

## Evaluation of Antirheumatic Activity of Petroleum Ether Extract of *Syzygium cumini* Stem Bark in Rats

R. V. VENKATARAMANAN\*, V. CHITRA, D. RAJU, M. SUMITHRA,  
MAID PRIYANKA PRAKASH and HARIKA GOSWAMI

Department of Pharmacology, SRM College of Pharmacy,  
SRM College of Pharmacy, Kattankulathur, India.

\*Corresponding author E-mail: ramananvetri@gmail.com

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### ABSTRACT

*Syzygium cumini* is a folklore plant traditionally indicated to treat various inflammatory disorders. In this study anti rheumatic activity of oral administration of petroleum ether extract of *Syzygium cumini* stem bark at the doses of 50,500,750,1000, mg/kg on complete Freund's complete adjuvant induced arthritis has been studied in rats. The treatment is assessed by measuring the paw volume, body weight, arthritic index, and rheumatoid factor. The investigated result showed that the extract inhibited the CFA induced arthritis in dose dependent manner and this effect was more significant ( $P < 0.05$ ) with 1000mg/kg dose. The standard drugs Indomethacin (10mg/kg), dexamethasone (0.1mg/kg) also produce significant anti rheumatic effect in rats and is compared with test drug. The result suggest that the petroleum ether extract of *Syzygium cumini* stem bark produced significant anti-rheumatic effect.

**Key words:** *Syzygium cumini*, Indomethacin, dexamethasone, Freund's complete adjuvant.

### INTRODUCTION

Arthritis is a form of joint disorder that involves inflammation of one or more joints<sup>1-2</sup>. Rheumatoid arthritis (RA) is a systemic autoimmune multisystem disease characterized by joint inflammation, morning stiffness, and destruction of articular tissues and restricted joint movement<sup>3-5</sup>. Arthritis can cause severe disability and ultimately affects a person's ability to carry out normal tasks, restricts the quality of life and causes premature death<sup>6</sup>. Any part of the body can become inflamed or painful from arthritis. Arthritis is the most common inflammatory disorders affecting approximately 0.5-1.0% of the global adult population, with female being affected three times more than males<sup>7-9</sup>. RA still remains a formidable disease, producing severe crippling deformities and functional disabilities and cartilage destruction and commonly leads to significant disability, caused by no. of pro-inflammatory molecules released by macrophages

including reactive oxygen species and eicosanoids such as, cytokines, leukotrienes, and prostaglandin. The regulation of these mediators secreted by macrophages and other immune cells<sup>10</sup> and modulation of arachidonic acid metabolism by inhibiting enzymes like Cox and LOX are the potential target for chronic inflammatory conditions<sup>11</sup>.

The prevalence of rheumatoid arthritis varies between 0.3% and 1% worldwide and is more in developed countries. It mainly affects women than man (3:1). Rheumatoid arthritis is a chronic systemic inflammatory illness with a prevalence of approximately 0.75% in India<sup>12</sup>.

*Syzygium cumini* (L) is an important medicinal plant used for treatment of diabetes, ulcers, some pharmacological activity like anti-allergic, gastro protective, anti-oxidant, anti-fertility, anti-viral

## MATERIALS AND METHODS

### Plant materials

The stem bark of *Syzygium cumini* was collected from natural habit and around Hyderabad. The plant was authenticated by Prof. P Jayaraman, PARC Chennai. Reg no of Certificate: PARC/2010/652.

### Preparation of extract

The collected stem bark of *Syzygium cumini* was cleaned, dried in the shade and cut in to coarse powder and extracted with petroleum ether as solvent. The extraction of petroleum ethers extract is done by using soxhlet apparatus by hot percolation method. The extraction is carried with 2 litres of solvent for a period of 72 hours. At the end of extraction the yields was in brown oil and it was concentrated in vacuum at 40°C using a rotary evaporator and the residues was stored in a freezer at -80°C for further tests.

### Animals

Male wistar rats of approximately the same age, weighing about 150-200g was selected for the study. They were housed in the polypropylene cages and were given feed with standard diet and water *ad libitum*. The study has got approved from IAEC (Institutional Animal Ethical Committee) of CPCSEA.

### Acute toxicity studies

Acute toxicity study was performed for petroleum ether extract according to acute toxic classic method as per OECD guidelines.

### Induction of arthritis<sup>13</sup>

Arthritis was induced in all the animals of each group by an intra-dermal injection of complete Freund's adjuvant suspension of 0.1 ml in the plantar surface of left hind paw which contains 1.0 mg dry heat killed *Mycobacterium tuberculosis* per millilitre sterile paraffin oil. Acute inflammation in the form of paw edema was produced after injecting CFA suspension.

