

Review Article

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A Review on the Pharmacology of *Holostemma ada-kodien* – A Vulnerable Medicinal Plant

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ABSTRACT

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Holostemma ada-kodien is a vulnerable medicinal species belongs to family asclepiadaceae, commonly known as Jeevanti, is being used since the ancient time, in the form of the drug Jivanthi. It has been attributed to contain numerous medicinal properties and is of very high commercial value. The tuberous roots of *H. ada-kodien* are used in herbal formulas. It contains the terpenoid sugar which has been studied for its various medicinal activities such as antipyretic, antioxidant, antidiabetic, hepatoprotective, antibacterial, and anthelmintic activity. This review is a comprehensive overview about the existing pharmacology of *H. ada-kodien*, helping to fuel further research in the various unexplored activities that are attributable to this plant.

Introduction

Since time immemorial, mankind has searched for medicines to remove pain and cure various diseases. Evidence exists for the use of medicinal plants up to 60,000 years ago but more recently, a 5000-year-old Sumerian clay slab was discovered verifying the utilization of medicinal plants for the preparation of drugs (Summer, 2000). Plants have different chemical compounds like secondary metabolites with many biochemical and bioactivity properties showing applications in various industries such as

pharmaceuticals (Koly Aktar and Tahira Foyzun, 2017). The interest in using natural sources or green medicine or medicinal plants is increasing worldwide due to their safety, efficacy, cultural acceptability, and lesser side effects as compared to synthetic drugs. One such medicinal plant is the *H. ada-kodien*, whose mention has been found since the ancient times, in the form of the drug “jivanthi” (Kolammal, 1979). Which has been an important ingredient in a number of ayurvedic formulations. *H. ada-kodien* yields

terpenoid sugars, and other highly valued secondary metabolites, which have a wide range of clinical applications such as antipyretic, antioxidant, antidiabetic, hepatoprotective, antibacterial, and anthelmintic activity etc.

Taxonomic classification (Albers, 1976)

Kingdom: Plantae,
Phylum: Magnoliophyta,
Class: Magnoliopsida,
Order: Gentianales,
Family: Asclepiadaceae,
Genus: *Holostemma* and
Species: *Holostemma ada-kodien*

Several vernacular names of *Holostemma ada-kodien* in different languages, in Sanskrit, it is known as Jivanti; Arane beeru, Jeeva haale, Maruligana kasa in Kannada; *Holostemma* in English; Chirvel, Kanju in Hindi and Adapathian, Atapatian in Malayalam (Joy *et al.*, 1998).

Plant description

Holostemma ada-kodien is a laticiferous perennial climber (Sivarajan and Balachandran, 1994; Kirtikar and Basu, 1975; Irimpan *et al.*, 2011) with slightly reddish stem. Immature leaves are light green were as mature ones are dark green in color. Leaf texture varied from smooth to slightly rough. The leaf shape was found to be ovate, slightly cordate and oblong.

Leaf apex shape varied from acute cuspidate and leaf base shape auriculate. Leaf venations are distinct with green and purplish colour and absence of leaf waxiness. Petiole color is green. Inflorescence is axillary cyme, flower bud is globose shape have medium to large. Corolla is gamopetalous, three colored type flowers *viz.*, creamish white, creamish white with pink streaks and pinkish.

Ecology

The peak flowering season during June to November, the fruits start to drying January-February month. Fruit maturation takes 102 to 158 days and seeds are very small, flat and dark brown in color, an healthy fruit contains 300-350 seeds and the tuberous roots are ready for harvesting after one and-a-half years.

Reasons for vulnerable

Although widely distributed throughout Southern India, the population in wild is gradually reducing due to the destructive and ruthless collection of root tubers, as a raw material for the ayurvedic drug preparations, and fruit set is a major problem in multiplying the species in wild, and other anthropogenic reasons the species became vulnerable (Nair *et al.*, 1992).

Chemical composition

Root tubers contain the terpenoid sugars which have medicinal properties (Ramaiah *et al.*, 1981). Its roots contain moisture 10.8%, Protein 4.07%, Sugar 24%, Starch 32.54 %, Fiber 12.2%, ash 3.07% ash contained Ca and P 2.50% ethanol extract of roots contained six amino acids *viz.*, alanine, glycine, serine, aspartic acid, threonine and valine, and benzene extract contained α -amyrin, lypeol and β -sitosterol (Manikpuri *et al.*, 2010).

Propagation

The species is propagated through seeds. Matured seeds are collected from the plant during January–February before they disperse from fruit. Seeds are cleaned, dried, and stored for sowing. But fruit set is usually less than 10% in this species, which is a major constraint for large-scale cultivation through seeds. The crop can also be propagated by

vegetative means through root and stem cuttings (Anita, D., 2008).

Medicinal uses

Traditionally the plant is used as an alternative, astringent to the bowels; cures ulcers, diseases of the blood, itching, leucoderma, gonorrhoea and it has ability to maintaining vigour, strength and vitality (Kirtikar, 1993; Gamble, 1967; Meena Thomas Irimpan, 2011). The root and leaves are used in the form of powder and juice to treat spider-poisoning. The roots rubbed into a mash are used in cold milk as a curare to diabetes (Kirtikar and Basu, 1975).

