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EFFECT OF ANTIULCER ACTIVITY OF RAUWOLFIA SERPENTINE (ROOT)

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ABSTRACT

Peptic ulcer disease has been one of the most prevalent gastrointestinal tract disorders in clinical practice for more than a century. Because it affects a large number of individuals worldwide, some researchers believe that Peptic ulcer disease is the new plague of the twenty-first century. Though a variety of medications are already available for treatment, recent discoveries have highlighted the complex pathophysiology of peptic ulcers. However, a significant disadvantage of gastric ulcer therapy nowadays is that the majority of medications on the market have a poor track record of treating stomach disorders and can have toxic side effects or even change the body's biochemical processes when used repeatedly. The current study aims to assess the gastroprotective benefits of Rauvolfia serpentina methanolic root extract against rats that have stomach ulcers induced by Indomethacin.

Despite a great deal of research on ulcers, the exact reason of persistent peptic ulceration remains unknown. It is commonly acknowledged that ulcers arise from an imbalance between aggressive factors and the preservation of mucosal integrity through endogenous defense systems, even if the genesis of the ulcers is unknown in most cases. Plant extracts are among

the various medicinal substances used to restore equilibrium. One such herbal medication that is presently being studied for its potential to treat ulcers is Rauvolfia serpentina root extract.

KEYWORD: *Rauvolfia serpentina***,** Peptic ulcer, Gastroprotective effects.

1. INRTODUCTION

Stomach and duodenal ulcers are examples of the digestive tract ulcers covered by the general term "peptic ulcer." In the past, it was thought that eating spicy food and stress caused this kind of ulcer. But as subsequent studies have demonstrated, these are only the exacerbating circumstances. The underlying reason can be an H. pylori infection or an adverse reaction to specific medications, such as non-steroidal anti-inflammatory drugs (NSAIDs). Pain and discomfort in the abdomen are signs of peptic ulcers. Additional signs and symptoms include bloating, nausea, vomiting, reduced appetite, and weight loss. Some people may also develop dark feces, which are indicative of gastrointestinal bleeding, and blood in their vomit and stools.

The physiological mechanisms that shield the gastric mucosa from acid-pepsin digestion have been dubbed "cytoprotection" in light of the increased focus on the significance of mucosal components in peptic ulcers in recent times. The majority of these cytoprotective strategies are connected to endogenous prostaglandin production, at least somewhat. Peptic ulcers are typically treated medically by neutralizing the acid or by blocking the release of acid. Antacids can be taken to neutralize stomach acid, but their effects are very temporary. Atropine and pirenzipine, two muscarinic antagonists, are efficient inhibitors of the formation of acid. The histamine H_2-receptor antagonist cimetidine, ranitidine and famotidine act as potent inhibitors (70-80%) of acid secretion. Complete inhibition of parietal cells acid secretion by receptor antagonist is difficult because of complexity of known receptors on parietal cells and a variety of second messenger signaling system coupled to these receptors which involve adenylate cyclase coupled with histamine receptor and intracellular Ca^{2+} with acetylcholine receptors.

2. METHODOLOGY

2.1 Selection and Collection of plant material

The plants have been selected on its availability and folk use of the plant. Active secondary metabolites may be found in the bark, leaves, flowers, roots, fruits, and seeds of the plant.

September 2023 saw the collection of fresh and healthy, disease-free plant leaves from the rural area of Raisen (M.P.).

2.2 Drying & Storage

To get rid of any undesired elements or dust particles that are sticking to the plant sample leaves, separate them and give them a wash in sterile distilled water. Fresh plant pieces were dried under cover of shade yet in the sun. Dried roots of *Rauvolfia serpentina* was preserved in plastic bags and closed tightly and powdered as per the requirements.

2.3 Determination of Percentage Yield

The amount of plant extracts recovered in mass during solvent extraction as opposed to the initial sample amount is known as the extraction yield, which is a measurement of the solvent's effectiveness in removing bioactive components from the chosen natural plant samples. Following extraction, the yield of the obtained plant extracts was measured in grams and subsequently converted to a percentage. The following formula was used to calculate the chosen plant materials' percentage yield.

The percentage yield of each extract was calculated by using following formula

$$\textbf{Percentage Yield} = \frac{\text{Weight of Extract}}{\text{Weight of Powder drug taken}} \text{ x } 100$$

2.4 Phytochemical Screening

The *Acacia longifolia* extract acquire was subjected to the precursory phytochemical analysis following standard methods by Khandelwal and Kokate. The extract was screened to identify the presence of various active principles of alkaloids, glycosides, phenols, flavonoids, Terpenoids, Saponins, Steroids.

