



ISSN (E): 2277- 7695  
 ISSN (P): 2349-8242  
 NAAS Rating: 5.03  
 TPI 2019; 8(2): 10-15  
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 www.thepharmajournal.com  
 Received: 05-12-2018  
 Accepted: 09-01-2019

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## Bed Anjeer (*Ricinus communis* Linn.) pharmacological actions, therapeutic uses and Phytochemistry: A review

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#### Abstract

*Ricinus communis* is a tall glabrous and glaucous shrub of family Euphorbiaceae has been used different parts of this plant for the treatment of different diseases. The Preliminary Phytochemical studied of *R. communis* revealed the presence of Steroids, Saponins, Alkaloids, Flavonoids, and Glycosides. In Unani system of medicine, the leaf, root and seed oil of this plant have been used, as it has *Mohallil* (Resolvent), *Musakkin* (Analgesic), *Mushil* (Purgative), *Jali* (Detergent) and *Muqi* (Emetic) etc. properties and used for the treatment of the *iltehab* (inflammation), *hudar* (rheumatism), *niqrous* (gout), *waja-ul-mufasil* (arthralgia), *faliij* (paralysis), *laqwa* (fascial palsy), *ra'sha* (tremor) etc. Jena and Gupta (2012) [8] studied that the anti-inflammatory activities of the leaves and root extract in Wistar albino rats in acute and chronic inflammatory models. The study indicated that the paw edema formation due to sub plantar administration of carrageenan, characterizing the cellular events of acute inflammation. The 250 and 500 mg/kg dose of *Ricinus communis* methanolic leaves extract possess protective effect in prevention of cellular events during edema formation and in all the stages of acute inflammation. The anti-inflammatory activity of *Ricinus communis* methanolic extract was due to the presence of flavonoids because the flavonoids have the protective effect against carrageenan-induced paw edema in rats.

**Keywords:** *Ricinus communis*, *Bed Anjeer*, anti-inflammatory, *Musakkin*, purgative

#### Introduction

Bed Anjeer (*Ricinus communis*) known as Castor oil plant of family Euphorbiaceae is a soft wooden small tree, wide spread throughout tropics and warm temperature regions of the world. Different parts of the plant are widely used by various communities and forest dwellers in many regions of the world for treating a variety of ailments. In Unani system of medicine, the leaf, root and seed oil of this plant have been used for the treatment of the *iltehab* (inflammation), *hudar* (rheumatism), *niqrous* (gout), *waja-ul-mufasil* (arthralgia), *faliij* (paralysis), *laqwa* (fascial palsy), *ra'sha* (tremor) etc. (Ladda and Kamthane, 2014; Anonymous, 2007; Sharma *et al.*, 2002; Kabiruddin, 2000; Kirtikar and Basu, 2005; Khan, 1313) [14, 1, 20, 9, 13, 11].



