Supplementary Materials:

Figure S1: Field design and distribution of four potato cultivars (Seresta, Sarion, Fontane, and Avarna) used in a series of initial population density, *P*i = eggs (g dry soil)$^{-1}$. On the left side of the figure, there exist cultivars with varying host-status to create a density gradient of potato cyst nematodes for the tolerance experiment.

Figure S2: Schematic overview of the 1m^2 grid from which the samples were taken from the estimation of the initial population density, *P*i = eggs (g dry soil)$^{-1}$.

Figure S3: Relationship between the *P*i, eggs (g dry soil)$^{-1}$ and Chlorophyl content index of four potato cultivars according to Seinhorst yield model Eq. 1 (A. Avarna; B. Fontane; C. Sarion; D. Serresta) E. Relative chlorophyll content index of all the cultivars combined.

Figure S4: Relationship between the *P*i, eggs (g dry soil)$^{-1}$ and NDRE index of four potato cultivars according to Seinhorst yield model Eq. 1 (A. Avarna; B. Fontane; C. Sarion; D. Serresta) E. Relative NDRE index of all the cultivars combined.

Table S1: Climate information during the cropping season of potato production: Date (YYYYMMDD); Mean temperature (Mean T) in 0.1 degrees Celsius (^{o}C); Maximum temperature (Max T) in 0.1 degrees Celsius (oC);); Minimum temperature (Mean T) in 0.1 degrees Celsius (oC);); Mean relative atmospheric humidity (Mean RAH) in %; Maximum relative atmospheric humidity (Max RAH) in %; Min relative atmospheric humidity (Min RAH) in %. The data is obtained from the website (https://www.knmi.nl/home) of The Royal Netherlands Meteorological Institute (KNMI). The data was recorded from KNMI weather station in Hoogeveen.

Table S2: Comparison of different methods of nematode detection. (Citation numberings are corresponded to those written in the manuscript).

Figure S1: Field design and distribution of four potato cultivars (Seresta, Sarion, Fontane, and Avarna) used in a series of initial population density, *P*i = eggs (g dry soil)$^{-1}$. On the left side of the figure, there exist cultivars with varying host-status to create a density gradient of potato cyst nematodes for the tolerance experiment.

