CALIFORNIA FRESH CARROT ADVISORY BOARD
Research Report
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Project Title: Identification of gene sources for resistance to root-knot nematodes attacking carrots in California

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Root-knot nematodes (*Meloidogyne* spp.) are a major problem to carrot production because their root infection causes galling and forking distortion of the taproot, rendering the carrots unmarketable. They are especially prevalent in the loam to sandy soils used for carrot production in California. In an approach to find alternative management strategies to soil fumigation treatments, our goal is to characterize carrot germplasm with genetic resistance and tolerance to root-knot nematodes, and to provide advanced lines that will enable carrot breeders to develop resistant cultivars suitable for California fresh market production. In collaboration with Dr. Phil Simon, USDA, Wisconsin, different sources of resistance and tolerance are being advanced and combined to provide carrot cultivars with a broad-based protection against the spectrum of root-knot nematode species. Emphasis is being placed on the high resistance to *M. incognita*, *M. javanica*, and *M. arenaria* in Brasilia line BR-1252, high resistance in several non-Brasilia resistance sources, and moderate to high tolerance and resistance to the northern root-knot nematode *M. hapla* in some of the USDA inbred lines and in additional resistance sources. Genetic characterization and combining abilities of different resistance sources are being investigated through crossing, progeny screening, and molecular marker analysis in allelism tests. New combinations among the resistance sources show excellent promise for developing broad-based root-knot nematode resistant carrots.

Our field screening of carrot breeding lines for nematode resistance has been expanded in recent years to include materials from seed companies, and we are fostering their collaborative involvement in the field trial assessments. Some of the most advanced nematode resistant selections have been seed-increased by seed companies to provide seed quantities large enough to perform small-scale field testing in commercial fields. An important feature in the process of selecting and advancing field and greenhouse screened materials is leaf tissue sampling for DNA extraction and marker analysis at time of resistance evaluation. Field and greenhouse selected roots were shipped to Dr. Simon in Wisconsin for selfing or crossing, following vernalization for several weeks in cold storage either before or after shipping.

Another component of our research is to determine how broadly effective the different carrot resistance sources are to multiple isolates of these primary root-knot nematode species. We have been testing almost 50 nematode isolates on a panel of eleven resistant carrot sources under controlled greenhouse screening assays.

Field screening of inbred lines and resistant progeny selections:

South Coast REC trials: Field screenings of advanced lines including inbred crosses developed by Dr. Simon were made in 2017 at the UC South Coast Research and Extension Center (SCREC), Irvine, Orange Co. Carrot lines together with known resistant and susceptible control lines were tested on two field sites, one infested with *M. incognita* (MI) and a second with *M. javanica* (MJ). The *M. incognita* population (isolate Beltran) at the SCREC site is originally from Stanislaus Co. in the San Joaquin Valley, California, and representative of *M. incognita* infestations in carrot growing areas of the state. The complete screening results from 1,240 plots on the two sites are summarized in Table 1. Tests were made in 3-foot plots as in previous years, planted on 6/6/2017 and harvested for evaluation on 10/26-27/2017. Infection was good to excellent and fairly uniform in both MI and MJ trials, based on infection levels in the susceptible Imperator-58 controls, which were planted every 5th plot. The mean control score in the MI trial was 6.71 (range 5 to 7), slightly lower than in the 2016 Kearney REC trial. The mean control score in the MJ trial was 5.75 (range of 4 to 7), also lower than the 2016 Kearney REC trial. Crop rotation at the SCREC sites, where a field block of 14-16-rows is used for trials every 4 years, has improved the infection levels and uniformity, and also minimized problems associated with other diseases. The 3-year crop cycle before the test year was sorghum followed by a susceptible legume followed by susceptible tomato.

The root symptom evaluations were based on a 0 to 8 scale for amount of taproot galling and galling of fibrous roots, plus a score of 9 if roots were rotted. Plots with a score of 0 were fully resistant. Plots with scores of 1 to 2 were mostly resistant with evidence of possible segregation. Plots with a score of 5 had > 50% susceptible roots, but often some resistant roots could be selected from the plot. Plots with a score of 7 were fully susceptible, and a plot with a score of 8 was susceptible mixed with some rot, mostly from infection by *Sclerotium rolfsii*. A score of 9 was given to plots that were completely lost to rot. Rot was not much of a problem in the trials in 2017, with no plots having scores of 8 or 9. Both trials were very effective in distinguishing resistant and susceptible entries, and a substantial percentage of entries were resistant (scores of 2 or lower), indicating resistance held up well to the high infection levels and high temperature.

In contrast to the 2014 trials conducted at South Coast REC, there was little evidence of forking in 2017. Horticultural quality overall was quite good given the harsh conditions (nematode infection level and high temperature), enabling selection for both nematode resistance and quality (root shape, etc.).

1,240 plots in total were planted in the two main field trials (MI and MJ). In each trial, 476 USDA breeding material entries from Phil Simon, 120 susceptible Imperator 58 checks, and 24 industry submissions (not including industry dedicated rows for breeding material) were planted. Entries were replicated once in each trial. In addition to the main trials, 4 rows consisting of 248 plots (62 plots/row) were allocated to industry in each trial for nematode screening and selection for resistance. For consistency, industry

plantings followed the protocol used in the main trials with a susceptible control every 5th plot along each row. Entries in the industry-dedicated rows were replicated twice.

A field day was held during the harvest evaluations on 10/27/2017, highlighted by the *M. incognita* trial, and attended by seed company and carrot industry personnel.

Main Nursery trials: Data from the field trials are presented in Table 1. Data on the 24 industry submissions were reported directly to the respective industry partners. Each trial included 347 USDA that are derived from selections made in 2016 in the Kearney nematode trials (section 1), a group of 40 entries derived from selections made in the UCR *M. hapla* multi-isolate greenhouse assays conducted in summer 2016 (section 2), 48 entries previously untested or derived from tests in previous years (e.g., 2015) (section 3), and a group of mostly newer inbreds (41 entries in section 4).

Entries in section 1 (from 101 to 447) that are derived from selections from both MI and MJ trials conducted at Kearney in 2016 are more advanced, ranging from F4 to F9 generations. Of these 347 entries, 262 (76 %) had scores of 2 or less. Many were highly resistant with scores of 0 in both trials. The high percentage of very resistant entries indicates selection in 2015 (also made at Kearney) and in 2016 under intense nematode pressure was very effective. Sources of resistance include Brasilia (BR or B), Homs (HM or H), Scarlet Fancy x Favorite (SFF or S), Western Red (WR or W), and Ping Ding (PD or P), singly or in various combinations. Older inbreds such as Nb8483 or Nb8524 and newer inbreds such as Npw2191, Nh0252, Nb1386, Nbh2306, and Ns5154 are highly resistant and are being utilized in crosses. Of particular importance was the observation of some very good horticultural quality combined with resistance, as seen in entries 129, 130, 132, 135, 237, 258, 357, 390, 414, 415 and 416. Some entries such as 132 and 390 had impressive taproot length (16 to 18"). Some entries either have resistance derived from Brasilia (258, 390, 415 and 416) or Brasilia combined with Homs (132, 135, 237, 357 and 414). This combination (Br + Homs) of resistance sources has been found consistently to be very effective in previous years.

Section 2 of Table 1 consists of entries (448 to 487) derived from selections made in the *M. hapla* multi-isolate greenhouse assays conducted in 2016. *M. hapla* resistant selections were made in 2 sources of Homs (H1 and H2), Homs x (Br1252 x 6274) or H x B, and F5 derived from a cross of Br1091 x Homs. Overall, H1 was fixed (non-segregating) for very strong resistance to *M. hapla* in the 2016-17 greenhouse assays following selections made in 2014. Although these entries were derived from selections for *M. hapla* resistance, overall they were also highly resistant to MI and MJ in the 2017 field trials. Of the 38 entries (2 entries in section 2, 483 and 485, were not related to the *M. hapla* entries), 30 (79%) had root-galling scores of 2 or lower. Of the 14 H1 entries, 12 were highly resistant.

