Journal For Innovative Development in Pharmaceutical and Technical Science (JIDPTS)
Volume:8,Issue:1,Jan:2025

(J I D P T S)
ISSN(O):2581-6934

A REVIEW ARTICLE ON ANTI-INFLAMMATORY ACTIVITY IN THE PLANTS

A.Madhu Bindu[1]*,V.Sucharitha Reddy[2], Rampelly Sainihal[3], Kurra Ushasri[4], Bandoji Bhavani[5], Nareddy Varshini[6]

[1,2,3,4,5,6] Department of Pharmacognosy, Pulla Reddy Institute of Pharmacy,

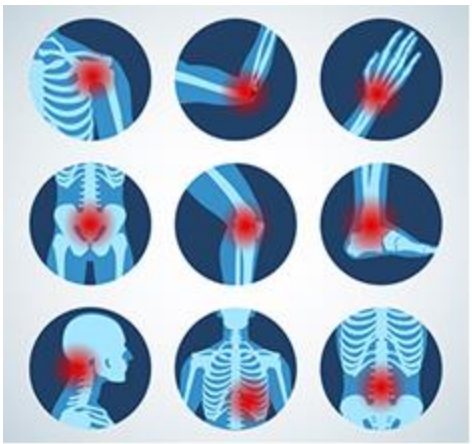
Jawarharlal Nehru Technological University, Dundigal, Hyderabad, Telangana- 500055.

1*Corresponding Author: A. Madhu Bindu

ABSTRACT: Inflammation is the body's natural response to any injury, infection or allergies causing irritation. It is considered as a protective process in the body eliminating the foreign particles causing the damage or injury. Generally inflammation is considered to have three types that is acute infalmmation , chronic inflammation, and sub acute inflammation. A short term response is shown in the acute inflammation, whereas a prolongated response that may lasts weeks , months or even in years are seen in the chronic inflammaiton. This review focuses and explores the biochemically active phytochemical constituents showing the antiinflammatory activty , and their basic mechanism of actions. It emphasises or signifies contributions of the role of the medicinal plants like aloe, berberies, cucurma, many more other plants. Even the traditional plants like ficus carica, Daphne mezereum are discussed by their antiinfalmmatory activity, individually considering the plants, their antiinflammatory activity, and the methods to extract the chemical constituents present in the plant that shows antiinflammatory activity are discussed. This review also tells the methadologies for the invivo studies widely on rats and pigs, using the carrageenan drug.

INTRODUCTION

Inflammation is an age-old, ancestral word, which comes from the Latin inflammare,meaning to ignite or burn. An analogy with fire is instructive because teleologically the purpose of inflammation is to pre-emptively 'ignite' in defence against an area of potential threats and then to spontaneously extinguish after threat neutralization[1]. The problem with inflammation is three-fold not all threats necessarily warrant an inflammatory response, including blunt trauma. Ischemia-reperfusion injury, exposure to toxins or crystal particulated and auto-inflammatory disease; inflammation is an a "equal opportunity offender" that singes both diseased and healthy tissues[2] as with any fire, the potential for smoldering persistence or uncontained inflammatory spread is ever-present. Biological objects in life sciences are often observed and described while taking part in processes with various,sometimes even directly opposite outcomes, whereby these processess are named indentically and according to the object concerned[3] .



Similarly, phagocytois denotes a process of engulfment and full digestion of bacteria by phagocyte but also a process of engulfment of bacteria by a phagocyte but also a process of engulfment of bacteria by a phagocyte followed by reproduction of bacteria with resultant phagocyte lysis, that is eating the host cell by bacteria[4,5]. On the organism scale, the classical meaning of "immunity"has been resistance to influences of infectious agents, meaning in reality absence of

inflammation in presence of a pathogenic microorganism. However, one of the classical experimental models of causing inflammation is application of complete Freund adjuvant (CFA), thatis generally regarded as one of the strongest immunostimulators[6]. Thus, by "immunity" one usually understands both absence of inflammation as apparent tolerance to microorganisms, and also vigorous inflammation, that is hypersensitivity to noxious stimuli. Wide variety of ambiguous terms in biology may be and often is an inspiration for further experimental and theoretical work and development of biological sciences. However, from a medical perspective ambiguous theoretical terms are a great obstacle because at one time and place, a process (physical, chemical, or biological) may take only one direction. Therefore, in order to reliably predict the influence of a given defined factor to a biological environment, one should first unambiguosly define its interaction with biological objects as a unidirectional process. For example, the biochemicalTypes of inflammation: inflammation can be classified into two main types based on its duration and underlying causes.

A. Acute inflammation

B. Chronic inflammation

Acute inflammation : It is of short duration and represents the early body reaction and is usually followed by repair. Its main features are accumulation of fluid and plasma at the affected site, intravescular activation of platelets, polymorphonuclear neutrophils as inflammmtory cells.

Response of the acute inflammatory response is a progressive process and maybe of two types:

1. Vascular events

2.Cellular events

Chronic inflammation: it is of longer duration and occurs either after the causative agent of acute inflammation persists for a long time or the stimulus is such that it includes chronic inflammation from the beginning. The characteristic features of chronic inflammation is presence of chronic term "hydrolysis" denotes only the process of disruption of bonds between monomeric units of biopolymers in presence of water and not vice versa. Since biochemical reactions between substrated generally satisfy this condition of unambiguousness, potential great benifits to medical sciences from explicitly defining biological processes in terms of biochemical reactions between substrates are here exemplified by a biochemical definition of the inflammatory process, an old, widely important but still controversial notion. Although the inflammatory process as a manifestation of disease has been recognized almost from historical beginnings of medicine, its nature and physiological significance have not become clear and undisputed until present time [7].

"ANTI-INFLAMMATION AND PRO-RESOLUTION"

The notion that the inflammatory response generated its own regulators in tandem with the better known proinflammatory mediators and pathways makes sense teleologically. From the cybernetic viewpoint it is easier to control a process with both positive and negative regulatory inputs. Or perhaps a finer level of control can be achieved, for example, consider the car metaphor of hitting the brakes to stop or the accelerator of hitting the brakes to stop or the accelerator to go. Indeed,several endogenous regulators of the inflammatory response have already been elucidated, adding support to the idea that this is a widely employed mechanism. Clearly, disturbances in such counter-regulatory circuits could lead to exacerbated inflammatory responses just as effectively (although perhaps less obviously) than excessive activation of the pro-inflammatory cascades. Notheworthy, one of the most widely used calsses of anti-inflammatory and immunosuppressive drugs, the glycocorticoids, have been developed from the pioneering work of Philip Hench and represents the first successful exploitation of an ecdogenous anti-inflammatory mediator, cortisol[8].

