Anti-inflammatory and anti-nociceptive effects of the methanolic extract of the stem bark of *Ficus vallis-choudae delile* (Moraceae)

A. Lawan*, U. A. Katsayal and A. H. Yaro

1Department of Human Physiology, Ahmadu Bello University, Zaria, Nigeria

2Pharmacognosy and Drug Development, Ahmadu Bello University, Zaria, Nigeria

3Pharmacology and Clinical Pharmacy, Ahmadu Bello University, Zaria, Nigeria

The methanolic stem bark extract of *Ficus vallis-choudae* was investigated for anti-inflammatory and anti-nociceptive activity. The anti-inflammatory effects were investigated using rat paw edema model, while the analgesic effects were studied using acetic acid induced writhing in mice. The results obtained revealed that the methanolic stem bark extract of *F. vallis – choudae* in doses of 50 and 100 mg/kg posses significant (P < 0.05) dose dependent anti-inflammatory effect and inhibit abdominal contractions caused by acetic acid in mice. The intraperitoneal LD50 in mice was found to be 470 mg/kg. The preliminary phytochemical screening revealed the presence of glycosides, flavonoids, tannins, alkaloids and saponins. The results of this study indicated the presence of biologically active substances which may be beneficial in the treatment of pain and inflammation.

Key words: Acetic acid - induced writhing, Anti-nociceptive, Anti-inflammatory, *F. Vallis-choudae*, Rat paw edema.

INTRODUCTION

Presently interest in herbal medicine is enjoying renaissance. Medicinal plants are believed to be impo-rtant source of new chemical substances with potential therapeutic effects (Farnsworth, 1989; Eisner, 1990). The study of plant species that have traditionally been used as pain killers should still be seen as fruitful and logical research strategy in the search for new analgesic drugs (Elisabetsky et al., 1995).

*Ficus vallis-choudae*, family Moraceae commonly known as Gimi (Hausa) in Nigeria, is a deciduous plant found mainly in the savanna region of West Africa. The stem bark is chewed with kola nut either to relieve thirst or as remedy for sore throat (Dalziel, 1995).

The various parts of the plant have been reported to be used in the treatment of stomach pain, paralysis, convulsion, epilepsy (Burkill, 1985). Few reports (oral communication) suggest that the stem bark is traditionally used to relieve pain and discomfort associated with hemorrhoids (Pile). The term “hemorrhoids” refers to a condition in which the veins around the anus or lower rectum are swollen and inflamed. Hemorrhoids are both inside and above the anus (internal) or under the skin around the anus (external). Hemorrhoids (piles) arise from congestion of internal and/or external venus plexuses around the anal canal (Guerrero, 2001).

There is no scientific report or verification of the use of this plant in the treatment of this condition. This study was therefore aimed at investigating possible anti-nociceptive and anti-inflammatory effect of the methanolic extract of *F. vallis-choudae* stem bark.

MATERIAL AND METHODS

Animal

Swiss albino mice weighing 18 - 25 g and Wistar rats weighing 150 - 200 g of both sexes available at the animal house, Department of Pharmacology, Ahamu Bello University, Zaria, were used. They were housed under room temperature, relative-humidity and light/dark cycle, fed with excel feeds (feed masters Plc, Kaduna) and water *ad libitum.*
Table 1. Effect of methanolic stem bark extract of *F. Vallis Choudae* on acetic acid-induced abdominal contractions in mice.

<table>
<thead>
<tr>
<th>Treatment (i.p.)</th>
<th>Dose (mg/kg)</th>
<th>No. of abdominal contractions/10 min</th>
<th>% inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saline (10 ml/kg)</td>
<td></td>
<td>38.2±3.4</td>
<td></td>
</tr>
<tr>
<td><em>F. Vallis-choudae</em></td>
<td>50</td>
<td>5.0±1.2</td>
<td>86.9*</td>
</tr>
<tr>
<td><em>F. Vallis-choudae</em></td>
<td>100</td>
<td>5.4±3.3</td>
<td>85.8*</td>
</tr>
<tr>
<td>ASA</td>
<td>150</td>
<td>18.2±1.8</td>
<td>52.3*</td>
</tr>
</tbody>
</table>

*P < 0.05 compared to control.

Plant material

The stem bark of *F. vallis-choudae* was collected around Tsimbiri Village, Sabongari Local Government Area, Kaduna State, Nigeria, in July 2003. The plant was identified and authenticated at the herbarium, Department of Biological sciences, Ahmadu Bello University, Zaria, Nigeria, where a voucher specimen (NO: 900348) was deposited for future reference.

Preparation of the extract

The bark was chopped, cleaned and air dried for 7 - 10 days. After that the size was reduced with a mortar and pestle into a fine powder. 100 g of the powder was extracted with 90% methanol (2.5 litres) using percolation process for 48 h. The liquid extract was then concentrated on a water bath to give a brownish solid extract with a mean yield of 10% w/w.

Phytochemical screening

Preliminary phytochemical analysis of the extract revealed the presence of flavonoids, glycosides, alkaloids, tannins and saponins.

