MISSISSIPPI SOYBEAN PROMOTION BOARD
PROJECT NO. 12-2015 (YEAR 3 OF 3)
2015 ANNUAL REPORT

Title: **Nematode management investigations in Mississippi soybean production systems**

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REPORT OF PROGRESS/ACTIVITY

OBJECTIVE(S):

1. **Determine the impact of Telone II on soybean production in nematode infested soils using site-specific technology.**

Due to the late nature of the planting in 2015, as well as the row spacing associated with the OVT planting equipment (30" planter, compared to a 38" Telone applicator) this objective was dropped until a more suitable location could be chosen and a planter could be meshed with the Telone applicator.

2. **Determine the role of seed-applied nematicides in soybean production systems.**

Two locations were planted to complete this objective (Ingomar and New Albany). Seed treatments were comprised of one base fungicide treatment (Trilex 2000) and several products to determine the effect on managing soybean cyst nematode (Ingomar) and the root-knot nematode (New Albany). The additional treatments were comprised of: Gaucho, Poncho Votivo, and two rates of Ilevo. In both instances a completely nontreated (naked seed) treatment was included for the sake of comparison. At Ingomar a total of 13 replications were planted with 10 replications planted at the New Albany location.

Soil samples were collected at the time of planting and at the end of the season (data not presented). Yield was harvested to determine the overall benefit of seed-applied nematicides as compared to a completely nontreated. At the Ingomar location, seed-applied nematicides mathematically increased yield compared to naked seed in two treatments, the Poncho Votivo and 0.15 mg/seed of Ilevo; however, neither increases were significantly different than the non-treated. The greatest increases in yield, a 8.7% increase, was achieved with the Poncho Votivo seed treatment. However, completely non-treated produced greater yield than three of the treatments. The second greatest increase in yield was produced with the high rate of Ilevo in combination with Gaucho, a 4% increase over the non-treated. No galling on roots or phytotoxicity as a result of seed treatments was observed at this particular location.

At the New Albany location, two different seed treatment trials were conducted. One trial used the same products as at the Ingomar location with the same variety while the second trial was conducted with a different variety and different set of products. The Bayer product trial root galling observations were made shortly before harvest to determine the longevity of the nematode treatment. Prior to harvest, roots

were removed from rows 1 and 4 with a shovel and rated on a scale of 0-5, whereby 0=no root galling and 5=severe root galling of the taproot as well as lateral roots. No significant differences in yield between the completely nontreated (naked) seed and the seed treated plots was observed. However, some mathematical differences existed whereby the greatest response, a 17.4% increase occurred with the Trilex + Gaucho + Ilevo (0.075 mg/seed). Similar results were observed at the Ingomar location suggesting that this particular seed treatment combination is effective across a wide array of soil classes as well as multiple nematode species. Even though root galling observations were made there was no direct correlation between root galling and yield in the seed-applied fungicide and nematicide plots.

3. Determine the role of variety in a heavily infested root-knot nematode field.

An entire set of the MS OVT, minus the conventional (MG IV and V) and LibertyLink (MG IV and V) varieties were planted at the New Albany location to determine the sensitivity of varieties to the root-knot nematode (RKN) for a total of 133 entries. Prior to harvest, roots were removed from rows 1 and 4 with a shovel and rated on a scale of 0-5, whereby 0=no root galling and 5=severe root galling of the taproot as well as lateral roots. Yield was harvested from the middle (rows 2 and 3) of each plot to assess the impact of RKN on overall yield.

Maturity Group IV early (appendix Table 3; Figure 1A):
Within the MG IV early varieties, the lowest yielding variety was Mycogen 5N433R2 with a yield of 32.1 bu/A. Morever, this particular variety had a relatively low root galling rating, on average a 1.2 on a scale of 0-5 indicating low sensitivity to RKN populations. The greatest yielding variety in the MG IV early varieties was Dyna-Gro 31RY45, with a yield of 61 bu/A. The Dyna-Gro variety had a low root galling rating, a 1.0, suggesting the variety has good resistance to the root-knot nematode. The most tolerant variety based on the lowest amount of root galling was Credenz CZ 4181 with a rating of 0.3 suggesting strong resistance; however, the yield was lower than the variety that produced the greatest yield, but was greater than the average of all the MG IV early varieties evaluated. In addition, yield significantly differed between among with a range of 28.9 bu/A between the 30 entries. Root galling also significantly differed among varieties with a low of 0.3 and a high of 4.0. No correlation between yield and rot galling was observed for this particular set of entries (Figure 1).

