

Anti-Arthritic Activity Of Ethano-Medicinal Herbal Plants

Dr. P. K. Saluja¹, Kavita Shukla² & Harishankar Yadav³

¹(Deptt. Of Botany & Biotechnology, Govt. D. B. Girls P.G. (Auto.) College, Raipur (C.G.), INDIA)

²(Research scholar, Govt. D. B. Girls' P.G. (Auto.) College, Raipur (C.G.), INDIA)

Email- – prakash.saluja@yahoo.com

Abstract: The rich and diversified flora of India provides valuable storehouse of medicinal plants. The curative properties of herbs have long been known and are documented in ancient manuscripts. The plant wealth of India also offers the people who tend live stock, a rich reservoir in treating the arthritis disease. Plants offer a cheap and alternative remedy to the people for treatment of arthritis. This study records indigenous medicinal plant utilization in treating arthritis. The paper deals with 37 genera belonging to 23 families used in arthritis practices by rural people. Ethno medicines are very cheap and have symptomatic curing which depends on person to person and their requirement. The purpose of the present study was to document the survey of the plant based human health care practitioners.

Key Words: Arthritis, ethno botany, Medicinal Plants.

I. INTRODUCTION

Arthritis is an auto immune disorder characterized by pain, swelling and stiffness. Its prevalence depends upon age. It is an inflammation of synovial joint due to immuno-mediated response. Today's life style of the human being are improper diet, lack of regular exercise and wrong posture and long working hours, use of laptops and desktops resulting the diseases Arthritis & Rheumatoid arthritis. Our traditional folklore healer cure it with herbal plant drugs. 100 forms of arthritis are recognized by medical practitioners. Human being have long history of medicinal plants for curing various ailments (Hill, 1989).

About 60-70% Population of developing worlds mainly depends on traditional medicinal system in other word complementary or alternative or folk medicine (Lal & Yadav 1983). Indigenous peoples used plants for their traditional medicinal systems are the main sources of new important pharmaceuticals (Balick and Cox 1996). Knowledge about traditional medicinal plants and their data are the rich source for the new researcher in model scientific age. The plant drugs are confirmed by different research work and pharmacological studies. Medicinal plants are used to treat illness and diseases for thousands of years. They have gained economical importance because of their application in pharmaceutical, cosmetic, perfumery and food industries. The interest in herbal systems of medicine is growing day-by-day because nature can cure many diseases. Plants as medicine very common in China, Japan, Mexico and India. Medicinal plants are used in treatment of various diseases. *Asparagus racemosus*, *Withania somnifera*, *Glycerrhiza glabra*, *Piper longum*, *Adathoda vasica*, *Zingiber officinale*, *Terminalia chebula*, *Phyllanthus emblica*, *Ricinus communis* etc., are used in Arthritis (Rehman et al 2011).

II. MATERIALS AND METHODS:-

The study is based on the field survey and published literature on medicinal plant of Raipur. Information were collected by personal interviewing, questionnaires, medicinal practitioners, general preparation method of medicine. Local name of plant and their uses to cure arthritis disease were documented by conducting interview. The area was visited several times for the collection of information related to medicinal plants. During interviews the local language is used and questionnaire was prepared for easy documentation regarding to medicinal plants.

III. RESULT AND DISCUSSION:-

Information on plants used as the traditional rheumatic medicines:-

3.1. Botanical Name-*Calotropis procera* Linn.

Common Name-Aak

Family-Asclepiadaceae

Medicinal uses & other biological activity- Different parts of this plant have been reported to exhibit anti-inflammatory, analgesic, anti-oxidant and antifungal activity. Leaves & stalk contain calotropin & calotropangolin. latex contain usharin, calotoxin & calactin (Kumar & Vijay 2007, Kumar *et al* 2011).

3.2. Botanical Name-*Ricinus communis* Linn.

Common Name-Arandi

Family-Euphorbiaceae

Medicinal uses & other biological activity- Leaf paste & seed oil is used for joint pain with swelling. The castor seed contains ricinin, a toxic protein. Three terpenoids and a tocopherol-related compound have been found in the aerial parts of *Ricinus communis*. Traditional Ayurvedic medicinal practitioner considers castor oil the king of medicine for curing arthritic diseases. Castor oil contain palmitic, stearic, arachidic, hexadecenoic, oleic, linoleic, ricinoleic. (Kabra *et al* 2011).

