

PEA (*Pisum sativum* ‘Bistro’ and ‘Boogie’)
Damping-off and root rot; *Pythium* spp.
Rhizoctonia spp.

A.C. Alcalá¹, L.D. Porter², M.L. Derie¹, B.J. Holmes¹,
G. Coffman², E.W. Gatch¹, and L.J. du Toit¹; ¹Washington
State University Mount Vernon NWREC, Mount Vernon,
WA, 98273; ²USDA-ARS, Prosser, WA 99350.

Evaluation of seed and drench treatments for controlling damping-off in organic pea crops in the semi-arid Columbia Basin of Oregon and Washington, 2011.

Thirteen and twelve seed and drench treatments were evaluated for potential control of damping-off in a certified organic pea processing crops near Boardman, OR and Soap Lake, WA, respectively. The cultivars were the same as planted in the surrounding commercial pea crops, ‘Bistro’ in Boardman and ‘Boogie’ in Soap Lake. Treatments included biological and non-biological products. Primed pea seed was also evaluated: for the Boardman trial, seed was soaked in water on a rotary shaker (150 rpm) for 16 hr followed by 8 hr of air-drying in a fume hood; for the Soap Lake trial, a similar protocol was used but drying was extended to 12 hr. The rate used for each treatment was the highest on the product label. Each seed treatment was applied either as a slurry 3 to 4 d prior to planting, or as a dry powder 1 d before planting. Drenches were applied immediately after planting. Plots planted with non-treated seeds and plots drenched with water after planting non-treated seeds served as the two controls. The applications of Stimplex, Soilgard 12G, and the water drench (control) were repeated 14 d after planting (dap). The Boardman trial was planted on 28 Mar and the Soap Lake trial on 5 Apr. A six-row belt planter was used to plant 690 seeds/plot (110 ft²/plot) at a depth of 1.5 to 2 in. with rows 11 in. apart. Treatments were arranged in a randomized complete block design at each site, with four replications at Boardman and five at Soap Lake. The plants at each site were maintained by the grower-cooperator, following accepted fertilization, center-pivot irrigation, and weed management practices. Stand counts were taken 14 dap and weekly thereafter until 35 dap. Five seedlings from three replicate plots of each treatment were sampled randomly 35 dap to isolate for root rot pathogens onto agar media. Root rot ratings (0 to 5 scale, where 0 = no visible symptoms, and 5 = dead plant), plant height, and shoot dry weight evaluations were done on 16 plants randomly sampled/plot at full bloom. The Boardman trial was harvested on 28 Jun, and the Soap Lake trial on 5 Jul. Plants from the center 3.28 ft of the four middle rows/plot were harvested manually and passed through a customized thresher to remove peas from the pods. Total pea weight and tenderometer readings were taken/plot. Data were analyzed using PROC GLM in SAS, and treatment means compared using Fisher’s protected least significant difference (LSD, $P = 0.05$). Yields were adjusted based on tenderometer readings. If needed, transformation (square root) was used to satisfy assumptions for parametric analyses, or Friedman’s non-parametric rank test was used if assumptions were not met.

Emergence (stand) at Boardman trial average 32% across all plots 35 dap. Root rot was observed on most plants sampled (avg rating = 1.57), and *Rhizoctonia* and *Pythium* were isolated from symptomatic roots. Pea plants had severe competition from regrowth of an overwintering triticale cover crop that preceded the pea crop. In contrast, there was 81% average emergence at the Soap Lake trial that had been in commercial farming for only two years (native sage brush in preceding years). Plants sampled from that trial showed almost no root rot (avg rating = 0.30) with very few weeds. At the Boardman trial, Nordox seed treatment and priming pea seed significantly increased emergence 21, 28, and 35 dap compared to both controls. In addition, plots planted with primed seeds had significantly greater pea yields than either of the control plots, and Nordox seed treatment increased yield significantly compared to the drench control plots. The other treatments did not have significant effects on any of the parameters measured (emergence, root rot, plant height, shoot dry weight, tenderometer readings, and yield), and Nordox and primed seed treatments had no significant effect on root rot or plant height. Under the very low disease pressure conditions at the Soap Lake trial, none of the treatments significantly increased emergence compared to the control plots planted with non-treated seed; however, the drench treatments and water drench control plots had significantly reduced stand counts compared to nine other treatments at 21 dap, demonstrating the potential negative effect of increased soil moisture on pea emergence as a result of drench applications. Acadian, HeadsUp, Mycoseed Treat, Natural II, and Nordox plots had significantly greater emergence than the water drench control plots at 35 dap. Nordox and Mycostop seed treatments significantly increased plant height compared to the water drench control plots. Nordox seed treatment significantly increased non-adjusted pea yield compared to that of both control treatments. Plots with HeadsUp, Mycoseed Treat and primed seed treatments produced significantly greater non-adjusted pea yields than yields in drench control plots. The adjusted yield was not affected significantly by any of the treatments compared to adjusted yields of the two control plots. Among the seed and drench treatments evaluated, Nordox and primed seed showed the greatest potential efficacy for managing damping-off in organic pea crops in central Washington.

