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ANTI-ARTHRITIC POTENTIAL OF THE AERIAL PARTS OF *PEPEROMIA PELLUCIDA* (L.) KUNTH. FROM NORTH MALABAR REGION OF KERALA

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ABSTRACT

Aqueous extract of aerial parts of the plant *Peperomia pellucida* (L.) Kunth were selected for screening its anti-arthritic activity by means of *in-vitro* models. During the process of evaluation, it was found that the aqueous extract possesses a significant dose dependent anti-arthritic action which was comparable with the standard drug aspirin. Extract showed maximum inhibition of protein denaturation in both egg and bovine serum albumin at a concentration of 1000 µg/mL.

KEYWORDS: *Peperomia pellucida* (L.) Kunth, Anti-arthritic, egg albumin, bovine albumin.

INTRODUCTION

India is enriched with different type of plants. India is a land of different group of people who have their own religion, beliefs, culture, language and dialects. Thus, diverse medicinal systems have developed in this region. A number of medicinal systems also introduced here from outside and enriched in India.[1] Plant as medicine are used since thousands of years ago. Ancient man was entirely relay upon the medicinal plants for their needs. For the past 300 years ago, large number of plants were used in health care practice. Countries such as India, Africa, China, Egypt etc used traditional medicines for practice.[2]

Arthritis is defined as “Painful inflammation and stiffness of the joints”. Inflammatory arthritis and non-inflammatory arthritis are the two main categories of arthritis. The critical first stage in further diagnosing and managing a patient is to determine whether their arthritis

is inflammatory or non-inflammatory. Even though all of the characteristics may not always be present, inflammatory arthritis is typically accompanied by the classic symptoms of inflammation: pain, erythema, warmth, swelling, and loss of function. Inflammatory arthritis can have a variety of infectious and non-infectious etiologies, and it may or may not be associated to systemic features of the underlying conditions that is causing it. Inflammatory arthritis always results in joint damage and deformities if ignored.[3]

MATERIALS AND METHODS

Source of the plant

Peperomia pellucida (L.) Kunth belong to the family Piperaceae. The plant is an annual or perennial herb, usually succulent herbs and often epiphytic. The plant is used traditionally for the treatment of rheumatoid arthritis by the tribals of Wayanad district of Kerala and also the extensive literature survey of *Peperomia pellucida* (L.) Kunth. reveals its anti-arthritic activity, which is not yet been scientifically proved and established. This was the rationale in selecting this particular plant species to investigate its anti-arthritic activity.[4,5]

The aerial part of the plant *Peperomia pellucida* (L.) Kunth were collected from the waste lands of Pariyaram, a place in Kannur district, Kerala during the month of August. The botanical identity of the plant was confirmed by Dr. P. Sreeja, Assistant Professor, Department of PG Studies and Research in Botany, Sir Syed College, Taliparamba, Kannur, Kerala. A voucher specimen bearing voucher specimen number 9941 has also been deposited in the Department of PG Studies and Research in Botany, Sir Syed College, Taliparamba, Kannur, Kerala. The collected leaves were dried in shade, powdered and closely packed in air tight container.

Preparation of the Extract

The fresh aerial parts of the plants were collected, washed to remove the adhering impurities and are subjected to shade drying and then crushed, powdered and soaked in water with occasional stirring to allow the soluble compounds to dissolve into water. After maceration, the liquid is strained to obtain the aqueous extract.[6]

***In-vitro* pharmacological studies**

Anti-arthritic activity

Denaturation of proteins by egg albumin

The 5 mL of reaction mixture consists of 0.2 mL of egg albumin obtained from the fresh hen's egg, 2.8 mL of phosphate buffered saline of pH 6.4 and 2 mL of varying concentrations of aqueous extract of the *Peperomia pellucida* so that the final concentration become 100, 200, 400, 600, 800 and 1000 µg/mL. Similar volumes of distilled water served as the control. Then the mixtures were incubated at 37±2˚C in a BOD incubator for 15 minutes and then heated at 70˚C for 15 minutes. After cooling, their absorbance was measured at 660 nm. Aspirin was used as reference standard.[7] The percentage of inhibition of protein denaturation was calculated by using the following formula;

% inhibition = (Abs control - Abs test)/ (Abs control) x 100

Denaturation of proteins by bovine albumin

0.05 ml various concentrations (100,200,400, 600, 800, 1000µg /ml) of test dugs and standard drug aspirin (100, 200, 400, 600, 800, 1000µg/ml) were taken respectively and 0.45 ml (0.5% w/v BSA) mixed. The samples were incubated at 37°c for 20 minutes and the temperature was increased to keep the samples at 60°C for 3 minutes. After cooling, add 2.5 ml of phosphate buffer to the above solutions. The absorbance was measured using UV-Visible spectrophotometer at 660 nm. The control represents 100% protein denaturation. The results were compared with Aspirin.[8,9]

% inhibition = (Abs control – Abs test) / (Abs control) ×100

RESULT

Anti-arthritic activity

Denaturation of proteins by egg albumin

Table 1: Percentage inhibition of protein denaturation of aqueous extract of aerial parts of *Peperomia pellucida* using egg albumin.

