RENIFORM NEMATODE REPRODUCTION ON SOYBEAN CULTIVARS AND BREEDING LINES IN 2015

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Abstract

In 2015, 116 private soybean cultivars and lines from the Arkansas Variety Testing Program and 219 breeding lines and varieties from Public Soybean Breeders: 68 from Arkansas (Chen), 21 from the Missouri (Shannon), 40 from Georgia (Li) and 90 from Southern Illinois (Kantartzi) were tested in the greenhouse to determine their suitability as hosts for the reniform nematode (RN), *Rotylenchulus reniformis*. Resistant soybean lines provide an economically effective management tactic to suppress RN population densities for a subsequent cotton crop. All genotypes were inoculated with 2,000 vermiform RN in two separate greenhouse studies, with private tested lines grown for 91 days and the public breeders lines tested 83 days. The RN resistant varieties Anand and Hartwig, the RN susceptible cultivars Braxton and Ellis, and fallow reniform nematode infested soil (to show survival without a host) served as controls. The reproductive index (RI = Pf/Pi) was calculated based on the average number of vermiform nematodes extracted from the soil of each treatment. Soybean lines with a greater (P = 0.05) RI than the resistant controls were considered suitable hosts for *R. reniformis*. Of the 116 Arkansas Variety test lines, 109 were considered suitable hosts; however private lines Delta Grow DG 4995 RR, Go Soy 4914GTS, Delta Grow DG 5128, and Go Soy Leland had a magnitude of resistance that was similar to the resistant controls while lines S11-20337, S11-17025, and S11-20195 are public breeder lines submitted by Missouri. The Reniform nematode did not reproduce more than the resistant checks Anand on (22 of the 219) and on (7 of the 219) Hartwig on breeding lines and varieties submitted by the Public Soybean Breeders. These lines may be of interest for developing reniform resistant cultivars in a soybean breeding programs. The four commercially available soybean lines from the Arkansas variety test may be useful in a cotton - soybean rotation to reduce the numbers of reniform nematodes and allow cotton to be grown economically.

Introduction

The reniform nematode (*Rotylenchulus reniformis*) causes considerable damage and yield loss to cotton in the United States from the middle-Atlantic states south and west to Texas. Presently no commercial upland cotton varieties have reniform nematode resistance, whereas several sources of reniform nematode resistance exist in soybean. Soybean reniform nematode resistance is most often linked to resistance to the soybean cyst nematode (SCN (*Heterodera*

glycines)) obtained from Peking and PI437654. It is known that SCN resistance obtained from PI-88788 lacks reniform resistance (Robbins & Rakes, 1996), which is unfortunate as the majority (over 95%) of soybean varieties with SCN resistance is linked to PI 88788.

The use of reniform nematode resistant soybean in a rotation with cotton can be a useful management option. Public soybean breeding lines from programs at the University of Arkansas, Clemson University, University of Missouri, University of Southern Illinois, and USDA from Jackson Tennessee that have a low rate of reniform nematode reproduction may prove very useful in breeding for reniform nematode resistance.

Information on the reproduction of the reniform nematode on contemporary soybean cultivars is limited. Robbins, et al. (1994) reported on the reproduction of the reniform nematode on 30 soybean cultivars. In 1996, Robbins & Rakes reported reniform nematode reproduction on 16 soybean cultivars, 45 germplasm lines, two cultivars Hartwig and Cordell with resistance from PI's 437654 and 90763, respectively, and the differentials used in the soybean cyst nematodes race determination tests. A history of the reniform nematode in the South was given to the Southern Soybean Disease Workers (Robbins 2013b). During the 1999 to 2015 period yearly tests have determined the host status for over 2,400 soybean lines (Robbins et al., 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007a, 2008, 2009, 2010, 2011, 2012, 2013a, 2014, 2015). These papers form the basis for reniform nematode reproduction information on contemporary soybean lines. The breeding lines tested for reniform nematode reproduction are given by Robbins et al. (2007b, 2008, 2009, 2010, 2011, 2012, 2013a, 2014, 2015).

