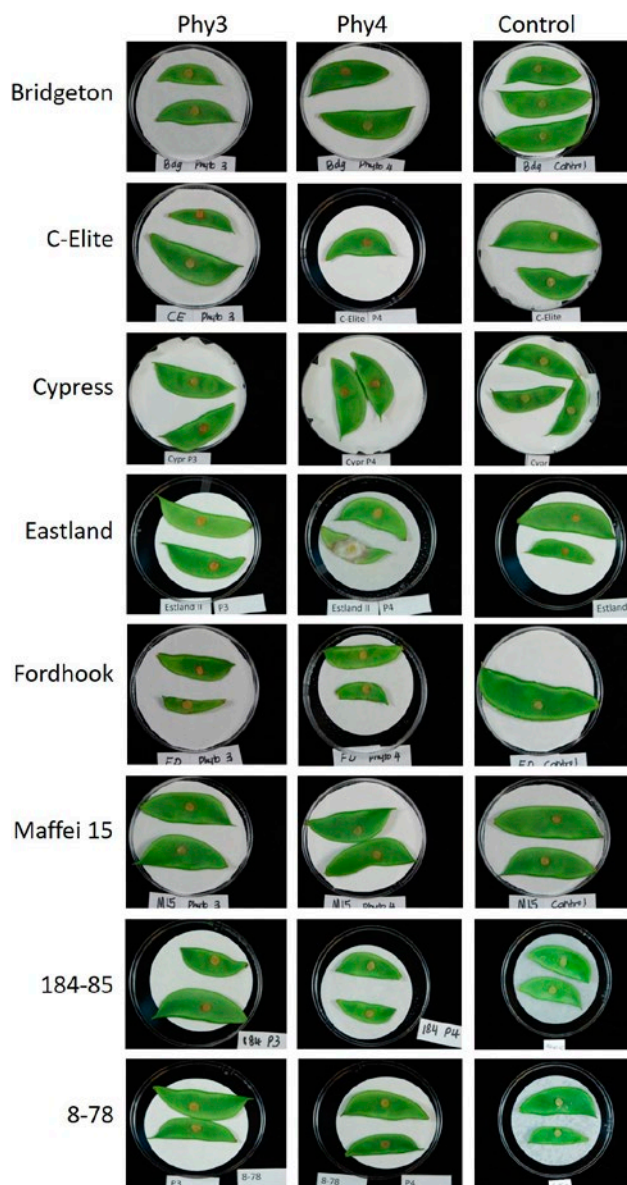


**Supplementary Figure S1.** *Phytophthora capsici* isolates were inoculated onto pods of the plant introduction line, PI477041, which had previously shown reduced symptoms in greenhouse tests. Of the 64 *P. capsici* isolates, two had reduced sporulation and produced browning (top panels), two had reduced sporulation (middle panels), and did not sporulate (lower left panel). The inoculated control showed neither signs nor symptoms (lower right panel). This experiment was repeated once, with similar results.



**Supplementary Figure S2.** *Phytophthium* isolates 3 and 4 were inoculated onto different cultivars of lima bean. The only combination that resulted in sporulation was between isolate 4 and the cultivar 'Eastland'. The experiment was repeated once with similar results.

**Supplementary Table 1.** Summary of characteristics from 64 *Phytophthora capsici* field isolates collected in 2014, 2015, and 2016 field seasons.

