PEA (*Pisum sativum* 'Serge')
Pythium root rot; *Pythium sp*.

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Efficacy of seed treatments in reducing seed and root rot of peas in the presence of metalaxyl-resistant *Pythium*, 2007.

Five organic seed treatments (Biolink Surfactant, molasses, molasses + CalCM, Humax, Humax + zinc sulfate), and eighteen commercial seed treatments (see table), were evaluated in a commercial pea field (sandy loam soil) in Paterson, WA to manage seed and root rot of processed peas. The soil from the field site had a mean of 89 total colonies and 27 metalaxyl-resistant colonies of *Pythium* per gram of soil. Plots were planted on 23 April using a six-row belt planter. Treatments were replicated four times in plots arranged in a randomized complete block design. Each plot was 6.1 meters long with a row spacing of 28 cm, seed spacing of 2.5 cm, and seeding depth of 5 cm. The plots were fertilized with a per hectare rate of 0.44, 50.24 and 0.91 liters of Thios 12-0-0-26, CN-9 and 2.5% liquid boron on 12 Mar, 26 May and 02 Jun, respectively. AgriSolutions Basagran herbicide was applied at 2.35 liters/ha and Nufarm Chiptox MCPA Sodium Salt Herbicide was applied at 2.24 kg/ha on 23 May. Plots were irrigated using an overhead-center pivot irrigation system following standard commercial practices for pea production in the state of Washington. Emergence was assessed on 07 May and plant height, root disease severity, dry plant weight and dry root weight were taken on 13 Jun. Fresh pea yield was assessed on 3 Jul when tenderometer (tenderness measured by a TU-12, FMC, Sterling, VA) readings approximated 109. Whole plants were removed from the middle 1.5 m mid-section of the four center rows of each plot and plants were passed through a customized de-viner to remove peas from the pods. The general linear model (PROC GLM) in SAS (SAS Institute Inc., Cary, NC) was used to analyze the disease and plant parameters that were measured. Mean pair-wise comparisons among treatments were made using Fisher's Least Significant Difference Test ($P \leq 0.05$).

Plant emergence of seed treated with the organic seed treatments was not significantly greater than that of the non-treated control (NTC), however, 17 of 18 commercial seed treatments significantly increased emergence above that of the NTC with Captan + Allegiance at the high rate (44.4 ml/45.4 kg seed) having the highest emergence rate. Plant height of 17 of 18 commercial seed treatments was significantly greater than the NTC with Captan + Allegiance at the high rate having the greatest mean height of all the treatments. Plant height was not significantly different between the NTC and any of the organic seed treatments. Root disease severity was significantly greater than the NTC for 13 of 18 commercial seed treatments and there were no seed treatments with mean root disease severity values significantly less than the NTC. The foliar dry weight of 4 of 5 of the organic seed treatments was significantly greater than the NTC with Humax + zinc sulfate having the greatest weight, and 6 of 18 commercial seed treatments were significantly less than the NTC. The dry root weight of seed treated with Sil-Matrix, Aliete, molasses, and the Biolink Surfactant were significantly greater than the NTC and there were no treatments with dry root weights significantly less than the NTC. Yields of seed treated with Captan + Allegiance at the high rate and Captan + Sil-Matrix were significantly greater than the NTC and the yield of seed treated with the Biolink surfactant and molasses were significantly less than the NTC. Tenderometer readings for Tachigaren, Captan + Tachigaren, and Magnum were significantly greater than the NTC, and tenderometer readings for Sil-Matrix, Captan + Allegiance at the low rate (22.2 ml/45.4 kg seed), Ranman, Biolink Surfactant, Humax, and Humax + zinc sulfate were significantly less than the NTC. Captan + Allegiance at the high rate appears to be the most effective treatment of those tested for use in commercial pea production based on yield and plant height and Allegiance (containing metalaxyl) was still effective as a seed treatment even in the presence of metalaxyl-resistant *Pythium*. None of the organic seed treatments tested significantly improved yield above that of the NTC and would not be recommended for organic production.