The objectives of the 2015 study were to: 1) identify new soybean cultivars that are poor hosts for the reniform nematode that would be useful in rotation with cotton or other reniform nematode susceptible crops in reniform nematode infested fields. 2) to identify useful breeding lines for use in selection of new reniform nematode resistant cultivars and 3) to list useful lines for cotton-soybean rotations from 2012 to 2015.

Materials and Methods

The soybean lines and cultivars tested in 2015 were from both private and public sources. Seeds of all cultivars were germinated in vermiculite and transplanted into 10-cm-diam. clay pots containing 500 cm3 of pasteurized fine sandy loam soil (approximately 86% sand, 8% silt, 6 % clay, <1% O.M.). The reniform nematode inoculum was obtained by washing the soil from the roots of the susceptible cultivar Braxton grown in the greenhouse for at least 10 weeks, suspending the nematodes in water, and pouring the nematode suspension through nested 850- and 38-µm-pore sieves. The material on the 38-µm-pore sieve was placed on a tissue in a Baermann funnel. All vermiform stages of *R. reniformis* were collected after 16 hours. A total of 2,000 vermiform reniform nematodes were injected with an autopipe into two, 2.5 cm-deep holes made in the soil in each pot containing one seedling in the cotyledon stage the day of transplanting. Pots were arranged in a randomized complete block design, with five replications per line or cultivar. Soybean cultivars Anand and Hartwig were included as resistant controls, Braxton as a susceptible control and an inoculated pot with no plant (fallow) as an inoculum survivor control. After 91 days for the private and 83 days for public varieties and lines, the number of vermiform reniform nematodes in the soil of each pot was determined (Jenkins, 1974). A reproductive index (RI), defined as the number of eggs + vermiform nematodes at test termination (Pf)/initial inoculation level (Pi), was calculated for each cultivar. In addition, the ratio of the RI of each cultivar to the RI of Anand (RA) and Hartwig (RH) was calculated. The log ratio data of both [log10 (RA + 1)] and [log10 (RH + 1)] were analyzed as a randomized complete block using analysis of variance. Log ratio transformations were used because of the high degree of variation in nematode counts within a cultivar. All statistical analyses were carried out using SAS version 8 (SAS Institute, Cary, NC).

Results

Of the Arkansas Variety test lines, 104 were considered suitable hosts; however; Delta Grow DG 4995 RR, Go Soy 4914GTS, Delta Grow DG 5128, and Go Soy Leland were commercial varieties and Missouri lines S11-17025, S11-20195, and S11-20337; 2524N had a magnitude of resistance that was similar to the highly resistant controls Anand and Hartwig. Four commercial varieties (Morsoy Xtra 55X75, Willcross WXR2524N, Progeny P 5752RY, USG 75B75R) and one Missouri line (S11-16653) were considered to be moderately resistant. The commercially available reniform nematode resistant soybean lines may be useful in a cotton - soybean rotation to reduce the numbers of reniform nematodes and allow cotton to be grown economically (Table 1).

Table 1. *Rotylenchulus reniformis* data of Average Soil Count per Pot (500 $cm^{3)}$, Reproduction index (Pf/Pi) and Disease Rating on 116 selected soybean cultivars and lines from the Arkansas Soybean Variety Testing Program 2015 tests.

