

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:

Kearney REC trials: Field screenings of advanced lines including inbred crosses developed by Dr. Simon were made in 2016 at the U. C. Kearney Research and Extension Center (KREC), Parlier, Fresno 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 Project 77) at the KREC site is originally from Tulare 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 approximately 2,000 plots on the two sites are summarized in Table 1. Tests were made in 3-foot plots as in previous years, planted 5/11/2016 and harvested for evaluation 09/28-29/2016. Infection was excellent and very uniform in both MI and MJ trials, on the basis of the susceptible I-58 controls, which were planted every 5th plot. The mean control score in the MI trial was 6.87 (range 5.5 to 9), slightly lower than in the 2015 Kearney REC trial. The mean control score in the MJ trial was 7.17 (range of 5 to 9), also higher than the 2015 Kearney REC trial. Crop rotation at Kearney where a field block of 44-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 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 more of a problem in the MJ trial on the basis of % of check plots with rot (30% of check plots in the MJ trial had scores of 8 or 9, compared to 13% in the MI trial), but this did not significantly impact scoring or selection in test (non-check) plots. 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 2016. Horticultural quality overall was quite good given the harsh conditions (nematode infection level and temperature), enabling selection for both nematode resistance and quality (root shape, etc.).

About 2000 plots in total were planted in the two main field trials (MI and MJ), about 400 more than planted in 2015. In each trial, 756 USDA breeding material entries from Phil Simon, 189 susceptible Emperor 58 checks, and 36 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, 6 rows consisting of 420 plots

(70 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 check 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 09/29/2016, highlighted by the *M. incognita* trial, and attended by seed company and carrot industry personnel.

Main Nursery trials: Data from the USDA trials are presented in Table 1. Data on the 36 industry submissions were reported directly to the respective industry partners. USDA entries included 43 populations from the 2015-16 winter trials in El Centro (section 1 of the table), 101 more advanced (F3 to F5) populations (section 2 of the table), 417 entries that are derived from selections made in 2015 from the Kearney nematode trials (section 3), and a group of 195 miscellaneous entries including 62 that are derived from selections made in the 2015 UCR multi-*incognita* isolate GH test conducted in summer 2015.

Entries in section 1 (from 101 to 143) were new and were being nematode screened for the first time. Most were either F2's or F3's and combined multiple resistances with quality (e.g., plot 118 – (HM x Bx6) x FS) or were from crossing resistance by resistance sources (e.g., plot 117 – (Bx6 x HM) x (8483 x 9256)). Plot scores indicated most F2's segregated for resistance (scores of 1 to 2) or had moderate levels of resistance (scores of 3 to 5), as would be expected where one of the parents (the root quality source) in the cross is susceptible.

In the second section of more advanced materials consisting of 101 entries (entries 144 to 244), many have been given an inbred designation (N in the pedigree) and have either a single resistance source (Nb or *brasilia*, Ns or SFF, Nh or *homs*, etc.) in the pedigree, or combine resistance sources (e.g., Npw). Of the 101 entries, about 40% are highlighted as very resistant (scores of 2 or <) in Table 1. There were also about 20 F1's in this group. Although most had scores >2, there were a few (plots 178, 203, 223, and 235) that held up well in both trials indicating that making F1 hybrids that are very resistant is possible, but will probably require having resistance in both parents, or in 2 of the 3 parents as seen in plot 235.

Of the 417 entries in the third section (entries 245 to 661), 348 entries or 83 % had scores of 2 or less and are highlighted in Table 1. Many were highly resistant with scores of 0 in both trials. This group is derived from selections made at Kearney in 2015, and the high percentage of very resistant entries indicates selection in 2015 under intense nematode pressure was very effective. Of particular interest was the observation of some very good quality along with the resistance, as seen in plots 494 thru 503. These entries are an inbred (Nbh2306B) that combines *Brasilia* (Br1252) and *Homs* as the resistance sources, and are advanced to F8. They are near commercial quality, and may only require another BC or two to reach commercial quality.

Section 4 contains miscellaneous entries, including a group of 62 entries derived from selections made in 2015 at UC Riverside as part of a multiyear, multi-isolate test of

resistant carrot genotypes. In this section, of the 195 entries, 162 or 83% were highlighted as very resistant (scores of 2 or < 2). Entries in this group included derivatives from selections made in the 2013 Kearney trials (3K designation under root source) and the 2012 South Coast REC trials (2SC designation). Of the 62 entries derived from the 2015 multi-isolate UCR test, 87% were highly resistant. Among these is a group with the pedigree SEM, derived from a cross of 8483 (Br1252) x 9256. Roots of this group have near immunity in their resistance to *M. incognita* on the basis of the 2015 GH (greenhouse) test. The other highly resistant group has the pedigree H x B, and combines BR1252 with Homs as resistance sources.

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 2016-17 winter nursery for crossing and (or) seed production.

Greenhouse evaluations:

Greenhouse trials were conducted with two objectives. The first major effort 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 effort was a continuation of controlled screening of populations segregating for *M. incognita* resistance (section 2), in attempts to define the trait loci and to develop markers for the loci for use in the breeding programs.

1. A second round of a multi-isolate screening of 11 resistant carrot genotypes (listed in Table 2) and 1 susceptible control (Imperator 58) was conducted to look at possible variability among root-knot nematode isolates on different sources of resistance. The focus in 2016 was to finish the *M. incognita* screens and to re-test the genotypes with the *M. hapla* isolates. The same set of *M. hapla* isolates that had been used in 2014 were again used in 2016, with the exception of isolate 34, which failed to produce sufficient inoculum for the test. Most isolates had been identified to species (and race where appropriate) previously using a host differential test. In addition, to confirm identification, all isolates were submitted to the CDFA diagnostic lab in Sacramento for species-specific molecular fingerprinting.

With the exception of five carrot genotypes (UCR 40, UCR 4, SEM, SFF, and the F5 genotype), seed for the carrot genotypes tested in 2016 came from roots selected from the 2014 *M. hapla* multi-isolate test (Table 2). The most resistant roots of each genotype were vernalized and sent to Wisconsin to be caged together to produce a new *M. hapla* resistant population. This was done to reduce variability in the test due to segregation for resistance and therefore give a more reliable test of variability among the nematode isolates. The F4 roots sent to Wisconsin also failed to produce seed, so an F5 source with the same pedigree (BR 1091 x Homs) and root source was substituted. Also, the UCR 4, SEM, and SFF roots selected for *M. hapla* resistance failed to produce seed, and therefore seed from roots of those genotypes that had been selected for *M. incognita*

resistance in 2015 was used. Each genotype x isolate combination was replicated 4 times. Carrots were direct-seeded into pots, 2 seeds/pot, and thinned to 1 plant/pot before inoculation. One month-old carrots at the 3- to 5-leaf stage were inoculated with approx. 50,000 eggs per plant in late August 2016.

As in 2014, some genotypes were prone to early bolting, primarily Ping Ding, but this was less of a problem in 2016 due to selection away from bolting. The test ran for about 10 weeks until early November, when tops were removed and the plants in pots moved to cold storage. The roots were washed and fibrous roots scored for galling and processed for nematode egg extraction. There was still some evidence of segregation in a few genotypes to some of the isolates, primarily in the Homs 2 and H x B genotypes. Resistant and susceptible roots of Homs 1, Homs 2, H x B, and F5 were sent to Wisconsin for planting in the winter (2016-17) greenhouse for seed production, crossing, and genotyping. The Homs 1 genotype appears to have benefited greatly from selections made in 2014, as the resistance was very strong (gall scores of 0 or 1) and uniform. Homs 1 clearly segregated in the 2014 *M. hapla* test, with gall scores ranging from 0 to 8. Of the 44 roots tested, 11 were resistant (scores of 0 or 1) and 33 were susceptible (scores of 5 to 8). This ratio (1R:3S) may indicate simple recessive resistance to *M. hapla* in this carrot genotype, although the sample size was small. A larger test of 200 to 300 plants of the seed source for that genotype is planned in 2017 to confirm and genetically map this resistance. Of 11 resistant Homs 1 roots identified in 2014, 6 were caged together to produce seed used in the 2016 test.

The preliminary data analysis from this 2016 experiment with 10 *M. hapla* isolates indicated clear differences in ability to infect the carrot genotypes, ranging from very aggressive (isolate 31, or carrot isolate) to weak (isolate 37, or Tennessee isolate). These same isolates behaved similarly in the 2014 test.

2. A screen with *M. incognita* was conducted previously on B3999 cage 333-1 BR-1252 derivatives that were fixed for the *Mj-1* gene resistance and which segregated for resistance to *M. incognita*. This identified 14 families that ranged from uniformly resistant to uniformly susceptible to segregating for resistance to *M. incognita*. These are all designated UCR sources, two of which (UCR 4 and 40) have been used in the multi-isolate tests. We have selected a sub-set of this material to genotype for *M. incognita* resistance gene mapping. The genotyping is currently underway in Wisconsin with DNA extracted from leaf material collected at Riverside.