Maturity Group IV late (appendix Table 4; Figure 1B):
Within the MG IV late varieties, the lowest yielding variety was Delta Grow DG 4765 with a yield of 33.7 bu/A. In addition, DG 4765 had one of the greatest root galling ratings (3.2) compared to the other entries suggesting a high level of susceptibility to the root-knot nematode. Even though this particular variety did not have the greatest root galling, the root galling associated with this particular Progeny variety suggests it is extremely susceptible to the RKN. The greatest yielding variety in this particular group was Go Soy 4914GTS with a yield of 63.7 bu/A. In addition, with the greatest yield, 4914 GTS also had the lowest root galling rating, 0.3, suggesting the variety is resistant to the root-knot nematode. The root galling encountered with some of the varieties suggests that some varieties, while good yielders in the presence of RKN, can see sustain a high level of root galling. Yield was significantly different among varieties with a range of 30 bu/A between the 51 entries. Root galling also significantly differed among varieties with a low of 0.3 and a high of 3.9. No correlation between yield and rot galling was observed for this particular set of entries (Figure 1).

Maturity Group V early (appendix Table 5; Figure 1C):
Within the MG V early varieties, the lowest yielding variety was Asgrow AG 5233 with a yield of 34.4 bu/A. However, the variety had a root galling rating of 1.9, which was well below some of the varieties with greater root galling observed. The greatest yielding variety was Asgrow AG 5535 with a yield of 62.2 bu/A. However, even though this particular variety produced the greatest yield the root galling that occurred as a result of RKN was still greater than 4, suggesting that the variety can out yield root damage

as a result of RKN. But, it should be noted that root galling was only observed at one time during the season. Yield significantly differed among varieties with a range of 42.4 bu/A between the 44 entries. In addition, root galling between varieties significantly differed with a range of 1 to 3.7. No correlation between yield and rot galling was observed for this particular set of entries (Figure 1).

Maturity Group V late (appendix Table; Figure 1D):
Within the MG V late entries, the lowest yielding variety was NK Brand S59-V9 with a yield of 42.8 bu/A. The greatest yielding variety was NK Brand S58-Z4 with 86.3 bu/A. Both varieties had substantial galling, with the greatest yielding variety having the greatest observed root galling. Yields significantly different among varieties with a range of 43.5 bu/A between the eight entries. In addition, root galling was significantly different among varieties with a low of 0.3 and a high of 2. A statistical correlation between yield and root galling existed for the MG V late varieties as indicated in Figure 1.

Correlation between yield and root galling (appendix Figure):
In general, from the 2015 data set root galling appears to not be correlated with yield. However, as outlined above, root galling is not necessarily and indicator of how the variety will perform with regards to yield in the presence of high root-knot nematode populations.

4. **Determine the role of winter cover cropping in soybean systems with high nematode pressure.**

Due to the loss of the Moon Lake, MS location this objective has not been implemented. However, plans are to do some limited cover crop projects in other areas and as portions of other projects.

IMPACTS AND BENEFITS TO MISSISSIPPI SOYBEAN PRODUCERS

Soybean producers can rely on the information from this particular project to A) provide data regarding the susceptibility of the most commonly planted soybean varieties in MS to the root-knot nematode, and B) most effective seed-applied nematicides in situations where root-knot nematode and/or soybean cyst nematode may be present. Choosing a root-knot nematode tolerant variety will greatly help reduce the risk associated with yield losses as a result of the nematode.

END PRODUCTS–COMPLETED OR FORTHCOMING

At present, several blog postings are planned. In addition, the data from trials during 2013, 2014 and 2015 will be turned into several Plant Disease Management Reports and submitted for the purposes of publication, likely in the fall of 2016 or spring of 2017. In addition, several blog posts will be created to disseminate the information to the greater agricultural community.