## RESULT AND DISCUSSION

Freund's complete adjuvant induced arthritis model are extensively used to study the pathogenesis of rheumatoid arthritis for testing therapeutics. One of the reasons for the wide utilization of this model is due to strong correlation between efficacy of therapeutic agents in the model and in rheumatoid arthritis in human and it is characterized by very rapid erosive disease. In adjuvant arthritis bacterial peptidoglycan and muramyl dipeptide are responsible for arthritis induction. It occurs through cell mediated autoimmunity by structural mimicry between mycobacterial and cartilage proteoglycans in rats.

The present study was designed to evaluate the anti-arthritic activity of Petroleum ether extract of *Syzygium cumini* which is very well reported to contain betulinic acid, beta sitosterol, friedelin, epi-friedelinol, gallic acid.

In the present study involves the release of number of mediators like cytokines, granulocyte monocyte colony stimulating factor, interferons. These mediators are responsible for the pain,

**Table 1: Effect of drugs on paw volume on different days of observation**

Group	Mean paw volume(ml) on different Days						
	1	3	5	7	9	13	21
Control	0.9±0.06	0.95±0.10	0.9±0.06	0.85±0.10	0.8±0.08	0.7±0.06	0.7±0.06
Dexamethasone	0.95±0.05	0.75±0.05	0.55±0.05	0.45±0.10	0.35±0.05	0.15±0.05	0.1±0.06
Indomethacin	0.85±0.05	0.65±0.05	0.45±0.13	0.3±0.06	0.2±0.0	0.1±0.06	0.05±0.05
SCPE 50	0.95±0.10	1.05±0.05	1±0.08	0.85±0.05	0.8±0.08	0.75±0.1	0.7±0.10
SCPE500	0.9±0.06	0.95±0.05	0.9±0.06	0.85±0.05	0.8±0.00	0.65±0.05	0.6±0.00
SCPE 750	0.8±0.00	0.95±0.05	0.9±0.06	0.7±0.06	0.5±0.06	0.35±0.05	0.3±0.006
SCPE 1000	0.75±0.05	0.85±0.05	0.75±0.05	0.055±0.05	0.35±0.05	0.2±0.05	0.15±0.05

destruction of bone and cartilage that can lead severe disability. Paw swelling is one of the major factors in assessing the degree of inflammation and therapeutic efficacy of the drugs.

The pain, inflammation and swelling of joints in arthritis can be greatly reduced by different compounds of *Syzygium cumini*. In contrast to the traditional NSAIDs which are reported to produce gastric ulceration and bleeding. But this plant has been reported to have gastro protective effect.

From the previous studies bark, seed leaves extract of this plant are having anti-inflammatory, antidiabetic and antibacterial activity.

Change in body weight has also been used to assess the course of disease and the response to the therapy of anti-inflammatory drugs. Adjuvant arthritis is characterized by reduced weight loss and the body weight loss is associated with increased production of pro inflammatory cytokines such as TNF-alpha and IL-1. Test drug showed significance increase the body weight as that of the vehicle control group.

In the present study the test extract in the doses of 750, and 1000mg/kg had anti-inflammatory effect as it decreased the paw edema significantly. Results of this study are in agreement to the available literatures.

**Table 2: Effect of Drugs on body weight**

Group	Changes in the body weight						
	1	3	5	7	9	13	21
Control	0	0	-6	-10	-12.5	-18.5	20
Dexamethasone	0	0	-3.75	-4.75	-5.25	-7	-8.25
Indomethacin	0	-5	-6.5	-8.25	-6.25	-6.25	-8
SCPE 50	0	-3.75	-6.25	-7.5	-13.75	-15.5	-17.25
SCPE500	0	-2.5	-1.25	0	-2.25	-5.25	-10.05
SCPE 750	0	0	-1.25	3.75	-7.5	-9	0.3±0.006
SCPE 1000	0	-1.25	-2.5	-3.75	-5	-6.75	-8.75

**Table 3: Effect of drugs on arthritic index**

	Control	Dex	Indo	SCPE50	SCPE500	SCPE750	SCPE1000
Mean	5	2.25	4.25	5.5	4.75	4.25	3.5
SD	0.816	0.957	0.957	0.577	0.957	1.258	0.577
SE	0.408	0.478	0.478	0.288	0.478	0.629	0.2088
P Value		<0.05					<0.05

### CONCLUSION

The present study was designed to evaluate the Anti rheumatic activity of petroleum ether extract of *Syzygium cumini* stem bark.

The petroleum ether extract of *Syzygium cumini* bark had a better effect on controlling CFA induced rheumatoid arthritis.

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