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Anti-inflammatory activity of some medicinal plants in India

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Abstract

In the present study, investigation of phytochemical constituents of *Cymbopogon citratus* (DC.) Stapf. *Hemidesmus indicus* (L.) R. Br. (Periplocaceae), *Sonerila tinnevelliensis* Fischer, *Goniothalamus wightii* J. Hk. & Thoms. and *Psychotria nudiflora* Wight & Arn. and anti-inflammatory activity of carrageenan-induced rat paw edema models. The results of active compounds were identified in alkaloids, flavonoids, sterols and essential oils were found to be all plants extracts. The pharmacological activity of anti-inflammatory activity was studied in carragennan induced rat paw edema model observed by 6 hrs. The results were demonstrated that the higher percentage of inhibition of petroleum ether extract of selected plants viz. *S. tinnevelliensis* (88.46%), *P. nudiflora* (87.98%), *C. citratus* (86.12%), *G. wightii* (77.96%) and *H. indicus* (77.89%) respectively and compared to control and standard ibuprofen, which is statistically significant.

Keywords: Phytochemicals, inflammatory activity, medicinal plants, medicine

1 INTRODUCTION

Plants are an important source of biologically active natural products and are considered a promising avenue for the discovery of new drugs due to easy access and relatively low cost, since they naturally grow in relative abundance [1-2]. The development of standardized herbal medicines with proven efficacy and safety of use is an important source for increasing the access of people to medicines and to offer new therapeutic options [3]. Currently, an estimated that about 13,000 plant species are known as worldwide to have use as drugs. In India, about more than 7500 species are used for whole plants and plant parts. They have been used for the traditional source of raw materials for medicine.

The development of anti-inflammatory agents with a no side effect is a great of interest. United State, survey of approximately 90% of arthritic patients have been used for alternative therapies for herbal medicines. In traditional practice, medicinal plants are used to control inflammation in many countries. This has caused an increase in the number of experimental and clinical. investigations directed towards the validation of the anti-inflammatory properties which are putatively· attributed to these remedies [4-5]. Leaf infusion of *U. baccifera* is emplyed on rheumatic pains and decoction of C. nutans actually is employed for soaking sore feet [6]. An antiinflammatory activities are reviewed from several plants and plants parts [7]. However, the present study have been successfully preliminary trial works of the selected medicinal plants of *Cymbopogon citratus* , *Hemidesmus indicus*, *Sonerila tinnevelliensis*, *Goniothalamus wightii* , *Psychotria nudiflora* and *Sonerila tinnevelliensis* and they were extracted with petroleum ether and their extract effect of acute anti-inflammatory activity studied for carrageenan induced ear odema in rat models.

2 MATERIALS AND METHODS

2.1 Medicinal plants collections

The selected medicinal plants of *Cymbopogon citratus*, *Hemidesmus indicus*, *Sonerila tinnevelliensis*, *Goniothalamus wightii* , *Psychotria nudiflora* and

Sonerila tinnevelliensis are collected from the Tirunelveli hills, Tirunelveli District, Tamil Nadu.

2.2 Extraction

500gms of air -dried powdered fruit material was extracted with petroleum ether using Soxhlet apparatus for 12hr. These extracts were concentrated and dried for using rotavapor. The collected extracts were subjected to qualitative phytochemical screening was performed [8]. All the extracts were to be found in the presence of phytoconstituents such as glycosides, carbohydrates, flavonoids, steroids and resins were confirmed by Harborne method [8].

2.3 Screening of the Anti-inflammatory Activity

All the chemicals were of analytical grade and were either Sigma or Merk chemicals.

2.4 Carrageenan induced paw edema in mice

Experimental Animals albino mice (25-30g) of either sex was used in the entire study. They were housed in standard polypropylene cages and kept under controlled room temperature (24 ± 2°C; relative humidity 60 -70 %) in a 12h light -dark cycle. The animals were fed with standard laboratory diet and water ad libitum. Food was withdrawing 12h before and during the experimental hours. The effect of oral administration of 400 mg/kg of the plant extract (Seen in table-2), 40 mg/kg ibuprofen or vehicle (Saline, 10ml/kg) on the hind-paw edema induced by sub plantar injection of 0.1ml Carrageenan (1% w/v) was evaluated by according to Winter et al., (1962) method [9]. The selected plant extract and treatment drug (400mg/kg) or Diclofenac sodium was administered orally, 1h before carrageenan injection while control group received saline (10ml/kg, p.o.). The hind paw volume was measured plethysmometrically before and after the carrageenan injection, at hourly intervals for 3hr. 0.1 mL of 1 % w/v carrageenan was injected into the sub plantar tissue of left hind paw of each rat. Swelling of carrageenan injected foot was measured at 0, 1, 2, 3 and 6 h using Plethysmometer. Measurement was carried out immediately before and 6hrs following carrageenan injection. Percentage of inhibition of test drugs was calculated in comparison with vehicle control (100%).

$$\% \text{ inhibition of edema} = \left(\frac{Vc - Vt}{Vc}\right) x100$$

Where, V_T = mean paw volume of test group & V_C = mean paw volume of control group.

2.5 Statistical analysis

Results were analyzed using one-way analysis of variance (ANOVA) and expressed as Mean ± SEM. Data was further subjected to Dunnett's test and differences between means were regarded significant at $P<0.05$.