Fig 1: Leaf of *Bed Anjeer*

#### Vernacular Names

Afghani: Bazanjir, Buzanjir  
 Afrikans: Kastero Leiboon

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Ambyona:	Camiri	Reggio:	Rizion
Arabic:	Charua, Khirwa	Russian:	Kleshtshevika, Sakalave
Assamese:	Eri	Sanskrit:	Amanda, Bhandu, Chankuka, Eranda, Ishta,
Bengali:	Bhirenda	Santali:	Eradom,
Betsileo:	Kinamina	Sarawan:	Bedanjir
Bombayese:	Erandi	Sardinia:	Ayrunkukuri
Brazil:	Carapeteiro Manonna	Sinhalese:	Eudaru, Telendaru
Burmese:	Kesu, Kyesku	South Africa:	Castor Bean, Castor Oil Plant, Palma Chisti, Ricino
Cambodia:	Lohongpreng	Sumatra:	Jarak
Canarese:	Avudala, Avudalu, Chittuharalu, Eranda Haralu, Manda	Swedish:	Undertrated
Catalan:	Figuera Infernal, Rissino	Tagalong:	Lansina, Lingasina, Tangantangan
Central Provinces:	Grundi	Tamil:	Andangam, Asaram, Attagam, Muttukkottai, Sanju,
Chinese:	Pi ma	Telugu:	Amudamu, Chittamudamu, Eradamu, Premudamu
Coimbatore:	Kotteimuttu	Tigre:	Kella
Deccan:	Erund, Ind, Rund, Yarand	Tigrinia:	Vulleh
Dutch:	Wonderboom	Treviso:	Rizin, Rizino
Egyptian:	Kiki	Turkish:	Hint
English:	Castor oil plant, Palma Christi	Tuscany:	Erbadalatte, Erbalattaria, Girasole Maggoiore, Manoaperta, Meo
Ewe:	Dzongbati, Lornggor	Urdu:	Eranda
French:	Bois De Carapat, Carapat, Grand Ricin, Palma Christi,	Uriya:	Bherontachitroko, Erondo, Gobo, Joda, Kalo, Monto,
Genoa:	Ricin, Ricinu		
German:	Wonderbaun		
Gujrati:	Diveli, Dveligo, Tirki		
Hindi:	Arand, Arandi, Arend, Errand, Erandi, Erend, Ind, Rand		
Hungarian:	Ricinus		
Italian:	Caffe Da Olio, Catapuzia Maggiore, ErbaVenaria		
Kachhi:	Harnoli		
Kharan:	Murghpad		
Konkani:	Erandi		
Krobo:	Kumenglo		
Kumaon:	Andi, Arandi, Inderendi		
La Reunion:	Ricin Tantan		
Las Bela:	Hiranr		
Malasar:	Tonda		
Malay:	Jarak		
Malaya:	Peemah		
Malayalam:	Amandam, Avanakka, Kotta Panjangulam Vardhamanam		
Malta:	Castor Oil Plant, Palma Chtisti, Ricino, Ricnu		
Marathi:	ErandsiYarandicha, Masa, Oldule		
Mentone:	Ricinu		
Mexican:	Tlapatli, Mundari, Bindidaru, Ranggafara		
Nandi:	Imanyet		
Nepalese:	Alha, Areta, Orer		
Persian:	Bedanjir, Bedanjira		
Portuguese Africa:	Bafureira		
Potenza:	Ricin		
Punjabi:	Aneru, Arand, Arind, Bedinjir		
Pushtu:	Arhand		

(Ibn Baitar, 2000; Anonymous, 2007; Nadkarni, 2007; Ghani, ynm; Hakeem, 2002; Kabiruddin, 2000; Kirtikar and Basu, 2005; Sharma *et al.*, 2002) [7, 1, 9, 6, 13, 11, 20].

#### Description According to Unani Classical Literature

The author of *Khazainul Advia*, Najmulghani mentions about three varieties of the drug:

1. A perennial bushy plant with large fruits and large red seeds.
2. A much smaller annual shrub with small grey (white) seeds having brown spots.

#### Parts Used

Leaves, seeds, oil, roots (Ghani, ynm; Anonymous, 2007; Kabiruddin, 2007; Hakeem, 2002; Kabiruddin, 2000; Sharma *et al.*, 2002) [1, 15, 6, 9, 20].

#### Mizaj

Hot 2<sup>0</sup> and Dry 2<sup>0</sup> (Anonymous, 2007; Nadkarni, 2007; Ghani, ynm; Hakeem, 2002; Kabiruddin, 2000) [1, 15, 6, 9].

#### Dose

**Leaves:** 7-10 grams (Kabiruddin, 2000) [9] 4.5 grams (Ghani, ynm)

**Seeds:** 4-15 seeds (Ghani, ynm) 5-10 seeds (Hakeem, 2002) [6] 3-5 seeds (Kabiruddin, 2000) [9] 7-10 grams (Anonymous, 2007) [1].

**Table 1:** Actions

Action	Reference
<i>Jazib</i> (Absorbant )	Nadkarni, 2007 [15]; Khan, 1313 [11].
<i>Jali</i> (Detergent )	Ghulam, 2007 [5]; Hakeem, 2002 [6]; Nadkarni, 2007 [15]; Anonymous, 2007 [1]; Ghani, ynm
<i>Kasir-e-Riyah</i> (Carminative )	Kirtikar and Basu, 2005 [13]; Nadkarni, 2007 [15]; Ghani, ynm; Hakeem, 2002 [6]; Sharma <i>et al.</i> , 2002 [20].
<i>Mana-e-Hamal</i> (Contraceptive)	Ghani, ynm
<i>Mulayyin</i> (Laxative )	Kirtikar and Basu, 2005 [13]; Ghani, ynm; Ghulam, 2007 [5].
<i>Muqawwi-e-Bah</i> (Aphrodisiac)	Ghani, ynm; Kirtikar and Basu, 2005 [13]; Sharma <i>et al.</i> , 2002 [20].

