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Review Article

A Review on Ethnopharmacological Potential of Ricinus Communis Linn.

KM Preeti, Ansu Bala Verma,
Department of Pharmacology,
Rameshwaram Institute of Technology and Management,
Lucknow, Uttar Pradesh, India
preeti30sept@gmail.com

ABSTRACT

In recent years, Ricinus communis Linn. has become a subject of interest because of its beneficial effects on human health. The present ethnopharmacological review was conducted to evaluate the therapeutic properties of Ricinus communis by scientific evidences. It belongs to the family Euphobiaceae which is commonly known as castor. ***Ricinus communis*** is found though out the hotter parts of India. This plant is extensively used in Ayurveda, Unani, Siddha, Homeopathic and Allopathic system of medicine as cathartic. Traditionally this plant is used as laxative, purgative, fertilizer and fungicides etc. whereas the plant possess beneficial effects as antioxidant, antifertility, anti-inflammatory , antimicrobial, CNS stimulant, antidiabetic, insecticidal, larvicidal, antinociceptive, antiasthmatic, antiulcer, immunomodulatory, hepatoprotective, lipolytic, wound healing and central analgesic and many other medicinal properties. The extracts or the isolated compounds of this plant have been found to have potent activity against various ailments. The aim of present article is to explore the pharmacological or medicinal importance of the plant ***Ricinus communis* linn.**

Keywords: Ricinus communis, Ethnopharmacology, Phytochemical Constituents.

INTRODUCTION

Erand has been freely used all over India since centuries. In day to day life, it is commonly used as a purgative. The botanical name of erand is *Ricinus communis* and it belongs to family Euphorbiaceae. [1] The seeds, seed oil, leaves and the roots of erand have great medicinal value. The plant is equally useful, both internally as well as externally. Externally, castor is effectively used in the diseases of vata associated with pain and swellings. Internally, erand is used as a potent drug in treating diseases of vata viz. arthritis, sciatica, facial palsy, paralysis, bodyache, tremors, headache etc.[2] The plant is native of India and cultivated throughout the country in gardens and fields and also grows wild in waste places. *R.communis* is a small wooden tree which grows to about 6 meters in height and found in South Africa, India, Brazil, and Russia. Stems of *Ricinus communis* have Anticancer, Antidiabetic and Antiprotozoal activity.[3] In the Indian system of medicine, the leaf, root and seed oil of this plant have been used for the treatment of inflammation and liver disorders [4], as they have been found to be anti-nociceptive [5], hepatoprotective [6], laxative [7] and diuretic [8].

Morphology

The castor oil plant is a fast-growing, suckering perennial shrub or occasionally a soft wooded small tree up to 6 meter or more, but it is not hardy in nature. This plant was cultivated for leaf and flower colors and for oil production. [9]

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Leaves are alternate, curved, cylindrical, purplish petioles, sub peltate, drooping, stipules large, ovate, yellowish, united into a cap enclosing the buds, deciduous, blade 6-8 inches across, palmately cut for three quarters of its depth into 7-11 lanceolate, acute, coarsely serrate segments, smooth blue green, paler beneath, red and shining when young. Flowers are monoecious, large, arranged on the thick rachis of an oblong, spicate panicle, which is at first terminal but becomes lateral by the growth of an axillary bud beneath it; male flowers shortly stalked, on branched peduncles at the base of the panicle, pedicels articulated about the middle; female flowers sessile, at the upper part; bracts broadly triangular. Fruit is blunt, greenish, deeply-grooved, tricoccus capsule, less than an inch long, with the prominences of the ovary becomes sharp, weak, spreading spines, 3-celled, dehiscing loculicidally and septicidally into 6 valves. Seeds are ovoid, flattened, nearly ⅝ inch long by ¼ broad, smooth, shining, pinkish- grey, prettily mottled with dark brown, caruncle large, subglobular, raphe faintly raised, running down centre of ventral surface, embryo large in axis of the endosperm, cotyledons foliaceous, broadly ovate, with a cordate base, veined.[10] Roots are light in weight almost straight with few rootlets, outer surface dull yellowish brown, nearly smooth but marked with longitudinal wrinkels. [11]