ACUTE INFLAMMATION RESOLUTION:

ISSN:-2581-6934 |Available at :www.jidps.com | pp :(10-27)

Although resolution in cellular and molecular terms has been known to pathologists at the tissue level for more than 100 years, only recently have wethat is, when the number of neutrophils infiltrating from the tissues are dropping and are actively pushed back by the mediators produced. Provides clear evidence for the role of active biochemical pathways in resolution. The resolution phase can be defined at the histological level as the interval from maximum neutrophilic infiltration to the point when they are lost from the tissue. Concomitantly, mononuclear cells are then introduced in a nonphlogistic fashion and play a key role in tissue repair. They, too, are eventually lost from the tissue and are not found in tissue sections following neutralozation of the insult. These cellular terms and temporal relationships, have now called for the need to introduce quantitative indices,which enable us to define the precises changes in leulocytic traffic and biochemical pathways activated in exuded, as well as determine the impact of various endogenous mediators, exogenous compounds and potential drugs within the resolution phase. Along begun to take note. Resolution of acute inflammation, or its ideal outcome, would be complete resolution. The return to hoeostatis by the tissue was thought to occur by passive mechanisms. Expressly, on surgical trauma, tissue, or chemical injury, the liberated chemical mediators would evoke leulocyte chemotaxis into tissue. The decrese in chemotactic grasdients or the bruning out of the initial sugnals was thought to eventually dissicpate depending on the magnitude of the invading microbes and or injury. Resolution of acute inflammation via the exodus of neutrophils from tissues after their infiltration and involvement in host defense, namely,after the job is done, was thought to be a passive series of events. The uncovering of several distinct biochemical pathways that are actively turned on during inflammation in the resolution phase, with these temporal changes in the quantity and quality of the leukocyte infiltrate, additional new approaches are needed to determine the impact of various endogenous mediators, exogenous compounds, and potential drugs within the resolution phase. Along with these temporal changes in the quantity and quality of the leukocyte infiltrate, additional new approaches are needed to define how infiltrating cells changes the stromal microenvironmental and thereby affect the timing of tissue repair and remodeling[8].

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A glance at table 1 shows that inflammation has been held responsible for aging and obesity, depression and cancer, not to speak of osteoporosis and erectile dysfunction. Its's complicated too complicated, perhaps. Most of these papers simply describe that one or another cell has made or responded to one or another mediator of inflammation. So perhaps we'd better go back to the original definition of inflammation and to its original cause: the battle between a host and an army of microbes. Redness and swelling with heat and pain rubor et tumor cum colore et dolore have been recognized as the four cardinal signs of inflammation since the writings of Aulus Cornelius Celsus. The fifth functio laesa(loss of function) was added by Rudolf Vrichow in 1858. doyesns of the field agree that although one can have one or another of these signs without inflammation, it ain't inflammation until one has at least four. Emotions , such as turning crimson like streep ogling balswin or pining in pain like a flummoxed steve martin, are not inflammation. But, if you've cought a bad strep in your throat or been stung by a wasp on your eyelid, only then are you inflamed, you've seen throat or been stung by a wasp on your eyelid, only then are you inflamed, you've seen redness and swelling with heat and pain first-hand.

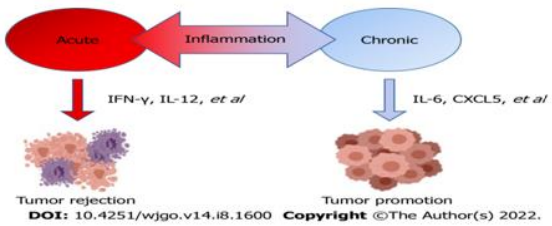

Table 1. Conditions Associated with "Inflammation" in Papers Listed by PubMed[a][9].

Infection	135,713
Cancer	33,602
Rheumatoid arthritis	9166
Atherosclerosis	8411
Obesity	4401
Aging	3682
Depression	2293
Alzheimer's	1231

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Osteoporosis	791
Schizophrenia	194
Fibromyalgia	175
Erectile dysfunction	82
Anorexia nervosa	41
Hirsutism	28

Table 2: Most Commonly Known Plants With Anti-Inflammatory Activity In Alphabetical Order:

S.No	NAME	FAMILY	PLANT PART	CHEMICAL CONSTITUENT	OTHER USES
1.	Aloe barbadensis	Liliaceae	leaf	Acemannan, Aloin,Emodin	Healing,moisturizer
2.	Andrographis paniculata	acanthaceae	leaves	Andrographolide	Antioxidant, antimicrobial
3.	Berberis vulgaris	berberidaceae	Bark , berries	Berberine	Digestive health, BP regulation
4.	Boswellia serrata	Burseraceae	stem	Boswellica cids , triterpenes	Pain relief cancer support
5.	Clitoira ternatea	Fabaceae	Leaves,flowers	Quercetin, anathocyanin	Antioxidantantidiabetic
6.	Curcurma longa	zingiberaceae	rhizome	cucurmin	Pain relief, skin health
7.	Dioscorea villosa	dioscoreaceae	Roots, tubers	diosgenin	Hormonal balance, nutritional benifits
8.	Daphne mezereum	Thymelaeaceae	Bark,roots	Daphnetin, daphnin	Analgeisc , anticancer
9.	Echinacea purpurea	Asteraceae	Roots, leaves	echinacoside	Wound healing, anxiety relief
10.	Epipremnum aureum	Araceae	Leaves, stem	saponins	Air purification
11.	Ficus carcia	Moriceae	Leaves, fruit	Flavonoids, ficin	Skin health,antioxidant
12.	Filipendula ulmaria	Rosaceae	Flowers, leafs	Salicylic acid, flavonoids	Antioxidant, respiratory support
13.	Gardenia jasminoides	Rubiaceae	Leaves, flowers	gardenoside	Antimicrobial, aromatic uses
14.	Geam rivale	Acanthaceae	Leaves, roots	geanrivilin	Antioxidant,wound healing
15.	Harpagophytum procumbens	pedaliaceae	roots	harpagoside	Antioxidant,antirheumatic
16.	Hibiscus rosa-sin-ensis	Malvaceae	Floweres, leaves	anthocyanins	Antioxidant,diuretic
17.	Ilex paraguariensis	aquifoliaceae	leaves	Caffeine and theobromine	Antioxidant, cardiovascular health
18.	Jatropa curcas	euphorbiaceae	Seeds, leaves	Phorbol esters	Pest control, biodesil
19.	Jasminum officinale	Oleaceae	Flowers, leaves	Jasmonic acid	Antioxidant,cosmetics
20.	Kava kava	Piperaceae	Roots	Kava lactones	Muscle relaxant
21.	Lonicera japonica	caprifoliaceac	Flowers , leaves	Chlorogenic acid	Antioxidant, antimicrobial
22.	Linum usitatissimum	linaceae	seeds	Alpha lenolenic acid	Antioxidant
23.	Mangifera indica	Anacardiaceae	Leaves, fruit	Mangiferin	Antioxidant
24.	Melissa officinalis	Limiaceae	Leaves	Rosmarinic acid	antimicrobial
25.	Nasturtium officinale	Brassicaceae	Leaves, stem	Glucosinolates	Antioxidant, antimicrobial
26.	Ocimum tenuiflorum	Limiaceae	Leaves	Eugenol	Antimicrobial, antioxidants
27.	Pisum sativum	Fabaceae	Seeds	Polyunsaturated fatty acids	Antioxidants
28.	Quercus robur	Fagaceae	Bark, leaves	Tannins	antimicrobial
29.	Rubus idaeus	Rosaceae	Fruit, leaves	Ellagic acid	Antioxidant
30.	Solanum lycopersicum	Solanaceae	Fruit	lycopene	Antioxidant,skin protection
31.	Tamarindus indica	Fabaceae	Fruit, pulp	Tartaric acid, flavonoids	Antioxidants
32.	Uncaria tomentosa	Rubeaceae	Bark, roots	Alkaloids	Antioxidants
33.	Valeriana officinalis	Valerianaceae	Roots	Valerenic acid	Muscle relaxant
34.	Withania somnifera	Solanaceae	Roots	Withnolides	Energy , cognitive health
35.	Xanthium strumarium	Asteraceae	Fruit, seeds	Xanthifructose , flavonoids	Antimicrobial
36.	Yucca schidigera	Asparagaceae	Roots, leaves	Saponins	Detoxification
37.	Zea mays	Poaceae	Corn silk, kernels	Flavonoids	Antioxidants

