

Confirmation of glyphosate resistant Russian-thistle in Washington State

John Spring and Drew Lyon

Field studies were conducted at the WSU Lind Dryland Research Station near Lind, WA, and at the WSU/ARS Palouse Conservation Field Station near Pullman, WA to quantify the magnitude of glyphosate resistance in a suspected resistant population of Russian-thistle collected in Columbia County, Washington.

Seeds of the suspected resistant population were collected from plants that had survived an application of glyphosate in a chemical fallow field in 2015. Seed from a population of Russian-thistle known to be susceptible to glyphosate were collected at a separate site in Washington in 2014. Seed of both types were started in a greenhouse in June 2016, and transplanted to field plots at 2 weeks after emergence. At 3 weeks after transplanting, glyphosate was applied at five rates (0, 16, 32, 64, and 128 fl oz /A of GlyStar® Original, plus 0.5% v/v NIS and 12 lb/100 gal AMS) using a CO₂ powered backpack sprayer calibrated to deliver 15 gpa at 20 psi through Teejet TurboTee 110015 nozzles. Plants were approximately 4" in height and diameter at the time of application. Applications were made at the Lind site on July 14th with an air temperature of 78 F, soil temperature of 70 F at 4 to 6 inches, and 28% relative humidity. Applications were made at the Pullman site on July 19th with an air temperature of 78 F, soil temperature of 68 F at 4 to 6 inches, and relative humidity of 35%. Percent control was estimated visually at 4 weeks after treatment on a scale of 0 (no control/injury) to 100 (complete plant death).

Resistance to glyphosate was confirmed in the suspected resistant population. Although resistance to typical field rates of glyphosate was present at both Lind and Pullman, the degree of resistance varied between sites. At Lind, hot, stressful conditions reduced the performance of glyphosate on the susceptible plants (with 32 fl oz/A providing only 72% control), however, the resistant plants survived 128 fl oz/A of glyphosate with only 60% control, clearly demonstrating a high level of resistance to glyphosate both relative to the susceptible check and in an absolute sense. At Pullman, susceptible thistle was completely controlled by all rates of glyphosate tested. The resistant population survived an application of 32 fl oz/A with only 50% control, but was well controlled by the time rates reached 64 fl oz/A. The resistant population was highly resistant to glyphosate relative to the susceptible check here as well, and survived a reasonable field use rate of glyphosate (0.75 lb ae/A). Overall, the resistant population exhibited approximately 4- to 8-fold resistance to glyphosate relative to the susceptible check, and would pose a major management challenge in a field setting.

The effect of temperature on the expression of glyphosate resistance (with higher temperatures resulting in much higher levels of resistance) that was seen in these trials has also been documented for several other weed species from around the world. This is important to keep in mind when managing potential glyphosate resistance in Russian-thistle. Under relatively cool conditions, the expression of resistance may be much lower, making detection and monitoring of resistant populations more complicated.

Percent control ratings at 4 weeks after application.

Rate (fl oz/A)	Lind		Pullman	
	Susceptible	Resistant	Susceptible	Resistant
0	0	0	0	0
16	34	0	100	20
32	72	4	100	50
64	100	21	100	94
128	100	61	100	100

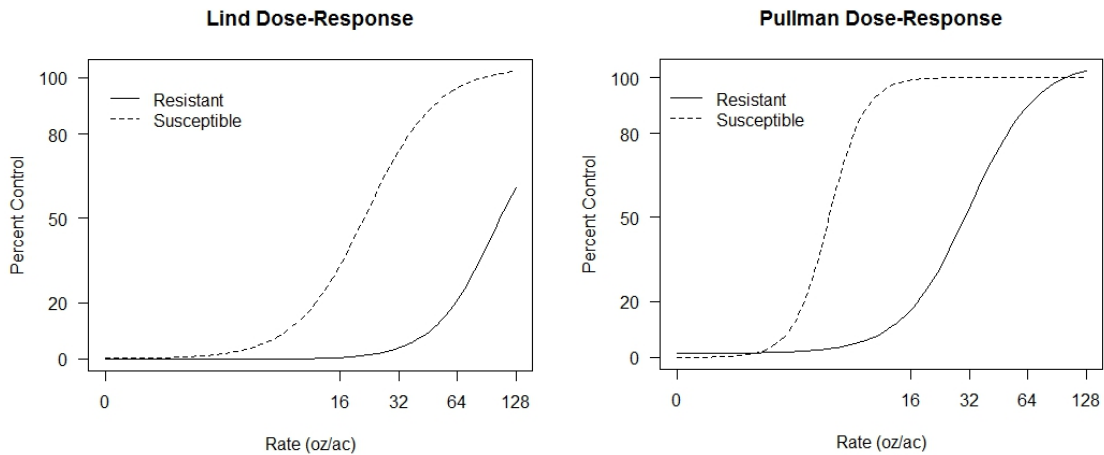
Resistant plants surviving 128 fl oz/A rate of glyphosate at Lind, 4 weeks after application.



Resistant plants surviving 32 fl oz/A rate of glyphosate at Pullman, 4 weeks after application.



Estimated dose-response curves for resistant and susceptible Russian-thistle populations at Lind and Pullman sites.



Some of the pesticides discussed in this presentation were tested under an experimental use permit granted by WSDA. Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties up to \$7,500. In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action by WSDA and/or the U.S. Food and Drug Administration. It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.