3.3. Botanical Name-*Zingiber officinale* Roscoe.

Common Name-Adark

Family-Zingiberaceae

Medicinal uses & other biological activity- Ginger oil contain monoterpenes, hydrocarbons, sesquiterpene hydrocarbons, oxygenated mono and sesquiterpenes. Ginger is used as stomachic, an aromatic, a carminative, stimulant, flavouring agent. Ginger extract is one of the effective arthritis joint pain remedies recommended by physicians. Root poultice is used for joints pain & swelling. Chemical present in it are Terpenes, cineol, borneol, citral, camphene, phellandrene, gingerol, shogaol, zingiberone, zingiberin. (Rehman *et al* 2011).

3.4. Botanical Name-*Curcuma longa* Linn.

Common Name-Haldi

Family-Zingiberaceae

Medicinal uses & other biological activity- Turmeric contains volatile oil, resins, starch grains and yellow color substances known as curcuminoids. The chief component of curcuminoids is known as curcumin. It contains campesterol, stigmasterol, β -sitosterol, cholesterol & fatty acids. It has antimutagenic, antispasmodic, antimicrobial and anticancer activities. Purified curcuminoids inhibited joint inflammation in both the acute and chronic phases of arthritis. (Kohli *et al* 2005).

3.5. Botanical name-*Ficus bengalensis* Linn.

Common name-Banyan tree

Family-Moraceae

Medicinal uses & other biological activity- -The bark, leaves and fruits of this group are used as astringent, haemostatic, anti-septic, anti-inflammatory, antioxidant and anticancer agent. The α -L rhamnoside and leucocynidin 3-O- α -D galactosylcellobioside, glucoside, beta glucoside, pentatriacontan-5-one, beta sitosterol- α -D glucose-19-20. A glycoside of leucopelargonidin was also isolated from the bark and it has antidiabetic effect. Anti rheumatic activity of the methanolic extract of the bark of *Ficus bengalensis* were studied. (Amandeep *et al* 2012).

3.6. Botanical name-*Withania somnifera* Linn.

Common name-Ashwagandha

Family-Solanaceae

Medicinal uses & other biological activity- The alkaloids, withanine, pseudo-withanine, tropine, pseudo-tropine, somniferine, somnine are mainly present in Winter cherry. Two acyl glucosides viz sitoindoside-7 and sitoindoside-8 have been isolated from roots. The plant has been useful as an aphrodisiac, liver tonic, anti-inflammatory agent & more reagent treat to Asthma, ulcer, insomnia. It help in arthritis, fatigue & stress disorder. (Mirjalili *et al* 2009).

3.7. Botanical name-*Justicia gendarussa* Linn.

Common name -Black adusa

Family-Acanthaceae

Medicinal uses & other biological activity- -Chemical analysis of aerial parts of *Justicia gendarussa* Linn., shows the presence of β -sitosterol, β -Sitosterol- β -D-glycoside and aromadendrin. The leaf of the plant is recommended to treat ailments such as rheumatism, arthritis, muscle pain. There are no published scientific studies on the anti-arthritic activities of the leaves of *J. gendarussa* or its potential toxicity. Therefore, the objective of this study is to examine the anti-arthritic potential and toxicity of the ethanolic leaf extract of this plant. It is useful in asthma, rheumatism and colics of children. (paval *et al* 2003).

3.8. Botanical name-*Diospyros melanoxylon* Roxb.

Common name- Tendu

Family- Ebenaceae

Medicinal uses & other biological activity- -The extract produced marked inhibitory effect on edema especially on secondary immunological arthritis and caused graded inhibition of both phases of formalin-induced pain The methanolic extract contains several phytochemicals like terpenoids, alkaloids, glycosides, flavonoids, steroids. A part made from the bark is applied to oils & tumors. The presence of flavonoids, tannins, saponin, steroids may attribute to its anti-rheumatic activity as well as modifying the autoimmune system .Naphthalene derivatives, Nephthoquinone are the chemical present in it .Traditional healers used as tendu belan in curing in arthiritis. A paste made from the bark is apply to boils & tumors.(Sunita *et al* 2012.)

3.9.Botanical name- *Mangifera indica* Linn.

Common name- Aam

Family- Anacardiaceae

Medicinal uses & other biological activity- Main constituents present in it are polyphenols, flavonoids, triterpenoids, mangiferin, isomangiferin, tannin and gallic acid derivatives. Mangiferin is extracted from mango at high concentrations from the young leaves, bark and from old leaves. The methanolic extract of *Mangifera indica* posses the anti inflammatory activity show in the arthritic parameter like arthritic index, paw edema and rheumatoid factor. (Garrido *et al* 2001,2004).

