https://doi.org/ 10.33472/AFJBS.6.Si2.2024.2732-2749

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

In Vitro Antimicrobial Activity of *Psoralea corylifolia* Extract

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Article History

Volume 6,Issue Si2, 2024

Received:29 Mar 2024

Accepted : 30 Apr 2024

doi: 10.33472/AFJBS.6.Si2.2024.2732-2749

Abstract

A medicinal plant is one that has compounds that can be utilized therapeutically or that serve as building blocks for the production of effective pharmaceutical products. The antibacterial activity of *Psoralea corylifolia* in seed and leaf extracts was proven in *Pseudomonas sp.*, *E. coli*, and *staphylococcus* species, but no researcher was able to observe the antimicrobial activity in many additional gram positive and gram negative bacteria.

Thus, the present research work was aimed at identification of the antimicrobial activity of *Psoralea corylifolia* seed extract in four different solvents viz., chloroform, acetone, ethanol and water. Five-gram (+ve) bacteria namely *B-megatrium, Sarcina lutea, β-haemolyticus, Streptococcus* and*M. tuberculosis* and five-gram (-ve) bacteria namely *S. shiga, S. boydii, S. flexneri, S. sonnei and S. sarcinaceae* were selected for the study. Ciprofloxacin and Vancomycin were used as antibiotics against gram (+ve) and gram (-ve) bacteria. The ethanol extract showed the highest zone of inhibition against *S. flexneri* at 16 nm, which was very close to the standard antibiotic's zone of inhibition (18 mm). Acetone, water, and ethanol were next with zones of inhibition of 15 nm against *S. shiga, S. sonnei, and S. sarcinaceae*, respectively. Aqueous extract against *Streptococcus* had a zone of inhibition of 21 nm, which was followed by ethanol extract against *S. haemolyticus*, which had a zone of inhibition of 22 nm. This was significantly closer to the usual zone of inhibition of the chosen antibiotic, ciprofloxacin. In conclusion, *Psoralea corylifolia L.* ethanolic extracts may be a source of fresh, potent herbal medications for treating infections brought on by multi-drug resistance strains of bacteria in both community and hospital settings.

Keywords: *Psoralea corylifolia,* Zone of inhibition, Antimicrobial activity.

Introduction

Medicinal plants are those that contain compounds that can be utilized to treat ailments in one or more of their constituent components[1].Plant-based medicines are well known for their efficacy, accessibility, and affordability[2]. Herbal remedies can be made from complete plant parts or mostly from the leaves, roots, bark, seeds, and flowers of various plants. They are applied topically, orally, or through inhalation[3]. The importance of medicinal plants to both individual and societal health is greater. These plants' medicinal usefulness comes from their bioactive phytochemical components, which have defined physiological effects on the human body[4]. Alkaloids, essential oils, flavonoids, tannins, terpenoids, saponins, phenolic compounds, and many others are among the most significant bioactive phytochemical components[5].These organic substances laid the groundwork for today's prescription medications[6].

Psoralea corylifolia

Psoralea corylifolia L. is a species of significant plant (Leguminosae). *P. corylifolia* is an annual herb that stands upright. This plant can grow anywhere between 30 and 180 cm tall, prefers a warm environment. Corylifolsac (prenylfoavanoids), which are found in the seeds of *Psoralea corylifolia*, are the plant's main active ingredients. Other active substances including psoralen, isopsoralen, and neobavaisoflavones can also be found in the dried, ripe fruits[7].Both in-vitro cultures and naturally occurring *Psoralea corylifolia* plants contain the flavonoids daidzein (4, 7 dihydroxuisoflavone) and genistein (4, 5, 7 trihydroxyisoflavone)[8].Other active components have been discovered in this plant, including neobavaisofloavone, borachin, Bavaisofavooz, bavachalcone, bavachromenepsoralidin, corylifolinin, barachinipsoralenoside, isopsoralenoside, and coumarins [9]. Traditional Chinese Medicine (TCM) uses its dry fruit and calls it “Buguzhi”3referred to as “Bu-gu-zhi” in Chinese, has great medicinal values since ancient times. P. corylifolia has a significant role in Ayurveda and Chinese medicine therapies. The plant has cytotoxic, antibacterial, and cardioactive effects. It functions as a pigment. The plant demonstrated cytotoxicity toward worms and malignancies[10,11].The Psoralea plant is regarded as warm in Chinese medicine since it has various therapeutic effects on the kidney and spleen meridians[12].Indigenous medical traditions treat a variety of illnesses with *P. corylifolia* seeds. The seeds are utilized in febrile situations and are diuretic, aphrodisiac, laxative, and anti-helminthic. The seeds are used in Ayurveda to cure a variety of ailments including alopecia, inflammation, leukoderma, leprosy, psoriasis, and eczema in the form of paste and ointment for external as well as internal usage[13].

Materials and Methods

All the glasswares and equipments were sterilized before use. Deionised water was used in the complete study.

Methods

Preparation of Extract

Using an electronic blender, the plant's seeds were ground into powder after being dried at 31°C. Using a Soxhlet device, the powder was treated to various extractions with chloroform, acetone, ethanol, and water. After being dried and dissolved in DMF solution, the extracts were tested for antibacterial activity[14].

Table 1: Bacterial Species Used for the Study

Bacteria Species	
Gram Positive Bacteria	**Gram Negative Bacteria**
B-megatrium	*S. shiga*
Sarcina lutea	*S. boydii*
β-haemolyticus	*S. flexneri*
Streptococcus	*S. sonnei*
M.tuberculosis	*S. sarcinaceae*

Preliminary Phytochemical Analysis

The presence of alkaloids, saponins, tannins, terpenoids, flavonoids, glycosides, volatile oils, and reducing sugars were tested for in the extracts using the methods listed below[15-18].

Test for Alkaloids

(a) Dragendorff'sTest: To 1 ml of the extract, add 1 ml of Dragendorff's reagent (Potassium Bismuth iodide solution). An orange-red precipitate indicates the presence of alkaloids.

(b) Mayer's Test: To 1 ml of the extract, add 1 ml of Mayer's reagent (Potassium mercuric iodide solution). Whitish yellow or cream-colored precipitate indicates the presence of alkaloids.

(c) Hager's Test: To 1 ml of the extract, add 3ml of Hager's reagent (Saturated aqueous solution of picric acid), yellow colored precipitate indicates the presence of alkaloids.

d) Wagner's Test: To 1 ml of the extract, add 2 ml of Wagner's reagent (Iodine in Potassium Iodide), Formation of reddish-brown precipitate indicates the presence of alkaloids.