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

Table 1. 2016 Nematode resistance screening carrot trials - Kearney REC

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
16	· New Production El Centro	101 to 143						
61	· F3-F5 Includes Some Inbreds	144 to 244						
164	· New Production Kearney	245 to 661						
682	· 2015 UCR Multi-isolate GH Test + Misc.	662 to 856						
887								
Key: Plot galling scores from 0 (fully resistant) to 7 (fully susceptible) 8 = susceptible + some rot 9 = Whole plot lost to rot (may or may not be resistant)					Plot Galling Scores			
					M. javanica		M. incognita	
· New Production El Centro					Plot	Checks	Plot	Checks
101	(SFF x (8483x9256?)) x 7808B, Flavor	F2	5014	121056	2.5		2.5	
102	7808B, Flavor x (SFF x (8483x9256?))	F2	5015	121058	1		3	
103	7808B, Flavor x (SFF x (8483x9256?))	F2	5015	121060	2		2.5	
104	Flavor, 7808B x (SFF x (8483x9256?))	F2	5016	121062	1	9	2.5	6
105	Flavor, 7808B x (SFF x (8483x9256?))	F2	5016	121064	3		4.5	
106	Nb6526B x ((5280B x (Turkish x P7262)) x Dutch Horn)	F3	5041	121154	1		1	
107	(FN2-9 x 2302) x (WR x PD)	F3	5056	121188	5		5	
108	(FN2-9 x 2302) x (WR x PD)	F3	5056	121190	4.5	6.5	5.5	6.5
109	(HM x SFF) x L0556B	F3	5062	121194	1		2.5	
110	(HM x SFF) x L0556B	F3	5063	121196	4		5	
111	(Bx6 x HM) x (Nb8483B x 9256B)	F3	5063	121198	2		1	
112	(PD x WR) x L7553B	F3	5068	121210	4	6	5	7
113	(Nb8483B x 9256B) x (Bx6 x HM)	F3	5073	121220	1		0	
114	(Nb8483B x 9256B) x (Bx6 x HM)	F3	5073	121222	1		1	
115	(Nb8483B x 9256B) x (Bx6 x HM)	F3	5074	121226	1		1	
116	(Nb8483B x 9256B) x (Bx6 x HM)	F3	5074	121228	1	8	1	6.5
117	(Nb8483B x 9256B) x (Bx6 x HM)	F3	5075	121230	0		0	
118	(HM x (Bx6)) x FS	F3	5080	121234	7		7	
119	(HM x (Bx6)) x FS	F3	5080	121238	3.5		5.5	
120	Nb8524B x (FN2-9 x 2302)	F3	5083	121246	7	7.5	7	7
121	(HM x (Bx6)) x FS	F4	5145	121388	1		1.5	
122	(WR x PD) x (FN2-9 x 2302)	F4	5149	121402	2.5		1	
123	Nb4002B x (FN2-9 x 2302)	F4	5146	121404	1		2	
124	(FN2-9 x 2302) x HM	F4	5150	121408	5.5	7	4	5.5
125	HM x (Bx6)	F3M	5155	121418	1		2	
126	HM x (Bx6)	F4	5155	121420	1		2.5	
127	HM x (Bx6)	F4	5155	121420	1		2.5	
128	Bx6	F2MSMSMSM	5180	121466	2.5	7	5	7
129	(Bx6) x PD	F6	5188	121468	2		1.5	
130	(FN2-9 x 2302) x Nb8503B	F4	5199	121490	5		7	
131	D.c. Z020 x Nb8524B	F3M	5660	121672	7		7	
132	D.c. Z020 x Nb8524B	F4	5661	121678	7	6.5	7	6.5
133	D.c. Z020 x Nb8524B	F3M	5669	121708	5		3.5	
134	Nb1393B	F4MS3	6418	122296	6.5		7	
135	(S.C. x Nb2201B) x Nb2195B2	BC1	6441	122325	3		3.4	
136	(S.C. x Nb2246B) x Nb2205B3	BC2	6445	122329	4	7	4	7
137	Nb2222B	F5MS2	6448	122334	2.5		2	

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
138	(S.C. x Nb2246B) x Nb2222B	BC1	6449	122335	3		3	
139	Nb2222B	F5MS2	6448	122336	2		3	
140	Nbh2306B	F8	6453	122340	3.5	7	4	7
141	(S.C. x Nb6509B) x Nbh2306B2	BC1	6454	122341	3		2.5	
142	Nb3271B	F2MSMS3M2S	6456	122346	4.5		3.5	
143	Nb3353B	F4MSM2	6461	122352	6		4.5	
F3-F5 Includes Some Inbreds								
144	Nb4002B	F3M4S	6465	122360	3	7.5	1	7
145	Nb4216B	F3MS	6468	122364	1		0	
146	Npw4217B	F3M2	6469	122366	1		0	
147	Ns4450B	F2M2S	6471	122370	3		1.5	
148	Ns6520B	F1XMS2M2S3	6478	122380	5.5	7	5	7
149	(L7550A x 1111B) x Ns6520B2	BC1	6479	122381	5		6	
150	Nb8483B	F3MSM3SMS	6487	122392	5.5		6	
151	Western Red	? + M1	-	122556	6		3	
152	Nh0252B	M4SMSM	-	B119-1	5	7	2.5	6.5
153	Nh0252B	M4SMSM	-	S278-1	5		3	
154	Nb1175B	F5M	-	B120-1	7		7	
155	SC x Nb1175B3	BC2	-	B120-2	6		6.5	
156	Nb2159B	F2MSMS5M2	-	N15721	5	7	6	7
157	Nb2159A	BC3	-	N151722	6		5	
158	Nb2159B	F2MSMS5M2	-	I105R2	5.5		7	
159	Nb2159A	BC3	-	I4R1	7	7	6.5	7
160	Nb3271B	F2MSMS3MSM	-	N151761	4		1.5	
161	Nb3271A	BC2	-	N151762	5		3	
162	Nb4001-1B	F3M3	-	B101-1	3.5		5	
163	Nb4001-2B	F3M2SM3	-	B102-1	3.5	7	2.5	8
164	Nb4001-3B	F3M2SM3	-	B103-1	1.5		1	
165	Nb4001B	F3M4	-	N110101	2		1	
166	(Nb4001 x Nb4002) x Nb4001	BC1	-	N110102	1		1	
167	(SC x Nb9297) x Nb4001	F1	-	N110103	3.5	8	2.5	7
168	Nb4001B	F3M4	-	S261-1	0		1	
169	Nb4001B	F3M4	-	S276-1	1.5		1.5	
170	Nb4001B	F3M2SM2	-	S434-1	6		6.5	
171	Nb4002B	F3M4	-	B104-1	1	7	2	7
172	Nb4002B	F3M4	-	N111041	1		1	
173	(Nb4001 x Nb4002) x Nb4002	BC1	-	N111042	2.5		1.5	
174	Nb4002B	F3M4	-	S263-1	3		3	
175	Ns5154B	F1XMS3M	-	B310-1	0	9	1	7
176	Nb6526B	F4M5SMSM	-	B105-1	1		1	
177	Nb6526B	R21R3	-	I104	0		2	
178	(Nb4001 x Nb8483) x Nb6526	F1	-	I104	1		1	
179	Nb6526B	F4M5SMSM	-	S277-1	1	7	1	6.5
180	Nb8483B	F3MSM3SM	-	B106-1	5.5		9	
181	Nb8483B	F3MSMS	-	S435-1	4		6.5	
182	Nb8503B	F3MSM2SM3	-	B121-1	1.5		1	
183	Nb8524B	F3M7	-	B115-1	2.5	7	3.5	6.5
184	(Nb4001 x Nb4002) x Nb8524	F1	-	N110512	3		4	
185	(Nb8524 x Nb8483) x Nb8524	F1	-	N110393	3.5		7	
186	Nb8524B	F3M6	-	V104068-2	2.5		5	
187	Nb8524A	BC3	-	V104069-2	3.5	6	4.5	7

