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RESEARCH ARTICLE

ETHANOMEDICINAL PLANTS WITH ANTI-INFLAMMATORY EFFECT FROM SOUTHERN HARYANA, INDIA: A REVIEW

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Abstract

Inflammation is a physiological host response to external challenges or cellular injury such as pathogens, damaged cells or irritants leading to the release of a complex array of inflammatory mediators and aiding the recovery of tissue structure and function.All inflammatory processes develop along a known sequence: locally increased blood supply, leakage of fluid, small molecule or proteins and infiltration of cells.Inflammation is not a synonym for infection, even in case where inflammation is caused by infection, response includes clinical signs of erythema, edema, hyperalgesia and pain. Since the ancient Greek and Roman era five basic symptoms of inflammation have been known i.e, redness, swelling, heat, pain and deranged function are produced by inflammatory agents such as nitric oxide, prostaglandins, bradykinin, serotonin, leukotrienes and histamine. The inflammatory process is a series of events that can be elicited by numerous stimuli such as infectious and thermal or physical injury through years of ingenious synthesis and structural modifications.

Introduction:-

Inflammation is a physiological response to tissue damage, whether resulting from physical injury, infectious, exposure to toxins or other types of trauma. The process of inflammation is basically the body's attempt to rid itself of the cause of trauma and to heal any damage caused by it (Medzhitov 2008; Guhathakurta et al., 2012; Ullah et al., 2014). The cardinal signs of inflammation are: pain, oedema, redness, heat and loss of function (Chandrasoma et al., 2005; Banasik 2011; Asif Noor et al., 2015). It involves a complex array of enzyme activation; mediators release, extravasation, cell migration, tissue breakdown and repair (Vane and Bolting 1995; Gupta 2012).At the onset of anti-inflammation, the cells undergo activation and release inflammatory mediators like histamine, serotonin, slow reacting substances of anaphylaxis (SRS-A), prostaglandins and some plasma enzyme systems, such as the complement system, the clotting system, the fibrinolytic system and the kinin system (Read 1995).These mediator molecules work collectively to cause increased vasodilatation and permeability of blood vessels. Thus, leading to increased blood flow, exudation of plasma proteins and fluids, and migrate on of leukocytes, mainly neutrophils, outside the blood vessels into the injured tissues. The duration of inflammation may be short (acute) or long (chronic) (Ullah et al., 2014; Danielson 2014). Acute inflammation is the initial response of the body to injurious stimuli and is achieved by increased movement of plasma and leukocytes from the blood into the injured tissues (Latha et al., 2012). It is good for our body since our body itself send cells and other inflammatory factors to deal with the foreign material(Medzhitov 2008), Occasionally acute inflammation becomes chronic because the cause of

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inflammation is not destroyed resulting in granulomatous inflammation such as gummas(syphilis), lepromas(Hansen diseases) and tubercles(tuberculosis) (Sun et al., 2014). Chronic inflammation can begin 2–4 days after the onset of the acute response and can last for weeks to months or years due to the persistence of the initiating stimulus, interference of the normal healing process, repeated bouts of acute inflammation, or low-grade soldering due to continued production of immune response mediators (Whicher and Chambers 1984; Dunne 1990; Jackson et al., 1997; Walsh and Pearson 2001; Dhalendra et al., 2013; Tabas and Glass 2013). Acute inflammation has therapeutic consequence whereas chronic inflammation leads to degeneration of tissues as well as structural cum organ alterations contributes to the progression of many chronic diseases such as multiple sclerosis, rheumatoid arthritis, atherosclerosis, psoriasis, inflammatory bowel diseases spondtlitis, pancreatitis, etc(Bhukya et al., 2009; Talwar et al., 2011; Ghosh 2011; Kumar et al., 2014).Acute and chronic inflammatory diseases are still one of the most important health problems in the world. Various agents are adapted to treat inflammatory disorders; their prolonged use often leads to serious adverse reactions such as gastric intolerance, bone marrow, depression, water and salt retention (Xiao et al., 2005; Yonathan et al., 2006).

There are various medicines for controlling and suppressing inflammatory crisis; steroids, nonsteroid anti-inflammatory drugs and immunosuppressant are the practical examples of these medications which are associated with adverse effects (Ghasemian, et al., 2016). Thus, we need to apply natural anti-inflammatory factors within medication therapy to achieve increased pharmacological response and the lowest degree of unwanted side effects (Bagad et al., 2013; Sowemimo et al., 2013; Ghasemian, et al., 2015). The use of traditional medicine is expanding to new horizons and plants still remained as the novel source of structurally important compounds that lead to the development of novel drugs. Herbal medicines are promoting subjects in medicine and, of course, we have to increase our knowledge about them. In this review, we have endeavored to assess the role of plant metabolities in inflammation and plants from Southern Haryana reported traditionally or clinically for their anti-inflammatory effects.