Year	PhyC Isolate	MT <sup>a</sup>	MS <sup>b</sup>	Source	Location	Field ID <sup>c</sup> Number
2014	33	A2	IS/IS/IS	Watermelon	Bridgeville, DE	1
	34	A2	S'/IS/IS	Watermelon	Georgetown, DE	2
	35	A2	S/S/S	Watermelon	Georgetown, DE	2
	36	A2	S/IS/S	Watermelon	Georgetown, DE	2
	37	A2	S/S/S	Pepper	Laurel, DE	3
	38	A1	I/I/I	Lima bean	Caroline Co., MD	4
	39	A1	I/I/I	Lima bean	Caroline Co., MD	4
	40	A1	IS/IS/IS	Lima bean	Federalsburg, MD	5
	41	A1	IS/IS/IS	Lima bean	Federalsburg, MD	5
	42	A1	IS/IS/IS	Lima bean	Federalsburg, MD	5
	43	A2	IS/IS/IS	Watermelon	Seaford, DE	6
	44	A2	I/I/I	Watermelon	Seaford, DE	6
	45	A2	IS/IS/IS	Lima bean	Georgetown, DE	7
	46	A2	IS/I/IS	Lima bean	Georgetown, DE	7
	47	A2	S/S/S	Watermelon	Bridgeville, DE	1
	48	A2	S/S/S	Watermelon	Bridgeville, DE	1
	49	A1	IS/IS/IS	Watermelon	Harrington, DE	8
	50	A2	S/S/S	Watermelon	Harrington, DE	8
	51	A2	IS/IS/IS	Lima bean	Preston, MD	9
	52	A2	S/S/S	Watermelon	Harrington, DE	8
53	A2	S/S/S	Watermelon	Harrington, DE	8	
55	A2	IS/IS/I	Lima bean	Galena, MD	10	
2015	61	A2	IS/IS/IS	Pepper	Selbyville, DE	11
	62	A2	S/IS/S	Pepper	Selbyville, DE	11
	63	A1	S/IS'/S	Pumpkin	Bridgeville, DE	12
	64	A1	I/I/I	Muskmelon	Bridgeville, DE	13
	65	A2	S/S/S	Pumpkin	Churchville, MD	14
	66	A2	S/S/S	Lima bean	Milton, DE	15
	67	A2	S/S/S	Lima bean	Milton, DE	15
	68	A2	S/S/S	Lima bean	Milton, DE	15
	69	A2	S/S/S	Lima bean	Milton, DE	15
	70	A2	S/S/S	Lima bean	Milton, DE	15
	71	A2	S/S/S	Lima bean	Milton, DE	15
	72	A2	S/S/S	Lima bean	Milton, DE	15
	73	A2	S/S/S	Lima bean	Milton, DE	15
	74	A2	S/S/S	Lima bean	Milton, DE	15
	75	A2	S/S/S	Lima bean	Milton, DE	15
	76	A2	S/S/S	Pepper	Waldorf, MD	16
2016	77	A2	S'/IS/IS	Pickling cucumber	Bridgeville, DE	17
	78	A1	S/S/S	Pickling cucumber	Bridgeville, DE	17
	79	A2	IS/IS/IS	Pickling cucumber	Bridgeville, DE	17
	80	A2	S/S/S	Pickling cucumber	Bridgeville, DE	17
	81	A1	S/S/S	Pickling cucumber	Bridgeville, DE	17
	82	A2	S/S/S	Pickling cucumber	Bridgeville, DE	17
	83	A2	S/S/S	Pickling cucumber	Bridgeville, DE	17
	84	A1	S/S/S	Pickling cucumber	Bridgeville, DE	17
	85	A1	S/S/S	Pickling cucumber	Bridgeville, DE	17

(Continued)

**Supplementary Table 1.** (Continued).

Year	PhyC Isolate	MT <sup>a</sup>	MS <sup>b</sup>	Source	Location	Field ID <sup>c</sup> Number
	86	A1	IS/IS/IS	Pickling cucumber	Bridgeville, DE	17
	87	A1	IS/S/IS	Pickling cucumber	Bridgeville, DE	17
	88	A1	S/IS/IS	Pickling cucumber	Bridgeville, DE	17
	89	A1	S/S/S	Watermelon	Bridgeville, DE	18
	90	A2	IS/IS/IS	Watermelon	Bridgeville, DE	18
	91	A2	IS/IS/IS	Watermelon	Bridgeville, DE	18
	92	A1	IS/IS/IS	Lima bean	Bridgeville, DE	17
	93	A2	IS/IS/IS	Lima bean	Bridgeville, DE	17
	94	A2	IS/IS/IS	Lima bean	Bridgeville, DE	17
	95	A1	S*/IS/IS	Lima bean	Bridgeville, DE	17
	96	A1	S/S/S	Lima bean	Bridgeville, DE	17
	97	A2	IS/IS/IS	Lima bean	Bridgeville, DE	17
	98	A1	IS*/S/S	Lima bean	Bridgeville, DE	17
	99	A1	S/S/S	Lima bean	Bridgeville, DE	17
	100	A2	S/S/S	Pumpkin	Bridgeville, DE	12
	101	A2	S/S/S	Pumpkin	Bridgeville, DE	12
	102	A1	IS/IS/IS	Pumpkin	Bridgeville, DE	12

<sup>a</sup> MT = Mating Type.

<sup>b</sup> Reaction to mefenoxam of the three single zoospore cultures (SZC) tested per field isolate: S-Sensitive, IS- Intermediately sensitive, I-insensitive.

