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# *IN-VITRO* ANTI-INFLAMMATORY ACTIVITY OF ETHANOLIC EXTRACT OF LEAVES AND STEM BARK OF *AGLAIA ELAEGNOIDEA*

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## ABSTRACT

The present study was aimed to rationalize the scientific basis in the uses of *Aglaia elaegnoidea* as anti-inflammatory agent. The plant is a phytotherapeutic plant used in traditional medicine that is thought to contain active ingredients that aid in the treatment and management of a variety of ailments. The protein denaturation method was used to assess the ethanolic extract of *Aglaia elaegnoidea's* leaves and stem bark's *in-vitro* anti-inflammatory activities. Inflammation and rheumatoid arthritis are both well-known effects of protein denaturation. *Aglaia elaegnoidea* leaf and stem bark extract demonstrated beneficial effects in acute anti-inflammatory property at 50, 100, 200, 400, 800, and 1600 µg/ml when compared to the standard drug Indomethacin. The plant have concentration-dependent anti-inflammatory properties. According to the results of the study, *Aglaia elaegnoidea* leaf and stem extract significantly reduced inflammation. Leaf extract has a greater potential for reducing inflammation than bark extract. The impact may have been brought on by *Aglaia elaegnoidea's* polyphenol and flavonoid concentration.

**KEYWORDS:** *Aglaia elaegnoidea*, anti-inflammatory, protein denaturation.

## INTRODUCTION

The inflammation is the local reaction of living mammalian tissue to injuries inflicted by any agent. It is a defence mechanism used by the body to stop or slow the spread of injurious agents as well as to remove any resulting necrosed cells and tissue. During acute inflammation, a number of chemicals are released from cells and plasma proteins and the total outcome, there is a rise in vascular permeability, which causes tissue edema. Histamine, PGs, eicosanoids, PAF, bradykinin, and serotonin are among the substances produced.[2],[14]

Redness, swelling, heat, discomfort and loss of tissue function are signs of inflammation inside the tissue level and are brought on by local immunological, vascular and inflammatory cell reactions to infection or damage. Vascular permeability alterations, leukocyte accumulation, recruitment and the liberation of inflammatory mediators are all significant microcirculatory events that take place throughout the inflammatory phase. Inflammation can have infectious or non-infectious etiologies. A chemical signalling cascade that drives actions aimed at mending damaged tissues is started by the organism for this reason of tissue damage. These signals cause leukocytes to go toward damaged areas from the overall circulation. These active leukocytes create cytokines, which trigger inflammatory reactions. Intracellular signalling pathways are activated by inflammatory stimuli, which then trigger the synthesis of inflammatory mediators.

Anti-inflammatory medicines are replaced with medicinal herbs since their use is linked to a multitude of negative side effects, including negative impacts on the kidney and gastrointestinal systems. The major drawback of recently developed, highly strong synthetic medications is related to their toxicity and increase of symptoms after cessation. There are several efforts to find anti-inflammatory medications from medicinal plants, therefore screening and the advent of pharmaceuticals with anti-inflammatory action are important. For humans, inflammation is a very difficult problem. Though it is true that that there are lots of anti-inflammatory medications on the market, it is thought that some of these medications are not always effective and possess negative adverse effects. In order to solve these issues, new drug molecules from plants must be discovered. Many phytochemicals found in plants are beneficial in lowering inflammation and causing fewer adverse effects.[5]

The indigenous chokkala tree, *Aglaia elaeagnoidea* (JUSS) Benth, of the Meliaceae family and is native to peninsular India. A prominent plant family that is employed and frequently grows in tropical areas is the Meliaceae. The fascinating biological processes in the various

secondary metabolite compounds found in Meliaceae plants is well documented.[11] It has attracted broad attention due to creation of phytoconstituents that show multiple biological activities. Similar to other *Aglaia* species, the rural populace uses the tree's leaves and bark for medicinal purposes.[10] The present work was aimed to study the *in-vitro* anti-inflammatory activity of leaf and stem bark of the plant *Aglaia elaegnoidea.*

## MATERIALS AND METHODS

### Plant material

Stem barks and leaves of *Aglaia elaegnoidea* were collected from Thepanpozhi village area, Tirunelveli district, Tamil Nadu during the month of March 2021. The plant was identified and authenticated by Dr. S. Mutheeswaran, Scientist, Xavier Research Foundation, Palayamkottai, Tamil Nadu, India. (Ref No: XCH-40375).

