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Research

Phytochemical Screening And Evaluation of Antiulcer Activity of *Hemidesmus Indicus* Leaves

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Abstract

The cause of ulceration in patients is mainly due to hyper secretion of gastric juice and also due to hyper secretion of pepsin. In traditional system of medicine a number of herbal preparations have been used for the treatment of peptic ulcers. There are various medicinal plants has been used for the treatment of gastrointestinal disorders. In view of this, in present study we have to evaluate the anti-ulcer activity of Hemidesmus Indicus. Study was carried out, by using three methods i.e., alcohol, paracetamol and stress induced ulcers in rats pretreated with the doses of 250 mg/kg AQHI and ALHI, 10mg/kg Omeoprazole and 50 mg/kg Ranitidine.

To evaluate the antiulcer activity of aqueous and alcoholic extracts of Hemidesmus Indicus leaves (AQHI and ALHI) at 250 doses using different experimentally induced gastric ulcer models in rats.

Gastric ulcers were induced in rats by 80% alcohol, paracetamol and forced immersion stress induced methods. In alcohol induced ulcer model, paracetamol induced ulcer model and stress induced model the ulcer index was determined. Where as in stress induced ulcers stress plays an important role in ulcerogenesis.

In alcohol-induced ulcers, AQHI and ALHI were effective in reducing lesion index and increasing the gastric mucus content. It was also effective in decreasing ulcer index in paracetamol-induced ulcers. All the results obtained with Hemidesmus Indicus were dose dependent. The results suggest that AQHI and ALHI possesses significant and dose dependent antiulcer activity. The antiulcer activity of AQHI and ALHI can be attributed to its cytoprotective and antisecretory action.

Keywords: Hemidesmus Indicus, antisecretory, cytoprotective, gastric ulcer, alcohol induced ulcers, paracetamol-induced ulcers and stress induced ulcers.

INTRODUCTION

Peptic ulcer and other acidic symptom affect up to ten percentages of the humans with sufficient severity to prompt victims to seek medical attention. The more significant disease condition requiring medical fuscous is ulcer and gastro esophageal disease. In the US, approximately 4 million people have peptic ulcer (duodenal and gastric types), and 350 thousand new patient are diagnosed in each year, around 180 thousand peoples are admitted to hospital and treated with drugs yearly, and about five thousand patient from this case die each year as a result of ulcer condition. The lifetime of human being developing a peptic ulcer is about 10 percentages for Americans males and four percentages for female population.

Peptic ulcers is wound in the lesions that are most often affected in younger to older adults population, but this may diagnosed in young adult life. They often appear without obvious sign and symptom, after a period of days to months of active phase of disease, it may heal with or without drug treatment. It also affect because of bacterial infections with H. Pylori.

Danger of ulcer

Bleeding: Upper gastrointestinal (UGI) bleeding is the secondary common medical condition that effect high mortality in peptic ulcer. UGI bleeding commonly present along with hematemesis (vomiting with digested food and blood or coffee-ground like substance) and black, tarry stools (melana). Clinical diagnosis of UGI done by nasogastric tube lavage shows blood or coffee-ground like material presence. However this diagnosis may be negative when the bleeding arises beyond a closed pylorus region. Most of the patient's having bleeding ulcers can be treated with fluid and blood resuscitation, drug therapy, and endoscopic surgery.

Perforation: This ulcer may be spread to small intestine, oesophagus and large intestine ulcers account for 60, 20 and 20 percent of perforations.

Penetration: Ulcer penetration called due to the permeation of the ulcer among the bowel part without free perforation and filtration of whole contents inside the peritoneal cavity. Surgical treatment regimen recommended that permeation affect in twenty percentage of ulcers, but little proportion of penetrating ulcers become clinically important. The common symptom these complications include acidic irritation, weight reduction and diarrhea: watery vomiting is an uncommon, but diagnostic symptom. No evident clinical data is available in the treatment regimen and guidance for the curing of penetrating ulcers.

Obstruction: Gastric wall obstruction among the frequent ulcer symptoms. Most of the cases are related with duodenal or pyloric part ulceration is 5 percent of the patient populations. Changes in lifestyle and dietary:

Aspirin and related drugs (non-steroidal anti-inflammatory drugs), alcohol, coffee (even decaf)9 and tea can interfere with the curing of the peptic ulcers. Smoking may also low the ulcer healing process. People with ulcer symptom have been evaluated to had more carbohydrate than people with no ulcers, from this route may occur with a genetic susceptibility for the ulcer pathogenis.

