

Comparative Analysis of The Phytochemical Profiles of Selected Edible Gums

Gupta Shalini*, Trupesh Revad, Himanshu Pandya, Hitesh Solanki

Department of Botany, Bioinformatics and climate Change Impacts Management, Gujarat University, Ahmedabad, Gujarat, India

ABSTRACT

This study examined the phytochemical and antioxidant characteristics of wild edible gums that were extracted from three different species, *Anogeissus latifolia*, *Acacia nilotica*, and *Acacia catechu*. The extractive values for these three species were 71%, 70%, and 49.6%, respectively, with only slight differences in test results, such as the presence of tannins, in *A. latifolia*, qualitative phytochemical screening showed that all samples included alkaloids, flavonoids, and steroids. The total flavonoid content of *A. nilotica* (169.30 ± 1.01 mg QE/g) and *A. latifolia* (173.67 ± 4.41 mg QE/g) was significantly higher than that of *A. catechu* (27.33 ± 0.25 mg QE/g), according to quantitative analysis, indicating possible variations in antioxidant ability. The DPPH radicals scavenging assay confirmed that *A. catechu* had the highest antioxidant activity ($IC_{50} = 374.90$ μ g/ml), followed by *A. latifolia* ($IC_{50} = 836.51$ μ g/ml) and *A. nilotica* ($IC_{50} = 1337.27$ μ g/ml). The results highlight the potential nutritional, medical, and industrial applications of these natural gums, with variations in yield, phytochemical composition and antioxidant efficiency highlighting the significance of species selection according on intended use.

Keywords: *Anogeissus latifolia*, *Acacia nilotica*, *Acacia catechu*, Qualitative, Quantitative, Antioxidant assay

INTRODUCTION

Natural exudates from plant and shrub stems or bark are known as wild edible gums. These gums are water-soluble or swell polysaccharides that have numerous nutritional, and medicinal, and, Industrial uses. Edible gums from the wild are necessary for human diet and have therapeutic uses. They are taken from a range of plant species, such as *Acacia*, *Sterculia*, and *Boswellia* are generally found in arid and semi-arid regions. The food industry makes extensive use of gums and their derivatives. They are less expensive and frequently available. Chemically inert, odourless, Harmless, and biocompatible. Because they dissolve in water, these gums are also known as hydrocolloids (Saha, A., et al., 2017). Often referred to as “Babul,” *Acacia nilotica* is a group of trees and shrubs that are members of the Fabaceae family (Nadkarni K. M. 2005). India is home to a large number of this pantropical and subtropical genus. It is essential in agro-pastoral and traditional system and occurs naturally (Shittu G. A. 2010). *A. nilotica* is used in traditional pharmacopoeia for animals and humans, as well as agriculture, pastoral,

industrial, and food production (Pirsa, S., et al., 2023; Yemenicioglu, A., et al., 2020). Furthermore, the fruits of *A. nilotica* are sold in the Central market. It was noted that *A. nilotica* bark is one of the most abundant natural antioxidants. Plant gum can be eaten raw and fried (Perumal, P. K., et al., 2023). *A. nilotica* have medicinal properties like astringent and styptic; used to treat sore throats, asthma, diabetes, bleeding piles, burns, leucorrhoea, urine and vaginal discharges, and halt bleeding (Chatterjee, A. 1991; Kumar, S., & Chauhan, A. K. S. 2005). *Acacia catechu* is prickly deciduous tree that can reach to 15 metres (50 feet) tall. In Linnaean scientific classification, the plant is known as khair in Hindi. *Senegalia catechu* can be found across south and Southeast Asia, including India, Myanmar, Thailand, and Indonesia. *Senegalia catechu* (Roxb.) (Family-leguminosae), a multipurpose business vegetable tree, is native to the Indian Peninsula, particularly Maharashtra, Gujarat, Rajasthan, and Tamil Nadu, where it thrives on Bone-dry, rough soils. This tree is also used to manufacture pulp wood, timber, feed, and gum, and it offers a variety of therapeutic benefits.

