

EVALUATION OF THE POTENTIAL ROLE OF AQUEOUS LEAVES EXTRACT OF *AVERRHOA CARAMBOLA* FOR *IN VITRO* ANTICANCER STUDIES

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ABSTRACT

Objective: *Averrhoa carambola* is known as a tree. *Averrhoa carambola* leaves are commonly used in Ayurvedic and traditional Chinese medicine is used for inflammatory skin disorders and fungal skin infections. The leaves of star fruit are rich in Vitamin C and bioactive compounds such as phenols and flavonoids abundant sources of antioxidants.

Methods: The qualitative phytochemical study of these plant extracts indicates the presence of tannins, saponins, flavonoids, alkaloids, proteins, and phenol. The herb has been used traditionally from antiquity, in the treatment of neurological health, memory issues, and breast cancer. It chiefly possesses the pharmacological study.

Results: Plant explains about antibacterial, antioxidant, antifungal, anticatalytic, and antiviral activities. The work is an endeavor to explore and assemble the various pharmacological action and pharmacognostic aspects of the leaves *A. carambola* reported to date.

Conclusion: The current research has shown that natural sources have therapeutic properties without much toxicity. This potential of plants is due to the presence of secondary metabolites. The results prove that *A. carambola* leaf extract has antioxidant, antibacterial, and antifungal activity. In addition to this, the present investigation revealed that *A. carambola* leaf extract can act as a potential drug for treating breast cancer.

Keywords: Ayurvedic, Skin disorders, Fungal skin infection, Phenols, Flavonoids, Antioxidants.

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INTRODUCTION

Averrhoa carambola bioactive compounds are responsible for medicinal properties. *Averrhoa Carambola* has proved to be effective in curing multiple diseases [1]. The percentage of antioxidant activity was assessed by DPPH and the reducing power of the extract was also determined [2]. The bioactive compounds were analyzed in photochemical screening and antibacterial and antifungal activity was also determined [3].

The project will be carried out on *A. carambola* as a chemotherapeutic agent [5]. Thus, it can be stated that these leaves are suitable drugs and can be further explored and exploited to meet the global demand for natural, cost-efficient, and safer bioactive compounds. *A. carambola* contains tannins, saponins, flavonoids, alkaloids, proteins, and phenols [6]. The pharmacological investigations revealed that they possessed antibacterial, antioxidant, anticancer, and antidepressant [7].

METHODS

Leaves of *A. carambola* leaves treated with cold extraction of phytochemical analysis, antioxidant activity, and *in vitro* cytotoxicity using VERO cell lines.

Cold extraction

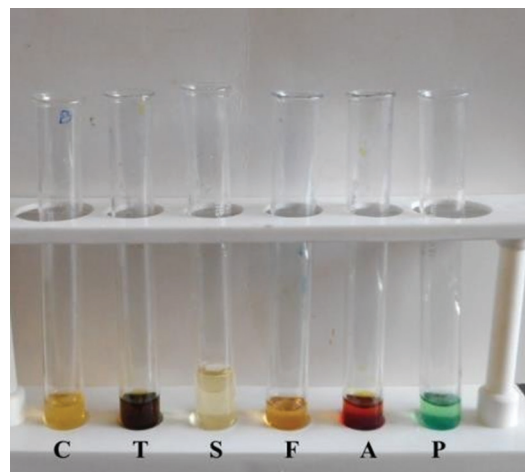
10 g of sample was weighed and soaked in 100 mL of aqueous. The extract was allowed to stand overnight and filtered using sterile filter paper. The filtrate was collected and incubated at room temperature for evaporation. Then measure the weight and find the yield by calculating.

$$\text{Yield} = \text{initial weight} - \text{final weight}$$

Aqueous extract [2.12 g/10 g leaves powder]

Moreover, assay antioxidant and used the techniques of thin layer chromatography, analysis for flavonoids and treated with antioxidant activity, antimicrobial activity such as antibacterial activity, antifungal activity, and minimum inhibitory concentration (MIC) assay.

