



Journal homepage: www.sciencearchives.org



<http://dx.doi.org/10.47587/SA.2021.2310>

Original Research Article



Reduce the severity of *fusarium* wilt in tomato by use natural plant produces

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Received: Aug 06,2021 / Revised: Sept 03, 2021/ Accepted: Sept 16, 2021

Abstract

Fusarium is the important economic fungi in the world, which is due to the high economic losses in the various crop types in general and in the tomato plant in particular. The current study addresses the resistance or reduction of the spread of fungus causing the Fusarium wilt disease using plant extracts where extracts were used for four plants (Nerium, Eucalyptus, Conocarpus, and Christ's Thorn Jujube) using extracts with different concentrations (10%, 20%, 30%, and 40%) showed satisfactory results for all plants and with increased concentration of the extracts of each plant the inhibition activity is increased also. Nerium and Eucalyptus outperform the rest of the plants in the different concentrations and Christ's Thorn Jujube is less inhibition than the rest of the plants used in the experiment. The use of plant extracts is a successful way to reduce the use of chemicals harmful to health and the environment, which is the primary objective of current and previous studies.

Keywords Plant extract, Antifungal, Inhibition, *Fusarium*

Introduction

Tomato known as (*Solanumlycopersicon* Mill.) is a very important vegetable in the world its second crop after potato. The annual world production of tomatoes in 2009 was about 152.9 tons (Anonymus, 2009) while in Iraq it was 830.000 tons in 2008 (FAOSTAT, 2008). Many economically important diseases of tomato which are caused by different types of fungi can make serious damage in tomato fields (Snyder et al., 2003). Fusarium wilt in tomatoes is one of these diseases which are caused by (*F. oxysporum* f. sp. *lycopersici*) is a serious problem because of the economic loss in tomato fields and tomato value. This pathogen is a soil-borne disease that can survive in a different type of soil for many years without a host (Farr et al., 1989). *F. oxysporum* f. sp. *Lycopersici* belongs to *Deuteromycota* fungi which are given macro and microspores and it already attaches the plant in vascular tissue and the severity case will close the vascular tissues (Snyder and Hans, 2003). Control of fusarium wilt can be due by using different methods such as fungicides, bioagents, and plant extract. Plant extract can be the best compared with fungicides because of the fungicides have a

high risk and residue effect which may be caused different diseases like cancer in humans and it may kill the bioagent, so using of plant extract can be control of pathogens and it is an environmental friend (Arabaea, 2018). Many plant extracts show antifungal, antioxidant, and antimicrobial against several diseases in plants, animals, and humans (Patwardhan 2005; Rad et al. 2014a).

Materials and Methods

The infected plant was collected from different fields of Almuthanna city. The pathogen was isolated and diagnosis in the laboratory of the biology department, college of science, Muthanna university. The pathogen was cultured in the petri dish and kept in an incubator at 25°C for future using. At the period of the present work which is from December- 2017 to Jun-2018, plant material was collected from different places of Almuthanna city for using plant extract against the pathogen. Four plants were collected which are explained in Table 1, the antifungal activity of each plant extract was tested at four concentrations (10, 20, 30, 40%) according to Singh and Majumdar (2001) method. the leaves of each plant were washed with sterilized water and put separately in an electric

grinder using an equal amount of sterilized distilled water (i.e., 1:1 ratio, w/v). the mixture was filtered by the double-layer cheesecloth. This obtained was the 100 percent concentration of each plant material. Different concentration of plant extract was prepared for the test it was (10, 20, 30, and 40%). Each concentration was tested in three treatments to get the best result. The food poison technique was used to study the inhibition capacities of plant extract of each plant at the different concentrations which are means mixed the plant extract with media in the petri dish and then plat the pathogen and incubate it at 25°C in the incubator. After ten days the petri dish was checked by the scale and collected the radial growth of pathogen and then collected the percent inhibition by followed Vincent, 1947 equation

$$I = ((C-T)/C) * 100$$

I = per cent inhibition, C = growth in control, T = growth in treatment

Table 1. list of plants which were used against fussarium wilt

sq	Common name	Scientific name	Using part
1	Nerium oleander	Nerium oleander	Leaves
2	Eucalyptus	Eucalyptus chamadulonsis	Leaves
3	Conocarpus	Conocarpus erectus var. Erectus	Leaves
4	Christ's Thorn Jujube	Ziziphusspina-christi	Leaves

Completely Randomized Design (CRD) was used for Data was analyzed by using Panse and Sukathme (1985) method. According to the table given by [Snedecor and Cochran \(1967\)](#) before analysis, the actual data in percentage were converted to angular values.

Results and Discussion

Based on what the results showed in [Table 2](#). which showed the significant superiority of the oleander extract for all the concentrations used (10, 20, 30, and 40), where the inhibition percentage was (26, 33, 38, and 42), respectively. While the Sidr plant extract was less effective in the same range of concentrations, where the inhibition was (12, 19, 26, and 32) percent. The eucalyptus extract showed a less inhibitory rate than the oleander extract, which was (21, 30, 35, and 48) percent. It is followed by the extract of the Quinocarp plant, which reached a peak of inhibition at (17, 22, 30, and 36) percent. Despite the variation in the inhibition value in [Table No. 2](#), all plant extracts showed a tendency to inhibit and limit the growth of usarium fungus.

