INTERNATIONAL JOURNAL OF PHYTOTHEARPY RESEARCH
ISSN 2278 – 5701

Review Article

Tylophora indica an Indian Ipecacuahna: A Review

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ABSTRACT

Tylophora indica is a perennial climbing plant native to India, found in plains, forests, hills of southern and eastern India. The leaves of *Tylophora indica* are included in Bengal pharmacopeia since 1884. It has longstanding reputation as a remedy for asthma. Root or leaf powder is used in diarrohea, dysentery and intermittent fever. It is an expectorant and administered in respiratory infections, bronchitis and whooping cough. Dried leaves are emetic, diaphoretic and expectorant. It is regarded as one of the best indigenous substitute for ipecacuanha, so it was considered as Indian Ipecacuahna since late 19th century. It has been used traditionally in siddha system of medicine & ayurveda. It is believed to have laxative, expectorant, diaphoretic and purgative properties. It has been used for the treatment of various respiratory problems and inflammatory conditions like asthma including allergies, bronchitis and colds, as well as dysentery and osteoarthritis pain. Tylophora is becoming increasingly popular for the treatment of asthma.

Keywords: ipecacuahna, osteoarthritis , *Tylophora indica*, whooping cough

INTRODUCTION:

Tylophora is a family of slender climbing perennial plants which has about 60 species from various parts of the world.This name has been derived from two ancient greek words – '*Tylos*' meaning "knot" and '*phoros*' meaning "bearing". It was earlier placed in Asclepiadaceae which has now been sunk into Apocyanaceace. *Tylophora indica* is indigenous to India where it grows wild in the southern & eastern regions & has a long standing reputation in the treatment of asthma. The leaves & roots of *Tylophora indica* have been included in Bengal Pharmacopoeia since 1884.

MORPHOLOGICAL CHARACTERISTIC

Leaves: about 5-10 cm long, ovate or oblong, opposite, acute/acuminate, base usually chordate.

Flowers: pale yellow, purple within, in lateral cymes.

Fruit: a follicle, in pairs, ridged, 7.5 - 10 cm long, tapering to a fine point at the apex.

Roots:fleshy,long.
Latex:watery

TAXONOMIC DESCRIPTION

BOTANICAL NAME: *Tylophora indica*

SUBFAMILY: Asclepiadaceae

KINGDOM : Plantae

ORDER**:** Gentianales

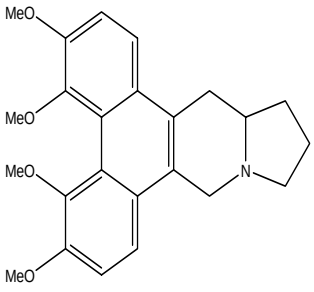
FAMILY*:* Apocynaceae

CHEMICAL COMPOSITION

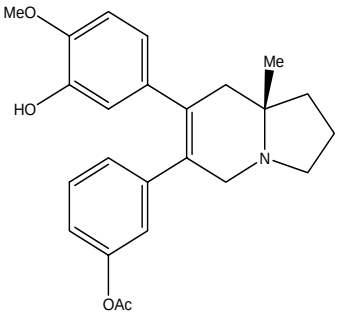
The plant has been reported to contain 0.2-0.46% alkaloids, flavanoids, wax, resins & tannins.

ALKALOIDS : A good number of *phenanthroindolizidine alkaloids* have been isolated.

