



A REVIEW OF ANTI ARTHRITIC MEDICINAL PLANTS

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ABSTRACT

Osteoarthritis is the most common degenerative form of joint disease. It will produce spontaneous worse symptoms. The conventional medicines are only for symptomatic relief and also have significant adverse effect. The prognosis of the disease is also worst. Worldwide interest is on the natural medicinal compounds for safe and effective treatment. Many medicinal plants have NSAID effect to relieve the causes of Osteoarthritis. Some of them are scientifically validated. Here in this review we have discussed some of the potent anti-arthritis effect which plays a way for further research on joint disease.

KEYWORD: Osteoarthritis, Anti-inflammatory, Anti-arthritis, natural plants.

INTRODUCTION

OA (Osteoarthritis), the most prevalent form of Joint disease, is characterized by erosion of articular cartilage. The joints chiefly affected by Osteoarthritis are the knee, hips, spine and hands. Despite other joint may be involved. Osteoarthritis is usually classified either as primary (idiopathic), or secondary. In the former, no obvious influencing factors can be identified, in the latter; the arthritis appears be the result of trauma, repetitive joint use.

Clinical manifestations of Osteoarthritis include pain with tenderness, rigidity and Immobilization of joint. In more advanced cases, denoting that reduced range of motion like congenital or developmental defect, metabolic or endocrine disorders or other factors disability may occur.

In the past, Osteoarthritis was considered as a degenerative disorder, in which the joint is gradually "wear out". It is now known that the joint cartilage of individuals is highly metabolically active engaging in a process of remodelling and repair of damage tissue.^[1] Inflammation is also a cause for Osteoarthritis.

Inflammation is a complex biological response of vascular tissue to harmful stimuli, pathogens, irritants characterized by rubor, calor, dolor^[2,3] and functio laesa.

Cyclooxygenase (COX) is the crucial important enzyme in the production of chemical compounds of prostaglandins, prostacyclin's and thromboxane's which are involved in inflammation pain and platelet aggregation.^[4]

Conventional pharmacological treatment of Osteoarthritis consists primarily of NSAIDs, and analgesics. While these medications often relieve symptoms, they are far from classical therapeutic agents, these drugs forms a barrier for COX-1 and COX-2 enzyme activity. Cyclooxygenase enzymes assists with prostaglandin production, NSAIDs, steroidal anti-inflammatory drugs are being used till now. As a result, long term uses of these drugs cause adverse side effects and damage human system such as Liver, Gastrointestinal tract, etc., produce the side effects like gastric lesions, cardiovascular failure, renal failure^[5] and gastrointestinal damage.^[6,7] In fact, there is evidence for both in animals with experimental Osteoarthritis^[8] and in humans^[9], that administration of NSAIDs may actually accelerate joint destruction.

New proposal are consequently required, both to increase the safety and efficacious treatment, to exert an essential influence on the course of the disease.

Plant medicines are significant in the primary health management in many developing countries. According to WHO, still about 80% of the world population depends on plant based drug. In Ayurveda, Siddha and Unani make effective of a large number of medicinal plants were used for the treatment of human disorders.^[10] The medicinal plants occupied an individual place in human life. It provides more knowledge about the use of plants or plant part as medicine.^[11]

Plant based drugs are used in the classical medicine have paid great importance because it is easily obtainable, inexpensive and also have low or no side effects.^[12] Many of the phytochemical have been used to

efficacious treatment to various illnesses for mankind. Most of the medicinal plant parts are used as raw drugs and they possess various medicinal resources.^[13]

The Phytomedicine are more important in the treatment of inflammation. In recent years, there is an increasing enlightenment about the important of medicinal plants. Many medicinal plants have shown to powerful anti-inflammatory effect in the treatment of inflammation.