Sl.no	Conc. µg/ml	Aqueous extract of *Peperomia pellucida*		Aspirin (Reference standard)	
		Absorbance at 660 nm	% Inhibition	Absorbance at 660 nm	% Inhibition
1	100	2.89	9.7	2.72	15
2	200	2.58	19.4	2.49	22.2
3	400	2.02	36.9	1.92	40
4	600	1.20	62.5	1.15	64.06
5	800	0.36	88.8	0.32	90

6	1000	0.26	92	0.12	96.3
Control		3.2			

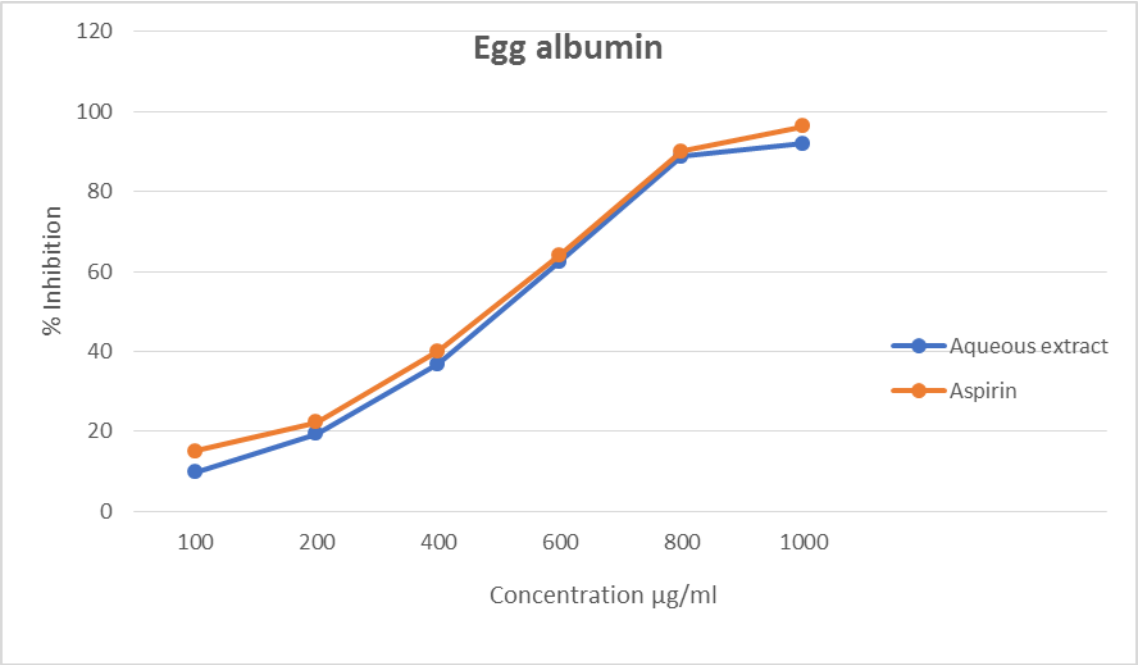

Figure 1: Percentage inhibition of protein denaturation of aqueous extract of aerial parts of *Peperomia pellucida* using egg albumin.

Denaturation of proteins by bovine albumin

Table 2: Percentage inhibition of protein denaturation of aqueous extract of aerial parts of *Peperomia pellucida* using bovine albumin.

Sl.no	Conc. µg/ml	Aqueous extract of *Peperomia pellucida*		Aspirin (Reference standard)	
		Absorbance at 660 nm	% Inhibition	Absorbance at 660 nm	% Inhibition
1	100	2.57	11.4	2.49	14.1
2	200	2.11	27.2	2.02	30.3
3	400	1.45	50	1.36	53.1
4	600	1.03	64.5	1.02	65
5	800	0.45	84.5	0.39	86.6
6	1000	0.35	88	0.29	90
Control		2.9			

