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ORIGINAL ARTICLE

Investigation Into Antioxidant and Antinuclear Effect and Mechanism of Sesamum Indicum Leaves in a Rodent Model

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ABSTRACT

Objective: An ethanolic extract of Sesamum indicum Linn was used to test for phytochemicals, antioxidant activity, and gastroprotective effects.
Study Design: Cross-Sectional Study
Place of Study: Rashid Latif Medical College Lahore.
Duration of Study: July 2021 to March 2022
Materials and methods: This study ulcerated Wister albino rats using pylorus ligation and indomethacin-induced ulcer screening. Ulceration required pylorus ligation. These ulcer screening models were used. An ethanolic S. indicum leaves (EESIL) at 100, 200, and 400 mg/kg (orally for 7 days) was compared against omeprazole, a common ulcer medication. The trial lasted seven days. Throughout the course of the experiment, readings were taken for the following variables: stomach content; pH; total acidity; pepsin activity ulcer score; free acidity; ulcer index (UI); percentage of inhibition of ulcers; mean mucin, pepsin, and total protein content; and ulcer index (UI).
Results: In comparison to the control group, the pylorus ligation model resulted in a decrease in pepsin activity, free acidity, pepsin content, ulcer score, total protein content, and % ulcer inhibition. Moreover, the overall acidity level was lower (P< 0.05 and P< 0.01). EESIL-tested groups had higher mean mucin and stomach content pH (P 0.05 and P 0.01). Both findings are statistically significant. EESIL dosages (100, 200, and 400 mg/kg) had dose-dependent gastroprotective effects. Compared to the control group, stomach metrics like UI and ulcer score dropped significantly (P< 0.05 and P<0.01), gastric pH increased, and ulcer percentage inhibition increased. Increased ulcer inhibition percentage. Moreover, stomach pH increased and ulcer percentage decreased.
Conclusion: Antioxidant, anti-ulcer, EESIL, and EESIL compounds have antioxidant action depending on concentration. Antioxidant is connected. The study found that the EESIL's increased defensive and decreased offensive components increased its antiulcer potential. This was due to the study's revisions. The research's offensive and defensive design caused this.
Keywords: Antioxidant, anti-ulcer, ethanolic extract of sesamum indicum leaves, indomethacin, pylorus ligation, ulcer index

INTRODUCTION

Peptic ulcers are a form of pathological lesion that can develop in any part of the digestive tract that has been subjected to acid and activated pepsin. Peptic ulcers can be caused by both chronic and acute exposure to acid and pepsin. The term "peptic ulcer disease" refers to one of the conditions that affect the greatest number of individuals in today's world (PUD). Because there is a disparity between the components that are protective and the factors that are aggressive, it has become a pervasive threat to the health of people all over the world. Dyspepsia, which includes pain, discomfort, bloating, fullness, nausea, heartburn, and regurgitation, are the general symptoms of gastric ulcers. At this time, the majority of patients who have gastric ulcers require long-term treatment with medications that block gastric acid discharges. PUD is one of the leading causes of preventable death in the United States. An H2-receptor antagonist like ranitidine and a proton-pump inhibitor like pantoprazole are two examples of the types of medications that fall under this category. [4]

The plant with the scientific name Sesamum indicum L. also goes by the common names til, beniseed, gingelly, and sim-sim. It is a member of the Pedaleaceae family. Other common names for the plant include sesamum and gingelly. People have been making use of and learning about this particular oilseed plant for a very long time, making it one of the most well-known and ancient oilseed plants. Although it is widely acknowledged in the academic literature that numerous local cultivars of sesame do exist, it is often assumed that just a single species of the genus Sesamum is capable of being cultivated. [5] The cultivation of sesame seeds for the production of edible oil is the oldest oilseed crop that is known to have been practised by humans. There are many different kinds of sesame, the most majority of which are broad in size. The sub-Saharan region of Africa is home to the vast majority of the widely dispersed varieties that belong to the genus Sesame. It was found out through an extensive range of different types of research that S. India was the country that pioneered the cultivation and discovery of the plant that would later be known as indicum. In order to develop therapies and management methods for ulcers, it is absolutely necessary to recognise phytoconstituents that are derived from plants. This treatment approach for ulcer care and therapy has made use of a wide array of herbal treatments over the course of its history. [6] On the other hand, a complete review of the available research showed that sesame leaves do not possess any antiulcer activity. This conclusion was reached after the leaves were tested. As a consequence of this, we sought to carry out research into the mechanism or mechanisms of action that are responsible for the antioxidant and antiulcer effects of S. indicum leaves extract in experimental rats.

