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AN EXPERIMENTAL EVALUATION OF IPOMOEA CARNEA LEAVES EXTRACT AS ANTI-FURUNCLE MODALITY: A PRELIMINARY STUDY

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ABSTRACT

Furuncle, also known as boil represents the commonest example of an abscess, and pyogenic microorganism *Staphylococcus aureus*, has been implicated as causal agents. The shrub *Ipomoea carnea* has been used traditionally for thousands of years. However, there are few scientific studies on this medicinal plant, and most of the information are scattered. In Gwalior forest division, the *Ipomoea* leaf poultice is popularly used by the Sahariya tribe and traditional healers to treat furuncles. This study was undertaken to evaluate the effect of leaves of this plant on the growth of causal organisms of furuncles and the subsequent inflammatory responses. The aqueous leaves extract [obtained by hot water maceration of the leaves powder] was studied for effects on the growth of clinically isolated strain of *Staphylococcus aureus*. The anti-inflammatory activity was investigated using acute paw edema induced by carrageenan in rats. The extract moderately inhibited the growth of the test organisms and significantly [$P < 0.05$] suppressed the development of acute edema of the rat paw. Our study provides evidence for potential applicability of *Ipomoea carnea* leaves aqueous extract as anti-furuncle modality.

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INTRODUCTION

Ipomoea carnea Jacq. (Convolvulaceae) also known as “Bush Morning Glory” is evergreen flowering shrub with multiple branches and thick stem. This plant, originally from the tropics of south America has spread all over the world including including American tropics, Argentina, Brazil and Bolivia, Pakistan, Srilanka and even in india. It is well distributed in Chhattisgarh and Madhya Pradesh part of india as a naturalized species invading the wetlands, canals, drain banks, wastelands, field edges and road sides [1]. *Ipomoea carnea* is popular in india where it is variously called Besharam and Behaya and is used as folk medicine in traditional medicinal systems including Ayurveda, Siddha and Unani for various ailments [2]. Documented evidence of pharmacological activities shows that the leaves of the plant possess anti-diabetic, anti-inflammatory, anti-microbial, anxiolytic and anticancer [3-7] properties. In African culture, the leaves of *Ipomoea carnea* are claimed to have anti-nociceptive and anti-inflammatory properties [8]. The isolation of alkaloidal constituents such as swainsonine and calystegines B1, B2, B3 and C1 [9] from the plant has been reported. A study in Haryana (India) reported *Ipomoea carnea* and *Ricinus communis* as traditional remedy for muscle strain [10].

In Gwalior forest division (India), the *Ipomoea* leave poultice is popularly used by the Sahariya tribe and traditional healers to treat furuncles [11]. Furuncles or boils are acute inflammation of hair follicles that have spread to the surrounding. Furuncles develop as a result of staphylococcus aureus and other pyogenic bacterial infections and antimicrobials and anti-inflammatory agents are choice of drugs for treatment of boils [12]. In common practice, Boil ripening i.e. accumulation of pus, by any mean is considered as indication of elimination of infection. Documented evidences suggest that the medicinal potency of an agent in the treatment of furuncles may derive from direct inhibition of the growth of the causal organisms, suppression of acute inflammatory response [13]. A sizable body of data indicated that *Ipomoea carnea* exhibits antimicrobial effect on laboratory strains. Effect of *Ipomoea carnea* on clinical strains of microorganisms is still unreported. Prompted by this in current study, we evaluated if *Ipomoea carnea* leaves aqueous extract could inhibit the growth of clinically isolated strains of *Staphylococcus aureus*. Furthermore, efforts were made to evaluate its possible anti-inflammatory effect in-vivo. The study is likely to substantiate the applicability of *Ipomoea carnea* as an anti- furuncle modality.

MATERIALS & METHODS

Plant material

Fresh leaves of *Ipomoea carnea* were collected in February 2017 from Gwalior region. The leaves were dried in shade at room temperature. The dried leaves were coarsely powdered, stored in airtight container until used. The powdered plant material [400 g] was extracted by macerating in hot water for 1 h. The extract was strained with a muslin cloth, allowed to cool and filtered. The filtrate was freeze dried to obtain 88 g [24 % w/w] of aqueous extract which was stored in refrigerator till further use.

Experimental animals

Adult Swiss albino rats [150–250 g] of both sexes were used after approval of the Institutional Animal Ethical Committee [IAEC] constituted under CPCSEA. Animals were housed in steel cages within the facility under standard conditions and allowed free access to standard pellets and water. Prior to their use, they were allowed two weeks for acclimatization within the work area environment.

Antimicrobial activity test

The inhibitory effect of aqueous extract on the growth of strains of *Staphylococcus aureus* clinically isolated from wounds and identified as earlier described was studied using the cup-plate diffusion method [12]. Briefly, sterile molten agar [20 ml] was seeded with 0.1 ml of standardized broth culture of bacteria [1×10^6 CFU/ml]. When set, four drops [0.02 ml per drop] of each concentration [3.125, 6.2, 12.5, 25, 50, and 100 mg/ml] of the extract were placed in wells [$n = 5$ /plate] bored on the agar by means of a sterile cork borer [6 mm diameter]. The plates [$n = 5$ per test organism] were incubated at 37°C for 24 h after which the inhibition zone diameter [IZD] of each concentration of the extract was measured. Gentamicin [0.7 mg/ml] was used as control.