<i>Mulattif</i>	Ghani, ynm, Ibn Baitar, 2000 [7].
<i>Mohallil</i> (Resolvent )	Anonymous, 2007 [11]; Hakeem, 2002 [6]; Ghani, ynm; Ghulam, 2007 [5]; Kabiruddin, 2000 [9]; Kirtikar and Basu, 2005 [13]; Nadkarni, 2007 [15]; Ibn Baitar, 2000 [7].
<i>Mus'hil</i> (Purgative)	Hakeem, 2002 [6]; Ghani, ynm; Kirtikar and Basu, 2005 [13]; Anonymous, 2007 [11]; Kabiruddin, 2000 [9]; Nadkarni, 2007 [15]; Anonymous, 2006 [1]; Ibn Baitar, 2000 [7]; Sharma <i>et al.</i> , 2002 [20].
<i>Muqawwi</i> (Tonic)	Kirtikar and Basu, 2005 [13]; Ghani, ynm
<i>Munagqi</i> (Expallent)	Ghani, ynm
<i>Muqi</i> (Emetic)	Ghani, ynm; Hakeem, 2002 [6].
<i>Mushtahi</i> (Appetizer)	Kirtikar and Basu, 2005 [13]; Ghani, ynm
<i>Mudir-e- Haiz</i> (Emmenagogue)	Ghani, ynm; Kirtikar and Basu, 2005 [13]; Nadkarni, 2007 [15]; Kabiruddin, 2000 [9].
<i>Mudir-e-Laban</i> (Lactagogue)	Kirtikar and Basu, 2005 [13]; Ghani, ynm
<i>Musakkin</i> (Analgesic)	Hakeem, 2002 [6]; Ghani, ynm; Kirtikar and Basu, 2005 [13]; Anonymous, 2007 [11]; Kabiruddin, 2000 [9]; Nadkarni, 2007 [15]; Anonymous, 2006 [1]; Baitar, ynm
<i>Qatil-e-Qirm-e-Shikam</i> (Anthelmintic)	Ghani, ynm; Kirtikar and Basu, 2005 [13]; Sharma PC <i>et al.</i> , 2002 [20].
<i>Qatai wa Mukhrij-e-Balgham</i>	Ghani, ynm; Khan, 1313 [11].
<i>Qatil-e-Janeen</i> (Abortifacient)	Ghani, ynm