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



There active compounds, such as catechin or epicatechin, perform significant functions as an anti-inflammatory and antioxidant agent (Kumari, M., et al., 2022). The plant's gum is fried in ghee, combined with light-baked wheat flour and dry fruits, and used to make "Ladoos." These are particularly given to postpartum mothers to relieve joint problems, and the gum is thought to relax the tightness in the abdominal muscles. *Acacia catechu* have medicinal properties like astringent and styptic; Tonic, emollient, and demulcent (Chopra, R. N., et al., 1956). *Anogeissus latifolia* (Dhawda gum) belongs to the Combretaceae family and is mostly produced in the Indian states of Chhattisgarh, Gujarat, Jharkhand, Madhya Pradesh, Maharashtra, and Andhra Pradesh. It has a glassy fracture and produce spherical tears that are typically smaller than 1 cm in diameter. It frequently appears in bigger vermiform clumps. Many industries use

dhawda gum (*Anogeissus latifolia*). It is used to make powdered, stable, oil-soluble vitamins. It is used as a binder in long-fibered, light-weight papers; it is used as an immersive fear of petroleum and non-petroleum to form liquid wax paste emulsions (Yogi RK, et al., 2017). Fried gum was eaten. Specially given to women after delivery to alleviate joint pain. *Anogeissus latifolia* have medicinal properties like, Astringent, postnatal tonic, and rheumatism (Chatterjee, A., & Pakrashi, S. C. 1991; Jain, S. K. 1991).

MATERIALS AND METHODS:

(1) Collection of Gum samples:

Fresh Gums samples were collected in a month of 2nd February 2025, from Kalupur local market in Ahmedabad, Gujarat, India.



Gum of *Acacia nilotica*



Gum of *Acacia catechu*



Gum of *Anogeissus latifolia*

(2) Preparation of samples:

The plant material (gum) of *Acacia nilotica*, *Acacia catechu*, and *Anogeissus latifolia* crushed to fine powder in grinder and stored in air tight bottles.

(3) Preparation of Gum Extract:

About 10 gm Gum powder was taken and kept in 100 ml solvent (aqueous) and then put it in Shaker for 24

hours. The solution was then filtered using whatmann filter paper no. 42 and kept in a room temperature of the evaporation of respective solvent. The dried extracts were then weighed for obtaining the extractive values of each gum samples. The yield value of each extract was calculated by using the formula.

Yield Extractive Value:

$$\text{Yield of extracts} = \frac{\text{Weight of extract from plant sample (W)}}{\text{Weight of dried plant sample}} \times 100$$

(4) Qualitative tests for phytochemical screening:

The phytochemical screening was carried out for all samples as per the standard method.

Test of Steroids: (Melad, F. M., et al., 2023; Khandelwal, K. 2008)

Salkowski Reaction:

Few milligrams of gum was taken in the taste tube. 2 ml of chloroform and 2 ml of conc. sulphuric acid was added from the side of the taste tube. The taste tube was shaken for a few minutes. The development of red colour in the chloroform layer indicated the presence of sterols.

Tests for Flavonoids:

Shinoda Test:

Few milligrams of gum was taken in the taste tube and dissolved in 5 ml ethanol (95% v/v) and reacted with few drops of concentrated hydrochloric acid and 0.5 g of magnesium metal. The pink, crimson or magenta colour is developed within a minute or two if Flavonoids are present.

Alkaline Reagent Test:

Extracts were treated with a few drops of sodium hydroxide solution. Formation of intense yellow colour, which becomes colourless on the addition of dilute acid, indicates the presence of flavonoids.

Lead Acetate test:

Extracts were treated with a few drops of lead acetate solution. Formation of yellow colour precipitate indicates the presence of flavonoids.