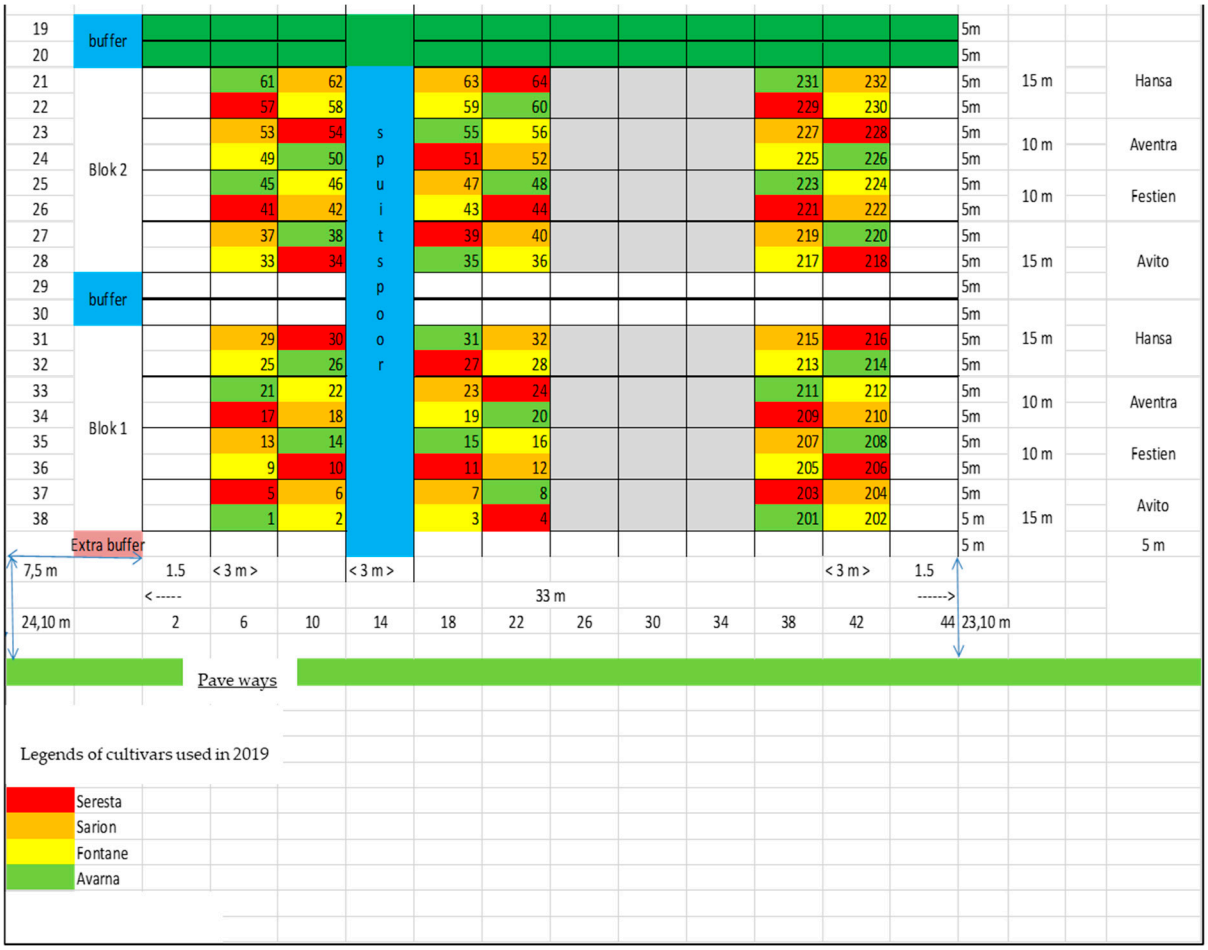


Figure S2: Schematic overview of the $1m^2$ grid from which the samples were taken from the estimation of the initial population density, *P*i = eggs (g dry soil)$^{-1}$.

