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FUNGI ISOLATED FROM PLANT SPECIES COLLECTED IN THE ARCTOWSKI REGION, ADMIRALTY BAY, KING GEORGE ISLAND, ANTARCTICA

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Abstract: *The distribution of fungi in Antarctica is linked to the distribution of hosts such as birds, invertebrate populations and vegetation, consisting mainly of bryophyte and lichen communities. Light is a factor which influences the growth, reproduction and physiology of fungi due to the deleterious effects of radiation released. This study aimed to evaluate the influence of light on radial mycelial growth of two species of filamentous fungi found in Antarctica: Pseudogymnoascus pannorum (Link) Minnis & D.L. Lindner and an unidentified strain growing over angiosperm Colobanthus quitensis (Kunth) Bartl. and on the moss Sanionia uncinata (Hedw.) Loeske, respectively. The collections of material for this study were conducted during the Brazilian Antarctic expedition XXXI (2012-2013). The strains were isolated in solid potato dextrose agar medium, with pH adjusted to 4 and incubated at 26±1°C. Statistical results show that the variable light influences the radial mycelial growth of these fungi.*

Keywords: Antarctica; Filamentous Fungi; Ecology

Introduction

The terrestrial flora of the Antarctica, is represented by only two species of Angiosperms, *Deschampsia antarctica* Desv., belonging to the family *Poaceae* and *Colobanthus quitensis* (Kunth) Bartl belonging to the family *Caryophillaceae* (Juss.) Rabeler & Bittrich. The bryophytes are represented by 22 species of liverworts and 60 species of mosses (Øvstedal & Smith, 2001). *Colobanthus quitensis* is represents the single dicotyledonous plant that has colonized the Antarctic ecosystem, and possesses interesting mechanisms to survive in hostile conditions (Lewis-Smith & Poncet, 1987). Due to these mechanisms *C. quitensis* has been studied the influence of temperature and light on their photosynthetic activities (Xiong *et al.* 1999; Perez-Torres *et al.*, 2004), the effect of ultraviolet-B radiation on their growth (Xiong *et al.*, 2002). The moss *Sanionia uncinata* (Hedw.) Loeske is the most abundant moss species on King George Island in the maritime Antarctic (Nakatsubo, 2002). According to Bhattarai *et al.* (2008), this specie may be an important source of natural antioxidant agents for improved medicinal and cosmetic applications. Studies show which this moss functions as a suitable bioindicator of metal pollution in polar regions (Samecka-Cymerman *et al.*, 2011).

Mycological studies have been conducted in the Antarctic Peninsula and investigated mainly by the presence of bacteria psichrophilic for biotechnological exploitation occasionally algae and more rarely, fungi (Ruisi *et al.*, 2007). The *Pseudogymnoascus pannorum* (Link) Minnis & D.L. Lindner species is able to tolerate and develop in extreme environments to environments with high salinity and poor in organic matter (Bergero *et al.*, 1999). Not only has ecological importance as biotechnology because it has the ability to hydrolyze starch and produce extracellular lipase, chinase, and urease, which allow this species to consume and metabolize diverse food sources in the cold and low rate of nutrients (Fenice *et al.* 1998). *P. pannorum* grows in different substrates is commonly reported growing on mosses (Tosi *et al.*, 2002), soils of cold regions (Mercantini *et al.*, 1989) and leaves of *C. quitensis* (Rosa *et al.*, 2010).

The light incidence influences physical, chemical and biological factors in the fungal cell, changes in light or UV may elicit mycelial differentiation, how hyphal differentiation into the fruiting structure, or sporulation in some fungi that produce airborne spores, or even cause cell mutagenesis (Webster & Weber, 2007). The aim of this study

was to evaluate and compare the radial mycelial growth of two species of Antarctic filamentous fungi on the incidence and absence of light.

Materials and Methods

Admiralty Bay is located in the central part of the King George Island and belongs to the archipelago of the South Shetland Islands, situated 130 km northwest of the Antarctic Peninsula (61°S 63° 30'S, 53° 55'W 62° 50'W) (Arigony Neto *et al.*, 2002). The collections of material for the study were conducted in the Brazilian Antarctic Expedition XXXI (2012-2013) and were transported to Brazil in frozen zipper bags. We used two species of filamentous fungi: *Pseudogymnoascus pannorum* and an unidentified strain, named as RGSRF001, both isolated of angiosperm *C. quitensis* and of the moss *S. uncinata*, respectively. The lineage used were isolated in a Petri dish with medium culture potato dextrose agar, with the pH adjusted to 4 and incubated at a temperature of 26 ± 1ºC. This temperature was chosen because the lineage showed faster radial mycelial growth, when compared with other temperatures tested. Three replicates of each species were cultured under long-day conditions (16h light/8h dark) using the lamp Ligh Plus Day (F20W-T10-5000K). Three other replicates were grown in total absence of light resources. Was utilized to analyze the radial mycelial growth, the inoculated plates were kept in an incubator chamber for 8 days. After this period, the plaques were removed for the measurement of colony diameter with a pachymeter every 24 hours, for 20 days for each treatment. The mean diameter of each replicate, for each treatment were calculated. The means were subjected to a test T ($p < 0.05$) for comparisons, using the Statistix 8.0 software.

Results

The results showed that the fungi RGSRF001 , that grows on the moss *S. uncinata* and the fungi *Pseudogymnoascus pannorum* that grows on the angiosperm *C. quitensis*, both has higher radial mycelial growth in the absence of light. When we compared the radial mycelial growth of the two species found verified that the species of fungi RGSRF001 (average radial mycelial growth rate 12.096 mm) had a greater growth compared as species *Pseudogymnoascus pannorum* (average radial mycelial growth rate 6.494 mm). This data shows that the incidence of the light interferes in the growth of these species of Antarctic fungi since both have higher growth in the absence of light (Table 1).

Discussion and Conclusion

The mycelium growth of filamentous fungi is a combination of growth, division and cell differentiation (Esposito & Azevedo, 2004). But this growth is influenced by physical parameters influencing fungal physiology include radiation (light or UV may elicit mycelial differentiation and sporulation in some fungi that produce airborne spores), and a light can trigger the hypha to undergo differentiation into the fruiting structure (Kavanagh, 2005). From these results, it turns out that light influences the mycelial growth of RGSRF001 and *Pseudogymnoascus pannorum* since both had higher growth rates in the absence of light. The rapid growth and abundant production of mycelium are two important factors for the spread and survival of fungi in environmental conditions (Davey *et al.*, 2009). Knowing the extrinsic factors, in the case the light, which favor or inhibit the growth of fungi are important to understand their development in different environments. Since in the Antarctica in the austral summer, the incidence of sunlight can reach 20 hours daily.

It is known that environmental factors influence the growth of the fungus (Esposito & Azevedo, 2004) and some species of fungi sustain biomass enlargement with light condition and others in the total absence. Comparing the growth in the absence and presence of light, of both species filamentous fungi and based on the obtained data, it was concluded that variable light has direct influence on the

Table 1. Comparison of the average radial mycelial growth (mm) in absence and incidence of light, of two lineages of filamentous Antarctic fungi, incubated at 26º C ±1 during 20 days. Averages followed by the same letter in the same row do not statistical differ each other by Tukey test ($p < 0,05$).

Lineages	Incidence of light	Absence of light
RGSRF001	11.63 B	12.71 A
Pseudogymnoascus pannorum	6.22 B	6.73 A

growth of these fungi. Probably, other abiotics conditions are needed to be investigated to be able to draw conclusions about the environmental proprieties that affect the fungi growing in Antarctica.

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