

ANTI INFLAMMATORY ACTIVITY OF *ERYTHRINA VARIEGATA*

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ABSTRACT

Objective: *Erythrina variegata* had been widely used for its reported biological activity in indigenous system of medicine. The present investigation was carried out to find the anti-inflammatory effect of ethanolic extract of *Erythrina variegata* in albino rats.

Methods: The anti-inflammatory activity was evaluated using acute inflammatory model like carrageenan induced paw edema and chronic inflammatory model like cotton pellet induced granuloma respectively.

Results: The ethanolic extract in different doses (200, and 400mg/kg, p. o) exhibited dose dependent and significant anti-inflammatory activity in acute and chronic model of inflammation.

Conclusion: The alcoholic extract of *Erythrina variegata* has anti-inflammatory activity. This activity was related to the dose and these results corroborate the potential traditional use of the plant in folk medicine.

Keywords: *Erythrina variegata*, Anti-inflammatory, Carrageenan induced paw edema, Cotton pellet granuloma.

INTRODUCTION

Pain and inflammation is a common complaint in most patients suffering from disease conditions. Inflammation is a host defense mechanism to combat or overcome the invading pathogen or the foreign particles [1]. Non-steroidal anti-inflammatory drugs (NSAIDs) make up one of the largest groups of drugs used for pain and inflammation. Currently available anti-inflammatory agents are associated with unwanted side effects and have their own limitations [2]. Inflammation is the response of living tissues to injury. It involves a complex array of enzyme activation, mediator release, and extravasations of fluid, cell migration, tissue breakdown and repair [3]. Inflammation is one among them, conventional drugs used to ameliorate this phenomenon are either too expensive or toxic and not commonly available to rural folks that constitute the major populace of the world, this study therefore seek to assess *Erythrina variegata* for anti-inflammatory activity and analgesic effects in experimental animal models.

The genus *Erythrina* comprises of about 110 species of trees and shrubs. The name "coral tree" is used as a collective term for these plants. Coral tree is indigenous to the Old World tropics, possibly originally from India to Malaysia, but is native of ancient westward to Zanzibar and eastward to eastern Polynesia (the Marquesas). It is typically found on sandy soil in the littoral forest, and sometimes in coastal forest up to 250 m (800 ft) in elevation. The coral tree is cultivated particularly as an ornamental tree and as a shade and soil improvement tree (it fixes nitrogen) for other tree crops such as coffee and cacao. The most attractive type, var. *variegata*, is grown for its variegated leaves, as well as its seasonal showy red flowers [4-6]. This fast-growing, 50-60 feet tall and wide deciduous tree with green and yellow-variegated, 6-inch-long leaves creates a broad canopy but has spiny branches. In spring, before the leaves appear, coral tree is decorated with showy red blossoms, each flower 2.5 inches long and arranged in dense, six-inch-long racemes. These blooms are followed by 12-inch-long, red/brown seedpods which contain poisonous seeds [7]. Studies on phyto chemical of *Erythrina variegata* species have demonstrated alkaloids and flavonoids as major constituents. Different parts of *E. Variegata* have used in traditional medicine as nervine sedative, febrifuge, anti-asthmatic and antiepileptic [8]. In the some experiments, it has potential effects for treatment of some diseases like convulsion, fever, inflammation, bacterial infection, insomnia, helminthiasis, cough, cuts and wounds [9-12]. A survey of literature indicated no systemic

approach has been made to evaluate the anti-inflammatory potential of *E. variegata* by in vivo method.

Phytochemical investigations on the plant revealed the presence of alkaloids [13], flavanoids and isoflavanoids [14-18]. Phenyl coumarins [19], lectins [20], flavones glycosides [21], steroids and fatty acids [22]. The present study involves estimation anti-inflammatory activity of ethanolic extract of *E. variegata* by Carrageenan induced rat paw oedema model and Cotton Pellet Induced Granuloma Animal Model.

MATERIALS AND METHODS

Plant material

The plant *Erythrina Variegata*, collected from the surrounding fields of Narsapur forest and was identified by Botanist. The leaves collected in the month of January were dried in the shade at room temperature and size reduced to coarse powder.