Sugar has also been reported to increase stomach pH14. Salt may cause the stomach and intestine irritation. Large uptakes of salt have been linked to higher risk of stomach ulcer

One of the amino acid Known as Glutamine, is the important source in the energy in cells which coverthe stomach and intestine. It is also prevent the stress ulcer related by large burns of the preliminary study about the pathogenesis of ulcers.

TYPES OF PEPTIC ULCER

1) Gastric ulcer
2) Duodenal ulcer

1)Gastric ulcer

Gastric ulcers are usually single and less than 20 millimeter in diameters. Ulcers on the small curvature are mainly related for the chronic gastritis condition, whereas those in the larger curvature are often associated to the non-steroidal anti-inflammatory drugs effects.

Physiological factors in gastric ulcers

Gastric ulcers almost invariably arise in the setting of H. pylori gastritis or chemical gastritis that results in injury to epithelium. Most patients with gastric ulcers secrete less acid than do those with duodenal ulcers and even less than normal persons.

The factors implicated include
(1) back-diffusion of acid into the mucosa,
(2) Decreased parietal cell mass,
(3) Abnormalities of the parietal cells themselves.

A minority of patients with gastric ulcers exhibit acid hypersecretion. In these persons, the ulcers are usually near the pylorus and are considered variants of duodenal ulcers. Interestingly, the intense gastric hypersecretion that occurs in the Zollinger-Ellison syndrome is associated with severe ulceration of the duodenum and even the jejunum but rarely with gastric ulcers.
Duodenal ulcer: Duodenal ulcers are ordinarily located on the walls of the duodenum, on a short distance of the pylorus region.

Physiological factors in duodenal ulcers

The maximal capacity for acid production by the stomach reflects total parietal cell mass. Both parietal cell mass and maximal acid secretion are increased up to twofold in patients with duodenal ulcers. However, there is a large overlap with normal values and only one third of these patients secrete excess acid. Accelerated gastric emptying, a condition that might lead to excessive acidification of the duodenum, has been noted in patients with duodenal ulcers. However, as with other factors, there is substantial overlap with normal rates. Normally, acidification of the duodenal bulb inhibits further gastric emptying. The pH of the duodenal bulb reflects the balance between the delivery of gastric juice and its neutralization by biliary, pancreatic and duodenal secretions. The production of duodenal ulcers requires an acidic pH in the bulb, that is, an excess of acid over neutralizing secretions. In ulcer patients, the duodenal pH after meal decreases to a lower level and remains depressed for a longer time than that in normal persons. Impaired mucosal defenses have been invoked as contributing to peptic ulceration. The mucosal factors, including the function of prostaglandins, may or may not be similar to those protecting the gastric mucosa.

MATERIALS AND METHODS

The designing of methodology involves a series of steps taken in a systematic way in order to achieve the set goal(s) under the prescribed guidelines and recommendations. It includes in it all the steps from field trip to the observation including selection and collection of the medicinal plant, selection of dose value, standardization of protocol, usage of instruments, preparation of reagents, selection of specific solvents for extraction, formation of protocols and final execution of the standardized protocol. All this requires good build of mind and a good and soft technical hand to handle the materials and procedure in a true scientific manner.

Drugs and Chemicals

Drugs and Chemicals used in this study were of analytical grade and of highest purity procured from standard commercial sources in India.

Table 1: Drugs and Chemicals

S.No	Materials	Company Name
1.	Omeoprazole	Cipla
2.	Ranitidine	Cipla
3.	Alcohol Merck	

PRELIMINARY QUALITATIVE TEST
Preliminary Phytochemical Screening
Preliminary phytochemical screening of the plant extract was carried out for the analysis of Alkaloids, Carbohydrates, Tannins, Saponins, Steroids, Phenols, Flavonoids .as per the standard methods.
1. Detection of Alkaloids: Extracts were dissolved individually in dilute Hydrochloric acid and filtered.
a) Mayer's Test: Filtrates were treated with Mayer's reagent (Potassium Mercuric Iodide).Formation of a yellow coloured precipitate indicates the presence of alkaloids.
b).Wagner's Test: Filtrates were treated with Wagner's reagent (Iodine in Potassium Iodide). Formation of brown/reddish precipitate indicates the presence of alkaloids.
c).Dragendroff's Test: Filtrates were treated with Dragendroff's reagent (solution of Potassium Bismuth Iodide). Formation of red precipitate indicates the presence of alkaloids.

d).Hager's Test: Filtrates were treated with Hager's reagent (saturated picric acid solution).Presence of alkaloids confirmed by the formation of yellow coloured precipitate.

