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Research/Review

In Vivo Evaluation Of Anti-Arthritic Activity In The Fruits Of *Phyllanthus Acidus* (L.) Using Albino Rats.

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	Abstract
Published on: 24 May 2024	<p>AIM: This study aimed to evaluate the Anti-arthritic activity of the alcoholic extract of <i>Phyllanthus acidus</i>(L.) fruits in albino rats using suitable animal models.</p> <p>METHODS: the <i>Phyllanthus acidus</i>(L.) plant was collected and authenticated. The fruits were dried for ten days subjected to get coarse powder. The coarse powder subjected to Soxhlet apparatus by using various solvents. The phytochemical analysis was conducted using various tests. The arthritic activity was induced by using Freund's adjuvant injection. The paw volume was assessed using plethysmometer.</p> <p>RESULTS: the alcoholic extract of <i>Phyllanthus acidus</i>(L.) showed anti-arthritic activity in rats. The arthritic activity induced by Freund's adjuvant injection was reduced in the treatment group, as observed in the plethysmometer.</p> <p>CONCLUSION: the findings of the study suggest that the alcoholic extract of <i>Phyllanthus acidus</i>(L.) fruits possesses anti-arthritic activity, but in less and could be a therapeutic agent for the treatment of arthritis disease. Further studies required to explore the mechanism of action and safety of this extract.</p>
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	<p>Keywords: <i>Phyllanthus acidus</i>(L.), anti-arthritic activity, extract, plethysmometer, Freund's adjuvant injection.</p>

INTRODUCTION

Arthritis is an auto immune disorder characterized by pain, swelling and stiffness; it is a form of joint disorder that involves inflammation in one or more joints. ^[1]There are over 100 different forms of arthritis. ^[2]Arthritis is extremely common. Experts estimate that more than one third of Americans have some degree of arthritis in their joints. ^[3] Arthritis is the most common cause of disability in the USA. More than 20 million individuals with arthritis have severe limitations in function on a daily basis. ^[4] Diagnosis is made by clinical

examination from an appropriate health professional, and may be supported by other tests such as radiology and blood tests, depending on the type of suspected arthritis.^[5] Arthritis are classified as some types such as Osteoarthritis, Rheumatoid arthritis, Lupus, Gout. Osteoarthritis is the most common form of arthritis. ^[6] Rheumatoid arthritis (RA) is a disorder in which the body's own immune system starts to attack body tissues. In rheumatoid arthritis, most damage occurs to the joint lining and cartilage which eventually results in erosion of two opposing bones. Lupus is a common collagen vascular disorder that can be present with severe arthritis. Other features of lupus include a skin rash, extremephtosensitivity, hair loss, kidney problems, lung fibrosis and constant joint pain.^[7] Gout is caused by deposition of uric acid crystals in the joint, causing inflammation. There is also an uncommon form of gouty arthritis caused by the formation of rhomboid crystals of calcium pyrophosphate known as pseudo gout. There are several types of medications that are used for the treatment of arthritis. Treatment typically begins with medications that have the fewest side effects with further medications being added if insufficiently effective.^[8]

METHODS

Collection and authentication of plant

The *phyllanthus acidus* plant was collected from the village of Narayanapuram, Dharmapuri district, Tamil Nadu and the specimen was submitted to the Sri Vijay Vidyalyaya College of Arts and Science, Dharmapuri, Tamil Nadu, with the authentication certificate.

Drying and grinding

Fruits of *Phyllanthus acidus* (L.) were collected, cut into small pieces and dried under shade morning time for 10 days. The dried parts were passed through sieve (coarse 40) this powder was used for the preparation of solvent extraction and 500 gram of powder was extracted by maceration technique.

Extraction of Plant Material

Fruits material was dried in the shade for ten days. Then shade dried plant was subjected to get coarse powder. The coarse powders were subjected to Soxhlet apparatus by using various solvent according to their polarity.

Phytochemical analysis

Various phytochemical tests were conducted to find the various phytochemical constituents present in the extract. The alcoholic extract of the fruits of *phyllanthus acidus* was used for the presence of phytochemical constituents such as alkaloids, terpenoids, flavonoids, steroids, anthroquinones, phenols, saponins, tanins, carbohydrates, oils and resins.

