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VITRO STUDY OF THE ANTIFUNGAL ACTIVITY OF *ALHAGI MAURORUM* AND *TAMARIX APHYLLA* EXTRACTS AGAINST SOME PLANT PATHOGENIC FUNGI.

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Abstract

The antifungal activity of *Alhagi maurorum* and *Tamarix aphylla* extracts was tested for inhibiting the growth of *Fusarium oxysporum*, causing tomato wilt disease, *Pythium aphanedrmatuim*, causing cucumber seedling damping off, and *Alternaria solani* causing early blight of tomato under *in-vitro* condition. The *T. aphylla* extracts of 40% had the highest effect against *F. oxysporum, P. aphanedrmatuim* and *A. solani* (47.19, 41.25 and 47.85% respectively), while *A. maurorum* extract had less effect against *F. oxysporum, P. aphanedrmatuim* and *A. solani* as compared to *Tamarix aphylla* extracts. The high antifungal activity of both plants extracts leads to the possibility of using the plant extract eco-friendly to avoid environmental pollution which is caused by fungicides.

Keywords – Plant extract; Antifungal; Inhibition; *Tamarix aphylla; Alhagi maurorum*.

INTRODUCTION

Plant extracts are believed to be a primary source of many new compounds and used as a source of treatment as a substitute for synthetic chemical compounds that have a negative impact on plant, human and animal life. Such plants were used in medicine by the Sumerians before 3000-1970 BC and then by the Assyrians and Babylonians for the period 1970-539 BC, treatments from plants were extracted by the Arabs in the period 500-1038 AD (Nadheerah, 2012). Extracts of Neem leaves can use to control of tomato mosaic tobamovirus (Sadik *et al*., 2008). The extract of garlic and ginger can be control some bacteria like *Staphlycoccus aureus*, *Streptococcus pyogenes*, *Escherachia coli*, and *Pseudomonas areuginosa* (Nazir et al., 2017). *Alhagi maurorum*, which is called Akool in Iraq, Camel Thorn, Persian Manna plant, is found in many parts the world in Africa, Europe, and the Middle East and it is considered as Camels food (Awmack and Lock, 2002). The activity of *Alhagi* species extracts against plant pathogenic fungi was reported by (Laghari et al., 2014, Al-Askar, 2012, Zain et al., 2012, Abd-Ellatif et al., 2011 and Abu-Taleb et al., 2011). *Alhagi maurorum* can be using to cure chronic and acute diseases (Mansoor Hameed *et al.,* 2011). While *Tamarix aphylla* (Tamarisk) is a plant dendritic, belongs to the family of Tamaricaceae, which is a saline and found in various parts of the world like Asia, Africa, and Europe (Orwa et al., 2009). This plant has been used as an antidote for certain ns and to healing some wounds (Abdallah and El-Ghazali, 2013). The antifungal properties of some plant could be used eco-friendly against the pathogens for diseases management (Mangang and chhetry, 2012). Natural plant products are the main source of new agricultural chemicals for the control of plant pathogens (Kagale *et al*., 2004). The extracts of number of plants such as *Eucalyptus globules* and *Datura stramonium* are effective against *Aspergillus* species and these extracts have been shown to reduce the growth of the fungus (Satish *et al*., 2007). The main objective of this work is to test the ability of *Alhagi maurorum* and *Tamarix aphylla* extracts to control of the plant pathogenic fungi by using them as natural fungicides to get easy methods for controlling plant diseases and to avoid the environmental pollution which are causing by using fungicide.

MATERIALS AND METHODS

The present study of the antifungal activity of plant extracts against plant pathogenic fungi was carried under *in-vitro* condition during 2016-2017 in the labs of Environment and pollution Department, College of Science, University of Muthanna.

1. Isolation of fungal pathogens: Infected plants samples were collected from different locations (**Table 1**). Pathogens were isolated from infected plants by cutting the infected part of plant into small parts and washing it by 1% Hgcl, for one minute. After that they were washed by distilled water three times dried and moved onto potato dextrose agar (PDA) Petri dishes which were incubated for 7-10 days in the incubator to get pathogenic colonies.

