Phytochemical Screening and in Vitro Antidiabetic Activity of Plumeria Acuminata Leaves

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Abstract: The present study was carried out to evaluate the preliminary phytochemical screening and in vitro antidiabetic activity of Plumeria acuminata leaves. The leaves of Plumeria acuminata was extracted with different solvents and phytochemical investigations were done for all extracts using standard procedures. In vitro anti-diabetic activity of ethyl acetate extract of Plumeria acuminata (MEPA) was evaluated using α-amylase inhibition assay. The percentage inhibition increased in a dose dependent manner. In this study we investigated the better in vitro anti-diabetic potential of the Plumeria acuminata.

Keywords: Plumeria acuminata, in vitro, antidiabetic, phytochemical screening, alpha Amylase, dose dependent.

INTRODUCTION

The importance of medicinal plant in drug development is known to us and humans have used them for different diseases from the beginning of human history [1]. Traditional folk treatment from wild plants has always guided researchers to search for novel medications to develop healthy life for humans and animals [2]. In addition, some medicinal plants are still obscured within the plant which needs to be scientifically evaluated.

Plant derived medicines have been the first line of defense in maintaining health and combating diseases. Many secondary metabolites of plants are commercially important and find use in a number of pharmaceutical compounds.

In the last century, roughly 121 pharmaceutical products have been discovered based on the information obtained from the traditional healers. Chemical principles from natural sources have become much simpler and have contributed significantly to the development of new drugs from medicinal plants.

Medicinal plants, since times, have been used virtually in all cultures as a source of medicine. Substances derived from the plants remain the basis for a large proportion of the commercial medications used today for the treatment of heart disease, high blood pressure, pain, asthma and other problems.

In India, plants like Abroma augusta (L.) L.f., Aconitum palatum D. Don, Aloe barbadensis Mill, Asparagus racemosus Willdl., Berberis aristata DC., Calamus rotang L., Cannabis sativa (L.), Catharanthus roseus (L.) G. Don., Cinnamomum tamala (Buch.-Ham.) Nees, Coccinea grandis (L.) Voigt., Costus speciosus Sm., Ficus racemosa (L.), Ipomoea batatas (L.) Lamk., Morodica champaria (L.), Nardostachys jatamansi DC., Picrorhiza kurrooa Royle ex Benth., Quercus lanata Sm., Swertia chirayita (Roxb. ex Flem.) Karst., Syzygium cumini (L.) Skeels, Trigonella foenum-graecum (L.), Urtica dioica (L.), Zingiber officinal Rosie, Allium cepa L., Allium sativum L., Aloe vera (L.) Burm.f., Cajanus cajan (L.) Millsp., Coccinia indica Wight & Arn., Caesalpinia bonducella (L.) Roxb., Ficus bengalensis L., Gymnema sylvestre R. Br., Ocimum sanctum L., Pterocarpus marsupium Roxb., Tinospora cordifolia (Willd.) Hook.f etc., are most commonly used species in traditional medicine as anti-diabetic agents [3].

The treatment of diabetes with synthetic drugs is costly and chances of side effects are high. Therefore Herbal drugs play an important role as alternative medicine due to less side effects and low cost. Plumeria acuminata belongs to the Apocynaceae family. Its common name "Frangipani" comes from an Italian noble family [4]. Also known as the Lei flower. They are recognized as excellent ornamental plants and often seen in the graveyards [5]. Plumeria plants are famous for their attractiveness and fragrant flowers. The Plant possess poisonous, milky sap. Contact with the sap may irritate eyes and skin. Plumeria acuminata leaves are traditionally being used for diabetes. There is no
scientific evidence on hypoglycemic, anti hyperglycemic activities of the parts (roots, leaves) of this plant. The plant is abundantly available in the southern parts of India. Hence we tried to evaluate the phytochemicals present and in vitro antidiabetic activity of Plumeria acuminata.

MATERIALS AND METHODS

Plant material
For the present investigation, the plant Plumeria acuminata was collected in Warangal district, AP, India. The leaves were shade dried and taxonomically identified by Dr. Vastavaya Raju, Head, Department of Botany, Kakatiya University, and Warangal. The voucher specimen (No: PGS-1) was deposited in our laboratory for further use.

Extraction
In present investigation the coarsely powdered leaves (750gm) of Plumeria acuminata were extracted successively using petroleum ether (60-80°C) and methanol by soxhlation. The solvent was removed by distillation and a greenish black-sticky residue is obtained. The methanol extract was re-extracted with ethylacetate and chloroform. The extracts thus obtained were weighed and percentage yields were calculated.