Figure1: Plant

Figure2 :Fruit

Vernacular names
English : Castor, Castor-oil plant
Hindi : Arand, Arand, Andi, Rend
Sanskrit : Gandharvahasta, Vatari
Gujrat: Erandio, Erando
Assam: Eda, Era
Kanada: Haralu, Oudala, Gida
Malyalam: Avanakku
Marathi: Errand
Bengali: Bherenda [12]

Taxonomical classification

Kingdom: Plantae
Order: Malpighiales
Family: Euphorbiaceae
Sub Family: Acalyphoideae
Tribe: Acalypheae
Sub Tribe: Ricininae
Genus: *Ricinus*
Species: *communis*

Benefits of the plant
Castor oil is widely used as a catharatic, and also for lubrication and illumination. The oil as

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such or after modification finds extensive applications in industry, particularly in USA. Bulk of the commercial oil is generally processed in a number of ways and then used for different purposes. The treated oil finds use in products like paints, enamels and varnishes, oiled fabrics, linoleum, patent leather, fly-paper, typewriting and printing inks, greases and special lubricants, polishes, waxes, cutting, dielectric and condenser oils, softening agent for gelatin in rayon sizing, nitrocellulose-baking finishes, hydraulic brake fluids, urethane foams and rubber substitutes, cosmetics, pharmaceuticals and insecticidal formulations. Oil from the perennial types is used for illumination and lubrication while that from the annual types is preferred for medicinal use. Castor oil is often given orally, alone or with quinine sulphate to induce labour in pregnancy at term. The oil can be used as a vehicle for parenteral administration of steroidal hormones. It is used in the preparation of liquid disinfectants like phenyls. It is an excellent illuminant and has been used in lamps from very early times in India. It is used in soap making. Castor cake is used as manure in India. It is rich in nitrogen and other minerals, and has been found to be suitable as manure for paddy, sugarcane, tobacco etc. Leaves are occasionally fed to cattle. They are reported to increase the yield of milk. The powdered leaves are used for repelling aphids, mosquitoes, white flies and rust mites. The insectisidal activity is probably due to the presence of the alkaloid ricinine in them. Expressed juice and aqueous and alkaline extracts of the leaves were active against mycobacteria and yeast. Leaves are said to use in the form of a poultice or fomentation on sores, boils and swellings. Leaves coated with oil and warmed, are commonly applied over the abdomen to give relief in the flatulence in the children. An infusion of leaves is used for stomache-ache, and as a lotion for the eye. Pounded leaves are said to give relief in caries, and are applied over guineaworm sores to extract the worm. Fresh juice of leaves is reported to be used as an emetic in the poisoning by narcotics like opium; it is also considered useful in jaundice. Leaves are considered lactagogue and are applied as poultice over the breasts or taken internally in the form of juice. Roots are administered in the form of a decoction for lumbago and allied complaints, in the form of a paste for toothache. Root bark is reported to be a powerful purgative. [13,14,15]

Phytochemical constituents

The presences of various phytoconstituents in different parts of *Ricinus communis* Linn have been reported.

Fatty acid

Seed oil of castor-plant showed the presence of fatty acid , ricinoleic acid (12-hydroxyoctadec-9-enoic acid). Ricinoleic acid comprises over 84% while other fatty acids present were linoleic (7.3%), oleic (5.5%), palmitic (1.3%), stearic (1.2%) and linolenic (0.5%), respectively. [16]

Essential oil

The GC-MS analyses of *R. Communis* essential oil using capillary columns has shown compounds like @-thujone (31.71%), @-pinene (16.88%), camphor (12.92%) and camphene (7.48%). [17]

