Research Article

IN VITRO ANTIOXIDANT AND ANTIMICROBIAL POTENTIAL EFFECT OF MURRAYA KOENIGII ROOT EXTRACT AGAINST MULTI DRUG RESISTANT HUMAN PATHOGENS

Sivaperumal Gopalan 1, Kannan Kulanthai 2, Gnanavel Sadhasivam 3, Murugan Natarajan 4, Natarajan Devarajan 5 and Thirumalairaj Jeyaraman 3

1Department of Chemistry, Government College of Engineering, Salem-636011, Tamil Nadu, India
2Natural Drug Research Laboratory, Department of Biotechnology, School of Biosciences, Periyar University, Salem, Tamil Nadu, India.
3Department of Microbiology, Periyar University, Salem, Tamil Nadu, India.

*Corresponding Author Email: spsiraphd@gmail.com

Article Received on: 29/09/16 Revised on: 25/10/16 Approved for publication: 07/11/16

DOI: 10.7897/2230-8407.0711129

ABSTRACT

To investigate the phytochemical screening, antibacterial, antifungal and antioxidant activity of the consecutive extract of Murraya Koenigii Roots (called as MKR). This research work comprises four different crude extract and it is mainly focused on the extract of MKRS; The phytochemical screening for all the crude extract was carried out by the standard method. The antimicrobial activities of MKRS; extract were evaluated by disk diffusion method. The antioxidant activity of MKRS; was the determination of DPPH, FRAP and ABTS at different doses and MKRS; was characterized by TLC, FT-IR and LC-MS. The antimicrobial activity of MKRS; showed promising effective activities against all the bacterial and fungal pathogens with a maximum zone of inhibition against E.coli 20±1.5 mm and Fusarium rhizopus 20±1.8 mm. The MIC values of antibacterial were shown the maximum range at 150µg / ml and 300µg / ml antifungal activity. The antioxidant activity of MKRS; exhibited the IC50 values ranging from 24.6 ± 0.8, 27.5 ± 2.2 and 37.7 ± 3.0. The phytochemical constituent’s alkalooids, tannins, saponin, carbohydrates, glycosides and oils were present in all the crude extracts. The TLC studies showed the presence of four different UV-active fractions. The FT-IR spectrum indicates the presence of possible functional groups O-H, C=O and N-H starching of aromatic conjugates. The LC-MS of the MKRS; shows m/z 263 and 332 two different peaks with responsible intensity. These finding shows evidence of MKRS; an excellent antimicrobial and antioxidant activities and have great potential as a source for natural health care products.

Keywords: Murraya Koenigii roots, Antibacterial Activity, Antifungal, Antioxidant activity, TLC, FT-IR and LC-MS (ESI) studies.

INTRODUCTION

Medicinal plants are natural resources for diverse and valuable bioactive metabolites, which form the backbone of traditional medicines. The herbal medicine for the primary healthcare medicine has been a worldwide increasing interest in therapeutic values of natural products from the plants due to the development of modern synthetic drugs. Plants have been used in traditional medicine for several thousand years. In India, it is reported that traditional healers use 2500 plants species serve as regular sources of medicine. During the last few decades, there has been an increasing interest in the study of medicinal plants and their traditional use in different parts of the world. A natural product derived from herbal medicine was used as an alternative form of health care. The screening of medicinal plants for active compounds has become very significant rich source for the secondary metabolites with interesting biological activities. In general, these secondary metabolites are an important source of a variety of structural arrangements and properties. Many infectious diseases are known to be treated with herbal remedies throughout the history of civilization. The urgent need to discover new antimicrobial compounds with diverse chemical structures and novel mechanisms for new active and re-emerging infectious diseases. The recent researchers are increasingly turning their attention to folk medicine looking for new leads to develop better drugs against bacterial and fungal microorganism’s infection. The bacteria cause serious infections in human as well as in other animals. For examples, it was found the S.aureus causes superficial skin lesion and food poisoning. In agricultural fields, actinomycetes are promising to be used for bio control against fungal pathogens of the plant. Thus, actinomycetes having activity against harmful fungi are useful not only for agriculture but also for human health. In current years, the trade gets to reduce and failed to the manage a specific health condition through improved food diet. Concern about health improvement, involving agricultural products with their potential benefits has enhanced research on antioxidant activity. The possible way to fight these incurable diseases is to improve our body’s transformation due to antioxidant defences. Plants can contribute in this area primarily due to the antioxidant activity of polyphenolic compounds. Antioxidant supplements containing plants may be used to help the human body to reduce oxidative damages. In modern days, the antioxidants and antimicrobial activities of the plant have formed the basis of many applications in pharmaceuticals, alternative medicines and natural therapy. The recent trends to use bioactive compounds from plants may act as a natural antimicrobial and antioxidant influence of the health. Therefore, researchers are progressively focused their attention on natural products and looking for new leads to develop an effective compound against microbial infections and screening of several medicinal plants for their potential antimicrobial activities. One such indigenous plant of Murraya Koenigii Roots (Rutaceae) was selected for this study. Most of the
lithprosct survey revealed that the extract of MKR discusses about the screening and as well as the biological study like antimicrobial activity, hypoglycemic activity, anthelminthic activity, antidiabetic activity 21-27. To the best of our knowledge, there was no information in the scientific literature on the antibacterial, antifungal and antioxidant activities of MKRS2 extract. Therefore, this present study was designed to evaluate phytochemical screening, TLC, FT-IR spectrum, LC-MS (ESI)-Mass spectra, antimicrobial activities and antioxidant activities, (DPPH, FRAP and ABTS) which provides a preliminary screening assessment of MKRS2 extract.