3.10. Botanical name- *Hemidesmus indicus* Linn.

Common name- Indian sarsaparilla

Family- Asclepiadaceae

Medicinal uses & other biological activity - *Hemidesmus indicus* Linn., is a species of plant that is found in South Asia. Root oil is used for joint pain. It contains coumarin, essential oil, starch, tannic acid, triterpenoid, saponin. It is used in the treatment of rheumatoid arthritis, nephritic complaints, chronic skin disease, chronic ulcer, blood purifier. (Mehta *et al* 2012).

3.11. Botanical name- *Piper nigrum* Linn.

Common name- Black pepper

Family- Piperaceae

Medicinal uses & other biological activity- Black pepper is indigenous & cultivation in south india .Pepper contain an alkaloid, piperin ,piperidine & starch. Leaf, fruit oil are used for joint pain with swelling .Piperine isolated from black pepper. Piperine is used in arthritis (Agrawal *et al* 2009).

3.12.Botanical name- *Saraca asoca* Roxb.

Common name- Ashok

Family- Caesalpiniaceae

Medicinal uses & other biological activity- -Preliminary phytochemical methanolic and ethanolic extracts indicate the presence Carbohydrates, tannin, flavonoid, saponin, glycosides, proteins and steroids (Mallikharjuna *etal*, 2007). It is used as spasmogenic, oxytoxic, uterotonic, anti-bacterial, anti-tumour, anti-progestational, anti-estrogenic, anti-cancer and anti-rheumatoid arthritis. Methanol extract of *Saraca asoca* Roxb., reduced the paw thickness in adjuvant induced arthritic rats (saravanan *et al* 2011) .

3.13. Botanical name- *Cleome gynandra* Linn.

Common name- Spider plant

Family- Capparadaceae

Medicinal uses& other biological activity- It is used in the treatment of rheumatoid arthritis. It contains chemical constituents such as triterpenes, tannins, anthroquinones, flavonoids, saponins, steroids, resins, lectins, glycosides, sugars phenolic compounds and alkaloids and these compounds might be responsible for anti-arthritic properties. Ethanolic extract of *Cleome gynandra* Linn., possess anti arthritic effect (Narendhirakannan *et al* 2005, 2007.).

3.14.Botanical name-*Boswellia serrata* Linn.

Common name-Shallai

Family-Burseraceae

Medicinal uses & other biological activity -It has shown anti-inflammatory antiarthritic activities .Extract of this gummy oleoresin have also been used anti-atherosclerotic.It contain β -boswellic acid in resin portion. Boswellia mainly contain volatile oil, terpenoids & sugar (Kumar 2010).

3.15. Botanical name- *Ammania baccifera* Linn.

Common name- Aginbuti(Rice field weed)Agnibuti ,Banmirchi

Family- Lythraceae

Medicinal uses & other biological activity -It contain sterols, glycosides, alkaloids, triterpanoids, &saponin.The arial part of *ammania baccifera linn.* significant anti-inflammatory & anti-arthritic activity. Shows the presence of β -sitosterol, b-Sitosterol-b-D-glycoside and aromadendrin. Alcoholic extract inhibit of inflammatimon arthritis .(*Tripathy et al 2010*).

3.16. Botanical name- *Aloe barbadensis Linn.*

Common name- Aloe ghritkumari

Family- *Liliaceae*

Medicinal uses & other biological activity –Aloe vera stimulates the immune system & it is a powerful anti-inflammatory agent. It contain many component including vitamin A,B,C & E& minerals, sugars, enzymes Anthraquinones ,fatty acid & human important 20 amino acid . It drink is used as a tonic for patient suffering from arthritis.It gives therapeutic benefit and also antibacterial & antifungal properties ,used as blood purifier, anti-inflammatory & fever reliever.(*Josph et al 2010*).

3.17. Botanical name- *Leucas aspera Linn.*

Common name- Dronapushpi

Family- *Lamiaceae*

Medicinal uses & other biological activity - It contains triterpenoids, oleanolic acid, ursolic acid and b-sitosterol, nicotine, sterols, glucoside, diterpenes and phenolic compounds. Ethanolic extract of *Leucas aspera Linn.*, Show anti rheumatoid arthritis effect in Complete Freund's adjuvant induce arthritis .The plant is used traditionally as an antipyretic and insecticide (*Prajapati et al 2010*).

3.18 .Botanical name-*Nyctanthes arbortristis Linn.*

Common name-Parijat

Family -*Oleaceae.*

Medicinal uses-It is used as laxative, diuretic, diaphoretic, used to expulse roundworm and threadworm in children's, to relieve cough, also used for the treatment of rheumatoid arthritis. The leaves of *Nyctanthes arbortristis Linn.*, inhibited the acute inflammatory edema produced by different phlogistic agents, viz. carrageenin, formalin, histamine, 5-hydroxytryptamine and hyaluronidase in the hindpaw of rats. (*Bhalerao et al 2011*).

