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Antibacterial activity of leaf and gall extracts of *Ficus glomerata* (Syn *Ficus racemosa*)

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Abstract: *Ficus glomerata* Roxb. of family *Moraceae is an evergreen, deciduous tree found throughout India and is often cultivated in villages for its edible fruit. It is usually planted around temple and known to be a member of '*ksirivrkas*' i.e. plants that are beneficial for human health. It is commonly known as Cluster Fig tree, Indian Fig Tree or Goolar (Gular).* F. glomerata *has been valued in ayurveda and unani system of medication for possessing variety of therapeutic properties and widely used in folk medicine for the treatment of various diseases. It consists of gall-like excrescences formed by insects on the leaves, petioles and branches of the plant by the insect* Pauropsylla depressa *(Homoptera). These galls, commonly known as* Karkatshringi *are extensively used in Ayurveda and Indian traditional medicine as a remedy for cough, asthma, fever, respiratory and in liver disorders.* The *extracts of the plants have also been reported to possess significant medicinal and pharmacological properties like hepatoprotective, gastroprotective, hypoglycemic, anti-microbial and anti-ulcer activities.*

In the present investigation antimicrobial activity of leaf and whole inflorescence extracts of Ficus glomerata has been assayed in vitro against Gram positive Streptococcus pyogenes, Staphylococcus aureus, Staphylococcus haemolyticus, Bacillus cereus, Bacillus subtilis and Gram negative Escherichia coli, Salmonella typhi, Pseudomonas aeruginosa, Acinetobacter baumanii, Klebsiella pneumonia, Alcaligenes faecalis, Citrobacter freundii, Enterobacter cloacae, Schigella flexnere and Proteus mirabilis. The results indicate that the four solvent extract fractions viz. Dichloromethane fraction of crude extraction (DCM), n-Hexane fraction of crude extraction (NHE), Ethylacetade fraction of crude extraction (EAE) and Methanol fraction of crude extraction (MEL) of leaves and galls were not equally antimicrobial against Gram positive and Gram negative bacteria. The solvent fractions are found to be more inhibitory to Gram negative bacteria in comparison to Gram positive bacteria.

Key Words: *Ficus glomerata, Leaves, Galls, Antibacterial, Bactericidal, Solvent extracts*

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I. Introduction

Ficus glomerata Roxb. (syn *Ficus racemosa*) of family Moraceae is an evergreen, moderate to large sized deciduous tree found throughout greater part of India and is often cultivated in villages for its edible fruit. It is usually planted around temple and known to be a member of '*ksirivrkas*' that is plants that are beneficial for human health. It is commonly known as Cluster Fig tree, Indian Fig Tree or Goolar (Gular). *F. glomerata* has been valued in ayurveda and unani system of medication for possessing variety of therapeutic properties and widely used in folk medicine for the treatment of various diseases. It consists of gall-like excrescences formed by insects on the leaves, petioles and branches of the plant by the insect *Pauropsylla depressa* (Homoptera). These galls, commonly known as *Karkatshringi* in Sanskrit are extensively used in Ayurveda and Indian traditional medicine as a remedy for cough, asthma, fever, respiratory and in liver disorders (Shrestha *et al*., 2013; Shantha *et al*., 1991; Raghunatha, 1995) [1, 2, 3]. *Karkatshringi* also finds usage in the treatment of children's ear infections, suppress hemorrhage from gums and used to suppress bleeding from nose (Shreshth *et al*., 2014; Sukh, 1997) [4, 5]. Hakims consider galls useful in pulmonary infections, diarrhea and vomiting.

F. glomerata extracts have also been reported to possess significant medicinal and pharmacological properties like hepatoprotective, gastroprotective, hypoglycemic, anti-microbial and anti-ulcer activities (Akhtar and Qureshi, 1988; Channabasavaraj *et al*., 2008; Rao *et al*., 2008; Joseph and Raj, 2010; Manohar *et al*., 2013) [6, 7, 8, 9, 10]. Historically, galls are used in some of the ayurvedic formulations like '*Chvyanprash avaleha',*

'KumariAsava', 'KumariKalp' etc. and prescribed for weakness as rejuvenating agent and tonic. The use of leaf galls as a rejuvenator may be attributed to antioxidant property (Kumar *et al*., 2005) [11].