DISCUSSION OF ANTI-ARTHRITIC MEDICINAL PLANTS

1. *Leucas aspera*

SCIENTIFIC CLASSIFICATION:

Kingdom	:	Plantae
Division	:	Angiosperma
Class	:	Dicotyledoneae
Series	:	Bicarpellatae
Order	:	Tubiflorae
Family	:	Labiatae
Genus	:	<i>Leucas</i>
Species	:	<i>aspera</i>

BOTANICAL DESCRIPTION

Leucas aspera is an annual, branched, herb erecting to a height of 15-60 cm with stout and hispid acutely quadrangular stem and branches. Leaves are sub-sessile or shortly petiolate, linear or linearly lanceolate, obtuse, pubescent up to 8.0 cm long and 1.25 cm broad, with entire or crenate margin; petiole 2.5-6 mm long. Flowers are white, sessile small, in dense terminal or axillary whorls; bracts 6 mm long, linear, acute, bristle-tipped, and ciliate with long slender hairs. Calyx variable, tubular, 8-13 mm long; tube curved, contracted above the nutlets, the lower half usually glabrous and membranous, the upper half ribbed and hispid; mouth small, very oblique, not villous, the upper part produced forward; teeth small, triangular, bristle-tipped, ciliate, the upper tooth being the largest. Corolla 1 cm long; tube 5 mm long and pubescent above, annulate in the middle; upper lip 3 mm long, densely white-woolly; lower lip about twice as long, the middle lobe obviate, rounded, the lateral lobes small, sub acute. Fruit nutlets, 2.5 mm long, oblong, brown, smooth, inner face angular and outer face rounded.^[14]

PHYTOCHEMICALS

Preliminary chemical examination of *L. aspera* revealed presence of triterpenoid in entire plant.^[15] Whole plant is reported to contain oleanolic acid, ursolic acid and 3-sitosterol.^[16] Among the 25 compounds identified from the leaf volatiles, u-farnesene (26.4%), x-thujene (12.6%) and menthol (11.3%) were the major constituents. The flower is reported to contain 10 compounds; among them amyl propionate (15.2%) and isoamyl propionate (14.4%) were dominant.^[17] Seed is reported to contain palmitic acid (6.25%), stearic acid (2.84%), oleic acid (42.07%), linoleic acid (48.11%), and linolenic acid (0.65%). The unsaponifiable fraction contained 3-sitosterol and ceryl alcohol.^[18] Shoot

contained novel phenolic compounds (4-(24-hydroxy-1-oxo-5-npropyltetracosanyl)-phenol), aliphatic ketols (28-hydroxypentatriacontan-7-one, 7hydroxydotriacontan-2-one),^[19] long-chain compounds (1-hydroxytetratriacontan-4-one, 32-methyltetratriacontan-8-ol),^[20] nonatriacontane, 5-acetoxytriacontane, β sitosterol and dotriacontanol. Leucolactone (I), isolated from the root of *L. aspera* have been characterized as 3, 3, 16cdihydroxyoleanan-28-1, 3-olide.^[21]

RESEARCH STUDY

Ethanol Extract of *Leucus aspera* exhibited significant anti-inflammatory ($p < 0.001$) and antioxidant activity ($p < 0.001$). It did not show mortality up to 2000 mg/kg body weight. Histopathological studies confirmed complete cartilage regeneration and near normal joint in Ethanol Extract of *Leucus aspera* treated arthritic rats. This study highlighted the antioxidant and anti-inflammatory potential of *Leucas aspera*.^[22]

2. *Semecarpus anacardium*

SCIENTIFIC CLASSIFICATION

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Order	:	Sapindales
Family	:	Anacardiaceae
Genus	:	<i>Semecarpus</i>
Species	:	<i>S. Anacardium</i>

BOTANICAL DESCRIPTION

It is a medium sized deciduous tree, growing up to 10-15 metres in height. The plant grows naturally in tropical and dry climate. Bark is grey in colour and exudes an irritant secretion on incising. The leaves are simple alternate, 30-60 cm long and 12-30 cm broad. They are glabrous above and pubescent beneath. The flowers are greenish white, in panicles. Fruits are ripe between December to March and are 2-3 cm broad, ovoid and smooth with a lustrous black. Flowering occurs in June and then onwards the plant bears fruits. It has got no specific soil affinity and easily recognized by large leaves and the red blaze exuding resin, which blackens on exposure.^[23]

