Land Rolling Increases Broadleaf Weed Emergence

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Introduction

Land rolling is done in the Northern Great Plains to push rocks into the soil to prevent damage to harvest equipment. The practice occurs widely on short-statured crops such as pea and lentil, and forages, including alfalfa and annual cereal hay crops.

Rationale & Methodology

A field trial was conducted to determine if land rolling, analogous to using a large packer wheel to improve soil-seed contact for more uniform crop emergence and subsequent maturity, influenced density or biomass of weeds associated with field pea, forage barley, or summer fallow. The experiment included two planting dates each of two years for barley and pea. Preplant tillage was done with a field cultivator for all treatments. Land roller diameter and length were 1.06 and 3.1 m, respectively, and rolling was done immediately after planting. Early emerging weeds were determined at 2-leaf stage for barley, and 3-4 leaf stage for pea. Weed density in summer fallow weed was assessed the same dates as barley. Soil at the experimental site was a Dooley sandy loam, near Froid, Montana.

Figure 1

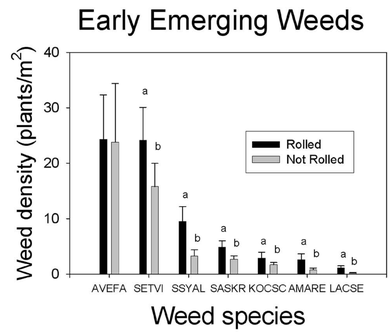


Figure 2

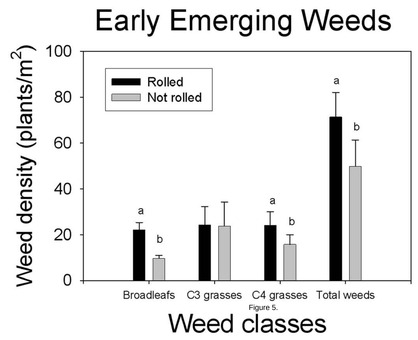


Figure 3

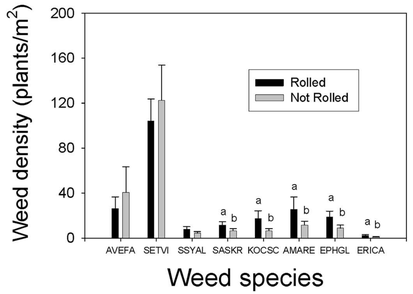


Figure 4

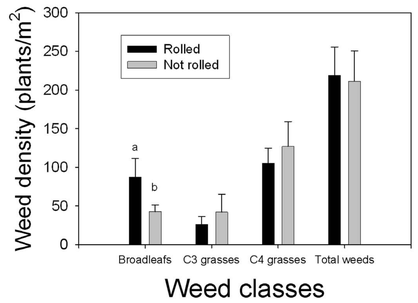


Table 1 *Weed species binomials, common names, and abbreviations used.*

Abbreviation	Binomial	Common name
AVEFA	*Avena fatua*	wild oat
SETVI	*Setaria viridis*	green foxtail
SYSAL	*Sisymbrium altissimum*	tumble mustard
SASKR	*Salsola iberica*	Russian thistle
KOCSC	*Kochia scoparia*	kochia
AMARE	*Amaranthus retroflexus*	redroot pigweed
LACSE	*Lactuca seriola*	prickly lettuce
EPHGL	*Chaemesyce glyptosperma*	ribseed sandmat
ERICA	*Conyza canadensis*	horseweed

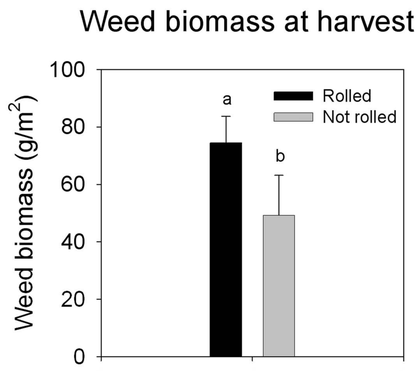
Table 2 *Water budget across forage barley, field pea, and summer fallow with and without land rolling after planting, 2004-2005, Froid, Montana*

	Preplant soil water	Postharvest soil water	Water use
	mm (0-105 cm)		mm
Rolled	180	160	235
Not rolled	189	169	233

Table 3 *Yield and yield components of field pea with and without land rolling after planting, 2004-2005, Froid, Montana.*

	Stand	Pods	Seed per Pod	Seed Wt.	Seed	Yield
	# m^{-2}		#	mg	# m^{-2}	kg ha^{-2}
Rolled	59	219	4.2	219	933 b	2062 b
Not rolled	63	239	4.5	222	1074 a	2393 a

Figure 5



Results

- Across years, crops, and planting dates, land rolling approximately doubled early emergence of tumble mustard, Russian thistle, kochia, redroot pigweed, and prickly lettuce (Figure 1). Early emerging broadleaf weeds, C4 grasses, and total weed densities were greater following rolling than non-rolled across crop treatments (Figure 2). Density of C3 grasses, predominantly wild oat, was not influenced by rolling.
- At harvest, land rolling increased densities of Russian thistle, kochia, redrood pigweed, ribseed sandmat, and horseweed (Figure 3). Total broadleaf weed density was greater in rolled plots, but grassy and total weeds did not differ between rolling treatments (Figure 4). Land rolling increased weed biomass at harvest from barley forage and summer fallow treatments (Figure 5).
- Land rolling did not influence water use (Table 2).
- Land rolling decreased pea yield through cumulative effects of slight reductions in stand, pod density, seed pod-2, and seed weight (Table 3).

Conclusions

- Land rolling increased early broadleaf weed emergence, and broadleaf weed density and biomass at harvest.
- Land rolling did not alter densities of wild oat or green foxtail at harvest.
- Land rolling an annual hay crop may be an effective practice to decrease broadleaf weed seed bank.
- Although rolling increased broadleaf densities in pea and decreased yield, the practice remains necessary to prevent damage to harvest equipment or crop quality.

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