

UTILITY OF *TYLOPHORA INDICA* AS ANTI-ASTHMATIC PLANT: A REVIEW

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Abstract: There is an increasing demand for plant based medicines to control many of the human diseases. *Tylophora indica* is one of the important medicinal plant of India. It is traditionally used to control asthma and allergic reaction. There is growing research on isolation and identification of bioactive constituents of plant. The present review highlights the morphology, medicinal uses, biochemistry and other aspects of *Tylophora indica* (Antamul.)

Keywords: *Tylophora indica*, Antamul, Indian Ipecac, Asthma

INTRODUCTION

Asthma is a chronic disease involving inflammation of bronchial tubes. It makes air difficult to move in and out of lungs. Its symptoms include breathlessness, coughing, wheezing, etc. More than 340 million people are suffering from the disease according to recent comprehensive analysis of WHO. Treatment of asthma to such a large population is a challenge. Allopathic medication has numerous side effects. Use and multiplication of medicinal herbs provide better solution to asthmatic patients. Antamool or *Tylophora indica* is an important medicinal plant with antiasthmatic properties. This review is an effort to summarize its botanical characteristics, ethno medicinal uses and pharmacological applications.

Botanical name: *Tylophora indica* (Burm. f.) Merrill.

Synonym: *Tylophora asthmatica* (Linn. f.).

Common Name: Antmul.



Other names:

Beng.- Antomul.

Guj.- Antamul.

Hindi- Antamuli.

Kan.- Kirumanji.

Mal.- Valli-pali.

Mar.- Pitakari, Khodki-Rasna.

Ori.- Mendi, Mulini.

Tam.- Naye-pallai.

Tel.- Veripala, Kukka-pala, Vettipala.

Eng-Indian ipecacuanha

Tylophora indica belongs to the family Asclepiadaceae and has been known in ayurveda for more than hundred years for its use in the treatment

of respiratory disease. Clinical trials have been done on *Tylophora indica* extract for evaluating their effectiveness in bronchial asthma.¹⁻³ The name is derived from the ancient Greek word 'tylos' which means knot and 'phoros' means bearing. *Tylophora* is also known to possess immunomodulatory, hypoglycaemic, antiallergic and antimicrobial properties. The plant has been traditionally used for the treatment of bronchial asthma, jaundice and inflammation. In Ayurveda, the plant has been used in treatment of asthma, dermatitis and rheumatism [1, 6]. Although the leaf and root of this plant are widely used for treating jaundice in Northern Karnataka, there is a paucity of scientific evidence regarding its usage in liver disorder [3]. The other reported activities include cytotoxic effect [7], immunomodulatory activity [8], anticancer activity [9] and anti-moebic activity [10]. This review summarizes the information concerning the botany, cultivation, ethnopharmacology, phytochemistry of the *Tylophora*.

Habit and Habitat

Tylophora indica is found in plains, hilly slopes and forests. It forms dense patches in the forests in moist, humid conditions in open hill slopes and narrow valleys. The plant grows in the area with lesser rainfall. *Tylophora* grows in a wide range of well-drained soil and prefers scanty localities [3].

Distribution

It is a twining perennial plant distributed throughout southern and eastern part of India in plains, forests and hilly places. It is indigenous to India and inhabits up to an elevation of 1260m in the sub-Himalayan tract. The plant is found growing normally in Uttar Pradesh, Bengal, Assam, Orissa, Himalayas and sub-Himalayas in India [2]. About 60 species are found in tropical, sub-tropical Asia, Africa and Australia and about 35 species are reported from China. Some species found in India are *Tylophora indica/asthmatica*, *Tylophora rotundifolia*, *Tylophora fasciculata*, *Tylophora apiculata*, *Tylophora anomala*, *Tylophora sylvatica*, *Tylophora heterophylla*, etc.