### Methods

### Extraction of plant material

The gathered plant material were thoroughly dried in the shade. To obtain a consistent coarse powder, the dried material was roughly ground and sieved (sieve # 40). In order to dispose fats that can interfere with the separation of chemical components, the dried coarse powder was defatted with petroleum ether (60–80°c) in a soxhlet extractor. The defatted marc was dried before being treated to a 72-hour extraction with 95 percent ethanol in a soxhlet equipment. The solvent was subsequently removed by distillation, the resulting extract was dried at lower pressure and the percentage yield was calculated.

W1-Weight of extract residue after solvent removal

W2-Weight of powdered sample taken for extraction

Percentage yield (gm) = W1/ W2x 100

Through phytochemical analysis, it was found that the plant included sugars, cardiac glycosides, flavonoids, alkaloids, terpinoids, quinones, phenols, coumarins and phytosteroids.[3]

## PHARMACOLOGICAL ACTIVITY

### Evaluation of *in-vitro* anti-inflammatory activity by Protein denaturation method

The extract of ethanolic of *Aglaia elaegnoidea* and the standard drug diclofenac sodium were dissolved in minimum quantity of dimethyl sulfoxide and dilution was done with phosphate buffer (0.2 M, PH 7.4). The final concentration of DMSO was less than 2.5% albumin solution (1 ml of 1 mM) in phosphate buffer was added to the test solution (4 ml) which

containing different concentrations of drug and incubation was done at 37° C for 15 minutes in incubator. The reaction mixture was kept in water bath for 15 minutes at 37° C to induce denaturation. The turbidity was measured at 660 nm after cooling for different concentrations (50 µg/ml, 100 µg/ml, 200 µg/ml, 400 µg/ml, 800 µg/ml and 1600 µg/ml). From the control the percentage of inhibition of denaturation was calculated. The standard drug used was diclofenac sodium. Experiment was performed in triplicate and average is taken.[7],[12] The amount of inhibition of denaturation was calculated by using the formula:

Percentage of inhibition = Absorbance of test- Absorbance of control/ Absorbance of test x 100

All the data were analyzed statistically by one-way ANOVA, analysis of variance and were expressed as mean ± SD

## RESULTS

### Anti-inflammatory activity

**Table: Effect of extract on percentage inhibition of albumin denaturation.**

| | Concentration (µg/ml) | | | | | |
|---|---|---|---|---|---|---|
| | **50** | **100** | **200** | **400** | **800** | **1600** |
| Diclofenac sodium | 33.14±0.95 | 44.57±0.51 | 62.69±0.23 | 75.85±0.12 | 84.14±0.05 | 88.72±0.02 |
| EELAE | 30.20±0.22 | 41.58±0.43 | 59.56±0.155 | 73.48±0.207 | 80.75±0.327 | 86.38±0.011 |
| EEBAE | 26.34±0.242 | 35.07±0.34 | 48.11±0.22 | 68.43±0.21 | 77.49±0.04 | 84.46±0.04 |

EELAE-Ethanolic extract of leaf of *Aglaia elaegnoidea*

EEBAE- Ethanolic extract of stem bark of *Aglaia elaegnoidea*

Each value is the mean standard deviation. N=6, Experimental group were compared with control. Significance of difference between groups was evaluated by using one way ANOVA. P<0.001 was considered as statistically significant.

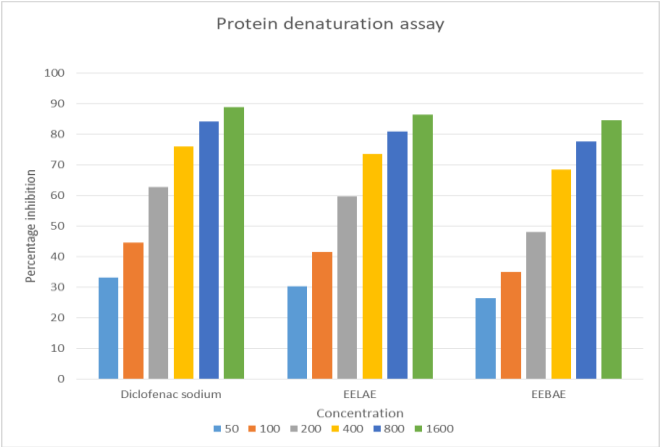


**Figure: Effect of extract on percentage inhibition of albumin denaturation.**

The different concentration of ethanol extract of leaf and bark extract of *Aglaia elaegnoidea* at 50, 100, 200, 400, 800 and 1600 µg/ml showed the inhibition of protein denaturation in a significant dose dependent manner.