Tests for Amino Acids:

Ninhydrin Test:

To the extract, 0.25% w/v ninhydrin reagent was added and boiled for a few minutes. Formation of a blue colour indicates the presence of amino acid.

Xanthoproteic Test:

The extracts were treated with a few drops of concentrated Nitric acid. Formation of yellow colour indicates the presence of proteins.

Test for sugars:

Fehling's Solution Test:

Fehling solution A and Fehling solution B Both were mixed in equal volumes immediately before use. A little of the test residue was dissolved in water, and a few ml of the Fehling's solution was added to it. This mixture was then warmed. If a red precipitate of cuprous oxide is obtained, reducing sugars are present.

Test for Glycosides:

Legal's Test:

Extracts were treated with sodium nitroprusside in pyridine and sodium hydroxide. Formation of pink to blood red colour indicates the presence of cardiac glycosides.

Tests for Alkaloids:

Wagner's Test:

Few ml extract are added in the test tube and treated with a 4-5 drops of Wagner's reagent (along the sides of test tube), Formation of brown/reddish colour Precipitate indicates the presence of alkaloids (Wagner, H. 1993; Banu, K. S., et al., 2015).

Mayer's Test:

Few ml extract are added in the test tube and treated with a two drops of Mayer's reagent (along the sides of taste tube), formation of creamy white colour precipitate indicates the presence of alkaloids (Evans, W. C. 2009).

Dragendroff's Test:

Few ml extract are added in the taste tube and treated with few drops of Dragendroff's reagent (along the sides of taste tube), formation of reddish/brown precipitate indicates the presence of alkaloids (De Silva, G. O., et al., 2017; Kumar, M. K., et al., 2011).

Tests for Tannins:

Ferric Chloride Reagent Test:

1 ml extract are added in the test tube and treated with 2 ml 5% ferric chloride reagent, Formation of dark green/bluish black colour indicates the presence of tannins (Audu, S. A. et al., 2007).

Lead Acetate Test:

1 ml Extract are added in the test tube and treated with 3 ml 10% lead acetate solution, Formation of White precipitate indicates the presence of tannins (Shaikh, J. R., et al., 2020).

(5) Quantitative screening (Total flavonoid content):

150 µl of the extracts of different variety of (gum aqueous extracts) was mixed with 1500 µl of 95% of methanol, and then 100 µl of aluminium chloride (10%) and potassium acetate (1M) was added

respectively and make volume up to 10 ml with distilled water and agitated. Incubation was done for 20-30 minutes at room temperature. The absorbance was assessed at 415nm against a blank having all the reagents without the sample using spectrophotometer. Measurement was done in duplicates and the total flavonoid quantified by the standard curve of quercetin solution (12.5, 25, 50, 75, 100, and 150 µg/ml, $R^2=0.9963$) (Quettier-Deleu, C., et al., 2000).

(6) Measurement of antioxidant activity:

DPPH radical scavenging activity:

The DPPH (2,2-diphenyl-1-picrylhydrazyl) reagent is used in the DPPH technique, which was developed by

