PRELIMINARY LIST OF MICROFUNGI FOUND IN *PARATRECHINA LONGICORNIS* (HYMENOPTERA: FORMICIDAE)

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A plethora of organisms are associated with ant colonies, ranging from arthropod inquilines to microorganisms. Microbes found in social insect colonies frequently include bacteria, yeasts, and filamentous fungi (microfungi), which may have important roles, or may be transient components of the ant colonies (Mueller et al. 2005).

Most available information on ant-fungal associations derives from studies with fungus-farming ants. These insects harbor a myriad of microbes in their nest including antagonistic microorganisms (Mueller et al. 2005). Little is known about microfungi associates of other ant groups, particularly urban ants.

The ant *Paratrechina longicornis* Latreille is regarded as a worldwide invasive pest ant of human structures and is commonly found in Brazil (Wetterer 2008). In the present study we report a preliminary list of the microfungi associated with colonies of *P. longicornis* collected from a peridomiciliar area in southeastern Brazil, and we illustrate some of the microfungi in Fig. 1.

Two colonies of *P. longicornis*, one located inside a sewer chamber and the other in an electric box, were sampled at the surrounding area of a dwelling house (both from college dorms) in the municipality of Campinas, Brazil (22°49'16.58"S, 47°05'20.33"W). A total of 100 workers were hand-collected from each colony and were kept in 2-mL sterile vials while on the way to the laboratory. Workers were divided into groups of 5 individuals, placed inside sterile Petri dishes and held in the dark at 25ºC without any food. As each worker died, it was transferred to sterile vials containing a piece of cotton moistened with sterile distilled water to provide a suitable environment for fungal growth (Hughes & Boomsma 2004). Vials were then incubated in the dark at 25°C, and checked daily under a stereomicroscope for any signs of growing fungi up to 20 d.

Once a growing fungus could be observed on a carcass, that carcass was removed from the vial, and spores or bits from mycelia were inoculated on MA 2% (in g L^{-1}: 20 malt extract and 15 of agar) supplemented with 100 mg L^{-1} of chloramphenicol. Fungal identification was made based on Domsch et al. (1980).

From the total of 200 collected ants, 153 dead workers (76.5%) presented fungi: 69 from 1 colony and 84 from the other. In addition to fungi, heavy bacterial loads were present on 18 out of 153 carcasses, and no fungi could be isolated on these (fungal inocula on plates were overgrown by bacteria). With 2 exceptions, only 1 microfungus was isolated from each carcass, thus a total of 137 isolates comprising 11 genera, 10 species, and 14 unidentified microfungi were obtained (Table 1).

Most of the isolated microfungi in our study are saprophytic species commonly found in soil (Domsch et al. 1980) and in mounds of fire ants (Baird et al. 2007). This reflects the method employed for obtaining the fungi, as saprophytic microfungi will benefit from the intrinsic competition to take over the carcass, as they are expected to have higher growth rates. A tentative exhaustive list of the microfungi associated with these ants thus could only be obtained by employing different isolation methods coupled with culture-independent tools (Baird et al. 2007) which likely will uncover the several fungal species associated with *P. longicornis* other than saprophytic ones.

The saprophytic microfungi isolated in the present study may be considered transient components of the fungal community associated with *P. longicornis* colonies. In another study, Zettler et al. (2002) used a different isolation method to study the fungal diversity from nest mound soil of *Solenopsis invicta* Buren, *Aphaenogaster texana* Wheeler, and in the soil away from nests, having isolated, respectively, 14, 19, and 29 fungal species. For these authors, fungal species found in the ant mound soil resisted the colony conditions induced by the ant workers or might not have been selectively removed by workers. Among the genera found by Zettler et al. (2002) were *Absidia* and *Penicillium*, which we also found with *P. longicornis* in the present study. In addition to saprophytic fungi, well-known ant fungal pathogens were also detected in the present study such as *Aspergillus flavus* (Hughes & Boomsma 2004) and *Metarhizium anisopliae* (Hughes et al. 2004).

Zarzuela et al. (2007) presented a list of fungi associated with several pest ants in southeastern Brazil, including *P. longicornis*, recovered from households and industrial kitchens. Although their methods for obtaining the fungi were different from those of the present study (for further reference see Zarzuela et al. 2007), these authors also found ubiquitous saprophytic filamentous fungi belonging to the genera *Aspergillus*, *Epicoccum*, *Fusarium*, *Neurospora*, *Nigrospora*, and *Rhizopus*, some of which were found in the present study and yet including species pathogenic to humans.

The information provided in the present study suggests that the main saprophytic fungi obtained in colonies of *P. longicornis* are transient components of the ant microbiome, however,

