

## REVIEW ARTICLE

### *Ricinus communis* Linn.: A Phytopharmacological Review

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#### ABSTRACT

The *Ricinus communis* L. plant is used to make castor oil. Its value for pharmacovigilance and its possible therapeutic applications. The plant has many practical uses, including as a laxative, a purgative, a fertilizer, and a fungicide. Flavonoids, saponins, glycosides, alkaloids, steroids, and other significant phytochemical components, among others, are responsible for the plant's activity. All plant parts are immensely important medicinally, both internally and externally; utilised externally in conditions characterised by discomfort and edema; used internally to treat conditions like headaches, tremors, body aches, facial palsy, paralysis, arthritis, sciatica, and more. The purpose of this publication is to provide future researchers with a thorough explanation of the Phyto-pharmacological features of *Ricinus communis*.

**Keywords:** Phytochemical constituents, Pharmacology, *Ricinus communis* L.

Received 24.11.2023

Revised 11.02.2024

Accepted 29.03.2024

#### How to cite this article:

Shinde Prashali, Gurdeep Singh, Deepak Kardile, Mohini Salunke, Balaji Wakure. *Ricinus communis* Linn.: A Phytopharmacological Review. Adv. Biores., Vol 15 (2) March 2024: 391-395.

#### INTRODUCTION

The existence of any human being would be impossible without nature. Humans need food, clothing, and shelter as necessities, and the plant kingdom provides all three, which are crucial for optimal health. Organic chemicals, many of which have been employed for medical purposes, are ridiculously abundant in plant kingdoms [1]. The scientific name for the plant that most people call a "castor plant" is *Ricinus*. The special roles that plant play in many ethnic and traditional healing modalities are becoming recognised. Recently, extracts from various sources have shown amazing bioactivities against a wide variety of diseases and conditions [2].

#### MORPHOLOGY

Growing castor plants as an agricultural crop goes back over 6,000 years. Depending on the variety, these fast-growing perennial shrub & its leaves are normally 30 to 60 centimeters in diameter with a green or reddish hue. Fruit is often a three-celled, spiny capsule with soft spins covering it that contains the seeds. In many societies around the world, castor plant extracts have been employed as a kind of treatment [3]. The importance of medicinal plants to human health has long been recognized. These plants have medicinal potential due to their bioactive phytochemical components, including vitamins and alkaloids, anthrocyanins, flavonoids, phenolics [4-6].

#### TAXONOMICAL CLASSIFICATION

Plant belonging to plantae kingdom, Malpighiales order, family Euphorbiaceae Genus *Ricinus* and Species *R. Communis*.

#### ETHNOMEDICINAL USES:

Uses of a tree in medicine Researchers have found promising results using *R. communis* to treat a wide range of medical conditions. The seeds were used as fertilizer after the oil had been extracted from them, after they had been roasted to lessen their toxicity, and after they had been put into animal diets. To loosen

stool, castor oil is commonly used. Soap, and a plethora of other items rely on it as a lubricant, lamp fuel, cosmetic ingredient, and production ingredient [3,7].

### **PHYTOCHEMICAL CONSTITUENTS**

Flavonoid molecule kaempferol-3-O has multiple biological functions. In addition to kaempferol O-rutinoside, quercetin-3-O-monoterpene, quercetin-3-O-D-glucopyranoside, quercetin-3-O-D-glucopyranoside, the extract also contains the molecules quercetin xylopyranoside, and quercetin-3-O-D-glucopyranoside. [8,9]. Alkaloids, flavonoids, and glycosides were identified in *Ricinus communis*. Six O-D-xylopyranosides, glucopyranosides, quercetin-3-O-D-glucopyranosides, and kaempferol-3-rutinoside were found in this plant species' study. Two demethylricinines were also discovered, albeit at a very low concentration (0.016%). Crystalline alkaloid ricinine is found in the seeds [10]. Stearic acid (0.7%), Dihydroxystearic acid (89.4%), ricinoleic acid (1.2%), palmitic acid (0.7%), hexadecenoic acid (0.2%), oleic acid (3.2%), and arachidic acid (0.3%), were all found in castor oil during a GLC (Gas-Liquid Chromatography) analysis [11]. It is also worth noting that ricinine can be in the plant's stem. Extracts of seed ether were analysed, and the compounds fucosterol, Y-sitosterol, ergost-5-en-3-ol, stigmasterol & oneprobucol were isolated [12]. Castor oil contained a wide variety of fatty acid esters, as determined by gas-liquid chromatography (GLC). About 45 percent of a seed's mass is made up of this fixed oil. The crystalline alkaloid ricinine and the fatty acids ricinoleic, isoricinoleic, stearic, and dihydroxystearic are all found in this fixed oil. The plant's stem also contains ricinine. Using capillary columns for GC-MS analysis, researchers were able to identify several chemical compounds in *R. communis* essential oil. Further analysis revealed that Pinene constituted 16.88% of the oil, with Camphor and Camphene found at 12.92% and 7.48%, respectively [13].