ALOE BARBADENSIS MILLER

Family: Liliaceae

(fig.1)

Plant part showing the anti-inflammatory activity: leaf of the aloe vera Aloe vera is widely recognized for

Fig.1

BOSWELLIA SERRATA

Family: Burseraceae

(fig.2)

Boswellia serrata (salai/salai guggul), is a moderate to large sized branching tree of family Burseraceae (genus boswellia), grows in dry mountains regions of India, northern Africa and middle east. Gum-resin extracts of boswellia serrata have been traditionally used in folk medicine for centuries to treat various chronic inflammatory diseases. The resins have a fragment aroma because of the presence of essential ouls and this accounts for their commercial importance. Pure oleo gum-resin collected in the optimum season hardens slowly, retaining its golden colour and transparency. But the colour varies from golden brown to dark brown or dark greenish-brown depending on the locality, season, size of the tree and the wound-surface.

The oral administration of different fractions of Boswellia serrata showed suppression of inflammation. The result strongly suggests that the oleo-gum resin can be used efficiently as anti-inflammatory activity

Fig.2

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CLITORIA TERNATEA

FAMILY: fabaceae

(fig.3)

Clitoria ternatea is commonly known as Asian pigeonwings, bluebellivine, bluepea, butterfly pea, cordonfan pea or darwin pea. It is a plant species that belongs to the family fabaceae, its extracts possess a wide range of pharmacological activities including anti microbial, anti pyretic, antiinflammatory, analgesic and local anesthetic. In the traditional (asian) indian systems of medicine particularly in Ayurveda, the roots, seeds and leaves of CT have long been widely used as a brain tonic and is believed to promote memory and intelligence. Phytochemical constituents were extracted by ethanol apueous extraction using 60%(v/v) in a shaking water bath with a cucular motion. The shaking water bath was set a 600C with a speed 100rpm for two hours.

Fig.3

DAPHINE MEZERFUM

Family: Thymelaeaceae

(fig.4)

Daphne mezerem, commonly known as mezereum, from a plant family thymelirascar, native to most of Europe and western Asia, north to northern Scandinavia and Russia. All parts of this plant are poisonous to humans if ingested, especially the fruits, sap and bark. Plant saps also typically cause skin irritations, several Daphne species have been used against inflammatory disorders.

Fig.4

Daphne is one of the largest out of almost 50 genera belonging to the thumelacaseae, family and it includes around 95 species. The genus Daphne has been used for medicinal purposes for centuries. They are used for medicinal purposed for centuries. They are used for the treatment of tumors,

gonorrhea, cutaneous infections, aches, theumatism, high blood pressure, malaria, and inflammations.

EPOPREMNUM AUREUM

Family: Araceae

(fig.5)

Epipremnum aureum has a shiny heart shaped,dark green, flat and plump leaves. Young plants comprises 8-20 cm long heart shaped leaves. Leaves are generally small and leaf surface is waxy. If they are grown under favourable conditions it grows longer and big in size. Aerial parts of epipremnum ponnatum showed anti-inflammatory activity. The results of preliminary phytochemical evaluations of epipremnum aureum leaves ethanolic extract consist of secondary metabolites such as alkaloids, tannin's, and triterpeniods.

Fig.5

because it is fat and cholesterol free and contain high number of amino acids.

FICUS CARICA

Family: Moraceae

(fig.6)

The fig tree, Ficus carica is one of the unique ficus species widely spread in tropical and subtropical countries. It has edible fruits with high commercial value. Fig has been traditionally used for its medicinal benefits as metabolic, cardiovascular, respiratory, antispasmodic and

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antiinflammatory remedy. Thus, it is concluded that the ethanolic extract of bark of ficus carica produces significant antiinflammatory activity in dose dependent manner. Fifteen anthocyanin pigments were isolated from the fig fruit and bark of F. carica. Figs are used as an excellent source of minerals, vitamins, carbohydrates, and dietary fibers

Fig.6

GARDENIA JASMINOIDE

Family: Rubiaceae

(fig.7)

Gardenia jasminoides, an evergreen tree that belongs to the Rubiaceae family, is cultivated in multiple areas in China, with a Chinese name of Zhi Zi. It also has various biological activities, such as antidiabetic, anti-inflammatory, antidepressant and antioxidant properties and improvement of the quality of sleep. Extraction methods such as solvent extraction, as well as ultrasound and microwave-assisted extraction (MAE) have been used to extract iridoids.