Test for Saponins

Take a little amount of each type of extract, add 20 ml of distilled water, and shake the mixture in a graduated cylinder lengthwise for 15 minutes. The presence of saponins is indicated by a 1 cm layer of foam.

Test for Glycosides

(a) Legal Test: The extract should be dissolved in pyridine before being made alkaline by adding sodium nitroprusside solution. Glycosides can be detected by the development of pink to red colors.

(b) BaljetTest: The yellow to orange colour of the sodium picrate solution when added to 1ml of the test extract indicates the presence of glycosides.

(c) Keller-KillaniTest: 1gm of powdered drug is extracted for 2 minutes with 10ml of 70% alcohol, filtered, and then added to the filtrate with 10ml of water and 0.5ml of a strong lead acetate solution. The filtrate is then agitated with 5ml of chloroform. In a porcelain dish, the chloroform layer is separated, and the solvent is gently evaporated away. The cooled residue should be dissolved in 2 drops of a 5 percent ferric chloride solution in 3 ml of glacial acetic acid. Transfer this solution with caution to the top of 2 ml of strong sulfuric acid. At the point where the two liquids converge, a reddish-brown layer develops, and the upper layer gradually turns bluish green and darkens as it stands.

(d) Borntrager's Test: To 1 ml of the extract solution, add a few cc of diluted sulfuric acid. Boil, filter, and then use chloroform to extract the filtrate. 1ml of ammonia was used to treat

the layer of chloroform. The ammonia layer development of a red colour reveals the presence of anthraquinones glycosides.

Test for Carbohydrates and Sugars

(a) Molisch's Test: To 2 ml of the extract, add 1ml of α-napthol solution, add concentrated sulphuric acid through the side of the test tube. Purple or reddish violet colour at the junction of the two liquids reveals the presence of Carbohydrates.

(b) Fehling's Test: Equal parts of Fehling solutions A and B should be added to 1 ml of the extract; heating will cause a brick-red precipitate, which confirms the presence of sugars.

(c) Benedict's Test: Add 1 ml of the extract solution to 5 ml of Benedict's reagent boils for 2 minutes, and then cools. Sugars are present because red precipitate forms.

Test for Tannins and Phenolic Compounds

(a) Mix some basic lead acetate solution with a little amount of the test solution. The occurrence of tannins is shown by the formation of white precipitates.

(b) When ferric chloride solution is added to 1 ml of the extract, a result with a dark blue or greenish black colour indicates the presence of tannins.

(c) A small amount of test extract is treated with ammonia solution and potassium ferric cyanide. Tannins are indicated by a deep red colour.

Test for Flavonoids

(a) The substance is observed in UV and visible light when it is in an alcoholic and aqueous solution with a small amount of ammonia; the creation of fluorescence reveals the presence of flavonoids.

(b) Sodium acetate, ferric chloride, and amyl alcohol are used to treat a little amount of extract. When an acid is added, a yellow colour solution that had developed dissipates, indicating the presence of flavonoids.

(c) **Shinoda's Test:** The presence of flavanones or flavonols is indicated by the vivid cherry red colour that the alcohol extract of powder treated with magnesium foil and concentrated HCl produces.

(d) The presence of flavones is shown by the production of a yellow colour after the extract has been treated with sodium hydroxide.

(e) When concentrated H_2SO_4 is applied to the extract, flavones are indicated by the production of a yellow or orange colour.

Test for Steroids

(a) Libermann-Burchard Test: 1gm of the test compound was diluted in a few droplets of chloroform, 3ml of acetic anhydride, 3ml of glacial acetic acid, and drops of concentrated sulfuric acid were placed around the walls of the test tube. These solutions were heated and cooled under running water. The presence of sterols is indicated by the colour, which is bluish green.

(b) Salkowski Test: Add equal amounts of concentrated H_2SO_4 and extract to chloroform for a final solution. To demonstrate that terpenoids were present, a reddish-brown colouring of the interface was created.

Test for Triterpenoids

Noller's Test: Two or three tin metal grains should be dissolved in 2 cc of thionyl chloride solution. The creation of pink colour in the test tube after adding 1 ml of the extract and warming it up confirms the presence of triterpenoids.

Antimicrobial Activity

The antimicrobial activity was determined by disc diffusion method [19]. Four different concentrations of 25mg/ml, 50mg/ml, 75mg/ml and 100mg/ml respectively were prepared. Each sterile disc was loaded with (10µl) of test extract and placed on the agar plates inoculated with respective microorganisms. The plates were kept for half an hour for pre-incubation diffusion. Then the plates were kept for incubation at 37°C for 24 hrs for bacteria. At the end of incubation, zones around the discs were measured in mm using Hi Antibiotic Zone scale. The study was performed in triplicate. Antibiotic used for Gram (-ve) bacteria was Vancomycin whose value was reported as Susceptible ≥ 17, (Intermediate 15nm-16nm) (Resistant ≤ 14).Antibiotic use for Gram (+ve) bacteria was Ciprofloxacin (Resistant ≤ 15) (Intermediate 16nm-20nm) and Susceptible = or ≥21 nm [20].

Disc Diffusion Method

Mueller-Hinton Agar (MHA), the ideal medium for routine susceptibility tests was used for the disc diffusion method. In order to create the inoculum for the disc diffusion method, an appropriate broth, such as tryptic soy broth, was used. This medium was sterilized, produced in accordance with the manufacturer's instructions, and distributed in tubes at 4-5 ml.

This technique is based on the idea that an antibiotic concentration gradient is created when an antibiotic-impregnated disc is placed on agar that has already been inoculated with the test bacterium. The antibiotic-impregnated disc picks up moisture and the antibiotic diffuse radials outward through the agar medium. The antibiotic is present in high concentrations at the disc's edge and gradually decreases as the space between them expands until the organism is no longer inhibited by the antibiotic, at which point it can grow unhindered. If the antibiotic suppresses bacterial growth, a clear zone or ring forms during incubation around the antibiotic disc [21].