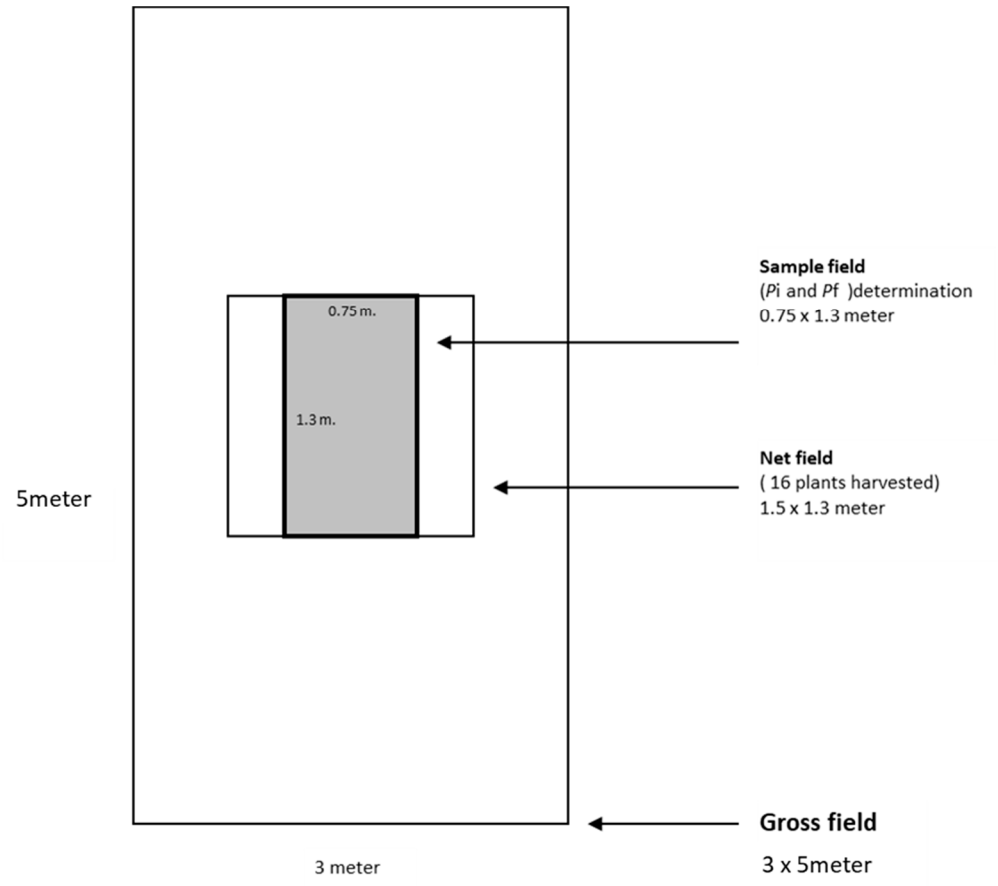
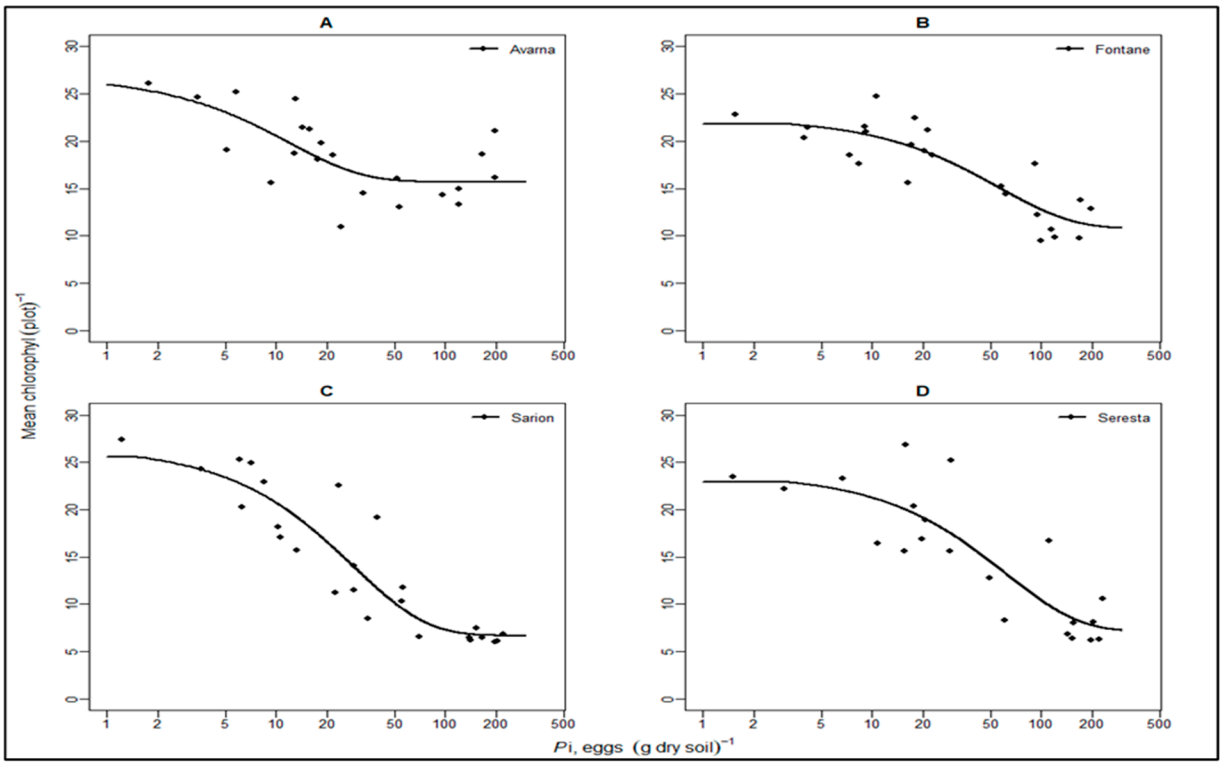