Analgesic activity

The anti-nociceptive activity of *F. vallis choudae* was evaluated using acetic acid induced writhing in mice. The *F. vallis choudae* extract at doses (50 and 100 mg/kg) significantly (p < 0.05) decreased the number of acetic acid-induced writhes in mice (Figure 1). Highest percentage inhibition of writhes of 86.91% was observed at a dose of 50 mg/kg while ASA gave an inhibition of writhes of 52.36% (Table 1). All values were significant (p < 0.05) compared with control.

Anti-inflammatory activity

The *F. vallis choudae* extract caused an inhibition of egg-albumin induced edema over a period of 120 min. The effect appeared to be dose-dependent (Figure 2). However, ASA (150 mg/kg) also produced the peak inhibitory effect (23%) (Table 2) and the value is statistically significant (p < 0.05).

DISCUSSION AND CONCLUSION

The physiology of nociception involves a complex inter-
Figure 1. Effect of methanolic stem bark extract of *F. vallis choudae* on acetic acid-induced abdominal contractions in mice (n = 20), p < 0.05.

Figure 2. Effect of administration of methanolic stem bark extract of *F. vallis choudae* on egg albumin induced in rats (n = 18) p < 0.05.

Table 2. Effect of methanolic stem bark extract of *F. Vallis Choudae* on egg-albumin induced edema in rats.

<table>
<thead>
<tr>
<th>Treatment (i.p.)</th>
<th>Dose (mg/kg)</th>
<th>Paw vol. (ml)</th>
<th>% inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saline (10 ml/kg)</td>
<td>0.53±0.01</td>
<td>11.54*</td>
<td></td>
</tr>
<tr>
<td><em>F. Vallis-choudae</em></td>
<td>50</td>
<td>0.46±0.02</td>
<td></td>
</tr>
<tr>
<td><em>F. Vallis-choudae</em></td>
<td>100</td>
<td>0.40±0.02</td>
<td></td>
</tr>
<tr>
<td>ASA</td>
<td>150</td>
<td>0.29±0.02</td>
<td></td>
</tr>
</tbody>
</table>

*P < 0.05 compared to control.

Action of peripheral and central nervous system (CNS) structures, extending from the skin, the viscera and the musculoskeletal tissues to the cerebral cortex.

Pathophysiology of pain shows alterations of normal physiological pathways, giving rise to hyperalgesia or allodynia (Riedel and Neeck, 2001). Modulation of nociception occurs at all levels of the neuraxis, thus eliciting the multidimensional experience of pain involving sensory
- discriminative, affective, motivational, cognitive and locomotor components. Acetic acid induced writhing test was used for detecting both central and peripheral analgesia. Intraperitoneal administration of acetic acid releases prostaglandins and sympathomimetic system mediators like PGE2 and PGF2 and their levels were increased in the peritoneal fluid of the acetic acid induced mice (Besra et al., 1996).

The present study has established the anti-nociceptive and anti-inflammatory effect of the methanolic stem bark of F. vallis choudae. The F. vallis choudae extract has significantly (P < 0.05) reduced the number of acetic acid-induced writhings in mice. The method employed in the anti-nociceptive studies, also called the abdominal constriction response, is very sensitive and is able to detect anti-nociceptive effects of compounds at dose level that may be inactive in other methods like the tail - flick test (Collier et. al. 1981). The abdominal constriction response is postulated to partly involve local peritoneal receptors (Bentley et al., 1983; Vongtau et al., 2000). The abdominal constriction produced after the administration of acetic acid is related to sensitization of nociceptive receptors to prostaglandins. It is therefore possible that the F. vallis choudae extract exert its effect probably by inhibiting the synthesis or action of prostaglandins.

The extract has also caused inhibition of albumin-induced edema in rats and this appeared to be dose-related (P < 0.05). The method used in determining anti-inflammatory activity is also useful in detecting activity in acute inflammation. Flavonoids isolated from some medicinal plants have been proven to posses anti-nociceptive and or anti-inflammatory effects (Duke, 1992) and it has been shown by Meli et al. (1990), Dicarlo et al. (1994) that flavonoids also inhibit gastric motility in a dose-dependent, manner. It is therefore possible that the inhibitory effects on anti-nociceptive and anti-inflammatory effects observed in the extract may be attributed in part to its flavonoid content.

Flavonoids also inhibit the phosphodiesterases involved in cell activation. Much of this effect is upon the biosynthesis of protein cytokines that mediates adhesion of circulating leukocytes to sites of injury. Flavonoids inhibit biosynthesis of prostaglandins, which are involved in various immunologic responses and are the end products of the cyclooxygenase and lipoxygenase parthways (Moroney et al., 1988). Protein Kinases are another class of the cyclooxygenase and lipoxygenase (Moroney et al., 1988). Inhibition of these enzymes provides the mechanism by which flavonoids inhibit inflammatory processes (Manthey et al., 2001).

From the results obtained F. vallis choudae extract does posses significant anti-nociceptive and anti-inflammatory activities. The association of both anti-nociceptive and anti-inflammatory effects is well documented for various non-steroidal anti-inflammatory agents (NSAIDS) (Gyiyes et al., 1985). The results tend to corroborate the traditional use of F. vallis choudae in the treatment of pain and discomfort associated with hemorrhoids. The results also suggest the presence of biologically active principles worthy of further investigation.

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REFERENCES