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Studies on the Antibacterial and Antifungal activities in the seed extracts of *Ricinus communis* L. (Castor Plant).

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ABSTRACT

Medicinal plants have curative properties due to the presence of various complex bioactive chemical Substances of different composition which are found as secondary plant metabolites in one or more parts of these plants. *Ricinus Communis* has significant medicinal/pharmacological value for maintaining the disease free healthy human life. The present work is oriented towards the Antibacterial & Antifungal activities of *Ricinus Communis* seeds. Two varieties of Castor plant (Green & Red) were thoroughly studied and analyzed for *in vitro* antimicrobial activities. It has been observed that the bioactive compound of *Ricinus communis* shows different antimicrobial efficacy in different organic solvent extracts. This work aims to collect, analyze & disseminate relevant knowledge about the antimicrobial activities of Castor with a view to promote further research in this area for serving the humanity.

1. Introduction

Medicinal plants have a significant role and an effectual use for the alleviation of many diseases **Dubey *et al*., (2004)**. An antimicrobial substance is a compound that kills or inhibits the growth of microorganisms, such as bacteria, fungi or protozoans. Antimicrobial drugs either kill microbes (microbicidal) or prevent the growth of microbes (microstatic). . The castor oil plant *Ricinus Communis* L, is a species of flowering plant in the Spurge family, Euphorbiaceae. (**Schery, 1972; Oyewole *et al*., 2010).** This family comprises over 7500 species of herbaceous plants, shrubs and trees organized into about 280 genera. . *Ricinus communis* L. is indigenous to the Southeastern Mediterranean basin, Eastern Africa and India, but it is widespread throughout tropical regions and some temperate areas. The word *Ricinus* means 'tick' and the specific epithet *communis* stands for 'common' in Latin **Bhattacharjee, (2000).** The seeds of Castor are the source of castor oil, used as cathartic and for lubrication and illumination. The oil has industrial uses in the manufacture of sebacic

acid, surface coatings, disinfectants, cosmetics and pharmaceutical preparations **(Bringi et al., 1985).** This study was therefore setup to ascertain the antibacterial & antifungal properties of seed extracts of *R. communis.*

2. Objectives

1. To collect, analyze and ascertain the phyto-pharmacological importance of Ricinus communis.
2. To study in vitro antibacterial and antifungal activities of different types of Castor seed extracts.

3. Materials and Methods

The Present investigation was carried out on *Ricinus communis* L. growing at various places of Jammu during a period of 2018-2019. The antibacterial studies were carried out in various solvent extracts of *Ricinus Communis* L. The following methods were applied: Fresh seed material *Ricinus communis* L. were collected from different waste places of Jammu region (J&K), washed thoroughly 2-3 times with running tap water and once with sterile water, shade dried, powdered and used for extraction. Aqueous, solvent extracts of methanol, ethanol and petroleum ether were prepared by relevant methods. Present investigation was carried out with three cultured strains of human pathogenic bacteria viz *Bacillus subtilis*, *Salmonella typhimurium* and *Staphylococcus aureus* in MH medium. The fungal species used was *Candida albicans* grown in SDA medium.

4. Observations and Results

I. Antibacterial Activities

The aqueous seed extract exhibited potential antibacterial activity against all the tested bacteria. The antibacterial activity in aqueous ,methanol, ethanol and petroleum ether solvent seed extracts of *R. Communis* on three human pathogenic bacteria namely *Bacillus subtilis*, *Salmonella typhimurium* and *Staphylococcus aureus* has been represented in Table 1-4.

Table 1: Antibacterial activity in aqueous seed extracts of Ricinus Communis against three human pathogenic bacteria.

S.No	Bacteria	Zone of Inhibition (mm)		
		Seed extract	Antibiotic	Control
01	*Bacillus Subtilis*	22.00	21.00	0
02	*Staphylococcus aureus*	20.00	18.45	0
03	*Salmonella Typhimurium*	15.00	13.00	0

It is indicated from present study that the highest activity was observed in *Bacillus subtilis* with maximum inhibition zone (22.00 mm). However, lowest activity was recorded in *Salmonella typhimurium* with (15.00 mm) minimum zone of inhibition.