Appendices (Tables 1-7; Figure 1 A-D):

Table 1. Response of soybean to seed treatment fungicide and nematicide products at Ingomar, MS, a location with a high soybean cyst nematode population.

	Yield (bu/A)	
Nontreated	31.1	abc
Trilex 2000 (base fungicide)	29.0	bc
Trilex 2000 + Gaucho	28.5	bc
Trilex 2000 + Poncho Votivo	34.3	a
Trilex 2000 + Gaucho + Ilevo 0.075 mg/seed	26.9	c
Trilex 2000 + Gaucho + Ilevo 0.15 mg/seed	32.6	ab
CV	18.6	
p-value	0.0194	
LSD	4.5	

Table 2. Response of soybean to Bayer seed treatment fungicide and nematicide products at Ingomar, MS, a location with a high soybean cyst nematode population.

	Yield (bu/A)
Nontreated (Mycogen variety)	33.9
Trilex 2000 (base fungicide)	35.5
Trilex 2000 + Gaucho	31.0
Trilex 2000 + Poncho Votivo	34.3
Trilex 2000 + Gaucho + Ilevo 0.075 mg/seed	34.2
Trilex 2000 + Gaucho + Ilevo 0.15 mg/seed	35.6
CV	16.08
p-value	0.6070
LSD	6.5

Table 3. Response of soybean to Syngenta seed treatment fungicide and nematicide products at Ingomar, MS, a location with a high soybean cyst nematode population.

	Yield (bu/A)	
Nontreated (Armor 4744)	32.1	b
ApronMAXX + Apron XL + Moly	35.2	ab
CruiserMAXX + Apron XL + Moly	37.8	a
Avicta Complete Beans 500 + Moly	32.0	b
CV	17.5	
p-value	0.042	
LSD	5.6	

Table 4. Response of Maturity Group IV early soybean varieties to root-knot nematode in New Albany, MS.

Brand	Variety	Yield		Galling	
Armor	46-R65	54.4	a-c	2.5	b-g
Armor	AR4305	38.2	f-h	1.7	d-i
Armor	AR4504	45.0	b-h	2.2	b-h
Armor	AR4615	41.0	d-h	2.1	c-i
Asgrow	AG 4135	42.1	c-h	1.7	d-i
Asgrow	AG 4232	36.4	gh	3.2	a-c
Asgrow	AG 4533	50.6	a-d	1.3	f-j
Asgrow	AG4336	43.4	b-h	2.2	b-h
Asgrow	AG4632	40.4	d-h	4.0	a
Credenz	CZ 4181 RY	49.8	a-f	0.3	j
Credenz	CZ 4590 RY	37.4	f-h	2.5	b-g
Croplan Genetics	R2C 4541	48.4	a-g	3.5	ab
Croplan Genetics	R2C4114	39.8	d-h	1.0	h-j
Delta Grow	4670R2Y	52.5	a-d	2.1	c-i
Dyna-Gro	31RY45	61.0	a	1.0	h-j
Dyna-Gro	S43RY95	55.8	ab	1.7	e-i
Dyna-Gro	S46RY85	41.7	c-h	2.6	b-f
Great Heart Seed	GT-435CR2	41.3	c-h	1.0	h-j
Great Heart Seed	GT-469CR2S	49.7	a-f	2.7	b-e
Morsoy Extra	46x95	42.6	c-h	2.6	c-f
Mycogen	5N404R2	32.1	h	1.2	g-j
Mycogen	5N433R2	49.8	a-f	2.5	b-f
Mycogen	5N452R2	46.5	b-g	2.2	b-h
NK Brand	S45-V8	37.3	f-h	2.5	b-g
Progeny	P 4214RY	39.9	d-h	2.8	a-e
Progeny	P4613RYS	41.6	c-h	2.9	a-e
Progeny	4211RY	40.6	d-h	3.0	a-d
Steyer	4303R2	48.9	a-g	2.7	a-e
Steyer	4602R2	43.2	b-h	0.9	ij
USG	74F24RS	47.6	b-g	2.4	b-g
	CV	17.8			36.5
	LSD	13.22			1.3
	p-value	0.0152			0.0001

Table 5. Response of Maturity Group IV late soybean varieties to root-knot nematode in New Albany, MS.

