RESEARCH ARTICLE

Evaluation of antiarthritic activity of *Synedrella nodiflora* plant extracts

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Abstract

Aim: This study aims to evaluate the antiarthritic activity of chloroform and ethanolic extracts of *Synedrella nodiflora.* **Materials and Methods:** Plant was collected and then powdered; the powdered plant was then cold macerated with 70% v/v of ethanol and chloroform for 48 h and 72 h, respectively. Both extracts, after the subsequent time, were concentrated to a syrupy mass in Soxhlet apparatus under reduced pressure and desiccated. Protein denaturation assay is based on the effect of plant extract to inhibit the happening of denaturation of protein from heat. We evaluated the potency of the plant extract to encumber the denaturation of protein. It was calculated in percentage and absorbance was studied at 660 nm. **Results and Discussion:** On increasing concentrations, it exhibited different percentage inhibition. Among chloroform and ethanol extract, ethanolic extract was found to be equally effective when compared to standard drug diclofenac sodium. In antidenaturation assay, the effect of plant extract was determined on the basis of its potential to inhibit the denaturation of the protein. **Conclusion:** Study indicates that the plant extract has the potency to exhibit antiarthritic activity and can be used to proceed with further *in vivo* studies and also the isolation of principle constituent.

Key words: Cold macerate, denaturation, percentage inhibition, soxhlet

INTRODUCTION

Synedrella nodiflora (L.)[1] Gaertn. (Asteraceae) is a shrub which indigenous to tropical American weed but now grown throughout the West African region. The leaves are eaten by the people of Ghana for medicinal uses and this plant also forms a part of fodder for livestock. In Ghanaian traditional medicine, the decoction of the whole plant is believed to have antiepileptic properties. Interestingly, the leaves of *S. nodiflora* are used occasionally for the treatment of hiccups and threatened abortion. In Nigeria, plants have been exploited to treat cardiac problems, inflammation, and for stopping bleeding problems. The plant has also been used for the treatment of headaches, earaches, stomachaches, and in embrocation for rheumatism in Malaysia and Indonesia. The whole plant extract has been reported to possess potent anti-inflammatory, antibacterial, and antioxidant and several activities.

In this study, we are performing denaturation assay for the evaluation of arthritic activity of the plant using chloroform and ethanolic extracts. During the assay, the extract with increasing concentrations exhibited increasing activity. Maximum concentration of samples and standard showed maximum response, where ethanolic extract was relatively close to standard.

MATERIALS AND METHODS

Collection and Processing of the Plant

The whole plant *S. nodiflora* was collected from Sengottai, Tirunelveli, Tamil Nadu, India, in the month of November, 2016. Plant material was identified and authenticated by Mr. V. Chelladurai, Retired research officer botany, C.C.R.A.S.

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Table 1: Percentage inhibition of ethanolic extract of *S. nodiflora*

Sample	Concentration	Absorbance	S-C	S-C/S	% inhibition
Ethanol	250	0.119	0.061	0.51260504	51.2605042
	500	0.126	0.068	0.53968254	53.96825397
	750	0.157	0.099	0.63057325	63.05732484
	1000	0.252	0.194	0.76984127	76.98412698
	2000	0.311	0.253	0.81350482	81.35048232
	Control	0.058			

S. nodiflora: Synedrella nodiflora

Table 2: Percentage inhibition of chloroform extract of *S. nodiflora*

Sample	Concentration	Absorbance	S-C	S-C/S	% inhibition
Chloroform	250	0.068	0.01	0.14705882	14.70588235
	500	0.085	0.027	0.31764706	31.76470588
	750	0.108	0.05	0.46296296	46.2962963
	1000	0.135	0.077	0.57037037	57.03703704
	2000	0.205	0.147	0.71707317	71.70731707
	Control	0.058			

S. nodiflora: Synedrella nodiflora

Table 3: Percentage inhibition of diclofenac sodium

Sample	Concentration	Absorbance	S-C	S-C/S	% inhibition
Diclofenac Sodium	250	0.141	0.083	0.58865248	58.86524823
	500	0.193	0.135	0.69948187	69.94818653
	750	0.289	0.231	0.79930796	79.93079585
	1000	0.348	0.29	0.83333333	83.33333333
	2000	0.476	0.418	0.87815126	87.81512605
	Control	0.058			

Govt. of India, Tirunelveli. The collected plant was free from diseases and also free from contamination of other plants. Before extraction, the plants were air dried for few days and then pulverized. The obtained powder was used for extraction procedures using different solvents.