MATERIALS AND METHODS

Extract preparation: fter being given a thorough cleaning, the leaves were allowed to dry in the shade before being ground into a powder. Using an electric blender, a total of 0.5 kilogrammes of air-dried leaves were reduced to a powdery consistency and mashed into a finer consistency. Following the defatting of pulverised leaves (0.5 kg) with petroleum ether using a Soxhlet system, the resulting slurry was filtered, and the residue was air-dried after 24 hours' time. After that, 400 grammes of the defatted and dried residue (out of a total of 0.5 kilogrammes) were subjected to 15 cycles of continuous extraction with one litre of ethanol that had a volume-to-volume ratio of 95% using a Soxhlet apparatus at a temperature ranging from 60 to 70 degrees Celsius. This process was carried out at a temperature of between 60 and 70 degrees Celsius. An extract that had been collected was put through an oven that had a hot air dryer in it so that it could be dried. Following the removal of the fat and the drying of the residue, we were left with a total of 42.3 grammes of extract. After the brownish

extract had been moved into a clean bottle, the bottle was put into a desiccator to ensure that it would remain dry until it was needed again in the future.

In vitro study: Diphenyl-1-picrylhydrazyl assay: We were able to evaluate how effective EESIL was at scavenging free radicals by employing the DPPH test method. [8]

The hydroxyl radical is a particular type of ROS that is exclusive to the biological system and contributes greatly to the potency of the system as a whole. Damage to the cells is brought on by the interaction of the hydroxyl ion with the polyunsaturated fatty acid molecules that are found in the phospholipids of the cell membranes. This interaction is what is known as the "redox reaction." [9]

Phenolic content in extract: The Folin-Ciocalteu method was utilised in order to carry out a colorimetric analysis with the objective of measuring the total quantity of phenolics that were present in the sample. This was done in order to determine whether or not the sample was suitable for consumption. In conjunction with the Folin-Ciocalteu phenol reagent, an aliquot of extract from either the bark or the leaf of the plant was utilised. The volume of the aliquot was 0.3 millilitres. This was done in order to facilitate a comparison of the outcomes (2.25 mL). The solution was stored in 2.25 millilitres (mL) of sodium carbonate that had a concentration of 6%, and it was allowed to sit at room temperature for a period of five minutes after it had been prepared. After that, we let it sit for the advised amount of time, which was one hundred and ten minutes, before continuing. The experiment that was conducted to assess the absorbance of the mixture employed a wavelength of 725 nm as its focal point. The findings were reported as the amount of gallic acid equivalent (GAE) in milligrammes per gramme of isolated material. These values were obtained from a standard calibration curve of gallic acid that covered a concentration range of 0 to 200 mg/mL. [10]

Flavonoid content in extract: After making certain tweaks to the aluminium colorimetric method, the total flavonoid content of the sample was determined using quercetin as the reference standard. A range of quercetin concentrations ranging from 0 to 200 mg/mL was produced so that a calibration curve could be generated from the data. In a nutshell, in two separate test tubes, 0.1 mL of 10% aluminium chloride, 80% methanol, 1 M potassium acetate, and distilled water were added to and mixed with 0.5 mL of standard and 0.5 mL of extract. This was done so that the concentration of both the extract and the standard could be determined more accurately. In order to make a blank, the same technique was carried out; however, 0.5 mL of distilled H2O was used in place of the standard or sample, and the quantity of aluminium chloride was also deducted from the overall amount. After placing each tube in the incubator, it was allowed to remain there at room temperature for a period of thirty minutes. [10]

Experimental animals: Guidelines for Experiments on Animals were adhered to during the entirety of the experiment, including its upkeep. Every animal was kept in a regular husbandry environment that provided them with food, water, and access to any libations they might require.

