Research Article

Antioxidant Potential of *Fagonia schweinfurthii* Hadidi from the Northern Western Ghats, India

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ABSTRACT

Fagonia schweinfurthii species were selected because only, these are ethnomedicinally used in different Indian medicinal systems. Traditionally, Fagonia has been used to cure diseases such as skin eruptions, heal sores, skin diseases, antipyretic, pain relief, ear infection, and venereal diseases. Phytochemical compounds are naturally present in medicinal plants. Secondary metabolites are used for checking biological activities such as antioxidant activity. Potential phytochemical leads to searching for new drugs, contributions in pharmacognosy, pharmaceutical, and healthcare products. Whole plant of *F.schweinfurthii* collected from Kesandphata, Pune (M.S.) India. Identification & classification of plants using different Flora. Plant material dried under shade conditions and successively extracted by cold extract for water and Soxhlet method hot extract for methanol and ethanol solvent for phytochemical tests and antioxidant activity. Antioxidant activity of *F. schweinfurthii* was examined by ABTS free radical scavenging assay and DPPH radical scavenging assay. The preliminary phytochemical analysis of aerial part and root extracts showed positive tests such as alkaloids, starch, protein, tannin, flavonoid, terpenoid, carbohydrates, lignin, and phenols. The extract showed ABTS free radical scavenging assay maximum activity of aerial part sample 22.80 % at 50 µg/ml and root sample 25.64 % at 50 µg/ml. The extract DPPH radical scavenging assay showed maximum activity of aerial part sample 96.78 % at 50 µg/ml and root sample 54.15 % at 50 µg/ml. Experimental investigations of an aerial part extract and root part extract of *F. schweinfurthii* plant show an antioxidant activity. Especially, the analysis of these plant part extract in methanol as solvent reveals the antioxidant activity. The more significant and prominent result was obtained in DPPH radical scavenging assay.

Keywords: *Fagonia schweinfurthii*, Phytochemistry, Antioxidant activity.

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INTRODUCTION

The Western Ghats (including Sri Lanka) is one of the biodiversity hotspots in India[1]. The region of Western Ghats consists of rich medicinal resource, and these medicinal plant sources will be used for pharmacognostic and bioprospecting study. The medicinal flora of Western Ghats is quite rich and its carry more than 62.8 % are endemic and medicinally significant. Due to its unique biodiversity, it is one of the important areas with very high value considering the bioprospecting of the plant[2]. The Western Ghats distribute unique 700 medicinal plants, they are used in traditional and folk medicinal practices[3]. In the Western Ghats, Selected ethnomedicinal plants use tribal people as different therapeutic propose. By using the hidden, unexplored, valuable knowledge of the tribal people for new drug discovery [4]. *Fagonia* belongs to the family Zygophyllaceae having 25 Genera's and about 285 species, which are distributed in mainly deserts and dry arid regions of the world[5]. Traditionally, *Fagonia* has been used to cure diseases such as skin eruptions, heal sores, skin diseases, antipyretic, pain relief, ear infection, and venereal diseases[6]. *Fagonia indica* has pharmacological activities such as antidiabetic, anticancer, antileishmanial, antipyretic, anti-inflammatory, laxative, gastroprotective, hepatoprotective and antioxidant effects [7]. Select these plant species because only, these are ethnomedicinally used in different Indian medicinal system aerial parts, and these plant species relatives' plants species also have potentially valuable compounds. These relative plant species have an ethnomedicinal value[8]. Many potential phytochemical constituents such as triterpenoids, saponins, flavonoid, saponins, sterols, terpenoids, flavonoids, coumarins, alkaloids, glycosides, proteins and amino acids have been reported in different *Fagonia* species[9]. From some selected traditional medicinal plant species isolation and identification of the bioactive compounds can be used to formulate new drugs to treat various diseases and disorders. The major bioactive chemical constituents of medicinal plants are tannins, alkaloids, flavonoids, terpenoids, phenolics, etc., it has several biological activities[10]. The preliminary phytochemical screening of *F. cretica* crude extract showed the active phytocomponents and antibiotic activity[11].Phytochemical compounds are naturally present in medicinal plants or parts such as leaves, fruits, flowers, aerial parts, and roots. Those secondary metabolites have

