ONION (*Allium cepa*)
Onion stunting; *Rhizoctonia* spp.

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Efficacy of fungicides to manage onion stunting caused by *Rhizoctonia* spp. in the Columbia Basin of Oregon and Washington, 2011-2012.

Onion stunting, caused by *Rhizoctonia* spp., has become a significant soilborne problem of onion bulb crops planted in sandy soils in the semi-arid Columbia Basin of Oregon and Washington following winter cereal cover crops. Research on the epidemiology and management of this disease is in progress. Cover crops such as winter wheat are essential to protect onion seedlings from wind- and sand-blasting in the spring. Pre-plant, banded, incorporated fungicide sprays were evaluated in commercial onion bulb crops grown in rotation with winter cereal cover crops in sandy soils in the Columbia Basin, to manage onion stunting caused by *Rhizoctonia* spp. Standard agronomic practices for the region were used by each grower-cooperator, and each field was irrigated by center pivot. Each experiment was set up as a randomized complete block design with six replications/treatment, unless stated otherwise. In 2011, the efficacy of each of two rates (9.5 and 19.0 fl oz/acre) of Quadris (azoxystrobin) application was compared with non-treated control plots in a field near Paterson, WA. The fungicide was applied in a 6 in. wide band over the bed, and incorporated 4 in. into the soil with a rototiller a day prior to planting onion seed of the cultivar Mercury. In 2012, two trials were completed. In one of the 2012 trials, Quadris (19.0 fl oz/acre) and Fontelis (penthiopyrad, 24.0 fl oz/acre) were applied in the same manner as in the 2011 trial, and compared with non-treated control plots in a field near Paterson, WA. Each plot was 12 beds wide (each bed 44 in. wide and planted with four rows of seed of the onion cv. Mercury) and the length of the entire field (approximately 0.5 miles). In the second 2012 trial, a pre-plant, banded, incorporated application of each of Quadris (12.0 fl oz/acre), Quadris (12.0 fl oz/acre) + Rhizoburst (1,280 fl oz/acre, 10-34-0 + 0-0-19 + humic acid), and ReZist (1,280 fl oz/acre, Cu 1.75%, Mn 1.75%, and Zn 1.75%, with polyamines and natural plant extracts) was compared with non-treated control plots in a field near Boardman, OR with four replicate plots/treatment. Each treatment was sprayed on the top of the bed and incorporated 4 to 5 in. into the soil with a rototiller a day prior to onion seeding. In this trial, the number of beds/plot ranged from 8 to 12, each bed was 40 in. wide with two double-rows of onion seed of the cv. Tamara, and the length of each plot was the radius of the field (approximately 0.25 miles). For each experiment, the number of patches of stunted onion plants, area of stunted patches, and rating of severity of stunting in the patches were recorded. In 2011, ratings were taken at the five true-leaf stage; and in 2012, ratings were done at the five and seven true-leaf stages. Severity of onion stunting was rated on a 1-3 scale, where: 1 = a majority of the plants in the patch were stunted < 33%, 2 = most plants were stunted 33 to 66%, and 3 = most plants were stunted > 66% compared to adjacent healthy plants. Plot size was standardized in the 2012 trials because of variation in plot sizes. Analyses of variance were computed for each experiment using Proc GLM in SAS (Version 9.2; SAS Institute, Cary, NC) and treatment means were compared using Fisher's protected least significant difference (LSD).