Triterpenoid saponin

The Seeds of *Ricinus communis* showed the presence of Triterpenoid Saponin, 3-O-[β -D-glucoronopyranosyl-(1→ 3)-α –L-rhamnopyranosyl-(1→ 2)β- D-glucopyranosyl]-4α,20α-hydroxy methyl olean-12-ene-28-oic acid. [18]

Triacylglycerols

Five types of castor bean seed oil triacylglycerols were identified as triricinolein, RRR (84.1%),diricinoleoylstearoylglycerol, RRS (8.2%), diricinoleoyloleoyl-glycerol, RRO (5.6%), diricinoleoyllinoleoylglycerol, RRL (1.2%) and

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diricinoleoylpalmitoyl-glycerol, RRP (0.9%) respectively. [16]

Flavonoid

The dried leaves of R. communis showed the presence of six flavones glycosides kaempferol-3-Oβ-D-xylopyranoside, kaempferol-3-O-β-D-glucopyranoside, quercetin-3-O-β-D xylopyrano side, quercetin-3-O-β-D-glucopyranoside, kaem pferol-3-O-β-rutinoside and quercetin-3-O-β-rutinoside. [19] Seed and leaf of R. Communis also showed the presence of flavonoids like prunin 2'-o-para coumaroyl, prunin 6"-o-para coumaroyl. [20]

Protein

Seeds of ricinus communis contain three toxic proteins Ricin A, B and C and one ricinus agglutinin. [21]

Steroid

Entire plant of Ricinus communis showed the presence of steroid Brassicasterol and Campesterol. [22]

Anthocyanins

The stem bark of the castor plant showed the presence of Anthocyanins, cyanidin 3-*O*-*β*-xylopyranoside-5-*O*-*β*- glucopyranoside (21 %) , cyanidin 3-*O*-*β* xylopyranoside-5-*O*-(6'''-*O*-malonyl-*β*- glucopyranoside) (79 %) and cyanidin 3-*O*-*β*-xylopyranoside-5-*O*-(6'''-*O*methylmalonate- *β*-glucopyranoside). [23]

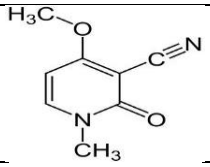
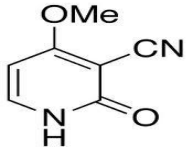
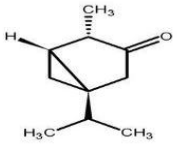
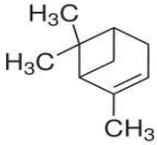
Tannins

The leaf extracts of *Ricinus communis* showed the presence of tannins such as catechin and gallic acid.

Alkaloid

Alkaloids are present in the aerial parts of the Ricinus communis. The root of Ricinus communis showed the presence of indole 3 acetic acid and the ricinin (0.55%) and N-Demethylricinin (0.016%). alkaloid present in the leaf of plant. [19]

Table no1. Stucture of phytochemical constitutes

Name of phytoconstituents	Structure	Reference
Ricinin		19
N-demethylricinine		19
α-thujone		17
α-pinene		17

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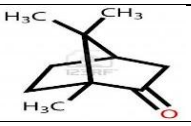
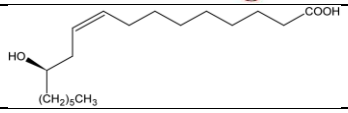
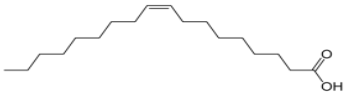
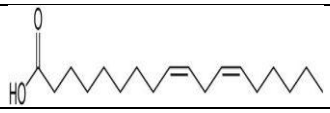
camphor		17
Ricinoleic Acid		16
Oleic Acid		16
linoleic Acid		16