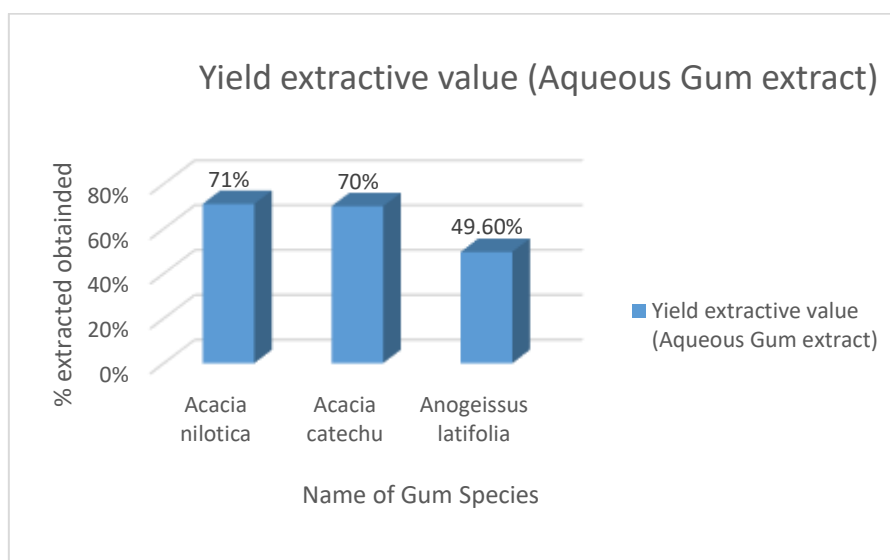
Marsden Blois in 1958 to measure a substance's capacity to scavenge free radicles. Firstly, take Gum extract having different concentration followed by adding 3ml DPPH solution. After that make final volume up to 1ml with solvent i.e. methanol and acetone. Incubate it for 30 minute under dark condition. Using UV spectrophotometer, the absorbance at 517nm was determined. For Ascorbic acid similar procedure was followed for the standard series with concentration 1mg/1ml (Blois, M. S. 1958).

RESULT AND DISCUSSION:

(1) Yield Extractive Value:

Table 1: Yield extractive value of selected Gum varieties.

Name of Gums	Yield extractive value
<i>Acacia nilotica</i>	71%
<i>Acacia catechu</i>	70%
<i>Anogeissus latifolia</i>	49.6%



Graph: 1 Yield extractive value of selected Gum species.

Figure 1 shows, *Anogeissus latifolia* exhibits a notably lower yield (less than 50%), whereas *Acacia nilotica* and *Acacia catechu* both exhibit comparably high extractive yields (around 70%). Practically speaking, this implies that when processed with water,

the two *Acacia* species Yield a comparatively higher amount of gum extract than *Anogeissus latifolia*.

(2) Qualitative Analysis:

Table 2: Preliminary phytochemical screening of gums:

Phytochemicals	Tests	Name of Varieties		
		<i>Acacia nilotica</i>	<i>Acacia catechu</i>	<i>Anogeissus latifolia</i>
Alkaloids	Mayer's Test	-	+	+
	Wagner's Test	-	-	-
	Dragendroff's Test	+	+	+

Tannins	Ferric Chloride Reagent Test	-	-	-
	Lead Acetate Test	-	-	+
Flavonoids	Shinoda Test	-	-	-
	Alkaline Reagent Test	+	+	+
	Lead Acetate test	-	+	-
Steroids	Salkowaski Reaction	+	+	-
Glycosides	Legal's Test	-	-	-
Amino Acids	Ninhydrin Test	-	-	-
	Xanthoproteic Test	-	-	-
Sugars	Fehling's Solution Test	-	-	-

Table 2: Qualitative screening of Gum species (Aqueous extract) (where + = present and - = absent)

Phytochemical screening reveals that all three kinds contain Alkaloids, with *Acacia catechu* and *Anogeissus latifolia* having a higher concentration, although tannins are only visible in *Anogeissus latifolia* using the lead acetate test. Flavonoids are consistently present in all samples, as demonstrated

by the alkaline reagent taste, although only *Acacia catechu* interacts with lead acetate. *Acacia nilotica* and *Acacia catechu* also contain Steroids (Salkowski reaction positive), but no Glycosides, Amino acids, or Sugars are present in any of the types.

