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Phytochemical, Antimicrobial and FTIR Analysis of Leaves Extracts of *Convolvulus arvensis* L.

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Abstract. Chemical composition, FTIR analysis, and antimicrobial activities of the crude leaf extract of *Convolvulus arvensis* L. were performed, using five different extracts for the utilization of medicine. FTIR spectra were used to study functional groups by using leaf extracts in different solvents. Alcoholic extracts were found to be richer in bioactive molecules containing alkaloids, phenolic compounds, flavonoids, coumarins, tannins, and glycosides, while the hexane extract exhibited significantly higher antimicrobial activities against *Proteus mirabilis* (17±0.3mm), *Bacillus atrophoeus* (11.5±0.3mm), and *B. subtilis* (12±0.3mm). All the extracts showed significant activity against Gramme-positive bacteria except *S. aureus*, while the hexane extract showed low antifungal activity against *Candida albicans*. FTIR spectral analysis shows that the functional groups in all solvents are almost identical. In conclusion, the leaves of *C. arvensis* contain active biomolecules, and the antimicrobial study encourages the use of these leaf extracts for the treatment of most common microbial diseases (antiseptic) and could be used in the therapeutic and pharmaceutical industries.

Keywords: phytochemical analysis, FTIR spectroscopy, antimicrobial activities

Introduction

Convolvulus arvensis L. commonly called bindweed is a dicotyledonous, persistent, herbaceous perennial weed that belongs to the family Convolvulaceae (Andrease *et al*., 2020; Khan and Hayat, 2015). Its origin is Europe and Asia and present in tropical and temperate regions of the world (Weaver and Riley, 1982; Khan and Hayat, 2015). *C. arvensis* is reported to have been used in the traditional medicine system from as early as the 1730s (Eastman *et al*., 2015). Aerial parts of *C. arvensis* were used as anti-spasmodic, anti-hemorrhagic, anti-angiogenetic, acute hepatitis and for the treatment of parasites and jaundice (Al-Bowait *et al*., 2010; Manandhar, 2002; Alkofahi *et al*., 1996; Desta, 1993). It has been also reported as a traditionally used medicine for the decoction in cough and flu, gonorrhea, constipation, chronic ulcers, wound healing, rheumatic pain, inflammation and swelling (Khakimov *et al*., 2021; Abidullah *et al*., 2019; Abidullah *et al*., 2018; Ali *et al*., 2013; Brown and Porter, 1942). The purified bindweed extract inhibits the growth of cancer cells and enhances the immune system by inhibiting the growth of blood vessels and improve immune function. It is also found as a blood purifier and use to ease the pain in the genital and nervous diseases (Singh *et al*., 2010; Akhtar and Begum, 2009; Ullah and Rashid, 2007).

C. arvensis flower is used as a tea (laxative) in different parts of the world and it is used for the treatment of muscular weakness (Austin, 2000; Chopra and Ishwar, 1994). *C. arvensis* is a host for pathogens and insect pests (Bisen and Singh, 2008). It has no fodder value and it contains anti-nutritional compounds including saponins, alkaloids and tannins (Khan and Hayat, 2015; Todd *et al.*, 1995). It also affects the growth of crops due to its allelopathic effects (Baličević *et al.*, 2014). The weeds caused a reduction in the yield of crop plants (Babar *et al.*, 2015; Mahmood *et al.*, 2015; Sadia *et al.*, 2015). The weeds should be managed to reduce the losses of crop plant yield.

The polyhydroxytropane alkaloid (Calystegins) from roots of naturally developing *Convolvulus arvensis* demonstrated strong inhibitory activity against β-glucosidase and α-galactosidase. The aqueous and alcoholic extract demonstrated mild diuretic, tranquilizing, hypoglycaemic and antihemorrhagic operation. The extracts were found to be healthy for liver and kidney functions. They also act to alleviate

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intestinal and uterine discomfort (Voronina and Frmakol, 1966).