Ficus glomerata commonly known as Udumbara or Krimiphala has great pharmacognostic values. Its roots are used in hydrophobia whereas bark is acrid, cooling, galactagogue and good for gynecological disorders. Fruits are astringent to bowels, styptic, tonic and used in the treatment of leucorrhoea, blood disorders, burning sensation, fatigue, urinary discharges, leprosy, menorrhagia, epistaxis and intestinal worms. According to unani system of medicine, leaves are astringent to bowels and good in case of bronchitis whereas fruits are useful in treatment of dry cough, loss of voice, diseases of kidney and spleen. Bark is useful in asthma and piles. Latex is applied externally on chronic infected wounds and to promote the healing. The tender leaf buds are applied on the skin, in the form of paste, to improve the complexion. Roots are used in dysentery, pectoral complaints, diabetes, applied in mumps, other inflammatory glandular enlargements.

The leaf of this plant is reported to contain sterols, triterpenoids (Lanosterol) and alkaloids, tannins and falconoid. Stem-bark offered gluanolacetate, β-sitosterol, leucocyanidin 3-O-β-D-glucopyrancoside, leucopelargonidin, leucopelargonidin- 3- O- α- L- rhamnopyranoside, lupeol ceryl behenate, lupeol acetate and α-amyrin acetate. From trunk bark, lupenol, β-sistosterol and stigmasterol have been isolated. Fruits have been identified for gluanol acetate, glucose, tiglic acid esters of taraxasterol, lupeol acetate, friedelin higher hydrocarbons (Hentriacontane) and other phytosterols. A tetra cyclic triterpene glauanol acetate has been isolated from the leaves. An unusual thermos table aspartic protease has been isolated from latex of the plant. The stem bark and fruit shows the presence of gluanol acetate (Malairajan *et al*., 2008**)** [12].

The ethanol extract of bark and leaves are reported for analgesic activity (Malairajan *et al*., 2008). This plant shows hypolipidemic effect by the fecal excretion of bile acids and cholesterol **(**Agarwal and Chouhan, 1988**)** [13]. The ethanolic extract lowered glucose level in alloxan induced albino rats conforming its hypoglycemic activity **(**Kar *et al*., 2003**)** [14]. Ethanolic extract of plant showed an anti diarrheal action in castor oil induced diarrhea (Mukharjee *et al*., 1998**)** [15]. The methanol extract of stem bark was tested for its anti tussive potential against a cough induced by sulphur dioxide gas in mice (Bhaskara *et al.,* 2003) [16] Ethanol extract of stem bark shows wound healing in excised and incised wound model in rats (Mukharjee *et al*., 1998) [15]. The decoction of the bark of *F. racemosa* was claimed as an ant diuretic in rats **(**Ratnasooriya *et al.,* 2003**)** [17]. An ethanolic extract of the leaves was evaluated for hepato protective activity in rats by subcutaneous injection of 50% v/v carbon tetrachloride The biochemical parameters SGOT, SGPT, serum bilirubin and alkaline phosphates were estimated to assess the liver function **(**Ratnasooriya *et al*., 2003**)** [17]. Anthocyanides of fruits of *F. recemosa* demonstrated vaso-protective effect in rabbits. The antibacterial activities of *F. recemosa* were reported to some extent (Channabasavaraj *et al*., 2008) [7].

Ficus glomerata possesses anti-inflammatory activity **(**Sackeyfio and Lugeleka, 1986) [18]. The ethanolic stem bark extract of *Ficus racemosa* inhibited cyclooxygenase-1(COX-1) (Li *et al.,* 2003) [19] and 5-lipoxygenase (5-LOX) enzymatic activities (Li *et al.,* 2004) [20] and prevented chemically induced renal oxidation and carcinogenesis (Khan and Sultana, 2005) [21]. The leaf extract of *F. racemosa* demonstrated anti-inflammatory activity against carrageenan, serotonin, histamine, and dextran-induced rat paw oedema models (Mandal *et al.,* 2000) [22]. Latex of *Ficus* species were investigated for anticancer activities (Lansky *et al*., 2008; Hemmatzadeh *et al*., 2003; Simon *et al*., 2001) [23, 24, 25]. Figs have also been shown to possess antioxidant and hypolipidaemic activities (Shukla *et al.,* 2004; Umerie *et al.,* 2004; Pratima *et al*., 2020) [26, 27, 28].

