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Review on Anti-inflammatory and Anticoagulant Activity of Medicinal Plants

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ABSTRACT

Since the beginning of time, herbal remedies have been utilized to treat a variety of illnesses and ailments. This review's primary focus is on anti-inflammatory and anticoagulant medicinal plants. Pain, redness, heat, or warmth, and swelling are the four main signs of inflammation. As secondary metabolites, plants can produce a large variety of phytochemical substances that have anti-inflammatory properties. There are numerous medicinal plants that may have anti- inflammatory properties. We have discussed some medicinal plants in this review that have anti-inflammatory properties. It includes Lantana camera linn., Azadirachta indica, Murraya koenigii, Curcuma longa, Zingiber officinale, and Hibiscus rosa sinensis. These are the anti-inflammatory medicinal plants, with their materials and methods. Anticoagulants, commonly referred to as blood thinners, are chemical compounds that stop blood from coagulating. Heart attacks, strokes, ischemic heart disease, deep vein thrombosis, and pulmonary embolism are just a few of the significant issues that blood clots in the body can lead to. Plants with anticoagulant properties have been utilized to treat certain disorders. The plants discussed in this review have effective anticoagulant properties. The plants are like Allium sativum, Camellia sinensis, Allium cepa, Curcuma longa, Cinnamomum cassia, and Vitis vinifera.

Keywords : Medicinal plants, Anti-inflammatory activity, Anticoagulant activity, Inflammation, Coagulation.

I. INTRODUCTION

Inflammation is a complicated biological reaction of vascular tissue to damaging stimuli, pathogens, and irritants and is marked by redness, warmth, swelling, and discomfort .either acute or chronic inflammation exists; the initial sign of inflammation could be acute. Chronic inflammation causes damage to the body because the inflammatory response is out of proportion. Prostaglandins, prostacyclins, and

thromboxanes, which are implicated in inflammation, pain, and platelet aggregation, are produced by the important enzyme cyclooxygenase (COX).[1] An important global issue is inflammatory disorders. Plant medicines play a significant role in the primary healthcare system in many developing nations. numerous medicinal plants were employed in Ayurveda, Siddha, and Unani for the treatment of human diseases.[2] In traditional medicine, plants are utilized to treat chronic and even infectious disorders since they have a significant potential for developing novel medications.there has been a rise in awareness in recent years.on the significance of herbal remedies. Several medicinal plants employing a variety of models, have demonstrated strong anti-inflammatory effects when treating inflammation.[3] The primary causes of morbidity and mortality in developed nations include thrombotic disorders like deep vein thrombosis, pulmonary emboli, ischemic stroke, hypercoagulable states, strokes, and heart attacks. Consequently, anticoagulants are crucial for the management of thromboembolic diseases.warfarin, heparins, vitamin K antagonists, and their derivatives have been used as anticoagulant medications for the treatment.. Although their effectiveness is still undeniable, many medications have dangerous, life-threatening side effects. Likewise have a lot of documentation.due to their biological capabilities, plants may be used as an alternative source for the creation of novel anticoagulant agents. The consumption of dietary anticoagulants or phytochemicals with anticoagulants is supported by strong scientific evidence.in the end, properties can reduce or eliminate the risks of thrombotic conditions.[4] This review focused on following plants which shows anti-inflammatory andanticoagulant activity.

Anti-inflammatory medicinal plants :

1. Lantana camera linn.

Family – Verbenaceae

Parts use – Leaves [5]

Chemical constituents – Terpenoids, flavonoids ,flavone - Tricin, Hispiduline,tannins.[6]

Fig 1: Lantana camera linn

Many Lantana species have aerial components that are commonly employed in traditional Treatments for cancer and tumors. To treat fever, the illness, and stomachaches, tea made From Leaves and flowers was consumed. The plant's various applications demonstrate anti-Malarial, Antibacterial, and anti-diarrheal properties. According to studies, aqueous extract Of Lantana Camara leaves is both highly effective and safe for treating hemorrhoids. Aqueous extract from Lantana camaraleaves has been said to have promising analgesic, anti-Inflammatory and anti- hemorrhoidal activities.

Material and methods :

Plant material : the leaf and bark of the lantana camera.

Extraction of plant material: The plant's leaves and bark were gathered, properly cleaned with distilled water, and the bark was then diced into little pieces.The leaves and bark were air- dried in a shaded environment. The mechanical grinder was constantly used to crush dried components into fine powder. 100g of powdered leaves and bark were individually extracted in methanol using the soxhlet

equipment, which was also employed for the extraction process. The extract was kept for later use after the filtrate was concentrated using a rotary evaporator to remove the methanol.carried out the phytochemical analysis of extract.

Drugs and Chemicals: Drugs pentazocine and indomethacin. Carrageenan and acetic acid. **Animals** : wistar albino rat (180-200g), **Acute toxicity:** The acute oral toxicity study on wistar albino rats was conducted in accordance with the Organization for Economic Cooperation and Development's guidelines.

