RESEARCH ARTICLE

Preliminary Phytochemical Screening and Comparative Antioxidant Potential of *Garcinia indica* (Thouars) Choisy, *Garcinia gummi-gutta* (L.) N. Robson and *Garcinia talbotii* Raizada ex. Santapau

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Abstract

The *Garcinia* genus is well known for its fruit-bearing tree species found in the Indian subcontinent and tropics all over the world. Three species of *Garcinia* were selected for this study, viz., *G. indica* (listed as vulnerable in the IUCN Red list), *G. gummi-gutta* and *G. talbotii* (both listed as species of least concern in the IUCN Red list), all of which are endemic to the Western Ghats region. This study was undertaken to assess the phytochemical profile of the selected species as well as to determine their antioxidant potential. Extracts of leaves, bark and fruit rind prepared in 70% ethanol were used for the analysis. The major categories of bioactive compounds were found to be alkaloids, diterpenes, phenolics, flavonoids and coumarins, present in leaves, bark as well as fruit rind. Total Phenolic Content and Total Flavonoid Content were highest in *G. gummi gutta* bark, followed by *G. indica* bark and finally *G. talbotii* leaves. DPPH (2,2-diphenyl-1-picrylhydrazyl) and ABTS (2,2′-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid)) assays were used to evaluate the antioxidant potential of the extracts and Ascorbic acid was used as the reference standard. Lowest IC_{50} values were exhibited by *G. gummi-gutta* bark extract (14.11 ± 0.21 μg/mL in DPPH assay; 5.37 ± 0.03 μg/mL in ABTS assay). IC_{50} values of *G. indica* bark extract were found to be 32.43 ± 0.63 μg/mL in DPPH assay and 12.08 ± 0.12 μg/mL in ABTS assay. Surprisingly, *G. talbotii* fruit rind showed an IC_{50} value of 34.18 ± 0.27 μg/mL in DPPH assay, while *G. talbotii* leaves showed an IC_{50} value of 6.74 ± 0.09 μg/mL in ABTS assay, which is comparable to the efficacy of the standard. These findings hint at the strong antioxidant potential displayed by all three species, especially *G. talbotii*, which has not been extensively studied until now. This research work also signifies the importance of underutilized plant parts (bark and leaves) of well-known fruit trees belonging to *Garcinia* genus.

Keywords: *Garcinia* species, Phytochemicals, Antioxidant, Phenolics, Flavonoids.

Highlights:

- *Garcinia indica* and *G. gummi-gutta* are popular fruit trees used in Western Ghats cuisine and traditional medicine for allergies, hyperacidity, and digestion.
- *G. talbotii*, an underutilized and under-explored tree endemic to the Western Ghats has been examined for its phytoconstituent profile and antioxidant potential.
- Bioactive constituents such as alkaloids, diterpenes, flavonoids, phenolics and coumarins have been detected in all three plants.
- High amounts of phenolics and flavonoids are found to be present in the bark and leaves, thus corroborating the high antioxidant activity exhibited by these plant parts.
- Comparative analysis shows that *G. gummi-gutta* exhibits the highest antioxidant activity, followed closely by *G. indica* and *G. talbotii*.

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Introduction

Oxidation is an essential biochemical reaction that occurs during all metabolic processes, such as respiration, energy production, etc., in cells of living organisms. Oxidation is necessary for the production of adenosine triphosphate (ATP), which is the energy currency of our cells. However, the by-product of these metabolic processes is the production of free radicals (Nijhawan *et al.,* 2019). They are reactive oxygen species or reactive nitrogen species (ROS/RNS) that can damage our cells at the molecular level. Biological ROS/RNS have unpaired electrons, which can react with important metabolites such as lipids, proteins, and nucleic acids, thus interfering with metabolic pathways and causing DNA damage (Somogyi *et al.,* 2007). Free radicals in the body are linked with several conditions, such as cancer, neurodegenerative disorders, diabetes, chronic

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inflammatory disorders, and accelerated aging (Ácsová *et al.,* 2019). Antioxidants are molecules that can inhibit these ROS or delay the oxidation process. They are free radical scavengers that protect the human body against oxidative stress (Gomathi *et al.,* 2012).

Antioxidants are mainly of two types: exogenous and endogenous. Endogenous antioxidants include enzymes like superoxide dismutase, catalase, etc. and proteins such as ceruloplasmin, haptoglobin, etc., while exogenous antioxidants are obtained via dietary sources like flavonoids, anthocyanins, polyphenols, coumarins, vitamins E and K, etc. (Pisoschi and Negulescu, 2011).

