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ANTI-INFLAMMATORY ACTIVITY OF *VITIS VINIFERA* IN WISTAR RATS

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Abstract

Background: It is true that many traditional herbal remedies have lost ground to contemporary medications, yet some have caught the interest of contemporary researchers and practitioners. Although modern medicine has undoubtedly advanced significantly, practitioners still use herbal remedies. The use of *Vitis vinifera* in traditional medicine has been supported by a number of scientific investigations. This study was conducted to determine the significance of *Vitis vinifera* in inflammation in Wistar rats.

Material and method: Wistar rats were selected to study the anti-inflammatory activity of the plant. Formaldehyde induced paw edema and formalin induced arthritis were used to assess the activity. the readings were noted on a Plethysmometer (UGO Basile).

Result: The results of the analysis reveal that *Vitis vinifera* possess significant anti-inflammatory activity in rodents. when compared with the saline-treated group. the paw volume (oedema) was significantly decreased in treated groups when compared with the saline-treated group.

Conclusion: The findings of our investigation clearly indicate that the juice possesses significant anti-inflammatory potential. This observed effect may be attributed to the rich phytochemical composition of the fruit. *Vitis vinifera* is known to contain a wide range of bioactive constituents, including proanthocyanidins, anthocyanins, flavonoids, phenolic acids, and other polyphenolic compounds, which are potent antioxidants.

Keywords:
Anti-inflammatory activity, Vitis vinifera, Formaldehyde, Plethysmometer.

Introduction:

It is true that many traditional herbal remedies have lost ground to contemporary medications, yet some have caught the interest of contemporary researchers and practitioners. Although modern medicine has undoubtedly advanced significantly, practitioners still use herbal remedies (Yuan, 2016).

Understanding traditional herbal remedies can lead to safer and more affordable herbal remedies (Patwardhan, 2005; Heinrich, 2002). Many contemporary drugs are derived from natural remedies (Tamboura, Sawadogo, Kaboré & Yameogo, 2000).

Nearly 40% of newly approved drugs in North America between 1983 and 1994 were from natural ingredients (Simmonds, 2003). Accordingly, research on natural products led to the development of 70% of the novel mixture compounds reported between 1981 and mid-2006 (Newman & Cragg, 2007; Newman & Cragg, 2012). According to a recent analysis of therapeutic writing, the majority of clinical research on plant medicines in the twenty-first century focuses on safety and efficacy and incorporates modernization and globalization (Liu & Wang, 2008). For more than 6000 years, *Vitis vinifera* has been valued for its medicinal properties. The oldest reports of people consuming grape products date back to 3500–2900 B.C. (Bowers, 1999).

Due to its use in the production of wine, *Vitis vinifera* is a highly cultivated natural product worldwide (Ali, Maltese, Choi & Verpoorte, 2009). The use of grapes in traditional medicine has been supported by a number of scientific investigations. To determine the significance of grapes in neurological disorders and inflammation, however, more scientific studies on their pharmacological properties are required.

Materials and Methods:

The collection of plant and preparation of juice:

The White Kishmish variety of *Vitis vinifera* fruits were purchased from local markets in Karachi, Pakistan. Following verification, the fruits were squeezed through a cotton cloth to extract fresh juice. The juice was extracted from fresh fruit each day. About 80–100 ml/100 g was the yield.

Animals' Selection:

Wistar rats (200 to 220 g) were selected for this study. Polypropylene cages were used for the housing of the rats and five rats were housed in each cage. The animals were provided with standard rat pellets and water *ad libitum*. The animals were deprived of the food six hours before the drug administration and during the conduct of the experimental tests.

Division of rats into different groups for formaldehyde-induced paw oedema method:

Group I: Normal control, given normal saline 8 ml/kg, *p.o.*

Group II: Treatment group, given VVJ 4 ml/kg, *p.o;*
Group III: Treatment group, given VVJ 8 ml/kg, *p.o;*
Group IV: Positive control, given acetyl salicylic acid 300 mg/kg, *p.o*

Division of rats into different groups for formalin induced arthritis:

Group I: Normal control, given normal saline 8 ml/kg, *p.o.*
Group II: Treatment group, given VVJ 4 ml/kg, *p.o;*
Group III: Treatment group, given VVJ 8 ml/kg, *p.o;*
Group IV: Positive control, given indomethacin 100 mg/kg, *p.o*

DOSING:

Vitis vinifera juice, normal saline, acetyl salicylic acid and indomethacin were administered through oral gavage.

