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" Anti-Inflnammatory Action Of Herbal Drug"

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ABSTRACT –

BACKGROUND: In recent times humans come across various types of inflammatory conditions. These inflammatory conditions cause discomfort, pain and suffer for acute or chronic period of time. In some case these inflammatory conditions can be fatal. These inflammatory conditions badly affect the quality of life. Hence management of inflammation is much needed. The aim to design an anti-inflammatory drug is to control the inflammatory mediators that cause inflammation and to reduce the symptoms.

OBJECTIVE- The objective of anti-inflammatory herbal drug is to provide natural and unconventional approach to managing inflammation in body. These herbal remedies aim to reducing pain and discomfort in body without any side effects on vital organ. These herbal remedies not only reduce inflammation but also enhance the immunity**.**

KEY WORDS- Anti-inflammatory drugs, herbal plants, mode of action, phytoconstituents, uses

RESULT- Anti-inflammatory drugs showed effective action against the inflammation and relieve the pain in the body system. Though inflammation is protective biological response of immune system to biological stimuli but the chronic inflammation may be fatal. Due to which complete intervention of inflammation is much needed. As compared to synthetic drug herbal medicine treat inflammation no side effects and is easily available, cheaper and safer option. Presence of phytoconstituents like Gingerol, Turmerones, Piperines, Curcumoids, Shagaols, Allicin, Helacin, etc. Are present in medicinal herbs. These phytoconstituents show anti-inflammatory activity. Different phytoconstituent has a different anti-inflammatory pathway. These phytoconstituents show their action on inflammation pathway by inhibiting lipo-oxygenase , cyclooxygenases, prostaglandins and arachidonic acid, etc. Common anti-inflammatory herbal plants are Ehretia Laevis Robx, Zingiber Officinalis, Piper nigrum, Allium Sativum, Arnica Montana and other plant species.

CONCLUSION- Natural herbs are safe, there is no side effect of natural herbs on the body and it is better option than synthetic drugs. The phytoconstituents present in the herbal drugs show comparatively greater action than the synthetic drug.

INTRODUCTION:

when any type of pathogen /virus/bacteria attacks on cell tissue damage as result body natural inflammation pathway get activated then body start to release inflammatory mediator which cause inflammation.[1]Inflammation is protective biological response immune system which is shown by following sing like redness heat, swelling, subsequent loss of organ function and pain. There are various types of inflammation such as microbial inflammation , autoimmune inflammation , allergic inflammation , metabolic inflammation, physical inflammation . until 19th century the underlying cause of inflammation were not discovered some common causes of inflammation are bacterial ,virus , fungi , protozoa , mediate abscess , pneumonia , HIV , autoimmune attack by auto antibodies , auto-reactive B and T cells, multiple sclerosis , allergens **,** overfeeding , excessive accumulation of metabolic , trauma , burn , radiation etc. Body secretes and synthesize various types of inflammation mediators during different inflammation responses [2].

Pathophysiology of Anti-inflammatory Action :

The mechanism of anti-inflammatory activity requires the participation of COX (cyclooxygenase) pathway as well as LOX (lipoxygenase) pathway. The following is a step-by-step description of how these pathways function to bring about the anti-inflammatory effects:

1.COX Pathway:

Enzyme COX converts arachidonic acid into prostaglandins .Prostaglandin production is regulated by the two isoforms of COX: constitutively expressed COX-1 and inflammation-induced COX-2 .By inhibiting COX-2, anti-inflammatory drugs can reduce the production of prostaglandins, which are pro-inflammatory mediators.However, a number of side-effects related with impaired platelet function or gastric ulcers arise due to suppressed activity against cyclooxygenase 1.COX-1 inhibition, however, may lead to undesirable side effects, such as gastric ulcers and impaired platelet function .Therefore, selective COX-2 inhibitors 6are developed to specifically target the inflammatory response without affecting the constitutive functions of COX-1[3]

LOX Pathway:

Arachidonic acid is changed into leukotrienes in the LOX pathway.When inflammation persists in an organism; it promotes conversion of arachidonic acid into leukotriene A4 using 5-lipoxygenase (5-LOX).This event automatically leads to LTA4 being subjected to several enzymatic conversions hence resulting to many other different leukotrienes like leukotriene B4 (LTB4) and cysteinyl leukotrienes that include LTC4,LTD4,LTE4 among others.Leukotrienes especially LTB4 play a central .