Fig.7

HIBISCUS ROSA SINESIS

Family: Malvaceae

(fig.8)

It is the national flower of malaysia called bunga raya in malay. This can be translated in a number of ways, including "great flower" introduced into the malay penisula in the 12th century, it was nominated as the national flower in the year 1958 by the ministry of agriculture amongest a few other flowers, namely ylang ylang, jasmine, lotus, rose, magnolis, and medlar. In july 28,1960, it was declared by the government of malaysia that H.rosa sinensis would be the national flower. The red of the petals symbolized the courage, life, and rapid growth of the Malaysian people, and the five petals represent the five rukun negara of Malaysia. The flower can be found imprinted on the notes and coins of the Malaysian ringgit. It is also a widely know ornamental plant throughout the tropics and subtropics. As it does not tolerate temperature below 10 degree , in temperate regions it is bests grown under glass. Plants grown in container may be placed outside during the summer months and moved into shelter furing the winter months. Numerous cultivars exist, with flower colors ranging from white though yellow orange to scarlet and shades of pink, with both single and double sets of petals. The cultivar 'Cooperi' has gained the royal horticultural society's award of garden merit. Desite its size and colorful hues which are typically attractive to nectarivore birds, the flowers of hibiscus are not visited regularly by hummingbirds when grown in the neotropics. Generalist species, like the sapphire spangled emerald or long billed species, like the stripe breasted starthroat are occasionally seen to visit the flowers . in the subtropical and temperate Americas, humming birds are regularly attracted to hibiscus. Its leaf,or flower is used for the ethanol extract , and were dissolved in distilled water and given intraperitonially to the rats, anti inflammatory activity test is performed.

Fig.8

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INDIGOFERA TINCTORIA

Family: fabaceae

(fig.9)

Indigofera tinctoria also called true indigo, is a species of plant from the bean family that was one of the original sources of indigo dye. True indigo is a shrub 1-2 metres high. It may be an annual, biennial or perennial depending on the climate in which it is grown. It has light green pinnate leaves and sheafs of pink or violet flowers. The rotenoids deguelin, dehydrodeguelin, rotenol, rotenone, tephrosin and sumatrol can be found in I.tinctoria. The plant is a legume, so it is rotated in to fields to improve the soil I the same way that other legume crops such as alfalfa and beans are. The plant is also widely grown as a soil improving ground-cover. Dye is obtained from the processing of the plants leaves. They are soaked in water and fermented in order to convert the glycosides indican naturally present in the plant to the blue dye indigotin. The precipitate from the fermented leaf solution is mixed with a strong base such as lye. Today most dye is synthetic, but natural dye form I. tinctoria is still available marketed as natural colouring where it is known as tarum in indonesia and nila in malaysia. In Iran and areas of the former soviet union it is known as basma.

Fig.9

JASMINUM OFFICINALE

Family: Oleaceae

(Fig.10)

Jasminum officinale, known as the common jasmine or simply jasmine, is a species of flowering plant in the olive family oleaceae. It is native to the cucasus and parts of asia, also widely naturalised. It is also known as summer jasmine, poet's jasmine, white jasmine, true jasmine or jessamine, and is particularly valued by gardeners throughtout the temperate world for the intense fragrance of its flowers in summer. It is also the national flower of pakistan. Jasminum officinale is a vigorous, twining decidous climber with sharply pointed pinnate leaves and clusters of starry, pure white flowers in summer, which are the source of its heady scent. The leaf has five to nine leaflets. The chemical constituents, found to be alkaloids, coumarins, flavonoids, tannins, terpenoids, glycosides, emodine, leucoanthocyanins, steroids, anthocyanins, phlobatinins, essential oils and saponins. Numerous cultivars have been developed for garden use, often with variegated foliage. The cultivar 'Argenteovariegatum' with cream white variegation on the leaves , has gained the royal horticultural society's award of garden merit. The essential oit of jasmine absolute has a heavy, sweet scent valued by perfumers. The flowers release their perfume at dusk, so flowers are picked at night and a tiny amount of oil is obtained from each blossom by solvent extraction, the result is an expensive oil which can be used in low concentrations. Jasmine is generally recognized as safe as a foof ingredient by the USFDA. It is unknown whether jasmine comsumption affects breastmilk, as the safety and efficacy of jasmine in nursing mothers or infants has not been adequetly studied. Drinking small amounts of jasmine tea likely are not harmful during nursing. Also allergic reactions to the jasmine may occur.

Fig.10

KALANCHOE PINNATA

Family: Crassulaceae

(fig.11)

Kalanchoe pinnata, commonly known as cathedral bells, air plant, life plant, miracle leaf. Goethe plant and love bush, is a succulent plant native to madagascar. It is a popular houseplant and has became naturalized in tropical and subtropical areas. The species is distinctive for the profusionof miniature plantlets

ISSN:-2581-6934 |Available at :www.jidps.com | pp :(10-27)

that form on the margins of its leaves, a trait it has in common with some other members of bryophyllum now included in kalanchoe. It is asucculent, perennial plant about one cm tall, with fleshy cylindrical stems and young growth of a reddish tinge, which can be forund in flower throughout mosts of the year. The leaves of this species are thick, fleshy,elliptical in shape, curved, with a creanate or serrated margin, often reddish. Simple at the base of the stem, the leaves are imparipinnate at the top, 10-30cm long,with three to five pairs of fleshy limb lobes. The leaves are remarkable for their ability to produce bulbis. At their margin, between the teeth, adventitious buds appear, which produce roots, stems and leaves, when the plantlets fall to the ground, they root can become larger plants. This is a fairly common trait in the section bryophyllum. The fruits are follicles (10-15mm) which are found in the persistent calyx and corolla. The terminal infloresence is a panicle, with many pendent, red orange flowers. The calyx is formed of long tube, red at the base, veined with yellowish green with four very small triangular lobes at the end. The tubular corolla, with a pronounced constriction separating the subspherical part of the ovoid part, is terminated by four lobes which reaches five cm in length. It is yellowish in colour with red-purple streaks. The eight stamens, each about 4 cm long, are in two whorls, welded on the corolla. The ovary has four carpels, slightly fused together in the center, with slender styles. Kalanchoe pinnata is native to Madagascar, and has become naturalized in tropical and subtropical areas, inhabiting warm and temperate climates from sea level to 2,600m, occupying sites on rock in tropical evergreen and dry decidious forests, as well as montane forests. In temperate regions, Kalanchoe pinnata is grown as an indoor ornamental plant. Like most succulents, it cannot survive hard frost and will not thrive in environments in which the temperature drops below 10 degree celsius. It favours well drained soil, the roots being otherwise susceptible to root. In the tropics, K.pinnata is grown outdoors in gardens, from which it may escape to become naturalised often as an invasive weed. In common with other species belonging to the crassulaceae including certain memebers of the genera tylecodon, cotyledon and adromischus, kalanchoe pinnata has been found to contain bufadienolide cardiac glycosided, these can cause cardiac poisoning, particularly in grazing animals. Bryphyllum pinnatum has been recorded in trinidad and tobago as being used as a traditional treatment for hypertension.