Phytochemical screening
These four fractions were evaluated by phytochemical qualitative reactions for usual plant secondary metabolites. The screening was performed for steroids, alkaloids, glycosides, flavonoids, saponins, tannins, carbohydrates and proteins [6-11]. The color intensity or the precipitate formation was used as analytical responses to these tests.

In-vitro antidiabetic activity

\[ \text{Activity} = \frac{\text{Conc. of Maltose liberated} \times \text{ml of enzyme used} \times \text{Dilution Factor}}{\text{Mol wt of Maltose} \times \text{Incubation time (min)}} \]

The inhibitory/induction property shown by the sample was compared with that of control and expressed as percent induction/inhibition. This was calculated according to the following formula.

\[ \% \text{ Inhibition/Induction} = \frac{\text{Activity in presence of compound}}{\text{Control activity}} \times 100 \]

STATISTICAL ANALYSIS
The data for various biochemical parameters were analyzed using analysis of variance (ANOVA), and the group means were compared by Newman-Keuls multiple range test (NKMRT). Values were considered statistically significant at p<0.001.

RESULTS AND DISCUSSIONS

Extraction
Various extracts (Petroleum ether, Chloroform, Ethyl acetate and chloroform extracts) of Plumeria acuminata leaves were prepared by successive solvent extraction. The colour, nature and percentage yields of all obtained extracts were recorded in the table 1.
Phytochemical screening

In present investigation, four different solvent extracts of *Plumeria acuminata* leaves are subjected to phytochemical evaluation. Standard tests and reagents were employed to detect various phytochemical studies. The experimental observations were recorded in table 2.

### Table-2: Phytochemical screening of different type of extracts

<table>
<thead>
<tr>
<th>Name of Test</th>
<th>Petroleum Ether</th>
<th>Methanol</th>
<th>Ethylacetate</th>
<th>Chloroform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkaloids</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Glycosides</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Saponins</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Steroids</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Proteins</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Amino acids</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Phenolics/tannins</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

**In-vitro antidiabetic activity**

The antidiabetic activity was investigated through the inhibition of α-amylase, an enzyme that made the digestion of starch and so reduced the glucose absorption. Standard Maltose curve is represented in Figure 1. From the standard curve, the concentration of maltose liberated by the treatment of various concentrations of EEPA was estimated. The percentage inhibition of α-amylase is given in Table 3. Inhibitory Activity of EEPA against α-amylase is shown in figure 2 by plotting graph against concentration and activity. The inhibition of enzyme activity, in the digestive tract of humans, is considered to be effective to control diabetes by diminishing the absorption of glucose decomposed from starch by these enzymes. The percentage inhibition increased in a dose dependent manner. In this study we investigated the better *in-vitro* anti-diabetic potential of the *Plumeria acuminata*. Therefore, effective and nontoxic inhibitors of α-amylase were present in the herb.

**CONCLUSION**

The present study indicates that treatment of EEPA at the doses of 250mg/kg and 500mg/kg brought the parameters altered to near normal level. From this we can conclude that EEPA can be used as a potent antidiabetic activity.

![Fig-1: Standard Maltose Curve](http://scholarsmepub.com/sjmps/1277)
Table 3: Percentage Inhibition of Ethylacetate Extracts of Plumeria Acuminata against α-Amylase

<table>
<thead>
<tr>
<th>Sample</th>
<th>Optical Density at 540nm</th>
<th>Conc. of Maltose liberated (µg)</th>
<th>Activity (µmoles/ml/min)</th>
<th>Percentage Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>1.39</td>
<td>112</td>
<td>0.031</td>
<td>100</td>
</tr>
<tr>
<td>100µg</td>
<td>0.86</td>
<td>68</td>
<td>0.018</td>
<td>58.06</td>
</tr>
<tr>
<td>75µg</td>
<td>0.92</td>
<td>73</td>
<td>0.02</td>
<td>64.52</td>
</tr>
<tr>
<td>50µg</td>
<td>0.99</td>
<td>79</td>
<td>0.021</td>
<td>67.74</td>
</tr>
<tr>
<td>25µg</td>
<td>1.14</td>
<td>91</td>
<td>0.025</td>
<td>80.65</td>
</tr>
<tr>
<td>10µg</td>
<td>1.29</td>
<td>104</td>
<td>0.028</td>
<td>90.32</td>
</tr>
</tbody>
</table>

Fig-2: Inhibitory Activity of Ethylacetate Extract of Plumeria acuminata against α-amylase

REFERENCES

Available online: http://scholarsmepub.com/sjmps/