The tuberous roots are useful in rejuvenative, aphrodisiac, expectorant, intestinal disorders galactagogue, stimulant, orchitis, pain, stomach ache, and in ophthalmic disorders (Singh *et al.*, 2012; Warriar, *et al.*, 1995; Chopra, *et al.*, 1956). And it has also some proven medicinal activity *viz.*, anti-diabetic (Janapati *et al.*, 2009) antipyretic, anthelmintic (Rubesh kumar Sadasivam *et al.*, 2014), antioxidant (Mallikarjuna *et al.*, 2011), hepatoprotective (Junapudi Sunil *et al.*, 2015) activity. Besides the medicinal virtues, the leaves, flowers and fruits are eaten as vegetables. And its bark fibre reported to be suitable for cordage and paper making.

Pharmacological potential

Antipyretic activity

This study was carried out to evaluate the antipyretic activity of the leaf extracts of *H. ada-kodien*. The methanolic and ethyl acetate leaf extract at the rate of 200 and 400mg/kg was compared against the acetylsalicylic acid (300mg/kg) and acetylsalicylic acid as positive control for assessing antipyretic activity on wistar rats. The methanolic showed the dose dependence reduction in

hyperpyrexia when compared with the ethyl acetate extract and positive control. Hence further investigation on the isolation of active principle will lead to a potent anti-pyretic agent (Rubesh kumar Sadasivam *et al.*, 2014)

Antioxidant activity

This study was carried out to evaluate antioxidant activity of hexane, ethyl acetate and methanolic extracts of *H. ada kodien* root tubers. The above extracts exhibited a dose dependent scavenging activity against 2, 2'-diphenyl-1-picrylhydrazyl (DPPH) radicals, Superoxide radicals, and Nitric oxide radicals. Further, the methanolic and ethanolic extracts showed relatively higher reducing power compare to that of butylated hydroxytoluene. TLC of the above extracts using the DPPH as a spraying reagent revealed yellow spots against purple background indicating the presence of potent antioxidant compounds (Mallikarjuna *et al.*, 2011).

Anti-Diabetic Activity

Evaluation was done to study the antidiabetic activity and phytochemical studies of ethanolic extract of *Holostemma ada kodien* in normal, glucose fed, alloxan-induced diabetic rats and to perform phytochemical studies. The alcoholic extract of *H. ada kodien* was studied for antidiabetic activity in normal, glucose fed and alloxan- induced diabetic rats by oral administration of extract (200 and 400 mg/kg body wt) for 7 days. The effect was compared with 0.5 mg/kg (i.p) glibenclamide. The alcoholic extract significantly lowered the blood sugar of hyperglycemic rats. From phytochemical studies shows the presence of alkaloids, flavonoids, flavanones, tannins, terpenoids, amino acids and carbohydrates. The results revealed that the traditional use in the treatment of diabetes (Rubesh Kumar Sadasivam *et al.*, 2014).

Plate.1 Jeevanti (*Holostemma ada-kodien*) a. young plant b. flowers c. fruit d. seeds



Hepatoprotective activity

Junapudi Sunil *et al.*, (2015) studied on Hepatoprotective Activity of *H. ada kodien* they found that Pre-treatment of the rats with alcoholic extract prior to paracetamol (PCM) administration caused a significant reduction in the values of aspartate amino transferase (AST), alanine amino transferase (ALT), alkaline phosphatase (ALP) and serum bilirubin (SB) ($p < 0.01$) approximately comparable to the hepatoprotective of standard drug was silymarin. From this study showed that the alcoholic extract of *H. ada kodien* possesses the hepatoprotective effect

against paracetamol (PCM) induced liver damage in rats.

Antibacterial activity

Meena Thomas Irimpan *et al.*, 2011 reported the antibacterial activity of the traditionally used medicinal plant *H. ada kodien* (Asclepiadaceae), in both methanolic and aqueous leaf extracts, have gram positive and gram negative bacteria.

The plant extracts exhibited significant antimicrobial potency, comparable to standard antibiotic Gentamycin.

Anthelmintic activity

This study was carried out to evaluate *in-vitro* anthelmintic activity of ethyl acetate leaf extracts of *H. ada-kodien* on Indian earthworm (*Pheretima posthuma*) for the various concentrations ranging from 50, 100, 200 and 400µg/ml. Albendazole was used as standard reference and distilled water as control. The paralytic and death rate were found to be exhibits the anthelmintic activity in its leaf extract (Rubesh Kumar Sadasivam *et al.*, 2014)

Ethnogaecological study

Abdulla Naseef *et al.*, (2012), recorded the ethnogaecological plants in the *Paniya* tribe. In their, *Holostemma* tubers (*Holostemma ada-kodien*) are boiled and taken as breakfast for gynaecological ailment.

In the present review, we have tried to summarize about Phytochemistry, Pharmacological activities of *H. ada-kodien* Schult. The plant contains of flavonoids; tannins, saponines, anthocyanins, steroids, alkaloids and phenols. There is no report regarding isolation of single chemical compounds and secondary metabolites. In review reported antipyretic, antioxidant, antidiabetic, hepatoprotective, antibacterial, and anthelmintic activity of *H. ada-kodien*.

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