Fig.11

LINUM USITATISSIMUM

Family: Linaceae

(fig.12)

Flax, also known as common flax or linseed, is a flowering plant, linum usitatissimum, in the family linaceae. It is cultivated as a food and fiber crop in regions of the world with temperate climated. In 2022, france produced 75% of the world's supply of flax. Textiles made from the flax are known in english as linen, and are traditionally used for bed sheets, underclothes, and tablen linen. Its oils is known as linseed oil. In addition to referring to the plant, the word flax may refers to the unspun fibers of the flax plant. The plant species is known only as cultivated plant and appears to have been domesticated just once from the wild species linum bienne, called pale flax. The plants called flax in new zealand are by contrast, members of the genus phormium. Several other species in the genus linum are similar in appeareance to L.usitatissium, cultivated flax, including some that have similar blue flowers, and others with white, yellow or red flowers, some of these are perennial plants, unlike L. usitatissium, which is an annual plant. Cultivated green, slender lanceolate, 20-40 mm long, 3 mm broad. The flowers are 15-25 mm in diameter with five petals, which can be colored white, blue, yellow, and red depending on the species. The fruit is round, dry capsuled 5-9 mm in diameter, containing several glossy brown seeds shaped like apple pips, 4-7 mm long. Flax is grown for its seeds, which can be ground into a meal or turned into linseed oil, a product used as a nutritional supplement and as an ingredient in many wood-finishing products. Flax is also grown as an ornamental plant in gardens. Moreover, flax fibers are used to make linen. The specific epithet in its binomial name, usitatissimum, means

ISSN:-2581-6934 |Available at :www.jidps.com | pp :(10-27)

most useful. Flax seeds are 7% water, 18% protien, 29% carbohydrates, and 42% fat. In 100 grams as a reference amount, flax seeds provide 534 kilocalories and contain high levels of protien, dietary fiber, several B vitamins, and dietary minerals . flax seeds are espcially rich in thamine, magnesium, and phosphorous. The soils most suitable for flax, besides the alluvial kind, are deep loams containg a large proportion of organic matter. Flax is often found growing just above the waterline in cranberry bogs. Heavy clays are unsuitable, as are soils of a gravelly or dry sandy nature. Farming flax requires few fertilizers or pesticides. Within eight weeks of sowing, the plant can reach 10-15cm in height, reaching 70-80 cm within 50 days.

Fig.12

MANGIFERA INDICA

Family: Anacardiaceae

(fig.13)

Mangifera indica, commonly known as mango, is an evergreen species of flowering plant in the family anacardiaceae. It is a large fruit tree, capable of growing to a height and which of 30 metres. There are two distinct genetic populations in modern mangoes the “INDIAN TYPE” and the sountheast asian type. Mangifera indica is a large green tree, valued mainly for its fruits, both green and ripe. Approximately 500 with more than 1000 wild which are unreported as each monoembryonic seed gives a new variety of mango , varities have been reported in india. It can grow up to 15-30 mts with a similar crown width and a trunk circumference of more than 3.7m. the leaves are simply, shiny and dark green. Yellow-white fragrant flowers appear at the end of winter and also at the beginning of spring. Both male and female flowers are borne on same tree. Climatic conditions have significant influence on the time of flowering. In southeastern Asia mangoes have been introduced to tother warm regions of the world, generally mango trees can withstand a minimum temperature. The tree grows best in well-drained sandy loam, it does not grow well in heavy wet soil. The optimal pH of the soil should be betweeen 5.2 and 7.5. the tree is more known for its fruit rather than for its timber. However, mango trees can be converted to lumber once their fruit-bearing lifespan has finished. The wood is susceptable to damage from fungi and insects. The wood is used for musical intruments such as ukeleles plywood and low-cost furniture. The bark is used to produce a yellow dye.

Fig.13

NASTUTIUM OFFICINALE

Family: Brassicaceae

(fig.14)

It is a perennial plant that grows in europe and some parts of asia. The leaves of the plant are broadly used as a diuretic, expectorant, and anti-diabetic agent. Watercress is usually eaten in fresh form in salands, soups and other recipes. In this study, antiinflammatory activity of the hydroalcoholic extract from aerial parts of nastutium officinale was investigated. Our fingings indicate potent antiinflammatory activity of N.officianle in synthesis and topical application and propose its potential as an antiinflammatory agent for treatment of inflammatory conditions. The topical antiinflammatory effect of N. officinale was studied on 12-0-tetradecoylphorbol-13-acetate induced mouse ear edema. There is no study about the possible anti-inflammatory effects of N.officinale with either in vivo and in vitro conditions. Therefore, the objective of the present work was to investigate the antinflammatory effects of a hydro-alcoholic extract from aerial parts of N.officinale in different experimental models of inflammation. Oral administration of the hydro-alcoholic extract of N.officinale was investigated on two well charchaterised animal models of

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inflammation, including carrageenan, or formali induced paw edema in rats. Nasturtium officinale mostly found in the native region of the Europe. This plant ethanolic extract is used in some acute animal models of inflammaiton. The main objective of the current research was to explore the systemic and topical antiinflammatory actions of N.officinale against two models of chronic inflammation and the role of IL-beta and TNF-alpha, as pro-inflammatory cytokines, in these effects.

Fig.14

OLIVE TREE

Family:

(fig.15)

Olive tree leaves are an abudant source of bioactive compounds with several benificial effects for human health. The effect of olive leaf extract in obesity. The molecular mechanism in preventing obesity-related inflammation has not been elucidated. Obesity is a state of chronic low-grade inflammation and is associated with an increase of inflammatory M1 macrophages infiltration in the adipose tissue. Olea europaea L.leaf extract anti inflammatory activity using an in vitro model of obesity induced inflammation obtained by stimulating murine macrophages RAW 264.7 with high dose of the free fatty acid palmitate. OLE significantly suppressed the induction of pro-inflammatory mediators, tumor necrosis factor , interleukin, nitric oxide, prostaglandin and reactive oxygen species, while it enhanced the anti-inflammatory cytokine, IL-10. the therapeutic feature of OLE in recovering obesity associated inflmmation via regulating M1/M2 status. OLE promoted the shift of M1 macrophage toward less inflammatory M2 cells via the modulation of the associated NF and proliferator activated receptor gamma signaling pathways.