In the 2011 trial in Paterson, WA, plots treated with either rate of Quadris (9.5 or 19.0 fl oz/acre) had a significant reduction in the number of patches of stunted plants, patched area, average severity of stunting, and patch severity index compared to the non-treated control plots (Table 1). Plots treated with Quadris at 9.5 and 19.0 fl oz/acre had 51 and 57% fewer patches, 60 and 68% smaller cumulative patched area, 19 and 23% less severe stunting, and 76 and 81% reduced patch severity index, respectively, compared to non-treated control plots. There was no significant difference in disease ratings between the two rates of Quadris application (Table 1). In the 2012 trial in Paterson, WA, plots treated with Quadris had significantly fewer stunted patches (24%), less stunted area (33%), less severe stunting (18%), and reduced patch severity index (44%) compared to non-treated control plots on 5 Jun (Table 2). In contrast, plots treated with Fontelis did not exhibit a significant reduction in incidence or severity ratings compared to control plots. At the second rating on 19 Jun, similar reductions in the number of patches and patch area were observed in plots treated with Quadris, whereas Fontelis was ineffective at reducing onion stunting. In the 2012 trial in Boardman, OR, Quadris applied alone or in combination with Rhizoburst effectively reduced the number of stunted patches, cumulative patch area, severity of stunted patches, and stunting index by 23 May and 6 Jun (Table 3). There was no significant difference in onion stunting parameters measured in plots treated with Quadris alone compared to Quadris + Rhizoburst. On 23 May, plots treated with Quadris had 52% fewer patches, 82% less patched area, 40% less severe stunting, and 84% reduced patch severity index compared to the non-treated control plots. Plots treated with ReZist did not differ significantly from the non-treated control plots in the first and second disease ratings. Based on these large-scale, grower-cooperator field experiments in the Columbia Basin, a pre-plant, banded and incorporated application of Quadris may effectively reduce onion stunting in terms of incidence of stunted patches, cumulative area of stunted patches, severity of stunting, and patch severity index.

Table 1.

Fungicide treatment and rate/A	Number of patches	Cumulative patch area (ft^2/plot)	Stunting severity (0 - 3 scale)	Patch severity index (area x severity)
Non-treated……	35 a*	949 a	1.89 a	1,990 a
Quadris 9.5 fl oz …..…….....	17 b	382 b	1.53 b	487 b
Quadris 19.0 fl oz …..…….....	15 b	303 b	1.46 b	379 b
LSD…….....	6	199	0.30	651

Table 2.

Fungicide treatment and rate/A	No. of patches/acre	Cumulative patch area (ft^2/acre)	Stunted patch area (% of plot)	Stunting severity (0 - 3 scale)	Patch severity index (area x severity)
		5 Jun 2012			
Non-treated control……..	73 a*	1,023 a	2.3 a	1.7 a	1,864 a
Fontelis 24.0 fl oz.....	62 a	904 ab	2.1 ab	1.6 ab	1,542 a
Quadris 19.0 fl oz ……	55 b$^{(P = 0.078)}$	688 b	1.6 b	1.4 b	1,039 b
LSD……..	20	266	0.6	0.2	458
		19 Jun 2012			
Non-treated control……..	41 ab	538 a	1.2 a	1.7 a	988 a
Fontelis 24.0 fl oz …….....	48 a	525 a	1.2 a	1.6 a	887 a
Quadris 19.0 oz ……	30 b	370 b	0.9 b	1.6 a	630 a
LSD……..	13	154	0.4	0.4	413

Table 3.

Fungicide treatment and rate/A	No. of patches/acre	Cumulative patch area (ft^2/acre)	Stunted patch area (% of plot)	Stunting severity (0 - 3 scale)	Patch severity index (area x severity)
		23 May 2012			
Non-treated control……..	64 a*	1,244 a	2.9 a	2.0 a	2,566 a
Quadris 12.0 fl oz ….....	31 b	222 b	0.7 b	1.2 b	398 b
Quadris 12.0 fl oz + Rhizoburst 1,280 fl oz.....	22 b	292 b	0.5 b	1.3 b	366 b
Rezist 1,280 floz.....	76 a	1,282 a	2.9 a	2.0 a	2,937 a
LSD……..	16	338	0.7	0.3	815
		6 Jun 2012			
Non-treated control……..	90 a	1,654 a	3.8 a	2.0 a	3,655 a
Quadris 12.0 fl oz ….....	24 b	199 b	0.5 b	1.2 b	251 b
Quadris 12.0 fl oz + Rhizoburst 1,280 fl oz …..	17 b	155 b	0.4 b	1.3 b	217 b
Rezist 1,280 fl oz.....	96 a	1,858 a	4.3 a	2.0 a	3,957 a
LSD……..	18	746	1.7	0.3	1,784

* For each table and each date that disease was evaluated, numbers within a column followed by the same letter are not significantly different based on Fisher's protected least significant difference (LSD) at $P = 0.05$ or at the probability level indicated in superscript parentheses.