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
188	Nb8542B	F3M6	-	V104070-2	1		1.5	
189	Nb8542A	BC4	-	V104071-2	3		3.5	
190	Nb9296B	F3M	-	N111031	4		5.5	
191	(Nb4001 x Nb4002) x Nb9296	F1	-	N111032	1.5	7	4	7
192	Nb9296B	F3M	-	B116-1	4		5	
193	Nb9297B	F4M2	-	B111-1	0		1.5	
194	S.C. x Nb9297B	F1	-	B111-3	5		6	
195	S.C. x Nb9297B	F1	-	B111-4	5	9	4	7
196	Nb9297B	F3M	-	B117-1	1		1	
197	Nb9297B	F3M	-	12-HC44-1	1.5		2	
198	Nb9324B	F5M2	-	B118-1	2		4	
199	HM x (Bx6)	F5M	-	B246-1	1	7	0	7
200	HM x (Bx6)	F5M	-	B247-1	0		0	
201	HM x (Bx6)	F5M	-	B248-1	0		0	
202	HM x (Bx6)	F5M	-	N111021	0		0	
203	(Nb4001 x Nb4002) x (HM x (Bx6))	F1	-	N111022	1	6.5	1	6
204	(Nb8524 x Nb8483) x (HM x (Bx6))	F1	-	N111023	2.5		4	
205	HM x (Bx6)	F5M	-	B267-1	1		1	
206	(Nb4001 x Nb4002) x (HM x (Bx6))	F1	-	N111022	3		1	
207	Nb8483B x Nb9256B	F4M2	-	S308-1	1.5	7	1	7
208	Nb8483B x Nb9256B	F4M	-	B108-1	1		0	
209	Nb8483B x Nb9256B	F4M	-	B109-1	0		0	
210	Nb8483B x Nb9256B	F4M	-	B110-1	0		1	
211	Nb8483B x Nb9256B	F4M	-	B111-1	0	5	0	6
212	Nb8483B x Nb9256B	F4M	-	B112-1	2		0	
213	Nb8483B x Nb9256B	F4M	-	B307-1	1.5		1	
214	Nb8483B x Nb9256B	F4M	-	B308-1	2		2	
215	Nb8483B x Nb9256B	F3M	-	S265-1	0		0	
216	Nb8483B x Nb9256B	F3M	-	S274-1	0	8	0	5.5
217	Nb8483B x Nb9256B	F3M	-	S275-1	1.5		1.5	
218	SFF (Ns5154)	F1XMS3M	-	S433-1	0		2.5	
219	PD	F1X3M	-	B309-1	3.5		4	
220	Npw2191B	F3M2SM2	6436	518-1	0	6	0	7
221	(Nb8483 x Nbh2306) x Npw2191	F1	6555	518-2	1.5		4.5	
222	(Nb8483 x Nbh4216) x Npw2191	F1	6560	518-3	0		4	
223	(Nb8524 x Nb84832) x Npw2191	F1	6583	518-4	2		2	
224	(Nb4001 x Nb6526) x Npw2191B	F1	6585	518-5	1.5	8	3	6
225	(S.C. x Nb8542) x Npw2191B	F1	6586	518-6	4		4.5	
226	Nb2195B	F4MSM	6440	519-1	1		5.5	
227	(Nb8483 x Nbh2306) x Nb2195	F1	6555	519-2	3		4.5	
228	(L7551 x 1131) x L0567	F1	6560	519-3	3	8	5	6
229	Nb2201B	F2MSMS2M2SM	6442	520-1	4		6	
230	Nb2205B x Nb2201B	F1	4806	520-2	4		6	
231	Nb2205B	F2MSMS2MSM	6446	521-1	1.5		1.5	
232	(Nb8483 x Nbh2306) x Nb2205	F1	6555	521-2	5	6	5	6.5
233	(Nb8483 x Nb4216) x Nb2205	F1	6560	521-3	3.5		6	
234	(3035 x Nb3999) x Nb2205	F1	6580	521-4	2		2.5	
235	(S.C. x Nb3999) x Nb2205	F1	6582	521-5	1.5		2	
236	(Nb8524 x Nb84832) x Nb2205	F1	6583	521-6	3	5.5	5	6
237	(S.C. x Nb9324) x Nb2205	F1	6584	521-7	2		3	
238	(Nb4001 x Nb6526) x Nb2205	F1	6585	521-8	3.5		5.5	
239	(S.C. x Nb8542) x Nb2205	F1	6586	521-9	5		5	

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
240	Npw5182B	F5M	5182	545-1	2	6.5	5	8
241	Nb9297B	F3M3	6497	575-1	3		2	
242	(S.C. x Npw21912) x Nb9297	F1		575-3	4		4	
243	(Nb8524 x Nb84832) x Nb9297	F1		575-4	4.5		6.5	
244	Nb9324B x Nb4216B	F x F	6498	576-1	3.5	7	5	7
New Production Kearney								
245	N2-9 x 2302) x ((B x 6) x (PD x PI32601	F3	15KI102	124310	4		4.5	
246	N2-9 x 2302) x ((B x 6) x (PD x PI32601	F3	15KI102	124311	6		3.5	
247	N2-9 x 2302) x ((B x 6) x (PD x PI32601	F3	15KI102	124312	3		3.5	
248	N2-9 x 2302) x ((B x 6) x (PD x PI32601	F2M	15KI102	124313M	3	7	1.5	6
249	0568B x HM	F3	15KI106	124316	3		2	
250	(HM x NF) x 0569B	F3	15KI107	124318	1		1	
251	(HM x NF) x 0569B	F3	15KI107	124319	2		2	
252	(FN2-9 x 2302) x (WR x PD)	F3	15KI109	124321	2.5	7	1	6
253	(FN2-9 x 2302) x (WR x PD)	F3	15KI109	124322	1		1	
254	(FN2-9 x 2302) x (WR x PD)	F2M	15KJ109	124324M	2		1	
255	(FN2-9 x 2302) x (WR x PD)	F3	15KJ109	124325	0		1	
256	(FN2-9 x 2302) x (WR x PD)	F3	15KJ110	124326M	3	8	2	6.5
257	0572B x (HM x SFF)	F3	15KI111	124328	6		6	
258	(HM x Bx6) x 9359B	F2M	15KI112	124331M	3		1.5	
259	(HM x Bx6) x 9359B	F2M	15KI112	124333M	5		4	
260	(HM x Bx6) x 9359B	F3	15KI112	124335	3.5	8	1.5	7
261	(HM x Bx6) x 9359B	F3	15KI112	124336	4		1.5	
262	(HM x Bx6) x 9359B	F2M	15KI113	124339M	1		1	
263	(HM x Bx6) x 9359B	F3	15KI113	124340	4		3	
264	(HM x Bx6) x 9359B	F3	15KI113	124341	3.5	8	2.5	6
265	(HM x Bx6) x 9359B	F3	15KI113	124342	4.5		1.5	
266	(HM x Bx6) x 9359B	F3	15KI113	124343	3		1	
267	(Bx6 x HM) x (8483B x 9256B)	F2M	15KI116	124346M	3.5		1	
268	(Bx6 x HM) x (8483B x 9256B)	F3	15KI116	124347	5	9	1	7
269	(PD x WR) x 9782B	F3	15KI118	124350	6.5		2.5	
270	(PD x WR) x 9782B	F2M	15KJ118	124351M	2		1	
271	SFF x (SFF x HM)	F2M	15KI121	124352M	1.5	7	1	9
272	SFF x (SFF x HM)	F3	15KI121	124353	2		1	
273	SFF x (SFF x HM)	F3	15KI121	124354	3		1	
274	SFF x (SFF x HM)	F3	15KI121	124355	1		0	
275	SFF x (SFF x HM)	F3	15KI121	124356	1	7	1	6.5
276	SFF x (SFF x HM)	F3	15KJ121	124357	1		2	
277	(8483B x 9256B) x (Bx6 x Homs)	F3	15KI125	124359	0		0	
278	(8483B x 9256B) x (Bx6 x Homs)	F2M	15KI125	124360M	0		1	
279	(8483B x 9256B) x (Bx6 x Homs)	F3	15KI125	124361	1	5.5	1	8
280	(8483B x 9256B) x (Bx6 x Homs)	F2M	15KI125	124362M	1		1.5	
281	(8483B x 9256B) x (Bx6 x Homs)	F3	15KJ125	124365	1		0	
282	(HM x NF) x 0569B	F3	15KI127	124366	2		1	
283	(HM x NF) x 0569B	F3	15KI127	124367	1	5.5	0	9
284	0571B x (HM x SFF)	F3	15KI128	124368	3		1	
285	0571B x (HM x SFF)	F3	15KI128	124369	2		2	