Preparation of extract

The coarse powder was extracted with ethanol (95%) and the residue was evaporated under reduced pressure in the rotary vacuum evaporator at 60°C to obtain a dark brown colored molten mass. The percentage yield was found to be 12.7% w/w.

Anti-inflammatory activity

Carrageenan induced rat paw oedema model: [23, 24]

Albino rats of either sex weighing 150 – 200 g were selected. They were maintained on the standard pellet diet and free access to water. The animals were divided into 6 groups of each containing six animals. The various groups treated were as follows:

Group A - Normal Control (treated with 0.2 ml of 2 % Tween -80 p. o.)

Group B - Diclofenac sodium (20 mg / kg, p. o.)

Group C - Alcoholic extract (200 mg / kg, p. o.)

Group D - Alcoholic extract (400 mg / kg, p. o.)

The normal control, Diclofenac sodium and test extracts were administered to the rats 30 minutes before the injection of 0.1 ml of 1% carrageenan suspension in normal saline at sub plantar region of the left hind paw, and the right hind paw served as reference. Immediately thereafter the oedema volume of the injected paws was

measured plethysmographically by mercury displacement method. For comparison purpose, the volume of oedema at various prefixed time intervals (0,1,2,3,4 hours) was measured. The difference between paw volumes of the treated animals was measured and the mean oedema volume was calculated.

Percentage reduction in oedema volume was calculated by using the formula:

$$\% \text{ reduction} = \frac{V_o - V_t}{V_t} \times 100$$

Where,

V_o = Volume of the paw of control at time 't'

V_t = Volume of the paw of drug treated at time 't'.

From the data, the mean oedema volume, standard deviation (S. D.), standard error (SEM) and percentage reduction in oedema were calculated.

The results of all the experiments conducted were subjected to one way analysis of variance (ANOVA) and Dunnet's test.

Cotton pellet induced granuloma animal model [25-26]

Animals were divided into four groups of six animals in each group as follows:

Group I: control received distilled water.

Group II: Animal treated with Dexamethasone (Dose: 0.5 mg / kg)

Group III: Animals treated with extract (Dose: 200 mg / kg)

Group IV: Animal treated with extract (Dose: 400 mg / kg)

At the end of the experimental period, rats were fasted overnight and the anesthetized rats were sacrificed by cervical decapitation. The blood sample was collected for Total W. B. C count and spleen weight.

Inflammation was induced by cotton pellet granuloma model (Sub acute). This method was adopted by D'Arcy (1960) which was carried out by using sterilized cotton pellet implantation method in rats. Under light ether anesthesia, by using blunted forceps and subcutaneous tunnel was made and sterilized cotton pellets (10±1 mg) were implanted in the axilla and groin region of the rat. After recovering from Anaesthesia, animals were treated orally with vehicle control (Distilled water 10 ml / kg), Dexamethasone and various doses of the herbal extract for consecutive 7 days, once per day. They were sacrificed on day 8th by cervical dislocation and the pellets were removed, freed from extraneous tissue and dried at 600C for 24 hrs. The percentage inhibition of the dry weight of the granuloma were calculated and compared.

Results were expressed as mean±Standard deviation (SD). Statistical analysis was performed using One-way analysis of variance (ANOVA). $P < 0.05$ was considered statistically significant.

RESULTS

Carrageenan induced rat paw oedema model

The two extracts of leaves of Erythrina Variegata at dose of 200 and 400 mg / kg exhibited significant anti-inflammatory activity in acute paw oedema model. 200 mg/kg dose of Alcoholic extract exhibited maximum inhibition of 56.23% and 400mg/kg dose of alcoholic extract showed maximum inhibition of 71.66%, the Diclofenac sodium has shown reduction in oedema volume by 75.73% in carrageenan induced rat hind paw oedema model.

