

## Short Communication

# Antibiotic like-substances produced by some trichophytic dermatophytes

Hammadi, D. K.\* , Selselet, G. A.<sup>1</sup>, S. A. Bensoultane<sup>2</sup>

<sup>1</sup>Laboratoire de microbiologie, Département de Biologie, Faculté des sciences, Université de Mostaganem, BP 227 Mostaganem (w-27000) Algeria.

<sup>2</sup>Laboratoire de microbiologie, Département de Biologie, Faculté des sciences, Université d'Oran –Es-Senia-Oran- (w-31000), Algeria.

Accepted 7 June, 2007

**Antibiotic production by dermatophytic fungi was demonstrated. Among 10 anthropophilic dermatophytes strains tested for their ability to produce antibiotics, four were found to be producers. The outcome for a qualitative identification of the produced antibiotics reveals four types ; a penicillin-like substance produced by *Trichophyton gourvillii*, and two different types of unknown substances obtained from two strains of *Trichophyton mentagrophytes* var. *interdigitales* and the kojic acid-like antibiotic substance produced by *Trichophyton verrucosum*.**

**Key words:** Dermatophytes, antibiotics, bioassay.

## INTRODUCTION

Dermatophytes are group of closely related fungi that have the capacity to invade keratinized tissue (skin, hair, nail) of humans and animals to produce an infection (Zagnoli, 2005). A dermatophyte infection may range from mild to severe as consequence of the hosts reactions to metabolic products of the fungus. Dermatophytes and congeners like most filamentous fungi of ascomycetous affinity have a secondary metabolism characterized by the production of substantial quantities of distinctive metabolites (Weizman and Summerbell, 1995). Dermatophytes fungi have long been known to produce antibacterial substances

The ability of dermatophytes to produce penicillin-like substances *in vitro* has been reported by several authors, (Uri et al., 1957; Youssef et al., 1978; Hammadi et al., 1988). Antibiotic production by dermatophytes was first investigated by Nakumura (1932) who discovered antibacterial activity in the *Trichophyton* species. Further observations were made by Honda in 1936 (cited by Hammadi et al., 1988). However, the classification of antibiotic type was made by Lapin-scott (1987) who thought dermatophytes produced a penicillin-like substance based on observations of activity against bacteria. Other wor-

kers reported *Epidermophyton floccosum*, *Microsporium canis*, *Microsporium equinum*, *Microsporium cookei*, *Microsporium gypseum*, *Trichophyton equinum*, *Trichophyton mentagrophytes*, *Trichophyton rubrum*, *Trichophyton terrestre* and *Trichophyton verrucosum* to produce penicillin, 6-aminopenicillanic acid, (Peck et al., 1945), fusidic acid and closely related compounds, azalomycin-like antibiotics, actinomycin-like antibiotic and ranges of compounds fusidanes (Ryall et al., 1980). Further observations on trichophytic isolates of dermatophytes (Hammadi et al., 1988) showed that *T. rubrum* and *T. mentagrophytes* produced a streptomycin-like and azalomycin-like compound and other unidentifiables.

The purpose of our study is the continuation of the identification of the antibiotic products of some trichophytic species and searching for new antibiotic products from some other trichophytic species that have not been studied.

## MATERIAL AND METHODS

Ten strains isolated and brought from Institut Pasteur d'Algerie, characterized as five strains of *Trichophyton mentagrophytes* var. *interdigitale* (S2, S3, S4, S9 and S10), one strain of *Trichophyton gourvillii* (S1), one strain of *Trichophyton violaceum* (S5), one strain of *T. rubrum* (S6), one strain of *T. verrucosum* (S7), and one strain of *Trichophyton shoenleini* (S8). The strains were maintained as spores suspensions in distilled water. For antibiotic production, spores were inoculated in 100 ml of fermentation unit medium (F.U.M.;

\*Corresponding author. E-mail: kyrabiology@yahoo.fr.

**Table 1.** Antibacterial screening of dermatophytic fungi metabolites.

Days	Strains									
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	18	0	0	0	0	0	0	0	0	0
13	18	17	0	19	0	0	0	0	0	0
14	20	19	0	20	0	0	0	0	0	0
15	20	19	0	20	0	0	17	0	0	0
16	23	20	0	22	0	0	17	0	0	0
17	24	19	0	22	0	0	17	0	0	0
18	24	20	0	25	0	0	18	0	0	0
19	29	22	0	27	0	0	19	0	0	0
20	29	22	0	28	0	0	22	0	0	0
21	28	24	0	30	0	0	22	0	0	0

Values are zones (diameter) of inhibition (mm). The fungi are *Trichophyton mentagrophytes* var. *interdigitale* (S2, S3, S4, S9 and S10), *Trichophyton gourvillii* (S1), *Trichophyton violaceum* (S5), *T. rubrum* (S6), *T. verrucosum* (S7), and *Trichophyton schoenleinii* (S8).

Hammadi et al., 1988) and incubated at 30°C in an orbital incubator at 140 rpm. After 10 days of incubation, the growth media was extracted with an equal volume of acetone. The acetone-water mixture was filtered and dissolved in aqueous acetone (10%). The presence of antibiotics was determined by bioassay using a standard plate diffusion methods. For the antibiotic production assay, plates were prepared using peptone yeast agar at pH 7.4 incorporated with 0.1 ml of *Bacillus subtilis* solution spores. The plates were incubated at 32°C and the zone diameters recorded. For the determination of antibiotic type, the Betina classification (Betina, 1973) was used.

The isolated compounds were separated by thin layer chromatography using four solvents in ascending chromatography system. The solvents were 1. distilled water, 2. n-butanol, 3. E-acetate, and 4. toluene. The  $R_f$  values were recorded of each solvent.

## RESULTS AND DISCUSSION

Bioassays results of the isolated dermatophytic fungal strains after 21 days of incubation is presented in Table 1. Four trichophytic strains, S1, S2, S4 and S7, gave active substance(s). *Trichophyton gourvillii* (S1) gave  $R_f$  value that is penicillin-like, while *T. verrucosum* (S7) gave  $R_f$  value of kojic acid-like antibiotics. However, the two species of *T. mentagrophytes* (S2 and S4) gave two unknown compounds, which do not match with Betina classification (Betina, 1973) of the thin layer antibiotic analysis (results not shown). The work done before by Hammadi et al. (1988) on the same species showed the production

of penicillin-like substances by the same species, the only differences for the work before is the temperature of incubation. For the previous work, the incubation temperature was 30°C, however the temperature of the present work is 32°C. Therefore, it can be deduced that incubation temperature has an effect on secondary metabolites production during the fermentation (Youssef et al., 1979).

The two unknown compounds produced by two species of *T. mentagrophytes* have the same  $R_f$  values using the water solvent. This would help suggest that the use of the different solvent system would help to classify the unknown compounds.

Screening of secondary metabolite products from dermatophytes fungi may also lead to the discovery of active substances against viral infections and cancers (Florenshstein et al., 1982). Whist dermatophytes themselves are not very destructive, their products could help the emergence of resistant pathogenic microorganisms. For these reasons, the products from dermatophytes need to be investigated to enable easier treatment with suitable antibiotics or other drugs.

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