INTRODUCTION
Medicinal herbs have been used comprehensively against various diseases for centuries as an alternative remedy for treating human diseases because they contain numerous active constituents of therapeutic value. The improvement of microbial resistance to antibiotics has led to a growing body of research into finding alternative sources for the treatment of resistant strains. Presently, the world population relies on plant-based medicines and serves as a first line of defense in maintaining health and fighting many diseases. (Trease and Evans, 1989)
Use of plants as a source of medicine has been inherited and is an important component of the health care system in India. The use of herbal medicine is progressively growing with roughly 40 per cent of the population reporting use of herb to treat medical illnesses. In western world also, the use of herbal medicines is steadily growing with approximately 40 per cent of the population reporting use of herb to treat medical illnesses within the past year. Public, academic, and government interest in traditional medicines is growing exponentially due to the increased incidence of adverse drug reactions and economic burden of the modern system of medicine. (Rabi et al., 2008)
Medicinal plants synthesize substances that are useful for the maintenance of health in humans and other animals. These include chemical substances called secondary metabolites that play a vital role in defense mechanism against various microorganisms and insects. (Nirmaladevi et al., 2008)
Medicinal plants possess antioxidant properties that protect the plant cells against the production of reactive oxygen species from cellular damage. Phenolic compounds present in the medicinal plants play a vital role in scavenging free radical species and protects human body against diseases (Kähkonen et al., 1999)

Traditional knowledge about medicinal plants has continuously nonstop the search for new cures. Supplementation of herbal antioxidants is indispensable to suppress the oxidative stress in a healthier way. (Varalakshmi et al., 2017) 

**Tridax procumbens** Linn is a wide spread weed and a Flowering plant that contains various medicinal values. The plant has been established for the treatment of wound healing, dysentery, epilepsy, hypertension, hepatotoxicity, hemorrhage and metabolic syndrome (Susila et al., 2002). Traditionally, **Tridax procumbens** has been in use in India as anticoagulant, antifungal and insect repellent. Its leaf extracts were known to treat infectious skin diseases in folk medicines. It is a well-known ayurvedic medicine for liver disorders or hepatoprotective nature besides gastritis and heart burn. (Wani et al., 2010). In view of dearth of information, the present study has been undertaken to investigate the Phytochemical, Mineral, Antioxidant and Antimicrobial effects of **Tridax procumbens** Linn (Leaves).

**MATERIALS AND METHODS**

The fresh parts of **Tridax procumbens** were collected from the local field of Lalgudi, Tiruchirapalli. The materials were washed with distilled water and air dried in the shade for two weeks. The plant materials were authenticated by the Botanists, St.Joseph's College, Tiruchirapalli.

**Extraction of plant material**

The dried leaves were grounded to coarse powder. 500 mg of powder was successively extracted with solvents like Ethanol and Aqueous extract. The extraction process was carried out using soxhlet apparatus for 36 hours.

**1. Phytochemical studies**

The crude product of **Tridax procumbens** obtained in soxhlet extraction technique was subjected to qualitative evaluation for the presence of Phytochemicals (Obadoni et al., 2001).

2. Antioxidant Assay

2.1: Superoxide dismutase (SOD)

The leaves (0.5 g) were ground with 3.0 ml of potassium phosphate buffer, centrifuged and used the supernatant. The assay mixture contained 1.2 ml sodium pyrophosphate buffer, 0.1 ml phenazine methosulphate (PMS), 0.3 ml nitro blue tetrazolium (NBT), 0.2 ml enzyme preparation and water in a total volume of 2.8 ml. The reaction was initiated by the addition of 0.2 ml of NADH, incubated at 30°C for 90 seconds and arrested by the addition of 1.0 ml glacial acetic acid. The reaction mixture was then shaken with 4.0 ml n-butanol, allowed to stand for 10 minutes and centrifuged. The intensity of the chromogen in the butanol layer was measured at 560 nm (Kakkar et al., 1984).

2.2: Catalase (CAT)

To 3.0 ml of H$_2$O$_2$-phosphate buffer, added 40 μl of enzyme extract (20% homogenate in phosphate buffer) and mixed thoroughly. The time essential for a reduction in absorbance by 0.05 units was documented at 240 nm (Luck, 1974).

2.3: Peroxidase (POD)

Enzyme extract (0.1 ml) (20% homogenate in phosphate buffer) was added to 3.0 ml pyrogallol solution, and adjusted the spectrophotometer to read zero at 430 nm. Added 0.5 ml of H$_2$O$_2$ and the change in absorbance was recorded every 30 seconds up to 3 minutes. (Reddy et al., 1995).

