ANTIBACTERIAL ACTIVITY OF AQUATIC- ETHANOL EXTRACT OF SUDANESE MEDICINAL PLANT (CORN SILK).

Haj Elamin. E. Azhari *; Mohammed. R.R**

**Department of Clinical Pharmacy & Therapeutics, Faculty of pharmacy, Karary University, Khartoum University & General Military Hospital, Sudan

**Faculty of pharmacy – Omdurman Islamic University (Sudan)

Correspondence to: Dr. Azhari .Elnour.Haj.Elamin., Department of Clinical Pharmacy & Therapeutics, Faculty of pharmacy, Karary University, Khartoum University & General Military Hospital, Sudan

Email id: azhari_elamin@hotmail.com; azhari_elamin@yahoo.com

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ABSTRACT

The crude alcoholic extract of the plant corn silk was tested for its antibacterial activity against nine organisms: Klebsiella pneumoniae, Escherichia coli, Salmonella paratyphi A, Salmonella paratyphi, Staphylococcus aureus, Streptococcus pyogenes, Lactobacillus plantarum and Bacillus subtilis. The aquatic-ethanol extract of Zea mays (corn silk) was found to have inhibitory effect against Escherichia coli in the concentration of 0.25mg/ml whereas the minimum inhibitory concentration (MIC) for Klebsiella pneumoniae, Salmonella paratyphi A and Salmonella typhi was found to be 0.5mg/ml. Among the gram +ve bacteria studied, Zea mays (corn silk) aquatic-ethanol extract showed no inhibitory effect against Staphylococcus aureus and Streptococcus pyogenes but has MIC of 0.25 mg/ml against Bacillus subtilis and 0.5 mg/ml against Lactobacillus plantarum

Key words: Crude Alcoholic Extract, Zea mays, Corn Silk, Antibacterial Activity, Nine Organisms

Abbreviations: (CAM) Complementary and Alternative Medicine, (MIC) Minimum Inhibitory Concentration

INTRODUCTION

A general disillusionment with conventional medicines, coupled with the desire for a 'natural' lifestyle has resulted in an increasing utilization of complementary and alternative medicine (CAM) across the developed world.1

A study of long-term trends in the use of CAM therapies in the United States of America reported that the use of CAM therapies has increased steadily since the 1950s. Use of CAM has increased independency of gender, ethnicity and level of education, but is more common in younger people. The use of herbal medicine increased particularly in the 1970s and then again in the 1990s.1

Maize (Zea mays. L) is the third most planted food crop and one of the major energy sources among the people of the semiarid tropics2. Corn silks are scientifically referred to as Maydis stigma or Zea mays as they reflect the soft, fiber-like growth which accompanies the ear of the corn [3]. This yellowish thread-like strands or tassels called stigmas are found inside the husks of corn. They are relatively (4-8 inches) long with a mild sweetish taste.

Herbal Use:

Corn silk is stated to possess diuretic and stone-reducing properties. It has been used for cystitis, urethritis, nocturnal enuresis, prostatitis, and specifically for acute or chronic inflammation of the urinary system1.

Pharmacological Actions:

In vitro and animal studies:

Corn silk is stated to possess cholagogue, diuretic, hypoglycaemic, and hypotensive activities in laboratory animals. Utilising aqueous extracts, a methanol-insoluble fraction has been reported to exhibit diuretic activity in rabbits, and an isolated crystalline component has been
documented to have a hypotensive action and to stimulate uterine contraction in rabbits.\(^1\). The latter two actions were thought to involve a cholinergic mechanism.

The action of corn silk extract on experimental periodontolysis in hamsters has been documented.\(^1\). Cryptoxanthin is stated to possess vitamin A activity; and Tannins are known to possess astringent properties.

**Constituents:**

- Amines 0.05%. Type is not specified, although hordenine is listed for the genus Zea.
- Fixed oils 1.85–2.25%. Contain glycerides of linoleic, oleic, palmitic and stearic acids.
- Saponins 3% (unspecified).
- Tannins Up to 11.5–13% (unspecified).

Other constituents; Allantoin, bitter glycosides (1%), cryptoxanthin, cyanogenetic compound (unidentified), Flavones (maysin), gum, phytosterols (e.g. sitosterol, stigmasterol), pigments, resin, vitamins (C and K).

Flavonoids

![Flavonoids](image)

Although it is still not widely accepted, herbal medicine is becoming more available in medical schools and pharmacy schools as a classroom topic. This allows more health care providers to become exposed to positive and potentially negative effects of using herbal medicines as part of treatment for health conditions.

We must emphasize that the call for the use of medicinal plants in the medication is not an invitation to failure or a step backwards, and not to the point where it is a denial of modern science, but an invitation to take the reasons of natural healing in the side of what they call the science of which reduce the human suffering from the ravages of chemicals. Therefore, the present study was designed to evaluate antimicrobial activities of alcoholic extracts of corn silk because it may possess remarkable therapeutic action in the treatment of a serious disease.

**MATERIALS AND METHODS**

**Plant Materials:**

Corn was bought from Bahry market on 26/3/2009, and then the corn silk was collected and dried in normal room temperature. The dried powdered material was then used for different experimental procedures.

**Extraction of Plant Materials:**

Five Kg of the corn silk was chopped into a coarse powder and soaked in 95% ethyl alcohol (100 ml), separately stirring was done by means of a mechanical stirrer (Gallen Kamp 280-010, Made in England) for one hour for one week and then filtered and concentrated into small volume to remove the organic solvent using rotary evaporator. The small volume was later freeze-dried. The extract was kept in a freezer, at 4°C for further studies.