Role of plant metabolites in inflammation:

Medicinal plants and their secondary metabolites are progressively used in the treatment of diseases as a complementary medicine. Many substances which interfere with the inflammatory response have been isolated from plants/herbs. Traditionally, people have been using powerful anti-inflammatory plants for thousands of years. Plants secondary metabolites have provided an important source of drugs since ancient times and now around half of the practical drugs used are derived from natural sources (Wang et al., 2008) and many of these herbal constituents are being prescribed widely for the treatment of inflammatory conditions(Bagul et al., 2005).

Phenolic compounds:

Phenolic compounds includes flavonoids, coumarins, tannins and phenolic acid are of important pharmacological value, some having anti-inflammatory properties (Yoon and Baek 2005; Mukherjee and Houghton 2009). Different types of phenolics compounds such as flavonoids, condensed tannins, and gallotannins are known to inhibit some molecular targets of pro-inflammatory mediators in inflammatory responses (Wadah et al., 2014; Fawole et al., 2009; Phanse et al., 2012).

Tannins and phenolic acids:

Condensed tannins (proanthocyanidins) are essentially derived from [+] gallocatechin, [−] epicatechin, [+] catechin and epigallocatechin, and their derivatives via carbon to carbon (C–C) links (Fawole et al., 2009; Agrawal and Paridhavi 2007). Proanthocyanidins are naturally-occurring plant metabolites, widely available in fruits, vegetables, nuts, seeds, flowers and bark. The beneficial effects of proanthocyanidins on human health have been attributed mainly to their strong free radical-scavenging and antioxidant activities. Proanthocyanidins are also associated with a number of biological activities, such as anti-inflammatory, anti-asthmatic, anticancer, antimicrobial, anti-allergy, antihypertensive and cardioprotective. (Diouf et al., 2009). These compounds are antagonists of particular hormone receptors or inhibitors of particular enzymes such as Cyclooxygenase (COX) enzymes (Agrawal and Paridhavi 2007). Gallotannins exert anti-inflammatory properties due to scavenging of radicals (Mangathayaru 2013) and inhibition of the expression of inflammatory mediators, such as some cytokines, inducible nitric-oxide synthase (iNOS), and COX-2 (Fawole et al., 2009.

It has been reported that some caffetannins and related compounds inhibit 5-Hydroxyeicosatetraenoic acid(HETE) and 5-lipooxygenase production, whereas others such as caffeic acid and caffeoylmalic acid have been reported to enhance Prostaglandin E_2 (PGE2) formation in a concentration-dependent fashion(Kimura et al., 1987).

Flavonoids:

Flavonoids are an important group of low molecular secondary metabolites produced by plants. They are polyphenolic compounds(Wadah et al., 2014; Mangathayaru 2013) naturally occurring in vegetables, fruits, flowers, seeds, grain, bark, stems, roots etc. Over 4000 different flavonoids have been described, and they are categorized into flavonols, flavones, catechins, flavanones, anthocyanidins and isoflavonoids (Wadah et al., 2014; Tandon and Verma 2009). Flavonoids have a variety of biological effects. they have been shown antimicrobial, antiviral, antiulcerogenic, cytotoxic, antineoplastic, mutagenic, anti-inflammatory, antioxidant, antihepatotoxic, antihipertensive, hypolipidemic and antiplatelet activities(Wadah et al., 2014; Mangathayaru 2013; Guabiraba et al., 2010).Flavonoids are known to act on the inflammatory response via many routes and blockmolecules like cyclooxygenease,inducible nitric-oxide synthase, cytokines, nuclear factor-κB and matrix metalloproeinases(Fawole et al., 2009).Flavonoids are rapidly absorbed by the human body and have been reported to have positive effects on numerous aspects of health, including a reduced risk of coronary heart disease, cancer, neurodegenerative diseases(Stough and Scholey 2013). Flavonoids showed significant activity in both proliferative and exudative phases of inflammation in rat models of inflammation. Flavonoids (such as rutin, quercetin, hesperidin) showed anti-inflammatory activity and inhibited the development of the induced granuloma (Guabiraba et al., 2010; Guardia et al., 2001). Some flavonoids, such as quercetin, blocked both the cyclooxygenase and lipooxygenase pathways at relatively high concentrations, while at lower concentrations; the lipooxygenase pathway was the primary target of inhibitory anti-inflammatory activity. On the other hand, when administered subcutaneously, hesperidin [hesperetin-7-rutinoside] exhibited significant anti-inflammatory activity on rat paw edema induced by both carrageenan and dextran and on carrageenan pleurisy, without producing the side effects that are caused by other classes of anti-inflammatory drugs(Guabiraba et al., 2010).

