Phytochemical Analysis of Leaf Extract of Plant Acacia nilotica by GCMS Method

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Abstract: Acacia nilotica once regarded as one of the worst weeds because of its invasiveness, potential for spread, economic and environmental impacts, thus it can easily grow and spread on large massive area for its survival. But recent studies and experiments shows that Acacia nilotica has many effective and efficient phytochemical activities in curing human diseases. Previous studies revealed that the plant extract has antibacterial activity, antimalarial activity, antifungal activity, antibiotic activity, anti-diarrhea activity, molluscidal activity, anti hypertensive activity, anthelmentic activity, anti denaturation property, antioxidant and anticancer property [1]. Traditionally the plant used widely for the treatment of various ailments, but scientifically few of them were screened as mentioned above. Thus further studies can be conducted to investigate the unexploited potential of Acacia nilotica. So as a part and as a basis for further exploitation, the phytochemicals of Acacia nilotica were identified, such as 3-picoline-2-nitro, 1-acetyl beta carboline, Hydroxy citronellal, Trans decalone, Propionic acid-2-chloro,ethyl ester, Lavandulyl acetate and D-Glucoronic acid by GCMS analysis and the biological activity of each compound was discussed in this paper. As Acacia nilotica can grow and spread easily and because of its higher biomass availability, it can prove as an effective and cheaper drug for various human diseases.

Key words: Acacia nilotica • Phytochemicals • GCMS analysis • Cheaper drug

INTRODUCTION

Acacia nilotica is a tree, 5-20 m high with a dense spheric crown, stems and branches usually dark to black coloured, fissured bark, exuding a reddish low quality gum. The therapeutic potentials of Acacia nilotica extracts in herbal medicine have been widely reported. Acacia nilotica belonging to the Leguminosae family and sub-family Mimosaceae has been subjected to long term clinical trials in folk medicine [2]. The bark, root, gum, leaves and flowers have found use for skin diseases, diarrhoea, dysentery, cough, diabetes, eczema, wound healing, burning sensation and as an astringent, demulcent, anti-asthmatic. The tender twigs are used as toothbrushes [3]. Plants have many phytochemicals with various bioactivities, including antioxidant, anti-inflammatory and anticancer. Studies have reported that extracts from natural products, such as fruits, vegetables and medicinal herbs, have positive effects against cancer, compared with chemotherapy or recent hormonal treatments [4]. Therefore, many plants have been examined to identify new and effective antioxidant compounds, as well as to elucidate the mechanisms of action [5]. Hence the aim of this study is to determine the phytochemical constituent of Acacia nilotica to ascertain the rationale for its use in traditional medicine.

MATERIALS AND METHODS

Collection of Plant Material: The leaves of Acacia nilotica collected from T M Palayam, Coimbatore.

Dry Powder Preparation: The plant leaf sample was dried in hot air oven at 40°C for 24 hours and ground into fine powder.

Sample Preparation for GCMS Analysis: About 5g of powdered material of plant was taken in a clean,

flat-bottomed glass container and soaked in 25mL of 80% methanol. The container with its content was sealed and kept for a period of seven days accompanying occasional shaking and stirring. The whole mixture then underwent coarse filtration by a piece of clean, white cotton material. Then it was filtered through whatman filter paper. The filtrate (methanolic extract) obtained for the plant was evaporated under ceiling fan and in a water bath until dried.

**GCMS Analysis:** The GCMS analysis was conducted at the south Indian textile research association, Coimbatore. 2µL aliquot was injected into a fisons GC8000 series GC coupled to a MD800 MS with quadrupole mass analyzer (fision instrument, Milano, Italy). The chromatography was performed by using the DB5-MS column. Injection temperature was 230°C. Helium flow was 1mL/min. After a 5 min solvent delay time at 70°C; the oven temperature was increased at 5°C/min to 310°C, 1min isocratic and cooled to 70°C, followed by the additional 5min delay. The ion trace integration was done using the mass lab find target method for the characteristic fragment of assigned peaks.

**Identification of Components:** Interpretation of mass spectrum GCMS was conducted using data base of National Institute Standard and Technology (NIST) and Wiley spectra Libraries. Spectrum of the unknown component was compared with the spectrum of known components stored in the NIST Library. The molecular weight, molecular formula and the number of hits used to identify the name of the compound from NIST and Wiley spectra Libraries were recorded.

