INTRODUCTION
Since the beginning of human civilization, medicinal plants have been used by mankind for its therapeutic value. According to the World Health Organization (WHO) in 2008, more than 80% of the world's population relied on traditional medicine for their primary healthcare needs. Medicinal plants are the sources of bioactive compounds used mainly for medicinal purposes. In recent years human pathogenic microorganisms have developed resistance in response to the indiscriminate use of commercial antimicrobial drugs commonly employed in the treatment of infectious diseases. This situation, the undesirable side effect of certain antibiotics, and the emergence of previously uncommon infections, has forced scientists to look for new antimicrobials. The bioactivity of plant extracts is attributed to phytochemical constituents. For instance, plant tannins have an anti bacterial activity.

Reports also show that flavonoids have anti viral and anti microbial activity and alkaloids extracted from plants commonly have anti microbial property. In this study two commonly used Eritrean traditional medicines Chena adam (Ruta chalpensis) and Hihot (Rumex nervosus) were studied for the phytochemical screening and anti bacterial activity.

Rue (Ruta chaflpensis) is a genus of strongly scented evergreen sub shrubs 20-60 cm tall, in the family Rutaceae, distributed in temperate and tropical countries and was introduced to America after the Spanish conquest. The genus name "Ruta" comes from the Greek word "reuo ", to set free, showing its reputation as a free from disease. There are perhaps 8 to 40 species in the genus. A well-known species is the Rue. The leaves are bipinnate or tripinnate, with a feathery appearance, and green to strongly glaucous blue-green in colour. The flowers are yellow, with 4–5 petals, about 1 cm diameter, and borne in cymes. The fruit is a 4-5 lobed capsule, containing numerous seeds.

The leaves and young stems have been reported to contain alkaloids, flavonoids, phenols, aminoacids, furanocoumarins and saponins. In addition, the phytochemical screening of the aerial parts of R. chalpensis was conducted for the determination of alkaloids, cardiac glycosides, flavonoids, tannins, coumarins, anthraquinones, saponins, volatile oil, volatile bases, cynogenic
glycosides, glucosinolates, sterols and/or triterpenes. Ruta is also one of the most frequently used plants for medicinal purposes. The characteristic odour of the plant and volatile oil is due to methyl n-nonyl ketone. There are two main species of Ruta used in traditional medicine: Ruta chalepensis and Ruta graveolens. Traditionally, Ruta is also used as remedy for many inflammatory diseases. Furthermore, extracts from rue have been used to treat eyestrain, sore eyes, and as insect repellent. Rue has been used internally as an antispasmodic, as a treatment for menstrual problems, as an abortifacient, and as a sedative. In Saudi Arabia, a decoction of the aerial parts of the plant is used as an analgesic and antipyretic and for the treatment of rheumatism and mental disorders. The plant is prescribed in the Indian system of medicine for the treatment of dropsy, neuralgia, rheumatism and menstrual and other bleeding disorders. In China, a decoction of the roots of the plant is used as anti-venom. The extracts of Ruta have an oxidative property which can control the colon cancer. During the tropical usage of the rue extracts care must be taken, after applying to the skin with sun exposure, the oil and leaves can cause blistering. Traditionally, in Eritrea, the leaves, stems and sometimes roots of Rumex nervosus are used as traditional medicines, for the eye disease, taeniacapitis, haemorrhoids, infected wounds, arthritis, eczema, abscess and gynecological disorders.

**MATERIALS AND METHODS**

**Collection of plant material**

The leaves of juvenile plants of Ruta chalepensis and Rumex nervosus were collected...
from the central region surroundings of Asmara at an altitude of 2300 meters, Eritrea and were authorized by Dr. Gebrehiwet, Department of Botany, Eritrean Institute of Technology and the specimen voucher was preserved in the herbarium.

**Extraction procedure**

The plant material was dried in shade, pulverized in household mixture. The powdered material was successively extracted by maceration in various solvents with different polarities like acetone, water and ethanol for four weeks. All the extracts were concentrated by evaporating the solvents, the concentrated extracts were used for phytochemical screening and antimicrobial activity.13-15

**Microbial strains**

The bacterial strains of *Staphylococcus aureus* and *Escherichia coli* were procured from the quality control laboratory, Massawa, Eritrea.

**Phytochemical screening**

The extracts of the dry powdered leaves of *Ruta chalpensis* and *Rumex nervosus* were analyzed for the presence of various phytochemical constituents like carbohydrates, reducing sugars, monosaccharide, Tannins, Saponins, Flavonoids, Terpenes/steroids (Liebermann - Burchard’s Test), Alkaloids, Anthraquinones (Borntrager’s test), cardiac glucosides (sodium nitroprusside method) proteins (copper sulphate and Folin Ciocalteau solution) and amino acids (Ninhydrin) were identified using standard phytochemical procedures 14-16.

**Antimicrobial activity**

The various solvent leaves extracts of *Ruta chalpensis* (Chena adam) and *Rumex nervosus* (Hihot) were tested by the disc diffusion method.19 The test microorganisms were seeded into Muller Hinton Agar medium by swab method of 10 μl(10 cells/ml) with the 24h cultures of bacteria growth in nutrient broth. After solidification the filter paper discs (5 mm in diameter) impregnated with the extracts were placed on test organism-seeded plates. *E. coli* and *S. aureus* were used for antibacterial test. Tetracycline positive control and solvent of the extract was used as a negative (or reference) control .The antibacterial assay plates were then incubated at 37°C for 24h. The diameters of the inhibition zones were measured in mm. Diameters less than 5 mm indicate no effect.