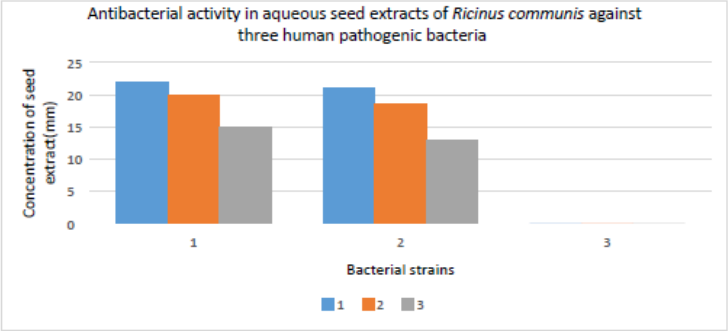


Table 2. Antibacterial activity in Ethanolic seeds extracts of *Ricinus communis* L. against three human pathogenic bacteria

S.No	Bacteria	Zone of Inhibition (mm)		
		Seed extract	Antibiotic	Contro 1
01	*Bacillus Subtilis*	20.00	21.00	0
02	*Staphylococcus aureus*	23.00	18.45	0
03	*Salmonella Typhimurium*	19.00	13.00	0

The highest antibacterial activity was observed on *Staphylococcus aureus* with (23.00 mm). Maximum Zone of inhibition, whereas least activity was found on *Salmonella typhimurium* with (19.00 mm) minimum zone of inhibition.

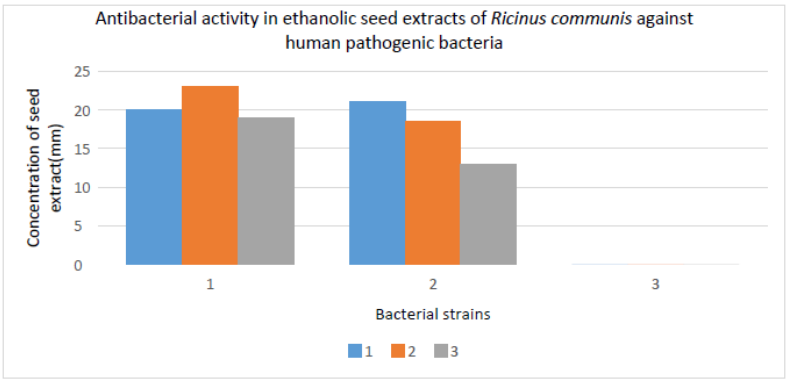


Table 3: Antibacterial activity in methanolic seed extracts of *Ricinus communis* against three human pathogenic bacteria.

S.No	Bacteria	Zone of Inhibition (mm)		
		Seed extract	Antibiotic	Contro 1
01	*Bacillus Subtilis*	25.30	21.00	0
02	*Staphylococcus aureus*	23.00	18.45	0
03	*Salmonella Typhimurium*	14.00	13.00	0

The highest antibacterial activity was observed in Bacillus subtilis with (25.30 mm) maximum inhibition zone of growth. Whereas, lowest activity was recorded in *Salmonella typhimurium* with (14.00 mm) minimum zone of inhibition

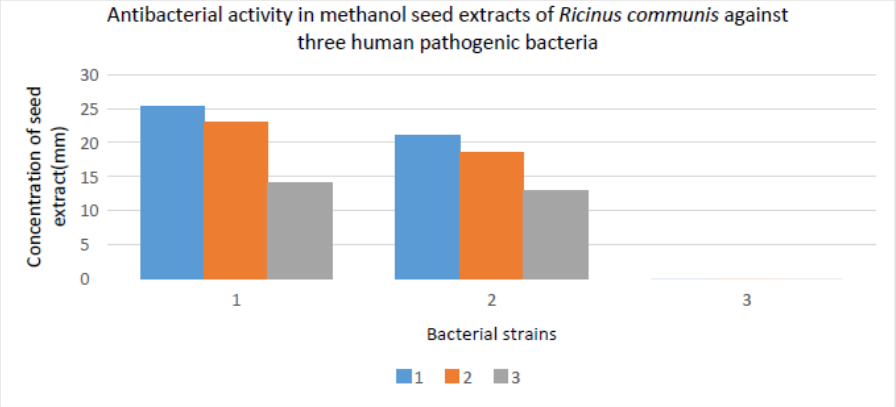
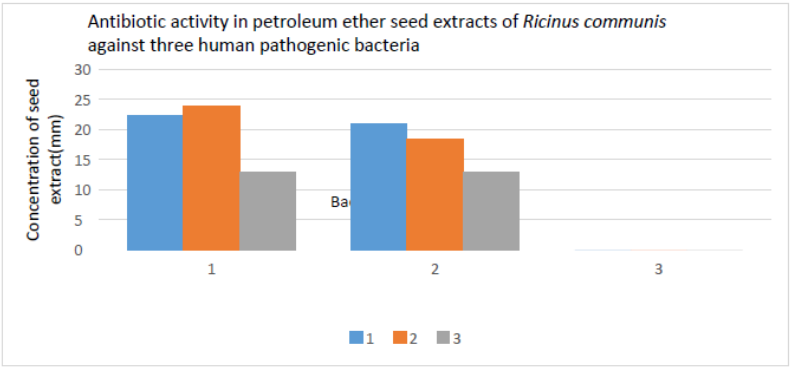


Table 4: Antibacterial activity in petroleum ether seeds extracts of *Ricinus communis* against three human pathogenic bacteria.

