



Anti-ulcer activity of *Phyllanthus Niruri* and *Opuntia Ficus indica* plant extract

Krati Sharma^{*1}, Rajeev Malviya¹ and Vishal Gupta¹

¹School of Pharmacy, Mansarovar Global University, Kolar road, Bhopal, (M.P.) - India

Article info

Received: 07/02/2022

Revised: 10/03/2022

Accepted: 25/03/2022

© IJPLS

www.ijplsjournal.com

Abstract

The present investigation carried out to study the anti-ulcer of opuntia ficus indica fruit extract and phyllanthus Niruri herb extract using two ulcer models Ethanol induced, and Pylorus ligation plus aspirin induced models. Effect of various doses of Opuntia ficus indica and Phyllanthus Niruri extract were studied on gastric secretion and gastric ulcers in Pylorus ligation plus aspirin induced and on ethanol- induced gastric mucosal injury in rats. The reduction in ulcer index in both the models along with reduction in volume and total acidity, proved the anti ulcer activity of opuntia ficus indica fruit extract and phyllanthus Niruri herb extract. Thus it can be concluded that both plant possesses anti-ulcer activity, which can be attributed to its anti-oxidant mechanism of action.

Key Words: Opuntia ficus indica and Phyllanthus Niruri, antiulcer, ethanol, pylorus ligation aspirin

Introduction

Peptic ulcer disease and its complications remain the cause of significant morbidity worldwide, representing a major burden for healthcare resources. Although potent anti-ulcer drugs are available, most of them produce several toxicities, thus emphasizing the need to search for new alternatives. As high as 80% of the world population depends on plant derived medicines for the first line of primary healthcare, reinforcing the theory that plant extracts can be good source of new drugs. [1] Peptic ulcer is one of the widespread gastrointestinal disorders. The various peptic ulcers are as follows:

- Duodenal ulcer
- Gastric ulcer
- NSAID induced ulcer
- Stress ulcer

Management of peptic ulcer:[2]

Peptic ulcer can be managed by following methods:

- By moderating gastric sourness, hyper motility and progressing ulcer remedial
- By inhibition of intricacies and recurrence
- By treating the disease developed by *Helicobacter pylori*

Treatment:

Withdrawal of the offending agents.

Diet:

- Antacid and Anti-secretory drugs: eg Ranitidine, omeprazole etc.
- Treating of *Helicobacter pylori* infection.
- Prevention of repetition: Ulcer repetition can be inhibited by combination of therapy like cimetidine and ranitidine.

***Corresponding Author**

Email: drkkshukla37@gmail.com

- **Surgery:** Surgery is preferable whenever
- Malignance is inferred in gastric ulcer.
- A duodenal ulcer comes to be incurable and stubborn to suitable curative management.
- A complexity such as natural hindrance or prick is existing.
- The patient bears from recurrent assaults of gastrointestinal hemorrhage.

Opuntia Ficus Indica, the Indian fig opuntia, fig opuntia, or prickly pear, is a species of cactus that has long been a domesticated crop plant grown in agriculture economies throughout arid and semiarid parts of the worlds and most commercially important cactus

Phyllanthus Niruri, was selected for the study as potential corrosion inhibitor. ***Phyllanthus niruri***

very common plant in Indian system, which has been used as anti-material, anti-bacterial and air purifier from ancient time in Indian homes

Material and Methods

Table: 1 Detail of Plant Extract

Plant Name	Family	Species	Drug
<i>Opuntia Ficus Indica</i>	Cactaceae	<i>Opuntia Ficus Indica</i>	Fruits
<i>Phyllanthus Niruri</i>	Euphorbiaceae	Niruri	Herb

Animal:

The animal experimental protocol was approved by the Department of Pharmacy, Mansarovar University Bhopal Institutional Animals Ethical Committee (IAEC), Deshpande Laboratories Pvt.Ltd. Bhopal(M.P.).

CPCSEA Registration no: 1582/PO/Re/11/CPCSEA.

Pylorus ligated ulcer: Albino Wistar rats of either sex weighing between (150-200gms) were divided into various groups consist of six animals in each group.[3]

Group1 Normal Control

Group2 Control (Ethanol 1ml/200gm, p.o)

Group3 Standard (Omeprazole 20 mg/kg,p.o)

Group4 Ethanol extract of fruit of *Opuntia ficus-indica* (250 mg/kg, p.o)

Group5 Aqueous extract of fruit of *Opuntia ficus-indica* (250 mg/kg, p.o)

Group6 Ethanol extract of herb of *Phyllanthus niruri* (500 mg/kg, p.o)

Group7 Aqueous extract of herb of *Phyllanthus niruri* (500 mg/kg, p.o)

In this method albino rats were fasted in individual cages for 24 hours. Care was being taken to avoid coprophagy. Test compounds or standard drug or control vehicle was administered 30 minutes prior to pyloric ligation. The fasted rats were anaesthetized with anesthetic ether. An incision of 1cm long was made in the abdomen just below the sternum. The stomach was exposed. A thread was passed around the pyloric sphincter and a tight knot was applied. After pyloric ligation the abdomen wall was closed by putting the sutures. The skin was cleaned from any blood spots and bleeding. Collodion was applied over the wound. The rats were kept in a separate cage and allowed them to recover. After 4 hours of pyloric ligation the animals were sacrificed with excess of anesthetic ether. The abdomen was opened and the oesophageal end (cardiac end) of the stomach was tied. The entire stomach was cutted and removed from the body of the animal. A small cut was done to the pyloric region just above the knot and the contents of the stomach were collected in a graduated centrifuge tube. The gastric content was centrifuged at 1,000 rpm for 10 minutes and the volume was noted. The stomach was opened along the greater curvature and washed it slowly under the running tap water. Put it on the slide glass and observed under 10 x magnifications for ulcers. The ulcer scoring was done as per Kulkarni SK⁸. [4]

0 = Normal coloured stomach

0.5 = Red colouration

1 = Spot ulcer

- 1.5 = Haemorrhagic streaks
2 = Ulcers ≥ 3 but ≤ 5
3 = Ulcers > 5

The mean ulcer score for each animal was expressed as ulcer index. The percentage protection was calculated using the formula.

$$\% \text{ protection} = 100 - \frac{ut}{uc} \times 100$$

Where, ut = Ulcer index of treated group and uc = Ulcer index of control group.