**Table 2:** Therapeutic Uses

Clinical indication	Reference
<i>Amraz-e-Miqad</i> (Rectal Disorder)	Ghani, ynm; Kirtikar and Basu, 2005 [13]; Ghulam, 2007 [5]; Kabiruddin, 2000 [9].
<i>Amraz-e-Jild</i> (Skin Disease)	Kirtikar and Basu, 2005 [13].
<i>Amraz-e-Kabid</i> (Hepatic Disorders)	Kirtikar and Basu, 2005 [13].
<i>Amraz-e-Raas</i> (Diseases of Head )	Ghani, ynm; Kirtikar and Basu, 2005 [13].
<i>Amraz-e-Qalb</i> (Cardiac Disease)	Kirtikar and Basu, 2005 [13].
<i>Basoor</i> (Boils)	Kirtikar and Basu, 2005 [13]; Ghani, ynm
<i>Bawaseer</i> (Haemorrhoids)	Ghani, ynm; Hakeem, 2002 [6]; Ghulam, 2007 [5]; Kabiruddin, 2000 [9]; Kirtikar and Basu, 2005 [13].
<i>Dard-e- Sar</i> (Headache)	Kirtikar and Basu, 2005 [13]; Ghani, ynm; Ghulam, 2007 [5].
<i>Deedan-e-Ama</i> (Intestinal Worms)	Ghani, ynm; Kirtikar and Basu, 2005 [13].
<i>Faliz</i> (Paralysis)	Hakeem, 2002 [6]; Kirtikar and Basu, 2005 [13]; Kabiruddin, 2000 [9]; Ghani, ynm; Nadkarni, 2007 [15]; Anonymous, 2007 [1]; Anonymous, 2006 [1]; Khan, ynm
<i>Ehraq</i> (Burn )	Kirtikar and Basu, 2005 [13]; Ghani, ynm; Ghulam, 2007 [5]; Hakeem, 2002 [6].
<i>Huma</i> (Fever)	Kirtikar and Basu, 2005 [13].
<i>Hudar</i> (Rheumatism)	Kirtikar and Basu, 2005 [13]; Ghani, ynm; Ghulam, 2007 [5]; Sharma <i>et al.</i> , 2002 [20].
<i>Ganj wa dad</i>	Ghani, ynm ; Khan, 1313 [11].
<i>Istisqa</i> (Ascites)	Hakeem, 2002 [6]; Kabiruddin, 2000 [9]; Ghani, ynm; Kirtikar and Basu, 2005 [13].
<i>Juzam</i> (Leprosy)	Ghani, ynm; Kirtikar and Basu, 2005 [13].
<i>Kharish</i> (Itching)	Ghani, ynm; Kabiruddin, 2000 [9].
<i>Khansi wa Nazla</i> (Cough and Cold)	Ghani, ynm
<i>Laqwa</i> (Fascial Palsy)	Ghani, ynm; Anonymous, 2007 [11]; Khan, 1313 [11].
<i>Ratondhi</i> (Night Blindness)	Kirtikar and Basu, 2005 [13].
<i>Niqrus</i> (Gout)	Ghani, ynm; Kabiruddin, 2000 [9].
<i>Nazool-ul-maa</i> (Cataract)	Ghani, ynm; Kirtikar and Basu, 2005 [13].
<i>Qabz</i> (Constipation)	Ghani, ynm; Khan, 1313 [11].
<i>Qoolanj</i> (Colitis)	Ghani, ynm
<i>Raa'sha</i> (Tremors)	Ghani, ynm; Kirtikar and Basu, 2005 [13]; Anonymous, 2007 [11].
<i>Tashannuj</i> (Convulsions)	Kirtikar and Basu, 2005 [13].
<i>Warm-e-Khussia</i> (Orchitis)	Ghani, ynm; Ghulam, 2007 [5]; Hakeem, 2002 [6].
<i>Warm-e-Pistan</i> (Mastitis)	Ghani, ynm; Ghulam, 2007 [5].
<i>Waja-ul-Mufasil</i> (Arthralgia)	Anonymous, 2007 [11]; Ghani, ynm; Kabiruddin, 2000 [9]; Kirtikar and Basu, 2005 [13]; Ghulam, 2007 [5]; Kabiruddin, 2009 [9].
<i>Waja-ul-Zohar</i> (Backache)	Ghani, ynm; Kirtikar and Basu, 2005 [13].
<i>Waja-ul-Asnan</i> (Toothache)	Kirtikar and Basu, 2005 [13].
<i>Waja-ul-Uzn</i> (Otagia)	Ghani, ynm; Kirtikar and Basu, 2005 [13].
<i>Waja-ul-Farz</i> (Vaginal pain)	Kirtikar and Basu, 2005 [13]; Ghani, ynm
<i>Waja-ul-Meda</i> (Stomachic)	Kirtikar and Basu, 2005 [13]; Hakeem, 2002 [6].
<i>Yarqan</i> (Jaundice)	Ghani, ynm
<i>Zeequnafs</i> (Asthma)	Ghani, ynm
<i>Zof-e-Ishteha</i> (Loss of Appetite)	Anonymous, 2006 [1]; Nadkarni, 2007 [15].

**Botanical Description****Habit and Habitat**

*Ricinus communis* is a tall glabrous and glaucous annual sometimes shrub by or almost small tree, 2-6 m high is a native of North East tropical Africa. The plant is cultivated throughout the India in gardens and fields and also grows wild in waste places up to 2400 meters. Castor Bean is originally native to Northeastern Africa and the Middle East. It had

escaped cultivation and become naturalized as a weed almost everywhere in the world that had a tropical or subtropical climate (Ladda and Kamthane, 2014; Anonymous, 2007; Sharma *et al.*, 2002) [14, 1, 20].