The genus *Garcinia* is widespread in India, having 43 species and 5 varieties, most of which are indigenous and wild (Sarma *et al.,* 2016). *Garcinia gummi-gutta* (L.) N. Robson, also known as *Garcinia cambogia* L., is widely used as a carminative and flavouring agent. It is also used in traditional medicine to treat ulcers, hemorrhoids, diarrhoea, dysentery, etc. The fruit is known to contain HCA (hydroxycitric acid), which is a popular weight reduction agent (Espirito Santo *et al.,* 2020). *G. gummi-gutta* is listed as a species of least concern according to the IUCN Red List.

G. indica (Thouars) Choisy, also known as kokum or kokoberry, is widespread in the tropical evergreen rainforests of Western Ghats in India (Panda *et al.,* 2014). Anthocyanins, HCA, garcinol, isogarcinol and polyphenols are the major phytoconstituents of kokum (Jena *et al.,* 2002). *G. indica* has been traditionally used as a souring agent in food and is known for its antioxidant, cardioprotective, anti-cancer and anti-allergic properties (Padhye *et al.,* 2009). *G. indica* is listed as a vulnerable species according to the IUCN Red List.

G. talbotii Raizada ex. Santapau is an evergreen tree widely distributed in the Western Ghats of India (Anerao *et al.,* 2021). *G. talbotii* is listed as a species of least concern according to the IUCN Red List. *G. talbotii* has shown good antioxidant potential as well as substantial phenolic and flavonoid content (Patil and Potdar, 2018). *G. talbotii* is found to be rich in Vitamin C along with macro and micronutrients. It is a highly underutilized tree with promising medicinal and nutraceutical value; hence, it can be considered as a Non-Conventional Edible Plant (NCEP) (Jain *et al.,* 2023).

Materials And Methods

Collection of Plant Material

The leaves, bark, and fruits of *G. indica*, *G. gummi-gutta* and *G. talbotii* were collected as follows: *G. indica* was collected from Yeoor hills, Thane, Maharashtra, on 15th April 2024; *G. gummi-gutta* was collected from Ponda, Goa on 25th May 2024 and *G.. talbotii* was collected from Matheran, Maharashtra on 14th of January 2025. The plant specimens were authenticated by comparing them with voucher specimens no. PD-5802 of P. Divakar (*G. indica*), specimen no. 1226 of M. R. Almeida (*G. gummi-gutta*) and specimen no. NI-2791 of N. A. Irani (*G. talbotii*) at the Blatter herbarium, St. Xavier's College (Empowered Autonomous Institute), Mumbai. The plant materials collected were kept in a hot air oven at 40°C for drying. After the process of complete drying, they were powdered with the help of a mixer-grinder and the powder was stored in an air-tight container.

Chemicals

L- ascorbic acid 99% extra pure, catechin, gallic acid, sodium carbonate, sodium hydroxide, sodium nitrite, aluminium chloride, DPPH (2,2 - diphenyl-1-picrylhydrazyl), ABTS ((2,2′-azino-bis (3 ethylbenzothiazoline-6-sulfonic acid)) and Folin-Ciocalteu reagent. All the chemicals used in the analysis were of analytical grade. Common laboratory reagents were used for preliminary phytochemical analysis.

Extract preparation

For quantitative and antioxidant assays: Dried powder (3g) of leaves, bark, and fruit rind *of G. indica*, *G. gummi-gutta* and *G. talbotii,* respectively, were soaked in 30 mL of 70% Ethanol. Samples were kept on an orbital shaker at 250 rpm for 24 hours for maceration. The extracts were filtered using a muslin cloth. The extract was then centrifuged at 5000 rpm and the supernatant was used. Later, extracts were evaporated to total dryness using a water bath to get dry extracts.

For preliminary phytochemical analysis: The extracts were prepared by macerating 5g of powder in 200 mL of 70% ethanol; further filtered using muslin cloth and centrifuged at 5000 rpm, then the supernatant was used.

Qualitative tests for preliminary phytochemical screening

Test for Alkaloids

Dragendorff's test

Few mL of solvent-free plant extract was mixed with a few mL of dilute HCl and the filtrate was taken. This filtrate was treated with 1 to 2 mL of Dragendorff reagent. Reddish- brown precipitate indicated the presence of alkaloids (Kumar *et al.,* 2013).

