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# *Trichosanthes cucumerina* Linn.: Investigations of some Selected Pharmacological Activities of Ethanolic Extract

[1]L.D.A.M. Arawwawala, [2]M.I. Thabrew and [1]L.S.R. Arambewela

[1]Industrial Technology Institute, Bauddhaloka Mawatha, Colombo 07, Sri Lanka

[2]Institute of Biochemistry, Molecular Biology and Biotechnology, University of Colombo, No. 90, (Cumaratunga Munidasa Mawatha), Colombo 3, Sri Lanka

## ABSTRACT

**Background:** *Trichosanthes cucumerina* Linn. (Family: Cucurbitaceae) is one of the medicinal plants that is often used in Sri Lankan traditional systems of medicine for the preparation of formulations to treat a variety of disease conditions. Most of therapeutic claims of *T. cucumerina* were validated using the hot water extract of the plant. However, no scientific investigations were carried out to investigate anti-inflammatory, gastroprotective and hypoglycemic activities of *T. cucumerina* cold ethanolic extract. **Objective:** The objective of the present study was to investigate (a) Anti-inflammatory, (b) Gastroprotection and (c) Hypoglycemic activities of *T. cucumerina* cold ethanolic extract. **Materials and Methods:** (a) Anti-inflammatory activity was investigated by carrageenan-induced rat paw oedema model, (b) Gastroprotective activity was investigated by absolute ethanol and indomethacin induced ulceration models and (c) Hypoglycemic activity was investigated by measuring the fasting blood glucose levels in normoglycemic rats. **Results:** Cold ethanolic extract significantly inhibited the paw oedema induced by carrageenan (inhibition by 74%) and the effect was comparable to that of the reference drug, indomethacin at 5 h (inhibition by 79%). Cold ethanolic extract exhibited a significant gastroprotection against absolute ethanol (inhibition of length by 91% and number by 92%) and indomethacin (inhibition of length by 87% and number by 86%) induced ulceration respectively compared to the control. Moreover, cold ethanolic extract significantly reduced the fasting blood glucose levels (60.5±2.6 mg $dL^{-1}$) in normoglycemic rats and the effect was comparable to that of the reference drug, tolbutamide at 6 h (62.4±1.8 mg $dL^{-1}$). **Conclusion:** *T. cucumerina* can be used to develop drugs that have anti-inflammatory, gastroprotection and hypoglycemic activities.

**Key words:** *Trichosanthes cucumerina*, cucurbitaceae, bio-activities

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## INTRODUCTION

*Trichosanthes cucumerina* Linn. (Family: Cucurbitaceae) is one of the medicinal plants that is often used in Sri Lankan traditional systems of medicine for the preparation of formulations used to treat a variety of disease conditions (Jayaweera, 1980). The vernacular name of the plant is Dummela in Sinhala, Kattuppeyppudal or pudal or peyppudal in Tamil and Wild Snakegourd in English. This plant is an annual, tendril climber wildly growing in the dry zone of Sri Lanka, India, Malay Peninsula and Philippine Islands. Leaves are simple, somewhat dissected, hairy throughout, alternate, 5-12 cm long, 6.5-11 cm broad, chordate with an excavated sinus at the base, more or less deeply palmate, 3, 5 or 7 lobed and petiole is 2-4.5 cm long. The stem is 3.6-4.5 cm long with slender, glabrous or slightly hairy. Flowers are white in color, regular, unisexual and monoecious (Jayaweera, 1980; Anonymous, 2002).

The whole plant including roots, leaves, fruits, seeds have medicinal properties. The root is used as a cure for bronchitis, headache and boils. Externally, the leaf juice is rubbed over the liver to relieve liver congestion. Both the root and fruit are considered to be cathartic. The fruit is used as an anthelmintic in French Guiana. The seeds are used for stomach disorders in Malabar Coast and are also considered antifebrile and anthelmintic. The aerial parts of *T. cucumerina* are used along with other plant materials for indigestion, bilious fevers, boils, sores, skin eruptions such as urticaria, eczema, dermatitis, psoriasis diabetes, ulcers and inflammation (Jayaweera, 1980; Anonymous, 2002). It is widely distributed in Asian countries including Sri Lanka, India, Malay Penisula and Philippine (Jayaweera, 1980).