PHYTOCHEMICALS

The most significant components of the *S. anacardium* Linn. are bhilawanol, phenolic compounds,^[24] biflavonoids, sterols and glycosides. An alkaloid, Bhilawanol, has been isolated from oil and seeds. Bhilawanol from fruits was shown to be a mixture of cis and Trans isomers of ursuhanol. Oil from nuts, bhilavinol, contains a mixture of phenolic compounds mainly of 1, 2-dihydroxy-3 (pentadecadienyl-8, 11) benzene and 1, 2dihydroxy-3 (pentadecadienyl-8', 11') - benzene.^[25] On exposure to air, phenolic compounds get oxidized to Quinones. The oxidation process can be prevented by keeping the oil under nitrogen. Nut shells contain the biflavonoids: biflavones A, C, A1, A2, tetrahydrorobustaflavone, B (tetrahydro mentoflavone),

jeediflavanone,^[26] semecarpuflyavan^[27] and gullulflavone.^[28] Other components isolated are anacardic acid, cardol, catechol, fixed oil, semecarpetin, anacardol, anacardoside and semecarpol. The kernel oil contains oleic acid- 60.6%; linoleic acid- 17.1%; palmitic acid- 16%; stearic acid- 3.8%; arachidic acid- 1.4%.

RESEARCH STUDY

The anti-inflammatory activity of *Semecarpus anacardium* in adjuvant-induced arthritic rat model with reference to mediators of inflammation (lysosomal enzymes) and its effect on proteoglycans.^[29] It is reported the presence of phenolic compounds like semecarpol and bhillawanol in the nuts found to inhibit acute tuberculin reaction in sensitized rats and also the primary phase of adjuvant arthritis. The drug also shows immunomodulatory effect during inflammation. *Semecarpus anacardium* blocks the TNF- α thus severity of inflammation is reduced.

3. *Vitex negundo*

SCIENTIFIC CLASSIFICATION

Kingdom	:	Plantae
Division	:	Angiosperms
Class	:	Eudicots
Order	:	Lamiales
Family	:	Lamiaceae
Genus	:	<i>Vitex</i>
Species	:	<i>V.negundo</i>

BOTANICAL DESCRIPTION

Vitex negundo Linn. (Verbenaceae) is a woody, aromatic shrub growing to a small tree. It commonly bears tri- or penta-foliolate leaves on quadrangular branches, which give rise to bluish-purple coloured flowers in branched tomentose cymes. It is grown commercially as a crop in parts of Asia, Europe, North America and the West Indies^[30]. Though *V. negundo* (will henceforth be referred to as *Vitex negundo* for sake of convenience) also finds use as a food crop (Facciola, 1990) and a source of timber^[31], this review deals only with the medicinal importance and other related attributes of the plant.

PHYTOCHEMICALS

Hydroxy-3,6,7,3',4'-pentamethoxyflavone 6'-p-hydroxybenzoyl mussaenosidic acid; 2'-p-hydroxybenzoyl mussaenosidic acid^[32] 5, 3'-dihydroxy-7,8,4'-trimethoxyflavanone; 5,3'-dihydroxy-6,7,4'-trimethoxy flavanone^[33] viridiflorol; β -caryophyllene; sabinene; 4-terpineol; gamma-terpinene; caryophyllene oxide; 1-oceten-3-ol; globulol^[34] betulinic acid [β -hydroxylup-20-(29)-en-28-oic acid]; ursolic acid [2β -hydroxyurs12-en-28-oic acid]; n-hentriacontanol; β -sitosterol; p-hydroxybenzoic acid^[35] protocatechuic acid; oleanolic acid; flavonoids^[36] angusid; casticin; vitamin-C; nishindine; gluco-nonitol; p-hydroxybenzoic acid; sitosterol.^[37]

RESEARCH STUDY

Anti-inflammatory properties of *Vitex negundo* extracts in acute and subacute inflammation.^[38] Anti-inflammatory and pain suppressing activities of fresh leaves of *Vitex negundo* are attributed to prostaglandin synthesis inhibition.^[39]

4. *Boerhaavia diffusa*

SCIENTIFIC CLASSIFICATION

Kingdom	:	Plantae
Division	:	Angiosperms
Class	:	Eudicots
Order	:	Caryophyllales
Family	:	Nyctaginaceae
Genus	:	<i>Boerhavia</i>
Species	:	<i>B.diffusa</i>

