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## ***In vitro* antibacterial activity of selected medicinal plants extract used in traditional treatment of common human wound infection in Fafan zone, Somali region, Ethiopia**

**Abas Mahammed, Habtamu Mitiku and Jemal Mohammed**

### **Abstract**

Wound infections remain one of the most common bacterial infections due to microbial drug resistance toward commonly used antimicrobials. The aim of this study was to evaluate *in vitro* antibacterial activity of *Jasminum floribundum*, *Euphorbia hirta*, *Euphorbia abyssinica*, *Sarcophyte piri*, *Commiphora myrrha* extract used in traditional treatment of common human wound infection. The test was done on standard bacterial strains of *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Streptococcus pyogenes*, *Proteus mirabilis*, and *Klebsiella pneumoniae* using disc diffusion techniques and Minimum inhibitory concentration. The Result of plant extracts exhibited inhibition zones ranging from  $10 \pm 2$  mm to  $24.9 \pm 0.9$  mm diameter. The Minimum inhibitory concentration value of plant ethanolic extracts against the tested bacteria ranged from 7.8 mg/ml extract of *Euphorbia hirta* on *S. pyogenes* and *Proteus mirabilis* and *Jasminum floribundum* on *Klebsiella pneumoniae* to 250.00 mg/ml. Further *in vivo* antibacterial activity and toxicity test are recommended for confirming efficacy and safety of these herbal medicines.

**Keywords:** Antibacterial activity, wound infection, medicinal plants, Jigjiga, Ethiopia

### **1. Introduction**

Infectious diseases of bacterial origins are still a major threat to human health. The impact is particularly large in developing countries due to unavailability of modern medicines and the emergence of widespread drug resistance [1]. The uses of antibiotics are widespread to find the solution to the problem of antibiotic resistances among infectious diseases microbial strains and finally reflects a very serious problem in the treatment of pathogenic microbes [2].

Wound infections are one of the most common bacterial infections and are an important cause of morbidity and account for 70-80% mortality [3-4]. It occurs due to physical injuries that result in an opening or breaking of the skin thereby causing the invasion of tissues by one or more species of pathogenic microorganism. Wounds allow bacteria, such as *Staphylococcus* spp., *Clostridium* spp. and many other bacterial strains, gain access to the internal tissue and cause the establishment of infections [5].

Wound is the cellular and anatomic disruption of a tissue which caused by chemical, physical, microbial, thermal, or immunological damage to the tissue [6]. It is a breakage of the skin, results in the loss of continuity of epithelium with or without the loss of underlying connective tissue. Physical, chemical, thermal, microbial, and immunological factors are responsible for causing wounds in human [7-8].

In addition to the prevalence of microbial infectious diseases and their complications are continuously increasing throughout the world mainly due to microbial drug resistance toward commonly used antimicrobials [9]. There is not even a single synthetic drug formulation in the market which can claims for its wound healing properties. The drugs available are either bacteriostatic or bactericidal and in these cases healing is by a natural phenomenon only [10].

About 80% of the developing world population relies on traditional plant remedies to meet health care needs. The reliance on traditional medicinal plants in developing countries may relate to failure of governments to ensure provision of 'modern' health services at an affordable price to everyone, and especially to the most vulnerable groups in society [11].

In east, central and west Africa, *Euphorbia hirta* is used to treat skin and wound infections asthma, oral thrush, boils, sores [12]. Early Muslim scholars reported many medicinal uses of *Commiphora myrrha* species. It has been found helpful in treating wound infection, intestinal disorder and diarrhea [13]. *C. myrrha* commonly known as myrrh is a tree belonging to Burseraceous family. It has been used as a traditional remedy in Arab countries for long time.

Originally it was found in Northern Africa, Arabia and Northern Somalia [14].