Test Line	Soil Count	RI = Disease Pf/Pi	Rating
Fallow - Survival Check	296	0.148	Check
Delta Grow DG 4995 RR	816	0.408	Resistant
Anand - Check	996	0.498	Check
S11-20337 (Missouri Line)	996	0.498	Resistant
Go Soy 4914GTS	1104	0.552	Resistant
Hartwig - Check	1092	0.546	Check
S11-17025 (Missouri Line)	1212	0.606	Resistant
S11-20195 (Missouri Line)	1464	0.732	Resistant
Delta Grow DG 5128	1788	0.894	Resistant
Go Soy Leland	1968	0.984	Resistant
S11-16653	3252	1.626	Mod Res
Morsoy Xtra 55X75	4692	2.346	Mod Res
Willcross WXR2524N	5188	2.594	Mod Res
Progeny P 5752RY	5203	2.602	Mod Res
USG 75B75R	5064	2.532	Mod Res
CZ 5147LL	5612	2.806	Mod Susc
Armor AR5605	6944	3.472	Mod Susc
Delta Grow DG 5230 RR2	6636	3.318	Mod Susc
Mycogen 5N522R2	8632	4.316	Mod Susc
CZ 5150LL	13364	6.682	Susceptible
Go Soy 5115LL	16376	8.188	Susceptible
Armor 53-L55	12600	6.300	Susceptible
Progeny P 5226RYS	21844	10.922	Susceptible
HBK 4653LL	14772	7.386	Susceptible
HALO 4:98	13856	6.928	Susceptible
Armor AR4615	15532	7.766	Susceptible
Willcross WXR2494NS	13588	6.794	Susceptible
Go Soy 4714GTS	16688	8.344	Susceptible
Armor AR4705	13628	6.814	Susceptible
CZ 4590RY	19476	9.738	Susceptible
AvDx-D415	17940	8.970	Susceptible
Pioneer P49T09BR	18260	9.130	Susceptible
CZ 4959RY	13864	6.932	Susceptible
Armor 44X5L	18984	9.492	Susceptible
UA 5014C	22156	11.078	Susceptible
Armor AR4504	18960	9.480	Susceptible
Dyna-Gro S44LS76	16592	8.296	Susceptible
Mycogen 5N404R2	16936	8.468	Susceptible

UA 5414RR	16968	8.484	Susceptible
Mycogen 5N433R2	21904	10.952	Susceptible
LG Seeds C4867R2	25656	12.828	Susceptible
UA 5814HP	21936	10.968	Susceptible
Delta Grow DG 4977 LL/STS	21044	10.522	Susceptible
Progeny P 5414LL	32972	16.486	Susceptible
HBK 4950LL	25004	12.502	Susceptible
Croplan R2C4914S	21760	10.880	Susceptible
Go Soy 4415LL	19200	9.600	Susceptible
Armor 57-R17	20548	10.274	Susceptible
Go Soy 5215LL	21512	10.756	Susceptible
Go Soy 4915R2	20960	10.480	Susceptible
USG 74A74RS	21384	10.692	Susceptible
Eagle Seed ES4772RY	31804	15.902	Susceptible
HALO 4:80	20720	10.360	Susceptible
Armor AR53X	28936	14.468	Susceptible
Go Soy 5315LL	21744	10.872	Susceptible
HBK 4953LL	21548	10.774	Susceptible
Delta Grow DG 4935 RR2/STS	35008	17.504	Susceptible
CZ 4105LL	37952	18.976	Susceptible
Pioneer P50T15BR	23464	11.732	Susceptible
LG Seeds C4780R2	32356	16.178	Susceptible
Armor AR4205	24176	12.088	Susceptible
Eagle Seed ES5508RY	20700	10.350	Susceptible
Willcross WXE2535NS	38288	19.144	Susceptible
REV® 44A14™	22060	11.030	Susceptible
LG Seeds C4322R2	24768	12.384	Susceptible
Armor 48-C5	32924	16.462	Susceptible
Armor 41X5L	40424	20.212	Susceptible
Go Soy Ireane	22800	11.400	Susceptible
Dyna-Gro S48RS53	22200	11.100	Susceptible
Morsoy Xtra 46X95	22900	11.450	Susceptible
S12-3791	22400	11.200	Susceptible
CZ 4540LL	26832	13.416	Susceptible
Go Soy Glider	32284	16.142	Susceptible
Armor 49X5L	27100	13.550	Susceptible
Dyna-Gro S42RY46	24600	12.300	Susceptible
Go Soy 4714LL	24700	12.350	Susceptible
NK S55-Q3 Brand	38444	19.222	Susceptible
CZ 4044LL	26500	13.250	Susceptible
Delta Grow DG 4781 LL	52868	26.434	Susceptible