Mayer's test

2 mL of plant extract was taken in a test tube and a few mL of 2N HCl was added. Then, a few drops of Mayer's reagent were added. Gelatinous white precipitate indicated the presence of alkaloids (Phuyal *et al.,* 2019).

Wagner's test

To 2 mL of plant extract, few drops of Wagner's reagent were added. Brown or red precipitate indicated the presence of alkaloids (Phuyal *et al.,* 2019).

Test for glycosides

Borntrager's test

Dilute sulphuric acid was added to 2 mL of plant extract. It was boiled and filtered. The cooled filtrate was shaken well with 1 mL of chloroform. The organic solvent layer was separated and ammonia was added to it. Pink colour should indicate the presence of anthraquinone glycosides (Singh and Kumar, 2017).

10% NaOH test

In a test tube, 1 mL of diluted sulphuric acid was mixed with 0.2 mL of plant extract and boiled for 15 minutes. After cooling, it was neutralised with 10% NaOH and 0.2 mL of Fehling's solution

A and B was added. Brick red precipitate should indicate the presence of glycosides (Singh and Kumar, 2017).

Test for cardiac glycosides

Bromine water test

A few mL of plant extract was mixed with a few mL of bromine water in a test tube. Yellow precipitate should indicate the presence of cardiac glycosides (Shaikh and Patil, 2020).

Test for diterpenes

Copper acetate test

A few mL of plant extract was taken in a test tube and a few drops of distilled water were added to it. Then, 3 to 4 drops of copper acetate solution were added to the test tube. Formation of emerald green colour indicated the presence of diterpenes (Shaikh and Patil, 2020).

Test for quinones

Alcoholic KOH test

In a test tube, 1 mL of plant extract was mixed with a few mL of alcoholic potassium hydroxide solution. Blue colour should indicate the presence of quinones (Kumar *et al.,* 2013).

Test for phenolic compounds

Iodine test

In a test tube, 1 mL of plant extract was mixed with a few drops of diluted iodine solution. A transient red colour indicated the presence of phenolics (Singh and Kumar, 2017).

Ferric chloride test

To 1 mL of plant extract, a few drops of 5% ferric chloride solution were added. Dark bluish green color indicated the presence of phenolics (Madike *et al.,* 2017).

Lead acetate test

To 1 mL of plant extract, a few drops of distilled water and a few drops of lead acetate solution were added. White precipitate indicated the presence of phenolics (Singh and Kumar, 2017).

Test for flavonoids

Lead acetate test

1 mL of plant extract was treated with a few drops of lead acetate solution. Yellow precipitate indicated the presence of flavonoids (Singh and Kumar, 2017).

Ferric chloride test

To 1 mL of plant extract, a few drops of 10% ferric chloride solution was added. Green precipitate indicated the presence of flavonoids (Audu *et al.,* 2007).

Test for coumarins

NaOH test

3 mL of 10% NaOH was added to 2 mL of plant extract. Formation of yellow colour indicated the presence of coumarins (Madike *et al.,* 2017).

Test for saponins

Froth flotation test

2 mL of plant extract was taken in a test tube with few mL of distilled water. Then, it was shaken vigorously. Froth indicated the presence of saponins (Phuyal *et al.,* 2019).

Test for carbohydrates

Barfoed's test

In a test tube, 1 mL of plant extract was mixed with 1 mL of Barfoed's reagent. Then, it was heated in a water bath for 2 minutes. Red precipitate indicated the presence of monosaccharides (Singh and Kumar, 2017).

Test for reducing sugars

Fehling's test

1 mL each of Fehling's A and B reagents was mixed and boiled for one minute. Equal volume of plant extract was added. The whole solution was heated in a boiling water bath for 5-7 minutes. Brick red precipitate indicated the presence of reducing sugars (Phuyal *et al.,* 2019).

Test for proteins and amino acids

Millon's test

2 mL of plant extract was mixed with a few drops of Millon's reagent. White precipitate indicated the presence of proteins and amino acids (Shaikh and Patil, 2020).