Treatment and rate	Boardman trial				Soap Lake trial				
	Seedling emergence ^z		Yield (lb/A)	Adjusted yield (lb/A) ^y	Seedling emergence ^z		Plant height (in.)	Yield (lb/A)	Adjusted yield (lb/A) ^y
	21 dap	35 dap			21 dap	35 dap			
Seed treatments									
Acadian Marine Plant Extract 8 oz/100 lb seeds..	54 cd ^x	67 bc	4,231 bc	5,884 b-d	155 ab	192 a-c	24.7 a-c	9,521 b-d	11,728
Actinovate STP 4 oz/100 lb seeds.....	48 cd	54 c	2,711 c	3,626 a	149 ab	183 b-f	23.4 cd	8,387 d	11,415
Heads Up Plant Protectant 0.01 oz/100 lb seeds.....	51 cd	61 bc	3,717 c	4,839 cd	161 a	198 a	24.7 a-c	11,352 ab	15,402
Myco Seed Treat 4 oz/100 lb seeds.....	55 cd	69 bc	3,837 c	5,318 b-d	160 a	192 a-c	24.1 b-d	10,760 a-c	12,870
Mycostop Mix 8 oz/100 lb seeds.....	53 cd	66 bc	4,146 bc	6,744 b-d	150 ab	186 a-f	25.6 ab	7,888 d	9,617
Natural II proprietary rate.....	58 cd	73 bc	4,324 bc	5,651 b-d	147 ab	193 a-c	23.4 cd	9,951 a-d	9,819
Nordox 75 WG 0.23 oz/100 lb seeds.....	92 b	107 a	6,159 ab	10,131 ab	163 a	198 ab	25.7 a	11,681 a	12,580
Primed seeds.....	117 a	130 a	7,603 a	13,168 a	136 b	170 f	23.5 cd	10,624 a-c	13,424
T-22 HC 2 oz/100 lb seeds.....	50 cd	54 c	3,380 c	2,617 d	153 ab	188 a-d	24.7 a-c	9,777 a-d	9,926
CO₂ backpack sprayer treatment^w									
Prestop WP 34.8 oz/A.....	68 c	83bc	4,408 bc	5,861 b-d	-	-	-	-	-
Drench treatments^v									
Serenade soil 192 fl oz/A	52 cd	61 bc	3,227 c	3,751 cd	83 c	177 e-f	23.6 cd	9,390 b-d	13,176
Soilgard 12G 8 lb/A.....	54 cd	65 bc	4,160 bc	6,013 b-d	86 c	178 c-f	22.8 d	9,108 cd	10,149
Stimplex 48 fl oz/A.....	61 c	76 bc	4,367 bc	5,526 b-d	99 c	185 b-f	24.0 b-d	8,799 cd	12,496
Control treatments									
Non-treated seeds.....	58 cd	70 bc	4,442 bc	7,530 a-c	152 ab	189 a-e	24.2 a-d	9,292 b-d	12,340
Non-treated seeds + water drench 3.5 gal/110 ft ²	41 d	55 c	3,603 c	4,157 cd	99 c	176 d-f	23.4 cd	8,123 d	9,746
LSD.....	20	24	2,023	Square root	22	Rank	1.6	2,094	NS

^z Seedling emergence = the total number of plants that emerged out of the 230 seeds planted in the center two rows of each plot.

^y Adjusted yield was calculated based on a tenderometer correction factor of 105 tenderometer reading following the method described by Anderson and White (1974) for green pea yields ranging between 81 and 120 tenderometer reading.

^x Means followed by the same letter are not significantly different based on Fisher's protected LSD. For transformed data, original means are shown but means separation letters are based on square root (for adjusted yield in the Boardman trial) and rank (for emergence 35 dap in the Soap Lake trial) transformations. Dependent variables with no significant effects in the ANOVA are not shown, except for adjusted yield at the Soap Lake trial. NS = no significant differences among treatments based on Fisher's protected LSD.

^w Application rate at 30 psi in 429 gpa. Prestop WP was not applied in the Soap Lake trial because of very windy conditions at the time of planting that prevented application by backpack sprayer.

^v For drench treatments, each product was applied with 3.5 gal water/plot (110 ft²) at planting and again 14 dap.