CZ 5445LL	26088	13.044	Susceptible
CZ 5225LL	27300	13.650	Susceptible
USG 74K95RS	45844	22.922	Susceptible
Morsoy Xtra 49X85	35196	17.598	Susceptible
Pioneer P41T33R	29900	14.950	Susceptible
LG Seeds C4994R2	26600	13.300	Susceptible
CZ 4748LL	38728	19.364	Susceptible
Delta Grow DG 5067 LL	28600	14.300	Susceptible
Armor 51X5L	29680	14.840	Susceptible
Croplan R2C4654	28600	14.300	Susceptible
Progeny P 4757RY	30000	15.000	Susceptible
Dyna-Gro S52LL66	31732	15.866	Susceptible
USG 75J45R	28100	14.050	Susceptible
CZ 5242LL	29000	14.500	Susceptible
Mycogen 5N490R2	32000	16.000	Susceptible
Mycogen 5N501R2	31400	15.700	Susceptible
Armor AR4305	32000	16.000	Susceptible
REV® 51A56™	33380	16.690	Susceptible
Armor AR4904	32100	16.050	Susceptible
Armor AR5615	37020	18.510	Susceptible
Braxton Check	45212	22.606	Check
Delta Grow DG 5367 LL	34300	17.150	Susceptible
Croplan R2C4700S	39400	19.700	Susceptible
NK S58-Z4 Brand	40464	20.232	Susceptible
USG 74D95RS	36600	18.300	Susceptible
USG Ellis	38936	19.468	Susceptible
Armor 47X5L	33700	16.850	Susceptible
Delta Grow DG 4567 LL	40212	20.106	Susceptible
Armor AR5205	36500	18.250	Susceptible
CZ 4818LL	39840	19.920	Susceptible
REV® 48A46™	42800	21.400	Susceptible
Ellis - Check	66968	33.480	Check
Delta Grow DG 4587 LL/STS	47200	23.600	Susceptible
Progeny P 4214RY	44900	22.450	Susceptible
CZ 4181RY	45100	22.550	Susceptible
Delta Grow DG 4775 RR2	46700	23.350	Susceptible
Dyna-Gro S55LS75	54700	27.350	Susceptible
Go Soy 5515LL	46900	23.450	Susceptible
Delta Grow DG 4985 RR2	56800	28.400	Susceptible
REV® 55L95™	57900	28.950	Susceptible
Progeny P 4814LLS	66560	33.280	Susceptible

Armor 49-X	67500	33.750	Susceptible

The reniform nematode did not reproduce more on 16 lines than Anand on the179 breeding lines and varieties submitted by Public Soybean Breeders. These lines may be of interest for developing reniform resistant cultivars in a soybean breeding programs (Table 2).

Table 2. *Rotylenchulus reniformis* data of Breeder, Line, Soil Count Average per Pot (500 cm^3), Reproduction Index = (Pf/Pi) and Disease Rating on 219 selected soybean breeding lines from cooperating Southern Soybean Breeders 2015 tests.