Preparation of Agar Medium

The dehydrated medium was made into MHA (Mueller-Hinton Agar) in accordance with the manufacturer's instructions. Distilled or deionized water should be used to prepare media. To completely dissolve the medium, it was heated with regular agitation and brought to a boil. It was then autoclaved for 15 minutes at 121°C to sterilize it. After sterilization, the pH of each preparation was measured; at room temperature, the pH should range from 7.2 to 7.4. This was accomplished by either allowing a little amount of medium to gel around a pH metre electrode or by macerating a small amount of medium in a small amount of distilled water. To 40–50°C, cool the agar medium. To a uniform depth of 4 mm, pour the agar into a clean glass or plastic petri dish that is lying flat allowed to become solid. Plates should be dried in an incubator at 30-37°C for no longer than 30 minutes, or until any excess surface moisture has evaporated, before use. The media needs to be wet but without any visible water droplets. Water droplets could cause swarming bacterial growth, which would lead to unreliable results. They can also quickly become polluted.

Storage

If plates won't be used right away, they can be kept in the fridge for up to 4 weeks at 2-8°C in airtight plastic bags. Unpoured media may be kept in airtight screw-capped bottles as long as the manufacturer's instructions are followed.

Control

Before using, streak bacterial colonies on the agar medium to see if the agar can support the growth of the control strains. Checking each batch of media's capacity to support the growth of a representative member of the species under examination is also advisable.

Inoculum Preparation

Take four or five colonies with a wire loop from a pure bacterial culture that isn't more than 48 hours old and that excludes organisms with slow growth rates. Collect colonies and transfer them to 5 cc of 0.9 percent saline or Trypticase soy broth. The broth should be incubated at 30°C or a temperature that promotes growth until it meets or exceeds the 0.5 MacFarl and threshold for turbidity (prepared by adding 0.5 ml of 0.048 M $BaCl_2$ to 99.5 ml of 0.36 NH_2SO_4; commercially available). When using 0.5 Mac Farl and (which has been vigorously shaken before use), compare the turbidity of the test bacterial culture to that of the control sample on a white background with a black line in sharp contrast. Arrow identifies the tube with the appropriate turbidity. By adding sterile broth or saline, turbidity can be reduced.

Inoculation of Plates

A sterilized cotton swab should be dipped into the predetermined bacterial suspension. By firmly pressing the swab against the tube wall at a level above the liquid, and remove extra inoculum. By streaking the agar with the inoculum-containing swab, inoculate it. Repeat the rubbing process after rotating the plate by 60 degrees repetition twice. The inoculum will be distributed evenly as a result of this. To allow for the absorption of extra moisture, let the medium's surface dry for 3 to 5 minutes, but no more than 15 minutes.

Antimicrobial Discs

There should be a limit on the antimicrobial agents that are tested. Include only one representative of each group of related medications, including those that are indicated for veterinary use to control or prevent disease and those that can be helpful for epidemiological or research purposes, in order to make the test feasible and applicable. Use antibiotic discs thatbought from a dependable supplier. The disc has a 6 mm diameter roughly. Disks should be carefully stored at 2 to 8 °C in a desiccant-filled container that is tightly sealed. It is not advisable to utilize expired discs.

Application

Placing an antibiotic disc on the inoculated and dried plate's surface requires the use of sterile forceps or a disc dispenser. As soon as possible, lightly press it down with the tool to make sure the disc is completely in touch with the agar surface. Once a disc has made contact with the agar surface, do not move it again because instantaneous drug diffusion happens. Place the discs such that their minimum center-to-center distance is 24 mm and that they are no closer than 10 to 15 mm from the petri dish's edge. A 9-cm petri dish can hold a maximum of six discs, while a 150 mm plate can hold a maximum of 12 discs. If overlapping zones of inhibition occur, lessen the number of discs put per plate.

Incubation

Plates should be incubated upside-down at 30 °C or another temperature that promotes growth. The zone of inhibition should be visible after 16 to 18 hours. Longer incubation periods may be necessary for species with slow growth.

Reading and Measurement of Zones of Inhibition

The zone of inhibition is the point at which no growth is visible to the unaided eye.Record the presence of individual colonies within zones of inhibition.Keep track of when fuzzy zones occur. The zone limit is the boundary of the typical growth zone.

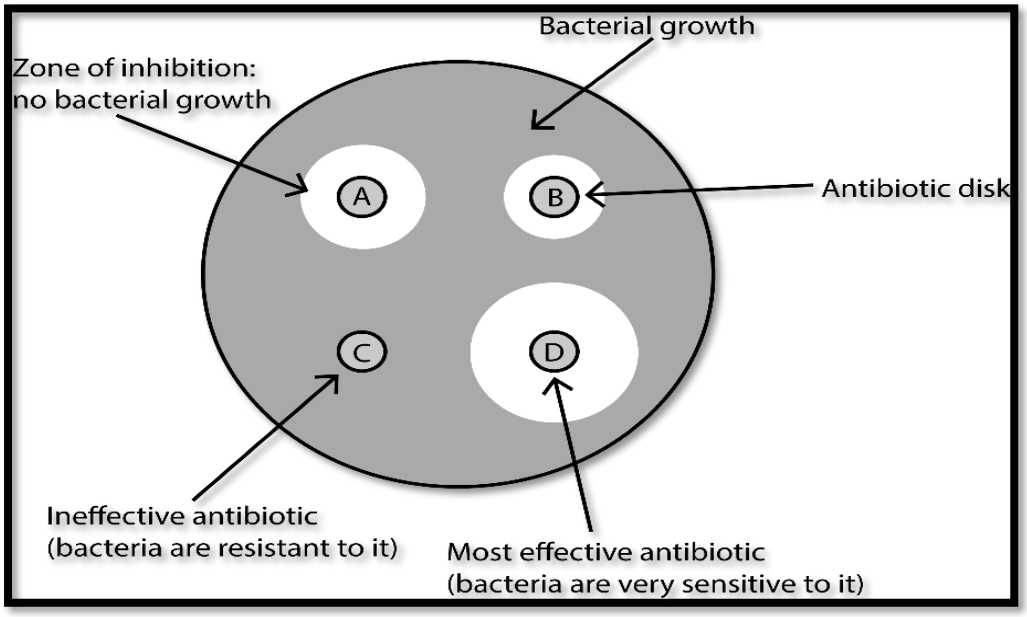

Figure 1: Zones of Inhibition

Reading

Read and record the diameter of the zones of inhibition using a ruler graduated to 0.5 mm.Round up the zone measurement to the nearest millimeter.Compare the diameter of the zone of inhibition of the test isolates with those in the chart of interpretative standard for veterinary pathogens.Results were labelled as Susceptible (S), Intermediate (I), or Resistant (R). Until interpretative zones had been defined, the results of susceptibility tests were only regarded qualitative. They were interpreted based on the presence or absence of a clear zone of inhibition.