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Morphology

Tylophora indica (Burm.F) Merrill, commonly known as Indian Ipecese or Antmool belongs to family *Asclepiadaceae*. The plant is perennial, small, slender, a twining or climbing herb. Leaves are obvate-oblong to elliptic-oblong, 3-10cm long and 1.5-7cm wide [3].

Roots are long, fleshy with longitudinally fissured light brown, corky bark. Flowers minute, 1-1.5cm across, in 2-3 flowered fascicles in axillary umbellate cymes. Calyx divided nearly to the base densely hairy outside; segment lanceolate, acute. Corolla greenish yellow or greenish purple; lobes oblong, acute. Fruit a follicle, up to 7 × 1cm, ovoid lanceolate, tapering at apex, finally striate, glabrous, Seeds 0.6-0.8 × 0.3-0.4cm long [4].

Cultivation practices

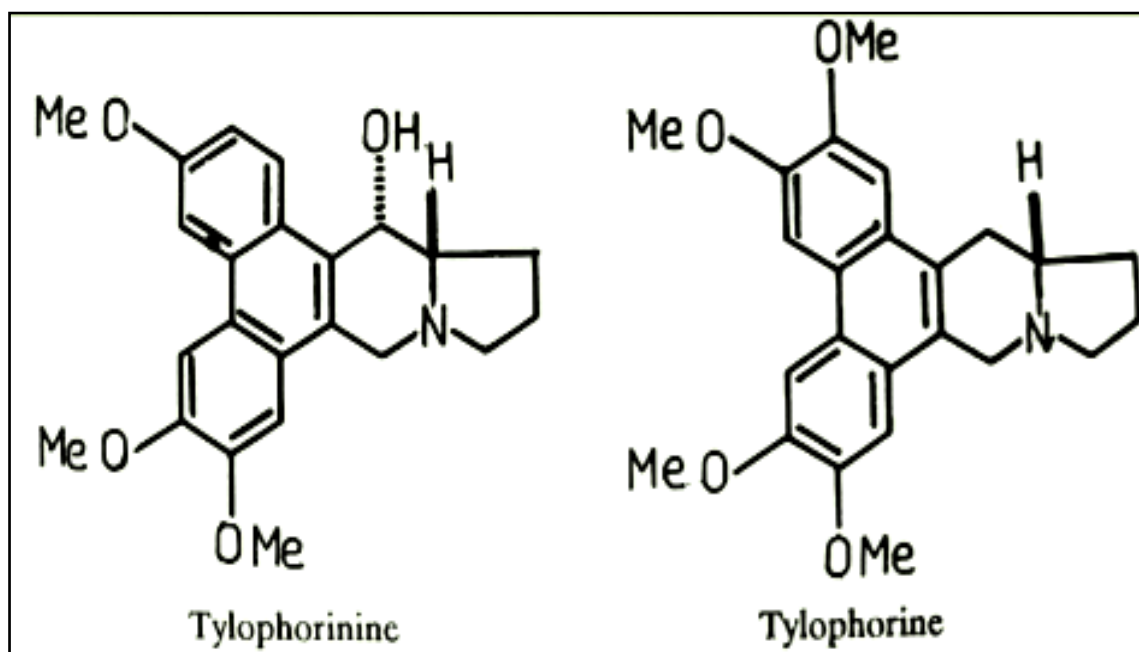
Tylophora is conventionally propagated through the seeds. The seeds show good germination percentage, but fruit set is rare. Seeds start germination in 10 days and the germination will complete in 3 weeks. After germination the 3 months old plantlets are ready to transplanting in the field but the transplantation should be done in rainy season and plant distance should also be maintained. The annual rainfall required for *Tylophora* plant is 1000 - 1500mm. The plant prefers partial shade condition of the forest and soil rich in humus. It needs the support of host vegetating for climbing to a sunny location. For its cultivation, loamy soil to clay and supplemented with farmyard manure, ambient

conditions of temperatures and sunlight are desirable. Each flower formulation have shown positive result for growth enhancement for this endangered plant (21)

Chemistry

Tylophora plant has been reported to contain 0.46% of alkaloids viz Tylophorine, Tylophorinine, Tylophorinidine, Septicine, Isotylocrebrine, Tylophoricine, sterols, flavanoids, wax, resins and tannins [5]. Actually, the major constituent of *Tylophora* is Tylophorine, responsible for a strong inflammatory action.

