Evaluation of Anti-inflammatory Action of Acacia farnesiana Fruit In Carrageenan induced Rat Paw Inflammation Model

Sandeep Kumar Yadav[1]*, Ms Diksha Singh[2], Rajiv Shukla[3]

[1]Research Scholar (Pharmacology), SHEAT College of Pharmacy, Varanasi
[2]Assistant Professor (Pharmacology), SHEAT College of Pharmacy, Varanasi
[3]Professor (Director), SHEAT College of Pharmacy, Varanasi
Department of Pharmacology, Sarswati Higher Education & Technical College of Pharmacy, Dr. A. P. J. Abdul Kalam Technical University, Lucknow, Uttar Pradesh, India, 226031.

Abstract-

Most allopathic treatments for inflammation fail to alleviate the underlying cause of this serious health issue. Traditional medicine has long made use of the pain-relieving properties of the Acacia farnesiana shrub. Nevertheless, the validity of such assertions has not been proven through scientific or experimental methods. Thus, the purpose of this research is to determine whether the fruit extract of Acacia farnesiana has any anti-inflammatory effects in living organisms using rat models.The carrageenan-induced paw-edema model was used to investigate the anti-inflammatory profile following the effective extraction of A. farnesiana fruit with solvents such as petroleum ether, chloroform, and ethanol. A. farnesiana fruit extract inhibited carrageenan-induced paw oedema via a dose-dependent anti-inflammatory mechanism. At 400 mg/kg, the ethanolic extract of A. farnesiana showed a notable anti-inflammatory activity. All things considered, the current study's findings provide credence to the long-standing belief that the ethanolic fruit extract of Acacia farnesiana can alleviate inflammation.

Keywords- *Acacia farnesiana,* Anti-inflammatory, Carrageenan, Diclofenac.

Introduction-

Inflammation occurs when the body reacts to a harmful stimuli. There are many other types of harmful substances that might trigger it, including infections, antibodies, or physical traumas. Surviving environmental infections and injuries requires the capacity to create an inflammatory response; yet, in some cases and conditions, this reaction may be overblown and prolonged without obvious benefit, and in rare cases, it can even have significant negative repercussions [1].

Mechanism of anti-inflammatory drugs-

The majority of nonsteroidal anti-inflammatory drugs (NSAIDs) inhibit cyclooxygenase-1 and -2 nonselectively. Many believe that blocking PG synthesis at the injury site is the primary way that NSAIDs reduce inflammation [2]. The role of PGs as an inflammatory mediator is limited. The generation of other mediators such as LTs, PAF, cytokines, etc. is unaffected by inhibiting COX. There are several potential anti-inflammatory targets since inflammation is the end outcome of a complex cascade of events involving numerous vasoactive, chemotactic, and proliferative components. Additional growth factors that NSAIDs may influence include IL-6, lymphocyte transformation factors, and GMCSF. One possible mechanism by which NSAIDs exert their effects is the stabilisation of the leukocyte lysosomal membrane, which in turn inhibits the activity of certain kinins [3] .

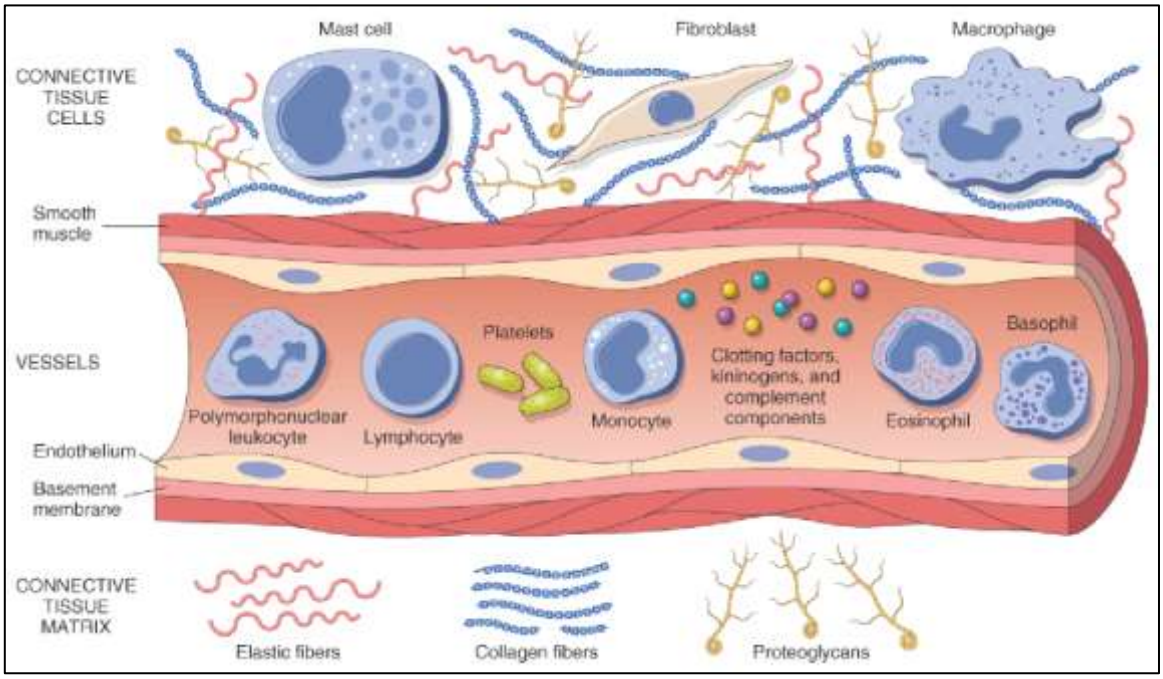

Figure 1- The components of acute and chronic inflammatory responses.

