REVIEW: PHARMACOLOGICAL ACTIVITY, NATURAL ACTIVE COMPOUND AND MECHANISM ACTION OF JARAK KEPYAR (*Ricinus Communis* L.)

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ABSTRACT

Medicinal sources of natural ingredients have long played an important role in pharmaceutical biology. The *World Health Organization* estimates that 80 percent of people still depend on traditional medicines. Jarak plants (*Ricinus communis L.*) is a family of *Euphorbiaceae* has been known all parts of the plant is used for the treatment of various diseases. Scientific verification should be made to know that from natural products can be used for treatment. The information conveyed in this review is, among other things, the proving of various pharmacological activities, the content of the active compound and the mechanism of the Jarak plant work. Local and international online literature either journals or research articles and reviews are used on this review. Many studies have revealed that all parts of the plant have pharmacological activity and used as antimicrobial, antioxidant, antidiabetic, hepatoprotector, immunomodulator, antifertility, antiulcer, antiinflammatory, antinociceptive and anticancer. Steroid, saponin, alkaloid, flavonoid, and glycosides active compounds that have pharmacological activity with different mechanisms in overcoming various diseases.

Keywords: *Ricinus communis L.*, natural active compound, pharmacological activity.

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INTRODUCTION

Medicinal sources of natural compounds have long played an important role in pharmaceutical biology. The *World Health Organization* estimates that 80 percent of people still depend on traditional medicines (Srivastava & Pandey, 2015). Jarak plant (*R. communis*) is a family *Euphorbiaceae* has been known part of various diseases. The results of phytochemical screening contain secondary metabolites of steroid, saponin, alkaloid, flavonoid, and glycosides (Nesar Ahmad et al, 2016). The aim of this review is to provide information ranging from the active compound content from Jarak plant (*R. Communis*) that has various pharmacological activities and mechanisms work in the treatment of various diseases.

RESEARCH METHODS

The various sources of information used in this article are derived from local and international online literature either the journal of research and review articles used in the last ten years, 2008-2018. "*Ricinus communis L*" is a keyword used to search online sources of information from a database Science-Direct, PubMed and jipb.net.

RESULTS AND DISCUSSION

1. Compound Content

The results of phytochemical screening by Israa Seger Salman et al. (2017) of leaft *R. communis* showed that terpenoid, flavonoid, streroid, alkaloid and tannin gave a positive results. While the result of identification by Brij B. Tewari at al. (2017) there are compounds of tannin, flavonoid and terpenoid. Likewise with parikshit Kumar et al. (2016) results indicate the alkaloid compounds, tannin, saponin and flavonoid. *R. communis* Seeds contain secondary metabolites that are alkaloid, terpenoid, tannin, steroid and saponin. Prior research on the stemsection identified secondary metabolite compounds with various fractionation resulted in fraction of water contained active compound that is saponin, petroleum ether fraction that is alkaloid, steroid and sterol, tannin and phenol component, while at methanol fraction of benzene and positive chloroform containts alkaloid, steroid and sterol, tannin and phenol components .

2. Pharmacological Activities

a. Antimicrobials

Assay of antimicrobial activity have been largely undertaken by earlier researchers among the bacterial and fungal groups and have been reported to have inhibitory growth capabilities of both groups *in vitro*. Phenolic compounds are the main agents in plants known for their antimicrobial effects. The ability of phenolic compounds to alter the permeability of microbial cells, resulting in the loss of macromolecules from the interior cells and phenolic compounds disrupt membrane proteins, resulting in deformation of microbial structures and functions.

Table 1. Antimicrobial activity of various parts of the plant distance kepyar

Parts of plants	Group	Species	Reference
Leaft	Bacteria	*Bacillus subtilis* *Escherichia coli* *Staphylococcus aureus* *P. aeruginosa* *K.pneumonia* *P.vulgaris*	(Jennifer Suurbaar et al., 2017), (Manik Sharma et al., 2013), (Manthri, 2011)
	Fungi	*A.fumigatus* *A. flavus*	(Bano, 2012)

Parts of plants	Group	Species	Reference
Seed	Bacteria	*B. Sereus* *Bacillus megaterium* *Bacillus halodurans* *Bacillus fusiformis* *Bacillus macerans* *Bacillus subtilis* *Enterococcus faecalis* *Escherichia coli* *Klebsiella pneumoniae* *Proteus vulgaris* *Pseudomonas aeruginosa* *Rhodococcus spp* *Shigella sonnei* *Shigella dysenteriae* *Streptococcus pyogenes* *Streptococcus faecium* *Streptococcus mitis* *Streptococcus pyogenes* *Staphylococcus aureus* *Salmonella typhimurium* *Salmonella enteriditis* *Sarcina lutea*	(Beenish Javaid et al., 2015), (Jumbo, 2008), (Singh Krishan Pratap et al., 2012), (Bhise, 2015), (Hashem Rahmati et al, 2015), (Awatif, 2018), (Bari, 2013), (Anupam Singh et al., 2012), (Momoh, 2012), (Shahid Aziz et al., 2016)
	Fungi	*Aspergillus niger* *Aspergillus flavus* *Candida albicans* *Candida glabrata* *Fusarium oxysporum* *Trichoderma harzianum*	
Root	Bacteria	*Bacillus subtilis* *Escherichia coli* *Proteus vulgaris* *Salmonella typhimurtium* *Pseudomonas aeruginosa* *Staphylococcus aureus*	(Mathur, 2011)
	Fungi	*Candida albicans*	