2. Detection of Carbohydrates: Extracts were dissolved individually in 5ml distilled water and filtered. The filtrates were used to test for the presence of carbohydrates.
a). Molisch's Test: Filtrates were treated with 2 drops of alcoholic α-naphthol solution in a test tube. Formation of the violet ring at the junction indicates the presence of Carbohydrates.
b).Benedict's Test: Filtrates were treated with Benedict's reagent and heated gently. Orange red precipitate indicates the presence of reducing sugars.
c).Fehling's Test: Filtrates were hydrolysed with dil. HCl, neutralized with alkali and heated with Fehling's A&B solutions. Formation of red precipitate indicates the presence of reducing sugars.

3. Detection of saponins
a). Froth Test: Extracts were diluted with distilled water to 20ml and this was shaken in a graduated cylinder for15 minutes. Formation of 1cm layer off a am indicates the presence of saponins.
b). FoamTest:0.5gm of extract was shaken with 2ml of water. If foam produced persists forten minutes it indicates the presence of saponins.

4. Detection of steroids.
a). Salkowski's Test: Extracts were treated with chloroform and filtered. The filtrates were treated with few drops of Conc. Sulphuric acid, shaken and allowed to stand. Appearance of golden yellow colour indicates the presence of triterpenes.
b). Libermann Burchard's test: Extracts were treated with chloroform and filtered. The filtrates were treated with few drops of acetic anhydride, boiled and cooled. Conc. Sulphuric acid was added. Formation of brown ring at the junction indicates the presence of phytosterols.

5. Detection of Phenols
Ferric Chloride Test: Extracts were treated with 3-4 drops of ferric chloride solution. Formation of bluish black colour indicates the presence of phenols.

6. Detection of Tannins
Gelatin Test: To the extract,1 %gelatin solution containing sodium chloride was added. Formation of white precipitate indicates the presence of tannins.

7. Detection of Flavonoids
Alkaline Reagent Test: Extracts were treated with few drops of sodium hydroxide solution. Formation of intense yellow colour, which becomes colourless on addition of dilute acid, indicates the presence of flavonoids.
Leadacetate Test: Extracts were treated with few drops of lead acetate solution. Formation of yellow colour precipitate indicates the presence of flavonoids.

Experimental animals

Wistar rats (150-200 g) and were procured from Animals were housed in appropriate cages in uniform hygienic conditions and fed with standard pellet diet (Amrul Laboratory Animal Diet) and water ad libitum. All the animals were maintained under standard conditions, that is room temperature 26 ± 1°C, relative humidity 45 - 55% and12:12 h light – dark cycle. The animals were housed in large spacious hygienic cages during the course of the experimental period. Animal studies had approval of IAEC.

Plant Material Collection

The leaf of Hemidesmus Indicus was collected from the Botanical garden and was identified and authenticated from Department. The plant material was cleaned, reduced to small fragments, air dried under shade at room temperature and coarsely powdered in a mixer. The powdered material was stored or taken up for extraction process.

Preparation of plant extracts

Preparation of Aqueous Extract

Fresh leaves of Hemidesmus Indicus were collected and washed under tap water. The leaves extract used was prepared by taking 20gms of finely cut leaves into 250ml beaker containing 200ml of water. The contents were mixed well and then the mixture was boiled up to 80-1000C for 4-5hrs. Further the extract was filtered with whatmann filter paper. The filtrate was boiled until the concentrated residue is formed. The concentrated product was sealed in sample covers and stored under room temperature and used for further experiment to check the activities.