Animals

150-200 gm of male albino rats were used for this investigation. Six animals per group per cage were kept in a controlled environmental condition. The animals were fed with standard diet and water *ad libitum*.

Pharmacological screening

Freund's Adjuvant Induced Arthritis

The male albino rats were divided into four groups. They are control, standard, drug treated (two groups low and high dose). Group I served as the control group and received 1% CMC (1 ml/1kg body weight). Group II was the standard group and received diclofenac sodium 15 mg/kg suspended in CMC. Group III was the first test group receiving ethanolic extract at dose of 400 mg/kg orally. The last 4th group was given ethanolic extract at dose of 800 mg/kg orally. Rats were injected with 0.1 ml of Freund's complete adjuvant (FCA) into the planter region of the left hind paw. The paw volumes of both the hind paws were measured using a plethysmometer and body weight was recorded on the day of adjuvant injection. The methanolic extract of the aerial parts of the plant (400 and 800 mg/kg) and diclofenac sodium (15 mg/kg) doses were administered orally for 14 days from the day of Freund's adjuvant injection. The changes in the paw volume were measured on various days up to 21 days following Freund's adjuvant injection. The change in the inflammatory reaction was measured by using mercury plethysmometer on 1st, 7th, 14th and 21st day from the day of adjuvant injection. The animals were observed on 1st, 7th, 14th and 21st day from the day of adjuvant injection.^[9]

RESULTS

Phytochemical analysis of alcoholic extract of *phyllanthus acidus*

The phytochemical analysis showing the presence of alkaloids, flavonoids, phenols, steroids, terpenoids, oils and resins.

Table 1: Phytochemical analysis of alcoholic extract of *phyllanthus acidus*

Phytochemical tests Phytochemicals	Extract (<i>Phyllanthus acidus</i> (L.))	
	Fruit	
Ethanol	+	
Alkaloids	+	
Flavonoids	+	
Steroids	+	
Terpenoids	+	
Anthraquinones	-	
Phenols	+	
Saponin	-	
Tanin	-	
Carbohydrates	-	
Oils & Resins	+	

Table 2: Effect of different Groups of Freund's adjuvant induced arthritis

Groups	Paw measurements(ml)				
	Si.no	1 st Day	7 th Day	14 th Day	21 th Day
Group1 (control group)	1.	0.98	1.65	1.46	1.18
	2.	0.92	1.62	1.49	1.16
	3.	0.96	1.66	1.42	1.17
	4.	0.95	1.69	1.41	1.12
	5.	0.93	1.69	1.43	1.20
	6.	0.97	1.63	1.47	1.12
	avg	0.95	1.66	1.45	1.16
Group 2 (standard group)	1.	0.64	0.82	0.73	0.35
	2.	0.69	0.76	0.76	0.35
	3.	0.66	0.85	0.69	0.39
	4.	0.59	0.75	0.77	0.32
	5.	0.61	0.81	0.72	0.34
	6.	0.69	0.79	0.76	0.36
	avg	0.65	0.80	0.74	0.35
Group 3 (drug treated 400 mg/kg)	1.	0.79	1.24	1.00	0.94
	2.	0.82	1.26	1.06	0.90
	3.	0.86	1.29	1.07	0.99
	4.	0.83	1.22	1.09	0.92
	5.	0.86	1.23	1.10	0.92
	6.	0.80	1.27	1.02	0.96
	Avg	0.83	1.25	1.06	0.94
Group 4 (drug treated 800 mg/kg)	1.	0.80	1.09	0.91	0.76
	2.	0.83	1.04	0.94	0.79
	3.	0.77	1.05	0.92	0.73
	4.	0.82	1.02	0.96	0.78
	5.	0.78	1.08	0.90	0.74
	6.	0.79	1.02	0.96	0.75
	avg	0.80	1.05	0.93	0.76