Carragennan induced paw edema :- Following the administration of both extracts to the overnight-fasted rats, a sub-planter injection of carrageenan (1% w/v) suspension was given to the right hind paw.Inflammation. Each of the six groups was ready.Consists of six animals.The first group got 0.9% normal Saline in 3% Tween 80 in saline (2 ml/kg), used as a negative control.The second group received indomethacin (10 mg/kg) and served as the third and fourth positive controls.100 mg/kg and 200 mg/kg of leaf extract were given to the group.The sixth group received 200 mg/kg and 100 mg/kg, respectively Bark extract in kilograms. After thecarrageenan injection Paw volume change was monitored at time points 0, 1, 3, 4, and 5.Plethysmographic analysis is used to determine the volume. Drugs Were justBefore freshly prepared. When compared to the standard, the bark and leaf extract-treated animals showed a substantial reduction in paw volume at 100 and 200 mg/kg doses.For up to 5 hours, both extracts demonstrated anti-inflammatory activity.Inflammation decreased by the extrac. therapy in a dose-dependent way.[7]

2. Azadirachta indica

Family – Meliaceae, **Parts use –** fruits,leaves [8] **Chemical constituents** – azadirachtin nimbolinin, nimbin, nimbidin, nimbid.[9]

Fig 2: Azadirachta indica

Uses for Azardirachtaindica (Meliaceae) include anti-inflammatory, anti-arthritic, Antipyretic, Hypoglycemic, anti-gastric ulcer, antifungal, antibacterial, and antitumor Properties.The carbon tetrachloride extract of Azadirachtaindica fruit skin and its Separated ingredient Azadiradione were used at two distinct dose levels (50 and 100 mg kg-1 body weight) to Study the plant's anti-inflammatory potential. Utilizing a model of Paw oedema caused by Carrageenan,anti- inflammatory, efficacy was found. The findings Showed that azadiradione Plus a 100 mg kg-1 dosage of carbon tetrachloride extract Significantly reduced pain and Inflammation in the treated rats. This research had Rationalized tribal people's ethnomedical use of the plants for wounds,burns and injuries.

Materials and methods:

Materials - Plant extract, **Chemicals** – Aspirin, **Animals** – Albino rats of weighing 150-200 g., **Methods** : Rat paw edema brought on by carrageenanThe animals were separated into six groups, each of which had six rats:

Group I: Control (0.5 ml/rat of pure water)

Group II: Standard (200 mg/kg of aspirin used orally)

Groups III, IV, V, and VI: intraperitoneally injected NSO at 0.25, 0.5, 1, and 2 ml/kg body Weight, respectively.The total oral dosage volume was maintained at 1 ml per rat. The volume of each Intraperitoneal injection was held constant at 0.5 ml/rat. A randomized control study was Conducted.The total oral dosage volume was maintained at 1 ml per rat. The volume of Each Intraperitoneal injection was held constant at 0.5 ml/rat. A randomized control study was Conducted. By injecting 0.1 ml of a 1% suspension of carrageenan in normal saline beneath The plantar aponeurosis of the right hind paw of rats, inflammation was elicited in the form of paw edema. Rats in the control group received injections of ordinary saline in their left Hind paw. At the tibio-tarsal joint of both hind limbs, a mark was produced. The water Displacement method was used to calculate the volume of the paw edema, and the Microburette was used to collect the displaced water.Inside the microburette was a glass Tube with a side vent.The 2 ml- capacity microburette has a glass tube with a side vent Attached inside of it. The microburette was mounted on a different pedestal than the glass Tube. Water overflowed from the side exit into the microburette during the experiment When the hind limb was dipped within the tube up to the specified mark at the tibio-tarsal Joint. The microburette, which contained micro-graduations, was used to measure the Volume of water displaced. The amount of water that was displaced matched the size of the Paw. All groups, save the control group, received aspirin and intraperitoneal NSO one hour Before the injection of carrageenan. Prior to the injection of carrageenan, both the standard And test medications were administered. We measured the volumes of both hind paws before and after 1, 2, 3, and 4. And then determine the percentage inhibition of paw edema.[10]

3. Murraya koenigii

Family – Rutaceae, **Parts use** – Leaves[11] **Chemical constituents** – linalool elemol , myrcene,,α-pinene,β-caryophyllene,bornyl acetate· [12]

Fig 3: Murraya koenigii

The Hindi term for Murrayakoenigii is Curry Patta. It belongs to the Rutaceae family. Uses: The plant has been used for a variety of purposes throughout history, including as a stimulant, stomachic, analgesic, and a remedy for diarrhea, dysentery, and bug stings, as well as to lessen body heat. The capacity to treat wounds and possess hypoglycemic, antibacterial, antifungal, antiulcer, anti-obesity, and anti-diarrheal qualities are among its further uses. Murrayakoenigii methanol extracts' anti-inflammatory properties In albino rats with carrageenan-induced inflammation, leaves act as a potent anti-inflammatory medication.

