Australian Journal of Basic and Applied Sciences

2018 Sept; 12(9): pages 128-130
DOI: 10.22587/ajbas.2018.12.9.21

Research Article
Journal home page: www.ajbasweb.com

AENSI Publications

Identification of Wood Deteriorating Fungi in a Semi-Deciduous Seasonal Forest Fragment

[1]Adão Batista de Araújo, [1]Thiago Cardoso Silva, [1]Josias Divino Silva de Lucena, [1]César Henrique Alves Borges, [1]Lúcia dos Santos Rodrigues, [2]Vinícius Staynne Gomes Ferreira, [1]Emmanoella Costa Guaraná Araujo and [1]Lúcia de Fatima de Carvalho Chaves

[1]Federal Rural University of Pernambuco, Recife, Pernambuco, Brazil
[2]Federal University of Campina Grande, Patos, Paraíba, Brazil

Correspondence Author: Adão Batista de Araújo, Federal Rural University of Pernambuco, Recife, Pernambuco, Brazil
E-mail: adao.b@hotmail.com

Received date: 12 June 2018, Accepted date: 14 September 2018, Online date: 25 September 2018

Abstract

The plants present a natural defense against degradation, but they are subject to the biodeterioration of their living or dead tissues, and some species are more susceptible than others due to their chemical composition and genetic load, which give them their characteristics of natural preservation. Due to its chemical and structural arrangement, the wood can suffer deterioration by different forms and can occur by chemical, physical, mechanical and biological agents. The primary biological agents responsible for the degradation of wood structures are insects, fungi, mollusks, crustaceans, and bacteria. Macrofungi constitute heterotrophic organisms that form easily distinguishable structures popularly known as mushrooms, ear-of-wood, molds, among others, some of these forms being associated with tree deaths in forest environments. Thus, the present work aimed to identify in situ situating fungi of wood in a fragment of Seasonal Semideciduous Forest, differentiating if such fungi occur in dead wood and live tree trunks. The study was developed in a native forest fragment, located in the municipality of Itambé-PE, with an area of 650 ha, for which information on the use history refers to at least 100 years without direct interventions. The city was divided into six rows spaced 400 meters apart, which were traversed to identify the fungal structures present in the woody materials. The evaluated characteristics for identification of the fungi were the color, size and specific morphometric features of the species, whose results were compared with the information described in the collection of the URM - UFPE Micoteca, following a taxonomic classification according to the Index Fungorum. 27 morphometrically different wood deteriorating fungi were observed in the natural environment, of which 20 morphospecies were identified, 13 of which occurred in dead woody material and the other seven species in living wood. The order with the highest species richness was Poryporales, whose fungi are responsible for the deterioration of lignocellulosic materials. The environmental conditions at the time of observation contributed to the development of the fruiting bodies of the fungi but may have made it difficult to identify them in the field.

Key words: Tropical forests, Xylophagous fungi, Wood biodeterioration

INTRODUCTION

The plants have a natural defense against degradation but are subject to the biodeterioration of their living or dead tissues. Some species are more susceptible than others, due to their chemical composition and genetic load, which give them their characteristics of natural preservation. Also, the environmental conditions where these species are inserted, or where the wood is exposed, contribute to the degradation of the material and the appearance of organisms. Therefore, decomposition of organic matter is one of the most critical stages in natural biogeochemical cycles, although it is undesirable in living plants and, consequently, in wood products (Taiz et al., 2017; Esposito; Azevedo, 2004).

Due to its chemical and structural composition, the wood can suffer deterioration of different forms, highlighting the damages caused by chemical, physical, mechanical and biological agents. The primary biological agents responsible for the degradation of wood structures are insects, fungi, mollusks, crustaceans, and bacteria (Moreschi, 2013). The mushrooms, when attacking woody materials, eventually degrade them, causing the appearance of discoloration, release of odors characteristic of the decomposition and disintegration of particles, which reduces the resistance of wood (Stangerlin et al., 2013).

