Scientific Reports in Life Sciences 5 (3): 32-37

DOI: https://doi.org/10.5281/zenodo.11080855

Isolation and identification of fungal diseases of broad bean (*Vicia faba* L.) in Ain-Zara region, Tripoli, Libya

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Received: 12 November 2023 / Revised: 5 December 2023/ Accepted: 13 December 2023 / Published online: 29 April 2024.

How to cite:

Afaf, A.S., Youssef, M.A., Abughnia, A.M., Alya, HB.D. (2024). Isolation and identification of fungal diseases of broad bean (Vicia faba L.) in Ain-Zara region, Tripoli, Libya, Scientific Reports in Life Sciences, 5(3), 32-37. **DOI**: https://doi.org/10.5281/zenodo.11080855

Abstract

This study was conducted to determine the incidence of fungal plant diseases on faba beans in some fields located in the Ain–Zara region - Tripoli and to identify the causal agents. A total of one- hundred plants of faba bean were collected during 2020-2021 season from some local farms in Ain–Zara region Tripoli (February – April). Fungal pathogens associated with leaves, stems, pods and roots of faba bean have been isolated and identified. The most important and widespread fungal diseases observed: Chocolate leaf spot, Root rot, Anthracnose, Alternaria blight, Ascochyta blight and Sclerotinia stem rot caused by *Botrytis fabae, Fusarium solani F. oxysporum, Colletotrichum spp, Alternaria alternata, Ascochyta fabae* and *Sclerotinia sp* respectively.

Keywords: Ain – Zara, faba bean, fungal diseases, incidence, Tripoli- Libya

Introduction

Broad bean or faba bean (*Vicia faba* L.) is a leguminous crop which consumed for its high protein content (El-holy, 2014). It is cultivated in the countries of the Nile Valley, North Africa and West Asia (Akem & Beller,1999; Aliyi et al., 2021). In Libya, it is grown in the coastal area specifically in Tripoli, Zawia, Al-Jable Al- Akhdar and Bengazi (Abu Ghaniye, 1998; Nwara & Bouazoum, 2021; El-Ammari, 2017).

Faba bean is affected by a wide range of fungal diseases including Chocolate leaf spot, Aschochyta leaf blight, Rust, Alternaria blight and Root rot (Abu Ghaniye, 1998; Akem and Beller,1999; Nwara & Bouazoum, 2021; El-Ammari, 2017; Konjengbam, 2023). Fungal diseases of fabae bean in Bengazi, were surveyed and observed that the most important and widespread fungal diseases include: Chocolate spot, Rust, Altrenaria leaf spot and Aschochyta fabae (El-Ammari, 2017). Nwara and Bouazzoum (2021), identified *Botrytis fabae* as the causal agent of broad bean in Al-marg and Al-wash in the Al-Jable – Al-Akhdar region (Nwara & Bouazoum, 2021). Akam and Bellar (1999), indicated in a survey that the most important and widespread fungal diseases in the main fabae bean growing regions of Syria were: Rust (*Uromyces fabae*), Chocolate spot (*Botrytis fabae* and *B. cinerea*), Aschochyta blight (Aschochyta fabe, leaf spot), (*Alternaria alternata* and *Macrophomina phaseolinal).* (Akam & Bellar, 1999). Faba bean is mainly grown and consumed in Libya as fresh vegetable pods and to a lesser extent as dry seeds (Nwara & Bouazzoum, 2021). The quality and quantity are affected by the infection of different diseases, especially fungal diseases. This study aims to list the main fungal diseases of Broad bean (*Vicia faba* L.) in Ain-Zara, Tripoli region.

Material and methods

Isolation, Purification and Identification of the isolated fungi

During the growing season of 2020-2021, a severe disease infection of faba bean was observed in some local farms in Ain–Zara Tripoli. To diagnose the fungal diseases, one hundred plants were selected randomly. The diagnosis was based on the visual disease symptoms in the field, and samples from the selected plants were taken to the laboratory at the Department of Botany – Faculty of Science University of Tripoli - Libya for isolation and identification of the causal pathogens (Fig. 1).

For the isolation of fungal pathogens from leaves, stems, pods and roots. These plant organs were washed using running water, cut into small pieces and surface sterilized, using 0.5% sodium hypochlorite solution, for 3 minutes, then washed three times with sterilized distilled water and blotted between sterilized filter papers to get rid of excesses water. Small pieces of each part were inoculated in PDA culture media and incubated at 25C^{o}. The colonies and spore development were observed after one week, pure cultures were obtained for each of the isolated fungi using hyphal tips and single spore culture technique as indicated by (Barnett & Hunter, 1972; Al-Boni, 1990; Booth, 1997) then the isolated fungi were identified by using the proper methods.

Figure 1. Disease symptoms of broad bean plants from the study region: A. Vegetative part, B. Whole plant, C. Leaves, D. Root

Disease incidence was measured as the proportion of the randomly selected plants displaying symptoms in the field.

$$\text{Disease incidence} = \frac{\text{Number of disease plants}}{\text{Total number of plants observed}} x100$$

Results

Several fungal diseases were observed on faba beans in Ain-Zara, Tripoli region which include, Chocolate leaf spot infected leaves, Anthracnose observed on pods, Alternaria blight and Ascochyta blight both infected leaves and pods, Sclerotinia stem rot observed on stem and root and Root rot observed on root (Table 1). Six genera caused these diseases. Chocolate leaf spots

showed the highest incidence (100%) followed by Root rot (90%), while, the incidence of Anthracnose, Alternaria, Sclerotinia, Stem rot and Aschochyta blight did not exceed 40 % (Table 2) and (Fig 2).