3.19. Botanical name-*Vitex negundo Linn.*

Common name-Nirgundi

Family-*Verbanaceae*

Medicinal uses & other biological activity - It is widely used in traditional medicine, particularly in South and Southeast Asia. It mainly contains many polyphenolic compounds, terpenoids, glycosidic iridoids and alkaloids It is used in the treatment of angina, cold and coughs. It is used as antibacterial agent. The fresh berries are pounded to a pulp and used in the form of a tincture for the relief of paralysis, pains in the limbs, weakness . (*subramani et al 2009*).

3.20. Botanical name-*Terminalia chebula Retz .*

Common name-Haritaki

Family-Combretaceae

Medicinal uses& other biological activity- Seed oil used for joint pain.It has also present tannic acid, chebulini cacid , resin , palmitic acid , oleic acid.The hydroalcoholic extract of *T. chebula* produced a significant inhibition of joint swelling as compared to control in both formaldehyde-induced and CFA-induced arthritis .*T. chebula* could be used as a disease-modifying agent in treatment of rheumatic (*Nair et al 2010*).

3.21. Botanical name-*Casia fistula Linn.*

Common name-Amaltas

Family-Caesalpinoideae

Medicinal uses & other biological activity -Fruit poultice is used for frozen joints.It is useful for rheumatic joint .the root is used in rheumatic condition .Pulp of pod contain anthraquinone , glycosides , sennosides A & B tannin & resin phenolic compound & flavanoids also reported.(*Bhalerao et al 2012*).

3.22 . Botanical name- *Solanum xanthocarpum (Schrad. & Wendle.)*

Common name- Bhatkateri

Family- Solanaceae

Medicinal uses & other biological activity - Leaf oil is used for joint pain .The part applied on swollen & painful joint in arthritis, reduces the pain & swelling effectively .Isolation of caffeic acid &oleandic acids. It is especially used for body joint pain .Glucoalkaloids and sterols. Fruits give solasonine, solamargine, and

solasodine; and sitosterol. (+)- solanocarpine, solanocarpidine, diosgenin, sitosterol, The herb is made to a paste and applied on swollen and painful joints to reduce the pain and swelling in arthritis.(Siddiqui1983).

3.23 .Botanical name- *Astercantha longifolia*

Common name- Talmakhana

Family- *Acanthaceae*

Medicinal uses & other biological activity -The main constituents are alkaloids, flavonoids, phenolic, carbohydrates, tannins, sugar and starch. It is used in the treatment of inflammation and rheumatoid arthritis in folk medicine .Root and leaf is an antirheumatic. (A.Doss *et al* 2012).

3.24.Botanical name- *cassia tora Linn.*

Common name- Charota

Family- *Caesalpinoideae*

Medicinal uses & other biological activity -Leaf paste used in rheumatism and also purgative. *Cassia tora* Linn. Leaves show anti-arthritis .Anthraquinone , β -sitosterol ,chrysophanol marker constituents, physcion ,emodi ,rubrofusarin chrycophonic acid -9-anthrone,palmitic acid succinic acid stearic,d-tartaric acid, uridine, quercitrin and many more other chemical compound.(Neelam Balekar *et al* 2013).

25. Botanical name-*Tamarindus indicus Linn.*

Common name-Imali

Family-*Caesalpinoideae*

Medicinal uses & other biological activity –

Tamarindus Indica Linn. of the active phenolic component We found 32 fatty acids,12essential elements Ar, Cd, Ca ,Cu, Fe, Na ,Mg, K, P, Pb Zn. Highest potassium accumulation in it. It has Histamine, Serotonin ,Prostaglandin, Bradykini ,leucotriene present in it . It has anti-inflammatary, analgesic & antioxidant properties.(Anupama *et al* 2012)

3.26. Botanical name- *Terminalia peniculata Roxb.*

Common name- Kinjal

Family- *Combretaceae*

Medicinal uses& other biological activity -It is used in cough, bronchitis, cardiac debility, diabetes, wound and skin disease. It contains alkaloids, triterpines, flavanoids, saponin, tannins. The aqueous extract of *Terminalia paniculata* Roxb., bark anti-rheumatic activity in arthritis(Talwar *et al* 2011).

3.27. Botanical name- *Carthamus tinctorius Linn.*

Common name- Kusum

Family- *Compositae*

Medicinal uses& other biological activity -the seed yield valuable oil, used in healing sores & in rheumatism .Chemical present is lycorine, alkaloid, tazattine. (Asgarpanah &Kazemivash 2013).

