Survey of fungi present in plant species of the dry forest in the microregion of Januária – MG

https://doi.org/10.56238/sevened2023.001-025

Amanda Dayanne Malta Matos
Doctoral student in Plant Production;
E-mail:amandadmmatos@gmail.com

Michelle de Oliveira Santos
Undergraduate student in Agronomic Engineering;

Luciele Barboza de Almeida
Master's Degree in Plant Production;

Martielle Batista Fernandes
PhD in Plant Production;

Sabrina Gonçalves Vieira de Castro
Master's student in Plant Production;

Irisléia Pereira Soares de Sousa
Doctoral student in Plant Production;

Marielly Maria Almeida Moura
Doctoral student in Plant Production;

Mirna Ariane Taveira de Sousa e Souza
Doctoral student in Plant Production;

Isabela Oliveira Santos
Doctoral student in Plant Production;

Edson Hiydu Mizobutsi
Doctor in Plant Pathology.

ABSTRACT

The dry forest is characterized by presenting a seasonal rhythm qualified by leaf fall during the dry period followed by recovery of the plant canopy in the rainy season. In this environment, there are studies related to the plant characterization of the area, but its microbiota is little studied. Thus, the objective of this work was to carry out a survey of phytopathogenic and endophytic fungal species found in plant species of the dry forest of the microregion of Januária-MG. Plants with typical disease symptoms were collected and the fungi isolated in the laboratory. To obtain the endophytic fungi, healthy tissues were collected. Morphological analyses were implemented to characterize the genus. In addition, the mycelial growth velocity index, characterization of mycelial color and texture were calculated. Thirty-three colonies of phytopathogenic fungi and thirteen colonies of endophytic fungi were isolated from the thirteen plant species collected. It was possible to identify the phytopathogenic fungus of the genus Pestalotia sp in cashew (Anacardium humile), jatobá (Hymenaea courbaril) and parakeet (Cochlospermum orinocense) plants and the fungus Penicilium, endophytic in castor bean plants (Esenbeckia febrifuga).

Keywords: *Febrifuge esenbeckia*, Etiology, Endophytic fungus, *Pestalotia*.

1 INTRODUCTION

The dry forest or seasonal deciduous forest is characterized by a sharp drop of leaves during the dry season. In the north of Minas Gerais, in the region of Januária, a typical dry forest can be found, on the limits of the municipality with Cônego Marinho and Bonito de Minas. Interest in the knowledge of fungal species with potential employment in agricultural practices has increased significantly with the discovery of plant growth promoting microorganisms, biological control agents for pests, pathogens, and weeds. Studies in the area of biological control invest in the use of microorganisms as

potential substitutes for chemical products in crops, thus favoring the preservation of the environment (Peixoto Neto et al., 2002).

Due to the fact that the dry forest is a little-explored biome, the chances of finding new microorganisms associated with plant species are high. The present work proposed to isolate and identify phytopathogenic and endophytic fungi present in dry forest species in the microregion of Januária/MG from the description morphological characterization of the genus, definition of mycelial growth rate, color and texture of the mycelium. In addition, the objective of this study was to set up a mycotheque and a herbarium with injured tissues to record the patterns of injury caused by phytopathogenic fungi.

2 MATERIAL AND METHODS

The work was carried out at IFNMG – Campus Januária – Laboratory of Phytopathology and at the State University of Montes Claros – Laboratory of Epidemiology and Biocontrol of Microorganisms. The samples were collected in the dry forest in a locality located on the banks of the municipal highway between Brejo do Amparo and the interchange that gives access to Cônego Marinho and Bonito de Minas.

Samples were collected between February and April 2012, during the rainy season. The material was taken from stems and leaves of plants with necrotic and healthy lesions. The trees were georeferenced. In the laboratory, part of the material was separated to make exsiccata. The indirect isolation of the fungus was performed in potato dextrose agar (PDA) medium and the material was kept at 25oC and photoperiod of 12 h.

In order to isolate endophytic fungi, it was proposed to use different culture media in order to select the medium that would allow greater recovery of these microorganisms. Thus, the following were used: acidified PDA, Sabouraud, Nutrient Agar and Plate Count Agar (PCA). For three days, the number of distinct colonies developed on each plate was counted. One colony was considered different from the other according to the color and texture of the mycelium it presented. The isolates obtained in pure culture were transferred to test tubes containing BDA and stored at 4°C. The identification of the genus was performed based on morphological characters according to dichotomous keys for imperfect fungi (Barnett, 1998).

To define the mycelial growth velocity index (MCVI), a disk of PDA medium with fungal mycelium (0.5 cm) was deposited in the center of each Petri dish with PDA medium, and three plates were used to evaluate the IVCM per isolate. Daily, for seven days, measurements were made in two perpendicular directions of the colony with the aid of a digital caliper. The mean diameter of each colony/evaluation was calculated. These data were used in the calculation of the MCVI, according to

the formula: MCVI = Σ (D – Da) x N -1, where: D = current mean diameter of the colony; Da= average diameter of the previous day's colony; N= number of days after inoculation.

The experimental design was completely randomized, with three replications. To determine the texture and color of the colonies, fifteen isolates were placed to grow in PDA medium under the incubation conditions described above. After seven days, the colonies were analyzed to define the texture according to the methodology of Nobles (1948) cited by Silva (2006).