The combination of phenolic compounds gives a synergistic effect. At low concentrations, phenol affects the activity of the enzyme while at high concetrations they cause protein denaturation. The results of the study that antimicrobial activity of isothiocynates derived from onions and garlic can inactivate extracellular enzymes by forming oxidative disulfide bonds and that the formation of reactive thiocyanate radicals against antimicrobial effects (Saeed A. Hayek, 2013).

b. Antioxidant

The antioxidant activity of essential oils was performed with three different tests. Methods of 1,1-diphenyl-2-picrylhydrazyl (DPPH), bleaching test of β-carotene and reduction power test. Essential oils indicate potential antioxidant activity with lower IC50 values indicates higher antioxidant activity. From the DPPH test and the bleaching test of β-carontene, showed antioxidant activity, but the density test showed a higher reduction capability of essential oils. Components contained in essential oils include camphor (12.98%), a-thujone (31.71%), a-pinene (16.88%), 1.8-cineole (30.98%), and camphene (7.48%). Prior research was conducted by Singh,A.S. (2009) proving the antioxidant activity of *R. communis* leaft extract with different solvent using DPPH method (1.1-diphenyl-2-pic-rylhydrazyl) showed that MeOH extract: water (8:2) indicates strong DPPH radical activity. The results of isolation by column chromatography and identification with different spectroscopy are known to be gallic acid, quercetin, gentisic acid, routine, epicatechin and ellagic acid as active components as antioxidants. The mechanism of action of quersetin and gallic acid associated with antioxidants acts on the NF-kB signaling pathway by inhibiting the activity of DNA bonding of the NF-kB complex and inhibiting the transcription activity of CRE and protein activator (AP-1) and JNK phosphorylation by inhibiting cAMP / protein kinase A (PKA) and protein kinase C (PKC).

c. Antidiabetes

R. communis seed methanol extract was tested for antihyperglycemic, antioxidant enzyme and hematologic parameter of aloxan induced albino rats. The results showed that methanol extract from *R. communis* had antihyperglycemic activity and modulated antioxidant enzyme activity significantly ($p \leq 0.05$). It can be proved that the extract has a positive effect on the hematological parameters. Quirtin compound successfully identified by

Singh,A.S. (2009) is one of the active components of antioxidants that have activity as antidiabetes. It is known that the mechanism of action of quercetin related to diabetes, among others, by activation of PI3K inhibited, decrease lipid peroxidation, increase antioxidant enzyme, inhibition of GLUT2 so that decrease of intestinal glucose absorption and cell proliferation recovery in diabetic rats.

d. Hepatoprotector

Evaluation of hepatoprotector activity of *R. communis* ethanol extract at dose of 100 mg / kg BW against ketoconazole induced rats. The level of protection is measured by performing various liver function tests. The results showed that *R. communis* ethanol extract with the dose showed a significant decrease in rat liver enzymes treated. The result of phytochemical screening of plant part extracts show the presence of flavonoids (kaempferol-3-0-beta-d-routoside and kaempferol-3-0-beta-d-xylopyranoid) as potential hepatoprotector agents. Unexplained workable mechanism associated with hepatoprotectors by increasing plasma membrane stabilization and improving biliary dysfunction effectively and preventing increased AST and ALP improves liver tissue (Ravishankar K. et al., 2012).

e. Imunomodulator

Result of Isolation of tannin compound from *R. Communis* immunomodulatory activity test *in vitro* on human neutrophil with nitroblue tetrazolium test showed that phagocytosis process happened to Candida albicans, neutrophil movement and kemotaksis movement. The concentration of 20 µg / ml gives a significant immunostimulant effect among other concentrations (Arvind Kumar et al., 2011). The mechanism of action of the tannin compound as an immunomedator is not known for certain but from other sources it says that tannins can physiologically stimulate phagocytic cells and have activity as an antinfection (P. Venkatalakshmi et al., 2016) (Beenish Javaid et al., 2015).

f. Antifertility

The results revealed an antifertility activity of methanol extract and water from *R. communis* stem in the female reproductive system. Positive phytochemical screening result contain alkaloid, flavonoid and polyphenol. The compound mixture is thought to have a direct effect on cell cycle and steroidogenesis. In this study used pigs as a test animal. The function of ovarian granulosa cells and regulation of *Luteinising Hormone* (LH) response is used as a parameter. The results show that both *R. communis* stem extracts stimulate cell proliferation (prolifelating cell nuclear antigen, PCNA) and apoptosis activation (casepase 3). The mechanism of action of water extract is to inhibit the effect of LH

stimulation on PCNA but not on casepase 3 and inhibit steroid release and suppress the effect of LH stimulation on progesterone release and activation of LH inhibitory effect on testosterone release. Prolonged release of progesterone and stimulation of testosteron secretion is a mechanism of extract of methanol *R. communis*. In conclusion that the water aquatic and methanol stems *R. communis* can be used as an alternative contraceptive of natural materials (S Nath et al., 2015).