3.28. Botanical name- *Capparis deciduas L. Edgen*

Common name- Karil

Family- *Capparadaceae*

Medicinal uses& other biological activity -The bark is used in cough, asthma and inflammation .the root is given in intermittent fevers & rheumatism. In it high amount of carbohydrates, protein, lipid, glutamic acid, ascorbic acid, methionine & cysteine in lowest amount present in it .Chemical present in it are Sterols, Diterpene alcohol, Capparasinine, Capparadisine .It has analgesic ,anti-inflammatory, and anti asthmatic in properties.(Baby Joseph & D.Jini 2011)

3.29. Botanical name-*Spondias mangifera Wild*

Common name-Amra(hogpum)

Family-*Anacardiaceae*

Medicinal uses& other biological activity -Bark grounded & mixed with water, it is rubbed on both articular & muscular rheumatism .Chemical present in it are flavanoids ,phenolic compound, tannins ,terpenoids.(Muhammad Arif *et al* 2011).

3.30. Botanical name- *Bridelia retusa Muell.Arg*

Common name- Khaja

Family- *Euphorbiaceae*

Medicinal uses & other biological activity The bark is used for tanning and mixed with gingili oil is applied in rheumatism. :phenolic, flavonoid, tannins, carbohydrates and mucilage content , proanthocyanidin ellagic acid mucilage, flavonoids and carbohydrates. Lignin ,starch ,Protien ,alkaloids ,steroids, glucoside, tannins (Kokate 2007).

3.31. Botanical name- *Capsicum annum* Linn.

Common name- Mirch

Family- Solanaceae

Medicinal uses & other biological activity -Dried chillies are carminative and medicinally used as counter irritants in lumbago, neurogia and rheumatism .It has protien ,ascorbic acid ,P, Zn. Cu ,capsaicin ,steroid ,triterpenoid, coumarin, glycoside & alkaloids.(Pandey *et al* 2012).

3.32. Botanical name- *Dolichus lablab* Linn.

Common name- Semi

Family- Pappilionateae

Medicinal uses&other biological activity-It has anti inflammatory and anti arthritic properties .It is rich in nutrients and good source of protein fibers, vitamins, antioxidants & phyto chemicals. used as diuretic, astringents & rheumatism .Chemical present in it are Sterols, fatty acid, palmitic acid, palmitoleic acid, linoleic acid & alkaloids.(Albert *et al* 2002).

3.33. Botanical name- *Sesbania sesban* Aculeata

Common name- Jait

Family- Pappilionateae

Medicinal uses& other biological activity- It has anti inflammatory and anti arthritic properties .The leaves are used as poultice in rheumatic swelling & other swellings .N ,fibre ,Fe, Ca, β -carotene, amino acid, arginine histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, valine (Patil *et al* 2010) .

3.34. Botanical name- *Azadirachta indica* A Juss

Common name- Neem

Family- Meliaceae

Medicinal uses& other biological activity -Neem oil is used in rheumatism. Azadiractin, nimbidin, triterpenoids, steroids and glycosides are the component present in it. Different Pharmacological studies in comparison to different inflammatory drug. it shows that induced ankle feet joint swelling and paw odema arthritis Nimbidin has better positive significant activity to used by other drugs. (Kaushik *et al* 2002).

3.35. Botanical name- *Syzygium operculatum* (Roxb.)Niedz.

Common name- Rajjamun

Family- Myrataceae

Medicinal uses& other biological activity -An extract of root boiled down to consistency of gur and is rubbed on joint for the rheumatism .Leaves used in dry form and fruits are eaten to treat Rheumatic pain .It has anti fungal & anti bacterial properties.(A.Kar *et al* 2013).

3.36.Botanical name- *Linum usitatissium* Linn.

Common name- Til

Family- Linaceae

Medicinal uses& other biological activity- Dried ripe seed are used in form of poultice for rheumatism swelling, gout, etc.Richest source of omega 3 fatty acid, alfa linolenic acid, (ALA), 3fatty acid EPA, DHA seed oil. Its chemical present in its are per 100gm. Saturated fat3.7 gm., poly unsaturated fat 29gm. ,mono - unsaturated fat 8gm,Sodium 30mg,Potassium 813mg, Carbohydrates 29gm.Dietryfiber 27gm Sugar1.6g.Vit. C, B, Mg, Ca, Omega 3 are chemical messengers that facilitate communication between nerve cells. It is The source of Serotonin (emotional stability) and Dopamine (positive emotions) .Omega 6 &Omega 3are present in it 1:4 ratio. It helps in Osteoporosis & muscoskeleton osteo arthiritis and as anti inflammatory. (Ila *et al* 2013)

3.37.Botanical name- *Ociumum gratissimum* Linn.