Fig.15

PISUM SATIVUM

Family:

(fig.16)

The aerial part of Pisum sativum , subspecies sativum, it is used to treat diabetes, heart diseases and as blood purifier. Traditional use of aerial parts of pisum sativum as a source of anti diabetic agent. Pisum sativum, locally known as matar, is an annual or perinnial herb. It is cultivated throughout the Bangladesh. These seeds are used as nutrient, appetizer, refrigent, laxative, astringent and also used in treating wrinkled skin, diabetes, acne, phlegm and intestinal inflammation. Petiole and tendril yielded kaempferol-3-triglucoside, quercentin-3-triglucoside, and their p-coumarin esters. Newly growth tender is used as vegetable in Bangladesh. The edible aerial part of pisum sativum, was collected in december 2014 from khuna, bangladesh and indentified by experts at bangladesh in national her-barium, dhaka, Bangladesh. The edible aerial part of P.sativum was collected in december 2014 from khulna, Bangladesh and identified by experts at Bangladesh national herbarium, dhaka, Bangladesh.

Fig.16

QUERCUS ROBUR L.

Family:

(fig.17)

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Oak bark was collected from Quercus robur L. , oak bark has been used since ancient times in european ethnomedicine because of its astringent,antimicrobial and hemostatic features, treatment of wounds and skin diseases. Quercus robur, Quercus petrae and Quercus pubescens, whereby the bark of 10-15 year old trees is preferentially utilised, because of its high tannin content, oak bark possesses astringent, desicating,emplastic, antimicrobial and antiinflammatory activities, among others the treatment of eczema, scrofula,menorrhagia, haemorrhoidal ailments, varices and the formation of fissures and rhagades of the skin and mucous membranes as well as skin inflammations and allergic diseases. Mast cells and basophils in parallel release inflammatory mediators such as interleukin and or tumor necrosis factor at sites of allergen exposition and thereby orchestrate.

Fig.17

RUBUS IDAEUS LINNAEUS

Family:

(fig.18)

Rubus idaeus linnaeus is a chinese herbal medicine that has been widely used in china for a long time to reinforce the kidney, nourish the liver, improve vision and arrest polyuria. The effectiveness of rubus idaeus has been proved by its long term clinical application. The research on the pharmacological activity of rubus idaeus has flourished. Rubus L. is one of the most species rich genera in the rosaceae family, but only a few species have been used as medicinal herbs.

Fig.18

SOLANUM LYCOPERSICUM

Family: Solanaceae

(fig.19)

Antiinflammatory activities of phytochemicals in a purple tomato extracts showed significant and dose dependent anti inflammatory effect in the in vivo carrrageenan induced paw oedema rat study, suggesting that anthocyanins may play a role in the anti inflammatory effect. The solanaceae family comprises about 3000 species and 150 genera. It is prevalent in tropical and subtropical regions of south america and has economic importance because several species of the solanum genus are cultivated for food, such as solanum tuberosum, solanum lycopersicum, solanum melongena, and solanum gilo. The specied solanum lycocarpum, St.hill, popularly known as the fruit of the wolf, is widely distributed in the brazilian cerrado. The fruits are usually consumed in natura or used in jellies, jams, or pasta preparations. It is a widely known sedative, in the treatment of epilepsy, asthma, diabetes, obesity, the reduction of cholesterol levels, and abdominal and renal pains. Biological activities such as antiinflammatory, antioxidants, cytotoxic, antibacterial, allelopathic, and larvicidal have been reported for this species. Ethanol extract and fractions obtained from leaves of solanum lycocarpum were examined in order to determine their phenolic composition, antioxidant, antibacterial, antiinflammatory, and cytotoxic potential. The ethyl acetate fraction also presented a less cytotoxic effect than the ethanol extract and other fractions. These activities found in solanum lycocarpum leaves

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can be attributed, atleast in part, to the presence of phenolic constituentsd such as flavonoids. This work provided the knowledge of phenolic composition in the extract and fractions and the antioxidant, antibacterial, antiinflammatory, and cytotoxic activities of leaves of S.lycocarpum.

Fig.19

TAMARINDUS INDICA

Family:

(fig.20)

The tamarindus indicaa tree, a long-lived evergreen hardwood found in various regions such as Egypt, tropical africa and asia , is also utilized for medicinal purposes. Various parts of the tamarind tree have been reported to exhibit antimicrobial, antiviral, antivenom, antidiabetic, antiasthmatic, antioxidant, antimalarial, and antiinflammatory activities. Additionally, extracts from the tree have traditionally been used to treat conditions such as diarrhea, dysentery, helminth infections, abdominal pain, and for wound healing. This research investigated the antiinflammatory, antidiabetic, and biocompatibility properties of tamarindus indica fruit coat aqueous extract through both in vitro and invivo studies. The aqueous extract of T.indica fruit coat contains medicinally important phytochemicals with notable antiinflammatory effects.

Fig.20

UNCARIA TOMENTOSA

Family:

(fig.21)

Uncaria tomentosa DC. Commonly known as cat's claw, is a tropical medicinal vine native to the amazon rainforest and other regions of south and central america. Traditionally, it has been used to treat conditions such as asthma, abscesses, fever, urinary tract infections, viral infections, and wounds. The plant is renowned for its immune rejuvenating, antioxidant, antimicrobial, and antiinflammatory properties. Rich in phytoconstituents like oxindole and indole alkaloids, glycosides, organic acids, proanthocyanins, sterols and triterpenes, U.tomentosa has significant medicinal values. Its bark and root have been used in traditionally medicine to treat inflammations, cancer, gastric ulcers, arthritis, and various infections.

Fig.21

VALERIANA OFFICIANALIS

Family: Caprifoliaceae

(fig.22)

The genus valeriana comprises approximately 250 species distributed worldwide, with 30 species native to china. Previous studies have identified various iridoids and sesquiterpenoids from the valeriana genus, some of which have demonstrated potential antiinflammatory properties. Valeriana plants, known for their natural sedative and analgesic properties, are notable for their therapeutic effects with low toxicity and minimal side effects. Valeriana jatamansi has been reported by our group, with some exhibiting antiinflammatory activity. From valeriana plants, particularly the roots and rhizomes of V.officinalis twenty six iridoids and ten

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sesquiterpenoids, including six new iridoids and a newly identified natural iridoid, have been obtained.

Fig.22

WITHANIA SOMNIFERA

Family:

(fig.23)

Withania somnifera also known as indian ginseng or indian winter cherry, is an ancient medicianl plant widely used in traditional indian systems like ayurveda and unani. Renowned as one of ayurveda's best rejuvenating agents, its roots, seeds, and leaves are extinsively utilized in various treatments. The roots are particularly effective in managing rheumatic pain, joint inflammation, nervous disorders, and epilepsy, while the leaves are applied to treat carbuncles, inflammation, and swellings. Medicinal plants serve as a rich source of natually active compounds and have been extensively utilized by tribal communities worldwide to address various ailments. Withania somnifera, a prominent plant in ayurvedic medicine, has been used for centuries to treat numerous conditions. The dried roots of W.somnifera are particularly valued for their therapeutic properties. Recent investigations have focusesd on extracting, detecting, and screening the active phytochemical compounds from different extracts of W.somnifera roots. Withania somnifera exhibited significant antiinflammatory effects in a rat model of carrageenan induced paw edema, peaking at 2 hours post administration and lasting for 4 hours. Its antiinflammatory action is attributed to the inhibition of histamine, 5-hydroxytrytamine, and prostaglandins, with antagonists like promethazine, cryproheptadine, and diclofenac enhancing its effect. The study suggests that W.somifera inhibits and 5-HT during the early phase and protaglandins in the delayed phase of inflammation.