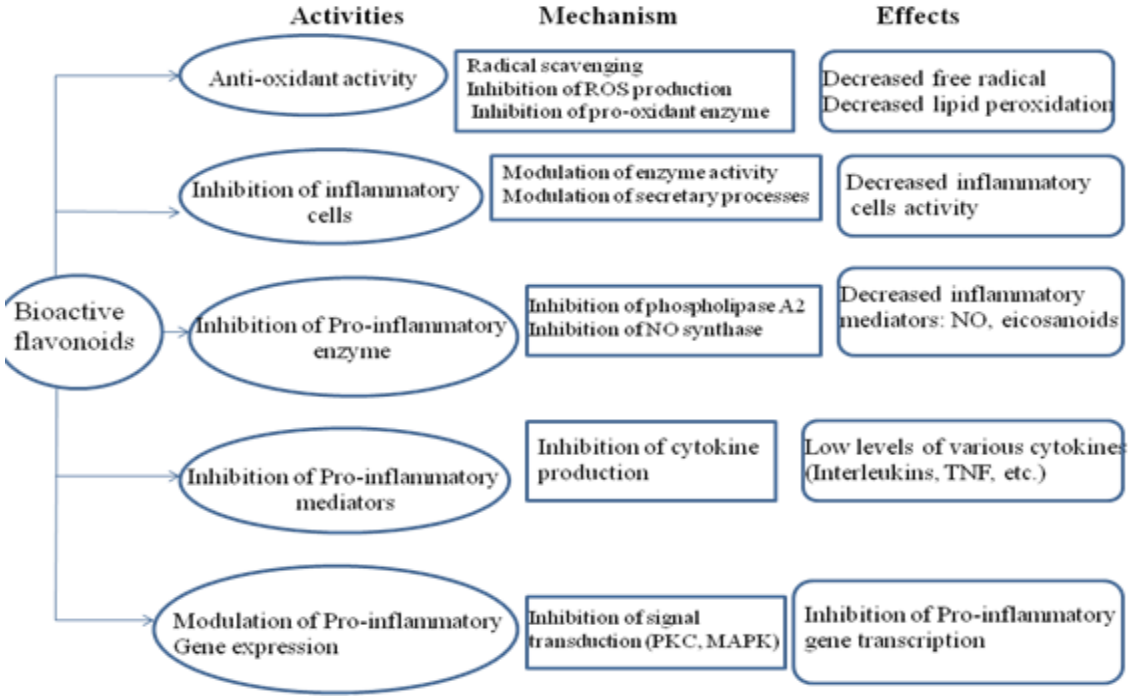

Figure 1:- Biochemical and pharmacological effects of flavonoids on inflammation and inflammation associated diseases (Kang et al., 2009).

Coumarins:

Coumarins represent a vast family of compounds which were naturally found in plants (Wadah et al., 2014). Several coumarins have been reported that possess anti-inflammatory activity. Aesculetin and scopolin isolated from Santolina oblongifolia show marked activity as inhibitors of release of eicosanoids (Silvan et al., 1996). Coumarin derivatives could be particularly effective in the treatment of high protein oedemas. It was reported that some coumarins possessed the antioxidant capacity scavenging superoxide anion radicals and some coumarins could inhibit both the lipoxygenase and cyclooxygenase pathways of arachidonic acid metabolism (Kang et al., 2009). Two coumarin derivatives, columbianetin (A) and libanoridin (B) were showed significant anti-inflammatory activity (Leal et al., 2000; Kupeli et al., 2002).

Alkaloids:
Alkaloids are a chemically heterogenous group of basic nitrogen containing substances found predominately in higher plants (Bhat et al., 2010). They have great diversity in their botanical and biochemical origin in chemical structure and pharmacological activity (Mangathayaru 2013) has also showed anti-inflammatory and analgesic activities (Gupta 2012). They also inhibited inflammatory mediators, capillary permeability, vasodilation, free radicals formation, platelets aggregation, endothelial derived factors and intracellular pro-inflammatory mediators. In additions alkaloids' able to restore body defense mechanisms by augmenting antioxidants and other associated biomolecules (Gupta 2012; Bhat et al., 2010). Some alkaloids such as isoquinoline, indole and diterpene are known to have good anti-inflammatory activity (Mangathayaru 2013). Recently, there has been interest in the use of bisbenzylisoquinoline alkaloids as potential antiinflammatory drugs, based on their ability to prevent the synthesis or the action of some proinflammatory cytokines. Some antirheumatic remedies in East medicine have been using bisbenzylisoquinoline alkaloids as major components since antiquity .They also possess antiinflammatory, immunomodulatory and antimalarial activities. One of the most investigated bisbenzylisoquinoline alkaloids is tetrandrine and its analogues berbamine and fangchinoline (Satoh et al., 2003). Bisbenzylisoquinoline alkaloids exhibited suppressive effects on in vitro histamine release and nitric oxide production. Cepharanthine was a highly potent inhibitor of HIV-replication in chronically infected monocytic cell line and suppressed the production of inflammatory cytokines and neural cell death (Wadah et al., 2014).

