Pharmacological Assessment of the Leaves Extract and Fractions of *Cassia fistula* Linn for Antityphoid Activity

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**Abstract**

To evaluate the antityphoid effect of leaves extract and fractions of *Cassia fistula*. The crude methanol extracts (CME) of the dried leaves obtained by 48 h cold maceration and further it was fractionated into n-hexane soluble (HF₁) and n-hexane insoluble (HF₂) fractions. Phytochemical analysis was carried out on its methanol leaf extract. Antityphoid activity of CME, HF₁ and HF₂ were evaluated in accordance with National Committee for Clinical Laboratory Standards (NCCLS) guidelines. The phytochemical study indicates the presence of terpenoids, saponins, glycosides, steroids, flavonoids, and tannins in extracts. The n-hexane insoluble fraction exerted antimicrobial activity against *Salmonella typhi* while n-hexane soluble fraction showed no activity. *C. fistula* leaves possess antityphoid activity.

**Keywords:** *Cassia fistula*, *Salmonella typhi*, Antityphoid activity, Leaves extract, Fractions

1 Introduction

Despite remarkable improvement in medical services, typhoid disease still remains one of the most causes of morbidity and mortality in many developing countries. It is caused by *Salmonella enterica serovar typhi* bacteria transmitted by the ingestion of food or water contaminated with water from an infested person. Salmonella infections are common in conditions of poverty, illiteracy, poor toilet habits and facilities, generally poor environmental and sanitary conditions. The frequency of such infection can be regarded as a general indicator of the level of development of any country. Medicinal plants are important therapeutic aid against various diseases. In Africa, modern and orthodox health care has never been, and probably will never be adequately and equitably provided, due to financial limitation related to rapid population growth, political instability, high inflation rates, and declining real income.

*Cassia fistula* is a fast-growing, medium-sized, deciduous tree. It is native to India, the Amazon and Sri-Lanka, and is now widely cultivated worldwide as an ornamental tree for its beautiful showy yellow flowers. The common name of *Cassia fistula* is “golden shower tree”, probably because it produces flowers which are golden yellow and hang in showering bunches of up to 40 cm long. In Brazil, the seeds of *C. fistula* are used as a laxative, the leaves for inflammation. *C. fistula* has high therapeutic values and exerts the antipyretic and analgesic effect. It is employed as a remedy for various forms of tumors. Three quarters of plants that provide active ingredients for prescription drugs come to the attention of researchers because of their use in traditional setting. Hence, the present study investigated the antityphoid activity of *Cassia fistula*.

2 Materials and Methods

2.1 Plant material

Leaves of *C. fistula* were collected from Owerri, Imo State, Nigeria and authenticated by Osuala FN, Pharmacognosy Department, Madonna University, Elele, Nigeria. The leaves were air-dried at room temperature for 28 days and pulverized. The powdered leaves (2 kg), was extracted with absolute methanol (Stigma Aldrich, Germany) by cold maceration for 48 h.

The mixture was filtered to obtain the crude methanol extract (CME) and stored in a refrigerator.

Using silica gel column chromatography, dried methanol extract (10 g) was partitioned to yield n-hexane soluble fraction (HF₁) and n-hexane insoluble fraction (HF₂).
and n-hexane insoluble fraction (HF2). Phytochemical screening of the extract and fractions were carried out12.

2.2 Test micro-organism

Strains of Salmonella typhi were obtained from Medical Laboratory Unit of Madonna University Teaching Hospital, Elele, Nigeria.

2.3 Antityphoid screening

The Salmonella typhi’s inoculum was uniformly spread using sterile cotton swab on a sterile Petri dish Mueller-Hinton (MH) agar. Before transferring this medium in sterilized petri plates, it was allowed to cool and then was poured into the petri plates and allowed to solidify. The wells were created using sterile agar borer and the wells were filled by adding 25 μl of CME, HF1 and HF2 at different concentration, 1,000 mg/ml, 2,000 mg/ml and 5,000 mg/ml by using micropipette. The systems were incubated for 24 h at 36 °C ± 1 °C under aerobic conditions. Simultaneously, addition of the respective solvents instead of extracts was carried out as controls, while Ciprofloxacin was used as a positive control. After incubation, confluent bacterial growth was observed. Inhibition of the bacterial growth was measured in mm13,14.

