Crested Wheatgrass Impedes the Spread of Medusahead

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SUMMARY

Establishing crested wheatgrass around the edge of medusahead infestations slowed the spread of the infestations into surrounding noninfested native plant communities. Crested wheatgrass decreased the availability of soil resources to medusahead and probably physically intercepted some of the dispersing medusahead seeds. Both the areas where crested wheatgrass was established and the areas protected by the crested wheatgrass had less medusahead than the control treatments.

INTRODUCTION

Invasive plants are decreasing biodiversity, reducing productivity, degrading wildlife habitat, and altering ecological functions of rangelands (DiTomaso 2000, Davies and Svejcar 2008). Efforts to restore plant communities invaded by exotic plant species are expensive, rarely successful, and may exacerbate the negative impacts of the invaders. Thus, efforts should be directed at preventing exotic plant invasions. To investigate the potential for competitive vegetation to reduce the spread of invasive plants, we evaluated the ability of crested wheatgrass (*Agropyron desertorum*) to reduce the establishment and spread of medusahead (*Taeniatherum caput-medusae*) into noninvaded plant communities.

METHODS

This study was conducted in the northwestern foothills of Steens Mountain in southeastern Oregon. Soils are a complex of different series with 20-35 percent clay content and moderate to high shrink-swell potential. Twelve sites were selected along medusahead invasion fronts. Each site was divided into two treatments 1) crested wheatgrass barrier (established crested wheatgrass) or 2) undisturbed control. Crested wheatgrass was established by drill seeding at 11 lbs/acre in a 45- by 18-ft band in front of the medusahead invasions three growing seasons prior to medusahead spread measurements. Herbaceous plant cover and density were measured in 2008. Nutrient supply rates of potassium, phosphorus, and inorganic nitrogen were also measured for each treatment plot.

RESULTS

In the Crested Wheatgrass Barrier

Medusahead and total annual grass cover were more than 7.1- and 2.7-fold greater, respectively, in the control treatment than in the crested wheatgrass treatment ($P < 0.01$ and $P = 0.04$, respectively; Fig. 1A). Medusahead and annual grass density were approximately 7.8- and 2.8-fold greater, respectively, in the control compared to crested wheatgrass treatment ($P = 0.01$ and 0.04, respectively; Fig. 1B). Potassium and ammonium concentrations were approximately 2- and 15-fold greater, respectively, in the control than crested wheatgrass seeded treatments ($P < 0.01$).

Beyond the Crested Wheatgrass Barrier

Medusahead cover and density were less in plant communities protected by a barrier of established crested wheatgrass than unprotected plant communities (42- and 47-fold difference, respectively; $P < 0.01$; Fig. 2).

DISCUSSION

Establishing competitive plants around infestations can reduce the spread of invasive plants by increasing the biotic resistance of the plant community to invasion and limiting the dispersal of invasive plant seeds into adjacent noninvaded plant communities. In this study, lower soil nutrient concentrations and less medusahead cover and density in the crested wheatgrass areas suggest that the establishment of crested wheatgrass increased the biotic resistance of these plant communities to invasion. The 40-fold greater presence of medusahead in plant communities without a crested wheatgrass barrier between them and the medusahead invasion demonstrates the effectiveness of a competitive vegetation barrier at reducing the spread of invasive plants into surrounding noninvaded plant communities. However, some medusahead seeds were able to establish beyond the barrier. This suggests the effectiveness would be improved by increasing the width of barriers and/or locating them further from the infestation edge to allow better establishment of competitive vegetation prior to experiencing pressure from the invader. The incorporation of an early detection and eradication program for satellite populations that establish beyond competitive vegetation barriers would also be fundamental to effectively reduce invasive plant spread.

MANAGEMENT IMPLICATIONS

Establishing crested wheatgrass adjacent to medusahead infestations can reduce the spread of medusahead. The establishment of crested wheatgrass appears to increase the biotic resistance of plant communities to invasion and reduce invasive plant propagule pressure in adjacent noninvaded areas. However, some medusahead may establish beyond the crested wheatgrass barrier; integrating crested wheatgrass barriers with other management actions will therefore probably be the most effective strategy to limit the negative impacts of medusahead. Considering the general failure of herbicides to impede the spread of invasive plant species, we suggest more efforts should focus on increasing the biotic resistance of plant communities to invasion and decreasing invasive plant propagule pressure.

REFERENCES

Davies, K.W., and T.J. Svejcar. 2008. Comparison of medusahead-invaded and noninvaded Wyoming big sagebrush steppe in southeastern Oregon. Rangeland Ecology and Management 61:623-629.

DiTomaso, J.M. 2000. Invasive weeds in rangelands: species, impacts, and management. Weed Science 48:255-265.

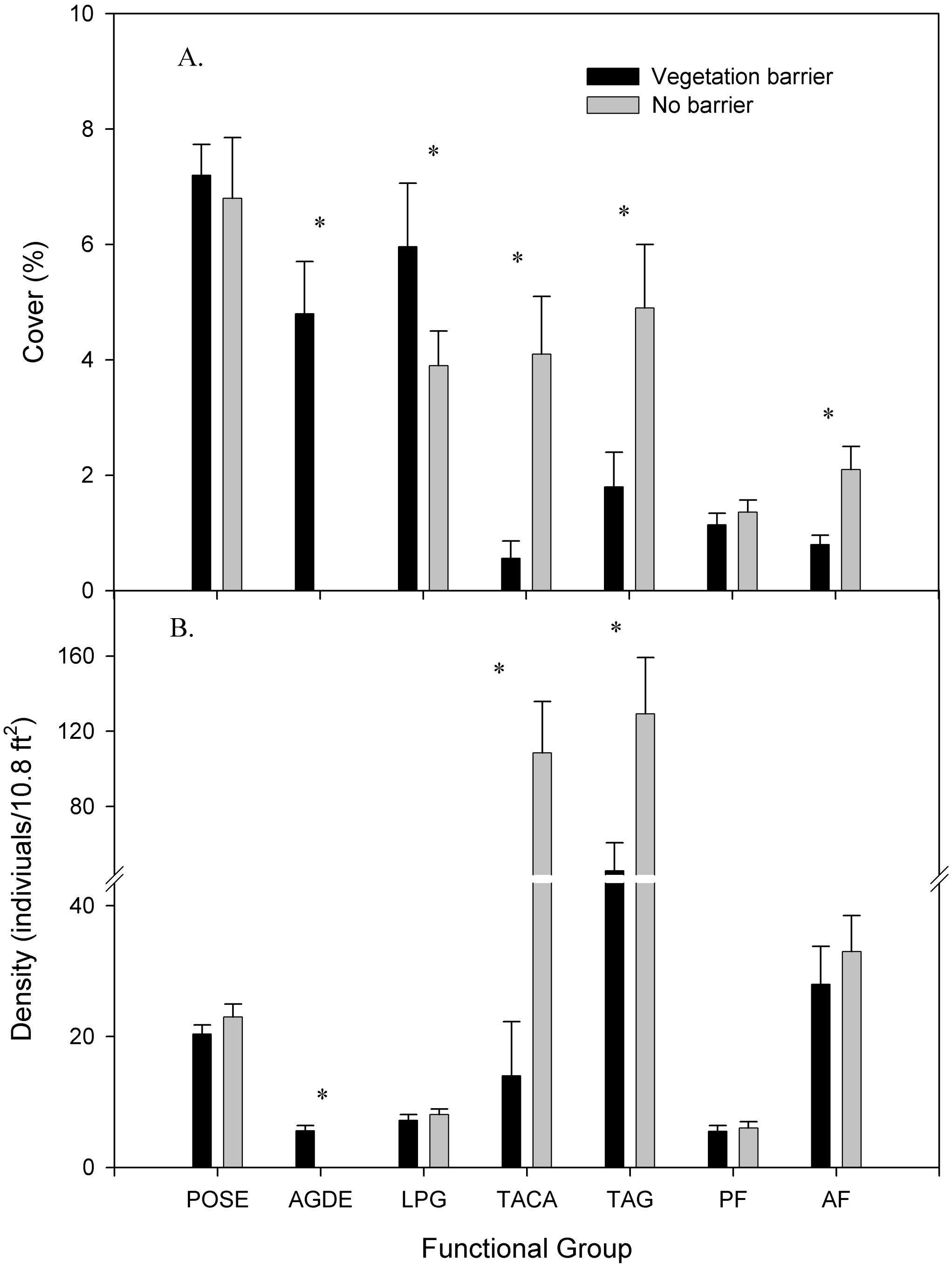

Figure 1. Cover (A) and density (B) of plant functional groups in the crested wheatgrass barrier and no barrier treatments (mean + S.E.). POSE = Sandberg bluegrass, AGDE = crested wheatgrass, LPG = large perennial bunchgrass, TACA = medusahead, TAG = total annual grass, PF = perennial forb, and AF = annual for. Asterisk (*) indicates significant difference between treatments (P < 0.05).

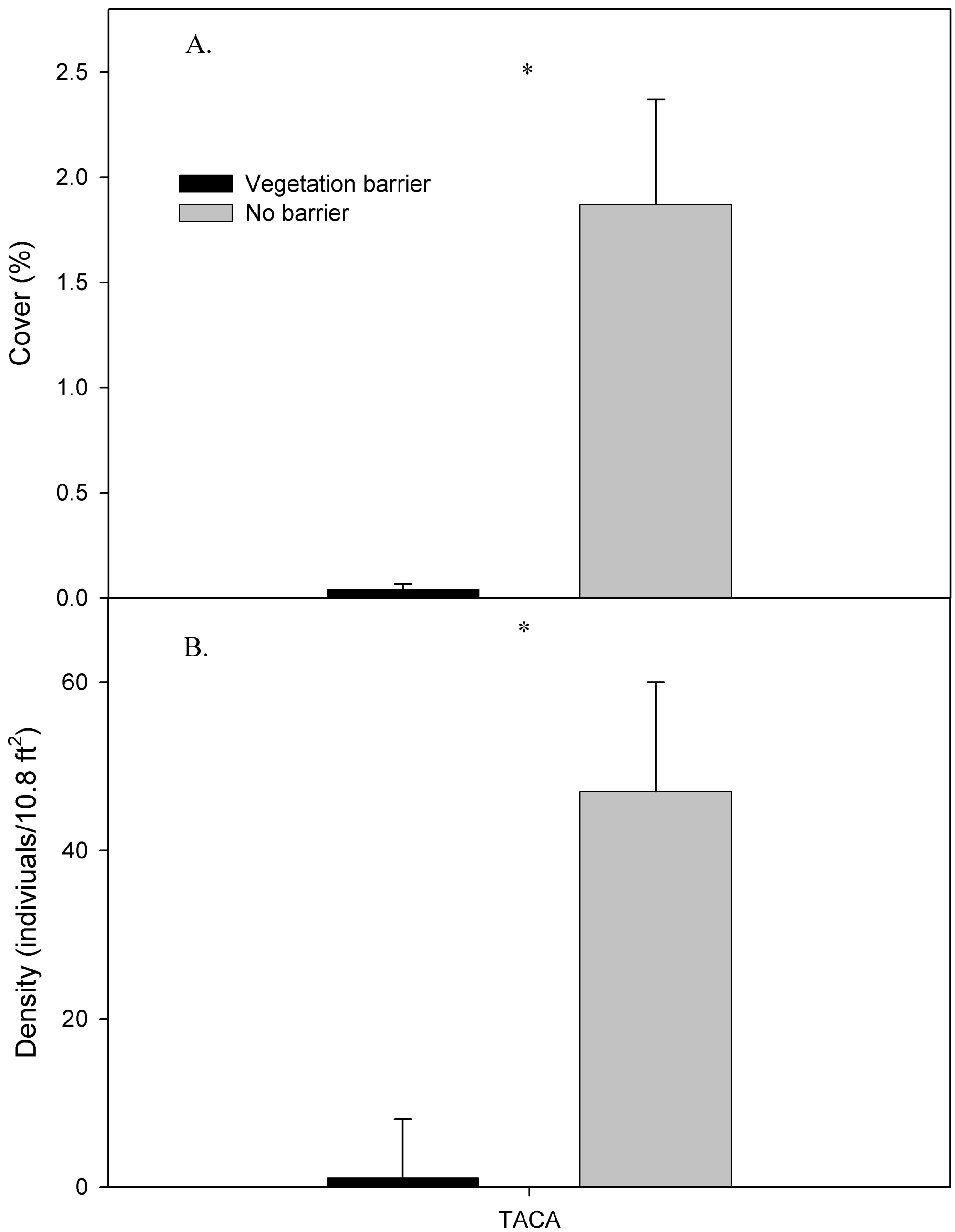

Figure 2. Medusahead (TACA) cover (A) and density (B) in the plant communities protected by a crested wheatgrass barrier and plant communities without a barrier between them and a medusahead infestation (mean + S.E.). Asterisk (*) indicates significant difference between treatments (P < 0.05).