Terpenes:
The chemical nature of the volatile oil is dependent on the nature of the terpene constituents it contains (Mangathayaru 2013). In recent years, several researchers have reported that mono-and sesquiterpene hydrocarbons and their oxygenated derivatives as the major components of essential oils of plant origin, which have potent anti-inflammatory effect (Silva et al., 2003). Carnosol and carnosic acid are phenolic diterpenes which have had anti-inflammatory activity(Poeckel et al., 2008).Triterpenoids are found to occur in any part of the plant as free alcohols, acids, methyl esters, acetates, ethers and glycosides. Tetraterpenoids popularly known as carotenoids are formed by union of eight isoprene units. Due to the presence of long chain of conjugated double bonds the carotenoids are coloured yelloe, orange and red. Most of them are fat-soluble pigments and are known as lipochromes. Carotenoids occurs in many plants and their distribution is found in almost all parts of the plants such as roots, leaves, fruits and seeds(Kupeli et al., 2002). The anti-inflammatory action of carotenoids has been suggested to be linked with conformational difference between antioxidants in the cell membrane and mitochondrial intermembrane space; that is the transmembrane alignment of carotenoids in the lipid bilayer provides exposure of the polar ends of the antioxidant molecules to the internal cytoplasm and the aqueous outer environment of the cell, thus facilitating electron transfer via the double bond of the carbon scaffold of those compounds(Karthikeyan and Deepa 2011). β-carotene possesses anti-inflammatory activity via its function as an inhibitor of redox- based processes, probably due to its antioxidant potential. This carotenoid has been tested in vivo and in vitro and was demonstrated to inhibit production of inflammatory mediators via modulation of expression of such promoters as NF-kB and iNOS in macrophage cell line RAW 264.7 stimulated with LPS(Hernandez- Ledesma and Herrero 2014)]. The carotenoids β-carotene and lycopene anti-inflammatory activity may be attributable to enhancement of the potency of the electrophile/antioxidant response element transcription system in view of their up-regulation of Hmox1 mRNA expression (Kawata et al., 2018).

Saponins:
Saponins are steroid or triterpene glycosides. There are a number of reports of saponins with anti-inflammatory properties. They showed anti-inflammatory activity against several experimental models of inflammation in mice and rats. Mechanisms considered included indirect and direct corticomimetic activity, inhibition of glucocorticoid degradation (glycyrrhizin), inhibition of enzymatic formation and release of inflammation mediators (Haiyin He et al., 1995; Wadah et al., 2014). Alpha- and beta-amyrin are pentacyclic triterpenes found in plants and are known to exhibit pronounced anti-inflammatory effects (Vitoret al., 2009; Holanda Pinto et al., 2008).

Sterols:
Phytosterols and their derivatives are essential components of plant biomembranes and they are biogenetic precursors of numerous metabolites such as plant steroid hormones (Wadah et al., 2014). Phytosterols anti-inflammatory properties are well known (Aldini et al., 2014). Antiatherosclerotic effects of plant sterols are well documented. The anti-atherogenic effects may be due, not only to their cholesterol-lowering activities, but also to other properties, such as effects on the coagulation system, an antioxidant system, and hepatic and lipoprotein lipase activities. Humans are not able to synthesize phytosterols, and dietary consumption is the only source of these

compounds (Haiyin He et al., 1995). Phytosterols seem a potential nutraceutical tool for gastrointestinal inflammatory diseases, combining metabolic systematic and local anti-inflammatory effects (Aldini et al., 2014).Phytosterols and phytostanols are plant derived sterols, structurally related to cholesterol (Ostlund 2002). Guggulsterone suppresses NF-kappaB and NF-kappaB-regulated gene products, which may explain its anti-inflammatory activities (Shishodia and Aggarwal 2004).

Medicinal plants with anti-inflammatory activity from Southern Haryana:

Haryana state is rich in plant biodiversity and provides habitat for a significant number of medicinal plants. Districts of South Haryana consist of Gurgaon district, Mahendragarh district, Palwal district and Rewari district. Literature survey on medicinal plant from southern Haryana were reavaled many medicinal plants which has shown anti-inflammatory activities, some of them are listed in table 1 shown below:

Table 1:- Plants of Southern Haryana with Anti-inflammatory activity (Nandkarni 1976; Gulati et al., 2002; Singh and Sheoran 2011; Rajvaidhya et al., 2012; Ansari and Bhatt 2015; Singh and Bhandari 2014; . Kirikar and Basu 2005; Singh and Devi 2018; 2020).