1.Curcuma Longa(Turmeric)

Biological source :*Curcuma longa* Linn. (Turmeric) is rhizome that belongs to the family Zingiberaceae that grows in the tropical and humid regions of Indian Subcontinent and Southeast Asia. In mild alkaline water the rhizomes of turmeric are harvested, washed and boiled to soften and it is sun dried [4].

Chemical Constituents:

In 2011 Li et. Al. identified at least 235 compounds, primarily phenolics and terpenoids including 22 diarylheptonoids and diarylpentonoids, 8 phenylpropene and other phenolic compound, 68 mono terpenes, 4 sterols, 2 alkaloids and 14 other compounds.

Curcuminoid(2-5%), Essential Oils(3%), Turmerone Derivatives(1%), Polysaccharides(15-30%), Protein amino acid(6-8%), Mineral[Calcium(0.04-0.08), Iron(0.9-1.8), Potassium(2.5-3.5), Magnesium(0.6-2.5), Zinc(0.3-0.5)][5].

Anti-inflammatory action:

The yellow pigment found in Curcuma longa is Curcumin . It is a major component of Turmeric acting as a antiinfalmmatory Specifically, Curcumin inhibits inflammatory cytokines such as TNF-a, IL-1, -2, -6, -8, -12, Mitogen-activated protein kinase (MAPK), and c-Jun N-terminal kinase (JNK), as well as suppresses the inducible nitric oxide synthase (iNOS), COX-2 and lipoxygenase (LOX) in a variety of cancer cells [6].

Curcumin has also been reported to decrease the expression of inflammatory markers such as NF-jB, COX-2, 5-LOX, macrophage inflammatory protein-1a (MIP-1a), adhesion molecules, C-reactive protein, and chemokine receptor type 4 (CXCR-4).

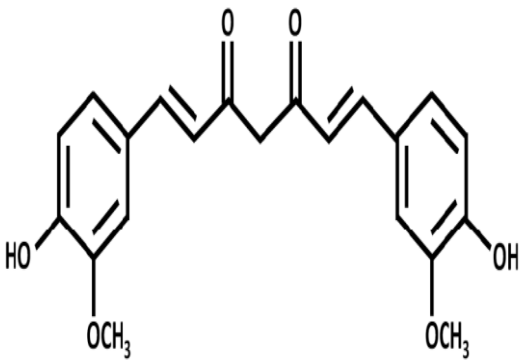
Method of extraction:

By the method of extraction there is separation of active chemical constitutions form the herbal drug.which can be use in the in production of herbal medicine and show its pharmacological effect in body.

List of method of extraction

1. Soxhlet extraction
2. Maceration extraction
3. Hydro Distillation
4. Microwave aided extraction
5. Enzyme assisted extraction
6. Ions liquid based extraction
7. Supercritical extraction
8. Supercritical fluid extraction

Plant Picture Structure of curcumin:



Other uses of Turmeric:

Antioxidant, Anti-tumor, Anti -cancer, Anti-fungal, Anti-HIV , Antidiabetic ,wound healing, lipid lowering, Antimutagenic potential, immunomodulating activity,also used in treatment of heart disease, skin treatment, arthritis, etc.[7]

2. Allium sativum (Garlic)

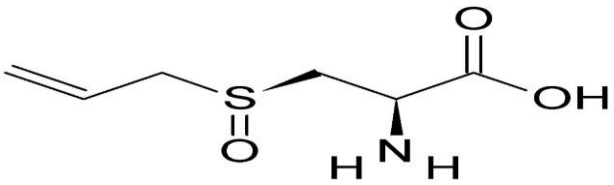
Biological Source: *Allium sativum* (Garlic) is bulbous plant belongs to the family *Lilaceae*that grows mostly in central Asia and in many countries around the world.