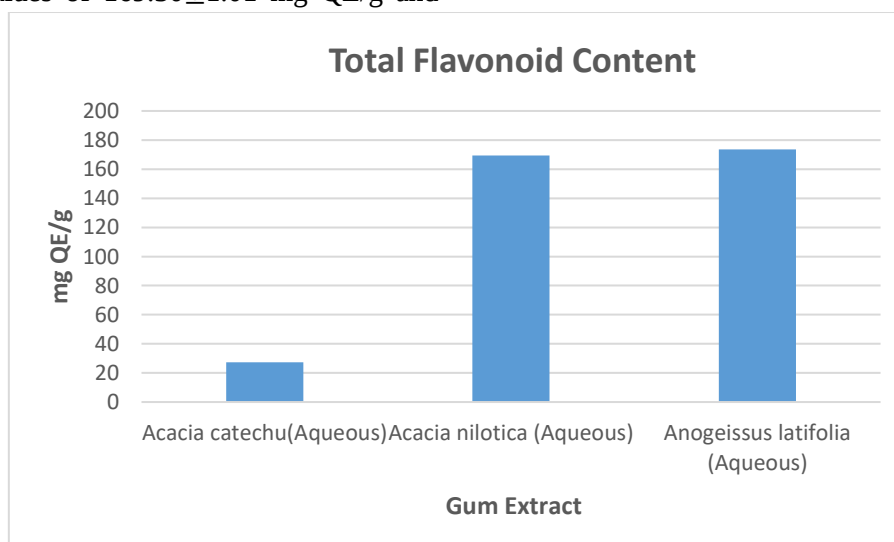
(3) Quantitative Screening (Total Flavonoid Content):

Table 3: Quantitative screening of Gum species (Aqueous extract) Mean O. D. of TFC.

Plant Varieties	Solvent	Total Flavonoid content
<i>Acacia nilotica</i>	Aqueous	27.33±0.25
<i>Acacia catechu</i>	Aqueous	169.30±1.01
<i>Anogeissus latifolia</i>	Aqueous	173.67±4.41

The Table data is supported by the table, which shows that the total flavonoid content (TFC) of the three plant extracts varies significantly. *Acacia catechu* has a significantly low TFC of 27.33±0.25 mg QE/g, while *Acacia nilotica* and *Anogeissus latifolia* have much higher values of 169.30±1.01 mg QE/g and

173.67±4.41 mg QE/g, respectively. This suggests that *Acacia nilotica* and *Anogeissus latifolia* may offer better antioxidant properties than *Acacia catechu* because of their significantly higher flavonoids concentrations.



Graph: 2 Total Flavonoid Content in Different Gum Extracts.

The bar chart Shows a large variance in total flavonoid concentration among the three aqueous extracts *Anogeissus latifolia* leads with over 180 mg QE/g, followed by *Acacia nilotica* with around 170 mg QE/g, and *Acacia catechu* lags Significantly with approximately 30 mg QE/g. This stark contrast suggests that extracts from *Anogeissus latifolia* and *Acacia nilotica* may have superior antioxidant

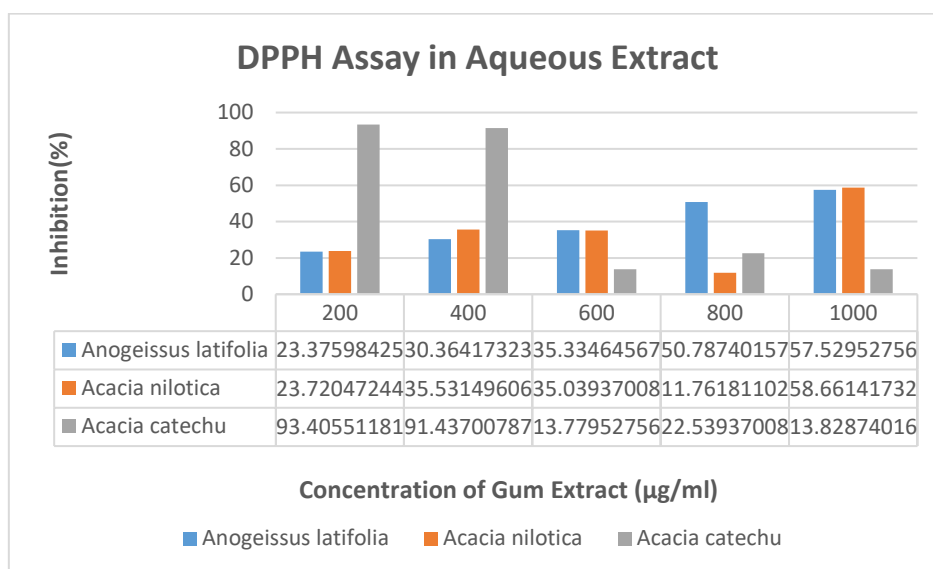
properties or other health benefits when compared to *Acacia catechu*, emphasizing the importance of selecting the appropriate extract based on flavonoid concentration.

