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Coded variety trial for cyst nematode resistant sugarbeet with adaptation to the Imperial Valley and new products for cyst nematode management

Kelley Richardson,
USDA-ARS,
Salinas, CA 93905

Becky Westerdahl
Department of Entomology & Nematology
University of California, Davis 95616

Oli Bachie
University of California Cooperative Extension
Holtville, CA 92250

Research Topic 1: Evaluate new varieties and new products for management of sugarbeet cyst nematode (SBCN) in a field trial at UC Desert Research and Extension Center (DREC).

Research Questions: Are there efficacious new varieties and new products for management of nematodes on sugarbeets?

Review of Prior Work: Until suspended in April of 1990, the use of 1,3-Dichloropropene (Telone II) was a primary tool for management of nematodes in sugarbeet production in California. A study conducted by SRI International estimates that because Telone II was not available the increase in losses on sugarbeets directly due to nematodes in 1991 vs historic average losses was 6.1 million dollars and that increases in nematicide treatment costs on this crop were 16 million dollars. Telone II is currently available for use on sugarbeets but on a limited basis and at a higher cost. Because of the lack of available nematicides, there is a continuing need to develop and test new products, and new sugarbeet varieties with nematode resistance.

Objectives and Progress for 2015-2016: Evaluate the effectiveness of new varieties and new nematicides against SBCN in a field at DREC. A trial was established in the Fall of 2015 at the University of California Desert Research and Extension Center in Holtville, CA (DREC). We initially planned for a trial with 20 treatments, but increased this to 26 treatments with 6 replicates per treatment to accommodate a wider range of varieties and new products that were available for testing. The following 15 varieties were tested in the 2015-2016 trial: SV2013, SV2014, SV2015, SV2016, C37, CN 927-4-309(E) 2013, CN 12-446 2013, 8931M 2008, 14921-516 2014, BTS 52 RR45, BTS 541N, BTS 5499, BTS 5460, BTS 5555, and Phoenix. The new product treatments were: GU 8-10, DKI QuYu, LM 15-01, STO-33, Root Power, Raize More, Majestene, and Nimitz EC. The trial also includes an untreated control and Telone II as a standard chemical treatment. The Telone II treatment, untreated control, and new product

treatments were planted to Phoenix. Telone II was applied October 8, 2015. The trial was planted October 27, 2015. Remaining treatments were applied October 28, 2015, followed by irrigation on the same day. The trial was harvested on April 11, 2016. Beets were hand dug from each replicate and analyzed at the tare and sugar labs at Spreckels Sugar factory in Brawley, CA. For analysis, the pounds per sugarbeet determined from the Spreckels laboratory data for Clean Beets was converted to tons/acre based on a 40 inch row spacing and a 5 inch spacing in the row between sugarbeets. Nematode samples were taken from each replicate, and analyzed for juveniles of sugarbeet cyst nematode.

An additional trial was initiated in the Fall of 2016. It consists of 26 treatments in a randomized complete block design with 6 replicates per treatment. A standard treatment of Telone II at 9 gpa was applied on September 27, 2016. The trial was planted on October 12, and remaining treatments were applied October 13, 2016, followed by irrigation on the same day. The Telone II treatment, untreated control, and eight new product treatments were planted to SV401. The eight new product treatments are: ISO 10% at 3.5 pts/acre, ISO 10% plus Sapropel, LM2016 at 2 pts/acre, Nimitz at 3.5 and 5 pts/acre, Nimitz at 3.5 pts/acre plus LM2016, Nimitz at 3.5 pts/acre plus ISO 10%, and Nimitz at 5 pts/acre plus LM2016. The 16 varieties being tested are: SV2012, SV2013, SV2014, SV2015, SV2016, BTS 5499, BTS 5460, BTS 541 N, BTS 566 N, BTS 52RR45, 14927-4-309E, P1518-411, P1407-311, P1528, N1512-446, and 14929-227(F)

Nimitz currently has a US EPA registration on several crops, and ADAMA is pursuing a registration for sugarbeets. GU 8-10 and ISO 10% are Guayule extracts. DKI QuYu from Desert King is a combination of Quillaja and Yucca extracts. STO-33, Root Power and Raize More are Stoller Products. Root Power contains Boron and Zinc and has been shown to accelerate root growth and cause plants to become more resistant to nematodes. LM 15-01 and LM2016 contain wetting agents and amino acids. Majestene is a bionematicide recently registered by Marrone Bio Innovations (http://marronebioinnovations.com/marrone-bio-innovations-receives-epa-approval-for-majestene-bionematicide/). Sapropel is an organic fertilizer.

