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Comparative Antibacterial and Antioxidant activity from root and fruit extracts of Momordica charantia L. and Momordica dioica Roxb

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ABSTRACT

Momordica charantia L. and Momordica dioica Roxb are perennial climbing creepers belonging to the family Cucurbitaceae and generally used as vegetables in Southern India, Bengal, Maharashtra and Madhya Pradesh. In the present study the methanolic extract of fruits and roots of M. charantia and M. dioica were analyzed for the presence of different phytochemical constituents. The extracts were also used for screening of antimicrobial and antioxidant properties. The activities of the compounds were compared with standard strain for antibacterial properties and the solvent extracts indicated that the compounds are active in exhibiting antibacterial role. Fruits and roots of M. charantia and M. dioica exhibited potent antioxidant activity by inhibiting DPPH free radicals which indicates the root and fruit extracts are very good source of natural antioxidant agent. The antibacterial activity of fruit extract was more than the root extract for both gram negative and gram positive bacteria. M. charantia and M. dioica exhibited potent antioxidant activity by inhibiting DPPH free radicals which indicate the fruit and root extracts of both plant materials can be used as an accessible source of natural antioxidant agent.

Key words : Momordica charantia, Momordica dioica, Root, Fruit extracts, Antibacterial, Antioxidant activity.

I. INTRODUCTION

Plants have been an integral part of human civilization. Medicinal plants have also been relied upon by over 80% of the world population for their basic health care needs (Sabir et al., 2007). Momordica dioica Roxb. is a perennial, rhizomatous, dioecious climber belonging to cucurbitaceae family. This is a seasonal vegetable of high demand and medicinal plant in Asian countries. This species is indigenous and because of its higher medicinal importance it is also cultivated throughout the world (Joseph, 2005). Spine gourd has various vernacular names in different regional languages of India viz; Akakara, Bodakakara, Kakor, Dharkarela, Batkarila, Kartoli, Aegaravalli and Vahisi (Bawara et al., 2010). Fruits of spine gourd are free from cholesterol and are highly energetic with adequate amount of water, protein and important minerals and vitamins (Ram et al., 2004; Aberoumand et al., 2009). The medicinal importances of spine gourd are sex-specific and only female plants have medicinal values. The leaves of female spine gourd are used as an aphrodisiac, to eliminate the parasites present in the human intestine, cure fever and respiratory disorders. Furthermore (Kumar et al., 2003), stated that root tubers are used for the treatment of headaches, kidney stones and jaundice. Medicinal value of this plant was reported and also these researchers reported that fruits are useful in the treatment of asthma, leprosy, fever, tumors, urinary discharges, excessive salivation, and heart disease. Furthermore (Jain et al., 2010), also noticed that fruit powder is used to induce sneezing, leading to nasal clearing.

Momordica Charantia commonly called bitter melon belongs to the family cucurbitaceae that grows in tropical areas, including parts of the Amazon, East Africa, Asia, and the Caribbean, and is cultivated throughout South America as a food and medicine. It's a slender, climbing annual vine with long-stalked leaves and yellow, solitary male and female flowers borne in the leaf axils. The fruit looks like a warty gourd, usually oblong and resembling a small cucumber. All parts of the plant, including the fruit, taste very bitter. In Guyana the leaf tea is used as traditional medicine for diabetes, to expel intestinal gas, to promote menstruation, as an antiviral for treating measles, hepatitis and feverish conditions. It is used as external application for sores, wounds, and infections and internally for worms and parasites (Ahmed et al., 2001; Takemoto, 1983). The fruits and leaves contain alkaloids, glycoside, saponin like substances, resin, an aromatic volatile oil and mucilage. These include alkaloids, insulin like peptides, and a mixture of steroidal sapogenins known as charantin.