BOTANICAL DESCRIPTION

B. diffusa L. is a perennial creeping weed, prostrate or ascending herb, up to 1 m long or more, having spreading branches. The roots are stout and fusiform with a woody root stock. The stem is prostrate, woody or succulent, cylindrical, often purplish, hairy, and thickened at the nodes. Leaves are simple, thick, fleshy, and hairy, arranged in unequal pairs, green and glabrous above and usually white underneath; ovate-oblong, round or subcordate at the base with smooth, wavy, or undulate margins; up to 5.5 \times 3.3 cm² in area. Flowers are minute, subcapitate, present 4–10 together in small bracteolate umbels, forming axillary and terminal panicles; hermaphrodite, pedicellate, and pink, or pinkish-red in colour; Bracts are deciduous and involucrate; Calyx and corolla replaced by perianth which is tubular in shape, the tube being short and narrow at the base and funnel-shaped at the top and constricted above the ovary. There are five lobes, which are small and acute. Two or three stamens are present and are slightly exerted. The stigma is peltate. The fruit is an achene and is detachable, ovate, oblong, pubescent, five-ribbed and glandular, anthocarpous, and viscid on the ribs.^[40]

PHYTOCHEMICALS

The quest to identify and isolate novel phytochemicals from *B. diffusa* has led many researchers to discover various compounds such as flavonoids, alkaloids, glycosides, steroids, triterpenoids, lipids, lignans, carbohydrates, proteins, and glycoproteins from its leaves, stems, seeds and roots. Two quinolizidine alkaloids identified as punarnavine I and punarnavine II was isolated from root, stem and leaves. Several volatile compounds were identified in both root and leaves.^[41]

RESEARCH STUDY

Anti-arthritic activity of root extract of *Boerhaavia diffusa* in adjuvant induced arthritis in rats. The petroleum ether extract of root of the *Boerhaaviadiffusa* 500 and 1000mg/kg p.o were tested for its anti-arthritic activity by complete Freund's adjuvant induced arthritis. Administration of the extract reported

significant reduction in paw swelling and paw diameter using digital plethysmometer. The results concluded that the extract of *Boerhaaviadiffusa* possess a potential anti-arthritis activity.^[42]

5. *Asperagus recemosus*

SCIENTIFIC CLASSIFICATION

Kingdom	:	Plantae
Division	:	Angiosperms
Class	:	Monocots
Order	:	Asparagales
Family	:	Asparagaceae
Genus	:	<i>Asperagus</i>
Species	:	<i>A.recemosus</i>

BOTANICAL DESCRIPTION

A climbing plant which grows in low forest areas throughout India. The plant grows throughout the tropical and subtropical parts of India up to an altitude of 1500m. The plant is a spinous under-shrub, with tuberous, short rootstock bearing numerous succulent tuberous roots (30–100 cm long and 1–2 cm thick) that are silvery white or ash coloured externally and white internally. These roots are the part that finds use in various medicinal preparations.^[43] The stem is woody, climbing, whitish grey or brown coloured with small spines. The plant flowers during February–March leaving a mild fragrance in its surrounding and by the end of April, fruits can be seen with attractive red berries.^[44]

PHYTOCHEMICALS

The major bioactive constituents of *Asperagus* are a group of steroidal saponins. This plant also contains vitamins A, B1, B2, C, E, Mg, P, Ca, Fe, and folic acid. Other primary chemical constituents of *Asperagus racemosus* are essential oils, asparagine, arginine, tyrosine, flavonoids (kaempferol, quercetin, and rutin), resin, and tannin.