S.no	Plants	Chemical Constitutent	Uses
1	Abrus precatorius Common mame: Indian liquorice, Gunja Family Leguminosae 	Alkaloids, steroids and other triterpenoids, isoflavanoquinones, anthocyanins, starch, tannin, protein, flavonoids, phenolic compound, fixed oil, amino acid	Leaves are used to relieve local pain in swellings, rheumatism etc. The seed paste applied to contusions to reduce pain and swelling
2.	Acacia Arabica Common name: Babul, Indian gum Arabic tree, Kali-kikar 	Contains Phenolics, condensed tannin and phlobatannin, gallic acid, stearic acid, kaempferol-3- glucoside, isoquercetin, leucocyanidin	Used in diabetes, skin diseases, leucorrhoea, antidiarrhoeal, antidysenteric, antidiabetic, astringent, antihelmentic, cough and bleeding piles, gonorrhoea and as an antiasthmatic
3	Acacia catechu Family: Leguminosae Common name: Cutch, Catechu, Kattha	Mixture of catechin isomers, acacatechin, catechutannic acid or phlibatanin, gum , quercitrin, quercetin, catechu red and water	Cooling, digestive, externally applied as astringent to ulcer, boils and skin eruptions

			
4	Acorus calamus L. Common name: Sweet Flag Family Arecaceae 	Contains alpha-asarone and other phytochemicals include, Beta-asarone, eugenol	The rhizome is a valuable Ayurvedic medicine effective in the treatment of various illnesses
5	Aconitum napellus Linn. Family: Ranunculaceae Common name: Mitha zahar, Vachhang, Aconite 	Contains two types of diterpenic alkaloids 1 Diacyl esters of polyhydric amino alcohols e.g., aconnine, neoline, benzyl aconnine, aconitine etc. 2. Amino alcohols. e.g., napelline, shorteine etc.	Used externally as local irritants, in rheumatism, neureglia, analgesic and inflammation of joints.
6	Aegle marmelos (L.) common name: Bilva, Sriphala, Bael Family Rutaceae 	Alkaloids and coumarins	Useful for urinary inflammation and the fruit pulp has cooling effect
7	Aesculus hippocastanum L. Common name: Horse chestnut family: Hippocastanaceae	Chief chemical constituent aesculin	Anti-inflammatory property

			
8	Alangium salvifolium (L.) Wang Common name: Hillsack tree, Sage leaved alangium Family Alangiceae 	Presence of alkoloid alangine and sterol	Roots having anti-inflammatory
9	Aloe vera Var. Officinalis common name: Ghoritkumari, kumari Family Liliaceae 	Principal constitutents antibiotic barbaloin active against bacilli, β-barbaloin, aloe-emodin and resins etc.	Interrupts viral replication and reduces inflammation
10	Alpinia officinarum Hance common name: Galangal Family : Zingiberaceae 	Rhizome are volatile oils (alpha pinene, cineole, linalool,) and sequiterpene lactones (galangol, galangin).	Antibacterial, antiviral and anti-inflammatory activity. They are also used for stomach pain, rheumatoid arthritis and fever.
11	Apium graveolens L. Common name: Celery Family: Apiaceae	Plant possesses volatile oils (limonene, phthalides and beta-selinene), coumarins, bergapten and apiin.	The seeds are useful in arthritis; helps to detoxify the body and improves blood circulation to muscles and joints.

			
12	Aristolochia bracteolata L. Family: Aristolochiaceae Common name: Dhumrapatra, Birthwort 	Including aristolochic acids and esters, aristolactams, aporphines, protoberberines, isoquinolines, benzylisoquinolines, amides, flavonoids, lignans, biphenyl ethers, coumarins, tetralones, terpenoids, benzenoids, steroids, and others	Antirheumatic, anti-septic and anti-inflammatory
13	Atropa belladonna L. Family: Solanaceae Common name: Belladona, Deadly nightshade 	Leaves and roots are rich in alkaloids atropine and hyocynine. These alkaloids combine to form hyoscyamine by racemisation.	Used as a mydriatic, analgesic, antispasmodic and nephritic against colic pain and neuralgia. It is routinely used to dilate pupil in ophthalmic procedures.
14	Arctostaphylos uva-ursi (L.) Spreng Family: Ericaceae Common name: Uva-ursi, Bearberry 	Flavonol gluco-isoquercitrin, arbutin	Used for urinary and antiseptic conditions It is a good anti-inflammatory plant
15	Azadirachta indica A. Juss. Family: Meliaceae Common name: Neem, Nimba	Nimbin, nimbidin, nimbidinic acid, meliacins and flavonoids	Antirheumatic, antiseptic, anti-inflammatory and relieves joint pain and muscle aches