Our traditional system of medicine and folklore are using the whole medicinal plant or a part for the treatment of all types of diseases successfully since the time immemorial. It includes antibacterial, anthelmintic, anti-inflammatory antioxidant, antitumor, cytotoxic agents (Rastogi et al., 2009). This is because the traditional medicines act as an easily available and effective source of medicines to people with broad spectrum actions like high percentage of cure with single therapeutic dose, cost effective and free from toxicity (Yadav et al., 2011; Mali et al., 2001). Reports also show that the plant has anti-tumor and anti-HIV activities (Nagasawa et al., 2002; Grover et al., 2004). The present study of Momordica charantia and Momordica dioica has been taken up to carry out antibacterial and antioxidant activity from root and fruit extracts.

II. MATERIALS AND METHODS

Plant materials

M. charantia and M. dioica were collected from Adilabad district of Telangana State and were grown in the research field of the Department of Botany, Osmania University, saifabad, Hyderabad.

Preparation of extracts

Plant samples were washed with distilled water and air-dried at room temperature for 7-10 days, then oven-dried at 40 ^{0}C to remove the residual moisture. The dried plant parts were pulverized and stored in air-tight containers at 4 ^{0}C for future use. 50 grams of powdered samples of fruit and root extract of M. charantia and M. dioica were extracted with methanol by soxhlation method at 60 to 80 ^{0}C. The three filtrates were separately concentrated in water bath at 40 ^{0}C and evaporated under reduced pressure

Antibacterial activity:

All the extracts were tested for antimicrobial activity by using Gram positive S. aureus and gram negative bacteria E. coli, P. aeruginosa, K. pneumonia by the paper disc diffusion method. In brief, approximately 20 mL of nutrient agar medium was poured into sterilized petri dishes. The bacterial test organisms were grown in a nutrient broth for 24 hours. A 50 µL nutrient broth culture of each bacterial organism (1×105 CFU/mL) was used to prepare bacterial lawns. Agar wells of 5 mm diameter were prepared with the help of a sterilized stainless steel cork borer. All compounds were dissolved in DMSO to get a stock solution of 1 mg/mL. The wells were loaded with 100 µL of each along with dimethyl sulfoxide (DMSO) as negative control and ampicillin (100 µg in DMSO) as positive control. The plates were incubated at 37 °C for 24 h and examined for the presence of zones of inhibition. The experiment is carried in triplicate and the diameter of zones of inhibition was measured and the mean value for each organism was recorded and expressed in millimeter unit.

Radical Scavenging Activity:

This assay is completely based on decrease in absorbance value of DPPH at 517 nm on addition of complex. The experiment involves diluting the working solution of the metal complexes and the ascorbic acid standard (700, 600, 500, 400, 300 and 200 µg/mL–1) in methanol. DPPH concentration was kept constant (2µL, 0.004 %) to this varying concentration of metal complexes and standard were added. The mixture was shaken vigorously and kept in dark for 30 min at room temperature. Then the absorbance was measured at 517 nm in a spectrophotometer. The whole experiment was carried out using spectroscopic grade methanol solvent at 298 K. The radical scavenging activity has been measured by using the following; equation.

Suppression ratio (%) = $[(A_0-A_i)/A_0)]$ X 100

Where A_i=the absorbance in the presence of the ligand or its complexes, A_0=the absorbance in the absence of the ligand or its complexes.

I. Results and discussion

Antibacterial activity of root and fruit extract of M. dioica and M. charantia

The antibacterial screening of the Fruit and Root extracts of M. dioica and Fruit M. charantia (1-4) was performed against gram positive (S. aureus) and gram negative bacteria (E. coli, P. aeruginosa and K. pneumonia) by the paper disc method. The activities of the compounds were compared with standard Ampicillin for antibacterial activity. The antibacterial properties of solvent extract are evaluated and presented in Fig-1, 2 and Table-1, indicating that the compounds are active in exhibiting antibacterial role. The order of activity towards gram negative bacteria is M. dioica root> M. dioica fruit> M. charantia root> M. charantia fruit and for gram positive bacteria the order is M. dioica Fruit> M. charantia Root> M. dioica Root> M. charantia Fruit, The present study results are similar with the findings of (Leelaprakash et al., 2011; Jagessar et al., 2008; Ilango, 2012; Vani et al., 2016).