In the present investigation antimicrobial activity of leaf and whole inflorescence extracts of *Ficus glomerata* has been assayed *in vitro* against Gram positive *Streptococcus pyogenes, Staphylococcus aureus, Staphylococcus haemolyticus, Bacillus cereus, Bacillus subtilis* and Gram negative *Escherichia coli, Salmonella typhi, Pseudomonas aeruginosa, Acinetobacter baumanii, Klebsiella pneumonia, Alcaligenes faecalis, Citrobacter freundii, Enterobacter cloacae, Schigella flexnere* and *Proteus mirabilis.* These microbes were isolated from soil near the area of medical waste disposal sites.

II. Materials and Methods

Isolation and Identification of microbes: Bacteria were isolated from soil collected from the area of medical waste disposal sites by serial dilution technique. The sample was inoculated onto 5% blood agar plates, selective and differential media viz. MacConkey's agar, cetrimide agar, xylose lysine deoxycholate agar, and Mannitol salt agar. The culture plates were incubated aerobically at 37^0C for 24 h and observed for bacterial growth. Pure cultures were prepared by streaking a small amount of cells from a distinct colony on a nutrient agar plate and incubated for 24 h at 37°C. The pure culture of each isolate was thus prepared Pure cultures were identified on the basis of their colonial morphology and Gram reaction according to the method as suggested by Forbes *et al*., (2007) [29] and Cheesbrough (2000) [30].

Solvents extracts: The four solvent extracts of leaves of *Ficus glomerata viz.* methanol extract, n-hexane, ethyl acetate, dichloromethane were tested against fifteen bacterial isolates viz. Gram positive Gram positive *Streptococcus pyogenes, Staphylococcus aureus, Staphylococcus haemolyticus, Bacillus cereus, Bacillus subtilis* and Gram negative *Escherichia coli, Salmonella typhi, Pseudomonas aeruginosa, Acinetobacter baumanii, Klebsiella pneumonia, Alcaligenes faecalis, Citrobacter freundii, Enterobacter cloacae, Schigella flexnere* and *Proteus mirabilis.*

Preparation of Plant extract: The leaves and galls (whole inflorescence) of *Ficus glomerata* were oven dried and ground into coarse powder separately using high capacity grinding machine. The coarse powder was then stored in air-tight container with marking for identification and kept in cool, dark and dry place. About 900 gm of powder of both leaves and galls was taken in clean, round bottomed flask and macerated at room temperature in 3 liters of methanol for 10 days with occasional shaking for better extraction. The whole mixture was then filtered through Whatman No.1 filter paper. After filtration the filtrate was concentrated at 40°C with a Heidolph rotary evaporation. The concentrated extract was then air dried to solid residue. The weight of the crude methanolic extract of leaves and galls obtained was 56 gm each.
The crude extract (35g) of leaves and galls of *F. glomerata* was dissolved separately in a solvent containing 90% methanol 10% distilled water to obtain aqueous methanol and partitioned between n-hexane, Di-Choloro Methane (DCM) and Ethyl Acetate fractions. All the four fractions were evaporated to dryness. After evaporation the weight of different fractions obtained was as follows:

Crude Methanol extract:	**35.0 gm**
n-Hexane fraction:	**6.57 gm**
Ethyl acetate fraction:	**4.567 gm**
Methanol fraction:	**2.94 gm**
Dichloro methane fraction:	**5.77 gm**

Solutions of known concentration (µg/ml) of the test samples were made by dissolving measured amount of the samples in calculated volume of solvents. Dried and sterilized filter paper discs (6 mm diameter) were then impregnated with known amounts of the test substances using micropipette. Discs containing the test material were placed on nutrient agar medium uniformly seeded with the test microorganisms. Standard antibiotic discs and blank discs (impregnated with solvents) are used as positive and negative control. These plates were then kept at low temperature (4^0C) for 24 hours to allow maximum diffusion. The antimicrobial activity of the test agent was determined by measuring the diameter of zone of inhibition expressed in millimeter.
The test microbes were grown in nutrient agar medium consisted of following ingredients:

Bacto peptone: 0.5 g/l; Sodium chloride: 0.5 g/l; Bacto yeast extract: 1.0 g/l; Bacto agar: 2.0 g/l; pH 7.2
The antimicrobial activity was screened by agar diffusion methods. The test organisms were transferred from the pure cultures to the agar slants with the help of a transfer loop under aseptic condition. The cultures were then incubated for 24 hours at 37^0C for their optimum growth. These fresh cultures were used for the sensitivity test.
The test organisms were transferred from the subculture to the test tubes containing about 10 ml of melted and sterilized agar medium with the help of a sterilized transfer loop in an aseptic area. The test tubes were shaken by rotation to get a uniform suspension of the organisms. The bacterial suspension was immediately transferred to the sterilized Petri dishes. Three types of discs were prepared for antimicrobial screening.
Standard discs: These were used as positive control to ensure the activity of standard antibiotic against the test organisms as well as for comparison of the response produced by the known antimicrobial agent with that of the test sample. In this investigation, kanamycin (30µg/disc) disc was used as the reference.
Blank discs
These were used as negative controls which ensure that the residual solvent (left over the discs even after air-drying) and the filter paper were not active themselves.
Sample discs with test samples
Measured amount of each test sample was as follow:
• Dichloromethane fraction of crude extraction (DCM)
• n-Hexane fraction of crude extraction (NHE)
• Ethylacetade fraction of crude extraction (EAE)
• Methanol fraction of crude extraction (MEL)
The amount of test sample taken was as follows:

Sample	**Dose (µg/disc)**	**Required amount for disc (mg)**

Dichloromethane	**200**	**4.0**
n-Hexane	**200**	**4.0**
Ethylacetate	**200**	**4.0**
Methanol	**200**	**4.0**

Standard Kanamycin (30 mg/disc) discs were used as positive control to ensure the activity of standard antibiotic against the test organisms as well as for comparison of the response produced by the known antimicrobial agent with that of produced by the test sample. Blank discs were used as negative controls which ensure that the residual solvents.

The sample discs, the standard antibiotic discs and the control discs were placed gently on the previously marked zones in the agar plates pre-inoculated with test bacteria. The plates were then kept in a refrigerator at 4^0C for about 24 hours upside down to allow sufficient diffusion of the materials from the discs to the surrounding agar medium. The plates were then inverted and kept in an incubator at 37^0C for 24 hours.

Determination of antimicrobial activity: The antimicrobial potency of the test agents are measured by their activity to prevent the growth of the microorganisms surrounding the discs which gives clear zone of inhibition. After incubation, the antimicrobial activities of the test materials were determined by measuring the diameter of the zones of inhibition in millimeter with a transparent scale.

Media and Chemicals: All the media and chemicals used were of AR quality and were obtained from Merck's Company, Germany. Gentamicin (Troge, Hamburg, Germany) was purchased from Lucas Pharmaceuticals Ltd. The data were analyzed statistically by one way analysis of variance (ANOVA) where $P \leq 0.05$ is statistically significant.

III. Results

In the present investigation fifteen bacterial floras were isolated from contaminated soil of the area of medical waste disposal. These included Gram positive Gram positive *Streptococcus pyogenes, Staphylococcus aureus, Staphylococcus haemolyticus, Bacillus cereus, Bacillus subtilis* and Gram negative *Escherichia coli, Salmonella typhi, Pseudomonas aeruginosa, Acinetobacter baumanii, Klebsiella pneumonia, Alcaligenes faecalis, Citrobacter freundii, Enterobacter cloacae, Schigella flexnere* and *Proteus mirabilis.* These were assayed for their growth inhibition in the presence of plant extracts.

The antimicrobial activities of the four solvent extracts of *leaves and galls of Ficus glomerata* have been presented in Table-1and 2; Figure-1 and 2.

Table-1: Antimicrobial activity of fifteen bacterial isolates against four different solvent extracts of leaves of *Ficus glomerata*