The macrofungus are heterotrophic organisms whose reproduction can be by vegetative form or by means of spores, in addition to forming fruiting bodies, efficiently distinguishable macroscopic structures popularly known as mushrooms, wooden ears, molds, among others (Rennó et al. 2016), some of these forms being associated with tree deaths in forest environments, acting as parasites and infecting tree individuals, spreading diseases and aggravating injuries.

In Brazil, due to the occurrence of different phytogeographical domains, a vast diversity of fungi occurs naturally. According to Maia and Carvalho Júnior (2010), there is a diversity of 1,749 species of endemic fungi in the Northeast of Brazil.

Thus, the present work aimed to identify in situ situating fungi of wood in a fragment of Seasonal Semideciduous Forest, differentiating if such fungi occur in dead wood and live tree trunks.

METHODS AND MATERIALS

Citation: Citation: Adão Batista de Araújo, et al., Identification of wood deteriorating fungi in a Semi-Deciduous Seasonal Forest Fragment. Australian Journal of Basic and Applied Sciences, 12(9): 128-130. DOI: 10.22587/ajbas.2018.12.9.21

The study was carried out in a forest fragment belonging to the Olho d'Água Central Plant, located in the municipality of Camutanga-PE, in the northern area of Pernambuco, at a distance of 113 km from the capital Recife, at coordinates 07º24'25 "latitude south and 35º16'28 "west longitude. Besides the municipality mentioned above, the territorial extension of the Plant covers some neighboring cities, as is the case of Itambé, Ferreiros, Aliança, Timbaúba, in Pernambuco, as well as other municipalities in the State of Paraíba.

The As' climate in the Köppen classification is warm and humid, with an average rainfall of 1,220 mm/year, mean annual temperature of 24ºC and average annual relative humidity of 80%. The predominant soil in the region is classified as umbric-dystrophic red-yellow Argisol, medium/clayey texture. The dominant forest typology is the Semidecidual Seasonal Forest (Álvares et al., 2013; EMBRAPA, 2013; IBGE, 2012).

The fragment selected for this study is located on the border between the municipalities of Itambé and Camutanga, distant 2.0 km from the headquarters of the Plant. This area has 650 hectares, with information on the use history that refer to at least 100 years without direct interventions. The city was divided into six rows spaced 400 meters between each other, to locate and identify the fungal structures (fruiting bodies) present in the woody materials, observing the occurrence of fungi in dead wood (logs and fallen branches), in the forest of living individuals or both situations. The evaluations were carried out in March and April of 2018.

The morphological characterization of the fungi was performed through the visual identification of the structures, which were photographed and the images were compared with the information described in the Micoteca URM collection (Mycology Department, Biological Sciences Center, Federal University of Pernambuco). The evaluated characteristics for identification of fungi were color, size and specific morphology of the individuals. The mushrooms were taxonomically classified according to the Index Fungorum (http://www.indexfungorum.org/).

RESULTS

A total of 27 morphometrically different wood-decaying fungi were found in a natural environment of a semideciduous seasonal forest fragment in Pernambuco, of which 20 (Figure 01) were identified at least at the taxonomic order level (Table 1). The other seven species were not detected in greater detail and were therefore included in the article only for additional information on species richness.

The fungi identified were distributed in seven orders, with emphasis on the order Polyporales, responsible for 50% of the richness of species raised. Gloeophyllales was the second most wealthy order, representing 20% of the species. The genera with the highest species richness were *Pycnoporus* and *Neolentinus*, which were represented by 25% and 20% of the species, respectively.

Table 1: Taxonomic classification of macroscopic wood deteriorating fungi in a natural environment of a semideciduous seasonal forest fragment of Itambé, Pernambuco - Brazil.