The active constituents of *Tylophora indica* are phenanthroindolizidine, alkaloids. Recently some rare alkaloids namely tyloindicines A, B, C, D, E, F, G, H, I, and J, desmethyltylophorine, desmethyltylophorinine, isotylocrebrine, anhydrostylophorinine, anhydrous-dehydrotylophorinine, γ -fagarine, skimmianine, 14-hydroxyisotylocrebrine, 4,6-desmethylisodroxy-o-Methyltylophorinidine have been reported. The non-alkaloidal compounds isolated from *Tylophora indica* are kaempferol, quercetin, α - and β -amyriins, tetratriacontanol, octacosanyl octacosanoate, stigmasterol, β -sitosetrol, tyloindane, cetyl-alcohol, wax, Resin, pigments, tannins, glucose, calcium salts, potassium chloride, quercetin and kaempferol. Steam distillation of an alcoholic extract of the air-dried root powder gave *p*-methoxy salicylaldehyde and a small amount of oily matter. (4,6 – 8)



Folk or traditional uses

In Ayurveda, the plant has been used in treatment of asthma. The alkaloid of *Tylophora* in powder form, about 400-500 milligrams given once daily to asthmatic patients for six days to cure asthma [12].

Traditionally, doses of 250 milligrams 1-3 times daily, standardized to 0.1% of tylophorine per dose have been used. Some clinical trial reports using 350 milligrams of *Tylophora* leaf placed in a capsule and given once daily for seven days. Some experts have

used *Tylophora* leaf taken in the amount of 200-400 milligrams dried herb daily. Another clinical trial reports the use of 40mg of alcoholic extract of *Tylophora indica* daily for six days. The alcoholic extract of crude *Tylophora* leaves in 1gm of glucose had comparable effects to that of chewing crude *Tylophora* leaves. The root or leaf powder is used in diarrhoea, dysentery and intermittent fever [13].

Medicinal Properties

Tylophora has been traditionally used for the treatment of bronchial asthma, jaundice and inflammation. It has antitumor, immunomodulatory, antioxidant, antiasthmatic, muscle relaxant. Although the leaf and root of this plant are widely used for treating jaundice in northern Karnataka, there is a paucity of scientific evidence regarding its usage in liver disorder. The other reported activities include immune-modulatory activity, anti-inflammatory activity, anticancer activity, antihistaminic and antireumatic. *Tylophora* is traditionally used as folk remedy in certain regions of India for the treatment of bronchial asthma, inflammation [6, 9] bronchitis, allergy and dermatitis [12, 19]. *Tylophora* also seems to be a good remedy in traditional medicine as anti-psoriasis [10]. The leaves and roots of *Tylophora* are used as a source of bioactive material [11]. It is reported to have laxative, expectorant, diaphoretic, purgative, stimulant, emetic and cathartic properties [2]. It has also been used for the treatment of allergies, cold, dysentery, hay fever and arthritis. It has reputation as alterative and as a blood purifier often used in rheumatism. It is an expectorant and administered in respiratory infection, bronchitis and whopping cough [3]. Dried leaves are emetic diaphoretic and expectorant. It is regarded as one of the best indigenous substitutes for Ipecacuanha. The leaves and roots are also used in hydrophobia. Leaves are employed to destroy worms and the leaf extract act as anti-tumor. The roots are suggested to be a good natural preservative of food.

