Plant-parasitic nematodes associated with *Panicum maximum and Mimosa hirsutissima* in a pasture field

Fitonematoides associados com *Panicum maximum* e *Mimosa hirsutissima* em uma área de pastagem

Fitonematodos asociados a *Panicum maximum* y *Mimosa hirsutissima* en una zona de pastoreo

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ABSTRACT
Pastures and weed plants can host plant-parasitic nematodes of economic importance, with the limited yield of pastures representing a continuous challenge for agriculture, especially in the lower Jequitinhonha Valley in southeastern Brazil, where dairy and beef cattle play a crucial role in the local economy. From this perspective, this study aimed to provide information on the population density of plant-parasitic nematodes associated with *Panicum maximum* cv. Mombaça and *Mimosa hirsutissima*, weed species commonly found in pasture areas cropped with this grass in the municipality of Almenara, MG, in the Jequitinhonha Valley region of southeastern Brazil. Soil and root samples were collected from the field and placed in plastic bags, which were labeled and taken to the laboratory for nematode extraction. Nematode population densities were estimated in a Peters counting slide under a light microscope, and genera identification was based on morphological traits. In rhizosphere soil (100 g) of *P. maximum* cv. Mombaça, the highest population densities were observed for *Helicotylenchus* sp. (3,999), followed by *Tylenchus* sp. (1,191), *Meloidogyne* spp. (939), and *Pratylenchus* sp. (544). In roots (1 g), on the other hand, the highest values corresponded to *Pratylenchus* sp. (19.6) and *Meloidogyne* spp. (15.5). However, in rhizosphere soil of *M. hirsutissima*, the highest population densities were recorded for *Tylenchus* sp. (2,072), *Helicotylenchus* sp. (1,883), *Pratylenchus* sp. (751), and *Meloidogyne* spp. (307). In contrast, in the roots, the highest

values were observed for *Meloidogyne* spp. (6.9), *Tylenchus* sp. (4.4), and *Pratylenchus* sp. (2.7). These findings are essential to take decisions on the management of plant-parasitic nematodes.

Kewwords: survey, *Meloidogyne* spp., *Pratylenchyus* sp., forage, dormideira, mombaça grass.

RESUMO

Plantas daninhas e pastagens podem ser hospedeiras de fitonematoides de importância econômica. A produtividade limitada das pastagens tem representado um desafio contínuo, principalmente na região do baixo Vale do Jequitinhonha, onde a pecuária de corte e de leite desempenha um papel crucial na economia local. Desta forma, o objetivo deste trabalho foi estimar a densidade populacional de fitonematoides associados com *Panicum maximum* cv. Mombaça e *Mimosa hirsutíssima*, planta daninha comumente encontrada em uma área de pastagem no município de Almenara, MG, região do Vale do Jequitinhonha. Para isso, amostras de solo e raízes foram coletadas, colocadas em sacos plásticos, identificadas e encaminhadas ao Laboratório para extração dos nematoides. As densidades populacionais foram estimadas em lâmina de Peters sob microscópio de luz e a identificação dos gêneros foi realizada com base em caracteres morfológicos. Em solo rizosférico (100 g) proveniente de *P. maximum* cv. Mombaça foram observadas elevadas densidades populacionais para *Helicotylenchus* sp. (3.999), *Tylenchus* sp. (1.191), *Meloidogyne* spp. (939) e *Pratylenchus* sp. (544), enquanto em raízes (1 g), os valores mais elevados foram obtidos para *Pratylenchus* sp. (19,6) e *Meloidogyne* spp. (15,5). Por outro lado, em solo rizósferico de *M. hirsutissima*, as maiores densidades populacionais foram detectadas para *Tylenchus* sp. (2.072), *Helicotylenchus* sp. (1.883), *Pratylenchus* sp. (751) e *Meloidogyne* spp. (307), e em raízes, para *Meloidogyne* spp. (6,9), *Tylenchus* sp. (4,4) e *Pratylenchus* sp. (2,7). Estes resultados são essenciais na tomada de decisões sobre o manejo destes fitonematoides.