Figure S3: Relationship between the *P*i, eggs (g dry soil)$^{-1}$ and Chlorophyl content index of four potato cultivars according to Seinhorst yield model Eq. 1 (A. Avarna; B. Fontane; C. Sarion; D. Serresta) E. Relative chlorophyll content index of all the cultivars combined.


A
Avarna
B
Fontane
C
Sarion
D
Seresta
Mean chlorophyll (plot)$^{-1}$
P_i, eggs (g dry soil)$^{-1}$

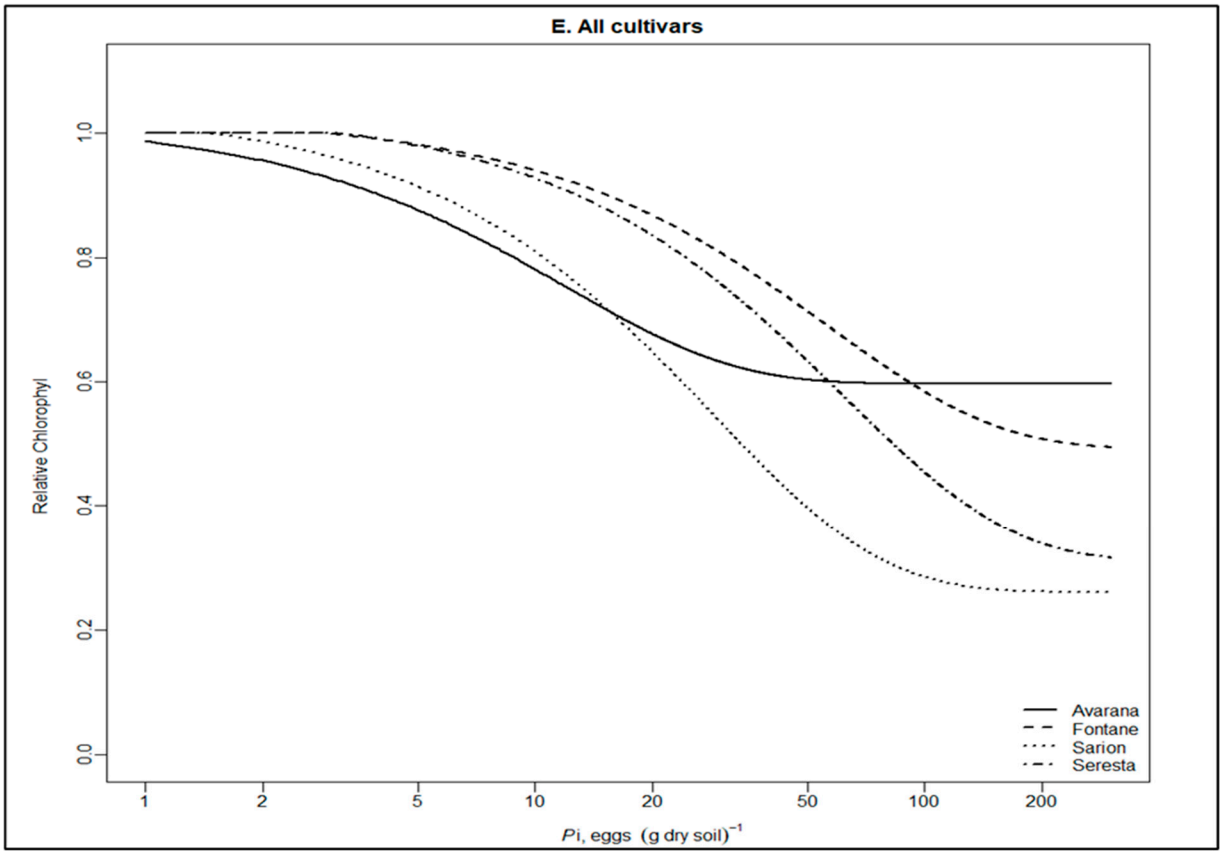