Breeder	Line	Soil Count	RI = Pf/Pi	Disease Rating
Fallow Ck	- - -	92	0.05	Survival CK
Kantartzi	FxH 23	2130	1.10	Resistant
Shannon	S13-11733	2311	1.20	Resistant
Kantartzi	Hartwig	2634	1.30	Resistant
Kantartzi	FxH 35	2796	1.40	Resistant
Kantartzi	Peking	3438	1.70	Resistant
Shannon	S13-1955	3365	1.70	Resistant
Shannon	S13-16712	3440	1.70	Resistant
Shannon	S13-10590	3520	1.80	Resistant
Shannon	S13-1961	3515	1.80	Resistant
Li	Hartwig	3738	1.90	Resistant
Res CK	Hartwig	4054	2.00	Resistant
Kantartzi	FxH 92	4000	2.00	Resistant
Kantartzi	FxH 26	4280	2.10	Resistant
Res CK	Anand	4460	2.20	Resistant
Kantartzi	FxH 37	5580	2.80	Resistant
Kantartzi	FxH 22	5720	2.90	Resistant
Li	G11-1614R2	6420	3.20	Resistant
Kantartzi	FxH 5	6584	3.30	Resistant
Kantartzi	FxH 40	8025	4.00	Mod. Resistance
Shannon	S13-8912	8160	4.10	Mod. Resistance
Li	G12-3698R2	8480	4.20	Mod. Resistance
Shannon	S13-5358	9798	4.90	Mod. Resistance
Chen	R12-514	13734	6.90	Mod. Resistance
Li	G11-2294R2	17229	8.60	Mod. Resistance
Kantartzi	FxH 8	19280	9.60	Mod. Susceptible
Chen	R09-5026	19633	9.80	Mod. Susceptible
Kantartzi	FxH 78	19640	9.80	Mod. Susceptible
Kantartzi	FxH 90	25672	12.80	Susceptible
Kantartzi	FxH 46	25780	12.90	Susceptible
Kantartzi	FxH 83	28960	14.50	Susceptible
Kantartzi	FxH 80	31140	15.60	Susceptible
Li	G12-2554R2	31640	15.80	Susceptible

Kantartzi	FxH 72	32420	16.20	Susceptible
Li	G93-9009	32760	16.40	Susceptible
Kantartzi	FxH 91	34800	17.40	Susceptible
Kantartzi	FxH 79	35160	17.60	Susceptible
Kantartzi	FxH 64	35300	17.70	Susceptible
Li	G11PR-56238R2	35680	17.80	Susceptible
Li	G11PR-209R2	35840	17.90	Susceptible
Chen	RM-21464	36820	18.40	Susceptible
Li	G13PR-110	37140	18.60	Susceptible
Kantartzi	FxH 76	37680	18.80	Susceptible
Chen	R10-563	38140	19.10	Susceptible
Kantartzi	FxH 33	38180	19.10	Susceptible
Chen	R12-6522RR	38960	19.50	Susceptible
Shannon	S13-16675	39336	19.70	Susceptible
Chen	R07-167	41075	20.50	Susceptible
Shannon	S13-9860	42040	21.00	Susceptible
Shannon	R11-1057	43280	21.60	Susceptible
Chen	S13-13084	43200	21.60	Susceptible
Li	G11-2675R2	43500	21.80	Susceptible
Kantartzi	R12-2079	44000	22.00	Susceptible
Chen	FxH 53	44077	22.00	Susceptible
Kantartzi	FxH 55	43959	22.00	Susceptible
Chen	R07-6614RR	44128	22.10	Susceptible
Shannon	R09-345	44680	22.30	Susceptible
Kantartzi	FxH 20	44592	22.30	Susceptible
Chen	S13-16392	44567	22.30	Susceptible
Shannon	S13-10021	45296	22.60	Susceptible
Chen	R11-7999	45780	22.90	Susceptible
Chen	R12-6529RR	45740	22.90	Susceptible
Chen	R09-4010	46000	23.00	Susceptible
Li	G12-2482R2	46000	23.00	Susceptible
Kantartzi	FxH 85	46440	23.20	Susceptible
Chen	R05-655	48000	24.00	Susceptible
Kantartzi	FxH 2	49160	24.60	Susceptible
Kantartzi	FxH 58	49200	24.60	Susceptible
Chen	R08-1830	50260	25.10	Susceptible
Kantartzi	FxH 3	50680	25.30	Susceptible
Kantartzi	FxH 30	50520	25.30	Susceptible
Li	G10PR-56444R2	52288	26.10	Susceptible
Li	G11PR-56151R2	52380	26.20	Susceptible
Sus Ck	FxH 9	52660	26.30	Susceptible