Acute oral toxicity study: In order to prepare ready for the experiment, the last part of the previous night was spent depriving three adult female albino rats of their usual food supply. This was done in preparation for the experiment. This was done in advance of the experiment so that we would be prepared. After giving each animal a different dose of an ethanolic extract of S. indicum, which ranged from 50 to 2000 mg/kg, the behaviour of the animals was observed continuously for one hour, then at semi-intervals for four hours for any significant change in behaviour, and finally for another 72 hours for any mortality, followed by 14 days for any mortality. The range of the doses used was from 50 to 2000 mg/kg. This was carried out in accordance with Oecd's Guideline 425, which is a document that was developed by an organisation known as the Organization for Economic Co-operation and Development (OECD). [11] Changes in the skin, fur, mucus membrane (nose), eyes, and autonomic salivation, lacrimation, sweat, dilatation of blood vessels, urine incontinence, and faeces) are checked once daily in the cage, as are changes in the central nervous system. Changes in the skin, fur, mucus membrane (nose), eyes, and autonomic salivation, lacrimation, sweat, and dilatation of blood vessels are also checked. Alterations in the skin, fur, mucous membrane (nose), and eyes, as well as autonomic salivation, lacrimation, sweat, and dilatation of blood vessels, are all examined for as well. Changes in the skin, fur, mucus membrane (the nose), and eyes could be symptoms of a more serious condition (tiredness, gait, tremors, and convulsions). According to the findings of study that was carried out on the topic, it is safe to consume leaf extract from S. indicum up to a dosage of 2,000 milligrammes per kilogramme of body weight. As a result of this, the doses of 100, 200, and 400 mg/kg that will be used in the clinical trials of antiulcer medications were decided upon. [11]

Grouping of animals and antiulcer study treatment plan: In every single one of the several versions of the experiment, albino rats were utilised, and those rats were separated into five groups of Five individuals each. The animals had unlimited access to water throughout the twenty-four hour fasting period that came before the testing. This interval was conducted to ensure accurate results. Animals in Group I was given distilled water as a vehicle control. Animals in Groups II, III, and IV were administered EESIL at scaled doses (100, 200, and 400 mg kg1 for 7 days (once daily), respectively). Animals in Group 5 were given omeprazole 20 mg/kg as a control group. The results of this study are presented in the following table.

Pylorus ligation induced ulcers: [Table 1] presents, for the purpose of this model, a classification of the animals in accordance with the level of antiulcer activity that each animal possesses. There were a total of five unique species represented within each of the four categories that were established for the animals to be placed in. The I Group was used as a control and received a dose of saline equivalent to 1 millilitre per kilogramme of body weight. This dose was taken orally. The following amounts of EESIL were respectively given orally to the Groups II, III, and IV: 100 mg kg1, 200 mg kg1, and 400 mg kg1 respectively. The last group received a dose of omeprazole equivalent to 20 milligrammes per kilogramme taken orally. In the thirty-six hours leading up to the pylorus ligation, the animals were fasted so they would not be affected by the procedure. [12] A minute incision was made right below the xiphoid process in order to expose the abdominal cavity of the animal while it was under the influence of ether for the little time that it was under the influence of this substance. After first slightly elevating it, the pyloric region of the stomach was ligated so that it could keep receiving blood supply despite the manipulation. After the stomach had been carefully adjusted in preparation for the treatment, the abdominal wall was then sewed back up. [13] Oral administration of the medication took place not too much longer after the ligation of the pylorus had been performed. After the pylorus ligation had been conducted for a period of six hours, the rats were given an overdose of ether anaesthesia and then shocked. During the postoperative phase, the animals were not permitted to consume any food or water. As the stomach was cut open, a glass jar was placed underneath it to collect any fluids that may have been released. Following the measurement of the total volume of the contents, the sample was put through a centrifuge for 10 minutes at a speed of 2,000 revolutions per minute. In order to evaluate the pH, free acidity, total acidity, and pepsin concentration of the supernatant, aliquots were used in the measuring process (1 ml each). On the other side, we utilised the precipitate, and using that, we were able to determine the total proteins. After determining whether or not any lesions were present in the foregut of each individual stomach, the severity of any lesions that were found was evaluated. [14]

Using the ulcer score for each animal, we were able to determine an ulcer index, which we will refer to as UI from here on out. With the use of the following formula, the UI that existed in the stomach after the pylorus had been ligated could be determined.

Where UI, UP (the proportion of animals that have ulcers), UN (the average number of ulcers associated with one animal), and US (the percentage of animals that have ulcers) are numbers that represent the percentage of animals that have ulcers (average severity score). After performing the calculation necessary to estimate the percentage of ulceration that was prevented, the results were compared to those obtained from the control group.

