A REVIEW ON PHYTOCHEMICAL CONSTITUENTS AND PHARMACOLOGICAL ACTIVITIES OF 
CLINACANTHUS NUTANS

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Received: 14 Aug 2014 Revised and Accepted: 15 Sep 2014

ABSTRACT

Clinacanthus nutans commonly known as Belalai gajah (Malay), Phaya yo (Thai) is traditionally used medicinal plant. The plant is used in skin rashes, snake bites, lesions caused by herpes simplex virus, diabetic myelitis, fever, diuretics and green tea and served as fresh drink. The phytochemical constituents existing in the plant comprise lupeol, b-sitosterol, stigmasterol, Botulin, myricyl alcohol C-glycosyl flavones (vitexin, isovitexin, shafooside, isoumorupentin 7-O-b-glucopyranoside, orientin and isoorientin), sulfur-containing glucosides, cerebrosides mixer, a monoacylmonogalactosylglycerol, 13-hydroxy-(13-S)-phaeophytin b, Pupurin-18-phytyl ester, phaeophorbide and chlorophyll derivatives. Pharmacological studies reported anti-Papillomavirus Infectivity, anti-viral activity on varicella-zoster virus, anti-inflammatory activity, anti-herpes Simplex virus type 1 and type 2 activity, anti-oxidant and protective effect against oxidative induced hemolysis.

Keywords: Clinacanthus nutans, Anti-viral, Anti-oxidant, Glycosides, Herpes Simplex Virus.

INTRODUCTION

Clinacanthus nutans (CN) have been used in traditional medicine in Thailand and Malaysia. Its therapeutic potential has not been explored completely. It is commonly known as Belalai gajah, Sabah Snake Grass in Malaysia [1], phaya yo or phaya plongtong in Thailand [2] and Giro de flores, cocodrilo flor, ezui hua in Chinese language [4].

Table 1: Common names of Clinacanthus nutans all around the world [2-4]

<table>
<thead>
<tr>
<th>Common names</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belalai gajah</td>
<td>Malay</td>
</tr>
<tr>
<td>Sabah Snake Grass</td>
<td></td>
</tr>
<tr>
<td>Twist of flowers</td>
<td>Chinese</td>
</tr>
<tr>
<td>Alligator flower</td>
<td></td>
</tr>
<tr>
<td>e zu hua</td>
<td></td>
</tr>
<tr>
<td>Phaya yo</td>
<td>Thai</td>
</tr>
<tr>
<td>Phaya plongtong</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Synonyms of Clinacanthus nutans [5]

<table>
<thead>
<tr>
<th>Clinacanthus nutans (Burm. f) lindau</th>
<th>Accepted name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinacanthus nutans var. robinsonii Benoist</td>
<td>Synonym</td>
</tr>
<tr>
<td>Clinacanthus burmannii Nees</td>
<td>Synonym</td>
</tr>
<tr>
<td>Justicia nutans Burm. f.</td>
<td>Synonym</td>
</tr>
</tbody>
</table>

Traditional uses

In Malaysia, the fresh leaves are boiled with water and consumed as herbal tea. It is used for treating skin rashes and snake bites, lesions caused by herpes simplex virus, diabetic myelitis, fever and diuretics [6][7]. In Thailand, an alcoholic extract of fresh leaves is used externally for treatment of skin rashes, snake and insect bite, herpes simplex virus (HSV), and varicella-zoster virus (VZV) lesions. The leaves can be consumed as raw material or mixed with other juices such as apple juice, sugarcane or green tea and served as fresh drink [8].
Table 3: Traditional uses of Clinacanthus nutans

<table>
<thead>
<tr>
<th>Country</th>
<th>Part use</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaysia</td>
<td>Fresh leaves</td>
<td>In Malaysia, the fresh leaves are boiled with water and consumed as herbal tea</td>
</tr>
<tr>
<td></td>
<td>leaves</td>
<td>It is commonly used in traditional Malaysia for its nourishing and anti-oxidant property. It is also used economical in house regimens for cancer patient [6-7, 9]</td>
</tr>
<tr>
<td>Thailand</td>
<td>Leaves</td>
<td>It is used for treating skin rashes and snake bites, lesions caused by herpes simplex virus, diabetic myeltis, fever and diarrheics [8]</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Fresh leaves</td>
<td>In Thailand, an alcoholic extract of fresh leaves is used externally for treatment of skin rashes, snake and insect bite, herpes simplex virus (HSV), and varicella-zoster virus (VZV) lesions. The leaves can be consumed as raw material or mixed with other juice such as apple juice, sugarcane or green tea and served as fresh drink [8]</td>
</tr>
</tbody>
</table>