Common name- Ram tulsi

Family- Lamiaceae

Medicinal uses& other biological activity -The plant are aromatic and baths of fumigation prepared with it are recommended in the treatment of rheumatism, paralysis, neuroglia. Essential oil alkaloids, steroid tannin oleandic acid, Oleanolic acid , terpene, ocimene, β -earyophyllene, sesquiterpene, phytochemicals present in it. It has anti inflammatory and analgesic properties. (K .S. Prabhu *et al* 2009).

IV. CONCLUSION:-

The present study reveals that the old methods of rheumatic treatment are still in use in the area and the aged local experts are present to whom the whole area worked for rheumatic diseases and are found to be more effectible as their methods are simple and especially more cost effective for poor people .All the plants and their chemical constituents or extracts are used by different types of medical practitioners of our traditional

healers. These plants' technical pharmacological analysis also confirms the present medicine has used chemicals and their properties to cure arthritic patients. It also showed that the plants & their properties are used by practitioners on the basis of patients' conditions and their requirements as the symptoms. Different pharmacological studies, metabolites present in it, also showed that present metabolites of plants are effectively worked as medicine in different chemical induced (caragenin, formalin etc.) arthritic models of study and it produced effective result. Only the remain work is quantity of that chemical (in the form of medicine) by the medical practitioners.



Aloe barbadensis Linn.



Boswellia serrata Linn.



Piper nigrum Linn.



Ginger officinale



Curcuma longa Linn.



Calotropis Procera Linn.



Camellia sinensis Linn.



Ficus bengalensis Linn.



Nycyanthes arbortristis Linn.



Vitex negundo Linn.



Justicia gendarussa Linn.



Terminalia paniculata Roxb.



Terminalia chebula Retz.



Saraca asoca Roxb.



Leucas aspera Linn.



Mangifera indica Linn.

REFERENCES:-

- [1]. Aggarwal SS, Paridhavi M. (2009). Herbal Drug Technology. Reprint.p.39.
- [2]. A. Doss and S.P. Anand (2012). Preliminary Phytochemical Screening of *Asteracantha longifolia* and *Pergularia daemia*© IDOSI Publications, DOI: 10.5829/idosi.wasj.2012.18.02.1136.
- [3]. Alternative Medicines Review 2008; 13(2): 165-167.
- [4]. Albert A. Fernandes, Gopalpur Nagendrappa(2002). Chemical constituents of *Dolichos lablab* (field bean) pod exudates. Journal of Agricultural and Food Chemistry - J AGR FOOD CHEM 04/2002; 27(4). DOI:10.1021/jf60224a031
- [5]. Amandeep Kaur, Parmindar Nain, Jaspreet Nain(2012). Herbal plant used in treatment of Rheumatoid arthritis: A review, International journal of pharmacy & pharmaceutical science Vol.4,suppl.4.
- [6]. . Anupama A Suralkar*, Kishor N Rodge, Rahul D Kamble, Kanchan S Maske (2012). Evaluation of Anti-inflammatory and Analgesic Activities of *Tamarindus indica* Seeds. International Journal of Pharmaceutical Sciences and Drug Research; 4(3): 213-217 ISSN 0975-248X.
- [7]. Anthony R. Torkelson "The cross Name Index To Medicinal Plants"Vol. Iv plants in Indian Medicine A_Z.