It has been considered effective as an aphrodisiac and nervine tonic (Murad *et al*., 2011). The whole plant is used as a sedative to relieve the discomfort in genital disorders as well as in nervous diseases e.g seizures and hysteria. In veterinary medicine, helminthiasis has been treated with the aerial parts of *C. arvensis* (Hussain *et al*., 2008). Therefore, many researchers are focusing on the biological properties of *C. arvensis*.

Today more than 50% of all the medicines used in the clinic are produced from natural sources and about 80% of the world's population uses plants as primary medicines (Younessi-Hamzekhanlu *et al*., 2020; WHO, 2019). Currently, modern english medicine and synthetic compounds decrease the importance of herbal products but still, now some people are returning to natural products with the hope of safety and efficacy. "Office of Alternative Medicine" has been established by the US government at the NIH at Bethesda where research is going on traditional medicines (Bose *et al*., 2001).

According to the review of literature, phytochemical analyses pharmacological effects and antibacterial activity of stem and leaves of *C. arvensis* L. have been reported by (Al-Snafi, 2016; Khan and Hayat, 2015). The chemical composition of seeds has been studied by (Meng *et al*., 2002; Todd *et al*., 1995) studied the phytochemistry of the whole plant. Furthermore, the chemical constitution, oral toxicity activities and anti-arthritic activity of the leaves in the methanolic extract have been reported by (Saleem *et al*., 2020) on the desirable plants, while (Hamedi *et al*., 2017) evaluate the catalytic, antibacterial and antibiofilm activities of the desire *C. arvensis* leaves extract by using function-alized silver nanoparticles. So, the current study was conducted to analyze the phytochemical, antimicrobial and FTIR analysis from the crude extract of *Convolvulus arvensis* L.

Materials and Methods

Plant collection and identification. Fresh leaves of *C. arvensis* were collected in March 2019 from the Botanical Garden of PCSIR Laboratories Complex, Peshawar. The plant was botanically identified by a taxonomist at Taxonomy Laboratory, Medicinal Botanic Center, PCSIR Labs., Peshawar. After collection, identified plant sample 12/SS-UD-S/2017 (voucher specimen) was deposited at the Herbarium of the Taxonomy Laboratory, Medicinal Botanic Center, PCSIR Labs., Peshawar.

Drying and grinding. The plant leaves were properly washed with clean distilled water and then dried in the shade at room temperature. After drying, the plant materials were then powdered well by using an electric grinder and placed into a well-closed container until use.

Extraction. Organic extractions, as well as aqueous extraction, were performed. The soxhlet extraction method was used for organic extractions. 10 g of dried plant powder were dissolved in 200 mL of four different solvents separately (ethanol, methanol, ethyl acetate and hexane). To evapourate the solvents the extracts were heated in a hot water bath at 37 ºC. The dried extracts were placed in desiccators and kept in the refrigerator at 2-8 °C for their future use (Harborne., 1998). For aqueous extraction, 10 g of the plant powder was mixed with 200 mL of distilled water in a beaker and heated on a hot plate at 40-60 °C and mixed with continuous stirring for 20 min. The mixture was filtered using Whatman filter paper and the filtrate was used for further analysis.

Phytochemical screening. ***Salkowski test for terpenoids*.** About 2 mL of chloroform was added to the test tube having 5 mL of extract and followed by the addition of 3 mL of concentrated sulfuric acid. The formation of a reddish-brown colouration at the interface confirmed the presence of terpenoids (Harborne, 1973).

***Test for alkaloids*.** 0.5 g of each sample was heated with 8 mL of 1% hydrochloric acid and filtered. Two mL of each filtrate was titrated with Mayer's reagent (potassiomercuric iodide solution) and Dragendroff's reagent (solution of potassium bismuth iodide) separately. The formation of cream or yellow precipitate indicates the presence of alkaloids (Harborne, 1973).

***Test for saponins*.** 0.2 g of extract was mixed with 20 mL of distilled water and boiled in a water bath for 5 min and filtered, when 5 mL of distilled water was mixed with 10 mL of the filtrate and mixed well. Formation of the emulsion after shaking vigorously the froth with three drops of olive oil shows the presence of saponins (Harborne, 1973).