RESEARCH STUDY

Anti-inflammatory and anti-arthritis activity of *Asperagus racemosus* roots. The hydro alcoholic extract of *Asperagus racemosus* roots (ARHE) in-vivo 200 and 400mg/kg were tested for its anti-inflammatory and anti-arthritis activity by Carragenan induced paw oedema methodology is used to induce inflammation whereas Freund's Complete adjuvant used to induce arthritis. The extract reduces paw volume, joint diameter, arthritic score and estimate the haematological parameters like RBC, WBC, ESR HB% for assessing arthritic activity. Their investigation concluded that the hydro alcoholic extract of *Asperagus racemosus* roots (ARHE) showed significant anti-inflammatory and anti-arthritis activity.^[45]

6. *Allium sativum*

SCIENTIFIC CLASSIFICATION

Kingdom	:	Plantae
Division	:	Angiosperms
Class	:	Monocots
Order	:	Asparagales
Family	:	Amaryllidaceae
Genus	:	<i>Allium</i>
Species	:	<i>A. sativum</i>

BOTANICAL DESCRIPTION

A. sativum belongs to Alliaceae family. It can grow easily to height of 12m plant.^[46] Scapes are stem end structures having flower heads of plant and base is formed by small bulbils. It has look of long gentle neck curving present at stem's upper end and is about 60 cm high.^[47] Bulb is underground part formed by cloves clusters. Its leaves are long, blade shaped arranged in alternative pattern.

PHYTOCHEMICALS

Chemical analysis shows highest concentration of sulphur compounds responsible for its pungent odour and therapeutic properties. Most important sulphur compounds are allin, allicin, ajoene, s-allylcystiene, diallyl trisulfides, vinylidithines, allylpropyl disulphides, and s-allylmercaptocystein. Allinase, peroxidases, myrosinase and other enzymes are also present in it in addition to minerals, vitamins, carbohydrates and proteins.^[48]

RESEARCH STUDY

Antibiotic, anti-inflammatory antibacterial, anti-sclerotic, anticoagulant, anti-asthmatic, expectorant, carminative are proved for *Allium* species.^[49]

7. *Hemidesmus indicus*

SCIENTIFIC CLASSIFICATION

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Order	:	Gentianales
Family	:	Periplocaceae
Subfamily	:	Asclepiadoideae
Genus	:	<i>Hemidesmus</i>
Species	:	<i>indicus</i>

BOTANICAL DESCRIPTION

Leaves are variable, from elliptic-oblong to linear lanceolate, 5 to 10 cm long, apiculate. Narrow leaves are acute and broad ones are often obtuse at the apex, dark green and with reticulate veins. Stem has numerous slender stems, which are terete, glabrous or pubescent and thickened at the nodes. Flowers are crowded in subsessile cymes in the opposite axils. Seeds are black, 6 to 8 cm long, ovate-oblong, flattened with silvery white, 2.5 cm long coma. Roots are cylindrical in shape, irregularly bent, curved or slightly twisted.

PHYTOCHEMICALS

Roots of *H. indicus* are reported to contain chemical constituents like - an essential oil containing 80% of 2-hydroxy 4-methoxy benzaldehyde, a ketone, fatty acids, saponin, tannins, resinal fractions, resin acids, sterols, sitosterol, stigmasterol and sarsapic acid. Hemidesmin 1, hemidesmin 2, alpha-amyrin, beta-amyrin, lupeol and 2-hydroxy4-methoxy benzoic acid have been isolated and identified from roots of *H. indicus*.

RESEARCH STUDY

Anti-arthritis activity of roots of *Hemidesmus indicus* R.Br. (Anantmul) in rats. The hydro alcoholic extract and its three fractions namely ethyl acetate, chloroform fraction and residual fraction of roots of *Hemidesmus indicus* were tested for its anti-arthritis activity by Freund's adjuvant induced arthritis. Rats treated with hydro alcoholic, ethyl acetate fraction, chloroform fraction and residual fraction significantly decrease the paw oedema and increase body weight. The haematological parameters like RBC, WBC, ESR, and HB% are evaluated and serum parameters such as ALT, AST, ALP, and C-reactive protein and serum nitrite are also estimated for assessing anti-arthritis activity. The results showed that the roots of *Hemidesmus indicus* have potential anti-arthritis activity and the activity might be due to the presence of Terpenoids in hydro alcoholic, as well as in ethyl acetate fraction.^[50]

8. *Mentha arvensis*

SCIENTIFIC CLASSIFICATION:

Kingdom	:	Plantae
Division	:	Angiosperms
Class	:	Eudicots
Order	:	Lamiales
Family	:	Lamiaceae
Genus	:	<i>Mentha</i>
Species	:	<i>M. arvensis</i>

