PRELIMINARY PHYTOCHEMICAL AND ANTISPASMODIC STUDIES OF THE STEM BARK OF *BOSWELLA DALZIELII*

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**ABSTRACT**

The stem bark of *Boswellia dalzielii* Hutch (Burseraceae) is usually prescribed in traditional medicine for a variety of gastrointestinal disorders. Phytochemical screening revealed the presence of carbohydrates, tannins, saponins, flavonoids, cardiac glycosides, sterols and terpenes. The methanolic extract showed dose dependent inhibition of acetylcholine and barium chloride induced contractions of isolated rabbit jejunum. The extract also reduced histamine and barium chloride induced contractions of isolated guinea pig ileum dose-dependently. The inhibitions were statistically significant on histamine and barium chloride induced contractions. The result indicated that the stem bark possesses antispasmodic activity and justify its use traditionally in alleviating gastrointestinal disorders.

**Keywords:** *Boswellia dalzielii*, Burseraceae, Chemical constituents, Antispasmodic activity

**INTRODUCTION**

*Boswellia dalzielii* Hutch (Burseraceae) commonly known as the frankincense tree grows up to 13m high and is found mainly in the Savannah region of West Africa. The tree has a characteristic pale papery bark that is peeling and ragged. The Hausa names include “Ararrabi”, “Basamu” and “Hanu”. The stem bark secretes a fragrant white gum that is burnt to fumigate cloth and to drive out flies, mosquitoes, etc from rooms. The stem bark is boiled to make a wash for fever and rheumatism while it is taken internally for gastrointestinal troubles. It is also used as a stomachic (Dalziel, 1956; Oliver, 1960; Burkill, 1985). Nwinyi *et al.*, (2004) has shown that the aqueous extract of the stem bark produced some anti-ulcer activity. The stem bark have been found to contain phenolic compounds such as protocatechuic acid, gallic acid and ethylgallate as well as a diterpenoid - incensole and triterpenoids - boswellic acid derivatives (Olukemi *et al.*, 2005). Antispasmodic agents have smooth muscle relaxation property and are used to decrease gastrointestinal motility, inhibit gastric acid
secretion and to relieve pain associated with diarrhea and other gastrointestinal disorders (Chris, 2006). In this study, the antispasmodic activity of the methanolic extract of the stem bark of *Boswellia dalzielii* was investigated.

**MATERIALS AND METHODS**

**Plant Materials**

The stem bark of the plant *Boswellia dalzielii* was collected around Zaria, Nigeria in the month of September, 2007. They were identified and authenticated at the Herbarium of the Department of Biological Sciences, Ahmadu Bello University, Zaria where a voucher specimen (number 2448) was deposited. The stem bark was air-dried and size reduced using mortar and pestle.

**Animals**

Four adult rabbits weighing 3.0-3.5kg and four guinea-pigs weighing 400-450g were obtained from the animal house, Department of Pharmacology, Ahmadu Bello University, Zaria. They were given access to standard animal feed and water *ad libitum*.

**Phytochemical Screening**

The powdered stem bark (100g) was extracted exhaustively with petroleum ether 60-80°C in a soxhlet apparatus for 24hrs. The marc was air dried and re-extracted with methanol. The petroleum ether and methanolic extracts were separately evaporated under reduced pressure to give solid residues weighing 10.76g and 21.82g, respectively. The residues were then subjected to phytochemical screening using standard tests to show the different types of phytochemical constituents present in the stem bark (Sofowora, 1993; Evans, 1996; Silva *et al.*, 1998).

**Antispasmodic Studies on Isolated Rabbit Jejunum**

The method described by Schlemper *et al.*, (1996) and modified by Amos *et al.*, (2000) was adopted. Four adult rabbits which had free access to food and water were starved overnight prior to the experiment. The animals were sacrificed by a blow on their head, exsanguinated and their abdomen cut open. Segments of their jejunum about 3.0 cm long were placed separately in 25ml organ baths containing Tyrode’s solution, well aerated and maintained at 37°C. The tissues were equilibrated for 60mins before use. Dose response curves for acetylcholine (0.02-0.16μg/ml bath concentrations) and barium chloride (0.2-1.6mg/ml bath concentrations) were obtained. The contractile responses of the spasmogens were recorded on the kymograph paper by means of a frontal writing lever in Ugo Basile unirecorder 7050 (GMBH, German). The tissue was washed three times with the physiological solution and allowed to rest before the addition of the next spasmogen. The direct effect of the extract (0.04-3.2mg/ml bath concentrations) was investigated after allowing the tissues to rest for 30mins. Similarly, the effect of the extract (0.4-3.2mg/ml) was investigated on sub maximal dose of acetylcholine (0.04μg/ml) and barium chloride (0.4mg/ml) so as to study the effect of the extract on these spasmogens. The percentage inhibition of contraction induced by each dose of the extract against the specific spasmogen was calculated.