In section 3 of Table 1 (488 to 635), there are no entries listed from 535 to 634. This section consists of earlier production material, either never tested in nematode field trials (488 to 509) or derived from selections made in years before 2016 (e.g., 516 to 534 were from the 2015 Kearney trials). Resistance was more variable in this group, as expected.

Of the 48 entries, 19 (40%) had scores of 2 or lower to both MI and MJ. Resistance (scores ≤ 2) to MJ was better than to MI, with 37 entries resistant to MJ and 23 resistant to MI. Selection for resistance was made in several of the MI plots.

In section 4 (636 to 700), entries 667 to 690 were allocated to industry and are left blank in the table. This section consists of miscellaneous entries that have not been tested for resistance. Most entries were moderately to fully susceptible, with a few exceptions. Entries 663 and 666 had lower root-gall scores and could be new sources of resistance. Entries 694 to 696 are inbreds that have been released and were highly resistant in the two trials.

Selection for resistance and quality were made on entries in both MI and MJ trials. Selected roots were shipped to Wisconsin to be vernalized and planted in the 2017-18 winter nursery for crossing and (or) seed production.

Associated Field Trial: In addition to the trials conducted at SCREC and with funding from the USDA-NIFA SCRI Program, a separate field trial was conducted in 2017 on a site infested with *M. incognita* at the UCR Coachella Valley Agricultural Research Station (CVARS) located in Thermal, CA. This trial was established to screen for resistance to *M. incognita* in the USDA carrot germplasm collection. Accessions were supplied by the USDA-ARS PI Research Unit, Ames, Iowa. A total of 695 accessions were tested, replicated twice, in 3-foot plots. Imperator 58 was used as the susceptible control. This trial was planted on March 29 and evaluated on August 16 and 17. Plots were scored for resistance using the same root-galling scale as the trials at SCREC. Potential resistance was identified, and resistant roots were selected in one or both replicates of about 45 accessions. These roots were shipped to Wisconsin for vernalization and planting in the 2017-18-winter nursery. Seed from the selected roots will be used to test for resistance to MI and MJ in 2018 at Kearney REC and to *M. hapla* in a greenhouse test. Bolting data was also collected in the trial.

Greenhouse evaluations:

Greenhouse trials were conducted with two objectives. One focus was to continue the screening of a carrot genotype resistance panel with multiple root-knot nematode isolates, in order to determine how broadly effective are the identified resistance sources to the main root-knot nematode species attacking carrots (section 1). A second focus was a continuation of controlled screening of populations segregating for nematode resistance (section 2), in attempts to define the trait loci and to develop markers for the loci for use in the breeding programs.

1. Multi-isolate screening of 11 resistant carrot genotypes and 1 susceptible control (Imperator 58) was continued to look at possible variability among root-knot nematode isolates on different sources of resistance. The focus in 2017 was to complete the *M. hapla* isolate screens to obtain nematode egg production data as a measure of resistance. The set of 11 *M. hapla* isolates were used in inoculation assays in greenhouse screens in 2016 and early 2017, from which root-galling

data were obtained previously. In the current reporting period, we obtained eggs/gram root data which overall correlated highly with the root-galling results. These data revealed excellent resistance to *M. hapla* which was effective across the majority of *M. hapla* isolates, especially in the Homs resistance source (see below).

2. Two tests were conducted on segregating carrot populations that are being used for genotyping and genetic analysis (Table 2).
    a. 174 plants of Homs with the seed source designation 87298 were tested with the San Brdo. isolate of *M. hapla*. This Homs source was first tested in 2014 and appeared to segregate for resistance. Selected roots from the 2014 test were used to develop a resistant population for testing in 2016. The resistant population was given the designation Homs 1 or HI. Of the 44 roots tested in 2014, 11 were resistant (scores of 0 or 1) and 33 were susceptible (scores of 5 to 8). This ratio (1R:3S) suggests resistance is determined by a single recessive gene, although the sample size was small. The larger test of 174 plants of the seed source (87298) conducted in 2017 supports the single recessive gene hypothesis (41R: 133S). Leaf samples were collected and sent to Wisconsin for genotyping (GBS) together with resistant roots for seed production and crossing.
    b. 257 plants of Sem 274-1 were tested with *M. incognita* isolate Project 77. Sem 274-1 was derived from resistant F3 roots from the cross 8483 x 9256. 8483 is an inbred developed from Br1252 x 6274. In 2014, Sem 274-1 was tested with multiple isolates of *M. incognita* and *M. javanica*. It was fixed for resistance to *M. javanica* (homozygous for gene *Mj-1*), but segregated for resistance to *M. incognita*. Resistant roots from the 2014 *M. incognita* tests were used to develop a resistant population for testing in 2015. The 2017 *M. incognita* assay of 257 plants of Sem 274-1 resulted in a range of root-galling scores from 0 (highly resistant) to 7.5 (susceptible), indicating additional genes are necessary for resistance to *M. incognita*. Leaf samples were sent to Wisconsin for genotyping (GBS).
    c. Also listed in Table 2 are other populations that have been tested since 2011 that are being used for genetic analysis. With the exception of Homs (section a), these other populations are derived from Brasilia1252 x 6274 with the intention of understanding the genetics of resistance to *M. incognita* in Brasilia 1252. Population source 95644, an F2 derived from FN2-9 x 8503, would be expected to segregate for *Mj-1* together with other genes determining *M. incognita* resistance. Sem 274-1, 80080 and the group of UCR populations are fixed for resistance to *M. javanica* (homozygous for *Mj-1*) and segregate for resistance to *M. incognita*. All populations listed in Table 2 have been leaf sampled for DNA extraction and samples sent to Wisconsin for genotyping (GBS).

Please also refer to the report by Dr. Phil Simon (Carrot Breeding to Develop and Introduce Improved Cultivars).

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot Galli	
	Rows		Content			Plot	Check
	#N/A	#N/A	#N/A				
	#N/A	#N/A	#N/A				
	#N/A	#N/A	#N/A				
	#N/A	#N/A	#N/A				
			#N/A				
Arlington 2016-17 Production — Kearney							
17SC101	(SFF x (8483x9256?)) x 7808B, Flavo	F_3	16K_mj101	129001⊗		0	
17SC102	(SFF x (8483x9256?)) x 7808B, Flavo	F_3	16K_mj101	129002⊗		1	
17SC103	7808B, Flavor x (SFF x (8483x9256?)	F_3	16K_i102	129003⊗		2	
17SC104	Flavor, 7808B x (SFF x (8483x9256?)	F_3	16K_mj104	129005_1⊗		0	**6**
17SC105	Flavor, 7808B x (SFF x (8483x9256?)	F_3	16K_mj104	129005_2⊗		3	
17SC106	Flavor, 7808B x (SFF x (8483x9256?)	F_3	16K_mj104	129006⊗		1	
17SC107	Nb6526B x ((5280B x (Turkish × P72(	F_4	16K_i106	129007⊗		0	
17SC108	(HM x SFF) x L0556B	F_4	16K_i109	129009_1⊗		3.5	**7**
17SC109	(HM x SFF) x L0556B	F_4	16K_i109	129009_2⊗		5	
17SC110	(Bx6 x HM) x (Nb8483B x 9256B)	F_4	16K_i111	129012⊗		2	
17SC111	(Bx6 x HM) x (Nb8483B x 9256B)	F_3M	16K_i111	129013M		3	
17SC112	(Bx6 x HM) x (Nb8483B x 9256B)	F_4	16K_mj111	129014⊗		2.5	7+
17SC113	(Bx6 x HM) x (Nb8483B x 9256B)	F_4	16K_mj111	129015⊗		2	
17SC114	(Bx6 x HM) x (Nb8483B x 9256B)	F_4	16K_mj111	129016⊗		5	
17SC115	(Nb8483B x 9256B) x (Bx6 x HM)	F_4	16K_i115	129017⊗		4	
17SC116	(Nb8483B x 9256B) x (Bx6 x HM)	F_4	16K_i115	129020⊗		-	7+
17SC117	(Nb8483B x 9256B) x (Bx6 x HM)	F_4	16K_i115	129022⊗		0	
17SC118	(Nb8483B x 9256B) x (Bx6 x HM)	F_4	16K_i117	129023⊗		1	
17SC119	(Nb8483B x 9256B) x (Bx6 x HM)	F_3M	16K_i117	129024M		0	
17SC120	(HM x (Bx6)) x FS	F_5	16K_i121	129026_1⊗		0	**6.5**