Determination of Free Acidity and Total Acidity:

1 ml of supernatant gastric content was pipette out and diluted it 10 ml with distilled water. The pH of this solution was noted with the help of digital pH meter. The solution was titrated against 0.01N sodium hydroxide using Topfer's reagent as indicator until all traces of red colour disappeared and the colour of the solution turned to yellowish orange. The volume of sodium hydroxide added was noted. The volume of alkali was corresponded to free acidity. Then 2 to 3 drops of phenolphthalein was added and titration was continued until a red tinge reappears. Again the total volume of alkali added was noted. The volume was corresponded to total acidity. [5]

Acidity was calculated by using the formula:

$$\text{Acidity} = \frac{\text{Volume of NaOH} \times \text{Normality of NaOH} \times 100 \text{ mEq/L}}{100 \text{ gm} \times 0.1}$$

Estimation of Total Proteins: An alcoholic precipitate was prepared by adding 9.0 ml of 90% alcohol to 1 ml of gastric juice. To 0.1 ml of this protein mixture, 1 ml of 0.1N NaOH was added. 0.4 ml phenol reagent was added to 0.05 ml of the reaction mixture and was kept for ten minutes to complete the reaction. Absorbance was measured at 610 nm against blank in a spectrophotometer. The amount of protein present in the gastric juice was calculated from standard curve prepared with bovine albumin and was expressed in term of $\mu\text{g/ml}$ of gastric juice. [6]

Estimation of total carbohydrates: An alcoholic precipitate containing the dissolved mucosubstances was prepared by adding 9 ml of 90% alcohol to 1 ml of gastric juice. The mixture was allowed to decant and the supernatant layer was discarded. The precipitate containing the mucosubstances was dissolved in 0.5 ml of 0.1N sodium hydroxide and 1.8 ml of 6N HCl was

added. This mixture was boiled on a water bath, neutralised and diluted with distilled water to get a final volume of 4.5 ml. This solution was used for the estimation of carbohydrates like total hexoses, hexosamine, sialic acid and fucose as follows.

Estimation of Fucose:

Reagents: Cysteine reagent: 600 mg of cysteine hydrochloride was dissolved in 20 ml of distilled water. It was stored in refrigerator until use. D (+) Fucose: Standard

Procedure: The blank and the sample tubes containing 0.4 ml of distilled water and 0.4 ml of hydrolysate was mixed carefully in a water bath with 1.8 ml sulphuric acid mixture. The reaction was allowed to take place for 3 minutes by heating on a water bath. After cooling the tubes 0.1 ml of cysteine reagent was added to the blank and to one of the tubes containing the hydrolysate (unknown) while cysteine reagent was not added to the test-tube containing the hydrolysate (unknown blank). The reaction was allowed to continue for 90 min. The absorbance was read spectrophotometrically at 396 and 430 nm using distilled water as blank.

The optical density for the fucose in the hydrolysate was calculated. The readings, which were taken at 396 and 430 nm, were noted and the difference calculated. Then the values without cysteine were subtracted from this and evaluated. Standard curve was prepared with D (+) – fucose. [7]

$$\begin{aligned} & \frac{(\text{OD}_{396} - \text{OD}_{430})_{\text{unknown}} - (\text{OD}_{396} - \text{OD}_{430})_{\text{unknown blank}}}{(\text{OD}_{396} - \text{OD}_{430})_{\text{water blank}}} \times \text{fucose content} \\ & \text{True optical density} = \dots\dots\dots \end{aligned}$$

Estimation of Hexosamine:

Reagents: Acetyl acetone reagent: 0.3 ml acetyl acetone and 9.7 ml of 1.5N sodium carbonate (anhydrous) were mixed just before use. Ethanol: It was dehydrated.

Ehrlich's reagent: It was prepared by mixing 1.6 g of p-dimethyl amino benzaldehyde in 30 ml of 90 % ethanol and then adding 30 ml of Conc. HCl. The reagent was then stored in a refrigerator. D (+) Glucosamine hydrochloride was used as standard.

Procedure: 0.5 ml of acetyl-acetone reagent was added to 0.5 ml of the hydrolysate fraction. The reaction was allowed to take place by heating for 20 min in a boiling water bath. The mixture was allowed to cool and 1.5 ml of 90% alcohol and 0.5 ml of Ehrlich's reagent was added. After 30 min the intensity of colour development was measured spectrophotometrically at 530 nm against blank. The amount of hexosamine present in the sample was estimated from the standard curve prepared by using D (+) glucosamine hydrochloride and concentration was expressed in $\mu\text{g/ml}$ of gastric juice.

Estimation of Total Hexoses:

Reagents: Orcinol reagent: 1.6 g of orcinol was dissolved in 100 ml of distilled water. This was prepared fresh before use. Sulphuric acid: 150 ml of conc. sulphuric acid was mixed with 100 ml of distilled water. D (+) Galactose- Mannose- Standard Orcinol-Sulphuric acid reagent: One volume of orcinol was mixed with 7.5 ml of sulphuric acid. This was prepared fresh before use.