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
286	7262B x HM	F2M	15KI132	124370M	0		0	
287	7262B x HM	F3	15KJ132	124371	1	6	1.5	7
288	x 6) x (PD x PI326011)) x (8483B x 925	F3	15KI133	124372	1.5		1.5	
289	x 6) x (PD x PI326011)) x (8483B x 925	F2M	15KI133	124373M	1.5		0	
290	x 6) x (PD x PI326011)) x (8483B x 925	F3	15KI133	124374	1		1	
291	x 6) x (PD x PI326011)) x (8483B x 925	F2M	15KJ133	124375M	1.5	7	0	6.5
292	x 6) x (PD x PI326011)) x (8483B x 925	F3	15KJ133	124376	1		-	
293	x 6) x (PD x PI326011)) x (8483B x 925	F2M	15KJ133	124377M	1		1	
294	NF x HM	F3M	15KI155	124385M	2		5	
295	NF x HM	F4	15KI150	124384	3	6	1.5	7
296	NF x HM	F3M	15KI155	124386M	1		3.5	
297	NF x HM	F4	15KI155	124387	0		2	
298	NF x HM	F4	15KI155	124390	0		2	
299	(PD x PI326011) x WR	F3MS2M	15KI166	124392M	1	5.5	1	9
300	(PD x PI326011) x WR	F3MS3	15KI166	124393	0		1.5	
301	(PD x PI326011) x WR	F3MS2M	15KJ166	124398M	1		1	
302	(PD x PI326011) x WR	F3MS3	15KJ167	124400	0		0	
303	(PD x PI326011) x WR	F3MS2M	15KI171	124405M	1	6.5	0	7
304	(PD x PI326011) x WR	F3MS3	15KI171	124407	0		1	
305	(PD x PI326011) x WR	F3MS2M	15KJ172	124412M	1		1.5	
306	(PD x PI326011) x WR	F3MS3	15KJ172	124413	1.5		1	
307	(PD x PI326011) x WR	F3MS3	15KI180	124417	1	8	0	6.5
308	(PD x PI326011) x WR	F3MS2M	15KJ180	124418M	0		1	
309	(PD x PI326011) x WR	F3MS2M	15KJ180	124420M	0		0	
310	PD x PI326011	F1M2SMS2M2S2M	15KI185	124422M	2		1.5	
311	PD x PI326011	F1M2SMS2M2S2M	15KI185	124423M	1	5.5	1	6.5
312	PD x PI326011	F1M2SMS2M2S2M	15KI185	124424M	0		2	
313	PD x PI326011	F1M2SMS2M2S2M	15KI185	124425M	0		1	
314	PD x PI326011	F1M2SMS2M2S3	15KI185	124426	1		0	
315	PD x PI326011	F1M2SMS2M2S3	15KJ185	124428	0	6	2	7
316	SFF	F2MS7	15KI196	124430	0		2.5	
317	SFF	F2MS6M	15KI196	124431M	0		0	
318	8483B x 9256B	F7	15KJ203	124432	1.5		1	
319	8483B x 9256B	F7	15KJ203	124433	1	6	1.5	6
320	(PD x PI236011) x WR	F5M	15KI208	124435M	0		1.5	
321	(PD x PI236011) x WR	F6	15KI208	124436	0		3.5	
322	(PD x PI236011) x WR	F5M	15KJ208	124437M	0		1	
323	(PD x PI236011) x WR	F5M	15KJ208	124438M	0	6.5	0	6.5
324	(PD x PI236011) x WR	F5M	15KJ208	124439M	0		5	
325	(PD x PI236011) x WR	F6	15KJ208	124440	0		1	
326	(WR) x (PD x PI326011)	F3MSM	15KI213	124442M	0		0	
327	(WR) x (PD x PI326011)	F3MS2	15KI213	124443	1		2	
328	HM x (Bx6)	F3M	15KI224	124444M	1.5	6.5	0	6
329	HM x (Bx6)	F3M	15KI224	124445M	1		0	
330	HM x (Bx6)	F3M	15KI224	124446M	0		1	
331	HM x (Bx6)	F3M	15KJ224	124447M	0		0	
332	HM x (Bx6)	F4	15KJ224	124448	0	6.5	1	7
333	HM x (Bx6)	F3M	15KJ224	124449M	0		1	
334	HM x (Bx6)	F4	15KJ224	124450	0		0	

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
335	(FN2-9 x 2302) x HM	F4M	15KI228	124451M	1		1.5	
336	(FN2-9 x 2302) x HM	F4M	15KI228	124452M	1.5	8	2	6.5
337	(FN2-9 x 2302) x HM	F5	15KI228	124453	0		2.5	
338	(FN2-9 x 2302) x HM	F5	15KI228	124454	1.5		2	
339	SFF	F1XMS3M2S2	15KI236	124463	2		3.5	
340	SFF	F1XMS3M2S2	15KI236	124464	1	7	1	7
341	SFF	F1XMS3M2S2	15KI236	124465	1		1	
342	SFF	F1XMS3M2S2	15KI236	124466	2.5		2	
343	PD	MXMS2M2SMSM	15KI259	124475M	1		1	
344	PD	MXMS2M2SMS2	15KJ259	124486	1	6	1	8
345	(Snts x EFM) x HM x (Bx6)	F4	15KI266	124487	3		4	
346	(Snts x EFM) x HM x (Bx6)	F4	15KI266	124488	1.5		3	
347	(Snts x EFM) x HM x (Bx6)	F4	15KI266	124489	1		4	
348	(Snts x EFM) x HM x (Bx6)	F4	15KI266	124490	2	6.5	3	7
349	(Snts x EFM) x HM x (Bx6)	F4	15KJ266	124491	1.5		4.5	
350	(Snts x EFM) x HM x (Bx6)	F4	15KJ266	124492	3		5	
351	(HM x Bx6) x 9359B	F4	15KI270	124494	3.5		1	
352	(HM x Bx6) x 9359B	F3M	15KI270	124495M	1	5	1.5	6
353	(HM x Bx6) x 9359B	F3M	15KI270	124496M	1		1	
354	(HM x Bx6) x 9359B	F4	15KJ270	124497	2		1	
355	(HM x Bx6) x 9359B	F3M	15KJ270	124498M	1.5		1.5	
356	(HM x Bx6) x 9359B	F4	15KJ270	124499	1	7	1	7
357	(Bx6 x HM) x (8483B x 9256B)	F4	15KI278	124501	3		0	
358	(Bx6 x HM) x (8483B x 9256B)	F4	15KI278	124502	2.5		0	
359	(Bx6 x HM) x (8483B x 9256B)	F3M	15KI278	124503M	1		1	
360	(Bx6 x HM) x (8483B x 9256B)	F3M	15KI278	124505M	1	8	1	7
361	SFF x Uberlandia	F5	15KI281	124507	1		2.5	
362	SFF x Uberlandia	F5	15KI281	124508	2.5		1	
363	SFF x Uberlandia	F5	15KI281	124509	2		3	
364	SFF x Uberlandia	F5	15KI281	124510	1.5	7	0	7
365	SFF x Uberlandia	F5	15KJ281	124511	4		2.5	
366	Nb8483B x 9256B	F7M	15KI285	124514M	1		1	
367	Nb8483B x 9256B	F8	15KI285	124515	1		0	
368	Nb8483B x 9256B	F7M	15KI285	124517M	0	7	0	5.5
369	Nb8483B x 9256B	F7M	15KI285	124518M	0		0	
370	Nb8483B x 9256B	F7M	15KI285	124519M	1		0	
371	Nb8483B x 9256B	F8	15KJ285	124522	0		0	
372	Nb8483B x 9256B	F7M	15KJ285	124523M	0	8	0	7
373	HM x (Bx6) x (Snts x EFM)	F5	15KI289	124525	0		1	
374	HM x (Bx6) x (Snts x EFM)	F4M	15KI289	124526M	1.5		0	
375	HM x (Bx6) x (Snts x EFM)	F5	15KI289	124527	0		1.5	
376	L9786B x HM	F5	15KJ291	124531	1	7	6	7
377	(Nb8483B x 9256B) x HM	F2MSM	15KJ296	124533M	1		2	
378	(Nb8483B x 9256B) x HM	F2MSM	15KJ296	124534M	2		0	
379	(Nb8483B x 9256B) x HM	F2MS2	15KJ296	124535	1.5		2	
380	(Nb8483B x 9256B) x HM	F2MS2	15KJ296	124536	2	8	1	6.5
381	(Nb8483B x 9256B) x HM	F2MSM	15KJ296	124537M	0		1	
382	(Nb8483B x 9256B) x HM	F2MS2	15KJ296	124538	1		1	
383	SFF x HM	F4MSM	15KJ297	124539M	2	7	2.5	8