NSAIDs (indomethacin) induced gastric ulcer: Indomethacin was given to animals orally at 20 mg/kg BW. This dosage was given to the animals exactly one hour after the last dose of the medicine being studied. The rats received nonsteroidal anti-inflammatory medications for six hours of the 10-hour trial (NSAIDs). The rats were then sedated with an overdose of anaesthetic. Dissection followed stomach removal. [15] After dissecting the stomach along its major axis, the interior was cleaned with serum physiological solution (0.9% NaCl) to remove debris. After stomach opening, this was done. After that, the mucosa was peeled to measure the UI, stomach volume, and pH. Each measurement used the stomach. [16]

Statistical analysis: We made use of both the mean and the standard error of the mean in order to adequately convey the assessments that we made on the observable data. In order to make a comparison of the means, a one-way analysis of variance was performed. In order to establish the statistical significance, it was necessary to check that P was lower than 0.05.

RESULTS

Preliminary phytochemicals: In accordance with the procedures that were supplied, the EESIL was subjected to a series of different phytochemical tests. EESIL was found to have a wide range of phytochemicals, which were identified as carbohydrates, flavonoids, glycosides, amino acids, steroids, alkaloids, proteins, and tannins.

Table 1 Grouping of Animals

Groups	Sample size
Control	5
EESIL 100 mg/kg	5
EESIL 200 mg/kg	5
EESIL 400 mg/kg	5
Omeprazole 20 mg/kg	5

EESIL=Ethanolic extract of Sesamum indicum leaves

Table 2: Effect of ethanolic extract of Sesamum indicum leaves on ulcer score, ulcer index and percentage inhibition of ulceration in pylorus ligation model

Treatment	Dose(mg/kg)	Ulcer score	Ulcer index	Percentage inhibition of Ulcers
control	1ml	3.42±0.14	13.67±0.21	
EESIL	100	3.19±0.14	11.58±0.85	24.5±0.4
EESIL	200	2.90±0.13	8.56±0.06	48.0±1.0
EESIL	400	2.02±0.14	2.71±0.26	67.4±2.6
Omeprazole	20	1.26±0.13	1.77±0.21	78.5±2.4

Table 3: Effect of ethanolic extract of Sesamum indicum leaves on mean mucin, pepsin content and total protein content in pylorus ligation model

Treatment	Dose (mg/kg)	Mean mucin (µg/g)	Pepsin content (µmole/mL)	Total protein content (µg/mL)
Control	1 ml	0.890±0.04	37.14±0.23	132.89±1.4
EESIL	100	0.350±0.04	32.39±0.02	130.19±4.50
EESIL	200	0.129±0.02	26.69±0.24	83.20±0.37
EESI	400	0.958±0.02	24.04±0.57	61.88±0.30
Omeprazole	20	1.839±0.04	14.52±0.02	56.55±0.69

Table 4: Effect of ethanolic extract of Sesamum indicum leaves on gastric content, gastric pH, ulcer score and ulcer index in nonsteroidal anti-inflammatory drugs -induced model

Treatment	Dose(mg/kg)	Gastric Content(ml)	Gastric pH	Ulcer score	Ulcer index	Percentage inhibition of ulcers
control	1ml	6.48±0.07	230±0.26	4.34±0.15	15.26±0.27	
EESIL	100	6.45±0.14	295±0.17	3.48±0.28	12.04±0.07	26.7±0.5
EESIL	200	7.01±0.17	2.58±0.01	2.08±0.15	7.68±0.06	46.8±1.5
EESIL	400	7.07±0.15	6.89±0.17	1.45±0.15	2.89±0.66	71.5±2.44
Omeprazole	20	6.14±0.17	5.81±0.17	1.18±0.15	1.67±0.23	87.4±0.2.5

In vitro study (antioxidant assays): Diphenyl-1-picrylhydrazyl activity: To get an idea of how much of an antioxidant impact EESIL has, the DPPH radical technique was performed, and ascorbic acid was utilised as the standard material. This was done in order to get an idea of how much of an impact EESIL has. Depending on how much of the original solution was utilised, the resulting solution can have a concentration that ranges anywhere from 20 to 100 micrograms per millilitre (g/ml). The chemical DPPH, which is a free radical, displays an extraordinarily high degree of stability. This is due to the fact that it contains no electrons. In addition to the antioxidant capabilities of the gold standard (ascorbic acid), the antioxidant capabilities of EESIL are explored in terms of inhibition here (percentage). At a concentration of 100 g/ml, both ascorbic acid and EESIL achieve their greatest inhibitory percentages; these percentages vary from 80.45% to 65.65%. After conducting tests, a concentration of 67.57 micrograms per millilitre was shown to be the half-maximal effective concentration of the extract.