**Scientific Classification**

Kingdom: Plantae  
Order: Malpighi ales

Family: Euhorbiaceae  
 Genus: *Ricinus*  
 Species: *communis*

### Plant Description

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. Leaves green or reddish-green, broad, palmately lobed, with 5-11 lobes, 30-60 cm dia., nearly orbicular, lobes oblong linear, acute or acuminate, margin serrate, vary from 4-20 cm in length, 2.5 -7.5 cm in width; petiole 10-20 cm long, cylindrical or slightly flattened towards distal and palmately attached to the blade, solid when young, becomes hollow on maturity smooth, alternate, palmately-divided and 20-60 cm in width. Flowers occur most of the year in dense terminal clusters (inflorescences), with female flowers just above the male flowers. This species is clearly monoecious, with separate male and female flowers on the same individual. There are no petals and each female flower consists of a little spiny ovary (which develops into the fruit or seed capsule) and a bright red structure with feathery branches (stigma lobes) that receives pollen from male flowers. Each male flower consists of a cluster of many stamens which literally smoke as they shed pollen in a gust of wind. Shiny seeds of castor plants are a little larger than pinto beans and have very beautiful and intricate designs. At one end is a small, spongy structure called the caruncle, which aids in the absorption of water, when the seeds are planted? Like human faces, finger prints or the spots on a leopard, no two seeds have exactly the same pattern. They are unquestionably among the most deadly seeds on earth, and it is their irresistible appearance that makes them so dangerous. The many "faces" of castor seeds like the faces and fingerprints of the people. The beautiful designs on castor seeds exhibit infinite genetic variation. The small structure on the end of each seed is a caruncle.

### Microscopic Examination

Seed shows a hard testa, membranous tegmen, a fleshy endosperm, and thin embryo with flat, broad cotyledons; testa consists of hard, single layered epidermis, radially elongated, compactly arranged, slightly curved tabular cells, having reddish brown contents followed by 8-10 layered, tangentially elongated parenchymatous cells, most of them containing oil globules, fibro-vascular bundles found scattered in this zone; endosperm consisting of oval, irregular cells filled with oil globules, abundant aleurone grains, measuring 8.2 - 13.75  $\mu$  in dia.; cotyledons, thin, flat and leafy.

**Powder:** Dark brown, oily; shows fragments of numerous elongated thick-walled, polygonal cells of testa, reddish-brown tabular cells, thin-walled oval to round parenchymatous cells of endosperm oil globules, numerous aleurone grains measuring up to 13.75  $\mu$  in dia. and including crystalloids and globoids within.

### Phytochemical Studies

The Preliminary Phytochemical study of *Ricinus communis* revealed the presence of steroids, saponins, alkaloids, flavonoids, and glycosides. The dried leaves of *Ricinus communis* showed the presence of two alkaloids, ricinine (0.55%) and N-demethylricinine and six flavones glycosides kaempferol-3-O- $\beta$ -D-xylopyranoside, kaempferol-3-O- $\beta$ -D-glucopyranoside, quercetin-3-O- $\beta$ -D-xylopyranoside,

quercetin-3-O- $\beta$ -D-glucopyranoside, kaempferol-3-O- $\beta$ -rutoside and quercetin-3-O- $\beta$ -rutoside. The monoterpeneoids (1, 8-cineole, camphor and  $\alpha$ -pinene) and a sesquiterpeneoid ( $\beta$ -caryophyllene), Gallic acid, quercetin, genticic acid, rutin, epicatechin and ellagic acid are the major phenolic compounds isolated from leaves. Indole-3-acetic acid had been extracted from the roots. The seeds contain 45% of fixed oil, which consist glycosides of ricinoleic, isoricinoleic, stearic and dihydroxystearic acids and also lipases and a crystalline alkaloids, ricinine. The GLC study of castor oil showed the presence of ester form of palmitic (1.2%), stearic (0.7%), arachidic (0.7%), arachidic (0.3%) hexadecenoic (0.2%), oleic (3.2%), linoleic (3.4%) ricinoleic (89.4%) and dihydroxy stearic acids. The stem also contains ricinine. The ergost-5-en-3-ol, Stigmasterol,  $\gamma$ -sitosterol, fucosterol; and one probucol isolated from ether extract of seeds. The GC-MS analyses of *Ricinus communis* essential oil using capillary columns are identified compounds like  $\alpha$ -thujone (16.88%), 1,8-cineol (30.98%),  $\alpha$ -pinene (16.88%), camphor (12.92%) and camphene (7.48%) (Jena and Gupta, 2012; Kang *et al.*, 1985; Khogali *et al.*, 1992; Anonymous, 2007; Thompson *et al.*, 1968; Upasani *et al.*, 2003) [8, 10, 12, 1, 22, 23].