Procedure: The reaction mixture containing 0.4 ml of hydrolysate and 3.4 ml of orcinol reagent was heated for 15 min. in the boiling water bath. The tubes were cooled to room temperature and the colour developed was measured at 540 nm against the blank. The amount of hexoses present in the sample was determined from the standard curve of D (+) galactose - mannose and has been expressed in $\mu\text{g/ml}$ of gastric juice. [8]

Estimation of Sialic Acid:

Reagents: Sodium arsenite: 0.5M sodium sulphate was prepared in 0.1N sulphuric acid and to 100 ml of this solution 10 g of sodium arsenite was added and stored in glass stoppered bottle. Thiobarbituric acid: 0.5 M sodium sulphate was prepared and to 100 ml of this solution 600 mg of thiobarbituric acid was added and stored. Sialic acid- Standard.

Procedure: A reaction mixture containing 0.5 ml of the hydrolysate in $0.1\text{NH}_2\text{SO}_4$ and 0.2 ml of sodium periodate was mixed and allowed to stand for 20 min. 1 ml of sodium arsenite solution was added and mixed by shaking. 3 ml of thiobarbituric acid was added and

the mixture was heated on a boiling water bath for 15 min. After cooling, 4.5 ml of cyclohexanone was added, thoroughly shaken and centrifuged. The pink colour formed in the supernatant layer was pipetted out and intensity of colour was measured spectrophotometrically at 550 nm. A standard curve was prepared using sialic acid and the amount of sialic acid present in the sample was determined expressed in $\mu\text{g/ml}$ of gastric juice. [9]

Histopathological Evaluation:

The stomachs of the all groups of animals were immersed in 10% formalin to study the histopathological changes. After the standard processing the wet ulcerated tissues were embedded in paraffin and cut into thick sections. Haematoxylin-eosin were used to stain the tissues and mounted with Canada balsam. Parameters used to study histopathological changes included shedding of gastric epithelium, gastric erosions, infiltration of neutrophils, oedema and inflammation. [10]

Results and Discussion

Pylorus ligated ulcer in rats

The anti ulcer activity of ethanol and aqueous extracts of *Opuntia ficus indica* and *Phyllanthus niruri* was studied at two dose levels (200 & 100 mg/kg) in pylorus ligated ulcerogenesis in rats.

Effect on Ulcer Index

The results indicated that *Opuntia ficus indica* and *Phyllanthus niruri* at dose levels of 200 mg/kg and 100 mg/kg significantly decreased the ulcer index ($p < 0.01$) which was also evidenced by significant increase in percentage ulcer protection at both the dose levels. The percentage protection of ulcers in the treated groups at 200 and 100 mg/kg of ethanol extract of herb was found to be 47.86% and 77.78% respectively and aqueous extracts showed 41.12% and 61.20% respectively. Omeprazole at 20 mg/kg showed a protection index of 88.89% (Table 2).

On the other hand, the percentage protection of ulcers in the treated groups at 250 and 500 mg/kg of ethanol extract of herb was found to be 55.6% and 70% respectively and aqueous extracts showed 46.66% and 65.60% respectively. (Table 3).

Morphological appearances of ulcers induced by pylorus ligated ulcer in rats and treated with ethanol and aqueous extracts of *Opuntia ficus indica* and

Phyllanthus niruri herb and herb are shown in Plate 5.3.

Effect on Gastric Volume

Gastric volume in *Opuntia ficus indica* and *Phyllanthus niruri* treated groups indicated that there was no significant decrease in the volume of the gastric juice at 200 and 100 mg/kg. ($p < 0.01$) (Table 4).

Effect on pH of Gastric Juice

The ethanolic and aqueous extracts of herb and stem of *Opuntia ficus indica* and *Phyllanthus niruri* at 200 mg/kg and 100 mg/kg significantly increased the pH of gastric juice ($p < 0.01$) and was comparable to the control and standard, Omeprazole at 20mg/kg (Table 4)

Table: 2 Effect of *Opuntia ficus indica* and *Phyllanthus niruri* herb extracts on pylorus ligated rats