Table 1: Features Acute and chronic inflammation

Acute inflammation	Chronic inflammation
Early onset (sec. – min)	Later onset (days)
Short duration (min. – days)	Longer duration (weeks – years)
Fluid exudation (edema(	Inducing B.V. proliferation and scarring
Polymorph nuclear leukocyte emigration .(neutrophils)	Involving lymphocytes , macrophages and plasma cell infiltration

Acacia farnesiana-

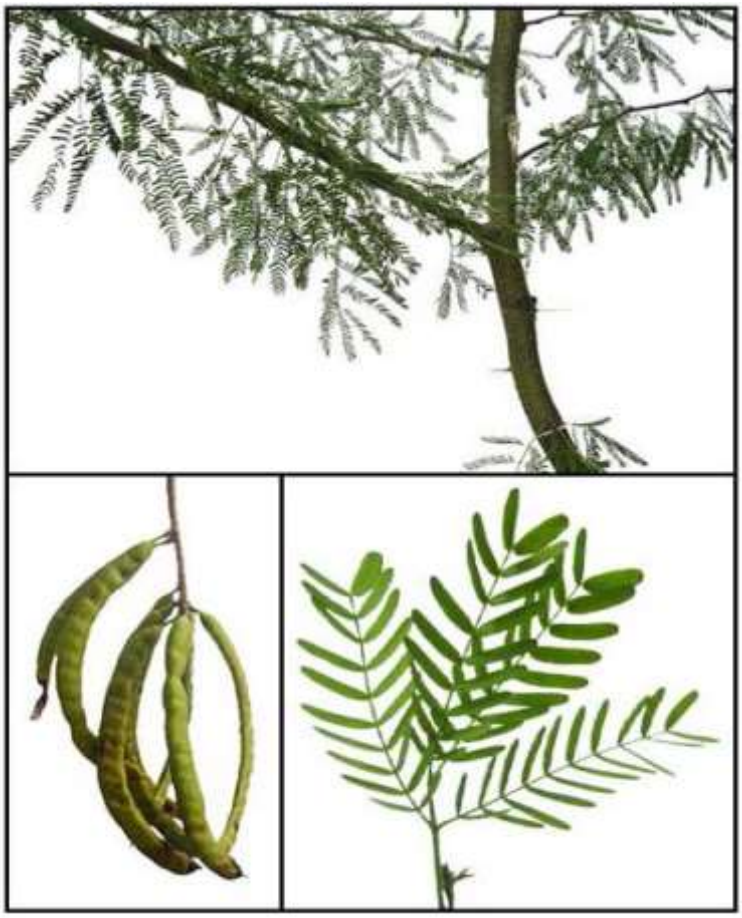

Fig.2: *Acacia farnesiana* tree, pod & leaves.

Synonyms-

Acacia acicularis Wild., Acacia densiflora (Small) Cory, Acacia ferox M.Martens & Galeotti, Acacia indica (Poir.) Desv.,Acacia lenticellata F.Muell., Acacia minuta (M.E.Jones) R.M.Beauch., Acacia pedunculata Willd., Acacia smallii Isely,Farnesia odora Gasp., Farnesiana odora Gasp., Mimosa acicularis Poir., Mimosa farnesiana L., Mimosa indica Poir,Mimosa suaveolens Salisb., Pithecellobium acuminatum M.E.Jones,Pithecellobium minutum M.E.Jones, Poponaxfarnesiana (L.) Raf. Vachellia densiflora Small, Vachelia farnesiana (L.)Wight & Arn [4].

Geographical distribution-

Northern tropical America is thought to be the place of origin for Acacia farnesiana, and it is also home to some of its closest relatives.Because of its fragrant flowers, this Acacia species has been transported to every tropical and subtropical region on Earth, making it the most spread Acacia species. Since then, it has become a common weed in many places, including parts of the southern US and Australia, where it has become a naturalised plant. It was the Spaniards that first imported Malesia to the Philippines from Mexico. All over Southeast Asia, it is now being recorded. Its current cultivation in Southern France is based on its initial European cultivation in the 1611 Hortus Farnesianus in Italy [5].

Botanical Description-

Native to the tropical regions of the Indian subcontinent, the medicinal Acacia farnesiana flourishes in the sandy riverbank soils of northern India and southern Tamil Nadu. Thorny bush or small tree, 8 m tall; bark light brown, rough; branches glabrous or nearly, purplish to grey, with very small glands; stipules spinescent, usually short, up to 1.8 cm long, rarely longer, never inflated; leaves twice pinnate, with a small gland on petiole and sometimes one on the rachis near top of pinnae; pinnae 2–8 pairs, leaflets 10–12 pairs, minute, 2–7 mm long, 0.75–1.75 mm wide, glabrous, leathery; flowers in axillary pedunculate heads, calyx and corolla glabrous, scented; pod indehiscent, straight or curved, 4–7.5 cm long, about 1.5 cm wide, subterete and turgid, dark brown to blackish, glabrous, finely longitudinally striate, pointed at both ends; seeds chestnut-brown, in 2 rows, embedded in a dry spongy tissue, 7–8 mm long, ca 5.5 mm broad, smooth, elliptic, thick, Sweet acacia, mimosa shrub, and cassie flower are some of its alternate names.