**Antispasmodic studies on Isolated Guinea Pig Ileum**

Four guinea pigs were sacrificed by a blow on their head, exsanguinated and their abdomen cut open. Segments of their ileum 3.0 cm long were mounted in 25ml well aerated organ baths containing Tyrode’s solution maintained at 37°C separately. The method described
above was adopted with minor modifications. Dose-dependent responses for histamine (0.04-0.32 µg/ml bath concentrations) and barium chloride (0.2-1.6 mg/ml bath concentrations) were obtained. Each addition being followed by washing the tissue three times with Tyrode’s solution and allowing an interval of 30 mins before the next addition of another dose. The effect of the extract at bath concentrations of (0.04-0.32 mg/ml) was investigated after allowing the tissue to rest for 30 mins. Similarly, varying doses of the extract was challenged with sub maximal dose of histamine (0.08 µg/ml) and barium chloride (0.4 mg/ml) in order to determine the effect of the extract on the spasmogens. Responses were recorded in Ugo Basile unirecorder 7050 (GMBH, German) and the percentage inhibition of contraction induced by each dose of the extract against the specific spasmogen was calculated.

**Statistical Analysis**

Responses were express as mean ± SEM and analysed using student t-test. P values less than 0.05 (P<0.05) were considered to be statistically significant.

**RESULTS**

The phytochemical screening of the stem bark of *Boswellia dalzielii* showed the presence of sterols and terpenes in the petroleum ether extract, while carbohydrates, tannins, saponins, flavonoids and cardiac glycosides were present in the methanolic extract.

The methanolic extract of the stem bark of *Boswellia dalzielii* inhibited acetylcholine induced contractions non-significantly (P>0.05) while it inhibited barium chloride induced contractions of the rabbit jejunum significantly (P<0.05) as shown in Table 1 and Figure 1. The extract also inhibited histamine and barium chloride induced contractions of the guinea-pig ileum significantly (P<0.05) as shown in Table 2 and Figure 2. The median inhibitory concentrations of the extract on these spasmogens were estimated to be 4.85 mg/ml on acetylcholine, 0.8 mg/ml on barium chloride with the rabbit jejunum and 0.4 mg/ml on histamine, 2.6 mg/ml on barium chloride with the guinea-pig ileum, respectively.

### Table 1: Effect of methanolic extract of stem bark of *Boswellia dalzielii* on acetylcholine (0.04 µg/ml) and barium chloride (0.4 mg/ml) induced contractions of rabbit jejunum (n = 4)

<table>
<thead>
<tr>
<th>Concentration of extract (mg/ml)</th>
<th>Acetylcholine Response (cm)</th>
<th>% Inhibition</th>
<th>Barium Chloride Response (cm)</th>
<th>% Inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td>_</td>
<td>3.0±0.04</td>
<td>_</td>
<td>6.6±0.08</td>
<td>_</td>
</tr>
<tr>
<td>0.4</td>
<td>2.8±0.08</td>
<td>7</td>
<td>4.3±0.10</td>
<td>33</td>
</tr>
<tr>
<td>0.8</td>
<td>2.6±0.08</td>
<td>13</td>
<td>3.3±0.06</td>
<td>50</td>
</tr>
<tr>
<td>1.6</td>
<td>2.4±0.04</td>
<td>20</td>
<td>1.3±0.03</td>
<td>80</td>
</tr>
</tbody>
</table>
Table 2: Effect of methanolic extract of stem bark of *Boswellia dalzielii* on histamine (0.08µm/ml) and barium chloride (0.4mg/ml) induced contractions of guinea-pig ileum (n = 4)

<table>
<thead>
<tr>
<th>Concentration of extract (mg/ml)</th>
<th>Histamine</th>
<th>Barium Chloride</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Response (cm)</td>
<td>% Inhibition</td>
</tr>
<tr>
<td>_</td>
<td>1.2±0.06</td>
<td>_</td>
</tr>
<tr>
<td>0.4</td>
<td>0.6±0.04</td>
<td>50</td>
</tr>
<tr>
<td>0.8</td>
<td>0.4±0.04</td>
<td>67</td>
</tr>
<tr>
<td>1.6</td>
<td>0.2±0.02</td>
<td>83</td>
</tr>
<tr>
<td>3.2</td>
<td>_</td>
<td>100</td>
</tr>
</tbody>
</table>

Figure 1: Effect of methanolic extract of the stem bark of *Boswellia dalzielii* on acetylcholine (0.04µg/ml) and barium chloride (0.4mg/ml) induced contractions of rabbit jejunum
DISCUSSION

The result of the phytochemical screening is in agreement with other study (Alemika and Oluwole, 1991) The LD$_{50}$ of the aqueous extract of the stem bark of the plant has been reported to be above 3000mg/kg and considered to be relatively safe when given orally (Etuk et al., 2006). The result of the isolated tissue study showed that the extract contains active constituents such as saponins, flavonoids and tannins, which possess the ability to antagonize the activities of spasmogens such as acetylcholine and histamine. The activities of spasmogens may be antagonized by the extract either through the muscarinic and histaminic receptor sites or other musculotropic routes such as the inhibition of calcium ion influx and outflux, as demonstrated by the extract through the inhibition of barium chloride induced contractions. From the result it was observed that the extract was more sensitive to histamine on the guinea pig ileum which was followed by the inhibition of barium chloride on the rabbit jejunum. Saponins and flavonoids have been shown to decrease acetylcholine and histamine induced contraction of guinea-pig and rabbit ileum (Chandel and Rastogi, 1980; Carlo et al., 1999). Tannins find wide use as astringents in gastrointestinal tract, reduces peristaltic movement and intestinal secretion (Ramstad, 1959). This observed activity could explain or justify the traditional use of the plant in relieving colic pain and other gastrointestinal troubles. The result of this study suggests that the stem bark of *Boswellia dalzielii* could be use as an adjuvant in the treatment of some gastrointestinal problems.
REFERENCES


