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

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Effect of timing of glyphosate application to a winter wheat cover crop on stunting of spring-sown onions caused by *Rhizoctonia* spp. in the Columbia Basin of Washington, 2012.

The development of patches of stunted onion plants caused by *Rhizoctonia* spp. is an emerging problem in onion bulb crops planted in the semi-arid Columbia Basin of Oregon and Washington following winter cereal cover crops. Cereals such as winter wheat are used as cover crops to protect onion seedlings from wind- and sand-blasting on the very sandy soils typical of this region. A herbicide is applied to kill the cover crop, usually prior to onion seeding in spring, so that the cover crop does not compete with the onion crop. The roots of the dying cover crop are readily colonized by *Rhizoctonia* spp., resulting in rapid buildup of inoculum, which then colonizes the onion seedlings, resulting in patches of stunted onion plants. It was anticipated that spraying herbicide on the cover crop at a sufficient interval prior to onion seeding might reduce colonization of onion roots by *Rhizoctonia* spp. and, therefore, reduce the severity of stunting of onion seedlings. Therefore, the effect on development of stunting in onion crops of three pre-plant application intervals for glyphosate to a winter wheat cover crop was evaluated in a grower-cooperator field near Paterson, WA. The winter wheat cv. Stephens was planted in strips as a cover crop on 10 Oct 2011. Spring 2012 treatments consisted of a pre-plant application of GlyStar Plus (glyphosate) at 48 fl oz/A to the cover crop 3, 17, and 27 days before onion seeding on 20 Apr 2012. The experiment was set up as a randomized complete block design with each treatment replicated six times. Each plot was 12 beds wide (each bed 22 in. wide with four rows of onion plants). Plot length ranged from 0.5 miles across the diameter of the center-pivot irrigated field. Recommended agronomic practices were followed by the grower-cooperator. Onion stunting was rated at the five and seven true-leaf growth stages (18 Jun and 3 Jul, respectively) for the eight center beds/plot to avoid effects of herbicide drift between adjacent plots. The number of patches in each plot was counted, and the length and width of each patch was measured as an estimate of patch size. Severity of onion stunting in each patch was rated on a 1-3 scale, where: 1 = a majority of plants in the patch were stunted by < 33%, 2 = a majority of the plants were 33-66% stunted, and 3 = a majority of the plants were stunted > 66% compared to adjacent, healthy plants outside the patch. Results were standardized to accommodate variation in plot size across the center-pivot field. Analyses of variance were calculated 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).

At the five true-leaf growth stage on 18 Jun, the plots in which the winter wheat cover crop was sprayed with herbicide 3 days prior to onion seeding had more patches, greater cumulative patched area, more severe stunting, and a greater patch severity index than plots in which herbicide was applied 17 or 27 days prior to onion seeding. In comparison to plots in which herbicide was applied 3 days prior to planting, application of herbicide to the cover crop 17 and 27 days before onion planting reduced the number of stunted patches by 32 and 55%, respectively; cumulative patched area and percentage of cumulative patched area by 46 and 54%, respectively; severity of stunting by 11 and 15%, respectively; and patch severity index by 53 and 59%, respectively. Overall, there were no significant differences in patch parameters between the 17 and 27 day herbicide treatments, except the number of patches/acre was significantly lower in plots sprayed with herbicide 27 days prior to planting compared to 17 days. By the seven true-leaf stage of onion growth on 3 Jul, the number of stunted patches was reduced by 22 and 70% in plots sprayed 17 and 27 days before planting onion seed, respectively, compared to plots sprayed 3 days prior to planting; however, the number of patches did not differ significantly between plots treated with herbicide 3 vs. 17 days prior to planting onion seed. Similarly, the cumulative area of patches in the onion crop was reduced 31 and 70% in plots sprayed with herbicide 17 and 27 days prior to planting, respectively, compared to 3 days prior to planting; and the percentage of plot area with stunted patches was reduced 31 and 70%, respectively, although only the 27 day herbicide treatment caused a significant reduction in comparison to the 3 day treatment. Average severity of stunting and the patch severity index were decreased significantly by applying herbicide to the cover crop either 17 or 27 days prior to planting onion seed: the former by 19 and 20%, respectively, and the latter by 40 and 74%, respectively, compared to applying herbicide 3 days prior to onion seeding. As the onion crop grew, the severity of stunting became less evident, and fewer patches were observed. Results from both disease rating dates revealed an inverse relationship between the timing of herbicide application to the cover crop and the incidence and severity of onion stunting. Therefore, a longer duration between herbicide application to a cereal cover crop and planting onion seed is advised to mitigate the effect of the cereal crop residues on *Rhizoctonia* spp. that cause stunting in onion bulb crops in the Columbia Basin of Oregon and Washington.

Herbicide application (days prior to planting onion seed)	No. of patches/ acre	Cumulative patch area (ft^2/acre)	Stunted patch area (% of plot)	Stunting severity (0 - 3)	Patch severity index/acre*
		18 Jun 2012			
3……..	56 a**	935 a	2.15 a	1.58 a	1,661 a
17…….	38 b	504 b	1.16 b	1.41 b	775 b
27…….	25 c	429 b	0.99 b	1.34 b	686 b
LSD……..	10	141	0.32	0.08	316
		3 Jul 2012			
3…….……....	23 a	545 a	1.26 a	1.59 a	886 a
17…….	18 a	377 a	0.87 a	1.29 b	529 b
27…….	7 b	164 b	0.38 b	1.27 b	227 b
LSD……..	8	200	0.46	0.21	307

* Patch severity index = (severity rating) x (area of the patch), summed for all patches in a plot.

** For each rating date, numbers in a column with the same letter are not significantly different based on Fisher's protected least significant difference (LSD) at $P = 0.05$.