Materials and Methods-

- **Plants and Chemicals Required-**

  All the ingredients used in this study were of standard pharmaceutical ranking. *Acacia farnesiana* are obtained from the local fields of Uttar Pradesh. , Ethanol, Diclofenac, Carrageenan, Normal saline solution, Petroleum Ether, Chloroform were obtained from the SHEAT College of Pharmacy and of analytical reagent ranking.

- **Apparatus Required-**

  Glass Rod, Water bath, conical flask, Round bottom flask, Condensor, Filter Paper, Test tube, Test tube holder, Pipette, Sub-planter Injection, Plethesmometer etc were obtained in the Pharmacology research laboratory of SHEAT College of Pharmacy, Varanasi.

- **Experimental Animal Required-**

  30 Albino rats of 200-250 gm were approved from the institutional animal ethical committee as per the direction of CPCSEA for the in-vitro animal study such as anti-inflammatory activity, and acute toxicity study.

- **Extraction of *Acacia farnesiana*-**

  A variety of phytoconstituents were extracted from Acacia farnesiana fruits using the continuous soxhlet hot extraction technique using solvents such as ethanol, chloroform, and petroleum ether.

- **Petroleum Ether Extraction-**

  The Soxhlet extractor device was used to extract 500 g of powdered plant material using 1.5 L of petroleum ether. A heated extraction process that was carried out continuously until all of the contents were removed. When the iodine vapours stopped becoming a hue, it meant the extraction was complete. After the extraction was complete, the solvent was removed using a distillation process. This extract was kept in desiccators for storage [6].

- **Chloroform Extraction-**

  After the marc was extracted with petroleum ether, it was given time to air dry before chloroform extraction. To find the extraction end, iodine fumes were used [7]

- **Ethanolic extraction-**

  After the marc had dried, it was extracted using chloroform and then ethanol. It was determined when the extraction procedure was to be completed by using iodine fumes [8].