(4) Antioxidant Activity:

DPPH Radical scavenging activity:

Table 4: Mean O. D. of Different Gum species (Aqueous extract).

Concentration	<i>Anogeissus latifolia</i>	<i>Acacia nilotica</i>	<i>Acacia catechu</i>
200	23.37598	23.72047	93.40551
400	30.36417	35.5315	91.43701
600	35.33465	35.03937	13.77953
800	50.7874	11.76181	22.53937
1000	57.52953	58.66142	13.82874



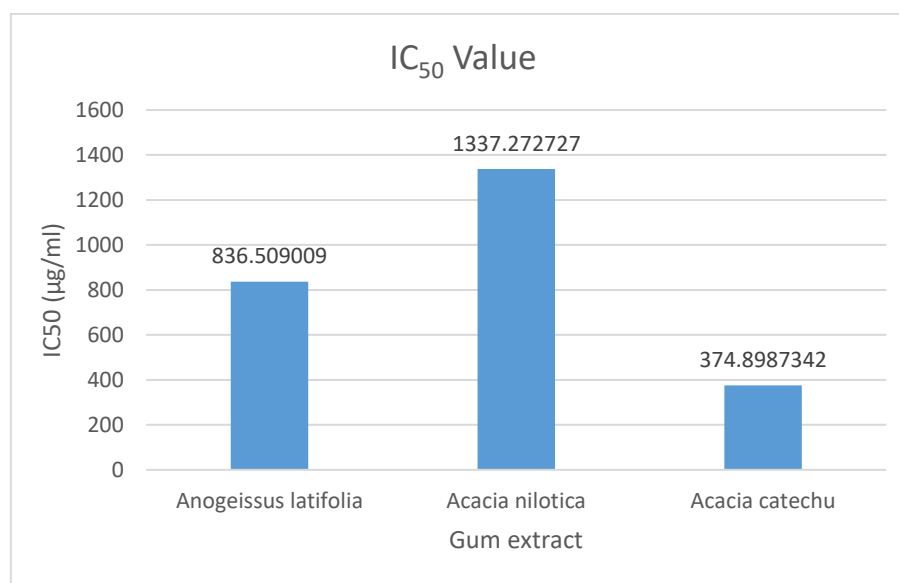
Graph: 3 DPPH scavenging activity of selectes Gums in Aqueous extract.

This graph depicts the DPPH Radicals scavenging activity (inhibition percentage) of three distinct gum extracts- *Anogeissus latifolia*, *Acacia nilotica* and *Acacia catechu* at varying concentrations. Higher doses of the extract, up to 100 µg/ml, show an increase in inhibition, indicating improved free radical scavenging. At 100 µg/ml, *Anogeissus latifolia* and *Acacia catechu* had the highest inhibition

value (about 57%), while *Acacia nilotica* also exhibits strong but slightly lower inhibition. Interestingly, at the highest tested concentration (1000 µg/ml), the inhibition values for all three extracts decline significantly. This suggests excessive concentration may interfere with the assay or that there is an ideal concentration range for antioxidant activity.

Table 5: IC₅₀ Value of selected three Gums variety. (Aqueous Extract)

Gums	Aqueous
<i>Anogeissus latifolia</i>	836.509
<i>Acacia nilotica</i>	1337.273
<i>Acacia catechu</i>	374.8987



Graph: IC₅₀ Values of antioxidant activity (DPPH) of selected Gums varieties.