			
16	Betula alba L. Family: Betulaceae Common name: Birch 	Birch oil from bark and contains glycoside	Used for rheumatism
17	Berberis vulgaris L. Family: Berberidaceae Common name: Common barberry 	Bark contains isoquinoline, berberin, berbamine and other alkaloids	Antipyretic, analgesic and for gall stones treatment
18	Blumea lacera DC. Family: Asteraceae Common name: Kukundara 	Various phytoconstituents including flavones, triterpenes, β-sitosterol, cineol, campesterol, lupeol, hentriacontane and α-amyrin	Essential oils are anti-inflammatory.
19	Boswellia serrata Family: Bursuraceae Common name: Shallaki, Loban 	Boswellin acids, serratol,	Anti-inflammatory agent, arthritis, low back pain, stiffness and rheumatic problems, osteoarthritis and spondylosis etc.
20	Boerhavia diffusa L. Family: Nyctaginaceae	Alkaloids	Cure pain, arthritis, rheumatic pain etc.

	Common name: Punarnava 		This plant is commonly used in many Ayurvedic orthopaedic and anti-inflammatory formulations
21	Brassica nigra Family: Cruciferae Common name: Black Mustard, Brown mustard 	Fixed oil, proteins, sinigrin, myrosin, sinapine sulphocyanate, erucic acid, behenic acid and sinapolic acid	Rubefacient, vesicant, counter irritant and condiments
22	Capsicum annuum Family: Solanaceae Common name: Lanaka, Chili 	Capsaicin, solanin, carotenoides, and volatile oils. Steroidal saponins (capsicidins)	Seeds are antiseptic, astringent and antibiotic rheumatic arthritis, local analgesic. It is also used as a rubefacient, rheumatic and arthritic conditions
23	Caesalpinia cristata L. Family: Caesalpinaceae Common name: Kuberaksha, Gatcka 	chief constituents are emol, bonducin, phytosterinin, bonducin. fatty oils and saponin	Useful as an antiseptic and in rheumatic arthritis
24	Cannabis sativa L. Family: Cannabaceae Common name: Marijuana 	Main psychoactive constituent of Cannabis is tetrahydrocannabinol (THC) , contain more than 500 compounds, among them at least 113 cannabinoids	Analgesic, sedative and hallucinogenic
25	Cedrus deodara Family: Pinaceae Common name: Deodar	Essential oils from resin contain myrecene, dimyrecene and polyrecene	Inflammation in adjuvant arthritis, nerve stimulant and

			provides relief from muscular sclerosis, cerebral palsy. It is also used in glaucoma
26	Corchorus aestuans Linn. Family Tilaceae 	Seeds contain cardenolides, beta-sitosterol, ceryl alchol, oligosaccharides.	Seeds and aerial parts- stomachic, anti-inflammatory. Used in pneumonia.
27	Commiphora wightii (Am .) Bhand. Family: Burseraceae Common name: Guggal 	Oleoresin i.e., bdellium	Cure arthritis
28	Commiphora mukul (Stocks) Engl. Family: Bursuraceae Common name: Guggal 	GuggIsteromes (guggulipid extracts), organic acids and sterols	recommended to cool inflamed joints, treat obesity, decongest sinuses and treat skin diseases, traditionally used in the treatment of rheumatoid arthritis syndrome in view of its anti-inflammatory activity and myofacial pain syndrome.
29	Citrus limononia Family: Rutaceae Common name: Lemon, nimbu	It contains volatile oil (limonene, alpha terpinene, alpha pinene, beta pinene, citral), coumarins, bioflavonoides, vitamins A, B, C etc.	The fruit juice is a good antioxidant and antirheumatic and useful in arthritis and gout.

			
30	Coriandrum sativum Linn. Family Umbelliferae; Apiaceae 	Coriander contains 0.5-1% volatile oil, consisting mainly of delta-linalool, alpha-pinene and terpinine. It also contains flavonoids, coumarins, phthalides and phenolic acids(including caffeic and chlorogenic)	Stimulant, stomachic, carminative, antispasmodic, diuretic; also hypoglycaemic and anti-inflammatory. Oil having bactericidal and larvicidal.
31	Curcuma longa L. Family: Zingiberaceae Common name: Turmeric, haridra, haldi 	The active constituents are curcuminods, curcumin, turmerone, cholagogue, choleratic acid zingiberone	strong antioxidant properties are reduction of inflammation by blocking prostaglandin. They are, therefore, routinely used to cure oedema, inflammatory bowel syndrome and rheumatoid arthritis
32	Cyperus rotundus L. Family: Cyperaceae Common name: Mustha, nutgrass, coco grass 	Tubers contain essential oil cyperinol, neutrasol, waxy glycerol and linolenic acid	Carminative, astringent, Anti-inflammatory, anti-rheumatic, hepatoprotective, diuretic, antipyretic, analgesic, hypotensive, emmenagogue, nervine tonic, renowned remedy for arthritis and related diseases
33	Enicostemma littorale Blume. Family: Gentianaceae Common name: Chota Chirayata	bitter glycosides and ophelic acid	It relieves rheumatism, swelling and abdominal ulcers