defense mechanisms against pathogenic microorganisms like fungi, viruses, and bacteria. The alkaloid is used in medicines as anesthetic agents [12].Plant-based isolated bioactive chemical constituents are multifunctional that means isolated bioactive compounds can be used treatment of different diseases[13]. The flavonoids present in many medicinal plants have an antioxidant activity. In the body developed scavenge free radicals, and thus body aerial parts against damage from free oxygen species. This plant secondary metabolite protect body against scavenge free radicals. Antioxidants extracted from plants play major role in cell protection [14,15]. Potential phytochemical leads to searching for new drugs, contributions in pharmacognosy, pharmaceutical, and healthcare products. Secondary metabolites are used for checking biological activities such as antioxidant activity [16,17]. Methanolic solvent extracts of *F. cretica* has good antimicrobial activity as well as strong antioxidant activity against reactive radical species[18,19].

MATERIALS AND METHODS

Collection of Plant Material

Whole plant of *Fagonia schweinfurthii* collected from Kesandphata, Pune (M.S.) India.

Taxonomy & Morphology: Identification and classification of plants using different Floras [20,21]. The plant specimen was identified and authentified by BSID0004383 and BSID0004384 voucher specimen at Botanical survey of India, Regional Office, Western Circle, Pune: 411 001.Maharashtra (India) (Figure 1, Table 1).

Table 1. Systematic position of *F. schweinfurthii*

Hierarchy
Kingdom: Plantae
Division: Angiosperms
Class: Dicotyledoneae
Order: Zygophyllales
Family: Zygophyllaceae
Genus: *Fagonia*
Species: *F. schweinfurthii* Hadidi.

Figure 1: Habit of *F. schweinfurthii*

Preparation of the crude extracts

Plant parts such as aerial part and roots collected and dried in shade place. This dried sample make fine powder and used for phytochemical evaluation and antioxidant analysis.

Solvent extraction: Fresh plant material collect and this plant material dried under shade condition and successively extracted by cold extract for water and Soxhlet method hot extract for methanol solvent for phytochemical tests and antioxidant activity [22].

Phytochemical Evaluation

Usually medicinal plant contains active constituents like alkaloids, carbohydrates, flavonoids, anthocyanins, tannins, glycosides, phenols, saponins, starch, lignins, etc. to test their presence via phytochemical tests [22].

Antioxidant Assays

ABTS free radical scavenging assay

Plant crude extracts 1 ml. were allowed to react with 1 ml of the ABTS solution and the absorbance was taken at 734 nm after 7 min using Microtiter plate spectrophotometer. 2,2'-azino-bis (3 ethylbenzo thiazoline-6-sulphonic acid) is chemical compound used to observed the reaction kinetics of specific enzymes. In this assay, ABTS is converted to its radical action by addition of sodium persulfate. This radical action is blue in color and absorbs light at 750 nm. The reaction monitored by spectrophotometrically. The ABTS scavenging capacity of the extract was compared with that of BHT and percentage inhibition calculated as ABTS radical scavenging activity (%) = [(Abs Control – Abs Sample)]/ (Abs Control)] x100. Where, Abs Control is the absorbance of ABTS radical + methanol; Abs Sample is the absorbance of ABTS radical + sample extract/ standard. IC50 (Inhibition coefficient) value was determined by interpolation from linear regression analysis OS % scavenging activity against sample concentration [23].