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Entry			Root	Seed		Plot	Galli
17SC121	(HM x (Bx6)) x FS	F_5	16K_i121	129026_2⊗		0	
17SC122	HM x (Bx6)	F_3M_2	16K_i125	129027,028,029,030,032&033		1	
17SC123	D.c. Z020 x Nb8524B	F_3M_2	16K_i133	129035cg129036		1	
17SC124	D.c. Z020 x Nb8524B	F_3M_2	16K_i133	129036cg129035		0	7
17SC125	Nb9324B x Nb4216B	F_2	16K_i244	129037⊗		4	
17SC126	Nb9324B x Nb4216B	F_2	16K_i244	129038⊗		3	
17SC127	(FN2-9 × 2302) x (WR x PD)	F_4	16K_i252	129049_1⊗		5	
17SC128	(FN2-9 × 2302) x (WR x PD)	F_4	16K_i252	129049_2⊗		3	7
17SC129	(FN2-9 x 2302) x ((B x 6) x (PD x PI3	F_3M	16K_mj247	129043M		2	
17SC130	(HM x NF) x 0569B	F_4	16K_i250	129046⊗		1	
17SC131	(FN2-9 × 2302) x (WR x PD)	F_4	16K_mj255	129052⊗		2.5	
17SC132	(HM x Bx6) x 9359B	F_4	16K_i260	129053_1⊗		1	6
17SC133	(HM x Bx6) x 9359B	F_4	16K_i260	129053_2⊗		0	
17SC134	(HM x Bx6) x 9359B	F_4	16K_i260	129054_1⊗		0	
17SC135	(HM x Bx6) x 9359B	F_4	16K_i260	129054_2⊗		1	
17SC136	(HM x Bx6) x 9359B	F_2MS	16K_mj262	129055⊗		1	6
17SC137	(HM x Bx6) x 9359B	F_2MS	16K_mj262	129056_1⊗		1	
17SC138	(HM x Bx6) x 9359B	F_2MS	16K_mj262	129056_2⊗		0	
17SC139	(Bx6 x HM) x (8483B x 9256B)	F_2MS	16K_i267	129057_1⊗		-	
17SC140	(Bx6 x HM) x (8483B x 9256B)	F_2MS	16K_i267	129057_2⊗		0	7
17SC141	(Bx6 x HM) x (8483B x 9256B)	F_2MS	16K_mj267	129059⊗		0	
17SC142	(PD x WR) x 9782B	F_4	16K_i269	129060⊗		1	
17SC143	(PD x WR) x 9782B	F_4	16K_i269	129061⊗		0	
17SC144	SFF x (SFF x HM)	F_4	16K_i276	129062_1⊗		0	7+
17SC145	SFF x (SFF x HM)	F_4	16K_i276	129062_2⊗		0	
17SC146	SFF x (SFF x HM)	F_4	16K_i276	129063⊗		0	
17SC147	SFF x (SFF x HM)	F_4	16K_mj276	129064⊗		0	
17SC148	SFF x (SFF x HM)	F_4	16K_mj276	129065⊗		1	7+

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Entry			Root	Seed		Plot	Galli
17SC149	(8483B x 9256B) x (Bx6 x Homs)	F_4	16K_i279	129066_1⊗		0	
17SC150	(8483B x 9256B) x (Bx6 x Homs)	F_4	16K_i279	129066_2⊗		0	
17SC151	(8483B x 9256B) x (Bx6 x Homs)	F_4	16K_i279	129067_1⊗		0	
17SC152	(8483B x 9256B) x (Bx6 x Homs)	F_4	16K_i279	129067_2⊗		1	
17SC153	(8483B x 9256B) x (Bx6 x Homs)	F_4	16K_i279	129068⊗		0	
17SC154	(8483B x 9256B) x (Bx6 x Homs)	F_4	16K_mj279	129069⊗		0	**6**
17SC155	(HM x NF) x 0569B	F_4	16K_i283	129071⊗		3.5	
17SC156	7262B x HM	F_2MS	16K_i286	129077_1⊗		2	
17SC157	7262B x HM	F_2MS	16K_i286	129077_2⊗		2.5	
17SC158	7262B x HM	F_2M_2	16K_i286	129078M		1	**6.5**
17SC159	7262B x HM	F_4	16K_mj287	129079⊗		0	
17SC160	7262B x HM	F_4	16K_mj287	129080⊗		2	
17SC161	((B x 6) x (PD x PI326011)) x (8483B	F_2MS	16K_mj289	129081_1⊗		0	
17SC162	((B x 6) x (PD x PI326011)) x (8483B	F_2MS	16K_mj289	129082⊗		0	**7**
17SC163	((B x 6) x (PD x PI326011)) x (8483B	F_2MS	16K_i291	129083⊗		0	
17SC164	((B x 6) x (PD x PI326011)) x (8483B	F_2MS	16K_i291	129084⊗		1	
17SC165	NF x HM	F_4M	16K_i297	129086M		0	
17SC166	NF x HM	F_5	16K_i297	129087⊗		1	**6**
17SC167	(PD x PI326011) x WR	F_3MS_2MS	16K_i299	129088⊗		2	
17SC168	(PD x PI326011) x WR	F_3MS_2MS	16K_i299	129089⊗		0	
17SC169	(PD x PI326011) x WR	F_3MS_2MS	16K_mj299	129091⊗		2	
17SC170	PD x PI326011	$F_1M_2SMS_2M_2$	16K_i311	129092⊗		1	**7**
17SC171	PD x PI326011	$F_1M_2SMS_2M_2$	16K_i311	129093_1⊗		1	
17SC172	PD x PI326011	$F_1M_2SMS_2M_2$	16K_i311	129093_2⊗		1	
17SC173	PD x PI326011	$F_1M_2SMS_2M_2$	16K_mj311	129094⊗		0	
17SC174	PD x PI326011	$F_1M_2SMS_2M_2$	16K_mj311	129095_1⊗		0	**6.5**
17SC175	PD x PI326011	$F_1M_2SMS_2M_2$	16K_mj311	129095_2⊗		0	
17SC176	SFF	F_2MS_8	16K_mj316	129096⊗		0	