Quantitative Analysis of Phenolics and Flavonoids

Total Phenolic Content

Total Phenolic content was estimated using the microplate method (Herald *et al.,* 2012). In each well 25 µL of either standard or extract was added, followed by 75 µL of deionised water and 25 µL of Folin-Ciocalteu reagent (1:1 dilution (v/v) with deionised water), followed by dark incubation for 6 minutes. After incubation, 100 µL of 7.5% sodium carbonate was added to each well. Then the plate was covered with aluminium foil and kept in the dark for 90 minutes. The plate was shaken using a double orbital mode at high intensity for 90 seconds in the microplate reader before measuring the absorbance. The absorbance was measured at 765 nm against a blank using an ELISA Plate Reader (SpectraMax iD3). Gallic acid was used as the standard.

Total Flavonoid Content

Total Flavonoid content was estimated using the microplate method (Herald *et al.,* 2012). In each well 25 µL of either standard or extract was added, followed by 100 µL of deionised water and 10 µL of 5% sodium nitrite. Then it was kept for incubation for 5 minutes. After 5 minutes, 15 µL of 10% aluminium chloride was added. Afterwards, 50 µL of 1 M sodium hydroxide and 50 µL deionised water were added. The plate was shaken using a double orbital mode at high intensity for 90 seconds in the microplate reader before measuring the absorbance. The absorbance was measured at 510 nm against a blank using an

ELISA Plate Reader (SpectraMax iD3). Catechin was used as the standard.

Antioxidant Analysis

DPPH Assay

The DPPH assay was carried out using the microplate method (Prieto, 2012). The DPPH solution was prepared in absolute methanol. In each well, 100 µL of either standard or extract was added, except in the control 100 µL of 70% ethanol was added. Then, 100 µL of 0.2 mM DPPH solution was added to each well. Afterwards, the plate was covered with aluminium foil and kept in the dark for 30 minutes for incubation. The plate was shaken using a double orbital mode at high intensity for 90 seconds in the microplate reader before measuring the absorbance. The absorbance was measured at 517 nm using an ELISA Plate Reader (SpectraMax iD3). Ascorbic acid was used as the standard. The following formula was used to calculate the percentage inhibition.

$$\% \text{Inhibition} = \frac{\text{Absorbance control} - \text{Absorbance sample}}{\text{Absorbance control}} \times 100$$

ABTS Assay

The ABTS assay was carried out using the microplate method (Lee *et al.,* 2015). For the preparation of ABTS reagent, first 7 mM ABTS solution and a 140 mM potassium persulfate solution were separately prepared in deionised water. Then 5 mL of 7 mM ABTS solution was mixed with 88 µL of 140 mM potassium persulfate solution. For free radical generation, it was kept in the dark for 16 hours at room temperature. Afterwards, it was diluted using deionised water (1:44 v/v). In each well, 100 µL of either standard or extract was added, except in the control, 100 µL of 70% ethanol was added. Then, 100 µL of ABTS reagent was added to each well. Afterwards, the plate was covered with aluminium foil and kept in the dark for 5 minutes for incubation. The plate was shaken using a double orbital mode at high intensity for 90 seconds in the microplate reader before measuring the absorbance. Later, the absorbance was measured at 734 nm using an ELISA Plate Reader (SpectraMax iD3). Ascorbic acid was used as the standard. The following formula was used to calculate the percentage inhibition.

$$\% \text{Inhibition} = \frac{\text{Absorbance control} - \text{Absorbance sample}}{\text{Absorbance control}} \times 100$$

Statistical Analysis

All the assays were carried out in triplicate. Results of all the assays carried out were expressed as mean ± SD.

RESULTS

Phytochemical Analysis

The preliminary phytochemical analysis indicated the presence of various phytochemicals as listed in Table 1.

Total Phenolic Content

In plant secondary metabolites, a large class of metabolites is Phenolic compounds. They are extensively distributed in fruits, vegetables, spices, legumes, grains, and nuts. Moreover, they also play a vital role in varied physiological processes like flavoring, coloring, stress resistance and plant quality. The intrinsic properties of phenolic compounds, like anticarcinogenic, anti-inflammatory, antimicrobial and antioxidant, have gained significance in current research (Zhang *et al.,* 2022). Total phenolic content was estimated using the Folin-Ciocalteu method. Gallic acid was used to obtain the standard curve, as shown in Fig.1. Total phenolic content of the samples was expressed as mg gallic acid equivalent per gram of sample, as shown in Table 2.

