

PHYTOCHEMICAL INVESTIGATION AND ANTICANCER ACTIVITY OF *RICINUS COMMUNIS*: A REVIEW

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Treatment of cancer with synthetic drugs is associated with various side-effects because of which scientists are more concerned to find out an alternative to treat cancer with lesser side effects. Due to these reasons researchers are gaining their interest in the manufacturing of naturally derived anticancer agents from herbal plants. Since ancient times herbal plants are known to have medicinal properties due to the presence of their various phytochemicals and play a vital role in maintaining healthy life style. Scientific data from number of studies reported the chemopreventive property of phytochemicals derived from medicinal plants against different types of cancer. Among of these, *Ricinus communis* L. plant from Euphorbiaceae family, commonly called as castor plant. It is known to have anticancer property from the ancient time. Extract of *Ricinus communis* found to have potential anticancer activity in both *in-vitro* and *in-vivo*. Combinational treatment of cancer with herbal drugs can reduce the side effects treatment on human body. Castor oil is strongly suggested for use of various disease treatments like gastrointestinal disorders. The present endeavor is focused on the phytochemicals of *Ricinus communis* and its studied anticancer activity.

Key words: Phytochemicals, *Ricinus communis*, anticancer, Cancer, herbal plant.

I. INTRODUCTION

Plants are useful for the survival of mankind since ancient times. It is considered as a major source of herbal medicines [1]. People before the civilization people were mostly dependent on herbal medicines. The significance of natural products derived from plants now a day's increasing because of their lesser side effects when compared with synthetic formulations. Researchers worldwide are focusing on the herbal plant research. The applications of herbal plant species to treat and resist the disease are very old practice. Various pharmacologically active compounds are present in plants that have potential for manufacturing of medicinal agents [2]. About 80% south Asia's people are dependent on traditional medicine [3]. Researcher's interest growing exponentially in the development of traditional medicine because of the adverse effects caused by synthetic drugs [4]. In herbal medicines, there are various kinds of plants that have capability to treat various types of disease. *Ricinus communis* is one of them. It belongs to Euphorbiaceae family and commonly called as castor plant. Castor plant is small tree or large shrub and commonly found in tropical regions [5, 6]. It is 5m tall in height. It grows straight and then develop branches. Its leaves are glossy with long stalks and their color is reddish green at the early stage of growth and later converts to green on maturation. Stem consists of hollow internodes and in reddish purple color. It's flowers grows on the top of stem in maximum size of 30cm. It consists of both female and male flower. Female flower is consists of red stigma and male flower is consists of yellow anthers [7].

Habitat: *Ricinus communis* is inherent to Africa and usually cultivated in areas like tropical and subtropical. This plant is commonly found in India [8].

II. TRADITIONAL USE OF *RICINUS COMMUNIS*

Castor seeds are well known for their poisonous property. Many folk medicines involves the use of castor seeds for the different kinds of diseases [9] Ricin present in castor seeds were also used in bioterrorism. Production of castor oil done in very large quantities almost among various countries and remaining toxins in castor meal is leached out by using carbon tetrachloride and hexane. Castor oil also used in paints flyapper, printing, greases, ink and special lubricant [9].

External application of its leaves have the ability to increase milk secretion in females. Castor cake also be used as manure in India. Its manure is suitable for the cultivation of sugarcane, tobacco, etc. External application of castor oil on abdomen gives relief to intestinal indigestion in children [10].

The herbal products derived from natural do not have any side-effects if their dose is maintained lesser than toxic level. In this review we studied the phytochemicals present in *Ricinus communis* and its anticancerous activity

III. PHYTOCHEMICAL STUDY OF *R. COMMUNIS*

As per data recorded from preliminary study of *R. communis*, it is found that it is found that it consists of Saponins, alkaloids, glycosides, flavonoids

S.No.	Plant part	Phytoconstituents
1.	Leaves	Alkaloids (0.55% of ricinine and 0.016% of demethylricinine) Flavones, Phenolic compounds (gallic acid, asesquiterpenoid, gentistic acid, ellagic acid, epicatechin, saponins, tannins, methyl gallate, chlorogenic acid [11,12,13,18,19]
2.	Roots	Indole -3-acetic acid, tannins, Ricin, phenols, flavonoids, tannins[11,12,13,18,19]
3.	Seeds	Fixed oil 45%, glycosides, lipases, ricinine, Y-sitosterolfucoesterol, stigmasterol, probucol, Ricin, flavonoids, tannins [9,18,19]
4.	Stems	Ricinine, flavonoids, tannins [9, 19]
5	Flower	Ricinine [9]