			
34	Ephedra gerardiana Wall Family: Gnetaceae Common name: Ma-huang, Ephedra, Som 	Chief constitutents are alkaloidal amines (0.5-2%). Important alkaloids are l-epherdrine, d-pseudoephedrine, 1-methyl ephedrine, non-ephedrine and dimethyl ephedrine and adrenaline.	Ephedrine increases blood pressure so it is used in asthma, hay fever, and whooping cough. It is cardiac and respiratory stimulant.
35	Erythroxylum coca Lam. Family: Erythroxylaceae Common name: Cocoa 	It is a source of cocaine alkaloid (coke)	one of the oldest anaesthetic and a highly addictive narcotic, causing indifference to pain and tiredness.
36	Eugenia caryophyllus L. Family: Myrtaceae Common name: Clove, lavang 	The Essential oil, eugenol is antiseptic and analgesic. The eugenol oil is composed of acetyl eugenol, Methyl salicylate, pinene and vanillin.	The oil is an excellent nerve pain drug and is therefore used To relieve tooth ache and muscle spasm. Routinely used in dentistry for centuries, it is an essential component of many types of toothpaste and also used as a flavouring agent.
37	Gelsimiun sempervirens (L.) J. St. Hil family : Logoniaceae common name: Yellow jasmine	The roots contain yellow jasmine indole alkaloid (gelsemine and gelsedine), iridoids, coumarins etc.	Used as a sedative, and commonly used in neuralgia

			migraine. It is also used as an antispasmodic and for suicidal patients.
38	Glycyrrhiza glabra L. family: Fabaceae common name: Yashtimadhu, liquorice 	They contain the active constituents, glycyrrhizin, sugar, resign, phytoestrogen and flavonoids.	The anti-inflammatory principle is derived from glycyrrhic acid, which gets converted to glycyrrhetic acid.
39	Harpagophytum procumbens DC Family: Pedaliaceae common name: Devil's claw, grapple apple 	The active chemical constituents are iridoid glycosides (harpagoside), stachyose sugars, phytosterols, flavonoids and harpagoquinone. The plant is a good anti-inflammatory and analgesic agent that relieves joint pain/rheumatism	anti-inflammatory, exudative and analgesic properties of this plant in easing joint pains, and muscular problems
40	Hemidesmus indicus (L.) Sm. Family: Asclepidaceae Common name: Sariva, sugandhapala	Essential oils, salicylic aldehyde, B-sitosterol, lupeol etc.	The roots are used to make a cooling beverage It is also used as an anti - rheumatic in local medicine.

			
41	Heliotropium indicum L. Family: Boraginaceae Common name: Indian heliotrope 	Indicine N -oxide is the chief alkaloid constitutents	It is anti-inflammatory, antitumour and local application in rheumatism.
42	Hydrastis canadensis L. Family: Ranunculaceae Common name: Yellow turmeric root 	Active constituents are isoquinoline alkaloids (hydrastine, berberine, canadine), volatile oil and resin	It is also used as anti -bacterial and for other uses, Anti-inflammatory substance.
43	Laurus nobilis L. Family : Lauraceae common name: Bay Laurel 	The volatile oil (3%) contains cineole, linalool, a-pinnene and a-terpineol	Essential oil from this tree is massaged into aching muscles and joints
44	Linum usitatissum L. Family : Linaceae	Fixed oil (30-40%), mucilage (6%), protein(25%), small amount of enyme	Emollient, expectorant, diuretic,

