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Research Article

Evaluation of the Antiulcer Properties of Castor Plants Indigenous to Kerala

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ABSTRACT

The castor oil plant (*Ricinus communis* L.) is a species of flowering plant of Euphorbiaceae family. It is also widely grown as an ornamental plant and for oil seed production in tropical and subtropical regions of the world. The aim of the study was to evaluate the antiulcer properties of the castor oil plant. The antiulcer property was studied by studying the H^+, K^+ -ATPase enzyme inhibition activity. The H^+, K^+- ATPase activity was conducted in the presence of different concentrations of castor seed extract. The percentages of inhibition were calculated. The percentages of inhibition obtained were 94.11%, 94.62%, 94.95%, 95.12% and 95.46% for samples with concentrations 100µl, 200µl, 300µl, 400µl and 500µl respectively. Phytochemical analysis was performed to reveal the presence of antiulcerogenic principles like alkaloids, flavonoids, phenolic compounds and saponins. Positive results were observed for all the four phytochemicals. This showed that *Ricinus communis* L. possess significant antiulcer property.

Key words: *Ricinus communis*, antiulcer, H^+, K^+- ATPase, percentage of inhibition, phytochemical analysis

1. INTRODUCTION

Peptic ulcers are one of the most common disease occuring in human beings. Peptic ulcer disease, also known as a peptic ulcer or stomach ulcer, is a break in the lining of the stomach. It is a chronic and recurrent disease and one of the most predominant of gastrointestinal diseases[1]. Treatment against peptic ulcers includes H_2 antagonists or proton-pump inhibitors, antibiotics or even a surgery [2]. The present study was carried out for the evaluation of the antiulcer properties of castor oil plants indigenous to Kerala. *Ricinus communis* L., the castor oil plant, is a species of flowering plant of Euphorbiaceae family. It is the sole species in the monotypic genus *Ricinus*, and *R. communis* L. is the only species with many polymorphic forms. It is also widely grown as an ornamental plant. It is a tall glabrous glaucous annual shrub. *Ricinus* has been freely used all over India since centuries [3]. The seeds, seed oil, leaves and the roots have great medicinal value. In Indian system of medicine, the leaf, root, and seed oil have been used for the treatment of inflammation and liver diseases as they have been found to be hepatoprotective, laxative, purgative and diuretic [4-8]. Mainly the seeds and oil of the plant *Ricinus communis* L. has antiulcer properties [4].

The extract of *Ricinus communis* L. was reported to show antiulcer property in various antiulcer models [8, 9], but still its activity on H^+, K^+ -ATPase remains to be unknown. On the basis of these observations, an attempt was made to determine the activity of the castor seed extract on the inhibition of H^+, K^+ -ATPase enzyme. The inhibition of the H^+, K^+ -ATPase activity can show whether a plant material has the ability to be an antiulcer agent or not [2, 10-12]. The mechanism of the antiulcer property of *R. communis* L. can thus be studied by studying the H^+, K^+ -ATPase inhibition activity. H^+, K^+ -ATPase (Gastric hydrogen potassium ATPase) is an enzyme whose purpose is to acidify the stomach. Excess acidification of the stomach may lead to the formation of peptic ulcers.

The castor plant also possesses antiulcerogenic principles like flavonoids, tannins, alkaloids and saponins [5, 6, 13-17]. Phytochemical analysis can be carried out to find out presence or absence of these antiulcerogenic principles.

2. MATERIALS AND METHODS

2.1 Plant material:

Fresh twigs of *Ricinus communis* L. were collected from different locations of Ernakulam District, Kerala, India for obtaining the fruit and were identified using the Flora of Presidency of Madras by J. S. Gamble [18] .The thorny coat were peeled and the seeds were collected and air dried.

2.2 Preparation of the seed extract:

The seeds collected were grounded into powder. 5g of the powder was weighed and the extract was prepared using chloroform. It was kept undisturbed for 3 days and extract was then filtered and used for the further study.

2.3 Preliminary phytochemical analysis:

Phytochemical tests were carried out inorder to find out the presence of phytochemical constituents like alkaloids (Dragendroff's Test), flavonoids (Concentrated Sulphuric acid Test), phenolic compounds (Ferric chloride Test), saponins (Foam test) etc. according to the standard procedures [19, 20, 21].

2.4 Analysis of proton pump activity:

2.4.1 Preparation of H^+, K^+- ATPase

Gastric membrane containing H^+, K^+- ATPase was prepared from mucosal stomach scrapings of sheep and was homogenized in 20mM Tris- HCl buffer (pH 7.4). The homogenate was centrifuged for 20minutes at 15,000 rpm and the resulting supernatant was used to determine the H^+, K^+- ATPase activity and its inhibition.