ORDER	FAMILY	GENRE	SPECIES	FIGURE
Agaricales	---	---	---	A
Auriculariales	Auriculariaceae	---	---	B
Gloeophyllales	Gloeophyllaceae	*Neolentinus*	*Neolentinus* sp.	C, D, E e F
			N. lepideus	G
Helotiales	Helotiaceae	*Bisporella*	*Bisporella*sp.	H
Polyporales	Fomitopsidaceae	*Antrodia*	*A. xantha*	I
		Postia	*P. guttulata*	J
	Hymenochaetaceae	*Phellinus*	*P. robiniae*	K
	Polyporaceae	*Hexagonia*	*H. hydnoides*	L
		Pycnoporus	*Pycnoporus*sp.	M, N, O e P
			P. cinnabarius	Q
		Trametes	*T. versicolor*	R
Xylariales	Xylariaceae	*Hypoxylon*	*Hypoxylon* sp.	S e T

In all, seven species were identified in living wood (fungi A, I, J, K, L, M, and O), either in live trunks or branches. The remaining 13 species were observed in a dead woody material. The data was the mean and standard deviation (n = 6). There were significant differences (P <0.05), as shown in figure 1 below.

Fig. 1: Wood spoilage fungi species in a natural environment of the Semidecidual Seasonal Forest fragment in Itambé, Pernambuco / Brazil.

Citation: Citation: Adão Batista de Araújo, et al., Identification of wood deteriorating fungi in a Semi-Deciduous Seasonal Forest Fragment. Australian Journal of Basic and Applied Sciences, 12(9): 128-130. DOI: 10.22587/ajbas.2018.12.9.21

DISCUSSION

Among the orders observed in the field, Polyporales presented the highest species richness. According to Reck and Silveira (2008), this order is one of the most representative among xylophagous fungi, thus giving great ecological importance in forest environments. These fungi are responsible for degrading the lignocellulosic materials and can occur in both tree trunks, litter, and soil. This fact was observed in the area, because among the seven species that occurred in living wood, six belonged to the order Polyporales.

The order Agaricales presented the other representative of the fungi found in living woody material. This order presents naturally occurring fungi in Brazil. Karstedt and Stürmer (2008) evaluated the behavior of individuals of this order in a Dense Ombrophylous Forest fragment and *Pinus* forest plantations in the state of Santa Catarina, concluding that in the native forest fragment there is more diversity than in plantations of exotic species, these also interfered in the individuals of *Pinus*.

The other fungi classified as taxonomically also have wood degradation capacity, also being associated with tree deaths in forest environments, as in the case of fungi of the genus *Neolentinus*, which appear in places with low luminosity, inhabiting fallen logs in the forest (Vlasenko et al., 2017), and was the second genus with the greatest diversity found in the area.

In a study carried out on a fragment of the Atlantic Forest of the Serra do Itajaí National Park, in Santa Catarina, Borba-Silva et al. (2015) identified 58 species of decomposing wood polypores, also occurring the species *Hexagonia hydnoides* and two species of the genus *Phellinus* and *Trametes*. It is observed that these genera and their species are of natural occurrence in the Brazilian Atlantic forest, acting as a regulator of the organic matter in these environments.

The fungus *Trametes versicolor* is also notable for its ability to deteriorate *Eucalyptus spp*. Wood, especially for the deterioration of both sapwood and heartwood (Silva et al., 2014).

As observations were made at the beginning of the rainy season in the region, presenting average precipitation between 120 and 160 mm and average temperatures between 25ºC and 27ºC (APAC, 2018), therefore the environmental conditions of temperature and humidity provided a favorable environment for the development of the fungi in the fragment. Nevertheless, questions such as the altitude of the studied area, high frequency of goes and conditions of higher atmospheric humidity influence the appearance of the fruiting bodies of the fungi (Rennó et al., 2016), which may have facilitated or hindered the identification of this visual mode.

Conclusion:

The native forest fragment evaluated has a richness of at least 27 morphometrically different fungi. Among them, the Poryporales order is the one with the highest number of xylophagous fungi present in the fragment, occurring both in living wood and dead woody material.