RESULTS



DISCUSSION

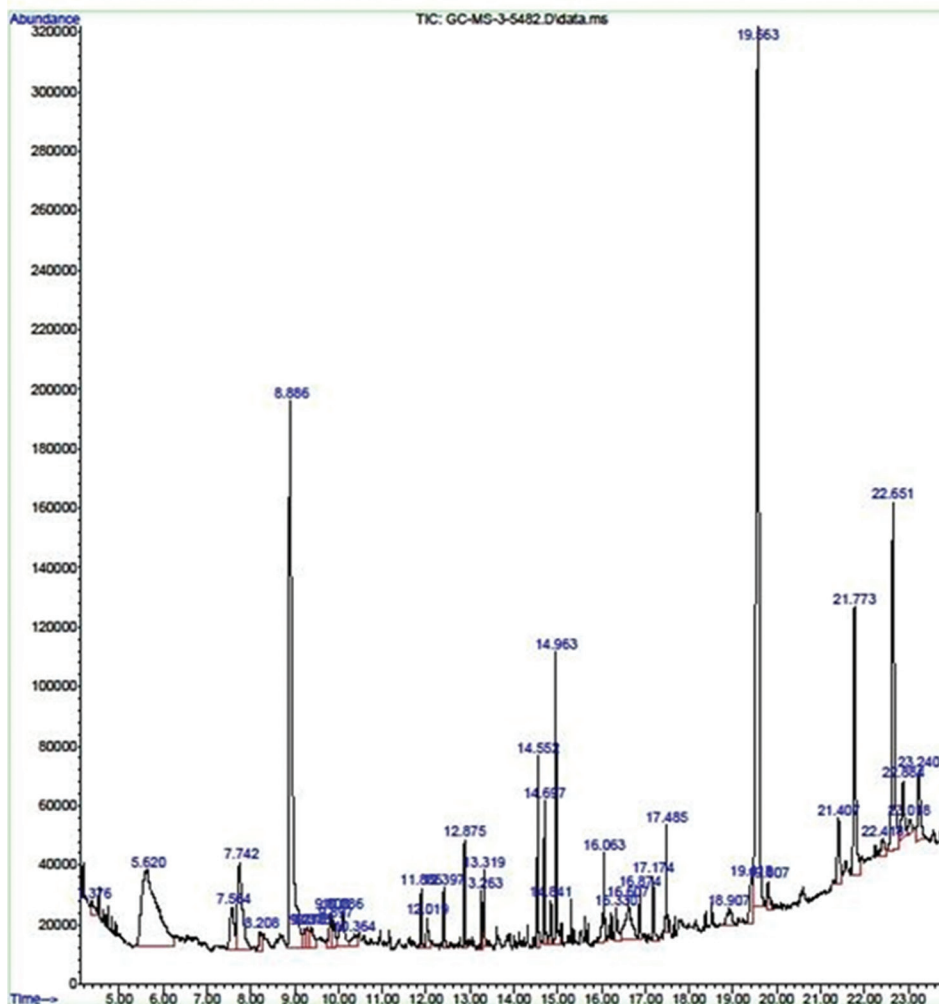
The *A. carambola* leaves were extracted using aqueous. The yield was observed in aqueous extract (2.12 g/10 g leaves powder). Similarly, Shu *et al.* (2014) reported that leaves and fruits from *A. carambola* (10 g) were extracted thrice with acetone: water (7:3). The final yield of acetone: water extracts (AWE) of leaves and fruits was 4.30 g and 5.79 g, respectively[8].

Library Search Report

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Table 1: Phytochemical analysis of aqueous extract of *Averrhoa carambola* leaves

S. No	Contents	Aqueous extract of <i>Averrhoa carambola</i> leaves
1.	Tannins	+
2.	Saponin	+
3.	Flavonoids	+
4.	Alkaloids	+
5.	Proteins	+
6.	Steroid	-
7.	Quinones	-
8.	Terpenoid	-
9.	Cardiac Glycosides	-
10.	Phenol	+

(+) positive (-) negative

Table 2 : Hydroxyl radical scavenging assay

Blank: 0.45					
Concentration(µg)	100	200	300	400	500
Standard OD	0.31	0.25	0.19	0.15	0.11
%inhibition	31.1	44.4	57.7	66.6	75.5
Blank: 0.43					
Sample/Concentration (µg)	100	200	300	400	500
Aqueous extract OD	0.35	0.32	0.29	0.27	0.25
% of inhibition	18.6	25.5	32.5	37.2	41.8

