Research Article

Phytochemical Profiling and Antioxidant Activity Assessment of Lucky Bamboo and Peace Lily Extracts

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ABSTRACT

Spathiphyllum macrophyllum (Peace Lilly) and Dracaena sanderiana (Lucky Bamboo) are popularly used ornamental plants. The study aimed to identify the phytochemical analysis and antioxidant activity. The phytochemicals in *Spathiphyllum macrophyllum* leaves such as carbohydrates, amino acids, glycosides, saponins, steroids, monosaccharides, and reducing sugar; *Dracaena sanderiana* contains phytochemicals such as glycosides, phenolic compounds, monosaccharides, amino acid, steroids and tri terpenoids, fats, and fixed oils. *In vitro* antioxidant studies have shown potential effects in scavenging DPPH and hydrogen peroxide in a concentration-dependent manner. These activities may be due to hydrogen hydrogen-donating capacity of the phytochemicals.

Keywords: *Spathiphyllum macrophyllum*, *Dracaena sanderiana*, Ornamental plants, DPPH, Hydrogen Peroxide.

INTRODUCTION

For thousands of years, attractive plants have captivated human senses and aesthetic sensibilities, leading to the development of many new cultivars. The primary goal of cultivating ornamental plants for commercial use is to create new, eye-catching cultivars with improved flowering and other aesthetic features[1]. Because they may purify air through a variety of processes, including filtration, precipitation, dilution, and absorption, indoor plants are regarded as natural air filters. Woody trees and ornamental plants can be utilized as environmentally beneficial substitutes to remove air pollution [2]. Shrubs, trees, foliage plants for both indoor and outdoor usage, and floriculture and nursery plants are all considered ornamental crops. Through their stomata, indoor plants release microscopic water droplets into the surrounding air, raising the humidity. However, when humidity levels are high, plants' rate of transpiration slows, keeping the interior humidity within human-safe levels. The process of "Phytoremediation," in which plants remove contaminants from the environment using a variety of techniques, uses plants as an effective environmental cleaning system[3]. Some of the greatest indoor plants for increasing oxygen levels and purifying the air are common indoor plants including snake plants, spider plants, rubber plants, peace lilies, ferns, and lucky bamboo. On the other hand, reports regarding the phytochemical analysis and pharmacological effects of indoor plants were still lacking. As a result, Peace Lilly and Lucky Bamboo, two often utilized indoor plants, were the subjects of the current study.

The Araceae family's peace lily is botanically known as Spathiphyllum macrophyllum. Common names include Cobra plant, Spathiphyllum, and Peace lily. indigenous to southeast Asia and the tropical Americas. The genus Spathiphyllum has roughly 47 species. According to the NASA Clean Air Study, formaldehyde and benzene are among the gaseous environmental pollutants that Spathiphyllum removes[4]. Additionally, antibacterial and anti-inflammatory properties against Bacillus subtilis and Escherichia coli were observed[5]. As part of the Asparagaceae family, lucky bamboo (Dracaena sanderiana) is one of the most commonly utilized decorative plants. Even though D. sanderiana shares some common names with real bamboo, it belongs to a completely separate taxonomic order. Even though Dracaena species have been the subject of several investigations, little is known about D. Sanderiana's pharmacological or antioxidant characteristics. Because there aren't many scientific studies on particular indoor ornamental plants like *Spathiphyllum macrophyllum and Dracaena sanderiana,* the current study was conducted to find possible phytochemicals and their mechanisms for scavenging free radicals using a variety of *in vitro* techniques.

MATERIALS AND METHOD

Collection of plant material and Preparation:

Plants of lucky bamboo and peace lily were obtained from the local nursery. The plant material (leaves) was washed with distilled water and cleaned. 10g of Leaves of lucky bamboo and peace lily were weighed and crushed in mortar and pestle and the obtained fresh juice was used for phytochemical analysis and antioxidant activity.

Phytochemical analysis

1. Tests for carbohydrates

a. Molish'stest (general test)

To 2-3 ml aqueous extract, add a few drops of alpha naphthol solution in an alcohol shake and add con. Sulphuric acid from the sides of the test tube. A violet ring is formed at the junction of the two liquids.