Kantartzi	Braxton	52640	26.30	Susceptible
Chen	Osage	52940	26.50	Susceptible
Shannon	S13-12611	53000	26.50	Susceptible
Kantartzi	FxH 42	53200	26.60	Susceptible
Kantartzi	FxH 19	53820	26.90	Susceptible
Kantartzi	FxH 29	54160	27.10	Susceptible
Kantartzi	R09-430	54800	27.40	Susceptible
Chen	RM-2463	54800	27.40	Susceptible
Chen	FxH 4	54780	27.40	Susceptible
Li	FxH 21	54880	27.40	Susceptible
Kantartzi	G12PR-63R2	54800	27.40	Susceptible
Chen	R10-28	54900	27.50	Susceptible
Kantartzi	FxH 12	55280	27.60	Susceptible
Chen	UA 5612	55340	27.70	Susceptible
Shannon	S13-16663	56200	28.10	Susceptible
Chen	R08-4004	56440	28.20	Susceptible
Kantartzi	FxH 39	57200	28.60	Susceptible
Chen	RM-1144	57660	28.80	Susceptible
Li	G12-2731R2	58680	29.30	Susceptible
Kantartzi	FxH 51	59000	29.50	Susceptible
Kantartzi	FxH 50	59200	29.60	Susceptible
Chen	R10-2622	59340	29.70	Susceptible
Li	G13LL-44	60100	30.10	Susceptible
Kantartzi	FxH 6	60880	30.40	Susceptible
Li	FxH 14	61020	30.50	Susceptible
Kantartzi	G00-3213	61000	30.50	Susceptible
Li	R10-2346	61620	30.80	Susceptible
Chen	CNS	61600	30.80	Susceptible
Chen	R12-7448RY	61800	30.90	Susceptible
Chen	R11-1525	62100	31.10	Susceptible
Li	FxH 70	62420	31.20	Susceptible
Kantartzi	G11-2663R2	62360	31.20	Susceptible
Chen	R11-89RY	62540	31.30	Susceptible
Li	Bossier	63400	31.70	Susceptible
Li	G13LL-56	63600	31.80	Susceptible
Chen	R11-8346	63800	31.90	Susceptible
Kantartzi	FxH 84	64400	32.20	Susceptible
Li	G12-2152R2	64800	32.40	Susceptible
Li	G12-2103R2	64800	32.40	Susceptible
Kantartzi	FxH 94	65000	32.50	Susceptible
Chen	R09-1589	65340	32.70	Susceptible