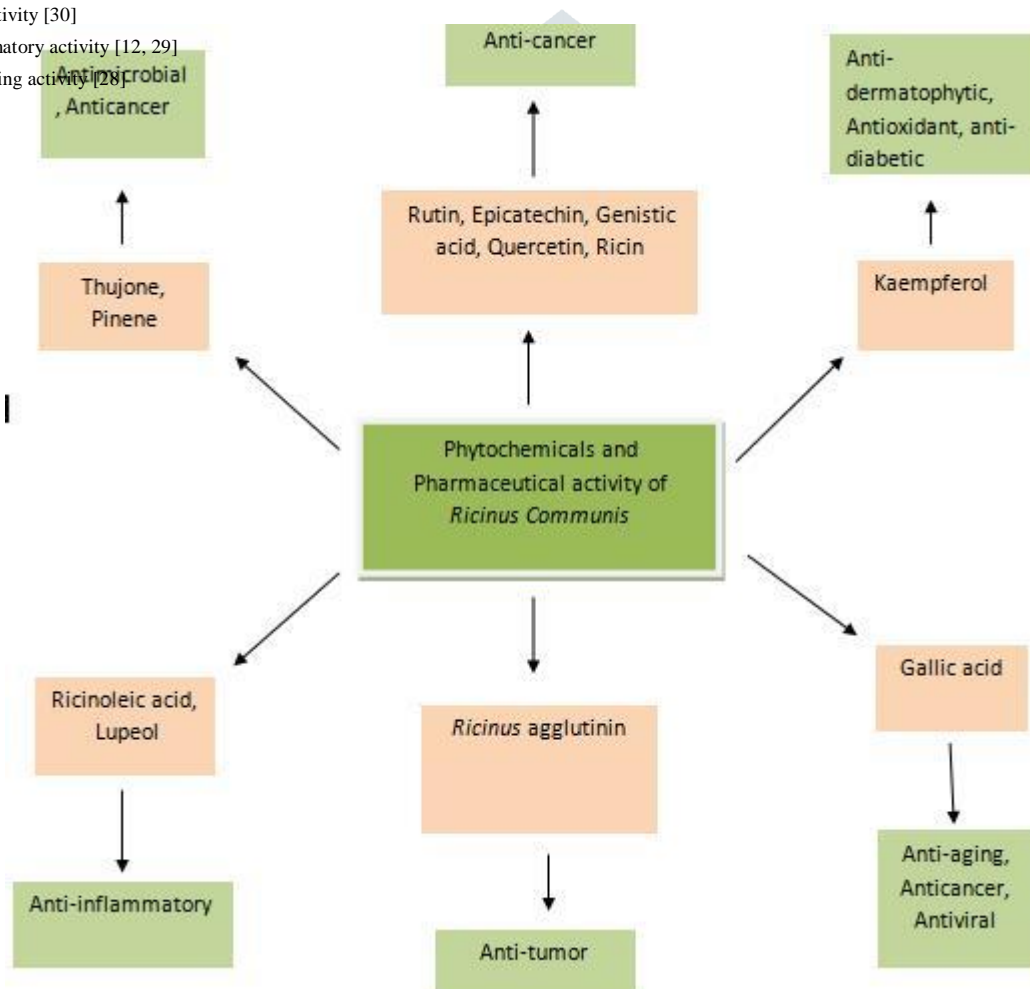
IV. ANTICANCEROUS ACTIVITY OF CASTOR PLANT