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
384	SFF x HM	F4MSM	15KJ297	124540M	1		1	
385	SFF x HM	F4MSM	15KJ297	124541M	1		1	
386	(PD x PI326011) x WR	F3MSMSM	15KJ298	124543M	1.5		1	
387	(PD x PI326011) x WR	F3MSMS2	15KJ298	124546	0	7	0	7
388	HM x SFF	F5	15KC307	124547	3		2	
389	HM x SFF	F4M	15KC307	124548M	1		1	
390	HM x SFF	F5	15KI307	124549	0		1.5	
391	HM x SFF	F5	15KI307	124550	2	8	2	8
392	HM x SFF	F4M	15KI307	124551M	0		1	
393	HM x SFF	F4M	15KI307	124552M	1		2.5	
394	HM x SFF	F5	15KI307	124553	1		2	
395	WR x PD	F3M2S2M	15KC310, J310	124554M	0	7	1	7
396	WR x PD	F3M2S3	15KC310, J310	124556	1		2	
397	WR x PD	F3M2S2M	15KC310, J310	124557M	1		1	
398	WR x PD	F3M2S3	15KC310, J310	124558	1		0	
399	(HM x SFF) x 0571B	F2M	15KI130	124559M	0	8	1	7
400	(HM x SFF) x 0571B	F2M	15KI130	124560M	1.5		0	
401	(HM x SFF) x 0571B	F2M	15KI130	124561M	0		1	
402	HM	XXMXS2M2SMS2M	15KI315	124564M	2		1.5	
403	HM	XXMXS2M2SMS3	15KJ315	124567	2	8	3	7
404	Nb8483B	F3MSM4S2M	15KJ322	124573M	1		1.5	
405	Nb8483B	F3MSM4S2M	15KJ323	124574M	2		1	
406	Nb8483B	F3MSM4S3	15KJ323	124575	2		-	
407	Nb8483B	F3MSM4S2M	15KJ323	124576M	1.5	7	1	7
408	Nb8483B	F3M9	15KI324	124579	0		0	
409	HM x (Bx6) x (Snts x EFM)	F4M	15KI331	124582M	1		0	
410	HM x (Bx6) x (Snts x EFM)	F4M	15KJ331	124588M	0		0	
411	HM x (Bx6) x (Snts x EFM)	F5	15KJ331	124589	0	7	1	7
412	(8483B x 9256B) x HM	F3M2	15KI335	124590M	1		1	
413	(8483B x 9256B) x HM	F3M2	15KI335	124591M	3		1.5	
414	(8483B x 9256B) x HM	F3M2	15KI335	124592M	0		1	
415	(8483B x 9256B) x HM	F3M2	15KI335	124593M	0	7	1	7
416	(8483B x 9256B) x HM	F3M2	15KI335	124594M	0		1	
417	(8483B x 9256B) x HM	F3MS	15KI335	124595	0		1	
418	(8483B x 9256B) x HM	F3M2	15KJ335	124596M	1		0	
419	(8483B x 9256B) x HM	F3M2	15KJ335	124597M	2	7	1	7
420	(8483B x 9256B) x HM	F3M2	15KJ335	124598M	1		0	
421	(8483B x 9256B) x HM	F3MS	15KJ335	124599	0		1	
422	(8483B x 9256B) x HM	F3M2	15KJ335	124600M	1		0	
423	(PD x PI326011) x WR	F3MSMSM	15KI335	124601M	1.5	7	1	6.5
424	(PD x PI326011) x WR	F3MSMSM	15KI335	124602M	0		0	
425	(PD x PI326011) x WR	F3MSMSM	15KI335	124603M	1.5		0	
426	(PD x PI326011) x WR	F3MSMS2	15KI335	124604	1		0	
427	(PD x PI326011) x WR	F3MSMSM	15KI335	124605M	1.5	7	1	6.5
428	(PD x PI326011) x WR	F3MSMSM	15KI335	124606M	0		0	
429	(PD x PI326011) x WR	F3MSMSM	15KI335	124609M	1		0	
430	(PD x PI326011) x WR	F3MSMS2	15KI335	124610	1		0	
431	WR x PD	F3M2SM	15KI367	124613M	1	8	1.5	5.5
432	WR x PD	F3M2SM	15KI367	124614M	1		0	

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
433	WR x PD	F3M2S2	15KI367	124615	1		0	
434	WR x PD	F3M2SM	15KI367	124616M	1		1	
435	WR x PD	F3M2S2	15KI367	124617	0	6.5	0	6
436	WR x PD	F3M2SM	15KJ367	124618M	1		0	
437	WR x PD	F3M2SM	15KJ367	124619M	0		0	
438	WR x PD	F3M2S2	15KJ367	124620	1		0	
439	WR x PD	F3M2S2	15KJ367	124621	0		1	
440	WR x PD	F3M2SM	15KJ367	124622M	1	9	1	5.5
441	WR x PD	F3M2S2	15KJ367	124623	0		1	
442	WR x PD	F3M2SM	15KJ367	124624M	0		0	
443	WR x PD	F3M2S2	15KJ367	124625	0		0	
444	HM x (Bx6)	F2MS4M	15KJ369	124626M	1	7	0	5.5
445	HM x (Bx6)	F2MS4M	15KJ369	124627M	0		1	
446	HM x (Bx6)	F5MSM	15KI375	124628M	2		0	
447	HM x (Bx6)	F5MSM	15KI375	124629M	0		0	
448	HM x (Bx6)	F5MSM	15KI375	124630M	0	8	0	6.5
449	HM x (Bx6)	F5MS2	15KI375	124631	0		0	
450	HM x (Bx6)	F5MS2	15KI375	124633	1		0	
451	HM x (Bx6)	F5MSM	15KJ375	124634M	1.5		0	
452	HM x (Bx6)	F5MS2	15KJ375	124635	0	9	0	7
453	SFF	F2MS6M	15KI389	124636M	1		0	
454	SFF	F2MS6M	15KI389	124637M	1.5		1	
455	SFF	F2MS6M	15KI389	124638M	0		1	
456	SFF	F2MS7	15KI389	124639	0	5.5	1	7
457	SFF	F2MS6M	15KJ39	124640M	1		0	
458	SFF	F2MS6M	15KJ39	124641M	1.5		0	
459	SFF	F2MS6M	15KJ39	124642M	1.5		0	
460	SFF	F2MS6M	15KJ39	124643M	1.5	7	1	7
461	SFF	F2MS6M	15KJ39	124644M	2		3	
462	SFF	F2MS7	15KJ39	124645	1		0	
463	SFF	F2MS3M	15KI410	124646M	1.5		1.5	
464	SFF	F2MS3M	15KI410	124647M	1	6.5	1	7
465	SFF	F2MS3M	15KI410	124648M	2		2	
466	SFF	F2MS3M	15KI410	124649M	1.5		1.5	
467	Nb8483B x 9256B	F4MS2	15KI415	124650	1.5		1	
468	Nb8483B x 9256B	F4MSM	15KI415	124651M	1	8	1.5	7
469	Nb8483B x 9256B	F4MS2	15KI415	124652	1		1	
470	Nb8483B x 9256B	F4MSM	15KJ415	124653M	1		1	
471	Nb8483B x 9256B	F4MSM	15KJ415	124654M	0		1.5	
472	Nb8483B x 9256B	F4MS2	15KJ415	124655	1	9	1	6.5
473	Nb1386B	F4MSM	15KI427	124656M	1		0	
474	Nb1386B	F4MSM	15KI427	124657M	1		0	
475	Nb1386B	F4MSM	15KI427	124658M	2		1	
476	Nb1386B	F4MSM	15KI427	124659M	1	7	1	7
477	Nb1386B	F4MSM	15KJ427	124660M	1		1	
478	Nb1386B	F4MSM	15KJ427	124661M	1		0	
479	Nb1386B	F4MS2	15KJ427	124662	1.5		0	
480	Npw2191B	F3M2SM	15KI434	124663M	1	7	1	7
481	Npw2191B	F3M2SM	15KI434	124664M	1		1	
482	Npw2191B	F3M2SM	15KI434	124666M	1.5		0	

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
483	Npw2191B	F3M2SM	15KI434	124667M	1		1	
484	Npw2191B	F3M2SM	15KI434	124668M	1	9	1	8
485	Npw2191B	F3M2SM	15KJ434	124669M	0		0	
486	Npw2191B	F3M2SM	15KJ434	124671M	0		0	
487	Npw2191B	F3M2SM	15KJ434	124672M	1		0	
488	Npw2191B	F3M2S2	15KJ434	124673	1	8	0	8
489	Nbh2306B	F7M	15KJ434	124674M	1		1	
490	Nbh2306B	F8	15KI437	124675	0		1	
491	Nbh2306B	F8	15KI437	124676	1		0	
192	Nbh2306B	F7M	15KI437	124677M	0	7.5	1	7
493	Nbh2306B	F7M	15KI437	124678M	0		0	
494	Nbh2306B	F7M	15KI437	124679M	1		0	
495	Nbh2306B	F8	15KI437	124680	1	8	0	8
496	Nbh2306B	F8	15KI437	124681	0		1	
497	Nbh2306B	F8	15KI438	124682	2		1	
498	Nbh2306B	F8	15KI438	124683	1		0	
499	Nbh2306B	F8	15KI438	124684	3	7	0	6.5
500	Nbh2306B	F8	15KI438	124685	0		0	
501	Nbh2306B	F8	15KI438	124686	0		0	
502	Nbh2306B	F8	15KI438	124688	2		0	
503	Nbh2306B	F8	15KJ438	124690	1	7	1	6
504	Nbh2306B	F7M	15KJ438	124691M	1.5		1	
505	Nbh2306B	F7M	15KJ438	124692M	1		1	
506	Nbh2306B	F7M	15KJ438	124694M	1		1	
507	Nbh2306B	F7M	15KJ438	124696M	1	6.5	0	6.5
508	Nbh2306B	F8	15KJ438	124697	0		0	
509	Nbh2306B	F8	15KI439	124698M	1		0	
510	Nbh2306B	F7M	15KI439	124699M	1		0	
511	Nbh2306B	F8	15KI439	124700	1.5	6.5	0	8
512	Nbh2306B	F7M	15KI439	124701M	1.5		1.5	
513	Nbh2306B	F8	15KI439	124702	1		1	
514	Nb4002B	F3M4SM	15KI440	124703M	2		2	
515	Nb4002B	F3M4S2	15KI440	124704	1	8	0	8
516	Nb4002B	F3M4S2	15KI440	124705	1		0	
517	Nb4002B	F3M4S2	15KI440	124706	0		1.5	
518	Nb4002B	F3M4SM	15KJ440	124707M	2		2	
519	Nb4002B	F3M4SM	15KJ440	124708M	1	6.5	1	8
520	Nb4002B	F3M4S2	15KJ440	124709	1		2	
521	Nb8503B	F3MS6	15KI446	124711	3.5		4.5	
522	Nb8503B	F3MS5M	15KJ446	124715M	3.5		0	
523	Nb8503B	F3MS5M	15KJ446	124716M	1	7	1.5	7
524	Nb8503B	F3MS6	15KJ446	124717	3.5		3.5	
525	Nb8503B	F3MS5M	15KJ446	124718M	3		4	
526	Nb8503B	F3MS6	15KJ446	124719	2		1	
527	Nb8503B	F3MS6	15KJ446	124720	2	7	2	7
528	Nb9297B	F3MS2	15KI447	124722	1		0	
529	Nb9297B	F3MSM	15KI447	124726M	1		0	
530	Nb9297B	F3MS2	15KJ447	124727	1		0	
531	Nb9297B	F3MS2	15KJ447	124728	0	8	1	7
532	Nb9297B	F3MS2	15KJ447	124730	3		1	