Test bacteria	Diameter of zone of inhibition in mm				
	Solvent fractions				
Gram positive bacteria	DCM	EAE	NHE	MEL	Kanamycin
Streptococcus pyogenes	-	-	17.50 ±0.17	12.25 ±1.12	-
Staphylococcus aureus	-	-	18.50 ±0.23	13.35 ±1.25	-
Staphylococcus haemolyticus	11.35 ±1.17	9.70 ±0.24	-	10.25 ±0.33	34.60 ±0.23
Bacillus subtilis	-	19.50 ±0.19	16.50 ±0.23	-	-
Bacillus cereus	-	14.35 ±1.05	-	19.5 ±0.25	35.5 ±0.35
Gram negative bacteria	DCM	EAE	NHE	MEL	Kanamycin
Eschericia coli	19.71 ±0.31	19.35 ±0.32	17.25 ±0.27	-	36.50 ±0.21
Salmonella typhi	19.80 ±0.18	18.25 ±0.24	16.75 ±0.29	17.35 ±0.25	36.50 ±0.41
Pseudomonas aeruginosa	19.75±0.11	18.85±0.17	18.25±0.28	16.75±0.17	36.45±0.14
Acinetobacter baumanii	18.85±0.13	19.45±0.16	18.65±0.17	17.75±0.15	35.25±0.15
Klebsiella pneumonae	15.65±0.14	15.25±0.14	14.65±0.14	14.35±0.16	-
Alcaligenes faecalis	16.75±0.15	16.85±0.13	17.35±0.21	18.25±0.26	35.45±0.23
Citrobacter freundii	15.65±0.11	15.45±0.14	14.35±0.23	14.25±0.24	-
Enterobacter cloacae	19.85±0.12	19.75±0.11	18.45±0.15	18.65±0.16	35.75±0.24
Schigella flexneri	19.75±0.13	19.85±0.12	18.25±0.16	17.45±0.17	34.35±0.21
Proteus mirabilis	18.65±0.18	19.25±0.15	19.35±0.11	17.45±0.19	34.25±0.17

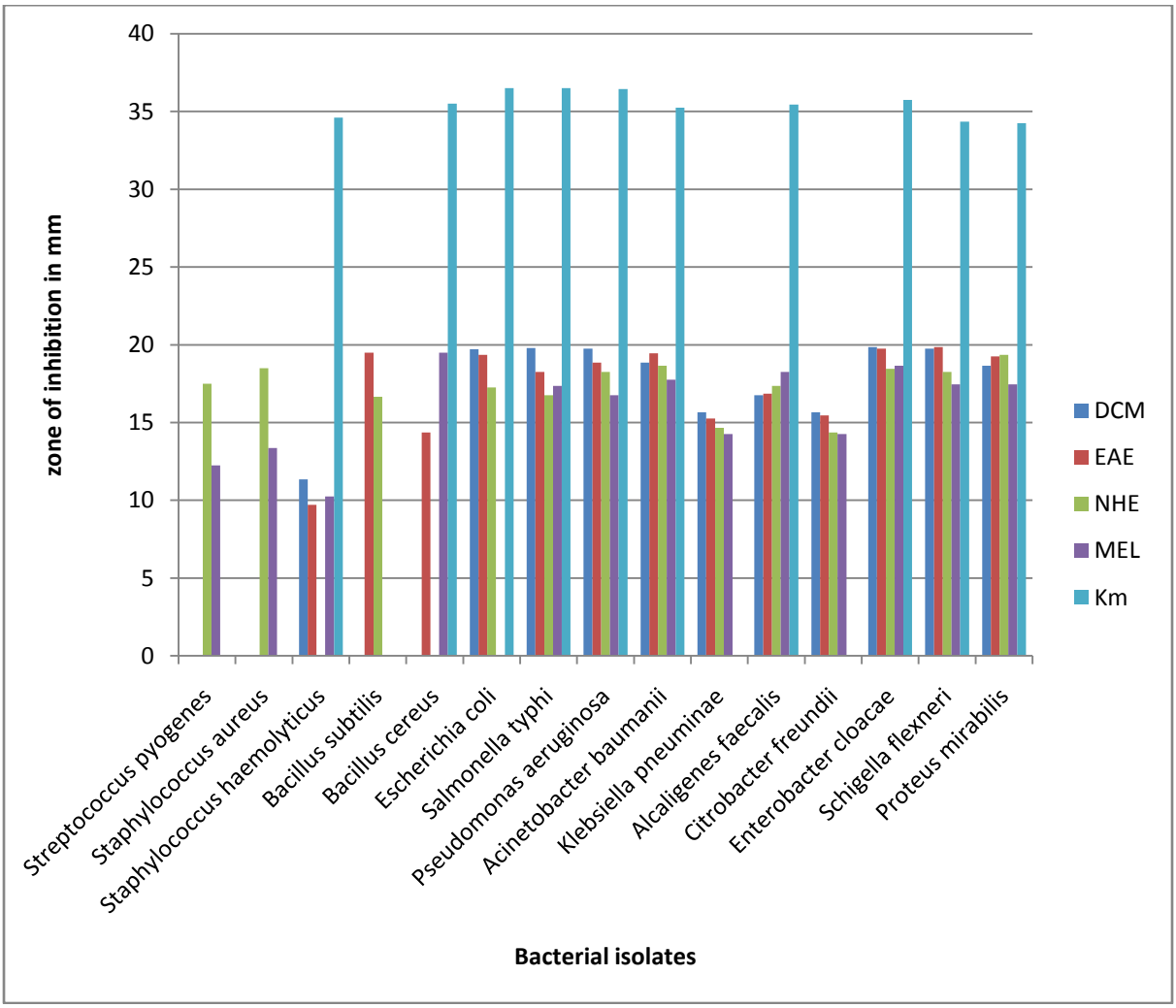

Figure-1: Antimicrobial activity of fifteen bacterial isolates against four different solvent extracts of leaves of *Ficus glomerata* and antibiotic kanamycin

Table-2: Antimicrobial activity of fifteen bacterial isolates against four different solvent extracts of galls of *Ficus glomerata*

Test bacteria	Diameter of zone of inhibition in mm Solvent fractions				
Gram positive bacteria	DCM	EAE	NHE	MEL	Kanamycin
Streptococcus pyogenes	-	-	21.50 ±0.18	12.25 ±1.15	35.65
Staphylococcus aureus	-	-	23.50 ±0.24	13.35 ±1.25	-
Staphylococcus haemolyticus	21.35 ±1.15	19.35 ±0.24	-	19.25 ±0.35	34.65 ±0.23
Bacillus subtilis	-	21.5 ±0.19	16.50 ±0.24	-	-
Bacillus cereus	-	25.35 ±1.05	-	19.5 ±0.21	35.50 ±0.35
Gram negative bacteria	DCM	EAE	NHE	MEL	Kanamycin
Eschericia coli	21.75 ±0.21	24.65 ±0.35	27.25 ±0.25	-	36.50 ±0.21
Salmonella typhi	23.85 ±0.17	23.75 ±0.22	26.75 ±0.26	27.35 ±0.15	36.50 ±0.41
Pseudomonas aeruginosa	22.76±0.13	28.85±0.27	28.25±0.21	26.75±0.18	36.45±0.14
Acinetobacter baumanii	23.85±0.13	26.65±0.17	28.65±0.27	27.75±0.16	35.25±0.15
Klebsiella pneumonae	25.67±0.15	24.45±0.14	24.65±0.24	24.35±0.16	-
Alcaligenes faecalis	23.76±0.15	23.85±0.14	27.35±0.23	28.25±0.21	35.45±0.23
Citrobacter freundii	24.67±0.13	25.55±0.14	24.35±0.22	24.25±0.14	-
Enterobacter cloacae	25.95±0.11	24.75±0.15	28.45±0.15	28.65±0.17	35.75±0.24
Schigella flexneri	25.95±0.13	24.87±0.13	28.25±0.14	27.45±0.16	34.35±0.21
Proteus mirabilis	24.75±0.17	25.55±0.15	21.35±0.13	27.45±0.18	34.25±0.17