Chemical constituents:

(E)-Ajoene, (Z)-ajoene, Alliin, Allicin, Allyl sulphide, 1,2-vinyldithiin

Moisture content (4.55mg/100g), crude protein (15.33mg/100g), crude fat (0.72mg/100g), crude fibre (2.10mg/100g), ash (4.08mg/100g), carbohydrate (73.22mg/100g), potassium (10.19mg/100g), calcium (26.30mg/100mg), iron (5.29mg/100g), phosphorous (10.19mg/100g),Zinc (0.34mg/100g), alkaloid (4.21mg/100g), tannins (3.54mg/100g), saponin (0.80mg/100g), flavonoid (5.56mg/100g).[8]

Plant Picture and Structure of Allicin:



Anti-inflammatory Action (moa):

The emigration of neutrophilic granulocytes into epithelia, which has anti-inflammatory activity in garlic, is caused by inhibiting such a process. Potent antioxidant activities were exhibited by aged black garlic (ABG) and these activities may be responsible for its anti-inflammatory activity. The ABG chloroform extract acts by reducing NF-κB activation in human umbilical vein endothelial cells caused by tumor necrosis factor-α (TNF-α). Furthermore, it was reported that ABG methanolic extract prevents the production of cyclooxygenase-2 (COX-2) and prostaglandin E2 (PGE2) via the inhibition of NF-κB [<73]. In [74], You et al. performed a study where they investigated the anti-inflammatory effect of ABG and concluded that this activity might be attributed to its direct suppression of toll-like receptor 4 (TLR4) signaling cascade activation in macrophages as well as reduction of nuclear NF-κB level and improvement on the NF-κB cytosolic levels on LPS-induced RAW264.7 cells besides IκB expression; another action mechanism for ABG extract was shown to inhibit iNOS and COX-2 expressions thus preventing NO, interleukin-6 (IL-6), TNF-alpha formation induced by LPS in RAW264.7 cell TPA-mediated dermatitis in mice. Allicin has immune cell activators with pathogen protective compounds through signaling pathways influence [9].

Method of Extraction:

By the method of extraction there is separation of active chemical constitutions form the herbal drug. which can be use in the in production of herbal medicine and show its pharmacological effect in body.

List of methods of extraction of Allicin:

1. Ultrasonic assisted extraction
2. Microwave assisted extraction
3. Pressurized liquid extraction
4. Super critical liquid extraction
5. High performance liquid chromatography

Uses of Garlic:

Anti-bacterial, Anti-cancer, Anti-fungal, Anti-hypercholesterolemic, Anti-hypertensive,Anti-inflammatory, Anti-oxidant, Anti-parasitic, Anti-viral, Hepatoprotective, Immunostimulatory, Insecticida[10].