Tests for reducing sugars

a) Fehling's test: Mix 1 ml of Fehling's A and Fehlin's B solution and boil for 1 min. Add an equal volume of test solution to the test tube. Heat in boiling water bath for 5-10 min. First yellow, then brick red ppt is observed.

b) Benidict's test: Mix equal volumes of Benedict's reagent and test solution in the test tube. Heat in boiling water bath for 5 min. the solution appears green-yellow or red depending on the amount of reducing sugars present in the test solution.

Tests for monosaccharides

a) Barfoed's test: M ix equal volume of Barfoed's reagent and test solution. Heat for 1-2 min boiling water bath and cool. Red ppt is observed.

b) Tests for pentose sugars: Mix equal volume of the test solution and HCl. Heat and add a crystal of phloroglucinol Red color appears.

c) Test for hexose sugars

I) Selwinoff'stest: Heat 3ml Selwinoff's reagent and 1ml test solution in a bearing water bath for 1-2 min. A red color is formed.

ii) Tollen's phloro glucinol test for galactose: Mix 2-5 ml con Hcl and 4 ml 0.5% phloro glucinol. Add 1-2 ml test solution. Heat. Yellow to red color appears.

d) Test for Non-reducing polysaccharide(starch)

Iodine test: Mix 3 ml test solution and 3 drops of dilute iodine solution. A blue color appears, it disappears on cooling.

2) Tests for proteins

A. Biuret test (General test): To 3 ml test solution add 4% NaOH few drops of Cuso4 Solution, violet or pink color appears.

Millions test: Mix 3 ml tests solution with 5 ml reagent white .ppt warm ppt turns into pink color

Xantho protein test: Mix 3 ml test solution with 1 ml con. Sulphuric acid. White PPT is formed. Boil PPT turns yellow. Add ammonium hydroxide. PPT turns orange.

3) *Tests for Amino Acids*

A. Ninhydrintest: Heat 3 ml test solution and 3 drops of 5% Ninhydrin solution in the boiling Water bath for 10 min. purple or bluish color appears.

B. Test for tyrosine: Heat 3 ml of the test solution and add 3 drops of million's reagent. The solution shows a dark red color.

C. Test for cysteine: To 5 ml test solution and a few drops of 40%NaoH and 10% lead Acetate solution. Boil. Black Ppt of lead sulfate is form

4.) *Tests for Glycosides*

A. Tests for cardiac glycosides

a) Baljet's test: A thick section shows a yellow to orange color with sodium picrate.

b) Legal's test: To aqueous or alcoholic extract, add 1 ml pyridine and 1 ml sodium nitroprusside. Pink to red color appears.

c) Keller Killiani test: To 2 ml extract add glacial acetic acid and one drop of 5% ferric chloride and con. Sulphuric acid. A reddish-brown color appears at the junction of the two liquid layers and the upper layer appears bluish-green.

B. Tests for Anthra quinone glycosides

a) Borntrager's test: To 3 ml extract add sulphuric acid. Boil and filtrate. To cold filtrate add equal vol benzene or chloroform. Shake well. Separate the organic solvent and add ammonia. The ammonical layer turns pink or red.

b) Modified Borntrager's test: To 5 ml extract add 5 ml 5% ferric chloride and 5 ml dilute Hcl. Heat for 5 min in a boiling water bath. Cool and add benzene or any other organic solvent. Shake well. Separate organic layer. Add equal volume extract Ammonical layer turns pinkish red color.

C. Tests for saponin glycosides

a) Foam test: Shake the drug extract or dry powder vigorously with water. Persistent foam observed.

b) Hemolytic test: Add drug extract or dry powder to one drop of blood on the glass slide. Hemolytic zone appears

D. Tests for cyanogenetic glycosides: To dry drug powder or extract add 3% aqueous mercury nitrate solution. Metallic mercury forms.

E. Tests for coumarin glycosides: Alcoholic extract when made alkaline, shows blue or green fluorescence.

5). *Tests for Flavonoids*

Shinoda test: To dry powder or extract, add 5 ml 95% ethanol, a few drops con. Hcl and 0.5 g magnesium turnings. Pink colored observed. To a small amount of residue, add lead acetate solution. Yellow PPT is observed.