- [8]. A. Kar, D .Bora, S .K. Borthakur , N K. Saharia(2013) "Wild Edible Plants Resources Used by the Mizos of Mizoram, India."Kathmandu University, Journal of science, Engineering and technology Vol.,july,106-126.
- [9]. Asgarpanah J, Kazemivash N(2013). Phytochemistry pharmacology and medicinal properties of *Carthamus tinctorius* L. hin J Integr Med. 2013 Feb;19(2):153-9. doi: 10.1007/s11655-013-1354- 5 Epub.
- [10]. Baby Joseph and D. Jini(2011) A Medicinal Potency of *Capparis decidua*-A Harsh Terrain Plants. Research journal of Phytochemistry 5 (1):1-13,ISSN 1819-3471.
- [11]. Balick,J.M. and Cox,P.A.(1996), in :Plants, people and culture:the science of ethnobotany,scientific american library, New york,228 pp.
- [12]. Bhavprakash Nighantu by Bhava Mishra, Translation(1959).Viswanath Dwivedi, Motilal Banarasidas, Varanasi.
- [13]. Bhalerao AR, Desai SK, Serathia BR, Vartak KM, Doshi(2011) GM Antiarthritic studies on *Nyctanthes arbortristis* and *Maharasnadi ghan*. Scholars Research Library; 3(4): 101-110.
- [14]. Bhalerao S.A. and Kelkar T (2012). Traditional Medicinal Uses, Phyto chemical Profile and Pharmacological Activities of *Cassia fistula* Linn. International Research Journal of Biological Sciences ISSN 2278-3202 Vol. 1(5), 79-84, Sept. I. Res. J. Biological Sci.
- [15]. Sunita Chintala, Anil Kandhula, Yasodha Krishana Janapathi, Fayaz Khan Md. And Divya Vani(2012). "Pharmacognostic Studies on *Diospyros melanoxylon*"IJUPSR Vol.3,issue 09,3438-3443,ISSN:0975-8232.
- [16]. Garrido, González, Delporte, Backhouse, Quintero, Nunez-Selles AJ *et al*(2001) Analgesic and anti-inflammatory effects of *Mangifera indica* L. extract (Vimang). Molecules; 15(1): 18-21.
- [17]. Garrido, Gonzalez, Lemus, Garcia, Lodeiro, Quintero *et al* (2004). In vivo and in vitro anti-inflammatory activity of *Mangifera indica* L. extract. Molecules ; 50(2): 143-149.
- [18]. Hill, A .F.(1989). in :Economic Botany: A text book of useful plants and plant products, second ed., McGraw Hill book company, Inc. .New York,560pp.
- [19]. Ila Tanna, Preeti Pandaya, Harisha C.R., V.J. Shukla & Chandola HM (2013). "Pharmacognostical and Phytochemical evaluation of Atasi (*Linum usitatissimum* L.). Indian Journal of Traditional Knowledge Vol.12 (4), pp. 688-692.
- [20]. Joshph B and Raj SJ(2010). Pharmacognostic and pharmacology properties of *Aloe vera*. International journal of Pharmaceutical Sciences Review and Research; 4(2): 106-109.
- [21]. Jean Bruneton. Text book of Pharmacognosy, Phytochemistry of Medicinal Plants. 2nd ed. P. 299-301.
- [22]. Kabra Mahaveer Prasad*, Rachhadiya Rakesh M. & Shete Rajkumar V.(2011). Pharmacological Investigation of Hydroalcoholic Extract of *Ricinus Communis* Leaves In Arthritis Induces Rats. Asian Journal of Biochemical and Pharmaceutical Research Issue 4 (Vol. 1) ISSN: 2231-2560 Research Article 310
- [23]. Kokate CK.(2007) Text book of Pharmacognosy. 39 ed. Niraliparkashan; p. 437.
- [24]. Kripa KG, Chamundeeswari D, Thanka J, Reddy (2010). CUM Effect of hydro alcoholic extract of aerial parts of *Leucas aspera* (Willd.) link on inflammatory markers in complete freund's adjuvant induced arthritic rats. International Journal of Green Pharmacy 2010; 4(4): 281-287.