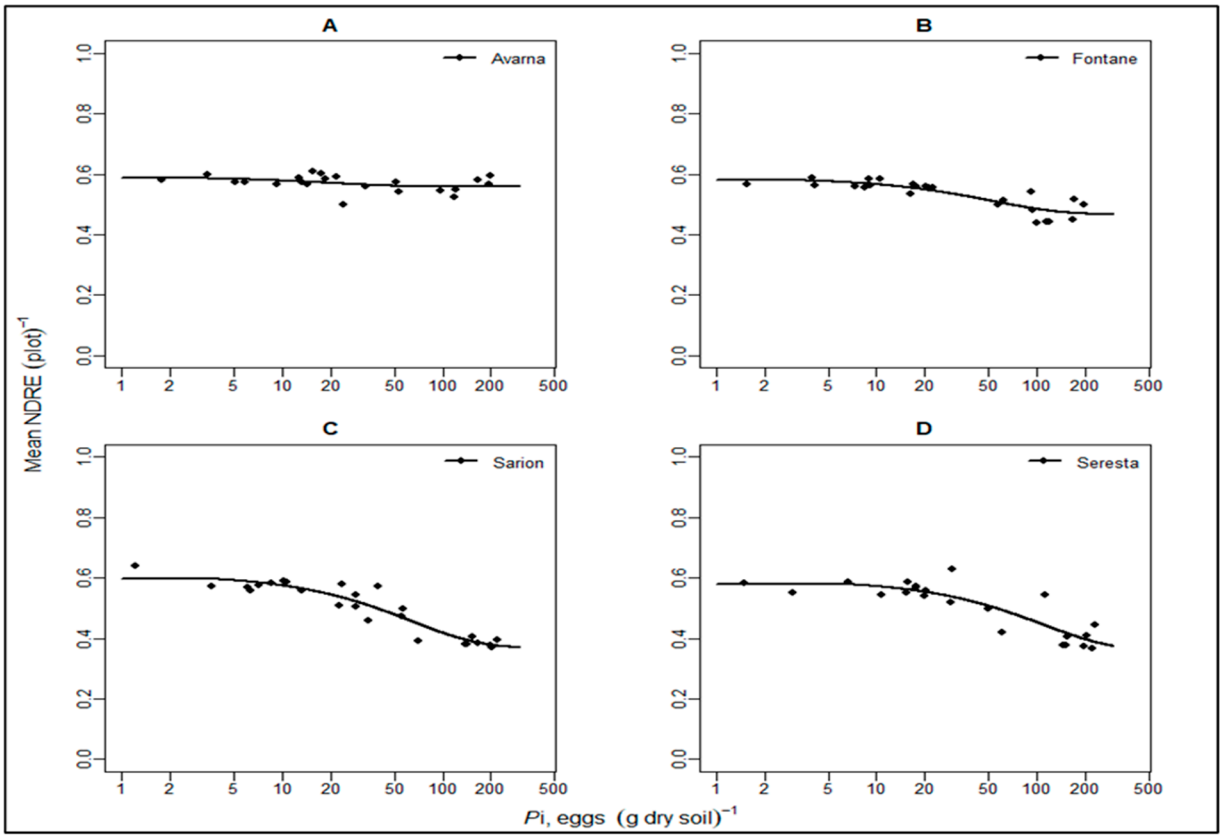

E. All cultivars
Relative Chlorophyl
Avarana
Fontane
Sarion
Seresta
P_i, eggs (g dry soil)$^{-1}$

Figure S4: Relationship between the *Pi*, eggs (g dry soil)$^{-1}$ and NDRE index of four potato cultivars according to Seinhorst yield model Eq. 1 (A. Avarna; B. Fontane; C. Sarion; D. Serresta) E. Relative NDRE index of all the cultivars combined.