Palavras-chave: levantamento, *Meloidogyne* spp., *Pratylenchyus* sp., forrageira, dormideira, capim-mombaça.

RESUMEN

Las malezas y los pastos pueden albergar fitonematodos económicamente importantes. La limitada productividad de los pastos ha sido un desafío continuo, especialmente en la región del valle de Jequitinhonha, donde la ganadería de carne y lácteos juega un papel crucial en la economía local. Por lo anterior, el objetivo de este estudio fue estimar la densidad poblacional de fitonematodos asociados con Panicum maximum cv. Mombasa y Mimosa hirsuíssima, una maleza que se encuentra comúnmente en una zona de pastoreo en el municipio de Almenara, en la región del valle de Jequitinhonha. Para ello, se recolectaron muestras de suelo y raíces, se colocaron en bolsas plásticas, se identificaron y se enviaron al Laboratorio para la extracción de los nematodos. Las densidades poblacionales se estimaron en portaobjetos de Peters bajo microscopio de luz y la identificación de géneros se realizó con base en caracteres morfológicos. En suelo rizosférico (100 g) de P. maximum cv. Se observaron densidades poblacionales elevadas de Mombasa para Helicotylenchus sp. (3,999), Tylenchus sp. (1,191), Meloidogyne spp. (939) y Pratylenchus sp. (544), mientras que en raíces (1 g), los valores más altos se obtuvieron para Pratylenchus sp. y Meloidogyne spp. 15.5. Por otro lado, en el suelo rizosférico de M. hirsutissima se detectaron las mayores densidades de población para Tylenchus sp. (2,072), Helicotylenchus sp. (1,883), Pratylenchus sp. (751) y

Meloidogyne spp. (307), y en raíces, para Meloidogyne spp. (6,9), Tylenchus sp. (4,4) y Pratylenchus sp. 2.7. Estos resultados son esenciales en la toma de decisiones sobre el manejo de estos fitonematodos.

Palabras clave: topografía, Meloidogyne spp., Pratylenchyus sp., forraje, amapola, pasto.

1 INTRODUCTION

Livestock production is one of the most important activities in Brazil, significantly contributing to both national and international markets (Gomes et al., 2017). In this scenario, counting on the largest commercial cattle herd in the world and with meat and milk production in constant increase, livestock farming is an essential sector for Brazilian agriculture (Valle and Pereira, 2019; ABIEC, 2020). However, one of the most persistent challenges that affect this enterprise is the low yield of the Brazilian pastures (Euclides et al., 2021). Among the forage grasses species used in Brazil, *Panicum maximum* is of great relevance (Rodrigues et al., 2020; Florentino et al., 2022).

In the Jequitinhonha Valley, where dairy and beef cattle are fundamental for the local economy, pasture management practices are of paramount importance (Santos and Souza, 2020). This region accounts for 9% of the herd of the State of Minas Gerais and is responsible for a significant amount of milk production in the state (RECITAL, 2020). However, in order to potentialize this market, it is necessary to enhance the quality of pastures. One constraint to this end is represented by weeds, which can affect pasture production (Oliveira and Freitas, 2008). Therefore, identifying the adequate control method for weeds species is essential to obtain healthy and productive pastures (Tuffi Santos et al., 2004).

However, apart from the challenges related to weed management, it is essential to consider other factors that affect pasture productivity, e.g., presence of plant-parasitic nematodes (Inomoto et al., 2007; Carvalho et al., 2013; Mainardi and Asmus, 2015; Babilônia and Mendes, 2020). In view of this, this study aimed to provide information on the population density of plant-parasitic nematodes associated with *Panicum maximum* cv. Mombaça and *Mimosa hirsutissima*, weed species commonly found in pasture areas cropped with this grass in the municipality of Almenara, MG, in the Jequitinhonha Valley region of southeastern Brazil.