The bar graph shows the IC₅₀ values (in µg/ml) for three gum extracts: *Anogeissus latifolia*, *Acacia nilotica* and *Acacia catechu*. The IC₅₀ Shows the concentration needed to inhibit 50% of activity, with lower values suggesting greater potency. *Acacia nilotica* has the lowest potency (IC₅₀ = 1337.27 µg/ml) Compared to the other two extracts. *Anogeissus latifolia* has a lower IC₅₀ value (836.51 µg/ml) while *Acacia catechu* has the lowest IC₅₀ (374.90 µg/ml), Indicating the highest effectiveness. This reveals that *Acacia catechu* gum extract is the most- strong inhibitor of activity, followed by *Anogeissus latifolia* while *Acacia nilotica* is the least effective.

CONCLUSION:

When processed with water, *Acacia nilotica* and *Acacia catechu* both have high yield extractive values (70%), suggesting that these species produce more gum. The yield of *Anogeissus latifolia*, on the other hand, is much lower (50%) and indicates a lower extraction efficiency. All three extracts contain alkaloids; however, the concentration is higher in *Acacia catechu* and *Anogeissus latifolia*. Flavanoids are regularly present, as shown by the alkaline reagent test, with minor differences in reactivity between species. Steroids are found in *Acacia nilotica* and *Acacia catechu*, while tannins can only be detected in *Anogeissus latifolia* using the lead acetate test. Glycosides, amino acids, and Sugars are absent from all samples, indicating a distinct phytochemical composition that may influence their biological

activity. *Acacia catechu* has a significantly lower TFC 27.33±0.25 mg QE/g than *Acacia nilotica* 169.30±1.01 mg QE/g and *Anogeissus latifolia* 173.67±4.41 mg QE/g. *Acacia nilotica* and *Anogeissus latifolia* had much higher flavonoid concentration, indicating that these extracts may have stronger antioxidant capabilities. The DPPH experiment demonstrates that antioxidant activity improves with concentration until it reaches an ideal point, after which it decreases, presumably due to interference at higher extracts concentrations. The IC₅₀ values provide more clarity on potency. *Acacia catechu* has the lowest IC₅₀ 374.90 µg/ml, indicating the highest free radical scavenging action. *Anogeissus latifolia* has an IC₅₀ of 836.51 µg/ml, while *Acacia nilotica* has the lowest potency at 1337.27 µg/ml. Despite having good extraction yields, *Acacia nilotica* and *Acacia catechu* have very different phytochemical profiles and antioxidant capabilities. While *Acacia nilotica* and *Anogeissus latifolia* have larger quantities of flavonoids and may provide additional antioxidant-related health advantages, *Acacia catechu* stands out for its strong antioxidant activity despite having a lower flavonoid concentration. These result highlight how crucial it is to choose gum extracts according to their intended bioactive qualities and possible uses