### **PHARMACOLOGICAL ACTIVITIES**

#### **Anti-inflammatory activity**

Various models were utilised to investigate the effects of leaf and root extract, using Wistar albino rats as the experimental subjects. This experiment provided evidence that the induction of paw edoema was a result of the subplantar injection of Carrageenan, thereby elucidating the underlying cellular mechanisms involved in the inflammatory process. The methanolic leaf extract of *R. communis*, administered at dosages of 250 and 500 mg/kg, demonstrates a protective effect in inhibiting cellular processes involved in the development of edoema and acute inflammation across all stages. Because flavonoids have a preventive role against Carrageenan-induced paw edema in rats, their presence causes the anti-inflammatory activity [3,14].

#### **Antioxidant activity**

Therefore, it can be concluded that *R. communis* seed extracts exhibited antioxidant activity by scavenging the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical and the hydroxyl radical generated from hydrogen peroxide, as well as by inhibiting lipid peroxidation using the Ferric thiocyanate procedure. Because of its powerful antioxidant activity even at low concentrations, *Ricinus communis* seeds may be useful in treating diseases caused by oxidative stress [15]. Highest levels of antibacterial and antioxidant activity have been found in plant extracts [16].

#### **Antimicrobial activity**

Bacteria such as *S. aureus*, *K. pneumoniae*, *E. coli*, and *Streptococcus* spp. larger zones of inhibition were observed with the petroleum ether and acetone extracts than with the ethanolic extract, even at higher doses, when antibacterial activity was observed. When evaluated using the well diffusion method, 200 mg/ml solvent extracts of *R. communis* root were found to be antibacterial against a wide range of pathogenic microbes [17].

#### **Antinociceptive activity**

By decreasing paw licking in response to formalin-induced pain, shortening tail immersion time, and alleviating writhing caused by acetic acid, methanolic leaf extract of *R. communis* displays considerable antinociceptive action in mice [22].

#### **Antiasthmatic activity**

Due to its possible antiallergic and mast cell stabilising effects, *R. communis* ethanolic root extract is beneficial in treating asthma. Mastcells are stabilised by saponins, and flavonoids have bronchodilator and smooth muscle relaxant properties. In addition to their in vivo antiallergic effect, apigenin and luteol in-like flavonoids often inhibit the release of basophil histamine and neutrophil beta-glucuronidase [18].

#### **Antidiabetic activity**

Using bioassays, researchers looked at how to extract and purify an *R. communis* root extract (RCRE) using ethanol. After 20 days of treatment with the efficacious dose of RCRE (500 mg/kg b. w.), diabetic rats showed improvements in liver and kidney function, total lipid profiles, and fasting blood glucose levels. Antihyperglycemic activity was greatest in the R-18 fraction compared to the other fractions.

When the extract was given to the RCRE at a dose of 10 g/kg b.w.t., there were no discernible changes in alkaline phosphatase, serum bilirubin, serum creatinine, SGOT, SGPT, or total protein. For millennia, people with diabetes have turned to *R. communis* for relief [19].

#### **Antihistaminic Activity**

At 100, 125, and 150 mg/kg intraperitoneally, an ethanol extract of *R. communis* root demonstrated anti-histaminic activity in mice subjected to Clonidine-induced catalepsy. In conclusion, it seems that flavanoids, tannins, and saponins—which are antiulcerogenic principles are present in castor oil [20].

#### **Antiulcer activity**

Significant anti-ulcer capabilities of *R. communis* seed oil has been shown at doses of 500 and 1000 mg/kg, with the latter being more effective against pylorus ligation-, aspirin-, and ethanol-induced ulceration in rats. Findings further demonstrated that the cytoprotective effect of the medicine or the fortification of the gastric mucosa and the consequent improvement of mucosal defence are responsible for the antiulcer activity of *R. communis*. [21].

#### **Wound healing activity**

It is thought that substances that prevent lipid peroxidation promote the survival of collagen fibrils by making collagen fibers stronger, boosting circulation, reducing cell damage, and encouraging DNA production. In an excision wound model, the effectiveness of castor oil in treating wounds was assessed by measuring scar size, the rate at which the scar area closed, and epithelialization. Inducing constriction and speeding up epithelialization, astringent and antibacterial properties found. Castor oil has been shown to hasten epithelialization and reduce scarring in animal models of excision wounds, according to the results of this study. The chemical has a 10% weight-to-weight concentration [23].