Treatment and rate per 45.4 kg seed[z]	Emer-gence[y]	Plant ht. (cm)[x]	Root disease severity[w]	Foliar dry wt. (g)	Root dry wt. (g)	Yield (g)[v]	Tender-ometer[u]
Non-treated control……	158 g	50.9 j	3.0 i-l	4.2 de	0.11 b-d	2.72 c-g	107 d-i
Captan + Allegiance (73.9 + 44.4 ml)...	347 a	61.1 a	3.2 e-i	3.3 hi	0.12 bc	3.63 a	106 e-i
Captan + Allegiance (73.9 + 22.2 ml)…	337 ab	60.8 a	2.8 l	3.5 f-i	0.11 cd	2.95 a-f	96 hi
Captan + Allegiance (73.9 + 44.4 ml) + Magnum (35.5 ml)……...	343 a	59.1 ab	2.9 j-l	3.2 hi	0.09 d	2.90 b-f	104 f-i
Captan + Aliete (73.9 ml + 85.0 g)……	324 a-c	57.6 b-e	3.3 b-e	3.7 e-i	0.11 bc	3.12 a-d	108 c-i
Captan + Magnum (73.9 ml + 35.5 ml).	324 a-c	58.9 ab	3.1 g-j	3.7 e-h	0.11 b-d	2.75 b-g	111 b-i
Captan + Phostrol (73.9 + 7.1 ml)……..	332 ab	58.1 b-d	3.3 b-e	3.7 e-h	0.12 bc	2.93 a-f	113 a-h
Captan + Ranman (73.9 + 0.57 ml)…….	335 ab	58.8 ab	3.4 b-d	3.6 e-i	0.12 bc	3.28 a-c	120 a-f
Captan + Sil-Matrix (73.9 + 7.4 ml)…..	304 bc	58.9 ab	3.2 d-h	3.4 g-i	0.11 b-d	3.43 ab	110 b-i
Captan + Tachigaren (73.9 + 316 g)…..	327 ab	55.1 f-h	3.4 a-c	3.1 i	0.11 b-d	2.85 b-f	117 a-g
Captan + Thiram (73.9 + 89 ml)……	321 a-c	58.3 bc	3.3 b-f	3.7 e-i	0.12 a-c	3.05 a-e	126 a-c
Aliete (85.0 g)……	263 de	55.8 d-g	3.6 a	4.1 d-f	0.14 a	2.33 f-h	124 a-e
Captan (73.9 ml)……...	319 a-c	56.1 c-g	3.0 h-l	3.5 f-i	0.11 b-d	3.23 a-c	107 c-i
Magnum (35.5 ml)……...	236 ef	54.1 g-i	3.5 ab	4.2 de	0.12 a-c	3.07 a-d	129 ab
Phostrol (7.1 ml)……...	218 f	56.8 b-f	3.2 d-g	4.0 d-g	0.12 bc	2.35 e-h	110 b-i
Ranman (0.57 ml)……	221 f	57.4 b-f	3.2 d-h	4.4 d	0.11 bc	3.22 a-d	93 i
Sil-Matrix (7.4 ml)……...	162 g	52.7 h-j	3.4 a-c	5.0 bc	0.14 a	2.82 b-g	100 g-i
Tachigaren (316 g)……...	304 bc	55.9 c-g	3.6 a	3.7 e-h	0.12 bc	2.70 c-g	132 a
42-S Thiram (89 ml)……	288 cd	55.4 e-f	3.1 f-i	3.6 e-i	0.11 bc	3.00 a-f	125 a-d
Biolink Surfactant (370 ml)……...	117 h	51.9 ij	2.8 kl	5.3 b	0.14 a	1.75 hi	93 i
CalCM + Molasses (756 g + 38 g)……	146 gh	52.4 ij	3.0 g-k	4.6 cd	0.11 b-d	1.60 i	107 d-i
Humax (93 ml)……...	156 g	52.4 ij	3.3 c-f	5.0 bc	0.12 a-c	2.33 f-h	93 i
Humax + zinc sulfate (93 ml + 11 g)…….	113 h	50.4 j	3.0 g-k	5.9 a	0.13 ab	2.52 d-g	92 i
Molasses (38 g)……...	145 gh	52.7 h-j	3.1 f-i	5.3 b	0.14 a	2.12 g-i	105 f-i
LSD[t]	*37.0*	2.47	0.19	*0.60*	*0.019*	*0.701*	*19.0*

[z] Complete product name if not complete in the table : Captan 400, Allegiance FL, Aliete 80 WDG, Ranman 400 SC, Thiram 42-S.

[y] Emergence = mean number of plants out of 400 seed planted in the center two rows of each plot that emerged 33 days after planting. Numbers followed by a different letter represent statistical differences at $P = 0.05$ using a Fisher's LSD test.

[x] Plant height, root disease severity, foliar dry weight and root dry weight were obtained by measuring sixteen plants per replicated plot of each treatment that were taken from four locations (four plants per location) from the center two rows of each plot at the bloom stage.

[w] Root disease severity = The root disease severity was based on a 0 to 5 scale, with zero indicating no root infection and 5 being 81 to 100% infected root area.

[v] Yield was taken from the center 1.5 m of the four middle rows in each plot.

[u] Tenderometer (tenderness measured by a TU-12 tenderometer, Sterling, VA)

[t] LSD = Fisher's least significant difference