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STUDIES ON THE ANTI- INFLAMMATORY PROPERTIES OF *CATHARANTHUS ROSEUS* AND *PSIDIUM GUAJAVA*

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Abstract

Chronic inflammation is a condition that poses a significant global health challenge. The search for effective therapeutic agents has increased interest in herbal medicine due to its potential efficacy, minimal side effects, and cost-effectiveness. *Catharanthus Rosea* (commonly known as Malagasy periwinkle) and *Psidium guajava* (guava) are two medicinal plants traditionally used for their anti-inflammatory properties. These plants are rich in bioactive compounds such as alkaloids, flavonoids, and phenolic acids have been known to modulate metabolic pathways and reduce inflammation. However, comparison of their therapeutic potential with standard drugs like Aspirin remain limited. This study aims to investigate and compare the anti-inflammatory activities of Catharanthus and guava plant extracts with the standard drug. The methodology used is *in vitro* Bovine Serum Albumin (BSA) Protein Denaturation Inhibition Assay, to examine the anti-inflammatory content of Guava and Periwinkle leaf extracts and compare to the standard drug, Aspirin. Aspirin provides a comprehensive assessment of their therapeutic efficacy. The results have shown, highest anti-inflammatory activity, in *Catharanthus roseus*. Both *Catharanthus roseus* and *Psidium guajava* showed increased anti-inflammatory activity compared to Aspirin indicating that herbal leaf extracts have greater potential in treating inflammation. By bridging traditional knowledge with modern scientific validation, this research seeks to contribute to the development of natural, plant-based alternatives for reducing inflammation.

Key words: Anti-inflammatory properties, *Catharanthus roseus*, Madagascar periwinkle, guava leaves, *Psidium guajava*.

INTRODUCTION

Phytoderivatives are bioactive compounds which exhibits anti-inflammatory properties derived from plants encompassing a wide range of chemical substances such as alkaloids, flavonoids, terpenoids, polyphenols and glycosides. These compounds are extracted from various plant parts, including leaves, roots, stems, flowers, and seeds, and are known for their therapeutic, nutritional, and industrial applications. Phytoderivatives play a significant role in traditional and modern medicine due to their anti-inflammatory properties. They are also utilized in the development of nutraceuticals, cosmeceuticals, and agrochemicals. Advances in extraction and purification technologies, such as supercritical fluid extraction and nanotechnology have enhanced the bioavailability and efficacy of these compounds in recent years (Smith *et al.*, 2020; Kumar *et al.*, 2020). Plants such as *Catharanthus roseus* (Madagascar periwinkle) and *Psidium guajava* (guava leaves) have gained significant attention for their therapeutic potential in reducing inflammation. Both plants are rich sources of bioactive compounds that contribute to their multi-functional health benefits.

The literature review presents organized data concerning the anti-inflammatory effects of phytoderivatives derived from medicinal plants. Phytoderivatives have become highly important in contemporary medicine because of their various pharmacological attributes and their ability to tackle intricate health issues (Khan and Rahman, 2025). Plant-derived phytoderivatives have been altered or treated to develop novel compounds with possible therapeutic advantages (Pham *et al.*, 2025). Several phytoderivatives from *Catharanthus roseus* and guava leaves have shown considerable promise as natural treatments for different conditions (Taher *et al.*, 2022). Compounds derived from plants like alkaloids, flavonoids, terpenoids, and polyphenols have been thoroughly researched for their effectiveness



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in managing chronic illnesses such as cancer, diabetes, cardiovascular diseases, and neurodegenerative disorders (Al-Harrasi *et al.*, 2025; Khan and Rahman, 2025; Martinez *et al.*, 2025; Schmidt and Weber, 2026; Patel and Singh, 2025). Their natural source, low toxicity, and capacity to influence various biological pathways render them appealing substitutes or complements to synthetic medications. (Pain, 2026); BCC Research, (2026). For example, phytochemicals such as curcumin, resveratrol, and quercetin have shown significant anti-inflammatory, antioxidant, and anticancer properties, presenting encouraging opportunities for drug development. (Patel *et al.*, 2020).