Total Flavonoid Content

Flavonoids represent a significant category of naturally occurring compounds. Specifically, they belong to the type of plant secondary metabolites that have a polyphenolic framework. These compounds are abundantly present in vegetables, fruits, and specific beverages. They are known for their varied beneficial antioxidant and biochemical properties related to various ailments such as atherosclerosis, Alzheimer's disease, and cancer. They are linked to a wide range of therapeutic benefits and are a crucial component in an array of pharmaceutical, nutraceutical, cosmetic and medicinal purposes (Panche *et al.,* 2016). Catechin was used to obtain the standard curve as shown in Fig. 2. Total flavonoid content of the samples was expressed as mg catechin equivalent per gram of sample as shown in Table 2.

DPPH Assay

DPPH radical exhibits exceptional stability because of the delocalization of its radical electrons within aromatic rings.

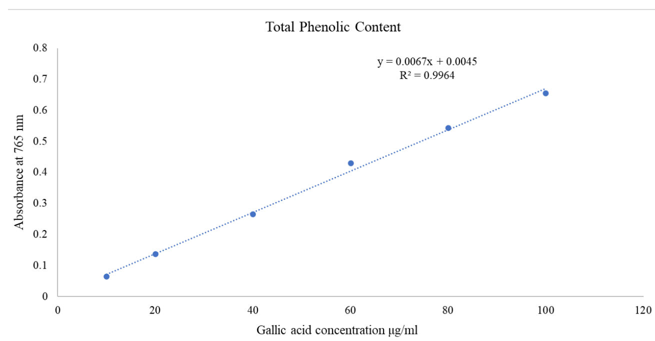

Fig.1: Standard curve of Gallic acid

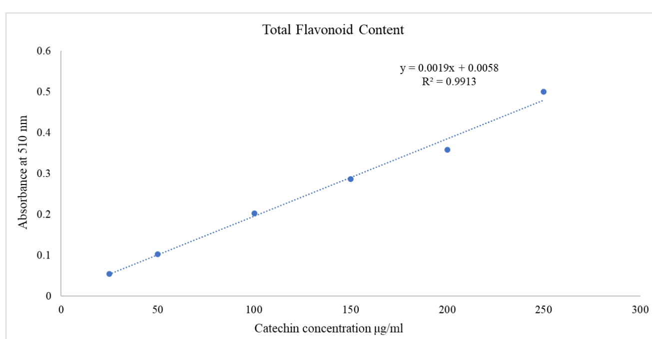

Fig. 2: Standard curve of catechin

Table 1: Preliminary phytochemical analysis

Test	*G. indica*			*G. gummi-gutta*			*G. talbotii*		
	Leaf	*Fruit rind*	*Bark*	*Leaf*	*Fruit rind*	*Bark*	*Leaf*	*Fruit rind*	*Bark*
Alkaloids									
Dragendroff	+++	+	+++	+++	+	+++	+++	+	+++
Mayer's	+++	+	+++	+++	+	+++	+++	+	+++
Wagner's	+++	+	+++	+++	+	+++	+++	+	+++
Glycosides									
Borntrager's test	-	-	-	-	-	-	-	-	-
10% NaOH test	-	-	-	-	-	-	-	-	-
Cardiac glycosides									
Bromine water test	-	-	-	-	-	-	-	-	-
Diterpenes									
Copper acetate test	+++	+++	+++	+++	+++	+++	-	-	-
Quinones									
Alcoholic KOH test	-	-	-	-	-	-	-	-	-
Phenolics									
Iodine test	++	++	++	++	++	++	++	++	++
Ferric chloride test	+++	+++	+++	+++	+++	+++	+++	+++	+++
Lead acetate test	+++	+++	+++	+++	+++	+++	+++	+++	+++
Flavonoids									
Lead acetate test	+++	+++	+++	+++	+++	+++	+++	+++	+++
Ferric chloride test	+++	+++	+++	+++	+++	+++	+++	+++	+++
Coumarins									
NaOH test	++	+++	+++	++	+++	+++	++	+++	+++
Saponins									
Froth test	+	-	-	++	-	-	+++	-	-
Carbohydrates									
Barfoed's test	+	+	-	+	+	-	+	+	-
Reducing sugars									
Fehling's test	-	+++	-	-	++	-	-	++	-
Proteins and amino acids									
Millon's test	++	+++	+	++	+++	+	++	+++	+