BOTANICAL DESCRIPTION

Mentha arvensis is an erect branched herb that grows up to 60 cm in height with suckers; the stem is cylindrical and the leaves are simple and opposite type 2.5-5 cm long, shortly petiole sessile oblong-ovate or lanceolate, obtusely or acutely serrate-cuneate at the base, sparsely hairy or almost glabrous; flowers lilac, arranged in verticillasters, borne on axils of leaves on upper stem^[51]. Diacytic stomata are present on the lower surface of the leaf. Under the microscope, the leaf also shows 3-8 celled clothing trichomes with striated cuticle. Two types of glandular trichome, one with a unicellular base and small single cell head and the other with a multicellular head characteristic of the family are present. Calcium oxalate is not present.^[52]

PHYTOCHEMICALS

The mint plant has been reported to possess terpenes such as α -menthol, neomenthol, isomenthol, d-menthone, isomenthone, menthofuran, methylacetate, carvomenthone, cineol, p-cymene, aromadendrene,

limonine, -phellandrene, pipertone, -pinene, carvacrol, α -pinene, α -phellandrene, -pinene, dipentene, cardinene, and -thujone in different proportions depending on the season, type of climate and the plant processing.^[53] It also contains the flavonoids such as quercetin, menthoside, and isorhoifolin^[54], vitamin K, thymol and eugenol.

RESEARCH STUDY

Anti-inflammatory and anti-arthritis activity of methanolic leaf extracts of *Mentha arvensis* Linn in arthritis induced male albino rats, the methanolic extract of mint leaves 150 & 200 mg/kg b.w were tested for its anti-inflammatory and anti-arthritis activity by complete Freund's adjuvant induced arthritis. Evaluation of haematological parameters such as HB%, WBC, ESR and RBC. Serum parameters and liver marker enzymes such as ALT, AST, ALP, urea, uric acid, and creatinine are also estimated for assessing the anti-inflammatory and anti-arthritis activity of methanolic extract of *Mentha arvensis*. Their investigation concludes that the methanolic extract of *Mentha arvensis* possess a significant anti-inflammatory and anti-arthritis activity.^[55]

9. *Cyperus rotundus*

SCIENTIFIC CLASSIFICATION

Kingdom	:	Plantae
Division	:	Angiosperms
Class	:	Monocots
Order	:	Commelinids
Family	:	Poales
Genus	:	<i>Cyperus</i>
Species	:	<i>C. rotundus</i>

BOTANICAL DESCRIPTION

It contains long rhizomes in ellipsoid form; sometimes tuberous; black coloured, with characteristic aromatic odour and taste, up to 60 cm high; leaves are 2-6 mm wide; spikes ovate, on rays to 6 cm long; spikelets linear 1-2 cm long, 12-30 flowered, the rachilla winged; scales are purplish, carinate, obtuse; achene sub-obovoid, trigonal, 1.5 mm long, black, minutely papillate.^[56]

PHYTOCHEMICALS

Phytochemical studies have shown that the major chemical components of this herb are essential oils, flavonoids, terpenoids, mono- and sesquiterpenes.^[57] The plant contains the following chemical constituents - Cyproterone, cypera-2, 4-diene, α -copaene, cyperene, aselinene, rotundene, valencene, ylanga-2, 4-diene, g-gurjunene, trans-calamenene, d-cadinene, g-calacorene, epi- α -selinene, α -muurolene, g-muurolene, cadalene, nootkatene by comparison with a spectral library established under identical experimental conditions, cyperotundone, mustakone, cyperol, isocyperol, and α -cyperone. The volatile oil constituents of *C. rotundus* were distinguished quantitatively with high amounts of sesquiterpenes (70%), with a low proportion of oxygenated monoterpenes (10%) and monoterpene

compounds (5%). The chemical composition of the volatile oils of *C. rotundus* has been extensively evaluated, and four chemo types (H-, K-, M- sO-types) of the essential oils from various parts of Asia have been reported. H. M. Sayed et al. reported the presence of another two more compounds isolated after a phytochemical investigation of the aerial parts of *C. rotundus* Linn. They are sitosteryl (6'-hentriacontanoyl)- β -D-galactopyranoside and three furochromones. It also found to contain proteins and traces of Mg, V, Cr, Mn, and Co.^[58]