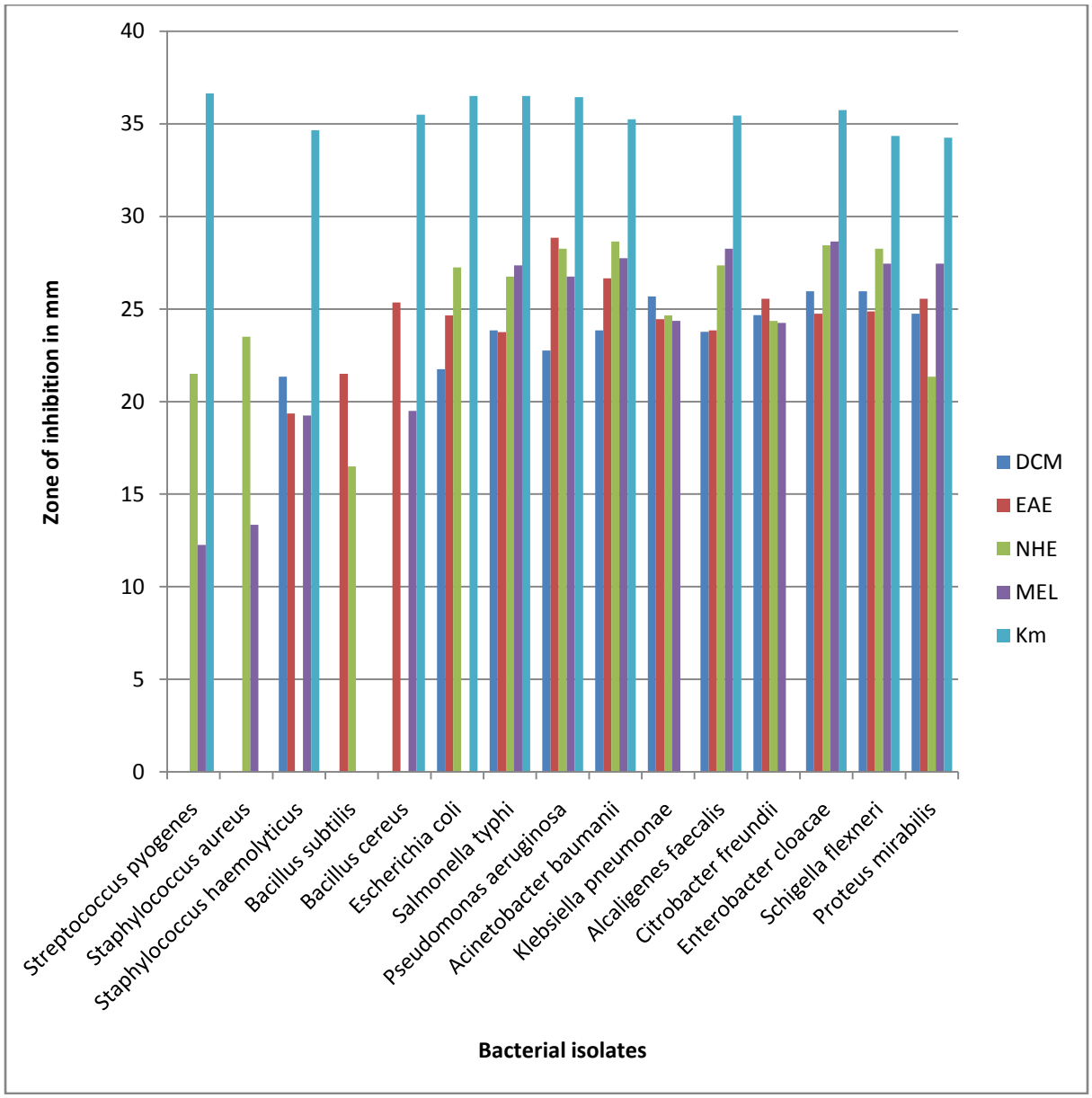

Figure-2: Antimicrobial activity of fifteen bacterial isolates against four different solvent extracts of galls of *Ficus glomerata* and antibiotic kanamycin

From the results (Table-1; Figure-1) it is evident that the four solvent extract fractions of leaves and galls were not equally antimicrobial against Gram positive and Gram negative bacteria. The solvent fractions are found to be more inhibitory to Gram negative bacteria in comparison to Gram positive bacteria. Among four solvent fractions Dichloromethane (DCM), ethyl acetate (EAE) of leaves and kanamycin did not cause any growth inhibition to *Streptococcus pyogenes* and *Staphyloccocus aureus*. The n-hexane (NHE) did not cause growth inhibition to *Styaphylococcus haemolyticus*. The dichloromethane (DCM), ethyl acetate (EAE) and methanol (MEL) fractions of leaves of *Ficus glomerata* caused only 11.35 mm, 9.7 mm and 10.25 mm growth inhibition to *S. haemolyticus.* DCM and MEL solvent extracts of leaves of *F. glomerata* did not cause any growth inhibition to *Bacillus subtilis*. This isolate was also found resistant to kanamycin. EAE and NHE fractions caused 19.50 mm and 16.50 mm growth inhibition respectively to this bacterium. Similarly, the DCM and NHE fractions did not cause growth inhibition to Bacillus cereus. The growth of this bacterium was inhibited by EAE, MEL and kanamycin to 14.35 mm and 19.50 mm and 35.50 mm respectively (Table-1; Figure-1).

