



Phytochemical analysis and antioxidant activity of *Haloxylon salicarnicum*, *Ochradenus arabicus* and *Tamarix nilotica*

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ABSTRACT

In the present investigation, the preliminary phytochemical analysis and antioxidant potential of hexane, chloroform, acetone and methanol extracts of *Haloxylon salicarnicum*, *Ochradenus arabicus* and *Tamarix nilotica* were reported. The presence of flavonoid, alkaloid, phenols, terpenoids, carbohydrate, tannin, protein, steroids, saponin, phlobatannin, cardiacglycoside, anthraquinones and volatile oils were determined and for antioxidant activity, DPPH, ABTS, superoxide anion radical and hydroxyl radical scavenging potential were studied. Strong presence of alkaloid, tannin, steroids in *H. salicarnicum*, flavonoid and phenols in *O. arabicus* and saponin *T. nilotica* were observed. In the present investigation, all the extracts inhibited the free radicals the methanol extract of *O. arabicus* was identified as potential crude extract compared to all other extracts with the IC₅₀ values of 91.65 (DPPH), 94.62 (ABTS), 95.82 (O₂) and 96.02 (OH) µg/mL. Whereas, the IC₅₀ value of the standard, Gallic acid were 125.25 (DPPH), 142.32 (ABTS), 130.78 (O₂) and 139.93 µg/mL (OH). Whereas, the IC₅₀ value of the standard, Gallic acid were 125.25 (DPPH), 142.32 (ABTS), 130.78 (O₂) and 139.93 µg/mL (OH). The present study suggests that methanol extract of *O. arabicus* can be used for the isolation potential natural antioxidant.

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INTRODUCTION

Antioxidants are the compounds or materials which can effectively catch the free radicals and reduce the occurrence of damage induced by the oxidative stress. Now a day, antioxidants and free radicals are widely discussed in the in the nutritional and clinical field [1] since the free radicals induced oxidative stress is mainly associated with the number of human diseases. The risk of illness caused by the free radicals is mainly due to pollution, unhealthy life style, exposure to chemicals, smoking, drugs etc., [2-3]. Furthermore, antioxidants also play a vital role in food preservation through the oxidation inhibition process and contribution to health promotion rented by nutraceuticals and dietary supplements [4]. Lipid oxidation is a main factor destroying food quality of fruits and vegetables, meat [5] and dairy products [6] in the food industry [7,8].

The synthetic antioxidants such as butylated hydroxytoluene (BHT), butylated hydroxyanisole (BHA), propyl gallate and citric acid are widely used in the food industry as preservatives/additives.

Application of these antioxidants during food processing leads to the appearance of notable side effects [9] i.e., enlarge the liver size, increase the microsomal enzyme activity in living cells and can exhibit carcinogenic effects [10]. Hence, the researchers are focused on natural antioxidants found in plants, animals and microorganisms [4,11,12] and also strong chelators of metal ions [13]. So, the present investigation was aimed to investigate the preliminary phytochemical analysis and antioxidant potential of some UAE indigenous plants such as *Haloxylon salicarnicum*, *Ochradenus arabicus* and *Tamarix nilotica*.

METHODS

Plant Collection and Crude Extract Preparation

The leaves of *Haloxylon salicarnicum*, *Ochradenus arabicus* and *Tamarix nilotica* were collected from its natural habitats in various palaces of Al Ain, UAE and the collected plants were dried in shade followed by oven (50 °C) prior to grinding in an

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electrical blender. For phytochemical analysis, methanol was used for the preparation of crude extracts. Whereas, for antioxidant study, different solvent systems viz. hexane, chloroform, acetone and methanol were used for preparation of crude extracts. After preparation, the solvents were evaporated and dried extracts were stored at 4 °C and used for antioxidant assay.

Preliminary Phytochemical Analysis

Pytochemical analysis (flavonoids, carbohydrates, alkaloids, saponin, phenols, tannins, phlobatannins, steroids, terpenoids, cardiac glycosides, volatile oils) were done on the methanolic extract of the powder form the leaves of *H. salicarnicum*, *O. arabicus* and *T. nilotica* using standard qualitative methods as described by and Harborne, Edeoga et al. [14,15].

Antioxidant Activity

DPPH• radical scavenging activity

The DPPH scavenging activity was determined spectrophotometrically by the method of Brand-Williams et al. [16].

ABTS•⁺ radical cation decolourization assay

ABTS•⁺ radical cation scavenging potential was determined by the method of Wolfenden and Willson [17].

Superoxide anion radical (O₂•⁻) scavenging assay

Superoxide anion scavenging activity was determined by the method of Nishimiki et al. [18].

Hydroxyl radical (OH•) scavenging assay

The hydroxyl radical scavenging activity of the plants was evaluated by the method of Halliwell et al. [19].

Statistical Analysis

Statistical analysis was performed using one way analysis of variance followed by Duncan's Multiple Range Test using

Statistical Package for the Social Science software (SPSS) package version 21.00. Results were expressed as mean ± standard deviation for six replicates. P values < 0.05 were considered statistically significant.