*Commiphora myrrha* is native to parts of Saudi Arabia, Oman, Yemen, Somalia, Eritrea and eastern part of Ethiopia. The gum resins of the plant used to treat wound infection [15]. Myrrh gum also used for treatment of indigestion, ulcers, colds, cough, asthma, lung congestion, arthritis pain, and cancer [16]. Myrrh used to treat different skin ailments. It has also been recommended for treatment of toothaches and bruises [17]. There is an increasing of antibiotic resistant strains together with high cost of new generation antibiotics for wound infections [18-19]. Antibiotic resistances among infectious microbial strains and eventually reflects a very serious problem in the treatment of pathogenic microbes [2]. In countries where the infectious diseases are prevalent, there is a need to develop some medicine of plant origin against persisting infectious diseases, which may be comparable to modern medicines [20]. Yet in Ethiopia little emphases have been given to traditional medicinal plant studies over the past decade [21]. In Somali region of Ethiopia, information regarding antibacterial activity of traditional medicinal plant is lacking. Even those available studies on different plant

species were focused on ethno-veterinary [22]. Many other ethno-botanical study of traditional medicinal plants had been conducted by different researchers in the study area [22-23-24]. However, these five Medicinal plants, namely: *Jasminum floribundum*, *Euphorbia hirta*, *Euphorbia abyssinica*, *Sarcophyte piri*, *Commiphora myrrha* were not used to study antibacterial activity in the study area. Therefore, the study was focus on evaluation and screening of antibacterial activity of five selected traditional medicinal plants used by local traditional people to treat human wound infection in in Fafan zone, Jigjiga area.

Finding from the study provide information about the potential of local medicinal plant against bacterial wound infection to concerned governmental and non-governmental bodies to guide management and conservation measures of plant species. In addition, the study indicates about the importance of treating wound infections by locally available medicinal plants and this will also contribute towards the diseases control. Furthermore, the findings serve as reference baseline data for further research to be done on these medicinal plants antibacterial activity in the study area and other endemic foci of the region.

## 2. Materials and Methods

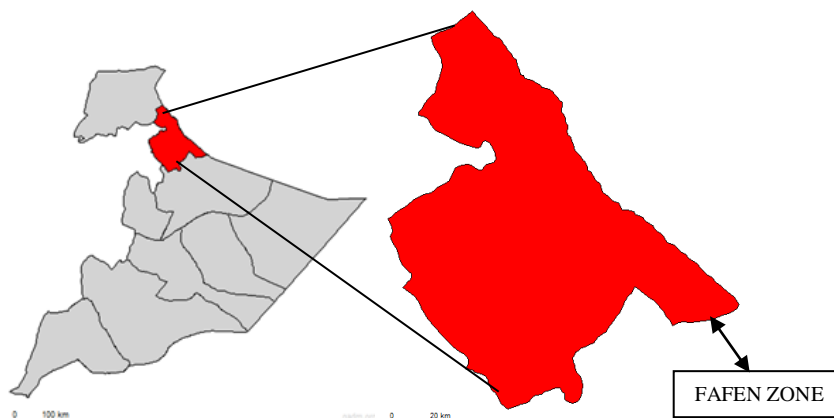


Fig 1: Map of study area

### 2.1. Collection and identification of plant materials

Selected medicinal plants used for traditional treatment of wounds were collected or purchased, identified, extracted and tested for their antibacterial activities against standard bacteria strains. The five-plant species were selected based on ethno pharmacological approach which was based on the traditional use of plants to treat specific diseases [25]. The leaves of *Jasminum floribundum* (Mudho Jiid Jiid), the stems of *Euphorbia abyssinica* (Dibow)), the roots of *Sarcophyte piri* (Like), the leaves of *Euphorbia hirta* (Caraba nadhi) and gum of *Commiphora myrrha* (Malmal) were collected from their natural environments within different districts of Fafan zone. The local community elders and those peoples with knowledge of traditional medicine from local community and botanist were accompanied with the principal study investigator for the collection of medicinal plants.

The collected plant specimens was identified using herbarium materials and taxonomic keys described in various volumes on the Flora of Ethiopia. Voucher specimens was deposited in the Herbarium of the Department of Biology, Jigjiga University, Ethiopia.