g. Antiulcer

Antiulcer extract test of juniper seed extract in vitro with concentration of 100µI, 200µI, 300µI, 400µI and 500µI has been shown to inhibit H+, K + ATPase enzyme. The result of percentage are 94.11%, 94.62%, 94.95%, 95.12% and 95.46% respectively. Phytochemical screening reveals the presence of alkaloid, flavonoid, phenolic components and saponin. It can be concluded that *R. communis* has significant antiulcer properties. Previous studies *in vivo* has been shown to prove antiulcer activity in ethanol induced rats, aspirin and pyloric ligation, revealing that castor oil at a dose of 500 mg / kg BW and 100 mg / kg BW orally before induction suggests that castor oil has antiscratch properties a significant, suspected mechanism as a cytoprotective agent by strengthening the gastric mucosa thus enhancing mucosal defenses. The contant of the compounds identified in castor oil are fatty oil (40-45%), protein (20-25%), lectin (0.1-0.7%) and ricin. It also contains α-tocopherol compounds, linoleic acid, niacin, γ-tocopherol and quercitrin (Rachhadiya Rakesh M. et al, 2011).

h. Antiinflammatory

Testing of antiinflammatory activity of the extract and fraction of *R. communis* leaf *in vivo* in carrhantan induced wistar rats using two subacute and subchronic test models proved that at dose of 500 mg / kg (methanol extract) and 50 mg/ kg (flavonoid fraction) has the strongest antiinflammantory activity against both test models, which is equivalent to a comparative drug used diclofenac sodium (20 mg / kg). It has been concluded that the presence of flavonoid that predominate as antiinflammatory. Other studies provide information that isolation results from *R. communis* root show flavonoid and identified as quercetin which has been reported to have antiinflammatory activity. The work mechanism that can be explained is the occurrence of inhibition of synthesis of various inflammatory mediators (Varinder Singh et al., 2013).

i. Antinociceptive

Antinociceptive activity of *R. communis* leaf methanol extract in albino rats using three methods, among others, induced acetic acid parameters observed were rat strain, induction of formalin

parameters observed by the attitude of clawing and licking and the tail investigation method that was observed were rat tail bends. The test doses used were 100, 125 and 150 mg / kg BW. The result showed that all three test models contained antinociceptive activity. Phytochemical screening indicates the presence of saponin, steroid, and alkaloid. The analgesic work mechanism of the test extract in the process of inhibition or release of endogenous substances that causes nerve end point pain resembles NSAIDs (Dnyaneshwar J Taur et al, 2011).

j. Anticancer

Research conductedby Asish Bhaumik et al. (2017) to determine the anticancer activity against human prostate cancer cells (DU-145) from *R. communis* seed extract *in vitro* with sulphorodamine B (SRB) method. The results showed that the presence of potential anticancer activity after being compared with 5-FU as a standard drug. The growth resistance of 96.54% showed 5-FU standard drug at concentration 50 µg / ml (IC50 = 1.5 µg / ml). IC50 extract of *R. communis* ethanol extract with the highest resistance activity of 92.80% at 40µg (IC50 = 2.5 µg / ml) and 90.06% growth resistance at 30 µg (IC50 = 2.9µg / ml). Phytochemical screening indicates the presence of carbohydrat, protein and polyphenol, aminoacid, carotenoid, phytosterol and alkaloid. Earlier researchers revealed that the results of ricin isolation from seed extract *R. communis* had anticancer activity against SKMEL28 cells and HaCaT cells in vitro. The results showed that the activity of SKMEL28 cell tumorigenesis barrier with IC50 value at 48 hours was 34 µg / ml for SKMEL28 and 5.2 µg / ml cells for HaCaT cells. While the decrease of SKMEL28 colon colonies size on soft in order that medium at concentration ≤3 µg / ml. The mechanism of action the ricin can be explained by signaling MAPK (RAS / RAF / MEK / ERK) by inhibiting the expression of ERK / p-ERK and inducing SKMEL28 cell apoptosis (Ngo Ngoc Trung et al., 2016)

CONCLUDE

The various pharmacological activities of the Jarak plant (*Ricinus communis* L) can therefore be used as antimicrobial, antioxidant, antidiabetic, hepatoprotector, immunomodulator, antifertility, antiulcer, antiinflammatory, antinociceptive and anticancer. Steroid, saponin, alkaloid, flavonoid and glycoside. It also contains α-tocopherol compounds, linoleic acid, naicin, γ-tocopherol, quercetrin lectin and ricin. In overcoming various diseases, *Ricinus communis* L. has a different working mechanism.

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