Results and Discussion

Extraction of Plant Material

Soxhlet extraction using multiple solvents with varied polarity was used to extract the bioactive mixtures. The extraction temperature and solvents used have a considerable impact on the bioactivity mix yield. The yield of concentrate obtained from 5gm of dry plant material for each of the separates Pe (Petroleum ether), Di (1, 4 Dioxan), Ac (Acetone), Me (Methanol), and DMF (N, N-dimethylformamide) was evaluated. Methanol had the highest extraction value and percent yield out of the five solvents.

Table2: Extractive Value and % Yield of *Psoralea corylifolia* Aerial part and Seeds

Solvent	**Raw Material (5gm)**	**Extractive Value**	**% Yield**
Pe (Petroleum ether)	Seed	0.262	6.33
Di (1-4 Dioxan)	Seed	0.128	3.65
Ac (Acetone)	Seed	0.138	1.85
Me (Methanol)	Seed	0.370	8.50

DMF (N, N Dimethylformamide)	Seed	0.075	0.61

Phytochemical Screening

Psoralea corylifolia seeds were subjected to a phytochemical screening, and the results showed that ethanol extracts included alkaloids, polyphenol, tannins, flavonoids, and glycoside.

Table 3: Phytochemical Analysis of Ethanol Extracts of *Psoralea corylifolia* Seeds

Plant Constituents	**Ethanol Extracts**
Alkaloids	Positive (+)
Polyphenols	Positive (+)
Carbohydrates	Negative (-)
Saponins	Negative (-)
Flavonoids	Positive (+)
Tannins	Negative (-)
Glycosides	Negative (-)
Triterpenes	Positive (+)
Steroids	Positive (+)

Evaluation of Antimicrobial Activity of *Psoralea corylifolia*

The antibacterial movement has been tested against two-gram positive and two-gram negative microorganisms using a variety of concentrates of the solvents.

Antimicrobial Activity of *P.corylifolia* Seed Extracts against Gram-negative Bacteria

Table 4-8 displays the zone of inhibition of *Psoralea corylifolia* seed extracts against Gram-negative bacteria.

Table4: Zone of Inhibition (nm) of different extracts of *Psoralea corylifolia* on S. shiga

Concentration(mg/ml)	**Chloroform**	**Acetone**	**Ethanol**	**Water**
25	-	-	-	-
50	-	-	-	-
75	-	-	10	13
100	14	15	-	-

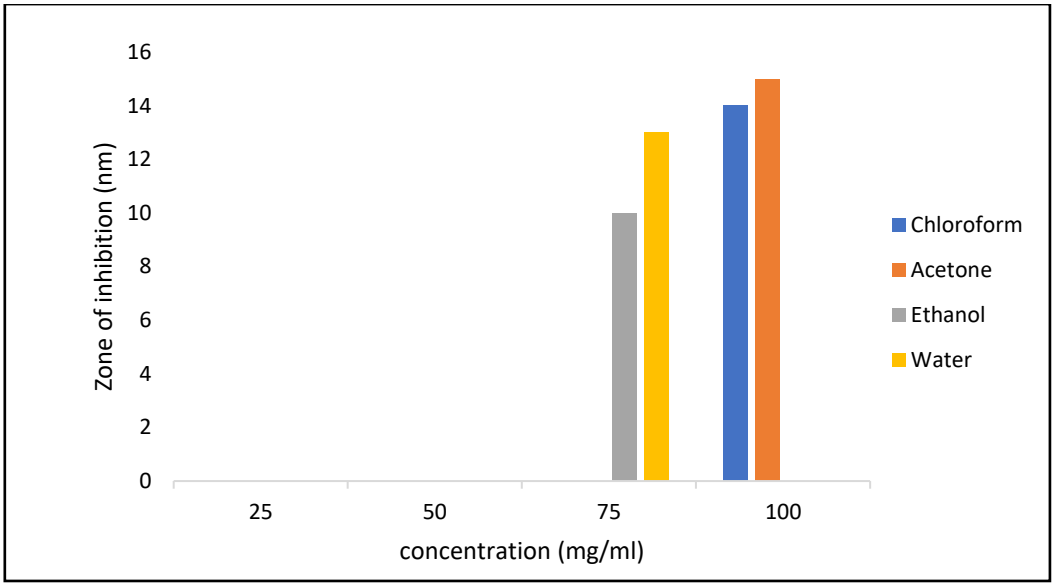

Figure2: Zone of Inhibition (nm) of Different Extracts of *Psoralea corylifolia* on *S. shiga*

Table 5:Zone of Inhibition (nm) of Different Extracts of *Psoralea corylifolia* on *S. boydii*

Concentration(mg/ml)	Chloroform	Acetone	Ethanol	Water
25	-	-	-	-
50	-	-	-	-
75	11	-	-	-
100	-	13	-	14

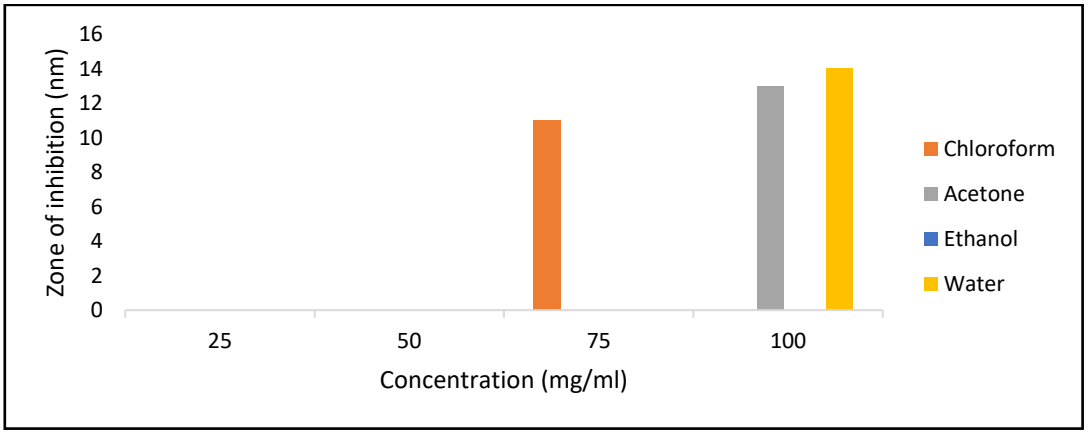

Figure 3: Zone of Inhibition (nm) of Different Extracts of *Psoralea corylifoliaS. boydii*

Table 6:Zone of Inhibition (nm) of Different Extracts of *Psoralea corylifolia* on *S. flexneri*