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
533	Nb8503B x (FN2-9 x 2302)	F3M	15KI461	124731M	1		1.5	
534	Nb8503B x (FN2-9 x 2302)	F3M	15KI461	124732M	1		0	
535	Nb8503B x (FN2-9 x 2302)	F3M	15KI461	124733M	1.5	8	2	7
536	Nb8503B x (FN2-9 x 2302)	F4	15KI461	124734	0		0	
537	Nb8503B x (FN2-9 x 2302)	F4	15KJ461	124736	0		1	
538	Nb8503B x (FN2-9 x 2302)	F4	15KJ461	124737	0		1	
539	L9786B x HM	F3M	15KI469	124739M	0	6	1.5	6.5
540	L9786B x HM	F4	15KI469	124740	1		0	
541	L9786B x HM	F3M	15KI469	124741M	1.5		0	
542	L9786B x HM	F4	15KI469	124742	0		0	
543	L9786B x HM	F3M	15KJ469	124743M	0	6.5	0	6
544	L9786B x HM	F3M	15KJ469	124744M	0		0	
545	L9786B x HM	F3M	15KJ469	124745M	0		1	
546	(Nb8483B x 9256B) x HM	F3M	15KI474	124746M	0		0	
547	(Nb8483B x 9256B) x HM	F4	15KI474	124747	0	8	1	6
548	(Nb8483B x 9256B) x HM	F4	15KJ474	124749	0		1.5	
549	(Nb8483B x 9256B) x HM	F3M	15KJ474	124751M	1		1	
550	(Nb8483B x 9256B) x HM	F3M	15KJ474	124753M	0		1	
551	(Nb8483B x 9256B) x HM	F3M	15KJ474	124754M	0		1	
552	SFF x HM	F6	15KI485	124755	1	6.5	1	6
553	SFF x HM	F5M	15KI485	124756M	1		1	
554	SFF x HM	F5M	15KI485	124757M	1		1.5	
555	SFF x HM	F5M	15KJ485	124758M	0		0	
556	SFF x HM	F5M	15KJ485	124761M	1.5	9	3	7
557	SFF x HM	F5M	15KJ485	124760M	1		1	
558	SFF x HM	F5M	15KJ485	124762M	0		1	
559	PD x WR	F3MS2M	15KJ485	124763M	0		1	
560	PD x WR	F3MS2M	15KI492	124764M	1	9	0	7
561	PD x WR	F3MS2M	15KI492	124766M	0		1	
562	PD x WR	F3MS2M	15KJ492	124767M	1		0	
563	PD x WR	F3MS2M	15KJ492	124768M	0		0	
564	PD x WR	F3MS2M	15KJ492	124769M	0	8	0	7
565	SFF x HM	F4M2	15KI506	124771M	0		1	
566	SFF x HM	F4M2	15KI506	124772M	1		0	
567	SFF x HM	F4M2	15KI506	124773M	0		0	
568	(PD x PI326011) x WR	F3MSM2	15KI509	124775M	0	8	1	7
569	(PD x PI326011) x WR	F3MSM2	15KI509	124776M	1		0	
570	SFF x HM	F1M2SMS2M2SM	15KI511	124777M	1		0	
571	SFF x HM	F1M2SMS2M2SM	15KI511	124778M	1		1	
572	SFF x HM	F1M2SMS2M2S2	15KI511	124780	1.5	7	1	7
573	SFF x HM	F1M2SMS2M2SM	15KJ512	124781M	1		0	
574	(PD x PI326011) x WR	F3M3	15KI521	124786M	1		0	
575	(PD x PI326011) x WR	F3M3	15KI521	124787M	1		1	
576	Nb6526B	F4M5MSMSM	15KI523	124789M	1.5	8	1	7
577	PD x PI326011	F1M2SMS2M2SM	15KI527	124791M	1		0	
578	PD x PI326011	F1M2SMS2M2SM	15KI527	124792	0		1	
579	PD x PI326011	F1M2SMS2M2SM	15KI527	124793	1		1	
580	Nb1391B	F4M3	15KI535	124794M	1.5	7	1.5	7
581	Nb1391B	F4M3	15KI535	124795M	0		0	

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
582	Nb1391B	F4M2S	15KI535	124796	0		0	
583	Nb1391B	F4M3	15KI535	124797M	0		0	
584	Nb8483B x 9256B	F4M2S	15KI537	124798	0	6.5	1	7
585	Nb8483B x 9256B	F4M3	15KI537	124799M	0		1	
586	Nb8483B x 9256B	F4M3	15KI537	124800M	0		1.5	
587	Nb8483B x 9256B	F4M3	15KJ537	124801M	1		1	
588	Nb8483B x 9256B	F4M3	15KJ537	124802M	0	6.5	0	8
589	Nb8483B x 9256B	F4M2S	15KJ537	124803	2		1	
590	Npw2191B	F3M2SM	15KI547	124808M	2		2	
591	Nbh2306B	F6M	15KI652	124812M	1.5		1	
592	Nbh2306B	F6M	15KI652	124813M	1	6.5	1	7
593	Nbh2306B	F7	15KI652	124814	2		1	
594	Nbh2306B	F7	15KJ562	124816	1.5		1.5	
595	Nbh2306B	F7	15KJ562	124817	1.5		0	
596	Nbh2306B	F6M	15KJ562	124818M	2	7	0	9
597	Nb3284B	F5M	15KI568	124823M	1		2	
598	Nb3284B	F6	15KI568	124824	0		1.5	
599	Nb4002B	F3M4SM	15KI573	124830M	1		0	
600	Nb4002B	F3M4S2	15KI573	124831	1	8	1	7
601	Nb6526B	F4M5SMS2MS	15KI589	124836	1		0	
602	Nb6526B	F4M5SMS2MS	15KI589	124837	1		1	
603	Nb6526B	F4M5SMS2M2	15KI589	124838M	1		1	
604	Nb8524B	F3M7	15KI597	124845M	0	9	1	7
605	Nb8524B	F3M6S	15KI597	124846	0		2	
606	Nb8524B	F3M6S	15KJ597	124847	2		3	
607	Nb8524B	F3M7	15KJ597	124848M	2.5	8	1	6
608	Nb4002B	F3M5	15KI604	124851M	1		0	
609	Nb4002B	F3M4S	15KJ604	124853	0		1	
610	Nb4002B	F3M5	15KJ604	124856M	1		0	
611	Ns5154B	F1XMS3M2	15KI605	124857M	1	7	0	5.5
612	Ns5154B	F1XMS3M2	15KI605	124859M	0		1	
613	Ns5154B	F1XMS3M2	15KI605	124860M	0		0	
614	Ns5154B	F1XMS3MS	15KI605	124861	0		0	
615	Ns5154B	F1XMS3M2	15KJ605	124862M	0	7	0	6.5
616	Ns5154B	F1XMS3M2	15KJ605	124863M	1		0	
617	Ns5154B	F1XMS3M2	15KJ605	124864M	1		0	
618	Ns5154B	F1XMS3MS	15KJ605	124865	0		1.5	
619	Nb4001B	F3M5	15KI606	124866M	1	6.5	0	6.5
620	Nb4001B	F3M4S	15KI606	124867	1.5		1	
621	Nb4001B	F3M5	15KI606	124870M	0		1	
622	Nb4001B	F3M4S	15KJ606	124871	1		1	
623	Nb4001B	F3M4S	15KJ606	124873	1.5	6.5	1	6.5
624	Nb6526B	F4M5SSMSM2	15KJ606	124875M	0		1	
625	Nb6526B	F4M5SSMSM2	15KI607	124876M	0		0	
626	Nb6526B	F4M5SSMSM2	15KI607	124877M	1		1	
627	Nb6526B	F4M5SSMSM2	15KI607	124878M	1.5	7	1	6.5
628	Nb6526B	F4M5SSMSM2	15KI607	124879M	3		1	
629	Nb6526B	F4M5SSMSM2	15KI607	124880M	1		0	
630	Nb6526B	F4M5SSMSM2	15KI607	124881M	1.5		0	