ACKNOWLEDGEMENTS

The present work was carried out with the support of the Coordination of Improvement of Higher Education Personnel - Brazil (CAPES) - Financing Code 001. We also thank the Central Power Plant Olho d'Água and the Federal Rural University of Pernambuco for their research support.

REFERENCES

APAC. Agência Pernambucana de Águas e Climas. Monitoramento Pluviométrico. Available in: <http://www.apac.pe.gov.br/meteorologia/monitoramento-pluvio.php>. Access in: 20 abr. 2018.

Alvares, C.A., J.L. Stape, P.C. Sentelhas, J.L. Moraes Gonçalves and G. Sparovek. 2013. Köppen's climate classification map for Brazil. *Meteorologische Zeitschrift* (Berlin), 22: 711-728.

Borba-Silva, M.A., E.R. Drechsler-Santos and G.L. Robledo. 2015. Community structure and functional diversity of polypores (Basidiomycota) in the Atlantic Forest of Santa Catarina State, Brazil. *Biotemas*, 28(1): 1-11.

CPRH. Companhia Pernambucana do Meio Ambiente. 2003. Diagnóstico sócio ambiental do litoral norte de Pernambuco.

EMBRAPA. 2013. Sistema de Classificação de Solos. Brasília: Embrapa Informação Tecnológica,

IBGE. Instituto Brasileiro de Geografia e Estatística. 2012. Manual técnico da vegetação brasileira. Rio de Janeiro: IBGE.

Karstedt, F., S.L. Stürmer, 2008. Agaricales em áreas de Floresta Ombrófila Densa e plantações de Pinus no Estado de Santa Catarina, Brasil. *Acta bot. bras*., 22(4): 1036-1043.

Maia, L.C., A.A. Carvalho Junior. 2010. Introdução: os fungos do Brasil. In: Forzza, RC., org., *et al*. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. Catálogo de plantas e fungos do Brasil [online]. Rio de Janeiro: Andrea Jakobsson Estúdio: Instituto de Pesquisa Jardim Botânico do Rio de Janeiro.

Moreschi, J.C. 2013. Biodegradação e preservação da madeira: biodegradação da madeira. 4 ed., v. 1. Paraná: Manual Didático - UFPR.

Reck, M.A., R.M.B. Silveira. 2008. Polyporales (Basidiomycota) no Parque Estadual de Itapuã, Viamão, Rio Grande do Sul. *Revista Brasileira de Biociências*, 6(3): 301-314.

Rennó, C.S.M., R.R. Oliveira, A.M.B. Machado. 2016. Levantamento da biodiversidade de fungos macroscópicos do Observatório Pico dos Dias. In: VII Congresso de Iniciação Científica da FEPI, 2016, Itajubá. Anais... Congresso de Iniciação Científica da FEPI (2010 - 2016).

Silva, L.F., J.B. Paes, W.C. Jesus Júnior, J.T.S. Oliveira, E.L. Furtado, F.R. Alves. 2014. Deterioração da madeira de *Eucalyptus spp*. por fungos xilófagos. *Cerne*, 20(3): 393-400.

Stangerlin, D.M., A.F. Costa, J.C. Gançalvez, T.C.M. Pastore, A. Garlet, 2013. Monitoramento da biodeterioração da madeira de três espécies amazônicas pela técnica da colorimetria. *Acta Amazonica*, 43(4): 429-438.

Taiz, L., E. Zeiger, I.M. Moller, A. Murphy. 2017. Fisiologia e desenvolvimento vegetal. 6 ed. Porto Alegre: Artmed,

Vlasenko, V.A.; A.V. Vlasenko, I.V. Zmitrovich. 2017. First record of *Neolentinus lepideus* f. ceratoides (Gloeophyllales, Basidiomycota) in Novosibirsk Region. *Current Research in Environmental &Applied Mycology*, 7(3): 187-192.