3. Ginger (Zingiber officinale Roscoe)

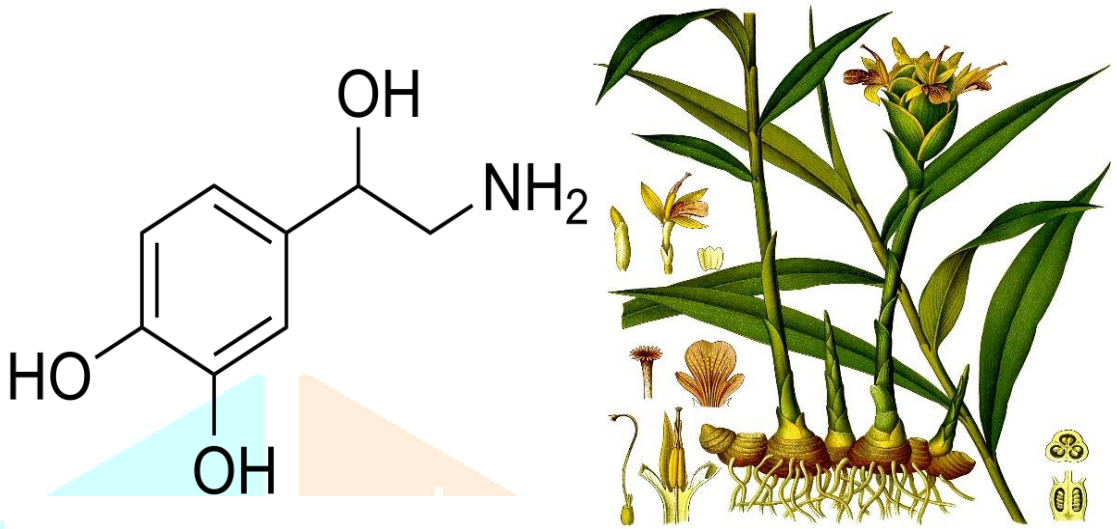
Biological source-Ginger (*Zingiber officinale Roscoe)*are widely Spice.Which belongs to family Zingiberaceae family.the genus of this spices is Zingiber genus.[11]

Chemicals Constituents:

Starch (40-70%), essential oil(1.5-3%),(9-12%),ash(8-12).[1]

1. Alkaloids, Glycoside, amino acid, proteins, phenols, flavonoid, tannins,carbohydrates

Plant Picture and Structure of Gingerol:



Anti-inflammatory action: The bioactive compounds found in ginger can be effective in attenuating the symptoms of chronic inflammatory disorders [12].

3.1. Rheumatoid arthritis:

Rheumatoid arthritis (RA) is a long-lasting autoimmune condition characterized by peripheral pain in the joints involving arms, legs, wrists and hands, shoulders, elbows, hips and knees. The nature of the disease process in RA is such that it involves the interaction between cells and mediators of the innate and adaptive immune system. This disease has no known cause but can be genetically related or influenced by epigenetics or environmental factors. Inflammation leading to pain, swelling and stiffness in synovial membrane (articular capsule- lining), especially after rest at night or during mornings. There are other more organ impairing consequences of a chronic inflammation like on any other tissue within the body (also called tendons & muscles) that surround these joint leading to mobility loss as well as impaired joint function; they include heart disease, lung disorder(s), or kidney problems. Likewise if inflammation is severe enough or for an extended period it may cause fever, fatigue (a general lack of energy), asthenia (muscle weakness), weight loss due to a decrease in body mass index (BMI) or even complete appetite suppression[13]. As such rheumatoid arthritis qualifies to be systemic.

3.2)Inflammatory Bowel Disease(IBD):

Ginger suppresses inflammatory response by inhibiting nuclear factor kappa B(NF-κB), TNF-α,Toll-like receptor family proteins(TLRs), nod-like receptor protein 3(NLRP3)-inflammasome signaling pathway, signal transducer and activator of transcription(SAT), mitogen activated protein kinases(MAPKs) as well as mammalian target rapamycin(mTOR). It also acts against several pro-inflammatory cytokines(IL6/IL-1β) including IL-2 inhibition. Moreover, it decreased cyclooxygenase-2 (COX-2) enzyme activity and monocyte chemoattractant protein-1 (MCP-1)[14].

Method of extraction: There are many chemical constituents in ginger which are responsible for showing different mode of action in body. for that the need of active constituents therefore by using different method we can separate it

List of extraction methods:

1.Soxhlet extraction

2.Solvent extraction

3.Steam distillation

4.microwave assisted extraction

5.ultrasonic assisted extraction

6.subcrtical water extraction

7.suppercritical CO_2 fluid extraction

Uses of Ginger

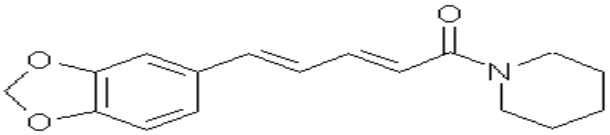
Antimicrobial activity, analgesic activity, antidiabetic activity, antioxidant, melanogenesis inhibitory activity, anti-hypertensive, anticancer and antitumor activity, anti-Alzheimer disease treatment, androgenic activity , insecticidal activity, immunomodulatory[15].