2.4: Glutathione S-transferase (GST)

Homogenized 0.5 g of the leaf sample with 5.0 ml of phosphate buffer centrifuged and used the supernatant for the assay. The reaction mixture in a total volume of 2.9 ml contained 0.1 ml GSH, 0.1 ml CDNB and phosphate buffer. The reaction was initiated by adding 0.1 ml of enzyme extract and observed the readings for every 15 seconds at 340 nm for a minimum of 3 minutes. (Habig et al., 1974).

2.5: Polyphenol oxidase (PPO)

The plant tissue (0.5 g) was homogenized in extraction medium (2.0 ml) containing HCl, sorbitol and NaCl. To 2.5 ml of phosphate buffer in the test cuvette, added 0.3 ml of catechol solution and set the spectrophotometer at 495 nm. Then added 0.2 ml of enzyme extract and recorded the change in absorbance for every 30 seconds upto 5 minutes. (Esterbauer et al., 1977).
2.6: Glutathione Reductase
The activity was measured by the method of Carlberg et al., (1975). Plant sample (0.5 g) was homogenized with 2.5 mM of Phosphate buffer (pH 7.5), 1 mM EDTA, 0.7 mM oxidized glutathione and 0.1 mM NADPH and the content were made up to 3 ml with water. The change in optical density was monitored after adding enzyme sample at 340 nm for 3 minutes at 30 seconds intervals.

2.7: Determination of ascorbic acid
The ascorbic acid was determined according to Cakmak and Marschner (1992) with some modification. The leaf extracts (0.5 ml of 1:10 g/ml (100 mg/ml) in ethanol was separately mixed with 5 ml of 5% meta-phosphoric acid, and centrifuged at 4000 rpm for 30 minutes. The reaction mixture contained 0.2 ml aliquot of the 4000 rpm supernatant, 0.5 ml 150 mM phosphate buffer (pH 7.4) containing 5 mM EDTA, 0.1 ml (10 mM) DTT (1,4-dithiothreitol) and 0.1 ml (0.5%, w/v) N-ethylmaleimide (NEM) to remove excess DTT. The color was developed after addition of the following reagents in the reaction mixture: 0.4 ml (10%) trichloroacetic acid (TCA), 0.4 ml (44%) ortho-phosphoric acid, 0.4 ml (4%) 2, 2’-bipyridine in 70% ethyl alcohol, and 0.2 ml (3%) FeCl₃. The mixture was then incubated at 40°C for 40 minutes, and the absorbance was measured at 525 nm. Ascorbic acid was used as a standard in the range of 0 to 100 µg/ml.

2.8: Determination of carotenoids
Total carotenoids were determined by the method of Jensen (1978). One gram sample was extracted with 100 ml of 80% ethanol solution and centrifuged at 4000 rpm for 30 minutes. The supernatant was concentrated to dryness. The residue was dissolved in 15 ml of diethyl ether and after addition of 15 ml of 10% methanolic KOH the mixture was washed with 5% ice-cold saline water to remove alkali. The free ether extract was dried over anhydrous sodium sulphate for 2 h. The ether extracts were filtered and its absorbance was measured at 450 nm by using ether as blank.

3: Determination of the free radical scavenging activities
The in vitro free radical scavenging activities of Tridax leaves were evaluated by DPPH, hydrogen peroxide, nitric oxide, and ferrous ion radical scavenging assays.

3.1: DPPH radical scavenging assay
DPPH (2,2-diphenyl-1-picryl-hydrazyl) free radical method is an antioxidant assay based on electron-transfer that produces a violet solution in ethanol. DPPH radical scavenging activity was measured according to the method of Mensor et al., (2001). A methanolic solution of 0.3 mM DPPH (0.5 ml) was added to equal volume of sample homogenate (20% homogenate was prepared in Tris EDTA buffer, pH 7.2) and allowed to react at room temperature. DPPH in methanol without plant extract served as positive control. After 30 minutes, the mixture was centrifuged and the absorbance of the supernatant was measured at 518 nm and converted in to percentage radical scavenging activity.

3.2: Hydrogen peroxide radical scavenging assay
The hydrogen peroxide scavenging activity was determined according to the method described by Ruch et al., (1989). A solution of H₂O₂ (4 mM) was prepared in phosphate buffer (pH 7.4). The concentration was determined spectrophotometrically from its absorption at 230 nm which was determined after 10 minutes against a blank solution containing phosphate buffer without H₂O₂.

3.3: Nitric oxide scavenging assay
Nitric oxide scavenging activity of Tridax leaves were determined by the method described by Green et al., (1982). 3 ml of reaction mixture containing sodium nitroprusside in PBS and the plant extract was incubated at 25°C for 150 minutes. Controls without test compound were kept in an identical manner. After incubation, 0.5 ml of Griess reagent was added. The absorbance of the chromophore formed was read at 546 nm. The percentage inhibition of nitric oxide generation was measured by comparing the absorbance values of control and those of test compounds (plant extract).

3.4: Ferrous ion radical scavenging activity
The ferrous ion radical scavenging activity was determined by the method described by Dasmaltchi et al., (2008). The reaction mixture contained 1.0 ml of various concentrations of the extract, 0.1 ml of 2 mM FeCl₂ and 3.7 ml of methanol. The control contained all the reaction reagents except sample. The reactions were initiated by the addition of 0.2 ml of 5 mM ferrozine. After 10 minutes at room temperature, the absorbance of the mixture was determined at 562 nm against a blank. A lower absorbance of the reaction mixture indicated a higher Fe²⁺ chelating ability.
4: Analysis of Minerals
The mineral content present in the Tridax ethanolic leaf extract was detected and analyzed by Atomic absorption Spectroscopy.

Procedure
The Leaf Sample was Dried and ground in to fine powder. Concentrated Nitric acid was added to the powder and left over night. The content was heated to dryness and the Ash was collected. To the Ash 5ml of Hydrochloric acid was added and Sample was calibrated.

5: ANTIMICROBIAL activity of Tridax procumbens
The antimicrobial activity of Tridax ethanolic leaf extract were tested in four different types of pathogenic bacteria such as Bacillus subtilis, Bacillus megaterium, Escherichia coli, and Staphylococcus aureus which were cultured on agar plates supplemented with different concentrations of plant extract by Agar well diffusion method. Pure Kanamycin (50µl) as a standard antibiotic for comparison of the results was taken. Disc Diffusion method were adapted to study the antibacterial activity of the plant extracts in triplicates and compared with the standard antibiotic.

RESULTS AND DISCUSSION
Table I: Phytoconstituents present in Tridax leaves of Ethanolic extract and aqueous extract

<table>
<thead>
<tr>
<th>Phytoconstituents</th>
<th>Tridax(leaves)</th>
<th>Ethanol Extract</th>
<th>Aqueous Extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkaloids</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Glycosides</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Phenol</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Steroids</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tannins</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Saponins</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table I Shows the level of phytochemical constituents present in Ethanolic and Aqueous Extracts of Tridax procumbens. The Ethanol extract possess more constituents when compared with aqueous extracts. These bioactive agents were shown to inhibit pathogenic microorganisms. (Benjamin et al., 1981)

Table II: Antioxidant Analysis in tridax leaves

<table>
<thead>
<tr>
<th>Antioxidants</th>
<th>Tridax leaves</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOD</td>
<td>17.09 ± 1.54</td>
</tr>
<tr>
<td>CAT</td>
<td>155 ± 2.90</td>
</tr>
<tr>
<td>POD</td>
<td>5.89 ± 0.53</td>
</tr>
<tr>
<td>GST</td>
<td>0.9 ± 0.002</td>
</tr>
<tr>
<td>PPO</td>
<td>1.9 ± 0.06</td>
</tr>
<tr>
<td>Glutathione Reductase</td>
<td>7.8 ± 0.78</td>
</tr>
<tr>
<td>Carotenoids(mg/100ml)</td>
<td>14.6 ± 0.40</td>
</tr>
<tr>
<td>Ascorbic acid(mg/100ml)</td>
<td>2.0 ± 0.30</td>
</tr>
</tbody>
</table>

The values are Mean ± SD of triplicates
SOD = expressed as U/mg of protein
CAT = expressed as µM of H₂O₂ consumed/min/mg
POD = change in OD/min/mg of protein µM of H₂O₂ consumed/min/mg protein
GST = n moles CDNB conjugated min/mg protein
PPO= activity was expressed as change in absorbance at 412 nm per minute/g fresh weight of tissue
Glutathione Reductase = n moles of NADPH oxidized/min/mg protein

Table II shows the activities of antioxidants in Tridax ethanolic leaf extract. From the results obtained, it was clear that the leaves possess considerably higher activities of all the enzymic antioxidants analyzed. The ethanolic Extract of leaf of Tridax possessed high percentage of radical scavenging activity, due to their hydroxyl groups. The antioxidant activity may be due to the hydrogen donating ability and the free radical scavenging activity of secondary metabolites present in the Plants. They can react with active oxygen radicals, such as hydroxyl radicals (Hussain et al., 1987) superoxide
anion radicals (Afanselv et al., 1989) and lipidperoxyl radicals and inhibit the lipid peroxidation at an early stage.