S.No	Bacteria	Zone of Inhibition (mm)		
		Seed extract	Antibiotic	Control
01	*Bacillus Subtilis*	22.30	21.00	0
02	*Staphylococcus aureus*	24.00	18.45	0
03	*Salmonella Typhimurium*	13.00	13.00	0



It is clearly indicated from Tables 1-4 that the highest antibacterial activity varied in different extracts (aqueous, methanol, ethanol & petroleum ether) when effects were compared with streptomycin as control.

II. Antifungal Activities

The result obtained on antifungal activities in various solvent seed extracts of *Ricinus communis* L. by disc diffusion method are described separately in the following headings.

Table 5: Antifungal activity in aqueous seed extract of *Ricinus communis* against *Candida albicans*.

S.No	Concentration of seed extracts	Zone of Inhibition (mm)		
		Candida albicans	Antibiotic (1mg/ml)	Control (Distilled water)
01	600 ppm	18.00	17.45	0
02	400 ppm	15.00	13.00	0
03	200 ppm	Nil	12.00	0

It is clearly indicated from Table 5 that the highest antifungal activity (18.00 mm) was observed in higher concentration (600 ppm) and lowest antifungal activity (15.00 mm) was recorded in moderate concentration (400 ppm) with minimum inhibition zone of diameter.

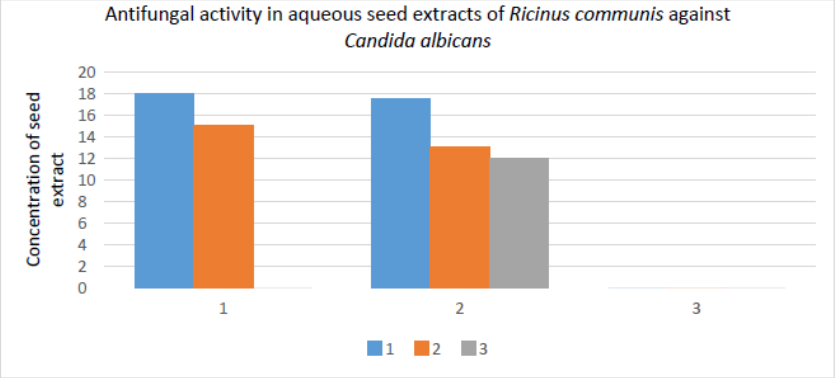


Table 6: Antifungal activity in methanol seeds extracts of *Ricinus communis* against *Candida albicans*.

S.No	Concentration of seed extracts	Zone of Inhibition (mm)		
		Candida albicans	Antibiotic (1mg/ml)	Control (Distilled water)
01	600 ppm	21.00	18.00	0
02	400 ppm	19.00	16.00	0
03	200 ppm	Nil	14.00	0

It is clearly indicated from Table 6 that the highest antifungal activity (21.00 mm) was observed in higher concentration (600 ppm) and lowest antifungal activity was recorded in moderate concentration (400 ppm) with minimum inhibition zone (19.00 mm) of diameter**.**

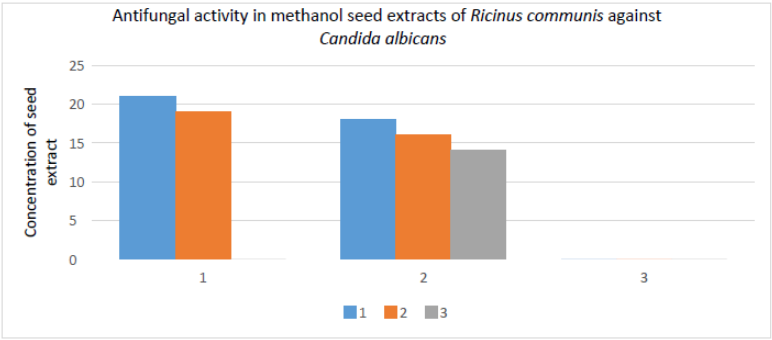


Table 7: Antifungal activity in ethanol seeds extracts of *Ricinus communis* L. against *Candida albicans.*

