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Dermatophytes Fungi as Producer of Antibiotic Like-Substances

[1]Hammadi Kheira, [1]A.G. Selselet and [2]S.A. Bensoltane

[1]Laboratoire de Microbiologie, Faculté Des Sciences,
Université de Mostaganem, BP 227 Mostaganem (W-27000) Algerie
[2]Laboratoire de Microbiologie industrielle, Faculté Des Sciences,
Université d'Es-senia Oran (W 31000), Oran, Algerie

Abstract: The antibiotic production by Dermatophytes fungi has been demonstrated in the shaker culture of the FUM. (Fermentation Unit Medium). Among 10 Anthropophilic Dermatophytes strains tested for their ability to produce antibiotics, only 4 strains have been found producers. The outcome for a qualitative identification of the produced antibiotics has been shown by the Thin-layer chromatography and Betina classification methods. Four types of antibiotics have been revealed: a penicillin-like substance produced by the strain of Trichophyton gourvillii and two different types of unknown substances obtained from Trichophyton mentagrophytes var. interdigitales and the Kojic acid-like antibiotics substance which has been given by Trichophyton verruccosum strain.

Key words: Dermatophytes · antibiotics · bioassays

INTRODUCTION

Dermatophytes are group of closely related fungi that have the capacity to invade keratinezed tissue (skin, hair and nail) of humans and animals to produce an infection [1]; the relation to a Dermatophyte infection may range from mild to severe as consequence of the hosts reactions to metabolitic 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 [2].

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 [3-5]. Antibiotic production by Dermatophytes was first investigated in 1932 by Nakumura who discovered an antibacterial activity in the Trichophyton species. Further observations of this nature were made by Honda in 1936 cited by Hammadi *et al*. [5]. However, the classification of antibiotic type was made by Lapin-scott [6] who thought Dermatophytes produced a penicillin-like substansce based on observations of activity against bacteria. Other workers reported *E. flocosum*; *M. canis*; *M. equinum*; *M. cookei*; *M. gypseum*; *T. equinum*; *T. mentagrophytes*; *T. rubrum*; *T. terrestre* and *T. verrucossum* to produce penicillin; 6-aminopenicillanicacid [7]; fusidicacid and closely related compounds; azalomycin-like antibiotics, actinomycin-like antibiotic and ranges of compounds fusidanes [8], further observations of an antibacterial activity by dermatophytes were made on a trichophytic isolates of dermatophytes [5] showed that *T. rubrum* and *T. mentagrophytes* were found to produce a streptomycin-like and azalomycin-like compound and other unidentifiable.

The purpose of our study is the continuation of the identification of the antibiotic products of some Trichophytic species, hunting new antibiotic products; from some other Trichophytic species not studied before using Betina analysis methods.

MATERIALS AND METHODS

Ten strains isolated and brought from Institut Pasteur d'Algerie; characterized as-five strains of Trichophyton mentagrophytes var. interdigitale coded as S2, S3, S4, S9, S10;

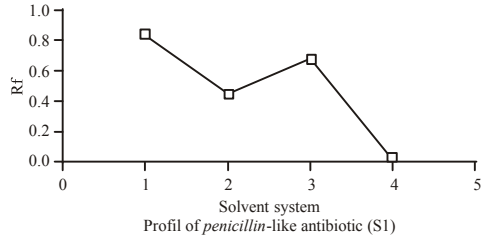
Corresponding Author: Dr. Hammadi, Kheira, Laboratoire de Microbiologie, Faculté Des Sciences, Université de Mostaganem, BP 227 Mostaganem (W-27000), Algerie

One strain of: Trichophyton gourvillii coded as S1;
Trichophyton violacium coded as S5;
Trichophyton rubrum coded as S6;
Trichophyton verrucosum coded as S7;
Trichophyton shoenleini coded as S8.

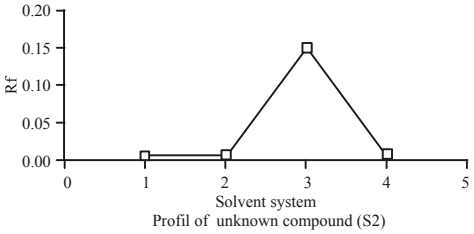
The strains were maintained as spores suspensions in Distilled water.

