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Diagnosis of phytopathogenic fungi of Lycopersicon esculentum L. in Oued Righ region (Algerian sahara)

Research

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CONFLICTS OF INTEREST

There are no conflicts of interest for any of the authors.

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ABSTRACT

Background:
Several phytopatogenic fungi attack tomato (Lycopersicon esculentum) plants in all the parts of this culture. In abundance use of chemical products we would like to investigate and produce molecules that can be used in biological control. This study was carried to study the fungal diseases of tomato plants in the region of Oued Righ.

Methods:
The chosen field test area was naturally infested with several symptoms in the roots, leaves and fruits. Samples were brought to laboratory and plated out on potato dextrose agar (PDA) medium and incubated at 26°C.

Results:
After isolation and identification, nine species of fungi were identified from the samples; Botrytis cinerea, Alternaria sp., Fusarium oxysporum f. sp. radicis-lycopersici, Cladosporium fulvum, Aspergillus niger, Penicillium sp., Stemphylium solani, Trichothecium roseum and Sclerotinia sclerotiorum. On the other hand, three species of these isolates were not identified.

Conclusion:
As a first step to isolate and identify these phytopatogenic fungi, we have to use biological molecules to fight against these diseases, also to be useful in developing novel and environmentally safe strategies to control economically important.

Keywords: Alternaria sp., Fusarium oxysporum f. sp. Radices-lycopersici, Identification, Isolation, Oued Righ, Southern Sahara, Tamato

INTRODUCTION

Tomato (*Lycopersicon esculentum* L.) is considered one of the most important economic vegetable crops in Algeria. Tomato plants are subjected to attack by several soils born fungal pathogens, which cause serious diseases as root rot and wilt [1]. However, fungal diseases, particularly early blight caused by *Alternaria solani* is most common and destructive one causing great reduction in the quantity and quality of fruit yields wherever tomato is grown [2]. *Fusarium oxysporum* (FOL) also is a known pathogen of tomato plant which is an economically important crop [3]. Tomato yield is significantly reduced by *F. oxysporum* because it can destroy roots of tomato at growth stages. Numerous strategies have been proposed to control these fungal pathogens [4; 5], with several saprophytes that were found in this plant like: *Aspergillus niger*, *Aspergillus flavus*, *Penicillium* spp. [6].

The overall aim of this work was to expand the knowledge of several phytopathogenic fungi that are associated with tomato culture in our region by isolation, purification and identification of the different isolates.

Materials and Methods

Fungal purification and identification

During 2016, field experiment was carried out at Oued Righ region; sampling was conducted to isolate and identify the diseases of tomato plants. The chosen field test area was naturally infested with several symptoms in the roots, stems, leaves and fruits (Fig. 1).

Figure 01. Samples from infected green-houses (A: Infected field; B: Affected leaf by Alternaria sp.; C: Affected roots by Sclerotinia sclerotiorum)

Infested samples were brought to the laboratory of plant protection, in the National Institute of Agronomic Research of Algeria (INRAA), to isolate these fungi. Fragments of reached parts from 5 to 10 mm presenting of the typical symptoms were cut out then planted in a suitable culture medium after disinfection, rinsing with sterile distilled water, and then drying. Incubation took place at temperature between 24-26 °C.

While the colonies were well differentiated, they will be then re-inoculated in the same medium of seeding (for obtaining purified cultures). The identification of fungal flora is not only carried out by the macroscopic aspect, it's based also on microscopic studies which were described by [7; 8] by using an OPTIKA microscope.

Results

Nine fungi species, *Botrytis cinerea*, *Alternaria* sp., *Fusarium oxysporum* f. sp. *radicis-lycopersici*, *Cladosporium fulvum*, *Aspergillus niger*, *Penicillium* sp., *Stemphylium solani*, *Trichothecium roseum* and *Sclerotinia sclerotiorum* were isolated from tomato plants (Tab. 1).

In Table 2, are shown the specific parts of the tomato infected plants from which every fungus was existed and isolated.