To evaluate the color of the mycelium of the surface and reverse of the colony, the Munsell Soil Color Charts was used.

Samples were collected from twelve plant species from the dry forest in the region of Januária/MG, among them periquiteira, cagaita, joá, cajuí, jatobá and jacarandá do cerrado. The choice of plant species was made according to their economic or medicinal importance. Of these, 33 colonies of phytopathogenic fungi were obtained.

To obtain the endophytic fungi, the castor bean (*E. febrifuga) was selected*, because it is a medicinal species and did not present any typical lesion of pathogens, demonstrating that, for some reason, it remained resistant to the attack of microorganisms even though it was in an environment where several other species presented.

3 RESULTS AND DISCUSSION

About thirteen colonies of endophytic fungi were obtained from castor bean samples. The Nutrient Agar medium showed the lowest performance in the recovery of fungal colonies.

Table 1. Morphological characterization of 15 isolates from plant species from the dry forest of the region of Januária/MG based on the mycelial growth velocity index (IVCM), mycelium color and texture.

Isolado	Hospedeiro	IVCM	Cor micélio aéreo	Cor reverso colônia	Textura
AM 01	Periquiteira	1,224	Branco	Marrom amarelado escuro	Camurça
AM 04	Cajui	1,093	Branco	Branco	Camurça
AM 05	Cajui	1,329	Cinza esverdeado claro	Cinza Claro	Cotonosa
AM 06	Cajui	1,200	Branco	Cinza Claro	Lacunosa
AM 07	Jatobá	1,091	Marrom oliva	Cinza muito escuro	Aveludada
AM 10	Jatobá	1,399	Branco	Branco	Camurça
AM 18	Cagaita	0,988	Cinza esverdeado muito escuro	Cinza esverdeado escuro	Camurça
AM 23	Joá	0,998	Marrom escuro acinzentado	Cinza esverdeado muito escuro	Crostosa
AM 24	Joá	1,089	Branco	Cinza	Farinácea
AM 25	Mamoninha	0,721	Cinza esverdeado	Cinza esverdeado claro	Camurça
AM 31	Mamoninha	0,893	Branco	Cinza claro	Aveludada
AM 32	Mamoninha	2,435	Branco	Preto	Flocosa
AM 34	Jacarandá do Cerrado	1,383	Branco	Marrom oliva claro	Cotonosa
AM 35	Jacarandá do Cerrado	1,008	Cinza	Preto	Plumosa
AM 36	Jacarandá do Cerrado	1,116	Amarelo	Vermelho escuro	Lacunosa

The endophytic isolate AM 25 was identified as *Penicillium* sp. This genus is very common as a causal agent of molds or blue molds, however, it has been reported as an endophytic fungus producing

compounds with interesting characteristics for various purposes (Mathew et al., 2010; Intaraudom et al., 2012).

The isolates presented different MVI, with BF 25 and AM 32 being the ones with the lowest and highest MVI, with 0.721 and 2.435 cm/day, respectively (Table 1). The color of the mycelium ranged from greenish, grayish, whitish and darkish tones to suede, cottony, lacunous, velvety, crusted, floury, flaky and feathery (Table 1). The exsiccates were of good quality, allowing the observation of the lesion pattern in the plant tissue.

4 CONCLUSIONS

The fragment of Mata Seca near the municipality of Januária-MG, finds many plant species affected by phytopathogenic fungi.

The genus *Pestalotia* was identified in three plant species and the genus *Penicilium* was identified as an endophytic fungus in castor bean.

The other isolates obtained should be identified, because it is believed, based on the morphological characterization of the colonies, that there is a wide variety of pathogenic and endophytic species in the collected material.

ACKNOWLEDGMENT

To CNPq for the granting of the scientific initiation scholarship to the second author. To the Laboratory of Epidemiology and Biocontrol of Microorganisms of Unimontes – Montes Claros/MG.

REFERENCES

BARNETT, H.L.; HUNTER, B.B. 1998 Illustrated genera of imperfect fungi. St. Paul: The American Phytopathological Society.

BATISTA, M. A.; TIMMERS, J. F.; CUNHA, R. P. P. 2006 Os Estados da Mata Atlântica - Bahia. In: Maura Campanili; Miriam Prochnow. (Org.). Mata Atlântica - Uma rede pela floresta. Brasilia: Rede de Ongs da Mata Atlântica, p. 129-141.

INTARAUDOM, C.; BOONYUEN N.; SUVANNAKAD R.; RACHTAWEE, P.; PITTAYAKHAJONWUT, P. 2012 Penicolinates A- E from endophytic Penicillium sp. BCC16054, Tetrahedron Letters, Available online 23 November 2012, ISSN 0040-4039.

MATHEW A.J.; JAYACHANDRAN K. 2010 Endophytic Penicillium citrinum Thom. from Scoparia dulcis Linn. Indian Journal of Microbiology, v 50, p 99-102.

PEIXOTO NETO, P. A. S.; AZEVEDO, J. L.; ARAÚJO, W. L. 2002 Microrganismos endofíticos. Biotecnologia Ciência & Desenvolvimento, Brasília, v. 29, p. 62-77.

SILVA, C. F. B. 2006 Características culturais e agressividade de isolados de Alternaria solani de batateira e tomateiro. Dissertação (Mestrado em Fitopatologia)-Universidade Federal de Viçosa-UFV.