**Corresponding Author:** L.D.A.M. Arawwawala, Industrial Technology Institute, Bauddhaloka Mawatha, Colombo 07, Sri Lanka
Tel: +94(11) 2379800 Fax: +94(11) 2379848

A few studies carried out with *T. cucumerina* in India and Thailand have shown that the seed has antidiabetic activity (Kar *et al*., 2003), root tubers can exert anti-inflammatory activity (Kolte *et al*., 1996) and whole plant has hepatoprotective (Kumar *et al*., 2009) and antidiabetic (Kirana and Srinivasan, 2008) activities. According to more recent reports, (Kongtun *et al*., 2009) the root and fruit also contain components that are cytotoxic to some cancer cell lines. In addition, antidiabetic (Arawwawala *et al*., 2009), gastroprotection (Arawwawala *et al*., 2010a), anti-inflammatory (Arawwawala *et al*., 2010b), antioxidant (Arawwawala *et al*., 2011) activities of *T. cucumerina* was investigated using hot water extract of the plant. However, no scientific investigations were carried out to investigate (a) Anti-inflammatory, (b) Gastroprotection and (c) Antidiabetic activities of cold ethanolic extract of *T. cucumerina*. Therefore, present study was designed to investigate the (a) Anti-inflammatory, (b) Gastroprotection and (c) Hypoglycemic activities of cold ethanolic extract of *T. cucumerina* using rats as the experimental model.

## MATERIALS AND METHODS

**Plant material:** *T. cucumerina* plants were collected from Western province of Sri Lanka. The plant was identified and authenticated by the curator of National Herbarium, Royal Botanical Gardens, Peradeniya, Sri Lanka. A voucher specimen (TS 01) was deposited in the Industrial Technology Institute, Colombo 7, Sri Lanka.

**Animals:** Healthy adult male and female Wistar rats (weighing 200-225 g) were used throughout the investigation. They were housed under standardized animal house conditions and fed with standard rat feed prepared by the Medical Research Institute, Sri Lanka according to W.H.O. standards and water ad libitum. All animal experiments were conducted in accordance with the internationally accepted laboratory animal use and care and guide lines and rules of the ethical committee, University of Kelaniya, for animal experimentations.

**Preparation of cold ethanolic extract:** *T. cucumerina* aerial parts were air dried for 3-5 days in the shade and cut into small pieces. Sixty grams were macerated with ethanol and kept for 48 h at room temperature (28-30°C). The extract was filtered and evaporated to dryness under reduced pressure at 50°C (yield 7.5% w/w dry weight basis) and stored at 4°C until use.

**Administration of extract:** During the experimentation, required amount of the cold ethanolic extract was weighed and reconstituted in 1 mL of 1% Tween 80. The route of administration was oral and the dose selected (750 mg $kg^{-1}$) was corresponds to the normal therapeutic dose of *T. cucumerina* administered to adult humans as calculated on the basis of relative surface areas of humans and rats (Paget and Barnes, 1996).

**Effect of the cold ethanolic extract of *Trichosanthes cucumerina* on carrageenan induced rat paw oedema:** Rats were randomly divided into 3 equal groups (n = 10/group; 5 female and 5 male) and treated orally in the following manner: Each rat in group 1 received 1 mL of Tween 80 (1% in DW) solution (control group), rats in group 2 received 750 mg $kg^{-1}$ of cold ethanolic extract in suspended in 1 mL of Tween 80 (1% in DW) solution and rats in group 3 received 10 mg $kg^{-1}$ of indomethacin, the reference drug. After 1 h, 0.1 mL of carrageenan suspension [carrageenan suspended in Phosphate Buffered Saline (PBS), pH: 7.4] was injected subcutaneously into the plantar surface of left hind paw of all these rats under mild ether anesthesia using a 25 G needle and 1 mL syringe. Effect of the cold ethanolic extract of *T. cucumerina* on carrageenan induced rat paw oedema was investigated according to the method described by Winter *et al*. (1962) with some modifications (Dharmasiri *et al*., 2003).

**Effect of the cold ethanolic extract of *Trichosanthes cucumerina* on the ulceration induced by absolute ethanol:** The food and water given to rats were withdrawn for 36 and 12 h, respectively before the commencement of the experiment. Rats were randomly divided into 3 equal groups (n = 10/group; 5 female and 5 male) and treated orally in the following manner: Each rat in group1 received 1 mL of Tween 80 (1% in DW) solution (control group), rats in group 2 received 750 mg $kg^{-1}$ of cold ethanolic extract in suspended in 1 mL of Tween 80 (1% in DW) solution and rats in group 3 received 100 mg $kg^{-1}$ of cimetidine, the reference drug. One hour after oral treatment with plant extract, reference drugs or distilled water, absolute ethanol (5 mL $kg^{-1}$) was administrated orally to each rat. After a further 1 h, effect of the cold ethanolic extract of *T. cucumerina* on the ulceration induced by absolute ethanol was investigated as described by Dharmasiri *et al*. (2007).