MATERIALS AND METHODS

Sample Collection

The Fresh roots of M. Koonigii were collected from Yercaud hills, Salem District, Tamil Nadu, India during the month of January 2016. An expert taxonomist identified plants at the Botanical Survey of India, Tamil Nadu, Agriculture University campus, Coimbatore, India. Voucher specimens (BSU/SRC/5/23/2016/TECH/166) are stored in the Department of Chemistry laboratories and available for further reference. The roots were washed with sterile distilled water to remove adherent soil particles and it was allowed to dry in the shade at room temperature for 20 days. The dried root materials were made into a fine uniform powder by mixer grinder and stored in a sterile plastic container.

Preparation of Plant Extraction

The air-dried powder of MKR (80g) was extracted with 800 mL of water, petroleum ether, ethyl acetate and methanol (1:10 ratio) by using Soxhlet apparatus up to 8 hrs. The resulting extract was collected and filtered using Whatman no.40 filter paper. A dark brown extract is obtained. The dark brown extract was cooled and filtered to remove the residue. The extract was concentrated on a rotatory evaporator at 40°C – 50°C under vacuum, which resulted in a dark brown semi-solid residue about 10g (10% w/w) and stored at -20°C.

ANTIMICROBIAL SCREENING

Test Microorganisms

The bacterial namely Enterococcus faecalis (MTCC 439), Proteus Vulgaris (ATCC 8427), Klebsiella pneumoniae (MTCC 423), Bacillus subtilis (MTCC 441), Shigella dysenteriae (ATCC 11837) E.coli (MTCC 739) shigella sonnei (ATCC 25931) and Staphylococcus aureus (MTCC2940) and five fungal strains namely Aspergillus niger (MTCC 1344), Candida albicans ATCC 2091, Penicillium hensyogenum MTCC160, Fusarium Rhizopus was and R. mycore were selected based on their clinical and pharmacological importance. They were obtained from Institute of Microbial Technology, Chandigarh, India. The stock cultures were incubated for 24 hours at 37°C on nutrient broth for bacteria and 72 hours at 37°C on potato dextrose broth for fungal stock cultures; the bacterial and fungal culture were subcultured and maintained on nutrient agar and potato dextrose agar slants respectively at 4°C.

Evaluation of Antimicrobial Activity

The antimicrobial activity of MKRS2 extract was carried out by agar well diffusion method as described by 28 with few modifications. 15 mL of sterile Mueller-Hinton Agar (MHA, Hi Media) and Potato Dextrose Agar (PDA, Hi-Media) were dispensed into each sterile Petri dish and allowed to solidify. All the eight bacterial, five fungal pathogens were inoculated onto the Muller Hinton agar and potato dextrose agar medium respectively by using a sterile cotton swab. About 5 mm size of the well was made on the Mueller-Hinton Agar and Potato Dextrose Agar plate by using sterile cork borer. Then various concentration (25.50 and 75 mg/mL) of MKRS2 extract were carefully transferred into the Muller Hinton agar and potato dextrose agar medium. The standard antibiotic Cefrolaxine (10 mg / 10 mL) were used as positive controls for bacteria and Fluconazole (10 mg / 10 mL) were used as positive controls for fungal pathogens. The plates were allowed to stand for one hour to obtain pre-diffusion of the extract 29 and incubated at 37°C for 24 hours (bacterial) and at room temperature for 24-72 hours (fungi). At the end of incubation period, the zone of inhibition was measured diameter in millimeter 30. All the experiments were carried out in triplicates to evaluate the mean values. The minimum inhibitory concentrations (MIC) of the extract against tested microorganisms were determined by broth dilution method 31. For broth dilution, 1 mL of a standardized suspension of a strain (106 CFU / mL) was added to each tube containing extract at various concentrations in nutrient broth medium. The tubes were incubated at 37°C for 24hrs (for bacterial strains) and 25°C for 48 hrs (for fungal strains) and tubes gently. The experiment was carried out in triplicates. The minimum inhibitory concentration (MIC) is taken as the lowest concentration of the extract at which there is turbidity after incubation.

