

1999

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Recommended Citation

Ralphs, M.H.; Nielsen, D.B.; Evans, J.O.; and Call, C.A., "Herbicide Control of Tall Larkspurs on Mountain Rangeland" (1999). *Archived Agriculture Publications*. Paper 9.
http://digitalcommons.usu.edu/extension_histag/9

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Herbicide Control of Tall Larkspurs on Mountain Rangeland



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Introduction

Tall larkspurs kill more cattle on mountain rangelands than any other plant or disease. Tall larkspurs are principal components of tall forb communities and occur in patches associated with snow drifts in mountain big sagebrush, aspen and subalpine plant communities. Controlling larkspur patches can substantially reduce cattle deaths (3). Larkspur will never be eradicated, but if its density could be reduced to where a cow could not eat enough larkspur, fast enough, death losses can be reduced.

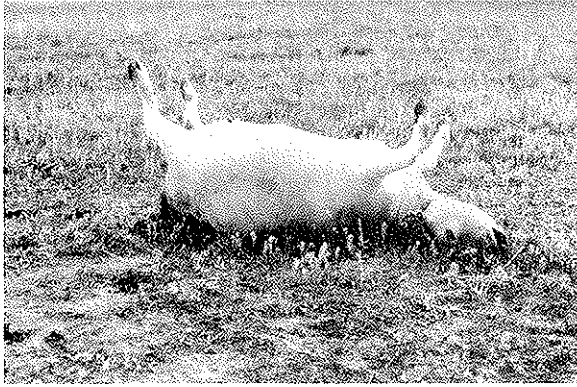
Larkspurs are difficult to control. They have a waxy leaf that reduces herbicide absorption, and herbicides must translocate down to the crown and taproot to kill the perennating buds. Three herbicides (Escort®, Tordon®, and Roundup®) have shown promise in controlling the two species of tall larkspur that are responsible for most cattle deaths on mountain rangelands (6).

Duncecap larkspur (*Delphinium occidentale*) occurs in northern Utah, northeast Nevada, Idaho, Wyoming, and Montana. It is most susceptible to all three herbicides when applied in the early vegetation stage of growth (6). Escort® is most effective at 0.5 to 1 oz ai/A (0.8 to 1.6 oz/A product) and

gave almost total control with no reinvasion for 5 years (5). However, it must be applied in the vegetative stage; efficacy declines as the duncecap larkspur matures. Tordon® at 1 lb ae/A (2 qt/A product) will control duncecap larkspur in the vegetative stage, but 2 lb ae/A (1 gal/A product) is required in the bud and flower stages. Roundup® was effective at 1 lb ai/A (1 qt/A product) in small plot tests, but it is not selective and kills all other vegetation. Roundup® can be selectively applied to individual larkspur plants with a back pack sprayer (7) or hand gun sprayer, or mechanically applied to the taller growing larkspur with a carpeted roller applicator (1).

Tall larkspur (*D. barbeyi*) occurs in central and southern Utah, Colorado, and Arizona. Research





conducted in the subalpine zone at 10,000 ft elevation under harsh growing conditions revealed that higher rates of herbicides were generally required for effective control (6). We suspect that tall larkspur at lower elevations in the aspen zone would respond to rates similar to those effective on duncecap larkspur. Tordon® at 1 lb ae/A (2 gt/A product) adequately controlled tall larkspur in the bud and flower stages; but 2 lb ae/A (1 gal/A product) was required in the vegetative stage due to the cooler, less favorable growing conditions early in the season. Escort® at 2 oz ai/A (3.3 oz/A product) was required to give adequate control in the vegetative and bud stages. It was not effective in the flower stage. New seedlings of tall larkspur were beginning to establish after 5 years on plots treated with Escort®, but plots treated with Tordon® or Roundup® were still devoid of larkspur after 5 years (5). The higher rate of Roundup® (2 lb ai/A) was required on the small plot trials, but rates similar to those on duncecap larkspur were effective using the back pack sprayer (7) or carpeted roller applicator (1).