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Entry			Root	Seed		Plot	Galli
17SC177	SFF	F_2MS_8	16K_mj316	129097⊗		-	
17SC178	8483B x 9256B	F_8	16K_i319	129098_2⊗		0	6
17SC179	8483B x 9256B	F_8	16K_mj319	129100_1⊗		0	
17SC180	8483B x 9256B	F_8	16K_mj319	129100_2⊗		2	
17SC181	8483B x 9256B	F_8	16K_mj319	129101_1⊗		2	
17SC182	8483B x 9256B	F_8	16K_mj319	129101_2⊗		0	6.5
17SC183	(PD x PI236011) x WR	F_5M_2	16K_i322	129102M		1	
17SC184	(PD x PI236011) x WR	F_5MS	16K_i322	129103⊗		0	
17SC185	(PD x PI236011) x WR	F_5MS	16K_mj322	129104⊗		0	
17SC186	(PD x PI236011) x WR	F_5MS	16K_mj322	129105⊗		0	6
17SC187	HM x (Bx6)	F_3MS	16K_i328	129106_1⊗		0	
17SC188	HM x (Bx6)	F_3MS	16K_i328	129106_2⊗		0	
17SC189	HM x (Bx6)	F_3MS	16K_i328	129107_1⊗		1	
17SC190	HM x (Bx6)	F_3MS	16K_i328	129107_2⊗		2	5
17SC191	HM x (Bx6)	F_3MS	16K_mj328	129108_1⊗		0	
17SC192	HM x (Bx6)	F_3MS	16K_mj328	129108_2⊗		0	
17SC193	HM x (Bx6)	F_3MS	16K_mj328	129109_1⊗		0	
17SC194	HM x (Bx6)	F_3MS	16K_mj328	129109_2⊗		0	5.5
17SC195	(FN2-9 x 2302) x HM	F_4MS	16K_i336	129111_1⊗		1	
17SC196	(FN2-9 x 2302) x HM	F_4MS	16K_i336	129111_2⊗		0	
17SC197	(FN2-9 x 2302) x HM	F_4M_2	16K_mj336	129112M		1	
17SC198	SFF	$F_1XMS_3M_2S_3$	16K_mj341	129114_1⊗		0	4
17SC199	SFF	$F_1XMS_3M_2S_3$	16K_mj341	129114_2⊗		1	
17SC200	(Snts x EFM) x HM x (Bx6)	F_4M	16K_i346	129118M		2	
17SC201	(Snts x EFM) x HM x (Bx6)	F_5	16K_i346	129119_1⊗		1	
17SC202	(Snts x EFM) x HM x (Bx6)	F_5	16K_i346	129119_2⊗		0	
17SC203	(Snts x EFM) x HM x (Bx6)	F_5	16K_mj346	129120⊗		0	
17SC204	(Snts x EFM) x HM x (Bx6)	F_5	16K_mj346	129121⊗		0	4.5

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot	Galli
17SC205	(HM x Bx6) x 9359B	F_3MS	16K_mj353	129122⊗		3	
17SC206	(HM x Bx6) x 9359B	F_3MS	16K_mj353	129123⊗		3	
17SC207	(HM x Bx6) x 9359B	F_5	16K_i354	129124⊗		3	
17SC208	(HM x Bx6) x 9359B	F_5	16K_i354	129125_1⊗		1	**6**
17SC209	(HM x Bx6) x 9359B	F_5	16K_i354	129125_2⊗		0	
17SC210	(Bx6 x HM) x (8483B x 9256B)	F_3MS	16K_i359	129126⊗		2	
17SC211	(Bx6 x HM) x (8483B x 9256B)	F_3M_2	16K_i359	129127M		0	
17SC212	(Bx6 x HM) x (8483B x 9256B)	F_3MS	16K_mj360	129128⊗		0	**7**
17SC213	(Bx6 x HM) x (8483B x 9256B)	F_3MS	16K_mj360	129129_2⊗		0	
17SC214	Nb8483B x 9256B	F_9	16K_mj367	129132⊗		0	
17SC215	Nb8483B x 9256B	F_9	16K_mj367	129133_1⊗		0	
17SC216	Nb8483B x 9256B	F_9	16K_mj367	129133_2⊗		1	**6.5**
17SC217	Nb8483B x 9256B	F_7MS	16K_i369	129134_1⊗		0	
17SC218	Nb8483B x 9256B	F_7MS	16K_i369	129134_2⊗		1	
17SC219	[HM x (Bx6) x (Snts x EFM)] x [(Nb8483B x 9256B) x HM]	M, FxF	16K_i373, 16	(129136-139)cg(129140-143)		0	
17SC220	(Nb8483B x 9256B) x HM	F_2MS_3	16K_mj379	129144⊗		0	**5**
17SC221	(PD x PI326011) x WR	F_3MSMSM_2	16K_i386	129145M		0	
17SC222	(PD x PI326011) x WR	$F_3MSMSMS$	16K_i386	129146⊗		0	
17SC223	(PD x PI326011) x WR	F_3MSMSM_2	16K_mj386	129147M		0	
17SC224	(PD x PI326011) x WR	$F_3MSMSMS$	16K_mj386	129148_1⊗		0	**7+**
17SC225	(PD x PI326011) x WR	$F_3MSMSMS$	16K_mj386	129148_2⊗		0	
17SC226	HM x SFF	F_4MS	16K_mj393	129151⊗		0	
17SC227	WR x PD	$F_3M_2S_4$	16K_mj398	129155_2⊗		0	
17SC228	HM x SFF	F_4MS	16K_mj389	129156_1⊗		0	**6**
17SC229	HM x SFF	F_4MS	16K_mj389	129156_2⊗		0	
17SC230	(HM x SFF) x 0571B	F_2MS	16K_mj401	129157_1⊗		0	

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot	Galli
17SC231	(HM x SFF) x 0571B	F_2M_2	16K_mj401	129158M		0	
17SC232	HM x (Bx6) x (Snts x EFM)	F_4MS	16K_mj409	129159_1⊗		1	7
17SC233	HM x (Bx6) x (Snts x EFM)	F_4MS	16K_mj409	129160⊗		1	
17SC234	HM x (Bx6) x (Snts x EFM)	F_4MS	16K_mj409	129161_1⊗		0	
17SC235	HM x (Bx6) x (Snts x EFM)	F_4MS	16K_mj409	129161_2⊗		2	
17SC236	HM x (Bx6) x (Snts x EFM)	F_5M	16K_i411	129162M		1	6.5
17SC237	(8483B x 9256B) x HM	F_3M_3	16K_mj416	129164_1M		0	
17SC238	HM x (Bx6) x (Snts x EFM)	F_5M	16K_i411	129163M		0	
17SC239	(8483B x 9256B) x HM	F_3M_2S	16K_mj416	129164_2⊗		0	
17SC240	(8483B x 9256B) x HM	F_3M_2S	16K_mj416	129165⊗		0	6.5
17SC241	(8483B x 9256B) x HM	F_3M_3	16K_mj420	129166M		0	
17SC242	(8483B x 9256B) x HM	F_3M_2S	16K_mj420	129167_1⊗		-	
17SC243	(8483B x 9256B) x HM	F_3M_2S	16K_mj420	129167_2⊗		0	
17SC244	(8483B x 9256B) x HM	F_3MS_2	16K_i421	129168_1⊗		0	6
17SC245	(8483B x 9256B) x HM	F_3MS_2	16K_i421	129168_2⊗		0	
17SC246	(8483B x 9256B) x HM	F_3MS_2	16K_i421	129169_1⊗		0	
17SC247	(8483B x 9256B) x HM	F_3MS_2	16K_i421	129169_2⊗		0	
17SC248	(PD x PI326011) x WR	$F_3MSMSMS$	16K_i429	129170⊗		0	6
17SC249	(PD x PI326011) x WR	$F_3MSMSMS$	16K_i429	129171⊗		0	
17SC250	(PD x PI326011) x WR	$F_3MSMSMS$	16K_mj429	129172⊗		0	
17SC251	(PD x PI326011) x WR	$F_3MSMSMS$	16K_mj429	129173⊗		0	
17SC252	WR x PD	F_3M_2SMS	16K_i431	129174⊗		0	
17SC253	HM x (Bx6)	F_5MSMS	16K_i446	129176_1⊗		1	
17SC254	HM x (Bx6)	F_5MSMS	16K_i446	129176_2⊗		0	5.5
17SC255	SFF	F_2MS_8	16K_i462	129178_1⊗		3	
17SC256	SFF	F_2MS_8	16K_i462	129178_2⊗		0	
17SC257	SFF	F_2MS_8	16K_i462	129179⊗		1	
17SC258	Nb8483B x 9256B	F_4MS_2M	16K_i469	129181M		3	7