Fig.23

XANTHIUM STRUMARIUM

Family: Compositae

(fig.24)

The genus xanthium comprises 25 species worldwide, with 3 species and one variety recorded in china. Historically, xanthium species have been utilized as traditional herbal medicines in various oriental countries. Among these, xanthium strumarium L. is the principal species, widely distributed across china and commonly used in traditional chinese medicine to treat conditions such as nasal sinusitis, headache, urticaria, and arthritis. The genus xanthium, an annual herb of the family compositae, is widely distributed across the globe. Traditionally, xanthium plants have been utilized in chinese medicine to treat ailments such as fever, rhinitis, headache, sinusitis, tympanitis, scrofula, and arthritis. Additionally, compounds and extracts derived from xanthium species have demonstrated various pharmacological activites, including antiinflammatory effects. Xanthatin demonstrated antiinflammatory activity by inhibiting PGE2 synthesis by 24% at a concentration of 100 micro grams per milli liter, and 5-lipoxygenases activity by 92% at a concentration of 97 micro grams per milli liter.

Fig.24

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YUCCA SCHIDIGERA

Family:

(fig.25)

Yucca schidigera, an herbaceous plant belonging to the lily family, is native to the deserts of the southwestern united states and northern mexico. Traditionally native americans utilized this plant in medicine to treat various ailments,including arthritis. Yucca schidigera, a medicinal plant antive to mexico, is known in folk medicine for its antiarthritic and anti inflammatory properties. It contains several physiologically active phytochemicals and is a rich source of polyphenols, including resveratrol and various stilbenes, such as yuccaols A,B,C,D and E. these phenolic componds are recognized for their anti inflammatory activity. Species of the yucca genus have been traditionally used in medicine to treat inflammation related conditions.

Fig.25

ZINGIBER OFFICINALE

Family:

(fig.26)

The zingiberaceae or ginger family, is a large group of aromatic perennial herbs widely distributed acroos the tropical regions of the world characterised by tuberous rhizomes , this family includes important spices such as ginger, curcumin, and cardomom.. these plants are also featured in traditional herbal medicines used to treat conditions,like dyspepsia, colds, migraines, rheumatism, and other disorders. The rhizomes of zingiber species are especially valued in traditionally healing systems. These species contain a wide array of chemical compounds, including organic acids , flavonoids, gingerols, diarylheptonoids, volatile oils, and terpenoids. Zingiber officinale, commonly known as ginger, is particularly rich in phenolic and terpene phytochemicals.

Fig.26

METHODOLOGIES:

Carrageenan induced paw oedema in rats;

A total of 40 make albino wistar rat were used in the experiments. Each rat weighed 200-500g, and all were obtained from Ataturk university's experimental animal laboratory at the medicinal and experimental and procedures were performed in accordance with national guidelines for the use and care of laboratory animals and approved by Ataturk university's local animal care committee. The rat were housed I standard plastic, the animals are starved for overnight.

- The animal should be grouped, this grouping is basse on the test compounds.
- Thirty minutes later, the rats are challenged by a subcutaneous injection of 0.05ml of 1% solution of carrageenan in to the plantar side of the left hind paw.
- The paw is marked with ink at the level of lateral malleouls and immersed in the mercury up to this mark.

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EVALUATION:

- The paw volume was measured using plenthysmometer at 3 and 6 hours, eventually at 24hour immediately after the injection.
- The increases in paw volume at 3 and 6 hours is calculated.
- The percentage increase in paw volume was measured by comparing the difference of the average valuses between treat group animals and control group animals is calculated at each interval time.
- A dose response curve is run for the active drugs and ED50 valuses can be determined.
- Generally the treated group animal show much less edema than control group animal.

Croton-oil induced ear edema in mice;

Both rat and mice are used, usually male rats(sprague-dawley) of 80-60 kg are selected, where as male swiss mice weighing between 25-30 g are selected. Animals were housed in groups of 2-4 per cage in temperature and humidity regulated rooms with 12 hours day and 12 hours night cycles. Grouping is done according to the body weight. In this methodology, a total of 15 ml containing an acetonic solution of 75 micron of croton oil is applied to the inner surface of the right ear of each mouse. The animals are previously, anaesthetised with diethyl ether at a rate 0.02 ml in rats and 0.01 ml in mice. Left ear remains untreated control group receives the irritant solution, while indomethacin serves as a standard(for reference). Varying dose levels of test drug are applied to inner surface of the right ear of each mouse inducing inflammation. As soon as the test and standard drug are given, the animals are sacrificed by cervical dislocation, both treated and untreated ear are removed and a plug of 8 mm diameter is removed from each of the ear. The difference in weight between the two plughs is taken as the measure of edematous response.

Oxazolone induced ear edema in mice;

This model permits the quantitative evaluation of the topical and systemic antiinflammatory activity of the compound following topical administration.

- The experimental animal used in this model is mice and they are divided into 12 groups each.
- The animals were housed in ventilated cages with controlled environmental conditions, including 60% humidity, a
- temperature of 22 degree celsius and 12 hour light-dark cycle. They were provided with a standard mouse diet and water available .
- They are injected with the 10ml of 0.5% of oxazolone solution inside of the right ear, in which test or standard are resolved. Group of 10 to 15 animals are treated with irritant alone or with the solution of the test compound. * The left ear remains untreated and actual inflammation occurs after 24hr. The animals are sacrificed under anaesthesia, at this time and a disc of 8 mm diameter is punched from both the sides. The discs are allowed to dry and are weighed on a balance. The weight difference is an indicator of inflammatory edema.
- Evaluation:
- Average values of the increase of weight are calculated for each treated group and compared statistically with control group.

UV erythema in guinea pigs;

Albino , guinea pigs of both the sexes weighting about 350 g are used. Four animals are used each for treatment and the control. Eighteen prior to the experiment, the animals are shaved on both the flanks and on the back, chemically by means of a depilatory cream or using a suspension of barium chloride. The next day the test compound is dissolved in the vehicle and half of it is administered to the animal by gavage, 30 mins before the UV exposure. Control animals are treated with the vehicle alone. The guinea pigs are placed in a leather cuff with a hole of 1.5 into 2.5 cm size punched in it, allowing the UV radiation to reach only this area.During this time, the remaining half of the test compound is administered. Generally the erythema is scored after 2 and 4 hours of exposure.