Material and methods :

Plant material – Collect the leaves of Murraya koenigii.

Preparation of leaves extract :The leaves were milled into a fine powder after being shaded and dried. By soaking 20g of the Powdered material in various solvents for 72 hours while stirring the mixtures with a sterile Glass rod every 24 hours, extracts of the substance in aqueous, methanolic, petroleum

ether, And hexane were created. Following a 72-hour interval, the extracts were filtered using Whatmann filter paper No. 1, the filtrate was obtained. Filters were stored in a water bath.In order to acquire the crude extract. **Animals** – Male albino rats (180 -200 g)

Carrageenan-induced edema in rats : Edema brought on by carrageenan in rats there were six groups, each with five animals.Sub-plantar injection of 0.1 ml of 1% sterile carrageenan in saline into the right hind paw caused paw edema. 60 minutes before the injection of carrageenan, 100, 200, and 400 mg/kg of M. koenigii solvent extracts were given orally. Aspirin (10 mg/kg) was given as the standard medication. The vehicle was given solely to the control group (10 ml/kg). Using a plethysmometer, the volume displaced by the paw was measured at times 0, 1, 2, 3, and 4 h following carrageenan injection to determine the extent of the inflammation. The percent inhibition of edema was computed in relation to the difference between the left and right paw volumes, which indicates the degree of inflammation. Rats in the control group's, oedema paw volume gradually increased. However, in the Test groups,400 mg/kg of methanol and aqueous extractsnDemonstrated a considerable Decrease in the oedemaPaw size. No decrease was observed inInflammation was identified In the case of rats given petroleum ether and hexane extract treatments. Methanol extracts Have been identified as having the highest anti- Inflammatory action of aqueous extracts that vary in dosage.[13]

4) Curcuma longa

Family – zingiberaceae, **Parts use** – Rhizomes, **Chemical constituents** – Curcumin, curcuminoid, ,demethoxycurcumin,bisdemethoxycurcumin.[14]

Fig 4: Curcuma longa

Curcumin, the most significant Secondary metabolite of C. Longa, is what gives this plant its Anti-inflammatory properties .Numerous clinical studies have been conducted to demonstrate Curcumin's anti-Inflammatory properties. In contrast to phenylbutazone, which was used as a Positive Control, their findings imply that curcumin can be beneficial in decreasing rheumatoid Arthritis (RA) inflammation and reducing clinical manifestations of RA, such as joint swelling And Morning stiffness . Additionally, patients with anterior uveitis who were given Curcumin Underwent exhaustive remission after two weeks . Curcumin's efficiency in treating people withDyspepsia and /or gastric.[15]

Materials and Methods:

Animals : male albino Swiss mice and albino Wistar rats of either sex bred. The animals were kept in typical laboratory settings with a 12 hour light/12 hour dark cycle, 20 to 24 degrees Celsius, and 30 to 70 percent humidity.

Drugs and Chemicals :Dexamethasone ,diclofenac sodium.

Plant Materials : Curcuminoids – Rhizomes (2 kg) were pulverized coarsely and refluxed in 8 L of ethyl acetate for 3 hours in a water bath before being filtered. Two more times were used for the extraction process. In order to create a thick paste,

the filtered extract solutions from each phase were mixed and concentrated by distillation under vacuum at less than 50°C. To obtain a yellow powder of curcuminoids (50 g), the mixture was further mixed with petroleum ether (1:3, 3 times) at room temperature. The insoluble material was then crystallized using isopropyl alcohol.

COFAE of C. longa -

The marc was then extracted three times with water (8 L each time) at 100°C for three hours before filtering (from powdered rhizomes produced following ethyl acetate extraction). A solution with 20% w/w solids was produced by combining and distilling the liquid extracts from three extraction washes under vacuum at 70°C. After being spray-dried, the concentrated solution was transformed into a 180 g free-flowing powder.

Oil of C. longa – C. longa rhizomes that had been coarsely powdered (5 kg) were suspended in 100 L of water and subjected to steam distillation. To obtain transparent oil (26 mL), the oil layer was separated and subjected to anhydrous sodium sulfate treatment.

Treatments Schedule – In order to simulate xylene-induced ear edema, 72 male albino Swiss mice and 72 albino Wistar rats of either sex were randomly divided into twelve groups, each with six animals. In the xylene-induced ear edema paradigm, two other groups of mice were given 0.5 and 50 mg/kg body weight of dexamethasone and diclofenac, respectively, as reference standard medications. The control group received water (10 mL/kg). Nine further groups each received three dose levels of COFAE, turmerones, and curcuminoids. Turmerones were delivered at 0.05, 0.1, and 0.25 mL/kg, whereas COFAE was given at 90, 180, and 360 mg/kg of mice body weight. Curcuminoids were given at 20, 60, and 180 mg/kg of mice body weight.