The results that we have shown have demonstrated an increase in the effect of plant extracts by increasing the

concentration of the extracts on the growth of the pathogen in vitro. These results showed similarities to what was mentioned in the results of the previous study by ([Boulennouar et al., 2009](#)), which was conducted to test the ability of plant extracts to inhibit the fusarium, as it showed the ability of the oleander plant extract to inhibit the growth of the fungus. ([Nashwa and Sallam 2011](#)) reported the susceptibility of Oleander and Claptose extracts on the growth of the fungus *Alternaria solani* ([Latha et al., 2009](#), [Goussouse et al., 2010](#)) reported the same effect on *Solanianilernaria*. These extracts may contain many substances that have an inhibitory effect on the fusarium, and this has been proven by many previous studies that were conducted through the researcher ([Al-Farwachi, 2007](#); [Hassan et al., 2007](#); [Hamed et al., 2006](#); [Sawaya et al., 2006](#); [Abbassi et al., 2004](#); [Hamdy et al., 1999](#); [Begum et al., 1997](#); [Maatooq et al., 1997](#); [Abiola et al., 1993](#); [Al-Said et al., 1988](#); [Habs et al., 1984](#)).

The same results appeared in previous studies, where they were shown through the use of plant extracts against the fungus *Alternaria*. The high inhibitory ability of the Quinocarpus plant extract is due to its possession of a higher amount of tannins compared to the rest of the phenolic compounds in it, as this inhibitory ability was proven on most microbes by ([Bashir et al., 2015](#)). While the inhibitory ability of the Sidr plant was proven by ([Ayman et al., 2013](#)), as the plant extracts have proven their inhibitory ability on a group of fungi (*Alternaria solani*, *Botrytis cinerea*, *Botrytis fabae*, *Fusarium oxysporum*, and *Fusarium solani*).

Conclusion

Despite the emergence of many similar types of research that have proven the ability of plant extracts to inhibit the growth of a wide range of plant pathogens, whether fungal or bacterial, but the use of pesticides is still widely used in our present time despite the danger of these compounds, whether on public health or the environment. We recommend limiting the use of pesticides and resorting to the use of safe and non-hazardous compounds such as plant extracts, which are abundantly available in various environments, thus saving material and health waste.

Conflict of Interest

The author hereby declares no conflict of interest.

Consent for publication

The author declares that the work has consent for publication.

Funding support

The author declares that they have no funding support for this study.

Table 2. Antifungal cavity of four plant at the different concentration

Host extract	Concentration	10%			mean	20%			mean	30%			mean	40%			mean
		T1	T2	T3		T1	T2	T3		T1	T2	T3		T1	T2	T3	
Christ's Thorn Jujube	growth	69.00	68.00	68.50	68.50	63.00	63.00	64.00	63.33	58.00	57.00	57.50	57.50	53.00	53.00	52.50	52.83
	Inhibit %	12.10	13.38	12.74	12.74	19.75	19.75	18.47	19.32	26.11	27.39	26.75	26.75	32.48	32.48	33.12	32.70
Conocarpus	growth	65.00	65.00	64.00	64.67	60.00	61.00	60.50	60.50	55.00	55.00	54.50	54.83	50.00	50.00	50.00	50.00
	Inhibit %	17.20	17.20	18.47	17.62	23.57	22.29	22.93	22.93	29.94	29.94	30.57	30.15	36.31	36.31	36.31	36.31
Eucalyptus	growth	61.00	62.00	61.50	61.50	55.00	55.00	54.50	54.83	51.00	51.00	51.00	51.00	48.00	48.00	48.00	48.00
	Inhibit %	22.29	21.02	21.66	21.66	29.94	29.94	30.57	30.15	35.03	35.03	35.03	35.03	38.85	38.85	38.85	38.85
Nerium or oleander	growth	58.00	58.00	58.00	58.00	52.00	52.00	51.50	51.83	49.00	48.00	48.50	48.50	45.00	45.00	44.50	44.83
	Inhibit %	26.11	26.11	26.11	26.11	33.76	33.76	34.39	33.97	37.58	38.85	38.22	38.22	42.68	42.68	43.31	42.89
Controll		79.00	78.50	78.00	78.50	79.00	78.50	78.00	78.50	79.00	78.50	78.00	78.50	79.00	78.50	78.00	78.50
CV		0.70				0.72				0.70				0.53			
S.Em		0.27				0.26				0.24				0.17			

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How to cite this article:

Atia E.A. and Atia, A.A. (2021). Reduce the severity of *fusarium* wilt tomato by use natural plant produces. *Science Archives*, Vol. 2 (3), 212-215. <http://dx.doi.org/10.47587/SA.2021.2310>