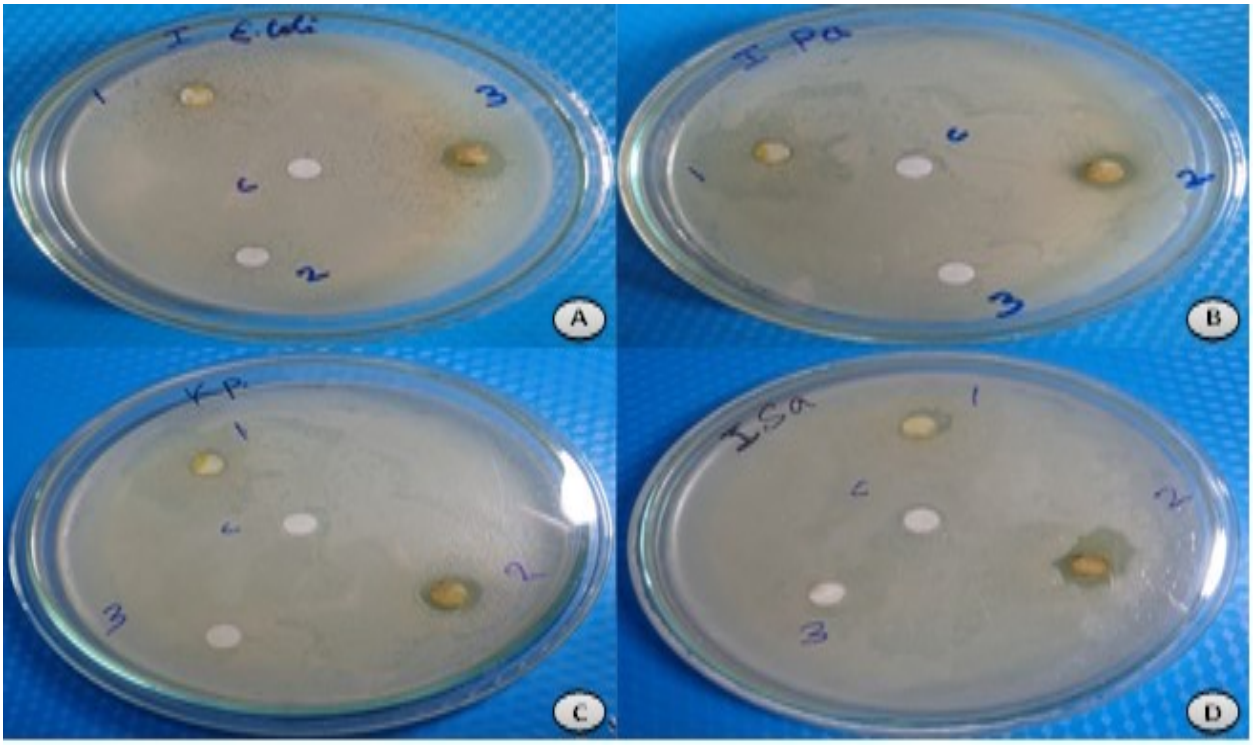

Figure 1. Antimicrobial activity of 1. Fruit extract of M. dioica, 2. Fruit extract of M. charantia, 3. Root extract of M. dioica. (A) E.coli, (B) P. aeruginosa (C) K. pneumonia(Gram Negative) and (D) S. aureus (Gram Positive) ampicillin, positive control.