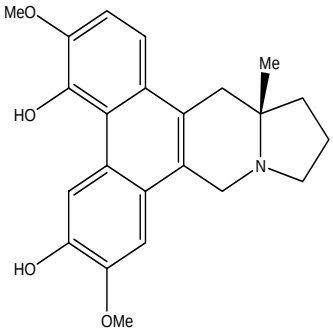
(A) RARE / NEW ALKALOIDS :



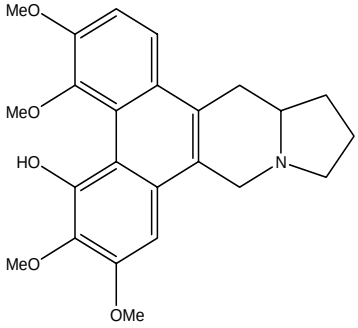
Tyloindicine – A



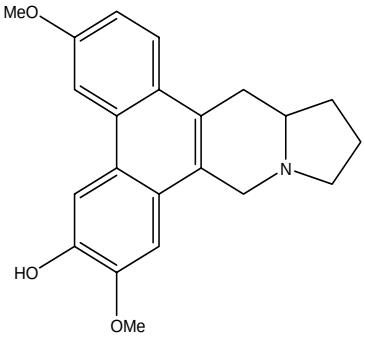
Tyloindicine- B



Tyloindicine – C



Tyloindicine - D



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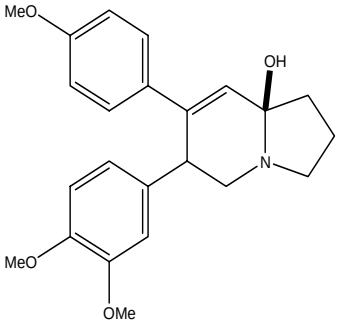
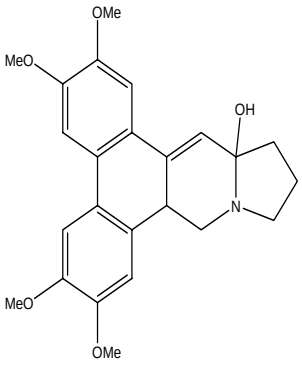
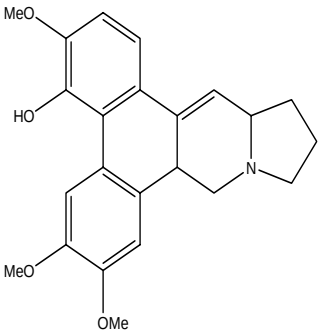