Most Important Results: At harvest in 2016, numerically, 18 of the varieties and new products tested and Telone had larger sugarbeets and greater yields (tons/acre) than the Untreated (Table 1, Figure 1). The exceptions were C37, CN 927-4-309(E) 2013, GU 8-10 at 3 pt/acre, LM 15-01 at 1 pt/acre, STO-33, and Majestene. Statistically, SV2014, SV2015, BTS 52 RR45, BTS 541N, and BTS 5499 at P=0.05; and BTS 5460 at P=0.10 had larger sugarbeets and greater yields (tons/acre) than the Untreated. Yields in the trial ranged from 7.74 (Majestene) to 32.68 (SV2014) tons/acre. Percent sugar ranged from 13.01 (C37) to 15.84 (BTS 5555). Numerically, twelve of the 25 varieties and products tested had a higher percent sugar than Untreated (Table 1). Numerically, all varieties and products tested except LM 15-01 at 1 pt/acre, Raize More, and Majestene had fewer cyst nematode juveniles in soil at harvest than the Untreated (Table 4, Figure 2). At P=0.05, SV2014, CN 12-446 2013, and BTS 541N had fewer cyst nematode juveniles in soil at harvest than the Untreated. At P=0.10, Telone also had had fewer cyst nematode juveniles in soil at harvest than the Untreated.

Research Topic 2: Evaluate new varieties for management of sugarbeet cyst nematode (SBCN) in a field trial at Imperial Valley Research Station (IVRS).

Research Questions: Are there efficacious new varieties for management of nematodes on sugarbeet?

Review of Prior Work: Fields infested with sugarbeet cyst nematode (SBCN) occur in the Imperial Valley and the pest is common throughout the western U.S. Tests at the Imperial Valley Research Station (IVRS) show that under SBCN conditions, sugarbeet ceased to grow in early May and by July, a very high percentage of infected plants had root rot or were dead. Thus, SBCN appears to have the potential to be very devastating to sugarbeet production in the Imperial Valley. Cyst nematode infestation is a continuing problem in the Imperial Valley causing direct losses and disrupted rotations. Historically, rotations of three years or longer have been required to reduce SBCN populations to levels below the damage threshold. There is a significant need to develop and test new sugarbeet varieties with nematode resistance.
Areas on the Imperial Valley Research Station at Brawley, CA have been inoculated with SBCN infested soil and sugarbeet inoculation crops grown to promote uniform infestation. A series of tests have been grown since 1993 to evaluate germplasm for reaction to SBCN and high temperature rots predisposed by nematode damage.

Objectives and Progress for 2015-2016: Evaluate the effectiveness of new varieties against SBCN in a field at IVRS. On November 17, 2015, a new trial with 16 treatments was initiated in a field at IVRS. The nine commercial varieties planted were SV2013, SV2014, SV2015, SV2016, BTS 52 RR45, BTS 541N, BTS 5499, BTS 5460, and BTS 5555. USDA-ARS germplasms were C37, CN927-4-309(E), and 8931M (all susceptible) and CN12-446, CN12-770, and CN921-516 (all resistant). There were 8 replicates per treatment in a randomized complete block design. The trial was harvested on July 22, 2016. The canopy of each plot was rated for foliar yellowing on a scale of 1-5, prior to harvest. Roots were mechanically harvested, weighed in pounds, and between 8 and 12 beets were collected for analysis in the tare and sugar labs at Spreckels Sugar factory in Brawley, CA. Plot weight in pounds was converted to tons per acre based on 20' rows, 30" bed spacing, and approximately 6" spacing between beets.

Initially selected as resistant from greenhouse experiments, single plots of *Beta vulgaris* subsp. *maritima* accessions PI 504215, PI 504231, PI 504244, PI 504252, PI 504256, PI 540664, PI 546393, and PI 546403 were included in the field trial as proof of concept for pre-screening for resistant accessions in the greenhouse prior to field evaluation. All accessions were dead prior to harvest suggesting sources of SBCN resistance must be introgressed into germplasm better suited to the high temperatures of the Imperial Valley.