Chen	R10-5086	66040	33.00	Susceptible
Li	G12-1475R2	66400	33.20	Susceptible
Chen	R11-2419	66600	33.30	Susceptible
Li	G11PR-407R2	66800	33.40	Susceptible
Li	G00-3880	66800	33.40	Susceptible
Li	G93-9106	67000	33.50	Susceptible
Shannon	S13-2743	67175	33.60	Susceptible
Kantartzi	FxH 10	67200	33.60	Susceptible
Chen	R11-2559	67600	33.80	Susceptible
Kantartzi	FxH 75	67600	33.80	Susceptible
Kantartzi	FxH 45	67800	33.90	Susceptible
Kantartzi	FxH 43	68000	34.00	Susceptible
Kantartzi	FxH 17	68120	34.10	Susceptible
Kantartzi	FxH 81	68400	34.20	Susceptible
Li	G12-6543	68800	34.40	Susceptible
Li	G13LL-5	68720	34.40	Susceptible
Li	Haskell	69080	34.50	Susceptible
Chen	R06-3733	69120	34.60	Susceptible
Chen	R10-5828	69600	34.80	Susceptible
Chen	R10-1261	70000	35.00	Susceptible
Kantartzi	FxH 48	70400	35.20	Susceptible
Chen	R09-4467	70600	35.30	Susceptible
Li	G12-1816R2	70800	35.40	Susceptible
Kantartzi	FxH 74	70920	35.50	Susceptible
Li	G12-3107R2	71400	35.70	Susceptible
Kantartzi	FxH 93	71640	35.80	Susceptible
Chen	R07-2000	71800	35.90	Susceptible
Chen	R10-2436	71740	35.90	Susceptible
Chen	UARK-292	71800	35.90	Susceptible
Kantartzi	FxH 7	72000	36.00	Susceptible
Kantartzi	FxH 65	72320	36.20	Susceptible
Chen	R11-6447	72600	36.30	Susceptible
Chen	R07-2001	72800	36.40	Susceptible
Kantartzi	FxH 1	73000	36.50	Susceptible
Shannon	S13-12582	73700	36.90	Susceptible
Chen	R12-226	74300	37.20	Susceptible
Kantartzi	FxH 28	74400	37.20	Susceptible
Li	G13LL-7	74400	37.20	Susceptible
Li	R11-357RY	74760	37.40	Susceptible
Chen	S13-11061	74850	37.40	Susceptible
Shannon	G12-2259R2	74720	37.40	Susceptible

Kantartzi	FxH 62	74960	37.50	Susceptible
Kantartzi	FxH 24	75200	37.60	Susceptible
Shannon	S13-11940	75200	37.60	Susceptible
Kantartzi	FxH 18	75400	37.70	Susceptible
Kantartzi	FxH 25	75400	37.70	Susceptible
Li	G12-3298R2	75560	37.80	Susceptible
Chen	R11-7141	76800	38.40	Susceptible
Kantartzi	FxH 82	76920	38.50	Susceptible
Kantartzi	FxH 47	77180	38.60	Susceptible
Kantartzi	FxH 54	77250	38.60	Susceptible
Kantartzi	FxH 59	77200	38.60	Susceptible
Chen	UARK-602	77600	38.80	Susceptible
Kantartzi	FxH 11	78000	39.00	Susceptible
Chen	R12-937	78800	39.40	Susceptible
Chen	R11-2299	80400	40.20	Susceptible
Kantartzi	FxH 13	80400	40.20	Susceptible
Kantartzi	FxH 57	80800	40.40	Susceptible
Chen	R11-171	81000	40.50	Susceptible
Chen	R11-2354	81400	40.70	Susceptible
Kantartzi	FxH 56	81600	40.80	Susceptible
Chen	R12-1012	82000	41.00	Susceptible
Chen	UARK-282	82000	41.00	Susceptible
Kantartzi	FxH 15	82000	41.00	Susceptible
Kantartzi	FxH 27	82000	41.00	Susceptible
Kantartzi	FxH 87	82800	41.40	Susceptible
Chen	R10-197RY	83060	41.50	Susceptible
Kantartzi	FxH 63	83400	41.70	Susceptible
Kantartzi	FxH 69	83400	41.70	Susceptible
Chen	R08-4002	83840	41.90	Susceptible
Chen	R12-6878RR	84020	42.00	Susceptible
Kantartzi	FxH 89	84800	42.40	Susceptible
Shannon	S13-11167	84800	42.40	Susceptible
Li	Ellis	85000	42.50	Susceptible
Sus Ck	G12-1149R2	85000	42.50	Susceptible
Kantartzi	FxH 44	85200	42.60	Susceptible
Kantartzi	Flyer	86000	43.00	Susceptible
Kantartzi	FxH 77	86000	43.00	Susceptible
Kantartzi	FxH 61	88000	44.00	Susceptible
Kantartzi	FxH 73	88000	44.00	Susceptible
Chen	R10-230	88400	44.20	Susceptible
Li	G12-6515	89200	44.60	Susceptible