Concentration(mg/ml)	Chloroform	Acetone	Ethanol	Water
25	-	-	-	-
50	-	-	12	-
75	-	-	-	13
100	-	14	16	-

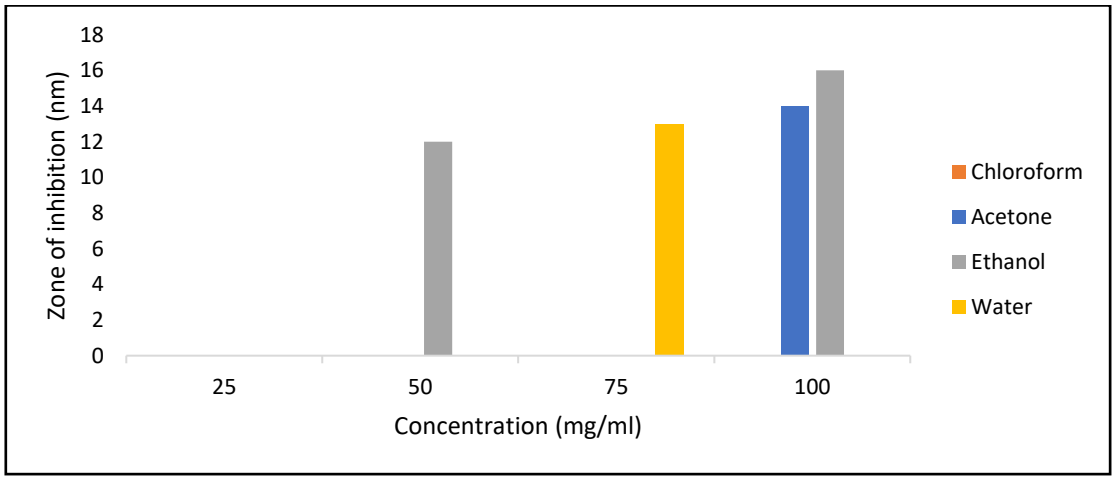

Figure 4: Zone of Inhibition (nm) of Different Extracts of *P. corylifolia* on *S. flexneri*

Table 7:Zone of Inhibition (nm) of Different Extracts of *P.corylifolia* on *S. sonnei*

Concentration(mg/ml)	Chloroform	Acetone	Ethanol	Water
25	-	-	-	-
50	-	-	-	**11**
75	-	**12**	**13**	-
100	**14**	-	-	**15**

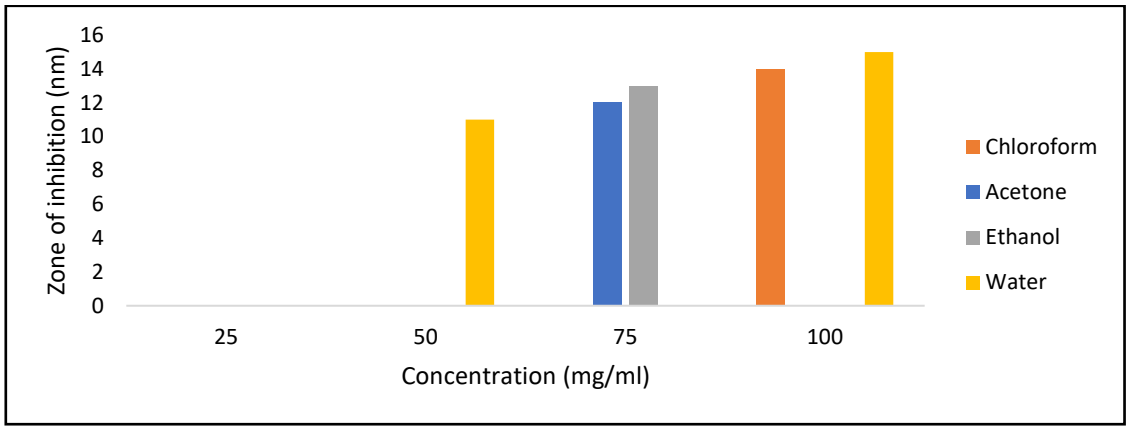

Figure 5: Zone of Inhibition (nm) of Different Extracts of *P. corylifolia* on S. sonnei

Table 8: Zone of Inhibition (nm) of Different Extracts of *P.corylifolia* on S. sarcinaceae

Concentration(mg/ml)	Chloroform	Acetone	Ethanol	Water
25	-	-	-	-
50	-	-	-	11
75	-	13	-	-
100	14	-	15	-

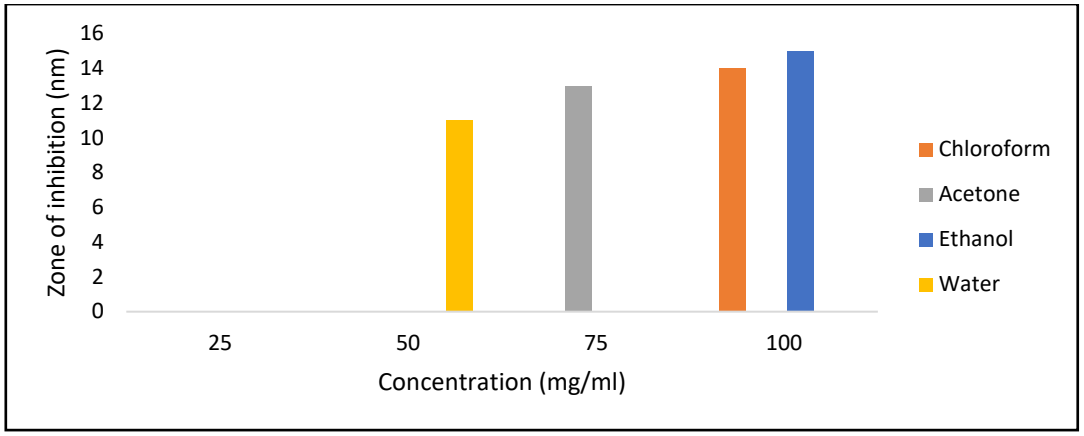

Figure 6: Zone of Inhibition (nm) of Different Extracts of *P. corylifolia* on *S. sarcinaceae*

Comparison of Zone of Inhibition of Different Extracts of *P.corylifolia*Seeds Against Standard Gram-negative Bacteria

The standard antibiotic used against gram negative bacteria was Vancomycin whose zone of inhibition was found to be 18 nm.