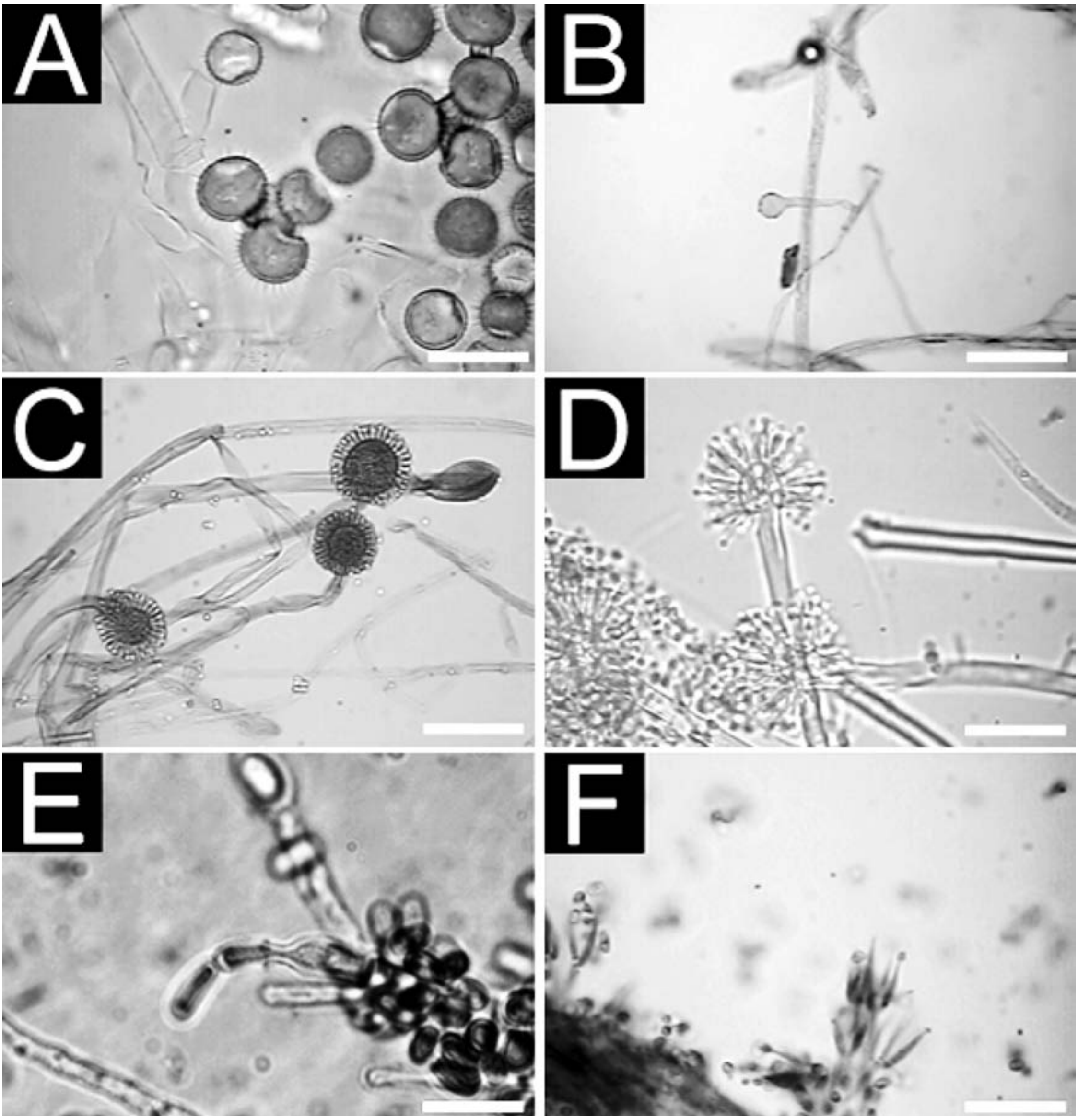

Fig. 1. Filamentous fungi from *Paratrechina longicornis*: (A) Sporangioles and (B) Sporangiophore from *Cunninghamella equinulata*; (C) Sporangiophore from *Syncephalastrum racemosum*; (D) Conidiophores from *Aspergillus versicolor*; (E) Detail of the conidiogenous cells from *Metharizium anisopliae* and (F) Conidiophores from *Paecilomyces lilacinus* Scale bars: (A), (D) and (E): 12.43 µm; (B), (C) and (F): 24.4 µm.

these fungi might serve beneficial or antagonistic functions for these ants. The species found in our study include several soil-borne microfungi that come in close contact with the ants, and some of these include insect pathogenic fungi which would be potential candidates for the biological control of urban ants.

Summary

We profiled the microfungi associated with colonies of the urban ant *Paratrechina longicornis* Latreille in peridomicilar areas at Campinas, Brazil. A total of 137 microfungal isolates were obtained from ant carcasses and the most fre-

TABLE 1. FILAMENTOUS FUNGI ISOLATED FROM CARCASSES OF *PARATRECHINA LONGICORNIS*.

Fungal species	Number of isolates	Prevalence (%)[1]
Ascomycota		
Acremonium sp.	1	0.7
Aspergillus candidus	1	0.7
Aspergillus flavus	42	30.7
Aspergillus ochraceus	1	0.7
Aspergillus versicolor (Fig. 1D)	1	0.7
Cladosporium sp.	25	18.3
Geotrichum sp.	3	2.1
Metarhizium anisopliae (Fig. 1E)	3	2.1
Monilia sp.	4	3.0
Paecilomyces lilacinus (Fig. 1F)	4	3.0
Penicillium sp.	32	23.4
Zygomycota		
Absidia corymbifera	1	0.7
Cunninghamella equinulata (Figs. 1A and 1B)	3	2.1
Cunninghamella polymorpha	1	0.7
Syncephalastrum racemosum (Fig. 1C)	1	0.7
Unidentified fungi	14	10.4
Total	137	100

[1]Based on the total number of isolates (n = 137).

quent taxa found were *Aspergillus flavus* (30.7%), *Penicillium* sp. (23.4%), and *Cladosporium* sp. (18.3%). The present report is preliminary, yet suggests *P. longicornis* harbor ubiquitous soil-borne saprophytic fungi as well as insect pathogenic fungi that are in close contact with this ant species in its natural environment.

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