### 2.2. Preparation of plant extracts

Plant materials were Shade-dried and coarsely powdered

using grinder machine, mortar and pestle and then subjected to extraction using absolute Ethanol and methanol by maceration technique. Powder material was separately mixed with the extraction solvent 100 g of powder in 500 ml of solvent proportion in Erlenmeyer flasks. The flasks were left on a mechanical shaker at 150 rpm for 72 hours at room temperature and then filter through what man No. 1 filter paper. The procedure was repeated three times to allow the solvent extract substantial quantities of the chemical constituents from the pounded plant materials. The extracts were further concentrated to dryness using evaporator (evaporated in a weighed flask, with a water bath set at 40°C). The yields from the different extracts was weigh and record and the resulting extracts were then transferred into well labeled vials and was kept at 4°C until required for use. Sterility of filtered extracts was checked by plating them on Muller-Hinton agar [26, 27].

### A. Phytochemical screening

The presence of bioactive constituents is associated with the antimicrobial activity of the plant and contributes to the antibacterial potential of plants.

Crude extracts of each plant was screened for the presence and absence of different phytochemical constituents to relate

the secondary metabolites with antibacterial activity. Hence, tests for saponins, tannins, flavonoids, phenolic compounds, terpenoid and alkaloids was carried out following standard procedures described by Sofowora (1993) and (Trease and Evans, 2002) [9]. After obtaining the crude extract from plant material, phytochemical screening was performed with the appropriate tests as shown below:

- a. **Test for saponins:** About 0.5g of the filtered plant extract was put in a test tube and 2ml of distilled water added and shaken vigorously. Formation of frothing or foam which persisted on warming was taken as preliminary evidence for the presence of saponins.
- b. **Test for tannins:** About 0.5g of the filtered plant extract was put in a test tube and 9ml of distilled water added. Decolouration was observed upon addition of bromine water which indicated the positive test for tannins.
- c. **Test for flavonoids:** Few pieces of magnesium metal strip were added to 5mls of the filtrate plant extract with concentrated hydrochloric acid (5ml). The formation of orange, red, crimson or magenta was taken as a positive test.
- d. **Test for terpenoid:** About 0.5g of the plant extract was dissolved in 3mls of Chloroform and filtered. 10 drops of acetic anhydride were added to the filtrate with 2 drops of concentrated Sulphuric acid (H<sub>2</sub>SO<sub>4</sub>) pink colour at the interphase was taken as the positive test.
- e. **Test for alkaloids:** About 0.5g of the plant extract was added with a few drops of picric acid reagent. A white or yellow precipitate indicated a positive test.

#### B. Test bacteria strains and inoculum preparation

The test organisms were laboratory strains of five bacteria species, namely, *Staphylococcus aureus* (ATCC25923), *Pseudomona saeruginosa* (ATCC27853), *Escherichia coli* (ATCC25922) *Streptococcus pyogens* (ATCC 19615), *Proteus mirabilis* (ATCC 49565) and *Klebsiella pneumoniae* (ATCC 27736). These bacteria were selected based on their potential to cause wound infections and was obtained from the Ethiopia Public Health Institute (EPHI). Muller Hinton agar (MHA) was prepared following the manufacturer's protocol or MHA with 5% sheep blood (for *streptococcus pyogens* to enrich the medium with nutrient). After cooling the media to about 45°. From a pure culture 3-5 selected colonies of bacteria were taken and transferred to a tube containing 4-5 ml sterile normal saline and mixed gently to make homogenous turbid suspension adjusted to a McFarland 0.5 standard. A sterile cotton swab was dipped into the standardized suspension of bacteria and then uniformly streaked over the entire surface of the Mueller- Hinton agar as per the guidelines of Clinical and Laboratory Standards Institute [27]. It was poured to pre-labeled sterile petri dishes aseptically and allowed time for the congealing of the agar. Then, standard pathogenic bacteria was inoculated and spread on the respective prepared agar using inoculating wire loop and incubated for 18-24 hours at 37 °C. Actively growing bacterial obtained turbidity visually comparable to that of 0.5 McFarland standards which corresponds to approximately 1 × 10<sup>8</sup> CFU/ml [27-28].