After isolation and purification of several colonies from tomato plants, we specified that the fungi isolated from these plants based on their differences in the moisture content, color and their characterization under microscope. The obtained results show the existing of nine species of fungi were identified from the samples (Fig. 2), namely; *Botrytis cinerea*, *Alternaria* sp., *Fusarium oxysporum* f. sp. *radicis-lycopersici*, *Cladosporium fulvum*, *Aspergillus niger*, *Penicillium* sp., *Stemphylium solani*, *Trichothecium roseum* and *Sclerotinia sclerotiorum*. On the other hand, only three species were isolated from these infected plants and we could not identify them (Fig. 3).

Figure 02. Fungi isolated from tomato plants in the region of Oued Righ (**A:** Macroscopic aspect; **B:** Microscopic aspect). **1:** *Botrytis cinerea*; **2:** *Alternaria* sp.; **3:** *Fusarium oxysporum* f. sp. *radicis-lycopersici*; **4:** *Cladosporium fulvum*; **5:** *Aspergillus niger*; **6:** *Penicillium* sp.; **7:** *Stemphylium solani*; **8:** *Trichothecium roseum*; **9:** *Sclerotinia sclerotiorum*

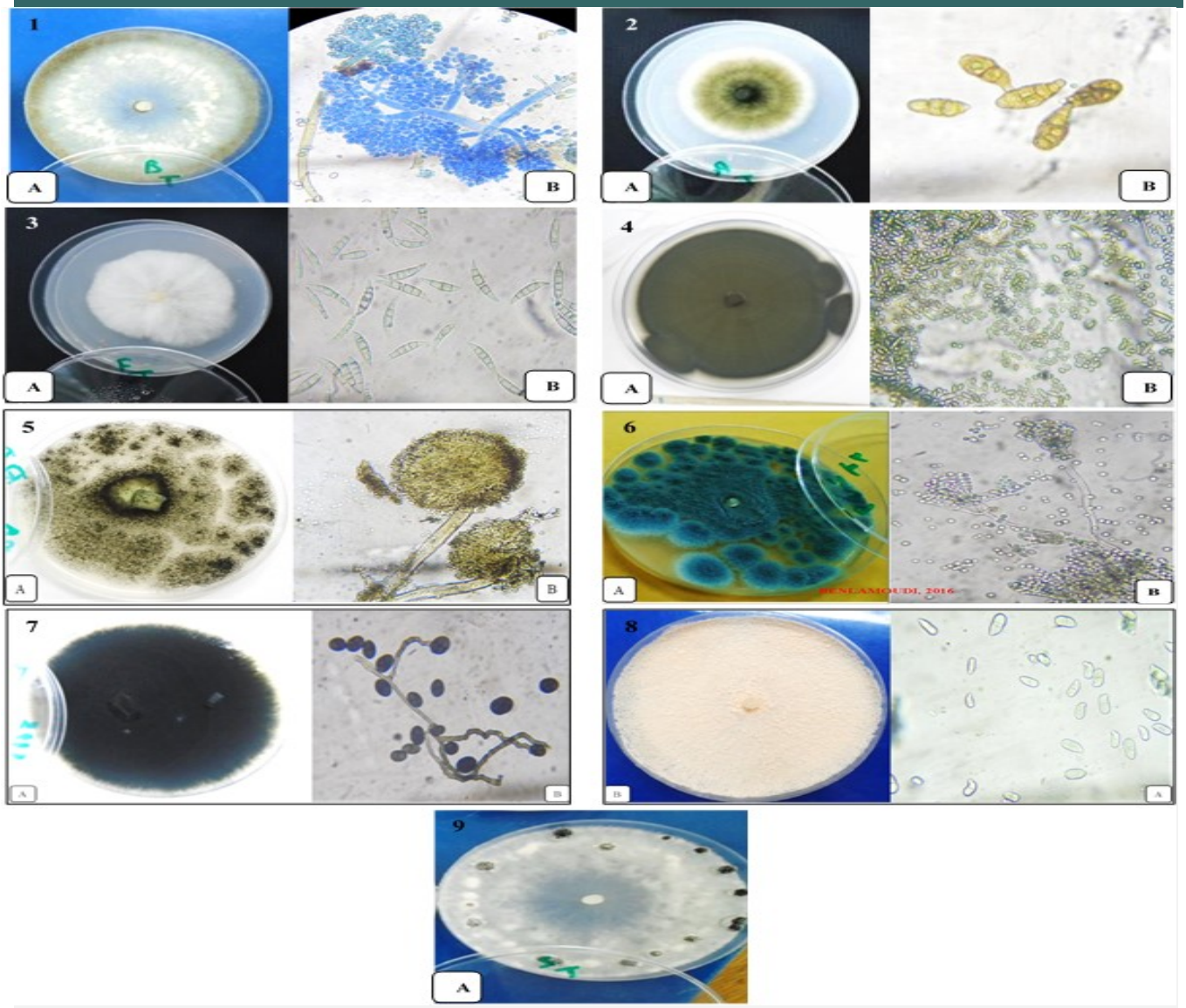


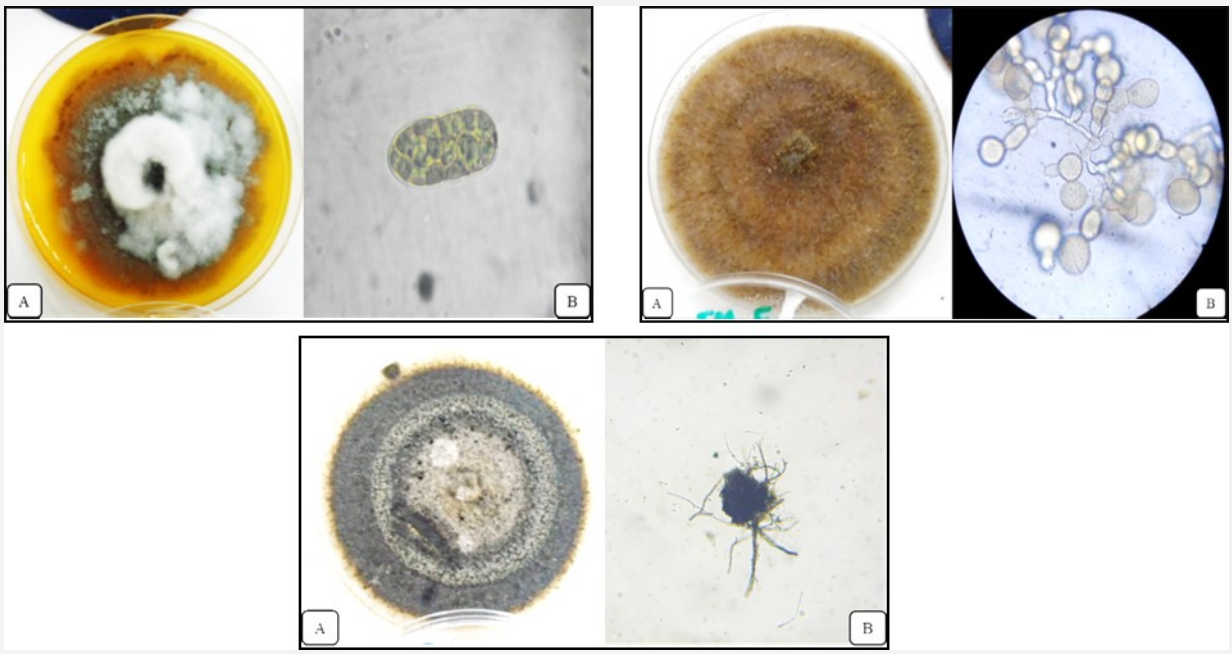
Table 1. Identification of fungal isolates from tomato samples