Method:
Formaldehyde-induced paw oedema:

Formaldehyde-induced paw oedema method was used to study the anti-inflammatory activity in Wistar rats. 0.2 ml of formaldehyde (1% w/v) was injected in the right hind paw of the animal beneath the skin of the planter (sub-plantar) aponeurosis through a needle (Upasani, Bachhav & Gulecha, 2009; Hajhashemi, Ghannadi & Sharif, 2003). Animals were given the juice orally and the readings were noted on a Plethysmometer (UGO Basile) (Vogel, 2008). Reduction in oedema in percentage was calculated for control and treated animal groups. Each group was contained of ten animals. The calculated percentage inhibition (% Inhibition) in inflammation, was obtained using the following equation:

% Inhibition = A−B /A x 100

Were,

A = Volume of hind paw for control animal group
B = Volume of the hind paw for treated animal group
(Punam, Bhanu & Manoj, 2014)

Formalin induced arthritis:

In this study, the formaldehyde (2%) was used at a dose of 0.1 ml to induce arthritis in rats. The drug was givens as a sub aponeurotic injection in the right hind paw of the rat on the first and the third day. The animals were treated daily with different doses of the juice (4 ml/kg and 8 ml/kg), saline (8 ml/kg) or indomethacin (100 mg/kg) for 10 days. The daily changes in paw size were also measured through Plethysmometer (UGO Basile) (Punam, Bhanu & Manoj, 2014).

Statistical Analysis:

One-way ANOVA and Newman-Keuls *post hoc* test were used to calculate the statistical significance. The data is expressed as mean ± SEM. Statistically significant difference was accepted at $P < 0.05$. GraphPad Prism version 5.00 was used as statistical software.

Results:

Formaldehyde-induced paw oedema:

The means of treated groups (VVJ 4 ml/kg and VVJ 8 ml/kg) were compared with the means of the normal control (saline-treated) group using Newman-Keuls *Post hoc* test. The results of the analysis reveal that the paw volume (oedema) was significantly decreased in treated groups when compared with the saline-treated group. Similarly, administration of aspirin (300 mg/kg, *p.o.*) exhibited a significant decrease in the paw volume (oedema) ($P < 0.001$) when compared with the normal control (saline-treated) group (Figure 1).

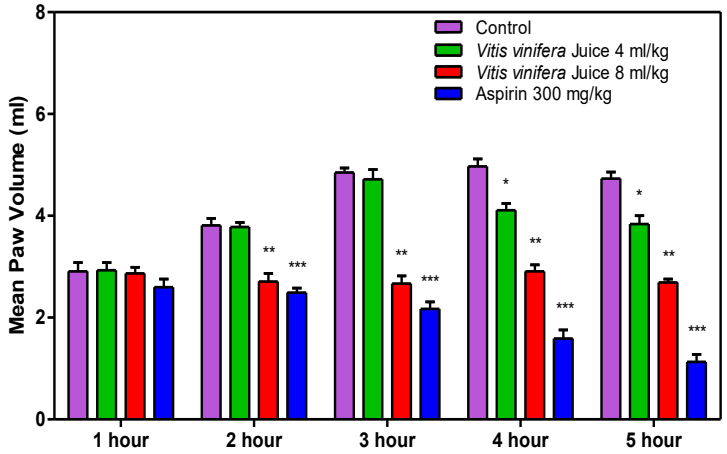

Figure 1. Effect of *Vitis vinifera* juice on paw volume (edema) of rats.

Number of animals per group (n) = 10. The observations are given as mean ± S.E.M.

$^{***}P<0.001$, $^{**}P<0.01$, $^{*}P<0.05$; ANOVA followed by Newman-Keuls test.