Table 2. Report on Ethnopharmacological activities

Activity	Plant part/extract	Animal / Experimental model	Result	Ref.
Analgesic activity	Seed / oil	Mice and rat / Hot-plate method, tail clip method and tail-immersion method	In analgesic studies, castor oil showed more significant analgesic activity at 1000 mg/kg(8.37±0.41**) and (4.90 ± 0.19**) then 500mg/kg tested dose level.. The analgesic activity of castor oil was however, less than that of pentazocine. The results suggest that castor oil possesses significant analgesic property.	24
Antiarthritic activity	Leaves / Hydroalco-holic extract	Rats / Freund's adjuvant induced arthritic rats	Ricinus communis leaves extract show the significant antiarthritic effect at the 200mg/kg and 400mg/kg dose level. It might be speculated due to phytochemicals present such as flavonoids and saponin..	25
Anti-inflammatory activity	Leaves / 80% Mathanolic extract	Wistar Rat / Carrageenan-induced paw edema (Acute model) and cotton pellet induced granuloma models (Sub-chronic model)	The results of 80% methanolic extract (500 mg/kg) and total flavonoids fractions (50 mg/kg) were at par with diclofenac sodium (20 mg/kg).Ricinus communis leaves have anti-inflammatory potentials and flavonoids are dominating this activity in the extract.	26
Antiasthmatic	Root / Ethanolic extract	Rats / Milk induced leucocytosis and eosinophilia , Passive cutaneous	The ERCR significantly decreases Milk induced leucocytosis and eosinophilia and protect degranulation of mast cells in mice.	27

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		anaphylaxis test , Mast cell degranulations	At same dose ERCR inhabited passive cutaneous anaphylaxis in rats. Hence ERCR shows antiasthmatic activity may be due to the presence of flavonoids and saponins.	
Antidandruff activity	Leaves / Aqueous , methanolic , chloroform and petroleum ether extract	Anti dandruff assay with DMSO	R.commuis leaf extracts has antidandruff effects and due to its potential bioactive compounds. Phytochemical screening of various solvent extracts of R.communis leaves revealed the presence of flavonoids, saponins, tannins, phlobatannins and terpenoids methanolic extracts exhibited significant activity (8.20 ± 0.3). Aqueous extracts of the leaves recorded appreciable inhibitory activity (5.74 ± 0.8) when compared with chloroform (1.66± 1.2) and petroleum ether extracts. Petroleum ether extract gave a mean zone of inhibition of 0.90 ± 0.3 mm, showing the ineffectiveness of the extract.	28
Antidiabetic activity	Root / Ethanolic extract	Alloxan induce diabetes mellitus	Blood glucose concentration of rats administered Ricinus communis reduced from 390.0 to 148.5 or 61.9%. Results from this study have confirmed the hypoglycaemic efficacy of root extract of Ricinus communis in rats.	29
Antinociceptive	Leaves / Methanolic extract	Acetic acid induced writhing test , Formalin induced paw licking and Tail immersion method	The results indicated that MRCL exhibited considerable Antinociceptive activity against three classical models of pain in mice at doses of 100, 125 and 150 mg/kg bw. Preliminary phytochemical analysis suggested the presence of saponin, steroids and alkaloids.	30
Antiulcer activity	Seed / oil	Rats / Gastric cytoprotection method , aspirin induce gastric mucosal damage , pyloric ligation.	The result of indicate that the higher dose of castor oil 1000mg/kg (UI ; 2.35 ± 0.15) was effective in protecting ulcer. It appears that castor oil possess antiulcerogenic principles like flavonoids tannins and saponins.	31

