OPEN ACCESS

Haya: The Saudi Journal of Life Sciences
Abbreviated Key Title: Haya Saudi J Life Sci
ISSN 2415-623X (Print) | ISSN 2415-6221 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Qualitative Phytochemistry, Antioxidant potential and Antimicrobial Activity of Methanolic Extracts of *Rungia repens* from Akola Region (MS), India

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DOI: 10.36348/sjls.2023.v08i07.002 | **Received:** 04.07.2023 | **Accepted:** 10.08.2023 | **Published:** 28.08.2023

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Abstract

Rungia repens is a common Acanthaceae member growing mostly in agricultural wastelands. This plant is noted to have febrifuge, antitussive, and vermifuge properties. The qualitative phytochemical study of the leaves and stem of *R. repens* showed that the plant is rich in phytochemical composition. The chemical analysis showed the presence of alkaloids, phenolics, cardiac glycosides, and steroids in the methanolic extract of this plant. The DPPH and FRAP assay showed that the plant parts have significant antioxidant potential. The disc diffusion of the methanolic extract of this plant reveals its antimicrobial activity. Thus, it is stated that the plant has significant antioxidant and antimicrobial potential.

Keywords: *Rungia repens*, Qualitative, Phytochemicals, Antioxidant, DPPH, FRAP.

INTRODUCTION

Since ages, humans are using various plants and plant parts/ products as traditional medicine since the beginning of human civilization for routine healthcare. This is quite evident from studies of the older civilizations of human settlements where palaeontologists discovered a number of medicinal herbs among the fossilized remains of Neanderthal ancestors (Mayeng, 1996). Since then, human beings were observed to be dependent on various plants for medicine, and this dependence is still apparent in the present era (Balandrin *et al.*, 1993 and Jackson, 2018). In other words, from times immemorial, plants continue to offer mankind novel healthcare remedies. Plants are rich in a diversity of secondary metabolites such as alkaloids, flavonoids, terpenoids, steroids, and tannins which have been found to have various biological properties (Cowan, 1999; Lewis and Ausubel, 2006; Rai *et al.*, 2014; Umashankar *et al.*, 2020). Plant extracts or herbal preparations have treated various infectious diseases throughout the history of mankind (Rabe and van Staden, 1997). These include concoctions, decoctions, infusions, and teas (Van Wyk, 2004]. Antioxidants are important in the prevention of human disease. Compounds with antioxidant activity may function as free radical scavengers complexes of pro-oxidants, metals, and reducing agents (Steenkamp *et al.*, 2005). The WHO estimated that over 80% of the people in developing countries rely on traditional remedies such as herbs having medicinal potential for their routine healthcare needs (Koche *et al.*, 2010). This means that about 3.5 to 4 billion people rely on plant resources for crude drugs and more (Bahmani and Eftekhari, 2012).

Rungia repens is commonly known as 'Parpatha' in Sanskrit and "Ghati-Pittpapra" in Marathi, belonging to the family Acanthaceae. It is a much-branched, spreading, or erect herb, found as a weed throughout the warmer parts of India, especially in cultivated fields during the winter season. The present study is focused on qualitative phytochemistry, antimicrobial activity, and antioxidant potential of leaf and stem extracts of *R. repens* collected from the Akola region of Maharashtra, India.

MATERIALS AND METHODS

The plant material of *Rungia repens* was collected during the winter season of 2019- 2020 from the Akola region (MS). After the collection of plant material, the plant specimen was identified taxonomically using the flora of Maharashtra (Karthikeyan and Singh, 2001), and a specimen herbarium was deposited in the Department of Botany, Shri Shivaji College of Arts, Commerce, and Science, Akola.

Preparation of the Extract

The collected plant material was shade dried for 15 days. The dried leaves and stems were powdered mechanically and stored in an airtight container for further analysis. The powdered leaf and stem were extracted with methanol and concentrated at room temperature. The extract obtained was stored in a glass bottle for further analysis.

Qualitative Phytochemical Screening

Chemical tests for screening and identification of bioactive chemical constituents present in the methanolic extract of the leaf and stem of *R. repens* were carried out using the standard procedure (Harborne, 1998; Koche *et al.,* 2010; Shirsat *et al.*, 2014).

***In vitro* antioxidant activity**

The antioxidant activity of methanol extract of leaves of *R. repens* was measured on the basis of the scavenging activity of the stable DPPH (1 1- diphenyl 2-picrylhydrazyl) free radical with minor modification. This method is widely used to check the free radical scavenging antioxidants (Choi CW *et al.,* 2002). The antioxidant activity of stem and leaf extracts of *R. repens* was also analysed using the modified FRAP assay method (Maruthamuthu and Kandasamy, 2016). The percentage inhibition was calculated using the following formula-

% of inhibition= (AB-AA/AB) ×100

Where AB is the absorbance of control; AA is the absorbance of the sample.