### Physicochemical Studies

#### Physical constants

	Values
Foreign matter	not more than 2 %
Total Ash	not more than 4 %
Acid-insoluble ash	not more than 1 %
Alcohol-soluble extractive	not less than 36 %
Water-soluble extractive	not less than 6 %

(Ladda and Kamthane, 2014; Anonymous, 2007; Sharma *et al.*, 2002) [14, 1, 20]

### Pharmacological Studies

#### Antimicrobial study

Poonam and Pratap (2012) [17] showed that the methanolic and aqueous extract of *Ricinus communis* had antimicrobial activity against four clinical bacterial strain *Escherichia coli*, *Bacillus subtilis*, *Bacillus cereus*, *Staphylococcus aureus* and two fungal strains *Candida albicans* and *Candida glabrata* with standard drug tetracycline (10 mg /ml).

In a study carried by Jena and Gupta (2012) [8] the antimicrobial activities of *Ricinus communis* were good against dermatophytic and pathogenic bacterial strains *Streptococcus pyogenes*, *Staphylococcus aureus* as well as *Klebsiella pneumoniae*, *Escherichia coli*. The result showed that the petroleum ether and acetone extracts possess good zone of inhibition whereas ethanolic extract having antibacterial activity only on higher concentration. The different solvent extracts of roots of *Ricinus communis* (200mg/ml) possess antimicrobial activity by using well diffusion method against pathogenic microorganisms such as *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Salmonella typhimurium*, *Proteus vulgaris*, *Bacillus subtilis*, *Candida albicans* and *Aspergillus niger*. The hexane and methanol extracts showed maximum antimicrobial activity where the aqueous extracts had no significant antimicrobial properties.

Naz and Bano (2012) [16] reported that methanol, ethanol and aqueous leaf extracts were found effective against Gram positive bacteria (*Bacillus subtilis* and *Staphylococcus aureus*) as well as Gram negative bacteria (*Pseudomonas aeruginosa* and *Klebsiella pneumoniae*). Antifungal activity of methanol

and aqueous leaf extracts were also carried out against selected fungal strains as *Aspergillus fumigatus* and *Aspergillus flavus*. Methanolic as well as aqueous leaf extracts of *Ricinus communis* were effective in inhibiting the fungal growth.

Sharma *et al.*, (2013) <sup>[19]</sup> reported that the *Ricinus communis* showed good activity against *P. aeruginosa*, *S. aureus*, *K. pneumonia* and *Proteus vulgaris*. The antimicrobial assay revealed that the methanol and ethyl acetate extracts of leaves of *Ricinus communis* possess good zone of inhibition whereas petroleum ether extract having antimicrobial activity only on higher concentration.

In a study carried by Verma *et al.*, (2011) <sup>[24]</sup> the antimicrobial activity of various extracts of roots (200mg/ml) of *Ricinus communis* were screened against pathogenic microorganisms such as *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Salmonella typhimurium*, *Proteus vulgaris*, *Bacillus subtilis*, *Candida albicans* and *Aspergillus niger* using well diffusion method. The result showed that *Ricinus communis* has potent antimicrobial activity.

#### Antiinflammatory study

Jena and Gupta (2012) <sup>[8]</sup> studied that the Antiinflammatory activities of the leaves and root extract in Wistar albino rats in acute and chronic inflammatory models. The study indicated that the paw edema formation due to sub plantar administration of carrageenan, characterizing the cellular events of acute inflammation. The 250 and 500 mg/kg dose of *Ricinus communis* methanolic leaves extract possess protective effect in prevention of cellular events during edema formation and in all the stages of acute inflammation. The Antiinflammatory activity of *Ricinus communis* methanolic extract was due to the presence of flavonoids because the flavonoids have the protective effect against carrageenan-induced paw edema in rats.

In a study by Ladda and Kamthane (2014) <sup>[14]</sup>, the effect of petroleum ether extract of root of *Ricinus communis* (150 mg/kg po) had been investigated against Carrageenan, 5-Hydroxytryptamin, Dextran, Bradykinin and Prostaglandin E, induced rat's hind paw edema. The result showed extract exhibited significant anti-inflammatory activity.

