

Management of Camelthorn along the Virgin River

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Introduction

Camelthorn (*Alhagi pseudalhagi*) is an invasive herbaceous perennial weed that can establish large dense stands throughout the western United States. Native to the Middle East, infestations are commonly found along rivers and in floodplains, especially in arid climates. While seedlings appear to be poor competitors, once perennialized, plants accumulate large amounts of carbohydrates below ground in perennial roots allowing plants be very competitive and tolerate many management techniques. Several populations of camelthorn have been discovered within Clark County Nevada along the Virgin River. These populations appear to be relatively young (< 5 years old) and eradication may be feasible, with minimal costs. However, little information is available as to the best management method for camelthorn. The objectives of this project were to quantify the effectiveness of various herbicide treatments on eradicating camelthorn and document the response of resident plant populations to these treatments along the Virgin River's riparian areas.

Materials and methods

Due to the presence of threatened and endangered species in the Virgin river, two different sites were evaluated as some herbicides could not be used next to water. The riparian experiment was established from waterline to 7 meters and the floodplain/riparian experiment > 7 meters away from water in the floodplain. Each experiment was a randomized complete block design with five replications, see table 1 for treatment details. Plants were applied at the flower bud stage in the spring (4/26/03) AND to resprouting tissue in the fall just prior to plant senescence (11/25/03). Applications were applied to all foliage and stems until visibly wet with a SP1 backpack sprayer with an adjustable tip. Camelthorn density and plant cover were evaluated throughout the experiment (4/25/03-4/7/04). Camelthorn density was recorded by counting the number of individual stems and crowns within each plot. Plant cover was evaluated by establishing permanent transects and recording point intercepts of plant species at one meter intervals across plots. Presence of all species was also documented within each plot. Data was analyzed by Analysis of Variance (ANOVA), if significant differences between treatments occurred, means were separated utilizing LSD at $p < 0.10$.

Results and discussion

None of the treatments eliminated camelthorn, but significant reductions in camelthorn density occurred in the floodplain/riparian site. Arsenal (Imazapyr) and Veteran 720 (2,4-D & Dicamba) reduced stem density 87 and 82 % respectively, while all other treatments (Garlon, Weedar 64, Rodeo) did not differ from the untreated control. At the riparian site near water, none of the herbicides evaluated (Rodeo, Weedar 64) provided ANY reduction in camelthorn density and after one year, infestations increased by over 50%. Thus, repeated applications of herbicides registered for use in water in the spring and fall to camelthorn had no impact on camelthorn

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invasion. Fortunately imazapyr has been recently registered for use in aquatic systems (under the tradename Habitat), and based on our results should be an effective tool for management of camelthorn near or in water.

Although herbicides were spot treated, nonselective herbicide treatments (Rodeo, Arsenal) were expected to have a greater impact on vegetation present compared to the untreated control and selective herbicides (Garlon, Weedar 64, Veteran 720). However, one year after applications ONLY camelthorn cover differed between treatments. Species richness was also similar across all treatments with values averaging from 4-6 plants/plot. This emphasizes that spot application to establishing infestations, if applied correctly, can have minimal impact to non-target species. Major species found in the floodplain/riparian site were arrowweed (*Pluchea sericea*) with 25-45% cover, saltcedar (*Tamarix* spp.) with 4-10% cover, and saltgrass (*Distichlis spicata*) with 2-6% cover. At the riparian site near water, similar results were seen except no differences in camelthorn cover were observed.

Conclusions and future research

This project demonstrated that two applications of Arsenal and Veteran 720 can reduce camelthorn populations by >80% within one year. However some observational data indicate that two applications (spring and fall) within one year may reduce control compared to one fall application. Areas adjacent to this study sites that were sprayed (Arsenal & Veteran 720) only in the fall provided near 100% control of camelthorn. Future research will hopefully determine why this occurs, but we think spring applied herbicides have limited translocation into roots and only kill the aboveground stems. Resprouting that occurs in the fall while common, did not produce as much live tissue compared to untreated controls. So when applications are made in the fall, less herbicide contacts the plant (less surface area of shoots) resulting in potentially less herbicide absorbed and translocated to the roots. Several other land managers in New Mexico and Arizona have had the best results with fall applications of systemic herbicides; therefore we are confident that this is the optimal timing for applications.

Longevity of weed seed is also a concern at these sites. The literature states that seedlings are poor competitors, but these areas are frequently disturbed, so seedling survival and establishment could occur. Prevention, monitoring, early detection and rapid response appear to be the best tools in managing this weed as control of large infestations is difficult.

Table 1: herbicide treatments

Experiment	Active ingredient	Herbicide ⁵	Formulation %	Acid equivalent %
Floodplain / riparian	2,4-D and Dicamba	Veteran 720	1 %	0.389 % 0.400 %
Floodplain / riparian	2,4-D	Weedar 64	2 %	0.389 %
Floodplain / riparian	Glyphosate	Rodeo	1.5 %	0.598 %
Floodplain / riparian	Imazapyr	Arsenal	1%	0.226 %
Floodplain / riparian	Triclopyr	Garlon 3A	1 %	0.318 %
Floodplain / riparian	Untreated control	-	-	-
Riparian	2,4-D	Weedar 64	2 %	0.778 %
Riparian	Glyphosate	Rodeo	1.5 %	0.598 %
Riparian	Untreated control	-	-	-

⁵ A surfactant (Kinetic at 0.625% v:v) was used with each treatment.