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STUDIES ON ANTIOXIDANT AND ANTIARTHRITIC POTENTIALS OF *JATROPHA TANJORENSIS* ELLIS AND SAROJA

ARUN KP[1*] AND BRINDHA P[1]

[1]CARISM, SASTRA University, Thirumalaisamudram, Thanjavur 613401, Tamil Nadu, India. Email: *kparunscientist@gmail.com

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ABSTRACT

Jatropha tanjorensis Ellis and Saroja an hybrid of *Jatropha species* and an unique *Jatropha gossypifolia* (euphorbiaceae) is an unique plant of Tiruchirapalli and Thanjavur districts, Tamilnadu, India. This plant drug was evaluated for its antioxidant and antiarthritic potential employing chemical methods. The plant Material is collected from in and around SASTRA University campus Thanjavur, Tamilnadu, INDIA shade dried coarsely powdered, ethanolic extract prepared, and both extract and fractions containing alkaloids were subjected to antioxidant activity using DPPH assay and biochemical parameters such as, inhibition of protein denaturation, membrane stabilization, and proteinase inhibitory action were evaluated to assess the antiarthritic effect of the selected drug. Ethanol extract and fractions collected revealed 77.7% and 74.8% free radical scavenging effect respectively, even at low concentration as much as 50µg/ml and comparable to the effect of standard (BHT). Extract revealed antiarthritic effect by preventing protein denaturation, increasing membrane stabilization and by proteinase inhibition. Isolated crude alkaloid fraction also showed similar activity. Data generated were compared with standard drug. Further in depth studies on this plant can result in an eco friendly cost effective antiarthritic herbal drug with antioxidant potential contributing towards the better healthcare of human society.

Keywords: *Jatropha Tanjorensis*

INTRODUCTION

Jatropha tanjorensis Ellis and Saroja is an interspecific hybrid of *Jatropha curcas* and *Jatropha gossypifolia* (euphorbiaceae)[1], unique plant to Tiruchirapalli and Thanjavur districts of Tamilnadu, India.

Antioxidants help in preventing damages resulting due to ROS and regresses lipid peroxidation which then leads to many chronic diseases [2,3,4]. Plant based natural antioxidants are presumed to be safe. Chemical antioxidants that are used today cause potential health hazard because of low solubility and fair antioxidant activity [5,6]. This has evinced interest to substitute them with naturally occurring antioxidants. Recently there has been an emerging trend towards the development of Herbal antioxidants. Rosemary and sage marketed now as an antioxidant dietary supplement [7]. In spite of many plants being used as medicines, only a few reports on chemical composition of these plants as well as their antioxidant activity are known. In the present work, antioxidant and anti-arthritic potentials of selected medicinal plant is also evaluated chemically.

In the present work attempts are made to assess antioxidant potential of the test drug by its DPPH radical scavenging activity and anti-inflammatory potential by stabilizing HRBC membrane against hypotonic induced membrane lysis. Anti-arthritic activity was also studied using heat induced protein denaturation protective activity and by assessing the preventive potential against trypsin induces proteinase activity.

MATERIALS AND METHODS

Plant materials

Jatropha tanjorensis fresh leaves were sourced from different locations in and around SASTRA University, Thanjavur during the month of October 2011 and identified and authenticated with the help of Herbarium samples deposited at Raphinet Herbarium, St. Joseph's College, Trichy, Tamilnadu, India [8].

Extraction of plant materials

Powdered, air-dried plant materials (100g) were defatted with Petroleum ether 60-80°C for 48 hours after which the dried residue was extracted with 2 ltrs. of ethanol (CH_3CH_2OH) by cold extraction for 48 hours, the obtained ethanolic extract was filtered and evaporated under vacuum and concentrated using water-bath kept at 70°C for few hours until a semi solid paste formed which was then freeze dried using lyophilizer (Christ, Germany). The dried extract was then partitioned using $CHCl_3$ (300 ml) and aq. HCl (2%, 500 ml). The $CHCl_3$ layer was then further extracted with aq. HCl (2x300 ml) until the last extractions showed a negative reaction toward Dragendorf's reagent. The acidic solution basified with NH_4OH to pH 11 and extracted with $CHCl_3$ resulting in crude alkaloid fraction (600 mg).

Determination of antioxidant activity (Scavenging Activity of DPPH Radical)

The free radical scavenging assay was done to determine the antioxidant activity of the investigated extract as described by Brand et. al., (1995)[9] using ethanolic extract and crude alkaloid. The radical scavenging activity was calculated from the equation:

$$\% \text{ of radical scavenging activity} = Abs_{control} - Abs_{sample}/Abs_{control} \times 100$$

Phytochemical screening of the Ethanolic extracts

Phytochemical screening was carried out as per standard textual procedures[10].

