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Characterization of *Dracaena trifasciata* Leaf Extracts: Potential as Sunscreen Agents and Antioxidants

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Abstract:

In this study, Antioxidant activity was performed by DPPH radical scavenging method for hydroalcoholic extract of leaves of Dracaena trifasciata plant, which showed that hydroalcoholic extract of leaves of this plant on higher concentration possess better antioxidant potential when compare to reference standard quercetin. They exhibited strong antioxidant DPPH radical scavenging activity with IC50 value of 119.04 and 39.21 for leaves extract and quercetin respectively. The antioxidant activity of hydroalcoholic extract could be due to the presence of flavonoids and phenols. Extracts were shows remarkable sunscreen activity with maximum sunscreen factor value of 16.3 at 100µg/ml concentration

Keywords: *Dracaena trifasciata,* Flavonoids, polyphenols, Antioxidant, SPF, DPPH

Introduction:

Antioxidants play a crucial role in maintaining cellular health by neutralizing reactive oxygen species (ROS) and reducing oxidative stress, which is implicated in various diseases, including cancer, cardiovascular disorders, and neurodegenerative conditions.[1] Research has revealed the diverse bioactivities of flavonoids, including antioxidant, anti-inflammatory, anti-cancer, anti-diabetic, neuroprotective, and cardioprotective effects. As potent antioxidants, flavonoids scavenge free radicals, inhibit oxidative stress, and protect cells from damage induced by reactive oxygen species (ROS). Flavonoids, a diverse group of polyphenolic compounds ubiquitous in plants, have garnered significant attention due to their wide-ranging biological activities and potential health benefits.[2] Phenolic compounds are a diverse group of secondary metabolites found abundantly in plants, known for their antioxidant properties and potential health benefits. The antioxidant activity of phenolic compounds is attributed to their ability to donate hydrogen atoms or electrons to free radicals, thereby stabilizing them and terminating chain reactions that propagate oxidative stress.[3]

Sunscreens are chemicals that protect against the adverse effects of solar radiation. Phytoconstituents extracted from plants have been recently considered as potential sunscreen resources because of their UV ray absorption capacity in the UV regions and their antioxidant property. There are reviews about the photoprotective effects of some naturally occurring herbal polyphenols and phenolic compound rich extracts in the skin damage induced by UV irradiation. Several studies have shown the flavonoids and phenolics act as free radical scavengers and enzyme inhibition causes oxidation.[4]

Dracaena trifasciata, commonly known as the snake plant or mother-in-law's tongue, is a popular ornamental plant appreciated for its aesthetic appeal and air-purifying properties. Dracaena trifasciata is a perennial evergreen succulent belonging to the Asparagaceae family. It is native to tropical West Africa and thrives in a variety of environments, ranging from low light to bright indirect sunlight. The plant is characterized by its sword-shaped leaves, which are often variegated with yellow or white stripes, and its upright growth habit, making it an ideal choice for indoor decoration.[5]

Figure 1: Leaves of Dracaena trifasciata

Materials and method:

Dracaena trifasciata plant was collected from Ashtang Ayurvedic College, Indore. The leaves were air dried at room temperature and milled with the aid of grinding machine.

Soxhlet extraction:

The extraction process was carried out using soxhlet extraction method. 50g leaves were weighed into reflux apparatus set up, containing 900ml of hydroalcoholic. The electronic hot plate set according to the boiling point of each solvent. The extraction process was carried out between 8-9hours until the extraction was completed. The extract was collected by evaporating the solvent using rotary evaporators, which was further poured into an air tight container.[6]

Determination of total phenolic compounds and flavonoids content:

Total phenolic compound contents were determined by the Folin-Ciocalteau method. The extract samples (0.5 ml of different dilutions) were mixed with 2.5 ml of 0.2 N Folin-Ciocalteau reagent (Sigma–Aldrich) for 5 min and 2.0 ml of 75 g/l sodium carbonate were then added. The absorbance of reaction was measured at 760 nm after 2 h of incubation at room temperature. Results were expressed as gallic acid equivalents. Total flavonoids were estimated using the method of Ordonez et al.,. To 0.5 ml of sample, 0.5 ml of 2% AlCl3 ethanol solution was added. After 1 h at room temperature, the absorbance was measured at 420 nm. Total flavonoid contents were calculated as quercetin from a calibration curve.[7]

DPPH radical-scavenging activity:

The stable 1,1-diphenyl-2-picryl hydrazyl radical (DPPH) was used for determination of free radical-scavenging activity of the extracts. Different concentrations of each extracts were added, at an equal volume, to methanolic solution of DPPH (100 µM). After 15 min at room temperature, the absorbance was recorded at 517 nm. The experiment was repeated for three times. Quercetin was used as standard controls. IC50 values denote the concentration of sample, which is required to scavenge 50% of DPPH free radicals.[8]

Sunscreen Activity:

The *in-vitro* determination SPF of hydroalcoholic leaves extract were done by UV Spectrophotometer. These sunscreen agents are widely used in the sunscreen formulation. The results are shown in the table respectively. SPF was calculated by the application of equation:

$$SPF = CF \sum_{290}^{320} EE(\lambda) \times I(\lambda) \times Abs(\lambda)$$

Where, CF = Correction Factor (10),

EE (λ) = Erythrogenic Effect of radiation

I (λ) = Solar Intensity spectrum

Abs (λ) = Spectrophotometric absorbance value.

The values of EE x I are constants

The aliquot prepared were scanned between 290-320 nm and the obtained absorbance values were multiplied with the respective EE (λ) and I (λ) values.

Then, their summation was taken and multiplied with the correction factor (10).[9]

Results

Total phenol and flavonoids contents:

Total phenol compounds, as determined by folin Ciocalteu method, are reported as gallic acid equivalents by reference to standard curve (y = 0.0064x, r2 = 0.989). The total phenolic contents of leaves were found to be 138.3 ± 5.5 mg gallic acid equivalent/g of extract powder, respectively. The total flavonoid contents of leaves were 29.1 ± 0.8mg quercetin equivalent/g of extract powder, respectively, by reference to standard curve (y = 0.0066x + 0.0131, r2 = 0.996).

DPPH radical-scavenging activity:

DPPH is a stable nitrogen-centered free radical the color of which changes from violet to yellow upon reduction by either the process of hydrogen- or electron- donation. Substances which are able to perform this reaction can be considered as antioxidants and therefore radical scavengers. It was found that the radical- scavenging activities of extracts increased with increasing concentration. IC50 for DPPH radical-scavenging activity was found to be 119.04 and 39.21 for leaves extract and quercetin respectively.

Table no. 1: Results of *in-vitro* DPPH radical scavenging Activity

Concentration	Quercetin	HADT extract
10 µg/mL	18.41±0.03	13.29±0.15
20 µg/mL	31.46±0.02	17.55±0.13
30 µg/mL	42.49±0.13	22.89±0.36
40 µg/mL	57.53±0.04	23.73±0.03
50 µg/mL	66.39±0.02	29.26±0.30
100 µg/mL	96.36±0.03	43.12±0.03

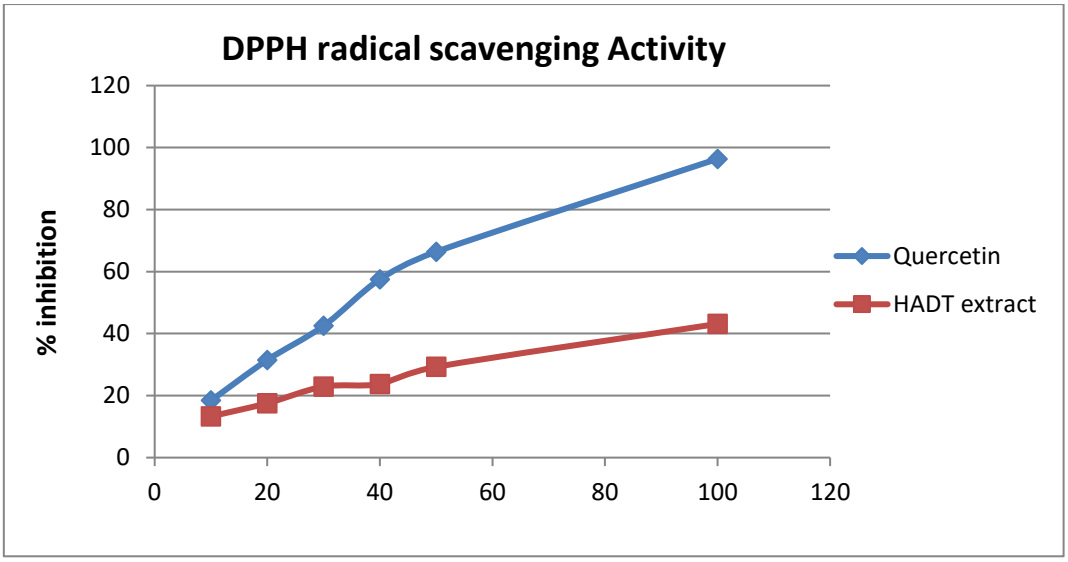

Figure 1: Invitro DPPH Radical scavenging activity

Sunscreen Activity:

SPF of leaf extract was checked by absorbtion spectroscopy by Mansur equation method. Spectrum of all extracts was taken from 290nm-400nm. Absorbances obtained in spectrum were considered for SPF calculations and depicted in Table 1. SPF of leaf extracts were found to be 8.3, 10.7, 11.9, 12.5, 13.2 and 16.3 for 10, 20, 30, 40, 50 and 100µg/ml extract respectively.

Table 2: Sun protection factor determination by *in-vitro* sunscreen activity of leaf extracts

EE(λ) x I(λ) (normalized)		**0.015**	**0.0817**	**0.2874**	**0.3278**	**0.1864**	**0.0839**	**0.018**	
Conc.	**Wavelength (λ nm)**	**290**	**295**	**300**	**305**	**310**	**315**	**320**	**SPF**
10µg/ml	Absorbance	0.971	0.891	0.842	0.816	0.804	0.824	0.836	**8.30883**
	EE(λ) x I(λ) x abs	0.01457	0.07279	0.24199	0.26748	0.14987	0.06913	0.01505	
	SPF=CFxEE(λ) x I(λ) x abs	0.14565	0.72795	2.41991	2.67485	1.49866	0.69134	0.15048	
20µg/ml	Absorbance	1.149	1.071	1.021	1.105	1.088	1.112	1.022	**10.7489**
	EE(λ) x I(λ) x abs	0.01724	0.0875	0.29344	0.36222	0.2028	0.0933	0.0184	
	SPF=CFxEE(λ) x I(λ) x abs	0.17235	0.87501	2.93435	3.62219	2.02803	0.93297	0.18396	
30µg/ml	Absorbance	1.212	1.204	1.21	1.188	1.224	1.118	1.222	**11.9767**
	EE(λ) x I(λ) x abs	0.01818	0.09837	0.34775	0.38943	0.22815	0.0938	0.022	
	SPF=CFxEE(λ) x I(λ) x abs	0.1818	0.98367	3.47754	3.89426	2.28154	0.938	0.21996	
40µg/ml	Absorbance	1.242	1.239	1.246	1.224	1.288	1.265	1.522	**12.5279**
	EE(λ) x I(λ) x abs	0.01863	0.10123	0.3581	0.40123	0.24008	0.10613	0.0274	
	SPF=CFxEE(λ) x I(λ) x abs	0.1863	1.01226	3.581	4.01227	2.40083	1.06134	0.27396	
50µg/ml	Absorbance	1.311	1.309	1.322	1.342	1.288	1.322	1.298	**13.2082**
	EE(λ) x I(λ) x abs	0.01967	0.10695	0.37994	0.43991	0.24008	0.11092	0.02336	
	SPF=CFxEE(λ) x I(λ) x abs	0.19665	1.06945	3.79943	4.39908	2.40083	1.10916	0.23364	
100µg/ml	Absorbance	1.622	1.628	1.632	1.644	1.65	1.624	1.638	**16.3857**
	EE(λ) x I(λ) x abs	0.02433	0.13301	0.46904	0.5389	0.30756	0.13625	0.02948	
	SPF=CFxEE(λ) x I(λ) x abs	0.2433	1.33008	4.69037	5.38903	3.0756	1.36254	0.29484	

Discussion

This study determined that hydroalcoholic extract of leaves Dracaena trifasciata plant showed better antioxidant potential by DPPH radical scavenging method when compare to standard quercetin and IC 50 value found to be as 119.04 and 39.21µg/ml for hydroalcoholic extract and quercetin respectively. So, we can say this plant is having antioxidant activity. Also extracts were shows remarkable sunscreen activity with maximum sunscreen factor value of 16.3 at 100µg/ml concentration. Thus the results of this research work conclude that the extracts have potency to protect against UV rays indicating sunscreen activity.

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