<sup>c</sup> The field ID number is the number assigned to each grower field sampled, where *P. capsici* was positively identified. Some fields, such as 12, were sampled across two years, and other fields, such as 8, 12, 17 and 18, are highlighted in green to denote both mating types were identified in these grower fields.

\*Statistically significant at  $\alpha=0.05$  using Student's t test.

**Supplementary Table S2.** Reaction of three single zoospore cultures (SZC) isolated from each of 21 *Phytophthora capsici* field isolates to technical grade mefenoxam and Ridomil Gold SL.

Field isolate-PhyC	Reaction to mefenoxam <sup>a</sup>	
	Technical grade	Ridomil Gold SL
33 <sup>b</sup>	I/I/I	IS/IS/IS
34 <sup>b</sup>	S/S/S	S/IS/IS
35	S/S/S	S/S/S
36 <sup>c</sup>	S/S/S	S/IS/S
37	S/S/S	S/S/S
38	I/I/I	I/I/I
39	I/I/I	I/I/I
40	IS/IS/IS	IS/IS/IS
41	IS/IS/IS	IS/IS/IS
42	IS/IS/IS	IS/IS/IS
43 <sup>b</sup>	I/I/I	IS/IS/IS
44 <sup>c</sup>	I/IS/I	I/I/I
45	IS/IS/IS	IS/IS/IS
46 <sup>c</sup>	IS/IS/IS	IS/I/IS
47	S/S/S	S/S/S
48	S/S/S	S/S/S
49 <sup>c</sup>	IS/I/IS	IS/IS/IS
51	IS/IS/IS	IS/IS/IS
52	S/S/S	S/S/S
53	S/S/S	S/S/S
55 <sup>c</sup>	IS/I/I	IS/IS/I

<sup>a</sup> Mefenoxam sensitivity of the three single zoospore isolates tested per field isolate. S- Sensitive IS- Intermediately sensitive I- Insensitive.

<sup>b</sup> isolates show an obviously different reaction between technical grade and Ridomil Gold SL.

<sup>c</sup> isolates show a slightly different reaction between technical grade and Ridomil Gold SL (i.e. one individual differs).

<sup>\*</sup>Statistically significant at  $\alpha=0.05$  using Student's t test.

**Supplementary Table 3.** Reaction of *Phytophthora capsici* isolates collected in 2014, 2015, and 2016 field seasons to mefenoxam (Ridomil Gold SL), and mefenoxam sensitivity predicted by the SSR markers PCSSR 19 and PCN3/PCN7.

Isolate	Reaction to mefenoxam <sup>a</sup>	PCSSR19 <sup>b</sup>	PCN3	Source	Location <sup>c</sup>	Mating type
33	IS	I	I	Watermelon	DE	A2
34	S-IS	S	S	Watermelon	DE	A2
35	S	S	S	Watermelon	DE	A2
36	S-IS	S	S	Watermelon	DE	A2
37	S	S	S	Pepper	DE	A2
38	I	S	I	Lima bean	MD	A1
39	I	S	I	Lima bean	MD	A1
40	IS	I	S	Lima bean	MD	A1
41	IS	I	S	Lima bean	MD	A1
42	IS	I	S	Lima bean	MD	A1
43	IS	S	I	Watermelon	DE	A2
44	I	S	I	watermelon	DE	A2
45	IS	I	I	Lima bean	DE	A2
46	IS-I	I	I	Lima bean	DE	A2
47	S	S	I	Watermelon	DE	A2
48	S	S	I	Watermelon	DE	A2
49	IS	I	I	Watermelon	DE	A1
50	S	S	S	Watermelon	DE	A2
51	IS	S	I	Lima bean	MD	A2
52	S	S	I	Watermelon	DE	A2
53	S	S	I	Watermelon	DE	A2
55	IS-I	I	I	Lima bean	MD	A2
61	IS	I	S	Pepper	DE	A2
62	S-IS	I	S	Pepper	DE	A2
63	S-IS	I	I	Pumpkin	DE	A1
64	I	I	I	Muskmelon	DE	A1
65	S	S	S	Pumpkin	DE	A2
66	S	S	S	Lima bean	DE	A2
67	S	S	S	Lima bean	DE	A2
68	S	S	S	Lima bean	DE	A2
69	S	S	S	Lima bean	DE	A2
70	S	S	S	Lima bean	DE	A2
71	S	S	S	Lima bean	DE	A2
72	S	S	S	Lima bean	DE	A2
73	S	S	S	Lima bean	DE	A2
74	S	S	S	Lima bean	DE	A2
75	S	S	S	Lima bean	DE	A2
76	S	S	I	Pepper	MD	A2
77	S-IS	S	S	Pickling cucumber	DE	A2
78	S	S	S	Pickling cucumber	DE	A1
79	IS	S	S	Pickling cucumber	DE	A2
80	S	S	S	Pickling cucumber	DE	A2
81	S	S	S	Pickling cucumber	DE	A1
82	S	S	S	Pickling cucumber	DE	A2
83	S	S	I	Pickling cucumber	DE	A2
84	S	S	S	Pickling cucumber	DE	A1
85	S	S	I	Pickling cucumber	DE	A1