For the 2016-2017 trial, commercial varieties included are SV2013, SV2014, SV2015, SV2016, BTS 52 RR45, BTS 541N, BTS 5499, BTS 5460, and BTS 566N. USDA-ARS germplasms are P1518-411, 14927-4-309(E), and 14929-227(F) (all susceptible) and P1407-311, P1528, and N1512-446 (all resistant). The experiment is a randomized, complete-block design with 20-foot, one-row plots replicated eight times.

Most Important Results: The level of infestation in the 2015-2016 trial was excellent and the canopy yellowing due to SBCN scores ranged from 1-5 (Table 5). Of the commercial varieties, BTS 541N (1.3), SV2014NRR (1.7) and SV2015NRR (2.2) had the lowest yellowing scores and BTS 5460 (4.7) and SV2016RR (4.7) had the highest scores. Root yield values ranged from 0 to 34.8 tons/acre with commercial varieties SV2014NRR (26.4) and SV2013RR (1.9) the highest

and lowest, respectively (Table 6, 7). Sucrose values ranged from 5.7% to 15.9%, with BTS 5499 (10.1%) and SV2015NRR (14.3) the lowest and highest, respectively.

Research Topic 3: Evaluate new varieties for management of SBCN in a greenhouse trial at USDA-ARS, Salinas, CA.

Research Questions: Are there efficacious new varieties for management of nematodes on sugarbeet?

Review of Prior Work: Years of SBCN screenings at the USDA-ARS have identified a correlation between the number of cysts counted in greenhouse trials and the level of resistance in field trials. SBCN-infested soil was collected in the Imperial Valley, CA and checked for cyst content prior to planting. After six weeks, plants are removed from the cone-tainers and soil is carefully dislodged. Roots are rinsed with water over sieves to remove all remaining soil and to collect the cysts. The cysts are then rinsed into a sample collection jar and briefly stored in the cold room (6^{o}C) until ready to be counted. Samples are poured into a watch glass and cysts are counted under a dissecting microscope.

Objectives and Progress for 2015-2016: Evaluate the effectiveness of new varieties for management of SBCN in a greenhouse trial at USDA-ARS, Salinas, CA. The commercial varieties BTS 52RR45, BTS 541N, BTS 5460, BTS 5499, BTS 5555, SV2013, SV2014, SV2015, and SV2016 and the USDA-ARS checks CN12-446 and CN921-516 (resistant) and 8931 and C37 (susceptible) were tested in the greenhouse in naturally infested SBCN soil. The experiment was an augmented randomized complete block design with planting date as blocks and replicated five times. Seven seedlings per check and 14 seedlings per commercial variety served as experimental units. Analysis of variance and comparison of all means was performed using the Tukey-Kramer adjustment.

Entries in the 2016-2017 SBCN variety greenhouse trial include the commercial varieties SV2013, SV2014, SV2015, SV2016, BTS 52 RR45, BTS 541N, BTS 5499, BTS 5460, and BTS 566N as well as resistant and susceptible USDA-ARS checks.

Most Important Results: Cyst counts ranged from 1 to 1080 cysts. SV2015NRR (46.7 cysts) had the lowest cyst count of the commercial varieties and was not significantly different than the resistant check CN921-516 (38 cysts) (Table 8). BTS52RR45 had the highest cyst count of 218.7 cysts.

Table 1. Harvest data for 2015 - 2016 UC Desert Research and Extension Center sugarbeet trial.