In the cotton pellet granuloma model, two other rat groups were given 0.5 and 5 mg/kg body weight of dexamethasone and diclofenac, respectively, as reference standard medicines. The control group received vehicle (water, 10 mL/kg). Nine groups of rats were given COFAE at 45, 90, and 180 mg/kg rat body weight, COFAE at 5, 25, and 125 mg/kg rat body weight,

turmerones at 0.05, 0.1, and 0.15 mL/kg, and curcuminoids at 5, 25, and 125 mg/kg rat body weight. Test chemicals, reference medications, and vehicles were given via gavage with a feeding needle.

Xylene-Induced Ear Edema – As previously mentioned, the xylene-induced ear edema test was conducted. One hour before applying xylene (50 µL) topically to the anterior and posterior surfaces of the right ear, male albino Swiss mice weighing 20–30 g (6–8 weeks) were given oral doses of the vehicle and test substances orally. The left ear served as the control. The animal was slaughtered after 4 hours of xylene application; both ears were cut off, and 6 mm-diameter ear discs were punched out and weighed. The indicator of inflammation was the average weight difference between the right and left ears.[16]

5). Zingiber officinale

Family – Zingiberaceae**Parts use** – Rhizomes, **Chemical constituents** – Gingerol, shagaol, zingiberene , phenolic compounds.[17]

Fig 5: Zingiber officinale

In general, ginger (Zingiber officinale) is used to treat ulcers, indigestion, and constipation.It Is a Member of

the Zingiberaceae family.As part of their investigation into the anti-inflammatory Properties of Zingiber officinale, Shimoda et al. produced a 40% ethanolic extract from Dried red ginger and assessed The ginger's antiinflammatory efficacy using models for both Acute and chronic Inflammation. The findings revealed a strong suppressive effect on both acute And chronic Inflammation, and it appears that this antiinflammatory action is mediated through The Inhibition of macrophage activation.

Material and method :

Plant material : Aqueous extract of rhizomes of Zingiber officinale., **Animals** :Female SD rats of weighing 160 – 200g, **Preparation of extract Z. officinale :** Peeled and diced ginger roots (weighing 20 g) were combined with 25 ml of ice-cold water and 75 ml of cold, sterile 0.9% NaCl solution to form a total volume of 100 ml. The uniformization Was done for 12 minutes in a blender. The standardized Three times, a mixture was passed Through cheesecloth. The filter media was centrifuged at 2000 rpm for 10 minutes, and the Clear supernatant was collected.Fraction was separated, and a volume of 100 ml was created with normal Saline. This ginger preparation's concentration was calculated toBased On the initial material's weight, have 200 mg/mL. Before feeding rats, aqueous extract was Kept in sample tubes At –20°C. Evaluation of anti-inflammatory activity –Five groups of rats (n = 6) were created. All other groups included carrageenan-induced inflammation-induced rats, with Group I Serving as a normal, non- inflammation control. As a carrageenan control, Group II was used. Groups III and IV were given oral doses of Z. officinale of 200 mg/kg and 400 mg/kg b.w., Respectively. Group V received a single dose of the reference medication diclofenac sodium (150 mg/kg b.w.) for 24hours.

Acute toxicity:

the acute oral toxicity of an aqueous extract of Z. officinale was investigated in female Sprague Dawley (SD) rats .

Three groups (n=6) of animals were given these extracts at concentrations of 1000, 1500, and 2000 mg/kg body weight. For two days, the treated animals were monitored for mortality and general behavior. No toxic effects were noticed until the study's conclusion.

Evaluation of anti-inflammatory activity : Six rats were split up into five groups. All other groups contained rats that had been exposed to carrageenan-induced inflammation, while Group I served as a normal, non-inflammation control. Carrageenan was used in Group II. Control. The doses given to Groups III and IV were 200 mg/kg and 400 mg/kg b.w.Orally taking
Z. officinale. Group V was given diclofenac as a reference medication. One dose of sodium (150 mg/kg b.w.) every 24 hours.[18]

6) Hibiscus Rosa sinensis

Family – Malvaceae, **Parts use** – Flowers and leaves., **Chemical constituents** – Tannins,flavonoids, alkaloids,quinins,saponins etc.[19]

Fig 6: Hibiscus Rosa sinensis

Anti-acute inflammatory action was produced by Hibiscus rosa sinensis L. It could lower PNL and

entail cyclooxygenase inhibition.Hibiscus Rosa Sinensis Linn hydroalcoholic extract had strong anti-inflammatory action, which may be related to the presence of flavonoids, phytosterols, and tannins. Rosa Sinensis HibiscusLinn has potent anti-inflammatory properties.It shows action by preventing paw edema brought on by carrageenan For rats.Powder from Hibiscus Rosa Sinensis Linn, Flowers showed anti-inflammatory, anticancer, and anti- implantation property and antidiabetic property.