**Effect of the cold ethanolic extract of *Trichosanthes cucumerina* on the ulceration induced by indomethacin and by absolute ethanol:** The food and water given to rats were withdrawn for 36 and 12 h, respectively before the commencement of the experiment. Twenty four rats were orally treated with 25 mg $kg^{-1}$ of indomethacin suspended in 1 mL of 1% methylcellulose and randomly divided into 3 equal groups (n = 8/group; 4 female and 4 male). After 1 h, rats

were treated orally in the following manner: each rat in group1 received 1 mL of Tween 80 (1% in DW) solution (control group), rats in group 2 received 750 mg $kg^{-1}$ of cold ethanolic extract in suspended in 1 mL of Tween 80 (1% in DW) solution and rats in group 3 received 100 mg $kg^{-1}$ of cimetidine, the reference drug. One hour after oral treatment with plant extract, reference drugs or distilled water, absolute ethanol (5 mL $kg^{-1}$) was administrated orally to each rat. After a further 1 h, effect of the cold ethanolic extract of *T. cucumerina* on the ulceration induced by indomethacin was investigated as described by Bhargava *et al*. (1973) with some modifications (Dharmasiri *et al*., 2007).

**Effect of cold ethanolic extract of *Trichosanthes cucumerina* fasting blood glucose levels in normoglycemic rats:** Rats were fasted overnight for 12 h and randomly divided into 3 groups (n =12/group; 6 female and 6 male). Each rat in group 1 received 1 mL of Tween 80 (1% in DW) solution and rats in group 2 received 750 mg $kg^{-1}$ of cold ethanolic extract suspended in 1 mL of Tween 80 (1% in DW) solution while rats in group 3 received the reference drug, tolbutamide at a dose of 75 mg $kg^{-1}$. The ability of the cold ethanolic extract to reduce the fasting blood glucose levels was determined by the glucose oxidase method using Randox assay kit (Randox Laboratories Ltd., Co. Antrium, UK).

**Statistical analysis of data:** Data are given as Mean±SEM. Statistical comparisons were made using one way ANOVA followed by Duncans Multiple range test. A $p \leq 0.05$ was considered as significant.

## RESULTS AND DISCUSSION

The World Health Organization (WHO) estimates that about 80% of the population of most developing countries relies on herbal medicines for their primary health care needs (Mukherjee and Wahile, 2006). Plants contribute to our lives more than animals, mainly due to their extraordinary array of diverse classes of biochemicals with a variety of biological activities. Furthermore, about 25% of drugs in modern pharmacopoeia are derived from plants (phytomedicines) and many others are synthetic analogues built on compounds isolated from plants (Rao *et al*., 2004). However, the efficacy and/or novel pharmacological effects or toxicological effects of many medicinal plants have yet to be properly evaluated. The overall results of the present investigation reveals that the cold ethanolic extract of *T. cucumerina* aerial parts can mediate potent (a) Anti-inflammatory, (b) Gastroprotective and (c) hypoglycemic activities.

As shown in Fig. 1. cold ethanolic extract significantly inhibited the paw oedema induced by carrageenan and the effect was comparable to that of the reference drug, indomethacin at 5 h. The areas under the curves for 750 mg $kg^{-1}$ of cold ethanolic extract and indomethacin were 72.05 and 55.47 $mm^2$, respectively. The cold ethanolic extract at a dose of 750 mg $kg^{-1}$ exhibited significant ($p<0.05$) gastroprotection against absolute ethanol [inhibition of length by 91% (6.0±0.7) and number by 92% (1.6±0.2)] and indomethacin [(inhibition of length by 87% (9.7±0.7) and number by 86% (2.5±0.3)] induced ulceration respectively compared to the control (Table 1). Cold ethanolic extract also exhibited gastroprotective activity comparable to that demonstrated by the reference drugs cimetidine and sucralfate. However, cold ethanolic extract of *T. cucumerina* can significantly inhibited the gastric ulcers induced by absolute ethanol rather than that of