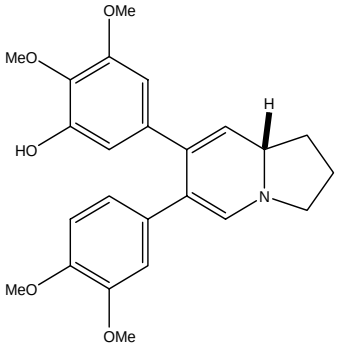
Tyloindicine - F



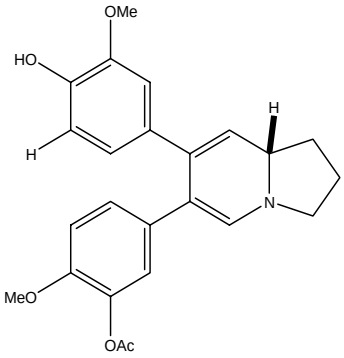
Tyloindicine -G



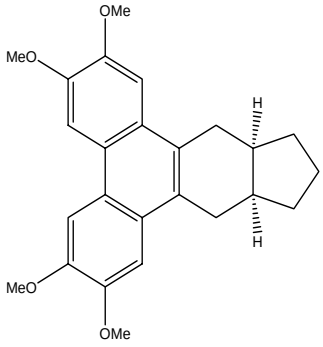
Tyloindicine -H



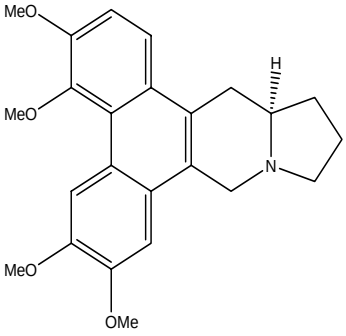
Tyloindicine -I



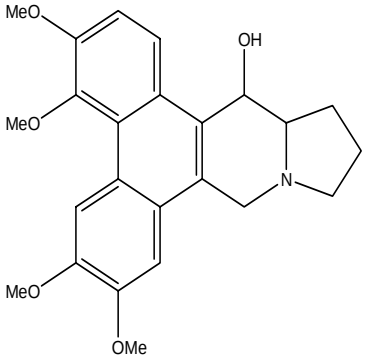
Tyloindicine -J



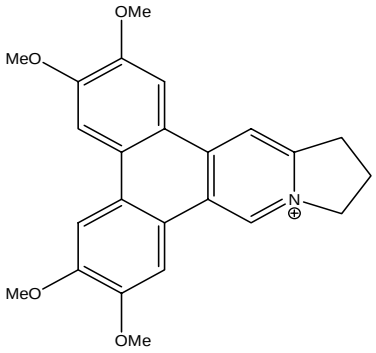
Tyloindane



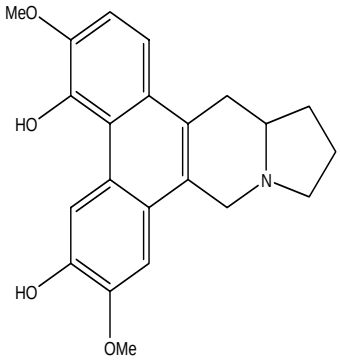
Isotylocrebrine



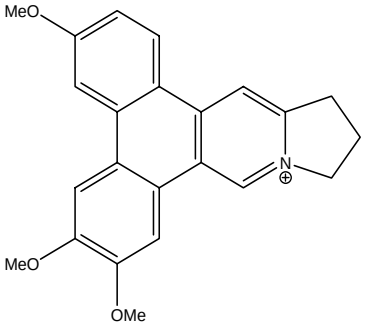
14-Hydroxyisotylocrebrine



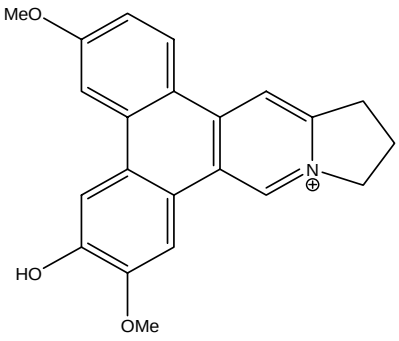
Dehydrotylophorine



4,6- Desmethylisotylocrebrine

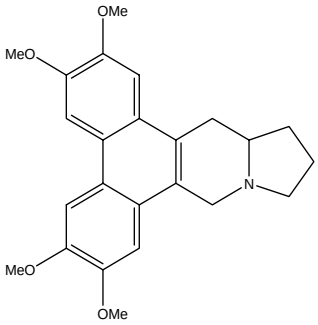


Anhydrodehydrotylophorinine

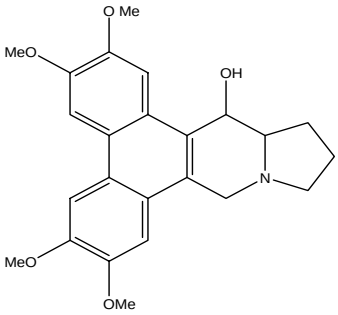


Anhydrodehydrotylophorinidine

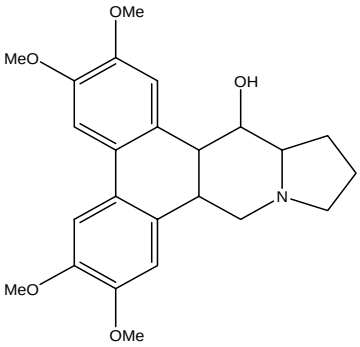
(B) KNOWN ALKALOIDS :