RESULTS AND DISCUSSION

Phytochemical Analysis

Preliminary phytochemicals analysis is a valuable step, in the detection of the bioactive compounds available in medicinal plants and subsequently may lead to drug discovery and development. The results on the preliminary phytochemical screening of *H. salicarnicum*, *O. arabicus* and *T. nilotica* are presented in Table 1. The results indicated that the presences of phytochemicals are varied among the plants tested. In the present study, volatile oils are not deducted in all the plant samples. Nevertheless, *H. salicarnicum* had strong presence of alkaloid, tannin, steroids and partially strong presence of flavonoid, saponin, cardiacglycoside and weak presence of phenols, terpenoids, carbohydrate, protein, phlobatannin and anthraquinines contents. Whereas, *O. arabicus* has strong presence of flavonoid phenols and partially strong presence of Alkaloid, Tannin, Saponin and weak presence of terpenoids, carbohydrate, protein, phlobatannin, cardiacglycoside, anthraquinines. Steroid content was not deducted in the leaves of *O. arabicus*. In *T. nilotica*, strong presence of saponin and partially strong presence of flavonoid, alkaloid, tannin, protein and phlobatannin were observed. Furthermore, phenols, carbohydrate, steroids, cardiacglycoside were weakly present in the *T. nilotica* leaves and anthraquinines was not deducted in the plant. There is no previous report on preliminary phytochemical screening on *H. salicarnicum*, *O. arabicus* to compare it. However, the result on phytochemical screening of *T. nilotica* is similar to the previous work [20].

Antioxidant Activity

The results on percentage of DPPH•, ABTS•⁺, O₂•⁻ and OH• radicals inhibition are given in Figs. 1a-d (*H. salicarnicum*), 1e-h (*O. arabicus*) and 1i-l (*T. nilotica*) and the IC₅₀ values are presented in Table 2. All the extracts inhibited the free radicals in dose depended manner. In the present investigation, the

Table 1: Phytochemical screening of *H. salicarnicum*, *O. arabicus* and *T. nilotica*

Phytochemicals	Observation	<i>H. salicarnicum</i>	<i>O. arabicus</i>	<i>T. nilotica</i>
Flavonoid	Yellow colour persist	++	+++	++
Alkaloid	orange precipitate	+++	++	++
Phenols	Blue colour	+	+++	+
terpenoids	reddish brown colour	+	+	++
Carbohydrate	Green colour	+	+	+
Tannin	Green brownish colour	+++	++	++
protein	white precipitate which turns red	+	+	++
Steroids	A reddish brown ring	+++	-	+
Saponin	formation of emulsion	++	++	+++
Phlobatannin	red precipitate	+	+	++
Cardiacglycoside	No yellowish brown ring of upper layer	++	+	+
Anthraquinines	Pink, violet or red coloration	+	+	-
Volatile oils	White precipitate	-	-	-

'+++'-strong presence; '++'- partially strong presence; '+'- weak presence; '-'- shows absence of phytochemicals

Table 2: Antioxidant activity of various extracts of *H. salicarnicum*, *O. arabicus* and *T. nilotica*

Name of the sample	IC ₅₀ µg/mL			
	DPPH [•]	ABTS ^{•+}	O ₂ ^{•-}	OH [•]
<i>Haloxylon salicarnicum</i>				
Hexane	194.17	190.33	202.42	150.96
Chloroform	149.70	158.02	178.76	162.28
Acetone	158.93	141.44	149.61	156.29
Methanol	112.56	104.38	105.10	107.22
<i>Ochradenus arabicus</i>				
Hexane	162.49	183.01	178.44	143.80
Chloroform	118.79	133.15	132.69	146.92
Acetone	162.49	155.47	148.50	133.90
Methanol	91.65	94.62	95.82	96.02
<i>Tamarix nilotica</i>				
Hexane	147.57	169.43	151.19	153.84
Chloroform	156.20	153.18	119.73	137.93
Acetone	124.10	152.29	137.43	141.20
Methanol	115.23	113.76	116.84	111.21
Gallic acid	125.25	142.32	130.78	139.93