6). *Tests For Steroids and Triterpenoids*

A. Salkowski reaction: To 2 ml extract, add 2 ml chloroform and 2 ml con. Sulphuric acid Shake well. The chloroform layer appears red and the acid layer shows greenish-yellow fluorescence.

B. Liebermann Burchard reaction: Mix 2 ml extract with chloroform. Add 1-2 ml acetic anhydride and add 2 drops of con. Sulphuric acid from the side of the test tube. First red, then blue and finally green color appears.

C. Sulphur powder test: Add a small amount of sulfur powder to the test solution, it sinks at the bottom.

7) Tests for Alkaloids

A. Dragen Dorff's reagent: Alkaloids give reddish brown Ppt with this reagent. (mercuric iodide solution).

B. Mayer's reagent: Alkaloids give cream color Ppt with Mayer's reagent. (Potassium mercuric iodide).

C. Wagner's reagent: Alkaloids give reddish brown Ppt. (Iodine potassium iodide solution)

D. Hager's reagent: Alkaloids give yellow Ppt (saturated solution of picric acid). Picrolonic acid Alkaloids give yellow Ppt.

8) Tests for phenolic compounds

Ferric chloride test: Treat the extract with ferric chloride solution, blue color appears if hydrolyzable tannins are present and green color appears if condensed tannins are present.

Test for chlorogenic acid: Treat the test solution with aq. Ammonia and exposure to air gradually green color is developed. Add Potassium dichromate: red Ppt. Add Bromine water. Discoloration of water

9). Fats and fixed oils: Saponification test: Add a few drops of 0.5N alcoholic potassium hydroxide to a small qty of various extracts along with a drop of phenolphthalein separately and heat on a water bath for 1-2 hrs. The formation of soap or partial neutralization of alkali indicates the presence of fixed oils.

***In vitro* antioxidant methods:**

Hydrogen Peroxide Scavenging Activity

The ability of extracts to scavenge hydrogen peroxide was determined by little modification here the solution of hydrogen peroxide (100mM) was prepared instead of 40mM in phosphate buffer saline of (PH 7.4), at various concentrations of extract (10 -50 µg/ml) were added to the hydrogen peroxide solution (2 ml). The absorbance of hydrogen peroxide at 230 nm was determined after 10 minutes against a blank solution containing phosphate buffer without hydrogen peroxide. A separate blank sample was used for background subtraction for each concentration. In the case of control takes the absorbance of hydrogen peroxide at 230 nm without sample extracts. Results are provided in the percentage inhibition activity was calculated from [(A0- A1)/A0] x 100, where A0 is the absorbance of the control and A1 the absorbance of extract/standard taken as Ascorbic acid (10 - 50 µg/ml) [6]

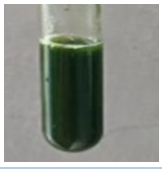
DPPH Radical Scavenging Assay

The antioxidant activity of the extracts is based on the scavenging activity of the stable 1,1-diphenyl-2-picrylhydrazyl (DPPH) free radicals. Plant extract (0.1 ml) was added to 3 ml of a .004% MeOH solution of DPPH. Water (0.1 ml) in place of the plant extract was used as a control. Absorbance at 517 nm was determined after 30 min, and the percent inhibition activity was calculated as [(A0 _ A1)/A0] 100, where A0 was the absorbance of the control, and A1 was the absorbance of the extract/standard [7]

RESULTS AND DISCUSSION

Generally, phytochemicals are considered research substances rather than necessary nutrients because there is currently insufficient evidence to support any potential health benefits. Major groups, including carotenoids and polyphenols, which include phenolic acids, flavonoids, stilbenes, or lignans, can be used to group phytochemicals under study. Based on their similar chemical structures, flavonoids can be further classified including anthocyanins, flavones, flavanones, isoflavones, and flavanols. The phytochemicals in *Spathiphyllum macrophyllum* leaves such as carbohydrates, amino acids, glycosides, saponins, steroids, monosaccharides, and reducing sugar; *Dracaena sanderiana* contains phytochemicals such as glycosides, phenolic compounds, monosaccharides, amino acid, steroids and tri terpenoids, fats, and fixed oils