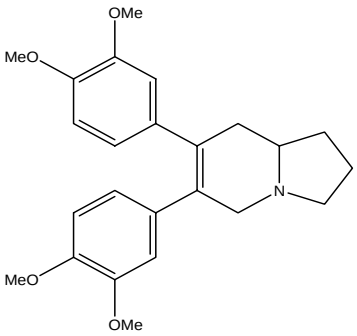
Tylophorine



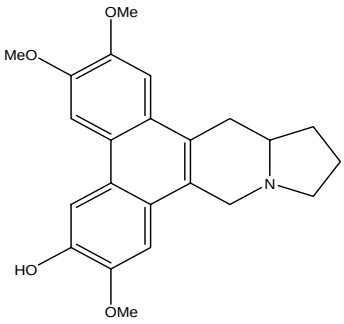
Tylophorinidine



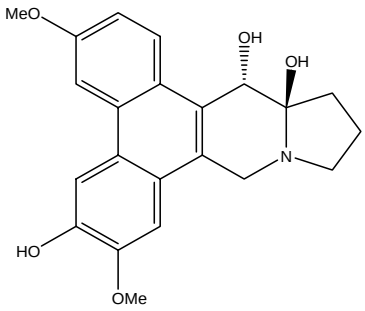
Tylophorinicine



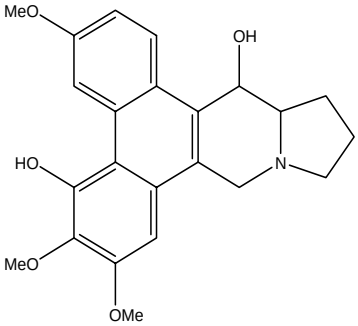
Septicine

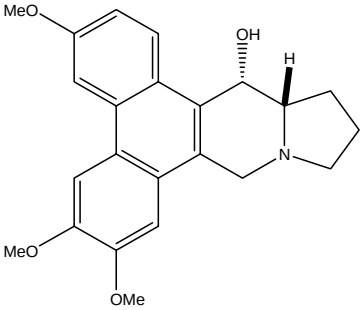


6-Desmethyltylophorine



Tylophorinidine





5-OH-O-Methyl-Tylophorinidine

Tylophorinine

OTHERS

Cetyl Alcohol	**Wax**	**Pigments**
A phytosterol	**Resin**	**Glucose**
Mineral salts	**Tannins**	**Tetratriacontanol**
Octacosanoate	**Flavanoids**	**Kaempferol**
β – amyrin	**Quercetin**	**α – amyrin**
Sterols	**β – sitosterol**	**Sigmasterol**

- ROOTS **:** p- methoxysalicyldehyde & essential oils
- FRESH LEAVES **:** (+) septicine, (+) isotylocrebrine, anhydrodehydrotylophorinine, dehydrotylophorine, anhydrodehydrotylophorinidine, tylophorinine* , tylophorinidine, tylophorine tylophorinine content of the leaves is a function of plant growths & is maximum during flowering period.)
- ROOTS AND AERIAL PARTS : α – fagarine & skimmianine

Propagated By : Stem cuttings

TRADITIONALUSES:

ROOTS:

- Substitute for ipecac
- Stimulant
- Cathartic
- Emetic
- Stomachic
- Diaphorectic
- Anti- asthmatic
- In whooping cough
- In diarrhea and dysentery (root powder)
- Rheumatic and gouty pain
- In intermittent malarial fever
- Alterative
- Blood purifier

LEAVES:

- Emetic
- Diaphorectic
- Expectorant
- Useful in cases requiring emesis

VERNACULAR NAMES:

Sans: Antamul
ben. : antamul, anantamul.
Guj.: Damnivel
Hin. : janglipikvam, antamul
Kan.: adumutadhagida
Mar. : khodiki, Raasna, Atkari
Tam. : Nanchchurupan, Nanja- murich-chaan, Mirkkurinja, Nayppala, Tellavidavela, kondachani
Tel. : Verripala, kukkapala

SAFETY PROFILE

1) It may cause nausea,vomiting, mouth soreness & alteration in taste as seen in some exceptional models.
2) However no serious adverse drug reactions have been reported.
3) It might be unsafe in patients with CV disorders, organ transplants, diabetes.
4) There is insufficient evidence to its recommendation in pregnancy, lactation, children below 2 years of age.
5) ADRs on oral consumption can be reduced when leaves are taken in capsulated form rather than chewing.
6) Tylophorine and tylophorinine from leaves have been claimed to cause dermatitis in one clinical trial.