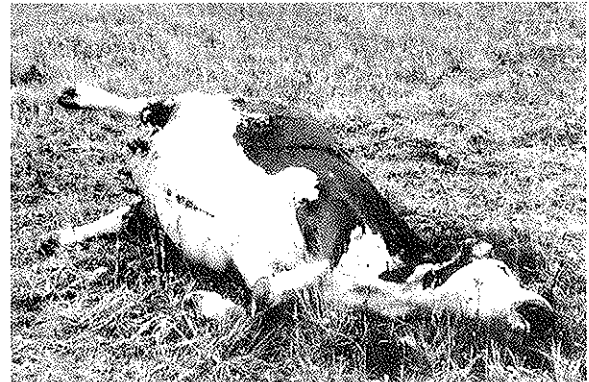
Response of Associated Vegetation

Tordon® and Escort® killed other broad-leaf forbs as well as larkspur. Less desirable weedy forbs (such as pine violet, yarrow and herbaceous sage) came back. Grass cover increased two to three fold and remained substantially higher after 5 years (5). Application of Roundup® with the backpack sprayer did not

adversely affect cover of associated forbs or grasses (7). However, grasses did not increase as they did in the Tordon® and Escort® treated plots. The carpeted roller application of Roundup® did not harm the lower growing forbs and grasses, but it did kill the taller desirable forbs such as Porter's ligisticum and mountain bluebell.

Herbicide Residue in Soil and Runoff Water

Tordon® is a restricted use herbicide because of its long persistence and relatively high water solubility. Low levels of Tordon® remained in the top 1 inch of soil (800 ppb) but only 350 ppb occurred in the next 2 inches (2). Tordon® was detected in the runoff water from snow melt the next spring (10 ppb) but was far below the drinking water standard (490 ppb), or the tolerance



level for sensitive fish (290 ppb). This level may damage alfalfa (8 ppb) in repeated irrigations, but the Tordon® concentration would be greatly diluted as it mixed with other water moving off site. Only a trace of Escort® was found in the soil (2.5 ppb) and none was detected in runoff water. Roundup® adheres tightly to soil particles and will not move off the site.

Economics

Returns from larkspur control are measured in the number of cows saved. If the average annual death loss to larkspur was 2.25%, and

spraying reduced this loss by 94%, all recommended herbicides and rates are economically feasible (4). If the internal rate of return (IRR) is higher than the cost of borrowing, a practice is economical. The higher IRR of the roller application of Roundup® is due to the reduced amount of herbicide applied by this method, only 35% of that used for broadcast spray applications.

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Table 1. Herbicides, rates and timing of application.

Herbicide	Duncecap larkspur		Tall larkspur	
	Rate	Stage	Rate	Stage
Escort®	0.5-1 oz ai/A* (0.8-1.6 oz/A) ^{1/}	Veg	2 oz ai/A (3.3 oz/A) ^{1/}	Veg-Bud
Tordon®	1 lb ae/A** (2 qt/A)	Veg	1 lb ae/A (2 qt/A)	Bud-Flower
	2 lb ae/A (1 gal/A)	Bud-Flower	2 lb ae/A (1 gal/A)	Veg
Roundup®				
broadcast	1 lb ai/A (1 qt/A)	Veg-Bud	2 lb ai/A (2 qt/A)	Bud
roller	4 oz ai/gal (0.5 pt/gal)	Bud	4 oz ai/gal (0.5 pt/gal)	Bud
spot spray	2 oz ai/gal (0.25 pt/gal)	Veg-Bud	2 oz ai/gal (0.25 pt/gal)	Veg-Bud

^{1/} Rates in parantheses refer to product quantities.
 * ai = active ingredients
 ** ae = acid equivalent

Table 2. Cost and returns of herbicide control of larkspur.

		Escort®	Tordon®	Roundup® Roller	Concentration Backpack
Herbicide	rate	2 oz ai/A (3.3 oz/A)	2 lb ai/A (1 gal/A)	4 oz ai/gal (0.5 pt/gal)	2 oz ai/gal (.25 pt/gal)
	cost	\$ 59.00	\$96.60	\$14.30	\$20.44
	Application cost	\$ <u>15.73</u>	\$ <u>15.73</u>	\$ <u>21.68</u>	\$ <u>41.79</u>
	Total cost	\$ 74.73/ac	\$112.23/ac	\$35.98/ac	\$62.23/ac
	Value of cattle saved (2.25% death loss)	\$24/ac	\$24/ac	\$24/ac	\$24/ac
	Internal rate of return IRR (10 year life)	30%	17%	66%	37%



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