Among Gram negative bacteria the growth of *Salmonella typhi, Pseudomonas aeruginosa, Acinetobacter baumanii, Alcaligenes faecalis, Enterococcus cloacae, Schigella flexneri* and *Proteus mirabilis* was inhibited by all the solvent extracts of leaves of *Ficus glomerata* and kanamycin. The growth of Escherichia coli was not inhibited by methanol extract fraction (MEL). Similarly, *Klebsiella pneumonae* and *Citrobacter*

freundii were found resistant to kanamycin but inhibited by all the four solvent extract fractions of leaves of *Ficus glomerata* (Table-1; Figure-1).

The antimicrobial activities of fifteen bacterial isolates against four solvent extracts of galls (whole inflorescence) of *Ficus glomerata* have been presented in Table-2 and Figure-2. From the results it is clear that the whole inflorescence extracts caused more growth inhibition to the present bacterial isolates in comparison to leaf extracts.

Among Gram positive bacteria the growth of *Streptococcus pyogenes, Staphylococcus aureus, Bacillus subtilis* and *Bacillus cereus* were not inhibited by DCM solvent fraction of galls of *F. glomerata*. The EAE fractions did not cause growth inhibition to *Streptococcus pyogenes* and *Staphylococcus aureus*. *Staphylococcus aureus* and *Bacillus subtilis* were found resistant to kanamycin.. The growth of *Staphylococcus haemolyticus* was inhibited by DCM, EAE and MEL fractions and kanamycin but not by NHE fraction of galls of *F. glomerata*. The growth of Gram negative bacterial isolates were maximally inhibited by all the four solvent extract fractions of gall. However, the growth of *Escherichia coli* was not inhibited by MEL fraction. *Klebsiella pneumonae* and *Citrobacter freundii* were found resistant to kanamycin among Gram negative bacterial isolates (Table-2; Figure-2).

IV. Discussion

The antimicrobial potential of leaves and galls of plants belonging to family Moraceae has been demonstrated by several workers viz. Triratana *et al*., (1987) [31], Wongkham *et al*., (2001) [32], Taweechaisupapong *et al*., (2005) [33], Taweechaisupapong *et al*., (2000) [34], Limsong *et al*., (2004) [35], Taweechaisupapong *et al*., (2002) [36], Taweechaisupapong *et al*., (2005) [33], Pratima *et al*., (2019) [37], Pratima *et al*., (2020) [28], Pratima *et al*., (2018) [38] and found a more or less similar results. Ethanol extracts from the sticks and leaves of *S. asper* have been shown to inhibit the growth of *Streptococcus mutans* (Triratana *et al*., 1987) [31].

The extract possessed a selective bactericidal activity towards gram positive and Gram negative bacterial isolates. In the present investigation the antimicrobial activity of four different solvent extract of of leaves and galls of Ficus glomerata has been studied and found to be inhibitory to *Streptococcus pyogenes, Staphylococcus aureus, Staphylococcus haemolyticus, Bacillus cereus, Bacillus subtilis* and Gram negative *Escherichia coli, Salmonella typhi, Pseudomonas aeruginosa, Acinetobacter baumanii, Klebsiella pneumonia, Alcaligenes faecalis, Citrobacter freundii, Enterobacter cloacae, Schigella flexnere* and *Proteus mirabilis.*. This is in conformity with the work of Wongkham *et al*., (2001) [37], Taweechaisupapong *et al*., (2000) [34], Limsong *et al*., (2004) [35], Taweechaisupapong *et al*., (2002) [36].

V. Conclusions:

From the results it can be concluded that the leaf and gall extracts of *Ficus glomerata* can reduce the microbial count to safe level when used as bactericidal agents. The leaf and gall extracts of *Ficus glomerata* found to be antibacterial and might be useful in controlling Gram positive and Gram negative aerobic and anaerobic bacteria that cause a number of human diseases. The active phytochemicals in F. glomerata responsible for antibacterial activities require further investigation at scientific level.

Conflicts of Interest: Authors declare no conflicts of interest directly or indirectly.

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