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot	Galli
17SC259	Nb8483B x 9256B	F_4MS_3	16K_i469	129182⊗		2	
17SC260	Nb8503B x (FN2-9 × 2302)	F_3MS	16K_i535	129185⊗		0	
17SC261	L9786B x HM	F_5	16K_mj540	129187_1⊗		-	
17SC262	L9786B x HM	F_5	16K_mj540	129187_2⊗		1	7
17SC263	L9786B x HM	F_4M	16K_i542	129189M		0	
17SC264	SFF x HM	F_5MS	16K_i555	129194⊗		0	
17SC265	PD x WR	$F_3MS_2M_2$	16K_i560	129196M		0	
17SC266	PD x WR	F_3MS_2MS	16K_i560	129197_1⊗		0	6
17SC267	PD x WR	F_3MS_2MS	16K_i560	129197_2⊗		0	
17SC268	PD x WR	F_3MS_2MS	16K_i560	129198_1⊗		0	
17SC269	PD x WR	F_3MS_2MS	16K_i560	129198_2⊗		0	
17SC270	SFF x HM	F_4M_2S	16K_i565	129199_1⊗		0	7
17SC271	SFF x HM	F_4M_2S	16K_i565	129199_2⊗		1	
17SC272	SFF x HM	F_4M_2S	16K_i565	129200_2⊗		0	
17SC273	SFF x HM	$F_1M_2SMS_2M_2$	16K_i570	129202⊗		0	
17SC274	Homs	M_4SMSMS_2	16K_i639	129203⊗		0	5.5
17SC275	Homs	M_4SMSMS_2	16K_i639	129204⊗		0	
17SC276	HM x (B x 6)	F_2MS_5	16K_i656	129207_1⊗		0	
17SC277	HM x (B x 6)	F_2MS_4M	16K_i656	129208M		0	
17SC278	HM x (B x 6)	F_2MS_5	16K_i656	129209_1⊗		1.5	5.5
17SC279	HM x (B x 6)	F_2MS_5	16K_i656	129209_2⊗		1	
17SC280	HM x (B x 6)	F_2MS_5	16K_mj656	129211⊗		1	
17SC281	H2 = Homs 2	$XMXMS_2M_2S$	16K_i687	129212M		-	
17SC282	H2 = Homs 2	$XMXMS_2M_2S$	16K_i687	129213_1⊗		0	6
17SC283	H2 = Homs 2	$XMXMS_2M_2S$	16K_i687	129213_2⊗		0	
17SC284	H2 = Homs 2	$XMXMS_2M_2S$	16K_i687	129214_1⊗		0	
17SC285	H2 = Homs 2	$XMXMS_2M_2S$	16K_i687	129214_2⊗		1	
17SC286	H x B = Homs x (Br1252 x 6274)	F_5MS_3	16K_i705	129216⊗		1	6

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot	Galli
17SC287	Npw2191B	F_3MS	16K_i726	129217⊗		0	
17SC288	Npw2191B	F_3MS	16K_i726	129218⊗		1	
17SC289	Npw2191B	F_3MS	16K_mj726	129219⊗		0	
17SC290	Npw2191B	F_3MS	16K_mj726	129220⊗		0	7
17SC291	(PD x PI326011) x WR	F_3MS_3	16K_mj729	129221⊗		0	
17SC292	(PD x PI326011) x WR	F_3MS_2M	16K_mj729	129222M		0	
17SC293	(PD x PI326011) x WR	F_3MS_3	16K_mj729	129223⊗		0	
17SC294	(PD x PI326011) x WR	F_3MS_3	16K_i731	129226⊗		0	5.5
17SC295	PD x PI326011	$F_1M_2SMS_2M_2$	16K_i734	129227_1⊗		0	
17SC296	PD x PI326011	$F_1M_2SMS_2M_2$	16K_i734	129227_2⊗		0	
17SC297	PD x PI326011	$F_1M_2SMS_2M_2$	16K_i734	129228M		0	
17SC298	PD x PI326011	$F_1M_2SMS_2M_2$	16K_i742	129229M		0	5
17SC299	PD x PI326011	$F_1M_2SMS_2M_2$	16K_mj742	129231M		0	
17SC300	PD x PI326011	$F_1M_2SMS_2M_2$	16K_mj742	129232⊗		0	
17SC301	(8483B x 9256B) x HM	F_2MS	16K_i749	129234_2⊗		0	
17SC302	(8483B x 9256B) x HM	F_2MS	16K_mj749	129236_1⊗		-	
17SC303	(8483B x 9256B) x HM	F_2MS	16K_mj749	129236_2⊗		0	
17SC304	SFF x HM	F_4MS	16K_i753	129237_1⊗		0	5
17SC305	SFF x HM	F_4MS	16K_i753	129237_2⊗		0	
17SC306	SFF x HM	F_4MS	16K_i753	129238_1⊗		0	
17SC307	SFF x HM	F_4MS	16K_i753	129238_2⊗		0	
17SC308	PD x PI326011	$F_1M_2SMS_2M_2$	16K_i757	129241⊗		0	7
17SC309	PD x PI326011	$F_1M_2SMS_2M_2$	16K_i757	129242⊗		0	
17SC310	PD x PI326011	$F_1M_2SMS_2M_2$	16K_i757	129243⊗		0	
17SC311	HM x SFF	F_4	16K_i763	129244⊗		1	
17SC312	HM x SFF	F_4	16K_i763	129245⊗		2	7
17SC313	SFF	F_2MS_4	16K_i783	129246_1⊗		1	
17SC314	SFF	F_2MS_4	16K_i783	129246_2⊗		1	

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot	Galli
17SC315	SFF	F_2MS_4	16K_i783	129247⊗		1	
17SC316	Nb8524B x (FN2-9 x 2302)	F_4	16K_i812	129250⊗		0	**5**
17SC317	Nb8524B x (FN2-9 x 2302)	F_4	16K_mj812	129252_1⊗		1	
17SC318	Nb8524B x (FN2-9 x 2302)	F_4	16K_mj812	129252_2⊗		-	
17SC319	Nb8524B x (FN2-9 x 2302)	F_4	16K_mj812	129253_2⊗		1.5	
17SC320	(Nb8483B x 9256B) x HM	F_4	16K_i813	129254_1⊗		0	**7**
17SC321	(Nb8483B x 9256B) x HM	F_4	16K_i813	129255⊗		0	
17SC322	PD x WR	F_3MS_3	16K_i816	129257⊗		0	
17SC323	PD x WR	F_3MS_3	16K_i816	129259⊗		6	
17SC324	PD x WR	F_3MS_3	16K_mj816	129260_1⊗		0	**6**
17SC325	PD x WR	F_3MS_3	16K_mj816	129260_2⊗		0	
17SC326	PD x WR	F_3MS_3	16K_mj816	129261⊗		0	
17SC327	PD x WR	F_3MS_2M	16K_mj816	129262M		0	
17SC328	P6139B x 2226B	F_2	16K_i823	129263⊗		6.5	**6**
17SC329	P6139B x 2226B	F_2	16K_i823	129265⊗		5	
17SC330	(Bx6 x HM) x (8483B x 9256B)	F_4	16K_i824	129266_1⊗		1	
17SC331	(Bx6 x HM) x (8483B x 9256B)	F_4	16K_i824	129266_2⊗		0	
17SC332	(Bx6 x HM) x (8483B x 9256B)	F_4	16K_i824	129267⊗		0	**7**
17SC333	L9786B x HM	F_5	16K_i829	129268_1⊗		0	
17SC334	L9786B x HM	F_5	16K_i829	129268_2⊗		0	
17SC335	L9786B x HM	F_5	16K_i829	129269_1⊗		0	
17SC336	L9786B x HM	F_5	16K_i829	129269_2⊗		0	**6.5**
17SC337	L9786B x HM	F_5	16K_mj830	129270⊗		0	
17SC338	L9786B x HM	F_4M	16K_mj830	129271M		0	
17SC339	PD x WR	F_3MS_4	16K_i831	129272⊗		4	
17SC340	PD x WR	F_3MS_3M	16K_i831	129273M		0	**4.5**
17SC341	PD x WR	F_3MS_4	16K_mj831	129276⊗		1	
17SC342	(Nb8483B x 9256B) x HM	F_2MS_2	16K_i832	129277_1⊗		0	