The colour of the radical is intense, deep purple. During assay, when the radical is interacting with antioxidants or reducing agents, it gets neutralised by them since they donate either a hydrogen atom or an electron. This process converts DPPH•. into a reduced form, either DPPH or DPPH-H. The unpaired electron of the DPPH radical intensely absorbs light at 517 nm, producing its deep purple colour. On the contrary, when these unpaired electron pairs pair with another electron, the original colour fades progressively, transforming into a pale-yellow shade (Bibi Sadeer *et al.,* 2020). IC_{50} value is the value that represents the concentration necessary to eliminate 50% of radicals (Patkar and Khan, 2024). The lower the IC_{50} value, the stronger the antioxidant activity. Ascorbic acid was used to obtain the standard curve, as shown in Fig. 3. IC_{50} values of the samples, as well as the standard, are shown in Table 3.

ABTS Assay

The ABTS assay measures the capacity of antioxidants to neutralise the 2,2'-azinobis (3- 3-ethylbenzothiazoline-6-sulfonic acid), which is distinguished by a blue-green chromophore with peak absorption at 734 nm (Munteanu and Apetrei, 2021). When the unstable form of ABTS radical, i.e., ABTS•+, receives an

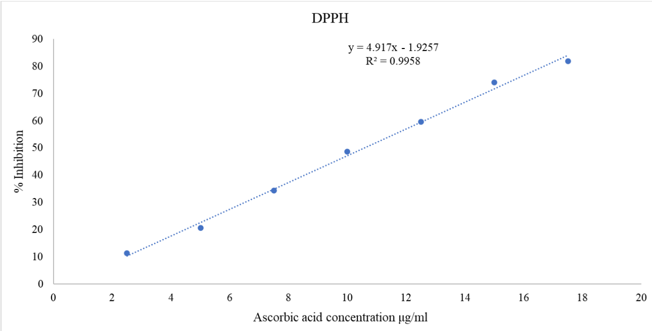

Fig.3: Standard curve of Ascorbic acid in DPPH assay

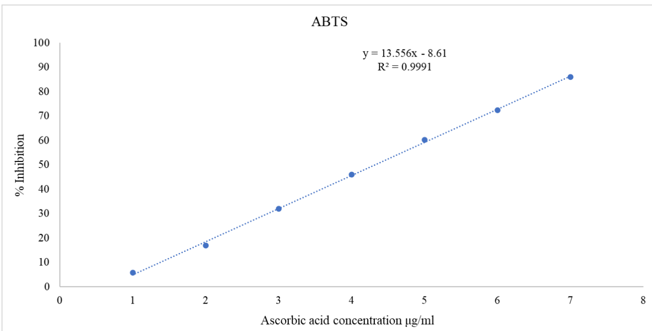

Fig.4: Standard curve of Ascorbic acid in ABTS assay

Table 2: Total phenolic and flavonoid content

Plant sample	*Total phenolic content (mg GAE/g)*	*Total flavonoid content (mg CE/g)*
G. indica Leaves	53.46 ± 1.22	11.51 ± 0.24
G. indica Fruit rind	62.16 ± 0.20	25.37 ± 1.71
G. indica Bark	272.81 ± 2.28	118.34 ± 3.47
G. gummi-gutta Leaves	146.79 ± 1.49	54.25 ± 1.31
G. gummi-gutta Fruit rind	20.52 ± 0.52	4.105 ± 0.00
G. gummi-gutta Bark	286.19 ±1.46	193.2 ± 3.47
G. talbotii Leaves	224.33 ± 1.46	99.93 ± 3.25
G. talbotii Fruit rind	172.99 ± 0.48	79.75 ± 4.94
G. talbotii Bark	144.63 ± 2.19	42.91 ± 0.65

electron from the antioxidant, its blue-green hue fades to a pale blue, which indicates the restoration of ABTS to its stable form (Bibi Sadeer *et al.,* 2020). IC_{50} value is the value that represents the concentration necessary to eliminate 50% of radicals (Patkar and Khan, 2024). The lower the IC_{50} value, the stronger the antioxidant activity. Ascorbic acid was used to obtain the standard curve, as shown in Fig.4. IC_{50} values of the samples, as well as the standard, have been shown in Table 3.

IC_{50} values can be categorised as follows

Very strong, strong, medium, weak and not active, based on numerical classes as seen in Table 4 (Kusumawati *et al.,* 2021).

