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A PHYTOCHEMICAL AND PHARMACOLOGICAL REVIEW ON THE WONDER HERB *TILIACORA ACUMINATA*

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ABSTRACT

Medicinal plants often form an important constituent of many formulations used by the folk medical practitioners**.** *Tiliacora acuminata* of Menispermaceae family is such a medicinal plant largely available in India. It is considered as an ingredient in many of the ayurvedic preparations. It is also regarded as an antidote for snake bite. As most parts of the plant have various pharmacological actions, this plant is known to be a wonder plant. The objective of this review is to understand the extend of phytochemical and pharmacological evaluations carried out on this plant.

Key words: Menispermaceae, Krsnavetra, Antibacterial, Tiliasine

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INTRODUCTION

Tiliacora acuminata is a large woody climber with branches cinereous and striate. Leaves are long, acuminate, ovate, cordate, or rounded at the base and the flowers are yellow in colour and are elongate, lax, axillary, racemose panicles(1) (Fig-1). This plant also finds frequent mention in ancient literature on Ayurvedic medicine as '**Krsnavetra**'which alleviates many ailments and cures cancerous diseases(2).Traditionally, it has been used to treat snake bites(3) in the form of paste of root or leaf applied on the bites. Cuts and wounds were cured by application of the leaf paste or macerated juice on the affected part(4). The synonyms of the plant are *Tiliacora racemosa* Colebr., *Cocculus acuminatus* DC. , *Menispermum acuminatum* Lam., *Tiliacora abnormalis* Miers. The regional names of the plant are Vallikanjiram (Malayalam), Tapering leaf Tiliacora (English), Nakamutti & Perunkattukkoti (Tamil), Kuriballi (Kannada), Bagamushada (Hindi).

Figure-1 ***Tiliacora acuminata***

PHYTOCHEMISTRY

The phytoconstituents present in a plant can be used for a number of medicinal purposes. The phytochemical constituents present in the plant *T.acuminata* were identified by examining the crude extracts of its leaves and stem. The phytoconstituents present are alkaloids, anthraquinones, catechins, coumarins, flavonoids, phenols, quinones, saponins, steroids, sugar,glycosides and xanthoproteins (Table-1) (5). Saraswathi Bai had reported the isolation of alkaloid Tiliacorine from the plant *Tiliacora acuminata*. Rao and Row later isolated another alkaloidTiliarine.Three diphenylbisbenzylisoquinoline alkaloids, Tiliacorine, Tiliacorinine, Nortiliacorinine A were isolated from the ethanol extract of the plant(6). Ray *et al* in 1990 reported the isolation of a diphenylbisbenzylisoquinoline alkaloid, Tiliaresine from the leaves of *Tiliacora racemosa* colebr(7) .Then later in 2001 Seal T *et al* had isolated another two new diphenylbisbenzylisoquinoline alkaloids, Tiliacosine and Tiliasine. They were isolated from the benzene extract of leaves of *Tiliacora acuminate(8)* and an alkaloid, N-Methyl Tiliamosine(9) was also isolated from the leaves of the plant.In 2008 Joseph *et al* reported the isolation of a lactone from the aerial parts of both the female and male flowers (10). The chloroform extract was used for the isolation. Joseph *et al* in 2009 reported the isolation and characterisation of some novel esters from the aerial parts of the plant (11).

A colourless oil, Accuminatide was isolated from the seeds of the plant *T.acuminata* by Britto *et al* and the IR spectra and the NMR spectra was noted and thus from the IR spectra, suggested the presence of CO group and from the NMR , the presence of two olefinic protons and nine methylene groups (12).

Table- 1 Phytoconstituents of different extracts of *Tiliacora acuminate*

Phytoconstituents	Different extracts				
	Petroleum ether	Benzene	Ethyl acetate	Ethanol	Methanol
Alkaloids	+	+	+	+	+
Anthraquinones	-	-	-	+	+
Catechins	+	-	+	+	+
Coumarins	-	-	+	+	+
Flavonoids	-	-	-	+	+
Phenols	+	+	+	+	+
Quinones	-	-	+	+	+
Saponins	+	+	+	+	+
Steroids	+	+	+	+	+
Sugar	+	+	+	+	+
Glycosides	+	+	+	+	+
Xanthoprotein	+	+	+	+	+

PHARMACOLOGICAL ACTIVITIES

Antioxidant activity

Flavonoids are able to scavenge hydroxyl radicals, superoxide anion radicals and lipid peroxy radicals, which highlights many of the flavonoids health promoting functions in organisms. They are important for prevention of diseases associated with oxidative damage of membrane, proteins and DNA (13). Ethyl acetate extract of the leaves of the plant showed antioxidant activity due to the presence of natural antioxidants ,flavonoids and tannins(14). Nishanthini *et al* had evaluated the in-vitro antioxidant activities of the seeds of *Tiliacora acuminata.* Antioxidant activity was evaluated using DPPH radical scavenging activity, Hydroxyl radical scavenging activity, superoxide radical scavenging activity, ABTS method and reducing power method (15). The elevated level of Lipid peroxidation in alloxan induced rats was reduced on the administration of ethanol extract of

seeds at a dose of 200mg/kg and 400 mg/kg of body weight for seven days (16).

Antimicrobial activity

The methanolic extract of *T.acuminata* leaves have shown antibacterial activity against the bacterial strains *Serratia spp, Bacillus subtilus, Pseudomonas aeruginosa* and the antifungal activity against the fungal strains *Candida albicans, Actinomycetes spp., Aspergillus nige(17)* .Sagayaraj *et al* evaluated the antimicrobial activitiy of the ethanolic extract of *T.acuminata* against some microorganisms and shown inhibition against *E.coli, Pseduomonas aeruginosa, Salmonella paratyphi* and *Bacillus cereu (18)* . Antimicrobial efficacy of the plant has also been evaluated by Ben.C. *et al* and concluded that the activity is due to the presence of bioactive compounds as alkaloids and saponins (19).