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot	Galli
17SC343	(Nb8483B x 9256B) x HM	F_2MS_2	16K_i832	129277_2⊗		0	
17SC344	(Nb8483B x 9256B) x HM	F_2MS_2	16K_i832	129278_1⊗		0	4
17SC345	(Nb8483B x 9256B) x HM	F_2MS_2	16K_i832	129278_2⊗		0	
17SC346	(PD x PI326011) x WR	F_3MSMS_2	16K_i834	129279⊗		2	
17SC347	(PD x PI326011) x WR	F_3MSMS_2	16K_i834	129280_1⊗		2	
17SC348	(PD x PI326011) x WR	F_3MSMS_2	16K_i834	129280_2⊗		2.5	5.5
17SC349	(PD x PI326011) x WR	F_3MSMS_2	16K_i834	129281⊗		0	
17SC350	WR x PD	$F_3M_2S_3$	16K_i837	129283⊗		0	
17SC351	HM x (Bx6) x (Snts x EFM)	F_5	16K_i841	129284⊗		0	
17SC352	HM x (Bx6) x (Snts x EFM)	F_5	16K_i841	129285⊗		0	
17SC353	HM x (Bx6) x (Snts x EFM)	F_5	16K_i841	129286⊗		1	
17SC354	HM x (Bx6) x (Snts x EFM)	F_5	16K_mj841	129288_1⊗		1	5.5
17SC355	(8483B x 9256B) x HM	F_5	16K_mj842	129289_1⊗		0	
17SC356	HM x (Bx6) x (Snts x EFM)	F_5	16K_mj841	129288_2⊗		2	
17SC357	(8483B x 9256B) x HM	F_5	16K_mj842	129289_2⊗		0	
17SC358	PD x WR	F_3MS_4	16K_i843	129292⊗		0	7
17SC359	SFF	$F_1XMS_2MS_5$	16K_mj844	129294_1⊗		0	
17SC360	SFF	$F_1XMS_2MS_5$	16K_mj844	129294_2⊗		0	
17SC361	SFF	$F_1XMS_2MS_5$	16K_mj844	129295⊗		0	
17SC362	(PD x PI326011) x WR	F_3MSMSM	16K_i845	129296M		2	7
17SC363	(PD x PI326011) x WR	F_3MSMS_2	16K_i845	129297⊗		0	
17SC364	(PD x PI326011) x WR	F_3MSMS_2	16K_mj845	129298_1⊗		0	
17SC365	(PD x PI326011) x WR	F_3MSMS_2	16K_mj845	129299⊗		0	
17SC366	HM x (Bx6) x (Snts x EFM)	F_4M	16K_i849	129300M		-	5.5
17SC367	HM x (Bx6)	F_3MS	16K_mj125	129302cg129306		0	
17SC368	(Nb4001 x Nb4002) x (HM x (Bx6))	BC_1	16K_i203	129306cg129302		0	
17SC369	HM x (Bx6)	F_5MS	16K_i199	129305⊗		3	
17SC370	Nb8483B x Nb9256B	F_3MS	16K_i217	129311_1⊗		2	6

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot	Galli
17SC371	Nb8483B x Nb9256B	F_3MS	16K_i217	129311_2⊗		2	
17SC372	PD	F_1X_3MS	16K_i219	129312_1⊗		2	
17SC373	PD	F_1X_3MS	16K_i219	129312_2⊗		2	
17SC374	PD	F_1X_3MS	16K_i219	129313⊗		2	6
17SC375	Western Red	? + MS	16K_i151	129315⊗		3	
17SC376	Nh0252B	M_4SMSMS	16K_i152	129318⊗		0	
17SC377	Nh0252B	M_4SMSMS	16K_i152	129319⊗		0	
17SC378	Nb1386B	F_4MSMS	16K_i477	129321_1⊗		0	5.5
17SC379	Nb1386B	F_4MSMS	16K_i477	129321_2⊗		0	
17SC380	Nb1386B	F_4MSMS	16K_i477	129324⊗		3	
17SC381	Nb1386B	F_4MS_2M	16K_i479	129326M		1	
17SC382	Nb1386B	F_4MS_2	16K_i793	129327_1⊗		0	6.5
17SC383	Nb1386B	F_4MS_2	16K_i793	129327_2⊗		0	
17SC384	Nb1386B	F_4MS_2	16K_i793	129328_1⊗		2	
17SC385	Nb1386B	F_4MS_2	16K_i793	129328_2⊗		0	
17SC386	Nb1386B	F_4MS_2	16K_mj793	129329⊗		0	6.5
17SC387	Nb1386B	F_4MSM	16K_mj793	129330M		0	
17SC388	Nb1391B	F_4M_3S	16K_i580	129331_1⊗		0	
17SC389	Nb1391B	F_4M_3S	16K_i580	129331_2⊗		2	
17SC390	Nb1391B	F_4M_3S	16K_i580	129332_1⊗		3	6
17SC391	Nb1391B	F_4M_3S	16K_i580	129332_2⊗		3	
17SC392	Nb1391B	F_6	16K_i796	129333_1⊗		1	
17SC393	Nb1391B	F_6	16K_i796	129334⊗		2	
17SC394	Nb2159B	$F_2MSMS_5M_2S$	16K_i158	129337⊗		3	6
17SC395	Npw2191B	F_3M_2SMS	16K_i486	129340⊗		0	
17SC396	Npw2191B	F_3M_2SMS	16K_i486	129341cg129342		0	
17SC397	(Nb8483 x Nbh2306) x Npw2191	BC_1	16K_i221	129342cg129341		0	
17SC398	Nb2222B	F_5MS_3	16K_i139	129343cg129346		2	6

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot	Galli
17SC399	(S.C. x Nb2246B) x Nb2222B	BC_2	16K_i138	129346cg129343		-	
17SC400	Nb2222B	F_5MS_3	16K_i139	129344⊗		1	
17SC401	Npw2191B	F_3M_2SMS	16K_mj590	129347_1⊗		2.5	
17SC402	Npw2191B	F_3M_2SMS	16K_mj590	129347_2⊗		0	
17SC403	Npw2191B	F_3M_2SMS	16K_mj590	129348⊗		2	
17SC404	Nbh2306B	F_9	16K_i140	129349cg129351		0	**6**
17SC405	(S.C. x Nb6509B) x Nbh2306B	BC_2	16K_i141	129351cg129349		0	
17SC406	Nbh2306B	F_9	16K_i140	129350cg129354		1	
17SC407	(S.C. x Nb6509B) x Nbh2306B	BC_2	16K_mj141	129354cg129350		0	
17SC408	Nbh2306B	F_7MS	16K_i494	129356⊗		2	**6**
17SC409	Nbh2306B	F_9	16K_i496	129359⊗		0	
17SC410	Nbh2306B	F_9	16K_i496	129360cg129353		0	
17SC411	(S.C. x Nb6509B) x Nbh2306	BC_2	16K_mj141	129353cg129360		0	
17SC412	Nbh2306B	F_9	16K_i496	129361⊗		2	**5**
17SC413	Nbh2306B	F_9	16K_mj501	129364⊗		0	
17SC414	Nbh2306B	F_9	16K_mj511	129366⊗		4	
17SC415	Nb3271B	$F_2MSMS_3M_2S$	16K_i142	129367cg129370		3	
17SC416	Nb3271A	BC_3	16K_i161	129370cg129367		1	**6**
17SC417	Nb3271B	F_2MSMS_3MS	16K_i160	129368⊗		2	
17SC418	Nb3284B	F_7	16K_i598	129371⊗		3	
17SC419	Nb4001B	F_3M_4S	16K_i168	129374⊗		4	
17SC420	(SC x Nb9297) x Nb4001	BC_1	16K_i167	129376cg129373		3.5	**5**
17SC421	Nb4001B	F_3M_4S	16K_i168	129373cg129376		4.5	
17SC422	Nb4002B	F_3M_4S	16K_i171	129379cg129383		3	
17SC423	Nb4001 x Nb4002	BC_2	16K_i173	129383cg129379		1	
17SC424	Nb4002B	F_3M_4S	16K_i171	129380⊗		2	**5**
17SC425	Npw4217B	F_3M_2S	16K_i146	129386⊗		0	
17SC426	Npw4217B	F_3M_2S	16K_i146	129389⊗		1	