(Continued)

**Supplementary Table 3.** (Continued).

Isolate	Reaction to mefenoxam <sup>a</sup>	PCSSR19 <sup>b</sup>	PCN3	Source	Location <sup>c</sup>	Mating type
86	IS	S	I	Pickling cucumber	DE	A1
87	S-IS	S	I	Pickling cucumber	DE	A1
88	S-IS	I	S	Pickling cucumber	DE	A1
89	S	S	S	Watermelon	DE	A1
90	IS	I	I	Watermelon	DE	A2
91	IS	I	I	Watermelon	DE	A2
92	IS	I	S	Lima bean	DE	A1
93	IS			Lima bean	DE	A2
94	IS	I	I	Lima bean	DE	A2
95	S-IS	I	S	Lima bean	DE	A1
96	S	S	S	Lima bean	DE	A1
97	IS	S	I	Lima bean	DE	A2
98	S-IS	I	S	Lima bean	DE	A1
99	S	S	S	Lima bean	DE	A1
100	S	I	I	Pumpkin	DE	A2
101	S	I	I	Pumpkin	DE	A2
102	IS	I	I	Pumpkin	DE	A1

<sup>a</sup> Reaction of the field isolates to mefenoxam based on three single zoospore cultures (SZC) tested per field isolate: S – sensitive, S-IS- sensitive to intermediately sensitive, IS- Intermediately sensitive, IS-I- intermediately sensitive to insensitive, I- insensitive

<sup>b</sup> marker phenotype S- sensitive I- Insensitive.

highlighted in yellow- instances where PCN3 predicts the correct reaction to mefenoxam

highlighted in green- instances where PCSSR19 predicts the correct reaction to mefenoxam

highlighted in blue- instances where the phenotype contradicts the genotype.

<sup>c</sup> DE- Delaware, MD- Maryland.

**Supplementary Table 4.** Details of micro-organism species recovered from water sources in Delaware, USA, based on 37 representative isolates tested. Numbers of isolates of each species, identification method, pathogenicity on lima bean and other hosts, and relevant references are presented.

Species	Number of isolates	Identification method <sup>a</sup>	Pathogenicity	Reference
<i>Phytophthora irrigata</i>	14	ITS and COX1 gene sequencing, PCR-SSCP	Not a known pathogen of lima bean. Can be pathogenic to azaleas and some vegetables such as tomato, pepper, and eggplant.	Hong <i>et al.</i> 2008, Plant Dis. 92: 1201–1207
<i>Phytophthora drechsleri</i> III	9	PCR-SSCP	Not a known pathogen of lima bean. can infect Bigonia, pepper, and Azalea	Hong <i>et al.</i> 2008, Plant Dis. 92: 1201–1207
<i>Phytophthora hydropathica</i>	8	PCR-SSCP	Not a known lima bean pathogen. Can infect <i>Rhododendron catawbiense</i> , <i>Kalmia latifolia</i> , cucumber, azaleas, dusty miller, tomato, and pepper	Hong <i>et al.</i> 2008, Plant Dis. 92: 1201–1207
<i>Pythium/Phytophythium</i> like species	3	PCR-SSCP	Not pathogenic on lima bean	Based on the results of this research
Maternal parent of <i>P. x stagnum</i>	2	ITS and COX1 gene sequencing	Not known	
<i>Phaeoconiella chlamydospora</i>	1	PCR-SSCP	not pathogenic on lima bean. Can be pathogenic on grapevine	Díaz and Latorre.2014. Plant Dis. 98: 351–360

<sup>a</sup>Single stranded confirmation polymorphism