Shah *et al.*, 2015 studied the anti-tumor activity of castor plant in *in- vivo* model (Melanoma induced C57BL/6 mice). They determined 50% lethal dose of crude extract. They found reduction in tumor size in *in- vivo* model after treating it with aqueous extract castor leaves. Prakash *et al.*, 2014 evaluated the anticancer activity of ethanolic extract of *Ricinus communis* seeds against seven different types of cancer cell lines. In this study extract found to be active against A-549, colon 502713, PC-5 and OVCAR -5 human cancer cell lines. The 41% cytotoxicity was found at colon 502713, 11% at A549, 12% at OVCAR -5 and 14% at PC-5 at the concentration of 100 µg/ml. They also studied ethanolic extract of stem of *Ricinus communis* showed 31% of cytotoxicity at HT-29, 9% at Hep-2, 40% at SiHa cell lines at the concentration of 100 µg/ml. Ilavarasan *et al.*, 2005 studied the free radical quenching activity and anti- inflammatory property of the methanolic extract of *Ricinus communis* on wistar albino rats. In this study methanolic extract inhibited the lipid peroxidation which was induced due to the ferrous sulphate and carbon tetrachloride in rat kidney and liver homogenates. Rao *et al.*, 2005 studied the mechanism of cell death. Induced by ricin. They concluded the cause cell death is due to the caspase-3 activation and by generation of ROS. Many studies was conducted with absolute methanol, ethanol, and aqueous extract of *Ricinus communis* and these extract was found to be active against cancer cell lines such as breast cancer cell lines, pancreatic cancer cell lines, hepatic cancer cell lines and cervical cancer cell lines. Endo *et al.*, 1986 recoded the cytotoxic effect of lectins derived from *Ricinus communis* on cell lines such as sarcoma 180, hela cells, erythrocytes. In a study Shah *et al.*, 2015 observed 50% cytotoxicity of aqueous extract of *Ricinus communis* was found against A375 cell lines at the dose of 48µg/ml. Abdulla Al- Mamun *et al.*, 2016 studied the crude protein concentration extracted from different varieties of castor bean from Bangladesh. Concentration range was taken between 21-35mg/ml. Castor variety V1 and V3 showed anti-proliferative and anti- bacterial activity. Apoptosis was induced on EAC cells, number of EAC cells found to be declined in concentration dependent manner in extract treated mouse. Salib *et al.*, 2014S studied the cytotoxicity of 50% ethanolic crude of *Ricinus communis* leaves against breast cancer MCF-7 cancer cell line. They found 50% of growth inhibition at the concentration of 17.9 µg/ml. They also compared the toxicity natural alkaloid ricinine ethyl ether [1-(ethoxymethyl)-4-methoxy-2-oxo-1,2-dihydropyridine-3c -arbo nitril] with prepared 50% ethanolic crude of *Ricinus communis*. They tested its *in-vitro* toxicity and found 50% of growth inhibition at concentration of 14.6 µg/ml which was lesser than their prepared extract. Nemudzivhadi & Masoko , 2014 tested anti-inflammatory and cytotoxicity of *Ricinus communis* leaves extract against Raw 264.7 macrophage cell lines and Caucasian skin fibroblast cell lines respectively. They found low toxic effect of *Ricinus communis* leaves in Bud-8 cell line at lesser concentration where high concentrations are more toxic. Darmanin *et al.*, 2007 prepared volatile extract of of *Ricinus communis* leaves by standard hydrolization. They found the cytotoxicity of leaves extract against melanoma cells at the concentration of 20µg/ml by analyzing it through morphological changes, flow cytometry and nuclear staining.

V. OTHER PROPERTIES OF *RICINUS COMMUNIS*

Other chemical properties of *Ricinus communis* reported by scientists are:

- ❖ Antifertility [26,27]
- ❖ Antiimplantation activity [22]
- ❖ Anti-oxidant activity [41, 42]
- ❖ Antinociceptive activity [33]
- ❖ *In - vitro* immunomodulatory activity [40]
- ❖ Hepatoprotective activity [38, 39]
- ❖ Antiulcer activity [37]
- ❖ Antimicrobial and antifungal activity [36]
- ❖ Insecticidal activity[35]
- ❖ Bone regeneration activity [29,12]
- ❖ Central analgesic activity [34]
- ❖ Antiasthmatic activity [33]
- ❖ Molluscicidal and larvicidal activity [31,32]
- ❖ Lipolytic activity [30]
- ❖ Antiinflammatory activity [12, 29]
- ❖ Wound healing activity [28]



[Source: Waseem *et al.*, 2018]

VI. CONCLUSION AND FUTURE PROSPECTS

Castor plants have many pharmacological applications in various kinds of disease and disorders. It have pharmacological activity like antimicrobial, anticancer, antidiabetic which are very useful to treat many life threatening disease in the world. These medicinal properties are due to the presence of phytoconstituents. By this review it can be accept that crude extract of different parts of castor plant consists of phytochemicals and have anticancer effect *in-vitro* and *in-vivo*. Further research should be done on isolated compounds of plants to determine their mechanism of targeting certain disease region and process of exerting their action.

In today's time people are more concerned about leading side effects of chemical drugs. Castor plant is very useful for the purpose of its medicinal use. The integrative use of castor seeds revealed that it can be very useful for the medical science for the betterment of human health. Different parts of castor plant have been reported to have anticancerous property. It may be due to the presence of phytochemicals in castor plant. Isolation of should be done to isolate individual phytochemicals for assessment of their medicinal property and know their mechanism. Then, with the help of genetic engineering we can increase production of particular useful phyto-constituent in limited time and limited space. Various *in- vivo* trials are in need to be conducted to know how phytochemicals are reacting with different organs at different concentrations.

Because of the presence of ricin in the castor plant is considered to be poisonous. Genetic engineering can help to decrease the Ricin content of the plant. A pharmaceutical dose should be identified to make ensure its anticancerous effects. Further clinical trials should be done to adopt its use in cancer treatment.

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