Anti inflammatory activity

.Various extracts of the whole plant exhibited moderate anti inflammatory activity when assessed by the carageenan induced paw oedema model using Diclofenac as the standard drug. The anti-inflammatory effect was thought to be due to alkaloids, flavonoids and tannins present in the drug (20).

Anticancer activity

Tiliacora racemosa, a plant frequently used in Ayurvedic medicine for the treatment of cancerous diseases was examined for cytotoxic action in four human tumour cell lines: acute myeloblastic leukaemia (HL-60), chronic myelogenic leukaemia (K-562), breast adenocarcinoma (MCF-7) and cervical epithelial carcinoma (HeLa). The alkaloid fraction from *Tiliacora racemosa* has exhibited maximum cytotoxicity against all four cell lines. On microscopic examination the cells treated with these agents exhibits the characteristic morphological features of apoptosis, such as cell shrinkage. Apoptosis induced by alkaloids, an active principle present in *Tiliacora racemosa* was found to be mediated by the activation of caspases (21) . Five diphenylbisbenzylisoquinoline (DBBI) alkaloids such as tiliacorinine, tiliacorine, nor-tiliacorinine A, tiliarine and tiliamosine were isolated from the ethanolic extract of the roots of *T. racemosa* Colebr. and of these (+)-tiliarine was found to exhibit a selective inhibitory effect against the human melanoma cells (G 361) but had no activity on normal human fibroblasts (CCD 974 SK) (22) .

Anti-diabetic activity

The water extract of *Tiliacora acuminata* was found to produce marked reduction in the blood glucose level between 2-4 hours of administration in both alloxan induced hyperglycaemic and normoglycaemic rats. When compared with the control Glibenclamide, the water extract caused noticeable reduction in the blood glucose level and the constituents present in the extract have similar activity as of Glibenclamide (23).

Thrombolytic activity

The aqueous extract of the bark of *Tiliacora acuminata* was subjected to evaluate the thrombolytic activity in Albino wistar rats. And at a dose of 400 mg/kg, the aqueous extract shows significant thrombolytic activity (24).

Antidiarrhoeal activity

The antidiarrhoeal activity of the ethanolic extract of the *Tiliacora acuminata* leaves was evaluated and it was tested by Castor oil induced diarrhoea in which Loperamide 50 mg/kg bodyweight was used as the standard and also tested by the Magnesium sulphate induced diarrhoea using Loperamide 3mg/kg bodyweight as the standard (25).

Wound healing property

Wound healing activity of the leaves was evaluated using the Excision wound model in Wistar rats using Nitrofurazone (0.2 %w/w in simple ointment) as standard drug. The leaf juice treated group showed 94.19% wound healing (26).

Miscellaneous activity

Mosquitoes are major vectors of many vector borne diseases which have the potential to kill more than a million victims (27). In many of the tropical developing countries *Culex quinquefasciatus* mosquito transmits the pathogen of Filariasis and they are easy to control in their habitat during their larval stage. The use of synthetic insecticides has shown adverse effect to the ecosystem resulting in harmful effects to human health. The use of biodegradable phytochemicals in mosquito control programme is thus a better alternative to synthetic chemicals. Singha et al have investigated the synergistic effect of crude and solvent extracts of fruits of *Croton caudatus* and flower of *Tiliacora acuminata* against *Culex quinquefasciatus.* When applied separately each

extract showed maximum activity ie the highest mortality at 0.5%. 100% mortality was shown when the 0.2% concentration of the mixtute of fruits of *Croton caudatus* and flower of *Tiliacora acuminata* in 1:1 ratio were applied (28). Someswar Singha has investigated the dose dependent pupicidal, adulticidal and ovicidal activities of *Tiliacora acuminata* leaf extracts .The acetone extract and crude extract were tested on *Culex vishnui* and the acetone extract showed more promising activity against the three lifecycle stages of the mosquito *Culex vishnui* (29) .

RESULT AND DISCUSSION

Table-2 shows the results of plant parts and phytoconstituents and activity of *Tiliacora acuminate*

Table-2 Results of *Tiliacora acuminate*

Plant parts used	Leaves, Bark, Root, Seed and Flowers
Solvent extracts	n-hexane , Chloroform, Ethyl acetate, Ethanol, Methanol, and Aqueous extracts.
Constituents isolated	• Alkaloids : Tiliacorine, Tiliacorinine, Nortiliacorinine A, Tiliaresine, Tiliacosine, Tiliasine, N-methyl Tiliamosine • Lactone : 4-hydroxy-3-[heptadeca-5'(ε)-dienyl]-5-nonadecadihydrofuran-2(3H)-one • Esters : Octyl(benzoylamino)acetate and Heptadeca-4-ene-acetate • Oil : Acuminatide
Activity	Antioxidant, Antibacterial, Antifungal, Anticancer, Anti inflammatory, Antidiabetic, Thrombolytic, Antidiarrhoeal, Wound healing activity.

CONCLUSION

The world over there has been considerable increase in demand for the herbal medicines. The side effects associated with the allopathic drugs necessities the herbal drug usage. Many studies have revealed the diverse pharmacological actions such as anti inflammatory, antidiabetics, antimicrobial, anticancer, antidiarrhoeal, antioxidant and wound healing property of *Tiliacora acuminata* plant. It seems worthwhile to explore further the individual phytoconstituents of *Tiliacora acuminata* for specific pharmacological activities.

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