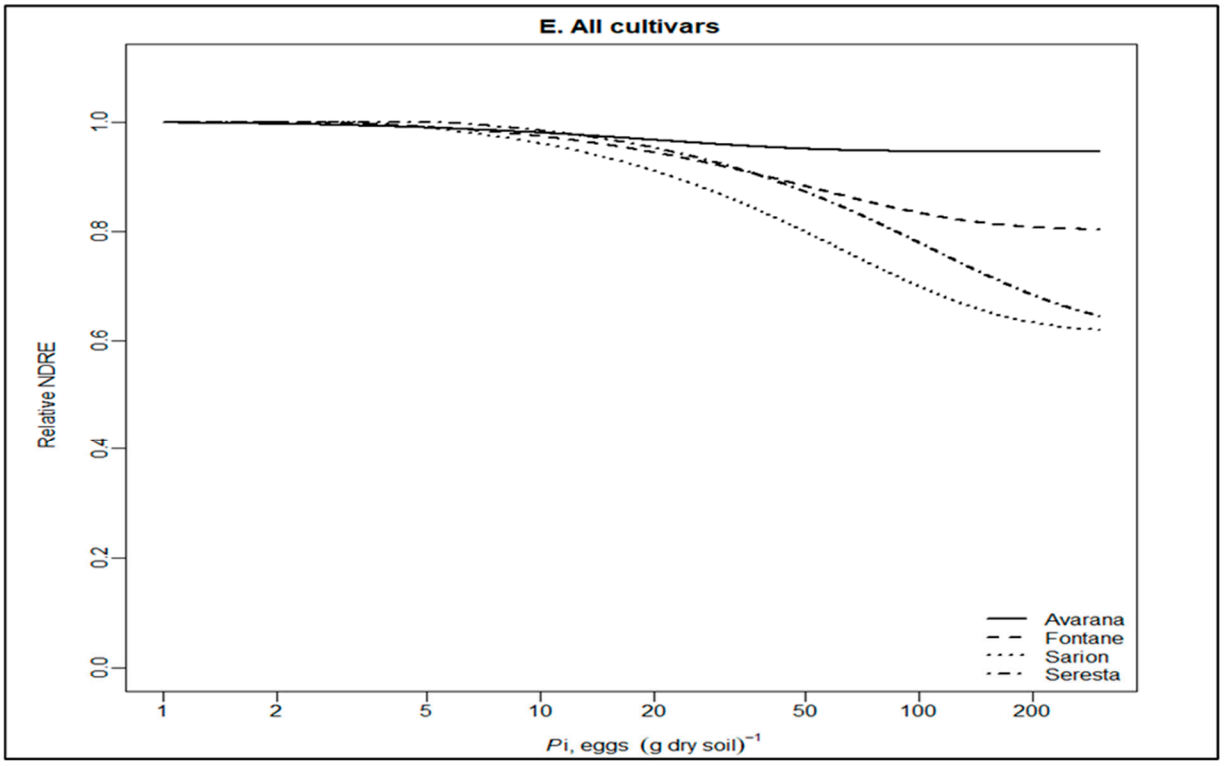


Table S1: Climate information during the cropping season of potato production: Date (YYYYMMDD); Mean temperature (Mean T) in 0.1 degrees Celsius (°C); Maximum temperature (Max T) in 0.1 degrees Celsius (°C); Minimum temperature (Mean T) in 0.1 degrees Celsius (°C); Mean relative atmospheric humidity (Mean RAH) in %; Maximum relative atmospheric humidity (Max RAH) in %; Min relative atmospheric humidity (Min RAH) in %. The data is obtained from the website (https://www.knmi.nl/home) of The Royal Netherlands Meteorological Institute (KNMI). The data was recorded from KNMI weather station in Hoogeveen.