Evaluation of In Vitro Antioxidant Activity

DPPH Radical Scavenging Assay

The extract of MKRS2 was used for the preparation of stock solution 1 mg/mL by using ethanol. The stock solution was further diluted and different concentrations (10- 50 µg / mL) were added to 1.5 mL of 0.1 mM ethanol solution of DPPH (1, 1-Diphenyl-2- picrylhydrazyl). The mixture was shaken vigorously and the absorbance was monitored at 517 nm against a blank after thirty minutes of incubation by using UV-vis spectrophotometer when the reactions reach study state. Ascorbic acid was used as reference compound. The inhibition percentage of radical scavenging activity was calculated by using the formula

\[
\text{% inhibition} = \frac{(A_0 - A_t)}{A_0} \times 100
\]

Where \(A_0\) is the absorbance of control at \(t = 0\) min and \(A_t\) is the absorbance of antioxidant at \(t = 30\) min. All measurement was done in triplicate 32.

ABTS Radical Scavenging Assay

The 2,2-azinoobis -3- ethyl benzthiazazole -6- sulfonic acid diammonium salt (ABTS) cation radical was produced by the reaction between 7 mM ABTS in H2O and 2.45 mM potassium persulfate, stored in dark at room temperature for 12-16 hrs. Before usage, the ABTS solution was diluted to get an absorbance of 0.450 ± 0.001 at 745 nm with water. The extract of MKRS2, with different concentrations (10-50 µg / mL) was prepared. An aliquot of 20 µL extracts of each concentration was added to 180 µL of radical solution (in triplicate) and absorbance was recorded for ABTS every 5 min during the incubation period. Absorbance at 745 nm was noted after five minutes against the blank by using UV-vis spectrophotometer (Elico 307). The test solutions were expressed as ABTS+ scavenging activity 33.

\[
\text{Inhibition} = \frac{(A_0 - A_t)}{A_0} \times 100
\]

Where \(A_0\) is the absorbance of the control (blank, without extract of MKRS2) and \(A_t\) is the Absorbance in the presence of MKRS2 extract.

58
Ferric ion Reducing Antioxidant Power Assay (FRAP)

The reducing power of MKRS2 extract was determined by following method\textsuperscript{34}. The different concentrations of samples ranging from (10 - 50 μg / mL) were suspended in 0.2 M phosphate buffer (pH 6.6) mixed with 0.125 mL of potassium ferricyanide (1%, w/v) and incubated at 50°C for 20 min and then finally 0.125 mL of trichloroacetic acid (10%, w/v) was added to terminate the reaction. Further, the solution was mixed with 1.5 mL of ferric chloride (0.1%, w/v) and the absorbance was measured at 700 nm. An increased absorbance of the reaction mixture indicated increased reducing power.

Phytochemical Screening Using Secondary Metabolites

All the phytochemical screening was carried out based on the procedure reported by\textsuperscript{35}.

