



Short Communication

Anti-inflammatory activity of *Guduchi Ghana* (aqueous extract of *Tinospora Cordifolia* Miers.)

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Abstract

Background: *Guduchi Ghana* is one of the unique Ayurvedic classical preparation which is prepared from aqueous of extract of *Guduchi* (*Tinospora cordifolia* Miers.) stem. It is one of the frequently used drugs to treat the *Madhumeha*, *Pandu*, *Kamala*, *Amlapitta*, *Grahani*, *Kustha*, *Jirna Jwara* and *Viswamjwara*, *Trishna*, *Shool*, *Yakritavikara*, etc. Looking to these indications, in market most of the Pharma industries prepared *Guduchi Ghana* by applying the various extraction process. **Aim:** To evaluate comparative anti-inflammatory activity of classically prepared and market sample of *Guduchi Ghana*. **Materials and Methods:** Both samples were evaluated for anti-inflammatory activity using carrageenan induced paw edema model in rats. Animals were divided in three groups, having six animals in each. Group A received test drug, Group B received market sample at a dose of 50 mg/kg orally, while Group C (control group) received tap water. **Results:** Reduction in edema was observed in Group A and B at 3 h interval by 33.06% and 11.71% respectively. Group A showed significant effects ($P < 0.05$) in comparison to control group. **Conclusion:** These experimental results have shown anti-inflammatory activity of *Guduchi Ghana*.

Key words: Anti-inflammatory activity, aqueous extract, carrageenan, *Ghana Kalpana*, *Guduchi*, *Tinospora cordifolia*

Introduction

Tinospora cordifolia (Willd.) Miers (family Menispermaceae),^[1] an important medicinal plant is also known as *Guduchi*. It is widely distributed in India, extending from the Himalayas down to the southern part of peninsular India.^[2] It is categorized as “*Rasayana*”^[3] and used for its anti-inflammatory,^[4,5] immunomodulatory,^[6] anti-allergic,^[7] anti-diabetic,^[8] properties etc. The whole plant is used medicinally; however, the stem is approved for use in medicine as listed by the Ayurvedic Pharmacopoeia of India. This is due to higher alkaloid content in the stems than in the leaves.^[9]

Inflammation is defined as the local response of living mammalian tissues to injury due to any agent. It is a body defense reaction in order to eliminate or limit the spread

of injurious agent. Depending upon the defense capacity of the host and duration of response, it is classified as acute and chronic. Among them the main features of acute inflammation are accumulation of fluid and plasma; Intravascular activation of platelets; and polymorphonuclear neutrophils as inflammatory cells.^[10] Histamine, 5-hydroxytryptamine and bradykinin are the first detectable mediators in the early phase of carrageenan-induced inflammation, whereas prostaglandins are detectable in the late phase of inflammation.

Guduchi Ghana.^[11] (concentrated form of decoction) is the secondary *Kalpana* (formulation) derived from the primary *Kalpana*, i.e. *Kwatha* (decoction). The other sample of *Guduchi Ghana* was purchased from the local market. Several research works have been carried out regarding the anti-inflammatory activity of the decoction,^[12] alcohol extract,^[13] water extract of the stem of *Giloe* (*T. cordifolia* that grow on *Azadirachta indica*)^[5] and water extract.^[14-16] The water extract of the plant is found to be more potent than the other extract.^[17] Hence, it has been planned to study the comparative anti-inflammatory activity of classically prepared and market sample of *Guduchi Ghana*.

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Materials and Methods

Collection of the plant material and preparation of the *Ghana* (extract)

For the preparation of *Guduchi Ghana*,^[11] the stem was collected from the periphery of Jamnagar and authenticated by the Botanist of Pharmacognosy Laboratory, I.P.G.T. and R.A., Jamnagar. The freshly collected stem was cut into small pieces; soaked in four times of water and made decoction of it. The decoction was reheated until it became semisolid and dried in the oven at 55°C.

The second sample of *Guduchi Ghana* was purchased from the market. This extract was prepared by centrifuge and spray drying method. First the decoction was made by using 16 times of water and reduced up to one-fourth in steam jacket vessel. Then, the liquid was centrifuged and the supernatant liquid was discarded. Thick slurry was dried by spray drying method.

Animal and dose selection

Charles Foster strain albino rats of either sex weighing between 180 and 275 g were obtained from the animal house attached to Pharmacology Laboratory, IPGT and RA, Gujarat Ayurved University, Jamnagar. They were housed at 22°C ± 2°C with constant humidity 50-60%, on a 12 h natural day and night cycles. They were fed with diet Amrut brand rat pellet feed (Pranav Agro Industries) and tap water *ad libitum*. This experiment was carried out after obtaining permission from "Institutional Animal Ethics Committee" (IAEC/2008/MD/03). The selected animals were grouped into three groups of 6 animals each. The test dose of the drugs for experimental study was calculated by extrapolating the human dose (500 mg/kg) to animals based on the body surface area ratio by referring to the standard table of Paget and Barnes.^[18] The stock solution was prepared freshly by mixing adequate quantity of water with both samples and used for all the experimental purpose. Group A received *Guduchi Ghana* prepared from classical method, Group B received *Guduchi Ghana* market sample at the dose of 50 mg/kg orally and Group C received tap water as a control. The drugs were administered to overnight fasted animals in the dose of 1 ml/100 g body weight with the help of gastric catheter sleeved to syringe.