	Body weight	Treatment	ULCER INDEX						Total score	Mean Ulcer Index \pm SEM	% protection
			Normal colour stomach	Red colouration	Spot ulcer (1.0)	Haemorrhagic streaks (1.5)	Ulcers ≥ 3 but ≤ 5 (2.0)	Ulcers > 5 (3.0)			
1	180	Normal Control	0	-	-	-	-	-	0	0 \pm 0	-
	170		0	-	-	-	-	-	0		
	165		0	-	-	-	-	-	0		
	158		0	-	-	-	-	-	0		
	185		0	-	-	-	-	-	0		
	175		0	-	-	-	-	-	0		
2	170	Control (Ulcerated) Pylorus Ligation	0	0.5	1.0	1.5	2.0	3.0	8.0	7.5 \pm 0.500	0
	160		0	0.5	1.0	1.5	2.0	-	5.0		
	155		0	0.5	1.0	1.5	2.0	3.0	8.0		
	165		0	0.5	1.0	1.5	2.0	3.0	8.0		
	178		0	0.5	1.0	1.5	2.0	3.0	8.0		
	185		0	0.5	1.0	1.5	2.0	3.0	8.0		
3	155	Omeprazole (20mg/kg)	0	0.5	-	-	-	-	0.5	0.833 \pm 0.210 **	88.89
	165		0	0.5	1.0	-	-	-	1.5		
	155		0	0.5	-	-	-	-	0.5		
	170		0	0.5	1.0	-	-	-	1.5		
	178		0	0.5	-	-	-	-	0.5		
	160		0	0.5	-	-	-	-	0.5		
4	178	Ethanol Herb Extract (200mg/kg)	0	0.5	1.0	-	2.0	-	3.5	3.91 \pm 0.351 **	47.86
	155		0	0.5	1.0	1.5	2.0	-	5.0		
	170		0	0.5	1.0	1.5	-	-	3.0		
	175		0	0.5	1.0	1.5	2.0	-	5.0		
	176		0	0.5	1.0	-	2.0	-	3.5		
	165		0	0.5	1.0	-	2.0	-	3.5		
5	180	Ethanol Herb Extract (100mg/kg)	0	0.5	1.0	-	-	-	1.5	1.666 \pm 0.333 **	77.78
	175		0	0.5	1.0	-	-	-	1.5		
	165		0	0.5	-	-	-	-	0.5		
	170		0	0.5	1.0	-	-	-	1.5		
	175		0	0.5	-	1.5	-	-	2.0		
	160		0	0.5	1.0	1.5	-	-	3.0		
6	155	Aqueous Herb Extract (200mg/kg)	0	0.5	1.0	1.5	2.0	-	5.0	4.416 \pm 0.374 **	41.12
	158		0	0.5	1.0	1.5	2.0	-	5.0		
	165		0	0.5	1.0	1.5	-	-	3.0		
	170		0	0.5	1.0	1.5	2.0	-	5.0		

	172		0	0.5	1.0	-	2.0	-	3.5		
	175		0	0.5	1.0	1.5	2.0	-	5.0		
7	182	Aqueous	0	0.5	1.0	1.5	-	-	3.0	2.91±	61.20
	175	Herb	0	0.5	1.0	1.5	-	-	3.0	0.153	
	160	Extract	0	0.5	-	-	2.0	-	2.5	**	
	168	(100mg/kg)	0	0.5	1.0	1.5	-	-	3.0		
	158		0	0.5	-	-	2.0	-	2.5		
	164		0	0.5	1.0	-	2.0	-	3.5		

Values are expressed as mean ± SEM (n=6) in each group.

* $P < 0.05$, ** $P < 0.01$ compared with the control (ANOVA test)

Table: 3 Effect of *Opuntia ficus indica* fruit and *Phyllanthus niruri* herb extracts on pylorus ligated rats

	Body weight	Treatment	ULCER INDEX						Total score	Mean Ulcer Index ± SEM	% protection
			Normal colour stomach	Red colouration	Spot ulcer	Haemorrhagic streaks	Ulcers ≥ 3 but ≤ 5	Ulcers > 5			
			(0)	(0.5)	(1.0)	(1.5)	(2.0)	(3.0)			
1	180	Normal	0	-	-	-	-	-	0	0±0	-
	170	Control	0	-	-	-	-	-	0		
	165		0	-	-	-	-	-	0		
	158		0	-	-	-	-	-	0		
	185		0	-	-	-	-	-	0		
	175		0	-	-	-	-	-	0		
2	170	Control (Ulcerated)	0	0.5	1.0	1.5	2.0	3.0	8.0	7.5±	0
	160		0	0.5	1.0	1.5	2.0	-	5.0	0.500	
	155	Pylorus	0	0.5	1.0	1.5	2.0	3.0	8.0		
	165	Ligation	0	0.5	1.0	1.5	2.0	3.0	8.0		
	178		0	0.5	1.0	1.5	2.0	3.0	8.0		
	185		0	0.5	1.0	1.5	2.0	3.0	8.0		
3	155	Omeprazole (20mg/kg)	0	0.5	-	-	-	-	0.5	0.833±	88.89
	165		0	0.5	1.0	-	-	-	1.5	0.210	
	155		0	0.5	-	-	-	-	0.5	**	
	170		0	0.5	1.0	-	-	-	1.5		
	178		0	0.5	-	-	-	-	0.5		
	160		0	0.5	-	-	-	-	0.5		
4	175	Ethanol	0	0.5	1.0	-	2.0	-	3.5	3.33±	55.6
	165	Herb	0	0.5	1.0	-	2.0	-	3.5	0.105	
	175	Extract	0	0.5	1.0	1.5	-	-	3.0	**	
	175	(200mg/kg)	0	0.5	1.0	1.5	-	-	3.0		
	176		0	0.5	1.0	-	2.0	-	3.5		
	170		0	0.5	1.0	-	2.0	-	3.5		
5	175	Ethanol	0	0.5	1.0	-	-	-	1.5	2.25±	70.0
	160	Herb	0	0.5	1.0	-	-	-	1.5	0.478	
	165	Extract	0	0.5	1.0	-	-	-	1.5	**	
	165	(100mg/kg)	0	0.5	1.0	-	-	-	1.5		
	168		0	0.5	-	1.5	2.0	-	4.0		

	155		0	0.5	1.0	-	2.0	-	3.5		
6	160	Aqueous	0	0.5	-	1.5	2.0	-	4.0	4.0±	46.66
	155	Herb	0	0.5	1.0	1.5	2.0	-	5.0	0.341	
	160	Extract	0	0.5	1.0	-	2.0	-	3.5	**	
	165	(200mg/kg)	0	0.5	1.0	1.5	2.0	-	5.0		
	170		0	0.5	1.0	-	2.0	-	3.5		
	158		0	0.5	1.0	1.5	-	-	3.0		
7	160	Aqueous	0	0.5	1.0	1.5	-	-	3.0	2.58±	65.60
	165	Herb	0	0.5	1.0	1.5	-	-	3.0	0.436	
	155	Extract	0	0.5	-	-	-	-	0.5	**	
	158	(100mg/kg)	0	0.5	1.0	1.5	-	-	3.0		
	165		0	0.5	-	-	2.0	-	2.5		
	170		0	0.5	1.0	-	2.0	-	3.5		

Values are expressed as mean ± SEM (n=6) in each group.

