Phytochemical screening of selected medicinal plants of the family Lythraceae

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INTRODUCTION

Medicinal plants play a major role in meeting the medical and health needs of about 70% of populations in developed and developing countries, which serve as an important resource for the treatment of various maladies and illnesses (Ngari et al., 2010). In developing countries, there is an increasing attempt to incorporate the traditional medicines, especially herbal preparations in the local healthcare systems and modernized people are increasingly turning to herbal medicine (Njoroge and Bussmann, 2007). Globally, about 85% of the traditional medicines used by different ethnic groups inhabiting various terrains for primary healthcare are derived from plants, especially in India; medicinal plants are widely used by all sections of the population with an estimated 7500 species of plants used by several ethnic communities (Farnsworth, 1988). The medicinal importance of a plant is due to the presence of some special substances like alkaloids, glycosides, resins, volatile oils, gums and tannins etc. The active principles usually remain concentrated in the storage organs of the plants (Himesh et al., 2011).

Lythraceae, the loosestrife family, with about 31 genera and 620 species of mostly perennial herbs, shrubs or trees is widely distributed in tropics but ranging into temperate climate regions (Mabberley, 2008; Walter et al., 2008). Many of the wild and cultivated species of lythraceae are known to have a medicinal importance (Shivrajan and Bhalchandra, 1994).

To investigate the secondary metabolites present in the leaves of the family Lythraceae (Lagerstroemia microcarpa Wt., Lagerstroemia reginae Roxb., Lawsonia inermis L., Punica granatum L.). The samples were extracted using solvents like acetone, chloroform, ethanol, petroleum ether and water. These mixtures were shaken at room temperature for 24 h. After incubation, the extracts were filtered using Whatman No.1 filter paper, collected and stored at 4°C. The extracts were concentrated using vacuum evaporator and dried at 60°C. Preliminary phytochemical screening was performed by standard methods. The phytochemical screening revealed the presence of alkaloids, carbohydrates, flavonoids, phytosterols, proteins, steroids, terpenoids, phenols, saponins, quinones, coumarins and glycosides. The findings of the study concluded that the leaf extracts have potential bioactive substances that may be used to formulate new and most potent antimicrobial drugs to overcome the problem of disease resistance.
**MATERIALS AND METHODS**

The fresh, mature healthy leaves of *Lagerstroemia microcarpa* Wt., *Lagerstroemia reginae* Roxb., *Lawsonia inermis* L., *Punica granatum* L. were collected from Nagercoil and its surrounding areas. The plant samples were shade dried and ground into fine powder with the help of mixer grinder. About 50g of powdered material was extracted in Soxhlet apparatus with 200 ml of each of the following solvents; aqueous, petroleum ether, acetone, ethanol and chloroform. The extracts obtained with each solvent were filtered through Whatman filter paper No. 1 and the filtrate was used for phytochemical analysis as per the standard prescribed methods (Harborne, 1998).

**RESULTS AND DISCUSSION**

Qualitative phytochemical screening was done in various leaf extracts of *L. reginae*, *L. microcarpa*, *L. inermis* and *P. granatum*. The phytoconstituents present were shown in Table 1. Out of the twenty tested extracts, eighteen extracts showed the presence of phytoesters, seventeen extracts showed the presence of steroids, fifteen extracts showed the presence of terpenoids, fourteen extracts showed the presence of proteins, twelve extracts showed the presence of phenols, ten extracts showed the presence of quinones, carbohydrates, flavonoids, coumarins, coumarins, followed by...
saponins and alkaloids in six extracts and glycosides were noticed only in two extracts. The value of medicinal plants lies in some chemical substances that produce a definite physiological action on the human body and the most important phytochemicals are alkaloids, flavonoids, tannins and phenolic compounds (Hill, 1952). The Medicinal plants have potent phytochemical components which are important source of antibiotic compounds and are responsible for the therapeutic properties (Jeeva et al., 2011; Jeeva and Johnson, 2012; Florence et al., 2012 & 2014; Joselin et al., 2012 & 2013; Sainkhediya and Ray, 2012; Sumathi and Uthayakumari, 2014).

In the present study, the leaf extracts of *Punica granatum* detected all the tested phytochemicals including alkaloids, carbohydrates, coumarins, flavonoids, glycosides, phenols, phytosterols, proteins, saponins, quinones, steroids and terpenoids. (Bhandary, 2012) reported that aqueous, chloroform and ethanol extracts of *P. granatum* peel showed the presence of triterpenoids, steroids, glycosides, flavonoids, tannins, carbohydrates and vitamin C; fruit extracts contains alkaloids, saponins, triterpenoids, steroids, glycosides, flavonoids, tannins, carbohydrates and vitamin C; extracts prepared from the seeds contains triterpenoids, alkaloids, steroids, glycosides, flavonoids, tannins, carbohydrates and vitamin C. In a previous study aqueous-ethanol extract of peel is diminished the blood sugar level and also induce the hyperlipidemia due to the presence of polyphenolic compounds (Cheng, 2005) and also provide protective effect against carbon tetrachloride and toxicity (Singh, 2002; Qnais, 2007) and methanolic extract of the *P. granatum* fruit peel is highly nutritive and contains the major chemical components such as punicalin, punicalagin, punicic acid and flavonoids like flavonols, flavones, kaempferol, luteolin, quercetin and high content of phenolic acids such as caffeic acid, fumaric acids, chlorogenic acid and P-coumaric acid (Akbarpour et al., 2009; Usha, 2013); hydroxy benzoic acids such as gallic acid and EA glycosides (Amakura, 2000) and also gallic acid, ellagitanins, catechin and ellagic acid (Nasr, 1996; Murthy et al., 2004). These ellagic acids exhibits powerful anticarcinogenic and antioxidant properties due to the presence of tannins (Shwartz et al., 2009), anthocyanidines such as cyanidin, pelargonidin and delphinidin (Noda, 2002) and also have high antibacterial activity against *E. coli* due to the presence of alkaloids, flavonoids and tannins (Growther, 2012).

![Figure 1 Occurrence of phytochemicals in Lytraceae leaf extracts](image-url)
This plant is effective in scavenging the free radicals due to the presence of anthocyanins, anthocyanidins, flavonoids and polyphenols (Kiran, 2013; Prasad et al., 2012) and highest antioxidant activity due to the presence of tannins (Shwartz et al., 2009) and also act as ecofriendly waste because of its numerous uses such as reducing agent in making silver nanoparticles (Middha et al., 2013). It also has ethnomedical properties such as anti-hyperglycemic (Middha et al., 2012), hepatoprotective effects (Murthy et al., 2004), antidiarrhoeal agent (Das, 1999) and also used in the treatment and prevention of cancer (Hong, 2008; Dikmen, 2011), cardiovascular disease (Jurenka, 2008), diabetes (Al-Mustafa and Al-Thunibat, 2008), infant brain ischemia, alzheimer’s disease, Parkinson’s disease, AIDS (Middha et al., 2011; Singh et al., 2012), dental conditions (Viuda-Martos et al., 2010), erectile dysfunction, protection from ultraviolet radiation, male infertility, arthritis, obesity (Kanatt et al., 2010) and dermal wounds (Hayouni et al., 2011) and also used as cattle feed and extraction of natural dyes (Shabtay et al., 2008).

The crude leaf extracts of Lawsonia inermis contains the phytoconstituents such as alkaloids, carbohydrates, coumarins, phenols, phytosterols, proteins, quinones, steroids and terpenoids. The aqueous, chloroform, methanol and acetone extracts of L. inermis had cardioglycosides, terpenoids, carbohydrates, phenols, quinones, tannins and proteins (Gull et al., 2013). The phytochemical constituents of L. inermis exhibit antimicrobial activity against both gram positive (S. aureus, B. subtilis, and S. epidermidis) and gram negative (E. coli, S. typhi, Klebsiella sp. and Shigella sp.) bacteria due to the presence of quinones (Hussain et al., 2011; Habbal et al., 2005). Similar studies were conducted by (Arun, 2010) on the methanolic extract of the L. inermis which showed active results against Staphylococcus aureus, Escherichia coli, Klebsiella pneumonia, Pseudomonas aeruginosa, Proteus mirabilis due to the presence of alkaloids, flavonoids, tannins and quinones. Aqueous, petroleum ether, chloroform, ethyl-acetate and methanol extract of the L. inermis leaves shows the phytoconstituents such as alkaloids, carbohydrates, flavonoids, glycosides, resins, tannins, saponins and sterols which showed antibacterial activities against Streptococcus pneumoniae, Streptococcus pyogenes and Shigella dysenteriae (Kawo and Kwa, 2011). (Saadabi, 2007) mentioned that methanol and chloroform extract of L. inermis leaves revealed the presence of mannite, tannic acid, gallic acid, naphthaquinone, cytotoxic acid, antilarquiones, mucilage, sterols, terpenoids and cyanogenic glycosides and also have antibacterial activity against S. aeruginosa, P. aeruginosa, B. subtilis and E. coli. It was reported that aqueous, petroleum ether, benzene, chloroform, methanol and ethanol extracts of the plant showed high antifungal activity against Aspergillus flavus which isolated from sorghum, maize and paddy seed samples (Dixit et al., 1980). Henna used as an astringent and antihemorrhagic agent and is also known for its hypotensive, cardiac inhibitory and sedative effects (Rahmoun et al., 2010), hypoglycemic (Syamsudin and Winarno, 2008), immunostimulant (Mikhaeil et al., 2004), hepatoprotective (Chaudary et al., 2012), anti-inflammatory (Singh et al., 1982), tuberculostatic (Sharma, 1990), anti-cancer and antioxidant properties (Kamal and Jawaid, 2010), antibacterial (Aliyu, 2006), antifungal, antiamoebiasis, (Khattak et al., 1985), antidiarrhoel, antipyretic, analgesic effects (Ali et al., 1995) diuretic, emmanagogue and abortificacient prophetically and non-toxic (Lemordant and Foresteier, 1983).

Lagerstroemia reginae leaf extracts was subjected to preliminary phytochemical screening to screen secondary metabolites namely alkaloids, carbohydrates, coumarins, flavonoids, glycosides, phenols, phytosterols, proteins, quinones, saponins, sterols, terpenoids. Similar studies conducted by (Meera, 2009) on the ethylacetate, butanol and water extract which showed bioconstituents such as aminocids, tannins, phytosterols and cardioglycosides and also have antibacterial, antiviral, antioxidant and anti-inflammatory activity. The plant contains triterpenoids, colocolic acid and malasinic acid; leaves contain lageracetal and sitosterol; fruits and leaves contain ellagitanins (Khare, 2007) and exhibit hypoglycemic activity (Vivek et al., 2012). The primary active chemical ingredient of the leaf extract is corosolic acid and is known potent glucophage, helpful in decreasing blood sugar levels (Principe and Jose, 2002). Phytochemical screening yielded phenolic compounds, flavonoids, saponins, tannins such as corosolic acid, ellagitanins, lagerstroemin, gallotannins, penta-O-galloyl-glucopyranase (Bai et al., 2008). (George et al., 2010) proved that methanolic extract of the leaves of Lagerstroemia reginae revealed the presence of alkaloids, saponins, flavonoids, glycosides, tannins and terpenoids as well as the methanolic extract of
Lagerstroemia speciosa leaves showed the presence of anthraquinones, flavonoids, saponins and tannins and Henna extract. Oman Medical Journal, 23: 253-256.


REFERENCES


Aliyu BS, 2006. Some ethno-medicinal plants of the Savanna regions of West Africa: Description and phytochemical, Triumph publishing company, Kano, P 69.


Al-Rubiay KK, Jaber NN, Al-Mhaaowe BH and AlRubaiy LK, 2008. Antimicrobial efficiency of...


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Table 1. Preliminary phytochemical screening of leaf extracts of selected Lythraceae members

<table>
<thead>
<tr>
<th>Lagerstroemia reginae</th>
<th>Phytochemical compounds</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Alkaloids</td>
</tr>
<tr>
<td>Aqueous</td>
<td>-</td>
</tr>
<tr>
<td>Petroleum ether</td>
<td>-</td>
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<tr>
<td>Chloroform</td>
<td>-</td>
</tr>
<tr>
<td>Ethanol</td>
<td>+</td>
</tr>
<tr>
<td>Acetone</td>
<td>+++</td>
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</tbody>
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| Lawsonia inermis      |                        |              |            |            |            |          |              |          |          |          |          |            |
| Aqueous               | +++                   | ++           | +          | -          | -          | +++      | +++          | +        | +++      | -        | +++      | -          |
| Petroleum ether       | -                     | -            | -          | -          | -          | -        | +++          | +        | -        | -        | -        | -          |
| Chloroform            | -                     | +++          | +          | -          | -          | -        | +++          | +        | -        | -        | -        | -          |
| Ethanol               | +                     | ++           | +          | -          | -          | +++      | +++          | +        | ++       | -        | +++      | +++         |
| Acetone               | -                     | ++           | +          | -          | -          | +++      | +++          | +        | ++       | -        | +++      | +++         |

| Lagerstroemia microcarpa |                        |              |            |            |            |          |              |          |          |          |          |            |
| Aqueous               | -                     | -            | -          | -          | -          | -        | ++           | +        | -        | -        | +++      | +++         |
| Petroleum ether       | -                     | -            | -          | -          | -          | -        | -            | -        | -        | -        | -        | -          |
| Chloroform            | -                     | +++          | +          | -          | -          | -        | -            | -        | -        | -        | -        | -          |
| Ethanol               | -                     | -            | ++         | -          | -          | -        | +++          | +        | -        | -        | -        | -          |
| Acetone               | -                     | -            | -          | +++        | -          | -        | +++          | +        | -        | -        | -        | -          |

| Punica granatum       |                        |              |            |            |            |          |              |          |          |          |          |            |
| Aqueous               | -                     | -            | ++         | +++        | -          | +++      | +++          | +        | +++      | -        | -        | +          |
| Petroleum ether       | -                     | -            | ++         | +++        | +          | +        | +++          | +        | -        | -        | -        | -          |
| Chloroform            | -                     | +            | -          | ++         | -          | ++       | +++          | +        | -        | -        | -        | -          |
| Ethanol               | ++                    | -            | -          | +++        | -          | +++      | +++          | +        | -        | -        | -        | -          |
| Acetone               | +                     | -            | -          | +++        | -          | +++      | +++          | +        | -        | -        | -        | -          |

Abbreviations: (-) Absent; (+) Low; (++) Average; (+++) High
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