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Anti-inflammatory and analgesic activity of ethanolic extracts of *Actinidia deliciosa* and *Vitis vinifera* in experimental rodent model

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Abstract

The present study was undertaken to evaluate the anti-inflammatory and analgesic activities of ethanolic extracts of *Actinidia deliciosa* and *Vitis vinifera* using experimental rodent models. Anti-inflammatory activity was evaluated using Complete Freund's Adjuvant (CFA)-induced arthritis in Wistar rats, while analgesic activity was assessed using Eddy's hot plate method in mice. Ethanolic extracts of *A. deliciosa* and *V. vinifera* were administered orally at a dose of 250 mg/kg. Indomethacin (2 mg/kg) served as the standard anti-inflammatory drug. CFA-induced arthritic rats showed significant joint swelling and reduction in body weight. Treatment with both plant extracts significantly reduced joint diameter and improved body weight compared to arthritic control animals ($p < 0.05$). In the hot plate test, both extracts significantly increased reaction time, indicating analgesic activity, with peak effects observed between 60 and 120 minutes post-administration.

The findings suggest that ethanolic extracts of *Actinidia deliciosa* and *Vitis vinifera* possess significant anti-inflammatory and analgesic properties and may serve as potential natural therapeutic agents for inflammatory disorders.

Keywords: *Actinidia deliciosa*, *Vitis vinifera*, anti-inflammatory activity, analgesic activity, CFA-induced arthritis, hot plate method

Introduction

Inflammation is a protective response of the body to tissue injury, infection, or chemical irritation and is characterized by pain, swelling, redness, and loss of function. Chronic inflammatory disorders such as arthritis are among the major causes of morbidity and disability in both humans and animals. Rheumatoid arthritis involves immune-mediated synovial inflammation resulting in progressive cartilage and bone destruction.

Non-steroidal anti-inflammatory drugs (NSAIDs) are commonly employed for the management of inflammatory pain; however, their prolonged use is associated with adverse effects such as gastrointestinal irritation, renal toxicity, and cardiovascular complications. This has encouraged the exploration of plant-derived compounds possessing anti-inflammatory and analgesic activities with improved safety profiles.

Actinidia deliciosa (kiwi fruit) is rich in polyphenols, flavonoids, vitamin C, and triterpenoids, which exhibit antioxidant and anti-inflammatory effects. *Vitis vinifera* (grape seed) contains high levels of proanthocyanidins and phenolic compounds known for their anti-inflammatory, analgesic, and immunomodulatory activities. Despite these reported pharmacological properties, comparative experimental evaluation of these plants using standardized animal models remains limited.

Therefore, the present study was designed to evaluate the anti-inflammatory activity of ethanolic extracts of *A. deliciosa* and *V. vinifera* using CFA-induced arthritis and to assess their analgesic activity employing the hot plate method in rodents.

Materials and Methods

Experimental animals

Healthy adult Wistar rats (180-200 g) and Swiss albino mice were used for the study. Animals were housed under standard laboratory conditions with free access to pelleted feed and water. All experimental procedures were carried out in accordance with CPCSEA guidelines and were approved by the Institutional Animal Ethics Committee.

Plant material and extraction

Whole fruits of *Actinidia deliciosa* and seeds of *Vitis vinifera* were shade dried, powdered, and subjected to Soxhlet extraction using 80% ethanol. The extracts were concentrated under reduced pressure and stored in desiccators until further use.

Acute toxicity study

Acute oral toxicity studies were conducted as per OECD guideline 423. Both extracts were found to be safe up to a dose of 2000 mg/kg body weight.

Anti-inflammatory activity (CFA-induced arthritis)

Arthritis was induced by intra-articular injection of 0.1 ml Complete Freund's Adjuvant into the right knee joint of Wistar rats. Animals were divided into the following groups (n=6):

- Normal control
- CFA control
- CFA + Indomethacin (2 mg/kg)
- CFA + *Actinidia deliciosa* extract (250 mg/kg)
- CFA + *Vitis vinifera* extract (250 mg/kg)

Treatments were administered orally from day 14 to day 28 post-CFA injection. Joint diameter and body weight were recorded at weekly intervals.

Analgesic activity (Hot plate method)

Analgesic activity was evaluated using Eddy's hot plate apparatus maintained at $55 \pm 1^\circ\text{C}$. Mice were divided into three groups: control, *Actinidia deliciosa* extract (250 mg/kg), and *Vitis vinifera* extract (250 mg/kg). Reaction time for paw licking or jumping was recorded at 0, 15, 30, 60, and 120 minutes after oral administration.

Statistical analysis

Data were expressed as mean \pm standard error (SE). Statistical analysis was performed using one-way ANOVA followed by appropriate post-hoc tests. A value of $p < 0.05$ was considered statistically significant.

Results

Effect on joint diameter and body weight

CFA-induced arthritic rats showed significant joint swelling and reduction in body weight compared to normal control animals. Treatment with ethanolic extracts of *Actinidia deliciosa* and *Vitis vinifera* significantly reduced joint diameter and improved body weight compared with CFA control rats ($p < 0.05$). The effects were comparable to those observed with indomethacin treatment.

Analgesic activity

Both plant extracts produced a significant increase in reaction time in the hot plate test, indicating analgesic activity. Maximum analgesic response was observed between 60 and 120 minutes after administration. *Vitis vinifera* extract exhibited marginally higher analgesic activity compared to *Actinidia deliciosa*.

Discussion

The present study demonstrated significant anti-inflammatory and analgesic activities of ethanolic extracts of *Actinidia deliciosa* and *Vitis vinifera* in experimental rodent models. The CFA-induced arthritis model closely resembles human

rheumatoid arthritis and is widely employed for evaluating anti-inflammatory agents.

Reduction in joint swelling suggests suppression of inflammatory mediator release, while improvement in body weight reflects attenuation of systemic inflammation. The analgesic activity observed in the hot plate test indicates central pain modulation, possibly mediated through inhibition of prostaglandin synthesis and antioxidant mechanisms.

The pharmacological effects observed in the present study may be attributed to the presence of polyphenols, flavonoids, and proanthocyanidins, which are known to inhibit cyclooxygenase enzymes and pro-inflammatory cytokines.

Conclusion

Ethanolic extracts of *Actinidia deliciosa* and *Vitis vinifera* exhibited significant anti-inflammatory and analgesic activities in experimental rodent models. These findings support the potential use of these plant extracts as natural therapeutic agents in the management of inflammatory and painful conditions.

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