Antimicrobial activity

The antimicrobial activity of leaf and stem extracts of *R. repens* was analysed. For the same, the antimicrobial activity of the methanolic extract was tested using the disc diffusion method (Koche *et al.,* 2010) against two fungi (*Aspergillus niger* and *Candida albicans*) and four bacterial strains (*Bacillus subtilis, Escherichia coli, Pseudomonas aeruginosa*, and *Staphylococcus aureus*).

RESULT AND DISCUSSION

The qualitative phytochemical analysis showed that the methanolic leaf and stem extracts of R. repens are rich in phytochemical composition. Leaf extract showed the presence of alkaloids, cardiac glycosides, terpenoids, reducing sugar, phenolics, and steroids. While the stem extract showed positive tests for cardiac glycosides, terpenoids, reducing sugar, phenolics, and steroids (Table-1).

Table 1: Qualitative phytochemical analysis of methanolic leaf and stem extracts of *Rungia repens*

Name of the test	Alkaloids	Cardiac glycoside	Terpenoids	Reducing Sugar	Saponins	Tannins	Flavonoids	Phenolics	Steroids	Carbohydrates	Protein and Amino acid
Leaf	+	++	+	+	-	-	-	+	+	-	-
Stem	-	++	+	+	-	-	-	+	+	-	-

(+: present, ++: present (higher level), - : Absent)

The antioxidant activity of the methanolic leaf and stem extract of Rungia repens was determined. The % scavenging DPPH and % scavenging of FRAP of methanolic leaf extract was 34.81 ± 3.21 and 41.41 ± 7.15 with IC50 values 57.02 ± 7.02 and 47.91 ± 4.01. For methanolic stem extract these values were 26.61 ± 2.97 and 31.44 ± 2.31 and IC50 values were 69.78 ± 8.97 and 52.65 ± 2.47.

Table 2: The antioxidant activity of methanolic extract of *Rungia repens* (% scavenging of DPPH and FRAP radical assays)

Sr. No.	Sample		% of scavenging DPPH	IC 50 value	% of scavenging FRAP	IC 50 value
1	***Rungia repens***	**Leaf**	34.81 ± 3.21	57.02 ± 7.02	41.41 ± 7.15	47.91 ± 4.01
2		**Stem**	26.61 ± 2.97	69.78 ± 8.97	31.44 ± 2.31	52.65 ± 2.47

The methanolic leaf and stem extract of *R. repens* showed promising results as antimicrobial potential against tested microbial organisms. For leaf extract, the zone of inhibition against fungal strain was in the range of 07 to 16 mm, and for stem extract, it was in the range of 04-12 mm against the control range of 17 to 20 mm. The antibacterial activity of methanol leaf extract was in the range of 05 mm to 16 mm and for stem extract 03 mm to 11 mm against the control ranging the zone of inhibition from 15 mm to 34mm.

Table 3: The antimicrobial activity of methanolic leaf and stem extract of *Rungia repens* (Zone of inhibition in mm)

Microbial strains	Zone of Inhibition (mm)		
	Control	Leaf extract	Stem extract
Aspergillus niger	Ketoconazole (17 mm)	07 mm	04 mm
Candida albicans	Ketoconazole (20 mm)	16 mm	12 mm
Bacillus subtilis	Doxycycline (22 mm)	08 mm	04 mm
Escherichia coli	Doxycycline (34 mm)	16 mm	11mm
Pseudomonas aeruginosa	Doxycycline (15 mm)	05 mm	03 mm
Staphylococcus aureus	Doxycycline (19 mm)	09 mm	06mm

The plant, *Rungia repens* is rich in various phytochemical compounds. It showed higher water-soluble components than alcohol-soluble compounds. Flavonoids and phenolics are among the major compounds present in the *Rungia repens* plant. (Karuna and Modi *et al.*, 2017 and Khalid *et al.*, 2019) and are powerful antioxidants. Our results are also in analogy with these reports. Plants contain various important phytoconstituent like terpenoids that exhibit various pharmacological activities (Kawale and Koche, 2010 and Koche *et al.*, 2016). The methanolic leaf and stem extract also showed significant antimicrobial potential against tested organisms. Due to the presence of such active phytochemicals, the plant is also used in some Siddha preparations (Nandha Kumar *et al.*, 2022). Thus, the plants have multi-active phytochemicals which give medicinal value to the plants. However, the pharmacological validation of these herbal extracts is essential.

ACKNOWLEDGMENT

The authors are grateful to BARTI for financial assistance, the Principal, Shivaji College of Arts, Commerce, and Science, Akola for providing the necessary facilities.

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