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Herbicide and heat to reduce seed germination of leafy spurge

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The seeds of leafy spurge are about the size and shape of pearl millet–2 to 2.5 mm long. Each seed plant can produce up to 150 seeds. Seeds are thrown up to 15 feet when the ripe fruit dehisces explosively. Most seeds germinate in the spring of the year when air temperatures reach the low 80ºs, others germinate later at different temperatures. Most of the viable seeds germinate within 2 years but the others remain viable up to 8 years. These latent seeds are enough to reestablish the infestation. Therefore, a chemical control treatment to kill the plant followed by a fire treatment to kill the embryos in the seeds to curtail seedling development would be very effective and economically acceptable in the control of leafy spurge on the northern High Plains.

Therefore, the objectives of our study were to determine if leafy spurge seedling development which re-establishes the infestation can be curtailed with fire and also to determine which combinations of herbicide and fire best control leafy spurge seedling development–early summer or fall applied herbicide treatment followed with back fire in the fall or back fire in the spring.

Research plots, 50 x 50 feet with 10 borders between plots were located in the Little Missouri National Grassland near Medora, and in the Sheyenne National Grassland near Lisbon, North Dakota. These study areas had a relatively high density and long age of the leafy spurge infestation. Study plots on the Medora Ranger District were defined as an upland site–east Twin Butte–and a floodplain site–Wannagan Creek. The plots in eastern North Dakota were low semi-wet meadow and a rolling upland sites.

The herbicide application was a tank mix of 1 pound acid equivalent of 2,4-D and 1/2 pound picloram per acre applied in June and September of 1985. This mixture was applied in water at 50 gallons of water per acre, low pressure spray (20 to 40 lbs. pressure). This was done by a certified applicator. Plots with herbicide application in June received heat (fire) treatments in October and those with the herbicide application in September received heat treatments the spring of 1986.

The heat treatment (fire) was accomplished through the use of a back fire (backed against the wind). Fires were initiated after 11 a.m. when temperatures were above 50º F, relative humidity 20 to 30% and winds 9 mph or less. The 10 foot borders around each plot were mowed by a lawn mower and treated with a commercial fire retardent (phoschek, monsanto). The fire lines were initiated with drip torches.

Viability (ability to germinate) of leafy spurge seed naturally dispersed in the soil and surface mulch were tested after the heat treatments. Ten samples were collected with the use of a square foot blade to a depth of four inches. These samples were placed in individual zip-lock top plastic bags for transport to the laboratory in Rapid City. Sample materials were kept moist and cool until separation of the leafy spurge seed from the soil and surface mulch. The seeds, 20 seeds in each sample, were placed in seed germinators of which the temperature alternated between 68 to 86º F with each temperature period lasting 8 hours. The germination test was conducted for a 3-week period. Seeds were examined daily for indications of germination, appearance of the hypocotyl was counted as germinated. Number of germinated compared to those not germinated were used as an indication of seed viability and effects of the treatments.

Here's what we learned. The spring fire following a fall application of herbicide was very effective in reducing viability of leafy spurge seed in the low land leafy spurge (Fig. 1). However, the fall burn following spring application of the herbicide was also quite effective (Fig. 2). One noteworthy point was the spring applied herbicide was about twice as effective as the fall applied herbicide in the reduction of germination. The effect of the fire was not quite as strong on the uplands but fall and spring applications of fire were equally effective. Fire in combination with herbicide reduces seed viability which now is a big stumbling block in the management of leafy spurge.

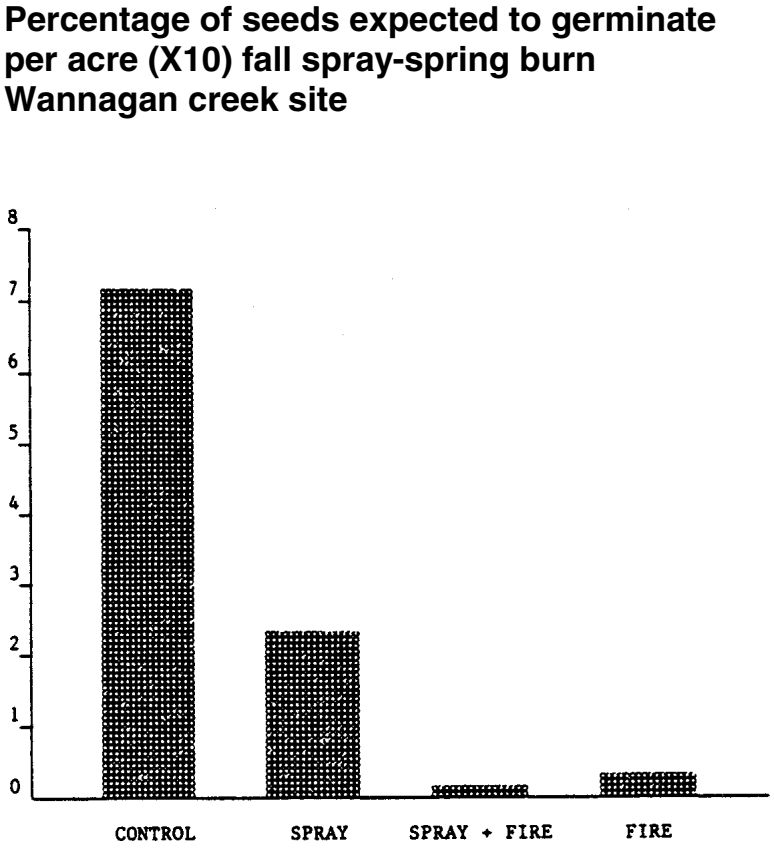

Fig. 1. Seed germination following fall spray and spring burn.

Percentage seeds expected to germinate per acre (X10) spring spray-fall burn Wannagan Creek site

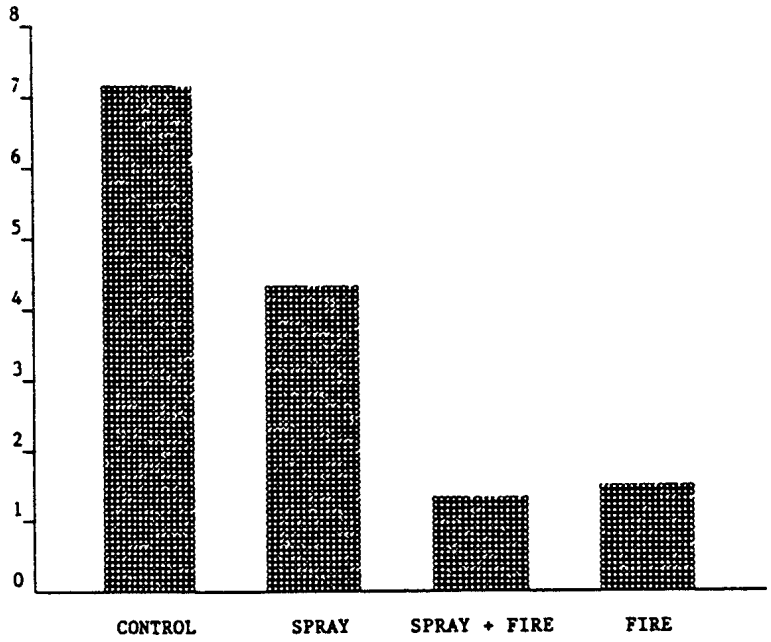

Fig. 2. Seed germination following spring spray and fall burn.