methanol extract of *O. arabicus* was identified as potential crude extract compared to all other extracts with the IC₅₀ values of 91.65 (DPPH), 94.62 (ABTS), 95.82 (O₂) and 96.02 (OH). Whereas, the IC₅₀ value of the standard, Gallic acid were 125.25 (DPPH), 142.32 (ABTS), 130.78 (O₂) and 139.93 µg/mL (OH). The presence of high level of phenols may be responsible for this activity. The activities of several extracts having antioxidant power have been elucidated by various workers in different plants recently [21-24]. The hexane, chloroform, acetone and methanol extracts of *H. salicarnicum* and *T. nilotica*, hexane, chloroform and acetone extract of *O. arabicus* also showed slight to moderate antioxidant potential and IC₅₀ values of the extracts were *H. salicarnicum* = hexane extract–194.17 (DPPH), 190.33 (ABTS), 202.42 (O₂) and 150.96 µg/mL (OH); chloroform extract–149.70 (DPPH), 158.02 (ABTS), 178.76 (O₂) and 162.28 µg/mL (OH); acetone extract–158.93 (DPPH), 141.44 (ABTS), 149.61 (O₂) and 156.29 µg/mL (OH); methanol extract–112.56 (DPPH), 104.38 (ABTS), 105.10 (O₂) and 107.22 µg/mL (OH); *O. arabicus* = hexane extract–162.49 (DPPH), 183.01 (ABTS), 178.44 (O₂) and 143.80 µg/mL (OH); chloroform extract–118.79 (DPPH), 133.15 (ABTS), 132.69 (O₂) and 146.92 µg/mL (OH); acetone extract–162.49 (DPPH), 155.47 (ABTS), 148.50 (O₂) and 133.90 µg/mL (OH); *T. nilotica* = hexane extract–147.57 (DPPH), 169.43 (ABTS), 151.19 (O₂) and 153.84 µg/mL (OH); chloroform extract–156.20 (DPPH), 153.18 (ABTS), 119.73 (O₂) and 137.93 µg/mL (OH); acetone extract–124.10 (DPPH), 152.29 (ABTS), 137.43 (O₂) and 141.20 µg/mL (OH); methanol extract–115.23 (DPPH), 113.76 (ABTS), 116.84 (O₂) and 111.21 µg/mL (OH). Recently, several antioxidant studies were performed on different plant species. Lim et al. [25] reported the antioxidant potential of ethyl acetate, ethanol, and methanol extracts of *Sargassum serratifolium*. The authors found that ethanol was the efficient solvent for the extraction antioxidant molecule as the ethanol extract showed good antioxidant potential. Antioxidant activity of ethanol and water extracts of *Trapa bispinosa* leaves was studied by Xia et al. [26]. Ethanol extracts showed good stronger superoxide anion scavenging capacity potential. In that way, the

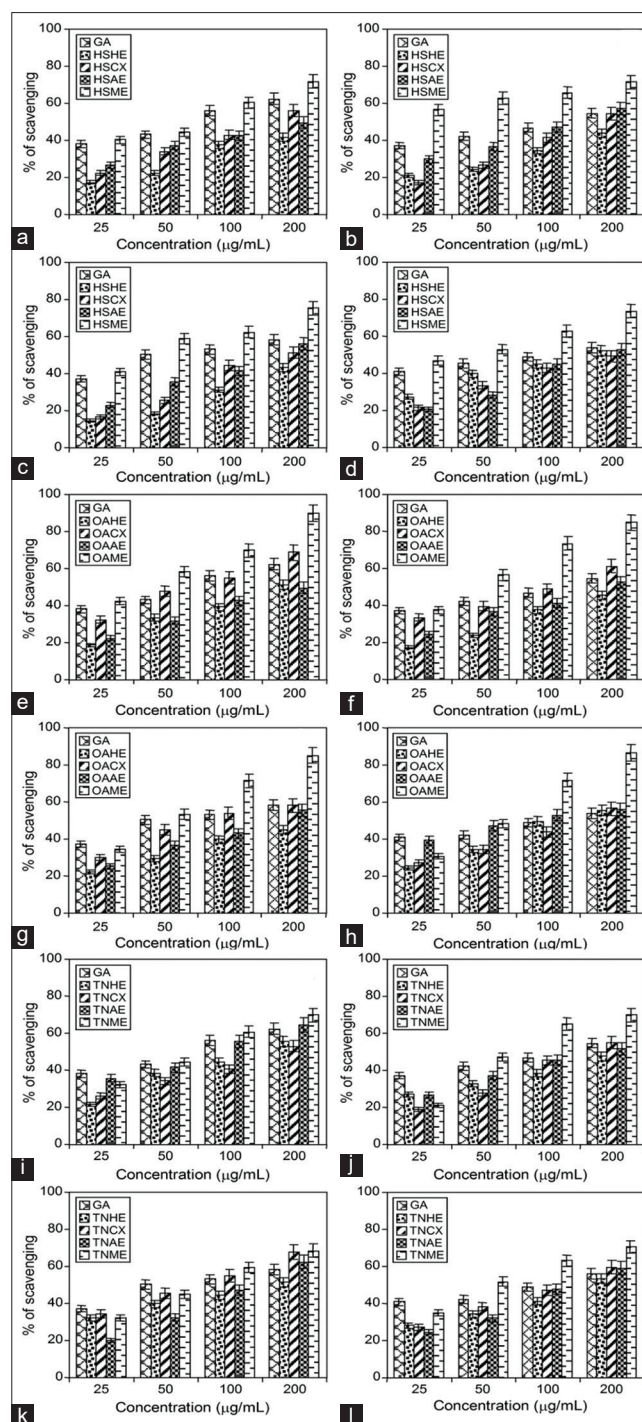


Figure 1: Free radicals inhibition percentage of *H. salicarnicum* (a- DPPH, b-ABTS, c-O₂^{•-}, d- OH[•]), *O. arabicus* (e- DPPH, f-ABTS, g-O₂^{•-}, h- OH[•]) and *T. nilotica* (i- DPPH, j-ABTS, k-O₂^{•-}, l- OH[•])

present study suggests that methanol extract of *O. arabicus* can be used for the isolation potential natural antioxidant.

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