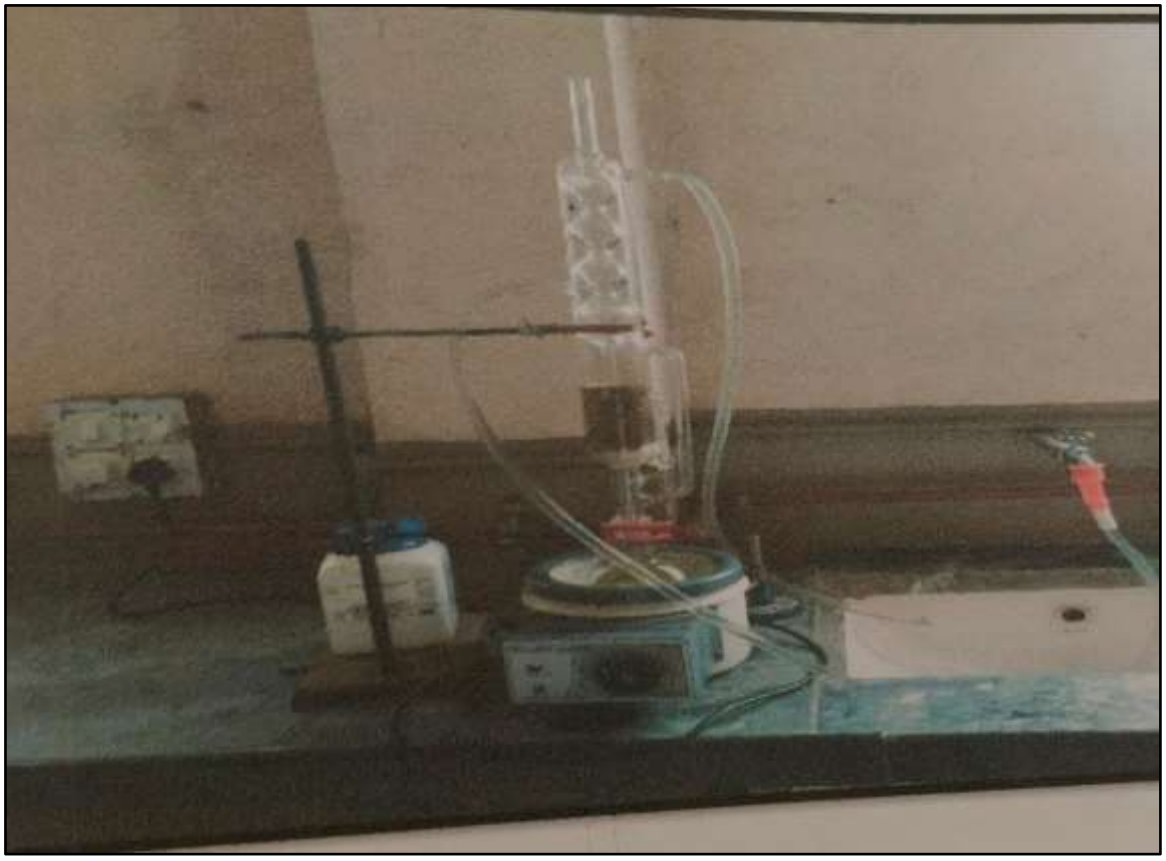

Figure 3: Soxhlet hot extraction of *Acacia farnesiana* fruit

Phytochemical Screening [9]-

After determining the plant extracts' phytochemical component types using a standard qualitative chemical assessment, we subjected them to phytochemical analysis to isolate each phytoconstituent. The presence or absence of several phytochemical components, including as alkaloids, glycosides, carbs, proteins, tannins, phenolics, steroids, and fixed oils, was determined by using well-established procedures [10].

- **Myer's test-**
  Tannic acid, Mayer's reagent (a potassium mercuric iodide solution), Wagner's reagent (iodine in potassium iodide solution), Hager's reagent (a saturated picric acid solution), and Dragendorff's reagent (a potassium bismuth iodide solution) are some of the solutions that may be used to precipitate alkaloids. In contrast to the reddish-brown precipitates, which are Wagner's and Dragendorff's separate, the cream-coloured ones are Mayer's, Hager's, Wagner's, and Dragendorff's. They might be amorphous or have a crystalline structure. The aforementioned compounds do not form a precipitate when combined with some alkaloids, such as caffeine. These reagents may also generate protein precipitates, hence it is crucial to be careful when using them in alkaloidal studies.

- **Wagner's Test**
  Using Wagner's reagent, the extract was combined. A reddish-brown precipitate confirmed the existence of an alkaloid. In Wagner's reagent, iodine and potassium iodide are dissolved in water. In the presence of potassium iodide, the iodine and the alkaloid form an insoluble, reddish-brown combination.
- **Dragendroff's Reagent**
  We used Dragendroff's reagent to process the isolated material. It was confirmed that alkaloids were present because a reddish-orange precipitate was generated. The reaction between the alkaloid and Dragendorff's reagent (potassium iodide-bismuth nitrate) produces ion pairs due to the nitrogen in the alkaloid and the heavy metal atom in the reagent.The insoluble precipitate is formed when these ion pairs combine with the alkaloid and Tetraiodobismuthate (BiI4).
- **Hager's Test**
  Prepare a mixture of the extract with Hager's reagent. The presence of a yellow precipitate indicated the presence of an alkaloid. Because microcrystalline compounds are formed, a crystalline yellow precipitate is created.
- **Mayer's Test**
  Mayer's reagent was used with the extract. A precipitate of white, cream, or yellow colour was an indication of the presence of alkaloids. A reaction between the nitrogen atom of the alkaloid and the heavy metal atom of Mayer's reagent (a solution of potassium mercuric iodide) produces ion pairs. The alkaloid and Tetraiodomercurate [HgI4] form an insoluble precipitate when the two react.
- **Molisch Test**
  Carbohydrates were confirmed when a purple ring appeared at the junction under the aqueous layer after treatment of the extract with 1 millilitre of strong sulphuric acid and 1 millilitre of alpha naphthol solution. Sulphuric acid creates furfural and 5-hydroxymethyl furfural when it dehydrates pentose and hexoses, respectively. An orange ring is created when the furfural and 5-hydroxymethyl furfural combine with the α-naphthol in the test reagent.
- **Iodine Test**
  Three drops of iodine and one millilitre of the extract made up the combination. Carbs were detected when a blue colouration appeared.Complexes of various colours are produced when polysaccharides and iodine come together. What gives the complex a certain colour is the polysaccharide's three-dimensional structure. In contrast to starch's coiled form, which appears blue when connected to iodine, glycogen's branching molecular structure turns red-violet.
- **Fehling's Test**
  The extract was combined with Fehling's solutions 1 and 2, both of which were in the same volume. The presence of carbohydrates was shown by the formation of a brick-red cuprous oxide precipitate when the mixture was heated. The focus of this investigation is on determining if reducing sugars are present or not. Solvent A is potassium sodium tartrate and solution B is copper sulphate, according to Fehling. As

the solution containing copper (II) ions is heated, carbohydrates cause it to change colour from a dark blue to an intractable red copper oxide precipitate.

- **Benedict's test**

  The extract (1 ml) was boiled for two minutes after adding Benedict's solution. The presence of carbohydrates was verified by the red precipitate. In Benedict's acidic solution, copper sulphate (CuSO4) reacts with electrons from the reducing sugar's aldehyde or ketone groups. In the process of oxidising reducing sugars, the copper ions in the solution generate a red precipitate of copper (I) oxide and carboxylic acid.

- **Borntrager's Test**

  I sonicated the extract with weak sulphuric acid and filtered it. Chloroform was then added to the filtrate. The organic layer was amended with ammonia at a ratio of 1:1. The bright pinkish colouration of the ammoniacal layer confirmed the presence of glycosides. The Borntrager's test may identify anthraquinone glycosides.The hydrolysis of anthraquinone glycosides results in the production of aglycone, which may be di, tri, or tetrahydroxylanthraquinone or a derivative of these compounds.