Table 9: Comparison of Zone of Inhibition of Different Extracts of *P. corylifolia*Seeds against Standard Gram-negativeBacteria

Bacteria Selected	**Conc.(mg/ml)**	**Chloroform**	**Acetone**	**Ethanol**	**water**
	Zone of Inhibition in (nm)				
S. shiga	25 50 75 100	- - - 14	- - - 15	- - 10 -	- - 13 -
S. boydii	25 50 75 100	- - 11 -	- - - 13	- - - -	- - - 14
S. flexneri	25 50 75 100	- - - -	- - - 14	- 12 - 16	- - 13 -
S. sonnei	25 50 75 100	- - - 14	- - 12 -	- - 13 -	- 11 - 15
S. sarcinaceae	25 50 75 100	- - - 14	- - 13 -	- - - 15	- 11 - -

Table 10: Comparison of Zone of Inhibition of Different Extracts of *P.corylifolia*Seeds against Standard Gram (-ve) Bacteria at High Concentration (100mg/ml)

Bacteria	Conc. (mg/ml)	Chloroform	Acetone	Ethanol	Water
S. shiga	100	14	15	-	-
S. boydii	100	-	13	-	14
S. flexneri	100	-	14	16	-
S. sonnei	100	14	-	-	15
S.sarcinaceae	100	14	-	15	-

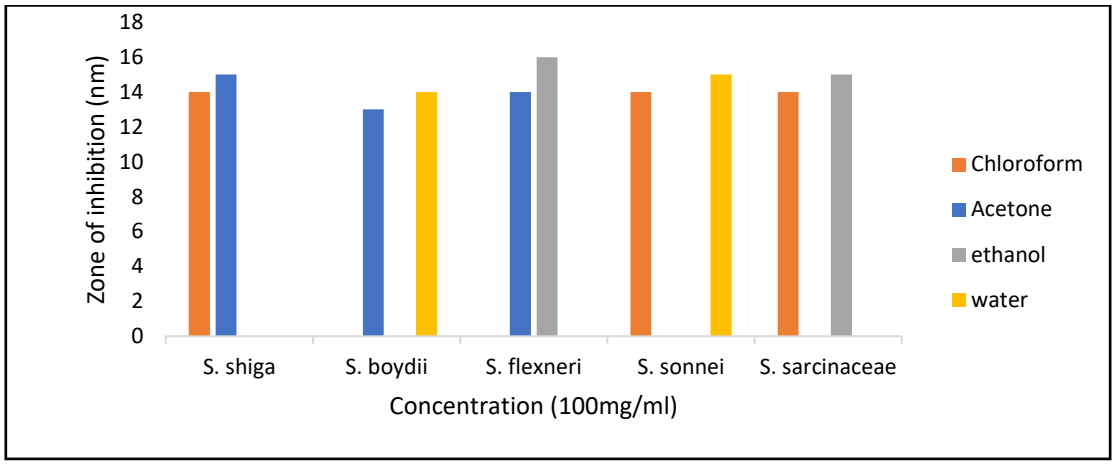

Figure 7: Comparison of Zone of Inhibition of Different Extracts of *P.corylifolia*Seeds against Standard Gram-negative Bacteria

Chloroform, acetone, ethanol and water extracts showed antimicrobial activity against Gram(-ve) bacteria i.e., *S. shiga, S. boydii, S. flexneri, S. sonnei*and *S. sarcinaceae*and these five-strains were found to be most sensitive to the seed extract of *Psoralea corylifolia*.

Different solvents were used to compare the antibacterial activity of *Psoralea corylifolia* seed extract, and the vancomycin standard (18 nm) was used to assess the zone of inhibition (nm) of five chosen gram-negative bacteria. Acetone and ethanol extracts demonstrated strong antibacterial action against *S. flexneri*, according to the findings of table 9. The ethanol extract showed the highest zone of inhibition against *S. flexneri* at 16 nm, which was very close to the standard antibiotic's zone of inhibition (18 mm). Acetone, water, and ethanol were next with zones of inhibition of 15 nm against *S. shiga*, *S. sonnei*, and *S. sarcinaceae*, respectively.

Antimicrobial Activity of *P.corylifolia*Seed Extracts against Gram-positive Bacteria

Table 11–16 displays the zone of inhibition of *Psoralea corylifolia* seed extracts against Gram-positive bacteria.

Table 11: Zone of Inhibition (nm) of Different Extracts of *P. corylifolia* on *B-megatrium*

Concentration(mg/ml)	Chloroform	Acetone	Ethanol	Water
25	-	-	-	-
50	-	-	-	-
75	-	-	-	19
100	20	-	21	-

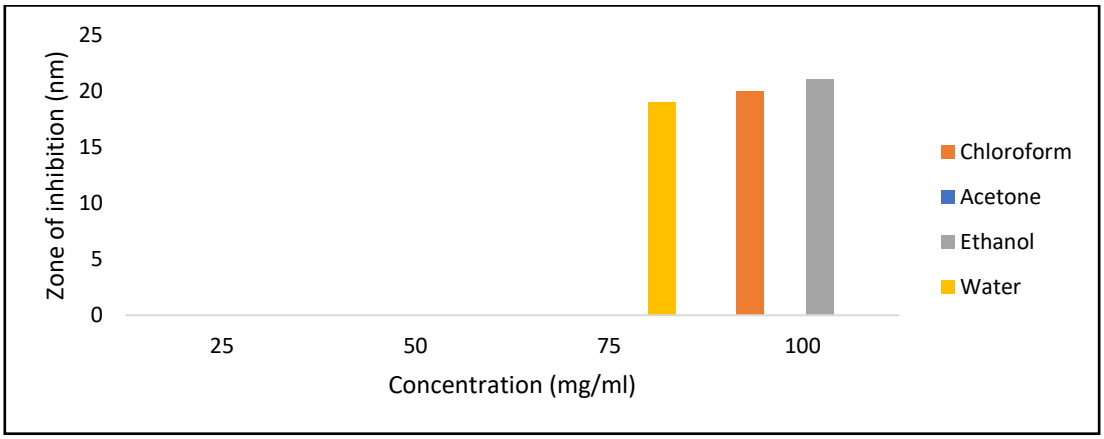

Figure 8: Zone of Inhibition (nm) of Different Extracts of *P.corylifolia* on *B-megatrium*

Table 12:Zone of Inhibition (nm) of Different Extracts of *P.corylifolia* on *Sarcina lutea*

Concentration(mg/ml)	Chloroform	Acetone	Ethanol	Water
25	-	-	-	-
50	-	-	-	-
75	-	18	-	-
100	19	-	20	-