Preparation of Alcoholic Extract

Fresh leaves of Hemidesmus Indicus were collected and washed under tap water. The leaves extract used was prepared by taking 20gms of finely cut leaves into 250ml beaker containing 200ml of alcohol. The contents were mixed well and then the mixture was boiled up to 50-600C for 4-5hrs. Further the extract was filtered with whatmann filter paper. The filtrate was boiled until the concentrated residue is formed. The concentrated product was sealed in sample covers and stored under room temperature and used for further experiment to check the activities.

Selection of dose for animal study

The dose considered for the experiment on rats was obtained from conversion of human dose of Hemidesmus Indicus (3-5 g/kg). The conversion factor of human dose (per 200 g body weight) is 0.018 for rats. Hence the calculated dose for the rats (considering human dose 3 and 5 g/kg) is 200 mg/kg. Acute toxicity was done at dose of 2000mg/kg body weight.

Pharmacological evaluation

Preparation of extracts

The aqueous and alcoholic extracts of Hemidesmus Indicus suspended in water in presence of 3%v/v Tween-80 solution. All the drugs were administered orally for experimental purpose. Each time preparations of the extracts were prepared when required. The drugs were administered at a constant volume of 10ml/kg for each animal.

RESULTS

Phytochemical screening test

The freshly prepared extract of the leaves of *Hemidesmus Indicus* was subjected to phytochemical screening tests for the detection of various active constituents. The extract showed the presence of alkaloids, tannins, steroids, phenolic and flavonoids, carbohydrates, and glycosides in crude extract of *Hemidesmus Indicus* leaves as depicted in Table 2.

Table 2: Result of chemical group tests of the Aqueous and Alcoholic Extract of *Hemidesmus Indicus* leaves.

Test	Aqueous Extract	Alcoholic Extract
Carbohydrates	+	-
Tannins	+	++
Flavonoid	++	+
Saponins	+++	++
Phenols	+	+
Steroids	+	++
Alkaloids	+	+
Glycosides	+	++

Aqueous and Alcoholic extract; (+): Present; (-): Absent; (+++); Reaction intensity is high; (++): Reaction intensity is medium; (+): Reaction intensity is normal;

ACUTE TOXICITY STUDY

Administration of the *Hemidesmus Indicus* extracts *in* rats at doses of 250 mg/kg by oral gavage did not reveal any adverse effects or signsof toxicity.

Observations twice daily for fourteen days also did not reveal any drug related observable changes or mortality. Accordingly, the acute oral LD50 of the extractives was concluded to exceed 2000 mg/kg body weight, the highest dose tested in the study.

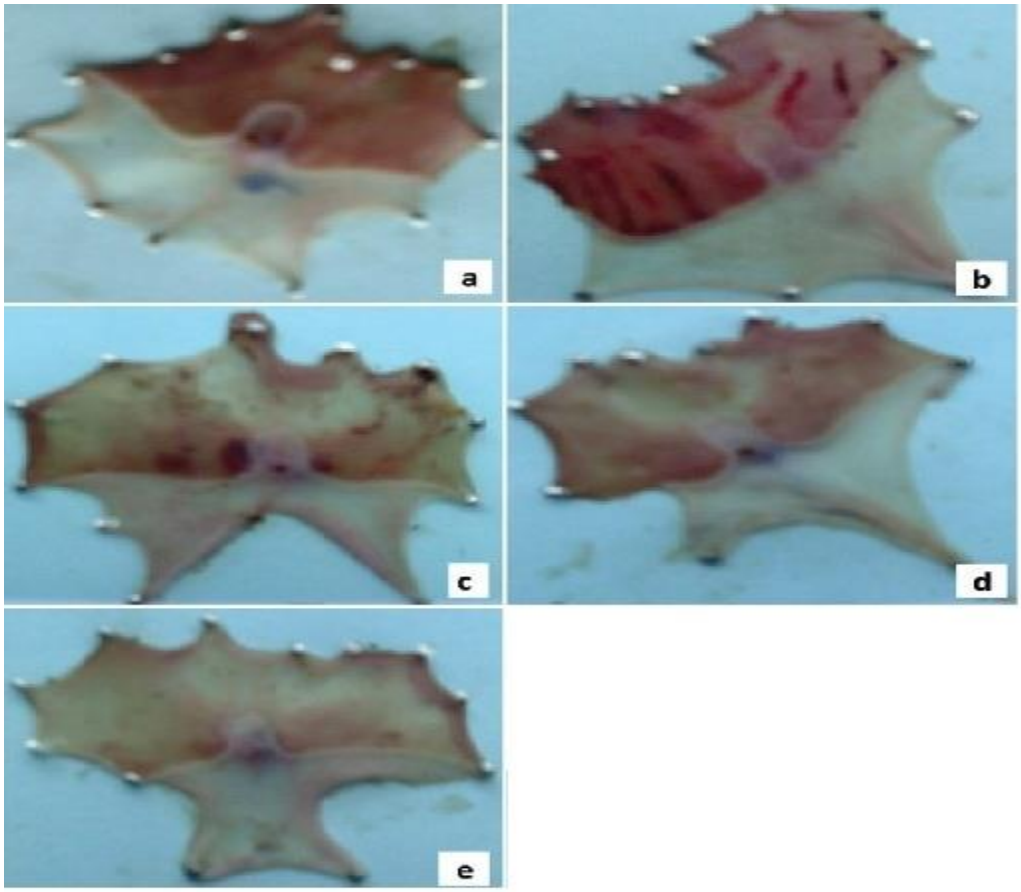
Effect on alcohol induced gastric ulcers