#### Central analgesic study

Ferraz *et al.* (1999) <sup>[3]</sup> showed that The crude extract of root bark of *R. communis* possesses central analgesic activity in tail flick response model to radiant heat at a dose of 250mg/kg. The ethanolic extract of pericarp of fruit of *R. communis* possesses typical CNS stimulant and neuroleptic effects. The stimulant effects, such as exophthalmus, hyperreactivity (evidenced by tremors or by the pinna and grip-strength reaction), memory improvement, and clonic seizures, seem to be due to the presence of the alkaloid ricinine. The main toxic compound of the extract also seems to be ricinine, because animals that died after administration of extract or ricinine showed similar signs: they all died after the occurrence of clonic seizures followed by an apparent breathing arrest. On the other hand, compounds other than ricinine may be responsible for the neuroleptic-like effects of the extract, because ricinine did not cause reduction of locomotor activity or catalepsy in the mice.

#### Wound healing study

Jena and Gupta (2012) <sup>[8]</sup> studied that the *Ricinus communis*

possess wound healing activity due to the active constituent of castor oil which produce antioxidant activity and inhibit lipid per oxidation. Those agents whose inhibits lipid peroxidation is believed to increase the viability of collagen fibrils by increasing the strength of collagen fibers, increasing the circulation, preventing the cell damage and by promoting the DNA synthesis.

#### Antifertility study

Sani *et al.*, (2007) <sup>[18]</sup> studied that the methanol extracts of *Ricinus communis* seed possess positive preliminary Phytochemical tests for both steroids and alkaloids. The pituitary gland releases gonadotrophins due to Sex hormones by both positive and negative feedback mechanism and also the pituitary gland block the release of luteinizing hormone (LH) and the follicle-stimulating hormone (FSH) because of the effect of combined oestrogen and progesterone in the luteal phase of the menstrual cycle. Finally it helps the inhibition of maturation of the follicle in the ovary and prevents ovulation. The sex hormone being steroidal compound's (phytosterols) and the presence of steroids in methanol extract of *Ricinus communis* seed produces anti-fertility effects (Kumary *et al.* 2003).

#### Antiasthma tic study

Dhyaneshwar *et al.*, (2011) <sup>[2]</sup> showed that the ethanolic root extract of *Ricinus communis* is effective in treatment of asthma because of its antiallergic and mast cell stabilizing potential effect. Saponins had mast cell stabilizing effect and the flavonoids possess smooth muscle relaxant and bronchodilator activity; the apigenin and luteolin like flavonoids were generally inhibit basophil histamine release and neutrophils beta glucuronidase release, and finally shows in vivo antiallergic activity. The *Ricinus communis* ethanolic extract decreases milk induced leukocytosis and eosinophilia and possess antiasthma tic activity due to presence of flavonoids or Saponin.

#### Hepatoprotective study

Shukla *et al.*, (1992) <sup>[21]</sup> studied that the *Ricinus communis* leaves ethanolic extract 250/500mg/kg bodyweight possesses hepatoprotective activity due to their inhibitory activities of an increase in the activities of serum transaminases and the level of liver lipid per oxidation, protein, glycogen and the activities of acid and alkaline phosphatase in liver induced by carbon tetrachloride (CCL4). The *Ricinus communis* ethanolic extract 250/500mg/kg body weight also treated the depletion of glutathione level and adenosine triphosphatase activity which was observed in the CCl4-induced rat liver. The presence of flavonoids in ethanol extract of *Ricinus communis* produces beneficial effect the flavonoids have the membrane stabilizing and anti-peroxidative effects. Hepatoprotective activity of leaves was also studied by Visen *et al.*, in 1992 <sup>[21]</sup>.

#### Antiulcer study

Rana *et al.*, (2012) <sup>[25]</sup> showed that the castor oil of *Ricinus communis* seed possess significant antiulcer properties at a dose of 500 mg/kg and 1000 mg/kg, but at the dose 1000 mg/kg was more potent against the ulceration caused by pylorus ligation, aspirin and ethanol in rats. The result showed that the antiulcer activity of *Ricinus communis* is due to the cytoprotective action of the drug or strengthening of gastric mucosa and thus enhancing the mucosal defence.

### Antimicrobial and antifungal study

The secondary infections in the immune compromised oral cancer cases were due to bacterial and fungal species. Rana *et al.*, (2012) [25] showed that the coadministration of *Ricinus communis* with the immune suppressant drugs for the prevention of infection against oral cancer treatment, patient show significant result.

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