RESEARCH STUDY

To evaluate the anti-inflammatory activity in adult albino wistar rats' *C. rotundus* extract of the tuber part was used. The test group was treated with ether, ethanol, and distilled water extract of three equal portions of the powder. On the basis of the literature survey, it was found that the extract showed significant anti-inflammatory activity against carrageenan induces rat paw oedema by the application of tuber extract of *C. rotundus*. The percentage inhibition of oedema was calculated by the formula:

$$\frac{(V_c - V_t / V_c) \times 100}{}$$

Where, V_c - Volume of paw oedema in the control group and V_t - Volume of paw oedema in the treated group. The ethanolic extract showed good anti-inflammatory effect than other solvents system.^[59]

10. *Strychnos potatorum*

SCIENTIFICAL CLASSIFICATION:

Kingdom	:	Plantae
Class	:	Angiosperms
Order	:	Gentianales
Family	:	Loganiaceae
Genus	:	<i>Strychnos</i>
Species	:	<i>potatorum</i>

BOTANICAL DESCRIPTION

Strychnos potatorum is a medium-sized, glabrous tree of height 1213 m. Stem is fluted and covered with black, thick, square to rectangular scales. Bark is 1.32 cm thick, black or brownish-black, corky, with very deep and narrow vertical, thin ridges, which easily break off. Branches are swollen at nodes. Leaves are about 57.5 cm long, nearly sessile, subcoriaceous, ovate or elliptic, acute, glabrous and shining, spuriously three or five nerved, with lateral nerves springing from the lower part of the mid rib, nearly reaching the tip. The base rounded or acute, petioles 2.5 mm long flowers large for the genus, in short almost glabrous nearly sessile axillary cymes; peduncles 0.5 mm long; and pedicels very short. Calyx $\times 2$ mm long, five lobed; lobes 2.5 mm long, oblong, acute with a tuft of hair inside towards the base of each lobe. Ovary ovoid, glabrous, tapering into a long glabrous style; and stigma obscurely two lobed. Fruit is a berry, black when ripe, globose, 12 cm in diameter, whitish, shining, with short addressed yellow silky hairs. Seeds are globose in shape.^[60]

PHYTOCHEMICALS

Phytochemical studies revealed the presence of diabolone (major alkaloid) and its acetate brucine, loganin, mannose, sucrose, arachidonic, lignoceric, linoleic, oleic, palmitic, and stearic acids^[61]. On saponification of the oil: β -sitosterol, stigmasterol (also in leaves and bark along with campesterol); oleanolic acid and its β acetate, saponins containing acid oleanic, galactose and mannose (seeds) and triterpenes and sterols mannogalactans^[62].

RESEARCH STUDY

The effect of the SPE and the whole SPP of *Strychnos potatorum* Linn seeds on the Freund's complete adjuvant (FCA) induced arthritic rat paw oedema, body weight changes and alterations in haematological and biochemical parameters in both developing and developed phases of arthritis was investigated in the laboratory on rats. Histopathology of proximal interphalangeal joints and radiology of hind legs were studied. Both SPP and SPE at the specified dose level showed reduction in rat paw oedema volume and it could significantly normalize the haematological and biochemical abnormalities in adjuvant induced arthritic rats in both developing and developed phases of FCA induced arthritis. Further the histopathological and radiological studies confirmed the antiarthritic activity of SPP and SPE.^[63]

CONCLUSION

In traditional medicine, large group of medicinal plants are used which have potential to cure many diseases. In Indian medicine commonly available many medicinal plants are used. The above referred studies reported that the reviewed medicinal plants have potent anti-inflammatory activity. In the above study, various models tested for its anti-inflammatory and Anti-arthritis activity. Carrageenan induced hind paw oedema, cotton pellet induced granuloma, and Freund's adjuvant's the standard experimental models of acute and sub-acute and chronic inflammation respectively. The experiment reveals about the effective medicinal plants in models of inflammation. This review paves a way for further identification of new compounds from various medicinal plants which may be effective in acute and chronic inflammation.

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