Formalin-induced arthritis:

The means of treated groups (VVJ 4 ml/kg and VVJ 8 ml/kg) were compared with the means of the normal control (saline-treated) group using Newman-Keuls *Post hoc* test. The results of the analysis reveal that the mean increase in paw volume was significantly decreased in treated groups when compared with the saline-treated group. Similarly, administration of indomethacin (100 mg/kg, *p.o.*) exhibited significant reduction in mean increase in paw volume ($P < 0.001$) (Figure 2).

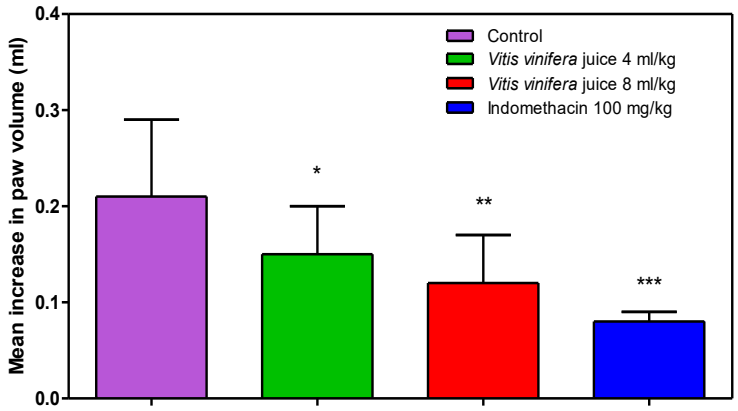

Figure 2. Effect of *Vitis vinifera* juice on formalin-induced arthritis in rats

Number of animals per group (n) = 10. The observations are given as mean ± S.E.M.

$^{***}P<0.001$, $^{**}P<0.01$, $^{*}P<0.05$; ANOVA followed by Newman-Keuls test.

Discussion:

Natural products, particularly those rich in antioxidants, have long been recognized for their therapeutic potential in the management of inflammatory conditions. Previous studies have demonstrated that antioxidant-rich fruits and plant-derived compounds exhibit significant anti-inflammatory activity by modulating oxidative stress and inhibiting pro-inflammatory mediators (Beg, Hasan, Hussain, Swain & Barkat, 2011; Mandal, Rajani, Sharma & Gupta, 2012). In this context, *Vitis vinifera* (grape) has attracted considerable attention due to its well-documented antioxidant properties (Jayaprakasha, Selvi & Sakariah, 2003; Burin, Ferreira-Lima, Panceri & Bordignon-Luiz, 2014).

Based on this rationale, the present study was designed to evaluate the anti-inflammatory activity of *Vitis vinifera* juice. The findings of our investigation clearly indicate that the juice possesses significant anti-inflammatory potential. This observed effect may be attributed to the rich phytochemical composition of the fruit. *Vitis vinifera* is known to contain a wide range of bioactive constituents, including proanthocyanidins, anthocyanins, flavonoids, phenolic acids, and other polyphenolic compounds, which are potent antioxidants. These compounds are capable of scavenging free radicals, reducing oxidative stress, and inhibiting key inflammatory pathways such as cyclooxygenase (COX) and lipoxygenase (LOX) enzyme systems (Ali, 2009; Nassiri-Asl, 2009).

Additionally, the presence of essential minerals, amino acids, sugars, and sterols may further contribute to its overall pharmacological activity by enhancing cellular defense mechanisms and stabilizing biological membranes. The synergistic interaction among these constituents could be responsible for the pronounced anti-inflammatory effect observed in this study (Georgiev,2014; Shi, 2003).

Overall, the results support the hypothesis that antioxidant-rich natural products like *Vitis vinifera* can serve as effective and safer alternatives to conventional anti-inflammatory agents. However, further studies involving isolation of active

constituents, mechanistic evaluations, and clinical trials are recommended to validate these findings and explore their potential therapeutic applications.

Conclusion:

Vitis vinifera juice has shown a significant erythropoietic activity in New Zealand White rabbits. The increase in the level of haemoglobin and erythrocyte counts by *Vitis vinifera* juice might be related to the antioxidant properties of its constituents and its nutritive potential.

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