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Studies on antioxidant activity of different extracts of aerial parts of Cadaba farinose Forsk: An in-vitro techniques

Jambula Dinesh Babu[1], Venugopalan Santhosh Kumar[*2]

[1]Research scholar, Department of Pharmacology, School of Pharmaceutical sciences, Vels Institute of Science, Technology and advanced studies, Pallavaram, Chennai-600117, Tamilnadu, India
[2]Department of Pharmacology, School of Pharmaceutical Sciences, Vels Institute of Science, Technology and advanced Studies, Pallavaram, Chennai-600117, Tamilnadu, India

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ABSTRACT

Cadaba farinosa (family Capparidaceae) is generally known as "Indian cadaba" in the traditional ayurvedic system. The current study, aerial parts of different concentrates (Pet.ether, ethyl acetate and methanol) of *Cadaba farinose* was evaluated for its *in-vitro* antioxidant potential by Diphenylpicrylhydrazyl radical, and total antioxidant activity taking ascorbate as standard and superoxide radical activity taking Quercetin as the standard for the in-vitro methods. The methanolic concentrates of *Cadaba farinose* & ascorbic acid exhibited antioxidant potential possessing IC_{50} 208μg/ml & 66μg/ml (Diphenylpicrylhydrazyl radical) , 188μg/ml & 57μg/ml (total antioxidant). The methanolic concentrates of *Cadaba farinose* & quercetin exhibited antioxidant potential possessing IC_{50} 252μg/ml & 60μg/ml (superoxide radical). The IC_{50} value was originated that methanolic concentrates of *Cadaba farinose* more efficient in Diphenylpicrylhydrazyl radical, superoxide radical activity, total antioxidant activity compared EA & PE concentrates. The difference in scavenging potential of the extracts can be due to variation in the percentage of bioactive compound present in different solvents. *Invitro* antioxidant studies show methanolic concentrates of *Cadaba farinose* have better antioxidant activity. This result indicates that aerial parts of methanolic concentrate *Cadaba farinose* could serve as a natural antioxidant, which may be useful in preventing free radical-induced diseases.

[*]Corresponding Author

Name: Venugopalan Santhosh Kumar
Phone: 9445305819
Email: natu9sea@gmail.com

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INTRODUCTION

Oxidative stress so-called is by an excessive load of free radicals that cause cumulative damage to cellular biomolecules leading to disruption of antioxidant defence mechanism (Tiwari, 2004). Generation of free radicals and imbalance of the body's defence mechanisms leads to oxidative stress. The root cause for the formation & generation free radicals is mainly by exogenous sources like Cigarette smoke, environmental pollutants, automobile exhaust, organic solvents, Radiations, air pollutants, pesticides (Halliwell *et al.*, 1992). The Primarily cause for the onset of a majority of disease conditions like Atherosclerosis, Hypertension, ischaemic diseases, Alzheimer disease,

Parkinsonism, Cancer and Inflammatory conditions due to imbalance between pro-oxidant and antioxidant homeostasis. The pharmacological mechanism of flavonoids is directly correlated with its antioxidant activities which can scavenge O_2^- and OH by single electron transfer. The scavenging process is recorded by Electron Spin Resonance (ESR) (Chen *et al.*, 1989).

The current trend of research is the investigation of medicines of plant origin which is affordable and access able with minimal side effects. As crude drugs of herbs and other plant materials rich in secondary metabolites like flavonoids, phenolic compounds, alkaloids etc. are increasing interest in the pharmaceutical industry because they prevent the degradation of lipids and enhance their free radical scavenging potential thereby improving its medicinal values (Lagarda *et al.*, 2006).

Cadaba farinosa (family Capparidaceae) is generally known as "Indian cadaba" in the traditional ayurvedic system. Quercetin, isoorientin, hydroxybenzoic acid, syringic acid, vanillic acid and 2-hydroxy-4-methoxy benzoic acid were isolated from *Cadaba farinosa (Khare, 2006)*. *Cadaba farinose* was used for different diseases like anthelmintic, antisyphilitic, aperients, stimulant, antiscorbutic, antiphlogistic (Ambasta, 1986). *Cadaba farinose* was used rheumatic pain (Ambasta, 1986).