Oral administration of 80% alcohol produced haemorrhagic gastric lesions in glandular portion of stomach. Pretreatment with AQHI and ALHI at the dose of 250 mg/kg and Omeprazole (10 mg/ kg) significantly ($p<0.001$) protected the gastric mucosa as shown by reduced values of lesion index (16.1 ± 3.25 and 27.12± 1.32 respectively) against alcohol challenge as compared to solvent control (38.12 ± 2.36).

Table 3: Effect of *Hemidesmus Indicus* at various doses on alcohol induced gastric ulcer in rats

Treatment (n=6)	Dose mg/kg (p.o.)	Lesion index	% Inhibition of ulcer	Mucus content (μg Alcian blue/g wet tissue)
1% CMC	-	31.21 ± 0.51	-	0.51 ± 0.31
Ulcer control	-	38.12±2.36	-	0.62±1.42
Omeprazole	10	27.12± 1.32	22.01	0.69 ± 1.10
AQHI	250	33.15 ± 0.26	8.15	0.27 ± 2.12
ALHI	250	16.1 ± 3.25	42.36	0.852± 1.12

Values are mean ± S.E.M. n=number of animals in each group. Significant differences with respect to solvent control group were evaluated by Student's t – test. ($p<0.05$, $p<0.01$ and $p<0.001$).



(a) Normal Control (b) Ulcer Control (c) AQHI (250 mg/kg) treated (d) ALHI (250 mg/kg) treated (e) Omeprazole (10 mg/kg treated).

Fig 1: Effect of *Hemidesmus Indicus* on alcohol induced ulcers in the rats in the study

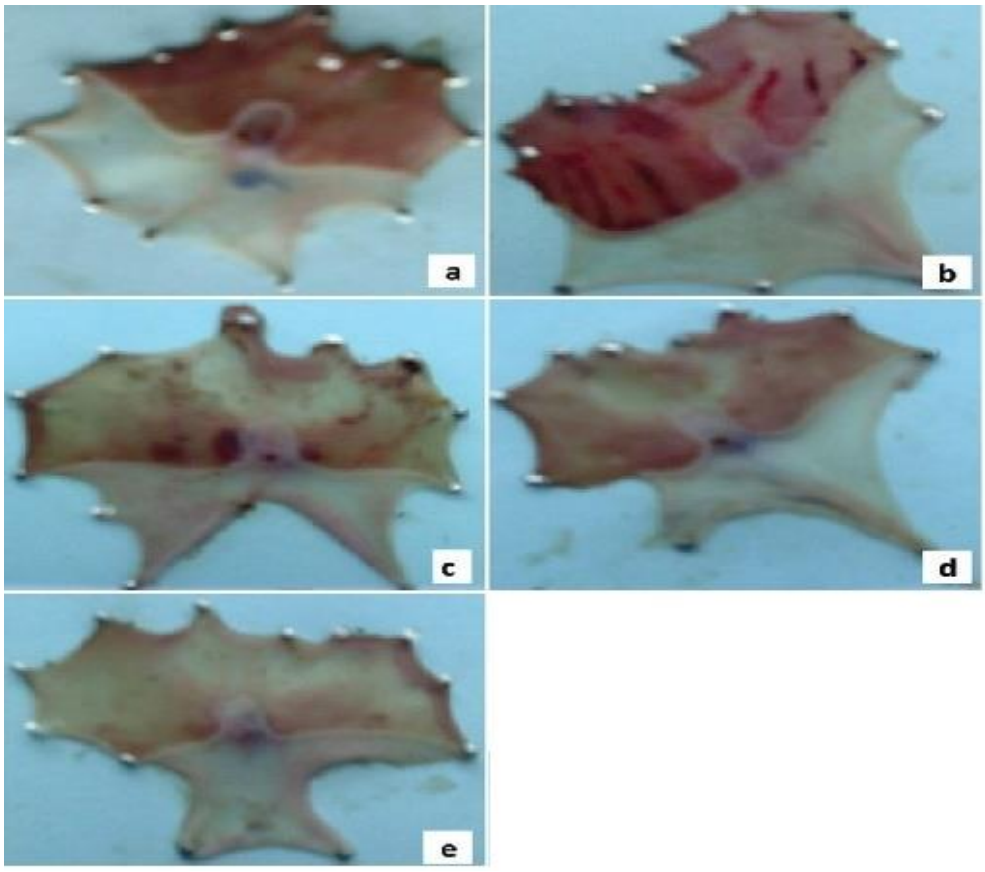
Effect on Paracetamol induced gastric ulcers