2.5 Estimation of total Phenolic, flavonoid and alkaloid Content

2.5.1 Total Phenolic content estimation

The total phenolic content of the extract was determined by the modified Folin-Ciocalteu method. 10 mg Gallic acid was dissolved in 10 ml methanol, various aliquots of 5- 25µg/ml was prepared in methanol. 10 mg of dried extracted dissolve in 10 ml methanol and filter. Two ml (1mg/ml) of this extract was for the estimation of phenols. 2 ml of extract or standard was mixed with 1 ml of Folin-Ciocalteu reagent (previously diluted with distilled water 1:10 v/v) and 1 ml (7.5g/l) of sodium carbonate. The mixture was vortexed for 15s and allowed to

stand for 15min for colour development. The absorbance was measured at 765 nm using a spectrophotometer.

2.5.2 Total flavonoids content estimation

Determination of total flavonoids content was based on aluminium chloride method.10 mg quercetin was dissolved in 10 ml methanol, and various aliquots of 5- 25µg/ml were prepared in methanol. 10 mg of extract dissolved in 10 ml methanol and filter. Three (1mg/ml) of this extract was for the estimation of flavonoid. 1 ml of 2% $AlCl_3$ methanolic solution was added to 3 ml of extract or standard and allowed to stand for 15 min at room temperature; absorbance was measured at 420 nm.

2.6 *In Vivo* antiulcer activity

Wistar rats (150–180 g) were group housed (n= 6) under a standard 12 h light/dark cycle and controlled conditions of temperature and humidity (25±2 °C, 55–65%). Rats received standard rodent chow and water *ad libitum*. Rats were acclimatized to laboratory conditions for 7 days before carrying out the experiments. All the experiments were carried in a noise-free room between 08.00 to 15.00 h. Separate group (n=6) of rats was used for each set of experiments. Preliminary experiments were carried out on rats (n=6). A methanolic roots extract of *Rauvolfia serpentine* was administered orally in different doses to find out the range of doses which cause zero and 100 % mortality of animals. Animals were kept fasting providing only water, amoxicillin microspheres were given p.o. in doses of 500, 1000 and 2000 mg/kg/p.o. administered orally for 4 days of six groups of rats (n=6) and the animals were kept under observation for mortality as well as any behaviour changes for evaluation of a possible anti-ulcer effect.

The animals were fasted for 24 h prior to the experiment. Under anaesthesia, ulcers were induced by applying indomethacin (40 mg/kg. p.o.) over the anterior serosal surface of the stomach for 60 seconds. The animals were treated with Cimetidine (10mg/kg, p.o.), low dose of methanolic roots extract *Rauvolfia serpentina* (100mg/kg p.o.) or high dose of methanolic roots extract of *Rauvolfia serpentina* (200mg/kg p.o.) Once daily, for 5 days after the induction of ulcer, while the control group received only the vehicle. The rats were sacrificed on the 5^{th} day, the stomachs removed and cut open along the greater curvature (Khare *et al.*, 2008). The ulcer index was determined using the formula

Ulcer index = 10/X

Where X = Total mucosal area/Total ulcerated area.

Table 2.1: Experimental designs of Indomethacin induced gastric ulcer.

Group	Treatment	Dose
Group-1	Normal control	1% CMC
Group-2	Positive control	1% CMC+ Indomethacin 40 mg/ kg
Group-3	Test group	MRERS (100 mg/kg) + Indomethacin 40 mg/ kg
Group-4	Test group	MRERS 200 mg/kg + Indomethacin 40 mg/ kg
Group-5	Standard group	Cimetidine (10 mg/kg) +Indomethacin 40 mg/kg

3. RESULTS AND DISCUSSION

3.1 Results of percentage yield of *Rauvolfia serpentina*

The ethanol solvents used for extraction of bioactive compounds from *Rauvolfia serpentina*. The percentage yield of methanol extracts of *Rauvolfia serpentina* was calculated and is shown in Table 3.1.

Table 3.1: Results of percentage yield of *Rauvolfia serpentine.*

S.N.	Plant Name	Percentage Yield (%)
1	***Rauvolfia serpentina* methanolic extract**	3.81

3.2 Preliminary phytochemical investigation of the extract

Results obtained from qualitative chemical tests are tabulated in Table 3.2.

Table No. 3.2: Result of Phytochemical screening of *Rauvolfia serpentina* methanolic extract.