DPPH radical scavenging assay

The antioxidant activities of the samples were measured in term of radical scavenging ability using the stable radical 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical-scavenging assay. Methanol solutions (40 µl) of the samples at various concentrations ((10 µg/ml, 20 µg/ml, 30 µg/ml, 40 µg/ml and 50 µg/ml), and positive control (ascorbic acid) at concentration (10 µg/ml, 20 µg/ml, 30 µg/ml, 40 µg/ml and 50 µg/ml) were added to 3 ml of DPPH in methanol (10 µg/ml) in a 96 well-microtitre plate. The change in absorbance (517 nm) measured after 30 min with a microtitre plate reader (Versamax) (Blois, 1958; Alam et al. 2013; Satya et al. 2015). Radical scavenging activity of DPPH radical is calculated by using following formula: DPPH scavenging effect (% inhibition) $=A_0-A_1/A_0*100$

Were, A_0- Absorbance of control reaction

A_1- Absorbance in presence of all of the extract and references[23].

RESULTS

Phytochemical analysis

The preliminary phytochemical analysis results of *F. schweinfurthii* (aqueous and ethanol extracts) were recorded (Table 2). *F. schweinfurthii* aerial part and root extracts contains alkaloids, starch, protein, tannin, flavonoid, terpenoid, carbohydrates, lignin and phenols.

Antioxidant activity

The ABTS free radical scavenging and DPPH radical scavenging assay of the *F. schweinfurthii* extract at different concentrations (10-50 µg/ml) were compared with ascorbic acid at varying concentrations (10-50 µg/ml). The notable increase in the ABTS assay antioxidant action is due to the scavenging ability of extracts and ascorbic acid. The extract showed maximum activity of aerial part sample 22.80 % at 50 µg/ml and root sample 25.64 % at 50 µg/ml, whereas ascorbic acid at the same concentration exhibited 55.80 % inhibition. The IC50 values were found to be 50 µg/ml and 50 µg/ml for ascorbic acid and *F. schweinfurthii* methanol aerial part and root extract respectively (Graph 1, Table 3).

The notable increase in the DPPH radical scavenging assay antioxidant action is due to the scavenging ability of extracts and ascorbic acid as a standard. The extract showed maximum activity of aerial part sample 96.78 % at 50 µg/ml and root sample 54.15 % at 50 µg/ml, whereas ascorbic acid at the same concentration exhibited 96.78 % inhibition. The IC_{50} values were found to be 50 µg/ml and 50 µg/ml for ascorbic acid and *F. schweinfurthii* methanol aerial part and root extract respectively (Graph 2, Table 4).