MATERIALS AND METHODS :

Using carrageenan to induce paw edema, the anti-inflammatory activity of the substance was evaluated. For this model, diclofenac served as the standard reference. Hibiscus Rosa Sinensis Linn's sun-dried leaves were pulverized and put through a Soxhlet extraction process with water and alcohol. ethanol-based extract Was used as a suspension to give the animals 2% gum acacia for experimental purposes.preparation of hydro alcoholic extract – Using a Soxhlet apparatus, the powder of Hibiscus Rosa Sinensis Linnflowers was charged into the thimble and extracted using 70% ethanol and 18 hours with 30% water. seems to be colorless.the presence of solvent in the siphon tube was a sign of thorough extraction, then additional analysis,extraction came to an end. then the extract was Into the previously weighed empty evaporated to a thick paste in the beaker. A water bath kept at 50 degrees celsius to produce alcohol extract. finally, the extract was air- dried.carefully to eliminate all solvent remnants and It was determined what the yield was. the excellent afterward, the dried extract was kept in an airtight until it is used.

Acute oral toxicity study by using OECD 425 Guidelines : In order to reduce the number of animals used in determining the acute oral toxicity of chemicals, this test procedure is used here. As well as in determining a median lethal dose of drugs. Using the median lethal dose, comparisons can be made. With data from the past. Along with the observation It permits the observation of indications of mortality, such as Toxicity.

Evaluation of Anti-inflammatory activity :

Carrageenan induced Hind paw edema in Albino Wistar rats.experimental animals : Albino Wistar rats of either sex, weighing 150–200 g, were housed in an animal facility and were split into four groups of six each.when the experimentation began, they were accustomed to living circumstances for at least one a week to get accustomed to the new an ecosystem that provides access to food, water, and as needed.

In order to counteract the impact of each experiment was run with consideration for diurnal fluctuation.leaving at the same time every day, between 9 a.m. and5 p.m o'clock Institutional Animal Committee permission was obtained before doing the experiment.

Group I animals used as the control were given 10% Tween-80 p.o

Group II: Animals in the control group received 10 mg/kg of sodium diclofenac.

Group III: animals were handled humanely.100 mg/kg body weight p.o of hydroalcoholic Rosa sinensis linnflowers of the hibiscus .

Group IV: Animals were handled humanely.400 mg/kg body weight per oral dose of hydroalcoholic Rosa sinensis hibiscus blossoms.

Procedure

Following each treatment for 60 minutes, 0.1 ml of 1% w/v carrageenan was injected into 0.1right hind paw's subplantar area. paw size was assessed on an hourly basis for a six hours at most when utilizing mercury.Plethysmograph. Decrease in paw volume was put up against the vehicle control.

Anticoagulant activity of Medicinal Plants:

Allium sativum,

Family –Lilliaceae, **Parts use** -Whole fresh bulb[20], **Chemical constituents** -alline, allicin, ajoine,allyl propyl disulfide, diallyl trisulfide, enzymes including allinase,peroxidases ,amino acids and their glucosides.[21]

Fig 7: Allium sativum

It obstructs platelet activities and prevents the formation of throbaxane. The aggregation of platelets is reduced by garlic.postoperative hemorrhage, spontaneous epidural hematoma, and postoperative bleeding are complications caused by A. sativa.supplements containing garlic should be avoided while taking warfarin. It is important to emphasize that a small amount of garlic is not harmful. When warfarin is used concurrently with high garlic consumption, complication results.[20]Garlic has anticoagulant properties through a number of mechanisms. The anticoagulant effects of non-steroidal anti-inflammatory drugs are improved by garlic. And drugs that thin the blood. It suggests that a daily dosage of 1-2 cloves or 4 g of garlic is good for your health.[22]

MATERIALS AND METHODs:

Plant collection : The garlic bulb was freshly collected.and then crushed into fine powder after being dried.

Preparation of plant extract -Both an Allium sativum water extract (AEAS) and a methanol extract (MEAS) were used.Allium sativum's fine powered bulb was extracted using a soxhlet device with methanol and water. To separate the solvent and residue, The extract was filtered and evaporated in order to separate the solvent and residue. the resulting semisolid residue was placed in a desiccator to be used later.

Study Population : Ten healthy volunteers provided blood samples. To determine the effects of garlic's in vitro anticoagulant properties, participants of both sexes were enlisted. The following criteria were used to select the participants: normal PT, no cardiovascular diseases (hypertension, congestive heart failure, or coagulation disorders like hemophilia A or B) or diabetes, no recent NSAID use, no obesity, no alcoholism or smoking, and no dyslipidemic disorder.

Collection of blood samples : Using sterile syringes, venous blood samples were drawn from the right arm and separately placed in trisodium citrate-containing containers to stop clotting.In order to get pure platelet plasma for the PT test, blood cells were separated from plasma using centrifugation. Each plasma sample was individually pipetted into a flat container using an automated pipette, and each was kept at room temperature.

