

Helicanthes elasticus (Desr.) Danser: Its Pharmacological Potentials and New Prospects

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Abstract

Helicanthes elasticus (Desr.) Danser is a member of family Loranthaceae which is found widely growing on mango trees in southern India. Alkaloids, carbohydrate, steroids, tannins, saponins, phenols, flavonoids and triterpenoids are mainly believed to be responsible for its wide therapeutic actions. It is known to possess medicinal activities such as antimicrobial activity, immunomodulatory hepatoprotective, antioxidant, anti diabetic, diuretic and natriuretic activity, cytotoxicity (anti-tumour activity), anti-asthmatic and anti-anaphylactic, anti-arthritis, anti-ulcer, anti-inflammatory, anti urolithiatic and nephroprotective activity. In this work information concerning pharmacological activities possessed by different parts of *Helicanthes elasticus* has been keenly observed and summarized.

Keywords: *Helicanthes elasticus*, Indian mango mistletoe, Loranthaceae, Medicinal plant, Pharmacological activities

Introduction

Mistletoe is the common name for the most obligate hemi parasite plants in the order of Santalales. They attach to and penetrate the branches of a tree or shrub by a structure called haustorium through which they absorb water and nutrients from the host plant. In India 6 mistletoes are considered to have medicinal properties in which two belong to genus *Loranthus* and four to the genus *Viscum*. *Helicanthes elastica* (Desr.) Danser belonging to the family Loranthaceae is a less known Indian mistletoe growing commonly on mango tree (*Mangifera indica*) as hemiparasites. It is widely distributed in the western ghats and mainly found growing in evergreen and moist deciduous forests and also in the plains^[1]. The plant possesses various pharmacological activities like antimicrobial activity, immunomodulatory hepatoprotective, antioxidant, anti-diabetic, diuretic and natriuretic activity, cytotoxicity (anti-tumour activity), anti-asthmatic and anti-anaphylactic, anti-arthritis, anti-ulcer, anti-inflammatory, anti urolithiatic and nephroprotective activity.

Plant Description

Common name: Indian Mango Mistletoe

Scientific name: *Helicanthes elasticus*

Kingdom: Plantae

Phylum: Tracheophyta

Class: Magnoliopsida

Order: Santalales

Family: Loranthaceae

Genus: *Helicanthes*

Species: *Helicanthes elasticus*



It is a semi-parasitic dichotomously branched subshrubs with woody branchlets and is swollen at nodes. Leaves are about 4-8 x 1.5-4 cm dimension, ovate or elliptic-oblong, base obtuse or truncate, apex acute or obtuse, thickly coriaceous, basally 3-nerved. Flowers are aggregated in short axillary fascicles. Calyx is minute, flask-shaped and margin is truncate. Corolla is white with green stripes about 3-3.5 cm long, which is split lengthwise into 5 linear, twisted lobes. Stamens are 5 which is exerted and filaments are crimson. Ovary is about 1.5 mm long, style 3-3.5 cm long and stigma is ovoid. Berries are about 6-8 x 3-3.5 mm, obovoid and red in colour^[2].



Figure 1: Flower and leaf of *Helicanthes elasticus*^[3,4]

Traditional Uses

Helicanthes elastica is used to check abortion. It is also used in vesical calculi and kidney infections and also used as poultices in sores and ulcers^[5].

Phytoconstituents

The whole plant of *Helicanthes elastica* is found to contain alkaloids, carbohydrate, steroids, tannins, saponins, phenols, flavonoids and triterpenoids. Also contain 1-octadecene, neophytadeine, hexadecanoic acid ethyl ester, octadecanoic acid ethyl ester, stigmasterol, γ -stigmasterol, β stigmasterol-3-ol, pentacosane and -sitost-4-en-3-one. The ethyl acetate extract contains friedelin, epifriedelinol, β amyryl, β sitosterol, ethyl gallate, gallic acid and β sitosterol 3- β -D glucopyranoside^[6, 7].

Pharmacological Activities

Antimicrobial activity

Antimicrobial activity involves inhibition of growth of bacteria, prevention of formation of microbial colonies and destruction of microorganisms. Infectious diseases have become a major concern in public health due to the increasing resistance of microorganisms against the antibiotics. The study suggests that the extract was found to be active against *K. pneumoniae*, *A. hydrophila*, *E. coli*, and *V. fischeri* at concentration ranging from 250 to 500µg/ml and *C. albicans* showed inhibition only at a concentration of 2000µg/ml when tested against bacteria like *Aeromonas hydrophila*, *Bacillus subtilis*, *Escherichia coli*, *Klebsiella pneumoniae*, methicillin-resistant *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Streptococcus pyogenes*, *Vibrio fischeri*, and a fungus *Candida albicans* by using agar well diffusion method and broth microdilution method. The study also suggests that the presence of ethyl gallate and gallic acid may be responsible for the antimicrobial activity^[8].