In *Hemidesmus Indicus* treated groups (250 mg/kg), the ulcer index values (0.48 ± 0.01 respectively) were significantly reduced ($p<0.001$) when compared to solvent control (0.71 ± 0.12), while the ulcer index for ranitidine treated group was 0.26 ± 0.05 ($p<0.001$). The %inhibition of ulcer showed by AQHI and ALHI (250mg/kg) and ranitidine was 55.4%, 37.1% and 53.3 % respectively. (Refer Table 4 and fig 2)

Table 4: Effect of *Hemidesmus Indicus* at various dose levels on paracetamol induced gastric ulcer in rats

Treatment (n=6)	Dose mg/kg (p.o.)	Ulcer index	% Inhibition of ulcer
1% CMC	-	0.71 ± 0.12	-
Ulcer control	-	0.83±0.20	--
Ranitidine	50	0.26 ± 0.05	55.4
AQHI	250	0.48 ± 0.01	37.1
ALHI	250	0.33 ± 0.06	53.3

Values are mean ± S.E.M. n=number of animals in each group; Significant differences with respect to solvent control group were evaluated by Student's t - test. ($p<0.001$).



(a) Normal Control (b) Ulcer Control (c) AQHI (250 mg/kg) treated (d) ALHI (250 mg/kg) treated (e) Ranitidine (50 mg/kg treated)

Fig 2: Effect of *Hemidesmus Indicus* on paracetamol induced ulcers in the rats in the study