Collection of blood and Plasma re-calcification: In a clean fusion tube, 0.2 ml of

plasma, 0.1 ml of crude extract at various concentrations, and various volumes of CaCl2 (25 mM) were combined and incubated at 370 °C in a water bath. In the control experiment, 0.9% saline water was used in place of the extract solution in the same volume. By tilting the test tubes every 5 seconds, the clotting time was timed using a stopwatch. The prothrombin time is referred to as this moment.[23]

Camellia sinensis.

Family –Theaceae, **Parts use –** Leaves[24] **Chemical constituents –** polyphenols, alkloids, polysacchrides, amino acids and vitamins,catechin, caffeine,epigallocatechin , gallate,gallic acid.[25]

Fig 8: Camellia sinensis

Cancer and digestive disorders are treated with Camellia sinensis.

It is also an antidiabetic, antimicrobial, and antioxidant. Warfarin's anticoagulant properties are counteracted by C. sinensis People receiving high concentrations of C. sinensis have bleeding, and the warfarin effect is reduced.[24]Due to the presence of vitamin K in green tea, drinking it may prevent the anticoagulant effects of warfarin.

Material and method :

Materials : Centrifuge, EDTA , Sodium Chloride, Calcium Chloride, Test tubes, Capillary tubes, Glass Slides, Syringes(5ml), Needles, Sprit, Cotton, Filter paper, Micropipettes, Green Tea.

Preparation of Plant Extracts : Green tea (Camellia sinensis L.) dried leaves were acquired from a neighborhood market. Each tea sample's 10 g of powdered leaves were extracted with 100 ml of distilled water (DW) at a constant temperature of 95 °C while being stirred continuously. After removing any remaining coarse particles with Whatman No. 1 filter paper, the supernatant was centrifuged at 3,000 rpm for 10 minutes. Green tea crude extracts (GTE), the supernatant, were kept at 2-4 °C until analysis.

Blood Collection and Plasma Sample Preparation : Blood was taken from a healthy volunteer donor (aged 18 to 35) through a vein puncture. Plasma samples were prepared. To stop the blood from clotting, it was stored separately in containers with EDTA.

To acquire pure platelet plasma (ppp) for the prothrombin time test, blood cells were separated from plasma using centrifugation (15 minutes at a speed of 3000 rpm).

Anticoagulation Assay :

Collection of Blood and Plasma Re-Calcification : In a clean fusion tube, 0.2 ml of plasma, 0.1 ml of variously diluted aqueous extracts, and various amounts of CaCl2 (25 mM) were combined. The tube was then incubated at 370 °C in a water bath. In the control experiment, 0.9% saline water in the same volume was used in place of the extract solution. By tilting the test tubes every 5 seconds, the stopwatch was used to measure the clotting time. The term "prothrombin time" refers to this period.[26]

Allium cepa

Family –Amaryllidaceae, **Parts use-** Bulb, **Chemical constituents –** Quercetin, allicin,vitamin, minerals.[27]

Fig 9 : Allium cepa

Using the concepts of the prothrombin time test, red onion aqueous extract was found to have anticoagulant activity in In vitro study.[28] Red onion aqueous extract prevents coagulation.

Clearly, it extended the prothrombin time. Red onion aqueous extract inhibits clot formation and prolongs prothrombin time at various doses. To treat and/or prevent cardiovascular problems, red onions can be used in addition to other anticoagulant medications.The common cold, arthritis, and other conditions have all been treated with onion it is used as traditional medicine to treat heart diseases, diabetes,headach. their phytoconstituents, which have been shown to have these advantageous properties: hypoglycemic and hypocholesterolemic effects, and their capacity to inhibit thromboxane and platelet aggregation formation.[29]

Material and method : The prothrombin time was measured in blood samples from healthy individuals to assess the in vitro anticoagulant effects of an aqueous extract (5%) of red onion in different volumes (25, 50, and 75 L).

Preparation of Allium cepa extract : Red onions (Allium cepa), fresh and recently cropped, were bought from the neighborhood vegetable market and recently harvested. The bulb, weighing 50 grams, was divided into thin slices and allowed to air dry. The slices were ground into a fine powder after being fully dried. A conical flask was filled with 100 ml of distilled water and five grams of the dry powder, and it was shaken continuously for three hours after being added. Suction pump filtering was used to remove the supernatant from the Allium cepa extract. Prothrombin time test principles were utilized to examine the anticoagulant activity of the final clear solution of Allium cepa aqueous extract in blood samples from healthy persons.

Study Population : Blood samples were collected from thirty healthy participants. Male and female test subjects of both sexes were employed to evaluate Allium cepa's anticoagulant properties. Participants ranged in age from 15 to 30. The following criteria were used to select them for this study: normal prothrombin time, absence of diabetes or cardiovascular diseases (hypertension, congestive heart failure, coagulation disorders like hemophilia A or B), absence of recent NSAID use, absence of obesity or smoking, and absence of dyslipidemic disorders.