3 RESULTS AND DISCUSSION

3.1 Qualitative analysis of phytoconstiuents

The active constituents of several plants parts were extracted with petroleum ether and results were represented in the table-1. The results of active compounds of selected plants extract were confirm the presence of alkaloids, phytosterols, phenols, lignin, flavonoids and volatile oils and absence of glycosides, saponins and tannins respectively (Table-1). The preliminary phytochemical results are helpful in finding chemical constituents in the plant materials that may lead to their quantitative estimation and also in locating the source of pharmacologically active chemical compounds. Secondary metabolite of carbohydrates, flavonoids, alkaloid, tannin, coumarin, steroid and phenol were identified in several plants such as *Phyllanthus amarus*, *Clerodendrum viscosum*, *Ailanthus excelsa*, *Syzigium cumini* and *Cassia occidentalis* [10]. These classes' alkaloids, Saponin, tannins, flavonoids are known to have activity against pathogens and therefore aid the antimicrobial activities of medicinal plants [11].

Table-1: Investigation of active compounds of selected plant extracts

S.No.	Phytoconstituents	*Cymbopogon citratus*	*Hemidesmus indicus*	*Sonerila tinnevelliensis*	*Goniothalamus wightii*	*Psychotria nudiflora*
1.	Alkaloids	+	+	+	+	+
2.	Volatile oils/ Tepenoids	+	+	+	+	+
3.	Carbohydrates	+	+	+	+	+
4.	Glycosides	-	-	-	-	-
5.	Phytosterols	+	+	+	+	+
6.	Saponins	-	-	-	-	-
7.	Fixed oils and fats	+	+	+	+	+
8.	Tannins	-	-	-	-	-
9.	Sapanins	-	-	-	-	-
10.	Gums and mucilage	-	-	-	-	-
11.	Lignin	+	+	+	+	+
12.	Flavonoids	+	+	+	+	+

3.2 Anti-inflammatory activity

Table -1: Antiinflammatory activity of some medicinal plants

Treatment Mg/Kg	Percentage of inhibition at time (h)				
	0 hr	1hr	2hr	3hr	6hr
Control	12.76	34.12	64.24	78.92	82.06
Standard (IBH)	17.19	39.78	71.47	75.12	88.10
Cymbopogon citratus	13.12	24.67	56.29	78.12	86.12
Hemidesmus indicus	7.12	12.46	45.78	56.98	77.89
Sonerila tinnevelliensis	8.97	56.12	67.12	74.34	88.46
Goniothalamus wightii	8.16	15.87	45.67	68.89	77.96
Psychotria nudiflora	9.15	18.45	45.14	78.12	87.98

The results of percentage inhibition of edema inhibition of selected plants were calculated for up to 6h. Experimental animals were treated with petroleum ether extracts of *Cymbopogon citratus* (DC.) Stapf. (Poaceae), *Hemidesmus indicus, Sonerila tinnevelliensis*, *Goniothalamus wightii* , *Psychotria nudiflora* Wight & Arn. (Rubiaceae) and *Sonerila tinnevelliensis* showed an anti-inflammatory activity comparable with that induced by carrageenan table-1. The results comparison with control and all extract maximum percentage of inhibition in *Sonerila tinnevelliensis* (88.46%), *Psychotria nudiflora* (87.98%), *Cymbopogon citratus* (86.12%), *Goniothalamus wightii* (77.96%) and *Hemidesmus indicus* (77.89%) respectively and compared to control and standard ibuprofen, which is highly statistically different according to Statistical Duncan Test. Earlier studies, Lemongrass consists of luteolin and its 6-C and 7-O–glycosides, isoorientin 2'-O-rhamnoside and isolation of the flavonoids quercetin, kaempferol and apiginin from the aerial parts [12]. The phenolic compounds elimicin, catecol, chlorogenic acid, caffeic acid and hydroquinone are also isolated from the plant [12]. Earlier studies, carrageenan-induced inflammation is useful to detect anti-inflammatory agents [13]. The development of edema in the paw of the rat has been described by Vinegar et al. (l969) as a biphasic event [14]. The initial phase is attributed to the release of histamine and serotonine [15]. The second, accelerating, phase of swelling is due to release of prostaglandin like substance (Vinegar et al. 1969). It has been reported that the second phase of edema is sensitive to both clinically useful steroidal and non-steroidal antiinflammatory agents [13-14] and they are related to COX inhibition, specially COX-2. There were some earlier reports on different phytochemical constituents of plants possessing anti-inflammatory activity [16-20]. Earlier studies of bark-wood powder of *Pterocarpus santalinus* in 7 mg/kg dose showed significant anti-inflammatory activity in carrageenan induced inflammatory model in rats [22]. According to Alam et al.,(2011) reported that Citrullus lanatus & nonaqueous fraction treated groups possess good anti-inflammatory properties which may be due to individual or combined action of phytoconstituents like alkaloids, steroids, tannin, phenolic, amino acids[23]. Therefore, may be acted for anti-inflammatory activity may be due to different phytochemical constituents were found to be selected plants of *Cymbopogon citratus* (DC.) Stapf. (Poaceae), *Hemidesmus indicus, Sonerila tinnevelliensis, Goniothalamus wightii* , *Psychotria nudiflora* Wight & Arn. (Rubiaceae) and *Sonerila tinnevelliensis*. Further studies are required to identify the actual chemical constituents that are present in the all crude extracts of these plant which are responsible for anti-inflammatory activity.

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