



ANTIFUNGAL ACTIVITY OF LEAF EXTRACTS OF *JATROPHA CURCAS* AGAINST FUNGAL PATHOGENS OF VEGETABLE BEANS

Suman Saini*

Microbiology Laboratory, Department of Botany, S.P.C. Government College, Maharshi Dayanand Saraswati University, Ajmer, Rajasthan-305001 India.

*Corresponding Author: Dr. Suman Saini

Microbiology Laboratory, Department of Botany, S.P.C. Government College, Maharshi Dayanand Saraswati University, Ajmer, Rajasthan-305001 India.

Article Received on 16/07/2022

Article Revised on 06/08/2022

Article Accepted on 26/08/2022

ABSTRACT

The present study was conducted with an aim of determining antifungal activity of leaf extracts of *Jatropha curcas* which belongs to the family Euphorbeaceae. The leaf were collected and shade dried and extracted using aqueous, ethanol, methanol and acetone in soxhlet assembly. Antifungal activity of leaf extracts in different solvents were tested against fungal pathogens of vegetable beans using disc diffusion method. The results revealed that the methanol leaf extracts were very effectively inhibited the fungal pathogens of vegetable beans followed by ethanolic extract. Aqueous and acetone extract gave minimum inhibitory activity. The present study confirmed that *Jatropha curcas* plant leaf extracts can be used to develop the plant based biofungicide to control the fungal pathogens of vegetable beans that can reduce the dependence on the synthetic fungicides and are ecologically safe and cheap. The preliminary phytochemical screening of *Jatropha curcas* showed alkaloids, glycosides, flavonoids and reducing sugars are present in leaf extracts prepared in different solvents while phenols and tannins are present in all solvents except acetone.

KEYWORDS: *Jatropha curcas*, Disc diffusion method, Antifungal, Soxhlet assembly.

INTRODUCTION

Fungi play negative effects on the productivity of several important crop plants. Fungi are significant destroyers of food stuffs and grains during storage, rendering them unfit for human consumption by retarding their nutritive value and by producing mycotoxins.^[1] In all over the world scientists are associated in discovering methods to control the fungal diseases of plants.^[2] Synthetic fungicides are generally used for preventing pre and post harvest crop losses caused by phyto-pathogenic microorganisms. Indiscriminative and extensive use of these synthetic fungicides are posing serious problem to the life supporting system due to their residual toxicity.^[3] Therefore, the development of plant based fungicides has been focused as a viable pest control strategy in recent years. Considering this fact, the present investigation has been emphasized to study the fungitoxic properties of leaf extract of *Jatropha curcas* against fungal pathogens of vegetable beans.

Almost all parts of *Jatropha curcas* plant are used in the Indian traditional system of medicine. Antifungal activity of aqueous, ethanol, methanol and acetone extracts of leaf has been studied with a view to find out a cheaper and ecofriendly method for preventing fungal contamination.

MATERIAL AND METHODS

(a) Collection of medicinal plant material

Fresh healthy leaves of *Jatropha curcas* were collected from different locations of Ajmer, washed with tap water, surface sterilized with 2% sodium hypochlorite for 5 min. and washed thoroughly 2-3 times with sterile distilled water then shade dried. Dried leaves were grinded in fine powder.

(b) Preparation of leaf extract

20 gm of powder of *Jatropha curcas* leaf was filled in thimble and extracted with aqueous, ethanol, methanol and acetone in Soxhlet extractor for 48 hrs. The extract were concentrated under reduced pressure and preserved at 4°C in airtight bottles for further use.

(c) Plant pathogenic fungi

Different samples of vegetable beans were collected from market as well as from different vegetable growing parts of Ajmer and Jaipur regions of Rajasthan. Fungal pathogens were isolated on Potato dextrose agar^[4] (PDA) medium and cultured. The fungal isolates thus purified were subjected to morphological, cultural and microscopic examination and identified accordingly using the methods given by pathologists.^[5-10] The culture samples were also sent to plant pathology laboratory,

IARI, Pusa, New Delhi for their confirmation. They were identified as *Alternaria alternata*, *Fusarium pallidoroeseum*, *Curvularia lunata* and *Macrophomina phaseolina*.

(d) Disc-diffusion method^[11]

20 ml of PDA medium was poured in sterilized petridishes and allowed to solidify. Then pure culture of fungi were spread in petridishes. Disc prepared by aqueous, ethanol, methanol and acetone extracts of leaf of *Jatropha curcas* were then put in the petriplates. These petriplates were incubated for 6 days at 30±2°C temperature and the inhibition in growth were recorded in mm. as diameter of zone of inhibition.