**Antimicrobial Activity Test:**

**Preparation of Standard Bacterial Suspensions:**

One ml of 24 hour broth cultures of the standard organisms were aseptically distributed onto nutrient agar slopes and incubated at 37°C for 24 hours. The bacterial growth was harvested and washed off with sterile normal saline. The suspensions were stored at 4°C until used.\(^4\).

**Antibacterial Activities Test:**

Antibacterial activity was studied by agar – diffusion method. Each of the inocula of the test organisms (1 ml) was poured into sterile Petri- dish. A medium (about 45°C) was poured into each of the Petri- dish (20 ml). The medium was left to stand to allow it to set. Cups were pored on the media with the aid of a sterile cork borer of 10 mm diameter and removal of the agar disc. The cups were marked, and then different concentrations of the plant extract were pipette into the cups using sterile syringes. Plates were then incubated at 37°C for 24 hours. The sensitivities of the test organisms to the plant extract were indicated by clear zones of growth inhibition around the cups containing the plant extract and the diameter of the clear zone was taken as an index of the degree of sensitivity\(^4\).

**Minimum Inhibitory Concentration(MIC):**

The minimum inhibitory concentrations of the plant extracts against the sensitive organisms were determined using the agar disc method. Serial dilutions of the plant extracts were prepared to obtain 1, 0.5, 0.25, 0.125 mg/ml. each of the inocula (1 ml) was poured into each Petri- dish and the agar was later poured by using the sterile 3 mm cork-borer and allowed to set wells. Sterile dilutions of the extract were added into the marked wells. The plates were incubated at 37°C for 24 hours. The growth was observed to determine the sensitivity of each organism using clear zones of no microbial growth. The least concentration of the plant extract that had inhibitory effect was taken as the minimum inhibitory concentration (MIC) of that plant extract against such organism.\(^4\).
RESULTS AND DISCUSSION:

Antimicrobial Activities of Corn Silk Extract:

Table (3.1): Antimicrobial Activities of The Aquatic- Ethanol Extracts of Corn Silk against Standard Microorganisms

<table>
<thead>
<tr>
<th>Culture Used</th>
<th>Concentration (mg/ml)</th>
<th>Control</th>
<th>0.125</th>
<th>0.25</th>
<th>0.5</th>
<th>1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Klebsiella Pneumoniae</td>
<td></td>
<td></td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td></td>
<td></td>
<td>10</td>
<td>10</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Salmonella paratyphi A</td>
<td></td>
<td></td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>Salmonella typhi</td>
<td></td>
<td></td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td></td>
<td></td>
<td>10</td>
<td>-ve</td>
<td>-ve</td>
<td>-ve</td>
</tr>
<tr>
<td>Streptococcus pyogenes</td>
<td></td>
<td></td>
<td>10</td>
<td>-ve</td>
<td>-ve</td>
<td>-ve</td>
</tr>
<tr>
<td>Lactobacillus Plantarum</td>
<td></td>
<td></td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Bacillus subtilis</td>
<td></td>
<td></td>
<td>10</td>
<td>17</td>
<td>18</td>
<td>20</td>
</tr>
</tbody>
</table>

DISCUSSION:

The studies on antibacterial activity of plant extracts present a unique challenge to strike new sources of medicine. Existing antibiotics have numerous drawbacks whereas the drugs of plant origin have no side effect or only marginal.

Antibacterial Activity Cultures of bacteria employed during this study were four gram -ve, i.e., Klebsiella pneumoniae, Escherichia coli, Salmonella paratyphi A and Salmonella paratyphi and four gram +ve, i.e., Staphylococcus aureus, Streptococcus pyogenes, Lactobacillus plantarum and Bacillus subtilis

Antibacterial activities of the alcoholic extract of Zea mays (corn silk) against gram -ve and gram +ve bacteria are presented in Table (3.1) and figs (4.1-4.2).

Zea mays (corn silk) extract was found inhibitory against Escherichia coli in the concentration of 0.25mg/ml whereas the minimum inhibitory concentration (MIC) for Klebsiella pneumoniae, Salmonella paratyphi A and Salmonella typhi was found to be 0.5mg/ml.

Among the gram +ve bacteria studied Zea mays (corn silk) alcoholic extract showed no inhibition against Staphylococcus aureus and Streptococcus pyogenes but having MIC of 0.25 mg/ml against Bacillus subtilis and 0.5 mg/ml against Lactobacillus plantarum.

CONCLUSION:

The presence of saponins, alkaloids and terpines in corn silk may be responsible for its antimicrobial activities.

Antibacterial effects of corn silk against Escherichia coli, Salmonella paratyphi A and Salmonella typhi suggest that it may posses remarkable therapeutic action in the treatment of gastrointestinal infection, enteric fever and diarrhea in man. However, the corn silk alcoholic extract was unable to inhibit Streptococcus pyogenes, which implies that they could not be used to treat skin diseases related to the later mentioned. Also the corn silk alcoholic extract failed to inhibit the growth of Staphylococcus aureus.
On the other hand, the plant extract was able to inhibit the growth of *Escherichia coli*; these may be due to the presence of the secondary metabolites in the extract.

The high potency of corn silk against these organisms gives scientific basis for its uses in the folk medicine in the treatment of cystitis, urethritis, nocturnal enuresis, prostatitis, and specifically for acute or chronic inflammation of the urinary system.

REFERENCES: