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Effects of Cattle Stocking Rates on Nematode Communities in South Florida

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Abstract

Ranch management practices aimed at cattle and pasture vegetation have the potential to impact other animals as well, including nontarget organisms. Soil-inhabiting nematodes are often used as bioindicators of nontarget effects because of their widespread occurrence and their diverse trophic habits and lifestyles. The effect of cattle stocking rates on nematode communities present in the soil was examined at the MacArthur Agro-Ecology Research Center in south-central Florida. Nematode abundance and richness (genera per sample) were not affected ($P > 0.10$) by cattle grazing in 2 different pasture types (tame grass and native) over three seasons. In general, populations of most nematodes showed strong seasonal responses, varying in numbers from year to year, possibly related to soil moisture levels. In comparison, the cattle stocking rates typically used in south-central Florida had little effect on soil nematodes, which were abundant nontarget organisms in this system.

Resumen

Las prácticas de manejo de pastizales dirigidos al ganado y la vegetación también tienen el potencial de impactar otros animales, incluyendo organismos que no son el blanco de interés. Por su amplia dispersión y sus diversos hábitats tróficos y estilos de vida, los nemátodos que habitan el suelo a menudo son usados como bioindicadores de efectos no deseados. Se examinó el efecto de las cargas animal del ganado sobre las comunidades de nemátodos presentes en el suelo en la Estación Experimental Agro-Ecológica McArthur localizada en el centro-sur de Florida. La abundancia y riqueza (géneros por muestra) de nemátodos no fueron afectados ($P > 0.10$) por el apacentamiento de ganado en 2 tipos diferentes de pradera (introducida y nativa) durante tres estaciones. En general, la población de la mayoría de los nemátodos mostraron fuertes respuestas estaciónales variando en número de año a año, posiblemente en función de los niveles de humedad del suelo. Las cargas animal típicamente usadas en la región centro-sur de Florida tienen poco efecto en los nemátodos del suelo, los cuales fueron abundantes en el sistema.

Key Words: bioindicators, grazing, nontarget organisms, pastures, ranch management, richness, trophic structure

INTRODUCTION

Ecosystems contain diverse communities of living organisms, from well-known vertebrates to relatively obscure microscopic forms (Begon et al. 1990; Stiling 2002). Any management practice applied for a specific purpose to an ecosystem may unintentionally disrupt some of these nontarget organisms that invariably occur within the system. For example, ruminant grazing impacts both native herbaceous plants and smaller herbivores in grassland ecosystems (Bolen and Robinson 1999). However, aboveground grazing impacts belowground processes as well (Bardgett and Wardle 2003), affecting microscopic soil organisms involved in decomposition processes (Coleman and Crossley 1996). Nematodes are a particularly diverse and abundant group of invertebrates that respond to a variety of disturbances to soil ecosystems including input of organic matter (Ferris et al. 2001; Wang et al. 2004c), tillage (Fiscus and Neher 2002), cover crops (Ferris et al. 2004; Wang et al. 2004a), and input of fertilizer nutrients and other chemicals (Ferris et al. 2004; Fiscus and Neher 2002; Wang et al. 2004b). Aboveground grazing impacts on nematodes are variable (Mulder et al. 2003), but linked to the quantity and quality of resultant organic matter and microbial biomass, with more impact on bacterivores expected in fertile systems and more impact on fungivores in infertile systems (Bardgett and Wardle 2003; Wardle et al. 2004).

This article is the third in a series of 4 articles from an integrated project addressing the influence of stocking density on the ecological, production, and economic aspects of ranch management systems in the subtropical rangelands of south central Florida. The current study seeks to determine the impact of aboveground grazing of grass by different cattle densities on belowground nematode communities in these pasture-based ecosystems. Nematodes possess many characteristics of good bioindicators (Anderson 1999), their responses to a variety of environmental factors are relatively well documented (McSorley 1997a; Bongers and Bongers 1998), and the group includes genera with a variety of different feeding habits (Bongers and Bongers 1998). Our null hypothesis was that grazing by

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