlex/ STS	4.8	37.2	S	3	MR
Revere 44-F44	XtendFlex/STS	4.4	37.2	S	0	R
AG46XF3	XtendFlex	4.6	37.6	S	6	S
NK49-C2XFS	XtendFlex/STS	4.9	38.0	S	6	S
Dyna-Gro S48XF35	XtendFlex	4.8	38.7	S	2	MR
Innvictis A5284XF	XtendFlex	5.2	40.0	S	5	MS
Progeny P4999E3S	Enlist E3/STS	4.9	40.9	VS	5	MS
Dyna-Gro S47XF23S	XtendFlex	4.7	41.7	VS	4	MS

Revere 51-F31	XtendFlex	5.1	41.8	VS	0	R
NK44-J4XFS	XtendFlex/STS	4.4	42.2	VS	3	MR
Revere 49-F36	XtendFlex/STS	4.9	42.2	VS	0	R
Pioneer P45A70LX	RR2 Xtend Liberty	4.5	43.3	VS	3	MR
Progeny P4824XF	XtendFlex	4.8	44.4	VS	4	MS
NK43-W1XFS	XtendFlex/STS	4.3	46.0	VS	0	R
AG48XF3	XtendFlex	4.8	46.7	VS	6	S
Revere 4826XFS	XtendFlex/STS	4.8	47.2	VS	5	MS
Innvictis A4664XF	XtendFlex	4.6	47.3	VS	0	R
Progeny P4947XFS	XtendFlex/ STS	4.9	47.8	VS	0	R
NK49-N7XF	XtedFlex	4.9	48.3	VS	0	R
USG 7435XFS	XtendFlex/STS	4.3	51.1	VS	0	R
Integra XF4875S	XtendFlex	4.8	51.7	VS	0	R
Progeny P4848XF	XtendFlex	4.8	55.6	VS	5	MS
Eagle Seed ES56E45	Enlist E3	5.6	56.7	VS	2	MR
Pioneer P48A14E	Enlist E3	4.8	57.8	VS	1	R
Innvictis A4862XF	XtendFlex	4.8	61.7	VS	0	R

^a Data are averages of three replications arranged in a randomized complete block design.

^b Root-knot nematode susceptibility was based on percent root system galled, whereas 0-1.0% = very resistant, 1.1-4.0% = resistant, 4.1-9.0% = moderately resistant, 9.1-20.0% = moderately susceptible, 20.1-40.0% = susceptible, 40.1-100.0% = very susceptible.

^c Frogeye susceptibility was based on a 0-9 scale (0 = no disease and 9 = severe disease) across the entire plot in the upper 1/3 of the canopy.