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Antimicrobial And Antioxidant Activities of Ricinus Communis L. Fruit

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Abstract
Background: Medicinal plants have important contribution throughout the world in health matters. Most of the drugs used today contain various plants active ingredients. The synthetic drugs used today are not good due to their side effects. There is a need to carry out a comprehensive study on medicinal plants.
Objective: The purpose of our study was to find out the antimicrobial and antioxidant activities of *Ricinus communis* L. fruit.
Methodology: *R. communis* L fruit were collected from different regions of district Bannu, Khyber Pakhtunkhwa during flowing season. The plant material was identified at the Department of Botany University of Science and Technology Bannu. Agar Tube Dilution method was used to determine the antimicrobial activity and DPPH assay for antioxidant potential determination of different extracts.
Results: In the antioxidant activity, the dichloromethane, hexane, and methanolic fractions of *Ricinus communis* L. fruit exhibited good activity as compared to ascorbic acid while the remaining fractions showed weak activities. The methanolic and dichloromethanr fractions showed strong activity against the various bacterial strains. The dichloromethane and hexane fractions showed strong antifungal activity against the various fungal strains.
Conclusion: Our study concluded that *R. communis* fruit has strong potential against bacteria and fungi. It also showed good antioxidant activity. Our study suggested designing a study for further investigation of active compounds in this plant.
Keywords: Antimicrobial; antioxidant; *Ricinus communis* L. fruit; DPPH

Introduction

Medicinal plants have important contribution throughout the world in health matters [1]. Plants and herbs showed important therapeutic potential. Most of the world's population is dependent on herbal medication as a basic tool. Most of the drugs used today contain various plants active ingredients and then utilized in cure and prevention of various diseases [2]. Numerous herbal medications are recognized having no adverse effects on health and environment, which are mostly seen in synthetic drugs [3, 4].

The plants *Ricinus communis* also has medicinal potential [5] and belongs to family Euphorbiaceae. The different parts of plants having medicinal value include stem, root, complete aerial parts, flowers and fruits [6]. Previous study reported that the methanolic extract of leaf has activity against inflammation, diabetes and microorganisms and is used for the treatment of liver problems and cancer of skin [7, 8]. Another study also reported the antibiogram activity of *Ricinus communis* against various bacteria that includes *S. aureus, P. aeruginosa, K. pneumoniae and E. coli* and antifungal activity against *Candida albicans* [9, 10]. *Ricinus communis* has good wound healing activity because castor oil is the active component present in the *Ricinus communis* which have antioxidant activity [11]. Various studies have also reported the use of *R. communis* leaves in the form of a poultice or fomentation on sores, boils and swellings [6]. No data is available about the therapeutic

application of fruit of *Ricinus communis*, therefore this study was conducted to find out the antimicrobial and antioxidant activity of fruit of *Ricinus communis.*

Materials and methods

Plants Collection and identification

R. communis L fruit was collected from different regions of District Bannu during flowing season. The plant materials was identified by a botanist, Dr Faizan Ullah at Department of Botany University of Science and Technology Bannu.

Extractions and Fractionations

The plant material (Fruit of *R. communis*) was kept in a shady place and was extracted with aqueous MeOH (80%) for eight days. Using Rota-vapor. The extract was obtained after evaporation. n-Hexane was used for removing fatty material. Fat free MeOH extract was then floated in water and was fractionated with different solvent including dichloromethane and ethyl acetate.

Anti-bacterial activity

Four bacterial strains i.e. *E. coli, S. epidermis, S. aureus, K. pneumoniae* were used in antibacterial activity. Well Diffusion Method was utilised for antibacterial activity and Muller Hinton agar was used. The wells in the center were assigned for antibiotic (KLARICID 250 mg) as standard drug. All concentrations of extract and standard were papered in DMSO. All concentrations and standard were added in respective wells. Petri plates were kept in incubator for 24 hrs at 37 ^{0}C. DMSO (0.1 ml) was used for same circumstance for each organism as under control. Inhibition zones were measured with the help of scale according to the guidelines of CLSI [12].

Anti-fungal activity

Anti-fungal potential of plant extract and fractions was measured with the help of Agar Tube Dilution Method [13, 14]. The various fractions of *R. communis* for antifungal activity were tested against, *Fusarium solani, Candida albiceans, Candida glabrata*, *Asperegillus flaviius,* and *Microosporum canis*. Test samples were papered in DMSO solvent. Sabouraud Dextrose Agar was used for fungi growth. The antifungal activity was measured according to the standard method [15].