Preparation of Extract[2]

2 kg of the powdered was cold macerated with 70% v/v of ethanol and chloroform for 48 h and 72 h, respectively. Both extracts, after the subsequent time, were concentrated to a syrupy mass in Soxhlet apparatus under reduced pressure. Then later, it was stored in a silica desiccator. After desiccation, 7% w/w yield was obtained.

Antidenaturation Assay[3]

Protein denaturation[4] assay is based on the effect of plant extract to inhibit the happening of denaturation of protein from heat.

Principle

In this study, it is the measure of an individual plant extract to inhibit the denaturation[5,6] that is possessed by heat. Whenever the heat is exposed to protein, they generally start to get degraded and collapsed. The aim of this study is to evaluate the potency of the plant extract to encumber the denaturation of protein. It was calculated in percentage and absorbance was studied at 660 nm.

Reagents Required

- Dimethylformamide (DMF).
- Phosphate buffer (0.2 M, PH 7.4).
- 1 ml of 1 mM albumin solution.
- Preparation of extracts (10, 50, 100, 200, 400, 800, and 1000 µg/ml) in DMF.
- Test solution 4 ml.

Procedure

The experiment was carried out with minor modification. The standard drug and extract was dissolved in minimum quantity

of DMF and diluted with phosphate buffer (0.2 M, PH 7.4). Final concentration of DMF in all solution was <2.5%. Different concentrations of test solution of drug were mixed with the albumin solution earlier prepared in phosphate buffer and incubated for 15 min in incubator at 37°C. Denaturation was induced by keeping the reaction mixture at 70°C in water bath for 15 min. After cooling, the turbidity was measured at 660 nm. Using the control value, the percentage of inhibition was calculated. The diclofenac sodium was used as standard drug.

The percentage inhibition of denaturation was calculated using following formula[7]:

% of inhibition = 100 × (At-Ac)/At

At(S) = O.D. of test solution.

Ac(C) = O.D. of control.

RESULTS AND DISCUSSION

Data Analysis

In this assay, we can clearly see that increase in concentration is equal to the increase in the potency. Among the concentrations used, 2000 µg/ml was found to be more effective and was relatively equal to the standard that has been used. Percentage inhibition of the standard was found to be 87.81, but the ethanolic extract has showed 81.35 which is very much close. Whereas, the chloroform extract exhibited 71.70 as its percentage inhibition at the maximum concentration.

On increasing concentrations, it exhibited different percentage inhibition. Among chloroform and ethanol extract, ethanolic extract was found to be equally effective when compared to standard drug diclofenac sodium. In antidenaturation assay, the effect of plant extract was determined on the basis of its potential to inhibit the denaturation of the protein. Denaturation was induced with the help of heat at 70°C in water bath for 15 min. Albumin was considered as a protein and with the effect of our extract to prevent the protein from heat was measured. It was read under 660 nm and calculated using appropriate formula. Percentage of inhibition of denaturation was calculated from control where no drug was added.

Tables 1-3 summarize the values that were obtained during the study with respect to the different concentrations and were tabulated accordingly. In Table 1, values of ethanolic extract were entered and it shows the best percentage for the inhibition when compared to the standard. Similarly, in Table 2, chloroform extract values were tabulated and it also shows an equally good response but not close enough to ethanolic extract. Both of them were compared with the standard drug in Table 3.