4. Piper nigrum (Black pepper)

Biological Source: Piper nigrum, belonging to the family Piperaceae

Chemical Constituents: lavonoids, phenolics, amides, alkaloids, steroids, neolignans, lignans, chalcones, terpenes, opiperine, isochavicine, and chavicine

Plant Picture and Structure of Piperine:



Anti-inflammatory Action:

Piperine is an active alkaloid, it's far the principle secondary metabolite of black pepper, determined mainly in its fruits and answerable for the taste and odor of the pepper Anti-inflammatory marketers are succesful to inhibit the cyclooxygenase COX-1 and COX-2 pathway of arachidonic acid metabolism which produces prostaglandins[16].

Method of extraction:

1.Soxhlet extraction

2.Ionic liquid (IL) primarily based ultra-sonification-assisted extraction

3.Microwave assisted extraction

4. Super important Fluid extraction

5. Ultrasound greatertor

6.Microwave refluxction

7. Naviglio extrac

extraction

Uses of Black Pepper:

Analgesic, Immunomodulatory, Anti-depressive, Anti-diarrheal, Hepatoprotective, Anti-tubercular interest, Anti-asthmatic, Anti-epileptic, Anti-fertility, Anti-hypertensive, Anti-hyper-lipidemic.

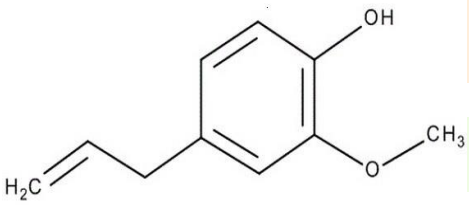
6.Ocimum sanctum (Tulsi)

Biological Source : Tulsi is a sacred plant of India which is aromatic plant belongs to the family Lamiaceae . Tulsi is found nolative to the Indian Subcontinent, Southeast Asia and widespread around the world.

Chemical Constituents:

Cirsilineol, ciricimaritin, isothymusin, apigenin, rosameric acid, eugenol, methyl eugenol, carvacrol, sesquiterpene hydrocarbon caryophyllene.

Structure of Eugenol :



Antiinflammatory action:

Many studies have proven that continual irritation stimulates development and development of most cancers because of the release of matrix metal-loproteinases (MMPs) from the inflammatory cells.Compounds isolated from O. Sanctum L. Extract, Civsilineol, Civsimavatine , Isothymonin, Apigenin, Rosavinic acid and Eugenol were observed for their anti-infl ammatory hobby or cyclooxygenase inhibitory interest. Eugenol verified ninety seven% cyclooxygenase-1 inhibitory hobby.

Method of Exctraction :

Tulsi (Holy Basil) possesses anti-inflammatory properties primarily due to its rich content of phytochemicals such as eugenol, rosmarinic acid, and flavonoids like orientin and vicenin. Here's a brief outline of methods used to extract these active compounds from tulsi[18]:

1. Water Extraction

2. Steam Distillation

3. Alcohol Extraction (Tincture)

4. Supercritical Fluid Extraction

Uses of Tulsi :

Antinociceptive (Analgesic), Anti-fertility, Anthelmintic activity, Antiinflamatory, Anticancer, Antidiabetic, Wound healing activity, Radio-protective effect, Genotoxicity, Antioxidant, Hypolipidemic, Antimicrobial, Gastroprotective, Immunomodulatory effect,

Bronchitis, Malaria, Diarrhea , Dysentery, Skin disease, Arthritis, Eye diseases, Insect bites and so on. The O. sanctum L. has also been suggested to possess antifungal , cardioprotective , analgesic, antispasmodic and adaptogenic actions.

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