Systemic acute edema of the rat paw

Paw edema was induced (4, 14) by injecting 0.1 ml of 1% w/v carrageenan suspended in 1% CMC into sub-plantar tissues of the left hind paw of each rat. Rats were divided into four groups; each group consisting of six animals.

Group I Carrageenan control

Group II Aqueous extract (250 mg/kg)

Group III Aqueous extract (500 mg/kg)

Group IV Etoricoxib (6 mg/kg) as standard reference

The paw volume was measured plethysmographically before the injection and after the injection for 0h, 1h, 2h and 3h interval gap. The average foot swelling in test as well as standard groups was compared with that of the control group and the % edema was calculated by using the formula:

$$\% \text{ Edema} = \left[\frac{Ct - Co}{Co} \right] \times 100$$

Where, Ct = Average paw volume of treated group.

Co = Average paw volume of control group.

Statistical analysis

Data obtained was analyzed using One Way ANOVA and further subjected to LSD post hoc test. Results are expressed as Mean \pm SEM. Difference between Means of treated and control groups was considered significant at $P < 0.05$.

RESULT & DISCUSSION

Evaluation of antibacterial effect of *Ipomoea carnea* showed that the aqueous leaves extract demonstrated moderate antimicrobial activity against clinically isolated strains of *Staphylococcus aureus*, the causal organism mostly associated with boils. The extract inhibited the growth of clinical isolates of *Staphylococcus aureus* at 100 mg/ml. The inhibitory effect of the extract was however; lower than that of gentamicin (0.7 mg/ml) [Table 1]. Anti-inflammatory agents have been reported to provide instant relief from pain and edema associated with furuncles. Oral administration of the extract significantly [$P < 0.05$] suppressed the development of acute edema of the rat paw induced by carrageenan at the 2 doses tested (250 mg/kg and 500 mg/kg). The aqueous extract of *Ipomoea carnea* leaves possesses anti-inflammatory property with the dose dependent effect carried out on experimental model. The inhibition of paw edema was found to be 14% (250 mg/kg) and 37% (500 mg/kg) respectively. Between the two doses studied, aqueous extract of *Ipomoea carnea* at a dose of 500mg/kg was found to possess significant anti-inflammatory activity as compared to Etoricoxib (6mg/kg) at 3rd h against carrageenan-induced rat paw edema [Table 2 and Figure 1].

Table 1: Antimicrobial activity.

Microorganism	Gram	Diameter of zone of inhibition (mm)*	
		<i>I. carnea</i> leaves aqueous extract	Standard (Gentamicin 0.7 mg/ml)
<i>Staphylococcus aureus</i> (clinical isolates)	Positive	16	20

Table 2: Effect of *Ipomoea carnea* leaves aqueous extract on carrageenan induced rat hind paw edema.

Treatment	Dose(mg/kg)	Mean paw volume (ml) at				% Inhibition of edema after 3h
		0h	1h	2h	3h	
Control	0.2 ml	2.5 \pm 0.2	4.2 \pm 0.3	4.1 \pm 0.6	3.9 \pm 0.4	-
Etoricoxib	6 mg/kg	2.5 \pm 0.2	3.6 \pm 0.2	2.8 \pm 0.2	2.5 \pm 0.2	39
Aqueous extract	250 mg/kg	2.5 \pm 0.2	3.8 \pm 0.2	3.7 \pm 0.3	3.5 \pm 0.2	14
Aqueous extract	500mg/kg	2.5 \pm 0.2	4.1 \pm 0.1	3.1 \pm 0.2	2.7 \pm 0.1	37

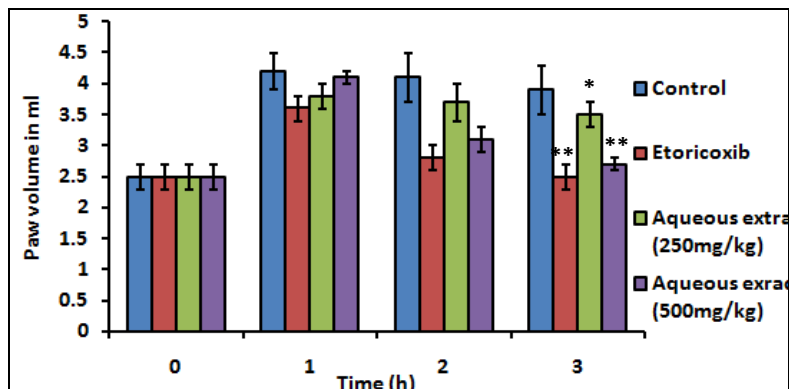


Figure 1: Anti-inflammatory activity of aqueous extract of Ipomoea carnea leaves on carrageenan induced rat hind paw edema.

Values are mean \pm SEM; n=6 *P<0.05, **P<0.01 compared with normal control.

CONCLUSION

The aqueous leaves extract of Ipomoea carnea leaves possess antimicrobial property against clinical isolated strains of staphylococcus aureus. This is the first report showing inhibition of clinical isolate strain of staphylococcus aureus by the aqueous extract of Ipomoea carnea leaves. Furthermore, results of our study strengthen the anti-inflammatory effect of Ipomoea carnea. The study further provides a rationale for traditional use of plant leaves as anti-furuncle modality. However, the study indicates that the plant can be studied further to elucidate exact mechanism of action and effectiveness of Ipomoea carnea as anti-furuncle agent.

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Conflict of interest:

None

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