Chocolate leaf spot caused by *Botrytis fabae* affected mainly the plant leaves whereas Root rot caused by *Fusarium oxysporum* was consistantly isolated from roots, *Colletotrichum* sp. infected the pods and reduced its quality. The remaining diseases caused by: *Alternaria alternata. Aschochyta fabae* and *Sclerotinia sp* showed mild effects by the end of April.

Table 1. Fungal Diseases of Broad bean (*Vicia faba*) in Ain - Zara Tripoli

Disease	Causal organism	Leaves	Pods	stem	Root
Chocolate leaf spot	*Botrytis fabe* *Botrytis spp*	+	_	_	_
Anthracnose	*Colletotrichum spp*	_	+	_	_
Alternaria blight	*Alternaria aternata*	+	+	_	_
Ascochyta blight	*Ascochyta fabae*	+	+	_	_
Sclerotinia stem rot	*Sclerotinia sp*	_	_	+	+
Root rot	*Fusariium solani*	_	_	_	+
	Fusariium oxysporum	_	_	_	+

Table 2. Disease incidence of Broad bean plants selected in the study

Disease	Disease incidence during 2020-2021 %
Chocolate leaf spot	100
Root rot	90
Anthracnose	40
Alternaria blight	30
Ascochyta blight	25
Sclerotinia stem rot	20

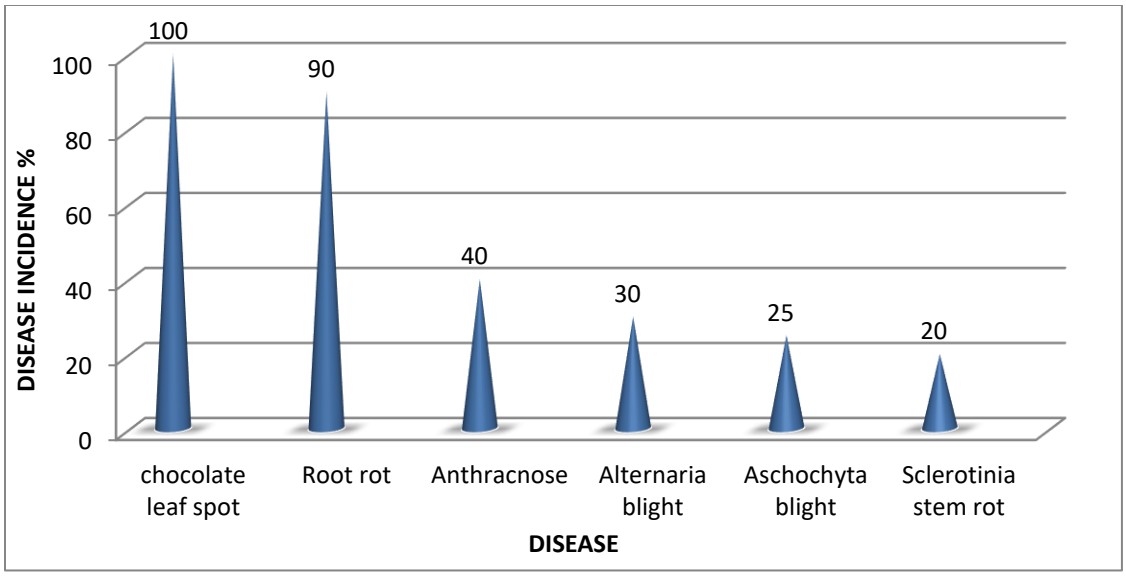

Figure 2. Disease incidence ratio of Broad bean plants selected from Ain-Zara region

Discussion

The results shown in table (1 & 2) indicated that the fungi associated with fabae bean in Ain-Zara Tripoli were: *Botrytis fabae, Fusarium solani F.oxysporum, Colletotrichum spp, Alternaria alternata, Ascochyta fabae* and *Sclerotinia sp*. These results agree with the results obtained by (Akem & Bellar 1999; El-Said et al., 2006; Sahile et al., 2011; Coca-Morante et al., 2012; Mahmoud et al., 2012; ELShahir, 2014; Sohair et al., 2015; Ahmed, 2017). The disease incidence of fabae bean as shown in table 2 and fig 1, indicated that the Chocolate leaf spot disease caused by *Botrytis fabae* was the most effective on the foliar parts of fabae bean, all the plants examined were infected (100%), followed by the Root rot (90%). The percentage of infection for the other diseases ranged between 20-40 %. These results agree with previous study in Libya and other countries (El-Ammari, 2017; Aliyi et al., 2021). The high disease incidence of Chocolate leaf spot and Root rot may be attributed to the occurance of the presence of seeds and the infected plant debris which considered as the source of inoculum for the next crop. There are other factors which increased the disease incidence as the weather and high humidity which occurred in Tripoli in winter during the last few years. More studies are needed to test the response of different varieties of fabae bean to the main fungi isolated in this study.

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