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Evaluation of Ulcer protective effect of Ethanolic Extract of *Canavalia gladiata* in Wistar Rats

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ABSTRACT

Peptic ulcer is an important and prevailing problem in many developing countries. Many drugs are available for the treatment of peptic ulcer. But on chronic administration of these drugs causes various adverse effects. Therefore, herbal medicines seems to be an alternative due to their fewer adverse effects. *Canavalia gladiata* commonly called as sword bean belongs to the family fabaceae. Since it has got lot of significance in traditional medicine, the main aim of the present study is to evaluate the anti-ulcer activity of *Canavalia gladiata* in wistar rats. Based on acute oral toxicity study according to the OECD guideline, one dose i.e. 250 mg/kg was selected for study. In aspirin induced ulcer model, ulcer index and percentage inhibition were determined. Ranitidine at 20 mg/kg was used as the standard drug. Pretreatment of ethanolic extract of *Canavalia gladiata* pods showed significant ($P < 0.001$) decrease in number of ulcers ulcer score index and increase in the percentage protection in aspirin- induced ulceration models. The ethanolic extract of *Canavalia gladiata* pods possesses significant antiulcer properties. In conclusion the antiulcer properties of the extract may be attributed to the presence of alkaloids and phenolic compounds present in the plant extract with various biological activities.

Keywords: *Canavalia gladiata*, Wistar Rats, Ulcer protective, fabaceae

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1. Introduction

Peptic ulcer was found to be an important problem in many developing countries (GW, 2001). It occurs due to an International Journal of Medicine and Pharmaceutical Research

imbalance between the aggressive (acid, pepsin and *Helicobacter pylori*) and the defensive (gastric mucus and

bicarbonate secretion, prostaglandins, innate resistance of the mucosal cells) factors (Tewari, Verma, & Jawaid, 2011). Many drugs including proton pump inhibitors, prostaglandins analogs, histamine receptor antagonists and cytoprotective agents are available for the treatment of peptic ulcer. But on chronic administration of these drugs causes various adverse effects ranging from dryness of mouth to achlorhydria, atrophic gastritis, osteodystrophy and encephalopathy (Ariyphisi I, Toshiharu A, Sugimura F, Abe M, Matsuo Y, 1986; KR, 2007). Therefore, herbal medicines seems to be an alternative for chronic drug administration, due to their fewer adverse effects. It was identified that almost 70% of the population were being dependent on traditional and herbal medicines for their primary health care needs (Antwi S, Martey ON, Donkor K, 2009). Since the extensive research is going on in the area of natural medicine, many plants were reported to have anti-ulcer activity.

Canavalia gladiata commonly called as sword bean belongs to the family fabaceae. In telugu it is called as chamma kaya and in tamil it is called as valavaraik- kay. It is distributed all through India. The legume is used as a vegetable in interiors of central and south India. *Canavalia gladiata* is large twiner, perennials or biennials with glabrous stems, branches with compound leaves and leaflets. Leaflets are ovate or oblong, glabrous above, downy-hirsute below, sub-acute or apiculate. Flowers are large, white or liliac, sword shaped flattened pods, fruits are large and seeds are reddish brown. The roots of *canavalia gladiata* traditionally used in curing enlargement of liver by grounding into paste with cow's urine and rice gruel administered internally for consecutive days (Ranganayakulu, 2014). The fruits are used as astringent, coolant, and appetizer. It contains carbohydrates, alkaloids Phenolic compounds, flavonoids and amino acids such as cystin, tyrosin, and tryptophan. Seeds contain three crystalline globulins canavalin, concaavalin A and B etc (Ranganayakulu, 2014). Since it has got traditional significance, the aim of the study is to evaluate the anti-ulcer activity of *Canavalia gladiata* in wistar rats.

2. Materials and Methods

Plant material

Fresh pods of *Canavalia gladiata* were collected from local areas in mangalagiri, Guntur dist and authenticated by Dr. P.Satyanarayana Raju, Plant taxonomist, Department of Botany, Acharaya nagarjuna University, Guntur, AP, India.