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
631	Nb6526B	F4M5SMSM2	15KJ607	124882M	1	6	0	6.5
632	Nb6526B	F4M5SMSMS	15KJ607	124883	0		1	
633	Nb6526B	F4M5SMSMS	15KJ607	124884	2.5		1	
634	Nb6526B	F4M5SMSMS	15KJ607	124885	1.5		1.5	
635	Nb6526B	F4M5SMSM2	15KJ607	124886M	1	7	0	8
636	Homs	M4SMSMS	15KI608	124889	1		2	
637	Homs	M4SMSM2	15KI608	124890M	1		0	
638	Homs	M4SMSMS	15KJ608	124893	1		2.5	
639	Homs	M4SMSMS	15KI609	124894	1	8	2	7
640	Nb4001B	F3M3S	15KI612	124896	1		3	
641	Nb4001B	F3M3S	15KI612	124898	4.5		5	
642	Nb8483B	F3MSM3SMS or F3MS	15KI621	124900	3		4.5	
643	Nb8524B	F3M6S	15KI621	124901	6	7	3	7
644	Nb8524B	F3M6S	15KI623	124902	5		5	
645	Nb8524B	F3M7	15KI623	124903M	5.5		4	
646	Nb8542B	F3M7	15KI625	124907M	0		0	
647	Nb8542B	F3M7	15KI625	124908M	3	9	1	8
648	HM x (Bx6)	F5M2	15KI634	124914M	0		0	
649	HM x (Bx6)	F5M2	15KI634	124915M	0		0	
650	HM x (Bx6)	F5MS	15KI634	124917	0		0	
651	Nb8483 x 9256	F3MS	15KI647	124922	0	8	0	7
652	Nb8483 x 9256	F3MS	15KI647	124923	0		0	
653	Nb8483 x 9256	F3MS	15KI647	124924	0		0	
654	Nb8483 x 9256	F3M2	15KI647	124925M	0		1	
655	HM x (B x 6)	F2MS3M	15KI647	124927M	0	9	1	6
656	HM x (B x 6)	F2MS4	15KI655	124928	0		0	
657	HM x (B x 6)	F2MS3M	15KI655	124929M	0		0	
658	HM x (B x 6)	F2MS3M	15KJ655	124930M	0		0	
659	HM x (B x 6)	F2MS3M	15KJ655	124931M	0	7	0	6
660	HM x (B x 6)	F2MS3M	15KJ655	124932M	1		1	
661	HM x (B x 6)	F2MS3M	15KJ655	124933M	0		0	
• 2015 UCR Multi-isolate GH Test + Misc.								
662	UCR 40 = Br 1252 x 6274 = 3999B	F3MS2	2015 GH Test	125399	0		1	
663	UCR 40 = Br 1252 x 6274 = 3999B	F3MS2	2015 GH Test	125408	0		2	
664	UCR 4 = Br 1252 x 6274 = 3999B	F3MS3	2015 GH Test	125414	0	7	2.5	7
665	4001 = Br 1252 x 6274	F3M4S2	2015 GH Test	125421	2		1	
666	4001 = Br 1252 x 6274	F3M4S2	2015 GH Test	125425	0		0	
667	4001 = Br 1252 x 6274	F3M4S2	2015 GH Test	125433	0		1	
668	4001 = Br 1252 x 6274	F3M4S2	2015 GH Test	125439	0	8	1	7
669	Sem = Br 1252 x 6274	F3MS3	2015 GH Test	125451	0		0	
670	Sem = Br 1252 x 6274	F3MS3	2015 GH Test	125455	0		1	
671	Sem = Br 1252 x 6274	F3MS3	2015 GH Test	125456	0		0	
672	Sem = Br 1252 x 6274	F3MS3	2015 GH Test	125459	0	6.5	2.5	7
673	Sem = Br 1252 x 6274	F3MS3	2015 GH Test	125460	0		1	
674	Sem = Br 1252 x 6274	F3MS3	2015 GH Test	125462	0		0	
675	Sem = Br 1252 x 6274	F3MS3	2015 GH Test	125464	0		1	
676	Sem = Br 1252 x 6274	F3MS3	2015 GH Test	125467	1.5	7	2.5	7

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
677	Sem = Br 1252 x 6274	F3MS3	2015 GH Test	125472	0		1	
678	Sem = Br 1252 x 6274	F3MS3	2015 GH Test	125476	0		0	
679	Sem = Br 1252 x 6274	F3MS3	2015 GH Test	125479	0		0	
680	Sem = Br 1252 x 6274	F3MS3	2015 GH Test	125483	0	8	0	7
681	Sem = Br 1252 x 6274	F3MS3	2015 GH Test	125488	0		1	
682	Sem = Br 1252 x 6274	F3MS3	2015 GH Test	125490	1		0	
683	H1 = Homs 1	M4SMS3	2015 GH Test	125502	1		3.5	
684	H1 = Homs 1	M4SMS3	2015 GH Test	125503	2.5	9	3	6.5
685	H1 = Homs 1	M4SMS3	2015 GH Test	125504	1		2	
686	H2 = Homs 2	XXMXMS2M2S3	2015 GH Test	125505	2		3	
687	H2 = Homs 2	XXMXMS2M2S3	2015 GH Test	125507	2		3	
688	H2 = Homs 2	XXMXMS2M2S3	2015 GH Test	125509	2.5	7	1.5	7
689	H2 = Homs 2	XXMXMS2M2S3	2015 GH Test	125511	1		1.5	
690	H2 = Homs 2	XXMXMS2M2S3	2015 GH Test	125513	1		2	
691	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125516	0		1.5	
692	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125517	0	6.5	0	7
693	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125519	0		0	
694	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125520	0		0	
695	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125524	0		1	
696	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125525	0	5	1	7
697	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125526	0		1	
698	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125527	0		0	
699	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125528	0		0	
700	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125529	0	6.5	0	8
701	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125533	1		1	
702	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125536	0		1	
703	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125541	0		0	
704	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125542	0	6.5	0	6.5
705	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125543	0		0	
706	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125547	0		0	
707	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125548	0		1	
708	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125550	1.5	7	0	8
709	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125552	0		0	
710	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125553	0		0	
711	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125554	0		0	
712	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125556	1	7	0	9
713	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125557	0		0	
714	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125558	1		0	
715	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125559	3		3	
716	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125560	0	6.5	0	5
717	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125561	0		0	
718	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125561	0		0	
719	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125562	0	7	1	6.5
720	H x B = Homs x (Br1252 x 6274)	F5MS2	2015 GH Test	125563	1		0	
721	SFF = Scarlet Fancy x Favorite	F1XMS3MS2	2015 GH Test	125566	0		2.5	
722	SFF = Scarlet Fancy x Favorite	F1XMS3MS2	2015 GH Test	125568	1		0	
723	PD = PD x PI326011	F1M2SMS2MS2	2015 GH Test	125575	4	7	5.5	8
724	Ns5154 x 2289B	F2	52009	123013	6.5		7	
725	9322B x 2577B	F2	52010	123014	5		5	
726	Npw2191B	F3M	0SC 598	90691-94M	1		1	

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
727	Nbh2306B	F6	2306	96368	1	6.5	1	6.5
728	(PD x PI326011) x WR	F3MS2	2SCI267	98296	1		0	
729	(PD x PI326011) x WR	F3MS2	2SCI267	98303	1		1	
730	(PD x PI326011) x WR	F3MS2	2SCI271	98311	3		2.5	
731	(PD x PI326011) x WR	F3MS2	2SCI271	98312	0	8	0	8
732	(PD x PI326011) x WR	F3MS2	2SCI271	98315	1		2	
733	(PD x PI326011) x WR	F3MS2	2SCI271	98318	0		2.5	
734	PD x PI326011	F1M2SMS2M2S2	2SCI312	98363	0		0	
735	PD x PI326011	F1M2SMS2M2S	2SCI320	98366	1.5	8	2	6.5
736	(B x 6) x (PD x PI326011) x (8483B x 9256B)	F2	20147	97394	9		1	
737	(HM x (B x 6)) x ((B x 6) x WR)	F3	2SCI103	98037	0		0	
738	HM x SFF	F3	2SCI192	98206	0		1	
739	(PD x PI326011) x WR	F3MS2	2SCI267	98295	0	6.5	0	6.5
740	(PD x PI326011) x WR	F3MS2	2SCI267	98302	1		1	
741	(PD x PI326011) x WR	F3MS2	2SCI271	98308	1		1	
742	PD x PI326011	F1M2SMS2M2S	2SCI320	98371	1		0	
743	8483B x 9256B	F6	2SCI380	98467	0	7.5	0	6
744	(PD x PI326011) x WR	F5	2SCI397	98486	1.5		1.5	
745	(WR) x (PD x PI326011)	F4	2SCI518	98584	1		0	
746	Nb2155B	F2MSMS5	3901	111424	1.5		2.5	
747	Npw2191B	F3M2S	3917	111452	0	7	1	7
748	(8483B x 9256B) x HM	F2M	2SCJ166	111600	0		2.5	
749	(8483B x 9256B) x HM	F2M	2SCJ167	111602	0		1	
750	NF x HM	F2M	2SCJ180	111614	2.5		3	
751	HM x SFF	F4M	2SCJ252	111620	0	8	0	8
752	SFF x HM	F4M	2SCJ260	111624	0		0	
753	SFF x HM	F4M	2SCJ261	111626	0		0	
754	(PD x PI326011) x WR	F3MSM	2SCJ266	111628	1		1	
755	(PD x PI326011) x WR	F3MSM	2SCJ267	111630	1	7	1.5	7
756	(PD x PI326011) x WR	F3MSM	2SCJ271	111632	1		1	
757	PD x PI326011	F1M2SMS2M2SM	2SCJ312	111634	1		0	
758	PD x PI326011	F1M2SMS2M2SM	2SCJ314	111636	0		1	
759	8483B x 9256B	F4MS2	2SCJ334	111646	2	7	1.5	7
760	HM x (Bx6)	F2MS4	2SCJ367	111668	3.5		1	
761	(PD x PI326011) x WR	F5	2SCJ397	111678	1		1	
762	(PD x PI326011) x WR	F4	2SCJ460	111686	1.5		0	
763	HM x SFF	F3	14SC_154	114087	-	9	0	7
764	(PD x PI326011) x WR	F3M2	2SCJ496	111690	1		1	
765	(PD x PI326011) x WR	F3M2	2SCJ496	111690	0		1	
766	Nb6526B	F4M5MSMS	2SCJ601	111706	1		0	
767	(Bx6 x HM) x (8483B x 9256B)	F2	30098	113048	1.5	8	1	7
768	SFF x (SFF x HM)	F2	30112	113056	0		0	
769	(8483B x 9256B) x (Bx6 x HM)	F2	30125	113062	1		1	
770	SFF x ?	F3	3K169	114081	9		0	
771	SFF x ?	F3	3K169	114082	0	6	0	6
772	WR x PD	F3M2S	3K208	114116	0		0	
773	WR x PD	F3M2S	3K208	114117	1		0	
7741	WR x PD	F3M2S	3K208	114118	0		0	
775	HM x (Bx6)	F2MS4	3K209	114120	0		0	
776	PD x PI326011	F1M2SMS2M2S	3K251	114162	1	7	0	6.5
777	SFF	F2MS6	3K258	114177	0		0	
778	(PD x PI326011) x WR	F3MS	3K287	114193	1.5		1	

