

Glyphosate with water conditioners and hard water. Ramsdale, Brad K. and Calvin G. Messersmith. The experiment was conducted to examine the influence of water conditioners and mixing order on glyphosate efficacy when treatments were applied in high-calcium hard water. 'Jerry' oat, 'Sunrise' proso millet, 'Neche' flax, and oilseed sunflower were planted as 6-ft-wide strips side-by-side on May 25, 2003, near Fargo, ND. Plots 10 ft wide were laid out perpendicular to the strips so that each plot contained all four assay species. Treatments were applied on June 18 with a CO₂-pressurized bicycle-wheel-type plot sprayer equipped with four 8001 flat-fan nozzles at 20-inch spacing. Spray volume was 8.5 gpa and spray pressure was 35 psi. Conditions at application were 75 F, 32% RH, wind at 10 to 15 mph, and sky 10% clouds. Plant sizes when treated were oat at 5- to 7-inch and 3- to 4-leaf, proso millet at 2- to 5-inch and 2- to 4-leaf, flax 1- to 5-inch, and sunflower 2- to 6-inch. Experimental design was a randomized complete block with four replicates. Herbicide treatments were applied in hard water that contained 1550 mg/L CaCO₃. Glyphosate was applied at a reduced rate to better detect treatment effects on glyphosate efficacy. The spray water conditioners were added to the spray mixture either before or after the glyphosate to determine whether mixing sequence affected glyphosate efficacy. Weed control was evaluated visually where 0 equaled no visible injury and 100 equaled complete control of assay species.

Glyphosate control of grass species was generally best when glyphosate was applied with AMS, Bronc Max, Quest, or Transport. Glyphosate applied with Choice or Insure-GL water conditioners provided greater species control compared to glyphosate alone, but these water conditioners were generally less effective for enhancing glyphosate efficacy than the other conditioners with this very hard water source. Mixing order did not influence glyphosate as efficacy was similar whether glyphosate was added before or after the water conditioner. (Dept. of Plant Sciences, North Dakota State University, Fargo)

Table. Glyphosate with water conditioners and hard water. (Ramsdale and Messersmith)

Treatment ^a	Rate	Herbicide added ^b	June 30				July 8			
			Oat	Proso millet	Flax	Sunflower	Oat	Proso millet	Flax	Sunflower
	(lb/A)		(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Glyphosate	0.06	Before	42	31	26	41	34	29	12	35
Glyphosate + AMS	0.06 + 1%	Before	68	70	54	74	61	66	54	75
Glyphosate + Choice	0.06 + 0.75%	Before	64	54	45	55	60	46	45	50
Glyphosate + Quest	0.06 + 0.75%	Before	71	71	54	71	68	70	65	71
Glyphosate + Bronc Max	0.06 + 0.75%	Before	64	66	56	74	63	61	61	76
Glyphosate + Insure-GL	0.06 + 0.25%	Before	61	50	39	51	58	48	44	48
Glyphosate + Transport	0.06 + 0.75%	Before	75	74	61	71	73	70	60	65
Glyphosate + AMS	0.06 + 1%	After	75	78	60	76	68	75	66	75
Glyphosate + Choice	0.06 + 0.75%	After	63	53	46	58	58	41	38	53
Glyphosate + Quest	0.06 + 0.75%	After	80	85	63	75	78	79	66	70
Glyphosate + Bronc Max	0.06 + 0.75%	After	64	66	56	75	61	59	60	75
Glyphosate + Insure-GL	0.06 + 0.25%	After	66	66	54	61	68	63	53	56
Glyphosate + Transport	0.06 + 0.75%	After	68	75	59	73	64	73	60	68
LSD (5%)			7	11	12	11	9	14	12	12

^a Glyphosate = Roundup UltraMax, isopropylamine salt.; AMS = ammonium sulfate; Choice = water conditioning agent by Loveland Industries Inc.; Quest = water conditioning agent and AMS replacement by Helena Chemical Company; Bronc Max = water conditioning agent containing AMS solution by Wilbur-Ellis; Insure-GL = water conditioning agent by Brandt Consolidated; Transport = sequestering system by Precision Laboratories Inc.

^b Mixing sequence where glyphosate was added to the spray mixture either before or after the water conditioner.