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A. Rodriguez

Universidad de Buenos Aires, Argentina

E. J. Jacobo

Universidad de Buenos Aires, Argentina

J. Zanduetta

Universidad de Buenos Aires, Argentina

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Changes on seed bank composition of Flooding Pampa rangeland by the use of glyphosate

Rodríguez, A. ; Jacobo, E. ; & Zanduetta, J. Departamento de Producción Animal, Facultad de Agronomía, Universidad de Buenos Aires. Av. San Martín 4453, Buenos Aires 1417, Argentina. arodrigu@agro.uba.ar

Key words : temperate grasslands, rangeland deterioration, herbicide use

Introduction To increase winter forage production of native rangelands of Flooding Pampa, a technique based on spraying glyphosate herbicide in late summer has been widespread during the last decade in this region. Glyphosate eliminates green vegetation growing in late summer, improving germination and establishment of cool season (C₃) annual grasses, that enhances winter forage and meat production. We postulate that annually application of glyphosate would reduce the seed bank of species that vegetate during summer, like perennial grasses and legumes, decreasing floristic diversity and deteriorating the rangeland.

Materials and methods In a commercial farm located in the Flooding Pampa region, we selected 13 paddocks dominated by native rangeland (30-120 ha each) and used for cow-calves operation. Five paddocks have never been treated with glyphosate and other 8 paddocks have been treated with glyphosate in late summer from the last 5 years consecutively. During the warm season (November 2006-February 2007) 3 soil samples (17×13×10 cm) of each paddock were extracted and put in plastic pots. The pots were watered periodically to register emerging seedlings until no more germination was observed. Each seedling was identified by genus and species and afterward were gathered in functional groups (Jacobó et al., 2006). Kruskal-Wallis test by ranks was used.

Results and discussion Seed bank of C₃ annual grasses (*Lolium multiflorum*, *Bromus unioloides*) in glyphosate-treated paddocks was significantly higher than that of non-treated ones (Figure 1), showing the effectiveness of glyphosate application to improve winter forage offer. Nevertheless, glyphosate application significantly reduced seed bank of sedges, warm season legumes (such as *Lotus glaber*) and C₄ tussock grasses (such as *Paspalum dilatatum*) (Figure 1). This may be related to the interruption of seed formation dispersal when this systemic herbicide is applied in late summer. The higher seed bank of C₄ creeping grasses in glyphosate-treated paddocks (Figure 1) is consistent with the higher tolerance of *Cynodon dactylon*, the main species of this functional group, to the herbicide. Species richness was significantly lower in glyphosate-treated paddocks respect to non-treated ones (8,75 vs. 12,67, $p < 0.01$), suggesting the lost of several seeds species form the rangeland seed bank when the technique is applied.

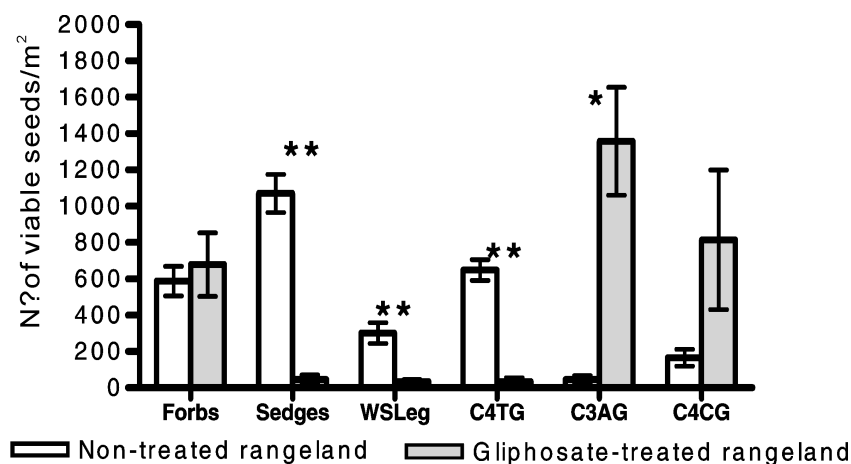


Figure 1 Number of viable seeds/m² gathered by functional groups: WSLeg: warm season legumes; C4TG: C₄ tussock grasses; C4CG: C₄ creeping grasses; C3AG: C₃ annual grasses. ** $p < 0.01$ * $p < 0.05$.

Conclusion The technique of spraying glyphosate in late summer changes seed bank composition of rangelands of Flooding Pampa and reduces seed availability of valuable forage species, leading to deterioration of this resource.

Reference

Jacobó, E., Rodríguez, A., Bartoloni, N. and Deregibus, V. A. (2006). Rotational grazing effects on rangeland vegetation at a farm scale. *Rangeland Ecology and Management*, 59(3): 249-257.