***Test for phlobatannins*.** 0.8 g of extract was added to the test tube and was boiled in 1% aqueous HCl. The presence of phlobatannins was confirmed by the formation of a red precipitate (Trease and Evans, 1989).

***Test for coumarins*.** 0.3 g of extract was taken in a test tube and the test tube was covered with a filter paper moistened with 1 N sodium hydroxide solution and place test tube in a boiling water bath for a few minutes. The filter paper was then examined under ultraviolet light. Yellow fluorescence indicates the presence of coumarins (Trease and Evans, 1989).

***Test for tannins*.** 0.5 g of the extract was mixed with 20 mL of water and filtered. The addition of a few drops of 0.1% ferric chloride to the filtrate gives a blue-black or brownish-green colour which indicates the presence of tannins (Sofowora, 1993).

***Test for flavonoids*.** 50 mg of the extract was dissolved in 10 mL of distilled water and filtered, while 5 mL of dilute ammonia solution and concentrated H_2SO_4 were added to the filtrate. The presence of flavonoids was confirmed by the formation of a yellow colour (Sofowora, 1993).

***Test for glycosides*.** Few drops of sodium nitroprusside and pyridine were added to the extract. The presence of glycosides was confirmed by the appearance of pink or red color (Ismail *et al*., 2016).

***Test for steroids*.** Concentrated sulphuric acid was added to the chloroform solution of the extract. The presence of steroids is confirmed by the formation of red colour (Hameed, 2012).

***Test for phenolic compounds*.** The extract was treated with few drops of 5% of ferric chloride solution. The formation of dark blue colour confirms the presence of phenols (Al-Khateeb *et al*., 2019).

***Fourier transform infrared (FTIR) spectroscopy*.** FTIR spectra were got from KBr pellets prepared by using 1 mg of leaves powdered leaves samples. The KBr were studied in the absorption mode of FTIR (System 2000, Perkin Elmer, Wellesly, MD, U.S.A) and all spectra were recorded from 600-3900/cm. The FTIR investigations were carried out with Prestige 21 by IR Solution software at Medicinal Botanic Centre, PCSIR Laboratories Complex Peshawar, Pakistan. The wavenumber range was selected in the range of middle infrared of 600-3900/cm. The peaks obtained were plotted as wavenumber/cm on x-axis and as % transmittance on y-axis.

Anti-microbial activities. ***Antibacterial assay*.** Different extracts of *C. arvensis* were screened out for their antibacterial activity by using the disc diffusion method (Chanda and Baravalia, 2010; Parekh and Chanda, 2007; Rahman and Moon, 2007).

***Sample and control preparation*.** A stock solution of a concentration of 3 mg/mL of each extract was prepared by dissolving 6 mg of plant extract in 2 mL DMSO. Further dilutions were made from stock solution by serial dilution method. 2 mg/mL solution of Cefixime was used as positive control, while DMSO was used as a vehicle.

***Media preparation*.** For bacteria inoculation, a Nutrient Broth medium was used. The nutrient broth is composed of Peptone from meat (5 g/L) and meat extract (3 g/L). To prepare media, 0.8 g of nutrient broth was dissolved in 100 mL of distilled water. Its pH was adjusted to 7.0 and was autoclaved at 121 °C at 15 atmospheric pressure for 45 min (Fatima *et al*., 2019). Nutrient agar was used to grow bacteria in Petri dishes for antibacterial assay. Its composition was: peptone (0.5%), beef/yeast extract (0.3%), agar (1.5%) and NaCl (0.5%), while 6 g nutrient agar was dissolved in 300 mL distilled water (pH 7.0) and autoclaved. 15 mL of autoclaved nutrient agar was poured into Petri plates and allowed to solidify for 30 min.

Bacterial species used. Antibacterial assay was carried out for nine bacterial strains. Three of them were gram-positive i.e *Staphylococcus aureus, Bacillus subtilis* and *Bacillus atrophoeus* and six were gram-negative i.e *Escherichia coli, Salmonella typhi, Pseudomonas aeruginosa, Proteus mirabilis, Klebsiella pneumoniae* and *Citrobacter freundii*. All these were procured from Microbiology Lab, MBC, PCSIR, Peshawar. The organisms were preserved on an agar slope at 4 °C and sub-cultured before use.