Table 1: Phytochemical Analysis of *Spathiphyllum macrophyllum*

Name of the chemical test	Observation	Present/absent	Result
Test for alkaloids Hager's reagent	Turns yellow color, yellow color ppt is not observed	present	
Test for glycosides Legals test	The pink or red color is observed	Absent	
Test for flavonoids Lead acetate test	Formation of yellow ppt is not observed.	Absent	

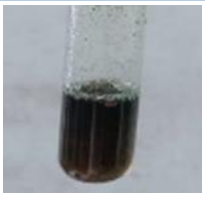
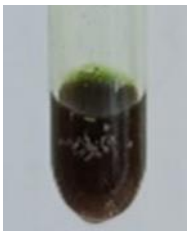
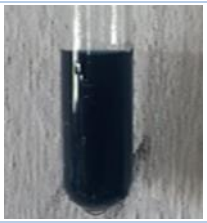
Test for saponin glycosides Foam test	Foam is observed	Present	
Test for proteins Millon's test	No change in the color	Absent	
Test for amino acids ninhydrin test	The blue color is observed	present	
Test for carbohydrates Molisch's test	The violet color ring is formed at the junction of two liquids.	Present	
Test for non-reducing sugars Iodine test	The blue color is not observed	Absent	
Test for reducing sugars Fehling's test	The brick red ppt is observed.	Present	
Test for monosaccharides Tests for pentose sugars	Brick red color is observed	Present	
Test for steroids &triterpenoids Salkowski reaction	The organic layer and aqueous layer get separated. chloroform layer appears red and the acid layer shows green fluorescence is observed.	Present	

Table 2: Phytochemical Analysis of *Dracaena sanderiana*

Name of the chemical test	Observation	Present/absent	Result
Test for alkaloids Hager's reagent	Turns yellow color, the yellow color ppt is not observed	Absent	
Test for glycosides Legals test	The pink or red color is observed	Absent	
Test for saponin glycosides Foam test	Foam is observed	Present	
Test for anthraquinone glycosides Borntrager's test	Phase separation is observed ammonical layer doesn't turn to a pink color	Absent	
Test for phenolic compounds Ferric chloride test	The green color is observed	Present	
Test for flavonoids Lead acetate test	Formation of yellow ppt is not observed.	Absent	
Test for proteins Millon's test	No change in the color	Absent	
Test for Aminoacids Ninhydrin test	The blue color is observed	present	
Test for non-reducing sugars Iodine test	The blue color is not observed	Absent	

Test for carbohydrates Molisch's test	The violet color ring is not formed at the junction of two liquids.	Absent	
Test for reducing sugars Fehling's test	The brick red ppt is not observed.	Absent	
Test for monosaccharides Tests for pentose sugars	Brick -red color is observed	Present	
Test for steroids &triterpenoids Salkowski reaction	chloroform layer appears red and the acid layer shows green fluorescence is observed.	Present	
Fats and fixed oils Saponification test	The formation of soap is observed.	Present	

In the disciplines of biology and medicine, free radicals are becoming more and more significant. Numerous distinct endogenous and external factors result in their production. The primary source of endogenous reactive oxygen species (ROS) generated at the cellular level is the mitochondria [8]. Under these circumstances, there is a high creation of ROS, which causes oxidative damage to the body and microorganisms. In addition to causing oxidative damage to cells and tissues, ROS actively participate in several homeostatic processes including growth, differentiation, metabolism, and immunity [9]