**RESULTS AND DISCUSSION**

GCMS analyzed results which include the active principles with their molecular formula and molecular weight is presented in Table 1. Here, seven compounds were identified and they are reported as 3-picoline-2-nitro, 1-acetyl beta carboline, Hydroxy citronellal, Trans decalone, Propionic acid-2-chloroethyl ester, Lavandulyl acetate and D-Glucoronic acid. On further study of each compound, it was found that they individually have its own biological importance.

Indole alkaloids are pharmacologically active natural products that have been shown to possess a wide range of biological activities, including cytotoxic, antiviral, antimicrobial, antiinflammatory, antiserotonin and enzyme inhibitory activities [6]. One important subclass of indole alkaloids is β-carbolines, which possess a common tricyclic pyrido [7] indole ring structure [8]. The β-carbolines skeleton is an important structure in drug discovery [9] and drugs on the market such as tadalafil possess this indole nucleus. 1-Acetyl-β-carboline was isolated as an anti-MRSA (Methicillin-Resistant Staphylococcus aureus) agent. Combination of 1-acetyl-β-carboline with ampicillin exhibited synergistic antibacterial activity against MRSA [10].

In the animal body, glucuronic acid is often linked to the xenobiotic metabolism of substances such as drugs, pollutants, bilirubin androgens, estrogens, mineralocorticoids, glucocorticoids, fatty acid derivatives, retinoids and bile acids [11]. D-Glucuronic acid exists as a component of glycosaminoglycans such as hyaluronan, heparin and chondroitin sulphate present in mammalian connective tissue such as cartilage. In all plants and mammals other than guinea pigs and primates-glucuronic acid is a precursor of ascorbic acid, also known as vitamin C [12]. Tissue repair and wound healing are complex processes that involve a series of biochemical and cellular reactions, beginning with inflammation and followed by the repair and remodeling of the injured tissue When there is damage to connective tissue it is important to address the nutritional requirements for the synthesis of both the collagen fibers and the proteoglycans [13]. Many nutrients are involved in connective tissue repair and wound healing: D-glucuronic acid is one of those wound healing compound [14].

3-picoline-2-nitro is also known as 3-Methyl-2-nitropyridine. 3-Picoline is usually useful precursor to agrochemicals, such as chlorpyrifosm [15] and also a main precursor to niacin, one of the B vitamins [16].

Hydroxy citronellal and Lavandulyl acetate are the floral compounds; it is used to impart the pleasant odor to numerous consumer products [17]. These volatile aroma compounds are also known as essential oils. There are various evidences reporting that essential oils has many biological activity such as anticancer, anti-nociceptive, anti-inflammatory, anti-viral and also anti oxidative property [18]. Trans-1-decalone is used as the substrate for enzyme assays.

Thus each compound identified in leaf extract of *Acacia nilotica* has its own biological importance and further study of this plant’s phytochemical by insilico and invito methods can prove its medicinal importance in future and can be an effective and efficient drug source in cheaper rate as it has higher biomass availability.
Table 1:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of the compound</th>
<th>Molecular formula</th>
<th>Molecular weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3-picoline-2-nitro</td>
<td>C₆H₆O₃N₂</td>
<td>138</td>
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<tr>
<td>2</td>
<td>1-acetyl beta carboline</td>
<td>C₁₀H₁₀ON₂</td>
<td>210</td>
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<tr>
<td>3</td>
<td>Hydroxy citronellal</td>
<td>C₆H₁₀O₂</td>
<td>172</td>
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<tr>
<td>4</td>
<td>Trans decalalone</td>
<td>C₁₀H₁₀O</td>
<td>152</td>
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<tr>
<td>5</td>
<td>Propionic acid-2-chloro,ethyl ester</td>
<td>C₇H₁₂O₂Cl</td>
<td>136</td>
</tr>
<tr>
<td>6</td>
<td>Lavandulyl acetate</td>
<td>C₁₀H₁₀O₂</td>
<td>196</td>
</tr>
<tr>
<td>7</td>
<td>D-Glucoronic acid</td>
<td>C₇H₁₀O₂</td>
<td>194</td>
</tr>
</tbody>
</table>

Fig. 1: 3-Picoline-2-Nitro

Fig. 2: 1-Acetyl beta carboline

Fig. 3: Hydroxy citronellal

Fig. 4: Trans decalalone

Fig. 5: Propionic acid-2-chloroethyl ester

Fig. 6: Lavandulyl acetate

Fig. 7: D-Glucoronic acid

REFERENCES


17. HERA(Human & Environmental Risk Assessment on ingredients of European household cleaning products), 2005, pp: 5.