Above-Ground Net Primary Production for *Elymus lanceolatus* and *Hesperostipa curtiseta* After a Single Defoliation Event

Author(s): A. Pantel, J. T. Romo, and Y. Bai
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Above-Ground Net Primary Production for *Elymus lanceolatus* and *Hesperostipa curtiseta* After a Single Defoliation Event

A. Pantel,[1] J. T. Romo,[2] and Y. Bai[2]

Authors are [1]Former Graduate Student and [2]Professors, Department of Plant Sciences, 51 Campus Drive, University of Saskatchewan, Saskatoon, Saskatchewan, Canada S7N 5A8.

Abstract

Above-ground net primary production (ANPP) of northern wheatgrass (*Elymus lanceolatus* [Scribn. & J. G. Sm.] Gould) and western porcupine grass (*Hesperostipa curtiseta* [Hitchc.] Barkworth) was determined after defoliation to a 7.5 cm stubble height on five landform elements in the Northern Mixed Prairie that had been ungrazed for >25 yr. Landform elements included north aspect–concave slopes, north aspect–convex slopes, south aspect–concave slopes, south aspect–convex slopes, and level uplands. ANPP was determined for 2 yr after defoliating plots once in May, June, July, August, September, October, November, or April. Northern wheatgrass and western porcupine grass ANPP varied among landform elements ($P < 0.01$), but not with the month of defoliation $\times$ landform element interaction ($P \geq 0.22$). Month of defoliation did not influence ANPP of northern wheatgrass ($P \geq 0.69$), but that of western porcupine grass was reduced by August and September defoliations ($P < 0.01$). ANPP of both grasses was insensitive to landform element in terms of defoliation responses. Northern wheatgrass ANPP was not responsive to temporal aspects of a single defoliation. With the exception of August and September defoliations, western porcupine grass also was insensitive to a single defoliation in different months. Land managers should consider rest (1 yr nongrazing) following grazing of western porcupine grass in August or September, whereas responses to defoliation in different months suggest northern wheatgrass can be grazed annually.

Resumen

Se determinó la producción primaria aérea anual neta (PPAN) de *Elymus lanceolatus* [Scribn. & J. G. Sm.] Gould y *Hesperostipa curtiseta* [Hitchc.] Barkworth luego de una defoliación hasta 7,5 cm de altura residual en cinco elementos del paisaje en la Pradera Mixta de América del Norte que había sido excluida del pastoreo por >25 años. Los elementos del paisaje incluyeron laderas cóncavas con exposición hacia el norte, laderas convexas con la misma exposición, laderas cóncavas con exposición al sur, laderas convexas con la misma exposición, y áreas planas elevadas. La PPAN se determinó durante dos años posteriores a un evento único de defoliación en mayo, junio, julio, agosto, septiembre, octubre, noviembre, o abril. La PPAN de *E. lanceolatus* y *H. curtiseta* varió entre elementos del paisaje ($P < 0.01$), pero no fue influenciada por la interacción entre el mes de defoliación y el elemento del paisaje ($P \geq 0.22$). El mes de defoliación no influenció la PPAN de *E. lanceolatus* ($P \geq 0.69$), pero la PPAN de *H. curtiseta* se redujo con las defoliaciones de agosto y septiembre ($P < 0.01$). La PPAN de ambas especies fue insensible a la ubicación en el paisaje en términos de respuestas a la defoliación. La PPAN de *E. lanceolatus* no respondió a los aspectos temporales de una única defoliación. Excepto las defoliaciones de agosto y septiembre, *H. curtiseta* también fue insensible a una única defoliación en meses distintos. *H. curtiseta* debería recibir descanso (1 año sin pastoreo) luego de ser pastoreada en agosto o septiembre, mientras que las respuestas de *E. lanceolatus* a la defoliación en diferentes meses sugiere que esta especie puede ser pastoreada todos los años.

Key Words: ANPP, Canadian Prairies, grazing management, landform elements, landforms, landscapes, Northern Mixed Prairie, northern wheatgrass, western porcupine grass

INTRODUCTION

Landscapes in the Northern Mixed Prairie are composed of many landform elements with species composition and production potential of plants varying among aspects (Ayyad and Dix 1964; Redmann 1975; Butler and Goetz 1986) and topographic positions (Klemmendson 1964; Redmann 1975). Plant community composition, the microenvironment, and resource availability also differ with slope degree, slope aspect, and landform element (Ayyad and Dix 1964; Baines 1973; Lieffers and Larkin-Lieffers 1987; Pennock et al. 1987; Braun 2005). Variable characteristics in the physical environment among slope aspects, slope degree, and landform elements can influence the rate at which plants recover their production following defoliation. Plants do indeed respond differently to grazing in different topographic positions (Archer and Tieszen 1986).

The importance of resting plants and allowing them to recover after grazing was highlighted by Voisin (1959), but few studies have addressed the time needed to regain their production potential. Resting plants after grazing might be more critical than grazing per se (Snyman 1998). Furthermore, simulation models indicate resting plants after grazing is integral to sustaining long-term productivity on rangelands

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Correspondence: J. T. Romo, Dept of Plant Sciences, 51 Campus Drive, University of Saskatchewan, Saskatoon, Saskatchewan, Canada S7N 5A8. Email: Jim.Romo@usask.ca

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