![Free radical scavenging activity of Tridax leaves](image)

**Fig. I:** Free radicals scavenging activity in *tridax leaves*

Free radicals and reactive oxygen species may cause deleterious effects in humans. The effects may cause Heart dysfunction, cancer, Arthritis etc. Plant sources act as natural antioxidants and play a role in scavenging free radicals from damage. Figure I show the free radical scavenging activity of *Tridax* leaves. The result confirms that *Tridax* leaves have potential antioxidant activity which may be due to the presence of more phytoconstituents which prevents the formation of lipid peroxides thus disrupting membrane organization. (Okawa et al., 1970)

**Table III: Mineral Analysis**

Table III shows the level of minerals in ethanolic extract of *Tridax* leaves. The values represents mean values of triplicates. *Tridax* showed enormous and rich amount of potassium and sodium which play an important role in metabolism, acid and water balance. (Ujowundu et al., 2008)

<table>
<thead>
<tr>
<th>Minerals</th>
<th>(mg/100g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium</td>
<td>2.45</td>
</tr>
<tr>
<td>Calcium</td>
<td>15.00</td>
</tr>
<tr>
<td>Iron</td>
<td>20.86</td>
</tr>
<tr>
<td>Potassium</td>
<td>55.00</td>
</tr>
<tr>
<td>Sulphur</td>
<td>5.45</td>
</tr>
<tr>
<td>Zinc</td>
<td>15.00</td>
</tr>
<tr>
<td>Manganese</td>
<td>10.56</td>
</tr>
<tr>
<td>Boron</td>
<td>6.78</td>
</tr>
<tr>
<td>Sodium</td>
<td>40.98</td>
</tr>
</tbody>
</table>

**Table IV: Antimicrobial activity of Ethanolic Extracts of Tridax**

<table>
<thead>
<tr>
<th>s.no</th>
<th>Concentration in mg</th>
<th>Staphylococcus aureus</th>
<th>Bacillus Subtilis</th>
<th>E.coli</th>
<th>Bacillus megaterium</th>
<th>Kanamycin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.25</td>
<td>2.8 mm</td>
<td>1.8 mm</td>
<td>1.6 mm</td>
<td>2.5 mm</td>
<td>2.5 mm</td>
</tr>
<tr>
<td>2</td>
<td>0.50</td>
<td>3.9 mm</td>
<td>1.9 mm</td>
<td>0.8 mm</td>
<td>2.0 mm</td>
<td>3.8 mm</td>
</tr>
<tr>
<td>3</td>
<td>1.00</td>
<td>5.5 mm</td>
<td>2.4 mm</td>
<td>1.5 mm</td>
<td>0.5 mm</td>
<td>5.2 mm</td>
</tr>
</tbody>
</table>
Table IV shows the antimicrobial effect of Tridax procumbens in ethanolic leaf extract. The activities were determined in different concentrations such as 0.25 and 0.50 and 1.00mg. The antimicrobial activity were studied against Staphylococcus, Bacillus Subtilis, E.coli and Bacillus megaterium. The maximum zone of inhibition of 5.5mm for Tridax was observed in 1mg concentration against Staphylococcus. Jayashree and Maneemegalai (2008) observed that ethanolic and methanolic extracts of leaves of Tridax procumbens possessed significant antibacterial activity against microorganisms (E.coli, Bacillus subtilis, Staphylococcus aureus, klebsiella pneumonia and Pseudomonas aeruginosa). The minimum inhibition zone (0.5mm) was observed in same concentration against Bacillus megaterium for Tridax. Plants rich in tannins have antibacterial potential due to their basic character that allows them to react with proteins to form stable water soluble compounds thereby killing the bacteria by directly damaging its cell membrane (Mohamed Shamshabudeenetal.,2010).

CONCLUSION
The investigation of the study reveals the presence of many important phytoconstituents and vital minerals in leaf extracts of Tridax procumbens which can provide various useful biological activities. Tridax procumbens leaves acquire good antioxidant role and thus act as an efficient free radical scavenger implicating its use in drug and food industries. The plant has significant anti microbiological activity, which clearly depicts and proves the efficacy of using Tridax as a Therapeutic drug.

REFERENCES
13. Mensor LI, Menezes FS, Leitao GG, Reis AS, Santos DT, Coube CS and Leitao SG. Screening of Brazilian