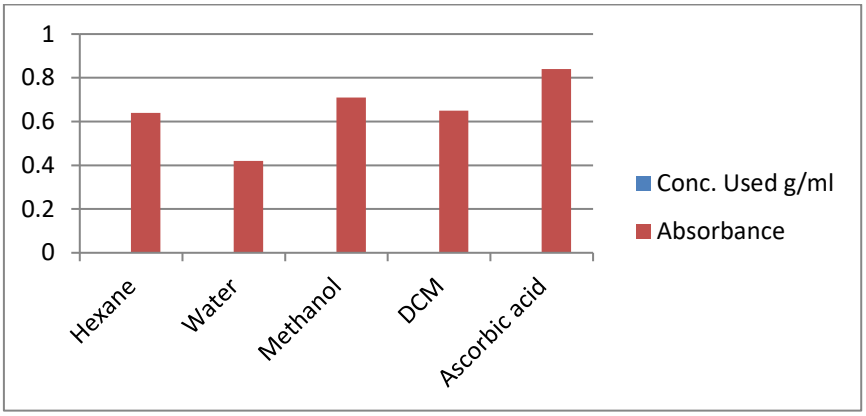
Antioxidant Activity

For antioxidant activity, the DPPH (1, 1-Dipheneyl-1, 2-picryle-hydarazyl) Assay was applied [16]. Test samples were treated with methanol, hexane, water and dichloromethane. The activity was carried out at temperature 37 ^{0}C in the absence of light. Spectrophotometer was utilised to measure the absorbance of extract. The absorbance of DPPH was measured at 517 nm. The calculation of scavenging ability of the extract was determined through % inhibition. The DPPH solution was formed by treating 0.025 g/1 ml CH_3OH. 0.025 g was taken from the prepared solution and after that 1 ml of the sample was treated with methanol. Both the solutions were treated in the absence of light (dark) for 60 mints at 25 °C. The experiment was repeated three times and % scavenging was calculated by using following formula;

$$\% \text{ scavenging} = \text{absorption of control} - \text{absorption of fraction} / \text{absorption of control} \times 100$$

Results and Discussion

In our study, the antioxidant results of various fractions of *R. communis* were compared with standard (Ascorbic acid). Dichloromethane, hexane, and methanol fractions showed good results as compared with ascorbic acid while the remaining fractions show weak activities. (Graph 1). These results were in comparison to a previous study who also reported the antioxidant activity of *R. communis* [16]



Graph-1: Antioxidant activity of various fractions *R. communis*

Zone of inhibition of different fractions of *R. communis* were noted against various bacteria with increasing concentration ingredients. The methanolic and dichloromethane fraction showed a good result against the various bacteria. While the remaining fraction showed poor results upon comparing with standard (Table 1). An earlier study done by Ashafa et al. [17] and Aiyegoro et al [18] reported similar results to our study. Fractions of *R. communis* were checked against six fungi species. The dichloromethane and hexane fractions showed good antifungal activity against the mentioned fungal strains. While the remaining fractions showed weak results as compared with standard (Table 2). These results are similar with the findings of the previous study [19].

Table 1: Anti-bacterial assay of Extract and Fractions of *R. cummunis*

Names of Bacterium	Water	Dichloromethane	Hexane	Methanol	Defatted MeOH fraction	Standard(cm) (Klaricid 250 mg)
E. coli	0.5	2.3	1.7	1.9	2.1	5.0 cm
S. epidermidis	0.5	2.9	1.6	2	2.4	4.5 cm
S. aureus	0.5	0.6	0.9	0.9	2.9	2.9 cm
K. pneumoniae	1.1	1.9	2.9	1.9	2.5	2.9 cm

Table 2: Antifungal activities of *R. communis* fractions

Name of fungus	Hexane	DCM	Methanol	Water	Control %
A. flavus	46%	100%	100%	100%	62.50%
M. canis	100%	12%	100%	32%	68.75%
F. solani	100%	16%	36%	100%	68.75%
C.albicans	100%	100%	100%	100%	81.25%
C.glabrata	100%	100%	100%	100%	93.25%

Conclusion

Our study concludes *that R. communis* Fruit has a strong potential against bacteria and fungi and also showed good antioxidant activity. The extracts potential effect on the inhibitory activity could be due to the presence of bioactive compounds in the fruit of plant. Therefore, our study also suggested to design a study for investigation of toxic effects of the active compounds in the said plant.

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