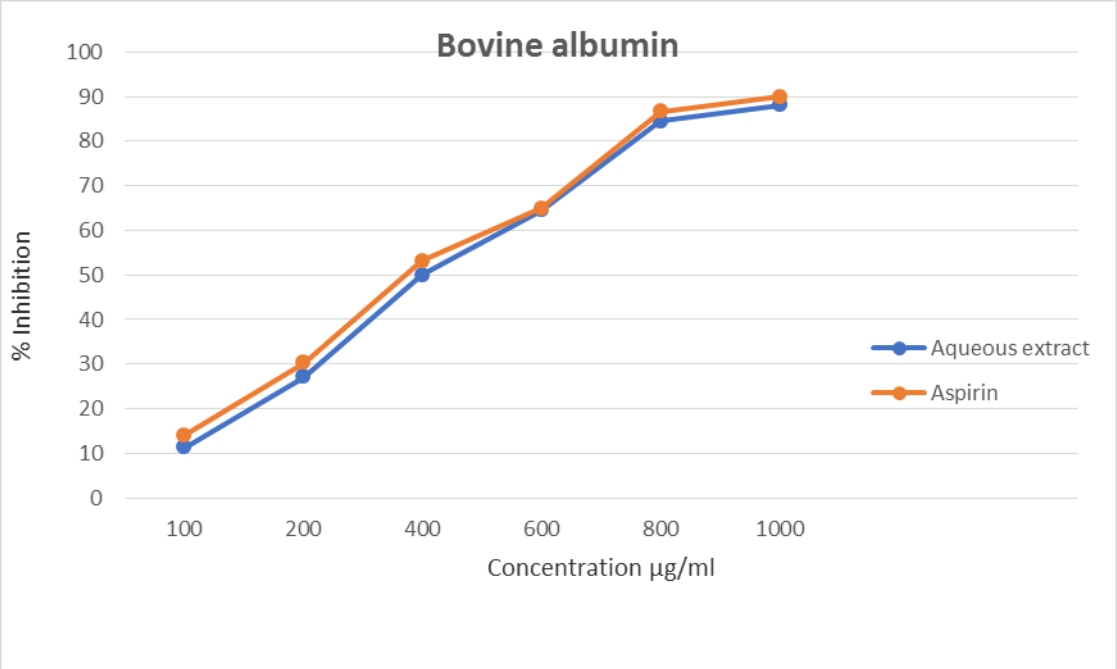

Figure 2: Percentage inhibition of protein denaturation of aqueous extract of aerial parts of *Peperomia pellucida* using bovine albumin.

DISCUSSION

Rheumatoid arthritis is a chronic inflammatory disease characterised by pain, stiffness and swelling in joints. It is an autoimmune disorder. Current treatment regimen in allopathy involves non-steroidal anti-inflammatory drugs and disease modifying anti- rheumatic drugs (NSAIDs and DMARDs). These drugs may produce many side effects. Apart from these chemical medication various natural medicines are used for the treatment of rheumatoid arthritis. Research and investigations suggest that various phytoconstituents obtained from plants have potential benefit on the treatment of rheumatoid arthritis.

Aqueous extract showed good free radical scavenging activity in Fe^{++} reduction.[10] The antioxidant activity exhibited by the aqueous extract of the plant drug could be due to the presence of flavonoids, tannins and phenolic compounds present in the plant. Preliminary phytochemical analysis also showed the presence of flavonoid, tannins and phenolic compounds.[11,12,13] The various therapeutic properties shown by the plant could be due to its antioxidant activity.

In anti-arthritic study, aqueous extract of *Peperomia pellucida* (L.) Kunth was subjected to *in-vitro* protein denaturation assay using egg albumin and bovine serum albumin. Aspirin was used as the standard drug. Results showed a maximum inhibition of protein denaturation in

both egg and bovine serum albumin at a concentration of 1000 µg/mL. At 1000 µg/mL, egg albumin showed 92 % inhibition with aqueous extract while aspirin showed 96.3 % and bovine serum albumin showed 88% arthritic protection with aqueous extract while that of aspirin produced a protection of 90 %. From the graph obtained, it can be clearly said that the response is dose-dependent.

The antiarthritic activity exhibited by the aqueous extract of the aerial parts of the plant could be due to the presence of flavonoids and phenolic compounds. Denaturation of tissue protein is one of the well documented causes of inflammatory and arthritic diseases. Production of auto antigens in certain anthric diseases may be due to *in-vivo* protein denaturation.[14,15,16] Hence the drugs which can prevent the denaturation of protein would be worth for establishing the antiarthritic and anti-inflammatory drug development. The mechanisms of denaturation probably involve alteration in electrostatic, hydrogen, hydrophobic and disulphide bonding. Most of the medicinal value of *Peperomia pellucida* is due to the presence of various secondary metabolites like Phenolic compounds, flavonoids, coumarins and anthraquinones.

CONCLUSION

It may be concluded that the aqueous extract of the aerial parts of *Peperomia pellucida* is capable of controlling the production of auto antigens due to *in-vitro* denaturation of proteins in rheumatic diseases. Further the isolation of lead molecules responsible for the antiarthritic activity has to be carried out which may be beneficial for the development of new natural antiarthritic agents with less side effects compared to synthetic molecules.

CONFLICT OF INTEREST: NIL.

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