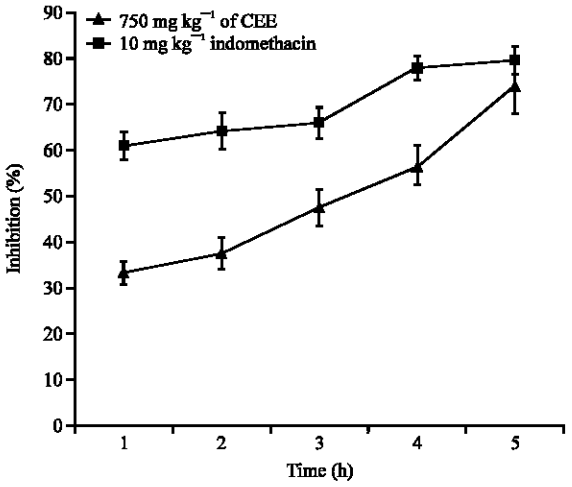


Fig. 1: Variation of the percentage of inhibition of inflammation in the carrageenan induced paw oedema model by Cold Ethanolic Extract (CEE) and indomethacin with respect to control

Table 1: Effects of the Cold Ethanolic Extract (CEE) of *Trichosanthes cucumerina* on the length of gastric lesions (mm) and number of lesions induced by absolute ethanol

| Groups | Length of hemorrhagic lesions (mm) | No. of hemorrhagic lesions |
|---|---|---|
| Control [1 mL of tween 80 (1% in DW)] | 70.1±3.0 | 19.1±1.4 |
| 750 mg $kg^{-1}$ of CEE (absolute ethanol induced ulceration) | 6.0±0.7* | 1.6±0.2* |
| 750 mg $kg^{-1}$ of CEE (indomethacin induced ulceration) | 9.7±0.7* | 2.5±0.3* |
| Cimetidine (100 mg $kg^{-1}$) | 4.8±0.9* | 1.2±0.3* |
| Sucralfate (400 mg $kg^{-1}$) | 3.1±0.7* | 0.9±0.2* |

Values are expressed as Mean±SEM, n = 8, *Significant when compared to the respective controls; $p \leq 0.05$. DW: Distilled water

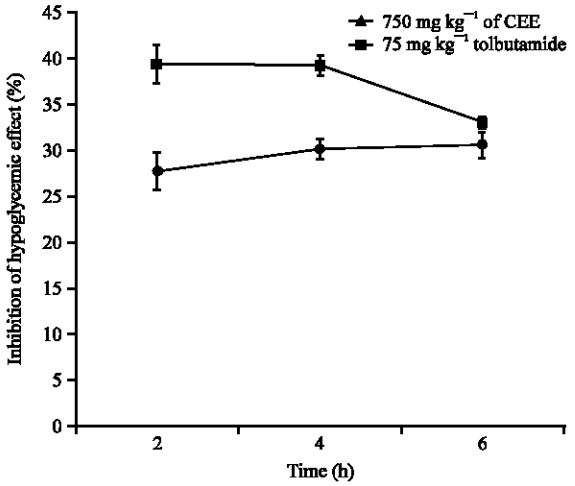


Fig. 2: Variation of the percent reduction of serum glucose levels by the Cold Ethanolic Extract (CEE) of *T. cucumerina* in normoglycemic rats. Values are expressed as the Mean±SEM, n = 12

indomethacin induced gastric ulceration. As shown in Fig 2, 750 mg kg$^{-1}$ dose of cold ethanolic extract also significantly ($p<0.05$) reduced the fasting blood glucose levels (60.5±2.6 mg dL$^{-1}$) in normoglycemic rats and the effect was comparable to that of the reference drug, tolbutamide at 6 h (62.4±1.8 mg dL$^{-1}$). The areas under the curves for 750 mg kg$^{-1}$ of cold ethanolic extract and tolbutamide were 480 and 634 mm$^2$, respectively (Fig. 2). According to the previous experiments, anti-inflammatory (Arawwawala *et al*., 2010b), gastroprotective (Arawwawala *et al*., 2010a) and antidiabetic activities (Arawwawala *et al*., 2009) of cold ethanolic extract of *T. cucumerina* was comparable to that of hot water extract at a dose of 750 mg kg$^{-1}$.

## CONCLUSION

Medicinal plants have been identified and used throughout human history. Plants have the ability to synthesize a wide variety of chemical compounds that are used to perform important biological functions and to defend against attack from predators such as insects, fungi and herbivorous mammals. Cold ethanolic extract of *T. cucumerina* exerts strong antiinflammatory, antidiabetic and gastroprotective effects in rats. However, it is imperative that more clinical and pharmacological studies should be conducted to investigate the unexploited potential of this plant. Due to the multiple bioactivities that can be exerted by *T. cucumerina* would be a good candidate for future drug development.

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