***McFarland turbidity standard*.** McFarland standard method is used to visually compare the concentration of bacterial cells in a suspension with a known concentration. 0.05 mL of 1% barium sulphate was added to 9.95 mL of 1% sulphuric acid with constant stirring to prepare 0.5 barium sulphate McFarland standard. To confirm the density of the suspension absorbance at 625 nm wavelength was measure using a spectrophotometer. The transmittance of the suspension should be between 99.92 to 99.99. McFarland standard was stored at room temperature in caps tightened tubes for further use. White background with black lines was used to compare the McFarland standard with inoculum.

***Refreshing cultures*.** The bacterial strains to be used were streaked onto a nutrient agar medium for refreshing

to obtain isolated colonies. 0.1 mL of inoculums of bacterial strains of old culture were mixed with 10-15 mL Luria broth in the test tube. Test tubes were then cover with cotton plugs and aluminum foil and incubated for 24 h at 37 °C. After incubation, well isolated colonies were selected using a sterilized wire loop and the bacterial growth was transferred to a physiological normal sterile saline solution. This inoculum and 0.5 McFarland standard were then compared. In case if the density of 0.5 McFarland and inoculum was not matching, the turbidity can be increased by adding more bacterial growth or decreasing turbidity by adding normal sterile saline.

Zone of inhibition test via disc diffusion method. 6 µL of the sample solutions of different concentrations (0.5, 1.0, 1.5 mg/mL) was added to the filter paper disc (having a diameter of 6 mm) and get dried at room temperature. Bacterial cultures were inoculated on a nutrient agar plate and then the samples were applied on discs with the help of forceps. Discs were placed on the agar surface at a specific distance. The cefixime was 6 µL also applied on discs that were pressed separately on the agar surface. The lid was closed and sealed with paraffin and placed in an incubator at 37 °C for 24 h. After overnight incubation, the appearance of the inhibition zone was checked and the diameter of the zone was measured with the help of a Vernier Caliper with a precision of 0.2 mm (Philip *et al*., 2009). The experiment was performed in triplicate to get the average.

***Antifungal assay*.** Antifungal activity of extracts was tested only against *Candida albicans* and it was also determined by the disc diffusion method as done for antibacterial assay. A stock solution of the extracts was prepared and then serial dilution was done. Terbinafine was used as positive control and was prepared in DMSO (2 mg/mL). DMSO was used as a vehicle. Growth inhibition was determined by measuring the zone of inhibition in mm using the Vernier Caliper.

Chemicals and reagents used. All the chemicals including ethanol, methanol, LB broth media etc were purchased from Sigma-aldrich USA. All analytical grade reagents were purchased from market. All chemicals and reagents were stored and used as recommended by the supplier. The strain's details are given in (Table 1).

Statistical analysis. Data were statistically by using (SPSS V® 21) software program. Results are expressed as mean± (SEM) and statistical significance was recognized at $P<0.05$.

Results and Discussion

Qualitative phytochemical screening. Medicinally active constituents were observed in the plant samples during the present investigation. Phytochemical screening of various fractions of the *C. arvensis* indicated the occurrence and absence of different elements as shown in (Table 2).

Methanolic extract of *C. arvensis* was consisted of alkaloids, flavonoids, phenols, steroids and glycosides, whereas terpenoids, phlobatannins, saponins, tannins and coumarins were absent. The presence of coumarins, tannins, flavonoids, glycosides, phenols and saponins was detected in ethanolic extract. Alkaloids, steroids, terpenoids and phlobatannins were absent in ethanolic extract. However, in water extract, terpenoids, alkaloids, glycosides, tannins and coumarins were not detected.