Flowering and fruiting period : February to October
Trade Name : Indian ipecacuanha, Emetic swallow- wort

HERB - DRUG INTERACTIONS

a) BRONCHODILATORS : Positive interaction i.e may increase bronchodilation.
b) ANTI DEPRESSANTS & SEDATIVES : CNS depressant at high doses MARKETED FORMULATIONS: Fizzle ® and Vasaforte®
(BRONCHODILATORY EFFECT)

DOSAGE: For the treatment of asthma LEAVES are used:

1) SOLID FORM: Typical dosage in dried or capsular form is 200 mg twice a day or 400 mg total in 2 doses.

2) IN LIQUID FORM : 1-2 ml of tincture can be taken per day .

BIOLOGICAL ACTIVITIES :

(1) Hepatoprotective activity:
The methanolic extracts of *Tylophora indica* leaves was screened for hepatoprotective activity in carbon tetrachloride induced hepatotoxicity in albino rats. *Tylophora indica* leaves exhibited significant reduction in serum hepatic enzyme when compared to rats treated with carbon tetrachloride alone [16]. The hepatoprotective activity of alcoholic (ALLT) and aqueous(AQLT) extracts of leaves of *Tylophora indica* against ethanol-induced hepatotoxicity. Ethanol induced significant changes in physical, biochemical, histological, and functional liver parameters. Pretreatment with ALLT and AQLT extract significantly prevented the physical, biochemical, histological and functional change induced by ethanol in the liver[17].

(2) Lysosomal enzyme inhibiting activity:
The flavone fraction from *Tylophora indica* leaves showed significant dose dependent lysosomal enzyme inhibiting activity against adjuvant-induced arthritis at20-50 mg/kg. Flavone fraction showed statistically significant inhibition of arthritis lesions ($p<0.05$) from day 18, ($p<0.025$) from day 20 and ($p<0.001$) from day 21 onwards in the adjuvant-induced arthritis studies which was compared to response of standard drug Indomethacin[18].

(3) Antiallergic activity:

The anti-allergic effect of *Tylophora indica* was compound with that of disodium cromoglycolate on perfused rat lung in sensitized rats by observing the changes in the volume of the perfusate per minute. Administration of aqueous extract of *Tylophora indica* and disodium chromoglycolate during perfusion of sensitized rat lung significantly increased the rate of flow. The action of *Tylophora indica* may be due to direct bronchodilator property and membrane stabilizing and immune-suppressive effects[19].

(4) Diuretic activity:

Aqueous and alcoholic extracts of *Tylophora indica* leaves were tested for diuretic activity in rats. The aqueous and alcoholic extracts of *Tylophora indica* leaves possess good diuretic activity. It is investigated that ethanol is most effective in increasing urinary electrolyte concentration of all the ions i.e sodium, potassium and chloride followed by chloroform and aqueous extracts while other extracts did not show significant increase in urinary electrolyte concentration[20].

(5) Mast cell stabilisation activity:

The total alkaloids of *Tylophora indica* were tested for mast cell stabilizing effect I comparision with disodium cromoglycolate by challenging against three different mast cell degranulators, diazoxide, carbachol and polymixinB, in-vitro. The results suggest that tylophora alkaloids may have similar mechanismof action disodium cromoglyacte through cylic AMP[23].

(6) Anti-Cancer Activity:

Tylophorine not only retards the S-phase progression but also dominantly arrests the cells at G1phase in HepG2, HONE-1, and NUGC-3 carcinoma cells. Moreover, tylophorine treatment results in down regulated cyclin A2 expression and over expressed cyclinA2 rescues the G1 arrest by tylophorine. Thus, we are the first to report that the down regulated Cyclin A2 plays a vital role in G1 arrest by tylophorine in carcinoma cells[24].