Table 1: Antibacterial activity of MKRS2 crude extract

<table>
<thead>
<tr>
<th>Name of the organisms</th>
<th>Concentration of MKRS2 Crude extract (mg / ml)</th>
<th>Zone of Inhibition (diameter in mm)</th>
<th>Streptomycin (control)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enterococcus faecalis</td>
<td>11±1.0</td>
<td>13±0.8</td>
<td>15±1.0</td>
</tr>
<tr>
<td>Proteus Vulgarius</td>
<td>11±1.4</td>
<td>13±1.3</td>
<td>15±0.4</td>
</tr>
<tr>
<td>Klebsiella pneumoniae</td>
<td>08±1.6</td>
<td>11±1.6</td>
<td>12±0.3</td>
</tr>
<tr>
<td>Bacillus subtilis</td>
<td>11±1.0</td>
<td>14±0.8</td>
<td>15±0.8</td>
</tr>
<tr>
<td>Shigella dysenteriae</td>
<td>15±1.3</td>
<td>16±1.2</td>
<td>20±1.0</td>
</tr>
<tr>
<td>E. coli</td>
<td>14±1.5</td>
<td>16±0.6</td>
<td>20±1.5</td>
</tr>
<tr>
<td>Shigella sonnei</td>
<td>06±1.2</td>
<td>06±0.4</td>
<td>06±1.6</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>12±0.9</td>
<td>15±0.9</td>
<td>15±1.3</td>
</tr>
</tbody>
</table>

Table 2: Minimum Inhibitory Concentrations of MKRS2 crude extract (µg/ml)

<table>
<thead>
<tr>
<th>Plant Extract</th>
<th>Test pathogens</th>
<th>MIC (µg / ml)</th>
<th>Streptomycin (control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MKRS2</td>
<td>Enterococcus faecalis</td>
<td>150</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>Proteus Vulgarius</td>
<td>125</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>Klebsiella pneumoniae</td>
<td>100</td>
<td>170</td>
</tr>
<tr>
<td></td>
<td>Bacillus subtilis</td>
<td>120</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>Shigella dysenteriae</td>
<td>100</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>E. coli</td>
<td>140</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>Shigella sonnei</td>
<td>120</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Staphylococcus aureus</td>
<td>138</td>
<td>148</td>
</tr>
<tr>
<td></td>
<td>Aspergillus niger</td>
<td>250</td>
<td>170</td>
</tr>
<tr>
<td></td>
<td>Candida albicans</td>
<td>170</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>Penicillium chrysogenum</td>
<td>200</td>
<td>185</td>
</tr>
<tr>
<td></td>
<td>Fusarium rhizopus</td>
<td>235</td>
<td>184</td>
</tr>
<tr>
<td></td>
<td>R. mycore</td>
<td>300</td>
<td>180</td>
</tr>
</tbody>
</table>

Table 3: Antifungal activity of MKRS2 crude extract

<table>
<thead>
<tr>
<th>Name of the fungal</th>
<th>Concentration (mg / ml)</th>
<th>Fluconazole (diameter in mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25 10±1.0</td>
<td>12±0.2 13±0.8 18±0.9</td>
</tr>
<tr>
<td>Aspergillus niger</td>
<td>7±1.8</td>
<td>8±0.9 18±1.4 18±0.6</td>
</tr>
<tr>
<td>Candida albicans</td>
<td></td>
<td>11±1.5 20±1.8 20±0.9</td>
</tr>
<tr>
<td>Penicillium chrysogenum</td>
<td>08±1.9</td>
<td>14±1.0 20±1.4 20±0.2</td>
</tr>
<tr>
<td>Fusarium rhizopus</td>
<td>15±1.9</td>
<td>20±1.8 20±0.9</td>
</tr>
<tr>
<td>R. mycore</td>
<td>-</td>
<td>20±1.4 20±0.2</td>
</tr>
</tbody>
</table>

Table 4: Preliminary phytochemical screening of MKRS2 extract

<table>
<thead>
<tr>
<th>S.No</th>
<th>Test</th>
<th>WA</th>
<th>PE</th>
<th>EA</th>
<th>ME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Alkaloids</td>
<td>--</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2.</td>
<td>Flavonoids</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>3.</td>
<td>Tannins</td>
<td>--</td>
<td>+</td>
<td>--</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>Terpenoids</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>5.</td>
<td>Steroids</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>6.</td>
<td>Proteins</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>7.</td>
<td>Saponins</td>
<td>--</td>
<td>--</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>8.</td>
<td>Glycosides</td>
<td>--</td>
<td>+</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>9.</td>
<td>Carbohydrates</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>10.</td>
<td>Oils</td>
<td>--</td>
<td>+</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>11.</td>
<td>Resins</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

WA = Water (S1), PE = Petroleum Ether (S2), EA = Ethyl Acetate (S3), ME = Methanol (S4) and + Present, - Absent