Phytoconstituents of the *A. carambola* aqueous extract of leaves were analyzed qualitatively. Our results showed the presence of tannin, saponin, flavonoid, protein, alkaloid, and phenol in the aqueous extracts[9]. These secondary metabolites could be the source of the therapeutic effects. Pal *et al.* (2019) revealed that the preliminary phytochemical screening of

Table 3 : Reducing power assay

Concentration(μg)	100	200	300	400	500
Standard OD	0.40	0.75	1.21	1.60	1.97
Sample/concentration (μg)	100	200	300	400	500
Aqueous extract OD	0.49	0.53	0.57	0.62	0.66
Amount of reducing powder (μg)	120	130	145	155	165

Table 4: Cytotoxicity activity of *Averrhoa carambola* leaves extract against VERO cell

S. No	Concentration $\mu\text{g/mL}$	Absorbance 540 nm	% cell viability
1	1000	0.35	26.3
2	500	0.51	38.3
3	250	0.72	54.1
4	125	1.03	77.4
5	62.5	1.28	96.2
6	31.2	1.33	100
7	DMSO	1.33	100
8	Control cells	1.33	100

the *A. carambola* aqueous extract contains tannins, flavonoids, phenols, terpenoids, sterols, fats, fixed oils, etc. [10]. Our results showed that the analysis of antioxidant properties in *A. carambola* aqueous extract of leaves exhibited IC_{50} values at 500 μg for DPPH scavenging analysis and reducing power assay showed 165 $\mu\text{g/mL}$.

Determining the antimicrobial properties of plant extracts can be of great importance in therapeutic cures. Antibacterial susceptibility tests are used in ethnopharmacological research to evaluate the potential antibacterial activity of biological extracts against various pathogenic pathogens. By establishing the MIC, these assays are used to screen plant extracts for antimicrobial properties as well as to determine the effectiveness of antimicrobial medicines in treating illnesses. *Staphylococcus aureus*, *Enterococcus faecalis*, and *Klebsiella pneumonia* showed more antibacterial activity in *A. carambola* ethanol extract of leaf (Silva *et al.*, 2021). Our results showed more antimicrobial activity in *Escherichia coli* (250 μg) and *Candida albicans* (250 μg) compared with other microbes [11].

Hydroxyl radical property can be formed by the Fenton reaction in the presence of reduced transition metals (such as Fe^{2+}). Scavenging of hydroxyl radical is an important antioxidant activity because of the very high reactivity of the OH radical, enabling it to react with a wide range of molecules found in living cells, such as sugars, amino acids, lipids, and nucleotides. Thus, removing OH \cdot is very important for the protection of living systems. As a result of the hydroxyl scavenging assay, the activity was found to be 41.8% in the aqueous extract of *A. carambola* leaves. Kandhasamy *et al.* (2013) investigated the hydroxyl radical scavenging potential of various solvent extracts of *Bauhinia vahlii* leaves such as petroleum ether, acetone, hot water, chloroform, and methanol. The methanol extract (84.4%) showed the highest activity compared with other extracts [12].

Shu *et al.* (2014) revealed that the most abundant fatty acids were α -linolenic acid (62.04%) for leaf extracts and oleic acid (55.44%) for fruit extracts of *A. carambola*. The amount of total unsaturated fatty acids in leaves and fruits comprised more than 77% of total fatty acid by

GCMS analysis. Nehal *et al.* (2020) also detected 24 volatile compounds in the fruit extract of *A. carambola*. In our results, 40 compounds were found for leaf extracts of *A. carambola* [13].

CONCLUSION

The current research has shown that natural sources have therapeutic properties without much toxicity. This potential of plants is due to the presence of secondary metabolites.

The results prove that *A. carambola* leaf extract has antioxidant, antibacterial, and antifungal activity. In addition to this, the present investigation revealed that *A. carambola* leaf extract can act as a potential drug for treating breast cancer. Toxicity and anticancerous activity of the sample were evaluated by VERO cell lines and cancer efficacy was found to be at a low concentration compared to cytotoxicity. Hence, the study has proven that it could be recommended for the pharmaceutical industry.

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AUTHORS CONTRIBUTION

SJB – conceptualization, data curation; project administration; formal analysis design, and experimental works, original draft; software; OM – writing – review and editing; DA – data curation, validation, and manuscript review; HB – supervision, validation, manuscript review, and approval.

CONFLICTS OF INTERESTS

The author declares no conflicts of interest

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