Table 1. Microbial stains used during experiments (Gram negative=Gr– and Gram positive=Gr+)

Bacteral strain	Type	Detail
Escherichia coli	Gr –	Isolated from the department of biochemistry, Quaid-e-Azam University Islamabad ATCC# 25922
Pseudomonas aeruginosa	Gr –	ATCC# 2721
Salmonella typhi	Gr –	-
Citrobacter freundii	Gr –	Obtain from the depart of biotechnology Quaid-e-Azam University Islamabad
Klebsiella pneumoniae	Gr –	Obtain from the depart of biotechnology Abdul wali khan university Mardan.
Proteus mirabilis	Gr –	Obtain from the depart of biotechnology Abdul wali khan university Mardan.
Bacillus atrophoeus	Gr+	Clinically isolated from the department of microbiology Quaid-e-Azam University Islamabad
Bacillus subtilis	Gr+	Isolated from the department of microbiology Quaid-e-Azam University Islamabad
Staphylococcus aureus	Gr+	ATCC# 3538
Candida albicans	-	Departament of chemistry, Quaid-e-Azam University Islamabad ATCC# 10231

The hexane extract was comprised of glycosides, coumarins, tannins and steroids. Similarly, ethyl acetate extract showed the presence of flavonoids, saponins, glycosides, tannins and steroids while terpenoids, phenols, coumarins, alkaloids and phlobatannins were absent in it. Terpenoids were not detected in any of the extracts.

FTIR spectroscopy. FTIR spectra and peak values of *Convolvulus arvensis* L. in leaves extract in a different solvent including water, ethanol, ethyl acetate and hexane are shown in (Fig. 1) (a), (b), (c) and (d) and Table 3 respectively. Spectral analysis of the desired plant in the different functional groups are almost identical and the major functional groups. The spectral peak of water and ethanol has slightly differed from each other. This technique was performed to compare characteristic functional group peaks of plant extracts. With the help of these peaks, we can guess the type of functional group and compounds present in extracts. The spectra of FTIR displayed by the extracts could be credited to the presence of phenolics, flavonoids, saponins, tannins, alkaloids and terpenoids. Spectra were recorded in the mid-infra-red region of 600-3900 cm^{-1} (see Fig 1). Table 4 shows the characteristic functional group peaks of plant extracts.

Anti-Microbial assays. ***Antibacterial activity*****.** On account of the potential existence of bioactive constituents for antimicrobial activities in plants; considerable interest have developed to evaluate the extracts of medicinal plants and to isolate promising candidates to control spoilage of food and pathogenesis in humans (Alzoreky and Nakahara, 2003; Valero and Salmeron, 2003). In the present investigation, different extracts of *C. arvensis* were evaluated for their potential antibacterial activities. The zone of inhibition values of the samples were determined to record the inhibition of the visible growth of bacteria. For this purpose, both kinds of bacteria; gram-negative bacteria and gram-positive were utilized to determine the efficacy of the extracts shown in Fig. 2(a, b, c, d, e, f, g, h and i).