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot	Galli
17SC427	Ns5154B	$F_1XMS_3MS_2$	16K_mj618	129398⊗		0	
17SC428	Ns4450B	$F_2M_2S_2$	16K_i147	129390⊗		0	5
17SC429	Ns4450B	$F_2M_2S_2$	16K_i147	129392⊗		0	
17SC430	Npw4458B	F_3MSM_2S	16K_i856	129393⊗		0	
17SC431	Ns5154B	$F_1XMS_3M_2S$	16K_i611	129396⊗		0	
17SC432	Npw5182B	F_5MS	16K_i240	129401⊗		0	5.5
17SC433	(Nb4001 x Nb8483) x Nb6526	OC?	16K_i178	129404⊗		3	
17SC434	(Nb4001 x Nb8483) x Nb6526	BC_1	16K_i178	129405cg129407		1	
17SC435	Nb6526B	$F_4M_5SMS_2M$	16K_mj602	129407cg129405		0	
17SC436	Nb6526B	$F_4M_5SMS_2M$	16K_mj602	129406⊗		0	4.5
17SC437	Nb6526B	$F_4M_5SMSM_2$	16K_i625	129408⊗		0	
17SC438	Nb8503B	F_3MS_7	16K_mj521	129410⊗		0	
17SC439	Nb8503B	F_3MS_7	16K_mj521	129411⊗		1	
17SC440	Nb8503B	F_3MS_5MS	16K_i522	129415⊗		-	7
17SC441	Nb8524B	$F_3M_6S_2$	16K_mj605	129416⊗		0	
17SC442	Nb8524B	$F_3M_6S_2$	16K_mj605	129417⊗		0	
17SC443	Nb8524B	F_3M_6SM	16K_mj605	129418M		0	
17SC444	Nb8542B	F_3M_7S	16K_i646	129420⊗		2	5.5
17SC445	Nb9297B	F_3MS_3	16K_mj528	129422⊗		0	
17SC446	Nb9297B	F_3MS_3	16K_mj528	129424⊗		0	
17SC447	(PD x PI326011) x WR	F_3MSMS_2	16K_mj845	129298_2⊗		0	
Arlington 2016-17 Production — Bill Matthews							
17SC448	"H1" = Homs 1	M_4SMSMS	Iso17 Rep2	131367⊗		0	6
17SC449	"HxB" = Homs x (Br1252 x 6274)	F_5M_2S	Iso17 Rep2	131369⊗		1	
17SC450	"H1" = Homs 1	M_4SMSMS	Iso17 Rep4	131372⊗		0	
17SC451	"H1" = Homs 1	M_4SMSMS	Iso30 Rep2	131375⊗		0	
17SC452	"H2" = Homs 2	$XMXMS_2M_2$	Iso30 Rep2	131376⊗		0	
17SC453	"H2" = Homs 2	$XMXMS_2M_2$	Iso30 Rep3	131379⊗		1	

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot	Galli
17SC454	"HxB" = Homs x (Br1252 x 6274)	F_5M_2S	Iso32 Rep2	131385⊗		0	5
17SC455	"H1" = Homs 1	M_4SMSMS	Iso32 Rep3	131386⊗		0	
17SC456	"HxB" = Homs x (Br1252 x 6274)	F_5M_2S	Iso32 Rep3	131388⊗		0	
17SC457	"H1" = Homs 1	M_4SMSMS	Iso32 Rep4	131389⊗		0	
17SC458	"H1" = Homs 1	M_4SMSMS	Iso33 Rep2	131391⊗		-	5.5
17SC459	"H2" = Homs 2	$XMXMS_2M_2S$	Iso33 Rep2	131392⊗		1	
17SC460	"HxB" = Homs x (Br1252 x 6274)	F_5M_2S	Iso33 Rep2	131393⊗		1	
17SC461	"H1" = Homs 1	M_4SMSMS	Iso33 Rep3	131395⊗		0	
17SC462	"H1" = Homs 1	M_4SMSMS	Iso33 Rep4	131396⊗		0	4.5
17SC463	"HxB" = Homs x (Br1252 x 6274)	F_5M_2S	Iso33 Rep4	131398⊗		0	
17SC464	"F5" = Br 1091 x Homs	F_6	Iso35 Rep2	131399⊗		4	
17SC465	"H1" = Homs 1	M_4SMSMS	Iso35 Rep4	131403⊗		0	
17SC466	"HxB" = Homs x (Br1252 x 6274)	F_5M_2S	Iso35 Rep4	131404⊗		2	5
17SC467	"H1" = Homs 1	M_4SMSMS	Iso36 Rep2	131406⊗		0	
17SC468	"H2" = Homs 2	$XMXMS_2M_2S$	Iso36 Rep2	131407⊗		0	
17SC469	"HxB" = Homs x (Br1252 x 6274)	F_5M_2S	Iso36 Rep2	131408⊗		2	
17SC470	"F5" = Br 1091 x Homs	F_6	Iso36 Rep3	131409⊗		0	5.5
17SC471	"H2" = Homs 2	$XMXMS_2M_2S$	Iso36 Rep3	131410⊗		0	
17SC472	"H2" = Homs 2	$XMXMS_2M_2S$	Iso36 Rep4	131412⊗		0	
17SC473	"HxB" = Homs x (Br1252 x 6274)	F_5M_2S	Iso36 Rep4	131413⊗		0	
17SC474	"H1" = Homs 1	M_4SMSMS	Iso37 Rep1	131414⊗		-	6
17SC475	"HxB" = Homs x (Br1252 x 6274)	F_5M_2S	Iso37 Rep4	131416⊗		2	
17SC476	"HxB" = Homs x (Br1252 x 6274)	F_5M_2S	Iso38 Rep1	131418⊗		-	
17SC477	"F5" = Br 1091 x Homs	F_6	Iso38 Rep2	131419⊗		-	
17SC478	"H2" = Homs 2	$XMXMS_2M_2S$	Iso38 Rep2	131420⊗		0	5.5
17SC479	"HxB" = Homs x (Br1252 x 6274)	F_5M_2S	Iso38 Rep3	131422⊗		1	
17SC480	"H1" = Homs 1	M_4SMSMS	Iso38 Rep4	131423⊗		0	
17SC481	"F5" = Br 1091 x Homs	F_6	Iso39 Rep1	131424⊗		1	

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot	Galli
17SC482	"H1" = Homs 1	M_4SMSMS	Iso39 Rep1	131425⊗		0	**5.5**
17SC483	S.C. x Nb9297B	BC_1	16K_i194	129429cg129429		2	
17SC484	"H2" = Homs 2	$XMXMS_2M_2S$	Iso39 Rep2	131428⊗		2	
17SC485	S.C. x Nb9297B	BC_1	16K_i194	129431cg129428		0	
17SC486	"HxB" = Homs x (Br1252 x 6274)	F_5M_2S	Iso39 Rep3	131430⊗		1	**4**
17SC487	"H1" = Homs 1	M_4SMSMS	Iso39 Rep4	131431⊗		0	
Earlier productions							
17SC488	Nb2159B	$F_2MSMS_4M_2N$	6899	608¬1		5	
17SC489	Nbh2306B	F_7M	6214	612¬1		2	
17SC490	Nb3271B	$F_2MSMS_3M_2S$	6930	128312		4.5	**6**
17SC491	Nb3271B	$F_2MSMS_3M_2S$	6930	622¬1		3	
17SC492	Nb3271A	BC_3	6933	622¬2		7	
17SC493	Npw4217B	F_3M_2M	6952	128324		0	
17SC494	Npw6163B	F_4M	6163	641¬1		2	**5**
17SC495	Nb9297B	F_3M_2S	6988	128342		0	
17SC496	(HM x SFF) x L0571B	F_2M	6064	127218		0	
17SC497	HM x (Bx6)	F_3M_2	6133	127392		2	
17SC498	HM x (Bx6)	F_3M_2	6133	127392		0	**5**
17SC499	PD x WR	F_3M	6170	127420		2	
17SC500	Nb8483 x 9256	F_4M_2S	6190	127424		1	
17SC501	(HM x Bx6) x L9359B	F_4	6198	127432		1	
17SC502	HM x (Bx6)	F_5MS_2	6208	127460		1	
17SC503	S.C. x SFF	BC_1	6176	127467		4	
17SC504	(FN2-9 × 2302) x (WR x PD)	F_4	6248	127522		0	**6**
17SC505	Various Reds x (Reds x 7262)	F_1MSM	6324	127634		7+	
17SC506	(HM x SFF) x L0556B	F_3	5063	121196		1	
17SC507	HM x (Bx6)	F_4	5155	121420		0	
17SC508	Nb3999B	F_3MSM	6873	$^{16'}$B115-1		1	**4.5**