2.4.2 Estimation of protein

The protein content of the supernatant was determined by Lowry's method (1951) using Bovine serum albumin (BSA) as standard.

2.4.3 H^+, K^+- ATPase assay

The enzyme extract of 100µl quantity was taken for testing the activity of H^+, K^+- ATPase. Reaction was carried out in 16mM Tris- HCl buffer (pH 6.5). The reaction was initiated by adding substrate (2mM ATP, 2mM MgCl2 and 10mM KCl) and then made upto 2ml and incubated for 30min at 37º C. The reaction was stopped by the addition of an assay mixture containing 45% Ammonium molybdate and 60% Perchloric acid. Phosphomolybdate formed was measured spectrophotometrically at 400nm.

2.4.4 Inhibition of H^+, K^+- ATPase in- vitro

The seed extract having different concentrations (100µl, 200µl, 300µl, 400µl, 500µl) were incubated with H^+, K^+- ATPase assay mixture for 30min. O.D values were noted. The results were expressed as percentage of inhibition of enzyme. The percentage of inhibition was calculated using the formula:

Percentage of inhibition =

$$\frac{[O.D_{(control)} - O.D_{(test)}] \times 100}{O.D_{(control)}}$$

3. RESULTS

3.1 Phytochemical analysis:

The phytochemical screening of *Ricinus communis* L. shows the occurrence of alkaloids, phenolics, flavonoids and saponins (Table 1).

3.2 Analysis of proton pump activity:

3.2.1 Estimation of protein

The protein content was found out to be 0.44mg/ml using Lowry's method.

3.2.2 Inhibition of H^+, K^+- ATPase in- vitro

The H^+, K^+- ATPase inhibitory activity of *Ricinus communis* L. was studied by using different concentrations of the castor seed extract. For the different concentrations of extract taken were 100µl, 200µl, 300µl, 400µl and 500µl, the percentages of inhibition obtained were 94.11%, 94.62%, 94.95%, 95.12% and 95.46% (Table 2). The data showed that the percentage of inhibition increases as the concentration of the extract increases ie, with an increase in the concentration of the extract the antiulcer activity increases.

4. DISCUSSION

Castor oil plant, *Ricinus communis* L. has many uses in day-to-day life. Castor oil has been widely reported to be used as a laxative, purgative and cathartic in Unani, Ayurvedic and other ethnomedical systems [4] . In addition to the above mentioned uses, castor plant also has analgesic, antiarthritic, antinflammatory, antiasthamatic, antidandruff, antinociceptive, antimicrobial, antifungal, hepatoprotective, bioinsecticidal activity, etc [7, 8, 13, 14, 16]. Castor oil plant also possesses significant antiulcerogenic property [4].

A large number of phytochemicals such as flavonoids, tannins, alkaloids and saponins from other plants have previously demonstrated potential antiulcer activity [8, 10, 22]. In the present study, the presence phytochemical constituents like flavonoids, phenolics, tannins and saponins etc, were found out (Table 1). This proves that *Ricinus communis* L. could be antiulcer agent. The results were similar to works done previously [6, 13, 15, 17, 22, 23].

The antiulcer property was confirmed by the H^+, K^+-ATPase inhibitory activity. The results of the present study showed percentages of inhibition of H^+, K^+-ATPase to be more than 90% with different concentrations of the castor seed extract. Therefore, *Ricinus communis* L. proved to be a good plant with significant antiulcer property. Similar studies were carried out in other plants[2, 10, 11, 12].The Castor oil plant (*Ricinus communis* L.) can thus be used as an antiulcer drug with much reduced side effects as compared to chemical drugs to treat Peptic ulcers after proper purification and formulation.

5. CONCLUSION

The present study has shown that Castor oil plant has significant antiulcerogenic property owing to the high H^+, K^+- ATPase inhibitory activity as well as to the presence of antiulcerogenic principles like alkaloids, flavonoids, phenolics and saponins. The present study suggests the use of castor oil as a remedy for peptic ulcers after purification and with proper pharmaceutical formulation. Further studies, on the H^+, K^+- ATPase inhibitory activity of castor oil are however, recommended to evaluate its antiulcerogenic power.

Table 1
Result of Phytochemical Analysis

Phytoconstituents	Castor oil
Alkaloids	+
Phenolics	+
Flavonoids	+
Saponins	+

Key: (+); Present, (-); Absent

Table 2
Percentage of inhibition of H^+, K^+- ATPase enzyme

Concentration of plant extract (in µl)	Percentage of inhibition (%)
100	94.11
200	94.62
300	94.95
400	95.12
500	95.46

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