Table 1: Anti-inflammatory activity of crude extract of Erythrina variegata by carrageenan induced rat paw oedema

Group	% Increase in paw volumes (ml ×1000) ± SEM (percent inhibition)				% reduction (after 4 hr)
	1 hr	2 hr	3hr	4hr	
Control	0.36 ±0.01	0.69 ±0.03	0.73 ±0.01	0.72± 0.01	
Diclofenac sodium (20 mg/kg)	0.21±0.01	0.23±0.02	0.21±0.01	0.17±0.02	75.73
E. variegata (200 mg/kg)	0.24±0.01	0.37±0.01	0.22±0.03	0.31±0.04	56.23
E. variegata (400 mg/kg)	0.32±0.04	0.23±0.03	0.18±0.01	0.20±0.01	71.66

Cotton pellet induced granuloma formation

The alcoholic extract at different doses and standard drug was evaluated by cotton pellet induced granuloma formation to understand its potential in sub-acute inflammatory phase. Table-2, indicates the significant ($p < 0.05$) reduction of wet weight and dry

weight of the cotton pellet. The standard drug dexamethasone produces maximum activity by inhibiting the wet weight and dry weight of cotton pellet 51.45% and 44.77% respectively. Two different dose (200, 400 mg/kg) showing significant reduction of wet weight and dry weight of cotton pellet at 42.67%, 28.15% and 27.74%, 26.54% respectively.

Table 2: Effect of E. variegata on wet weight and dry weight cotton pellets

Group	Mean wet weight of cotton	% of inhibition	Mean dry weight of cotton	% of inhibition
control	180.29 ± 12	-	51.71 ± 0.59	-
Standard Dexamethasone	83.75 ± 5.75	51.45*	23.35 ± 1.63	44.77*
E. variegata (200 mg/kg)	90.25 ± 0.86	42.67**	33.81 ± 0.90	28.15**
E. variegata (400 mg/kg)	129.99 ± 3.48	27.74*	36.88 ± 0.95	26.54*

* Denotes significance at the level of $p \leq 0.05$

** Denotes significance at the level of $p \leq 0.01$

DISCUSSION

Carrageenan-induced hind paw oedema is the standard experimental model of acute- inflammation. The time course of oedema development in carrageenan-induced paw oedema model in rats is generally represented by a biphasic curve [27]. The first phase of inflammation occurs within an hour of carrageenan

injection and is partly attributed to trauma of injection and also to histamine, and serotonin components.

The second phase is associated with the production of bradykinin, protease, prostaglandin, and lysosome. Prostaglandins (PGs) play a major role in the development of the second phase of inflammatory reaction which is measured at +3 h [28].

The doses 200 mg/kg and 400 mg/kg of alcoholic extract of *Erythrina variegata* produced a significant inhibition of carrageenan induced paw oedema at +3h and +6h. Therefore, it can be inferred that the inhibitory effect of alcoholic extracts of *Erythrina variegata* on carrageenan induced inflammation could be due to inhibition of the enzyme cyclooxygenase and subsequent inhibition of prostaglandin synthesis. Significant inhibition of paw oedema in the early hours of study by *Erythrina variegata* could be attributed to the inhibition of histamine and/or serotonin. The decrease in paw oedema inhibition at +6h may be attributed to the termination of test drug action.

Cotton pellet granuloma is one of the exudative of inflammation and the cotton pellet granuloma is taken as proliferate phase of inflammation. During the inflammatory process migration of WBC takes place which is the biological marker. Enlargement of the spleen occur as spleen has the phagocyte nature. It was observed that the extract of the E. Variegata significantly reduced the granuloma formation in rat. It was found that the extract at the dose 200 mg/kg and 400mg/kg produced a significant anti-inflammatory activity by reducing the dry weight and wet weight of granuloma, inhibiting the migration of WBC. The spleen weight also significantly decreases by the extract. The antiinflammatory potential may be attributed to the presence of phytoconstituents such as polyphenolic compound (flavonoids) and steroidal saponin. The better suggestion is that the lower dose (200mg/kg body weight) produces a better activity than the higher dose.

CONCLUSION

On the basis of these findings, it may be inferred that alcoholic extract of *Erythrina variegata* has anti-inflammatory activity. This activity was related to the dose and these results corroborate the potential traditional use of the plant in folk medicine. At present, there are no reports on an investigation to identify the active components present in ethanolic extract of *Erythrina variegata*. Further investigations are anticipated to identify the active components and lead to their further clinical use.

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CONFLICT OF INTERESTS

Declared None

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