Date	Mean T	Max T	Min T	Mean RAH	Max RAH	Min RAH
20190519	164	249	91	78	98	38
20190520	145	196	112	91	98	78
20190521	133	164	114	89	98	78
20190522	128	184	69	73	96	41
20190523	144	226	49	63	98	38
20190524	147	226	67	66	94	35
20190525	125	181	85	75	92	55
20190526	158	211	85	77	97	58
20190527	141	184	100	72	96	46
20190528	109	157	31	73	94	53
20190529	126	189	24	61	98	37
20190530	164	206	126	77	91	63
20190531	178	234	107	73	97	51
20190601	179	249	107	72	94	42
20190602	227	300	127	58	94	33
20190603	172	214	111	73	92	59
20190604	193	248	118	68	92	39
20190605	192	236	158	77	96	55
20190606	144	192	84	84	98	61
20190607	161	234	77	70	98	46
20190608	140	168	120	70	84	58
20190609	151	208	88	69	87	42
20190610	178	232	123	77	98	56
20190611	155	199	108	86	100	60
20190612	149	184	101	84	96	71
20190613	149	203	111	73	93	47
20190614	181	242	105	72	94	47
20190615	162	201	100	89	99	64
20190616	163	215	93	82	100	60
20190617	192	260	100	71	100	45
20190618	207	275	122	71	98	41
20190619	195	257	132	79	98	55
20190620	174	217	129	82	98	61

20190621	153	208	81	77	97	57
20190622	158	220	71	74	98	54
20190623	212	287	119	61	93	39
20190624	247	316	180	55	68	37
20190625	271	349	184	57	86	36
20190626	200	242	142	77	95	58
20190627	157	206	119	71	82	58
20190628	171	237	109	70	96	46
20190629	218	321	93	60	98	23
20190630	207	267	114	67	96	48
20190701	178	233	121	70	93	48
20190702	161	221	87	65	98	42
20190703	137	205	69	67	100	38
20190704	160	228	46	68	98	49
20190705	175	223	106	69	97	49
20190706	151	213	98	81	98	66
20190707	138	176	92	67	87	46
20190708	131	178	92	76	94	54
20190709	143	209	66	67	98	39
20190710	136	197	63	77	99	38
20190711	167	214	123	90	98	73
20190712	171	228	113	87	100	63
20190713	164	213	136	79	98	60
20190714	145	176	123	80	98	66
20190715	150	199	122	76	92	55
20190716	150	168	134	83	89	78
20190717	173	245	115	75	98	43
20190718	191	262	105	72	98	42
20190719	197	254	137	68	100	35
20190720	191	243	156	79	96	58
20190721	176	223	109	76	98	50
20190722	194	266	112	77	98	58
20190723	235	323	123	65	100	29
20190724	275	368	180	56	91	22
20190725	292	390	166	53	99	22
20190726	284	356	203	42	70	15
20190727	256	325	194	46	73	26
20190728	226	308	165	67	89	29
20190729	211	268	152	67	94	41
20190730	215	307	116	65	98	28
20190731	176	235	140	81	96	56
20190801	170	223	124	86	98	66
20190802	175	228	138	88	98	66
20190803	171	213	122	82	98	59
20190804	178	244	96	78	100	51