S. no.	Constituents	Methanolic extracts
1.	**Alkaloids** Dragendroff's test Wagner's test Mayer's test Hager's test	 **+ve** **+ve** **+ve** **+ve**
2.	**Glycosides** Legal's Test	 **+ve**
3.	**Flavonoids** Lead acetate test Shinoda test	 **+ve** **+ve**
4.	**Phenolics** Ferric Chloride Test	**+ve**
5.	**Saponin** Froth Test	**+ve**
6.	**Tannins** 5% $fecl_3$ test	**+ve**
7.	**Proteins and Amino acids** Xanthoproteic Test Ninhydrin test	 **+ve** **+ve**
8.	**Cabohydrates** **Fehling's Test**	 **+ve**

+ ve – Present, - ve – Absent

3.3 Estimation of Total phenolic and Total flavonoids content

Table 3.3: Estimation of total phenolics and total flavonoids content.

S. No	Extract	Total phenolic content (mg/ml)	Total flavonoids Content (mg/ml)
1	**Methanolic roots extract *Rauvolfia serpentina***	2.31	1.02

3.4 Results of *In Vivo* antiulcer activity

Table 3.4: Anti-ulcerogenic effect of methanolic roots extract *Rauvolfia serpentina* against ulcerogenic agents in rats (Ulcer index).

(INDOMETHACIN INDUCED GASTRIC ULCERS MODEL)

S.N.	Animal (n=6)	Dose and Treatment	Ulcer index
1	**Group 1** Normal control	CMC	0.81±0.25
2	**Group 2** Positive control	CMC +IND	5.2±1.6*
3	**Group 3** Test group	MRERS (100 mg/kg, p.o.) +IND	3.91±0.21**
4	**Group 4** Test group	MRERS (200 mg/kg, p.o.)+IND	2.05±0.11**
5	**Group 5** Standard group	Cimetidine (10 mg/kg, p.o.) +IND	1.69±0.11**

The present study investigated the effect of methanolic roots extract *Rauvolfia serpentine* on the gastric ulcers. methanolic roots extract *Rauvolfia serpentina* showed effect on the healing of gastric ulcers induced by indomethacin. It acts through the inhibition of cell wall biosynthesis that leads to the death of the bacteria. methanolic roots extract *Rauvolfia serpentina* was effective in reducing the ulcer area and the ulcer score. *Rauvolfia serpentina* has an antiulcer effect. It increased healing of indomethacin induced ulcer. The study showed the antiulcer activity of methanolic roots extract *Rauvolfia serpentina* against indomethacin-induced gastric ulcer models. NSAID's are the most common OTC drugs which are used extensively for all types of pain. Indomethacin is a non-selective COX inhibitor, inhibits the arachidonic acid pathway and the formation of protective prostaglandins. Prostaglandins especially PGE-2 and PGI-2 are antiulcerogenic and they play a crucial role in gastric mucus secretion and mucosal blood flow. Apart from that NSAID’s also inhibit mucosal cell proliferation and bicarbonate secretion thereby greatly reducing the integrity of the gastric mucosa. Administration of indomethacin in test groups produced significant visible gastric

erosions, bleeding and necrosis thereby increasing the ulcer index score. Groups pre-treated with methanolic roots extract *Rauvolfia serpentina* showed a significant reduction in the intensity of gastric lesions, and ulcer index score.

CONCLUSION

The results of the phytochemical analysis of Rauwolfia serpentine root extract were established. Alkaloids, carbohydrates, resin, cardiac glycoside, flavonoids, tannins, and saponins were shown to be positive results. A recent study assessed Rauwolfia serpentine root's antiulcer properties. In this study, the oral administration of indomethacin caused the ulcer. The animals with ulcers displayed a decrease in mucosal thickness, a loss of gastric juice, and erosion of the epithelial cells on their surface. Animals given standard medication exhibited no harm at all. Determining the therapeutic efficacy of bioactive chemicals derived from plants requires careful examination and characterization. The methanolic extract's total flavonoid and phenolic content was determined to be 1.02 and 2.31 mg/ml of roots, respectively. Serpentine Rauvolfia. The current study looked into how Rauvolfia serpentina root extract in methanol affected ulcers. The methanolic root extract of Rauvolfia serpentina exhibited a therapeutic effect on indomethacin-induced stomach ulcers. It works by preventing the creation of the cell walls, which kills the bacteria. Rauvolfia serpentina methanolic root extract effectively decreased ulcer area and ulcer score. An antiulcer action is present in Rauvolfia serpentina. It accelerated the healing of ulcers caused by indomethacin.

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