3 Results

The phytochemical studies showed the presence of terpenoids, saponins, glycosides, steroids, flavonoids and tannins in methanol extract. The n-hexane soluble fractions (HF1) contained steroids, terpenoids, while n-hexane insoluble fraction (HF2) contained tannins, flavonoids, saponins and glycosides (Table 1). Except the n-hexane soluble fractions (HF1) which showed no activity, the extract and fractions of C. fistula revealed antimicrobial efficacy against Salmonella typhi. The bioassay of the diluted standard drug (Ciprofloxacin) for MIC determination against Salmonella typhi are as shown in table 2.

3.1 Table 1: Phytochemical constituents of the leaf extract and fractions of C. fistula

<table>
<thead>
<tr>
<th>Phytochemical constituents</th>
<th>Extract</th>
<th>HF1</th>
<th>HF2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terpenoids</td>
<td>+</td>
<td>+</td>
<td>_</td>
</tr>
<tr>
<td>Saponins</td>
<td>+</td>
<td>_</td>
<td>+</td>
</tr>
<tr>
<td>Glycosides</td>
<td>+</td>
<td>_</td>
<td>+</td>
</tr>
<tr>
<td>Steroids</td>
<td>+</td>
<td>+</td>
<td>_</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>+</td>
<td>_</td>
<td>+</td>
</tr>
<tr>
<td>Tannins</td>
<td>+</td>
<td>_</td>
<td>+</td>
</tr>
</tbody>
</table>

HF1 = n-hexane soluble fraction; HF2 = n-hexane insoluble fraction; + = Present, - = Absent

3.2 Table 2: Result of IZD (mm) and IZD2 (mm)2 of extract and fractions against Salmonella typhi

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Conc. (μg)</th>
<th>IZD (mm)</th>
<th>IZD2 (mm)2</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF1</td>
<td>1,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>2,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>5,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>HF2</td>
<td>1,000</td>
<td>3.0</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td>2,000</td>
<td>3.5</td>
<td>12.2</td>
</tr>
<tr>
<td></td>
<td>5,000</td>
<td>4.5</td>
<td>20.2</td>
</tr>
<tr>
<td>CME</td>
<td>1,000</td>
<td>2.5</td>
<td>6.2</td>
</tr>
<tr>
<td></td>
<td>2,000</td>
<td>9.0</td>
<td>81.0</td>
</tr>
<tr>
<td></td>
<td>5,000</td>
<td>14.0</td>
<td>196.0</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>10</td>
<td>16.0</td>
<td>256.0</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>21.0</td>
<td>441.0</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>25.0</td>
<td>625.0</td>
</tr>
</tbody>
</table>

Where (-) means no inhibition

The present observation supported the fact that organic solvent extraction was suitable to verify the antibacterial properties of medicinal plants18,19. The standard antimicrobial (Ciprofloxacin) showed very good activity against Salmonella typhi. The great activity observed with the use of lowest concentration (higher dilution) of Ciprofloxacin compared to crude extract and fractions is mainly due to high purity level thus devoid of contaminant or impurity that may antagonized its activity unlike the plant sample extract and fractions. C. fistula acclaimed for the prevention and treatment of tumour9 may be buttressed by the fact that flavonoids which are present could be very useful as antioxidant suggesting the plant importance20.

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5 Conclusions

C. fistula leaves extract, and fractions possessed anti-typhoid effect exhibiting inhibiting activity against Salmonella typhi. In this regard, more study is needed in the areas of isolation; purification and identification of specific active compound(s) responsible for the anti-typhoid properties as this will enhance the exploration of medicinal properties of ethnobotanicals as well as help curb the menace of bacterial resistance in chemotherapy.

6 Conflict of interests

No conflict of interest declared.

7 Author’s contributions

I approved the final manuscript for publication.

8 References