EVALUATION:

The degree of erythema is evaluated in a double blinded manner.

The following scored are given:

0-NO erythema

1-Weak erythema

2-Strong erythema

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3-very strong erythema

Animals with a score of 0 or 1 are said to be protected, the scoring after 2 and 4 hours, generally indicates some duration of the effect and EDs, values can be calculated.

Pleurisy test;

The animal used in pleurisy test was mouse. A single dose of 0.1ml carrageenan was injected intravenously. After 4 hours the animal was killed with an over dose of ether and the pleural cavity was washed with 1.0ml of sterile PBS, containing heparin(20 IU per ml). samples of the pleural lavage were collected for determination of exudation, myleoperoxidase, adenosine deaminase activities, and nitric oxide levels, as well as for determination of total and differential leukocytes counts. Total leukocyte counts were performed in a Neuberger chamber. The serum level of the C-reactiver protein was also analysed. In another set of experimental animals were treated 30 mins before carrageenan with a solution of Evans blue dye in order to evaluate the degree of exudation in the pleural space. The amount of dye was estimated by colorimetry using an Elisa plate reader at 600nm, by interpolation from a standard curve of Evans blue dye in the range of 0.01 to 50 micrograms per ml.

EVALUATION;

The values of each experiment group are averaged and compared with that control. ED50 values can be calculataed using various doses.

Granuloma pouch technique;

Male or female sparague-dawley rats with a body weight betweeen 150 to 200 g are used. Ten animals are taken for controls and for test groups. The back of the animals is shaved and disinfected, with a very thin needle a pneumoderma is made in the middle of the dorsal skin by injection of 20ml of air under ether anestheisa, which results in oval air pouch. 0.5 ml of 1% solution of croton oil in sesame oil is injected, avoiding any leakage of air. The air pouch is removes after 48 hours. The test compound is injected directly in to the air sac at the same time as the irritant. On the 4th or 5th day animals are sacrificed under anaesthesia. The pouch is opened and the exudate is collected in glass cylinder. Total number of leukocytes migrated into the pouch are evaluated after staining with erythrosine B.

EVALUATION;

The average value of the exudates of the controls and the test groups are calculated. Comparison is made by statistical means.

Vascular permeability;

Albino wistar are used each group containing 4 rats of 2.3-3 months of age weighing 200-250 g. laboratory conditions were kept at 20 to 50 degree relative humidity. Procedures were performed. Control group will receive distilled water 1% w/v 1ml/100g by oralroute and other group will receive test compound by oral route and standard group will receive diclofenac 10ml/kg by intraperitoneal route. After 30 min, the animals are anesthetized with ethr anesthesia and sacrificed. The abdomen is cut open and exposed viscera. The animals are held by a flap of abdominal wall over a petri dish. The peritoneal fluid collected,filtered and made up volume to 10ml using normal saline solution and centrifuged at 3000rpm for 15 mins. The absorbace of the supernatant is measured at 590 nm using spectrophotometer.

EVALUATION:

Decreased concentration of dye with respect to absorbance indicates reduction in permeability.

Cotton wool induced granuloma;

Male rats weighing about 180-200 g are used. The test drugs were administered orally once on a dosage regimen for 7 days and the control group received the vehicle. Two sterilized pellets of cotton wool were implanted subcutaneously, one on each side of abdomen of the animal, under the light ether anaesthesia and sterile technique. The rats were sacrificed on the 8th day, the implanted pellet was dissected out and the wet weight was recorded. Thymuses were also dissected out. Both of these dried at 60 degrees for 18 hours and the dry weight was recorded.

EVALUATION

The weight of trasudate and the granuloma as well as the percent granuloma inhibiton of the test drugs were also recorded.

Glass rod granuloma technique;

In this technique, glass rod with a diameter of 6mm and 40 mm length are selected. Male sprague-dawley rats with an initial weight of 130 g are selected. These rats are anaesthetized with ether and their back skins were shaved and disinfected. From an incision in the caudal region a subcutaneous tunnel is formed in the cranial direction with a closed blunted forceps.

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The glass rod is introduced into this tunnel which lies on the back of the animal. The incision wound is closed by sutures. The animals are kept in separate cages, the rods remain insitu for 20 or 40 days. At the end, the animals are sacrificed under CO2 anaesthesia. The glass rod is prepared with surrounding connective tissue which forms a tube around the glass rod. Wet weight of the granuloma tissue is recorded, finally it is dried and dthe dry weight is also recorded.

EVALUATION;

Granuloma weight reduced by the test compound is compared with that of the standard.

Sponge implantation technique;

Sponges used for implantation are prepared from poly vinyl foam sheets 5mm discs are punched out to standard size and weight using a 13 mm cork borer. The sponges are then soaked in 76% v/v ethanol for 30 mins and then heated at 80 degree for two hours. Prior to implantation in the animal, the sponges are soaked in sterile 0.9% saline in which either drugs, antigens or irritants have been suspented. Sponges are implanted in female wistar rats weighing about 150-200 g under ether anaesthesia. A 20 mm dorsal incision is made and the dermis is seperated from the underlying muscle layer by insertion of blunt forceps to form separate cavities in to which the sponges are inserted. Up to 8 sponges may be implanted per rat. The insertion is closed with micheal clips and the animals are maintained at a constant temperature of 24 degrees.

EVALUATION:

For estimation of fluid phasse of sponge exrdated eg; protein content enzymes levels and biological mediators such as prostaglandins as well as for leucocyte migration, sponges removed after 9 hours.

CONCLUSION:

We've seen that inflammation is the biologicalresponse serves to be the body's protective mechanism againsts the foreign particals. Plants found across the world have a vast antiinflammatory properties. Even for the plants which are found near , have a rich source of the chemical constituents(active), such as alkaloids, flavonoids, terpenoids, polyphenols, many more exhibiting the antiinflammatory properties. So scientists continue to search and are able to produce potential inventions for various diseases. Inorder to obtain the chemical constituents, several extraction methods are used, which involes mainly the usage of the solvent methanol and ethanol. Other solvents also include some of the organic solvents, like acetone, chloroform. Soxhlation and maceration extraction technques are vastly practiced. Soxhlation shows better extraction of the chemical bioactive components from the plant (dry powder). the plant parts used for the extraction processes is purely based upon the concentration of the bioactive constituents which shows the anti inflammatory. Such as the plant parts like leaves, roots, stem , bark, fruits, seeds, and flowers.

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