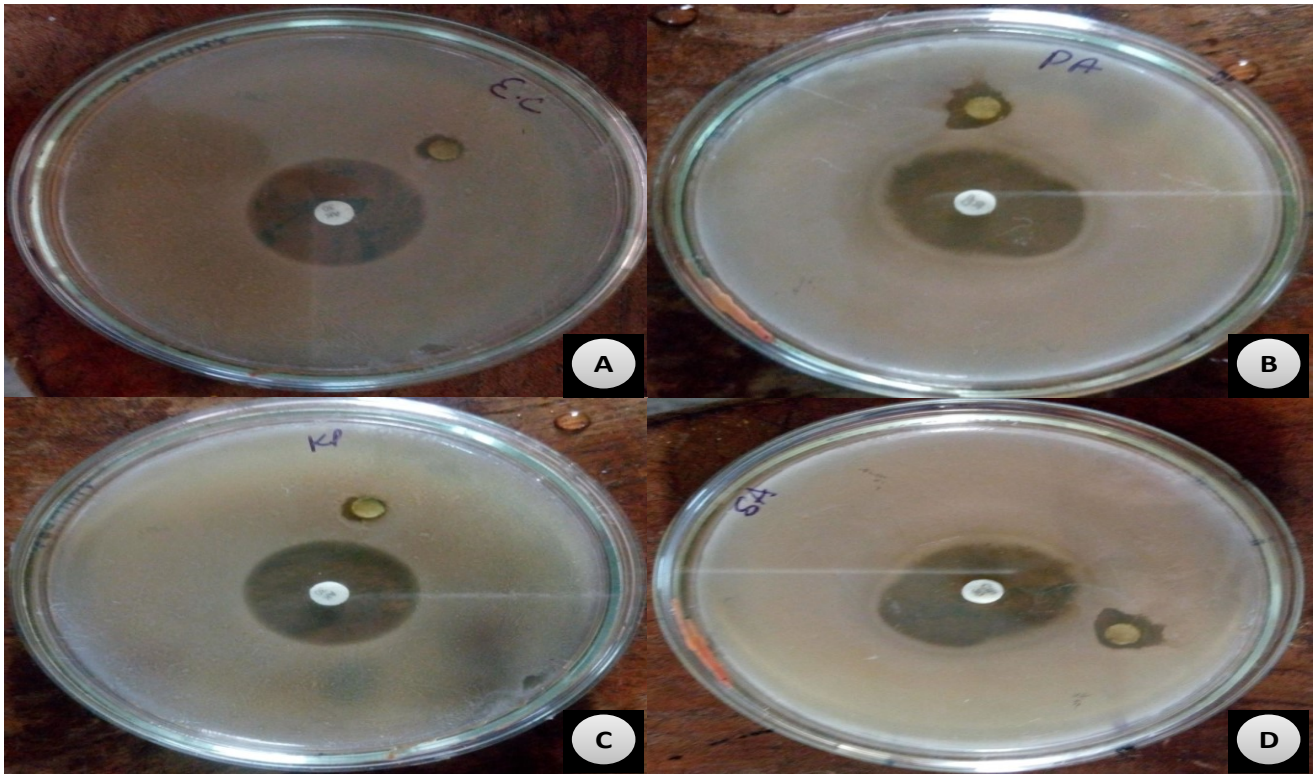

Figure 2. Antimicrobial activity of Root extract of M. charantia. (A) E.coli, (B) P. aeruginosa (C) K. pneumoniae (Gram Negative bacteria) and (D) S. aureus (Gram Positive bacteria) ampicillin as positive control.

Table 1. Minimum inhibition zone:

Plant extract	Bacterial inhibition zone (mm) Gram negative bacteria			Bacterial inhibition zone (mm) Gram positive bacteria
	E. coli	P. aeruginosa	K. pneumonia	S. aureus
1. M. dioica Fruit	4	2	5	6
2. M. dioica Root	2	4	6	4
3. M. charantia Fruit	6	2	2	3
4. M. charantia Root	4	3	4	6

Antioxident Properties of Fruit and Root extract of M. charantia and M. dioica

The model of scavenging the stable DPPH radical is a widely used technique to screen antioxidant properties by spectrophotometer in a very short time period. When the (between antioxidant molecule and DPPH radical (Ref) occurs, it results in decrease in absorbance at 517 nm. This is because the radical is scavenged by antioxidants through donation of hydrogen to form the reduced form (DPPH-H), and this property is also visually noticeable as the color changes from purple to yellow. The more rapidly the absorbance decreases, the more potent is the antioxidant compound. In the present study the antioxidant activity of Fruit and Root extract of M. charantia and M. dioica was evaluated by scavenging stable DPPH radical (Fig:-3). The DPPH radical scavenging activities were found to be 62.26 % for ascorbic acid, 21.30 % for M. charantia fruit extract, 16. 50 % for M. dioica fruit extract, 12.60% for M.