Preparation of Plant extract

The Pods of *Canavalia gladiata* were cleaned and allowed to dry in shade, powdered using mechanical grinder. The powder was packed in soxhlet at 40°C for 6-8 hrs and extracted using ethanol as a solvent. Extracts were concentrated under vacuum using rotary flash evaporator to get the residues.

Animals

Wistar albino rats of either sex, weighing 150–200 g were taken and maintained under standard laboratory conditions (temperature 25±2 C, relative humidity 55±10% and 12-h light: 12-h dark cycle). Animals were allowed to take

standard laboratory feed and *ad libitum*. The experiments were carried out after the prior approval of all experimental protocols by the institutional animal ethics committee.

Acute Toxicity studies

Acute toxicity study was performed for ethanolic extract of *Canavalia gladiata* as per OECD guidelines. Female albino wistar rats were used for acute toxicity study. The animals were kept fasting for overnight with water *ad libitum*, after which the extracts were administered orally at the dose of 300 mg/kg and observed for 14 days. If mortality was observed in two out of three animals, then the dose administered was assigned as toxic dose. If the mortality was observed in one animal, then the same dose was repeated again to confirm the toxic dose. If mortality was not observed, the procedure was repeated for further higher dose, i.e., 2000 mg/kg. one doses was selected for evaluation of anti-ulcer activity, i.e., 250 mg/kg (Handa, S., Anupama, 1990).

Aspirin-induced gastric ulcer: (Nair et al., 2010)

One day before the induction of ulcers, animals were divided into groups (n=6) randomly and drugs/vehicle was administered as follows.

Group-I (control) received 2 ml/kg vehicle (saline),

Group-II (standard) received ranitidine (20 mg/kg body weight),

Group-III (Plant extract) received CGE (250 mg/kg body weight),

Groups-IV (only Plant extract) received CGE (250 mg/kg body weight)

CGE was given *per orally*. The animals were then fasted (with free access to water) for a period of 24 h so as to ensure complete gastric emptying. The 24 h fasted animals were again administered with the drugs/vehicle 1 hr prior to the experiment. Aspirin was administered in a dose of 500 mg/kg body weight orally to I, II & III groups (Parmar NS, 1993)12. Animals were allowed to fast for 5 more hours. Animals were then sacrificed under anesthesia. Midline abdominal incision was made on stomach and was dissected along the greater curvature. All the gastric content was drained out. The stomach was then cut open along the greater curvature and evenly spread out on a dissection board. The mucosa of animals in each group was examined under microscope. The number of ulcers and their severity (Khandelwal, 2000), were recorded using arbitrary scale as follows.

Scoring of ulcer (Kulkarni, 2002)

0 = Normal colored stomach

0.5 = Red coloration

1 = Spot ulcer

1.5 = Hemorrhagic streaks

2 = Ulcers 3 but 5

3 = Ulcers >5

Calculation of ulcer index (Vogel, 2002)

$$UI = UN + US + UP \times 10^{-1}$$

UI = Ulcer Index

UN = Average of number of ulcer per animal

US = Average of severity score

UP = Percentage of animal with ulcer

Calculation of % inhibition (Hojage M.G., Hriprassanna R.C. & Matha Pati. S., 2010)

$$100 - \frac{\text{Control mean ulcer index} - \text{test ulcer index}}{\text{Control mean ulcer index}} \times 100$$

Statistical analysis

The results were expressed as mean \pm SEM. Statistical difference between means were determined by one-way ANOVA followed by Dunnett's post hoc test $P > 0.05$ as the limit of significance (SEM= standard of error of mean).

3. Results and Discussion

In the present study, Ethanolic Pod extract of *Canavalia gladiata* was evaluated for its anti-ulcer activity against aspirin induced peptic-ulcer model. The results of study were tabulated in Table-I.