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot	Galli
17SC509	Nb8503B	F_3MSM_3	6883	$^{16'}$B116-1		0	
17SC510	Homs	XMXMS	3N196	74078		0	
17SC511	Homs	XMXMS	3N196	74078		0	
17SC512	Homs	XMXMS	3N196	74080		2	**4**
17SC513	Homs	XMXMS	3N196	74080		0	
17SC514	HM = Nh0252B	M_4SMSM	-	$^{12'}$S278-1		0	
17SC515	(8483B x 9256B) x HM	F_2M	2SCJ167	111602		0	
17SC516	(HM x NF) x 0569B	F_3	15KI107	124318		0	**5**
17SC517	(FN2-9 × 2302) x (WR x PD)	F_2M	15KJ109	124324		3	
17SC518	(FN2-9 × 2302) x (WR x PD)	F_3	15KJ110	124326		3.5	
17SC519	(HM x Bx6) x 9359B	F_2M	15KI112	124331		3	
17SC520	(HM x Bx6) x 9359B	F_2M	15KI112	124333		2	**4**
17SC521	(HM x Bx6) x 9359B	F_3	15KI112	124335		4	
17SC522	(HM x Bx6) x 9359B	F_3	15KI112	124336		2	
17SC523	(HM x Bx6) x 9359B	F_2M	15KI113	124339		1.5	
17SC524	(HM x Bx6) x 9359B	F_3	15KI113	124340		2	**4.5**
17SC525	(HM x Bx6) x 9359B	F_3	15KI113	124341		1	
17SC526	(HM x Bx6) x 9359B	F_3	15KI113	124342		1	
17SC527	(HM x Bx6) x 9359B	F_3	15KI113	124343		2	
17SC528	(8483B x 9256B) x (Bx6 x Homs)	F_3	15KI125	124361		0	**4**
17SC529	7262B x HM	F_3	15KJ132	124371		2	
17SC530	((B x 6) x (PD x PI326011)) x (8483B	F_3	15KI133	124372		1	
17SC531	((B x 6) x (PD x PI326011)) x (8483B	F_2M	15KI133	124373		2	
17SC532	(PD x PI236011) x WR	F_5M	15KJ208	124437		0	**5**
17SC533	SFF	$F_1XMS_3M_2S_2$	15KI236	124463		0	
17SC534	PD	$XMXMS_2M_2S$	15KJ259	124486		0	
17SC635	(Nb8483B x 9256B) x (Bx6 x HM)	F_3	5074	121226		5	

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot	Galli
Inbreds							
17SC636	9304B	—	9509	[99']930-1		-	**6**
17SC637	FW -HCM	S_1M	5387	[95']524-1		5	
17SC638	2226B	$M_4SM_4SM_2$	?	V104073-2		5	
17SC639	7254B	F_2MS_2M	3712	[03']348–1		2.5	
17SC640	6333B	F_2MSM_6	9829	[09']928–1		5	**5.5**
17SC641	6253B	F_2MSM_6	2635	[02']235–1		4	
17SC642	7262B	F_5M_6	1726	[01']167–1		5	
17SC643	7322C	M_{12}	6734	[06']646–1		-	
17SC644	2327B	XM_7	3783	[13']320¬1		2	**5**
17SC645	L2577B	F1X4M4SM	6156	[15']534¬1		4	
17SC646	5367B	M_1SM_3	4517	[04']467–1		5	
17SC647	Nb2205B	F2MSMS2M	6446	[15']521¬1		3.5	
17SC648	P6139B	F_1XSMS_2M	6770	[16']639¬1		3.5	**6**
17SC649	P6245B	F_5MS_2M	6773	[16']645¬1		4	
17SC650	L1408B	F1X4M3S3M	6117	[15']515¬1		6	
17SC651	R6637	F2XM6	6386	[15']569¬1		7	
17SC652	B1111	F_2M_9	?	[15']I030¬2		4	
17SC653	3513B	?	?	[06']H305-21		1	
17SC654	(Uberlandia-Second Gen. x (LRSurrey	X_2M_2	3604	[13']389¬1		2	**5**
17SC655	Nb8524B	F_3M_6	?	[12']B115¬1		2.5	
17SC656	Nb2159B	?	?	N151721		2	
17SC657	5367B	M_1SM_2	3786	[03']365–1		4	
17SC658	P1129B	?	?	N151731		6	**4.5**

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot	Galli
17SC659	P0114B	?	?	N151681		5	
17SC660	PD x PI326011	F_1X_3SM	?	$^{12'}$B309¬1a		1	
17SC661	R6636B	…X_2MSM_3	?	$^{13'}$S364¬1		6.5	
17SC662	R5647B	?	?	N151701		6	**5**
17SC663	R5647B	?	?	N151701		3	
17SC664	R5647B	?	?	N151701		1.5	
17SC665	R5647B	?	?	N151701		2	
17SC666	R5647B	?	?	N151701		1.5	**4.5**
17SC679						2.5	
17SC680						5	
17SC681						3	
17SC682						2	**4**
17SC683						5	
17SC684						4	
17SC685						4.5	
17SC686						1	**5**
17SC687						0	
17SC688						1.5	
17SC689						0	
17SC690						0	**4**
17SC691	1129	F_2M_3	2691	$^{02'}$226–1		4	
17SC692	5367	M_1SM_4	7740-41	$^{97'}$729-1		3.5	
17SC693	5494B	F_3M_3	3796	$^{03'}$368–1		3	
17SC694	Nb4001B	F_3M_4	?	N110101		1	**4**
17SC695	Ns5154	$F_1XMS_2M_2$	?	$^{12'}$B310¬1		0	
17SC696	Nb4002B	F_3M_4	?	N111041b		0	
17SC697	R4294B	$F_1MS_2M_3$	6809	$^{16'}$B113¬1a		6	

Table 1. 2017 Nematode resistance screening carrot field trials - UC South Coast REC.

Entry			Root	Seed		Plot Galli	
17SC698	FS	$S_2X_2MS_2M$	6393	$^{16'}678\neg 2$		4	**4.5**
17SC699	D.c. Z020	M_1S_4M	6365	127728M		3	
17SC700	Nb3271B	?	?	N151761		1	

Table 2. Segregating carrot populations assayed with *Meloidogyne* spp. in greenhouse tests for genotyping and genetic analysis.

Population	Year tested	Pedigree	Generation	No. plants tested	Nematode species/isolate
87298	2017	Homs	M4SMS	174	hapla/S. Brdo
Sem 274-1	2017	Br x 6274 (8483 x 9256)	F3M	257	incognita/Pr. 77
80080	2014	Br x 6274 (8483 x 9256)	F3	84	incognita/Beltran
95644	2014	FN2-9 x 8503	F2	180	incognita/Beltran
UCR 2	2011-2013	Br x 6274 (3999B)	F3MS	345	incognita/Beltran
UCR 4	↓	↓	↓	104	↓
UCR 5				165	
UCR 9				48	
UCR 12				136	
UCR 26				11	
UCR 28				7	
UCR 29				158	
UCR 31				222	
UCR 35				109	
UCR 40				81	
UCR 43				17	
UCR 44				18	
UCR 47				223	