	Treatment	Weight/Beet (lb) 0.05	0.1	Tons/Acre 0.05	0.1	Percent Sugar 0.05	0.1
1	Untreated	0.57 EF	E	8.98 EF	E	14.12 DEFGH	DEFGHI
2	Telone 9gpa	0.70 EF	DE	10.92 EF	DE	13.60 DEFGH	FGHIJK
3	SV2013	0.66 EF	DE	10.27 EF	DE	15.75 AB	AB
4	SV2014	2.08 A	A	32.68 A	A	14.50 BCDE	CDEFG
5	SV2015	1.18 BCD	BC	18.45 BCD	BC	14.63 ABCD	CDEF
6	SV2016	0.65 EF	DE	10.11 EF	DE	15.53 ABC	ABC
7	C37	0.53 F	E	8.38 F	E	13.01 H	K
8	CN 927-4-309(E) 2013	0.52 F	E	8.15 F	E	13.11 FGH	IJK
9	CN 12-446 2013	0.70 EF	DE	11.02 EF	DE	13.05 GH	JK
10	8931M 2008	0.80 DEF	DE	12.56 DEF	DE	13.36 EFGH	HIJK
11	14921-516 2014	0.64 EF	DE	10.09 EF	DE	14.10 DEFGH	DEFGHIJ
12	BTS 52 RR45	1.33 B	B	20.85 B	B	14.70 ABCD	BCDE
13	BTS 541N	1.36 B	B	21.37 B	B	14.29 CDEFG	DEFGH
14	BTS 5499	1.23 BC	BC	19.30 BC	BC	14.52 BCDE	CDEFG
15	BTS 5460	0.94 CDE	CD	14.79 CDE	CD	14.75 ABCD	BCD
16	BTS 5555	0.68 EF	DE	10.61 EF	DE	15.84 A	A
17	GU 8-10 1 pt/acre	0.61 EF	E	9.58 EF	E	13.93 DEFGH	DEFGHIJK
18	GU 8-10 3 pt/acre	0.51 F	E	7.98 F	E	13.90 DEFGH	DEFGHIJK
19	DKI QuYu 3 pt/acre	0.71 EF	DE	11.07 EF	DE	14.27 DEFG	DEFGH
20	LM 15-01 1 pt/acre	0.48 F	E	7.58 F	E	13.88 DEFGH	DEFGHIJK
21	LM 15-01 3 pt/acre	0.63 EF	DE	9.81 EF	DE	14.17 DEFGH	DEFGH
22	STO-33 1 pt/acre	0.51 F	E	8.04 F	E	13.70 DEFGH	EFGHIJK
23	Root Power 1 pt/acre	0.65 EF	DE	10.23 EF	DE	14.31 CDEF	DEFGH
24	Raize More 1 pt/acre	0.59 EF	E	9.32 EF	E	14.01 DEFGH	DEFGHIJK
25	Majestene 2 gpa	0.49 F	E	7.74 F	E	13.70 DEFGH	DEFGHIJK
26	Nimitz 3.5 pt/acre	0.70 EF	DE	11.02 EF	DE	13.50 DEFGH	GHIJK

Each figure is the mean of 6 replicates.

Means not followed by the same letter are significantly different from each other according to Fisher's Protected Least Significant Difference Test at P = 0.05 or 0.10.

Table 2. Harvest data for 2015 - 2016 UC Desert Research and Extension Center sugarbeet trial.

		N (ppm)		Percent Purity	
	Treatment	0.05	0.1	0.05	0.1
1	Untreated	272.56 HIJ	HIJ	80.78 CDEF	CDEF
2	Telone 9gpa	419.79 ABCD	BCD	79.71 FG	F
3	SV2013	298.68 FGHIJ	GHIJ	83.34 A	AB
4	SV2014	400.61 BCDEFG	BCDEF	83.80 A	A
5	SV2015	306.79 DEFGHIJ	FGHIJ	82.99 AB	AB
6	SV2016	415.99 ABCDE	BCDE	83.65 A	AB
7	C37	330.56 CDEFGHIJ	DEFGHI	77.81 G	G
8	CN 927-4-309(E) 2013	216.40 J	J	81.09 BCDEF	CDEF
9	CN 12-446 2013	287.70 GHIJ	HIJ	79.97 EFG	F
10	8931M 2008	442.65 ABC	ABC	79.38 FG	FG
11	14921-516 2014	253.90 IJ	IJ	80.65 CDEF	DEF
12	BTS 52 RR45	529.89 A	A	82.18 ABCD	ABCD
13	BTS 541N	360.13 BCDEFGHI	BCDEFGH	83.85 A	A
14	BTS 5499	358.46 BCDEFGHI	BCDEFGH	81.94 ABCDE	BCDE
15	BTS 5460	300.52 EFGHIJ	GHIJ	82.57 ABC	ABC
16	BTS 5555	386.06 BCDEFGH	BCDEFG	82.58 ABC	ABC
17	GU 8-10 1 pt/acre	452.03 AB	AB	79.60 FG	FG
18	GU 8-10 3 pt/acre	360.49 BCDEFGHI	BCDEFGH	80.19 DEF	EF
19	DKI QuYu 3 pt/acre	354.31 BCDEFGHI	CDEFGH	80.53 CDEF	DEF
20	LM 15-01 1 pt/acre	319.96 DEFGHIJ	EFGHI	80.99 BCDEF	CDEF
21	LM 15-01 3 pt/acre	348.05 BCDEFGHI	CDEFGHI	80.36 DEF	DEF
22	STO-33 1 pt/acre	321.67 DEFGHIJ	EFGHI	81.12 BCDEF	CDEF
23	Root Power 1 pt/acre	337.02 BCDEFGHI	DEFGHI	80.73 CDEF	DEF
24	Raize More 1 pt/acre	344.56 BCDEFGHI	DEFGHI	79.99 EF	F
25	Majestene 2 gpa	408.08 BCDEF	BCDE	80.66 CDEF	DEF
26	Nimitz 3.5 pt/acre	411.37 ABCDEF	BCDE	79.97 DEFG	F