- **Modified Borntrager's Test**

  To proceed, the extract had to be boiled and cooled before a few drops of ferric chloride solution and four millilitres of diluted hydrochloric acid were added. Benzene was then added to the filter. Ammonia was added to the chloroform layer.A reddish tint to the ammoniacal layer proved that glycoside was present.The decreased form of theanthraquinones means they may not pass Borntrager's test. Ferric chloride, which triggers oxidative hydrolysis, is then used.The liberated anthraquinones are extracted using carbon tetrachloride; these compounds change colour from rose-pink to cherry-red when combined with weak ammonia.

- **Legal Test**

  The presence of glycosides was confirmed by the production of a blood-red colour when pyridine and an alkaline sodium nitroprusside solution were combined.Any glycoside containing digitoxose may be tested using this method. The red hue is produced by an interaction between the five-member lactone cycle of cardenolides and sodium nitroprusside in an acidic solution.

- **Foam Test**

  To make the extract 20 times weaker, distilled water was used. For fifteen minutes, a graduated cylinder was used to stir the diluted extracts. A 1-centimeter foam developed, indicating the presence of saponins.Saponin glycosides form a colloidal solution in water that foams when shaken because they diminish surface tension. The hydrolysis of saponin glycosides causes the formation of sapogenin, an aglycone, glucuronic acid, and usually β-D-glucose or its acid.

- **Liebermann sterol test**

  A glacial acetic acid solution containing glycosides or steroidal aglycones was supplemented with 1 drop of concentrated H2SO4. Shades ranging from pink to crimson to violet to blue to green were seen.

- **Liebermann-Burchard Test**
  In order to dissolve the extracted material, 2 millilitres of chloroform were used. Also added were ten drops of acetic anhydride and two drops of strong sulphuric acid. The presence of steroids was confirmed by a deep blue or violet colouration that became green. The outcome of this colorimetric test for cholesterol detection is a gradient of colours ranging from a very dark green to a dazzling green. As a result of chemical interactions, the hydroxyl group (-OH) of cholesterol increases the un-saturation conjugation in the next fused ring, leading to colourism.

- **Salkowski Test**
  A minimal quantity of chloroform was used to solubilise one millilitre of the extracted raw medication. This was then mixed with a drop of powerful sulphuric acid. The pigmentation becoming red was a sure sign of steroids. A sterol is an alcohol. The Salkowski test involves protonating the hydroxyl groups of alcohols, which is done by treating cholesterol and other sterols with a strong acid. The formation of charge transfer complexes causes the conjugated dienes that result in a shift in hue.
- **Ninhydrin reagent Test**
  The material was hardly dissolved in water. The extract solution was fortified with two drops of freshly made 0.2% Ninhydrin reagent before heating. Amino acids, peptides, and proteins were indicated by purple colours. Triketohydrindene hydrate, the chemical name of ninhydrin, is a powerful oxidising agent. The reaction between ninhydrin and all α-amino acids produces diketohydrin, a compound having a purple hue.
- **Shinoda Test**
  In order to make the extract solution in alcohol, magnesium turning pieces were added. The ingredients were boiled before strong hydrochloric acid was added drop by drop. If the Shinoda test turns up a magenta hue, it means that flavonoids, namely isoflavones, are present. During the test, the flavones in the sample are reduced to anthocyanidins. A yellowish hue is produced by the conjugation of flavonoid molecules, in contrast to the redder hue that results from the prolonged conjugation in the resultant anthocyanidin.
- **Saponification test**
  Several drops of 0.5N alcoholic potassium hydroxide and one drop of phenolphthalein were added to the extract. A water bath was used to warm the mixture for two hours. If the soap is made or partially neutralised, it can be a sign that there are fixed oils.When triglycerides, which are lipids, are hydrolysed alkalinely (with KOH or NaOH), the result is glycerol and fatty acid salts (soap).

Table 2: Preliminary Phytochemical Screening of Extract

Sr. No.	Phytoconstituent	Pet. Ether	Chloroform	Ethanol
1.	**Test for Glycosides**			
	Legal's test	+	+	+
	Keller-killiani test	+	+	+
	Borntragers test	-	+	+
2.	**Test for Steroids**			
	Salkowski test	+	+	-
3.	**Test for Amino acids**			
	Ninhydrin test	-	-	+
4.	**Test for Saponin**			
	Foam test	+	+	+
5.	**Test for Flavonoids**			
	Shinoda test	-	-	+
	Lead acetate test	-	+	+
6.	**Test for Alkaloids**			
	Mayer's test	-	+	+
	Wagner's test	+	-	+
7.	**Test for Tannins and phenolic compounds**			
	Fecl3 test	+	+	-
	Lead acetate test	+	+	-
	Dil. Nitric acid test	-	+	+

+: present, - : absent

Thin Layer Chromatography of plant extract-

TLC is useful technique for selecting an appropriate mobile phase for the separation of phytoconstituent by column chromatography [11].

- **TLC of ethanolic extract of *Acacia farnesiana*-**
  The presence of naringenin in the alcoholic extract was confirmed using thin layer chromatography, which revealed a green spot that was compared to the standard naringenin.
- **Chromatographic conditions-**
  Stationary phase: silica gel
  Mobile phase:

a) Ethyl acetate:Ethanol:Formic acid (8:8:4:1)
b) Ethyl acetate:Ethanol:Formic acid (10:8:2:1)

Length of run: 8.1 cm and 8.3 cm

Standard sample: Naringenin (1mg/1ml)

Chember saturation: 30 minutes

Visualizing agent: UV (254 nm, 366 nm), Ammonical vapour, Ethnolic ferric chloride solution.

