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Ropewick Application to Control Old World Bluestems

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Ropewick Application to Control Old World Bluestems

Abstract

Old world bluestems (OWB) were introduced into the United States in the early 1900s for conservation and forage purposes. The two main OWB species found throughout the southern Great Plains are Caucasian bluestem (*Bothriochloa bladhii*) and yellow or King Ranch bluestem (*Bothriochloa ischaemum*). These introduced OWB grasses are warm-season grasses with excellent persistence and production characteristics for regions with low rainfall. These grasses also produce abundant seed and establish more easily under arid conditions compared to some of our most common native warm-season grasses of the Great Plains. The characteristics that enable OWB to be well adapted and to grow and persist in the Great Plains also enable OWB to become invasive and encroach areas where it is not wanted. Several studies have examined herbicides to control OWB, and glyphosate products showed the most economical and promising short-term control success. However, glyphosate is a non-selective herbicide and has the potential to injure almost all vegetation with which it comes into contact, including desirable native species that may be growing among a stand of sprayed OWB. Wick applicators have been used extensively in grain row crop systems to wipe herbicide on weedy species that grow taller than the desirable grain crop. Because OWB matures more quickly than many native species, OWB could potentially be treated with a wick applicator as it matures following its elongation and elevation above native grass species. Therefore, applying glyphosate with a ropewick applicator to control OWB warranted investigation.

Keywords

weed science

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Ropewick Application to Control Old World Bluestems

K.R. Harmony

Introduction

Old world bluestems (OWB) were introduced into the United States in the early 1900s for conservation and forage purposes. The two main OWB species found throughout the southern Great Plains are Caucasian bluestem (*Bothriochloa bladhii*) and yellow or King Ranch bluestem (*Bothriochloa ischaemum*). These introduced OWB grasses are warm-season grasses with excellent persistence and production characteristics for regions with low rainfall. These grasses also produce abundant seed and establish more easily under arid conditions compared to some of our most common native warm-season grasses of the Great Plains. The characteristics that enable OWB to be well adapted and to grow and persist in the Great Plains also enable OWB to become invasive and encroach areas where it is not wanted. Several studies have examined herbicides to control OWB, and glyphosate products showed the most economical and promising short-term control success. However, glyphosate is a non-selective herbicide and has the potential to injure almost all vegetation with which it comes into contact, including desirable native species that may be growing among a stand of sprayed OWB. Wick applicators have been used extensively in grain row crop systems to wipe herbicide on weedy species that grow taller than the desirable grain crop. Because OWB matures more quickly than many native species, OWB could potentially be treated with a wick applicator as it matures following its elongation and elevation above native grass species. Therefore, applying glyphosate with a ropewick applicator to control OWB warranted investigation.

Experimental Procedures

Stands of Caucasian OWB located at the Kansas State University Agricultural Research Center – Hays were assigned to one of six treatment combinations of glyphosate herbicide application method and the height of prior year residual OWB growth. Application methods included a broadcast spray of 2.0 lb glyphosate/acre, a single pass of a ropewick applicator with a 50:50 (glyphosate:water) mixture on a volume:volume basis, and a double pass from opposite directions of the same 50:50 herbicide mixture from the ropewick applicator. Ropewick applications were made approximately 6-8 inches above the soil surface. All three application methods were performed in OWB stands with low residue height or high residue height remaining from the prior growing season. The low residue height was created by mowing prior year vegetation to a 4-inch height at the start of the growing season and prior to any herbicide application, while leaving the prior year residue uncut created the high residue height. All herbicide application

method and residue height combinations were compared to untreated control plots of OWB. Control of OWB, as assessed by visual observation of the loss of stand density and the lack of OWB growth and dry matter production, was recorded two months following treatment and again the following growing season. After plot observations were made the following growing season, the herbicide treatments were reapplied to each plot and were observed for OWB control two months after retreatment and again the following growing season. Therefore, plots were assessed for OWB control four times during the study. Treated plot areas were 6 ft × 15 ft. The study was established in 2006 as a randomized complete block design with four replications, and another duplicate study was initiated at a separate location in an adjacent pasture in 2007. Results of the two study locations were combined. Initial herbicide applications and retreatments were made in early August each year, and visual assessments of control were made at the end of the growing season in which herbicides were applied and again in late June or early August the following year prior to any retreatment.

Results and Discussion

The broadcast spray treatment of 2.0 lb glyphosate/acre displayed the greatest control at each observation time. Few OWB plants survived the spray treatment and retreatment, and more than 90% of OWB was controlled in the last two years of the study. Two passes with the glyphosate mixture in the ropewick applicator had better OWB control than using a single pass with the ropewick applicator. Two passes, one each from opposite directions, applies more herbicide to the vegetation and covers more vegetation surface area than a single pass with the applicator. Residue height did not matter for the broadcast spray treatment and had a minor impact on the two-pass ropewick application treatment. After herbicide retreatment in year two, control was greater in the two-pass ropewick treatment with high residue height compared to low residue height. This is opposite of what was hypothesized. Low residue heights were intended to reduce the amount of dead plant material intercepting the herbicide and not translocating it to the live plant. However, control was greater for high residue in the two-pass ropewick treatment, and this also held true for the single-pass ropewick treatment both before and after retreatment in year two. High residue levels provide shading of the growing canopy, and therefore may have caused etiolation (lengthening of stems to reach sunlight) and elevated more leaf material above the residue and above the height of the ropewick applicator. If more leaf material was elevated, then more leaf surface area would potentially receive herbicide application from the ropewick treatment. Two passes with the ropewick applicator and retreatment the next year controlled nearly 65% of the OWB, but any new OWB seedlings emerging as a result of opening the canopy would be missed by the ropewick application. Broadcast spray treatments would be able to control new seedlings the year after initial treatment if a retreatment occurs. A combination of a ropewick application in year one followed by a broadcast spray application in year two may also be a viable strategy to target control of established OWB plants and newly emerging seedlings the following year.

Implications

For greatest control of OWB, broadcast spray treatments are advised over ropewick wiping techniques. Ropewick applications would allow short native vegetation in the canopy to escape herbicide injury, but may not provide as much OWB control. How-

ever, a combination of ropewick application in year one and a broadcast spray in year two may be a viable option.

Table 1. Control estimates for Caucasian old world bluestem (OWB) when treated with different glyphosate application techniques and with different heights of prior year OWB residue at Hays, KS

Application method	Residue height	Number of passes	% Control			
			Year 1	Year 2	1 retreat	
					Year 2	Year 3
Untreated	Low		0.0 d	0.0 e	0.0 f	0.0 d
Untreated	High		0.0 d	0.0 e	0.0 f	0.0 d
Ropewick	Low	1	30.6 c	34.4 d	45.0 e	42.5 c
Ropewick	High	1	36.3 c	42.5 c	52.5 d	46.9 c
Ropewick	Low	2	58.8 b	60.6 b	71.9 c	59.4 b
Ropewick	High	2	60.6 b	65.6 b	76.3 b	68.6 b
Spray	Low		91.3 a	97.8 a	100.0 a	97.5 a
Spray	High		89.4 a	95.4 a	99.4 a	96.0 a

Values in a column followed by a different letter are statistically different at the P < 0.05 level.