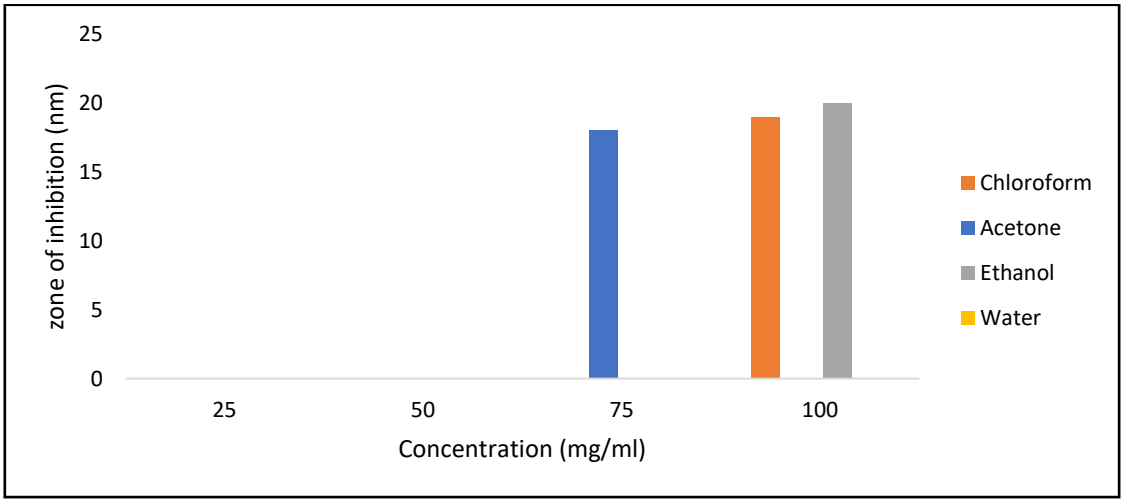

Figure9: Zone of Inhibition (nm) of Different Extracts of *P.corylifolia* on *S. lutea*

Table 13:Zone of Inhibition (nm) of Different Extracts of *P.corylifolia* on *β haemolyticus*

Concentration(mg/ml)	Chloroform	Acetone	Ethanol	Water
25	-	-	-	-
50	-	-	-	-
75	-	20	-	-
100	-	-	22	-

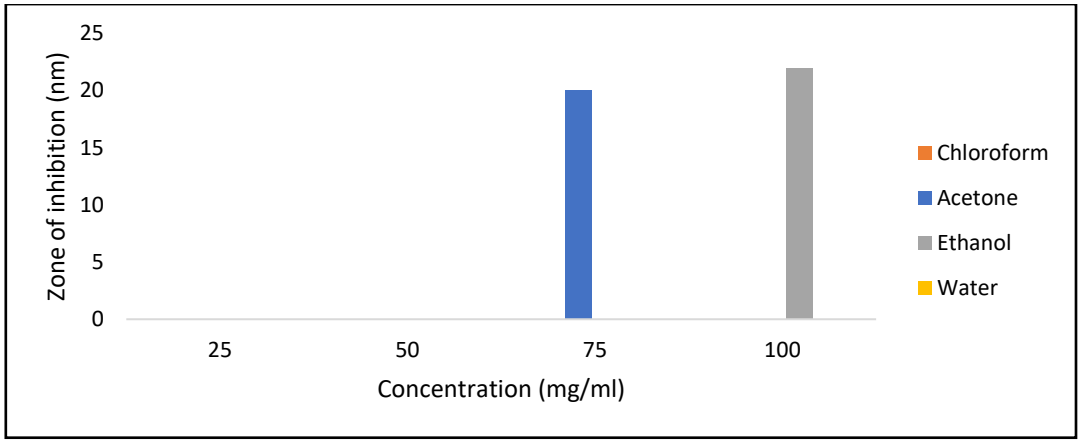

Figure 10: Zone of Inhibition (nm) of Different Extracts of *P.corylifolia* on *β-haemolyticus*

Table14: Zone of Inhibition (nm) of Different Extracts of *P.corylifolia* on *Streptococcus*

Concentration(mg/ml)	Chloroform	Acetone	Ethanol	Water
25	-	-	-	-
50	-	-	-	19
75	-	-	-	20
100	-	-	-	21

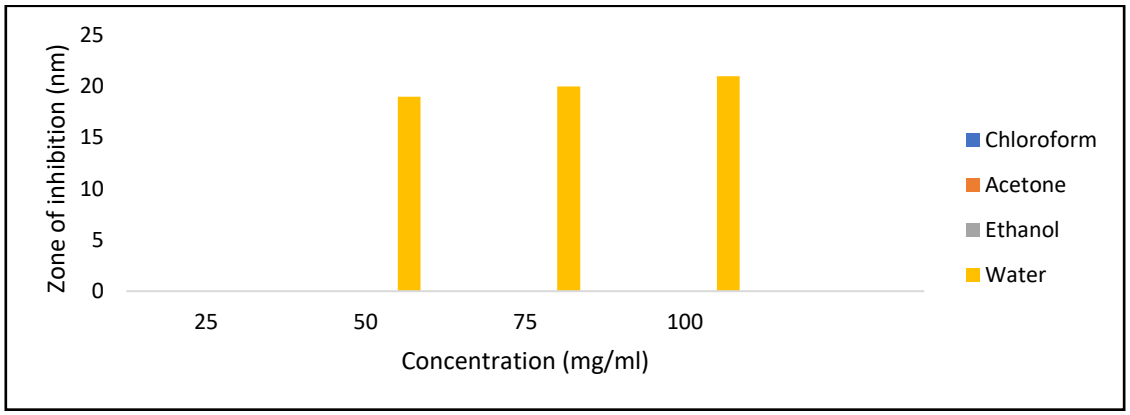

Figure11: Zone of Inhibition (nm) of Different Extracts of *P. corylifolia* on *Streptococcus*

Table15:Zone of Inhibition (nm) of Different Extracts of *P.corylifolia* on *M. tuberculosis*

Concentration(mg/ml)	Chloroform	Acetone	Ethanol	Water
25	-	-	-	-
50	-	-	-	-
75	-	17	-	19
100	20	-	21	-

