Evaluation of Spray Adjuvants for Use with Herbicides for Broom Snakeweed Control

Robert Sanderson, Ellis Huddleston, Kirk C. McDaniel, Jim Ross, and Andrew Hewitt

How effective are spray adjuvants for enhancing snakeweed control?

Adjuvants are materials added to a pesticide mixture in the spray tank to improve mixing and application or enhance pesticide performance. While pesticides are formulated to be suitable to many types of application conditions, they cannot be formulated for all possible situations. Adjuvants are used to customize the formulation to specific needs and compensate for local conditions—commonly, to improve wetting ability of a spray solution, control evaporation, improve weatherability, enhance uptake of pesticide into plants, improve spray deposition, and reduce drift. This paper reports on studies with adjuvants used with picloram for broom snakeweed control.

Picloram applied at one-half the recommended rate has been shown to control snakeweed successfully about 60% of the time based on spray trials conducted by NMSU over the past 12 years. Failure to control snakeweed 40% of the time using rates lower than recommended is not acceptable to producers, but the use of a surfactant could increase pesticide contact and uptake by snakeweed and possibly improve effectiveness of the herbicide. This study examines the benefit of adding a surfactant to low rates of picloram. The results (Table 1) from spray trials with an organo-

Table 1. Snakeweed mortality following applications of picloram and picloram plus an organosilicone surfactant under various environmental conditions on the NMSU Corona Research Ranch. Treatments were evaluated 18 August 1992.

Date		10/25/91	10/24/91	11/14/91	12/6/91	12/5/91	4/8/92	5/8/92
Spray Time		8:15-9:15	3:45-4:30	8:30-9:20	8:45-9:30	2:10-2:45	9:15-10:15	11:15-12:15
Air Temp °C		8.6	18.5	8.8	.8-11.6	13.8-11.8	18	19.5
Soil Temp (10, 50 cm)		12.7, 16.3	19.0, 16.0	8.8, 8.7	1.2, 4.2	2.9, 4.1	9.3, 9.5	14.7, 15.2
% RH		70-50%	25%	89%	42-25%	18%	17%	36%
Wind Speed (km/hr)		2.9	4.2	3	5.5	<3	<3	4.7
	kg/ha	% Snakeweed Mortality						
Picloram	0.07	5	8	14	4	15	11	3
+ Surfactant	0.125%	5	13	11	5	9	18	4
Picloram	0.14	17	32	38	25	27	66	4
+ Surfactant	0.125%	26	44	31	21	13	54	13
Picloram	0.21	78	68	80	18	33	85	23
Picloram	0.28	93	78	85	55	55	95	35
Surfactant	0.125%	4	6	7	1	5	2	2
Control	—	7	5	11	2	6	1	2
LSD=	(0.05)	14	25	34	24	18	26	6

silicone surfactant conducted in 1992 under various environmental conditions on the NMSU Corona Research Ranch suggest the surfactant did not increase snakeweed mortality when low rates of picloram were applied.

The droplet size spectrum is one of the most important factors in spray deposition and drift, and is especially important in applying herbicides with aircraft. Adjuvants that change the droplet size spectra can potentially affect the amount of drift. Three "drift retardant/deposition aid" type adjuvants were tested. Each adjuvant was added to picloram mixed with water at the manufacturer's recommended rate. The droplet size spectrum produced by each mixture through a D8-46 nozzle at standard operating conditions was determined in a wind tunnel using laser-based droplet sizing equipment. Picloram without adjuvant was tested as a reference in each study. The volume median diameter (VMD), which is a typical droplet size representing the spectrum, and the percentage of the spray volume less than 106 and 191 micrometers (measures of driftable fraction) did not differ for each mixture tested (Table 2). However, this study only measured the droplet size spectra produced at the atomizer. Droplet size can also change before the spray reaches the target because of evaporation. If adjuvants change the evaporation rate of the mixture, droplet size and drift could still be affected. More work on adjuvants is required to determine these effects.

Table 2. Droplet size spectra parameters for picloram with and without adjuvant when sprayed through a D8-46 nozzle operating at a pressure of 25 psi in a 110 mph airstream.

		% spray volume less than	
	VMD	106µm	191µm
Picloram	218	12.8	38.6
Picloram + adjuvant 1	227	13.8	35.8
Picloram	216	13.2	39.5
Picloram + adjuvant 2	210	13.1	40.8
Picloram	229	11.5	36.0
Picloram + adjuvant 3	252	12.7	30.8

Robert Sanderson is an assistant professor of Entomology and Ellis Huddleston is a professor of Entomology, both in the Department of Entomology, Plant Pathology and Weed Science. Kirk McDaniel is a professor of Range Science in the Department of Animal and Range Science. Jim Ross and Andrew Hewitt are research specialists in the Department of Entomology, Plant Pathology and Weed Science.