Phytoderivatives are progressively being incorporated into personalized medicine and nutraceuticals, meeting the rising need for holistic and preventive health management. (Al-Harrasi *et al.*, 2025). Their contribution to fighting antimicrobial resistance is significant, as numerous plant-derived substances show extensive antimicrobial effectiveness against drug-resistant microorganisms (Sharma *et al.*, 2020). Progress in biotechnology and nanotechnology has facilitated the creation of innovative drug delivery systems, improving the bioavailability and therapeutic effectiveness of phytoderivatives. (Kumar *et al.*, 2020). Phytoderivatives serve as a fundamental element in the shift towards effective, sustainable, and patient-focused medical solutions. Inflammation and oxidative stress are linked, as reactive oxygen species can trigger inflammatory pathways, while inflammatory cytokines can intensify oxidative stress, forming a harmful cycle that sustains diabetic complications. (Giacco and Brownlee, 2010). Addressing inflammation and oxidative stress through therapeutic interventions, such as anti-inflammatory agents and lifestyle modifications has emerged as a promising strategy for managing diabetes and its complications. (Burgos-Morón *et al.* 2019), Zimmet *et al.*(2022).

Phytoderivatives, possess anti-inflammatory characteristics, and exhibit alleviating these pathological conditions, providing a natural and sustainable method for managing diabetes (Prasad *et al.*, 2020). Wang *et al.* (2023) investigated on phytoderivatives such as quercetin, curcumin, and EGCG that inhibit the activation of inflammatory pathways, resulting in reduced production of pro-inflammatory mediators. Oxidative stress was strongly associated with inflammation since reactive oxygen species (ROS) have the ability to activate NF- κ B, COX, and LOX pathways. (Wang *et al.*, 2023). Improvements in extraction and analytical methods have further improved their use in contemporary medicine (Ojha *et al.*, 2019).

Phytoderivatives obtained from different plant origins have shown considerable therapeutic potential owing to their anti-inflammatory effects. Presented below is a tabular column (Table-1) featuring various common plant sources along with their bioactive compounds, such as Catharanthus roseus and Guava leaves, emphasizing their pharmacological properties. reactions. Their mechanisms of action targeting multiple pathways, along with their safety and availability, render them strong contenders for additional research and development in plant-derived therapies. This review emphasizes the necessity for uniform extracts, comprehensive pharmacological research, and clinical trials to completely utilize their therapeutic capabilities. Conventional remedies, like Guava leaves and periwinkle leaves, have been utilized for centuries to address various ailments, including diabetes, inflammation, and oxidative stress. Here are several possible functions of these conventional medicines. *Psidium* (Guava) leaves and *Catharanthus* (Madagascar Periwinkle) leaves have demonstrated anti-inflammatory properties, diminishing inflammation and alleviating symptoms in ailments like arthritis. (Setyaningrum *et al.* ,2021); Sitompul and Ganie, 2017). Their mechanisms of action targeting multiple pathways, along with their safety and availability, position them as strong candidates for continued research and development of plant-derived therapies. This review highlights the necessity for standardized extracts, comprehensive pharmacological research, and clinical trials to fully utilize their therapeutic capabilities.



Table-1 Plant Sources and Their Bioactive Compounds with Anti-inflammatory Properties

	Plant Source	Bioactive Compounds:	Anti-inflammatory Properties
1	<i>Catharanthus roseus</i> (Madagascar Periwinkle)	Vincristine, vinblastine and other indole alkaloids.	Vincristine and vinblastine have been shown to inhibit pro- inflammatory cytokines such as TNF- α and IL-6, reducing inflammation in chronic diseases (Kumar et al., 2020).
2	Guava Leaves (<i>Psidium guajava</i>)	Quercetin, gallic acid, catechin and flavonoids	Quercetin and gallic acid inhibit NF- κ B and COX-2 pathways, reducing inflammation in conditions like arthritis and metabolic disorders (Rahim et al., 2019).

RESEARCH METHODOLOGY

Collection of Plant Leaves: To study the anti-inflammatory activity in the leaf extract, periwinkle (*Catharanthus*) and Guava(*Psidium*) leaves were collected in Hyderabad.

Preparation of extracts: washed with tap water, and dried in a hot air oven at 55°C for 24 hours. The dried leaves were then ground into a fine powder. For the extraction process, 20g of *Catharanthus* leaf powder was mixed with 200 ml of distilled water, while 30g of Guava leaf powder was mixed with 300 ml of distilled water. The mixtures were placed in a water bath at 100°C for 2 hours, with periodic stirring. After extraction, the mixtures were filtered using Whatman No. 1 filter paper into conical flasks, covered with aluminum foil, and stored in the refrigerator.

Procedure of Anti-Inflammatory test (*in vitro* Bovine Serum Albumin (BSA) Protein Denaturation Inhibition Assay):

1 mg of plant extract + 1ml of BSA(Bovine Serum Albumin) incubate it for 20 mins then take OD values and then keep it into water bath for the induced inflammation, then take the OD value at 660 nm. (Siddiqui, 2020).

RESULTS

The results show considerable anti-inflammatory activity of the plant extracts.

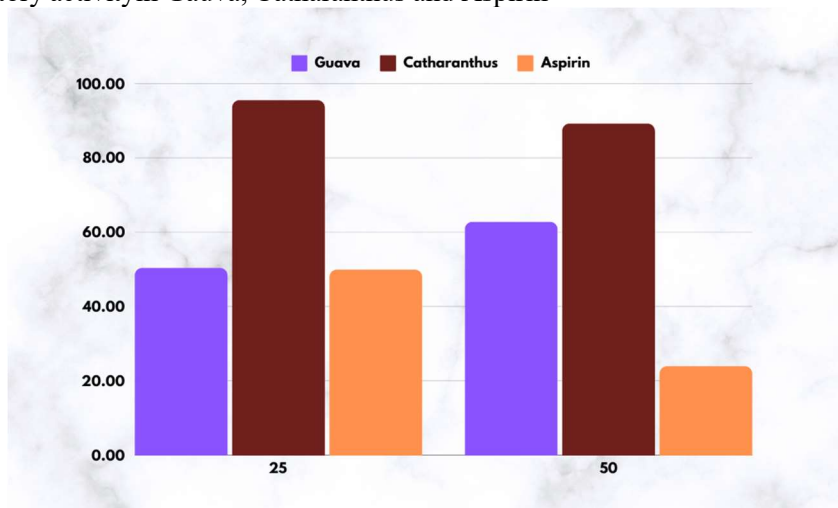
- Catharanthus roseus* exhibited the highest anti-inflammatory activity, measuring 89.2 mg at 50% concentration and 95.5 mg at 25%. (Table-2, Graph-1).
- Guava's anti-inflammatory effects were moderate, recording 62.75 mg at 50% and 50.35 mg at 25%.(Table-2, Graph-1).
- Aspirin, despite being a well-known anti-inflammatory agent, demonstrated significantly lower activity than both plant extracts. (Table-2, Graph-1).

Table-2 The plant extract anti-inflammatory activity with respect to concentraion

Concentrations	Guava	Catharanthus	Aspirin
50	62.75	89.2	23.9
25	50.35	95.5	49.9



Graph-1: Anti-Inflammatory activity in Guava, Catharanthus and Aspirin



x-axis: Concentrations of leaf extracts and aspirin at 25% and 50%

y-axis: Anti-inflammatory activity in mg.

DISCUSSION

Anti-Inflammatory Activity in *Catharanthus* and *Psidium*: Inflammation is a key biological response to injury or infection, often mediated by the activation of immune cells and the release of pro-inflammatory cytokines. Many plant species have been explored for their anti-inflammatory potential due to their bioactive compounds.

1. In the present study, the anti-inflammatory activity of *Catharanthus roseus* and *Psidium guajava* leaves was evaluated, revealing significant potential in both plant extracts. The observed anti-inflammatory properties of *Catharanthus* was found to be very high when compared to *Psidium*. In contrast, *Guava*'s anti-inflammatory efficacy was found at moderate levels in the present study. The reduced activity of aspirin may result from its altered mechanisms of action when compared to the plant extracts.

2. Comparison of Anti-Inflammatory Activity

- a. *Catharanthus roseus*, activity was found highest when compared to the leaf extract of *Psidium*. The high level of anti-inflammatory activity is due to alkaloids such as vincristine and vinblastine, which are well documented for their pharmacological properties. In addition, studies suggest that these alkaloids contribute to the plant's anti-inflammatory effects by inhibiting pro-inflammatory mediators such as nitric oxide (NO), prostaglandins, and cytokines. (Pham *et al.*, 2025). Naeem *et al.*, 2025). The flavonoids and phenolic compounds present in *Catharanthus* may also play a role in reducing oxidative stress, which is closely linked to inflammation. The plant exhibits anti-inflammatory activity by suppressing pro-inflammatory cytokines (e.g., TNF- α , IL-6) and inhibiting enzymes like cyclooxygenase (COX) and lipoxygenase (LOX). This makes it effective in managing inflammation-associated complications of diabetes. (Pham *et al.*, 2025); Al-Harrasi, *et al.*, 2025).
- b. *Psidium guajava* (guava) activity was found to be moderate and higher when compared to Aspirin. The activity is accounted for its high flavonoid and tannin content, particularly quercetin, which exhibits strong anti-inflammatory activity. (Kumar *et al.*, 2021). Quercetin has been reported to inhibit cyclooxygenase (COX) and lipoxygenase (LOX) pathways, which are major contributors to inflammatory responses. (Choi, 2008). Additionally, guava leaves contain essential oils and polyphenols that modulate inflammatory pathways by



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downregulating inflammatory cytokines like TNF- α , IL-6, and IL-1 β . (Jang et al., 2014). *Guava* leaves contain bioactive compounds that modulate inflammatory pathways reducing the production of pro-inflammatory mediators such as prostaglandins and cytokines. This makes them effective in alleviating chronic inflammation associated with metabolic disorders. (Basha and Sankaranarayanan, 2018).

Both *Catharanthus* and guava leaves exhibit their anti-inflammatory activity through multiple mechanisms:

- i. **Inhibition of Pro-Inflammatory Enzymes:** Guava leaf extracts inhibit COX and LOX enzymes, reducing prostaglandin synthesis. *Catharanthus* alkaloids interfere with the production of inflammatory mediators such as NO and prostaglandins. (Jang et al. (2014); Kawakami et al. (2009);Pham et al., 2025).
- ii. **Reduction of Oxidative Stress:** Guava leaves contain high levels of antioxidants, including vitamin C and flavonoids, which neutralize reactive oxygen species (ROS) that contribute to inflammation. *Catharanthus*-derived compounds have been found to protect against oxidative stress, further aiding in reducing inflammation. (Kumar et al., 2021); Awasthi et al. (2024).
- iii. **Modulation of Cytokine Production:** Both plants regulate the immune response by reducing inflammatory cytokines (IL-6, TNF- α) and increasing anti-inflammatory cytokines (IL-10).(Setyaningrum and Saraswati ,2021) ; Pham et al.(2025).

CONCLUSION

In the present research, analyses of the antioxidant profiles of *Catharanthus roseus* (Periwinkle) and *Psidium guajava* (Guava leaves) extracts, using Aspirin as a standard. Consequently, they offer plant-derived alternatives to combat diseases associated with inflammatory responses. The results indicated that both periwinkle and guava had anti-inflammatory activity higher than Aspirin, due to the presence of bioactive compounds. In conclusion, this study verifies that these common botanical sources are natural biological anti-inflammatory products. The present study, confirms the importance of herbal medicine.

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