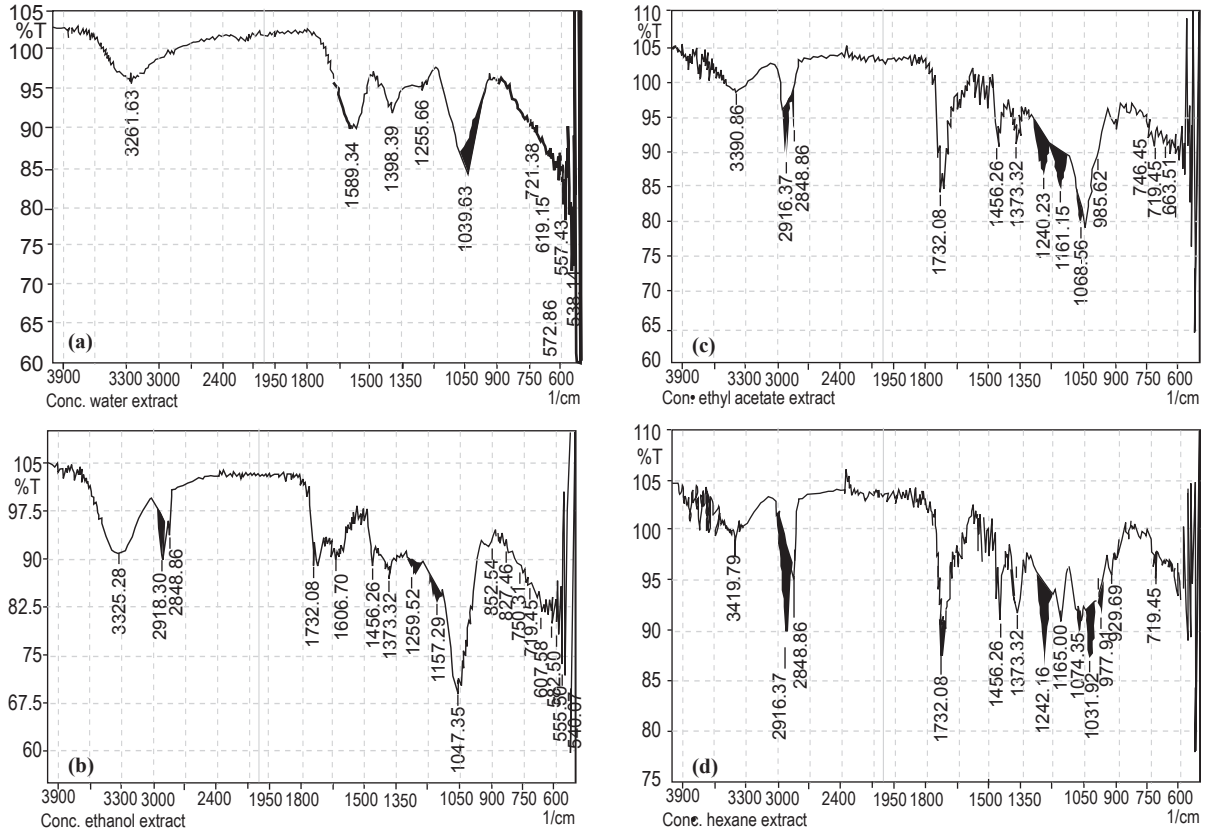

Fig. 1. FTIR peak values of Convolvulus arvensis L. in leaves extracts, **(a)** FTIR spectra in water extract, **(b)** FTIR spectra in ethanol extract, **(c)** FTIR spectra in ethyl acetate extract, **(d)** FTIR spectra in hexane extracts.

Table 2. Phytochemical constituents of leaves extract of *Convolvulus arvensis* L.

Solvents extracts phytochemicals	Aqueous	Ethanol	Ethyl acetate	Hexane	Methanol
Alkaloids	ND	ND	ND	ND	+
Coumarins	ND	+	ND	+	ND
Flavonoids	+	+	+	ND	+
Glycosides	ND	+	+	+	+
Phenols	+	+	ND	ND	+
Phlobatannins	+	ND	ND	ND	ND
Saponins	+	+	+	ND	ND
Steroids	+	ND	+	+	+
Tannins	ND	+	+	+	ND
Terpenoids	ND	ND	ND	ND	ND

ND (Not detected); + (Detected)

***Antibacterial activities of C. arvensis*.** Antibacterial activities of all extracts were recorded in the form of the zone of inhibition at a concentration of 0.5, 1.0 and 1.5 mg/mL. That hexane extract has maximum zone of inhibition, 17±0.2 mm at 1.5 mg/mL and 14.5±0.2 mm at 1 mg/mL concentration against *Proteus mirabilis* followed by ethanolic extract (9.0±0.2 mm) at 1.5 mg/mL. Water extract did not affect the growth of *P. mirabilis*. The maximum zone of inhibition against *B. subtilis* was exhibited by hexane extract (12±0.2 mm) at 1.5 mg/mL followed by ethyl acetate (8±0.2 mm). Other fractions displayed low to moderate effects. However, *E. coli* and *S. typhi* strains showed resistance against all extracts. The two fractions; ethanolic and ethyl acetate extract presented low activity (10±0.2 mm