Anti-inflammatory activity in rats

The standard method for screening anti-inflammatory effect was followed.^[19] Rats of either sex weighing between 180 and 275 g were used. Rats were provided with food and tap water up to the start of the experiment. The test drug was administered at a dose of 50 mg/kg body weights to three groups for 7 days. On 7th day, initially left hind paw volume up to the tibiotarsal articulation was recorded by using plethysmograph. The plethysmograph employed consisted of a 10 ml glass vessel (25 × 65 mm) fixed to a 2 ml glass syringe through pressure tubing. A total volume of 4 ml of mercury was filled in the syringe and the mercury level was adjusted to zero mark on the micropipette. The space between the zero mark and the fixed mark on the glass vessel was filled with water and few drops of teepol. The initial level of fluid was adjusted and set at zero. The paw was immersed in water exactly up to the tibiotarsal articulation. The increased level of water in the glass vessel was adjusted to the prefixed mark by releasing

the pressure of the connected syringe. The level where water and mercury interface in the micropipette was recorded as paw volume. On 5th day 1 h after drug administration, edema was produced by injecting 0.1 ml of freshly prepared 1% carrageenan in sterile saline solution to the sub-plantar aponeurosis of the left hind limb. The rats were administered tap water in the dose of 2 ml/100 g body weight to ensure uniform hydration and hence to minimize variations in edema formation. Paw volume was recorded 3 h after carrageenan injection. Results were expressed as an increase in paw volume in comparison to the initial paw volume and also in comparison with the control group.

Statistical analysis

All the values were expressed as mean ± standard error of mean. The data was analyzed by unpaired *t*-test. A level of *P* < 0.05 was considered to be statistically significant. Level of significance was noted and interpreted accordingly.

Results and Discussion

Anti-inflammatory activity

The effect of test drugs on carrageenan induced paw edema is depicted in Table 1. In Group A statistically significant decrease (*P* < 0.05) was observed in comparison to control group; while moderate decrease was observed in Group B which was statistically non-significant. The difference in suppression observed in Group A was found to be significant in comparison to Group B.

Considering the preliminary nature of the study and also fundamentally inflammatory process is the same in the majority of the tissue, the test drugs were evaluated against Carrageenan induced paw edema to determine whether they have anti-inflammatory activity, especially against acute inflammation or not. Carrageenan induced paw edema is considered to represent the first phase of the inflammatory reaction, which is characterized by fluid and cell exudation. The development of edema in the paw of the rat after injection of carrageenan is a biphasic event. The initial phase of the edema has been attributed to the release of histamine and serotonin, the edema maintained during the plateau phase to kinin like substances and the second accelerating phase of swelling to the release of prostaglandin like substances.^[20-22] Among the two test formulations, *Guduchi Ghana* prepared by classical method produced significant suppression of carrageenan-induced edema indicating that it inhibits fluid exudation and thus acute inflammation. Market sample failed to suppress the carrageenan

Table 1: Effect of test drug on carrageenan induced hind paw edema in albino rats

Treatment	% increase in paw volume (after 3 h)	% inhibition
Control	59.55±05.42	-
<i>Guduchi Ghana</i> prepared from <i>Kwatha</i> (50 mg/kg)	38.79±03.42*	33.06 ↓
<i>Guduchi</i> extract market sample (50 mg/kg)	51.16±04.59	11.71 ↓

Each value is expressed as mean increase in paw volume±SEM. **P*<0.05 is considered to be statistically significant with respect to control. ↓: Decrease

induced paw edema to significant extent in comparison to control group, while *Guduchi Ghana* prepared by classically produced a considerable suppression in edema formation. Inhibition of edema observed in inflammatory models in the present study, may be attributed to the ability of *Guduchi Ghana* to modify the role of various chemical mediators of inflammation like histamine and 5 HT during the initial phase of inflammation dry up through attenuation of their formation or through activity at the receptor levels.

Conclusion

It was observed that classically prepared *Guduchi Ghana* produced significant anti-inflammatory activity. Though market sample of *Guduchi Ghana* exhibited similar activity but the magnitude of the effect was much less. Classical method has been found much better in comparison to the market sample.

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हिन्दी सारांश

गुडूची घन का शोथहर प्रभाव

बिस्वज्योति पटगिरी, भारती एल. उमेराठिया, पियुष यु. वैष्णव, प्रदीपकुमार प्रजापति,
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प्रस्तुत अध्ययन का उद्देश्य शास्त्रीय विधि से निर्मित और बाजार से उपलब्ध गुडूची घन का तुलनात्मक शोथहर प्रभाव देखना है। इस का अध्ययन केरेजीनीन द्वारा उत्पन्न शोथ पर प्रभाव द्वारा किया गया। उसके द्वारा यह निश्चित करना था की दोनो मे से कौन सी विधि शोथ पर ज्यादा प्रभावि है। उपरोक्त दोनो सेम्पल को ५० मि.ग्रा./कि.ग्रा. की मात्रा मे मुख द्वारा देने पर केरेजीनीन द्वारा उत्पन्न पंजे के शोथ पर प्रभाव क्रमशः ३३.०६% और ११.७१% था। इस तरह शास्त्रीय विधि से निर्मित गुडूची घन शोथ को घटाने मे मध्यम प्रभावी रहा और उसका शोथहर कर्म जो शास्त्रोक्त है, वो सिद्ध होता है।