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
779	HM	KMXMS2M2SM	3K290	114197	3		1	
780	HM	KMXMS2M2SM	3K290	114199	1	7	1	7
781	HM x (Br 1091)	F1MSMS	3K294	114203	1		2.5	
782	SFF	F2MS3	3K304	114214	1.5		1	
783	SFF	F2MS3	3K304	114215	1.5		1	
784	SFF	F2MS4	3K306	114217	1	8	1.5	7
785	SFF	F2MS4	3K306	114218	1		1	
786	Nb8483B x 9256B	F4MS	3K317	114221	0		0	
787	Nb8483B x 9256B	F4MS	3K317	114222	0		0	
788	Nb8483B x 9256B	F6	3K322	114233	1	7	0	6.5
789	Nb8483B x 9256B	F6	3K321	114225	1		0	
790	Nb8483B x 9256B	F6	3K321	114227	1		0	
791	Nb8483B x 9256B	F6	3K322	114231	0		1	
792	Nb1386B	F4MS	3K374	114242	1.5	7	0	7
793	Nb1386B	F4MS	3K374	114243	0		0	
794	Nb1386B	F4MS	3K374	114245	1		0	
795	Nb1386B	F4MS	3K374	114248	0		0	
796	Nb1391B	F5	3K375	114251	1.5	7	1	7
797	Nb1391B	F5	3K375	114252	0		0	
798	Npw2191B	F3M2S	3K391	114274	1		1.5	
799	Npw2191B	F3M2S	3K391	114277	1		2	
800	Npw2191B	F3M2S	3K391	114279	1.5	6.5	1	7
801	Nbh2306B	F7	3K401	114287	1		1	
802	Nbh2306B	F7	3K401	114290	1.5		3	
803	Nb4002B	F3M4S	3K419	114308	0		0	
804	Nb4002B	F3M4S	3K419	114310	1	6.5	1	7
805	Nb4002B	F3M4S	3K419	114311	1		1	
806	Nb9297B	F3MS	3K453	114362	2.5		1	
807	Nb9297B	F3MS	3K453	114363	0		2	
808	Nb9297B	F3MS	3K453	114364	1	9	1	7
809	Nb9297B	F3MS	3K453	114366	1		1.5	
810	Nb9297B	F3MS	3K453	114367	0		0	
811	Nb8503B x (FN2-9 x 2302)	F3	5K117	114493	1		1	
812	Nb8524B x (FN2-9 x 2302)	F3	5K119	114506	1	6.5	2.5	7
813	(Nb8483B x 9256B) x HM	F3	3K168	114555	0		1	
814	(Nb8483B x 9256B) x HM	F3	3K168	114559	1		0	
815	SFF x HM	F5	3K187	114585	2		3	
816	PD x WR	F3MS2	3K191	114607	1	7	1	7
817	(Nb8483B x 9256) x HM	F3	4187	116418	2		2	
818	HM x (Bx6)	F3	4201	116432	1		2	
819	HM x (Bx6)	F5MS	4201	116438	1		3.5	
820	SFF	F1XMS4	4219	116460	0	7	2.5	6.5
821	(FN2-9 x 2302) x HM	F4	4239	116472	2		1	
822	(8483B x 9256B) x HM	F2MS	4446	116818	3		2	
823	P6139B x 2226B	F x F	4705	117075	5		3.5	
824	(Bx6 x HM) x (8483B x 9256B)	F3	40980	118863	2.5	8	2	7
825	(Bx6 x HM) x (8483B x 9256B)	F3	40980	119428	3		1	
826	Nb8483B x 9256B	F7	J250	119431	2		1	
827	Nb8483B x 9256B	F7	J250	119432	0		0	
828	Nb8483B	F3MSM4S2	J303	119446	1	6.5	3	7
829	L9786B x HM	F4	J356	119456	0		0	
830	L9786B x HM	F4	J356	119457	0		0	

Entry No.	Pedigree	Gen.	Root Source	Seed Source	Plot Scores			
					M. javanica		M. incognita	
831	PD x WR	F3MS3	J391	119465	0	7	0	6.5
832	(Nb8483B x 9256B) x HM	F2MS	J418	119473	1		1	
833	SFF x HM	F4MS	J429	119476	0		1	
834	(PD x PI326011) x WR	F3MSMS	J461	119480	0		1	
835	HM x (Nb8483B x 9256B)	F3M	I124	119495,96	1	7	1	7
836	SFF x ?	F4	I149	119515	1.5		1	
837	WR x PD	F3M2S2	I171	119542	1		1	
838	(PD x PI326011) x WR	F3MS2	I225	119586	1		1	
839	Nb1386B	F4MS2	I263	119615	0	7	0	7
840	HM x (Bx6) x (Snts x EFM)	F4	I347	119680	1		0	
841	HM x (Bx6) x (Snts x EFM)	F4	I347	119681	1		1	
842	(8483B x 9256B) x HM	F4	I363	119695	0		0	
843	PD x WR	F3MS3	I390	119704	0	8	1.5	7
844	SFF	F1XMS2MS4	I441	119731	1		1	
845	(PD x PI326011) x WR	F3MSMS	I461	119744	1		0	
846	(PD x PI326011) x WR	F3MSMS	I461	119745	1		0	
847	(HM x Bx6) x 9359B	F3	40975	118849	3	6.5	1.5	6.5
848	(Bx6 x HM) x (8483B x 9256B)	F3	40979	118860	1		0	
849	HM x (Bx6) x (Snts x EFM)	F4	J347	119452	0		0	
850	HM x SFF	F4	I154	119525	1		1	
851	HM x (Bx6) x (Snts x EFM)	F4	I347	119678	0	9	1	6
852	Nb2160B	F2MSMS4	2160	233-1	3		1.5	
853	Nb6526B	F4M5MSMSM	4484	463-1	0		0	
854	Nb6526B	F4M5SMS2M	3941	349-1	1		1	
855	Npw2191B	F3M2SM	4796	417-1	1	6	0	6.5
856	Npw4458B	F3MSM2	4458	444-1	1		1.5	
· End					End	End	End	End

Table 2. Carrot genotypes used in multi-isolate greenhouse tests and their 2014 and 2016 seed sources (*M. hapla*).

Carrot Genotype	Pedigree	Other		2014 test		2016 test	
		ID		Seed Source		Seed Source	
UCR 40	Br x 6274	3999B		UCR 40		UCR 40*	
UCR 4	Br x 6274	3999B (Mj-1 only)		UCR 4		119355-376*	
4001B	Br x 6274			Nun 110101		119195-200**	
SEM	Br x 6274	8483 x 9256		Sem 274-1		119322*	
F4 (2014)	BR1091 x Homs			68679-9		-	
F5 (2016)	BR1091 x Homs			-		114642-643*	
Homs 1	Homs			87298		119253-258**	
Homs 2	Homs			90818		119274-283**	
H x B	Homs x (BR1252 x 6274)			Nun 111021		119377-382**	
SFF	Scarlet Fancy x Favorite			Bejo 310-1		119333-342*	
WR	Western Red			84158		Not tested	
PD	PD x PI326011			90830		119343-345**	
Imp. 58	Imperator 58	Sus. Check		Commercial		Commercial*	

** Seed derived from resistant roots selected in 2014 *M. hapla* test. *Seed also used in 2015 *M. incognita* test.