2 MATERIAL AND METHODS

A survey for phytonematodes was conducted during July 2022 in a field of 5 hectares cultivated with *P. maximum* cv. Mombaça, showing the predominance of the weed commonly known as *dormideira* (*M. hirsutissima*), in the municipality of Almenara, located in the lowland region of the Jequitinhonha Valley, northeast of the State of Minas Gerais, Brazil (16°04'25''S, 40°38'29''W).

Twenty sub-samples of soil and roots were randomly collected from the surveyed plant species at a depth of 0-20 cm from the root zone of plants. Then, the samples were thoroughly mixed, and a composite sample weighing approximately 400 g of soil and 80 g of roots was placed in plastic bags and taken to the Plant Pathology Laboratory of the Institute of Agrarian Science of the Federal University of Minas Gerais. Weed identification was based on the descriptions of Lorenzi (2008 and 2014).

Nematodes were extracted from 100 g of soil in triplicate, according to the method of Jenkins (1964). The nematodes extracted from Mombaça grass roots were obtained by processing 64 g of roots and 21 g of dormideira grass roots, according to Coolen and D'Herde (1972). Nematode identification was performed according to morphological features (Mai and Mullin, 1996) and their population density was estimated by counting the nematodes using a Peters counting slide under a light microscope.

3 RESULTS AND DISCUSSION

The survey revealed that nine nematode genera were present in the field (Table 1). In rhizosphere soil of *P. maximum*, the highest population densities were observed for *Helicotylenchus* sp. (spiral nematode), followed by *Tylenchus* sp., *Meloidogyne* spp. (root-knot nematode), and *Pratylenchus* sp. (root-lesion nematode). In the roots, the highest population levels corresponded to *Pratylenchus* sp. and *Meloidogyne* spp. On the other hand, in rhizosphere soil of *M. hirsutissima*, the highest population densities were recorded for *Tylenchus* sp., *Helicotylenchus* sp., *Pratylenchus* sp., and *Meloidogyne* spp. In the roots, the highest values were observed for *Meloidogyne* spp., *Tylenchus* sp., and *Pratylenchus* sp., with this weed being a new host to economically important phytonematodes and with the possibility of maintaining high nematode population densities in the field.

Helicotylenchus sp. nematodes are cosmopolitan and feed on numerous plants worldwide, including forage grasses (Shurtleff and Averre, 2000). Our results partially support a previous study (Inomoto et al., 2007) that reported that *Mombaça* grass can

increase the population density of *P. brachyurus* in the soil. With regard to *Meloidogyne* species, this grass was considered susceptible to *M. javanica* showing a reproduction factor greater than 1.0 (Babilônia and Mendes, 2020). This survey will be useful to establish further studies about the damage of these genera on Mombaça grass and develop management practices.

Table 1. Nematode population densities found in 100 g of soil (mean number of nematodes) and 1 g of roots of *Panicum maximum* cv. Mombaça and *Mimosa hirsutíssima*.

Genera	***Panicum maximum***		***Mimosa hirsutissima***	
	Soil	**Roots**	**Soil**	**Roots**
Pratylenchus	544	19.6	751	2.7
Meloidogyne	939	15.5	307	6.9
Helicotylenchus	3999	0	1883	1.0
Tylenchus	1191	3.4	2072	4.4
Rotylenchus	292	0.3	256	0
Tylenchulus	158	1.3	47	0
Rodopholus	0	0	20	0
Mesocriconema	33	0	0	0
Paratylenchus	157	0.3	270	1.0

Source: Author's research

4 CONCLUSIONS

Nine genera of nematodes associated with *P. maximum* and/or *M. hirsutissima* were identified: *Pratylenchus* sp., *Meloidogyne* spp., *Helicotylenchus* sp., *Tylenchus* sp., *Rotylenchus* sp., *Tylenchulus* sp., *Radopholus* sp., *Mesocriconema* sp., and *Paratylenchus* sp. Of these, *Pratylenchus* sp., *Meloidogyne* spp., *Tylenchus* sp., and *Paratylenchus* sp. were observed concomitantly in soil and roots in both plant species.

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