The flower buds are stimulant, antiscorbutic, purgative, antiphlogistic and anthelmintic, especially for round worm (Nadkarni, 2002). *Cadaba farinose* was used as hepatoprotective activity (Telrandhe *et al.*, 2010). *C. farinose* was used for the treatment of wound healing (Habib *et al.*, 2004) and anticancer (Graham *et al.*, 2000). Still, no literature is available on the antioxidant activity of aerial parts *Cadaba farinosa*. Thus, the present study to assess antioxidant activities of aerial parts *Cadaba farinosa.*

METHODOLOGY

Gathering & Identification of Plant

The aerial parts *Cadaba farinose* (family Capparidaceae) were gathered form Senkottai, Tirunelveli District of Tamilnadu, India. Plant identification was made from Botanical investigation of India, Palayamkottai. The *Cadaba farinose* were desiccated under shadowy, segregate, crushed through the grinder. (ShajiSelvin and Muthu, 2010).

Preparation of Concentrates

The pulverized materials were packed in a muslin cloth and extracted with pet.ether, ethyl acetate and methanol as solvents respectively according to the increasing order of polarity (Alagumanivasagam and Kottai Muthu, A., Manavalan, R , 2010) through hot constant percolation method in Soxhlet equipment (Borse *et al.*, 2012) for twenty-four hours.

The concentrates were concentrated through the rotational evaporator and subjected to solidify drying in a lyophilizer till dry powder was acquired. (Alagumanivasagam *et al.*, 2012).

Assessment of Antioxidant potential through invitro methods:

The variety of concentrates of *Cadaba farinose* were used assessment of antioxidant activity by Mensor *et al.* (2001) method was adopted for Diphenyl picrylhydrazyl radical assay, Winterbourn *et al.* (1975) method described for Superoxide radical (O_2^-) assay & Prieto *et al.* (1999) method described for total antioxidant activity.

RESULTS

DPPH scavenging activity

The DPPH activity of PE concentrates of *Cadaba farinose* appeared Table 1. The PE concentrates of *Cadaba farinose* exhibit a more DPPH activity of 50.04% at 800 μg/mL & ascorbate was recorded 72.82% at 800 μg/mL. The IC_{50} of the PE concentrates of *Cadaba farinose* & ascorbic acid was recorded 795μg/mL & 66μg/mL correspondingly.

DPPH activity of EA concentrates of *Cadaba farinose* summarized in Table 2. The EA concentrates of *Cadaba farinose* exhibit more DPPH scavenging potential of 57.18% at 800 μg/mL & ascorbate was recorded 72.82% at 800 μg/mL. The IC_{50} of the EA concentrates of *Cadaba farinose* & ascorbic acid was recorded 582μg/mL & 66μg/mL correspondingly.

DPPH potential of methanolic concentrates of *Cadaba farinose* appeared in Table 3. The methanolic concentrates of *Cadaba farinose* having more DPPH scavenging potential of 64.46% at 800 μg/mL & ascorbate were recorded 72.82% at 800 μg/mL. The IC_{50} of the methanolic concentrates of *Cadaba farinose* & ascorbic acid were recorded 208μg/mL & 66μg/mL correspondingly.

The methanolic concentrates of *Cadaba farinose* were recorded to more activity than PE & EA concentrates.

The IC_{50} of the methanolic concentrates of *Cadaba farinose* & ascorbic acid were found to be 208μg/mL & 66μg/mL correspondingly.

Among the three different plant concentrates tested, interestingly, in the DPPH radical activity of the methanolic concentrate of *Cadaba farinose* having more Diphenylpicrylhydrazylradical potential comparable with that of ascorbic acid.

Table 1: DPPH radical activity of Cadaba farinose PE extract

S.no	Extract (μg/mL)	% of activity(±SEM)*	
		PE concentrates	Ascorbate
1	100	10.57±0.064	54.19±0.024
2	200	24.78±0.036	59.24±0.032
3	400	37.67±0.052	65.32±0.054
4	800	50.04±0.012	72.82±0.062
		IC_{50} = 795 μg/mL	**IC_{50} = 66 μg/mL**

*Everyvalue was articulated as mean ± SEM for three experimentation

Table 2: DPPH radical activity of Cadaba farinose EA extract

S.No	Extract (μg/mL)	% of activity(±SEM)*	
		(EA concentrates)	(Ascorbate)
1	100	26.15±0.065	54.19±0.024
2	200	35.98±0.043	59.24±0.032
3	400	44.34±0.032	65.32±0.054
4	800	57.18±0.028	72.82 ±0.062
		IC_{50} = 582μg/ml	**IC_{50} = 66 μg/ml**