REFERENCE

1. Audu, S. A., Mohammed, I., & Kaita, H. A. (2007). Phytochemical screening of the leaves of

- Lophira lanceolata (Ochanaceae). Life Science Journal, 4(4), 75-79.
2. Banu, K. S., & Cathrine, L. (2015). General techniques involved in phytochemical analysis. International journal of advanced research in chemical science, 2(4), 25-32.
3. Blois, M. S. (1958). Antioxidant determinations by the use of a stable free radical. Nature, 181(4617), 1199-1200.
4. Chatterjee, A. (1991). The treatise on Indian medicinal plants (Vol. 6). Publications & Information Directorate.
5. Chopra, R. N., & Nayar, S. L. (1956). Glossary of Indian medicinal plants. Council of scientific and Industrial Research.
6. De Silva, G. O., Abeysundara, A. T., & Aponso, M. M. W. (2017). Extraction methods, qualitative and quantitative techniques for screening of phytochemicals from plants. American Journal of Essential Oils and Natural Products, 5(2), 29-32.
7. Evans, W. C. (2009). Trease and Evans' pharmacognosy. Elsevier Health Sciences.
8. Jain, S. K. (1991). Dictionary of Indian folk medicine and ethnobotany: a reference manual of man-plant relationships, ethnic groups & ethnobotanists in India. Deep publications.
9. Khandelwal, K. (2008). Practical pharmacognosy. Pragati Books Pvt. Ltd.
10. Kumar, M. K., Kaur, G., & Kaur, H. (2011). INTERNATIONALE PHARMACEUTICA SCIENCIA.
11. Kumar, S., & Chauhan, A. K. S. (2005). Medicinal plants used by local inhabitants in Bharatpur district, Rajasthan.
12. Kumari, M., Radha, Kumar, M., Zhang, B., Amarowicz, R., Puri, S., ... & Lorenzo, J. M. (2022). Acacia catechu (Lf) Willd.: A review on bioactive compounds and their health promoting functionalities. Plants, 11(22), 3091.
13. Melad, F. M., Alsadi, H., & Edrah, S. M. Journal of Pharmacy & Allied Medicine.
14. Nadkarni, K. M. (2010). Indian plants and drugs. Ajay Book Service.
15. Perumal, P. K., Dong, C. D., Chauhan, A. S., Anisha, G. S., Kadri, M. S., Chen, C. W., ... & Patel, A. K. (2023). Advances in oligosaccharides production from algal sources and potential applications. Biotechnology Advances, 67, 108195.
16. Pirs, S., & Hafezi, K. (2023). Hydrocolloids: Structure, preparation method, and application in food industry. Food Chemistry, 399, 133967.
17. Quettier-Deleu, C., Gressier, B., Vasseur, J., Dine, T., Brunet, C., Luyckx, M., ... & Trotin, F. (2000). Phenolic compounds and antioxidant activities of buckwheat (Fagopyrum esculentum Moench) hulls and flour. Journal of ethnopharmacology, 72(1-2), 35-42.
18. Saha, A., Tyagi, S., Gupta, R. K., & Tyagi, Y. K. (2017). Natural gums of plant origin as edible coatings for food industry applications. Critical reviews in biotechnology, 37(8), 959-973.
19. Shaikh, J. R., & Patil, M. (2020). Qualitative tests for preliminary phytochemical screening: An overview. International journal of chemical studies, 8(2), 603-608.
20. Solomon-Wisdom, G. O., & Shittu, G. A. (2010). In vitro antimicrobial and phytochemical activities of Acacia nilotica leaf extract. J. Med. Plants Res, 4(12), 1232-1234.
21. Thakur, N., Mittal, P., Kaur, R., & Goswami, M. (2015). Phytochemical screening of gum extracted from curcuma amada. International Journal of Pharmacognosy, 2(8), 419-425.
22. Wagner, H. (1993). Sound-localization deficits induced by lesions in the barn owl's auditory space map [published erratum appears in J Neurosci 1993 Apr; 13 (4): following table of contents]. Journal of Neuroscience, 13(1), 371-386.
23. Yemenicioğlu, A., Farris, S., Turkyilmaz, M., & Gulec, S. (2020). A review of current and future food applications of natural hydrocolloids. International Journal of Food Science & Technology, 55(4), 1389-1406.
24. Yogi, R. K., Kumar, A., Singh, A. K., & Kumar, N. (2017). Marketing efficiency of various channels for disposal of natural resins in tribal areas: a case study of central and north eastern plateau zones of India. Jharkhand Journal of Development and Management Studies, 15(4), 7475-7492.

HOW TO CITE: Gupta Shalini*, Trupesh Revad, Himanshu Pandya, Hitesh Solanki, Comparative Analysis of The Phytochemical Profiles of Selected Edible Gums, Int. J. Sci. R. Tech., 2025, 2 (4), 217-224. <https://doi.org/10.5281/zenodo.15191952>