Organisms	In the field	Macroscopic examination	Microscopic examination
B. cinerea	Responsible for the gray rot in fruits which is very polyphagous and represents sclerotic aspects in roots	brownish colonies and having a shaved development	The macro conidia are ovoid unlike micro conidia which are spherical and small
Alternaria sp.	Rounded and angular spots	Greenish color at the start that quickly becomes dark	Seated hyphae. Conidiophores are split, brown, pluricellular, piriform or ovoid aspect
F. oxysporum	Causes vascular wilt by invading xylem vessels with yellowing color in the roots	Colonies are whitish with a fluffy or cottony form	The macro conidia are fusiform and split and the micro conidia
C. fulvum	Manifests itself as yellowish, chlorotic spots that gradually become necrotic on the upper surface of the leaves and a greenish gray mold on the underside	The colonies have a velvety or fluffy texture, sometimes powdery with an olive-green color	Micro conidia demonstrate seated and pigmented hyphae.
A. niger	Causes black mold on fruits	Black colour with white edges	Large conidial heads, dark brown becoming radiate and split to columns
Penicillium sp.	They are responsible for soft, wet and dark lesions that can develop either from the implantation zone of the peduncle or elsewhere on the fruit, at the level of an injury	The colonies are bluish-green and velvety aspect	The phialides are ampliform and the conidia are spherical in ovoid or spherical form
S. solani	This disease is manifested by gray spots on the leaves which become dry and brittle thereafter	Colonies are deer to cottony in texture, and brown-black in color	The conidia are solitary, rounded at the ends, divided by several longitudinal and transverse partitions
T. roseum	It causes circular lesions soaked with water that can be haloed from a brown area, on the fruits, and they are covered with a pale pink mold covered with white	Colonies are initially white, then rapidly develop a pinkish color with a powdery, velvety aspect	Conidiophores are trained and conidia are bicellular and hyaline
S. sclerotiorum	Causes white rot at the collar and attacks both seedlings and adult plants.	White snowy mycelium which has a very rapid development with a black sclerotia	

Table 2. Isolated fungi from different parts in the tomato

Parts	*B. cinerea*	*Alternaria* sp.	*F. oxysporum*	*C. fulvum*	*A. niger*	*Penicillium* sp.	*S. solani*	*T. roseum*	*S. sclerotiorum*
Fruit	X				X				
Leaf	X	X		X		X	X	X	
Root			X	X				X	
Stem	X	X	X				X	X	X

Figure 03. Unknown fungi isolated from tomato plants in the region of Oued Righ (**A:** Macroscopic aspect; **B:** Microscopic aspect)



Discussion

According to several researches on fungal diseases in different cultures in the entire world, tomato is one of the most important cultures that can be attacked by several types and phytopathogenic fungi species, for this, we have recommended to isolate and identify the existing fungi that are associated with this culture in our region, as a first step. In this study, we have isolated nine different species of fungi including *Botrytis cinerea*, *Alternaria* sp., *Fusarium oxysporum* f. sp. *radicis-lycopersici*, *Cladosporium fulvum*, *Aspergillus niger*, *Penicillium* sp., *Stemphylium solani*, *Trichothecium roseum* and *Sclerotinia sclerotiorum*. Despite all these identified species, we could not identify three species that were isolated from this culture.

Our findings revealed that tomato samples were infected in varied degrees with several pathogenic fungi that are known to cause root rot and wilt diseases in tomato and according to Kristensen et al. [9], the most widely distributed pathogen of tomato fruit rot is *Fusarium* species.

The obtained results were confirmed that is isolated previously in the same region from the same culture. Mlik et al. [10] were found the early blight, Fusarium wilt, that were associated with tomato in the region of Oued Righ and Benlamoudi [11]; Benlamoudi et al. [12] have isolated the same fungi that us from the same region.

Some of the most common fungal diseases that infect tomatoes and grown on it include Anthracnose fruit rot, Early blight, Septoria leaf spot, Late blight, and Buckeye rot all which produce distinct symptoms making them easily diagnosable [13].

Conclusion

The present study demonstrated that the tomato plants are associated with all these nine isolates (*Botrytis cinerea*, *Alternaria* sp., *Fusarium oxysporum* f. sp. *radicis-lycopersici*, *Cladosporium fulvum*, *Aspergillus niger*, *Penicillium* sp., *Stemphylium solani*, *Trichothecium roseum* and *Sclerotinia sclerotiorum*) that were isolated and identified in several parts of it: stem, root, leaf and fruit.

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