(e) Phytochemical analysis of leaf

The leaf extracts prepared in aqueous, ethanol, methanol and acetone solvent were screened for the presence of phytochemicals namely, alkaloids, glycosides, saponins, terpenoids, phenols, tannins, flavonoids, triterpenoids, steroids and reducing sugars by standard phytochemical tests.^[12-15]

RESULTS AND DISCUSSIONS

The medicinal plant *Jatropha curcas* is rich in bioactive phytocostituents and exhibited antifungal activity against phytopathogens of vegetable beans showing different sensitivity with different concentrations viz. 50, 100, 150 and 200 mg/ml. The results are summarized in table 1.

Table 1: Effect of leaf extract of *Jatropha curcas* on test fungi.

Solvent extracts	Concentration	<i>Alternaria alternata</i>	<i>Fusarium pallidoroeseum</i>	<i>Curvularia lunata</i>	<i>Macrophomina phaseolina</i>
	mg/ml				
Distilled water	50	12.2	13.0	11.7	11.0
	100	15.0	15.4	14.6	13.9
	150	17.9	18.6	17.0	16.7
	200	21.0	22.3	20.3	20.0
Ethanol	50	11.5	12.5	11.9	10.9
	100	15.2	16.0	15.0	14.9
	150	17.3	17.5	18.9	18.0
	200	21.5	22.5	21.4	20.5
Methanol	50	14.2	14.5	14.0	14.5
	100	16.5	17.0	18.2	13.2
	150	19.9	20.0	20.2	21.0
	200	22.5	23.0	22.0	22.6
Acetone	50	10.2	13.2	10.5	9.2
	100	12.3	16.2	13.8	12.1
	150	15.4	18.5	17.2	15.9
	200	20.0	21.5	20.5	19.5

Table 1: Preliminary phytochemical screening of *Jatropha curcas* leaf extracts in different solvents.

S. No.	Chemical constituent	Distilled water	Ethanol	Methanol	Acetone
1.	Alkaloids	+	+	+	+
2.	Glycosides	+	+	+	+
3.	Saponins	-	-	+	-
4.	Terpenoids	-	-	-	-
5.	Phenols	+	+	+	-
6.	Tannins	+	+	+	-
7.	Flavonoids	+	+	+	+
8.	Triterpenoids	-	+	+	-
9.	Steroids	-	-	-	-
10	Reducing sugars	+	+	+	+

Table 1 showed zone of inhibition of leaf extracts in different solvents against tested fungi. The results showed that methanol extract gave maximum zone of inhibition followed by ethanol. Aqueous and acetone extracts of leaf showed minimum results. Methanol leaf extract of *Jatropha curcas* inhibited the growth of *Fusarium pallidoroeseum* to the high extent followed by *Curvularia lunata* than *Alternaria alternata* and *Macrophomina phaseolina*. Similar results were obtained

from Magreth *et al.* studies that *Jatropha curcas* leaf extracts possessed fungicidal properties since they inhibited the growth of *Phaeoisariopsis personata*.^[16] Akinpelu *et al.*, investigated the antibacterial activity of the methanolic extracts of the leaves of *Jatropha curcas* against 13 bacterial species including *Escherichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*. The extract showed appreciable inhibitory activity against these organisms.^[17] Similar results were obtained

from the present investigation also. Igbinosa *et. al.*, studied antimicrobial activity of *Jatropha curcas* and found that methanol extract was reported to be more effective than the ethanol extract against all the organisms and the water extract showed low antimicrobial activity.^[18] It was concluded that in the present investigation methanolic extract was highly effective than ethanolic, acetone and aqueous extracts. Similarly, Babayemi *et. al.* showed that methanol extract of *Jatropha tanjorensis* had the highest inhibitory activity against bacteria isolated from wound samples compared to other crude extracts and ciprofloxacin.^[19] The inhibitory activity of plant extract is largely dependent on the concentration, parts of the plant used and the microbes tested.^[20]

Preliminary phytochemical analysis of aqueous, ethanol, methanol and acetone extracts of leaf of *Jatropha curcas* are seen in table 2. This table shows that alkaloids, glycosides, flavonoids and reducing sugars are present in leaf extracts prepared in different solvents while phenols and tannins are present in all solvents except acetone. Triterpenoids is present in ethanol and methanol solvent while saponins only present in methanol solvent. Similar results were obtained from the previous studies. The phytochemical screening of present work agrees with the results of Adebayo and Kofi who showed the presence of reducing sugars, alkaloids, triterpenoids, tannins in ethanol, aqueous and petroleum ether extracts. The ethanol extract gave superior antibacterial activities as compared with aqueous and petroleum ether.^[21]

CONCLUSION

It was concluded from present investigation that aqueous, ethanol, methanol and acetone extracts of leaf of *Jatropha curcas* can be used as antifungal agents against fungal pathogens of vegetable beans.