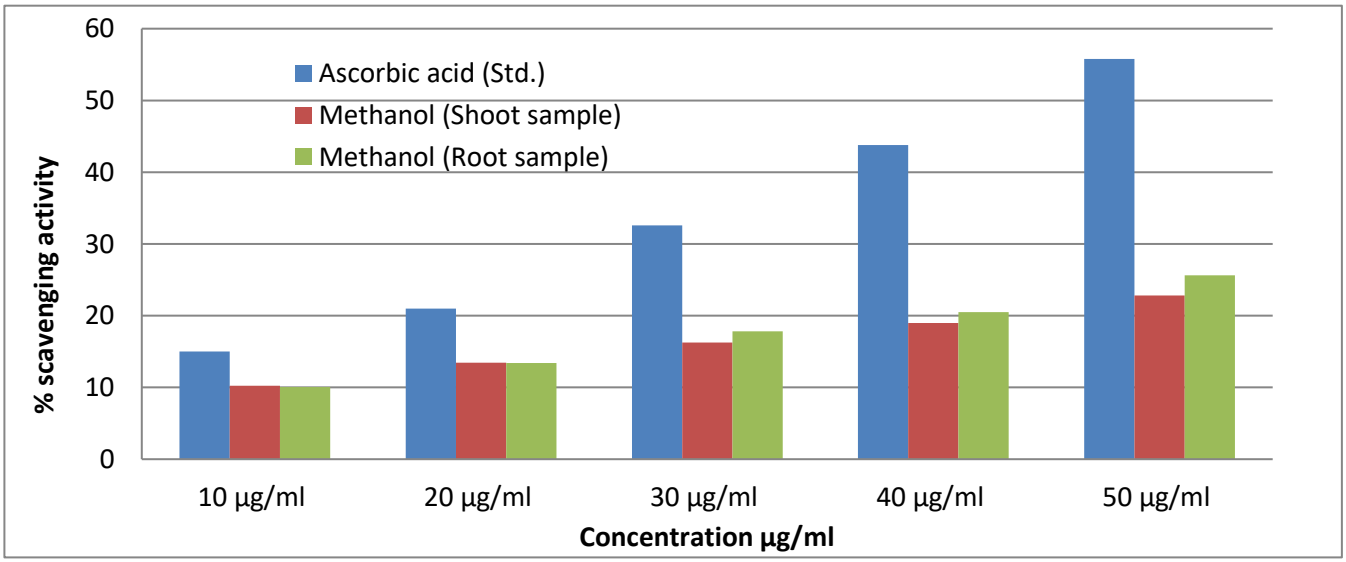
Table 2: Phytochemical tests

Phytochemicals	Result			
	Aerial parts extract		Root extract.	
	A.E.	E.E.	A.E.	E.E.
Alkaloids	+	+	+	+
Starch	+	+	+	+
Protein	+	+	+	+
Tannin	+	+	+	+
Saponin	+	-	+	-
Flavonoid	+	+	+	+
Free Amino Acid	+	-	+	-
Terpenoid	+	+	+	+
Carbohydrates	+	+	+	+
Lignin	+	+	+	+
Phenols	+	+	+	+

Abbreviations: A.E.= Aqueous Extract, E.E.= Ethanol Extract, (+) = Present, (-) = Absent

Table 3: Antioxidant activity of *F.schweinfurthii* aerial part and root by ABTS assay.

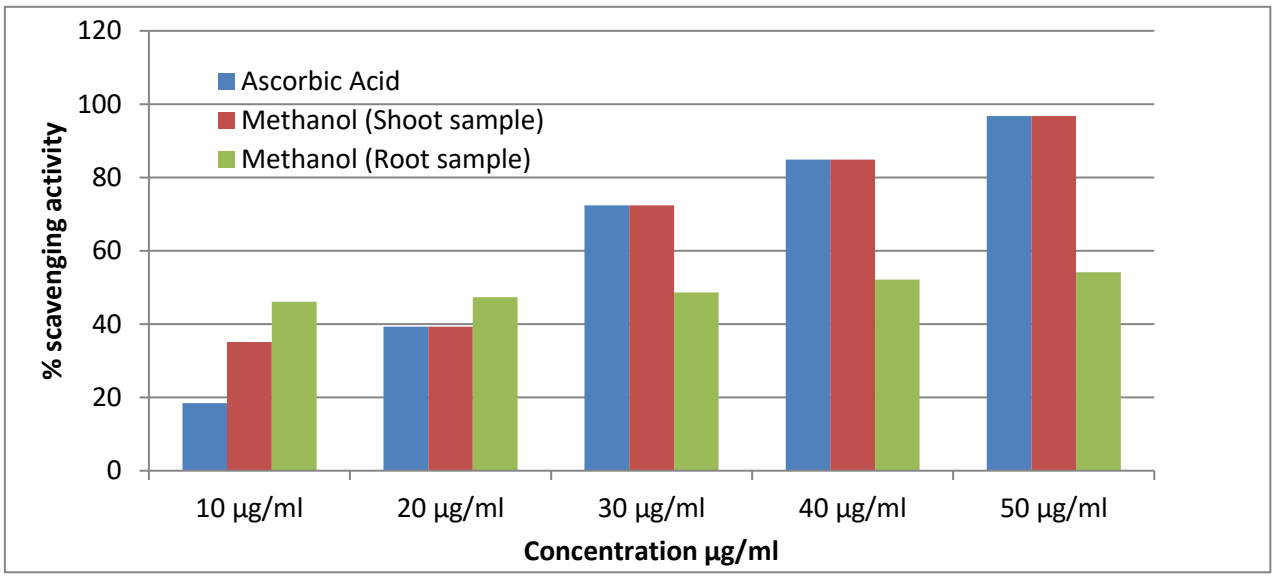
Concentration in µg/ml	Ascorbic Acid I%±SD	Methanol (Aerial part sample) I%±SD	Methanol (Root sample) I%±SD
10 µg/ml	15.01±0.27	10.22±0.28	10.06±0.28
20 µg/ml	21.01±0.26	13.44±0.28	13.40±0.28
30 µg/ml	32.60±0.24	16.25±0.27	17.84±0.27
40 µg/ml	43.80±0.22	18.97±0.27	20.49±0.27
50 µg/ml	55.80±0.19	22.80±0.26	25.64±0.28