59
Figure 1: FT-IR spectrum of MKRS2 crude extract

Figure 2: Antioxidant activities of MKRS2 crude extract

Figure 3: LC-MS (ESI) Spectrum of MKRS2 crude extract
RESULTS

In the present investigation preliminary phytochemical screening has been done for all the crude extracts for the presence of phytochemical constituents namely alkaloids; tannins, saponin, carbohydrates, glycosides, and oils as shown in Table 4. The alkalioid were observed with PE, EA and ME. The bacteria and fungi used in this study are associated with various forms of diseases. The results of antibacterial susceptibility revealed that E.coli was more the most susceptible to the action of MKRS₂ with an inhibition zone diameter of E.coli (20±1.5), and Shigella dysenteriae (20±1.0) followed by Enterococcus faecalis (15±1.0), Proteus Vulgarius (15±0.4), Klebsiella pneumoniae (12±0.3), Bacillus subtilis (15±0.8), Staphylococcus aureus (15±1.3) and Shigella sonnie (06±1.6) for the maximum concentrations of 75 mg / ml shown in Table 1. The MKRS₂ extract against the selected fungal are in the range of 13±0.8, 8±0.9, 13±0.5, 20±1.8 and 20±1.4 for the maximum concentrations of 75 mg / ml respectively. The present investigation supports the antibacterial activities of MKRS₂ crude extract exhibited promising inhibitory activity against a pathogenic microorganism. The results of the present investigation confirmed the broad-spectrum antibacterial activity of MKRS₂ crude extract against the tested bacteria’s.

The MIC result of MKRS₂ crude extract based on the present study can be summarized that the extract from MKRS₂ had effective antibacterial activity and antifungal activity against all the bacterial and fungal strains tested. The MIC values of the extract are found to differ for the bacterial strains and it is observed that MIC values are much lower than the standard drug shown in Table 2.

In the antifungal activity of MKRS₂ crude extract showed maximum inhibitory activity effect against Fusarium rhizopus followed by R. mycore (20±1.4 mm) and moderate activity against (Aspergillus niger and Penicillium chrysogenum 13±0.5 mm as shown in Table 3. The roots of MK extract were found to possess concentrations dependent scavenging activity of DPPH radicals and the results are presented in Table.3. So, the MKRS₂ extract are exhibited great antioxidant effects at 50 µg / ml (98.05 %) respectively compared with the high antioxidant effect of ascorbic acid. The ABTS stable free radical with the characteristic absorption at 745 nm was used to study the radical scavenging effect of MKRS₂ reacted with ABTS at the maximum concentrations of 50 µg / ml (92.03 %) respectively. The reducing power of the MKRS₂ crude extract was found to be steadily increased in direct proportion to the increasing concentration of the extract. Further, they exhibited significant antioxidant activities of FRAP at maximum concentration of 50 µg / ml (85.6.6 %) MKRS₂ extract compared with standard ascorbic acid.

The qualitative analysis of MKR (WA, PE, EA and ME) crude extract revealed the presence of alkaloids; tannins, saponin, carbohydrates and oils were present as shown in Table 4.

These results suggest the presence of primary bioactive metabolite, which acts, as the precursors for the synthesis of secondary metabolites. The bioactive fraction compounds from MKRS₂ extract were analysis by thin layer chromatography using solvent system petroleum ether: Ethyl acetate (PE:EA 8:2) ratio produced very good UV active fraction was identified. Further, functional groups were analyzed using FT-IR spectroscopy. The spectrum showed peaks at 3425 cm⁻¹ (strong O-H bonding) which indicates the presence of O-H stretching of carboxyl group and N-H stretching of secondary amides. These peaks were indicated the presence of bonded hydroxyl groups. Further, the peaks observed at 2820 cm⁻¹, 2849 cm⁻¹ represents the C-H stretching bonds of alkanes. The peak observed at 1392 cm⁻¹, 1305 cm⁻¹,1588 cm⁻¹ and 1503 cm⁻¹ represent the C=C aromatic conjugates. The peaks observed at 1279 cm⁻¹, and 1261cm⁻¹ represent the aliphatic amide C-N stretching bond. It could be concluded that the possible functional group are present in the MKRS₂ crude extract FT-IR shown in Figure 1.

In this LC-MS (ESI) mass spectra was studied by the extract of MKRS₂ present in four different chromatogram and the molecular ion M+1 at m/z 210,248,263 and 332 is consistent with the molecular mass. The Mass spectrum indicates that possible indole carbazole alkaloid derivatives were present.