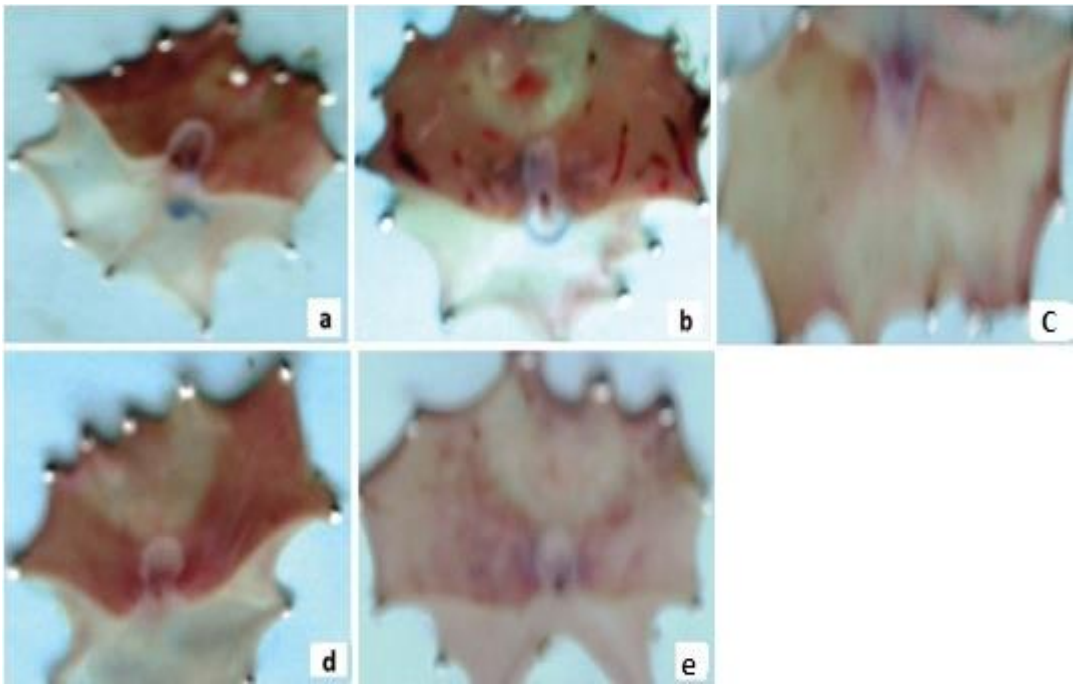
Stress-induced ulcers

In water immersion stress induced ulcers, the mean score value of ulcer inhibition was found to be significant ($P<0.001$) for 250 mg/kg of the extract. The percentage ulcer inhibition was 77.15 and 83.64 for 250 mg/kg for both aqueous and alcoholic extracts, and that of the standard was found to be 88.28.

Table 5: Effect of *Hemidesmus Indicus* at various dose levels on Stress induced gastric ulcer in rats.

Group	Dose mg/kg (p.o.)	Ulcer index	Percentage inhibition
Normal Control	-	00.00±0.00	-----
Ulcer control	-	24.21±2.32	------
Standard	50	3.50±0.22	88.28
AQHI	250	7.74±0.20	77.15
ALHI	250	5.11±2.49	83.64

Values are mean ± S.E.M. n=number of animals in each group; Significant differences with respect to solvent control group were evaluated by Student's t - test. (p<0.001).



(a) Normal Control (b) Ulcer Control (c) AQHI (250 mg/kg) treated (d) ALHI (250 mg/kg) treated (e) Omeprazole (10mg/kg treated)

Fig 3: Effect of *Hemidesmus Indicus* on stress induced ulcers in the rats in the study

DISCUSSION

The anti-ulcer activity of *Hemidesmus Indicus* was evaluated by employing alcohol/paracetamol/acetic acid/stress induced gastric ulcers in rats. Alcohol and paracetamol induced ulcer models were used because they represent some of the most common causes of gastric ulcer in humans. Many factors and mechanisms are implicated in the ulcerogenesis and gastric mucosal damage induced by different models employed in the present study involving the increase of gastric acid output, vascular injury, depletion of gastric wall mucin, mucosal damage induced by non-steroidal anti-inflammatory drugs and free radical production.

Alcohol induced gastric injury is associated with significant production of oxygen free radicals leading to increased lipid peroxidation which causes damage to cell and cell membranes. *Hemidesmus Indicus* has significantly protected the gastric mucosa against alcohol challenge as shown by reduced values of lesion index as compared to solvent control group suggesting its potent cytoprotective effect. This is further substantiated by increase in gastric mucus content produced by *Hemidesmus Indicus* extract.

NSAID's like paracetamol, aspirin, indomethacin cause gastric mucosal damage by decreasing prostaglandin levels through inhibition of PG synthesis. *Hemidesmus Indicus* extract was significantly effective in protecting gastric mucosa against paracetamol induced ulcers at all the dose level studied. Hence *Hemidesmus Indicus* extract affords effective protection to gastric mucosa against various insults by increasing gastric mucus content and decreasing the acid volume, free and total acidity in rats.

Stress plays an important role in ulcerogenesis. The Pathophysiology of stress-induced gastric ulcers is complex. Stress-induced ulcers are probably mediated by histamine release with enhancement in acid secretion and a reduction in mucus production. The aqueous and alcoholic extracts of *Hemidesmus Indicus* were effective in reducing the ulcers induced by stress.