The presence of naringenin in the alcoholic extract was confirmed using thin layer chromatography, which revealed a green spot that was compared to the standard naringenin.

UV Cabinet at 254 nm **UV cabinet at 366 nm**

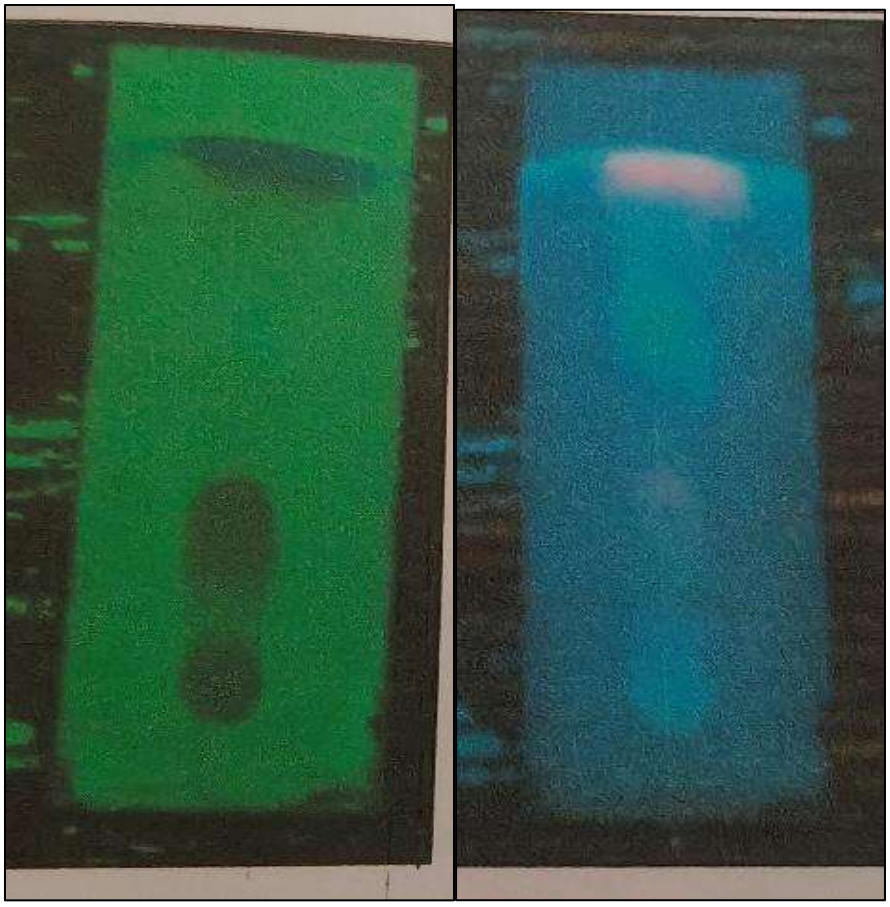

Figure-4: TLC profile of ethanolic extracts of plants of *Acacia farnesiana*

Anti-inflammatory Activity by using Carrageenan induced Rat Paw Inflammation Model-

- **Preparation of animals-**
  Ayar, Varansi's Animal House is where we got our hands on male and female Albino Wistar rats, which weigh 200-250 grammes each. The animals were housed in an

optimum setting with a 12-hour light/dark cycle and room temperatures 25 ± 1°C. They were provided with an ordinary pellet diet and allowed unrestricted access to water. Maintaining a relative humidity of 44% to 56% was carefully managed. The rats were made to fast for an hour prior to the start of the experiment.

- **Acute toxicity study-**

  In order to evaluate acute toxicity in vivo, male Wistar rats were used. In this investigation, we adhered to the chemical testing requirements outlined in Protocol 425 of the OECD. Administering 2000 mg/kg, p.o. of all Acacia farnesiana extracts to all chosen animals (n=6 each group) was determined to be the lethal dosage (LD50) that causes 50% of the test animals within a group to die. This protocol was followed in accordance with OECD guidelines for the testing of plant extracts.

  In order to detect any behavioural changes in the rats after therapy, they were closely observed. Within the first thirty minutes, an observation was made, and further assessments were conducted at regular intervals throughout the day. Daily evaluations were administered over 14 days, with a focus on the first four hours. Toxic effects, such as changes in skin and eye health, respiratory problems, convulsions, or death, were carefully observed in the rats.

- **Pharmacological Evaluation of Extract-**

  To develop a scientific foundation for their usage in clinical settings, extracts must first be evaluated from a pharmacological standpoint to ascertain their therapeutic potential, safety, and efficacy. An in-depth analysis of the pharmacodynamic and pharmacokinetic properties helps to comprehend the action mechanisms and possible side effects associated with the extract's active ingredients.

- **Experimental Protocol [12]-**

  Rats were kept in different 5 groups; n=6.