	Common name: Uma, alsi, flax seed 	lipase and linamarin and sucrose, raffinose, cellouse and mucilage.	demulcent, laxative, demulcent, Poultices for gouty and rheumatic swellings, Internally used for gonorrhoea and inflammation of urinary tract. The alkoloid mescaline is a powerful hallucinogen and good pain killer used for rheumatism
45	Mimosa pudica L. Family: Mimosoideae Common name: Lagalu, touch me not 	Mimosin	It is commonly used in the treatment of piles, fistula, and also used as anti-inflammatory
46	Mentha piperata L. Family: Lamiaceae Common name: Menthol, peppermint 	Alpha-pinene, Sabinene, Beta-pinene, Beta- Myrcene, Cineol, Linalool, Menthol	Anti-inflammatory, cytotoxic and antioxidant activities
47	Ricinus communis Linn. Family: Euphorbiaceae Common name: Castor bean oil, Ricinus oil	Fixed oil (55%), proteins(20%) , consisting of globulin, albumin, glycoprotein, ricin, ricinine alkaloid and some enzymes. Fixed oil consists of the glycerides of ricinoleic(87%), isoricinoleic, stearic (1%), dihydroxystearic (traces), linoleic (3%), oleic (7%) and palmitic(2%) acids	Purgative, emollient, used as ointment base, for the preparation of fexible collodion, to prepare undecylenic acid which is a fungistatic preparation.

			
48	Rheum emodi and R. Webbianum Family: Polygonaceae Common name: Indian Rhubarb 	Emodin, emodin-3-monomethyl ether (Physcion), chrysophanol, aloe-emodin and rhein	Purgative and astringent tonic, in atonic dyspepsia and cleaning teeth. Powdered roots are sprinkled over ulcers for quick healing
49	Salvodora persica L. Family: Salvodoraceae Common name: Chota peelu, tooth brush tree 	The chief constituents are alkaloid chlorine trimethylalmine, resin, silica, sulphur and vitamin C	Tender twigs as tooth brushes for healing, hardening gums and to prevent tooth decay. It is effective against gum inflammation and is also used as an antiseptic.
50	Sesamum indicum Family: Pedaliaceae Common name: Sesamum seed oil, Teel oil	Mixture of glyceride of oleic(43%), linoleic (43%), palmitic (9%), stearic (4%), arachidic, hexadecenoic, lignoceric and myristic acids. Also contains proteins, Vitamin B3 and E, folic acid and calcium.	Demulcent, in dysentery and urinary complaints. It is used for traditional ayurvedic massages to relieve arthritic pain. It is used as a base in cosmetics and creams.

			
51	Sida cordifolia Family :Malvaceae common name: Bula 	Contains ephedrine, which is an amphetamine-like stimulant	wild plant of India is anti-inflammatory and commonly used as poultice in combination with turmeric
52	Silybum marianum Family : Asteraceae common name: Milk thistle 	Silymarin, a flavone (silybin) is one of the active compound :	
53	Swertia chirayita Family: Gentianaceae Common name: Kiratatikta, Chiretta 	Active constituents of it are chiratin and ophelic acid	relieves inflammation, swelling and improves mobility
54	Tinospora cordifolia Miers Family: Menispennaceae common name: Giloy, gulancha, amrit	Bitter chemicals, glycosides, terpenes, tinosorprine and cordifolisides A, B and C have been isolated from leaves and stems. It strengthens natural immunity, lowers blood cholesterol etc.	The stem is used for the treatment of rheumatism. It is antiperiodic, antipyretic and anti-inflammatory. Bitter chemicals, glycosides, terpenes, tinosorprine strengthens natural immunity, lowers

			blood cholesterol etc.
55	Trachyspermum ammi Linn Family: Umbelliferae Common Name: Carum Copticum, Ajowan 	Ajowan oil (3-4%) contain thymol (30-40%). The other minor constitutents are proteins and tannins	It is used as flavouring agent, carminative, stomachic, spice and as a source of menthol.
56	Withania somnifera Dunal Family: Solanaceae Common name: Ashwagandha 	Chemical constituents of the roots are steroidal alkaloids (withanoides) some important as tropine, pseudotropine, hygrine, isopelleterine, anaferine, anahygrine etc, fatty acids, essential oils and amino acids.	used in inflammation, as sedative, aphtodisiac, bacteriostatic, anti-cancer, a nervine tonic and antistress rejuvenator etc.
57	Zingiber officinalis Roscoe Family: Zingiberaceae Common name: Ginger, adarak 	The active constituents are volatile oil and resins. The constituents of ginger oil are monoterpenes (phellandrene, carnphene, cineolc, citral and borneol) and sesquiterperenes (zingiberine and bisabolene), apart from gingerol, gingren oils, methylgingediol, gingeryl and methyl gingediacetates.	The activity is due to gingerol, Dehydrogingeridione and gingerdione were shown to be potent inhibitors of prostaglandin synthesis which confirms the mechanism of anti-inflammatory and antirheumatic effects.

Conclusion:-

The traditional knowledge of medicinal plants play an important role in community health care. Development is far from meeting the expectations of local people mainly in terms of exciting health care facilities and herbal industries in spite of rich bioresources. The information provided in present study could be useful for researcher and documentation about the medicinal plants, in preservation of traditional medicinal wealth for future plan for drug development.

Conflicts Of Interest:

The authors declare that there are no conflicts of interest.

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