The effects in all the 3 models studied were dose dependent. In conclusion, to the best of our knowledge for the first time, we have demonstrated that Hence *Hemidesmus Indicus* extract has gastro protective activity against experimentally induced ulcers in rats. The mechanism of gastro protective action can be attributed to its antisecretory and cytoprotective property. However further experiments are required to establish and elaborate the molecular mechanism(s) of its Anti-ulcer activity.

CONCLUSION

The anti-ulcer activity of the plant *Hemidesmus Indicus* was evaluated by employing paracetamol, alcohol and stress induced ulcer models. These models represent some of the most common causes of gastric ulcer in humans. Many factors and mechanisms are implicated in the ulcerogenesis and gastric mucosal damage induced by different models employed in the present study involving, depletion of gastric wall, mucin mucosal damage induced by nonsteroidal anti-inflammatory drugs and free radical production.

NSAID's like aspirin and paracetamol causes gastric mucosal damage by decreasing prostaglandin levels through inhibition of PG synthesis. Alcohol and Aqueous extract of the plant of *Hemidesmus Indicus* was significantly effective in protecting gastric mucosa against paracetamol induced ulcers at all the dose level studied.

Alcohol induced gastric injury is associated with significant production of oxygen free radicals leading to increased lipid peroxidation, which causes damage to cell and cell membrane. The extracts of the *Hemidesmus Indicus* has significantly protected the gastric mucosa against alcohol challenge as shown by reduced values of lesion index as compared to control group suggesting its potent cytoprotective effect. It has been proposed that in pyloric ligation, the digestive effect of accumulated gastric juice and interference of gastric blood circulation are responsible for induction of ulceration.

The antiulcer activity of *Hemidesmus Indicus* extracts in stress induced model is evident from its significant reduction in gastric volume, ulcer index and increase in pH of gastric juice. Because of animals treated with *Hemidesmus Indicus* extracts significantly inhibited the formation of ulcer in the stomach and also decreased both acid concentration, gastric volume and increased the pH values.

It is suggested that *Hemidesmus Indicus* extracts can suppress gastric damage induced by aggressive factors. It is generally accepted that gastric ulcers result from an imbalance between aggressive factors and the maintenance of the mucosal integrity through endogenous defence mechanisms. The excess gastric acid formation by prostaglandin (PG) includes both increase in mucosal resistance as well as a decrease in aggressive factors, mainly acid and pepsin. Inhibitions of PG synthesis by aspirin coincide with the earlier stages of damage to the cell membrane of mucosal, parietal and endothelial cells.

The preliminary phytochemical studies revealed the presence of flavonoids in aqueous and alcoholic extracts of *Hemidesmus Indicus* various flavonoids have been reported for its anti-ulcerogenic activity with good level of gastric protection. So the possible mechanism of antiulcer action of *Hemidesmus Indicus* may be due to its flavonoid content. In this study we observed that *Hemidesmus Indicus* provides significant anti-ulcer activity against gastric ulcers in rats.

On the basis of the present results and available reports, it can be concluded that the anti-ulcer activity elucidated by *Hemidesmus Indicus* could be mainly due to the modulation of defensive factors through an improvement of gastric cytoprotection and partly due to acid inhibition.

Recommendations

The Research work can be extended:

- ✓ Further, more herbal extracts can be screened for its Anti- ulcer Activity and used for treatment.
- ✓ Anti- ulcer activity should be evaluated of Polyherabal formulation for its synergitic action.
- ✓ Clinical Trials of Polyherbal formulations should be carried out for Anti- ulcer activity.

FUTURE SCOPE OF RESEARCH WORK

- Present study mainly focused on using natural resources in greater amount both from toxicity as well as cost oriented issues.
- Natural components are easily obtainable. Hence, in future it can effectively replace synthetic derivatives.

- Benefits are like free from toxicity, needed in little quantity plus effortlessly obtainable at fewer prices in contrast to synthetic component to achieve higher yield, optimization as well as novel processes serve such purpose by providing optimal criteria to conduct experiments. Such issues should be focus in near future.
- The plant were found having activity against GI Ulcers as evident from this study.
- Pharmacologic activities which may be a hint to investigate use of herbal as therapeutic agents.
- Hence, this may be useful to discover safer substitute for Ulcer management for numerous ailments.
- However, Future work can be done for isolating its main constituents which are responsible for this activity and for elucidating its mechanism of action of Anti- ulcer activity of these plant extracts.

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