The mitochondrial respiratory chain stands out as one of the primary contributors to cellular ROS, generating reactive oxygen species during ATP synthesis in normal oxygen metabolism. Consequently, ROS are commonly considered by-products resulting from the energy supply to cellular activities [10]. Increasing evidence suggests that dietary phytochemicals go beyond simple antioxidant roles, influencing several cellular pathways linked to health and disease prevention [11]. Both radicals and non-radical molecules can be found in reactive oxygen and nitrogen species. The three chemical species of the Fenton/Haber Weiss route (O^2 •− superoxide radical, H_2O_2 hydrogen peroxide, and HO• hydroxyl radical), which are byproducts of the partial reduction of oxygen, are examples of reactive oxygen species. Whereas a one-electron reduction of molecular oxygen produces superoxide, hydrogen peroxide, and hydroxyl radicals, a four-electron reduction of molecular oxygen produces water without producing ROS [11]. H_2O_2 lacks unpaired electrons and is not a radical, whereas O^2 •− and HO• do and are classified as free radicals because they have unpaired electrons in their exterior orbitals. Singlet oxygen, ozone (O^3), and hydrogen peroxide (H_2O_2) are examples of non-radical derivatives of oxygen [13]. A well-used, rapid, simple, and reasonably priced method for measuring antioxidant qualities is 2,2-Diphenyl-1-picrylhydrazyl (DPPH), which uses free radicals to determine whether a material can act as a hydrogen provider or a free-radical scavenger (FRS). Eliminating DPPH, which is a stabilized free radical, is related to the DPPH testing technique. An odd electron combines with the free radical DPPH to produce a significant absorbance at 517 nm, or a purple color. Compared to the DPPH-H form, it is more radical because it results in decolorization, or a yellow tint, as the number of electrons absorbed rises. The lowering capacity is greatly impacted by decolorization [14].

The *S macrophyllum* and *Dsanderiana* showed dose-dependent inhibition of DPPH radicals (Figure 1,2) the effect of antioxidants on DPPH is thought to be due to their hydrogen-donating powder and IC 50 values at

320.23mg/ml and 293.31mg/ml respectively for *S. macrophyllum* and *D. sanderiana*

Table 3: Evaluation of DPPH radical scavenging activity of *Spathiphyllum macrophyllum* and *Dracaena sanderiana*

Concentration	*Spathiphyllum macrophyllum*	*Dracaena sanderiana*
	%Inhibition (DPPH)	
100mg/ml	30.09±1.23	22.19±1.39
200mg/ml	41.23±1.34	32.19±1.51
300mg/ml	50.35±1.56	50.74±1.75
400mg/ml	56.43±1.67	70.73±1.21
500mg/ml	63.53±1.84	79.30±1.94
IC_{50}	320.23	293.31