#### **Larvicidal activity**

*Anopheles arabiensis*, *Callosobruchus chinensis*, and *Culex quinquefasciatus* are all killed in their larvicidal stages by the aqueous leaf extract of *R. communis*. Enhancing the immune system's reaction to an infection is a typical use for immunomodulatory medicines. Phagocytosis is the mechanism through which leucocytes consume pathogens. Phagocytosis is the process by which neutrophils eliminate germs from within the cell. Tannins in *R. communis* leaves greatly boost the immunomodulatory effect of human neutrophils' phagocytic activity [13].

#### **Anti-cancer activity**

Melanoma, MCF7 (breast cancer), HepG2 (liver cancer), PC3 (pancreatic cancer), and cervical carcinoma cell lines have all been tested in experiments using fractions containing 100% ethanol, methanol, and an aqueous phase [24]. The potential anti-cancer effects of *R. communis* have been the subject of much research [25]. A considerable body of scholarly research has been dedicated to the exploration and documentation of the anticancer attributes associated with *R. communis*. Preliminary research on three different cell lines (HeLa, sarcoma 180, and human erythrocytes) found that *R. communis* lectins showed cytotoxic effects [26]. Researchers in this study examined the cytotoxic effects of *R. communis* in vitro using multiple cancer cell lines, including colon, liver, breast, cervical, ovarian (OVCAR-5), cutaneous (B16F10), and prostate. The anti-cancer properties of *R. communis* have been studied extensively, indicating that it may serve as a rich source of anti-cancer chemicals for medical use.

#### **Antifungal activity**

The antifungal characteristics of *R. communis* have been documented in its root, leaf, and stems. The efficacy of *R. communis* methanolic and aqueous extracts against a diverse range of fungus has been observed. To a lesser extent, antifungal activity was detected against *Alternaria solani* [27], but it was most evident against *Candida albicans*. Several types of fungi were used in a study to see if *R. communis* extract had any antifungal effects. *R. communis* leaf aqueous extract was found to be the least effective against *Aspergillus fumigatus* and *Aspergillus flavus* in a separate study [28]. The findings provide evidence for the antifungal properties of the *R. communis* extract and indicate its potential as a viable candidate for the development of a new antifungal medicine.

#### **Analgesic activity**

It was determined that *R. communis* exhibits potent central analgesic effects. Multiple experiments have been conducted in order to demonstrate analgesic properties of *R. communis* extract. The extract derived from *R. communis* has been shown to exhibit characteristic stimulant & neuroleptic effects on central nervous system. Alkaloid ricinine found in *R. communis* is accountable for inducing stimulant effects such as hyperactivity, cognitive improvement, given that ricin does not impede the brain's exploratory behaviour, it may be concluded that ricin is not anxiogenic. An aqueous extract from *R. communis*'s root bark was tested separately to compare its pain-relieving effects to those of the common drug diclofenac (50mg/kg). Albino mice were given 100 and 200 mg/kg of *R. communis* extracts to see what effects they had. Two separate techniques, Eddy's hotplate method and tail immersion method, were used to determine the analgesic's identity [29].

### **Anticonvulsant activity**

Epilepsy is a wide spread disorder in which the brain's neuronal discharges cause seizures to occur. Testing of isolated *R. communis* compounds for anticonvulsant action revealed that they were effective epileptics. Convulsions were seen in all the animals following electric shock therapy. A chemical from *R. communis* seeds caused an inhibition of seizures in animals at a dose of 60 anthelmintic mg/kg, compared to atypical drug's 8.89% seizure inhibition [30].

### **Anti-helminthic activity**

This study investigates the impact of *R. communis* on paralysis induction and the duration of worm mortality. The efficacy of the anthelmintic activity was evaluated by employing both ethanolic and in contrast to the ethanolic extract, the aqueous ricinus extract exhibited much higher activity at a concentration of 100 mg/mL & had a faster onset of action. Consequently, it was determined that the aqueous extract of *R. communis* exhibited a higher efficacy in terms of its anthelmintic properties [31].

### **Anti-fertility activity**

Initial phytochemical results for steroids and alkaloids in methanol extracts of *R. communis* seeds were promising. Oestrogen and progesterone work together to prevent the release of LH & FSH during the luteal phase of the menstrual cycle. Pituitary glands gonadotropin secretion is also influenced by sex hormones, both positively and negatively. In the end, it aids in the inhibition of ovarian follicular maturation, which thwarts ovulation. The steroid compound responsible for the sex hormone's effects is called phytosterols. It's important to note that the steroids with anti-fertility activities are found in the *Ricinus communis* seeds methanol extract [1].

## **CONCLUSION**

In the field of botanical medicine, *Ricinus communis*, or the castor plant, is well-known and commonly used for its therapeutic properties. These findings add to the growing body of evidence supporting *R. communis*'s promising medicinal potential through its pharmacological effects. This is the go-to database for information on chemicals, including their pharmacological effects and molecular structures. The plant's high potential for discovery is supported by the identification of phytochemical components and the demonstration of pharmacological activity.

**Conflict Of Interest:** No conflict of interest.

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