Pharmacological studies

Anti-Asthmatic activity: The plant is known to exhibit anti asthmatic activity by the direct stimulation of adrenal cortex. Alcoholic extract of the plant inhibited phagocytosis in mice. The anti-allergic effect of *Tylophora indica* was compared 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 stabilising and immune-suppressive effects [17].

A brief exposure of human peripheral leukocytes from asthmatic children to tylophorine (an alkaloid

occurring in *Tylophora asthematica*) caused the stimulation of adenylylase. This effect was not observed in the leukocytes from the nonasthmatic children or adults.

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 [14]. The hepatoprotective activity of alcoholic and aqueous extracts of leaves of *Tylophora indica* against ethanol-induced hepatotoxicity. Ethanol induced significant changes in physical, biochemical, histological, and functional liver parameters. Pretreatment with alcoholic and aqueous extracts significantly prevented the physical, biochemical, histological and functional changes induced by ethanol in the liver [15].

Lysosomal enzyme inhibiting activity

The flavone fraction from *Tylophora indica* leaves showed significant dose dependent lysosomal enzyme inhibiting activity against adjuvant-induced arthritis at 20-50 mg/kg. Flavone fraction showed statistically significant inhibition of arthritis lesions from day 18, from day 20 and from day 21 onwards in the adjuvant-induced arthritis studies which was compared to response of standard drug indomethacin [16].

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 [18].

Commercial demand and formulations

Tylophora species are now in great demand in worldwide because of their proven efficacy against asthma. An ayurvedic nutraceuticals, Sabina Corporation, a U.S. company produced standardized extract of *Tylophora indica* having composition of 0.1% alkaloid used for respiratory disorders. Ayush Herbs Inc. company marketed *Tylophora* Plus capsules is an Ayurvedic herbal formulation designed to support the lungs. The combination of *Tylophora indica*, Piper longum, Ginger and *Embolia officinalis* have been shown to support the body's immune function. Another drug produced commercially is Geriforte Aqua used for delayed hypersensitivity by Himalaya group of companies.

Biotechnological approach for the propagation

Plant raised through the seeds shows tremendous genetic variation which is not suitable for commercial cultivation. Vegetative propagation is difficult in *Tylophora* due to low seed viability and germination rate [14]. In addition, the destruction caused by harvesting the roots as a source of drug has threatened the survival of the plant. Thus, large-scale demand necessitates rapid multiplication of *Tylophora*. Biotechnological investigation was aimed to develop rapid micropropagation protocol *in vitro* through tissue culture. Micropropagation is one of the important methods for enhancing the rate of multiplication. Through this technique, large number of plant can be raised from a small part of plant tissue within a short span of time. Plant tissue culture has been extensively utilized for the improvement of many medicinal plants. In *Tylophora indica* many tissue culture studies have reported for successful representation protocols. Somatic embryogenesis has been reported from mature leaves of *Tylophora indica* [16, 18]. Another protocol has been developed for high-frequency shoot regeneration and plant establishment of *Tylophora* from petiole-derived callus [9]. New and efficient transformation system for *Tylophora indica* using *Agrobacterium rhizogenes* to infect excised leaf and stem explants and intact shoots were also reported [8]. Root explants cultured on MS medium supplemented with 6-benzyladenine (BA) produced organogenic nodular meristemoids (NMs) within four weeks [17]. Protoplast culture and plant regeneration of *Tylophora* was achieved through callus regeneration [9].

CONCLUSION

According to WHO Asthma is a chronic disease characterized by recurrent attacks of breathlessness and wheezing. It is one of the most common chronic diseases among children, involving about 235 million people. Nowadays, the market is flooded with synthetic drugs to control asthma, but they show many side effects during long-term usage. There is an increasing trend for the usage of herbal drugs to control major diseases including asthma. *Tylophora indica* is an important antiasthmatic medicinal plant used in several Ayurvedic preparations. The present review of *Tylophora* is useful for further studies.

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