

Anti-inflammatory activity of *Polygala chinensis* L whole plant (Polygalaceae)

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ABSTRACT

This study was intended to evaluate the anti-inflammatory activity of ethanol extract of *Polygala chinensis* whole plant in carrageenan induced paw edema in albino rats at the dose level of 100 and 200 mg/Kg body weight. The extract exhibited significant anti-inflammatory activity. The results were compared with standard drug Indomethacin (10mg/Kg).

Key words: Carrageenan, paw edema, siriyanangai.

1. INTRODUCTION

Producing carrageenan induced inflammation in the rat hind paw edema is a useful method for screening potential anti-inflammatory agents.^[1] A wide variety of plants with potent anti-inflammatory activity are used in traditional medicines. The search for safe and effective anti-inflammatory drugs through the evaluation of medicinal plants known to be used in the treatment of inflammation disorder is continued even today. *Polygala chinensis* L belongs to Polygalaceae family. It is commonly known as "Siriyanangai". Genus *Polygala* is an annual, diffuse herb, 10-25 cm tall. Flowers are papilionaceous, primary root orange, stems woody at base, branches terate, crisped pubescent. Leaf blade green, obovate, elliptic or lanceolate, inflorescence raceme, super axillary, rarely axillary, shorter than leaves, densely few flowered, flowers 4-5mm long, sepals 5, persistent, green, eiliate, outer sepals 3, ovate-lanceolate, apex acuminate, inner sepals 2, petaloid falcate, petals 3, connate at base, yellowish or white with pink, lateral petals shorter than keel, inside with fascicled white hairs at base. Stamens 8, ovary compressed-orbicular.

Polygala was traditionally used by Americans to treat snake bite ^[2] and as an expectorant to treat cough and bronchitis. *Polygala* is considered as a powerful tonic herb ^[3] that can help to develop the mind and aid in creative thinking. Hence an attempt is known to evaluate the efficacy of *Polygala chinensis* as an anti-inflammatory agent in traditional healing system.

2. MATERIALS AND METHODS

2.1. Plant Material:

The mature plants of *Polygala chinensis* were collected from Vadavalli, Coimbatore, Tamil Nadu, India. The plant was identified with the help of local flora and authenticated in Government of India, Botanical Survey of India, Southern Circle, Coimbatore, Tamilnadu, India.

2.2. Preparation of plant extract for anti-inflammatory activity

The dried whole plants of *Polygala chinensis* were powdered in a Wiley mill. Hundred grams of plant powder was packed in a Soxhlet apparatus and extracted with ethanol. The ethanol extract was concentrated in a rotary evaporator. The concentrated ethanol extract was used for anti-inflammatory activity.

2.3. Animals

Adult Wistar Albino rats of either sex (150-200g) were used for the present investigation. Animals were housed under standard environmental conditions at temperature (25±2°C) and light and dark (12:12 h). Rats were fed with standard pellet diet (Goldmohur brand, MS Hindustan lever Ltd., Mumbai, India) and water *ad libitum*.

2.4. Acute toxicity study

For toxicity studies, six Albino rats of either sex were administered orally with the test substance in the range of 100-200 mg/kg and the mortality rates were observed after 72h. The ethanol extract of *Polygala chinensis* exhibiting no mortality at 2000 mg/kg dose was considered as LD₅₀ cut off dose (safe dose). So 1/20 and 1/10 of that were selected (100 and 200 mg/kg) for the experiment as sub maximal and maximal dose.

2.5. Anti-inflammatory activity

2.5.1. Carrageenan induced hind paw edema:

Albino rats of either sex weighing 150-200 grams were divided into four groups of six animals each. The dosage of the drugs administered to the different groups was as follows. Group I - Control (normal saline 0.5 ml/kg), Group - II and III - *Polygala chinensis* (100 mg/kg and 200 mg/kg, p o.), Group IV - Indomethacin (10 mg/kg, p.o.). All the drugs were administered orally. Indomethacin served as the reference standard anti-inflammatory drug. After one hour of the administration of the drugs, 0.1 ml

of 1% W/V carrageenan solution in normal saline was injected into the sub plantar tissue of the left hind paw of the rat and the right hind paw was served as the control. The paw volume of the rats were measured in the digital plethysmograph (Ugo basile, Italy), at the end of 0 min., 60min., 120min., 180min., 240min., 360min., and 480min. The percentage increase in paw edema of the treated groups was compared with that of the control and the inhibitory effect of the drugs was studied. The relative potency of the drugs under investigation was calculated based upon the percentage inhibition of the inflammation.

$$\text{Percentage inhibition} = \frac{\text{control (\% increase in paw volume in third hour)} - \text{Test (\% increase in paw volume in third hour)}}{\text{control (\% increase in paw volume in third hour)}}$$

Table-1: Percentage inhibition of paw edema exhibited of by whole plant extract of *Polygala chinensis* in adult albino rats.