Table 3: Experimental Design

Group 1: Normal saline.
Group 2: Carragenan + Diclofenac (10 mg/kg)
Group 3: Carragenan + *Petroleum ether extract* (100 mg/kg).
Group 4: Carragenan + *Chloroform extract* (200 mg/kg).
Group 5: Carragenan + *Ethanol extract* (400 mg/kg)

Assessment of anti-inflammatory activity-

- **Carrageenan-induced paw edema in rats -**

  The creatures were marked on both back paws, weighed, and assigned a number. Six animals each made up each of the six groupings. Every rat had its initial paw volume

measured using a Plethysmometer. There were five sets of six animals each in the experiment. Oral dosing of the control, test, and standard drugs was performed. To produce inflammation, animals from all groups were injected with 0.1 ml of a 1% carrageenan suspension in 0.9% normal saline under the sub-plantarly into the right hind paw 30 minutes after taking the medications orally. The first group served as the control and was given an oral solution of normal saline. As a control, Group 2 had 10 mg/kg of Diclofenac; groups 3, 4, and 5 got 100, 200, and 400 mg/kg of extracts orally, respectively. The animals were observed for changes in paw volume at 1, 3, 4, and 6 hours after the carragenan injection using a plethysmometer.

Figure 5: Administration of Carragenan in rat paw for induce inflammation.

Figure 6: Administration of oral dose of standard or test drug.

Result and Discussion-

- **Physicochemical study of Acacia farnesiana-**

  The physicochemical parameters of the plant material, including its nature, colour, extractive value, loss on drying, and ash value, were tested on powdered plant materials that had been air dried. Results are shown in Table 2 & 3.

Table 4:Physiochemical study of *Acacia farnesiana*

Solvent	Nature of extract	Colour	Extractive value obtained (% w/w)
Ethanol	Semisolid	Dark brown	14% w/w
Water	Semisolid	Light brown	12%w/w
Petroleum ether	Semisolid	Yellow	1.92% w/w

Table 5:Result of LOD and ash value of *Acacia farnesiana*

Sr. No.	Parameter Studies	Result Obtain
1.	Loss on drying	10.2 % w/w
2.	Ash value	6.5 % w/w

Pharmacological Study-

- **Acute oral toxicity study-**

Administering 2000 mg/kg, p.o. of all Acacia farnesiana extracts did not result in any behavioural abnormalities or death, as determined by the plant extracts' Lethal Dose (LD50) tests conducted in accordance with OECD recommendations. Each extract was thus studied at doses of 100, 200, and 400 mg/kg, p.o.

Table 6: Dose selection and finalizing LD50 cut off value of extract.

Name of extract	LD50 cut off mg/kg b.w.	Therapeutic dose
Pet-ether	2000 mg/kg	100 mg/kg
Chloroform	2000 mg/kg	200 mg/kg
Ethanol	2000 mg/kg	400 mg/kg

- **Evaluation of anti-inflammatory activity-**

- **Effect of various extracts of Acacia farensiana fruits on Carragenan induced rat paw edema**

Comparing the amount of paw oedema after 3 hours, 4 hours, and 5 hours after treatment with the ethanolic extract of A. farnesiana to the control group, as well as at 5 hours after

treatment with lesser dosages, revealed a dose-dependent decrease. In comparison to the control group, all three extracts significantly reduced paw oedema at the end of the fifth hour: 20.54%, 39.08%, and 50.11%, respectively. Among all extracts, the A. farnesiana fruit extract at 400 mg/kg showed the greatest decrease. When compared to all of the extracts, the standard medication diclofenac demonstrated a much larger reduction in paw oedema (50.11%). At the conclusion of the 5-hour period, the greater dosage of plant extracts did not vary significantly from the conventional medicine.Both table 5 and table 6 provide this data.

Table 7: *Effect of* oral administration of fruit extract of Acacia farensiana and Diclofenac on carrageenan-induced paw edema in rats. (n=6)

Groups	Treatment (mg/kg)	Changes in Paw Edema Volume (ml)				
		1 hr	2hr	3hr	4hr	5hr
Normal	10 ml	0.75 ±0.09	0.86±0.65	0.90±0.81	0.92±0.82	1.18±0.19
Diclofenac	10 mg/kg	0.69±0.49**	0.64±0.50**	0.62±0.30**	0.55±0.68**	0.54±0.62**
Pet. ether	100 mg/kg	0.76 ±0.06	0.82±0.66	0.84±0.69	0.94 ±0.17*	0.90±0.85**
Chloroform	200 mg/kg	0.73 ±0.84	0.77±0.52*	0.76±0.56*	0.74±0.50**	0.66±0.69**
Ethanol	400 mg/kg	0.71±0.78	0.66±0.46	0.65±0.50	0.63±0.50	0.58±0.60

The findings were presented as the Mean ± SD. The results of the one-way ANOVA followed by the post-hoc Bonferroni test showed a significant p-value (<0.05) when compared to the control group.The results of the one-way ANOVA and post-hoc Bonferroni test showed a significant p-value (<0.001) when compared to the control group.