Phytochemistry

Clinacanthus nutans contains lupeol (1), β-sitosterol (2)[17], stigmasterol(3) [16] Botulin[18] and myricyl alcohol[10][11]. It also contain six known C-glycosyl flavones isolated from the n-BuOH- and water soluble portion of the methanolic extract of the stems and leaves of C. nutans collected in Thailand such as vitexin (4), isovitexin, shaftoside (5), isomollupentin 7-O-β-glucopyranoside (6), orientin (7) and isoorientin[12].

Five sulfur-containing glucosides were isolated from the n-BuOH-soluble portion of a methanolic extract of the stems and leaves of C. nutans [13]. A mixture of cerebrosides [6] and a monacyl monogalactosyl glycerol[25]-1-O-linolenoyl-galactopyranosylglycerol[9] were isolated from the EtOHc-soluble fraction of the ethanolic extract of the fresh leaves of C. nutans [14].

13-hydroxy- (13-S)-phaeophytin b, Pupurin-18-phtyl ester and Phaeophorbide a were isolated from leaves of hexane and chloroform extract of C. nutans [15]. Trigalactosyl and digalactosyl diglycerides[10] were isolated from the leave extract and possess anti-herpes simplex virus effect [19].


Three chlorophyll derivatives (phaeophytin) [11-13] were isolated from the chloroform extract of Clinacanthus nutans Lindau leaves. Three of these were known compounds with structures related to chlorophyll a and chlorophyll b namely 132-hydroxy-(132-R)-phaeophytin b, 132-hydroxy-(132-S)- phaeophytin-a and 132-hydroxy-(132-R)-phaeophytin [21].

![Chemical structures of Clinacanthus nutans](image)

Fig. 3: Chemical structures of Clinacanthus nutans

Pharmacological activities reported
Pharmacological activity | Part use | Extract/Fraction/isolate | Dose tested/ route of administration | Animals/Cell line culture | Experimental model (In Vivo / In Vitro) | Results | Reference
--- | --- | --- | --- | --- | --- | --- | ---
Cholinergic modulation | L | Methanol | 250 mg/kg, 500 mg/kg, 1 000 mg/kg bw | Male mice | In vivo | A | 22
Cytoxic Study | ------ | Stock solution in DMSO | 0.01, 0.005, 0.001, 0.0005, 0.0001 and 0.00001% | Koi Fin cell line (KFC) | In-vitro | B | 23
Anti-Papillomavirus Infection | ------ | Stock solution in DMSO | Different concentrations in different compounds | 293FT cells | In-vitro | C | 24
Anti-inflammatory activity virucidal Activity | L | n-BuOH-soluble fraction | ---------- | ---------- | In-vitro | D | 25
Anti-viral Activity on varicella-zoster virus. Dengue Virus Type 2 Infection | ------ | ethanol extracts | ---------- | ---------- | In-vitro | E | 26
Anti-herpes Simplex Virus type 1 Activity | Ethyl Acetate Extract | 1.9, 2, 4, 8, 19, 38, 76, 152ug/ml | C6/36 cell line, A549 cell line | Vero cells | In-vitro on the Vero cells by using plaque reduction assay | H | 29
Acute toxicity Study Anti-herpes Simplex Virus type 2 Activity | Ethanol | 5.44g/Kg bw | rats | Kidney cell line | In vivo | I | 30
Anti-oxidant, protective effect against oxidative induced hemolysis | Ethanol | ---------- | Baby hamster kidney cell line | In-vitro | J | 31

Clinical trials
Clinical trials have reported the successful use of a *C. nutans* preparation (cream) for treatment of genital herpes and varicella-zoster lesions in patients [33-36].

CONFLICT OF INTERESTS
Declared None

REFERENCES
2. Smitinand T. "Thai Plant Names (Botanical Names-VernacularNames)." Royal Forest Department, Phahonyothin, Bangkok, Bangkok, Thailand; 1980. p. 88.