**RESULTS**

**Phytochemical Screening**

The results of the phytochemical analysis investigated for *Ruta chalpensis* and *Rumex nervosus* using in different solvent (acetone, ethanol, and aqueous) extracts are presented in Table 1.

| Test for | Extract | Acetone | Rumex | Water |
|---------|---------|---------|-------|-------|
|         |         |         |       |       |
| 1       | +       | +       | +     | +     |
| 2       | +       | +       | +     | +     |
| 3       | +       | +       | +     | +     |
| 4       | +       | +       | +     | -     |
| 5       | +       | +       | +     | +     |
| 6       | -       | -       | +     | -     |
| 7       | +       | +       | +     | +     |
| 8       | +       | +       | +     | -     |
| 9a      | +       | +       | +     | +     |
| 9b      | +       | +       | -     | -     |
| 9c      | +       | +       | +     | +     |
| 10      | +       | +       | +     | +     |

**Remarks**

1. Carbohydrate (Molish’s Test), 2. Reducing sugar (Fehling’s test), 3. Monosaccharides (Barfoed’s test), 4. Fats and oils (Solubility test), 5. Proteins (Xanthoproteic test), 6. Alkaloids (Mayer’s test), 7. Flavonoids (Concentrated sulfuric acid test), 8. Terpenes/Steroids (Liebermann-Burchard test), 9a. Cardiac glycosides (Keller-Killani test), 9b. Anthraquinone glycosides (Borntrager’s test), 9c. Saponin glycosides (Foam test), 10. Tannins /Phenolic (FeCl₃ solution test).

**Antimicrobial Assay activity**

The results of antibacterial activity of *R. chalpensis* and *R. nervosus* leaves extracts are shown in Table 2 and 3; Figure 4 and 5.

| Bacteria | Standard | Acetone | Ethanol | Water |
|----------|----------|---------|---------|-------|
|          |          |         |         |       |
| *E. coli*| 9.0      | 8.5     | 7.5     | 0.0   |
| *S. aureus*| 9.0    | 6.5     | 8.0     | 5.0   |
Table 3
Inhibition zones of *Rumex nervosus*

| Bacteria  | Average inhibition zone (mm) |
|-----------|-----------------------------|
|           | Standard | Acetone | Ethanol | Water  |
| *E. coli* | 9.0      | 6.0     | 0.0     | 6.5    |
| *S. aureus* | 9.0    | 0.0     | 5.0     | 0.0    |

Figure 4
Antimicrobial activity of Acetonic extract of *Rutaceae* (Chena Adam) against *E. Coli*

Figure 5
Antimicrobial activity of Ethanolic extract of *Rutaceae* (Chena Adam) against *E. Coli*

The activities observed for both plants are in concordant with the positive control that inhibited with an average of 9 mm in both the positive and negative gram bacteria. *E. coli* and *S. aureus* which are also resistant to different antibiotics had their growth inhibited by acetone, ethanol and aqueous extracts of *R. chalpensis* and *R. nervosus* (Figure 6 and 7).

**DISCUSSION**

**Phytochemical Screening**
Both plants showed the presence of different types of active constituents like alkaloids, flavonoids, terpenoids, tannins, glycosides, volatile oils, etc.\(^{13}\)

Majority of the bioactive components were extracted in the acetone and ethanol extracts. Only flavonoids, tannins and cardiac glycosides, secondary metabolites, are extracted on the aqueous extraction. Saponines are present in leaves and young stems of the *Rutachalpensis* plant.\(^{20}\)

These saponines are one of the active components having anti microbial activity.\(^{21}\)

**Antimicrobial Assay activity**
All extracts showed activity. The acetone extract of *R. chalpensis* showed maximum growth inhibition (8.5 mm) against gram negative bacteria. While ethanol extract of the same plant showed maximum growth inhibition against gram positive bacteria (8 mm). So the plant showed significant inhibition for gram positive and gram negative bacteria. Moreover, *R. chalpensis* has good inhibition for gram positive bacteria in all the extracts (Figure 4 and 5).

Results also showed that *R. nervosus* has inhibitory effect for gram positive bacteria only in the ethanol extract. But it has more inhibition against Gram negative bacteria in the ethanol and aqueous extracts. The plant showed maximum inhibition of (6.5 mm).

**CONCLUSION:**
The two terrestrial medicinal plants *Ruta chalpensis* and *Rumex nervosus* are rich in secondary metabolites like alkaloids, flavonoids, tannins, steroids, cardiac glycosides, etc.\(^{13}\) The
presence of various bioactive compounds justifies the use of whole plant for various diseases by traditional practitioners in Eritrea. Most of the bioactive components were extracted in the acetone and ethanol extracts. So the acetone or ethanol extracts are more essential as traditional medicines. The results suggest that the presence of flavonoids, cardiac glycosides and tannins/phenolic compounds of these plants may contribute to their claimed antibacterial property in aqueous extracts. Various workers have shown that Gram positive bacteria are more susceptible towards plants extracts as compared to Gram negative bacteria and in this study it is evident that all extracts of Rumex species induce apoptosis in 1301, 582.

Further ways of extraction and spectroscopic isolation of compounds from these two plants is, however, required to confirm specificity of the compounds responsible for antimicrobial activity.

ACKNOWLEDGEMENT
The authors are thankful to Dr. Zekaria Abdulkerim, the Dean, Prof. D. Damodaran Nambudiri, chairman of research office, College of Marine Science and Technology, Massawa, Eritrea, North East Africa for the support and encouragement.

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