## DISCUSSION

Due to their extensive biological and therapeutic activity, higher safety margins and lower costs, herbal medicines are much sought after for primary healthcare in both developed and developing nations.[15] The potential for their application in the treatment of many chronic and infectious diseases has increased the quest for phytochemicals with anti-inflammatory and anti-oxidant characteristics in recent years. The outcomes of research supported the traditional usage of *Aglaia elaegnoidea* as medicine. We specifically discovered potent anti-inflammatory properties in *Aglaia elaegnoidea's* ethanolic leaf and stem extracts.

The extractive yield of an ethanol extract of a leaf was 9.49% w/w, while that of an extract of a bark was 2.15% w/w. When compared to bark extracts, leaf extract demonstrated a high extractive yield.

In the current investigations the inhibition of protein denaturation in different concentration in the ethanolic extract of leaf and bark of *Aglaia elaegnoidea* at 50, 100, 200, 400, 800 and 1600 µg/ml produce significant concentration dependent manner. The extract showed marked anti-inflammatory effect equal to that of standard drug diclofenac sodium. $IC_{50}$ value of standard drug diclofenac sodium is 117.36, where ethanolic extract of leaf of *Aglaia elaegnoidea* is 138 and bark extract of *Aglaia elaegnoidea* was 331.65.

The findings demonstrate that the extract suppressed protein denaturation up to 86.38%, bark extract up to 84.46% and standard drug up to 88.72% at a strength of 1600 µg/ml. At a dosage of 50 µg/ml, both leaf and bark extracts significantly reduced protein denaturation. The action was dose-dependent and it's been discovered that it gets stronger as the extract's concentration gets higher. Leaf extract offer potential anti-inflammatory effect than bark extract.

Ethanolic extracts of *Aglaia elaeagnoidea* contained alkaloids, saponins, phenol, glycosides, steroids, flavonoids, amino acids, anthroquinones, catechin, coumarins, quinones and carbohydrates, according to preliminary phytochemical investigation.The potential bioactive components of the stem bark and leaf of *Aglaia elaegnoidea* were investigated. Scientific

evidence for the plant's anti-tumor, analgesic, anti-hypertensive, and anti-inflammatory qualities comes given the existence of those components in the plant extract.[3],[4]

Proteins can lose their structure through a process called protein denaturation by application of external stress or compounds and is seen as a marker for inflammatory and arthritic diseases. The ability of flavonoid-rich extract of *Aglaia elaegnoidea* of leaf and stem bark to inhibit protein denaturation also lend credence to its anti-inflammatory activity. The flavonoid-rich extract was effective in inhibiting albumin denaturation.[6],[8]

The extract has shown considerable anti-inflammatory activity. The extract has exhibited strong anti-inflammatory properties. Autoantigen synthesis can be controlled by *Aglaia elaegnoidea* and thereby it inhibits the denaturation of proteins and its effect was compared with the standard drug. The secondary metabolites which were found in previous preliminary phytochemical screening studies of the plant might be responsible for this activity.[13] Numerous flavonoids and related polyphenols considerably contribute to the anti-inflammatory action of numerous plants based on current studies. The inclusion of active substances including alkaloids, flavones, glycosides, saponins and triterpenoids may be the origin of the anti-inflammatory activity.[9],[11]

In many studies, flavonoids from plant extracts were found to exhibit anti-microbial and anti-oxidant properties. Flavonoids' presence is related to their anti-oxidant action.[1] Previous research indicated that the ethanolic extract of *Aglaia elaegnoidea's* leaves and stem bark has anti-oxidant potential.[10] The effectiveness of reducing inflammation was assessed and the ethanolic extracts of the leaf and bark revealed a favorable association between anti-oxidant and anti-inflammatory action.

## CONCLUSION

The anti-inflammatory activity could be because of the existence of phytochemical compounds. It contains anti-oxidants and anti-inflammatory substance like flavonoids and sterols which would have contributed to anti-inflammatory action. The alkaloids and saponins proven to limit the release of inflammatory mediators which causes articular swelling. Pro inflammatory mediators are inhibited by phenolic substances. All of these characteristics put forward the anti-inflammatory effect of *Aglaia elaegnoidea's* ethanol extract .The content of secondary metabolites was high in the leaves and bark of extract of ethanol. Aglaia

elaegnoidea leaf ethanolic extract has much more anti-inflammatory action than bark extract.These plant's bioactivity is known to be supported by these secondary metabolites.

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