*Every value was articulated as mean ± SEM for three experimentation

Table 3: DPPH radical activity of Cadaba farinose methanolic extract

S.No	Extract (μg/mL)	% of activity(±SEM)*	
		(Methanolic concentrates)	Ascorbate
1	100	37.48±0.032	54.19 ±0.024
2	200	49.82±0.067	59.24 ±0.032
3	400	57.67±0.034	65.32 ±0.054
4	800	64.46±0.018	72.82 ±0.062
		IC_{50} = 208μg/mL	**IC_{50} = 66μg/mL**

*Every value was articulated as mean ± SEM for three experimentation

Table 4: Activity of PE extract of Cadaba farinose on Superoxide radical method

S.no	Extract (μg/mL)	% inhibition (±SEM)*	
		(PEextract)	(Quercetin)
1	100	22.42±0.024	64.32±0.018
2	200	34.56±0.045	71.12±0.024
3	400	42.75±0.076	83.44±0.046
4	800	48.12±0.038	91.23±0.016
		IC_{50} = 933μg/mL	**IC_{50} = 60 μg/mL**

*Every value was articulated as mean ± SEM for three experimentation

Table 5: Activity of EA extractof Cadaba farinose on Superoxide radical method

S.no	Extract (μg/ml)	% of inhibition(±SEM)*	
		(Ethyl acetate extract)	(Quercetin)
1	100	25.44±0.034	64.32 ±0.018
2	200	37.83±0.023	71.12 ±0.024
3	400	49.45±0.047	83.44 ±0.046
4	800	56.87±0.056	91.23 ±0.016
		IC_{50} = 405μg/mL	**IC_{50} = 60 μg/mL**

*Every value was articulated as mean ± SEM for three experimentation

Table 6: Activity of Methanolic extract Cadabafarinose on Superoxide radical method

S.no	Extract (μg/mL)	% inhibition(±SEM)*	
		Methanolic extract	Quercetin
1	100	36.64±0.056	64.32 ±0.018
2	200	52.02±0.034	71.12 ±0.024
3	400	59.58±0.042	83.44 ±0.046
4	800	64.49±0.082	91.23 ±0.016
		IC_{50} = 252μg/mL	**IC_{50} = 60 μg/mL**

*Every value was articulated as mean ± SEM for three experimentation

Table 7: Total antioxidant activity of Cadaba farinose PE Extract

S.no	Extract (μg/ml)	% inhibition(±SEM)*	
		PE concentrates	Ascorbate
1	50	22.45±0.056	50.76±0.024
2	100	26.64±0.028	61.68±0.035
3	200	33.34±0.044	74.64±0.048
4	300	39.42±0.037	98.12±0.021
		IC_{50} = 620μg/mL	**IC_{50} = 57μg/mL**

Every value was articulated as mean ± SEM for three experimentation

Table 8: Total antioxidant activity of Cadabafarinose EA Extract

S.no	Extract (μg/mL)	% inhibition(±SEM)*	
		(EAconcentrates)	Ascorbate
1	50	16.18±0.032	50.76 ±0.024
2	100	24.28±0.022	61.68 ±0.035
3	200	35.12±0.058	74.64 ±0.048
4	300	44.56±0.028	98.12 ±0.021
		IC_{50} = 470μg/mL	**IC_{50} = 57μg/mL**

*Every value was articulated as mean ± SEM for three experimentation

Table 9: Total antioxidant activity of Cadabafarinose methanol Extract

S.no	Extract (μg/mL)	% inhibition(±SEM)*	
		Methanol concentrates	Ascorbate
1	50	33.22±0.029	50.76±0.024
2	100	41.54±0.036	61.68±0.035
3	200	51.26±0.075	74.64±0.048
4	300	60.98±0.064	98.12±0.021
		IC_{50} = 188μg/mL	**IC_{50} = 57 μg/mL**

*Every value was articulated as mean ± SEM for three experimentation

Superoxide activity

Superoxide radical activity was expressed in terms of % inhibition of generated free radicals respectively for various concentrations. Superoxide radical potential of PE extract of *Cadaba farinose* shown in Table 4. The more Superoxideradical potential of PE extract and standard at 800 μg/ml was recorded 48.12% and 91.23%. IC_{50} of PE extract and standard was recorded as 933μg/millilitre and 60μg/millilitre correspondingly.

Superoxide radical potential of EA extract of *Cadaba farinose* appeared in Table 5. The more SO scavenging potential of EA extract and standard 800μg/mL was recorded 56.87% and 91.23% correspondingly. EA extract and Quercetin IC_{50} was recorded as 405μg/mL and 60μg/mL correspondingly.