Table 1: List of plant pathogenic fungi, which were collected from the field

Sl. No.	Pathogen	Disease	Host
1	*Fusarium oxysporum*	Wilt disease	tomato
2	*Pythium aphanedrmatuim*	seedling damping off	Cucumber

3	*Alternaria solani*	Early blight	tomato

2 - Collection and preparation of plant extracts: Samples of two plants species were collected from different locations in Muthanna city, *Alhagi maurorum*, which is most common in Iraq native and used as a feed for camels, is called in Iraq as "Akool". *Tamarix aphylla* is dendritic and saline. To prepare plant extracts we followed to a method, which is given by (Gerard et al., 1994). The plant samples were washed with tap water to remove the soil and dust from it. In this process sterile distilled water was added (1:1 v/w) so that 20 g of plant leaves were added to 20 ml of sterile distilled water and crashed by pestle and mortar. After that we filtered it through a muslin cloth. The extract formed a standard leaf extract solution of 100% concentration. The plant was extract sterilized in the autoclave (1.1kg cm^{-2} for 20 minutes).

3. Antifungal activity: Three replications of each treatment were done and the poisoned food technique which are given by Grover and Moore, (1962), was employed to test the antifungal activity of the plant extracts, required quantity of plant extracts was added separately into potato dextrose agar so as to get the desired concentration (20 and 40%) of the plant extracts and then sterilized in autoclave. Later, 20 ml of the poisoned medium was poured into sterilized Petri plates. Mycelial disc of 5 mm was added on the middle of each PDA plate containing plant extracts and used as an inoculum. Control plates which did not include plant extracts were compared with plates containing plant extracts. The antifungal activity of plant extract was recorded by calculating the radial growth of fungi and the inhibition percentage of plant extract by following equation (Vincent, 1947):

$$I = \frac{C - T}{C} * 100$$

Where,

I = percent inhibition; C = growth in control; T = growth in treatment

4. Statistical analysis: The method of Panse and Sukathme, 1985, was used for data analysis and the actual data in percentage were converted to angular values, before analysis according to the table given by Snedecor and Cochran (1967).

RESULTS

1- Effect of plant extracts against *Fusarium oxysporum*, which causes tomato Wilt disease disease: *Alhagi maurorum* and *Tamarix aphylla* extract of 20 and 40% concentration reduced the growth of *Fusarium oxysporum. T. aphylla* extracts of 40% concentration caused the highest effect against *F. oxysporum* **(**47.19%**).** *A. maurorum* extract which was less effective than *T. aphylla* extracts with both concentration (Table2).

Table 2: Effect of plant extracts *Fusarium oxysporum*

Sl. No.	Botanical Name	Common Name	20 % concentration		40 % concentration	
			Radial growth(mm)	Inhibition percentage	Radial growth(mm)	Inhibition percentage
1	*Alhagi maurorum*	Akool	38.00	24.75(29.8) *	28.33	43.89(41.4) *
2	*Tamarix aphylla*	Tamarisk	36.83	27.06(31.35)	26.67	47.19(43.39)
3	Control		50.50	------	50.50	------
	mean		41.78	25.91(30.59)	35.17	45.54(42.44)
	CD 0.05		0.60	0.91	1.31	1.64
	SEM±		0.15	0.15	0.33	0.27
	CV%		0.63	0.85	1.64	1.10

The mark (*) means the value in the parenthesis is arc sine transformed

2 - **The effect of plant extracts against *Pythium aphanedrmatuim*, which causes the disease of seedling damping off on the Cucumber:** According to the results (Table 3), the extract of *Tamarix aphylla* was more effective than *Alhagi maurorum*, especially with the 40% concentration.

Table 3: The effect of plant extracts against *Pythium aphanedrmatuim*

Sl. No.	Botanical Name	Common Name	20 % concentration		40 % concentration	
			Radial growth(mm)	Inhibition percentage	Radial growth(mm)	Inhibition percentage
1	*Alhagi maurorum*	Akool	39.83	21.12 (27.36) *	31.33	37.95 (38.03) *
2	*Tamarix*	Tamarisk	39.17	22.44 (28.28)	29.67	41.25(39.96)

	aphylla				
3	Control	50.50	------	50.50	-----
Mean		43.17	21.78 (27.82)	37.17	39.60(39.00)
CD 0.05		0.93	1.97	1.31	1.67
SEM±		0.24	0.32	0.33	0.27
CV%		0.95	2.02	1.55	1.22

The mark (*) means the value in the parenthesis is arc sine transformed

3 - Effect of plant extracts against *Alternaria solani* causing tomato early blight disease: *Tamarix aphylla* extract caused higher inhibition growth against *Alternaria solani* at 20 and 40% concentration (25.08 and 47.85% respectively) than *Alhagi maurorum* extract (Table 4).

Table 4: The effect of plant extracts against *Alternaria solani*

Sl. No.	Botanical Name	Common Name	20 % concentration		40 % concentration	
			Radial growth(mm)	Inhibition percentage	Radial growth(mm)	Inhibition percentage
1	*Alhagi maurorum*	Akool	39.67	21.45 (27.59) *	28.67	43.23 (41.11) *
2	*Tamarix aphylla*	Tamarisk	37.83	25.08 (30.05)	26.33	47.85 (43.77)
3	Control		50.50	-----	50.50	-----
mean			42.67	23.27 (28.82)	35.17	45.54(42.44)
CD 0.05			0.93	1.93	0.93	0.83
SEM±			0.24	0.32	0.24	0.14
CV%			0.96	1.91	1.16	0.55

The mark (*) means the value in the parenthesis is arc sine transformed

DISCUSSION

According to result of the experiment which is recorded in Tables 2, 3 and 4, the extract of *Tamarix aphylla* and *Alhagi maurorum* showed activity against plant pathogenic fungi. This activity may be due to different chemical compounds which play the main role for inhibiting the pathogenic growth. The main phytochemicals compounds in *T. aphylla* extracts are phenolic compounds, saponins, alkaloids, glycosides and tannins (Auribie, 2011). Flowers and leaves of *T. aphylla* extracts contain tannins, steroids, phlo-tannins, flavonoids, phenols, saponin and terpenoids (Qasim *et al*., 2013). The higher activity *T. aphylla* extract may be due to its salinity, which would mean the osmosis happened in fungal cells. The activity of *Alhagi maurorum* maybe due to its chemical compounds such as phenolic compounds, carbohydrates, fatty acids, sterols, flavonoids, coumarins, alkaloids, proanthocyanidins, vitamins and lupeol which are involved in the activity against different plant pathogens, fungi and bacteria (Soad *et al*., 2015). The results are in agreement with the antifungal activity of *Tamarix aphylla* against *Penicillium notatum, Aspergillus flavus, Aspergillus fumigatu and Fusarium oxysporum* reported by Sadafbibi *et al*., (2015). The ability of *Tamarix aphylla* to reduce the fungal growth in-vitro was recorded by Dushyent and Bohra, (1997). Antifungal activity of *Tamarix aphylla* and *Alhagi maurorum* was reported against *Aspergillus flavus* (Zain *et al*., 2012) while antimicrobial activity of *Tamarix aphylla* extract on pathogenic tested microbes was reported by Sulaiman, (2015).

CONCLUSION

In conclusion, the present study provides the ability of especially plant extract of *Tamarix aphylla* and also *Alhagi maurorumm* to control of plant pathogenic fungi. We suggest that these extracts can be used as an eco-friendly compounds which has a non-reside effect as compared with chemical compounds (fungicides), which have many problems and may cause environmental pollution. Both plants species grow were a wild and have wide distribution in the world.

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REFERENCE

Abdallah E.M. and G.E. El-Ghazali, Screening for antimicrobial activity of some plants from Saudi folk medicine. *Global J. Res. Med. Plants & Indigen. Med.* 2: 189–197 (2013).

Abd-Ellatif, S., Abdel Rahman, S.M. and S.F. Deraz, Promising antifungal effect of some folkloric medicinal plants collected from El-Hammam habitat, Egypt against dangerous pathogenic and toxinogenic fungi. *Journal of*

Agricultural and Biological Science 6(9): 25-32 (2011).

Abu-Taleb, A.M., K. El-Deeb and F.O. Al-Otibi, Bioactivity of some plant extracts against *Drechslera biseptata* and *Fusarium solani*. *J. Food Agric. Environ*. 9: 769-774 (2011).

Al-Askar, A.A., In Vitro antifungal activity of three Saudi plant extracts against some phytopathogenic fungi. *Journal of Plant Protection Research* 52(4): 458 – 462 (2012).

Auribie MA., Antioxidant activity of tannin from *Tamarixa phyla* leaves. *Basra J. Agric. Sci*. 24: 1-10 (2011).

Awmack, C.S. and J.M. Lock, The genus *Alhagi* (Lguminasae: Papilionoideae) in the Middle East. *Kew Bull*. 57:435-445 (2002).

Dushyent G. and A. Bohra, Effect of extracts of some halophytes on the growth of *Alternaria solani*. *Journal of Mycological Plant Pathology* 27: 233 (1997).

Gerard E.J., V. Chandrasekar and V. Kurucheve, Effect of six selected plant products and oil cakes on the sclerotial production and germination of *Rhizoctonia solani*. *Indiqn Phytopath*. 47: 183-185 (1994).

Grover R.K. and J.D. Moore, Toxicometric studies of fungicides against brown rot organisms Sclerotinia fructicola and S. laxa. Phytopathology 52: 876- 880 (1962).

Kagale S., T. Marimuthu, B. Thayumanavan, R. Nandakumar and R. Samiyappan, Antimicrobial activity and induction of systemic resistance in rice by leaf extract of *Datura metel* against *Rhizoctonia solani* and *Xanthomonas oryzae* pv. *oryzae*. *Physiological and Molecular Plant Pathology* 65:91–100 (2004).

Laghari, A., S. Memon, A. Nelofar and K.M. Khan, Determination of Volatile Constituents and Antimicrobial Activity of Camel Thorn (*Alhagi camelorum*) Flowers. *Anal. Lett*. Pp. 413 – 421 (2014).

Mangang H.C. and G.K.N. Chhetry, Antifungal Properties of certain Plant Extracts against *Rhizoctonia Solani* Causing Root Rot of French Bean In Organic Soil of Manipur. *IJSRP* 2(5): 1-4 (2012).

Mansoor H., M. Ashraf, F. Al-Quriany, T. Nawaz, M.S.A. Ahmad, A. Younis and N. Naz1, Medicinal Flora of the Cholistan Desert: A Review. Pak. J. Bot. 43: 39-50 (2011)

Nadheerah F.N., A Pharmacological Evaluation of Aqueous Extract of *Alhagi Maurorum. Global Journal of Pharmacology* 6 (1): 41-46 (2012).

Nazir Ahmed Brohi, Agha Asad Noor and M.A. Sial, Dose Response Curve of Various Plant Extrats on G+Ve and G-Ve Bacterial Isolates. Pak. J. Biotechnol. 14(2) 205 – 209 (2017).

Orwa C., Mutua A., Kindt R., R. Jamnadass and S. Anthony, Agroforest tree Database: a tree reference and selection guide version 4.0. http://www.worldagroforestry.org/sites/treedbs/treedatabases.asp (2009)

Panse, V.G. and P.V. Sukathme, Statistical Methods for Agricultural Workers. *ICAR Publications*, New Delhi, Pp. 145-155 (1985).

Qasim, S.M., A. Sumbal, S. Shah, S., Bano, S.M. and S. Chundrigar, Phytochemical screening of *Tamarix dioica* Roxb. ex Roch. *J. of pharmacy research* 7: 181- 183 (2013).

Sadafbibi, M.A., N.S. Kulsoombibi and Abdur Raheem, Antifungal activity of *Tamarixa phylla* (L.) Karst. Stem-bark extract against some pathogenic fungi. *International Journal of Pharmacological Research* 5: 44-48 (2015).

Sadik M.S., B.M. Abdel-Wahab, R. Kamel, M. Ibrahim and M.I. Salama, Effect of Natural Extracts of Some Plants on the Antiviral Activity of Tomato Mosaic Tobamovirus. *Pak. J. Biotechnol*. 5 (1-2) 73-81 (2008).

Satish, S., Mohana, D.C., Ranhavendra, M.P. and Raveesha, K.A., 2007. Antifungal activity of some plant extracts against important seed borne pathogens of *Aspergillus* sp. *Journal of Agricultural Technology*, Vol. 3(1): 109-119.

Snedecor, G.W. and W.G. Cochran, Statistic methods, 6th ed, Ames: Iowa State Univ. Press Pp593 (1967).

Soad M.A., A.A. Housien, A.A. Ismail and F.S. Sabra, In Vitro Activity of Hexane and Ethanol Extracts of Camelthorn, *Alhagi maurorum* against Plant Pathogenic Fungi and Bacteria. *Asian Journal of Agriculture and Food Sciences* 3: 561-568 (2015).

Sulaiman A.A., Phytochemical and Antimicrobial Properties of *Tamarix aphylla* L. Leaves Growing Naturally in the Abha Reg-ion, Saudi Arabica. *Arabian Journal of Science and Engineering*. 41(6): 2123-2129 (2015).

Vincent J.M., Distortion of fungal hyphae in the presence of certain inhibitors. *Nature* 159: 850-850 (1947).

Zain, M.E., A.S. Awaad, M.R. Al-Outhman and R.M. El-Meligy, Antimicrobial activities of Saudi Arabian desert plants. *Phytopharmacology* 2(1): 106-113 (2012).