P* < 0.05, *P* < 0.01 compared with the control (ANOVA test)

Determination of free acidity and total acidity effect on free acidity and total acidity

Estification of gastric juice indicated that there was a significant (*p* < 0.01) decrease in the free acidity and

total acidity of the gastric juice in Animals treated with 200 mg/kg and 100 mg/kg of *Opuntia ficus indica* and *Phyllanthus niruri* and was comparable to that of Omeprazole (20 mg/kg) treated group (*p* < 0.01) (Table 4

Table: 4 Effect of herb and herb extracts of *Opuntia ficus indica* and *Phyllanthus niruri* on antisecretory parameters of pylorus ligated rats

Gr. No.	Treatment	Dose (mg/kg b.w.)	Gastric Volume (ml/100g)	pH	Free Acidity (mEq/l/100g)	Total Acidity (mEq/l/100g)
1	Normal Control	-	-	-	-	-
2	Control (Ulcerated)	-	4.86± 0.11	1.7 ± 0.096	73.88± 1.257	155.98± 2.344
3	Omeprazole	20 mg/kg	2.18± 0.079**	5.3 ± 0.141**	26.15± 0.761**	65.11± 0.326**
4	Ethanol Herb Extract	200 mg/kg	4.18± 0.079	2.71± 0.101**	63.58± 0.866**	131.80± 0.435**
5	Ethanol Herb Extract	100 mg/kg	3.08± 0.047**	4.05± 0.084**	46.71± 0.819**	91.30± 0.447**
6	Aqueous Herb Extract	200 mg/kg	3.85± 0.111*	2.85± 0.105**	61± 0.957**	124.46± 0.566**
7	Aqueous Herb Extract	100 mg/kg	3.11± 0.083**	3.08± 0.101**	49.33± 0.539**	98.18± 0.440**

8	Ethanol Herb Extract	250 mg/kg	4.01± 0.070	2.88± 0.047**	58.83± 0.398**	112.25± 0.863**
9	Ethanol Herb Extract	500 mg/kg	3.25± 0.18**	3.53± 0.076**	49.7± 0.364**	90.08± 0.426**
10	Aqueous Herb Extract	250 mg/kg	3.55± 0.042 **	2.9± 0.073**	56.96± 0.683**	106.93± 0.560**
11	Aqueous Herb Extract	500 mg/kg	2.9 ± 0.051**	3.11± 0.166**	48.5± 0.476**	95.23± 0.398**

Values are expressed as mean ± SEM (n=6) in each group.

* $P < 0.05$, ** $P < 0.01$ compared with the control (ANOVA test)

Effect on total proteins

The ethanol and aqueous extracts of herb and herb of *Opuntia ficus indica* and *Phyllanthus niruri* indicated the results that the total protein content was

significantly decreased ($p < 0.01$), in the treated group at 200 and 100 mg/kg when compared to the control (Table 5)

Table: 5 Effect of *Opuntia ficus indica* and *Phyllanthus niruri* herb and herb extracts on total proteins and C/P of pylorus ligated rats

Gr. No.	Treatment	Dose (mg/kg b.w.)	Total Proteins (µg/ml)	C/P
1	Ulcerative Control	-	487.16± 0.792	0.83
2	Omeprazole	20 mg/kg	244.81± 1.249**	4.63
3	Ethanol Herb Extract	200 mg/kg	412.66±0.802**	1.52
4	Ethanol Herb Extract	100 mg/kg	278.82± 0.666**	2.97
5	Aqueous Herb Extract	200 mg/kg	431.16±1.194**	1.43
6	Aqueous Herb Extract	100 mg/kg	310.66±0.560**	2.44
7	Ethanol Herb Extract	250 mg/kg	422.16±0.703**	1.57
8	Ethanol Herb Extract	500 mg/kg	301.66±0.666**	2.55
9	Aqueous Herb Extract	250 mg/kg	435.33±0.802**	1.55
10	Aqueous Herb Extract	500 mg/kg	292.65±0.792**	2.63

Values are expressed as mean \pm SEM (n=6) in each group.

* $P < 0.05$, ** $P < 0.01$ compared with the control (ANOVA test)

Effect on total carbohydrates

Carbohydrates content of *Opuntia ficus indica* and *Phyllanthus niruri* (Linn.) treated group indicated that there was a significant increase ($p < 0.01$) in the total

carbohydrate content at 250 and 500 mg/kg treated group and standard group was comparable to the control group. (Table 6)

Table: 6 Effect of *Opuntia ficus indica* and *Phyllanthus niruri* herb and herb extracts on total carbohydrates of pylorus ligated rats