DISCUSSION

The powdered roots samples were extracted with four different solvents like water, petroleum ether, ethyl acetate and methanol. The highest yield was obtained from PE crude extract contained high percentage of brown colour semi-solid. The data presented in this study showed that the MKRS₂ extract of possessed antibacterial, antifungal and antioxidant properties. The biological studies of this extract were dose dependant in all experiments. The phytochemicals are important for the plants to protect themselves from various diseases. The significance of huge medicinal properties was used from ancient time as a source of medicine. The research about medicinal plants to screen phytochemicals classes is very important since these plants show good activity against chronic diseases like cancer; heart etc., the studies of biological active compounds in medicinal plants demonstrated the importance of identifying new metabolites in the area of human disease. In the present study investigation, the extract of MKRS₂ was found to be effective against tested pathogenic strains. The antibacterial activity of the extract of MKRS₂ was quantitatively assessed gram-positive and gram-negative bacteria by inhibition zone activity and minimum inhibitory concentration. The MKRS₂ crude extract shows a very good antimicrobial activity. There are several studies of antimicrobial potential of MKRS₂ crude extracts. The previous report of MKR extract were shown to possess bioactive compounds having antimicrobial and antifungal activity. The antibacterial activity of extract against DPPH radical showed a proportional effect with the standard drug. Our results demonstrated an important antioxidant activity against DPPH. It could be enhanced related to high carbozole alkaloids content. Similarly the active alkaloids content could enhance the proton donation to the unpaired electrons of the radical. The data obtained from this study concurred with the finding of 48. It could be concluded from this study that MKRS₂ extract could serve as potential sources of natural antioxidant activity agent against radical-related diseases. ABTS assay was carried out to gain a broad knowledge of the antioxidant activity of the plant extract due to different solubility or testing system of the reacting solution. The total antioxidant potential of the extract was measured based on the decolourisation of the blue chromospheres of
ABTS radical formed by the reaction of ABTS and potassium persulphate. The antioxidant activity of MKRS: extract graph is shown in figure 2. The reaction of plant extract to the performed radical cation converts into ABTS in concentrations related manner. Our results from this assay confirmed the antiradical activity of extract against DPPH radical, which is comparable to the standard antioxidant drug 48. The FRAP assay is used to measure the reducing potential of the extract. It depends on reducing reaction where Fe³⁺ to converted to form Fe²⁺ and it forms the color compound. In the present study MKRS: extract shows higher antioxidant activity is comparable to standard ascorbic acid with IC₅₀ values ranging from 24.6 ± 0.8, 27.5 ± 2.2 and 37.7 ± 3.0 respectively.

The antioxidant activities were following the order DPPH > ABTS > FRAP. Phytochemicals are important for the plants to protect themselves from various diseases. The research about medicinal plants to screen phytochemicals classes is very important since these plant show good activity against antimicrobial and antioxidant studies. The phytochemical screening of MKR: revealed the presence of alkaloids for all the crude extract. The TLC studies shows possible UV active fractions were identified for the MKRS: crude extract. The FT-IR studies support to the MS (ESI) mass spectra was present in the positive and gram negative bacteria with significant activity effective against antibacterial and antifungal agents with the MS (ESI) mass spectra was present in the positive and gram negative bacteria with significant activity effective against antibacterial and antifungal agents with significant activity effective against antibacterial and antifungal agents with significant activity effective against antibacterial and antifungal agents with significant activity effective against antibacterial and antifungal agents with significant activity effective against antibacterial and antifungal agents with significant activity effective against antibacterial and antifungal agents with significant activity effective against antibacterial and antifungal agents with significant activity effective against antibacterial and antifungal agents with significant activity effective against antibacterial and antifungal agents with significant activity effective against antibacterial and antifungal agents with significant activity effective against antibacterial and antifungal agents with significant activity effective against antibacterial and antifungal agents with significant activity effective against antibacterial and

Acknowledgement

The authors are very much thankful to Dr. R.S.D. Wahida Banu, Principal, Government College of Engineering, Salem-636 011, Tamil Nadu for providing the facilities to carry out this research work and for her constant encouragement.

References


Cite this article as:

Source of support: Nil, Conflict of interest: None Declared

Disclaimer: IRJP is solely owned by Moksha Publishing House - A non-profit publishing house, dedicated to publish quality research, while every effort has been taken to verify the accuracy of the content published in our Journal. IRJP cannot accept any responsibility or liability for the site content and articles published. The views expressed in articles by our contributing authors are not necessarily those of IRJP editor or editorial board members.