Immunomodulatory activity

Substances that stimulate or suppress the immune system of the body are called as immunomodulators. According to the study, the alcoholic and aqueous extract of the whole plant of *Helicanthes elasticus* contains constituents such as gallic acid, ethyl gallate, phytosterols, triterpenoids and other phenolics which is responsible for immunomodulatory activity. It evaluated the immuno-modulatory effect on antibody formation against sheep red blood cells and on cell mediated immunity of immunological paw oedema model at concentrations 200mg/kg and 400mg/kg. The extract has shown marked immune modulatory activity against SRBC induced antibody formation and has potential immunomodulatory activity especially humoral immunity without significant modification in cell mediated immunity. Histopathological examination of spleen tissues showed that there was marked increase in the white pulp of mass and in lymph node there was increased cellularity and formation of distinct germinal cells^[9].

Hepatoprotective activity

Hepatoprotection is the ability of a substance to prevent damage to liver. Sunil *et al* reported the hepatoprotective activity of *Helicanthes elasticus* which is due to the presence of polyphenol content. The acute oral toxicity study was conducted on the aqueous and 95% ethanolic extract of whole plant of *Helicanthes elasticus* at concentrations 200mg/kg and 400mg/kg and it revealed that the extract is safe up to a dose of 2000mg/kg body. The hepatoprotective activity of the extract against paracetamol induced toxicity was evidenced by significant reduction in the elevated serum transaminase levels and the histopathological studies showed marked reduction in the fatty degeneration and centrilobular necrosis in animals receiving different doses of extract along with paracetamol as compared to the control group^[10].

Anti- diabetic activity

Diabetes is a metabolic disorder which is characterised by high blood glucose level which occurs either due to decreased production of insulin by the pancreas or when the cells does not respond to the insulin produced. The study reported the anti-hyperglycaemic activity of methanolic extract of whole plant of *Helicanthes elasticus* on Streptozotocin induced diabetic rats at a concentration of 200mg/kg. The presence of flavonoids and other phenolic compounds may be responsible for antihyperglycemic activity. The activity was confirmed by observing the significant reduction in the blood glucose level at

0, 30, 60, 120 and 240 min in fasted and glucose loaded diabetic rats in acute studies and at 1st, 7th, 14th and 21st day in sub-acute studies of Streptozotocin induced diabetic rats after extract administration at 200 mg/kg body weight^[11]. Ajithkumar T.G et al reported in vitro anti-diabetic potential of methanolic extract of whole plant of *Helicanthes elasticus* (Desr.) Danser by using Invitro α -Amylase Inhibition Assay and Invitro α -Glucosidase Inhibition Assay at concentrations 10, 20, 50, and 100 μ g/mL. Inhibition of α -amylase could be attributed to various phytoconstituents such as cardiac glycosides, flavonoids and various phenolic compounds. The inhibition of α -glucosidase could be due to the presence of saponins and alkaloids. The effective lowering of postprandial hyperglycaemia is offered by alpha-amylase and alpha-glucosidase inhibition^[12].

Antioxidant activity

Oxidative stress is the imbalance between free radicals and antioxidants within the body. Antioxidants are substances that protect the cells from damage caused by the free radicals. The study reported the antioxidant properties of the ethanolic extract of whole plant of *Helicanthus elastica* using reducing power assay and scavenging of free radicals like nitric oxide, hydroxyl, hydrogen peroxide, and 1,1-diphenyl-2-picrylhydrazyl at concentrations ranging from 5 to 100 μ g/mL^[13].

Diuretic activity

Diuresis is the condition in which there is increased excretion of urine. Diuretics are substances that promotes the formation of urine by the kidney. Namita et al reported the diuretic activity of methanolic extracts of whole plant of *Viscum articulatum* (VA) Burm. f. and *Helicanthus elastica* (Desr.) Danser in rats. Diuretic, saluretic and natriuretic effects were reported after the oral administration of the extracts at concentrations 100, 200 and 400 mg/kg. The polyphenolic and triterpenoid contents were determined quantitatively using chemical assays and high-performance liquid chromatography (HPLC) analysis respectively. Phytochemical analysis revealed the presence of polyphenolics and triterpenoids, such as oleanolic acid and lupeol, as the major phytochemicals involved. It also suggests that a higher content of polyphenolics in association with lower triterpenoid content was found to favour potassium-sparing effects^[14].

Cytocidal activity

Cancer could be a group of disease involving abnormal cell growth with the potential to invade or spread to other parts of the body. Anticancer agents are substances that prevent or inhibit the formation or growth of tumours. K.T. Mary et al reported the cytocidal activity of biologically active extracts of whole plant of *Helicanthes elasticus* by short-term incubation method and tissue culture. When the extract was given either simultaneously or prophylactically, it reduced solid and ascites tumours in mice and was found to be cytotoxic in vitro. The active component of the extract was found to be a protein of approximate molecular weight 80,000 Da which have similar mechanism of action as that of peptide isolated from *Viscum album*. It also stimulated peritoneal macrophage to release tumour necrosis factor and induced monocyte differentiation. The study suggests that the tumour reducing component was found to be a protein^[15].