Each figure is the mean of 6 replicates.

Means not followed by the same letter are significantly different from each other according to Fisher's Protected Least Significant Difference Test at P = 0.05 or 0.10.

Table 3. Harvest data for 2015 - 2016 UC Desert Research and Extension Center sugarbeet trial.

	Treatment	Unclean			Clean		
			0.05	0.1		0.05	0.1
1	Untreated	6.36	EF	FG	5.73	EF	E
2	Telone 9gpa	7.47	EF	EFG	6.97	EF	DE
3	SV2013	7.06	EF	EFG	6.55	EF	DE
4	SV2014	21.99	A	A	20.84	A	A
5	SV2015	12.17	BCD	BCD	11.77	BCD	BC
6	SV2016	6.84	EF	EFG	6.45	EF	DE
7	C37	5.93	F	FG	5.34	F	E
8	CN 927-4-309(E) 2013	5.60	F	FG	5.20	F	E
9	CN 12-446 2013	7.43	EF	EFG	7.03	EF	DE
10	8931M 2008	8.73	DEF	DEF	8.01	DEF	DE
11	14921-516 2014	7.07	EF	EFG	6.43	EF	DE
12	BTS 52 RR45	13.67	BC	BC	12.73	BC	B
13	BTS 541N	14.77	B	B	13.63	B	B
14	BTS 5499	13.52	BC	BC	12.31	BC	BC
15	BTS 5460	10.30	CDE	CDE	9.43	CDE	CD
16	BTS 5555	7.42	EF	EFG	6.77	EF	DE
17	GU 8-10 1 pt/acre	6.63	EF	FG	6.11	EF	E
18	GU 8-10 3 pt/acre	5.47	F	FG	5.09	F	E
19	DKI QuYu 3 pt/acre	7.65	EF	EFG	7.06	EF	DE
20	LM 15-01 1 pt/acre	5.21	F	G	4.83	F	E
21	LM 15-01 3 pt/acre	6.70	EF	FG	6.26	EF	DE
22	STO-33 1 pt/acre	5.54	F	FG	5.21	F	E
23	Root Power 1 pt/acre	7.07	EF	EFG	6.53	EF	DE
24	Raize More 1 pt/acre	6.41	EF	FG	5.94	EF	E
25	Majestene 2 gpa	5.19	F	G	4.83	F	E
26	Nimitz 3.5 pt/acre	7.43	EF	EFG	6.98	EF	DE

Each figure is the mean of 6 replicates.

Means not followed by the same letter are significantly different from each other according to Fisher's Protected Least Significant Difference Test at P = 0.05 or 0.10.

Table 4. Cyst nematode data for 2015 - 2016 UC Desert Research and Extension Center sugarbeet trial.