Brand	Variety	Yield		Galling	
Armor	49X	36.9	j-m	2.0	b-m
Armor	AR4705	58.1	a-d	2.5	a-i
Armor	AR4904	44.8	d-m	2.3	a-k
Asgrow	AG 4835	50.1	a-l	3.9	a
Asgrow	AG4934	38.9	j-m	2.9	a-g
Credenz	CZ 4959 RY	48.3	b-m	2.0	b-m
Croplan Genetics	R2C 4752S	47.3	c-m	2.9	a-g
Delta Grow	DG 4755 RR2	39.9	i-m	2.3	a-c
Delta Grow	DG 4765 RR2/STS	47.3	m	2.1	a-e
Delta Grow	DG 4775 RR2/STS	36.2	lm	2.3	a-l
Delta Grow	DG 4790RR2	54.4	a-j	3.1	a-e
Delta Grow	DG 4825 RR2/STS	53.1	h-m	1.4	f-n
Delta Grow	DG 4880RR	49.4	a-l	2.0	b-m
Delta Grow	DG 4935 RR2/STS	49.9	a-l	1.7	d-n
Delta Grow	DG 4970RR	56.3	a-g	2.4	a-j
Delta Grow	DG 4995 RR	60.5	a-c	1.2	g-n
Dyna-Gro	DG 37RY47	42.7	e-m	2.5	a-i
Dyna-Gro	S48RS53	45.1	lm	3.5	ab
Dyna-Gro	S49RY25	53.5	a-j	3.1	a-e
Go Soy	4914GTS	63.7	a	0.3	n
Go Soy	4915R2	42.6	e-m	2.5	a-i
GoSoy	4714GTS	48.8	a-l	0.8	j-n
Great Heart Seed	GT476CR2	47.1	c-m	3.3	a-d
Great Heart Seed	GT-477CR2	44.7	d-m	3.2	a-e
Great Heart Seed	GT482 CR2S	39.6	i-m	2.1	i-n
Hornbeck	HBK RY4721	48.1	b-m	1.7	d-n
MorSoy Extra	49X85	57.6	a-e	3.5	ab
Morsoy Xtra	47X12	58.6	a-d	2.7	a-h
Morsoy Xtra	48X02	57.2	a-e	1.9	j-n
Mycogen	5N479R2	50.5	a-l	2.0	b-m
Mycogen	5N490R2	56.8	a-f	2.8	a-h
NK Brand	S47-K5	55.1	a-h	2.9	a-g
NK Brand	S48-D9	50.2	a-l	2.7	a-h
Progeny	4850RYS	47.9	b-m	3.3	a-d
Progeny	4900RY	56.7	a-f	2.9	a-g
Progeny	P 4757RY	56.0	a-g	2.6	a-i
Progeny	P4788RY	48.4	b-m	2.9	a-g
Schillinger	495.RC	46.7	c-m	2.8	a-h
Steyer	4802R2	39.1	j-m	2.9	a-g
Terral REV®	47R34™	52.7	a-j	2.3	a-l
Terral REV®	47R53™	42.7	e-m	2.1	b-m
Terral REV®	48A46™	60.4	a-c	0.6	mn
Terral REV®	49A14™	59.2	a-d	2.3	a-l
Terral REV®	49A55™	41.4	g-m	2.7	a-h
Terral REV®	49A75™	51.9	a-k	2.0	b-m
Terral REV®	49R94™	53.7	a-j	1.9	c-n
Univ. of Missouri	S11-20337	62.4	ab	0.7	l-n
USG	74B83RS	52.0	a-j	1.7	d-n
USG	74D95RS	46.3	c-m	3.0	a-f
USG	74K95RS	48.8	a-l	2.5	g-n
USG	A74A74RS	41.8	e-m	2.3	a-k
	CV	18.43		42.27	
	p-value	0.0026		0.0012	
	LSD	14.9		1.6	

Table 6. Response of Maturity Group V early soybean varieties to root-knot nematode in New Albany, MS.