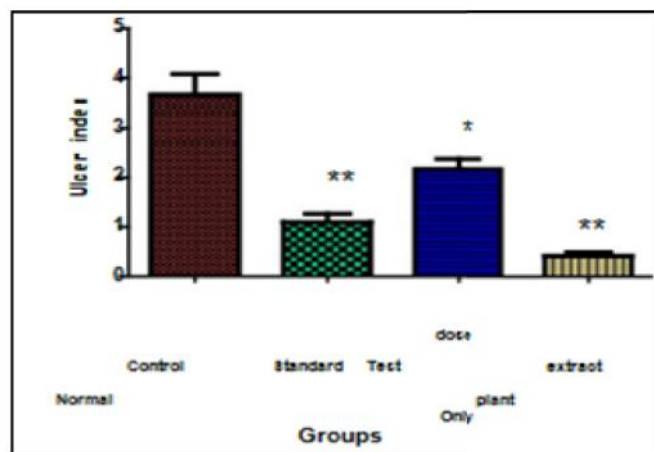


Figure 1: Effect of ethanolic extract of canavalia gladiata pods on Peptic-ulcer in rats Significance was expressed as mean \pm SEM and * $P < 0.01$, ** $P < 0.001$

Discussion

Although the etiology of peptic ulcer is unknown in most of the cases, but it is generally accepted that it is caused due to an imbalance between aggressive factors and the maintenance of mucosal integrity through the endogenous defense mechanisms. The treatment of peptic ulcer is mainly targeted at reducing the hydrochloric acid secretion, increasing gastric cytoprotection, eradication of *H. pylori* or curing Zollinger Ellison syndrome (Jana U, Bhattacharya D, Bandopadhyay S, Pandit S, Deb-nath PK, 2005). Different therapeutic agents are used to treat peptic ulcer, including plant extracts (Al, 2009) So far, several plants have been screened for antiulcer activity. *Canavalia gladiata* extract is one of the herbal agents used in the present study to evaluate the anti-ulcerogenic in aspirin induced ulcers in rats. NSAID's like aspirin causes damage of gastric mucosa by decreasing prostaglandin levels through inhibition of PG synthesis¹⁶. Prostaglandins were found to play a vital role in maintaining mucosal integrity. An Increase in certain endogenous prostaglandins enhances gastric mucosal resistance to ulcerogenic agents (Robert, 1979). The mechanisms involved in prostaglandin action are many, including stimulation of mucus and bicarbonate output (Hogan, D. L.; Ainsworth, M. A. and Ibensberg, 1994), gastric mucosal blood flow (Gaskil, D. L.; Serinek, K. L. and Levine, 1982), decreasing gastric motility, increasing the release of endogenous mediators of gastric injury vasoactive amines and leukotrienes and stimulation of cellular growth and repair (Hawkey, C. J. and Rantim, 1985). The preliminary phytochemical studies revealed the presence of alkaloids, carbohydrates, proteins; phenolic compounds have been reported for its anti-ulcerogenic activity. the plant extract at dose of 250 mg/kg showed significant gastro protective activity 40.98% compared with standard drug ranitidine 20mg/kg showed 69.94% (Table-I)

Table 1: Effect of ethanolic extract of canavalia gladiata pods on Peptic-ulcer in rats

Group	Treatment	Dose (mg/kg)	Ulcer index	% Protection
Group-1 (normal control)	Saline	-	3.66 \pm 0.41	--
Group-2 (Standard)	Ranitidine	20	1.10 \pm 0.17**	69.94
Group-3 (Test)	CGE	250	2.16 \pm 0.21*	40.98
Group-4 (only extract)	CGE	250	0.41 \pm 0.09**	89.07

Significance is expressed as mean \pm SEM and * $P < 0.01$, ** $P < 0.001$

4. Conclusion

From this study, it was found that ethanolic extract of canavalia gladiata pods have significant anti-ulcer activity. Further studies need to carry out to characterize and explore the biological activity of the compounds in the extract.

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