Hydroxyl radical scavenging activity: In order to evaluate the antioxidant capabilities of EESIL, an additional procedure, known as a 4-hydroxyl radical scavenging assay, was carried out. In this particular experiment, ascorbic acid acted as the component that functioned as a benchmark or standard. It's possible for the concentration of the test substances to be anywhere from 250 ng/ml all the way up to 1000 ng/ml. Both ascorbic acid and EESIL had the highest inhibition percentages in 1000 g/ml concentrations, with 85.43% and 69.46% for ascorbic acid and EESIL, respectively. EESIL had the lowest inhibition percentage, with 69.46%. When comparing the antioxidant power of standard and EESIL, the percentage of inhibition is the metric of choice. The half-maximal effective concentration of the extract was determined to be 64.41 micrograms per millilitre.

In-vivo anti-ulcer activity study: The effect of an ethanolic extract of the leaves of Sesamum indicum on a model of gastric ulcers that has a pylorus ligation: For rats whose pyloruses were tied off, the secretion of gastrointestinal content, stomach pH, total acidity, pepsin activity, UI, free acidity, ulcer score, percent ulcer inhibition, pepsin content, mean mucin, and total protein content are reported in , [Table 2], and [Table 3]. The findings are detailed in [Table 2], [Table 3], and [Table 4], respectively. [Table 1] summarises the findings. As contrasted with the first group, not only did the content of the stomach and the UI decrease by a sizeable amount, but so reduced the amount of pepsin activity, free acidity, pepsin content, total acidity, and total protein content (P 0.05 and P 0.01, respectively). On the other hand, all three of the variables—the pH of the gastric content, the mean mucin, and the percentage ulcer inhibition—showed substantial increases (P 0.05 and P 0.01, respectively). The percentages of inhibition showed by EESIL (100, 200, and 400 mg kg1) were respectively 24.5+0.4, 48.0+1.0, and 67.4+2.6, while the percentage of inhibition shown by omeprazole, a traditional drug, was 78.5+2.4. When coupled with omeprazole, EESIL showed evidence of having an antiulcer effect at a dose of 400 mg/kg.

DISCUSSION

It has been shown that S. thermophilus as a gastroprotectant, as well as the antioxidant actions of S. thermophilus. In experimental rats with pyloric ligation and indomethacin-induced stomach ulcers, indicum extract was studied, along with the possible underlying processes that are involved in the actions that these circumstances have. Prior to conducting the pharmacological activity assessment, the preliminary phytochemicals analysis of test extracts (EESIL) was conducted out first. This was done before the pharmacological activity evaluation. PUD is a common illness that manifests in the gastrointestinal tract and can cause a variety of symptoms. Anti-ulcer medications are linked to a sizeable number of undesirable adverse effects [18]. Several plant species have been shown to be beneficial in the treatment of gastroduodenal problems by clinical investigations. These studies have been conducted. The formation of a gastric ulcer can be traced back to an increase in hydrochloric acid (the acid produced by the stomach) that was brought on by stress. An increase in hydrochloric acid output contributes to ulceration because it makes the lumen of the stomach, which is not

protected, more vulnerable to the acid that has built up. This ultimately leads to the development of an ulcer in the stomach .[19]