Table 3: IC_{50} values of DPPH and ABTS assay

Standard/Plant sample	*DPPH (IC_{50} Value µg/mL)*	*ABTS (IC_{50} Value µg/mL)*
Ascorbic acid	10.56 ± 0.04	4.33 ± 0.02
G. indica Leaves	476.35 ± 8.10	153.18 ± 2.45
G. indica Fruit rind	155 ± 5.22	44.85 ± 0.47
G. indica Bark	32.43 ± 0.63	12.08 ± 0.12
G. gummi-gutta Leaves	58.63 ± 0.74	21.63 ± 0.15
G. gummi-gutta Fruit rind	614.86 ± 6.28	198.54 ± 4.49
G. gummi-gutta Bark	14.11 ± 0.21	5.37 ± 0.03
G. talbotii Leaves	38.77 ± 0.10	6.74 ± 0.09
G. talbotii Fruit rind	34.18 ± 0.27	9.30 ± 0.16
G. talbotii Bark	86.66 ± 1.13	10.54 ± 0.12

Table 4: Classification of antioxidant activity based on IC_{50} values

IC_{50} Value (µg/mL)	*Antioxidant Activity*
< 50	Very Strong
50 -100	Strong
101-250	Medium
250-500	Weak
> 500	Not active

Discussion

The preliminary phytochemical screening indicated that all three species of *Garcinia* showed the presence of alkaloids, diterpenes, phenolics, flavonoids and coumarins. Leaves, bark, and fruit rind of all three species showed the presence of phenolics and flavonoids. Assays on TFC and TPC showed that the bark of *G. indica* and *G. gummi-gutta* is richer in phenolics and flavonoids as compared to their leaves and fruit rind; however, the bark is not utilized as much as the fruit rind in food preparation or herbal medicine. It was observed that *G. talbotii* leaves contain more phenolics and flavonoids as compared to its fruit rind and bark.

Antioxidant activity was assessed using DPPH and ABTS assays, both of which show similar results to the TPC and TFC assays. The overall results show that extracts of *G. talbotii* have comparable antioxidant activity to that of *G. indica* and *G. gummi-gutta*. Among the leaf, fruit and bark extracts of *G. indica* and *G. gummi-gutta*, the bark extracts showed the lowest IC_{50} value. Interestingly, *G. talbotii* fruit rind shows good scavenging activity against DPPH radical, while *G. talbotii* leaves are highly effective at neutralizing ABTS radical. IC_{50} value of *G. gummi-gutta* bark extract (in DPPH assay) is very close to that of the reference standard, Ascorbic acid. Similarly, IC_{50} values of *G. talbotii* leaf extract and *G. gummi-gutta* bark extract (in ABTS assay) are extremely close to the value of Ascorbic acid. As per the categorization given in Table 4, almost all IC_{50} values of *G. talbotii* extracts fall in the 'Very strong' category, i.e., <50, thus highlighting its promising antioxidant potential.

The results of this study align with previously documented research on *G. indica* and *G. gummi-gutta*. Because *G. talbotii* is relatively less explored in terms of phytochemistry and antioxidant potential, the present work is a novel study into its efficacy as a viable therapeutic agent.

Conclusion

The study aimed to evaluate the potential antioxidant activity of the underexplored plant *G. talbotii* as compared to the well-documented species *G. indica* and *G. gummi-gutta*. The genus *Garcinia* is known for its high therapeutic and nutritional value. All the species of *Garcinia* considered for this study are endemic to the Western Ghats of India and are an important part of the area's ecology. *G. indica* and *G. gummi-gutta* are popularly used in the local cuisine and also have medicinal and therapeutic properties. However, *G. talbotii* is not as deeply studied or well-documented as the above-stated plants. This analysis gives concrete evidence of the strong antioxidant potential of *G. talbotii* and also validates further research on these lines. Given its rich phytochemical profile and antioxidant properties, it shows promise in the medical, pharmaceutical and nutraceutical industries. However, detailed research is required to identify and isolate specific bioactive metabolites to boost the usage of this plant in the pharmaceutical industry. Additionally, it also advocates the conservation of all three species in their native habitat, as they may be important repositories of herbal medicines that need to be sustainably sourced for future use.

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Author Contribution

Snehal Unde and Shubham Patkar designed as well as performed the experiments, analysed the results meticulously and produced the paper. Dr. Rajendra Shinde edited and critically reviewed the manuscript before approving the final version for publication.

Conflict of Interest

None.

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