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Antimicrobial and Antifungal activity	Leaves / Methanolic , Ethanolic and Water extract	Bacteria and fungi / Agar well diffusion method and agar tube dilution method	Methanolic leaf extracts were found to be more active against Gram positive bacteria as well as Gram negative bacteria than ethanol and aqueous leaf extracts. Methanolic as well as aqueous leaf extracts of Ricinus communis were effective in inhibiting the fungal growth.	32
Hepatoprotective activity	Leaves / Ethanolic extract	Rats / carbon tetra chloride (Ccl4) induced hepatotoxicity	The hepatoprotective activity was studied in liver by measuring the parameters like serum levels of Glutamic oxaloacetate transaminase (SGOT), Glutamic pyruvic transaminase (SGPT), Bilirubin, Alkaline phosphatase (ALP) and histological changes in liver of different groups of animals were observed. The results of the present study showed that, the levels of SGOT, SGPT, ALP, Bilurubin were significantly increased in hepatotoxin treated group ($P<0.001$) when compared with control group.	33
Hypolipidmic activity	Root / Aqueous extract	Pap-method , Polyvinylsulphate method , Dextran sulphate-Mg^{2+} method and glycerol-phosphate oxidase method	A significant reduction in the ratio of High density lipoprotein to Low density lipoprotein compared with the diabetic untreated rats is suggestive of the ability of the extract to reduce atherosclerosis, a complication of diabetes.	29
In-vitro Immunomodulatory activity	Leaves / Mathanolic extract	Qualitative nitroblue terazolium tert , phagocytosis of killed candida albicans, nutrophil locomotion chemotexis test	The isolated compound (tannin) of *R.communis* was tested at concentrations, viz 10 µg/ml, 20 µg/ml, 40 µg/ml, 100 µg/ml and 1000 µg/ml. The isolated compound showed predominantly significant activity on human neutrophils in all the parameters tested, which was comparable to the standard and control at different concentrations, indicating the possible immunomodulating effect.	34
Bio-Insecticidal activity	Leaf , root and seed Kernel / Aqueous extract	Field-cage experiments-Direct treatment of diamondback moth infested cabbage	In view of the low oviposition rates, oviposition deterrent, immature mortality, and the relatively low persistence of the toxic ricin oil, it can be expected that the use of *R.*	35

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		plant in cage experiments, Residual activity of the botanical treatments, Effect of different treatments on the oviposition behaviour of P. xylostella.	*communis* product be suitable for P. xylostella population density reduction in the field.	
In-vitro Cytotoxic activity	Leaves/essential oil	HeLa cells/MTT test	At a concentration of 3 mg/ml, essential oil destructed HeLa cells by about 30%, however at a concentration of 4 mg/ml, almost all HeLa cells were destructed. Cytotoxicity was expressed as the concentration of oil inhibiting cell growth by 50% (IC50). The IC50 value of *R. communis* essential oil was evaluated to 2.63 mg/ml.	36
In-vitro Antioxidant activity	Stems / petroleum ether , benzene , chloroform , methanol, 50% methanol crude, aqueous crude extract	DPPH Method, Nitric Oxide Radical Inhibition Method	The six extracts *Ricinus communis* stem and two standards tested for antioxidant activity using DPPH method, the benzene and 50% methanol successive extracts showed the maximum antioxidant activity with IC50 values of 36.19 ± 2.332 µg/ml and 34.40 ± 5.98 µg/ml, respectively. The methanol and chloroform extract also showed antioxidant activity with IC50 values of 64.18 ± 3.20 and 66.17 ± 6.30 µg/ml. The distilled water crude extracts showed IC50 values of 106.14±4.33 µg/ml, respectively. The *Ricinus communis* stem extracts also produce antioxidant activity due to the Presence of flavonoids in their extracts.	37

DISCUSSION AND CONCLUSION

Plants have been used as a source of medicine since the dawn of civilization. These medicines occupied a distinct place in the life right from the primitive period till date and provided information on the use of plants or plant products and products as medicine. The use of medicinal plants in the management of various illnesses is due to their phytochemical constituents and dates back antiquity. It is very essential to have a proper documentation of medicinal plants and to know their potential for the improvement of health and hygiene through an ecofriendly system. Thus, a detailed and systematic ethnomedicinal study is required for identification, cataloguing and documentation of plants, which may provide a meaningful way for the promotion of the traditional knowledge of the herbal medicinal plants.

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