Table No: 3 % Of Inhibition Of Drugs

GROUPS	TIME INTERVEL			
	DAY 1	DAY 7	DAY 14	DAY 21
GROUP 1	-	-	-	-
GROUP2	31.58%	51.81%	48.97%	69.83%
GROUP3	12.63%	24.70%	26.90%	18.97%
GROUP4	15.79%	36.75%	35.86%	34.48%

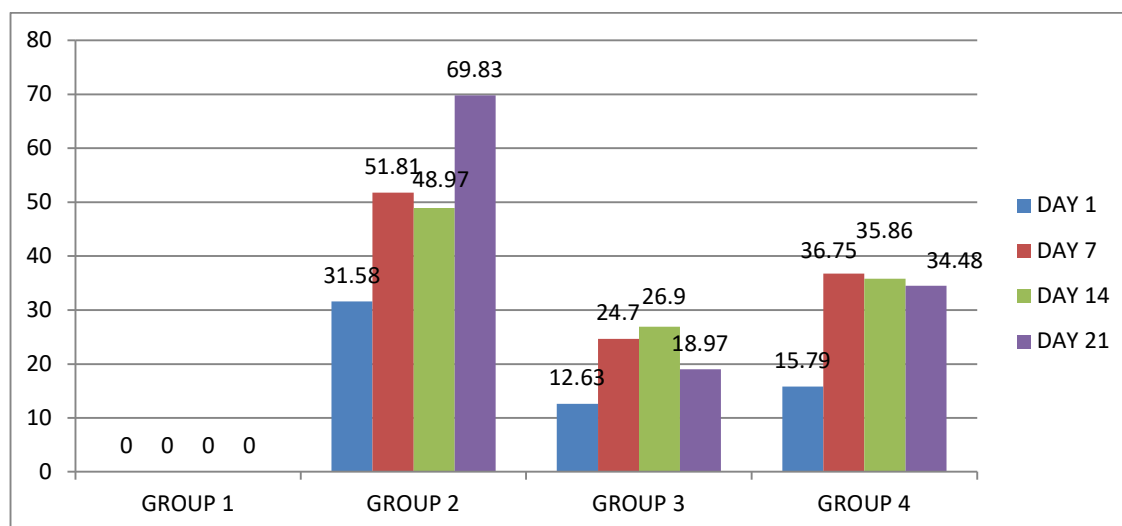


Fig 1: % Of Inhibition Of Drugs

The collected data was subjected to appropriate statistical tests by using percentage calculation to find variation manually.

DISCUSSION

In the present study the Freund's adjuvants induced arthritis test was selected for in vivo assessment of anti-arthritic property of ethanolic extract of *Phyllanthus acidus* (L.) The concentrations of compound *Phyllanthus acidus* (L.) ranges 400mg/kg and 800mg/kg were tested for its Freund's adjuvants induced arthritis method. The results were clearly demonstrated that the compound *Phyllanthus acidus* (L.) have anti-arthritic activity.

Maximum percentage of Freund's adjuvants induced arthritis 34.48% was observed from ethanol extracts concentration of 800mg/kg. Diclofenac sodium, a standard anti-inflammatory drug showed the maximum inhibition 69.83% at the concentration of 15mg/kg.

CONCLUSION

Phyllanthus acidus (L.) is a valuable medicinal plant which has been valuable for centuries in ayurvedic medicine. Phytochemical analysis of *Phyllanthus acidus* (L.) of fruits extracts revealed the presence of various bio chemical compounds such as flavonoids, alkaloids, amino acids, volatile oil, fixed oils, proteins, steroids and triterpenoids. Since flavonoids have remarkable anti-arthritic activity and anti-inflammatory activity as well. Our present work aim is to evaluate the in vivo anti - arthritic activity of *Phyllanthus acidus* (L.) by Freund's adjuvants induced arthritis is a well-documented cause of inflammation and rheumatoid arthritis. The data of our studies suggests that *Phyllanthus acidus* (L.) of fruits extract showed significant anti- arthritic activity but in less % of activity. Therefore our studies support the isolation and active constituents of *Phyllanthus acidus* (L.) support in treating arthritis disease.

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Conflict of interest statement

I declare that we have no conflict of interest.

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