BRIEF COMMUNICATION

ANTIFUNGAL ACTIVITY OF Cymbopogon nardus (L.) Rendle (CITRONELLA) AGAINST Microsporum canis FROM ANIMALS AND HOME ENVIRONMENT

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SUMMARY

Dermatophytosis is a common zoonosis in urban centers. Dogs and cats have played an important role as its disseminators. Environmental decontamination is essential for the prevention of its propagation to humans and animals. However, sanitizers or disinfectants with antifungal activity, currently available, have high toxicity. The present study evaluated the in vitro effects of an extract of citronella (Cymbopogon nardus) on 31 Microsporum canis isolates from animals and home environments. Susceptibility tests were performed based on document M38-A2 (2008) of the Clinical and Laboratory Standards Institute with modifications for natural products. Although susceptibility variation was observed between the fungus tested, the concentrations that inhibited the growth of 50 and 90% of the microorganisms were low (19.5 and 78 μg/mL, respectively). Thus, this citronella extract showed potent fungistatic and fungicide activities against M. canis isolated from animals and home environments. Therefore, it could be an alternative for dermatophytosis prophylaxis in the home environment.

KEYWORDS: Citronella; Microsporum canis; Dermatophytosis; Profilaxy.
25 °C. Afterward, the fungal structures were detached in sterile saline solution (0.85%). The inoculum concentration was adjusted to 1 × 10⁴ colony forming units per milliliter (CFU/mL) in RPMI 1640 medium (Roswell Park Memorial Institute, Gibco) with L-glutamine without sodium bicarbonate, buffered with MOPS (3-[N-morpholino]propanesulfonic acid, 0.165 M, pH 7.2, Sigma) plus 2% glucose.

The susceptibility assay was performed using the microdilution broth method according to document M38-A2 (2008) of the Clinical and Laboratory Standards Institute with some modifications for natural products. Briefly, the extract was tested at concentrations that ranged from 9.7 μg/mL to 5,000 μg/mL. Terbinafine was used as a control (0.002 and 0.008 μg/mL). The reading was performed, by visual observation, after seven days of incubation at 25 °C. The minimum inhibitory concentration (MIC) was considered the lowest concentration that inhibited 100% of fungal growth compared with the control. For both the citronella extract and terbinafine, the MIC was calculated according to the inhibition of growth of 50% (MIC₉₀) and 90% (MIC₉₀₀) of the microorganisms.

The minimum fungicidal concentration (MFC) was determined by transferring the contents from MIC assay to plates with drug-free Mycosel Agar. The lowest concentration of the extract that inhibited fungi growth in complete medium was considered the MFC.

Ten houses were visited where 11 animals had confirmed cases of dermatophytosis. In eight, it was possible to isolate the pathogen from the environment. In three houses, asymptomatic animals were found with positive microbiological tests for *M. canis*. In four homes, the disease spread to humans or animals.

The MIC of the citronella extract against 31 *M. canis* isolates and the control strain ranged from 9.75 to 625 μg/mL. However, in most of the studied samples, both the MIC₉₀ and MIC₉₀₀ were low (19.5 and 78 μg/mL, respectively). Only a low percentage of isolates (3.23%) demanded a high concentration of the citronella extract (625 μg/mL) to show fungicidal activity.

The citronella extract, according to the criteria established by SCORZONI et al. (2007)¹⁴, had moderate to strong antifungal activity (Table 1); it was strong for most of the *M. canis* samples tested (80.65%). The present data indicate that the fungistatic and fungicidal activities of the citronella extract were identical for most of the *M. canis* isolates tested. In only six isolates, the fungicidal concentration of the extract was slightly greater than the inhibitory concentration.

Our results demonstrated the *in vitro* efficiency of citronella extract on inhibiting *M. canis* obtained from animals and the home environment where these animals lived. Citronella essential oil has been used as an insect repellent and disinfectant¹⁰,¹⁶, but the high cost and manufacturing complexity limits its use. However, citronella extract use in controlling dermatophytosis is encouraged by its low cost, easy formula preparation, and accessibility. It is also rich in citronellal and geraniol.¹⁰ The present study indicates a new option of low-cost disinfectants.

In the present study, the terbinafine MIC of 32 isolates ranged from 0.001 to 1 μg/mL, and the MIC₉₀ and MIC₉₀₀ were also low (0.001 μg/mL). These *in vitro* results suggest a homogeneous fungi population profile with regard to antifungal susceptibility. The MIC₉₀₀ for terbinafine was low, confirming the results reported by GUPTA et al. (2001)⁹. These data may suggest the use of terbinafine for the treatment of dermatophytosis caused by *M. canis*. Nevertheless, the high cost of this product makes its use prohibitive in environmental control.

In conclusion, the citronella extract showed strong antifungal activity, both fungistatic and fungicidal, against isolates of *M. canis*, suggesting its potential use in the control of zoonoses of fungal origin. Further studies should be conducted incorporating this extract in sanitizers for domestic environments where animals live, with the goal of use it in prophylaxis against dermatophytosis carried by pets.

RESUMO

Atividade antifúngica de *Cymbopogon nardus* (L.) Rendle (citronela) contra *Microsporum canis* de animais e ambiente doméstico

A dermatofitose é uma zoonose comum nos centros urbanos. Cães e gatos têm desempenhado um papel importante como seus disseminadores. A descontaminação ambiental é essencial para a prevenção da propagação da infecção em seres humanos e animais. No entanto, desinfetantes ou sanitizantes com atividade antifúngica que estão disponíveis atualmente têm alta toxicidade. O presente estudo avaliou os efeitos *in vitro* de um extrato de *Cymbopogon nardus* (citronela) em 31 *Microsporum canis* isolados de animais e meio ambiente doméstico. Os testes de susceptibilidade foram realizados com base no documento M38-A2 (2008) do Clinical and Laboratory Standards Institute com modificações para os produtos naturais. Embora tenha sido observada variação de susceptibilidade entre os fungos testados, as concentrações que inibiram o crescimento de 50% e 90% dos microrganismos foram baixas (19,5 e 78 μg/mL, respectivamente). Assim, o extrato de citronela mostrou potente atividade fungistática e fungicida contra *M. canis* isolados de animais e ambiente doméstico.

### Table 1

| Drugs | *M. canis* (31) |
|-------|----------------|
| MIC | 9.75-625 |
| TERB | 0.001-1 |
| MIC₉₀ | 19.50 |
| TERB | 0.001 |
| MIC₉₀₀ | 78.00 |
| TERB | 0.001 |
| MFC | 9.75-625 |
| MFC₉₀ | 19.50 |
| MFC₉₀₀ | 78.00 |

¹Minimum inhibitory concentration - MIC (μg/mL); MIC₉₀ and MIC₉₀₀ for drug and extract: MIC capable of inhibiting 50% and 90% of the isolates, respectively.
²Minimum fungicidal concentration – MFC (μg/mL); The MFC₉₀ and MFC₉₀₀ are the MFCs capable of inhibiting 50% and 90% of the isolates, respectively. *Trichophyton rubrum* ATCC 28189 – MIC = 39 μg/mL, MFC = 39 μg/mL.
meio ambiente doméstico. Portanto, este extrato pode ser uma alternativa para a profilaxia da dermatofitose no ambiente doméstico.

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CONFLICT OF INTERESTS

The authors declare that there are no conflicts of interest.

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