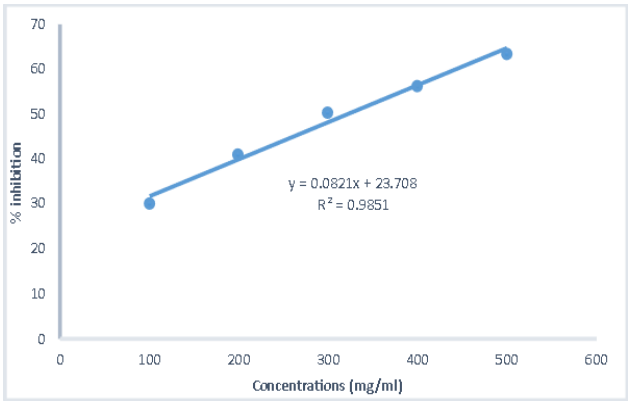


Figure 1: Inhibition of DPPH radical activity of *Spathiphyllum macrophyllum*

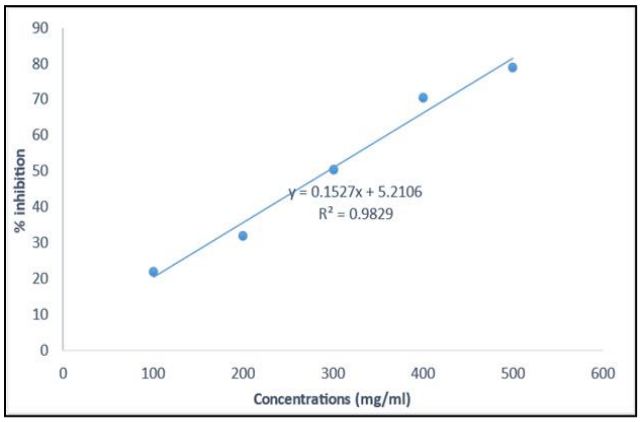


Figure 2: Percentage Inhibition of DPPH Radical with *Dracaena sanderiana*

Since hydrogen peroxide is liposoluble, it can permeate the membranes of cells. Most lipids, proteins, and nucleic acids cannot be easily oxidized by this non-free radical due to its poor reactivity (Choe E, 2006). The danger of H_2O_2 comes from its homolytic fission, which is caused by UV light or interaction with transition metal ions (Fenton reaction), which turns it into the hydroxyl radical (HO•). In biological systems, hydrogen peroxide can react with superoxide anion, HOCl, or chloramines to form singlet oxygen (Stief TW, 2003). Superoxide dismutase (SOD) catalyzes a disturbed process that produces hydrogen peroxide in vivo. According to the current investigation, S. macrophyllum and D. sanderiana show stronger concentration-dependent hydrogen peroxide inhibition (figure 3, 4). The IC 50 values of the selected were found at 442.11mg/ml and 239.16mg/ml respectively for *S. macrophyllum* and *D. sanderiana.*

Table 4: Evaluation of hydrogen peroxide scavenging activity of *Spathiphyllum macrophyllum* and *Dracaena sanderiana*

Concentration	*Spathiphyllum macrophyllum*	*Dracaena sanderiana*
	%Inhibition (H_2O_2)	
100mg/ml	25.44 ±1.23	40±1.22
200mg/ml	30.10 ±1.36	44.03±1.40
300mg/ml	36.62±1.43	56.15±1.60
400mg/ml	45.01±1.59	65.38±1.89
500mg/ml	57.12 ±1.62	73.07±1.92
IC_{50}	442.11	239.16

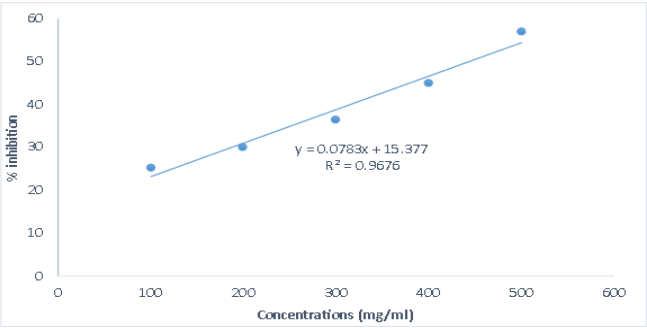


Figure 3: % Inhibition of Hydrogen peroxide activity of *Spathiphyllum macrophyllum*

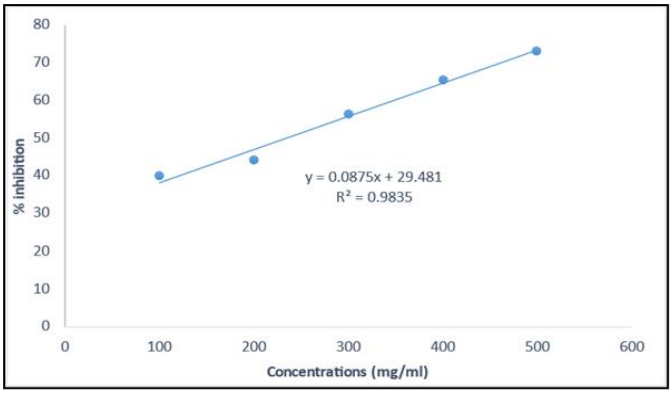


Figure 4: % Inhibition of Hydrogen peroxide activity of *Dracaena sanderiana*

CONCLUSIONS

The phytochemicals in *Spathiphyllum macrophyllum* leaves such as carbohydrates, amino acids, glycosides, saponins, steroids, monosaccharides, and reducing sugar; *Dracaena sanderiana* contains phytochemicals such as glycosides, phenolic compounds, monosaccharides, amino acid, steroids and tri terpenoids, fats, and fixed oils. The peace

Lilly and lucky bamboo showed significant antioxidant activity against DPPH radical and hydrogen peroxide which might be due to the electron-donating capability and hydrogen-donating capability.

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Abbreviations:

DNA: Deoxyribonucleic acid

DPPH: 2,2-diphenyl-1-picrylhydrazyl

H_2O_2: Hydrogen peroxide

MeOH: Methanol

NaOH: Sodium Hydroxide

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