Li	FxH 66	89860	44.90	Susceptible
Kantartzi	G11-1984R2	89800	44.90	Susceptible
Shannon	S13-10592	90160	45.10	Susceptible
Chen	R09-1237	91600	45.80	Susceptible
Chen	R11-399	91600	45.80	Susceptible
Kantartzi	FxH 88	92000	46.00	Susceptible
Shannon	S13-1261	92000	46.00	Susceptible
Chen	R12-2142	92800	46.40	Susceptible
Chen	UA 5414RR(R04-1268RR)	94000	47.00	Susceptible
Chen	UA 5014C (R05-3239)	95000	47.50	Susceptible
Chen	R11-262	96400	48.20	Susceptible
Kantartzi	FxH 16	96600	48.30	Susceptible
Chen	R11-2517	96800	48.40	Susceptible
Kantartzi	FxH 41	98400	49.20	Susceptible
Kantartzi	FxH 67	98800	49.40	Susceptible
Chen	R09-1223	100800	50.40	Susceptible
Chen	UA 5814HP (R09-3789)	101000	50.50	Susceptible
Chen	R12-1622	102800	51.40	Susceptible
Chen	R02-6268F	103200	51.60	Susceptible
Chen	UA 5213C	103200	51.60	Susceptible
Chen	R12-11713	107200	53.60	Susceptible
Kantartzi	FxH 32	110420	55.20	Susceptible
Li	G12-2062R2	112800	56.40	Susceptible
Li	G12-1784R2	116400	58.20	Susceptible
Kantartzi	FxH 36	118000	59.00	Susceptible
Kantartzi	FxH 38	123280	61.60	Susceptible
Kantartzi	FxH 68	141400	70.70	Susceptible

List of Public Soybean Breeders commercial lines and varieties from the test years 2012 to 2015 are given (Table 3). These varieties would be especially important for a cotton-soybean rotation where reniform is a problem. Other earlier tests are not given because of rapid replacement of these varieties by new varieties and their subsequent unavailability.

Table 3. Private commercial soybean varieties tested in 2012, 2013, 2014, and 2015 that exhibit variety reniform resistance.

2012	**2013**	**2014**	**2015**
Armor 49-C3	Delta Grow 4940	Delta Grow DG4940RR	Delta Grow DG 4995 RR
MPG 5214	ARMOR X1410	Armor AX4520	Go Soy 4914GTS
REV®55R83	MPG-S-5214NRR	Eagle Seed ES5335RY	Delta Grow DG 5128
	Willcross RY2513N	LG Seeds C5252R2	Go Soy Leland
	Leland	Asgrow AG5535 GENRR2Y	
	ARMOR X47C	Willcross WX 2524N	
	Schillinger 4712R2	Armor AX4450	
	Eagle Seed 5650RR	Dyna-Gro S52RY75	
		Delta Grow DG5230GENRR2Y	
		Mycogen X54522NR2	

Summary

Commercial reniform nematode resistant soybean varieties may be useful in cotton-soybean rotations. Of the 116 private soybean lines tested in 2015 seven exhibited adequate resistance to be considered useful in a cotton-soybean rotation (Table 1). All Commercial Varieties tested in 2015 can be found in Table 1.

Public breeding lines with a useful level of reniform resistance in varieties and breeding lines tested in 2015 are listed in Table 2. Of 2015's 219 public breeding lines, varieties, and lines 11 would be useful in reniform resistance breeding programs. In table 3 all soybean varieties with levels of resistance to reniform nematode useful in cotton-soybean rotations of tests since 2012 are listed. Annual Reproductive Indexes of the reniform nematode have been reported by the senior author since 1998. Finding the older varieties may be a challenge as many private varieties last only a very few seasons (years).

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