		Cyst Nematode Juveniles / Liter of Soil			
				log	
	Treatment	0.05	0.1	0.05	0.1
1	Untreated	972.67 ABCD	ABCD	AB	ABC
2	Telone 9gpa	240.67 DE	EFG	BCDE	DEFG
3	SV2013	308.67 CDE	DEFG	ABCDE	ABCDEF
4	SV2014	94.33 E	G	E	G
5	SV2015	407.00 CDE	CDEFG	ABCDE	ABCDEF
6	SV2016	772.67 ABCDE	ABCDEFG	AB	AB
7	C37	856.67 ABCDE	ABCDEF	ABCDE	ABCDEF
8	CN 927-4-309(E) 2013	935.33 ABCD	ABCDE	ABCDE	BCDEFG
9	CN 12-446 2013	231.00 DE	FG	CDE	EFG
10	8931M 2008	891.00 ABCDE	ABCDEF	ABC	ABCDE
11	14921-516 2014	292.33 CDE	DEFG	BCDE	CDEFG
12	BTS 52 RR45	415.33 CDE	CDEFG	ABCDE	ABCDEF
13	BTS 541N	275.33 CDE	DEFG	DE	FG
14	BTS 5499	750.67 ABCDE	BCDEFG	AB	ABC
15	BTS 5460	791.33 ABCDE	ABCDEFG	ABCD	ABCDE
16	BTS 5555	591.67 BCDE	CDEFG	ABCDE	BCDEFG
17	GU 8-10 1 pt/acre	829.33 ABCDE	ABCDEF	AB	AB
18	GU 8-10 3 pt/acre	672.00 ABCDE	CDEFG	ABC	ABCD
19	DKI QuYu 3 pt/acre	776.67 ABCDE	ABCDEFG	AB	AB
20	LM 15-01 1 pt/acre	1459.00 A	A	A	A
21	LM 15-01 3 pt/acre	430.67 CDE	CDEFG	ABCDE	ABCDEF
22	STO-33 1 pt/acre	496.33 CDE	CDEFG	ABCDE	ABCDEF
23	Root Power 1 pt/acre	771.33 ABCDE	ABCDEFG	ABCD	ABCDE
24	Raize More 1 pt/acre	1379.33 AB	AB	AB	AB
25	Majestene 2 gpa	1097.33 ABC	ABC	ABC	ABCD
26	Nimitz 3.5 pt/acre	525.33 CDE	CDEFG	ABCDE	ABCDEF

Each figure is the mean of 6 replicates.

Means not followed by the same letter are significantly different from each other according to Fisher's Protected Least Significant Difference Test at P = 0.05 or 0.10.

Table 5. Foliar yellowing due to SBCN data for 2015-2016 SBCN Variety Trial at Imperial Valley Research Station

Entry	Variety	Canopy Yellowing (1-5)	
1	BTS 52RR45	3.6	BCDE
2	BTS 541N	1.3	I
3	BTS 5460	4.7	AB
4	BTS 5499	3.7	ABCD
5	BTS 5555	4	ABC
6	CN12-446 (res)	2.6	EFG
7	CN921-516 (res)	3	CDEF
8	CN12-770 (res)	1.9	GHI
9	927-4-309 (susc)	5	A
10	8931 (susc)	1.9	GHI
11	C37 (susc)	2.7	DEFG
12	SV2013	4.2	ABC
13	SV2014NRR	1.7	HI
14	SV2015NRR	2.2	FGH
15	SV2016	4.7	AB

Entries followed by the same letter are not significantly different at (p=0.05).

Table 6. Harvest data for 2015-2016 SBCN Variety Trial at Imperial Valley Research Station

Entry	Variety	Root Yield (Tons/Acre)		Sucrose (%)	
1	BTS 52RR45	9.1	BCDE	10.7	BCD
2	BTS 541N	23.5	AB	13.2	AB
3	BTS 5460	6.5	CDEF	10.2	CD
4	BTS 5499	3.6	EFG	10.1	CD
5	BTS 5555	6.7	CDEF	10.2	CD
6	CN12-446 (res)	13.1	ABC	9.3	D
7	CN921-516 (res)	4.3	DEFG	9.3	D
8	CN12-770 (res)	11.9	ABCD	10	D
9	927-4-309 (susc)	0	H	-	-
10	8931 (susc)	7.6	CDE	10.6	BCD
11	C37 (susc)	3.7	EFG	9.8	D
12	SV2013	1.9	G	12.9	ABC
13	SV2014NRR	26.4	A	14	A
14	SV2015NRR	21.6	AB	14.3	A
15	SV2016	2.2	FG	14.1	A

Entries followed by the same letter are not significantly different at (p=0.05).
No roots were harvested from 927-4-309 for sugar analysis.