Gr.No.	Treatment	Dose (mg/kg b.w.)	Total Carbohydrates ($\mu\text{g/ml}$)			
			Total Hexose	Hexosamine	Fucose	Sialic acid
1	Control (Ulcerated)	-	153.5 ± 0.562	166.5 ± 0.562	69.66 ± 0.557	18.83 ± 0.703
2	Omeprazole	20 mg/kg	498.83 $\pm 1.013^{**}$	428.33 $\pm 0.802^{**}$	155.66 $\pm 0.666^{**}$	52.16 $\pm 0.542^{**}$
3	Ethanol Herb Extract	200 mg/kg	286.16 $\pm 0.600^{**}$	222.16 $\pm 0.945^{**}$	81.83 $\pm 0.600^{**}$	38.83 $\pm 0.703^{**}$
4	Ethanol Herb Extract	100 mg/kg	370.45 $\pm 0.392^{**}$	320.66 $\pm 0.402^{**}$	92.64 $\pm 0.569^{**}$	44.36 $\pm 1.636^{**}$
5	Aqueous Herb Extract	200 mg/kg	274.32 $\pm 1.021^{**}$	227.54 $\pm 0.365^{**}$	74.66 $\pm 0.687^{**}$	40.22 $\pm 0.721^{**}$
6	Aqueous Herb Extract	100 mg/kg	332.83 $\pm 1.016^{**}$	298.36 $\pm 0.0324^{**}$	92.65 $\pm 0.709^{**}$	36.22 $\pm 0.333^{**}$
7	Ethanol Herb Extract	250 mg/kg	280.22 $\pm 0.666^{**}$	270.35 $\pm 0.065^{**}$	79.55 $\pm 0.365^{**}$	36.87 $\pm 0.332^{**}$

8	Ethanol Herb Extract	500 mg/kg	335.21 ±0.663**	302.66 ±0.982**	90.66 ±0.709**	40.88 ±0.630**
9	Aqueous Herb Extract	250 mg/kg	287.66 ±0.323**	279.65 ±0.221**	70.36 ±0.666**	39.83 ±0.731**
10	Aqueous Herb Extract	500 mg/kg	350.55 ±0.362**	301.66 ±0.695**	87.25 ±0.321**	32.64 ±1.402**

Values are expressed as mean ± SEM (n=6) in each group.

P* < 0.05, *P* < 0.01 compared with the control (ANOVA test)

Histopathological studies

The control group of rats treated with pylorus ligation induced ulcer showed histopathological changes of the gastric mucosa characterized by loss of glandular architecture, oedema and erosions of the epithelial layer, evident oedema, congestion and infiltration by inflammatory cells. The rats treated with the ethanol

and aqueous extracts at 200 and 100 mg/kg, b.w showed minimum ulceration and oedema but gastric epithelium was not intact. However, at a dose of 200 and 100mg/kg ethanol and aqueous extracts of fruit and herb of *Opuntia ficus indica* and *Phyllanthus niruri*, the rats showed significant regenerative changes indicating healing

Figure: 1 Histopathological studies of the antiulcer activity of *Opuntia ficus indica* and *Phyllanthus niruri* by pylorus ligated ulcer in rats

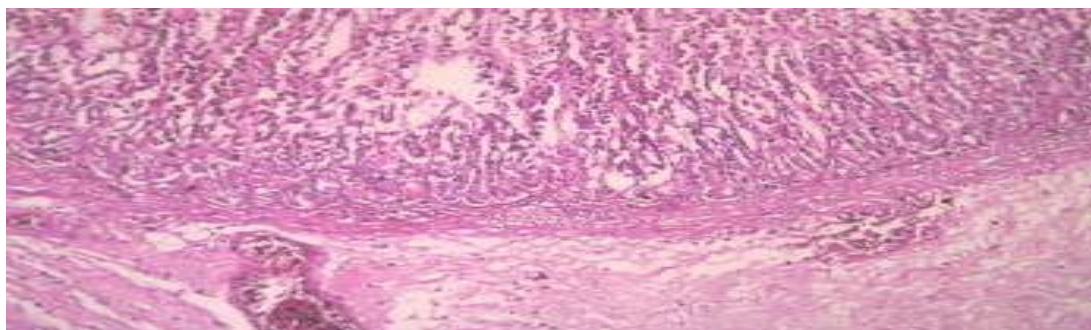


Figure: 2 Section of the stomach of Omeprazole (20 mg/kg b.w) treated group of pylorus ligated ulcer in rats.