Treatment	Dose mg/kg	Oedema volume (ml)				% Inhibition after 180 min
		0 min	60 min	120 min	180 min	
Group-I	1%Saline solution	33.29±1.63	61.35±1.48	87.14±1.93	124.56±4.31	-
Group-II	100	34.16±1.86	42.14±2.06*	68.23±1.98*	53.11±2.18**	57.36
Group-III	200	29.21±1.36	34.19±1.86**	45.66±1.24**	43.26±2.09**	65.26
Group-IV	10	27.13±1.63	32.84±1.16*	46.23±1.14*	40.96±1.68**	67.11

Each Value is SEM ± 5 individual observations * P < 0.05; ** P<0.01 Compared paw edema induced control vs drug treated rats

2.6. Statistical analysis

The data were analyzed using student's t-test statistical methods. For the statistical tests a p values of less than 0.01 and 0.05 was taken as significant.

3. RESULT AND DISCUSSION

The plant extracts did not exhibit any mortality upto the dose level of 2000 mg/Kg. The ethanol extract of whole plant of *Polygala chinensis* showed anti-inflammatory activity on carrageenan-induced edema in rats. The ethanol extract of *Polygala chinensis* whole plant at the dose level of 100 and 200 mg/kg decreases the edema significantly (p<0.01) at 3rd and 4th after administration of the extract when compared to the control group. The percentage inhibition of inflammation after 3hr of carrageenan injection

was 57.36% and 65.26% at 100 and 200mg/kg dose level respectively. The effect was compared to activity produced by standard drug Indomethacin at 3hr after administration (67.11%).The incredible development in the field of synthetic drugs during present era is accompanied by numerous undesirable side effects. Whereas plants still hold their own unique place, with lesser side effects. Therefore, a systematic approach should be made to find out the efficacy of plants against inflammation as herbal anti-inflammatory agents [4]. The enzyme, phospholipase A₂, is known to be responsible for the formation of mediators of inflammation such as prostaglandins and leukotrienes. By attracting polymorphonuclear leukocytes to the site of inflammation, they can lead to tissue damage probably by the release of free radicals. Phospholipase A₂ converts phospholipids in the

cell membrane into arachidonic acid, which is highly reactive and is rapidly metabolized by cyclooxygenase (prostaglandin synthesis) to prostaglandins. Prostaglandins are major components that induce pain and inflammation [5,6]. Carrageenan-induced paw edema is the standard experimental model of active inflammation. Carrageenan-induced paw edema is a biphasic response. The first phase is mediated through the release of histamine, serotonin and kinins whereas the second phase is related to the release of prostaglandin and slow reacting substances which peak at 3hr [7-10]. Our results revealed that administration of ethanol extract inhibited the edema starting from the first hour and during all phases of inflammation, which is probably due to inhibition of different aspects and chemical mediators of inflammation.

Phytol 9,12-Octadecadienic acid(2,2)-, Oleic acid, Ethyl iso-allocholate, and 6,7-Epoxypregn-4-ene-9,11,18-triol-3,20-dione,11,18 diacetate were reported in the ethanol extract of *Polygala chinensis* whole plant by GC-MS analysis^[11]. These compounds may have the role in anti-inflammatory effect.

4. CONCLUSION

This study emphasized the need to carry out in-depth phytochemical and pharmacological evaluations of *Polygala chinensis* whole plant and ascertain their claims in the light of modern scientific understanding such that their potentials may be tapped for better use as alternate and safe herbal drugs.

ACKNOWLEDGEMENT

The author wishes to thank Dr.R.Sampathraj, Honorary Advisor, Samsun Clinical Research Laboratory, Tirupur, for their assistance in animal studies.

5. REFERENCES

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