S.No	Concentrations of seed extract	Zone of Inhibition (mm)		
		Candida albicans	Antibiotic (1mg/ml)	Control (Distilled water)
01	600 ppm	19.00	17.50	0
02	400 ppm	15.00	14.40	0
03	200 ppm	Nil	10.00	0

It is clearly indicated from the Table that the highest antifungal activity (19.00mm) was observed in higher concentration (600 ppm) and lowest antifungal activity (15.00 mm) was recorded in moderate concentration (400 ppm) with minimum inhibition zone of diameter.The all zones of inhibition were compared to the corresponding zones of inhibition of antibiotics. The lower concentration (200 ppm) of seed extract was not sensitive against the tested fungal strains.

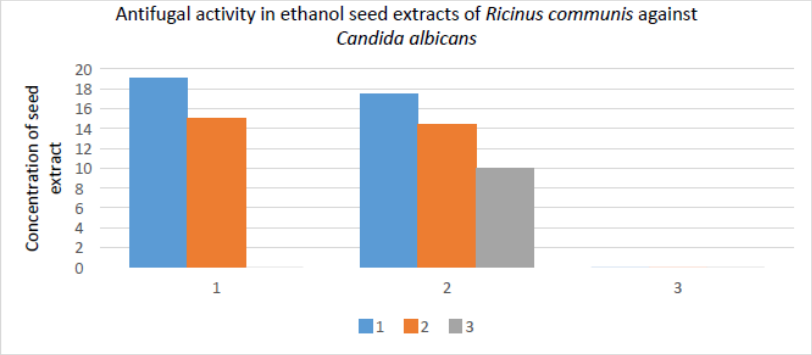
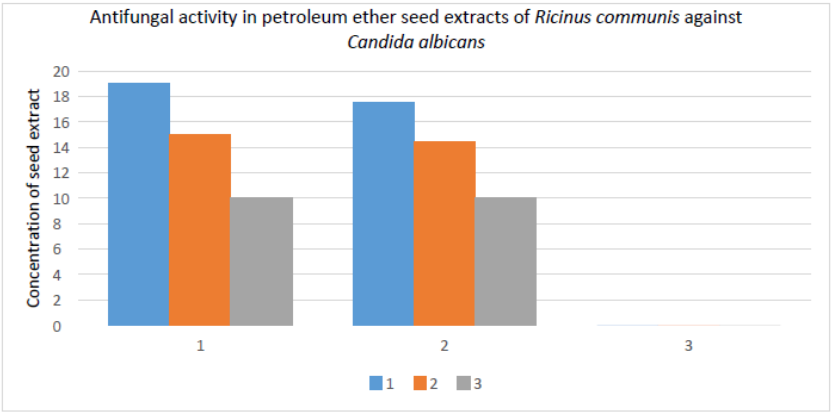


Table 8: Antifungal activity in petroleum ether seed extracts of *Ricinus communis* against *Candida albicans*

S.No	Concentrations of seed extract	Zone of Inhibition (mm)		
		Candida albicans	Antibiotic (1mg/ml)	Control (Distilled water)
01	600 ppm	19.00	17.50	0
02	400 ppm	15.00	14.40	0
03	200 ppm	10.00	10.00	0

It is clearly shown from Table 8 that the highest antifungal activity (19.00 mm) was observed in higher concentration (600 ppm) and lowest antifungal activity (15.00 mm) was recorded in moderate concentration (400 ppm) with minimum inhibition zone of diameter.



Analysis of the effectiveness of bioactive compounds present in the seed extracts of *Ricinus communis* in different solvents showed variable results by comparing the zones of inhibition with streptomycin used as control.

5. Conclusion

Studies on the antimicrobial activities of seed extracts of *Ricinus Communis* L. revealed the significant antibacterial and antifungal activities in different solvent extracts against all the tested bacteria and fungi. The antibacterial and antifungal activity in the seed extracts can be attributed to the presence of secondary metabolites and other bioactive compounds. It is, therefore, suggested that these extracts have great therapeutic value that can be used in the treatment of infectious diseases caused by those bacteria and fungal strains against which the seed extracts showed significant activity. Thus, *Ricinus communis* has potential antibacterial and antifungal applications and may serve as novel potent material for the pharmaceutical industries in developing good efficacy drugs in future against several bacterial and fungal species at a reasonably lower cost.

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