Graph 1: Antioxidant activity of *F.schweinfurthii* aerial part and root by ABTS assay

Table 4: Antioxidant activity of *F.schweinfurthii* aerial part and root by DPPH assay

Concentration in µg/ml	Ascorbic Acid I%±SD	Methanol (Aerial part sample) I%±SD	Methanol (Root sample) I%±SD
10 µg/ml	18.39±0.59	35.06±0.22	46.11±0.77
20 µg/ml	39.33±0.38	39.33±0.20	47.37±0.12
30 µg/ml	72.41±0.32	72.41±0.29	48.62±0.17
40 µg/ml	84.90±0.08	84.90±0.24	52.14±0.15
50 µg/ml	96.78±0.26	96.78±0.15	54.15±0.14



Graph 2: Antioxidant activity of *F.schweinfurthii* aerial part and root by DPPH assay

DISCUSSION

Fagonia plant genus is traditionally well known for the treatment of various diseases and abnormalities such as skin eruptions, heal sores, skin diseases, antipyretic, pain relief, ear infection, and venereal diseases [6]. *Fagonia indica* has pharmacological activities like antidiabetic, anticancer, anti-leishmanial, antipyretic, anti-inflammatory, laxative, gastro protective, hepatoprotective and antioxidant effects. *F. schweinfurthii* was also reported as an ethnomedicinal plant[8,7]. A number of phytochemical constituents were reported in some *Fagonia* species such as triterpenoids, saponins, flavonoids, saponins, sterols, terpenoids, flavonoids, coumarins, alkaloids, glycosides, proteins, and amino acids. *F. schweinfurthii* aerial part and root photochemical analysis showed positive tests like alkaloids, starch, protein, tannin, flavonoid, terpenoid, carbohydrates, lignin, and phenols[9,10]. The preliminary phytochemical analysis of *F. cretica* species showed the vital phytocomponents and antibiotic activity, during the study also detected phytocomponents [11]. Potential phytochemicals found in this medicinal plant species, its futuristic leads to finding new drugs. The novel drug will contribute to pharmacognosy, pharmaceutical, and healthcare products. Plant-based secondary metabolites are used for checking biological activities such as antioxidant activity, during the study we observed significant bioactive antioxidant activity of *F. schweinfurthii*[16,17]. Methanolic extracts of *F. cretica* have good antimicrobial potential as well as strong antioxidant activity against reactive oxygen and nitrogen species. Our study also found strong antioxidant activity [18,19].

CONCLUSION

These plants based secondary metabolite compounds are well known for their many biological activities. Experimental investigation of an aerial part extract and root part extract of *Fagonia schweinfurthii* plant shows an antioxidant activity. Especially, the analysis of these plant part extract in methanol as solvent reveals the antioxidant activity. The more significant and prominent result was obtained in DPPH radical scavenging assay. Thus, this preliminary analysis of phytochemical tests and radical scavenging assays will use in the detection of the active principles chemical components and later may lead to novel drug discovery and development.

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