#### C. Antimicrobial susceptibility tests

##### a. Disc diffusion method

Disc diffusion method for antimicrobial susceptibility testing was carried out according to the standard method by Bauer *et al.*, (1966) with CLSI modification to assess the presence of antibacterial activities of the plant

extracts. From a pure culture 3-5 selected colonies of bacteria were taken and transferred to a tube containing 4-5ml sterile normal saline and mixed gently to make homogenous turbid suspension adjusted to a McFarland 0.5 standard. A sterile cotton swab was dipped into the standardized suspension of bacteria and then uniformly streaked over the entire surface of the Mueller- Hinton agar as per the guidelines of Clinical and Laboratory Standards Institute [28]. The plates was dried for 3-5 minutes and then used for the antibacterial susceptibility test. The sterile paper disks (6 mm in diameter discs) were prepared and sterilized at 121 °C for 15 minutes in the autoclave. The sterile paper disks (6 mm in diameter discs) which was impregnated with a series of 20 µl of the plant extracts at the concentration of 500 mg/ml was placed on the Mueller Hinton agar surface and allowed to dry at 37 °C for 24 hours. Each test plate comprises of seven discs. One positive control, which was a standard commercial antibiotic disc, one negative control, and five treated discs. The standard antibiotic disc was gentamicin 10 µg. Disks impregnated with ethanol were serve as negative control. Inoculated plates were incubated at 37 °C for 18-24 hours in inverted position. At the end of incubation period, the diameter zone of inhibition was measured by using a ruler. Each assay was performed in triplicates. The results were recorded by measured by ruler. The zone of growth inhibition (mm) surrounding the discs for the extracts that were shown ≥8 mm diameter of inhibition zone were regarded as significant susceptibility of the organism to the extracts. Result of the triplicate analysis was interpreted as [28-29].

##### b. Determination of minimum inhibitory concentration (MIC)

Minimum inhibitory concentration of crude extracts of the selected medicinal plants were performed for extracts that showed ≥ 8 mm diameter growth inhibition zone using serial broth dilution methods (Paulson D, 2008) [26]. The extract solution of 500 mg/ml was serially diluted with nutrient broth as 1:2, 1:4, 1:8, 1:16, 1:32, 1:64, 1:128 and 1:256 to bring 250 mg/ml, 125 mg/ml, 62.5 mg/ml, 31.25 mg/ml, 15.63 mg/ml, 7.81 mg/ml, 3.95 mg/ml and 1.95 mg/ml concentrations, respectively and 20 µl of a standard suspension of the test organism was added to each concentration of the extract. Two test tubes containing nutrient broth without antimicrobial agent were added in each test. One of these tubes was inoculated with the test organism; the other was left uninoculated and was served as a control for media sterility. The broth tubes were incubated at 37 °C for 18-24 hr. The lowest concentrations, at which there was no turbidity regarded as MIC value of the extract [30].

#### D. Data analysis

Data was analyzed by using SPSS version 20 software. The zones of inhibitions were expressed as Mean ± SD. Statistical analysis of mean of the triplicate analysis were calculated and undertaken by analysis of variance (one way ANOVA) test to determine whether there was significant difference in zone of inhibition between extracts concentrations. Result was considered statistically significant at P-value <0.05.

### 3. Results

#### 3.1. Phytochemical screening

The five selected medicinal plants extracts were found to be

positive for the presence of all most all of the tested secondary metabolites like alkaloids, tannins, flavonoids, saponins, polyphenols and terpenoid. The presences of these bioactive constituents were associated with the antimicrobial

activity of the plants and contribute to the antibacterial potential of these plants. Except for *Jasminum floribundum* which lack phenolic compound (Table-1).

**Table 1:** Phytochemical screening active of extract of the five selected medicinal plants

Phytochemicals constituents	Plant extract									
	<i>Jasminum floribundum</i>		<i>Euphorbia abyssinica</i>		<i>Sarcophyte piri</i>		<i>Euphorbia hirta</i>		<i>Commiphora myrrha</i>	
	M	E	M	E	M	E	M	E	M	E
Alkaloids	+	+	+	+	+	+	+	+	+	+
Flavonoids	+	+	+	+	+	+	+	+	+	+
Phenolics	-	-	+	+	+	+	+	+	+	+
Saponins	+	+	+	+	+	+	+	+	+	+
Terpenoid	+	+	+	+	+	+	+	+	+	+
Tannins	+	+	+	+	+	+	+	+	+	+

+: Present, -: Absent, M: Methanolic extracts, E: Methanolic extracts

**3.2. Antibacterial activity of extracts**

The five selected Medicinal plants, the ethanolic and methanolic extracts of *Jasminum floribundum*, *Euphorbia hirta*, *Euphorbia abyssinica*, *Sarcophyte piri* and *Commiphora myrrha* showed significant antibacterial activity against all of the test organisms (zone of inhibition  $\geq 8$ mm diameter). The plants extracts were exhibited inhibition zones ranging from  $10 \pm 2$  mm to  $24.9 \pm 0.9$  mm diameter, with the most significant results shown by all ethanolic extracts

remarkably that of *Commiphora myrrha* demonstrated good inhibition zones with the greatest zones ( $12 \pm 1 - 24.9 \pm 0.9$  mm) produced against the standard strains of *Streptococcus pyogenes*. The rest four medicinal plant extracts likewise showed growth inhibition against all selected bacterial strains. Results of the disk diffusion method showed that the most commonly inhibited bacteria by the ethanolic plant extracts were the standard strains of *Streptococcus pyogenes* and *S. aureus*, followed by *Escherichia coli*. (Table-2)

**Table 2:** Mean zone of inhibition against test organisms of five selected medicinal plants extracts at 500 mg/ml

Test organism	Mean inhibition zone of plant extract (Mean $\pm$ SD mm)										
	<i>Jasminum floribundum</i>		<i>Euphorbia abyssinica</i>		<i>Sarcophyte piri</i>		<i>Euphorbia hirta</i>		<i>Commiphora myrrha</i>		<i>Gentamicin</i> (10 $\mu$ g/disc)
	M	E	M	E	M	E	M	E	M	E	
<i>Staphylococcus aureus</i>	12.2 $\pm$ 0.9	20.9 $\pm$ 1.7	12 $\pm$ 1	17.5 $\pm$ 1.5	12.3 $\pm$ 1.5	16.7 $\pm$ 2.5	10.2 $\pm$ 1.3	20.2 $\pm$ 0.8	12 $\pm$ 2	24.9 $\pm$ 0.9	26 $\pm$ 0.3
<i>Escherichia coli</i>	10 $\pm$ 2	17.3 $\pm$ 1.5	14 $\pm$ 1	16 $\pm$ 0.2	15.3 $\pm$ 2.5	14 $\pm$ 2.3	10.4 $\pm$ 0.5	21 $\pm$ 2	12 $\pm$ 1	22 $\pm$ 0.4	28 $\pm$ 0
<i>Pseudomonas aeruginosa</i>	14.6 $\pm$ 0.5	15.5 $\pm$ 1.8	12.3 $\pm$ 0.6	16.8 $\pm$ 1.1	13.2 $\pm$ 0.4	15 $\pm$ 1.2	13.1 $\pm$ 0.8	19.4 $\pm$ 2.2	12.3 $\pm$ 0.6	19.4 $\pm$ 0.5	26 $\pm$ 0.5
<i>Streptococcus pyogenes</i>	13.4 $\pm$ 1.1	15.7 $\pm$ 0.2	12.8 $\pm$ 1.3	16.3 $\pm$ 1.5	14.2 $\pm$ 2.2	15.9 $\pm$ 1.9	12 $\pm$ 0.4	18.9 $\pm$ 0.9	13.5 $\pm$ 0.5	22.8 $\pm$ 5.6	28 $\pm$ 0.1
<i>Klebsiella pneumonia</i>	11 $\pm$ 1	14.3 $\pm$ 0.1	12.5 $\pm$ 0.9	19 $\pm$ 2.1	12.2 $\pm$ 1.2	18.1 $\pm$ 1.3	11.6 $\pm$ 0.6	18.2 $\pm$ 0.6	12.6 $\pm$ 1.2	16.2 $\pm$ 0.7	27 $\pm$ 0.4
<i>Proteus mirabilis</i>	10.5 $\pm$ 0.8	19.1 $\pm$ 1.2	12 $\pm$ 0.4	21.3 $\pm$ 0.6	13 $\pm$ 0.1	16 $\pm$ 1.5	12 $\pm$ 1	20.1 $\pm$ 1.1	12.6 $\pm$ 1.1	17.4 $\pm$ 0.5	26 $\pm$ 0.2

M: Methanolic extracts, E: Methanolic extracts

**3.3. Minimum inhibitory concentration of extracts**

The MIC value of plant ethanolic extracts against the tested bacteria ranged from 7.8 mg/ml extract of *Euphorbia hirta* on *S. pyogenes* and *Proteus mirabilis* and *Jasminum floribundum* on *Proteus mirabilis* to 250.00 mg/ml (ethanolic extract of *Euphorbia abyssinica* on *Escherichia coli* and *Sarcophyte piri* on *Klebsiella pneumoniae*). The most frequent MIC value of the extracts was 62.5 mg/ml, followed by 31.50 and 125.00 mg/ml, 15.6 mg/ml, mg/ml, 7.81 mg/ml, 250.00 mg/ml. The MIC values *Jasminum floribundum* of ranged from 7.8 mg/ml to 125 mg/ml. Its ethanolic extract had higher MIC values than its methanolic extracts except for *Proteus mirabilis* strains, which had similar MIC values for both extracts. The MIC values of ethanol extract *Euphorbia hirta* ranged from 7.8 mg/ml to 125 mg/ml. Its ethanolic extract has

MIC value of 15.6 mg/ ml against *Staphylococcus aureus*. Ethanolic extracts of, *Euphorbia abyssinica*, *Sarcophyte piri* and *Commiphora myrrha* had MIC value 62.50 mg/ml. While the methanolic extract of, *Jasminum floribundum*, *Euphorbia abyssinica* and *Euphorbia hirta* had MIC value of 125.00 mg/ml, against *Staphylococcus aureus*. The MIC value of methanolic extract *Commiphora myrrha* of ranged from 31.25 mg/ml to 250 mg/ml. The MIC value of *Commiphora myrrha* against *Pseudomonas aeruginosa* was similar to that of *Euphorbia hirta* on *P. aeruginosa* against which is 31.25 mg/ml. The MIC value of the *Euphorbia hirta* ethanolic extract consistently showed strong antibacterial activities ranged from 7.8 to 125 mg/ml, followed with *Commiphora myrrha* which show antibacterial activity with MIC values ranging from 15.6 to 125 mg/ml (Table 3).

**Table 3:** The mic values of the five selected medicinal plants extracts against test organisms using broth dilution methods

Test organism	MIC of plant extract (mg/ml)									
	<i>Jasminum floribundum</i>		<i>Euphorbia abyssinica</i>		<i>Sarcophyte piri</i>		<i>Euphorbia hirta</i>		<i>Commiphora myrrha</i>	
	M	E	M	E	M	E	M	E	M	E
<i>Staphylococcus aureus</i>	125	125	125	31.2	250	125	125	15.6	31.2	15.6
<i>Escherichia coli</i>	62.5	125	125	250	250	15.6	250	125	62.5	15.6
<i>Pseudomonas aeruginosa</i>	62.5	65.5	250	31.5	62.5	62.5	31.2	62.5	31.2	31.5
<i>Streptococcus pyogenes</i>	250	65.5	125	62.5	31.2	125	125	7.8	125	125
<i>Klebsiella pneumonia</i>	62.5	31.2	31.2	62.5	125	250	250	31.2	31.2	62.5
<i>Proteus mirabilis</i>	250	7.8	62.5	62.5	125	62.5	62.5	7.8	125	62.5

M: Methanolic extracts, E: Methanolic extract

#### 4. Discussion

The research for new antibacterial agents has become a very important, especially in recent times, considering the escalating levels of antibiotic resistance among pathogenic bacteria. One of the efforts in this research is focused on the use of medicinal plants, which are widely available resources with fewer side effects, less expensive and have shown antimicrobial properties<sup>[31]</sup>.