Collection of blood samples : Using sterile syringes, blood samples from healthy people were taken from veins in their right arms and deposited separately in containers containing trisodium citrate to stop the blood from clotting. To acquire pure platelet plasma (ppp) for the prothrombin time test, blood cells and plasma were separated using centrifugation. Each person's plasma sample was collected, pipetted separately into individual containers, and stored at room temperature.

In vitro anticoagulant test of allium cepa extract :

Each individual plasma sample was separated into four groups, each of 50µL.to determine their prothrombin time.The stable, liquid, mixed calcium/thromboplastin rabbit brain (DiaMed LTD, UK) was used as the gold standard for Group 1 (n = 30) in order to ascertain the normal prothrombin time (positive control group). The plasma samples were added separately to three volumes of Allium cepa extract (25, 50, and 75 L) while being gently stirred in a water bath.Then, using pipette volume adjustment, thromboplastin reagent (100 L) was added separately to the mixture of each plasma sample.After that, a stopwatch was used to time how long the clot had been forming. The prothrombin time is the name given to this period.To counteract the sodium citrate and promote clotting, thromboplastin reagent was given to the plasma.

Curcuma longa

Family –Zingiberaceae, **Parts use** – Roots and Rhizomes, **Chemical constituents** : Curcumin, bisdemethoxycurcumin,
Curcumenol,curcuminoid, ,demethoxycurcumin.[30]

Fig 10: Curcuma longa

According to Manikandan et al. (2004), curcumin's anticoagulant action has demonstrated that it prolongs the time it takes for blood to clot, as demonstrated by prothrombin time, thrombin time, and activated partial thromboplastin time measurements when compared to a control blood sample. Furthermore, according to Kim et al. (2012), curcumin and its derivative (bisdemethoxycurcumin) significantly delayed activated partial thromboplastin time and prothrombin time, inhibited thrombin, and active factor X activities.[31]

Material and method :

Turmeric Leaf (Curcuma Longa) Collection and Processing :

The turmeric leaf was divided into tiny pieces and dried for five days in the shade. To extract the flavors of dried and powdered leaves, the Soxhlet extractor was employed. Hexane is used to remove soil from leaf surfaces. Using an electric grinder, the thoroughly dried leaves were ground into a fine powder. At a traditional extraction, 200 ml of hexane were placed around the bottom of a flask and used to extract 50 g of powdered plant material that was securely packed into a column while being refluxed at roughly 60°C. Vacuum filtration was used to separate the acquired liquid extracts from the solid residue, and a rotary evaporator was used to concentrate them.

Anticoagulant Activity PT And APTT :

The determination of APTT and PT was done. Briefly, 10 µl of samples (oil and nanoparticles) were combined with 90 µl of citrated normal human plasma, which was then incubated at 37 °C for 1 minute. (100 µl) of the APTT assay reagent was then added to the mixture, which was then let sit for 1 minute at 37 °C. The addition of 20 mM CaCl2 (100 µl) was then made, and the clotting time was noted. For the PT assay, citrated normal human plasma (90 µl) and a sample (10 µl) were combined and incubated at 37 °C for 1 minute. After preincubating the PT assay reagent (200 µl) for 10 minutes at 37°C, the clotting time was measure.[32]

Cinnamomum cassia

Family –Lauraceae, **Part used -** Bark, **Chemical constituents -** Coumarin,cinnymyl acetate,hydroxycinnamaldehyde,cinnamaldehyde,N-acetyl-l-cysteine, eugenol.[33]

Fig 11: Cinnamomum cassia

It is useful for rheumatism, muscle pain, and depression. It shows Aromatic, anti-coagulant

pharmacological action. The anti-coagulant action of C. cassia was reported by Kim et al.

Circulation is improved with C. cassia. This plant's extract has been successful in preventing platelet coagulation. From this substance, thirteen compounds were extracted. Eugenol, hydroxycinnamaldehyde, methoxycinnamaldehyde, coniferaldehyde, amygdalactone, and cinnamic alcohol are examples of active substances. Statistically speaking, these substances were statistically significantly more suppressive than acetylsalicyclic acid (ASA). Among all the compounds in C. cassia, eugenol and coniferaldehyde were discovered to be the most active components. Because it can increase the anticoagulation potential of anticoagulant medications,

C. cassia should be avoided in individuals receiving anticoagulant therapy.

Materials and Methods :

Plant material and preparation of extracts:

Cinnamomum cassia L. bark was used. In a dark, room-temperature environment, the samples were washed and dried. Using an electric mill (Moulinex), the dried seeds and bark of these plants were processed into powders. A combination of ethanol and water (100 ml, 70:30 (v/v)) containing 5 g of the powders was macerated for 24 hours with a magnetic stirrer. A rotary evaporator was used to evaporate the solvent dry at 60 °C under decreased pressure after the resulting macerate had been filtered using filter paper N01. After being dissolved in ethanol, the residue was stored at 4 °C in a refrigerator until further study.