Auto digestion of the stomach mucosa and degeneration of the wall of the gastric mucosa are the two processes that are responsible for creating damage to the upper gastrointestinal tract. Both of these processes can be caused by conditions such as peptic ulcer disease. Pylorus ligation ulcers are one indication of this illness that can be seen by the naked eye. The growth of lesions, the start of bleeding, and the likelihood of a catastrophic rupture are all examples of these injuries. Stomach ulcers are caused by an accumulation of gastric acid, which happens when there is a blockage in the pyloric aperture of the stomach, causing it to become clogged. This leads to the buildup of gastric acid in the stomach. This condition is referred to as "gastric reflux disease" in the medical field. It may be possible, through the use of some pharmaceuticals, to reduce the amount of acid that is produced by the stomach while simultaneously increasing the quantity of mucus that is secreted. This would be a win-win situation. This would be a situation in which everyone would benefit. If you do this, there is a chance that it will be beneficial in preventing ulcers from developing as a result of the treatment that you are receiving. Omeprazole is an antiulcer medication that, like ranitidine, inhibits pepsin activity and stomach secretion by employing a method that works against the secretary function of the stomach. This is how the medication suppresses pepsin activity and stomach secretion. Pepsin activity and gastric secretion are both lowered as a result of taking this medicine. Another medication that can help reduce the amount of acid produced in the stomach is omeprazole. The digestive effects of retained gastric fluids (including pepsin and gastric acid), the disruption of the normal flow of blood through the stomach, and an increase in the formation of free radicals are the root causes of auto-digestion as well as the disintegration of the stomach wall. Auto-digestion can also be caused when blood flow through the stomach is disrupted, which can cause an increase in the formation of free radicals. [20] When it comes to the prevention of stomach ulcers as a consequence of pyloric ligation, the use of medications that lower the amount of gastric juice that is produced and increase the amount of mucus that is produced may be of value. A greater quantity of mucus is produced as a result of having a pyloric ligation performed. [14] Within the excitable model of pylorus ligation, activation of the pyloric smooth muscle was seen. The findings of this study make it abundantly clear that there is a dose-dependent decrease in the quantity of stomach acid secretion. This was demonstrated by the fact that the amount of acid produced by the stomach decreased. This was the primary finding that came from the research. [15] In the excitable model of the pylorus ligature, activation takes place. According to Pylor's excitable model, which was developed back in the day. [20]

Nonsteroidal anti-inflammatory medications, also known as NSAIDs for their abbreviated form, are one of the pharmacological classes that are prescribed to patients with the highest frequency all over the world. This is because of the medications' ability to reduce pain and inflammation without causing steroidal effects. The phrase "nonsteroidal anti-inflammatory medicine" is frequently abbreviated to "NSAID," which stands for its full name. [21] According to the findings of recent studies, the use of nonsteroidal anti-inflammatory drugs, or NSAIDs for short, is the factor that contributes to the formation of stomach ulcers more frequently than any other factor. Indomethacin, for instance, is an example of an experimental model for the formation of stomach ulcers that is frequently used and is helpful from a therapeutic point of view. This model was developed in the 1950s and has been used to study the disease ever since. This model is utilised for the purpose of researching the effects of various drugs on the mucosal lining of the stomach. For instance, the drug indomethacin is commonly utilised in the laboratory setting and has been shown to be an excellent experimental model for the formation of stomach ulcers.

It is also an appropriate model from a therapeutic standpoint. It accomplishes this by blocking the production of prostaglandins, commencing lipid peroxidation, creating reactive oxygen species (ROS), triggering apoptosis and necrosis in stomach cells, and reducing bicarbonate levels. [22, 25,26] Indomethacin is another example of a medication that has the potential to create ulcers in the stomach. Because it reduces the level of bicarbonate in the stomach, generates reactive oxygen species (ROS), initiates lipid peroxidation, induces stomach cell apoptosis and necrosis, and suppresses the creation of prostaglandins, indomethacin is the cause of gastric ulcers. [23,27,28] Flavonoids are known to possess antioxidative capabilities due to the fact that they are able to bind metal ions such as copper and iron, scavenge free radicals, and inhibit enzymes that are responsible for the generation of free radicals .[24,29]

CONCLUSION

The findings lend support to the idea that EESIL exhibits an antioxidant activity, which may be seen here. The oral delivery of S did not result in any of the observed fatalities that were possible. Indicum was still efficacious even when administered at the maximum dose of 2,000 mg/kg. In the pyloric ligation model, it was found that EESIL greatly suppressed stomach volume, acidity, pepsin activity, ulcer score, UI, pepsin content, and total protein content. This finding was made possible by the fact that EESIL reduced the length of the pyloric ligation. Also, it had a mucin mean, a percentage suppression of ulcers, and a gastric pH. It was found that EESIL was able to considerably raise the pH of the stomach in ethanol-induced ulcers, stop the growth of ulcers, and reduce the quantity of ulcerative inflammation (UI), ulcer score, and gastric content. These results were observed. It was found that EESIL significantly improved stomach pH and prevented a significant percentage of ulcers in patients with indomethacin-induced ulcers, all while reducing the amount of gastric content, score, and index. This was seen to be the case in both instances. The findings of the study revealed that the EESIL possessed greater antiulcer capability as a consequence of a reduction in the number of offensive factors and an increase in the number of defensive aspects. These changes were brought about as a direct result of the investigation.

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