(7)Anti-TumorActivity:

Tylophorine analogs had an inhibitory effect on cyclic AMP response elements, activator protein-1sites, or nuclear factor-kappaB binding site-mediated transcriptions. In summary, these tylophorine analogs are a unique class of antitumor compounds that have a mode of action different from known antitumor drugs[25]. Polar phenanthrene-based tylophorine derivatives (PBTs) were designed, synthesized and evaluated as potential antitumor agents. The newly synthesized PBTs were evaluated for cytotoxic activity against the A549 human cancer cell line. Among them, *N*-(2,3-methylenedioxy-6-methoxy-phenanthr-9-ylmethyl)-l-2- piperidinemethanol and *N*-(2,3-methylenedioxy-6-methoxy-phenanthr-9-ylmethyl)-5-aminopentanol showed the highest potency with IC50 values of 0.16 and 0.27μM , respectively[26].

(8)Antifeedant and antimicrobial activity:

Crude and pure extracts of *Tylophora indica* were investigated in view of antifeedant and antimicrobial activity. Pure compounds displayed strong antibacterial activity at lower concentrations in all tested bacterial strains except *E.coli.* while all the crude and pure compounds showed antifungal activity against *Aspergillus niger, Aspergillus*

fumigates and *Trichoderma virdae* , the pure compounds had strong antifungal activity compared to Crude extracts [27].

(9) Anti-Asthmatic:

A brief exposure of human peripheral leukocytes from asthmatic children to tylophorine (an alkaloid occurring in *Tylophora asthamatica*) caused the stimulation of adenylcyclase. This effect was not observed in the leukocytes from the nonasthmatic children or adults [28].

(10) Cardiac activity:

The hydroalcoholic extract of Tylophora indica (HETI) was screened for experimentally induced myocardial infarction in rats. Albino rats were treated with HETI at doses of 100 mg/kg, (HETI-100) or 200 mg/kg (HETI-200) and propranolol 10 mg/kg (PRO-10) for 30 days orally. MI was induced by subcutaneous administration of isoprenaline (IPL) 150 mg/kg for two consecutive days. Pretreatment of animals with PRO-10 and HETI-200 provided significant myocardium protection from IPL damage as indicated by significant decrease in lactate dehydrogenase (LDH) and creatine phosphokinase-MB (CK-MB) activities in serum and an increase in activities of these enzymes in heart tissue homogenate (HTH). HETI in higher doses improves the myocardial recovery from injury induced by IPL. [14]

(11) Anti-hyperglycemic and anti hyperlipidemic activity

A single oral administration with the crude extract of *Tylophora indica* caused a significant decrease in serum glucose levels in all rat groups. Moreover, these doses of the crude extract produced a significant time-dependent hypoglycemic effect as shown throughout the period studied. the main mechanism by which *Tylophora indica* brings about its hypoglycemic action probably is by stimulating peripheral glucose consumption.

(12) Recovery in Isoprenaline-Induced Myocardial Damage in Rat Heart

HETI (hydroalcohil extract of Tylophora indica) in higher doses improves the myocardial recovery from injury induced by IPL (isoprenaline) . The observations made in the present study showed that prior administration of high dose of HETI prevents oxidative stress and associated structural changes induced by potent cardiotoxic IPL.

(13)Anti-oxidantactivity

The DPPH (1, 1- diphenyl- 2-picrylhydrazyl) radical scavenging activity of methanolic extract of *Tylophora indica* was carried out and it *suggested* that it may be used as antioxidant.

(14)Anti-bacterialactivity

Antibacterial activity of ethyl acetate and methanol extracts of plant was investigated by well-diffusion method against bacterial pathogens associated with HIV. The plant extracts showed better inhibitory activity against the tested organisms. Methanolic leaf extract of *Tylophora indica* showed highest inhibitory activity. The activity showed against the *Klebsiella pneumoniae, Escherihcia coli, Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Salmonella typhi* known to be found among the HIV patients.[15]

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