Acknowledgement

I would like to express my sincere thanks to the Head, Department of Botany, S.P.C. Government College, Ajmer, Rajasthan, India for providing me the facilities to conduct the research work. Moreover I also express my gratitude to the team of Plant pathology laboratory, Indian Agricultural Research Institute, New Delhi for necessary efforts made by them in the identification of pathogen.

REFERENCES

1. Satish S, Mohana DC, Raghavendra MP and Raveesha KA. Antifungal activity of some plant extracts against important seed borne pathogens of *Aspergillus* spp. J. of Agri. Technol, 2007; 3: 109- 119.
2. Poonam, M., Tripta, J., and Kanika, S. Antifungal activity of leaf extracts of *Polyalthia longifolia* [Sonn.] Benth. And Hook. F. gainst *Rhizoctonia solani*. Plant Archives, 2021; 21, 1: 1366-1371.
3. Satish S, Mohana DC, Raghavendra MP and Raveesha KA. In vitro evaluation of the antifungal potentiality of *Polyalthia longifolia* against some *Sorghum* grain moulds. J. of agri. technol, 2010; 6(1): 135-150.
4. Ricker AJ and Ricker RS. Introduction to research on Plant disease. St. Louis Jonh's Swift Co., New Yark, 1936; 117.
5. Agrios GN. Significance of plant diseases in plant pathology. Academic press, London, 2005.
6. Baudoin ABAM. Laboratory exercise in plant pathology: An instructional kit. APS Press, St. Paul MN, 1988.
7. Barnett HL. Illustrated genera of fungi. Burgess publishing company. Minnaopolis, 1955-1960.
8. Cappuccino JG. Microbiology, A Laboratory manual. Pearson Education, 2009; 7.
9. Clements FE and Shear CL. The genera of fungi. Hafner Publishing Company, Inc. New Yark, N. Y., 1973.
10. Ellis MB. Dematiaceous hyphomycetes. Commonwealth mycological institute, Kew, Surrey, England, 1971.
11. Omenka CA and Osouha JO. Antimicrobial potency of grapefruit seed extract on five selected pathogens. *Nigerian J. of Microbiol*, 2000; 14(2): 39-42.
12. Trease GE and Evans WC. A text book of of Pharmacognosy. Bacilliere Tinal Ltd., London, 1989; 13.
13. Singleton VL, Orthofer R and Lamuela-Raventos RM. Analysis of total phenols and oxidization substrates and antioxidants by means of folin-ciocalteu reagent. *Methods Enzymole*, 1999; 299: 152-177.
14. Siddiqui AA and Ali M. Practical and Pharmaceutical Chemistry. CBS Publisher and Distributor, 1st ed. New Delhi, 1997; 126-131.
15. Iyenger MA. Study of crude drugs. 8th ed. Manipal power press, Manipal, India, 1995; 2.
16. Akinpelu DA, Olayinka, A. and Athony, I.O. The bioactive potentials of two medicinal plants commonly used as folklore remedies among some tribes in West Africa. *Afr. J. Biotechnol*, 2009; 8: 1660-1664.
17. Igbinosa OO, Igbinosa EO and Aiyegoro OA. Antimicrobial activity and phytochemical screening of stem bark extracts from *Jatropha curcas* (Linn). *African Journal of Pharmacy and Pharmacology*, 2009; 3(2): 058-062.
18. Babayemi OO Oke EA and Bayode MT. Antibacterial activity of *Jatropha tanjorensis* leaf extracts against bacteria associated with wound infections from the clinical setting. *Nusantara Bioscience*, 2021; 13, 2, 239-246.
19. Magreth F, Musa C, Patrick A, Ndakidemi, Ernest R and Mbega. Phytochemical analysis and in vitro antifungal evaluation of *Jatropha curcas* against late leaf spot disease on groundnut. *Journal of animal & plant sciences*, 2021; ISSN 2071-7024, 47(1): 8358-8371.
20. Ekundayo FO, Adeboye CA and Ekundayo EA. Antimicrobial activities and phytochemical

screening of pignut (*Jatropha curcas* Linn.) on some pathogenic bacteria. Journal of Medicinal Plants Research, 2011; 5(7): 1261-1264.

21. Adebayo OL and Kofi AP. Comparison of antibacterial properties of solvent extracts of different parts of *Jatropha curcas* L. Int. J. Pharm. Phytopharmacol. Res, 2011; 1(3): 117- 121.