- [25]. Kirtikar KR, Basu BD(1933). Indian Medicinal Plants. 2nd ed. New Delhi: Published by Bishen Singh; p. 2390–2392.
- [26]. Kohli K, Ali J, Ansari MJ, Raheman Z (2005). Curcumin: A natural antiinflammatory agent. Indian Journal of Pharmacology; 37(3); 141-147.
- [27]. Kumar AM (2010). Ethnomedicinal plants as anti-inflammatory and analgesic agents. Research Signpost ; 267-293.
- [28]. Kumar VL, Chaudhary P, Ramos MV, Mohan M, Matos MP.(2011). Protective Effect of Proteins Derived from the Latex of *Calotropis procera* against Inflammatory Hyperalgesia in Monoarthritic Rats. Phytother Res. doi: 10.1002/ptr.3428
- [29]. Kumar Vijay L and Sanjeev Roy(2007) . *Calotropis procera* Latex Extracts affords Protection against inflammation and oxidative stress in Freud's Complete Adjuvant induced Monoarthritis in rats. Mediators Inflamm; 2007: 47523.Published online 2007 March 19.
- [30]. K.S. Prab, R. Lobo, A.A. Shirwaikar and A. Shirwaikar(2009). *Ocimum gratissimum*: A Review of its Chemical, Pharmacological and Ethnomedicinal Properties.The Open Complementary Medicine Journal, 1, 1-15 .
- [31]. Kaushik Biswas, Ishita chattopadhyay,Ranjit K. Banerjee and Uday Bandyopadhyay(2002). Biological activities & properties of Neem(*Azadirachta indica*),Current science,Vol.82,No.11.
- [32]. Lal, S.D. and Yadav, B.K.(1983). Folk medicines of Kurukshetra District (Haryana),India.J.Econ.Bot.,37.
- [33]. Muhammad Arif *, Sheeba Fareed and Md. Sarfaraj Hussain(2011). Estimation of antioxidant activity of microwaveassisted extraction of total phenolics and flavonoids contents of the fruit *Spondias mangifera* Willd. / Asian Journal of Traditional Medicines, 6 (4)
- [34]. Mehta A, Sethiya NK, Mehta C, Shah GB(2012). Anti-arthritis activity of roots of *Hemidesmus indicus* R.Br. (Anantmul) in rats. Asian Pac J Trop Med ; 5(2): 130-5.
- [35]. Mirjalili MH, Moyano E, Bonfill M, Cusido RM and Palajon J(2009). Steroidal Lactones from *Withania somnifera*, an ancient plant for novel medicines. Molecules; 14: 2373-2393.
- [36]. Narendhirakannan RT, Subramanian S and Kandaswamy M(2005). Free radical scavenging activity of *Cleome gynandra* L. leaves on adjuvant induced arthritis in rats. Molecular and Cellular Biochemistry ; 276(1-2): 71-80.
- [37]. Narendhirakannan RT, Subramanian S and Kandaswamy M(2007) Evaluation of Anti-inflammatory Activity of *Cleome gynandra* L. Leaf Extract on Acute and Chronic Inflammatory Arthritis Studied in Rats. Journal of Pharmacology and Toxicology; 2: 44-53.
- [38]. Nair V, Singh Surender, Gupta Y K(2010). Anti-arthritic and disease modifying activity of *Terminalia chebula* Retz., in experimental models. Journal of Pharmacy and Pharmacology; 62(12): 1801–1806.
- [39]. Neelam Balekar, Anil Kumar Pasi, Gaurav Parihar and D. K. Jain(2013). Antiarthritic activity of hydroalcoholic seed extract of *Cassia tora* Linn. Top class journal of herbal medicine .Vol. 2(11) pp.254-260,26 Nov 2013,ISSN 2315-8840.Top class of global journal.
- [40]. Prajapati MS, Patel JB, Modi K, Shah MB(2010). *Leucas aspera*: A review. Pharmacognosy Review; 4 (7): 85-87. .
- [41]. Pandey Sunil, Yadav Sanjay, Singh Vinod(2012). Pharmacognostical investigation and standardization of *capsicum annum* l. Roots International Journal of Pharmacognosy and Phytochemical Research; 4(1);21-24 ISSN: 0975-4873
- [42]. R. B. Patil, B. K. Nanjwade and F. V. Manvi (2010). Effect of *Sesbania grandiflora* and *Sesbania sesban* bark on Carrageenan Induced Acute Inflammation and Adjuvant-Induced Arthritis in Rats an International Jou. of Pharmaceutical Sciences Vol.-1, Issue-1.
- [43]. Ram p. Rastogi B.N. Melhotra (1970-79). compendium of Indian medicinal plants vol-II,IV, 1970-79 central drug research institute lukhnow and publication and information directed new delhi.
- [44]. Rehman R, Akram M, Akhtar N, Jabeen Q, Saeed T, Shah SMA *et al* (2011.) *Zingiber officinale* Roscoe (pharmacological activity). Journal of Medicinal Plants Research 2011; 5(3): 344-348.
- [45]. Saravanan S, Babu NP, Pandikumar P, Ignacimuthu S(2011) Therapeutic effect of *Saraca asoca* (Roxb.) Wilde on lysosomal enzymes and collagen metabolism in adjuvant induced arthritis. Inflammopharmacology ; 19(6): 317-25.
- [46]. Seth S.D. and Sharma B (2004). medicinal plants in india. Indian J. Med. Res.20 (1) 9-11 .
- [47]. Siddiqui S, Faizi S, Shaheen B.(1983). Studies in the chemical constituents of the fresh berries of *Solanum xanthocarpum* Schrad. & Wendle. Journal of Chemical Society Pakistan. 5:99–102.

- [48]. Subramani J, Damodaran A, Kanniappan M, and Mathuram LN(2009). Anti-inflammatory effect of petroleum ether extract of *Vitex negundo* leaves in rat models of acute and subacute inflammation. *Pharmaceutical Biology* ; 47(4): 335-339.
- [49]. Tripathy S, Pradhan D and Anjana M(2010). Anti-inflammatory and antiarthritic potential of *Ammania baccifera* Linn. *International Journal of Pharma and Bio Sciences* ; 1(3): 1-7.
- [50]. Talwar S, Nandakumar K, Nayak PG, Bansal P, Mudgal J, Mor V *et al* (2011). Anti-inflammatory activity of *Terminalia paniculata* bark extract against acute and chronic inflammation in rats. *Journal of Ethnopharmacology* ; 134(2); 323-328.