Table 8: Impact of oral administration of extracts of *A. farnesiana* and Diclofenac on percentage reduction of carrageenan-induced paw edema in rats. (n=6)

Groups	Treatment (mg/kg)	Paw Edema (% inhibition)				
		1hr	2hr	3hr	4hr	5hr
Normal	10 ml	-	-	-	-	-
Diclofenac	10 mg/kg	13.90*	26**	32.84**	53.83**	60.12**
Pet. ether	100 mg/kg	3.7	4.66	6.71	17.66*	20.54*
Chloroform	200 mg/kg	8.82	12.61*	17.81*	36.58**	39.08**
Ethanol	400 mg/kg	11.05	16.80	22.48**	48.72**	50.11**

Results were expressed in Mean ± SD. * significant p-value (<0.05) with one-way ANOVA followed by post-hoc test Bonferroni when compared with control. ** Significant p-value (<0.001) with one-way ANOVA followed by post-hoc test Bonferroni when compared with control.

Conclusion-

A. farnesiana has a long history of use as a natural remedy for inflammatory and painful conditions, and our investigation has shown that its ethanolic extract, when administered at a dose of 400 mg/kg, demonstrates strong anti-inflammatory properties. It is possible that the extract is inhibiting molecules involved in pain pathways and the mechanisms that regulate them, in addition to a number of physiological mediators of inflammation. Phytochemicals such flavonoids, saponins, terpenoids, steroids, alkaloids, phenols, and tannins may be responsible for this activity. Traditional usage of A. farnesiana for inflammation and discomfort have some scientific backing, according to the current results.

Acknowledgement-

The authors of this research article are greatful to the Department of Pharmacology, SHEAT College of Pharmacy, Dr. A. P. J. Abdul Kalam Technical University, Lucknow, Uttar Pradesh, India, 226031 for providing laboratory and library facilities for writing the paper and conclude the knowledge for future aspect.

References-

1. Vijay Nigan. Phyto-chemical analysis and antifungal activity of aerial parts of Acacia farnesiana (L.) Willd. International Journal of Medical Science and Clinical Research.2019, Vol.1 (3): 08-15.
2. Kadam RK, Khairnar PV, Chakote VR, Shinde MU. Study of alcoholic extract of Acacia farnesiana (L.) Willd Pods. J Univ Shanghai Sci Technol. 2021;23:56.
3. Delgadillo Puga C, Cuchillo-Hilario M, Navarro Ocaña A, Medina-Campos ON, Nieto Camacho A, Ramírez Apan T, López-Tecpoyotl ZG, Díaz Martínez M, Álvarez-Izazaga MA, Cruz Martínez YR, Sánchez-Quezada V. Phenolic compounds in organic and aqueous extracts from Acacia farnesiana pods analyzed by ULPS-ESI-Q-oa/TOF-MS. In vitro antioxidant activity and anti-inflammatory response in CD-1 mice. Molecules. 2018 Sep 18;23(9):2386.
4. Ramli S, Harada KI, Ruangrungsi N. Antioxidant, antimicrobial and cytotoxicity activities of Acacia farnesiana (L.) Willd. Leaves ethanolic extract. Pharmacognosy Journal. 2011 Jul 1;3(23):50-8.
5. Ragavi.M, Sharmila.M, Hardha.B, Senthil Kumar.M. A Comprehensive Review on Phytochemical Evaluation and Pharmacological Activity of Acacia Farnesiana. International Journal of Pharmaceutical Research and Applications.2023.8(4):1527-1542.
6. Leal LS, Silva RO, Araújo TD, Silva VG, Barbosa AL, Medeiros JV, Oliveira JS, Ventura CA. The anti-inflammatory and antinociceptive effects of proteins extracted from Acacia farnesiana seeds. Revista Brasileira de Plantas Medicinais. 2016 Jan;18:38-47.
7. Hernández-García E, García A, Garza-González E, Avalos-Alanís FG, Rivas-Galindo VM, Rodríguez-Rodríguez J, Alcantar-Rosales VM, Delgadillo-Puga C, del Rayo

Camacho-Corona M. Chemical composition of Acacia farnesiana (L) wild fruits and its activity against Mycobacterium tuberculosis and dysentery bacteria. Journal of Ethnopharmacology. 2019 Feb 10;230:74-80.

8. Dhingra AK, Chopra B, Bonthagarala B. Natural anti-inflammatory agents: Recent progress and future perspectives. Ann. Pharmacol. Pharm. 2018;3(5):1158-68.
9. Kedir G, Ayele AG, Shibeshi W. In-vivo evaluation of analgesic and anti-inflammatory activities of the 80% methanol extract of Acacia seyal stem bark in rodent models. Journal of Pharmaceutical Health Care and Sciences. 2024 Nov 18;10(1):75.
10. Biradar SR, Rachetti BD. Extraction of some secondary metabolites & Thin layer chromatography from different parts of Acacia farnesiana L. IOSR J. Pharm. Biol. Sci. 2013 Sep;7:44-8.
11. DelgadilloPuga, Mario CuchilloHilario, et al.,Antioxidant activity and protection against oxidative induced damage of Acacia shaffneri and Acacia farnesiana pods extracts:invitro and in vivo assasys,DelgadilloPuga al.BMC Complementary and Alternative Medicine (2015)15:435.
12. Srikanth.M,Suresh kasala,et al.Evaluation of In Vitro Anthelmintic Activity of Acacia Farnesiana(L),IJPPR International journal of pharmacy and pharmaceutical research,May 2019 vol:9,Issue:2