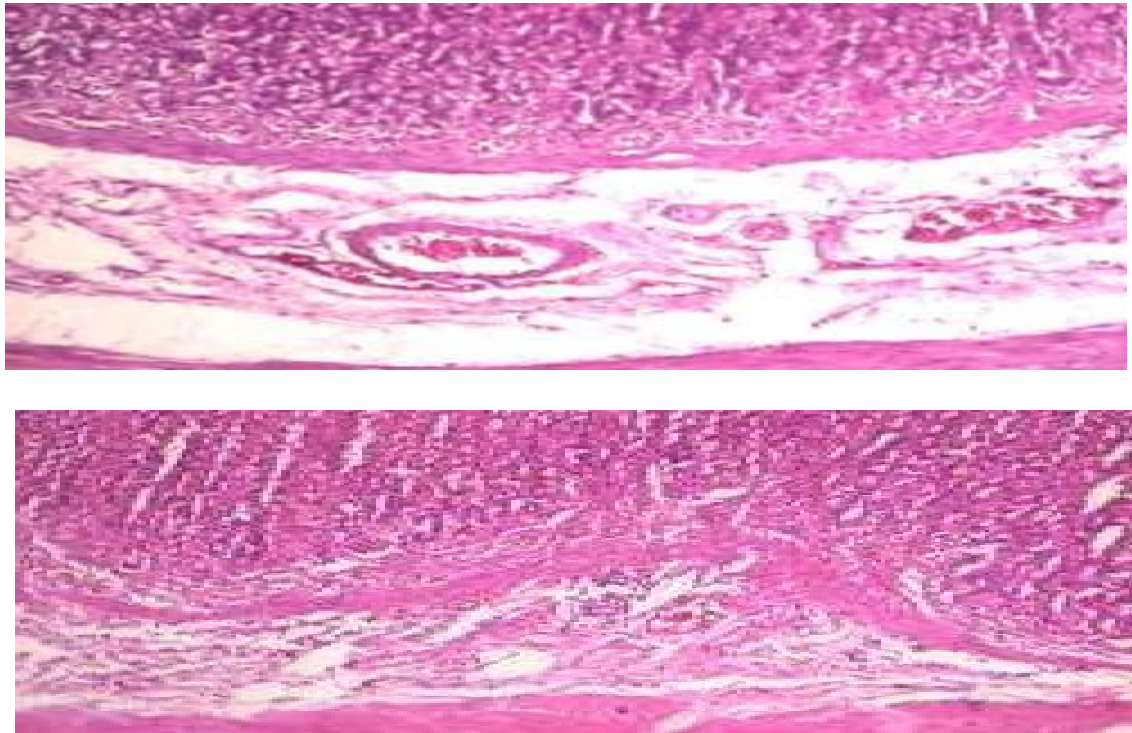


Figure: 3Section of the stomach of ethanol extract of *Opuntia ficus indica* and *Phyllanthus niruri* herb (200 mg/kg b.w) treated group of pylorus ligated ulcer in rats.

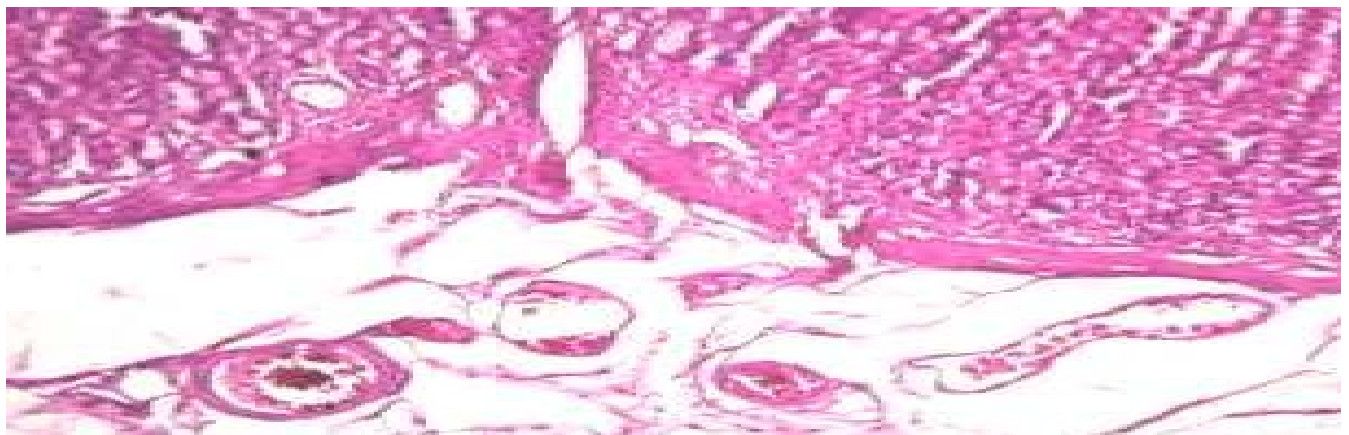


Figure: 4 Section of the stomach of aqueous extract of *Opuntia ficus indica* and *Phyllanthus niruri* herb (100 mg/kg b.w) treated group of pylorus ligated ulcer in rats.



Figure: 5Section of the Stomach of ethanol extract of *Opuntia ficus indica* and *Phyllanthus niruri* herb (200 and 100mg/kg b.w) treated group of pylorus ligated ulcer in rats.



Figure: 6 Section of the stomach of aqueous extract of fruit of *Opuntia ficus indica* and *Phyllanthus niruri* herb (200 and 100mg/kg b.w) treated group of pylorus ligated ulcer in rats.

Conclusion

From the above results it can be inferred that the ethanol extracts of *Phyllanthus Niruri* and *Opuntia ficus-indica* displayed significant anti-ulcer activity. The extracts impart anti-ulcer activity due to presence of polyphenol and flavonoids component. These phytoconstituents scavenge the free radical produce by pylorus ligation and reduced the gastric mucosal damage. Moreover, it also protects the stomach from mucosal injury by inhibiting the succession of gastric ulcers. Accordingly, the anti-ulcer activity of the extracts is referred to the impressive antioxidant properties of the extracts. Additionally, it is also documented that terpenoids heal the ulcer present in stomach, due to the activation of cellular protection, reduction of

mucosal prostaglandins metabolism, cytoprotective action and reduction of gastric vascular permeability. On the basis of phytochemical investigation we also referred that extract contributes antiulcer activity due to terpenoids present in extracts.

References

1. Soladoye MO, Amusa NA, Raji-Esan SO, Chukwuma EC, Taiwo AA (2010). Ethnobotanical survey of anti-cancer plants in Ogun state, Nigeria. *Ann. Biol. Res.* 1(4):261-273.
2. NCI (1999). National Cancer Institute. Cancer Facts. National Institute of Health, Bethesda, Maryland, USA.