20190805	197	253	157	76	93	54
20190806	184	235	134	77	98	51
20190807	180	230	133	77	97	52
20190808	179	242	100	74	100	47
20190809	176	217	89	90	100	70
20190810	202	237	168	66	92	44
20190811	183	234	142	65	81	44
20190812	162	216	127	81	98	55
20190813	140	193	104	85	98	54
20190814	153	215	77	76	98	44
20190815	169	206	139	88	98	72
20190816	176	218	122	74	96	57
20190817	172	204	149	92	98	82
20190818	162	195	127	89	97	74
20190819	161	210	121	77	94	55
20190820	150	215	88	80	98	55
20190821	149	223	65	77	100	48
20190822	162	250	71	73	100	42
20190823	175	260	77	72	99	39
20190824	206	296	128	64	95	28
20190825	215	311	112	65	95	26
20190826	237	319	138	66	98	36
20190827	248	337	164	63	96	28
20190828	226	301	153	74	98	42
20190829	192	248	109	80	100	54
20190830	167	248	86	74	100	34
20190831	197	296	88	71	100	29
20190901	155	207	101	79	97	52
20190902	144	201	94	74	97	47
20190903	161	201	120	79	93	65
20190904	150	193	107	87	97	68
20190905	128	167	75	83	96	67
20190906	133	180	73	76	97	55
20190907	130	179	88	91	100	75
20190908	129	189	79	86	98	51
20190909	114	184	45	83	100	56
20190910	117	183	47	85	100	61
20190911	138	161	80	94	98	79
20190912	182	225	153	80	98	56
20190913	154	200	63	78	98	50
20190914	119	195	47	80	99	46
20190915	143	209	62	83	97	68
20190916	126	166	86	90	98	72
20190917	119	164	77	79	94	50
20190918	102	164	50	83	97	58

20190919	97	172	35	78	100	47
20190920	103	179	24	84	100	58
20190921	141	224	60	68	99	40
20190922	177	255	92	67	93	41
20190923	159	201	124	91	98	72
20190924	149	194	103	87	98	68
20190925	151	182	131	89	98	72
20190926	155	173	127	95	98	88
20190927	151	184	131	86	97	73
20190928	147	183	127	88	97	67
20190929	143	160	125	96	98	91
20190930	134	164	111	86	96	66
20191001	134	181	97	94	98	78
20191002	102	138	72	84	97	60
20191003	107	156	67	88	97	69
20191004	90	97	61	95	98	89
20191005	86	136	32	87	100	67
20191006	85	102	59	83	90	74
20191007	87	127	21	85	96	69
20191008	129	159	109	91	98	77
20191009	106	137	84	92	96	79
20191010	115	148	86	85	97	70
20191011	139	160	121	89	96	80
20191012	118	158	109	96	98	83
20191013	157	207	110	91	98	81
20191014	139	159	118	92	98	86
20191015	146	180	124	92	98	78
20191016	132	156	111	94	98	79
20191017	133	155	118	92	98	77
20191018	120	157	97	86	97	76
20191019	108	134	88	91	98	83
20191020	103	121	63	97	100	92
20191021	124	167	105	89	100	79
20191022	118	144	81	94	100	85
20191023	104	151	43	94	100	80
20191024	139	181	103	88	98	77
20191025	134	155	111	84	96	74
20191026	160	187	126	76	95	65
20191027	93	126	64	82	96	66
20191028	70	130	27	87	98	62
20191029	48	111	3	88	100	66
20191030	31	90	-8	87	98	66

Table S2: Comparison of different methods of nematode detection. (Citation numberings are corresponded to those written in the manuscript).

	Method	Type	Time-consumption	Advantages	Disadvantages	References
Existing methods	Soil Sampling	Classic	Slow (Days to weeks)	Accuracy Standardized	Only a small area can be sampled; It requires knowledge of nematode sytematics; Expensive (Labor, Microscope)	[34,35]
	Plant/root Sampling	Classic	Slow	Relatively Inexpensive	Only few plants can be sampled; It requires knowledge of nematode systematics	[12]
	Virtual Inspection for morphological characteristic	Classic	Quick	Inexpensive Quick	Inaccurate; Subjective; Complex to operate and requires specialized technicians; Advanced training and experience required:	[34]
	Biochemical and PCR-based methods	Last decades	It varies depending on the methods	Sensitivity Accuracy is getting better	Expensive (Reagent, qPCR equipment, labor) Need to be trained for interpretation	[22]
Precision Agriculture	Sensing technology (UAV/Satellite)	New	Relatively fast	Relatively fast; Whole field can be scanned ; Dynamic monitoring	It requires professional expertise. Processing images takes time to generate a map	[22]