Human blood sample: By venipuncture in a plastic bag, the blood was drawn from untreated, healthy donors whose quick time test (TQ) results were normal (Koko et al., 2008).The 3.2% anticoagulant solution in a tube 9 volumes of water to 1 volume of sodium citrat Blood. After that, the blood was centrifuged at 3000 rpm for 10 minutes to produce platelet-poorplasma.

Coagulation assay :

Using either the Rapid Time test (QT) or the Prothrombin Time test (PT), the anticoagulant activity of ethanolic extracts at four dilutions (100%, 75%, 50%, and 25%) for each was assessed in vitro by the exogenous route in normal deplatelet plasma. In a clean fusion tube, 50µl of ethanolic extracts and 100µl of plasma were combined and incubated for 3 minutes at 37 °C in a water bath. 200µl of sodium chloride (CaCl2) was then added to the mixture, which was then incubated again for 10 min. at 37 °C with stirring, and the coagulation time TQ was recorded on a 4-channel digital thrombotimer-type coagulant meter.The sample has an anticoagulant impact on this coagulation pathway, which can be explained by a longer coagulation time than the negative control.In addition, we determined the thrombophlebitis rate (TP%) and international normalized ratio (INR), both expressed in relation to the healthy person's coagulation time.[34]

Vitis vinifera

Family – Vitaceae, **Part used** – Seed[35], **Chemical constituents** – Grape seed contain catechin, epicatechin, Gallic acid.[36]

Fig 12: Vitis vinifera

Since ancient times, Vitis vinifera has been eaten as a fruit. For CVS, it is a promising neutraceutical.

Additionally, grape seed demonstrates antioxidant, immunomodulatory, anticancer, and cardioprotective properties.The commercial Vitis vinifera extract has demonstrated positive anticoagulant action. By causing an increase in prothrombin time when blood samples were exposed to various extract concentrations, Vitis vinifera exhibits an anticoagulant effect.

Material and method :

Twenty healthy volunteers between the ages of 19 and 38 with normal blood samples were included in this study. Before adding grape seed extraction (GSE) (as a control) and after adding GSE at various doses (25, 50, and 75%), tests for prothrombin time (PT) and activated partial thromboplastin time (APTT) were run.

Study design and population - Twenty blood samples were taken from healthy people ranging in age from 19 to 38. Any participant having a history of coagulation-affecting behaviors (smoking, illnesses, regulatory supplements of drugs, or herbs) was excluded from the trial.

Sample collection - Under aseptic conditions, blood was taken. Platelet-deficient plasma (PPP), which was separated in a simple container and maintained at -20 ° C, was obtained by centrifuging 2.5 ml of blood that had been drawn into a container containing 3.2% trisodium citrate for 15 minutes at 4000–4500 rpm.

Preparation of grape seed extraction – Grape seeds collected and thoroughly rinsed to get rid of any sticking substances, and then allowed to air dry. Using a mortar and pestle, the seeds were blended together. Grape seeds in powder form were extracted with a 50% (v/v) ethanol solution over the course of one night. The resultant mixture was filtered through paper before being dried in an oven at 37°C.Then, 20 grams were weighted and mixed with 100 ml of distilled water to create a 20% concentration, which was then kept at4°C for later use.

Coagulation assay – Prothrombin time (PT) and activated partial thromboplastin time (APTT) assays were carried out in order to determine the coagulation of the collected human platelet-poor plasma (PPP).The stock solutions' grape seed extraction was prepared at three different concentrations (25%, 50%, and 75%), and it was added to the normal blood samples (10 L of extract plus 90 L of PPP).

The in vitro anticoagulant activity of the extraction was then evaluated using coagulation assays.All samples were divided into two groups: one group served as a control (samples mixed with DW), while the other group contained samples treated with three different concentrations of the extract (25, 50, and 75%).All test and control samples were incubated in water for 3 to 10 minutes before being analyzed using the test's specific methods .(100 µL of Sample+200 µL of the reagent for PT test) and For APTT (100 µL of sample + 100 µL of reagent + 100 µL of calcium chloride). When PT was carried out using various GSE concentrations (25, 50, and 75%), there was a statistically significant rise in Versus control (P = 0.000).[37]

II. CONCLUSION

One of the most significant sources of medicines comes from plants. Due to their accessibility, availability, inherited practice, economic viability, and perceived efficacy, medicinal plants have been used to treat various illnesses since ancient times.Plants have various activities, such as anti-inflammatory and anticoagulant. various parts of the plants show anti-inflammatory and anticoagulant activities.This review explores various medicinal plants that show anti- inflammatory and anticoagulant activity with their material and methods.also will help current and upcoming researchers in their further study of these important medicinal plants.

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