charantia and M. dioica root extract, at concentration of the 200 µg/mL^{-1}. Ascorbic acid exhibited higher DPPH scavenging activity than the compound at all concentrations. At the concentration of 700 µg/mL^{-1} scavenging activities were found to be 96.28, 87.54, 78.12, 66.70 and 63.24 % for Ascorbic acid, M. charantia fruit, M. dioica fruit, M. charantia root and M. dioica root extract respectively. The metal scavenging activity which is the measure of antioxidant property at the concentration of above compounds at 200 µg/mL^{-1} follows the order: Ascorbic acid > M. charantia fruit> M. dioica fruit> M. charantia root> M. dioica root extracts. The result of present study is in agreement and similar with the findings of (Bumrela et al., 2009; Vani et al., 2016; Mohan et al., 2015).

Fig: 6. Antioxident Properties Fruit and Root extract of *M. charantia* and *M. dioca*

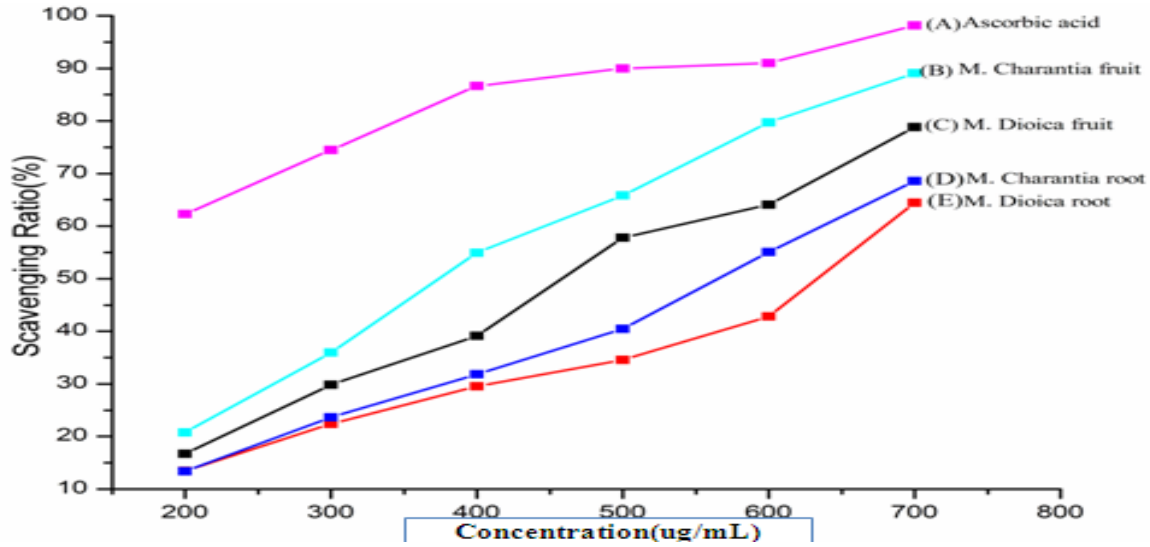

Figure 3. Radical-scavenging activity of the Fruit and Root extract of M. charantia and M. dioica .

III. CONCLUSION

From our study and with previous literature survey we can come to a conclusion that the Momordica charantia and Momordica dioica fruits and roots are rich in phytochemicals that are active in exhibiting antibacterial property. Study confirms the antibacterial activity of M. charantia and M. dioica fruit and root extract. The antibacterial activity of fruit extract was more than the root extract for both gram negative and gram positive bacteria. M. charantia and M. dioica exhibited potent antioxidant activity by inhibiting DPPH free radicals which indicate the fruit and root extracts of both plant materials can be used as an accessible source of natural antioxidant agent. This is valuable information for preparation of drugs in pharmaceutical industry and there is a need for more intensive research in this medicinal plant since the compounds play a great role in healthcare.

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