Vegetation changes following biosolids applications at an old Boer lovegrass pasture in northern Sonora, México

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Introduction

Short grass prairies (*Bouteloua-Aristida*) are the main vegetation type in northern Sonora, México, however, factors such as land fragmentation, overgrazing, severe droughts and lack of infrastructure in most ranches poor grazing management has caused land degradation. Boer lovegrass (*Eragrostis curvula* var. *conferta*) is an introduced species planted to increase productivity on deteriorated rangelands. Forage production with Boer lovegrass increases two to three fold as compared to native grasses after range seeding but productivity declines as stands become old. Biosolids have been recognized as a useful soil amendment and source of nitrogen, phosphorus, organic matter and other nutrients, which can enhance soil physical properties as well as plant yield (US Environmental Protection Agency 1999, Kinney *et al*. 2006). These organic compounds of human origins may play an important role in rangelands increasing soil fertility, however data do not exist to justify its use in México.

This study was conducted to evaluate forage responses of old Boer lovegrass stands to biosolids applications.

Methods

The study was conducted through 2006-2008 at Cananea, Sonora, México (Latitude 30°58'00"N; Longitude 110° 08'30"W). Type "A" biosolids were hand-applied during 2006 on triplicate 5 m x 5 m plots. The area was fenced to protect from cattle grazing and small wildlife.

Variables evaluated were plant density, height, basal cover and forage production. Plant density was estimated by counting plants on three 1m^2 quadrants, randomly selected per plot. Plant height was measured with a tape in all plants within these three quadrants. Plant basal cover was estimated in the same quadrants by individually measuring the basal area of each plant. Forage production was estimated by clipping forage on 10 m^2 quadrats per plots. Forage samples were taken to the University of Sonora Laboratory and weighted after they were dried in an oven for 72 h. All variables were measured for three growing seasons after biosolids application.

A randomised complete block design was used. Data were analyzed by ANOVA ($P \leq 0.05$).

Table 1. The response of old Boer lovegrass stands to biosolids at north Sonora, México.

Variable	Biosolids rates		
	0 (t/ha)	25 (t/ha)	50 (t/ha)
Grass density (pl/m^2)	3.70 b	5.30 a	6.20 a
Grass height (cm)	116.50 b	159.30 a	165.00 a
Grass basal cover (%)	14.30 b	19.60 a	21.80 a
Forage production (t/ha)	0.96 c	1.63 b	2.24 a

Results

Results show that precipitation was average during the study period with 412, 425 and 420 mm for 2006, 2007 and 2008, respectively. Plant density, height, basal cover and forage production were significantly increased ($P \leq 0.05$) by biosolids (Table 1). Boer lovegrass density averaged 3.7 pl/m^2 in the untreated control and increased 43.2 and 67.6% on plots treated with 25 and 50 t/ha of biosolids. Plant height averaged 116.5 cm in the control and increased 36.7 and 41.6 % on plots treated with 25 and 50 t/ha of biosolids. Boer lovegrass basal cover averaged 14.3% in the untreated plots and increased 37.0 and 52.4 % on plots treated with 25 and 50 t/ha of biosolids. Total forage production averaged 0.96 t/ha dry matter basis and increased 69.8 and 113.3 % on plots treated with 25 and 50 t/ha of biosolids, respectively.

These results agree with Wester *et al*. (2003) and Dominguez-Caraveo *et al*. (2010) who suggested that biosolids improve seedling emergence and may prolong the conditions needed for seedling survival, consequently increasing plant density. Similar results were reported by Fresquez *et al*. (1990) with biosolids when applied to semiarid grasslands. Sullivan *et al*. (2006) and Ippolito *et al*. (2010) reported an increase in grass growth and an increase in perennial cover of several grass species, as well as an increase in forage quality and biomass production in areas treated with biosolids (Wester *et al*. 2003; Sullivan *et al*. 2006). These forage responses have been evident even 4 to 6 years after biosolids application (Wester *et al*. 2003; Tarrason *et al*. 2007).

Conclusion

Biosolids significantly increased Boer lovegrass plant density, height, basal cover and forage production even three

growing seasons after application at rates of 25 and 50 t/ha in a semiarid rangeland. Ranchers using biosolids may almost double the grazing capacity and production potential of their rangelands. The uses of these nutrient-rich organic materials can play an important role in the improvement of deteriorated rangelands in northern México.

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