Brand	Variety	Yield		Galling	
Armor	50-R21	36.5	j-m	2.2	c-k
Armor	51-R50	52.1	c-j	3.0	a-e
Armor	AR5205	59.1	b-h	2.1	c-k
Armor	AR5605	69.1	ab	1.1	jk
Armor	AR5615	52.1	c-j	2.5	a-h
Asgrow	AG 5335	50.9	c-k	3.1	a-d
Asgrow	AG 5535	76.8	a	1.8	e-k
Asgrow	AG5233	34.4	lm	1.9	d-k
Asgrow	AG5332	47.1	f-l	3.3	a-c
Asgrow	AG5533	57.2	b-h	2.2	c-k
Croplan Genetics	R2C 5081	56.5	b-h	2.3	c-k
Delta Grow	5128 RR	63.8	a-e	2.9	a-f
Delta Grow	DG 5170 RR2/STS	55.4	b-h	3.7	a
Delta Grow	DG 5230 RR2	44.6	h-m	2.5	a-h
Delta Grow	DG 5575RR2	54.9	b-h	2.5	a-h
Delta Grow	DG 5625RR2	52.3	c-j	1.0	k
Dyna-Gro	92RY55	58.9	b-h	2.0	c-k
Dyna-Gro	S52RY75	64.1	a-e	3.7	a
Dyna-Gro	S56RY84	63.0	a-f	1.8	e-k
Great Heart Seed	GT516CR2	44.7	h-m	2.7	a-g
MorSoy Extra	55X75	66.5	a-c	1.5	g-k
Mycogen	5N501R2	35.1	k-m	3.1	a-e
Mycogen	5N550R2	45.6	g-l	2.6	a-h
Mycogen	5N552R2	65.8	a-c	1.9	d-k
NK Brand	S50-J7	64.6	a-d	3.0	a-e
NK Brand	S52-Y2	61.1	a-g	2.6	a-h
NK Brand	S55-Q3	64.3	a-e	2.0	c-k
Progeny	P 5226RYS	28.4	m	3.6	ab
Progeny	P5101RY	52.8	c-i	2.0	c-k
Progeny	P5213RY	46.1	g-l	3.2	a-d
Progeny	P5333RY	49.3	c-l	2.3	c-k
Progeny	P5555RY	57.2	b-h	2.5	a-h
Progeny	P5610RY	61.1	a-g	1.8	e-k
Schillinger	5220.RC	38.6	i-m	2.4	b-i
Terral REV®	51A56™	38.5	i-m	2.5	a-h
Terral REV®	52A94™	53.8	b-i	1.1	i-k
Terral REV®	54R84™	43.5	h-m	1.7	f-k
Terral REV®	55R53™	46.3	g-l	2.3	b-j
Terral REV®	56R63™	43.9	h-m	1.8	e-k
Univ. of Arkansas	R10-197RY	45.1	h-m	2.1	c-k
Univ. of Arkansas	R11-89RY	45.1	h-m	2.2	c-k
Univ. of Arkansas	Ua 5414RR	48.6	e-l	1.7	e-k
Univ. of Missouri	S11-20195	49.0	c-l	1.3	h-k
USG	75J45R	53.3	b-i	2.3	c-k
		CV	18.23		34.17
		p-value	<0.0001		0.0017
		LSD	15.9		1.3

Table 7. Response of Maturity Group V late soybean varieties to root-knot nematode in New Albany, MS.

Brand	Variety	Yield		Galling	
Asgrow	AG5831	56.1	b-d	1.7	a
Dyna-Gro	39RY57	65.6	b	2.0	a
Dyna-Gro	S57RY26	61.4	bc	0.9	bc
NK Brand	S58-Z4	86.3	a	2.0	a
NK Brand	S59-V9	42.8	e	1.8	a
Progeny	P 5752RY	63.4	bc	0.9	bc
Terral REV®	57R21™	48.0	de	0.3	c
USG	75B75R	51.9	c-e	1.3	ab
		CV	11.7		27.5
		p-value	0.0001		0.0006
		LSD	12.6		0.7

Figure 1. Scatter plots presenting the relationship between yield and root galling as related to root-knot nematode. Scatter plots present the data from top left and in clockwise order, **A)** Maturity Group IV early varieties, **B)** Maturity Group IV late varieties, **C)** Maturity Group V early varieties, and **D)** Maturity Group V late varieties.