Table 3. Zones of inhibition (ZOI) shown by different extracts of *C. arvensis* L. against different microbial strains

Microbial strains	Aqueous			Ethanol			Ethyl Acetate			Hexane		
	0.5mg	1mg	1.5mg	0.5mg	1mg	1.5mg	0.5mg	1mg	1.5mg	0.5mg	1mg	1.5mg
Escherichia coli	--	--	--	--	--	--	--	--	--	--	--	--
Pseudomonas aeruginosa	--	--	7.0	--	--	7.0	--	--	--	6.5	8.0	10
Salmonella typhi	--	--	--	--	--	--	--	--	--	--	--	--
Citrobacter freundii	--	--	6.5	9.0	9.5	10	8.0	8.5	9.0	6.5	7.0	7.5
Klebsiella pneumoniae	--	--	--	--	--	--	6.5	7.0	7.5	--	8.0	9.0
Proteus mirabilis	--	--	--	--	8.0	9.0	--	6.5	8.0	9.5	14.5	17
Bacillus atrophoeus	6.5	6.5	7.0	--	7.0	7.5	--	--	--	9.0	10	11.5
Bacillus subtilis	6.5	7.0	7.5	--	6.5	7.5	--	6.5	8.0	9.0	10	12
Staphylococcus aureus	--	--	--	--	6.5	7.0	--	--	--	--	--	--
Candida albicans	--	--	6.5	--	--	--	--	--	--	7.5	8.0	8.5

Table 4. Assessment of the FTIR spectrum of *C. arvensis* L. leaves powder extract

Solvent extract	Peak value	Functional group	Type of vibration
Aqueous	3261, 1589, 1398, 1255, 1039, 721, 619, 572, 557, 538	phenols, nitro groups, secondary amines, aromatic amines, carboxylic acids, alkyl halides, alkyl halides	Stretch, N=O Bend, N-H Bend, C-H Stretch, C-N Stretch, O-H Stretch, Stretch, C-Cl Stretch
Ethanol	3325, 2918, 2848, 1732, 1606, 1456, 1373, 1259, 1157, 1047, 852, 827, 750, 719, 607, 582, 555, 540	carboxylic acids, aldehyde/ketone, primary amines, nitro groups, alkenes, aliphatic amines, alkyl halides	O-H Stretch, Stretch, N-H Bond, N=O Bend, C-N Stretch, C-Cl Stretch
Ethyl acetate	3390, 2916, 2848, 1732, 1456, 1373, 1240, 1161, 1068, 985, 746, 719, 663	carboxylic acids, aliphatic amines, alkyl halides, alkyl halides	C=O Stretch, C-N Stretch, C-H wag (-CH2X), Stretch
Hexane	3419, 2916, 2848, 1732, 1456, 1373, 1242, 1165, 1074, 1031, 977, 929, 719	alcohols/phenols, carboxylic acids, nitro groups, aliphatic amines, alkyl halides	O-H Stretch, O-H Stretch, N=O Stretch, C-N Stretch, C-H wag (-CH_2X)

and 9.0±0.2 mm at 1.5 mg/mL, respectively) against *C. freundii*. Ethanolic and water extracts did not retard the growth of the *K. pneumoniae* strain used in this study. However, ethyl acetate (7.5±0.2 mm at 1.5 mg/mL) and hexane (9.0±0.2 mm at 1.5 mg/mL) extract showed a low effect on the growth of *K. pneumoniae*. The growth of *S. aureus* was not affected by any extract except ethanolic extract (7.0±0.2 mm at 1.5 mg/mL). *Pseudomonas aeruginosa* strain exhibited resistance against ethyl acetate therefore no zone of inhibition was observed. Retarding effect of hexane extract on the growth of *Bacillus atrophoeus* was low (11.5±0.2 mm) whereas water and ethanol manifested very low efficacy (7.0±0.2 and 7.5±0.2 mm, respectively). In comparison to standard antibiotic cefixime used in this study, *B. procumbens* extract as well as its derived fractions did not cross the zone of inhibition. The zone of inhibition of cefixime was (38±0.2 mm at 1.0 mg/mL).