The ethanolic extract of *Euphorbia hirta* showed highest inhibitory activity ( $20.2 \pm 0.8$  mm) against standard strains of *S. aureus*. The current observation on the inhibitory activity of *Euphorbia hirta* against *S. aureus* was more comparable with a study done by antibacterial activity obtained in this study varied with solvents used for extraction ethanol extracts had better activity than methanol extracts but almost all the five medicinal plants species showed antibacterial activity towards one or another bacterium. The results obtained indicated that both ethanolic and methanolic extracts of the *Euphorbia hirta*, *Commiphora myrrha*, *Jasminum floribundum*, *Sarcophyte piriei* and *Euphorbia abyssinica* inhibited the growth of the bacteria. All the plant species tested had antibacterial activity against both ethanol and methanolic extracts at different concentrations of medicinal plant. This therefore this shows that the extract contains substance(s) that can inhibit the growth of microorganisms. In this study, the ethanolic extracts of *Commiphora myrrha*, *Sarcophyte piriei* and *Euphorbia hirta* exhibited the most potent antibacterial activity with the MIC values of 15.6 mg/ml against *Staphylococcus aureus*. On the other hand, methanolic extract of *Sarcophyte piriei* showed minimum inhibition zones at a concentration of 250 mg/ml against *S. aureus* and *Escherichia coli*. This was similar to the methanolic extract of *Jasminum floribundum* on *Streptococcus pyogenes* and *Proteus mirabilis*.

Other researchers have also shown that extracts of plants inhibit the growth of various microorganisms at different concentrations<sup>[32, 33]</sup>. The maximum antibacterial activity was shown by *Commiphora myrrha*, followed by *Euphorbia hirta* and *Euphorbia abyssinica*, respectively. *In vitro* antimicrobial studies regarding *Jasminum floribundum* are rarely encountered.

1. Addai *et al.*, 2016 reported that *Euphorbia hirta* showed antibacterial activity against both *E. coli* and *P. aeruginosa* and can be used against wound infection. Alkaloids and saponins detected in may be responsible for the antibacterial activity of these plants species. This study indicates that the plant was potential sources of natural antibacterial agents to be used against wound infections. The diminishing efficacy and increasing resistance of synthetic drugs further aggravate this problem, thus, scientists are directed to seek more natural or organic materials for solutions. Traditional medicine has been practiced worldwide for centuries; particularly the application of herbal plants for therapeutic purposes. The significant antibacterial activity of the active plant extracts was comparable to the standard antimicrobials gentamicin 10 µg/disc.
2. This finding also agrees with previous report of Okwori *et al.*, 2007<sup>[8]</sup> who reported ethanol to be the best solvent for the extraction of most plant active ingredients of medical importance. The phytochemical screening of the plants extracts showed the presence of some important bioactive compounds which included Alkaloids, Terpenoids, Flavonoids, Phenols, Saponins, Steroids and Tannins with antibacterial activities<sup>[34]</sup>.

3. The phenolics and polyphenols are another group of that have exhibited antimicrobial activity. Important subclasses in this group of compounds which have been found to have antimicrobial activity include phenols, phenolic acids, quinones, flavones, flavonols, tannins flavonoids (Angeh, 2006). Tannins have been traditionally used for treatment of wounds, catarrh, inflamed surfaces of the mouth, hemorrhoids and diarrhea<sup>[34]</sup>.

#### 5. Conclusion

The results in this study concluded that the selected five plants extracts have important antibacterial activities for the treatment of wound infections. Flavonoid, alkaloid, tannin, polyphenol, Steroid, Saponins and terpenoid bioactive chemicals were detected in ethanol and methanol extract of tested plants. Ethanol extracts exhibited a higher degree of antibacterial activity as compared with methanol extracts. The results found in this study are indicative that these plants can be used as leading compounds in antibacterial drug development. However, further *in vivo* and *in vitro* safety and toxicity test are recommended. In addition, further antibacterial activity studies are needed to evaluate antibacterial activity towards clinical strains of pathogen causing wound infection. The usefulness of *Jasminum floribundum*, *Euphorbia abyssinica*, *Sarcophyte piriei*, *Euphorbia hirta* and *Commiphora myrrha* should be confirmed through further research by different extraction method toward isolation and identification of active ingredients.

#### 6. Ethical considerations

An ethical approval was obtained from Institutional Health Research Ethics Review Committee (IHRERC) of Haramaya University College of Health and Medical Sciences. Clearance No. (Ref.No.IHRERC/067/2019).

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#### 8. Conflicts of interest

The authors declare that they have no conflicts of interest.

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