Anti-ulcer activity

Peptic ulcer is a lesion in the mucosa of the digestive tract, caused by the digestive action of pepsin and stomach acid. Jacob Jincy et al reported the anti-ulcer activity of methanolic leaves extract of

Helicanthes elasticus by ethanol and pylorus ligation method at concentrations 200 and 400 mg/kg. The extract has the presence of four major compounds like friedelin, quercetin, gallic acid and ellagic acid. Treatment with *H. elasticus* showed a decrease in ulcer index against ethanol and pylorus ligation induced ulcerations. The antisecretory and cytoprotective effects of the extract may be responsible for its antiulcer activity. It also suggests that the anti-ulcer activity is due to the presence of sterols, terpenoids, flavones, tannins and glycosides present in *H. elasticus*^[16].

Anti-inflammatory activity

Inflammation may be a local response to cellular injury that is marked by capillary dilatation, leukocytic infiltration, redness, heat, and pain and act as a mechanism initiating the elimination of noxious agents and of damaged tissue. Anti-inflammatory agents are substances that reduce inflammation within the body. The study reported the anti-inflammatory activity of methanolic leaves extract of *Helicanthes elasticus* by using carrageenan induced paw oedema and cotton pellet induced granuloma in rats at concentrations 200 and 400 mg/kg. The extract contains four major compounds like friedelin, quercetin, gallic acid and ellagic acid. It also suggests that the presence of sterols, terpenoids, flavones, tannins and glycosides present in *H. elasticus* is responsible for the anti-inflammatory activities of the extract^[16].

Anti-Asthmatic and Anti-Anaphylactic activity

Asthma is a condition within which a person's airways become inflamed, narrow and swell and produce extra mucus, which makes it difficult to breathe. Anaphylaxis is a severe, potentially life-threatening allergic reaction. Nimgulkar Chetan Chandrakant et al reported the Anti-Asthmatic and Anti-Anaphylactic Activity of ethyl acetate fraction of whole plant of *Helicanthus elastica*. These activities may be due to presence of polyphenolic compounds present in it. The anti asthmatic activity of *H. elastica* was studied on the bronchial hyperactivity models like histamine induced bronchospasm in guinea pigs at concentrations 25, 50,100 mg/Kg. The anti-anaphylactic activity was studied by active and passive anaphylaxis in rats at concentrations 25, 50,100mg/Kg^[17].

Anti-Arthritic activity

Arthritis is the inflammation of one or more joints, causing pain and stiffness which can worsen with age. The study reported the anti-arthritic activity of the methanolic extract of whole plant of *Helicanthes elasticus*. The methanolic extract of the plant has shown the presence of phenolics and flavonoids. Protein denaturation method was used to determine the anti arthritic activity at concentrations 10, 20, 50 and 100µg/mL. According to the study the antiarthritic activity may be due to the presence of phenolics and flavonoids^[18].

Anti-urolithiatic activity

Urolithiasis is a condition which is marked by the formation or presence of calculi in the urinary tract. Anti-urolithiatic activity include reduction in the stone forming constituents in the urine and preventing the formation of calculi in the urinary tract. Najmudheen A.P et al reported the anti-urolithiatic activity of methanolic extract of aerial parts of *Helicanthes elastica*. The plant extract contains carbohydrates, flavonoids, phenolics, glycosides, tannins, steroids and triterpenoids. In the study ethylene glycol was

given orally to induce urolithiasis in two different doses 200mg/kg and 400mg/kg for preventive and curative treatment regimen. Extract treated groups of animals showed significant improvement in serum markers like blood urea nitrogen, uric acid and creatinine and urine markers like calcium, magnesium and total protein and the kidney damage which is due to urolithiasis produced by ethylene glycol. The results were also supported by histopathological studies^[19].

Nephroprotective activity

Nephroprotective are those substances that protect the kidney from harm. The study reported the nephroprotective activity of methanolic extract of aerial parts of *Helicanthes elastica*. The plant extract contains carbohydrates, flavonoids, phenolics, glycosides, tannins, steroids and triterpenoids. In the study, kidney toxicity was induced by cisplatin. Two different doses 200mg/kg and 400mg/kg of the extract was used and the extract treated groups of animals showed significant improvement in serum markers urea, creatinine, uric acid and total protein and the kidney damage caused by cisplatin^[19].

Conclusion

Our effort was to summarize the therapeutic potential of *Helicanthes elasticus* plant parts. The reported studies on the plant showed that it has various chemical constituents like alkaloids, carbohydrate, steroids, tannins, saponins, phenols, flavonoids and triterpenoids. *Helicanthes elasticus* plant parts found to possess various pharmacological activities like antimicrobial activity, immunomodulatory hepatoprotective, antioxidant, anti diabetic, diuretic and natriuretic activity, cytotoxicity (anti-tumour activity), anti-asthmatic and anti-anaphylactic, anti-arthritis, anti-ulcer, anti-inflammatory, anti urolithiatic and nephroprotective activity. The various constituents present in the plant might be responsible for various activities. Our work may give comprehensive information regarding the plant which will be helpful to all the researchers for their study in future.

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