Antifungal activity of C. arvensis. The antifungal activity of *C. arvensis* is displayed in Table 3. Antifungal activity of *C. arvensis* extracts was tested against *Candida albicans*. None of the ethanol extracts of *C. arvensis* showed activity against *C. albicans*, while the highest activities have been reported in hexane extract it both 1 mg (8.0 cm) and 1.5 mg (8.5 cm) followed by ethyl acetate 7.5 cm at 1.5 mg, while the low activity (6.5 cm) was seen by aqueous extract at the same concentration (1.5 mg).

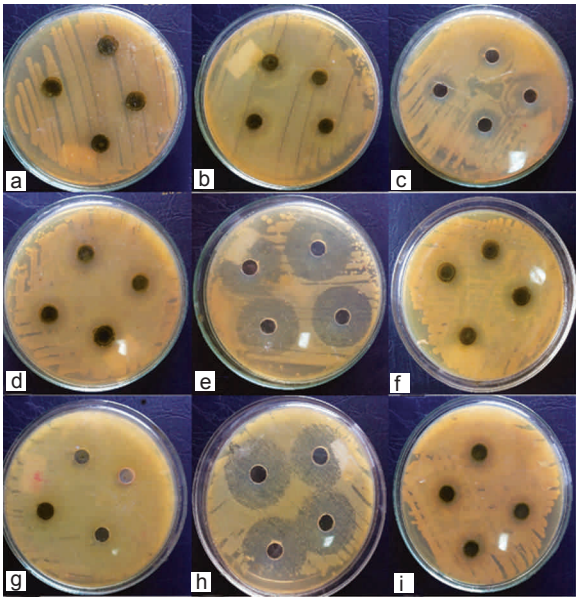

Fig. 2. Antimicrobial activity of leaves extract of *C. arvensis* L. against nine different microbial strains. **(a)** Zones of inhibition against *Escherichia coli* strains, **(b)** Zones of inhibition against *Pseudomonas aeruginosa* strain, **(c)** Zones of inhibition against *Klebsiella pneumoniae*, **(d)** Zones of inhibition against *Proteus mirabilis*, **(e)** Zones of inhibition against *Citrobacter freundii,* **(f)** Zones of inhibition against *Staphylococcus aureus*, **(g)** Zones of inhibition against *Salmonella typhi,* **(h)** Zones of inhibition against *Bacillus atrophoeus* and **(i)** Zones of inhibition against *Bacillus subtilis*.

Conclusion

The present study aims to evaluate the phytochemical constituents and antimicrobial activities of *Convolvulus arvensis* of different extracts. The phytochemical studies showed that *C. arvensis* contained alkaloids, phenolic compounds, flavonoids, steroids, tannins, glycosides and coumarins which are very useful and act as a potential source of useful drugs to improve the health status of humans. Novel bioactive compounds from the extracts can be investigated, which possess antifungal, antibacterial and several other therapeutic properties.

The data of the reference study obtained by using a phytochemical screening base study was compared to the ones previously published using an H-NMR assay. A similar result was observed, by using the phytochemical analysis. According to previously published data of (Alshoushan *et al*., 2021), the phytochemical screening of *C. arvensis* contains flavonoids, tannins, saponins, steroids, carbohydrates and coumarin in ethyl acetate and methanolic extract. Furthermore, an H-NMR base study shows that the scopoletin was found in aerial parts of the plant while phenolic coumarin (7-hydroxy-6-methoxy coumarin), caffeic acid (3,4-hydroxycinnamic acid) and ferulic acid (4-hydroxy-3-methoxy cinnamic acid) were also present. The chemical constituents present in the extract have been reported to possess many biological activities (Alshoushan *et al*., 2021). So, the results indicate that the phytochemical analysis of the desire plants needs more exploring. Hence, this plant can be further subjected to isolation of the therapeutically active compounds that may serve as leads in the development of new pharmaceuticals research.

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Conflict of Interest. The authors declare they have no conflict of interest.

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