Table 7. Harvest data for 2014-2015 SBCN Variety Trial at Imperial Valley Research Center

Entry	Variety	N (ppm)		Purity (%)	
1	BTS 52RR45	291.4	AB	69.9	ABC
2	BTS 541N	276.6	ABC	78.8	A
3	BTS 5460	243.7	ABC	58.8	D
4	BTS 5499	259.2	ABC	67.4	ABCD
5	BTS 5555	307	A	73	ABC
6	CN12-446 (res)	263	ABC	68.1	ABCD
7	CN921-516 (res)	35	D	61.7	CD
8	CN12-770 (res)	214.5	ABC	71.8	ABC
9	927-4-309 (susc)	-	-	-	-
10	8931 (susc)	218.5	ABC	74.4	AB
11	C37 (susc)	258.3	ABC	71.6	ABC
12	SV2013	197.6	BC	64.6	BCD
13	SV2014NRR	220.9	ABC	79.7	A
14	SV2015NRR	191.4	C	79.2	A
15	SV2016	269.3	ABC	77.9	AB

Entries followed by the same letter are not significantly different at (p=0.05).
No roots were harvested from 927-4-309 for sugar analysis.

Table 8. Cyst counts for 2015-2016 SBCN Variety Greenhouse Trial at USDA, Salinas, CA

Entry	Variety	Cyst Count	
1	BTS 52RR45	218.7	AB
2	BTS 541N	53.4	C
3	BTS 5460	178.6	AB
4	BTS 5499	129.2	B
5	BTS 5555	177.9	AB
6	CN12-446 (res)	44.4	C
7	CN921-516 (res)	38	C
8	8931 (susc)	171.7	AB
9	C37 (susc)	235.8	A
10	SV2013	183	AB
11	SV2014NRR	52.2	C
12	SV2015NRR	46.7	C
13	SV2016	176.7	AB

Figure 1. Sugarbeet yield in DREC trial.

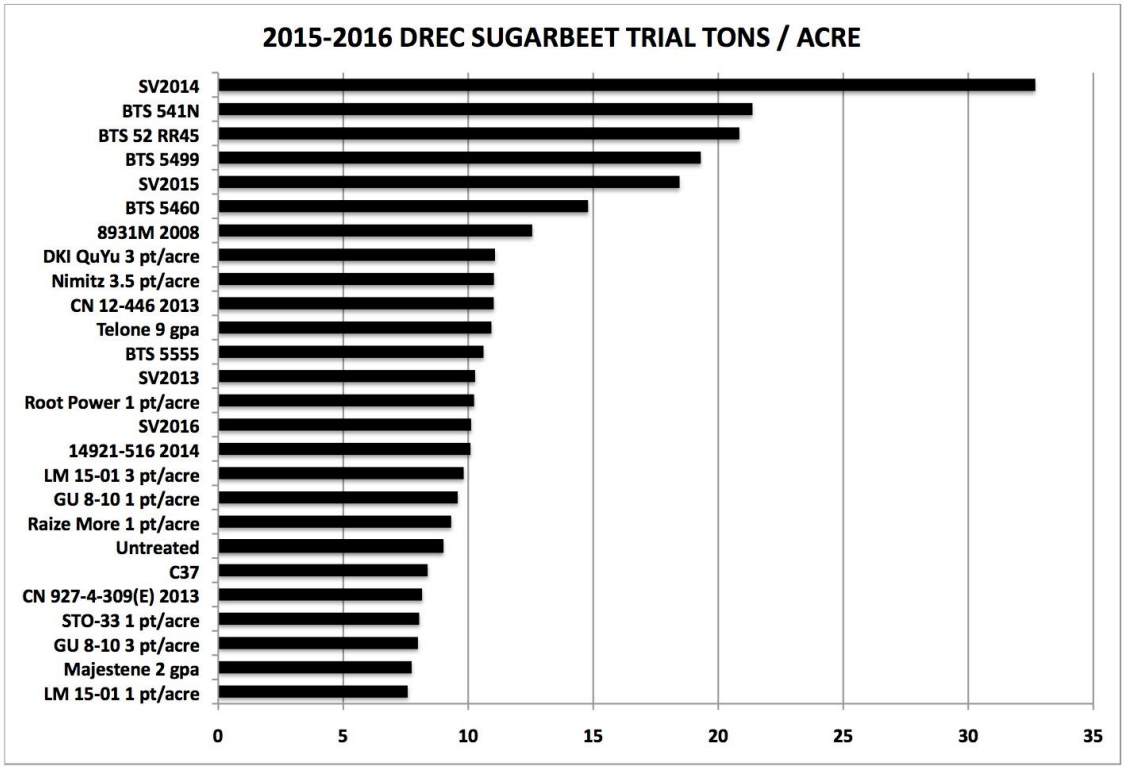

Figure 2. Sugarbeet cyst nematode at harvest in DREC trial.