For antibiotic production; spores were inoculated in 100m, amounts of Fermentation Unit Medium (FUM) and Incubated at 30°C in an orbital incubator at 140 revs/minute.

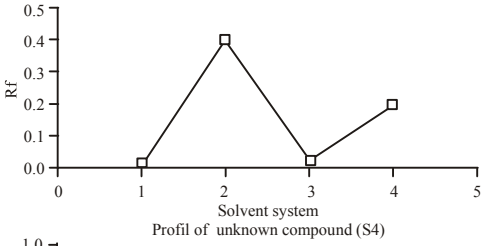
After 10 days of incubation in the FUM (Fermentation Unit Medium); the growth was extracted with an equation volume of acetone. The acetone-water mixture was filtered. The crude acetone was drayed dissolved in 5m of aqueous acetone (10%), the presence of antibiotics was determined by bioassay using a standard plate diffusion methods. For the antibiotic production assay plates were prepared using (P.Y.A) peptone yeast agar at pH 7.4 Incorporated with 0.1 ml of *Bacillus subtilus* solution spores. The plats were incubated at 32°C and the zone diameters recorded. For the determination of antibiotic type the Betina classification was used. The layer chromatography of four solvents in ascending chromatography system. The solvents were 1-Distilled water; 2-n-butanol; 3-E-acetate; 4-Touluene and the Rf values were recorded Of each solvent.



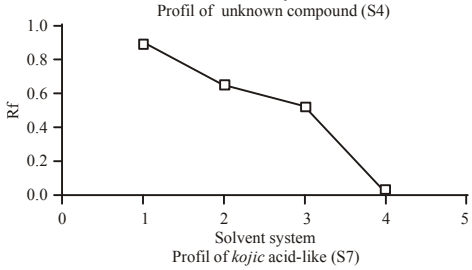
Profil of *penicillin*-like antibiotic (S1)



Profil of unknown compound (S2)



Profil of unknown compound (S4)

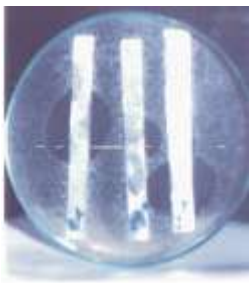


Profil of *kojic* acid-like (S7)

RESULTS AND DISCUSSION

The results of bioautography showed by the Rf values of each antibiotic produced using solvents system Solvants.

Strains	Distilled water (1)	n.Butanol(2)	E-acétate (3)	Toluène (4)
S1	0.75	0.44	0.66	0.00
S2	0.00	0.00	0.14	0.00
S4	0.00	0.40	0.01	0.19
S7	0.89	0.65	0.51	0.00
(Pénicillin)	0.85	0.37	0.72	0.00


Bioautography photo of the strain S7


Bioautography of the strain S1

DISCUSSION

Four trichophytic species coded S1, S2, S4 and S7 gave an active substance a patterns profils however six species were not producers S3; S5; S6; S8; S9; S10.

The species of T. gourvillii gave a pattern with Rf values of penicillin-like that means; that it is producer of substance penicillin-like and the species of T. verruccosum gave a substance with Rf values of kojic acid-like; however the two species of T.mentagrophytes gave two unknown compounds which do not matching with Betina classification of the thin layer antibiotic analysis; the work done before by Hammadi *et al*. [5] 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 work done before we the incubation temperature was 30c however the temperature of the present work is 32c, so we can deduce that the changes of the incubation temperature has an effect on the molecule formation of the secondary metabolites during the fermentation [4].

The two unknown coumpounds produced by two species of T.mentagrophytes have the same Rf values of the water solvent. This would help suggest; that the use of the different solvent system would help to classify the unknown compounds; and may be if we continue the research by testing the secondary metabolite products from Dermatophytes fungi is also necessary to find antibiotics active against viral infections and cancers [9]. whist Dermatophytes themselves are not very destructive,their products would help the emergence of resistant of 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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