Superoxide radical scavenging potential of methanolic extract of *Cadaba farinose* appeared in Table 6. Superoxide radical scavenging potential was more in methanolic extract and Quercetin (standard) at 800μg/mL was recorded 64.49% and 91.23%. Methanolic extract and standard IC_{50} was recorded as 252μg/mL and 60μg/mL correspondingly.

IC_{50} values and Superoxide radical potential revealed that methanol extract of *Cadaba farinose* is a better activity in scavenging superoxide radical when compared EA and PE extracts. The methanolic extract of *Cadaba farinose* exhibited higher ability in scavenging superoxide anion radical when compared to the standard Quercetin.

Total antioxidant activity (Phosphomolybdic acid method)

Total antioxidant activity of PE concentrates of *Cadaba farinose* appears in Table 7. The PE concentrates of *Cadaba farinose* exhibit an overall antioxidant activity of 39.42% at 300μg/ml & ascorbic acid was recorded 98.12% at 300μg/mL. The IC_{50} of the PE concentrates of *Cadaba farinose* & ascorbic acid was recorded 620μg/mL &57μg/mL correspondingly.

Total antioxidant activity of EA concentrates of *Cadaba farinose* appears in Table 8. The EA concentrates of *Cadaba farinose* exhibit an overall antioxidant activity of 44.56% at 300 μg/mL & ascorbic acid was recorded 98.12% at 300 μg/mL. The IC_{50} of the EA concentrates of *Cadaba farinose* & ascorbic acid was recorded 470μg/mL & 57μg/mL correspondingly.

Total antioxidant activity of methanol concentrates of *Cadaba farinose* appeared in Table 9. The methanol concentrates of *Cadaba farinose* exhibit an overall antioxidant activity of 60.98% at 300 μg/mL & ascorbic acid was recorded 98.12% at 300 μg/mL. The IC_{50} of the methanol concentrates of *Cadaba farinose* & ascorbic acid was recorded 188μg/mL & 57μg/mL correspondingly.

IC_{50} values &total antioxidant potential revealed that methanol concentrates of *Cadaba farinose* is better activity in scavenging total antioxidant potential when compared ethyl acetate & PE extracts.

DISCUSSION

Several *in vitro* model systems have been used for assessing the scavenging activity in various concentrates of *Cadaba farinose.* Antioxidant agents as free radical scavengers, initiator of the complexes of prooxidant metals, reducing compounds and quenchers of singlet oxygen formation (Andlauer and Furst, 1998). The *in-vitro* antioxidant potential of various extracts was evaluated by DPPH radical activity, superoxide radical scavenging activity and total antioxidant activity. The studies were carried out taking ascorbic acid and Quercetin used as the standard antioxidant, which is also a natural antioxidant.

Diphenylpicrylhydrazylis a stable N_2-centered free radical generally utilized for testing the antioxidant potential of herbal concentrates. When the stable Diphenylpicrylhydrazyl radical accepts an elec-

tron from the antioxidant compound, the violet colour of the Diphenylpicrylhydrazyl as reduced to yellow coloured diphenylpicrylhydrazine radical which was measured colourimetrically. Substances which can perform this reaction can be considered as antioxidants & therefore radical scavengers (Mohammad *et al.*, 2009). DPPH radical scavenging activity was examined various extracts and found IC50 value reflects higher scavenging ability. Among the three different plant extracts tested, interestingly, in the DPPH radical scavenging activity of the methanol concentrates of *Cadaba farinose* exhibited DPPH radical scavenging potential comparable with that of standard ascorbate.

Superoxides could be produced in huge amounts by various biological processes. It is known to be more injurious to cellular components as an originator of the most ROS, contributing to tissue damage and many disorders (Halliwell, 1999). The methanolic extract of *Cadaba farinose* exhibited higher ability in scavenging superoxide anion radical when compared to the standard Quercetin.

CONCLUSION

The current trends, antioxidative activity of the herbs having more interest due to their possible use as natural additives to substitute synthetic ones. Among the three various extracts,methanolic extract of *Cadaba farinose* exhibited higher potency of antioxidant activity. These results indicate that methanol concentrates of *Cadaba farinose* might serve as a natural antioxidant, which may be useful in preventing free radical-induced diseases.

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Conflict of interest

The author declares that there is no conflict of interest

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