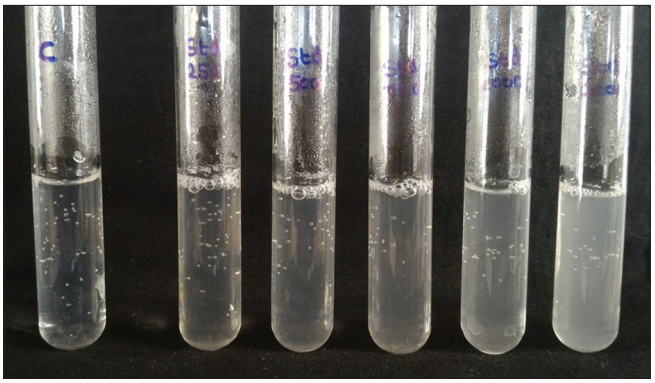


Figure 1: Testing samples of standard

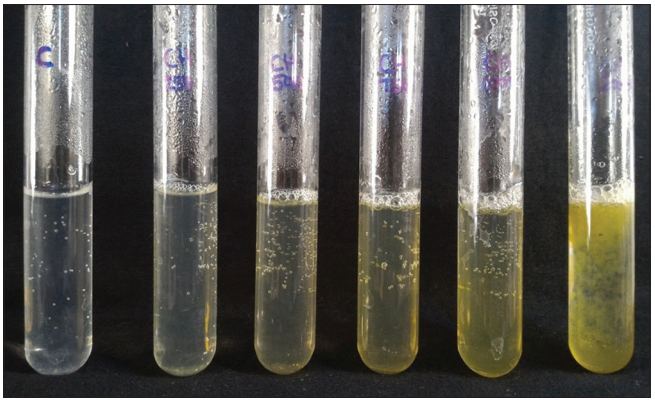


Figure 2: Testing samples of chloroform extract

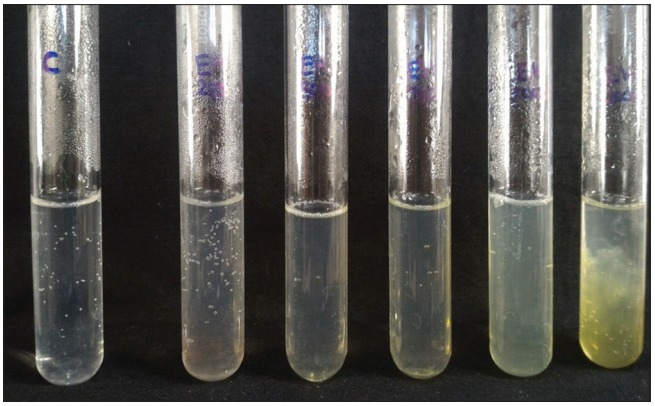
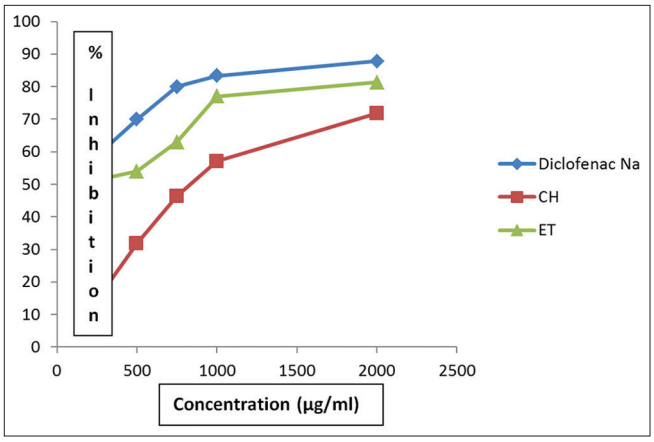


Figure 3: Testing samples of ethanolic extract

Graph 1 was also incorporated using the values to indicate the rise in activity with respect to the increase in concentration and Figures 1-3 show the samples before reading the absorbance.

CONCLUSION

Our investigation has clearly demonstrated the potential of the *S. nodiflora* plant extract to possess antiarthritic property. It may be the phenolic part that is responsible for this activity. However, further, the aim of the study is to perform *in vivo* studies to authenticate the biological activity.[8]



Graph 1: Concentration versus percentage inhibition

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