Anti Arthritic activity:

Inhibition of protein denaturation

Protein denaturation was evaluated using standard published procedures [11].

Effect on Membrane Stabilization (Anti Inflammatory activity)

Anti-inflammatory activity was measured following methods described in literature[12, 13].

Proteinase inhibitory activity

Proteinase inhibitory activity was measured using published methods [12, 13].

RESULTS AND DISCUSSION

With a view to develop an anti-inflammatory, anti-arthritic and antioxidant agents of plant origin a common plant available in and around Thanjavur District, *Jatropha tanjorensis* belonging to Euphorbiaceae is selected. After proper identification and authentication the plant material was extracted with ethanol and subjected to targeted activities.

Free Radical scavenging activity

The ethanol extracts and fractions revealed encouraging results even at low concentrations (Table 1) comparable to the standard drug used. The alkaloid fraction showed IC_{50}=10.19µg/ml which is even superior to standard antioxidant BHT (IC_{50}=20.15µg/ml), crude ethanol extract showed IC_{50} value of 49.66µg/ml.

Phytochemical screening

Ethanolic extract revealed the presence of flavonoids, terpenoids, tannins, volatile oils, and alkaloids, where as crude alkaloid containing fraction answered positively for terpenoids indicating the presence of mixtures of alkaloids and terpenoids (Table 2).

Table 1: Antioxidative efficacy of *Jatropha tanjorensis* leaves extract

Extracts	Radical scavenging activity in %								
Conc.	Blank	5 (µg/ml)	10	50	100	250 (µg/ml)	500	750	1000
Crude ethanolic extract	7.8 ± 0.09	36.5 ± 2.7	58.1 ± 1.1	77.7 ± 1.6	87.6 ± 0.4	95.3 ± 1.0	96.6 ± 0.3	97.6 ± 0.2	97.8 ± 0.2
Crude alkaloid fraction	7.8 ± 0.09	24.6 ± 2.1	41.7 ± 3.4	74.8 ± 1.3	85.9 ± 1.0	93.5 ± 0.7	95.9 ± 0.4	97.2 ± 0.2	97.6 ± 0.1

n=3, mean ± standard deviation.

Table 2: Qualitative Phytochemical analysis of *Jatropa tanjorensis* leaf extract

Constituents	Ethanol	Crude Alkaloid fraction
Alkaloids	+	+
Sugars	+	-
Flavonoids	+	-
Glycosides	-	-
Proteins	-	-
Amino acids	-	-
Saponins	-	-
Steroids	+	-
Tannins	-	-
Coumarins	-	-
Fixed oils	+	-
Resins	-	-
Lipids	-	-
Terpenoids	+	+

+ Presence; – Absent

Anti Arthritic

Inhibition of Protein denaturation

From the results of the present study it is inferred that *Jatropha tanjorensis* is capabe of inhibiting protein denaturation and thereby controlling the production of auto-antigens.

Anti-inflammatory activity

The effect of plant extracts on stabilization of RBC membrane may be considered as a factor stabilizing lysosomal membrane (Table 3). The results obtained suggested that the test drug possessed good membrane stabilization potential.

Proteinase inhibitory potential

Proteinases are one of the causative agents for arthritic reactions. Neutral serine proteinases of lysosomal granules present inside the neutrophils are considered as rich sources of proteinases. *Jatropha tanjorensis* extract and fractions showed considerable level of protection by inhibiting proteinases (Table 3). This justifies the usefulness of *Jatropha tanjorensis* in the management and treatment of inflammation associated diseases like arthritis.

From the results obtained in the present work, it may be concluded that herb *Jatropha tanjorensis* possess significant anti-arthritic activity. Further clinical studies may reveal its potency and its safety in arthritic patients.

Table 3: Anti arthritic and Anti-inflammatory activity of *Jatropha tanjorensis* leaves extract.

Treatment		Inhibition of Protein Denaturation (%)	Membrane Stabilization	Proteinase Inhibition
Crude Ethanol Extract	100µg/ml	73.4 ± 0.5	76.2 ±2.1	77.9 ±2.9
	250µg/ml	78.8 ±2.6	82.8 ±0.7	81.6 ±0.5
Crude Alkaloid Fraction	100µg/ml	69.7 ±3.9	74.8 ±1.9	73.0 ±2.4
	250µg/ml	76.3 ±0.4	82.2 ±0.7	78.1 ±2.4
Positive Control	250µg/ml	19.5 ±2.6	19.2 ±4.6	20.8 ±3.0

n=3, mean ± standard deviation.

CONCLUSION

The present study is the first report that proved the anti arthritic and antioxidant potentials of *Jatropha tanjorensis* scientifically. This provides an opportunity of using this medicinal plant as a promising source of natural antioxidant and anti-inflammatory agent. Further indepth studies can results in the development of new natural bioactive compounds for the management of arthritis.

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