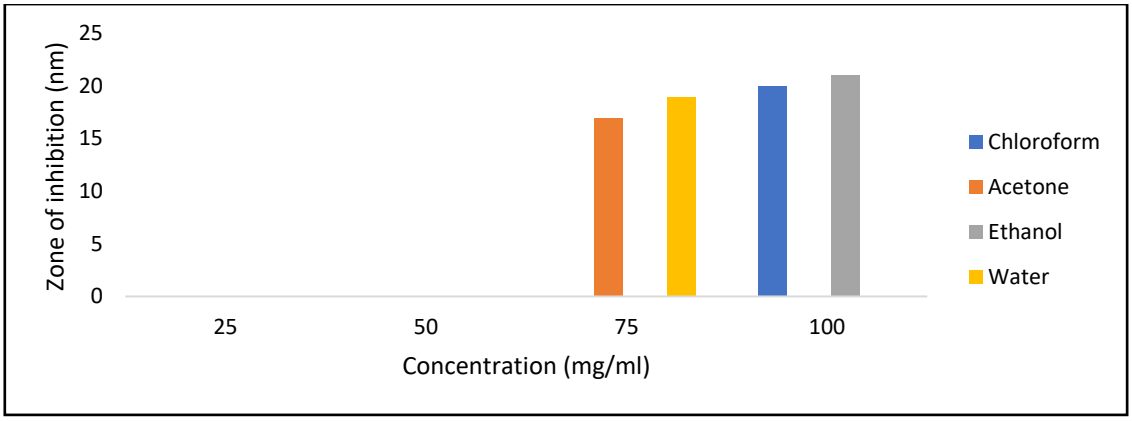

Figure 12: Zone of Inhibition (nm) of Different extracts of *P. corylifolia* on *M. tuberculosis*

Comparison of Zone of inhibition of Different Extracts of *P.corylifolia*Seeds using Different Solvents against Standard Gram-positive bacteria

The standard antibiotic used against gram negative bacteria was Ciprofloxacin whose zone of inhibition was found to be 23 nm.

Table16: Comparison of Zone of inhibition of Different Extracts of *P. corylifolia*Seeds using Different Solvents against Standard Gram-positiveBacteria

Bacteria Selected	Conc.(mg/ml)	Chloroform	Acetone	Ethanol	Water
	Zone of Inhibition in (nm)				
B-megatrium	25 50 75 100	- - - 20	- - - -	- - - 21	- - 19 -
Sarcina lutea	25 50 75 100	- - - 19	- - 18 -	- - - 20	- - - -
β-haemolyticus	25 75 50 100	- - - -	- - 20 -	- - - 22	- - - -
Streptococcus	25 50 75 100	- - -	- - - -	- -	- 19 20 21
M. tuberculosis	25 50 75 100	- - - 20	- - 17 -	- - - 21	 - 19 -

Table 17: Comparison of Zone of Inhibition of Different Extracts of *P.corylifolia*Seeds against Standard Gram-positiveBacteria at High Concentration (100mg/ml)

Bacteria	Conc. (mg/ml)	Chloroform	Acetone	Ethanol	Water
B-megatrium	100	20		21	-
Sarcina lutea	100	19		20	
β-haemolyticus	100	-		22	-
Streptococcus	100		-		21
M. tuberculosis	100	20	-	21	-

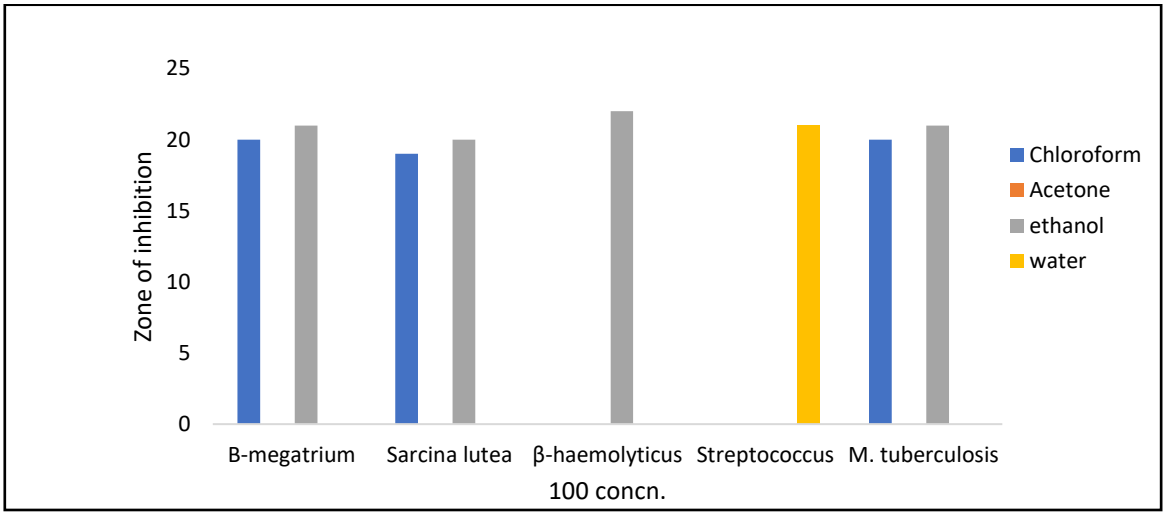

Figure 13: Comparison of Zone of Inhibition of Different Extracts of *P.corylifolia*Seeds against Standard Gram-positive Bacteria at High Concentration (100mg/ml)

Chloroform, acetone and ethanol extracts showed antimicrobial activity against Gram (+ve) bacteria i.e., *B-megatrium, Sarcina lutea, β-haemolyticus, Streptococcus, M. tuberculosis*and these five strains found to be most sensitive to the seed extract of *P.corylifolia*. Ciprofloxacin antibiotic was taken as standard which was having zone of inhibition at 24nm. The highest zone of inhibition in case of ethanol extract against β-haemolyticus was found to be 22nm which was very much nearer to the standard zone of inhibition of selected antibiotic i.e., Ciprofloxacin followed by aqueous extract against Streptococcus having zone of inhibition of 21 nm.

Conclusion

The present study was conducted to evaluate the antimicrobial activity of seed extracts i.e., chloroform, acetone, ethanol and water of *Psoralea corylifolia* against five selected gram-positive and gram-negative bacteria. The antimicrobial activity was determined by disc diffusion method. Out of four extracts, for both gram (-ve) and (+ve) bacteria, the ethanol extract was found to be highly active against *S. flexneri* and *β-haemolyticus*, respectively. *Psoralea corylifolia* was found to have antibacterial action in the current investigation against a variety of pathogenic microorganisms. In conclusion, *Psoralea corylifolia L*. ethanolic extracts may be a source of fresh, potent herbal medications for treating infections brought on by multi-drug resistance strains of bacteria in both community and hospital settings.

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