3. Fox AM, Gordon DR, Dusky JA, Tyson L, Stocker RK (2005). Cancer, Types and Symptoms. edis.ifes.ufl.edu/st10.
4. Dardi MS, Telang RS, Simarjeet K (2012). Anticancer drugs from plant origin. p6.
5. De Gramont, A., Van Cutsem, E., Schmoll, H.-J., Tabernero, J., Clarke, S., Moore, M.J., Cunningham, D., Cartwright, T.H., Hecht, J.R., Rivera, F., 2012. Bevacizumab plus oxaliplatin-based chemotherapy as adjuvant treatment for colon cancer (AVANT): a phase 3 randomised controlled trial. *The lancet oncology* 13, 1225-1233.
6. Bolarin DM (2009). Cancer: Essentials and Basic Information. Babs-Olatunji Publisher, Nigeria. P 322.
7. Soladoye MO, Amusa NA, Raji-Esan SO, Chukwuma EC, Taiwo AA (2010). Ethnobotanical survey of anti-cancer plants in Ogun state, Nigeria. *Ann. Biol. Res.* 1(4):261-273.
8. Jacques Ferlay, Hai-Rim Shin, Freddie Bray, David Forman, Colin Mathers, Donald Maxwell Parkin, Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008, *International Journal of Cancer*, 127(12), 2010, 2893-2917.
9. Seth Eckhouse, Grant Lewison, Richard Sullivan, Trends in the global funding and activity of cancer research, *Molecular oncology*, 2, 2008, 20-32.
10. Gadhvi NP (2002). Herbal therapy for advanced breast cancer: Personal experience with 100 patients. P 2.
11. Sciences. 2002; 24(1): 12.
12. Imbert TF (1998). Discovery of podophyllotoxins. *Biochemistry* 80:207-212.
13. Konczak I *et al.* (2009). An evaluation of health enhancing compounds. Barton, ACT, Australia: Rural Industries Research and Development Corporation.
14. Haridas V, Nishimura G, Xu ZX, Connolly F, Hanausek M, Walaszek Z (2009). Avicin D: A protein reactive plant isoprenoid dephosphorylates Stat 3 by regulating both kinase and phosphatase activities. *PLoS ONE*. 4:5578.
15. Nassr-Allah AA, Aboul-Enein AM, Aboul-Enein KM, Lightfoot DA, Cocchetto A, El-shemmy HA (2009). Anti-cancer and antioxidant activity of some Egyptian medicinal plants. *J. Med. Plants Res.* 3(10):799-808.
16. Poma A, Miranda M, Spanò L (1998). Differential response of human melanoma and Ehrlich Ascites cells *in vitro* to the ribosome inactivating protein luffin. *Melanoma Res.* 5:465-467.
17. Shoeb M (2006). Anticancer agents from medicinal plants. *Bangladesh J. Pharmacol.* 1:35-41.
18. Nirmala MJ, Samundeeswari A, Sankar PD (2011). Natural plant resources in anti-cancer therapy: A review. *J. Res. Plant Biol.* 1(3):1-14.
19. Guzman M (2003). Cannabinoids: potential anticancer agents. *Nat. Rev. Cancer* 3:745-755.
20. Tang Y, Li X, Liu Z, Simoneau AR, Xie J, Zi X (2010). Flavokawain B, a kava chalcone, induces apoptosis via up-regulation of death-receptor and expression in androgen receptor negative, hormonal refractory prostate cancer cell lines and reduces tumour growth. *Int. J. Cancer* 127:10.
21. Gerber, D.E., 2008. Targeted therapies: a new generation of cancer treatments. *Am Fam Physician* 77, 311-319.
22. Shojaei, F., 2012. Anti-angiogenesis therapy in cancer: current challenges and future perspectives. *Cancer letters* 320, 130-137.
23. Cohen, M.H., Gootenberg, J., Keegan, P., Pazdur, R., 2007. FDA drug approval summary: bevacizumab (Avastin) plus carboplatin and paclitaxel as first-line treatment of advanced/metastatic recurrent nonsquamous non-small cell lung cancer. *The Oncologist* 12, 713-718.
24. Biochemistry and Biotechnology, The Humana Press Inc.
25. Carter, N.J., 2014. Regorafenib: a review of its use in previously treated patients

with progressive metastatic colorectal cancer. *Drugs & aging* 31, 67-78.

26. Scaltriti, M., Baselga, J., 2006. The epidermal growth factor receptor pathway: a model for targeted therapy. *Clinical Cancer Research* 12, 5268-5272.
27. Laurent-Puig, P., Cayre, A., Manceau, G., Buc, E., Bachet, J.-B., Lecomte, T., Rougier, P., Lievre, A., Landi, B., Boige, V., 2009. Analysis of PTEN, BRAF, and EGFR status in determining benefit from cetuximab therapy in wild-type KRAS metastatic colon cancer. *Journal of Clinical Oncology* 27, 5924-5930.
28. Price, T.J., Peeters, M., Kim, T.W., Li, J., Cascinu, S., Ruff, P., Suresh, A.S., Thomas, A., Tjulandin, S., Zhang, K., 2014. Panitumumab versus cetuximab in patients with chemotherapy-refractory wild-type KRAS exon 2 metastatic colorectal cancers.
29. André, T., Boni, C., Mounedji-Boudiaf, L., Navarro, M., Tabernero, J., Hickish, T., Topham, C., Zaninelli, M., Clingan, P., Bridgewater, J., 2004. Oxaliplatin, fluorouracil, and leucovorin as adjuvant treatment for colon cancer. *New England Journal of Medicine* 350, 2343-2351.
30. Chabner, B.A., Roberts, T.G., 2005. Chemotherapy and the war on cancer. *Nature Reviews Cancer* 5, 65-72.

Cite this article as:

Sharma K., Malviya R. and Gupta V. (2022). Anti-ulcer activity of *Phyllanthus Niruri* and *Opuntia Ficus indica* plant extract. *Int. J. of Pharm. & Life Sci.*, 13(3): 1-14.

Source of Support: Nil

Conflict of Interest: Not declared

For reprints contact: ijplsjournal@gmail.com